Four Housing Courts
Lansdowne Road
London

Combined Geotechnical and Ground Contamination Risk Assessment Report

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EXECUTIVE SUMMARY

The following presents a summary of the main findings of the report. 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.

The development proposals are understood to comprise the construction of a mixture of apartment blocks and houses, including associated areas of private garden and communal soft landscaping, together with the provision of new play areas at four housing courts located at Lansdowne Road, London.

Reference to geological datasets indicates that the site is expected to be underlain by the Enfield Silt Member over the Kempton Park Gravel Member, overlying the London Clay Formation. The ground investigation confirmed the underlying soils to comprise a variable and locally significant thickness of made ground, overlying the Enfield Silt Member and, in turn, Kempton Park Gravel Member deposits. The cable percussion boreholes encountered the London Clay Formation soils beneath the superficial deposits.

The Enfield Silt Member and London Clay Formation are both classed as Unproductive Strata. The Kempton Park Gravel Member is classed as a Secondary A Aquifer. Though the majority of Arundel Court does not lie within a SPZ, the western end lies within an Outer zone – SPZ2. Baldewyne Court, Fiske Court and Ashdowne Court do not lie within a SPZ. Groundwater was encountered at depths of between 0.99m and 2.60m during the intrusive works and subsequent monitoring visits.

Precautions against shrinkage and heave for any new foundation system should assume a high volume change potential for the fine-grained soils. The undisturbed sand and gravel soils of the Kempton Park Gravel Member may be considered to be non-plastic and hence non-shrinkable.

A net allowable bearing capacity of 100kN/m^2 may be assumed for spread (pad or strip) foundations up to 1.00m across bearing within the within the Enfield Silt Member soils of at least firm consistency or Kempton Park Gravel Member soils of at least medium dense relative density, typically encountered at depths of below 1.00m and 2.40m below ground level.

In view of the locally significant depth of made ground soils, localised soft/loose soils and presence of soils of high volume change potential consideration may need to be given to adopting a piled foundation solution. 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 made ground, Enfield Silt Member and/or Kempton Park Gravel Member soils. For concrete in contact with the London Clay Formation a DS-2 and an AC-2 ACEC classification should be assumed, although if these soils were to be significantly disturbed during construction activities, a higher DS-4 and AC-4 classification should be assumed.

Ground floors should be suspended unless the conditions set out within this report can be met.

Design equilibrium California bearing ratios and moduli of subgrade reaction are presented in the report. The subgrade is not likely to be susceptible to frost heave.

The investigation works have identified complete pollutant linkages at each court, and remedial works will be required as part of the development to reduce the risk to end users to an acceptable level.

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1. INTRODUCTION

It is proposed to undertake development work within four housing courts (Baldewyne Court, Arundel Court, Fiske Court and Ashdowne Court) located along Lansdowne Road, London.

The development proposals are understood to comprise the construction of a mixture of apartment blocks and houses, including associated areas of private garden and communal soft landscaping, together with the provision of new play areas. The existing residential blocks at each of the courts are to be retained. Copies of the proposed development layouts for each court are presented in Appendix A.

Three Phase 1 Desk Study reports assessing the four housing court sites (a single report covering both Arundel and Baldewyne Court and individual reports for each of Fiske and Ashdowne Court) have been prepared by RSK Geosciences[1]. These reports identified a number of potential contamination linkages and recommended that intrusive site investigation works and quantitative contamination risk assessments be undertaken. Each report also provided an initial geotechnical assessment, all recommending intrusive geotechnical site investigation works should be undertaken.

Ashdown Site Investigation Ltd was requested to undertake a ground investigation and to provide advice to assist with the structural design as well as carry out a quantitative contamination risk assessment.

The specific objectives of the works were to:
a) Establish the expected geology and hydrogeology at the site;
b) Investigate the ground and groundwater conditions in the areas of proposed development;
c) Provide advice to assist others in undertaking design of foundations, ground floors and road pavements;
d) Test for the presence of contaminants identified by the preliminary conceptual model;
e) Develop a quantitative conceptual model of the site, refining the preliminary model to identify any pollutant linkages that may be present; and
f) Provide an indicative assessment of the waste classification of the materials tested.

The scope of the works covered by this report, and the terms and conditions under which they were undertaken, were set out within the offer letter Q13071, dated 16th May 2023. The works were undertaken under purchase order: 3400056427 provided by the client, Haringey Council.

[1] RSK Geosciences Report Refs. 1921836-01(00), 1921836-02(00) and 1921836-03(00), all dated August 2021.

2. SITE CONTEXT

2.1 Site Location

The four housing courts are located on Lansdowne Road, Tottenham, London, and are centred on the approximate Ordnance Survey national grid reference 534268, 190682. The stretch of Lansdowne Road on which the four housing courts are situated runs in an approximate east-west direction.

Baldewyne Court is located on the southern side of Lansdowne Road, between residential dwellings on Burlington Road to the west and Cromberdale Court to the east.

Arundel Court is located opposite Baldewyne Court on the northern side of Lansdowne Road, between Horsham Court to the west and housing on Baronet Road to the east.

Fiske Court and Ashdowne Court are also situated opposite one another, further along Lansdowne Road to the east. Fiske Court is located on the northern side of Lansdowne Road, between Baronet Road to the west and St Paul's Road to the east, with Ashdowne Court located on the southern side, between Spencer Road to the west and Tilson Road to the east.

A site location plan and site plans of each of the courts are presented as Figure 1 and Figures 2a to 2d, respectively.

Each of the courts comprises apartment blocks with associated areas of communal soft landscaping, areas of car parking and rows of small single-storey domestic garages.

2.2 Geological and Hydrogeological Data

2.2.1 Expected Geology and Aquifer Designation

The stratigraphic succession that may be expected to underlie the site has been established by reference to British Geological Survey (BGS) mapping and the BGS Lexicon of Named Rock Units. The expected stratigraphy is presented in the following table.

Table 1. Expected Strata and Aquifer Designation

Type	Stratum	Aquifer Designation
Superficial	Enfield Silt Member	Unproductive Stratum
	Kempton Park Gravel Member	Secondary A Aquifer
Bedrock	London Clay Formation	Unproductive Stratum

The Enfield Silt Member generally comprises soft structure-less sandy clay and silt with variable gravel content. The material may have been reworked by water flow to produce some lateral variability in the grain size of the soil. Where it has not been reworked by river action, it may be subject to significant collapse in volume where it is affected by water flow. The formation is recorded by the BGS to range in thickness between 1m and 5m, averaging 2m and to overlie the river terrace deposits.

The Kempton Park Gravel Member forms part of the river terrace gravel associated with the Thames. It typically comprises sand, derived mainly from the Tertiary beds, together with gravel

of sub angular flint, chert and Lower Greensand rock types. The formation is recorded by the BGS to have an average thickness of around 6m, although it may be deeper where infilling deep hollows.

The London Clay Formation mainly comprises bioturbated or poorly laminated, blue-grey or grey-brown, slightly calcareous, silty clay and sometimes clayey silt, with some layers of sandy clay. It commonly contains thin courses of carbonate concretions ('cementstone nodules') and disseminated pyrite. It also includes a few thin beds of shells and fine sand partings or pockets of sand, which commonly increase towards the base and towards the top of the formation. At the base, and at some other levels, thin beds of black rounded flint gravel occurs in places. Glauconite is present in some of the sands and in some clay beds, and white mica occurs at some levels. The formation is recorded by the BGS to range in thickness up to 150m.

2.2.2 Groundwater Source Protection Zones (SPZ)

The Environment Agency defines SPZs as those areas where groundwater supplies are at risk from potentially polluting activities and accidental releases of pollutants. SPZs are primarily a policy tool used to control activities close to water supplies intended for human consumption.

Though the majority of Arundel Court does not lie within a SPZ, the western end lies within an Outer zone – SPZ2. Baldewyne Court, Fiske Court and Ashdowne Court do not lie within a SPZ.

3. SITE WORKS

3.1 Introduction

The intrusive site works comprised a series of cable percussion boreholes, dynamic sampler boreholes and hand dug pits, together with accompanying in situ geotechnical testing. The intrusive work was carried out between 14th August 2023 and 21st August 2023. The exploratory hole locations are shown on Figures 2a-2d.

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

3.2 Exploratory Holes

The following tables summarise the intrusive works undertaken at the site.

Table 2. Summary of Intrusive Works Undertaken (Baldewyne Court)

Designation	Depth (m bgl)	Method
BH01	15.00	Cable Percussion Borehole
WS01	1.90	Dynamic Sampler Borehole
WS02	3.00	Dynamic Sampler Borehole
WS03	1.70	Dynamic Sampler Borehole
TP01	0.80	Hand Dug Pit
TP02	0.55	Hand Dug Pit
TP03	0.95	Hand Dug Pit
TP04	0.60	Hand Dug Pit

Table 3. Summary of Intrusive Works Undertaken (Arundel Court)

Designation	Depth (m bgl)	Method
BH02	25.00	Cable Percussion Borehole
WS04	2.00	Dynamic Sampler Borehole
WS05	2.20	Dynamic Sampler Borehole
WS06	3.00	Dynamic Sampler Borehole
TP06	0.70	Hand Dug Pit

Table 4. Summary of Intrusive Works Undertaken (Fiske Court)

Designation	Depth (m bgl)	Method
WS07	3.00	Dynamic Sampler Borehole
WS08	3.00	Dynamic Sampler Borehole
WS09	3.00	Dynamic Sampler Borehole
WS10	3.00	Dynamic Sampler Borehole

Table 5. Summary of Intrusive Works Undertaken (Ashdowne Court)

Designation	Depth (m bgl)	Method
BH03	15.00	Cable Percussion Borehole
WS11	3.00	Dynamic Sampler Borehole
WS12	3.00	Dynamic Sampler Borehole
TP05	0.60	Hand Dug Pit

3.3 Sampling

Samples of soil were taken from the exploratory holes at the depths shown in the exploratory hole records. The types of samples taken are indicated on the exploratory hole records. Details on the sample types are provided in the explanatory notes.

Where appropriate, samples 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.

3.4 In Situ Strength Testing

The positions, types and 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. Further details on the in situ testing methods are provided in the explanatory notes.

3.5 Installations

Gas and groundwater monitoring standpipes were installed to depths of between 1.50m and 3.00m in boreholes WS02, WS04, WS09 and WS12 (one at each of the courts). Descriptions of the installations are shown on the exploratory hole records.

The concentrations of gases and depths to groundwater were recorded within the standpipes on three occasions between 29th August 2023 and 12th September 2023. The readings are presented in Appendix B.

3.6 Laboratory Testing

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

Geotechnical testing was undertaken by Ashdown Site Investigation Ltd.

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

4. GROUND CONDITIONS

4.1 Stratigraphy

4.1.1 Surface Covering

In general, each of the exploratory holes was excavated through a surface cover of asphalt and/or concrete some 30mm to 200mm in thickness.

Boreholes WS02, WS04, WS05 and WS12 and trial pits TP01 to TP06 were all excavated through an initial surface cover of topsoil.

4.1.2 Made Ground

Made ground, generally comprising gravelly sandy silty clay and/or gravelly sand/sandy gravel, was recorded within each of the boreholes to depths of between 0.80m and 1.90m below ground level, and to the full depth of each of the trial pits. The gravel fraction comprised variable quantities of flint, brick, concrete, ash/clinker-like material, organic material, bituminous material, chalk, mortar, wood, glass, plastic, ceramic, litter, slate, tile, bone fragments and metal. At times occasional cobbles of brick, concrete and flint were also noted.

Within borehole WS02, fragments of asbestos containing material (ACM) were recorded within the shallow made ground between 0.05m and 0.40m below ground level.

4.1.3 Enfield Silt Member

Underlying the made ground, boreholes BH01, BH03, WS02 to WS04 and WS06 to WS12 progressed into undisturbed, slightly gravelly, slightly sandy to sandy, silty clay deposits. These soils were recorded to the full depth (3.00m) of boreholes WS02 and WS09, and to depths of between 1.10m and 2.70m below ground level in the remaining boreholes.

These deposits were generally recorded as firm and stiff, and occasionally as very stiff. However, when encountered within borehole WS06, between depths of 1.00m and 2.20m below ground level they were recorded as soft to firm. Similarly, when encountered within borehole WS11, between depths of 1.00m and 2.40m below ground level, the deposits were recorded as very soft to soft (rare organic material also being noted).

These deposits are considered to represent the Enfield Silt Member indicated to underlie the site on BGS geological maps.

4.1.4 Kempton Park Gravel Member

Beneath the made ground and/or Enfield Silt Member deposits, where penetrated, the boreholes encountered very sandy gravels and very gravelly sands. These soils were recorded to the full depth of the dynamic sampler boreholes, and to depths of between 3.20m and 5.60m below ground level within the cable percussion boreholes.

Generally, these coarse-grained soils were recorded as medium dense varying dense and very dense. Locally loose soils were noted within borehole WS08 at depths of between 2.10m and 2.40m below ground level.

These deposits are considered to represent the Kempton Park Gravel Member indicated to underlie the Enfield Silt Member on BGS geological maps.

4.1.5 London Clay Formation

The cable percussion boreholes progressed through the Kempton Park Gravel Member deposits into firm to stiff, becoming stiff and very stiff clay deposits. Locally thin claystone bands were encountered at depth.

These deposits are considered to represent the London Clay Formation indicated to be present beneath the superficial deposits on BGS geological maps.

4.2 Stability

Temporary steel casing was installed to depths of between 4.00m and 8.00m below ground level to maintain the stability of the cable percussion boreholes BH01 to BH03 during boring.

Instability was recorded locally, particularly within the coarser grained soils, during drilling and excavation of the shallower exploratory holes.

4.3 Groundwater Conditions

The shallow hand dug pits TP01 to TP06 and the cable percussion boreholes, which were cased through the superficial deposits, remained dry during drilling/excavation.

Groundwater was recorded at depths of between 0.99m and 2.60m below ground level within the uncased dynamic sampler boreholes during drilling and during subsequent monitoring visits.

5. GEOTECHNICAL ASSESSMENT

The geotechnical assessment has been prepared in connection with the development proposals shown on the drawings included in Appendix A.

In summary, the proposed development is understood to comprise the construction of additional residential buildings replacing some of the existing garages and parking areas. New parking areas, soft landscaped areas, cycle/refuse stores and play/amenity areas are also proposed.

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

5.1 Foundations

5.1.1 Soil Shrinkage/Heave Potential

The fine-grained soils of the made ground, Enfield Silt Member and London Clay Formation have been classified as clays, and with modified plasticity indices in the range of 4% to 59%, the soils may be expected to exhibit up to a high volume change potential.

It is recommended that the design of precautions against shrinkage and heave for any new foundation system (spread footings, piles, pile caps and ground beams etc.) should assume a high volume change potential for the fine-grained soils and take into account current guidance such as that given by the Building Research Establishment (BRE)[2] or the National House Builders Council (NHBC)[3].

The undisturbed sand and gravel soils of the Kempton Park Gravel Member may be considered to be non-plastic and hence non-shrinkable.

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. Detailed foundation design, including assessment of foundation type, minimum founding depths for spread foundations, requirements for sleeving or reinforcing of piled foundations and requirements for placement of void formers et cetera, should take into account the findings of this report and the presence of trees (previous, present and proposed). In connection with the latter, it is recommended that an arboricultural survey of the site that identifies the species and maturity of the existing or any recently felled trees in the areas of the proposed new buildings should be provided to engineers responsible for the foundation design. Information on proposed planting schemes that may affect foundation design should also be provided.

5.1.2 Spread Foundations

5.1.2.1 Foundation Depths for Spread Foundations

Foundations should be constructed to bear below soils that are likely to be affected by significant soil volume changes caused by seasonal changes in moisture content to avoid damage to foundations that could otherwise arise. In addition, all made ground and any soils disturbed by the construction or removal of any previously existing foundations or services should be regarded as being variable in nature and state of compaction and, as such, unsuitable as a founding

[2] www.bre.co.uk : BRE Digests 240, 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.
[3] http://www.nhbc.co.uk/ : NHBC Standards, Chapter 4.2.

medium for shallow footings. New footings should be constructed so as to bear below made ground/disturbed natural soils and soil subject to seasonal soil volume changes, whichever is the deeper, and onto undisturbed, competent, natural deposits.

Summary guidance on suitable minimum foundation depths to protect against the effects of seasonal soil volume changes is presented in the table below but designers undertaking detailed design of foundations should follow the detailed guidance provided within Chapter 4.2 of the NHBC Standards.

Table 6. Indicative Minimum Foundation Depths

Tree Type	Water Demand of Tree	Tree Distance to Tree Height Ratio (D/H)									
		0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.80	1.00	1.25
		Minimum Foundation Depth Required in High Volume Change Potential Soils (m)									
Broad Leaf	High	†					2.50	2.30	1.90	1.50	1.00*
	Moderate	2.40	2.25	2.05	1.85	1.65	1.50	1.30	1.00*	1.00*	1.00*
	Low	1.80	1.65	1.50	1.35	1.20	1.00*	1.00*	1.00*	1.00*	1.00*
Coniferous	High	†			2.20	1.80	1.40	1.00*	1.00*	1.00*	1.00*
	Moderate	2.40	2.00	1.60	1.20	1.00*	1.00*	1.00*	1.00*	1.00*	1.00*

* Minimum foundation depth required to protect against soil volume changes.
† Foundations deeper than 2.50m require specialist design to protect against soil volume changes.

Where specialist foundation design is required (foundation depths exceeding the maximum permitted by the guidance) then piled foundations are likely to be needed, though commercial considerations may also dictate that piled foundations may be more economic even in comparison with conventional spread foundations constructed to depths less than the maximum permitted by guidance.

Details on the water demand and mature height of common trees is given within Table 3 of Chapter 4.2 of the NHBC standards which should be referred to when assessing minimum foundation depths required for the proposed development. A summary is provided in the table below.

Table 7. Indicative Summary of Water Demand and Mature Height of Common Trees

Tree Type	High Water Demand		Moderate Water Demand		Low Water Demand	
	Tree	Height (m)	Tree	Height (m)	Tree	Height (m)
Broad Leaf	Elm	18 – 24*	Acacia	18	Birch	14
	Oak	16 – 24*	Alder	18	Elder	10
	Poplar	15 – 28*	Apple	10	Fig	8
	Willow	16 – 24*	Ash	11 – 23*	Hazel	8
	Eucalyptus	18	Laurel	10	Holly	12
	Hawthorn	10	Beech	20	Honey Locust	14
			Blackthorn	8	Hornbeam	17
			Cherry	8 – 17*	Laburnum	12
			Chestnut	20 – 24*	Magnolia	9
			Lime	22	Mulberry	9

Tree Type	High Water Demand		Moderate Water Demand		Low Water Demand	
	Tree	Height (m)	Tree	Height (m)	Tree	Height (m)
			Maple	8 – 18*	Tulip Tree	20
			Pear	12		
			Plane	26		
			Plum	10		
			Sycamore	22		
			Tree of Heaven	20		
			Walnut	18		
			Whitebeam	12		
Coniferous	Cypress	18 – 20*	Cedar	20		
			Douglas Fir	20		
			Larch	20		
			Monkey Puzzle	18		
			Pine	20		
			Spruce	18		
			Wellingtonia	30		
			Yew	12		

* Dependent on particular species.

5.1.2.2 Bearing Capacity for Spread Foundations

For design purposes, a net allowable bearing capacity of 100kN/m^2 may be assumed for spread (pad or strip) foundations up to 1.00m across bearing within the Enfield Silt Member soils of at least firm consistency or Kempton Park Gravel Member soils of at least medium dense relative density. The quoted bearing capacity is expected to limit settlement to less than 25mm.

Attention is drawn to the presence of interbedded fine-grained soils and coarse-grained soils beneath the site. As there is the potential for mixed soil conditions to be present beneath footings, designers should consider the need for foundations to be reinforced due to the potential for differential cracking to develop as a result of coarse-grained and fine-grained soils settling at different rates under loading.

Care must be taken to ensure that new foundations do not undermine or impose additional loading (vertical or lateral) on existing foundations. Similarly, the construction of new foundations should be undertaken carefully and monitored in those situations where temporary works could affect existing foundations.

Localised very soft to soft and loose soils were recorded locally to depths of between 2.20m and 2.40m within boreholes WS06 (Arundel Court) WS08 (Fiske Court) and WS11 (Ashdown Court). It is therefore recommended that if spread foundations are to be adopted, the foundation formations should be inspected by suitably qualified persons and additional in situ testing undertaken to confirm that soils of firm consistency or medium dense relative density (or better) are present at and below formation level.

5.1.3 Piled Foundations

It is considered that the Kempton Park Gravel Member and underlying London Clay Formation 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 at relatively shallow depth, potential relict structural obstructions and/or naturally occurring hard strata that were recorded during excavation of the boreholes. In connection with the latter, attention is drawn to the use of chiselling techniques required to advance boreholes BH01 and BH03 through claystone bands. 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 through the very dense sands and gravel and very stiff clays would prove difficult and could 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.

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 and locally soft Enfield Silt Member soils to a depth of 3.00m, over medium dense sand and gravels, and in turn, below a depth of 5.00m progressing into stiff clays (Cu of 75kPa) becoming very stiff (Cu of 150kPa) below a depth of 15.00m has been adopted. Groundwater has been assumed to be present at a depth of 1.00m below ground level.

In view of the variable and locally significant depth of made ground, presence of localised soft soils and soils of high volume change potential, for the purpose of the preliminary calculation, the benefit of shaft resistance within the upper 3m has been discounted.

Table 8. Indicative Axially Loaded Pile Working Capacities

Working Loads of Piles (kN)			
Length (m)	**Diameter (mm)**		
	250	**300**	**450**
10	60	75	130
15	105	130	205
20	200	245	395

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 3.0m has been discounted.

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.

5.2 Ground Floors

In view of the variable thickness of made ground and the presence of soils of high volume change potential underlying the site, it is recommended that ground floors should be suspended.

Current guidance[4] suggests that ground bearing floor slabs may, however, be considered where:

1. All made ground is removed from beneath the building footprint;
2. The depth of foundations required to protect against seasonal soil volume changes close to trees is less than 1.5m; and
3. Further works demonstrate that close to the time of construction, no significant soil desiccation is present.

Where the above criteria cannot be met ground floors should be suspended.

If ground bearing floors are adopted it is recommended that the potential for differential movement, both between the floor slab and walls and across the floor slab itself, should be anticipated. Such floors should be fully debonded from walls. Formations should be adequately proof rolled and any excessively soft materials excavated and replaced with a suitable, well graded granular fill. The depth of any fill should be limited to a maximum of 600mm unless placed to an engineering specification designed to limit internal settlement of the fill materials to a tolerance to be advised by the designer. The detailing of services through, or under, ground-bearing floors should incorporate flexible connections and, where appropriate, enhanced falls.

5.3 Groundwater

Groundwater was recorded between depths of 0.99m and 2.60m below ground level on completion of the exploratory holes and over the monitoring period. Whilst several exploratory holes were dry during the short period of the intrusive works, it should be noted that water levels within the exploratory holes may not have equilibrated with the groundwater table at the time the readings were recorded and that groundwater levels should be expected to fluctuate seasonally.

Where excavations are proposed to extend below the groundwater table, particularly within coarse-grained soils, groundwater control will be required to maintain adequately dry working conditions and excavation stability. In such circumstances it is recommended that trial pumping from proposed formation depths should be undertaken in advance of detailed design to fully establish requirements for groundwater control at this site.

[4] http://www.nhbc.co.uk/ : NHBC Standards, Chapter 4.2.

5.4 Stability of Excavations

All made ground or coarse-grained natural soils 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. All excavations should be suitably supported.

All excavations requiring human entry must be shored as necessary to conform to current best practice, as accepted by the Health and Safety Executive (HSE)[5]. 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.

5.5 Aggressivity to Concrete

The aggressivity of the soils to concrete has been assessed in accordance with guidance published by the BRE[6].

In consideration of the site context, 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 noted occurrence of groundwater, 'mobile groundwater' conditions should be assumed.

The soils present beneath the site may be expected to contain sulphides which if exposed to air and water, and potentially bacterial action, may oxidise and convert into sulphates. The sulphides are significantly more likely to oxidise in ground that has been significantly disturbed, for example by cutting and filling as part of earthworks or by excavation and backfilling. Ground that is not disturbed beyond the cut face (e.g. piling operations or excavation without backfill) would not generally be considered by the guidance as being disturbed ground. Where disturbed ground is likely to result from construction activities a Design Sulfate Class based on the total potential sulphate should be adopted.

The following table summarises the characteristic values indicated from the chemical analysis of the soils present beneath the site.

[5] Relevant guidance is given on the HSE website, www.hse.gov.uk
[6] BRE Special Digest 1:2005 Concrete in Aggressive Ground.

Table 9. Assessment of the Chemical Analysis of the Soil

	Made Ground, Enfield Silt Member and Kempton Park Gravel Member			London Clay Formation		
	Characteristic Value	**Design Sulfate Class**	**ACEC Classification**	**Characteristic Value**	**Design Sulfate Class**	**ACEC Classification**
pH	7.0	-	-	7.8	-	-
Water Soluble Sulphate (mg/l as SO4) *	100	DS-1	AC-1	600	DS-2	AC-2
Total Potential Sulphate (TPS % SO4)	No Oxidisable Sulphides	N/A	N/A	5.3	DS-5	AC-5

Notes: * Characteristic value rounded to nearest 100. Where the characteristic water-soluble sulphate is a Design Sulfate Class of DS-3 or less and the characteristic total potential sulphate indicates a DS-5 Class, the Design Sulfate Class may be limited to DS-4.

In accordance with the guidance, 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 made ground, Enfield Silt Member and/or Kempton Park Gravel Member soils.

For concrete in contact with the London Clay Formation soils a DS-2 Design Sulfate Class and an AC-2 ACEC classification should be assumed where the London Clay Formation soils will not be significantly disturbed. Where the London Clay Formation soils will be disturbed during construction activities, a higher DS-4 and AC-4 classification should be assumed.

5.6 Pavement Design

Current guidance[7] suggests that pavement design should be based on the design subgrade surface modulus, determined as being equal to the lower of the short-term subgrade modulus and the long-term subgrade modulus. The subgrade surface modulus can be related to California bearing ratio using the formula, $E = 17.6(CBR)^{0.64}$, where E is the subgrade modulus expressed in MPa.

Cone penetrometer tests were undertaken to establish the California bearing ratio (CBR) of the in situ soils at the time of the investigation. The range of values determined is presented on the test result records within Appendix B, and the table and graphs contained within Appendix D. A summary of the in situ test data is presented below. It is noted that in situ CBR values are, in part, dependent on the moisture content of the tested soils and are consequently subject to seasonal variation.

Table 10. In Situ CBR Values (At Time of Ground Investigation Works)

	CBR (%)	**Modulus of Subgrade Reaction E (MPa)**
Minimum	2.9	35.1
Average	25.3	129.7
Maximum	114.7	366.0

[7] Highways England Design Manual for Roads and Bridges CD 225 Rev1; Design for new pavement foundations.

	CBR (%)	Modulus of Subgrade Reaction E (MPa)
10%ile	6.6	59.1
20%ile	10.1	77.1
50%ile (Median)	17.3	108.9

Equilibrium CBR values can be derived from knowledge of soil classification data (plasticity index for soils exhibiting cohesion (clay type) and particle size distribution for granular soils) and pavement thickness. Historical guidance[8] suggests the following design equilibrium CBR values would be applicable to the Enfield Silt Member soils and derived made ground for the construction of pavement. The subgrade moduli calculated from these design equilibrium CBR values can be reasonably considered to be representative of long-term subgrade modulus using the formula given above.

Table 11. Long-term CBR Values

Stratum		Design Equilibrium CBR Value (%)		†Modulus of Subgrade Reaction E (MPa)
		Thin Road* Pavement	Thick Road* Pavement	
Fine grained Enfield Silt Member and Derived Made Ground	**Minimum**	2.2	2.7	28.7
	Average	3.2	4.3	36.8
	Maximum	3.8	5.7	41.4
Coarse Grained Kempton Park Gravel Member Soils		20	20	119.7

* Thin pavement being 300mm sub-base, thick pavement being 1200mm sub-base. †Modulus based on average of all calculated moduli based on CBR values for thin sub-base.

Designers will need to select an appropriate design equilibrium CBR value / modulus of subgrade reaction taking account of proposed pavement thickness, expected winter groundwater conditions, the standard to which pavement is to be designed and any local authority or other regulatory/warrantor requirements together with construction conditions likely to prevail at the time of construction.

The subgrade may be assumed not to be susceptible to frost heave.

[8] Highways England Design Manual for Roads and Bridges Interim Advice Note 73/09 Rev1; now withdrawn.

6. QUANTITATIVE CONTAMINATION ASSESSMENT

6.1 Baldewyne Court

The proposed development works in this court comprise the construction of apartment blocks in the north eastern and north western corners of the site, with new areas of communal soft landscaping around the blocks. New play areas and an outdoor gym are proposed to be built along the southern boundary of the site.

6.1.1 Preliminary Conceptual Model

A copy of the preliminary conceptual model for Baldewyne and Arundel Courts, taken from the RSK report, is presented in Appendix E.

6.1.2 Assessment Strategy

The investigation works in this court comprised one cable percussion borehole and three dynamic sampler boreholes along the northern edge of the site and four trial pits along the southern edge of the site. Samples of the underlying made ground encountered were tested for a range of heavy metals, PAH compounds, petroleum hydrocarbons and asbestos.

To assess the potential risk identified from ground gases, standpipes were installed across all four blocks and were monitored on 3 occasions.

6.1.3 Selection of Soil Screening Values

For the assessment of risk to end users, comparison of the results of the laboratory testing has been made against published soil screening values (SSV) comprising the 'Suitable For Use Levels' (S4UL)[9] or, in lieu of an S4UL being developed for lead, the Category 4 Screening Level (C4SL)[10].

In view of the development proposal, the SSV utilised in this assessment are those calculated for the generic 'Public Open Space near Residential Housing' (POS_{resi}) land use.

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.

[9] Nathanail, C.P, et al., The LQM/CIEH S4ULs for Human Health Risk Assessment, 2015, Land Quality Press, Nottingham. Copyright Land Quality Management Limited reproduced with permission; Publication Number S4UL3071.
[10] SP1010: Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination. Final Project Report, published by DEFRA, 2014.

6.1.4 Heavy Metals & Polycyclic Aromatic Hydrocarbon (PAH) Compounds

The following table summarises the SSV along with the maximum and minimum concentrations of the heavy metals and PAH compounds tested for.

Table 12. Summary of Test Results – Heavy Metals and PAH Compounds

Contaminant	SSV (mg/kg)	No. of Samples	Minimum Concentration (mg/kg)	Maximum concentration (mg/kg)	Limit of Detection (mg/kg)	No of exceedances
Arsenic	79	8	6	22	< 2	0
Water Soluble Boron	21000	8	<LOD	1.8	< 1	0
Cadmium	120	8	<LOD	0.6	< 0.2	0
Chromium	1500	8	8	25	< 2	0
Hexavalent Chromium	7.7	8	<LOD	<LOD	< 2	0
Copper	12000	8	19	100	< 4	0
Lead	630	8	156	764	< 3	1
Mercury	120	8	<LOD	<LOD	< 1	0
Nickel	230	8	7	25	< 3	0
Selenium	1100	8	<LOD	<LOD	< 3	0
Zinc	81000	8	87	246	< 3	0
Naphthalene	4900	8	<LOD	<LOD	< 0.1	0
Acenaphthylene	15000	8	<LOD	<LOD	< 0.1	0
Acenaphthene	15000	8	<LOD	<LOD	< 0.1	0
Fluorene	9900	8	<LOD	<LOD	< 0.1	0
Phenanthrene	3100	8	<LOD	0.47	< 0.1	0
Anthracene	74000	8	<LOD	<LOD	< 0.1	0
Fluoranthene	3100	8	<LOD	1.18	< 0.1	0
Pyrene	7400	8	<LOD	1.06	< 0.1	0
Benz(a)anthracene	29	8	<LOD	0.67	< 0.1	0
Chrysene	57	8	<LOD	0.63	< 0.1	0
Benzo(b)fluoranthene	7.1	8	<LOD	0.77	< 0.1	0
Benzo(k)fluoranthene	190	8	<LOD	0.22	< 0.1	0
Benzo(a)pyrene	5.7	8	<LOD	0.64	< 0.1	0
Indeno(123-cd)pyrene	82	8	<LOD	0.41	< 0.1	0
Dibenz(ah)anthracene	0.57	8	<LOD	<LOD	< 0.1	0
Benzo(ghi)perylene	640	8	<LOD	0.37	< 0.1	0

One of the samples has recorded a concentration of lead above the SSV. None of the remaining contaminants were recorded at concentrations above their respective SSV.

6.1.5 Asbestos

Five of the eight samples screened have recorded the presence of amosite asbestos, recorded to be present as fibre bundles and microscopic pieces of board. A discrete piece of suspected asbestos insultation board, taken from borehole WS02, was also confirmed to contain amosite asbestos.

6.1.6 Petroleum Hydrocarbons

The following table lists the SSV for petroleum hydrocarbon equivalent carbon weight fractions and BTEX compounds calculated for 1% organic content.

Table 13. SSV for petroleum hydrocarbon equivalent carbon weight fractions

Petroleum Hydrocarbon Fraction	SSV (mg/kg)	Petroleum Hydrocarbon Fraction	SSV (mg/kg)
Aliphatic EC 5-6	570000	Aromatic EC 5-7	56000
Aliphatic EC >6-8	600000	Aromatic EC >7-8	56000
Aliphatic EC >8-10	13000	Aromatic EC >8-10	5000
Aliphatic EC >10-12	13000	Aromatic EC >10-12	5000
Aliphatic EC >12-16	13000	Aromatic EC >12-16	5100
Aliphatic EC >16-35	250000	Aromatic EC >16-21	3800
Aliphatic EC >35-44	250000	Aromatic EC >21-35	3800
		Aromatic EC >35-44	3800

Whilst full speciation of the concentrations of petroleum hydrocarbons by aromatic and aliphatic fractions was not undertaken, 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, it can be reasonably concluded that no significant risk is present.

None of the samples recorded concentrations of individual petroleum hydrocarbon weight fractions above the more conservative SSV.

Comparison of the test results for petroleum hydrocarbons has been undertaken with the threshold value for PE water supply pipework[11]. The concentrations recorded do not exceed the threshold values.

6.1.7 Baldewyne Court – Conclusions

The shallow soils beneath the site have been recorded to contain concentrations of lead above the SSV and amosite asbestos has been found in multiple locations, including within existing soft covered areas.

Remedial works will be necessary to reduce the risk to proposed end users of the development to an acceptable level.

In the context of the site and proposed development works, the concentrations of contaminants recorded are not considered to pose an unacceptable risk to controlled waters.

[11] 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.

6.2 Arundel Court

The proposed development works in this court comprise the construction of three apartment blocks along the southern boundary, with new areas of communal soft landscaping provided around the blocks. A new play area is proposed in the north eastern corner of the site.

6.2.1 Preliminary Conceptual Model

A copy of the preliminary conceptual model for Baldewyne and Arundel Courts, taken from the RSK report, is presented in Appendix E.

6.2.2 Assessment Strategy

The investigation works in this court comprised one cable percussion borehole and three dynamic sampler boreholes along the southern boundary of the site, and a trial pit in the north eastern corner of the site. Samples of the underlying made ground encountered were tested for a range of heavy metals, PAH compounds, petroleum hydrocarbons and asbestos. A sample from WS04, located adjacent to the electricity sub-station in the south west of the site, was tested for concentrations of PCB.

To assess the potential risk identified from ground gases, standpipes were installed across all four blocks and were monitored on 3 occasions.

6.2.3 Selection of Soil Screening Values

In view of the development proposal, the SSV utilised in this assessment are those calculated for the generic 'Public Open Space near Residential Housing' (POS_{resi}) land use.

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.

6.2.4 Heavy Metals & Polycyclic Aromatic Hydrocarbon (PAH) Compounds

The following table summarises the SSV along with the maximum and minimum concentrations of the heavy metals and PAH compounds tested for.

Table 14. Summary of Test Results – Heavy Metals and PAH Compounds

Contaminant	SSV (mg/kg)	No. of Samples	Minimum Concentration (mg/kg)	Maximum concentration (mg/kg)	Limit of Detection (mg/kg)	No of exceedances
Arsenic	79	5	12	17	< 2	0
Water Soluble Boron	21000	5	<LOD	<LOD	< 1	0
Cadmium	120	5	<LOD	0.5	< 0.2	0
Chromium	1500	5	19	23	< 2	0
Hexavalent Chromium	7.7	5	<LOD	<LOD	< 2	0
Copper	12000	5	28	136	< 4	0
Lead	630	5	178	349	< 3	0

Contaminant	SSV (mg/kg)	No. of Samples	Minimum Concentration (mg/kg)	Maximum concentration (mg/kg)	Limit of Detection (mg/kg)	No of exceedances
Mercury	120	5	<LOD	1.3	< 1	0
Nickel	230	5	12	20	< 3	0
Selenium	1100	5	<LOD	<LOD	< 3	0
Zinc	81000	5	93	272	< 3	0
Naphthalene	4900	5	<LOD	0.22	< 0.1	0
Acenaphthylene	15000	5	<LOD	<LOD	< 0.1	0
Acenaphthene	15000	5	<LOD	0.27	< 0.1	0
Fluorene	9900	5	<LOD	0.2	< 0.1	0
Phenanthrene	3100	5	<LOD	1.99	< 0.1	0
Anthracene	74000	5	<LOD	0.55	< 0.1	0
Fluoranthene	3100	5	<LOD	3.58	< 0.1	0
Pyrene	7400	5	<LOD	3.03	< 0.1	0
Benz(a)anthracene	29	5	<LOD	1.99	< 0.1	0
Chrysene	57	5	<LOD	1.87	< 0.1	0
Benzo(b)fluoranthene	7.1	5	<LOD	1.87	< 0.1	0
Benzo(k)fluoranthene	190	5	<LOD	0.65	< 0.1	0
Benzo(a)pyrene	5.7	5	<LOD	1.72	< 0.1	0
Indeno(123-cd)pyrene	82	5	<LOD	0.91	< 0.1	0
Dibenz(ah)anthracene	0.57	5	<LOD	0.21	< 0.1	0
Benzo(ghi)perylene	640	5	<LOD	0.76	< 0.1	0

None of the samples recorded concentrations of heavy metals or PAH compounds above their respective SSV.

6.2.5 Asbestos

The sample from TP06, excavated in the north east of the site in the location of the proposed play area, was recorded to contain amosite asbestos present as fibre bundles.

6.2.6 Petroleum Hydrocarbons

The following table lists the SSV for petroleum hydrocarbon equivalent carbon weight fractions and BTEX compounds calculated for 1% organic content.

Table 15. SSV for petroleum hydrocarbon equivalent carbon weight fractions

Petroleum Hydrocarbon Fraction	SSV (mg/kg)	Petroleum Hydrocarbon Fraction	SSV (mg/kg)
Aliphatic EC 5-6	570000	Aromatic EC 5-7	56000
Aliphatic EC >6-8	600000	Aromatic EC >7-8	56000
Aliphatic EC >8-10	13000	Aromatic EC >8-10	5000
Aliphatic EC >10-12	13000	Aromatic EC >10-12	5000
Aliphatic EC >12-16	13000	Aromatic EC >12-16	5100
Aliphatic EC >16-35	250000	Aromatic EC >16-21	3800
Aliphatic EC >35-44	250000	Aromatic EC >21-35	3800
		Aromatic EC >35-44	3800

Whilst full speciation of the concentrations of petroleum hydrocarbons by aromatic and aliphatic fractions was not undertaken, 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, it can be reasonably concluded that no significant risk is present.

None of the samples recorded concentrations of individual petroleum hydrocarbon weight fractions above the more conservative SSV.

Comparison of the test results for petroleum hydrocarbons has been undertaken with the threshold value for PE water supply pipework. The concentrations recorded do not exceed the threshold values.

6.2.7 Polycyclic Biphenyls

The sample from borehole WS04 did not record concentrations of PCB above the limit of detection for the test.

6.2.8 Arundel Court – Conclusions

As asbestos materials have been recorded in the existing area of soft landscaping in the north east of the site, it should be assumed that remedial works are necessary to reduce the risk to end users to an acceptable level.

In the context of the site and proposed development works, the concentrations of contaminants recorded are not considered to pose an unacceptable risk to controlled waters.

6.3 Fiske Court

The proposed development works in this court comprise the demolition of a row of garages along the northern boundary and the construction of houses with private gardens.

6.3.1 Preliminary Conceptual Model

A copy of the preliminary conceptual model for Fiske Courts, taken from the RSK report, is presented in Appendix E.

6.3.2 Assessment Strategy

The investigation works in this court comprised four dynamic sampler boreholes along the northern edge of the site. Samples of the underlying made ground encountered were tested for a range of heavy metals, PAH compounds, petroleum hydrocarbons and asbestos. A sample from borehole WS10, located close to the electricity sub-station in the north east of the site, was tested for concentrations of PCB.

To assess the potential risk identified from ground gases, standpipes were installed across all four blocks and were monitored on 3 occasions.

6.3.3 Selection of Soil Screening Values

In view of the development proposal, the SSV utilised in this assessment are those calculated for the generic "Residential with homegrown produce" land use.

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.

6.3.4 Heavy Metals & Polycyclic Aromatic Hydrocarbon (PAH) Compounds

The following table summarises the SSV along with the maximum and minimum concentrations of the heavy metals and PAH compounds tested for.

Table 16. Summary of Test Results – Heavy Metals and PAH Compounds

Contaminant	SSV (mg/kg)	No. of Samples	Minimum Concentration (mg/kg)	Maximum concentration (mg/kg)	Limit of Detection (mg/kg)	No of exceedances
Arsenic	37	5	8	34	< 2	0
Water Soluble Boron	290	5	<LOD	3.1	< 1	0
Cadmium	11	5	0.3	2.3	< 0.2	0
Chromium	910	5	24	34	< 2	0
Hexavalent Chromium	6	5	<LOD	<LOD	< 2	0
Copper	2400	5	29	261	< 4	0
Lead	200	5	62	1590	< 3	4
Mercury	40	5	<LOD	1.3	< 1	0
Nickel	180	5	22	37	< 3	0

Contaminant	SSV (mg/kg)	No. of Samples	Minimum Concentration (mg/kg)	Maximum concentration (mg/kg)	Limit of Detection (mg/kg)	No of exceedances
Selenium	250	5	<LOD	<LOD	< 3	0
Zinc	3700	5	280	1830	< 3	0
Naphthalene	2.3	5	<LOD	<LOD	< 0.1	0
Acenaphthylene	170	5	<LOD	<LOD	< 0.1	0
Acenaphthene	210	5	<LOD	<LOD	< 0.1	0
Fluorene	170	5	<LOD	<LOD	< 0.1	0
Phenanthrene	95	5	<LOD	1.21	< 0.1	0
Anthracene	2400	5	<LOD	0.17	< 0.1	0
Fluoranthene	280	5	<LOD	2.42	< 0.1	0
Pyrene	620	5	<LOD	2.09	< 0.1	0
Benz(a)anthracene	7.2	5	<LOD	1.14	< 0.1	0
Chrysene	15	5	<LOD	1.24	< 0.1	0
Benzo(b)fluoranthene	2.6	5	<LOD	1.68	< 0.1	0
Benzo(k)fluoranthene	77	5	<LOD	0.39	< 0.1	0
Benzo(a)pyrene	2.2	5	<LOD	1.26	< 0.1	0
Indeno(123-cd)pyrene	27	5	<LOD	0.82	< 0.1	0
Dibenz(ah)anthracene	0.24	5	<LOD	0.2	< 0.1	0
Benzo(ghi)perylene	320	5	<LOD	0.76	< 0.1	0

Four of the five samples recorded concentrations of lead above the SSV. None of the remaining contaminants were recorded at concentrations above their respective SSV.

6.3.5 Asbestos

None of the five samples recorded the presence of any asbestos materials.

6.3.6 Petroleum Hydrocarbons

The following table lists the SSV for petroleum hydrocarbon equivalent carbon weight fractions and BTEX compounds calculated for 1% organic content.

Table 17. SSV 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	70
Aliphatic EC >6-8	100	Aromatic EC >7-8	130
Aliphatic EC >8-10	27	Aromatic EC >8-10	34
Aliphatic EC >10-12	130	Aromatic EC >10-12	74
Aliphatic EC >12-16	1100	Aromatic EC >12-16	140
Aliphatic EC >16-35	65000	Aromatic EC >16-21	260
Aliphatic EC >35-44	65000	Aromatic EC >21-35	1100
		Aromatic EC >35-44	1100

Whilst full speciation of the concentrations of petroleum hydrocarbons by aromatic and aliphatic fractions was not undertaken, 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, it can be reasonably concluded that no significant risk is present.

None of the samples recorded concentrations of individual petroleum hydrocarbon weight fractions above the more conservative SSV.

Comparison of the test results for petroleum hydrocarbons has been undertaken with the threshold value for PE water supply pipework. The concentrations recorded do not exceed the threshold values.

6.3.7 Polycyclic Biphenyls

The sample from borehole WS10 did not record concentrations of PCB above the limit of detection for the test.

6.3.8 Fiske Court – Conclusions

The shallow soils beneath the site have been recorded to contain concentrations of lead above the SSV.

Remedial works will be necessary to reduce the risk to proposed end users of the development to an acceptable level.

In the context of the site and proposed development works, the concentrations of contaminants recorded are not considered to pose an unacceptable risk to controlled waters.

6.4 Ashdowne Court

The proposed development works in this court comprise the construction of new houses with private gardens in the south western corner of the site, along with new areas of parking and communal soft landscaping in the south east.

6.4.1 Preliminary Conceptual Model

A copy of the preliminary conceptual model for Ashdowne Court, taken from the RSK report, is presented in Appendix E.

6.4.2 Assessment Strategy

The investigation works in this court comprised one cable percussion borehole and two dynamic sampler boreholes in the south west of the site where the new houses are proposed, along with a trial pit on the eastern side of the site where new areas of car parking and soft landscaping are proposed. Samples of the underlying made ground encountered were tested for a range of heavy metals, PAH compounds, petroleum hydrocarbons and asbestos.

To assess the potential risk identified from ground gases, standpipes were installed across all four blocks and were monitored on 3 occasions.

6.4.3 Selection of Soil Screening Values

For the assessment of risk to end users, comparison of the results of the laboratory testing has been made against published soil screening values (SSV) comprising the 'Suitable For Use Levels' (S4UL)[12] or, in lieu of an S4UL being developed for lead, the Category 4 Screening Level (C4SL)[13].

In view of the development proposal, the SSV utilised in this assessment are those calculated for the generic "Residential with homegrown produce" land use.

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.

6.4.4 Heavy Metals & Polycyclic Aromatic Hydrocarbon (PAH) Compounds

The following table summarises the SSV along with the maximum and minimum concentrations of the heavy metals and PAH compounds tested for.

Table 18. Summary of Test Results – Heavy Metals and PAH Compounds

[12] Nathanail, C.P, et al., The LQM/CIEH S4ULs for Human Health Risk Assessment, 2015, Land Quality Press, Nottingham. Copyright Land Quality Management Limited reproduced with permission; Publication Number S4UL3071.
[13] SP1010: Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination. Final Project Report, published by DEFRA, 2014.

Contaminant	SSV (mg/kg)	No. of Samples	Minimum Concentration (mg/kg)	Maximum concentration (mg/kg)	Limit of Detection (mg/kg)	No of exceedances
Arsenic	37	5	14	29	< 2	0
Water Soluble Boron	290	5	<LOD	<LOD	< 1	0
Cadmium	11	5	<LOD	1.8	< 0.2	0
Chromium	910	4	14	36	< 2	0
Hexavalent Chromium	6	4	<LOD	<LOD	< 2	0
Copper	2400	4	21	192	< 4	0
Lead	200	4	25	1100	< 3	2
Mercury	40	4	<LOD	<LOD	< 1	0
Nickel	180	4	19	34	< 3	0
Selenium	250	4	<LOD	<LOD	< 3	0
Zinc	3700	4	66	1960	< 3	0
Naphthalene	2.3	4	<LOD	0.28	< 0.1	0
Acenaphthylene	170	4	<LOD	<LOD	< 0.1	0
Acenaphthene	210	4	<LOD	0.34	< 0.1	0
Fluorene	170	4	<LOD	0.23	< 0.1	0
Phenanthrene	95	4	<LOD	3.57	< 0.1	0
Anthracene	2400	4	<LOD	0.86	< 0.1	0
Fluoranthene	280	4	<LOD	6.47	< 0.1	0
Pyrene	620	4	<LOD	5.59	< 0.1	0
Benz(a)anthracene	7.2	4	<LOD	2.9	< 0.1	0
Chrysene	15	4	<LOD	2.85	< 0.1	0
Benzo(b)fluoranthene	2.6	4	<LOD	3.41	< 0.1	1
Benzo(k)fluoranthene	77	4	<LOD	1.21	< 0.1	0
Benzo(a)pyrene	2.2	4	<LOD	2.96	< 0.1	1
Indeno(123-cd)pyrene	27	4	<LOD	1.92	< 0.1	0
Dibenz(ah)anthracene	0.24	4	<LOD	0.47	< 0.1	2
Benzo(ghi)perylene	320	4	<LOD	1.61	< 0.1	0

Samples of the shallow soils have recorded concentrations of lead and multiple PAH compounds above their respective SSV.

6.4.5 Asbestos

None of the four samples screened recorded the presence of any asbestos materials.

6.4.6 Petroleum Hydrocarbons

The following table lists the SSV for petroleum hydrocarbon equivalent carbon weight fractions and BTEX compounds calculated for 1% organic content.

Table 19. SSV 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	70
Aliphatic EC >6-8	100	Aromatic EC >7-8	130
Aliphatic EC >8-10	27	Aromatic EC >8-10	34

Petroleum Hydrocarbon Fraction	SSV (mg/kg)	Petroleum Hydrocarbon Fraction	SSV (mg/kg)
Aliphatic EC >10-12	130	Aromatic EC >10-12	74
Aliphatic EC >12-16	1100	Aromatic EC >12-16	140
Aliphatic EC >16-35	65000	Aromatic EC >16-21	260
Aliphatic EC >35-44	65000	Aromatic EC >21-35	1100
		Aromatic EC >35-44	1100

Whilst full speciation of the concentrations of petroleum hydrocarbons by aromatic and aliphatic fractions was not undertaken, 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, it can be reasonably concluded that no significant risk is present.

None of the samples recorded concentrations of individual petroleum hydrocarbon weight fractions above the more conservative SSV.

Comparison of the test results for petroleum hydrocarbons has been undertaken with the threshold value for PE water supply pipework. The concentrations recorded exceed the threshold value for the use of PE water supply pipe.

6.4.7 Ashdown Court – Conclusions

The shallow soils beneath the site have been recorded to contain concentrations of lead and PAH compounds above the SSV. The concentrations of petroleum hydrocarbons recorded exceed the threshold for use of PE water supply pipe.

Remedial works will be necessary to reduce the risk to proposed end users of the development to an acceptable level.

In the context of the site and proposed development works, the concentrations of contaminants recorded are not considered to pose an unacceptable risk to controlled waters.

6.5 Analysis of Ground Gas Monitoring Results

Monitoring of the gas concentrations within the four gas monitoring standpipes installed across the four courts was carried out on three occasions.

Atmospheric pressures varied between 1010 and 1018 during the monitoring period. Monitoring was carried out during periods of both rising and falling atmospheric pressure.

Assessment of the results of the monitoring has been carried out in general accordance with the current guidance[14].

The guidance provides a methodology for assessing the risk from ground gases by the calculation of site-specific gas screening values (GSV) for carbon dioxide and methane. These are calculated by multiplying the concentration (percentage/volume) of a gas by a gas flow rate (l/hr).

[14] CIRIA document C665, Assessing risks posed by hazardous ground gases to buildings, 2007.

The assessment has been carried out by calculating the GSV using the highest consistent flow rate recorded multiplied by the highest gas concentration recorded. This is considered to represent a highly conservative assessment of the risk posed by ground gases.

Where no detectable gas concentrations or flow rates are recorded, the GSV are calculated assuming values equal to the limit of detection of the instrument are present.

The peak concentration of carbon dioxide recorded was 6.0% by volume. No detectable concentrations of methane or gas flow rates were recorded.

The following table summarises the calculated GSV:

Table 20. Calculated GSV for Carbon Dioxide and Methane

Gas	GSV
Carbon Dioxide	0.06 x 0.1 = 0.006
Methane	0.001 x 0.1 = 0.0001

For sites that do not fall within the definition of "typical" 2 storey housing, Table 8.5 of the CIRIA document sets out a series of "Characteristic Situations" for different GSV, with Table 8.6 providing guidance on the degree of protection required for each situation.

The calculated GSV place the site within Characteristic Situation 1. No specific gas protection measures are required for this situation.

It is noted that the maximum concentration of carbon dioxide in one of the standpipes (WS09) exceeded 5.0%. The guidance suggests where carbon dioxide concentrations of over 5.0% are recorded, that consideration is given to whether or not the Characteristic Assessment level indicated by the GSV should be increased.

The potential source of ground gases identified by the desk study reports were two very small ponds; one measuring ~5m in diameter, the other ~5m by 20m. These were present on the northern edge of Arundel Court and encroaching into the south eastern corner of Baldewyne Court, respectively, on the 1864 map, but were no longer shown by the time of the 1896 revision, by which time the site and surrounding area had been heavily developed for housing. Given the very small size of the ponds and the significant time since they were no longer shown, the gas generation potential of these features is negligible.

During the monitoring period none of the standpipes recorded any detectable gas flow rates and the higher gas concentrations were only found in one standpipe.

In view of the above, the conclusion of the assessment in line with the calculated GSV is considered to be appropriate, and no specific gas protection measures are considered to be necessary to mitigate risk from ground gases.

6.6 Quantitative Contamination Risk Assessment

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[15].

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 F.

Table 21. 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

6.6.1 Contaminant Pathways Identified

The development is to comprise new residential buildings together with areas of private garden and communal soft landscaping.

Pathways associated with gas and vapour intrusion into new buildings are considered to be valid, along with direct contact and dust related pathways and, in those areas where private gardens are proposed, pathways associated with the consumption of home grown produce.

Should the proposed development plans be altered, a revised risk assessment may be required.

It is noted that an asbestos survey of existing structures and infrastructure[16] was beyond the brief of this report. The risk assessment assumes that, should asbestos be identified within any buildings or infrastructure that are to be demolished as part of the development works, any such materials will be managed in accordance with current legislation and guidance, to ensure this does not represent an ongoing risk to end users and, specifically, to ensure that asbestos materials are not introduced into the underlying soils.

The site has been recorded to be underlain by the Enfield Silt Member and Kempton Park Gravel, which are in turn underlain by the London Clay Formation.

While the Kempton Park Gravel is classed as a Secondary A Aquifer, the Enfield Silt and the London Clay Formation are classed as Unproductive Strata. The western edge of Arundel Court lies within an Outer Source Protection Zone. However, this is expected to relate to the more

[15] Contaminated Land Risk Assessment: A guide to good practice, CIRIA C552, 2001.
[16] As defined under Section 5(a) of the Control of Asbestos Regulations, 2012.

permeable Lambeth Group and White Chalk Sub Group which would be anticipated to be present beneath the London Clay Formation.

Given the heavily urbanised nature of the site, the shallow aquifer is not considered to be a sensitive resource and therefore viable pathways linking potential contamination on the site with sensitive groundwater are not considered to be present.

6.6.2 Contamination Sources Identified

The following sources of contamination have been identified by the quantitative contamination risk assessment:

Baldewyne Court

- Made Ground containing asbestos and concentrations of lead above the SSV.

Arundel Court

- Made Ground containing asbestos.

Fiske Court

- Made Ground containing concentrations of lead above the SSV.

Ashdowne Court

- Made Ground containing concentrations of lead and PAH compounds above the SSV and concentrations of petroleum hydrocarbons above the threshold value for use of PE water supply pipe.

6.6.3 Quantitative Conceptual Model

The quantitative conceptual models for each of the proposed development areas are presented in Appendix G.

6.7 Risks to Other Potential Receptors

All construction workers must undertake their own risk assessment, based upon the works to be carried out and the proposed method by which this will be achieved, in accordance with current health and safety legislation. Their assessment should take into account all available information about the site, including that present within this report.

Appropriate working procedures and PPE should be adopted to ensure the health and safety of the site operatives. Instruction should be given in the recognition of potentially hazardous materials. All site personnel should be appropriately briefed on the discovery strategy, presented below, and what actions they must take in the event that further evidence of contamination is identified or suspected.

6.8 Recommendations

As complete pollutant linkages relating to end users have been identified at each of the development areas, it is considered that remedial measures will be required as part of the proposed development.

The remediation works ultimately adopted should be detailed within a separate remediation strategy, along with a verification plan. The latter should be produced once this risk assessment report has been reviewed and approved by the appropriate authority.

7. HANDLING AND DISPOSAL OF WASTE

7.1 Waste Management – Legislative Framework

"A material is waste if the holder has discarded it. Assessment of whether a material has been discarded is based on the actions of the holder. A holder may unintentionally, involuntarily or accidentally discard a material. They may also be required to discard it" [17].

Soils excavated during construction works are generally considered to be waste (examples of this have been given by previous Environment Agency guidance).

Soils may also be used as a non-waste (on the same site or another site) in accordance with the CL:AIRE code of practice[18], but only if the soils meet the four principles for use of materials as a non-waste.

Soils and other materials taken for disposal should be handled, transferred and disposed of as controlled waste in accordance with current waste management[19,20] and duty of care regulations[21] and comply with current codes of practice[22]. Waste transfer notes detailing the site address, the waste type, details of the haulage contractor and full details of the disposal site must be kept by the waste producer.

The disposal of any asbestos containing materials (where encountered) should be undertaken by appropriately trained personnel. The disposal of such material and other hazardous waste should be undertaken in accordance with the Hazardous Waste Regulations 2005[23].

It is a legal requirement to correctly assess and classify waste[24]. Classification of waste requires analysis of total contaminant concentrations within the soils, as specified in WM3[25]: The guidance notes that "*Landfill WAC analysis (specifically leaching test results) must **not** be used for waste classification and hazardous waste assessment purposes*."

7.2 Analysis of Laboratory Test Results

Characterisation of the waste in full accordance with current guidance[26] was beyond the scope of this assessment. However, analysis of the results of the laboratory testing has been undertaken using the HazWasteOnline™[27] tool. HazWasteOnline classifies waste as either hazardous or non-hazardous based on its chemical composition, related legislation and the rules and data defined in the current UK and/or EU technical guidance. The HazWasteOnline output sheets generated by the tool are presented in Appendix H.

The following table summarises the classification of soils tested, the appropriate code from the List of Wastes (LoW) and, where undertaken, the findings of the WAC testing.

[17] Environment Agency, Check if your material is waste, Updated 6th January 2022
[18] CL:AIRE Definition of Waste: Development Industry Code of Practice, Version 2, March 2011
[19] The Waste (England and Wales) Regulation 2011
[20] Section 34, Environmental Protection Act 1990
[21] The Environmental Protection (Duty of Care) Regulations 1991
[22] Waste Duty of Care: Code of Practice, Updated 26th November 2018
[23] Hazardous Waste (England and Wales) Regulations 2005
[24] Environment Agency, Disposal of waste to landfill, Published 30th January 2020
[25] Technical Guidance WM3: Waste Classification – Guidance on the assessment of waste, 1st Edition v1.2.GB, Oct 2021
[26] As discussed in BS EN 14899:2005 Characterisation of waste
[27] https://www.hazwasteonline.com/

Table 22. Summary of Classification of Samples from HazWasteOnline Analysis

Exploratory Hole Location	Sample Depth (m bgl)	Court	Classification	Code from LoW	WAC Test Results (where testing undertaken)
BH02	0.25	Arundel	Non-Hazardous	17/05/2004	-
TP06	0.5	Arundel	Non-Hazardous	17/05/2004	-
WS04	0.2	Arundel	Non-Hazardous	17/05/2004	-
WS05	0.15	Arundel	Non-Hazardous	17/05/2004	Fails Inert WAC
WS06	0.5	Arundel	Non-Hazardous	17/05/2004	-
BH03	0.5	Ashdowne	Non-Hazardous	17/05/2004	-
TP05	0.4	Ashdowne	**Hazardous**	**17-05-03***	-
WS11	0.4	Ashdowne	Non-Hazardous	17/05/2004	-
WS12	0.4	Ashdowne	**Hazardous**	**17-05-03***	Passes Hazardous WAC, Fails Stable Non-Reactive Hazardous
BH01	0.3	Baldewyne	Non-Hazardous	17/05/2004	-
TP01	0.3	Baldewyne	Non-Hazardous	17/05/2004	-
TP02	0.25	Baldewyne	Non-Hazardous	17/05/2004	-
TP03	0.2	Baldewyne	Non-Hazardous	17/05/2004	Passes inert WAC
TP04	0.1	Baldewyne	Non-Hazardous	17/05/2004	-
WS01	0.2	Baldewyne	Non-Hazardous	17/05/2004	-
WS02	0.15	Baldewyne	Non-Hazardous	17/05/2004	Passes Inert WAC
WS03	0.5	Baldewyne	Non-Hazardous	17/05/2004	-
WS07	0.35	Fiske	Non-Hazardous	17/05/2004	Fails Inert WAC
WS08	0.6	Fiske	Non-Hazardous	17/05/2004	-
WS09	0.2	Fiske	Non-Hazardous	17/05/2004	-
WS10	0.5	Fiske	**Hazardous**	**17-05-03***	Fails Hazardous WAC
WS10	1.1	Fiske	Non-Hazardous	17/05/2004	-

The asterisk (*) at the end of a code indicates that the waste is classified as hazardous.

Although the samples from Baldewyne and Arundel Courts were classified as non-hazardous based on the concentrations of heavy metals etc. within the soils, multiple samples from these areas recorded the presence of amosite asbestos present as microscopic board and fibre bundles.

In relation to asbestos within waste, WM3 states:

"The assessment of asbestos containing waste considers both the presence of asbestos as
- fibres that are free and dispersed, and
- identifiable pieces of asbestos containing material

If the waste contains fibres that are free and dispersed then the waste will be hazardous if the waste material *as a whole* contains 0.1% or more asbestos by weight."

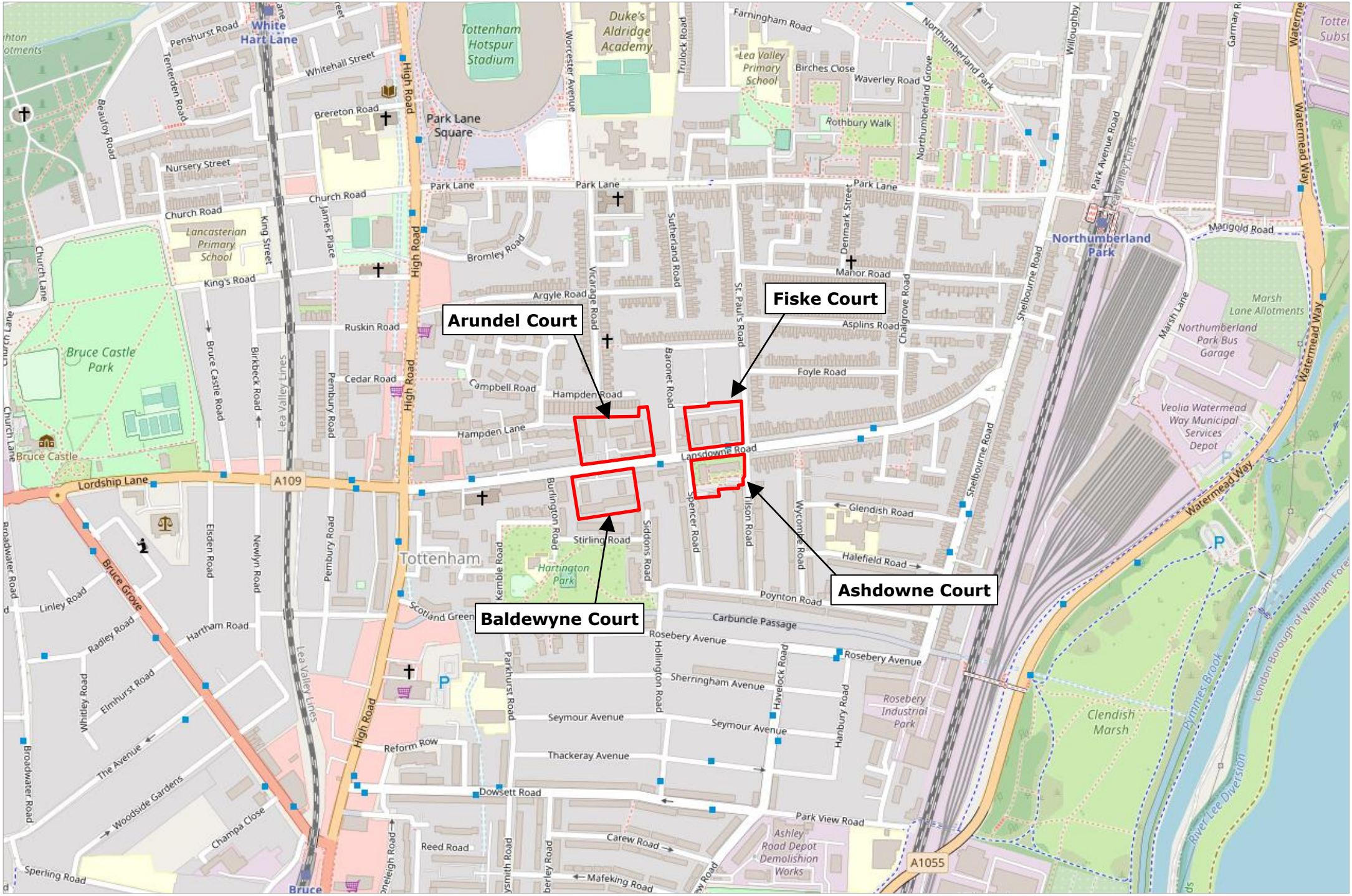
Further works would be required to establish the extent of the asbestos contaminated soils and to allow quantification analysis to be carried out, before the appropriate waste code for these materials can be determined.

At this stage, it would be prudent to assume that any materials removed would need to be treated as hazardous waste, most likely with a code of 17 06 05* construction material containing asbestos.

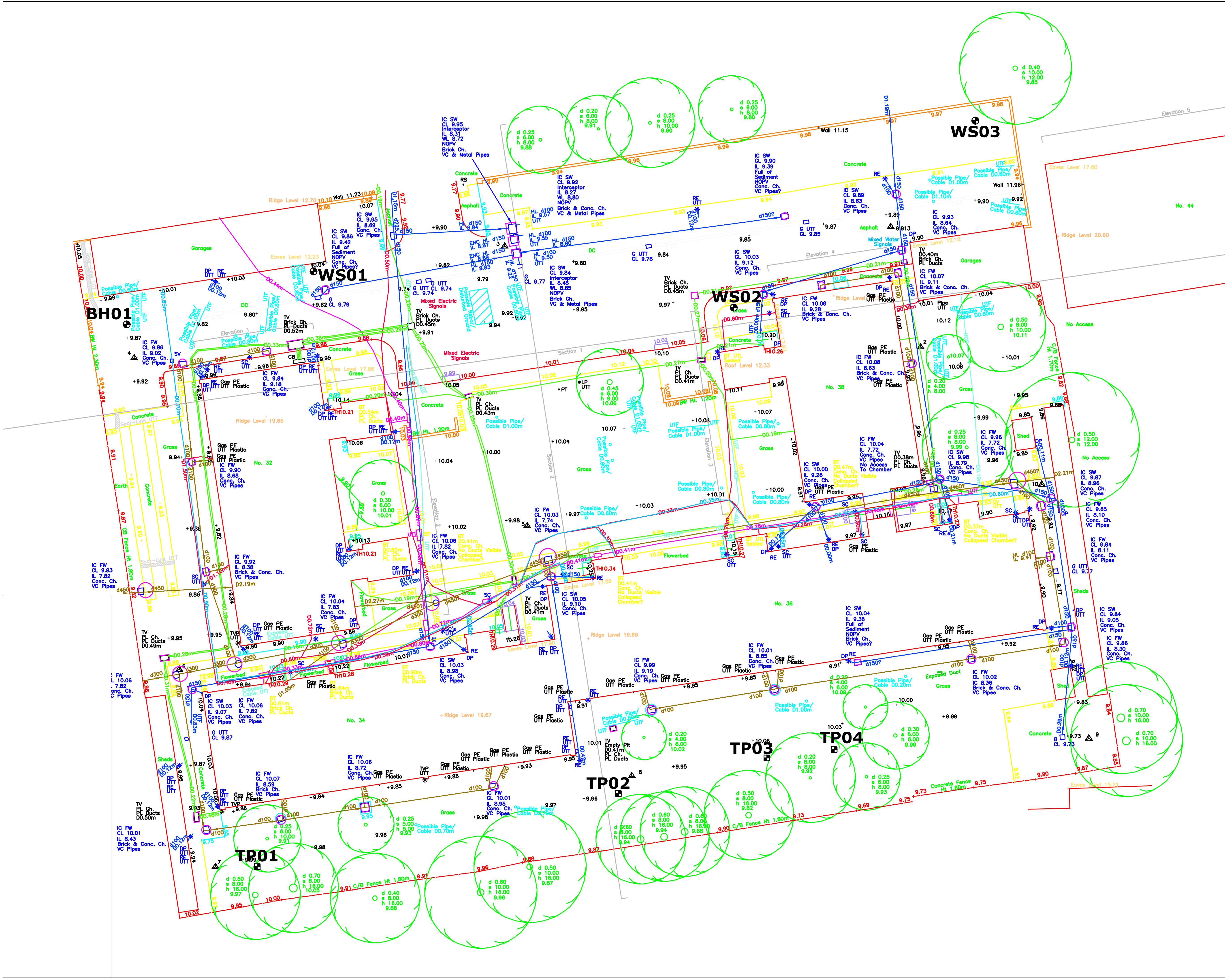
Ashdown Site Investigation Ltd.

FIGURES

Figure 1	Site Location Plan
Figures 2a-2d	Site Plan



ASHDOWN SITE INVESTIGATION LIMITED	Site Location Plan	Site Name	Figure No.	Project Reference
		Four Housing Courts, Lansdowne Road, London	1	P16180



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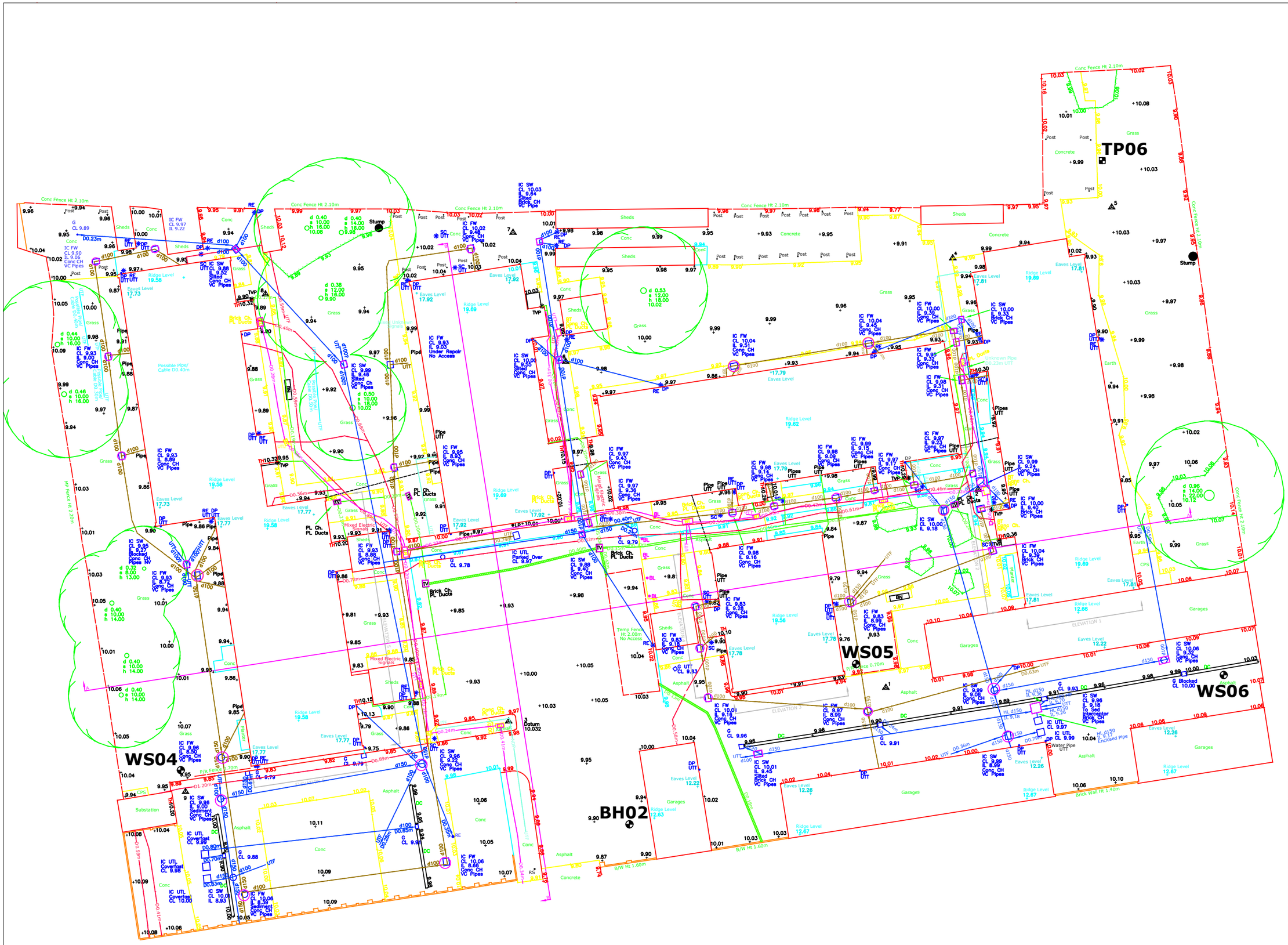
Unit 3
The Old Grain Store
Ditchling Common Business Park
Ditchling
East Sussex
BN6 8SG
01273 483119
contact@ashdownsi.co.uk

Site:	Four Housing Courts Lansdowne Road London
Project Ref:	P16180
Figure No.	2a
Drawing Title	Site Plan - Baldewyne Court
Scale	NTS



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East Sussex
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Site:

Four Housing Courts
Lansdowne Road
London

Project Ref:

P16180

Figure No.

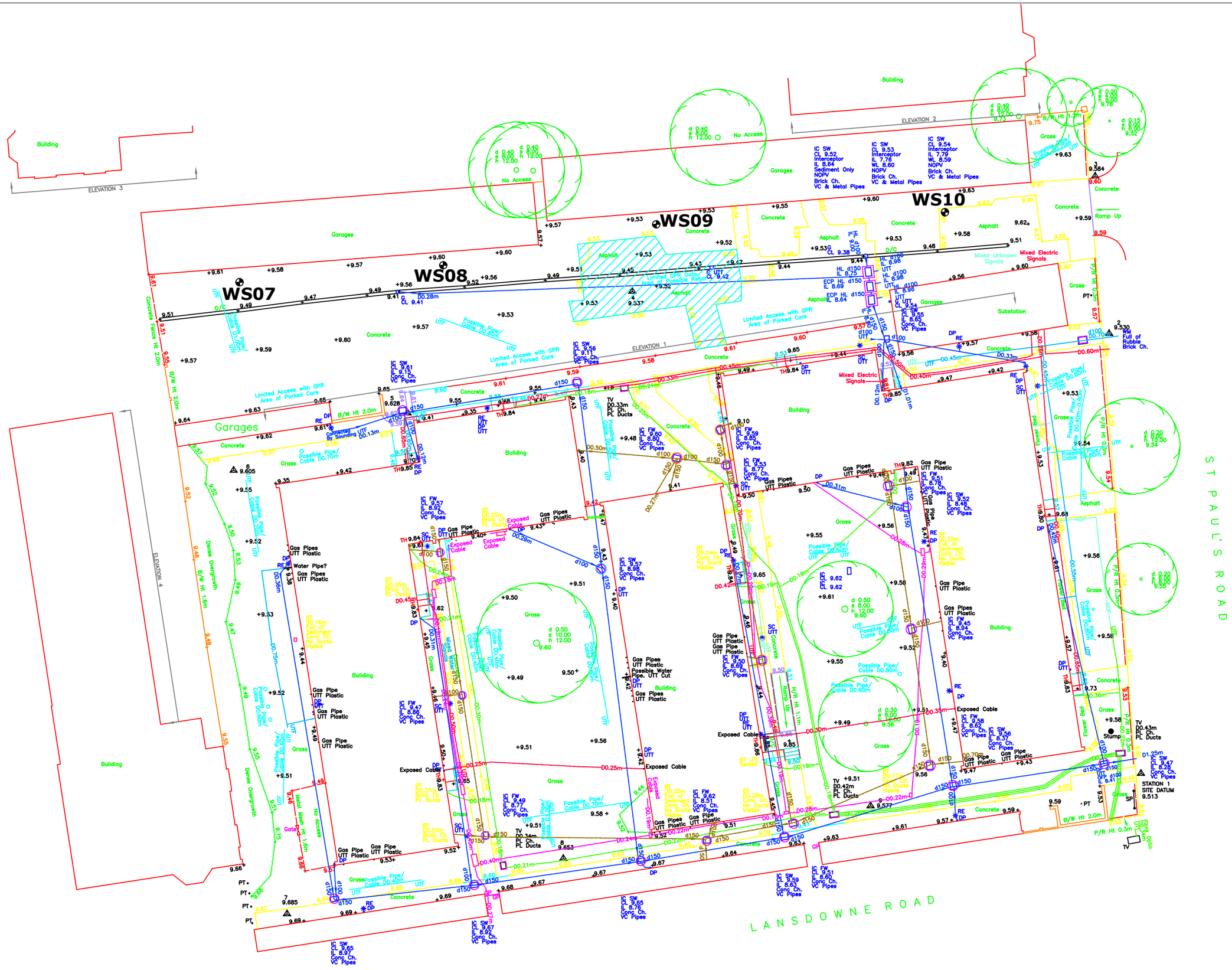
2b

Drawing Title

Site Plan - Arundel Court

Scale

NTS



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Project Ref:

P16180

Figure No.

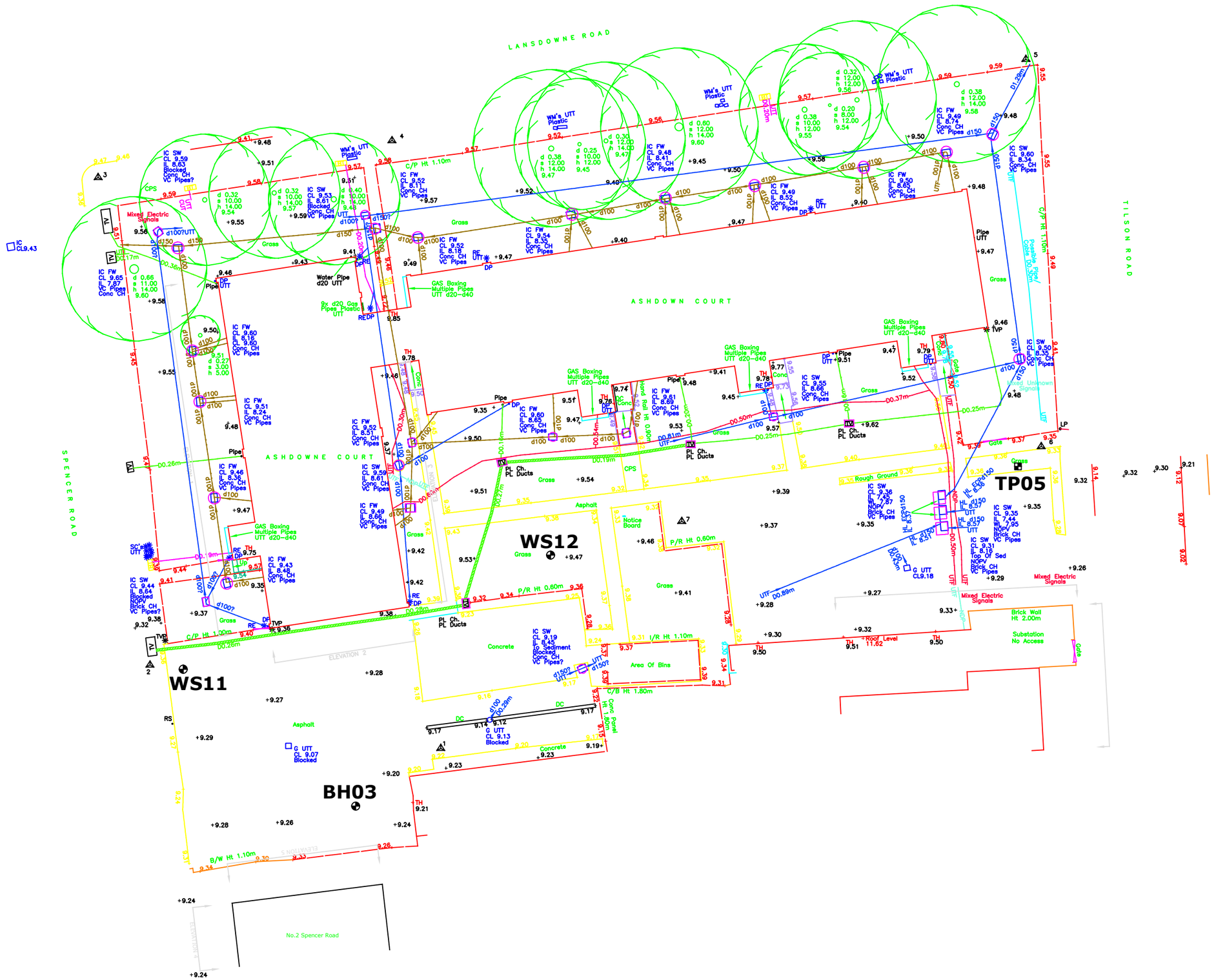
2c

Drawing Title

Site Plan - Fiske Court

Scale

NTS



N

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Site:	Four Housing Courts Lansdowne Road London
Report Ref:	P16180
Figure No.	2d
Drawing Title	Site Plan - Ashdowne Court
Scale	NTS

APPENDIX A

Proposed Development Layout

Gyoury Self
CONSULTING ENGINEERS
STRUCTURAL·CIVIL·ENVIRONMENTAL

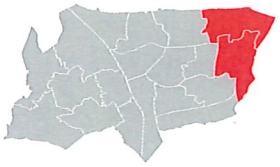
Gyoury Self Partnership (St Albans)
4b Parkway, Porters Wood
St Albans, Hertfordshire AL3 6PA

1.0 Site

Site Location

The 2 no. sites are located to the north-east of the London Borough of Haringey. The sites are located in the Tottenham Hale ward.

The site is located in the London Borough of Haringey



The associated council wards are located in the North-East of the borough with Arundel and Baldewynne Court in the Tottenham Hale ward [1], whilst located to the North is the Northumberland Park ward [2]

Key

— Site Boundary

Arundel Court Indicative Proposed Site Layout

Key:

- Site boundary
- Existing trees
- New landscape
- Existing landscape
- Existing buildings
- Reconfigured parking spaces
- Relocation of existing refuse bins
- New residential development
- New bike storage
- Existing substation
- New trees
- New refuse stores
- New amenity area
- Wider landscape enhancement

scale: 1:500@ A3

0 5 10 15 20 25m

LAAB-BPTW-012-00-DR-A-0103-P04-S3

Baldewynne Court Indicative Proposed Site Layout

Key:

- Site boundary
- Existing trees
- New landscape
- Existing landscape
- Existing buildings
- Reconfigured parking spaces
- Relocation of existing refuse bins
- New residential development
- New bike storage
- New trees
- New refuse stores
- Welfare Space
- New amenity area
- Wider landscape enhancement

scale: 1:500@ A3

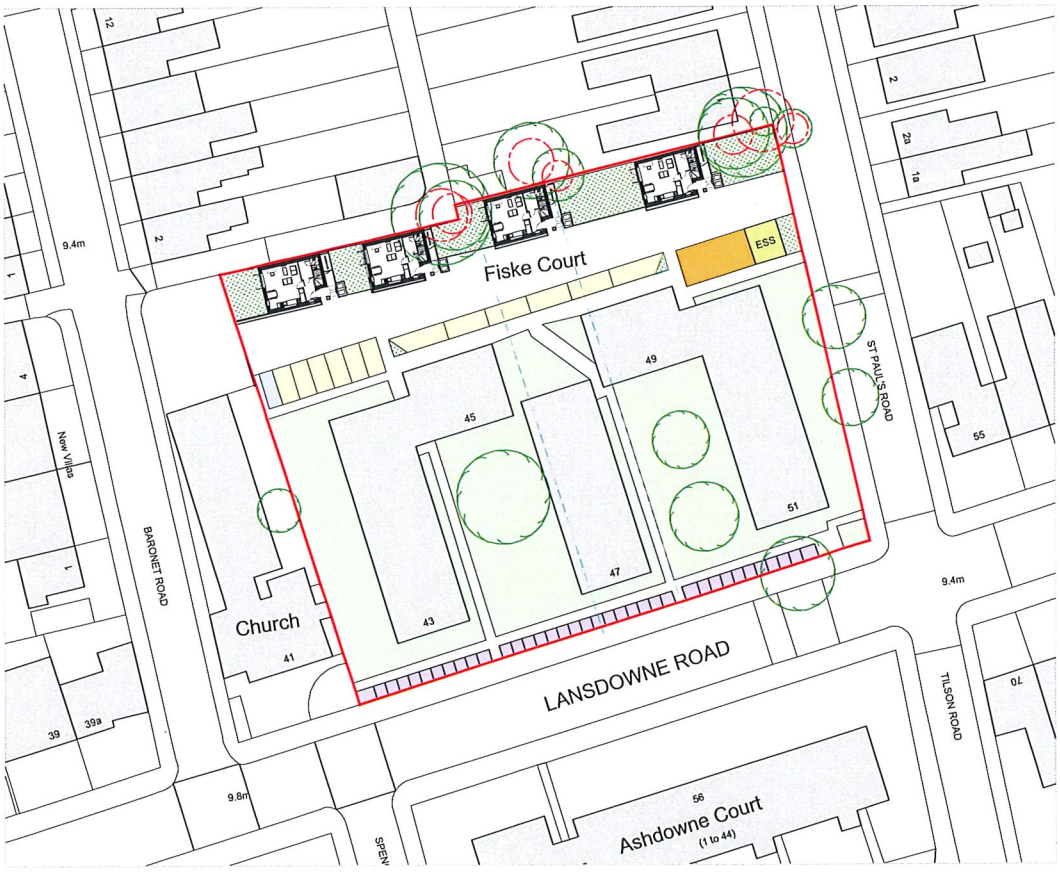
0 5 10 15 20 25m

LAAB-BPTW-012-00-DR-A-0112-P03-S3

Fiske Court Proposed Site Layout

Key:

- Site boundary
- Existing trees
- New landscape
- Existing landscape
- Existing buildings
- New parking spaces
- New refuse stores
- New bike storage
- Existing pram sheds
- Existing substation



Fiske Court parking spaces:

22 No exisitng parking spaces

17 No parking spaces with proposed

scale: 1:500@ A3

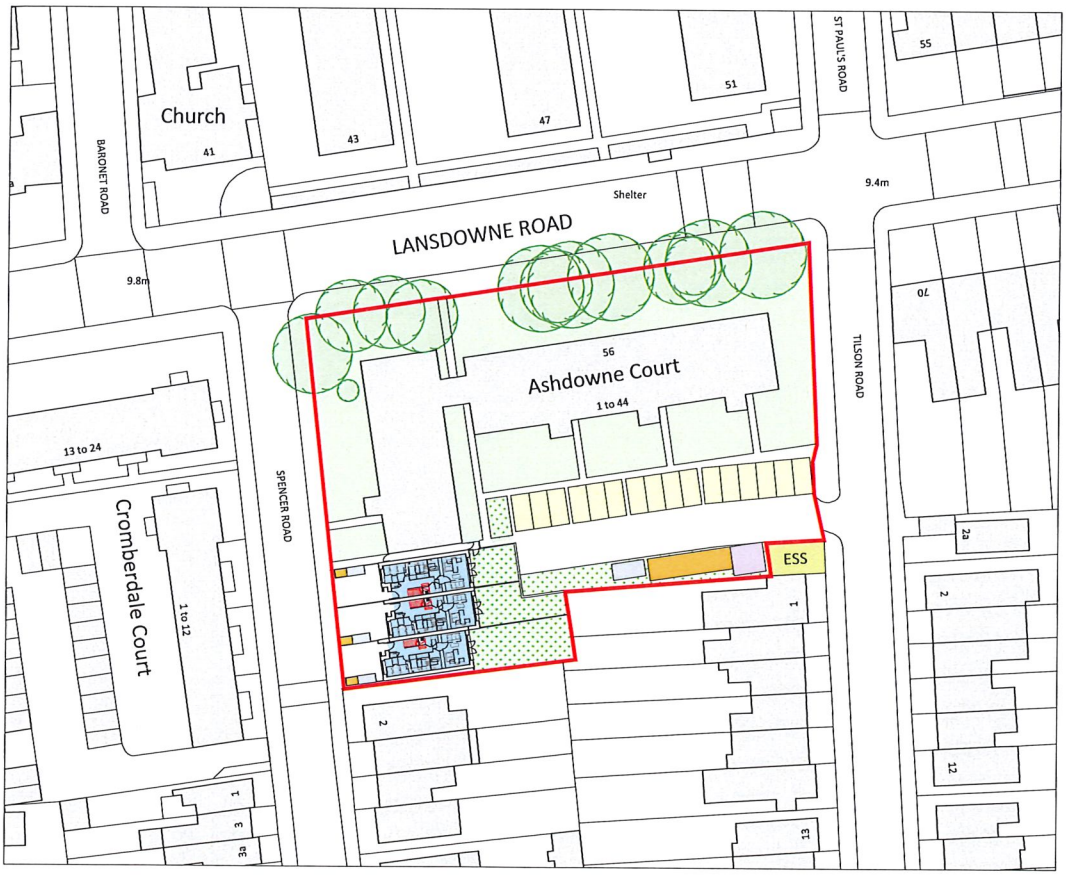
0 5 10 15 20 25m

LAFR-BPTW-010-00-DR-A-0111-P01-S3

Ashdowne Court Proposed Site Layout

Key:

- Site boundary
- Existing trees
- New landscape
- Existing landscape
- Existing buildings
- New parking spaces
- New refuse stores
- New residential development
- New bike storage
- Bulk Store
- Existing substation



scale: 1:500@ A3

0 5 10 15 20 25m

LAAS-BPTW-XX-00-DR-A-0013

APPENDIX B

Explanatory Notes
Exploratory Hole Records
DPSH-B Dynamic Probe Records
In-situ TRL Cone Penetrometer (CBR) Test Results
Gas Concentration and Groundwater Monitoring Results

Explanatory Notes

Symbols and abbreviations on Exploratory Hole Records

Samples

U 'Undisturbed' Sample: - 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.
Pi Piston Sample: 'Undisturbed' sample 100mm diameter by 600mm long.
D Disturbed Sample
R Root Sample
B Bulk Disturbed Sample
W Water Sample
ES Environmental Suite (on older records may be references J T)

In Situ Testing

S Standard penetration test (SPT): Using the split spoon sampler.
C Standard Penetration Test (SPT): Using a solid cone instead of the sampler – conducted usually in coarse grained soils or weak rocks.
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: Number of blows for 300mm penetration shown under Vane/Pen Test and N Value column.

Excavation Method

CP Cable Percussion Borehole
RC Rotary Cored 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

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) and Part 2 Principles of classification (BS EN 14688-2) as well as the BS5930 code of Practice for Ground Investigations.

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) as well as the BS5930 code of Practice for Ground Investigations. TCR – Total Core Recovery, SCR – Solid Core Recovery, RQD – Rock Quality Designation, NI – Non Intact, If – indicative fracture spacing (min/ave/max), FI – Fracture Index.

Chalk Description

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.

In Situ Strength Testing

Standard penetration testing (SPT) carried out in accordance with BS EN ISO 22476-3:2005.

Continuous dynamic probe testing conducted using a super heavy DPSH-B (As defined by BS EN ISO 22476-2:2005) 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.

Perth penetrometer tests carried out in accordance with Australian Standard AS 1289:6.3.3-1997, Method of Testing Soils for Engineering Purposes; no equivalent European or British Standard having been published to date.

Undrained shear strength determinations made in-situ using a Geonor hand shear vane or a hand penetrometer.

Testing to determine the in-situ California Bearing Ratio (CBR) of soils conducted at shallow depths using a hand-held Transport Research Laboratory (TRL) cone penetrometer.

ASHDOWN SITE INVESTIGATION LIMITED
Email: contact@ashdownsi.co.uk
Web: www.ashdownsi.co.uk
Tel: 01273 483119

Site Name: Four Housing Courts, Lansdowne Road, London

Job Number: P16180

Start Date: 18/08/2023

End Date: 18/08/2023

Borehole Number: **BH01** Sheet 1 of 2

Standpipe Installation	Sample/ Test Type	Depth From (m)	Depth To (m)	Test Result	SPT 'N' Value 0 10 20 30 40 50	Depth	Legend	Stratum Description
						0.00		Asphalt.
	D	0.30				0.20		MADE GROUND: Brown gravelly sandy clay. Gravel is subangular to subrounded fine to coarse flint and brick.
	J T	0.30						
	D	0.50				0.70		MADE GROUND: Dark grey/ black gravelly slightly sandy clay. Gravel is subangular to subrounded fine to medium flint and brick.
	D	1.00						
	J T	1.00						
	D	1.20	1.65			1.30		Firm orange brown slightly gravelly slightly sandy silty CLAY. Gravel is subangular to subrounded fine to medium flint. (Enfield Silt Member)
	C	1.20		N=5 (1,1/1,1,1,2)				
	D	1.75				1.75		Medium dense varying dense orange brown very sandy slightly clayey subangular to subrounded fine to coarse GRAVEL of flint. (Kempton Park Gravel Member)
	D	2.00	2.50					
	C	2.00		N=40 (7,10/9,10,10,11)				
	D	2.75						
	B	3.00	3.45					
	C	3.00		N=10 (3,4/3,2,2,3)		3.20		Firm to stiff brown and dark grey slightly gravelly slightly sandy CLAY. Gravel is subangular to subrounded fine to medium flint. (Weathered London Clay Formation)
	D	3.75						
	U	4.00	4.45	20		4.00		Stiff brown and dark grey CLAY. (London Clay Formation)
	D	4.50						
	D	5.00	5.45					
	S	5.00		N=15 (5,4/3,3,4,5)				
	D	6.00						
	U	6.50	6.95	20				
	D	7.00						
	D	7.50						
	D	8.00	8.45					
	S	8.00		N=25 (3,5/6,7,6,6)				
	D	9.00						
	U	9.50	9.95	25				
	D	10.00				10.00		"Continued on next sheet"

Remarks

Casing: Borehole cased to 4.00m depth.

Groundwater: Borehole dry on completion.

Stability: n/a

Chiselling: Chiselling techniques adopted to progress borehole between 10.70m and 10.90m depth.

Notes: 200mm diameter borehole to 3.00m depth then reduced to 150mm diameter.

Excavation Method:	CP
Borehole Diameter:	200mm/ 150mm
Casing Diameter:	200mm/ 150mm
Made By:	PJ

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Site Name: Four Housing Courts, Lansdowne Road, London

Job Number: P16180

Start Date: 18/08/2023

End Date: 18/08/2023

Borehole Number: **BH01**

Standpipe Installation	Sample/ Test Type	Depth From (m)	Depth To (m)	Test Result	SPT 'N' Value 0 10 20 30 40 50	Depth	Legend	Stratum Description
	D	10.50						Stiff to very stiff brown and dark grey CLAY. (London Clay Formation)
	D	11.00	11.45					with a band of claystone between 10.70m and 10.90m depth.
	C	11.00		N=33 (4,5/7,8,9,9)				
	D	12.00						
	U	12.50	12.95	30				
	D	13.00						
	D	14.00						
	D	14.55	15.00					
	S	14.55		N=33 (4,6/7,8,9,9)		15.00		End of borehole at 15.00m

Remarks

Casing: Borehole cased to 4.00m depth.

Groundwater: Borehole dry on completion.

Stability: n/a

Chiselling: Chiselling techniques adopted to progress borehole between 10.70m and 10.90m depth.

Notes: 200mm diameter borehole to 3.00m depth then reduced to 150mm diameter.

Excavation Method:	CP
Borehole Diameter:	200mm/ 150mm
Casing Diameter:	200mm/ 150mm
Made By:	PJ

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Site Name: Four Housing Courts, Lansdowne Road, London

Job Number: P16180

Start Date: 16/08/2023

End Date: 17/08/2023

Borehole Number: **BH02** Sheet 1 of 3

Standpipe Installation	Sample/ Test Type	Depth From (m)	Depth To (m)	Test Result	SPT 'N' Value (0 10 20 30 40 50)	Depth	Legend	Stratum Description
						0.00		Asphalt.
	J T	0.25				0.10		MADE GROUND: Brown gravelly sandy clay. Gravel is subangular to subrounded fine to coarse flint and brick.
	D	0.30						
	D	0.50						
	D	1.00				1.00		
	D	1.20	1.65					Dense orange brown very sandy slightly clayey subangular to subrounded fine to coarse GRAVEL of flint. (Kempton Park Gravel Member)
	C	1.20		N=43 (7,8/10,12,12,9)				
	D	1.75						
	B	2.00	2.45					
	C	2.00		N=40 (5,7/8,10,10,12)				
	D	2.75						
	D	3.00	3.45					
	C	3.00		N=26 (4,7/6,7,7,6)				
	D	3.75						
	D	4.00	4.45					
	C	4.00		N=18 (5,4/5,6,4,3)				
						4.50		Firm to stiff brown and dark grey slightly gravelly slightly sandy CLAY. Gravel is subangular to subrounded fine to medium flint. (Weathered London Clay Formation)
	D	4.75						
	D	5.00	5.45			5.00		Stiff brown and dark grey CLAY. (London Clay Formation)
	C	5.00		N=17 (2,2/3,3,4,7)				
	D	6.00						becoming stiff below 6.50m depth.
	U	6.50	6.95	25				
	D	7.00						
	D	7.50						
	D	8.00	8.45					
	S	8.00		N=27 (5,6/7,6,7,7)				
	D	9.00						
	U	9.50	9.95	25				
	D	10.00				10.00		"Continued on next sheet"

Remarks

Casing: Borehole cased to 8.00m depth.

Groundwater: Borehole dry on completion.

Stability: n/a

Chiselling: n/a

Notes: 200mm diameter borehole to 20.00m depth then reduced to 150mm diameter.

Excavation Method:	CP
Borehole Diameter:	200mm/ 150mm
Casing Diameter:	200mm/ 150mm
Made By:	PJ

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Site Name: Four Housing Courts, Lansdowne Road, London

Job Number: P16180

Start Date: 16/08/2023

End Date: 17/08/2023

Borehole Number: **BH02**

Standpipe Installation	Sample/ Test Type	Depth From (m)	Depth To (m)	Test Result	Depth	Stratum Description
						Stiff to very stiff brown and dark grey CLAY. (London Clay Formation)
	D	10.50				
	D	11.00	11.45			
	S	11.00		N=32 (5,5/7,7,8,10)		
	D	12.00				
	U	12.50	12.95	30		
	D	13.00				
	D	13.50				
	D	14.00	14.45			
	S	14.00		N=35 (4,7/8,8,10,9)		
	D	15.00				
	U	15.50	15.95	30		
	D	16.00				
	D	16.50				
	D	17.00	17.50			
	S	17.00		N=33 (8,7/7,8,8,10)		
	D	18.00				
	U	18.50	18.95	30		
	D	19.00				
	D	19.50				
	D	20.00	20.45		20.00	

"Continued on next sheet"

Remarks

Casing: Borehole cased to 8.00m depth.

Groundwater: Borehole dry on completion.

Stability: n/a

Chiselling: n/a

Notes: 200mm diameter borehole to 20.00m depth then reduced to 150mm diameter.

Excavation Method:	CP
Borehole Diameter:	200mm/ 150mm
Casing Diameter:	200mm/ 150mm
Made By:	PJ

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Site Name: Four Housing Courts, Lansdowne Road, London

Job Number: P16180

Start Date: 16/08/2023

End Date: 17/08/2023

Borehole Number: **BH02**

Standpipe Installation	Sample/ Test Type	Depth From (m)	Depth To (m)	Test Result	SPT 'N' Value 0 10 20 30 40 50	Depth	Legend	Stratum Description
	S	20.00		N=40 (5,7/8,10,10,12)				Stiff to very stiff brown and dark grey CLAY. (London Clay Formation)
	D	21.00						
	U	21.50	21.95	40				
	D	22.00						
	D	22.50						
	D	23.00	23.45					
	S	23.00		N=41 (5,8/9,10,10,12)				
	D	24.00						
	D	25.00	25.45			25.00		End of borehole at 25.00m
	S	25.00		N=45 (6,8/9,10,12,14)				

Remarks

Casing: Borehole cased to 8.00m depth.

Groundwater: Borehole dry on completion.

Stability: n/a

Chiselling: n/a

Notes: 200mm diameter borehole to 20.00m depth then reduced to 150mm diameter.

Excavation Method:	CP
Borehole Diameter:	200mm/ 150mm
Casing Diameter:	200mm/ 150mm
Made By:	PJ

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Site Name: Four Housing Courts, Lansdowne Road, London

Job Number: P16180

Start Date: 16/08/2023

End Date: 16/08/2023

Borehole Number: **BH03** Sheet 1 of 2

Standpipe Installation	Sample/ Test Type	Depth From (m)	Depth To (m)	Test Result	SPT 'N' Value (0 10 20 30 40 50)	Depth	Legend	Stratum Description
	J T	0.20				0.00		Asphalt.
	D	0.30				0.10		MADE GROUND: Brown sandy clayey subangular to subrounded fine to coarse gravel of flint, brick, ash-like material, glass, metal and ceramic.
	D	0.50						
	J T	0.50				0.80		MADE GROUND: Dark grey/ black gravelly slightly sandy clay. Gravel is subangular to subrounded fine to medium flint, brick, ash-like material and glass.
	J T	0.90						
	D	1.00				1.10		Firm to stiff orange brown and grey slightly gravelly slightly sandy silty CLAY. Gravel is subangular to subrounded fine to medium flint. (Enfield Silt Member)
	U	1.20	1.65	20				
	J T	1.50						
	D	1.75						
	D	2.00	2.45					
	C	2.00		N=14 (2,3/2,4,4,4)				
						2.50		Medium dense orange brown very sandy slightly clayey subangular to subrounded fine to coarse GRAVEL of flint. (Kempton Park Gravel Member)
	D	2.75						
	B	3.00	3.45					
	C	3.00		N=20 (6,4/5,4,5,6)				
	D	3.75						
	D	4.00	4.45					
	C	4.00		N=19 (5,4/3,4,6,6)				
	J T	4.50						
	D	4.75						
	D	5.00	5.45					
	C	5.00		N=23 (3,6/5,6,6,6)				
						5.60		Stiff brown and dark brown slightly gravelly slightly sandy CLAY. Gravel is subangular to subrounded fine to medium flint. (Weathered London Clay Formation)
	D	6.00				6.00		Stiff brown and dark brown CLAY. (London Clay Formation)
	D	6.50	6.95					
	S	6.50		N=29 (3,7/6,7,6,10)				
	D	7.50						
	U	8.00	8.45	25				
	D	9.00						
	D	9.50	9.95					
	S	9.50		N=30 (4,5/6,7,8,9)				
						10.00		"Continued on next sheet"

Remarks

Casing: Borehole cased to 6.00m depth.

Groundwater: Borehole dry on completion.

Stability: n/a

Chiselling: Chiselling techniques adopted to progress borehole between 14.50m and 15.00m depth.

Notes: 200mm diameter borehole to 3.00m depth then reduced to 150mm diameter.

Excavation Method:	CP
Borehole Diameter:	200mm/ 150mm
Casing Diameter:	200mm/ 150mm
Made By:	PJ

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Job Number: P16180

Start Date: 16/08/2023

End Date: 16/08/2023

Borehole Number: **BH03** Sheet 2 of 2

Standpipe Installation	Sample/ Test Type	Depth From (m)	Depth To (m)	Test Result	SPT 'N' Value 0 10 20 30 40 50	Depth	Legend	Stratum Description
								Stiff to very stiff brown and dark brown CLAY. (London Clay Formation)
	D	10.50						
	U	11.00	11.45	30				
	D	12.00						
	D	12.50	12.95					
	S	12.50		N=37 (4,8/9,8,9,11)				
	D	13.50						
	U	14.00	14.45	60				
								with a band of claystone between 14.50m and 15.00m depth.
	D	15.00	15.45			15.00		
	C	15.00		N=37 (5,6/8,8,10,11)				End of borehole at 15.00m

Remarks

Casing: Borehole cased to 6.00m depth.

Groundwater: Borehole dry on completion.

Stability: n/a

Chiselling: Chiselling techniques adopted to progress borehole between 14.50m and 15.00m depth.

Notes: 200mm diameter borehole to 3.00m depth then reduced to 150mm diameter.

Excavation Method:	CP
Borehole Diameter:	200mm/ 150mm
Casing Diameter:	200mm/ 150mm
Made By:	PJ

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Job Number: P16180

Start Date: 18/08/2023

End Date: 18/08/2023

Borehole Number: **WS01**

Standpipe	Sample/ Test Type	Depth From (m)	Depth To (m)	Test Result	Dynamic Probe 0 5 10 15 20 25 30	Legend	Depth	Stratum Description
							0.00	Asphalt.
							0.03	Concrete.
	J T	0.20					0.12	MADE GROUND: Brown and orange brown mottled slightly gravelly slightly sandy silty clay. Gravel is subangular to subrounded fine to coarse flint with rare concrete, brick, ash-like material, organic material and plastic.
	D	0.50						
	J T	0.50						
	J T	1.00	1.20				1.00	MADE GROUND: Orange brown, grey brown and brown mottled slightly gravelly slightly sandy silty clay. Gravel is subangular to subrounded fine to medium flint with rare ash-like material and brick.
	J T	1.40	1.60				1.20	Medium dense orange brown slightly clayey very sandy subangular to subrounded fine to coarse GRAVEL of flint with rare iron staining. (Kempton Park Gravel Member) becoming very dense below 1.50m depth.
	D	1.70	1.90				1.90	End of borehole at 1.90m

Remarks

Groundwater: Borehole dry on completion.

Stability: Borehole stable on completion.

Notes: No further progress below 1.90m depth - too dense.

Excavation Method: WLS

Borehole Diameter: Various

Made By: TM

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Site Name: Four Housing Courts, Lansdowne Road, London

Job Number: P16180

Start Date: 18/08/2023

End Date: 18/08/2023

Borehole Number: **WS02**

Standpipe	Sample/ Test Type	Depth From (m)	Depth To (m)	Test Result	Dynamic Probe 0 5 10 15 20 25 30	Legend	Depth	Stratum Description
							0.00	Topsoil.
	J T	0.15					0.05	MADE GROUND: Brown gravelly silty fine to coarse sand. Gravel is subangular to subrounded fine to coarse flint, brick, and concrete with rare ash-like material, ceramic, glass, litter and suspected asbestos containing material. With occasional cobbles of flint, brick and concrete.
	D*	0.20						
	J T	0.45					0.40	MADE GROUND: Yellow brown gravelly fine to coarse sand. Gravel is subangular to subrounded fine to coarse brick, concrete, flint and sandstone with rare glass and ash-like material. With occasional cobbles of brick and concrete.
	J T	1.00	1.20				1.00	MADE GROUND: Black and brown mottled gravelly sandy clay. Gravel is subangular to subrounded fine to coarse flint and bituminous material with rare ash-like material and brick.
	D	1.70						
	D	2.00	2.60				1.90	Firm to stiff varying stiff brown, orange brown and grey brown mottled slightly gravelly slightly sandy silty CLAY. Gravel is subangular to subrounded fine to coarse flint. (Enfield Silt Member)
								becoming stiff below 2.30m depth.
								becoming gravelly below 2.50m depth.
								no recovery of soils sample below 2.60m depth.
							3.00	End of borehole at 3.00m

Remarks

Groundwater: Groundwater at 2.60m depth on completion of borehole.

Stability: Borehole collapsed to 2.60m depth on completion.

Notes: D* - sample of asbestos containing material for laboratory testing.
Standpipe installed to 2.50m depth; 2.50m to 1.00m slotted pipe with gravel surround; 1.00m to ground level 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: TM

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Job Number: P16180

Start Date: 18/08/2023

End Date: 18/08/2023

Borehole Number: **WS03**

Standpipe	Sample/ Test Type	Depth From (m)	Depth To (m)	Test Result	Dynamic Probe 0 5 10 15 20 25 30	Legend	Depth	Stratum Description
							0.00	Concrete.
							0.15	MADE GROUND: Yellow brown and orange brown sandy subangular to subrounded fine to coarse gravel of brick, flint and with rare slate and tile. With occasional cobbled of concrete.
	J T	0.25					0.30	
	J T	0.50						MADE GROUND: Brown gravelly sandy clay. Gravel is subangular to subrounded fine to coarse flint, brick and concrete with rare slate, glass, ceramic, ash-like material and chalk. With occasional cobbles of brick and concrete.
	J T	0.95					1.00	
	J T	1.10	1.30				1.10	Orange brown, brown and grey mottled slightly gravelly slightly sandy silty CLAY. Gravel is subangular to subrounded fine to medium flint. (Enfield Silt Member)
	D	1.30	1.50					Medium dense varying dense orange brown, grey brown and brown very sandy clayey subangular to subrounded fine to coarse GRAVEL of flint with occasional pockets of clay and iron staining. (Kempton Park Gravel Member)
							1.70	End of borehole at 1.70m

Remarks

Groundwater: Borehole dry on completion.

Stability: Borehole stable on completion.

Notes: No further progress below 1.70m depth - too dense.

Excavation Method: WLS

Borehole Diameter: Various

Made By: TM

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Site Name: Four Housing Courts, Lansdowne Road, London

Job Number: P16180

Start Date: 15/08/2023

End Date: 15/08/2023

Borehole Number: **WS04**

Standpipe	Sample/ Test Type	Depth From (m)	Depth To (m)	Test Result	Dynamic Probe 0 5 10 15 20 25 30	Legend	Depth	Stratum Description
							0.00	Topsoil.
	J T	0.20					0.10	MADE GROUND: Brown very gravelly very clayey fine to coarse sand. Gravel is subangular to subrounded fine to coarse brick, flint and concrete with rare plastic, ash-like material, slate and glass. With occasional cobbles of brick.
	J T	0.60					0.40	MADE GROUND: Brown sandy subangular to subrounded fine to coarse gravel of brick and flint with rare plastic, ash-like material, slate and glass. With occasional cobbles of brick and flint.
							1.00	
							1.10	Firm to stiff orange brown and grey mottled slightly gravelly slightly sandy CLAY. Gravel is subangular to subrounded fine to coarse flint. (Enfield Silt Member)
	D	1.50						Medium dense brown sandy slightly clayey subangular to subrounded fine to coarse GRAVEL of flint. (Kempton Park Gravel Member)
								becoming dense below 1.60m depth.
								becoming very dense below 1.80m depth.
							2.00	End of borehole at 2.00m

Remarks

Groundwater: Groundwater at 1.20m depth on completion of borehole.

Stability: Borehole collapsed to 1.50m depth on completion.

Notes: No further progress below 2.00m depth - too dense.
Standpipe installed to 1.50m depth; 1.50m to 1.00m slotted pipe with gravel surround; 1.00m to ground level 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: TM

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Job Number: P16180

Start Date: 15/08/2023

End Date: 15/08/2023

Borehole Number: **WS05**

Standpipe	Samples and In Situ Testing: Sample/ Test Type	Depth From (m)	Depth To (m)	Test Result	Dynamic Probe 0 5 10 15 20 25 30	Legend	Depth	Stratum Description
	J T	0.15					0.00	Topsoil over, MADE GROUND: Dark brown gravelly silty slightly clayey fine to coarse sand. Gravel is subangular to subrounded fine to coarse of brick, flint, ash-like material, clinker-like material, glass, ceramic, concrete, plastic and bituminous material. With occasional cobbles of brick and flint.
	D	0.70					0.60	MADE GROUND: Brown and grey and orange brown mottled slightly gravelly slightly sandy silty clay. Gravel is subangular to subrounded fine to medium brick, ash-like material and mortar.
	J T	0.80						
	J T	1.20	1.50				1.10	MADE GROUND: Dark brown and grey brown gravelly fine to coarse sand with occasional pockets of silty clay. Gravel is subangular to subrounded fine to medium brick, ash-like material and clinker-like material.
	J T	1.80	2.20				1.80	Very dense yellow brown very gravelly slightly clayey fine to coarse SAND. Gravel is subangular to subrounded fine to coarse flint. (Kempton Park Gravel Member)
							2.20	End of borehole at 2.20m

Remarks

Groundwater: Groundwater at 1.90m depth on completion of borehole.

Stability: Borehole collapsed to 2.10m depth on completion.

Notes: No further progress below 2.20m depth - too dense.

Excavation Method: WLS

Borehole Diameter: Various

Made By: TM

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Site Name: Four Housing Courts, Lansdowne Road, London

Job Number: P16180

Start Date: 15/08/2023

End Date: 15/08/2023

Borehole Number: **WS06**

Standpipe	Sample/ Test Type	Depth From (m)	Depth To (m)	Test Result	Dynamic Probe 0 5 10 15 20 25 30	Legend	Depth	Stratum Description
							0.00	Asphalt.
							0.03	Reinforced concrete.
	J T	0.20					0.12	MADE GROUND: Brown gravelly fine to coarse sand. Gravel is subangular to subrounded fine to coarse flint, concrete and brick.
							0.30	MADE GROUND: Brown and dark grey brown mottled slightly gravelly slightly sandy silty clay. Gravel is subangular to subrounded fine to coarse flint, brick, ash-like material, slate, glass and clinker-like material.
	J T	0.50						
	D	0.70						
	J T	0.90						
	D	1.10					1.00	Firm to stiff brown with occasional black speckling slightly sandy silty CLAY. (Enfield Silt Member)
	H	1.10		40				
	H	1.50		35			1.50	Soft to firm green grey with occasional black speckling slightly gravelly slightly sandy silty CLAY . Gravel is subangular to subrounded fine to medium flint. (Enfield Silt Member)
	J T	1.80						
	V	2.00		30				
	D	2.10					2.20	Medium dense green grey and yellow brown very gravelly slightly clayey fine to coarse SAND. Gravel is subangular to subrounded fine to coarse flint. (Kempton Park Gravel Member) becoming dense below 2.30m depth. becoming very dense below 2.60m depth.
	D	2.50					3.00	End of borehole at 3.00m

Remarks

Groundwater: Groundwater at 2.00m depth on completion of borehole.

Stability: Borehole collapsed to 2.30m depth on completion.

Notes: n/a

Excavation Method: WLS

Borehole Diameter: Various

Made By: TM

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Site Name: Four Housing Courts, Lansdowne Road, London

Job Number: P16180

Start Date: 21/08/2023

End Date: 21/08/2023

Borehole Number: **WS07**

Standpipe	Sample/ Test Type	Depth From (m)	Depth To (m)	Test Result	Legend	Depth	Stratum Description
				Dynamic Probe 0 5 10 15 20 25 30			
	J T	0.12	0.25			0.00	Concrete.
						0.12	MADE GROUND: Yellow brown gravelly fine to coarse sand. Gravel is subangular to subrounded fine to coarse brick and flint.
	J T	0.35				0.25	MADE GROUND: Dark grey slightly gravelly slightly sandy silty clay. Gravel is subangular to subrounded fine to coarse ash-like material, brick and glass.
						0.60	MADE GROUND: Grey brown, orange brown and green grey mottled slightly sandy silty clay. Gravel is subangular to subrounded fine to medium flint.
	D	0.80				0.85	Firm varying stiff green grey, grey and orange brown slightly gravelly slightly sandy silty CLAY. Gravel is subangular to subrounded fine to medium flint. (Enfield Silt Member)
	J T	0.80					
	H	1.00		60			
	V	1.00		120			
	D	1.20					
	J T	1.30					
	H	1.30		60			
	H	1.40		50			
	D	1.60				1.60	Medium dense grey and yellow brown very sandy slightly clayey angular to rounded fine to coarse GRAVEL of flint. (Kempton Park Gravel Member)
							becoming dense below 1.70m depth.
							becoming very dense below 1.80m depth.
	D	2.70					
						3.00	End of borehole at 3.00m

Remarks

Groundwater: Groundwater at 1.70m depth on completion of borehole.

Stability: Borehole collapsed to 2.00m depth on completion.

Notes: n/a

Excavation Method: WLS

Borehole Diameter: Various

Made By: TM

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Site Name: Four Housing Courts, Lansdowne Road, London

Job Number: P16180

Start Date: 21/08/2023

End Date: 21/08/2023

Borehole Number: **WS08** Sheet 1 of 1

Standpipe	Sample/ Test Type	Depth From (m)	Depth To (m)	Test Result	Dynamic Probe 0 5 10 15 20 25 30	Legend	Depth	Stratum Description
							0.00	Concrete.
	J T	0.20					0.12	MADE GROUND: Dark brown gravelly fine to coarse sand. Gravel is subangular to subrounded fine to coarse flint and brick with rare glass, ash-like material, slate and concrete.
	J T	0.60					0.40	MADE GROUND: Dark grey, grey brown and green brown mottled slightly gravelly sandy silty clay. Gravel is subangular to subrounded fine to coarse flint with rare brick, ash-like material and clinker-like material.
	H	0.90		125			0.80	Stiff orange brown, brown and grey mottled slightly gravelly slightly sandy silty CLAY. Gravel is subangular to subrounded fine to medium flint. (Enfield Silt Member)
	J T	1.00	1.20					
	V	1.00		>130				
	H	1.10		150				
	D	1.80					1.50	Medium dense grey and orange brown very sandy slightly clayey angular to rounded fine to coarse GRAVEL of flint. (Kempton Park Gravel Member)
	D	2.00						becoming loose between 2.10m and 2.40m depth.
								becoming medium dense below 2.50m depth.
								becoming dense below 2.60m depth.
	D	2.80						becoming very dense below 2.80m depth.
							3.00	End of borehole at 3.00m

Remarks

Groundwater: Groundwater at 1.80m depth on completion of borehole.

Stability: Borehole collapsed to 2.00m depth on completion.

Notes: n/a

Excavation Method: WLS

Borehole Diameter: Various

Made By: TM

ASHDOWN SITE INVESTIGATION LIMITED
E-mail: contact@ashdownsi.co.uk
Web: www.ashdownsi.co.uk
Tel: 01273 483119

Site Name: Four Housing Courts, Lansdowne Road, London

Job Number: P16180

Start Date: 21/08/2023

End Date: 21/08/2023

Borehole Number: **WS09**

Standpipe	Sample/ Test Type	Depth From (m)	Depth To (m)	Test Result	Dynamic Probe 0 5 10 15 20 25 30	Legend	Depth	Stratum Description
							0.00	Concrete.
	J T	0.20					0.12	MADE GROUND: Dark brown slightly gravelly slightly sandy clay. Gravel is subangular to subrounded fine to coarse flint and brick with rare ash-like material, clinker-like material, metal and glass.
	J T	0.70					0.50	MADE GROUND: Yellow brown and grey brown slightly gravelly slightly sandy silty clay. Gravel is subangular to subrounded fine to medium flint with rare ash-like material and brick.
	D	0.80					0.90	Stiff to very stiff orange brown and grey brown and grey mottled slightly gravelly slightly sandy silty CLAY. Gravel is subangular to rounded fine to coarse flint. (Enfield Silt Member)
	D	1.10						with occasional pockets of sandy gravel between 1.40m and 1.80m depth.
	H	1.10		>225				
	J T	1.20						
	D	1.70					1.90	Firm grey brown and orange brown mottled slightly gravelly sandy silty CLAY with frequents pockets of sand. Gravel is subangular to subrounded fine to coarse flint. (Enfield Silt Member)
	H	2.20		40				
	D	2.30						
	D	2.90						
	H	2.90		50			3.00	End of borehole at 3.00m

Remarks

Groundwater: Groundwater at 1.90m depth on completion of borehole.

Stability: Borehole stable on completion.

Notes: Standpipe installed to 3.00m depth; 3.00m to 1.00m slotted pipe with gravel surround; 1.00m to ground level 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: TM

ASHDOWN SITE INVESTIGATION LIMITED
E-mail: contact@ashdownsi.co.uk
Web: www.ashdownsi.co.uk
Tel: 01273 483119

Site Name: Four Housing Courts, Lansdowne Road, London

Job Number: P16180

Start Date: 21/08/2023

End Date: 21/08/2023

Borehole Number: **WS10**

Standpipe	Sample/ Test Type	Depth From (m)	Depth To (m)	Test Result	Dynamic Probe 0 5 10 15 20 25 30	Legend	Depth	Stratum Description
	J T	0.12	0.25				0.00	Asphalt.
							0.03	Concrete.
							0.12	MADE GROUND: Gravelly sand. Gravel is subangular to subrounded fine to coarse brick, concrete and flint with rare glass.
							0.25	
	J T	0.50						MADE GROUND: Dark brown/ black and grey slightly gravelly slightly sandy silty clay. Gravel is subangular to subrounded fine to coarse flint and brick with rare ash-like material, bone clinker-like material, metal, glass and slate.
							0.90	
	D	1.00						MADE GROUND: Brown, orange brown and grey brown mottled slightly gravelly slightly sandy silty clay. Gravel is subangular to subrounded fine to medium ash-like material and brick.
	J T	1.10						
							1.30	
	H	1.40		40				Firm orange brown, grey brown and brown mottled slightly gravelly slightly sandy silty CLAY. Gravel is subangular to subrounded fine to medium flint. (Enfield Silt Member)
	D	1.50						
	H	1.60		50				
	J T	1.90					1.95	
	D	2.10						Medium dense yellow brown very gravelly slightly clayey fine to coarse SAND with occasional pockets of silty clay. Gravel is subangular to rounded fine to coarse flint. (Kempton Park Gravel Member)
							2.50	
	D	2.60						Medium dense orange brown very gravelly slightly clayey fine to coarse SAND. Gravel is subangular to subrounded fine to coarse flint. (Kempton Park Gravel Member)
								becoming dense below 2.80m depth.
								becoming very dense below 2.90m depth.
							3.00	End of borehole at 3.00m

Remarks

Groundwater: Groundwater at 1.80m depth on completion of borehole.

Stability: Borehole collapsed to 2.70m depth on completion.

Notes: n/a

Excavation Method: WLS

Borehole Diameter: Various

Made By: TM

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E-mail: contact@ashdownsi.co.uk
Web: www.ashdownsi.co.uk
Tel: 01273 483119

Site Name: Four Housing Courts, Lansdowne Road, London

Job Number: P16180

Start Date: 21/08/2023

End Date: 21/08/2023

Borehole Number: **WS11**

Standpipe	Sample/ Test Type	Depth From (m)	Depth To (m)	Test Result	Dynamic Probe 0 5 10 15 20 25 30	Legend	Depth	Stratum Description
							0.00	Asphalt.
							0.15	MADE GROUND: Orange brown gravelly slightly clayey sand. Gravel is subangular to subrounded fine to coarse flint, glass, brick and ash-like material.
	J T	0.40						
							0.60	MADE GROUND: Dark brown/ black slightly gravelly slightly sandy clay. Gravel is subangular to subrounded fine to medium flint, glass and brick.
	J T	0.80						
	V	1.00		50			1.00	Soft varying firm green grey and dark grey slightly sandy silty CLAY with rare organic material. (Enfield Silt Member)
	H	1.20		<25				
	J T	1.30						
	D	1.40						
	H	1.50		<25			1.60	Very soft to soft brown, orange brown and grey mottled slightly gravelly sandy CLAY. Gravel is subangular to subrounded fine to coarse flint. (Enfield Silt Member)
	D	1.90						
	D	2.30					2.40	Very dense yellow brown very sandy slightly clayey subangular to rounded fine to coarse GRAVEL of flint. (Kempton Park Gravel Member)
	D	2.50						becoming dense below 2.70m depth. becoming medium dense below 2.80m depth.
							3.00	End of borehole at 3.00m

Remarks

Groundwater: Groundwater at 2.30m depth on completion of borehole.

Stability: Borehole sides squeezing in below 2.00m depth.

Notes: n/a

Excavation Method: WLS

Borehole Diameter: Various

Made By: TM

ASHDOWN SITE INVESTIGATION LIMITED
E-mail: contact@ashdownsi.co.uk
Web: www.ashdownsi.co.uk
Tel: 01273 483119

Site Name: Four Housing Courts, Lansdowne Road, London

Job Number: P16180

Start Date: 17/08/2023

End Date: 17/08/2023

Borehole Number: **WS12**

Standpipe	Sample/ Test Type	Depth From (m)	Depth To (m)	Test Result	Legend	Depth	Stratum Description
						0.00	Topsoil over,
	J T	0.10				0.15	MADE GROUND: Brown slightly gravelly clayey sand. Gravel is subangular to subrounded fine to medium flint, brick, ash-like material, wire, concrete, clinker-like material and ceramic.
	J T	0.40					MADE GROUND: Brown grey gravelly silty sand. Gravel is subangular to subrounded fine to coarse brick, flint, concrete with rare wire, ash-like material, metal, ceramic, glass, bituminous material and chalk.
	J T	0.70	0.90			0.60	MADE GROUND: Dark brown, brown and orange brown mottled gravelly slightly sandy silty clay. Gravel is subangular to subrounded fine to medium brick and ash-like material.
	D	0.95				0.90	Firm to stiff brown, orange brown and grey mottled slightly gravelly slightly sandy silty CLAY with occasional iron staining. Gravel is subangular to subrounded fine to medium flint. (Enfield Silt Member)
	H	1.10		60			
	D	1.20					
	H	1.50		110			
	D	1.90				1.70	Stiff to very stiff brown and orange brown slightly gravelly sandy CLAY with occasional pockets of sandy gravel. Gravel is subangular to subrounded fine to coarse flint. (Enfield Silt Member)
	D	2.60				2.70	Dense brown very sandy slightly clayey angular to rounded fine to coarse GRAVEL of flint. (Kempton Park Gravel Member)
	D	2.90					becoming very dense at base.
						3.00	End of borehole at 3.00m

Samples and In Situ Testing

Dynamic Probe: 0 5 10 15 20 25 30

Remarks

Groundwater: Borehole dry during drilling.

Stability: Borehole stable on completion.

Notes: Standpipe installed to 3.00m depth; 3.00m to 1.00m slotted pipe with gravel surround; 1.00m to ground level 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: TM

ASHDOWN SITE INVESTIGATION LIMITED
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Site Name: Four Housing Courts, Lansdowne Road, London

Job Number: P16180

Start Date: 14/08/2023

End Date: 14/08/2023

Trial Pit Number: **TP01**

Samples and In Situ Testing						
Sample/ Test Type	Depth From (m)	Depth To (m)	Test Result	Legend	Depth/ Reduced Level	Stratum Description
J T	0.10				0.00	Topsoil.
J T	0.30				0.15	MADE GROUND: Brown gravelly slightly sandy clay. Gravel is subangular to subrounded fine to coarse concrete, brick and flint.
D	0.80				0.80	End of trial pit at 0.80m

Remarks

Groundwater: Trial pit dry on completion.

Stability: Trial pit stable on completion.

Notes: No further progress below 0.80m depth - too hard/ compact for hand held tools.

Excavation Method: HDP

Pit Length: n/a

Pit Width: n/a

Made By: JN

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Tel: 01273 483119

Site Name: Four Housing Courts, Lansdowne Road, London

Job Number: P16180

Start Date: 14/08/2023

End Date: 14/08/2023

Trial Pit Number: **TP02**

Samples and In Situ Testing						
Sample/ Test Type	Depth From (m)	Depth To (m)	Test Result	Legend	Depth/ Reduced Level	Stratum Description
J T	0.05				0.00	Topsoil.
					0.10	MADE GROUND: Brown gravelly slightly sandy clay. Gravel is subangular to subrounded fine to coarse flint, concrete, glass and brick.
J T	0.25					
						with concrete at base.
D	0.55				0.55	End of trial pit at 0.55m

Remarks

Groundwater: Trial pit dry on completion.

Stability: Trial pit stable on completion.

Notes: No further progress below 0.55m depth - concrete obstruction.

Excavation Method:	HDP
Pit Length:	n/a
Pit Width:	n/a
Made By:	JN

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Tel: 01273 483119

Site Name: Four Housing Courts, Lansdowne Road, London

Job Number: P16180

Start Date: 14/08/2023

End Date: 14/08/2023

Trial Pit Number: **TP03**

Samples and In Situ Testing				Legend	Depth/ Reduced Level	Stratum Description
Sample/ Test Type	Depth From (m)	Depth To (m)	Test Result			
					0.00	Topsoil over,
J T	0.20					MADE GROUND: Brown gravelly slightly sandy clay. Gravel is subangular to subrounded fine to coarse flint, clinker-like material, glass and brick.
					0.75	
J T	0.80					MADE GROUND: Orange brown slightly gravelly slightly sandy clay. Gravel is subangular to subrounded fine to medium flint with rare brick.
D	0.95				0.95	End of trial pit at 0.95m

Remarks

Groundwater: Trial pit dry on completion.

Stability: Trial pit stable on completion.

Notes: No further progress below 0.95m depth - too hard/ dense.

Excavation Method: HDP

Pit Length: n/a

Pit Width: n/a

Made By: JN

ASHDOWN SITE INVESTIGATION LIMITED
E-mail: contact@ashdownsi.co.uk
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Tel: 01273 483119

Site Name: Four Housing Courts, Lansdowne Road, London

Job Number: P16180

Start Date: 14/08/2023

End Date: 14/08/2023

Trial Pit Number: **TP04**

Samples and In Situ Testing				Legend	Depth/ Reduced Level	Stratum Description
Sample/ Test Type	Depth From (m)	Depth To (m)	Test Result			
J T	0.10				0.00	Topsoil over, MADE GROUND: Dark brown/ black very sandy subangular to subrounded fine to coarse gravel of flint, concrete, brick and wood.
D	0.60				0.60	End of trial pit at 0.60m

Remarks

Groundwater: Trial pit dry on completion.

Stability: Trial pit collapsing on completion.

Notes: No further progress below 0.60m depth - due to instability of pit.

Excavation Method:	HDP
Pit Length:	n/a
Pit Width:	n/a
Made By:	JN

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Web: www.ashdownsi.co.uk
Tel: 01273 483119

Site Name: Four Housing Courts, Lansdowne Road, London

Job Number: P16180

Start Date: 14/08/2023

End Date: 14/08/2023

Trial Pit Number: **TP05**

Samples and In Situ Testing				Legend	Depth/ Reduced Level	Stratum Description
Sample/ Test Type	Depth From (m)	Depth To (m)	Test Result			
					0.00	Topsoil with rare gravel of plastic and flint.
J T	0.10				0.05	MADE GROUND: Brown very gravelly clayey fine to coarse sand. Gravel is subangular to subrounded fine to coarse flint, brick, concrete, ash-like material, clinker-like material, glass, ceramic and mortar.
J T	0.40					
					0.60	End of trial pit at 0.60m

Remarks

Groundwater: Trial pit dry on completion.

Stability: Trial pit stable on completion.

Notes: No further progress below 0.60m depth - too hard/ compact for hand held tools.

Excavation Method: HDP

Pit Length: n/a

Pit Width: n/a

Made By: TM

ASHDOWN SITE INVESTIGATION LIMITED
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Web: www.ashdownsi.co.uk
Tel: 01273 483119

Site Name: Four Housing Courts, Lansdowne Road, London

Job Number: P16180

Start Date: 14/08/2023

End Date: 14/08/2023

Trial Pit Number: **TP06**

Samples and In Situ Testing				Legend	Depth/ Reduced Level	Stratum Description
Sample/ Test Type	Depth From (m)	Depth To (m)	Test Result			
J T	0.10				0.00	Topsoil.
					0.15	MADE GROUND: Brown gravelly slightly sandy clay. Gravel is subangular to subrounded fine to coarse flint, brick, concrete and metal.
J T	0.50					
D	0.70				0.70	End of trial pit at 0.70m

Remarks

Groundwater: Trial pit dry on completion.

Stability: Trial pit stable on completion.

Notes: No further progress below 0.70m depth - too hard/ compact for hand held tools.

Excavation Method: HDP

Pit Length: n/a

Pit Width: n/a

Made By: JN

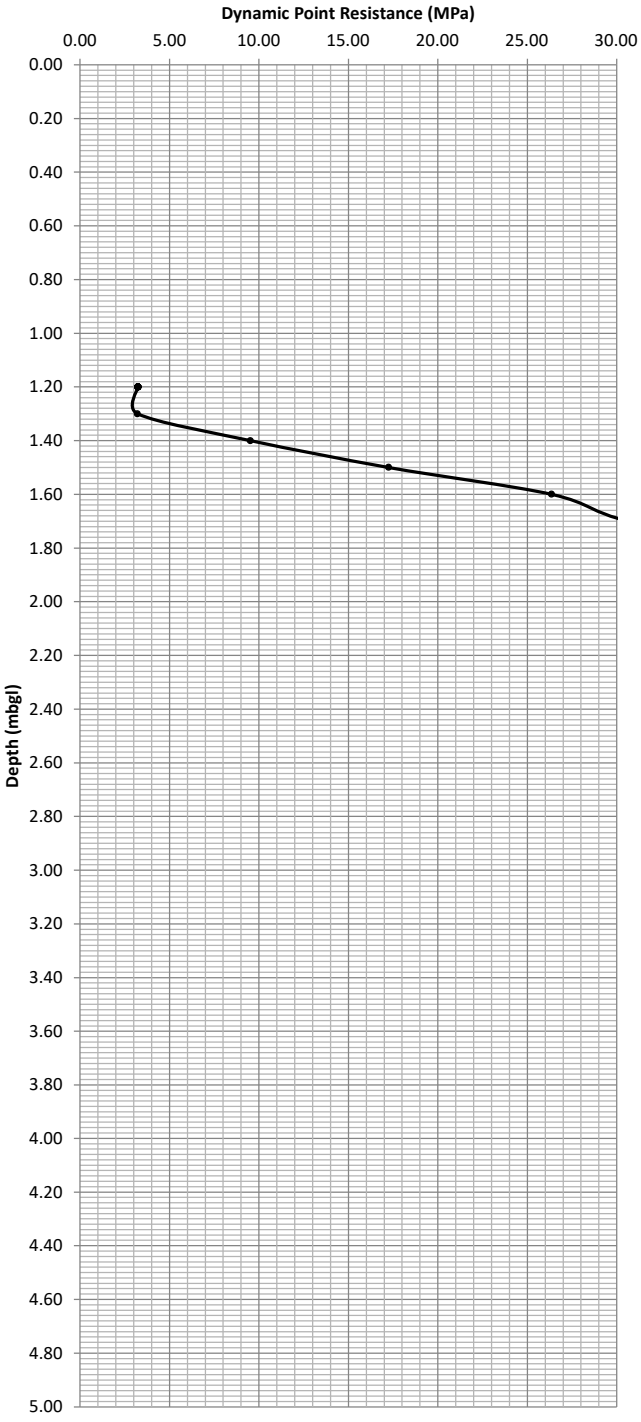
ASHDOWN SITE INVESTIGATION LTD

Dynamic Probe Record

SITE Four Housing Courts, Lansdowne Road, London **Report Ref.** P16180

Test Location Reference	WS01

Depth (mbgl)	Blows (per 100mm)	Average Penetration per Blow (m)	Unit Point Resistance (MPa)	Dynamic Point Resistance (MPa)
0.10				
0.20				
0.30				
0.40				
0.50				
0.60				
0.70				
0.80				
0.90				
1.00				
1.10				
1.20	2	0.05	3.84	3.25
1.30	2	0.05	3.84	3.21
1.40	6	0.02	11.51	9.52
1.50	11	0.01	21.11	17.25
1.60	17	0.01	32.62	26.37
1.70	20	0.01	38.37	30.68
1.80	26	0.00	49.88	39.44
1.90	27	0.00	51.80	40.52
2.00	30	0.00	57.56	44.54
2.10	30	0.00	57.56	44.06
2.20				
2.30				
2.40				
2.50				
2.60				
2.70				
2.80				
2.90				
3.00				
3.10				
3.20				
3.30				
3.40				
3.50				
3.60				
3.70				
3.80				
3.90				
4.00				
4.10				
4.20				
4.30				
4.40				
4.50				
4.60				
4.70				
4.80				
4.90				
5.00				



Notes:
No further progress below 2.10m depth - hammer bouncing.

Hammer Mass	63.5	kg
Fall Height	0.76	m
Cone Area	0.0019	m^2
E_{theor}	473	J
Energy Ratio	0.77	
Anvil Mass	1	kg
Rod Mass	8.79	kg/m

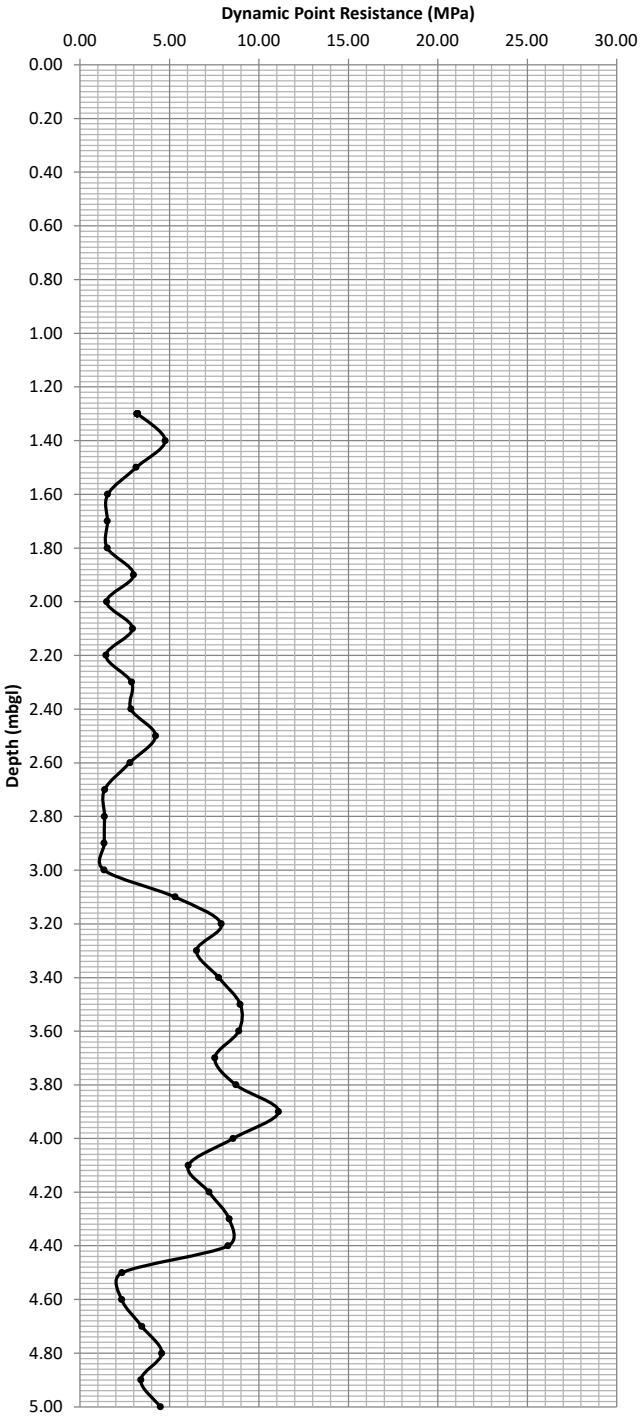
ASHDOWN SITE INVESTIGATION LTD

Dynamic Probe Record

SITE Four Housing Courts, Lansdowne Road, London **Report Ref.** P16180

Test Location Reference	WS02

Depth (mbgl)	Blows (per 100mm)	Average Penetration per Blow (m)	Unit Point Resistance (MPa)	Dynamic Point Resistance (MPa)
0.10				
0.20				
0.30				
0.40				
0.50				
0.60				
0.70				
0.80				
0.90				
1.00				
1.10				
1.20				
1.30	2	0.05	3.84	3.21
1.40	3	0.03	5.76	4.76
1.50	2	0.05	3.84	3.14
1.60	1	0.10	1.92	1.55
1.70	1	0.10	1.92	1.53
1.80	1	0.10	1.92	1.52
1.90	2	0.05	3.84	3.00
2.00	1	0.10	1.92	1.48
2.10	2	0.05	3.84	2.94
2.20	1	0.10	1.92	1.45
2.30	2	0.05	3.84	2.88
2.40	2	0.05	3.84	2.85
2.50	3	0.03	5.76	4.23
2.60	2	0.05	3.84	2.79
2.70	1	0.10	1.92	1.38
2.80	1	0.10	1.92	1.37
2.90	1	0.10	1.92	1.35
3.00	1	0.10	1.92	1.34
3.10	4	0.03	7.67	5.31
3.20	6	0.02	11.51	7.89
3.30	5	0.02	9.59	6.52
3.40	6	0.02	11.51	7.75
3.50	7	0.01	13.43	8.95
3.60	7	0.01	13.43	8.87
3.70	6	0.02	11.51	7.54
3.80	7	0.01	13.43	8.71
3.90	9	0.01	17.27	11.10
4.00	7	0.01	13.43	8.56
4.10	5	0.02	9.59	6.06
4.20	6	0.02	11.51	7.21
4.30	7	0.01	13.43	8.34
4.40	7	0.01	13.43	8.27
4.50	2	0.05	3.84	2.34
4.60	2	0.05	3.84	2.32
4.70	3	0.03	5.76	3.45
4.80	4	0.03	7.67	4.57
4.90	3	0.03	5.76	3.40
5.00	4	0.03	7.67	4.49



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	kg
Rod Mass	8.79	kg/m

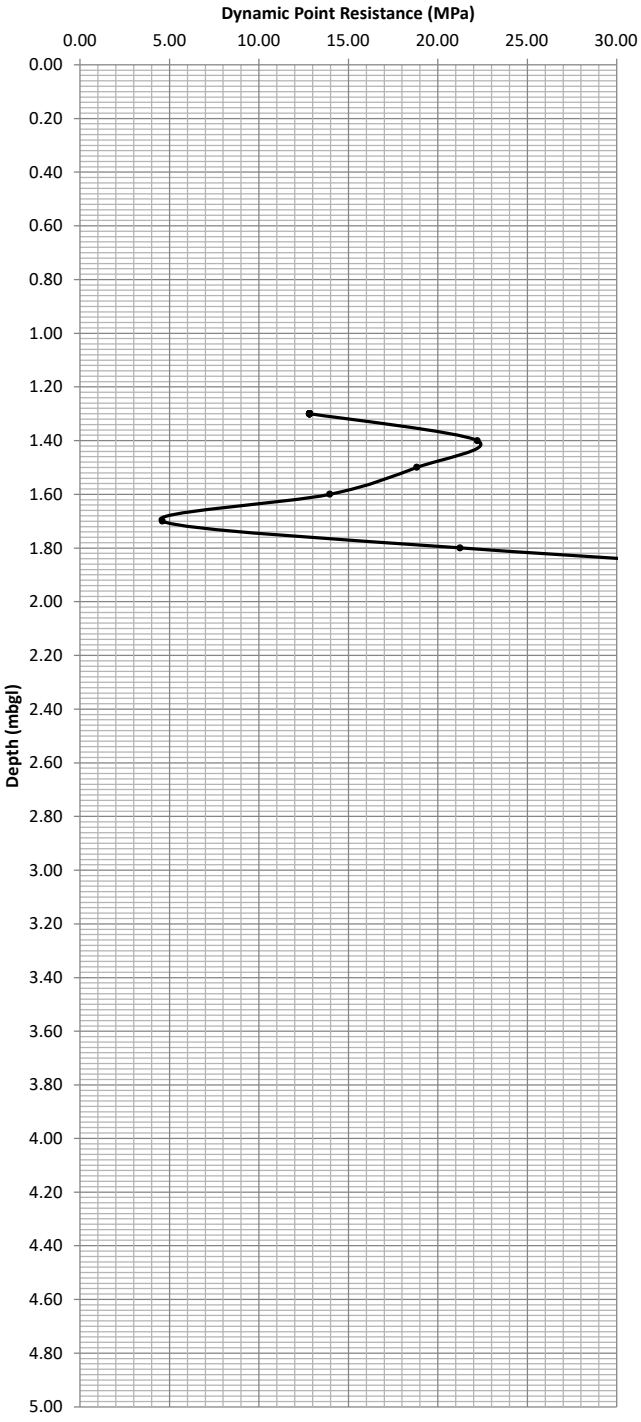
ASHDOWN SITE INVESTIGATION LTD

Dynamic Probe Record

SITE Four Housing Courts, Lansdowne Road, London **Report Ref.** P16180

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				
0.30				
0.40				
0.50				
0.60				
0.70				
0.80				
0.90				
1.00				
1.10				
1.20				
1.30	8	0.01	15.35	12.84
1.40	14	0.01	26.86	22.21
1.50	12	0.01	23.02	18.82
1.60	9	0.01	17.27	13.96
1.70	3	0.03	5.76	4.60
1.80	14	0.01	26.86	21.24
1.90	30	0.00	57.56	45.02
2.00				
2.10				
2.20				
2.30				
2.40				
2.50				
2.60				
2.70				
2.80				
2.90				
3.00				
3.10				
3.20				
3.30				
3.40				
3.50				
3.60				
3.70				
3.80				
3.90				
4.00				
4.10				
4.20				
4.30				
4.40				
4.50				
4.60				
4.70				
4.80				
4.90				
5.00				



Notes:
No further progress below 1.90m depth - hammer bouncing.

Hammer Mass	63.5	kg
Fall Height	0.76	m
Cone Area	0.0019	m^2
E_{theor}	473	J
Energy Ratio	0.77	
Anvil Mass	1	kg
Rod Mass	8.79	kg/m

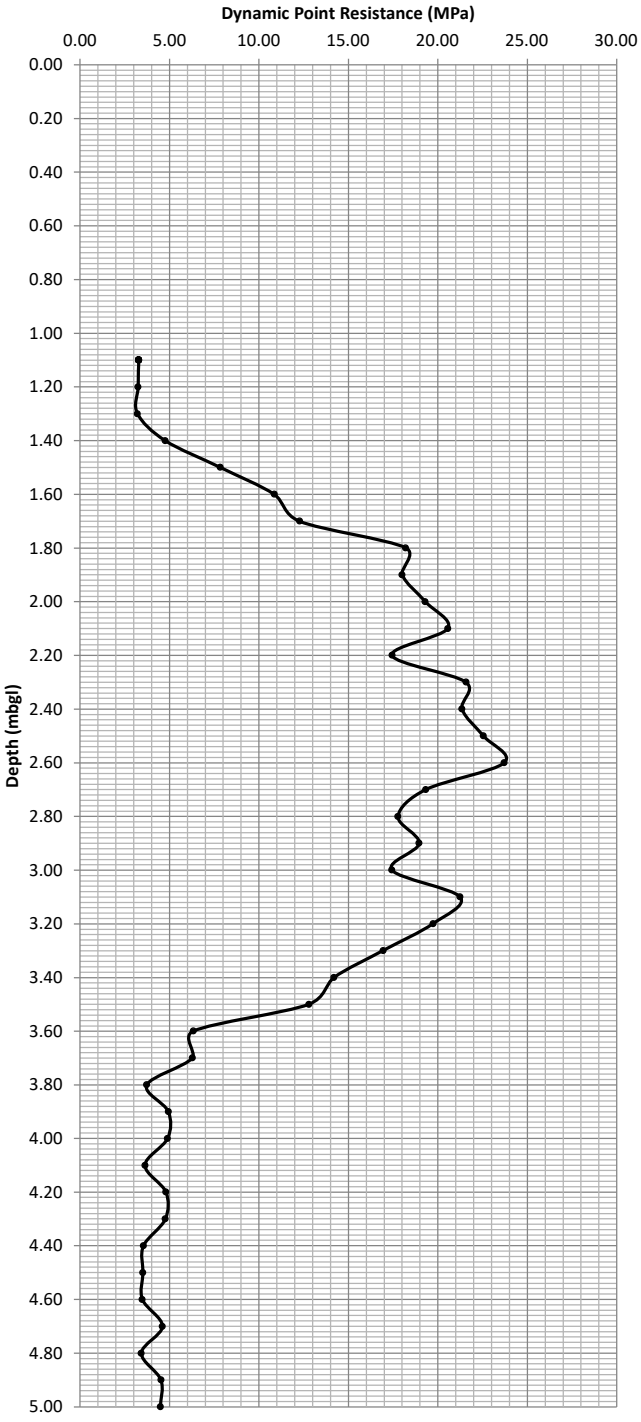
ASHDOWN SITE INVESTIGATION LTD

Dynamic Probe Record

SITE Four Housing Courts, Lansdowne Road, London **Report Ref.** P16180

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				
0.30				
0.40				
0.50				
0.60				
0.70				
0.80				
0.90				
1.00				
1.10	2	0.05	3.84	3.29
1.20	2	0.05	3.84	3.25
1.30	2	0.05	3.84	3.21
1.40	3	0.03	5.76	4.76
1.50	5	0.02	9.59	7.84
1.60	7	0.01	13.43	10.86
1.70	8	0.01	15.35	12.27
1.80	12	0.01	23.02	18.20
1.90	12	0.01	23.02	18.01
2.00	13	0.01	24.94	19.30
2.10	14	0.01	26.86	20.56
2.20	12	0.01	23.02	17.44
2.30	15	0.01	28.78	21.57
2.40	15	0.01	28.78	21.35
2.50	16	0.01	30.70	22.55
2.60	17	0.01	32.62	23.71
2.70	14	0.01	26.86	19.33
2.80	13	0.01	24.94	17.78
2.90	14	0.01	26.86	18.96
3.00	13	0.01	24.94	17.43
3.10	16	0.01	30.70	21.25
3.20	15	0.01	28.78	19.73
3.30	13	0.01	24.94	16.94
3.40	11	0.01	21.11	14.20
3.50	10	0.01	19.19	12.79
3.60	5	0.02	9.59	6.34
3.70	5	0.02	9.59	6.28
3.80	3	0.03	5.76	3.73
3.90	4	0.03	7.67	4.93
4.00	4	0.03	7.67	4.89
4.10	3	0.03	5.76	3.64
4.20	4	0.03	7.67	4.81
4.30	4	0.03	7.67	4.76
4.40	3	0.03	5.76	3.54
4.50	3	0.03	5.76	3.51
4.60	3	0.03	5.76	3.48
4.70	4	0.03	7.67	4.61
4.80	3	0.03	5.76	3.43
4.90	4	0.03	7.67	4.53
5.00	4	0.03	7.67	4.49



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	kg
Rod Mass	8.79	kg/m

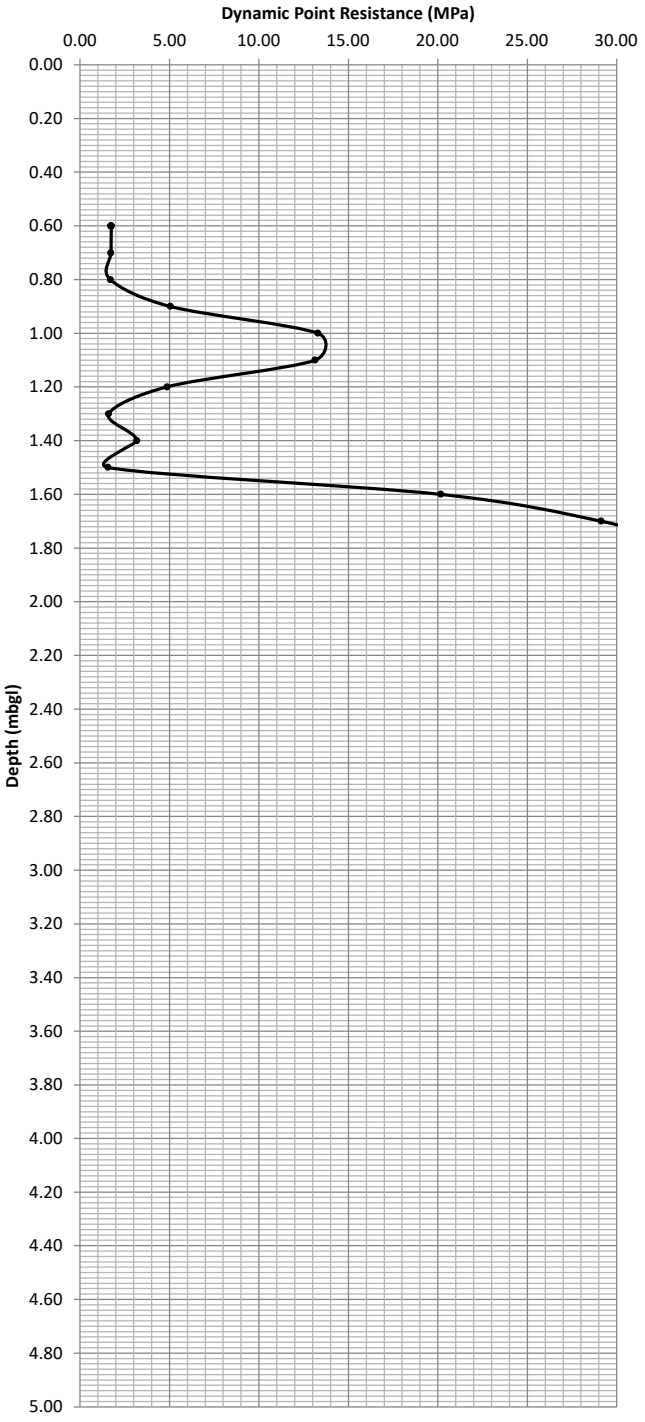
ASHDOWN SITE INVESTIGATION LTD

Dynamic Probe Record

SITE Four Housing Courts, Lansdowne Road, London **Report Ref.** P16180

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				
0.30				
0.40				
0.50				
0.60	1	0.10	1.92	1.75
0.70	1	0.10	1.92	1.72
0.80	1	0.10	1.92	1.70
0.90	3	0.03	5.76	5.05
1.00	8	0.01	15.35	13.30
1.10	8	0.01	15.35	13.14
1.20	3	0.03	5.76	4.87
1.30	1	0.10	1.92	1.60
1.40	2	0.05	3.84	3.17
1.50	1	0.10	1.92	1.57
1.60	13	0.01	24.94	20.16
1.70	19	0.01	36.45	29.14
1.80	23	0.00	44.13	34.89
1.90	30	0.00	57.56	45.02
2.00	26	0.00	49.88	38.60
2.10	28	0.00	53.72	41.13
2.20	29	0.00	55.64	42.15
2.30	30	0.00	57.56	43.15
2.40				
2.50				
2.60				
2.70				
2.80				
2.90				
3.00				
3.10				
3.20				
3.30				
3.40				
3.50				
3.60				
3.70				
3.80				
3.90				
4.00				
4.10				
4.20				
4.30				
4.40				
4.50				
4.60				
4.70				
4.80				
4.90				
5.00				



Notes:
No further progress below 2.30m depth - hammer bouncing.

Hammer Mass	63.5	kg
Fall Height	0.76	m
Cone Area	0.0019	m^2
E_{theor}	473	J
Energy Ratio	0.77	
Anvil Mass	1	kg
Rod Mass	8.79	kg/m

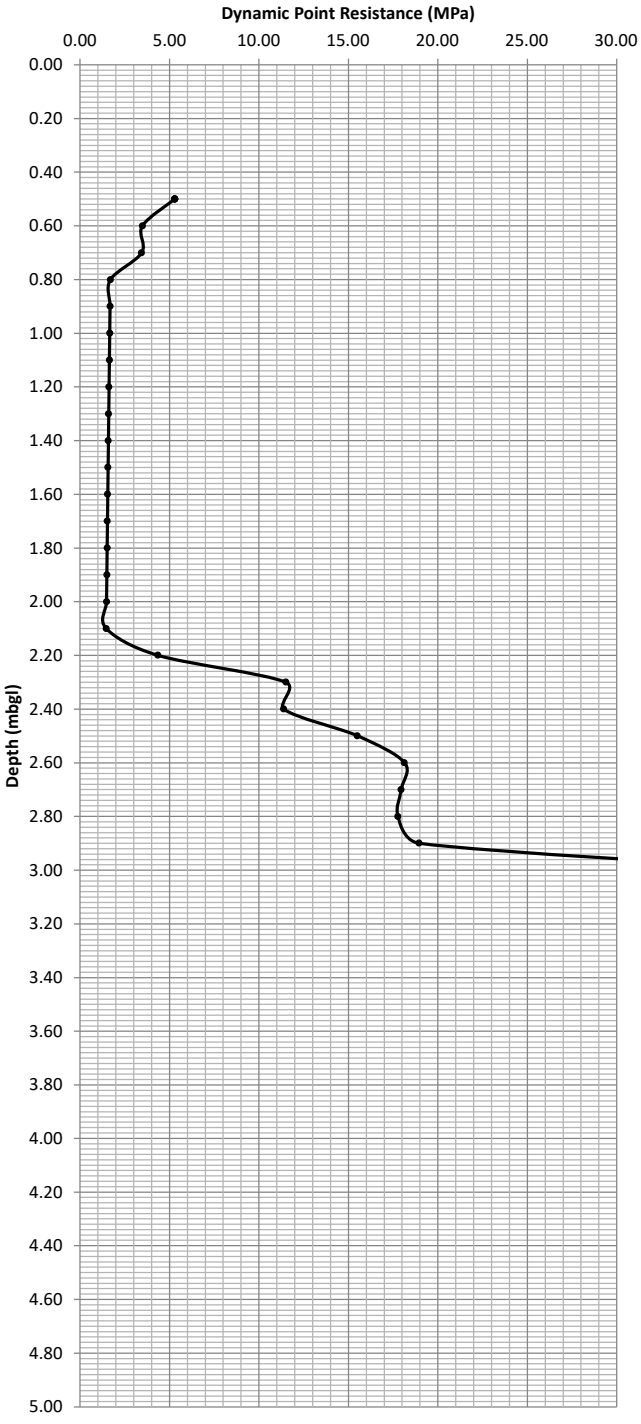
ASHDOWN SITE INVESTIGATION LTD

Dynamic Probe Record

SITE Four Housing Courts, Lansdowne Road, London **Report Ref.** P16180

Test Location Reference	WS06

Depth (mbgl)	Blows (per 100mm)	Average Penetration per Blow (m)	Unit Point Resistance (MPa)	Dynamic Point Resistance (MPa)
0.10				
0.20				
0.30				
0.40				
0.50	3	0.03	5.76	5.31
0.60	2	0.05	3.84	3.49
0.70	2	0.05	3.84	3.45
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	1	0.10	1.92	1.62
1.30	1	0.10	1.92	1.60
1.40	1	0.10	1.92	1.59
1.50	1	0.10	1.92	1.57
1.60	1	0.10	1.92	1.55
1.70	1	0.10	1.92	1.53
1.80	1	0.10	1.92	1.52
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	1.47
2.20	3	0.03	5.76	4.36
2.30	8	0.01	15.35	11.51
2.40	8	0.01	15.35	11.39
2.50	11	0.01	21.11	15.50
2.60	13	0.01	24.94	18.13
2.70	13	0.01	24.94	17.95
2.80	13	0.01	24.94	17.78
2.90	14	0.01	26.86	18.96
3.00	30	0.00	57.56	40.23
3.10				
3.20				
3.30				
3.40				
3.50				
3.60				
3.70				
3.80				
3.90				
4.00				
4.10				
4.20				
4.30				
4.40				
4.50				
4.60				
4.70				
4.80				
4.90				
5.00				



Notes:
No further progress below 3.00m depth - hammer bouncing.

Hammer Mass	63.5	kg
Fall Height	0.76	m
Cone Area	0.0019	m^2
E_{theor}	473	J
Energy Ratio	0.77	
Anvil Mass	1	kg
Rod Mass	8.79	kg/m

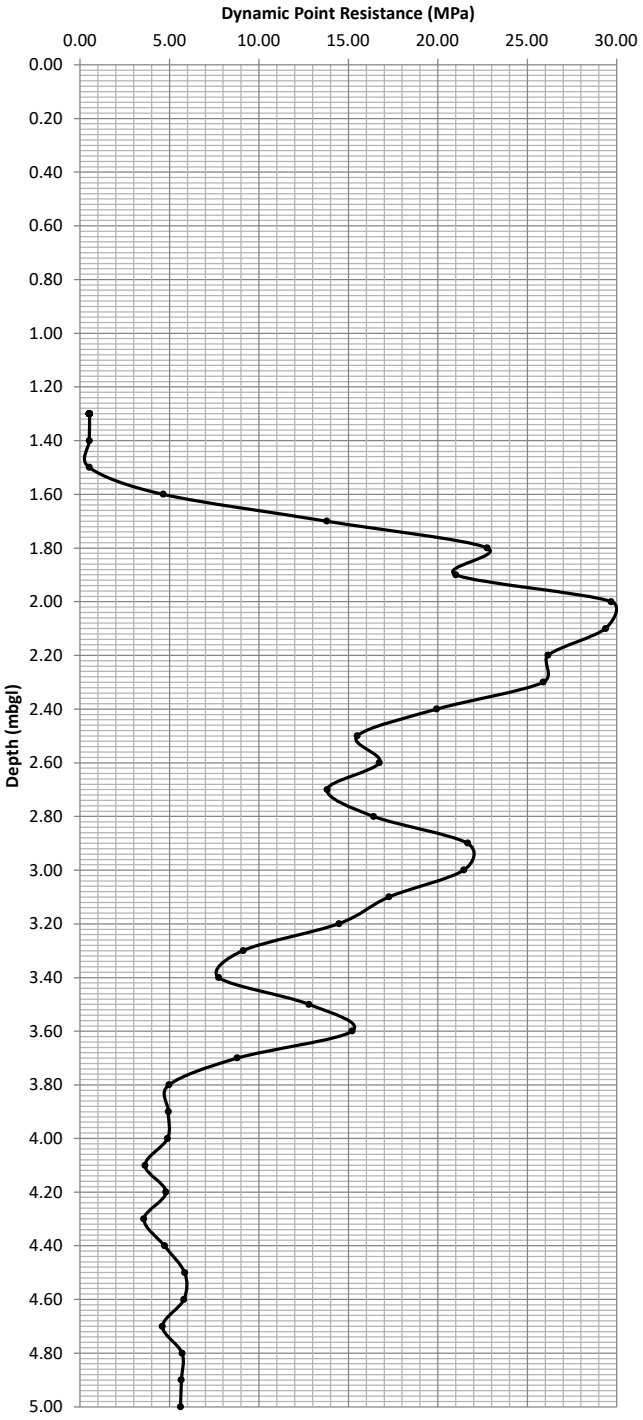
ASHDOWN SITE INVESTIGATION LTD

Dynamic Probe Record

SITE Four Housing Courts, Lansdowne Road, London **Report Ref.** P16180

Test Location Reference	WS07

Depth (mbgl)	Blows (per 100mm)	Average Penetration per Blow (m)	Unit Point Resistance (MPa)	Dynamic Point Resistance (MPa)
0.10				
0.20				
0.30				
0.40				
0.50				
0.60				
0.70				
0.80				
0.90				
1.00				
1.10				
1.20				
1.30	0.33	0.30	0.63	0.53
1.40	0.33	0.30	0.63	0.52
1.50	0.33	0.30	0.63	0.52
1.60	3	0.03	5.76	4.65
1.70	9	0.01	17.27	13.80
1.80	15	0.01	28.78	22.75
1.90	14	0.01	26.86	21.01
2.00	20	0.01	38.37	29.69
2.10	20	0.01	38.37	29.38
2.20	18	0.01	34.54	26.16
2.30	18	0.01	34.54	25.89
2.40	14	0.01	26.86	19.93
2.50	11	0.01	21.11	15.50
2.60	12	0.01	23.02	16.74
2.70	10	0.01	19.19	13.81
2.80	12	0.01	23.02	16.41
2.90	16	0.01	30.70	21.66
3.00	16	0.01	30.70	21.46
3.10	13	0.01	24.94	17.27
3.20	11	0.01	21.11	14.47
3.30	7	0.01	13.43	9.12
3.40	6	0.02	11.51	7.75
3.50	10	0.01	19.19	12.79
3.60	12	0.01	23.02	15.21
3.70	7	0.01	13.43	8.79
3.80	4	0.03	7.67	4.98
3.90	4	0.03	7.67	4.93
4.00	4	0.03	7.67	4.89
4.10	3	0.03	5.76	3.64
4.20	4	0.03	7.67	4.81
4.30	3	0.03	5.76	3.57
4.40	4	0.03	7.67	4.72
4.50	5	0.02	9.59	5.86
4.60	5	0.02	9.59	5.81
4.70	4	0.03	7.67	4.61
4.80	5	0.02	9.59	5.71
4.90	5	0.02	9.59	5.66
5.00	5	0.02	9.59	5.62



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	kg
Rod Mass	8.79	kg/m

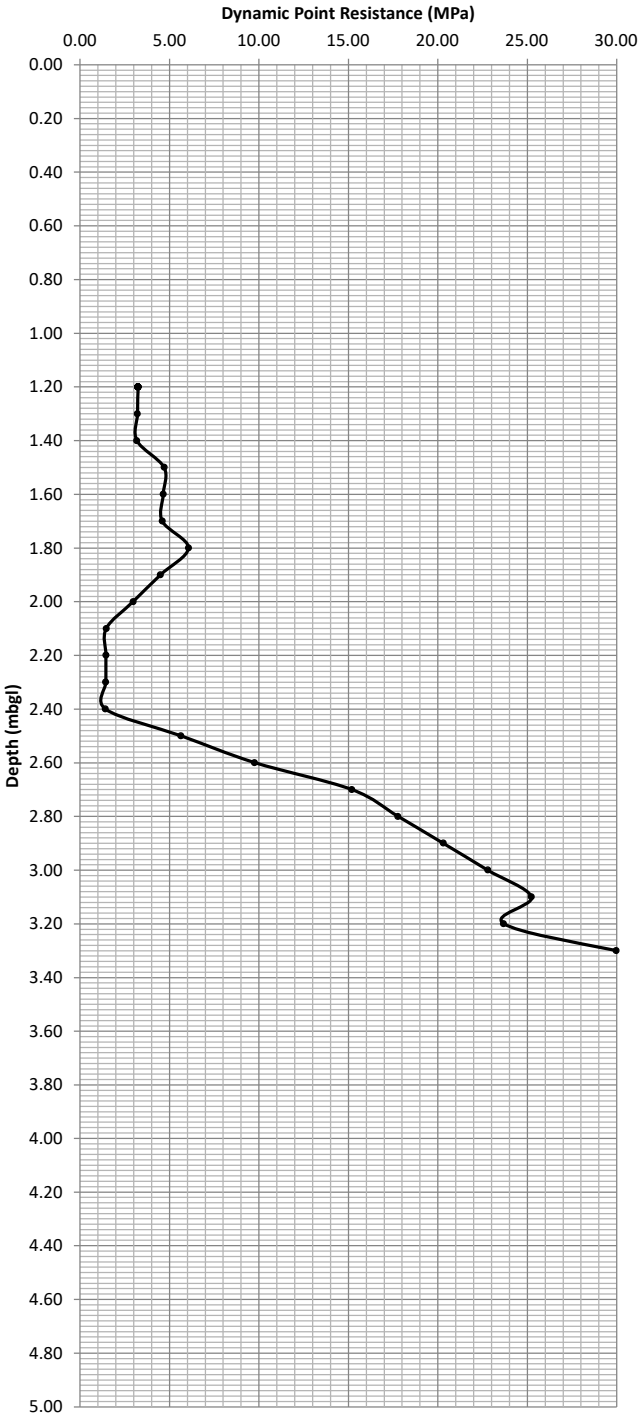
ASHDOWN SITE INVESTIGATION LTD

Dynamic Probe Record

SITE Four Housing Courts, Lansdowne Road, London **Report Ref.** P16180

Test Location Reference	WS08

Depth (mbgl)	Blows (per 100mm)	Average Penetration per Blow (m)	Unit Point Resistance (MPa)	Dynamic Point Resistance (MPa)
0.10				
0.20				
0.30				
0.40				
0.50				
0.60				
0.70				
0.80				
0.90				
1.00				
1.10				
1.20	2	0.05	3.84	3.25
1.30	2	0.05	3.84	3.21
1.40	2	0.05	3.84	3.17
1.50	3	0.03	5.76	4.71
1.60	3	0.03	5.76	4.65
1.70	3	0.03	5.76	4.60
1.80	4	0.03	7.67	6.07
1.90	3	0.03	5.76	4.50
2.00	2	0.05	3.84	2.97
2.10	1	0.10	1.92	1.47
2.20	1	0.10	1.92	1.45
2.30	1	0.10	1.92	1.44
2.40	1	0.10	1.92	1.42
2.50	4	0.03	7.67	5.64
2.60	7	0.01	13.43	9.76
2.70	11	0.01	21.11	15.19
2.80	13	0.01	24.94	17.78
2.90	15	0.01	28.78	20.31
3.00	17	0.01	32.62	22.80
3.10	19	0.01	36.45	25.23
3.20	18	0.01	34.54	23.68
3.30	23	0.00	44.13	29.97
3.40	30	0.00	57.56	38.73
3.50				
3.60				
3.70				
3.80				
3.90				
4.00				
4.10				
4.20				
4.30				
4.40				
4.50				
4.60				
4.70				
4.80				
4.90				
5.00				



Notes:
No further progress below 3.40m depth - hammer bouncing.

Hammer Mass	63.5	kg
Fall Height	0.76	m
Cone Area	0.0019	m^2
E_{theor}	473	J
Energy Ratio	0.77	
Anvil Mass	1	kg
Rod Mass	8.79	kg/m

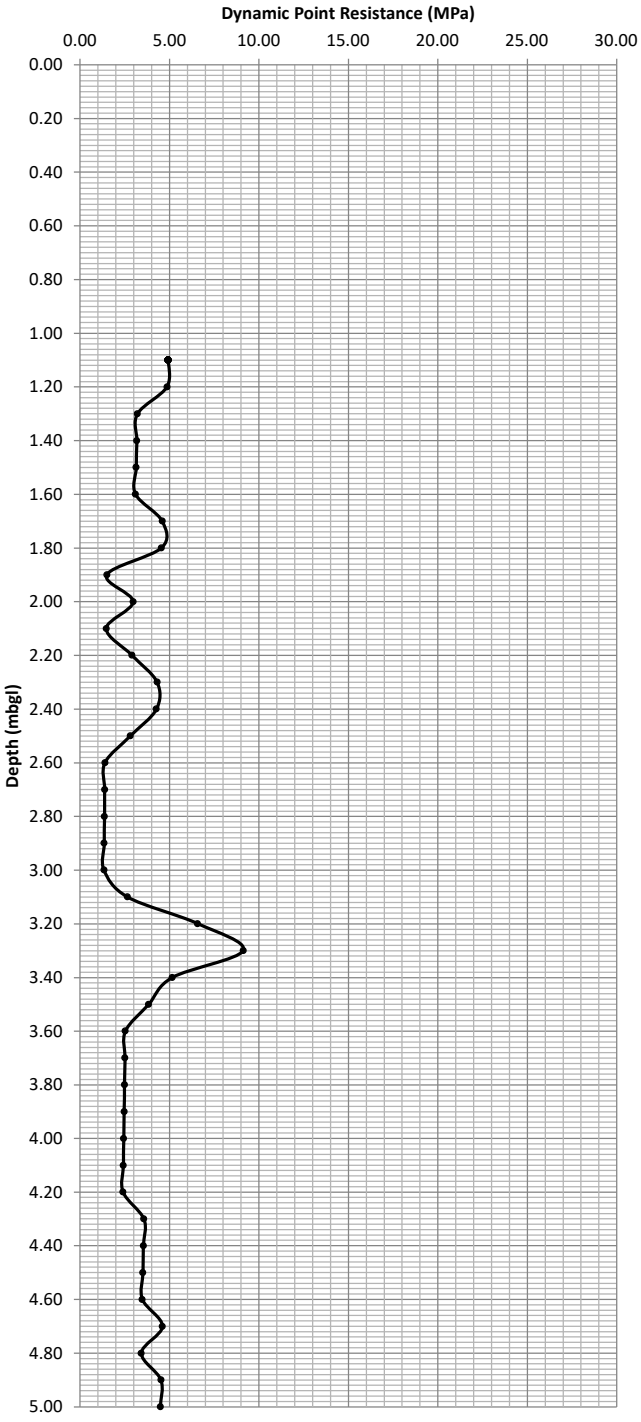
ASHDOWN SITE INVESTIGATION LTD

Dynamic Probe Record

SITE Four Housing Courts, Lansdowne Road, London **Report Ref.** P16180

Test Location Reference	WS09

Depth (mbgl)	Blows (per 100mm)	Average Penetration per Blow (m)	Unit Point Resistance (MPa)	Dynamic Point Resistance (MPa)
0.10				
0.20				
0.30				
0.40				
0.50				
0.60				
0.70				
0.80				
0.90				
1.00				
1.10	3	0.03	5.76	4.93
1.20	3	0.03	5.76	4.87
1.30	2	0.05	3.84	3.21
1.40	2	0.05	3.84	3.17
1.50	2	0.05	3.84	3.14
1.60	2	0.05	3.84	3.10
1.70	3	0.03	5.76	4.60
1.80	3	0.03	5.76	4.55
1.90	1	0.10	1.92	1.50
2.00	2	0.05	3.84	2.97
2.10	1	0.10	1.92	1.47
2.20	2	0.05	3.84	2.91
2.30	3	0.03	5.76	4.31
2.40	3	0.03	5.76	4.27
2.50	2	0.05	3.84	2.82
2.60	1	0.10	1.92	1.39
2.70	1	0.10	1.92	1.38
2.80	1	0.10	1.92	1.37
2.90	1	0.10	1.92	1.35
3.00	1	0.10	1.92	1.34
3.10	2	0.05	3.84	2.66
3.20	5	0.02	9.59	6.58
3.30	7	0.01	13.43	9.12
3.40	4	0.03	7.67	5.16
3.50	3	0.03	5.76	3.84
3.60	2	0.05	3.84	2.53
3.70	2	0.05	3.84	2.51
3.80	2	0.05	3.84	2.49
3.90	2	0.05	3.84	2.47
4.00	2	0.05	3.84	2.45
4.10	2	0.05	3.84	2.42
4.20	2	0.05	3.84	2.40
4.30	3	0.03	5.76	3.57
4.40	3	0.03	5.76	3.54
4.50	3	0.03	5.76	3.51
4.60	3	0.03	5.76	3.48
4.70	4	0.03	7.67	4.61
4.80	3	0.03	5.76	3.43
4.90	4	0.03	7.67	4.53
5.00	4	0.03	7.67	4.49



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	kg
Rod Mass	8.79	kg/m

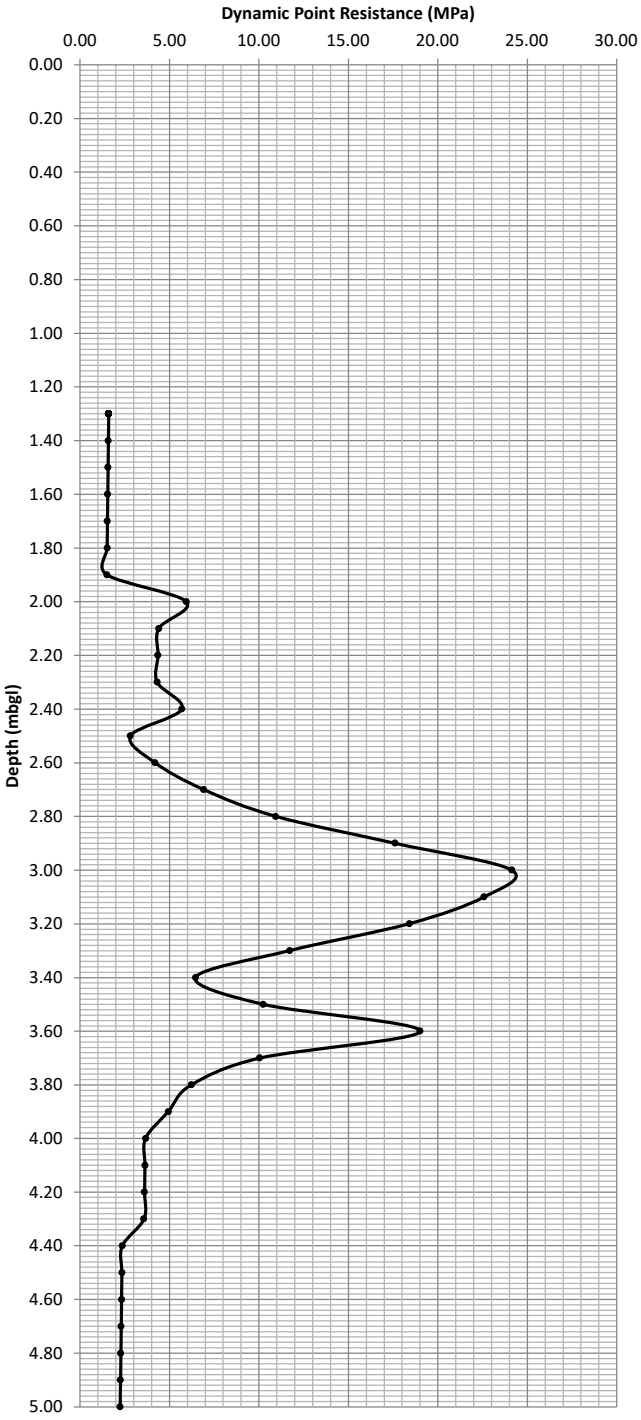
ASHDOWN SITE INVESTIGATION LTD

Dynamic Probe Record

SITE Four Housing Courts, Lansdowne Road, London **Report Ref.** P16180

Test Location Reference	WS10

Depth (mbgl)	Blows (per 100mm)	Average Penetration per Blow (m)	Unit Point Resistance (MPa)	Dynamic Point Resistance (MPa)
0.10				
0.20				
0.30				
0.40				
0.50				
0.60				
0.70				
0.80				
0.90				
1.00				
1.10				
1.20				
1.30	1	0.10	1.92	1.60
1.40	1	0.10	1.92	1.59
1.50	1	0.10	1.92	1.57
1.60	1	0.10	1.92	1.55
1.70	1	0.10	1.92	1.53
1.80	1	0.10	1.92	1.52
1.90	1	0.10	1.92	1.50
2.00	4	0.03	7.67	5.94
2.10	3	0.03	5.76	4.41
2.20	3	0.03	5.76	4.36
2.30	3	0.03	5.76	4.31
2.40	4	0.03	7.67	5.69
2.50	2	0.05	3.84	2.82
2.60	3	0.03	5.76	4.18
2.70	5	0.02	9.59	6.91
2.80	8	0.01	15.35	10.94
2.90	13	0.01	24.94	17.60
3.00	18	0.01	34.54	24.14
3.10	17	0.01	32.62	22.58
3.20	14	0.01	26.86	18.42
3.30	9	0.01	17.27	11.73
3.40	5	0.02	9.59	6.46
3.50	8	0.01	15.35	10.23
3.60	15	0.01	28.78	19.01
3.70	8	0.01	15.35	10.05
3.80	5	0.02	9.59	6.22
3.90	4	0.03	7.67	4.93
4.00	3	0.03	5.76	3.67
4.10	3	0.03	5.76	3.64
4.20	3	0.03	5.76	3.60
4.30	3	0.03	5.76	3.57
4.40	2	0.05	3.84	2.36
4.50	2	0.05	3.84	2.34
4.60	2	0.05	3.84	2.32
4.70	2	0.05	3.84	2.30
4.80	2	0.05	3.84	2.28
4.90	2	0.05	3.84	2.27
5.00	2	0.05	3.84	2.25



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	kg
Rod Mass	8.79	kg/m

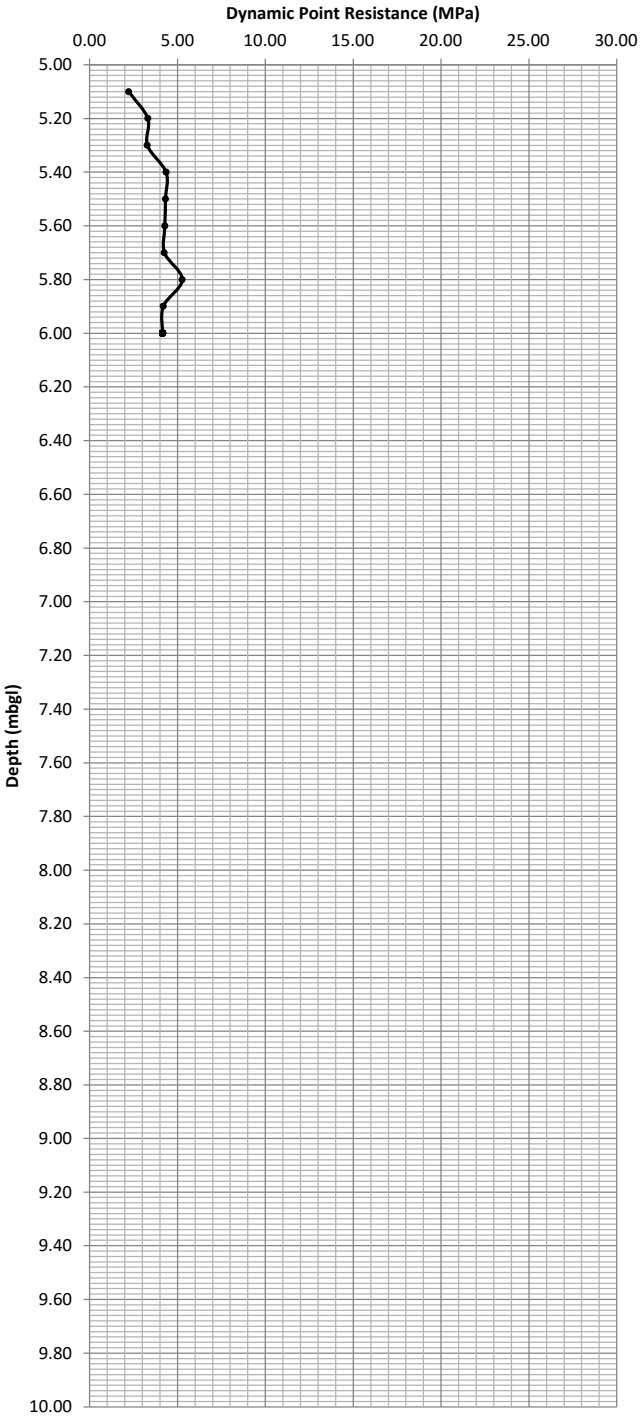
ASHDOWN SITE INVESTIGATION LTD

Dynamic Probe Record

SITE Four Housing Courts, Lansdowne Road, London **Report Ref.** P16180

Test Location Reference	WS10

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	2.23
5.20	3	0.03	5.76	3.32
5.30	3	0.03	5.76	3.29
5.40	4	0.03	7.67	4.35
5.50	4	0.03	7.67	4.32
5.60	4	0.03	7.67	4.29
5.70	4	0.03	7.67	4.25
5.80	5	0.02	9.59	5.28
5.90	4	0.03	7.67	4.19
6.00	4	0.03	7.67	4.16
6.10				
6.20				
6.30				
6.40				
6.50				
6.60				
6.70				
6.80				
6.90				
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				
8.30				
8.40				
8.50				
8.60				
8.70				
8.80				
8.90				
9.00				
9.10				
9.20				
9.30				
9.40				
9.50				
9.60				
9.70				
9.80				
9.90				
10.00				



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	kg
Rod Mass	8.79	kg/m

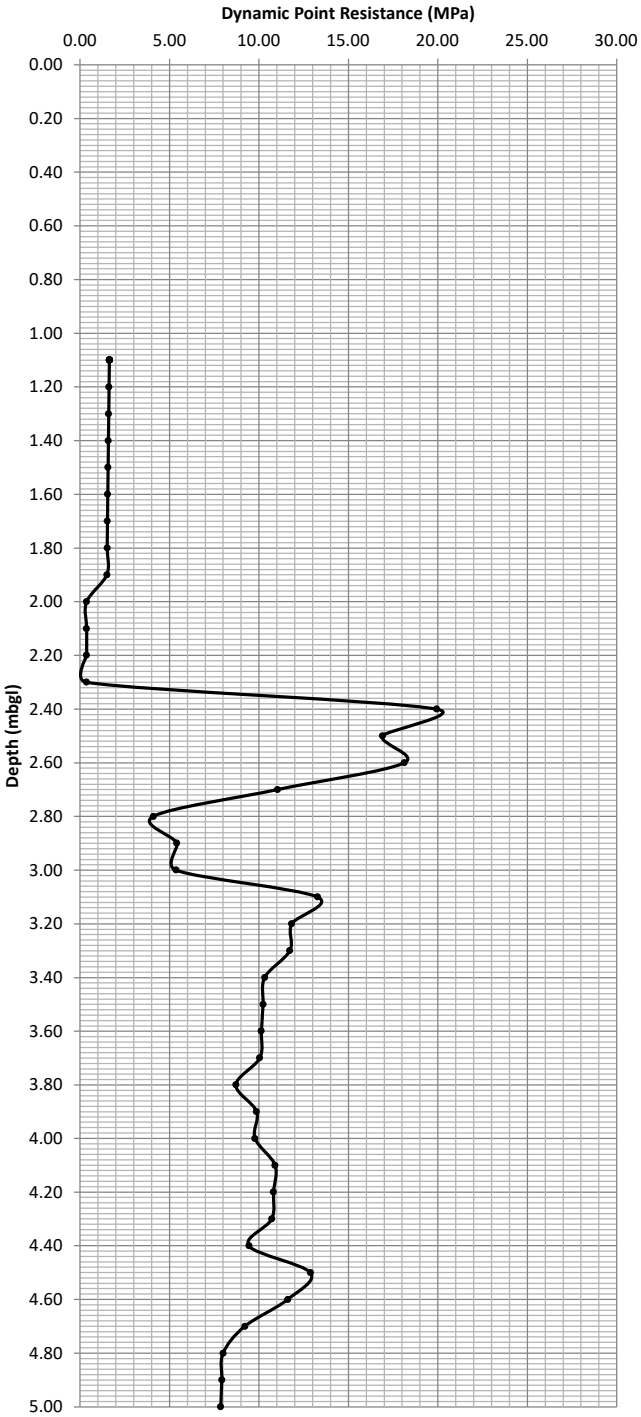
ASHDOWN SITE INVESTIGATION LTD

Dynamic Probe Record

SITE Four Housing Courts, Lansdowne Road, London **Report Ref.** P16180

Test Location Reference	WS11

Depth (mbgl)	Blows (per 100mm)	Average Penetration per Blow (m)	Unit Point Resistance (MPa)	Dynamic Point Resistance (MPa)
0.10				
0.20				
0.30				
0.40				
0.50				
0.60				
0.70				
0.80				
0.90				
1.00				
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	1.59
1.50	1	0.10	1.92	1.57
1.60	1	0.10	1.92	1.55
1.70	1	0.10	1.92	1.53
1.80	1	0.10	1.92	1.52
1.90	1	0.10	1.92	1.50
2.00	0.25	0.40	0.48	0.37
2.10	0.25	0.40	0.48	0.37
2.20	0.25	0.40	0.48	0.36
2.30	0.25	0.40	0.48	0.36
2.40	14	0.01	26.86	19.93
2.50	12	0.01	23.02	16.91
2.60	13	0.01	24.94	18.13
2.70	8	0.01	15.35	11.05
2.80	3	0.03	5.76	4.10
2.90	4	0.03	7.67	5.42
3.00	4	0.03	7.67	5.36
3.10	10	0.01	19.19	13.28
3.20	9	0.01	17.27	11.84
3.30	9	0.01	17.27	11.73
3.40	8	0.01	15.35	10.33
3.50	8	0.01	15.35	10.23
3.60	8	0.01	15.35	10.14
3.70	8	0.01	15.35	10.05
3.80	7	0.01	13.43	8.71
3.90	8	0.01	15.35	9.87
4.00	8	0.01	15.35	9.78
4.10	9	0.01	17.27	10.91
4.20	9	0.01	17.27	10.81
4.30	9	0.01	17.27	10.72
4.40	8	0.01	15.35	9.45
4.50	11	0.01	21.11	12.88
4.60	10	0.01	19.19	11.61
4.70	8	0.01	15.35	9.21
4.80	7	0.01	13.43	8.00
4.90	7	0.01	13.43	7.93
5.00	7	0.01	13.43	7.87



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	kg
Rod Mass	8.79	kg/m

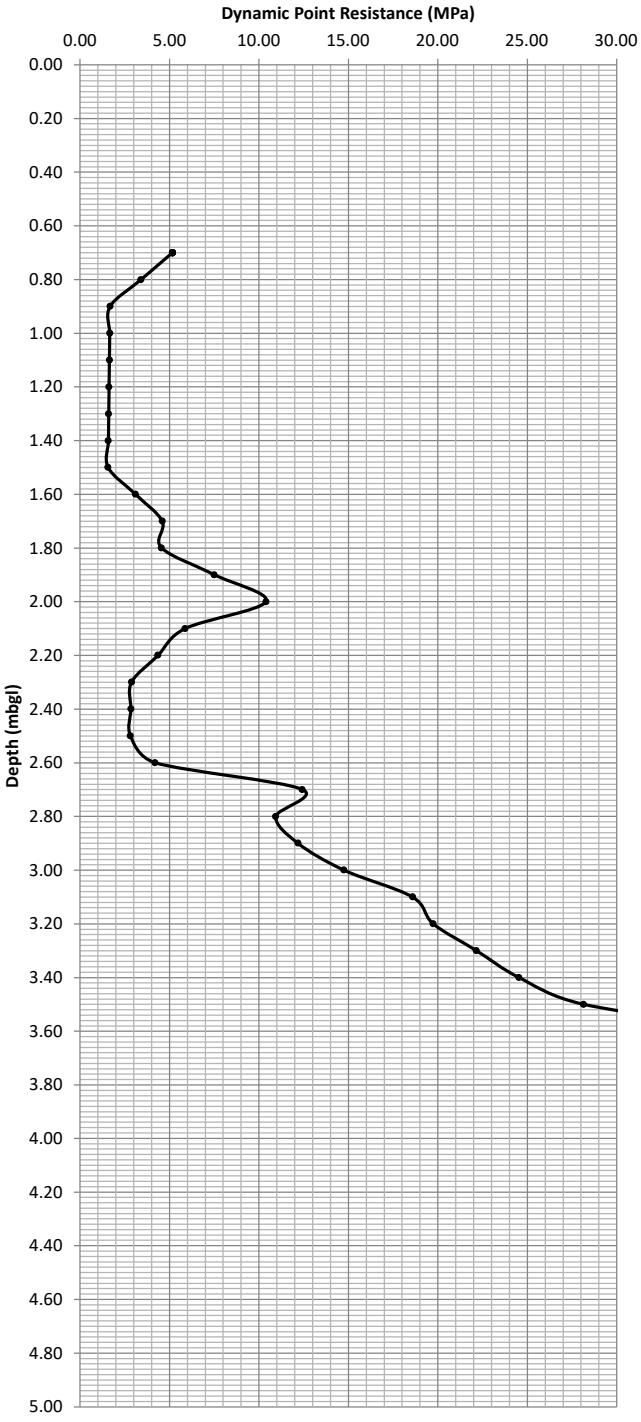
ASHDOWN SITE INVESTIGATION LTD

Dynamic Probe Record

SITE Four Housing Courts, Lansdowne Road, London **Report Ref.** P16180

Test Location Reference	WS12

Depth (mbgl)	Blows (per 100mm)	Average Penetration per Blow (m)	Unit Point Resistance (MPa)	Dynamic Point Resistance (MPa)
0.10				
0.20				
0.30				
0.40				
0.50				
0.60				
0.70	3	0.03	5.76	5.17
0.80	2	0.05	3.84	3.41
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	1.59
1.50	1	0.10	1.92	1.57
1.60	2	0.05	3.84	3.10
1.70	3	0.03	5.76	4.60
1.80	3	0.03	5.76	4.55
1.90	5	0.02	9.59	7.50
2.00	7	0.01	13.43	10.39
2.10	4	0.03	7.67	5.88
2.20	3	0.03	5.76	4.36
2.30	2	0.05	3.84	2.88
2.40	2	0.05	3.84	2.85
2.50	2	0.05	3.84	2.82
2.60	3	0.03	5.76	4.18
2.70	9	0.01	17.27	12.43
2.80	8	0.01	15.35	10.94
2.90	9	0.01	17.27	12.19
3.00	11	0.01	21.11	14.75
3.10	14	0.01	26.86	18.59
3.20	15	0.01	28.78	19.73
3.30	17	0.01	32.62	22.15
3.40	19	0.01	36.45	24.53
3.50	22	0.00	42.21	28.14
3.60	30	0.00	57.56	38.02
3.70				
3.80				
3.90				
4.00				
4.10				
4.20				
4.30				
4.40				
4.50				
4.60				
4.70				
4.80				
4.90				
5.00				



Notes:
No further progress below 3.60m depth - hammer bouncing.

Hammer Mass	63.5	kg
Fall Height	0.76	m
Cone Area	0.0019	m^2
E_{theor}	473	J
Energy Ratio	0.77	
Anvil Mass	1	kg
Rod Mass	8.79	kg/m

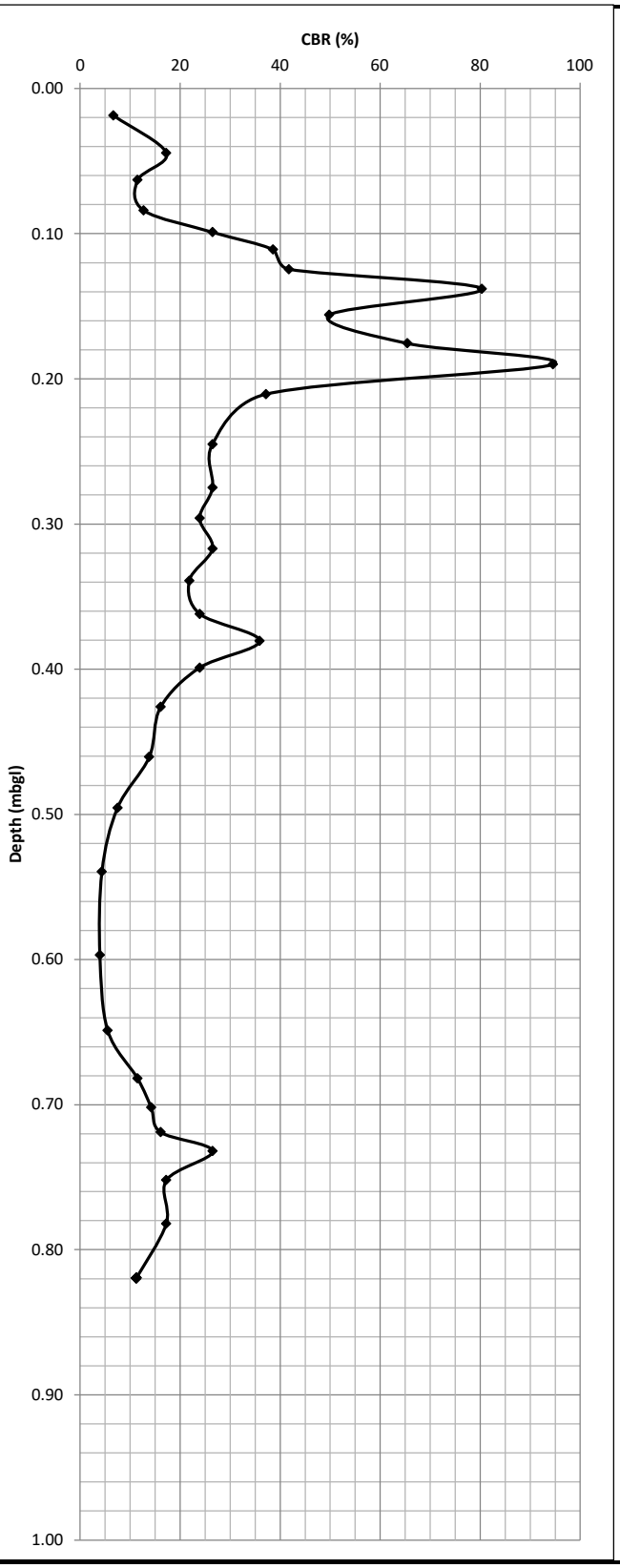
ASHDOWN SITE INVESTIGATION LTD

TRL Dynamic Cone Penetrometer Record

SITE Four Housing Courts, Lansdowne Road, London **Project Ref.** P16180

Test Location Reference	WS02
Depth of Start of Test (mbgl)	0.00

No. Blows	Total Blows	Reading (mm)	Depth (mbgl)	CBR%
DCP Zero Reading		83	0.00	
1	1	120	0.04	7
1	2	135	0.05	17
1	3	157	0.07	12
1	4	177	0.09	13
1	5	187	0.10	26
2	7	201	0.12	39
2	9	214	0.13	42
4	13	228	0.15	80
4	17	250	0.17	50
4	21	267	0.18	65
4	25	279	0.20	95
4	29	308	0.23	37
4	33	348	0.27	26
2	35	368	0.29	26
2	37	390	0.31	24
2	39	410	0.33	26
2	41	434	0.35	22
2	43	456	0.37	24
2	45	471	0.39	36
2	47	493	0.41	24
2	49	525	0.44	16
2	51	562	0.48	14
1	52	595	0.51	7
1	53	650	0.57	4
1	54	710	0.63	4
1	55	754	0.67	6
1	56	776	0.69	12
1	57	794	0.71	14
1	58	810	0.73	16
1	59	820	0.74	26
2	61	850	0.77	17
2	63	880	0.80	17
2	65	925	0.84	11



Notes: CBR Value calculated in accordance with the TRRL equation given in TRL Road Note 8.

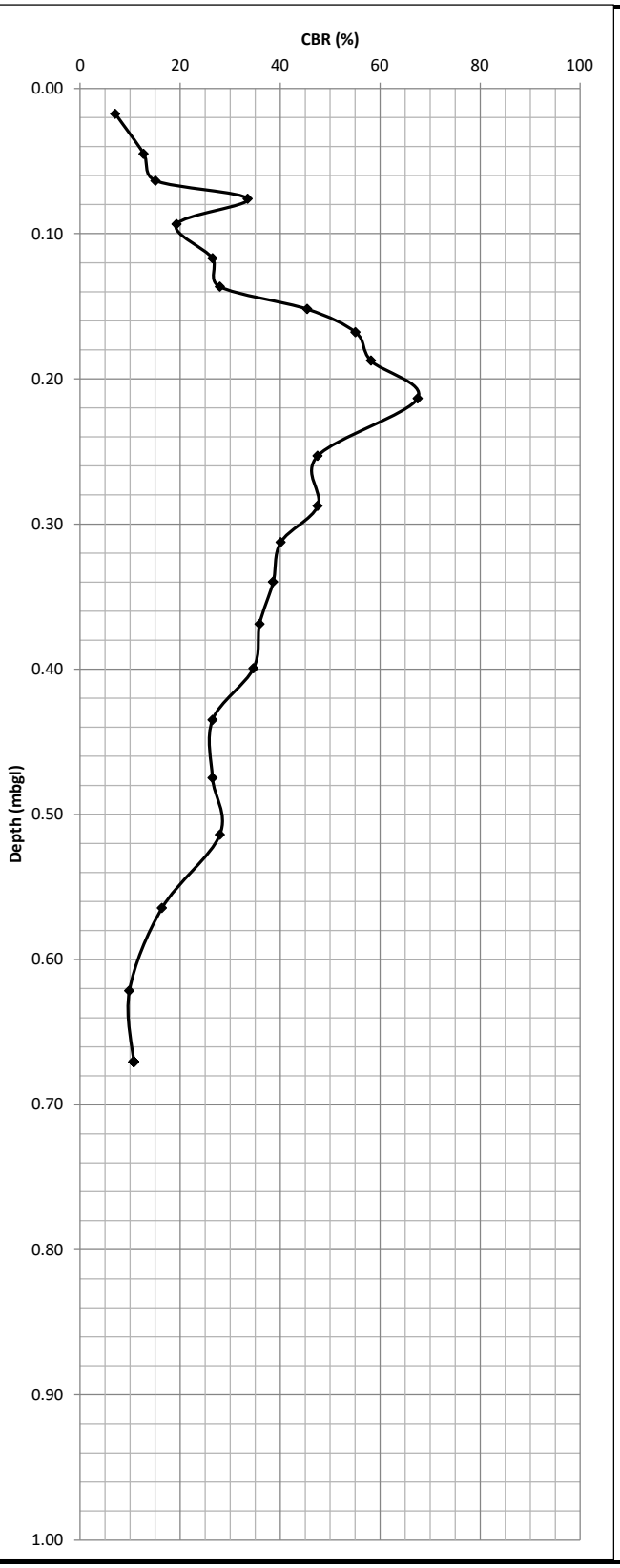
ASHDOWN SITE INVESTIGATION LTD

TRL Dynamic Cone Penetrometer Record

SITE Four Housing Courts, Lansdowne Road, London **Project Ref.** P16180

Test Location Reference	WS04
Depth of Start of Test (mbgl)	0.00

No. Blows	Total Blows	Reading (mm)	Depth (mbgl)	CBR%
DCP Zero Reading		58	0.00	
1	1	93	0.04	7
1	2	113	0.06	13
1	3	130	0.07	15
1	4	138	0.08	34
2	6	165	0.11	19
2	8	185	0.13	26
2	10	204	0.15	28
2	12	216	0.16	45
4	16	236	0.18	55
4	20	255	0.20	58
8	28	288	0.23	68
8	36	334	0.28	48
4	40	357	0.30	48
4	44	384	0.33	40
4	48	412	0.35	39
4	52	442	0.38	36
4	56	473	0.42	35
4	60	513	0.46	26
4	64	553	0.50	26
4	68	591	0.53	28
4	72	654	0.60	16
2	74	705	0.65	10
2	76	752	0.69	11



Notes: CBR Value calculated in accordance with the TRRL equation given in TRL Road Note 8.
Potential services- hit something hard.

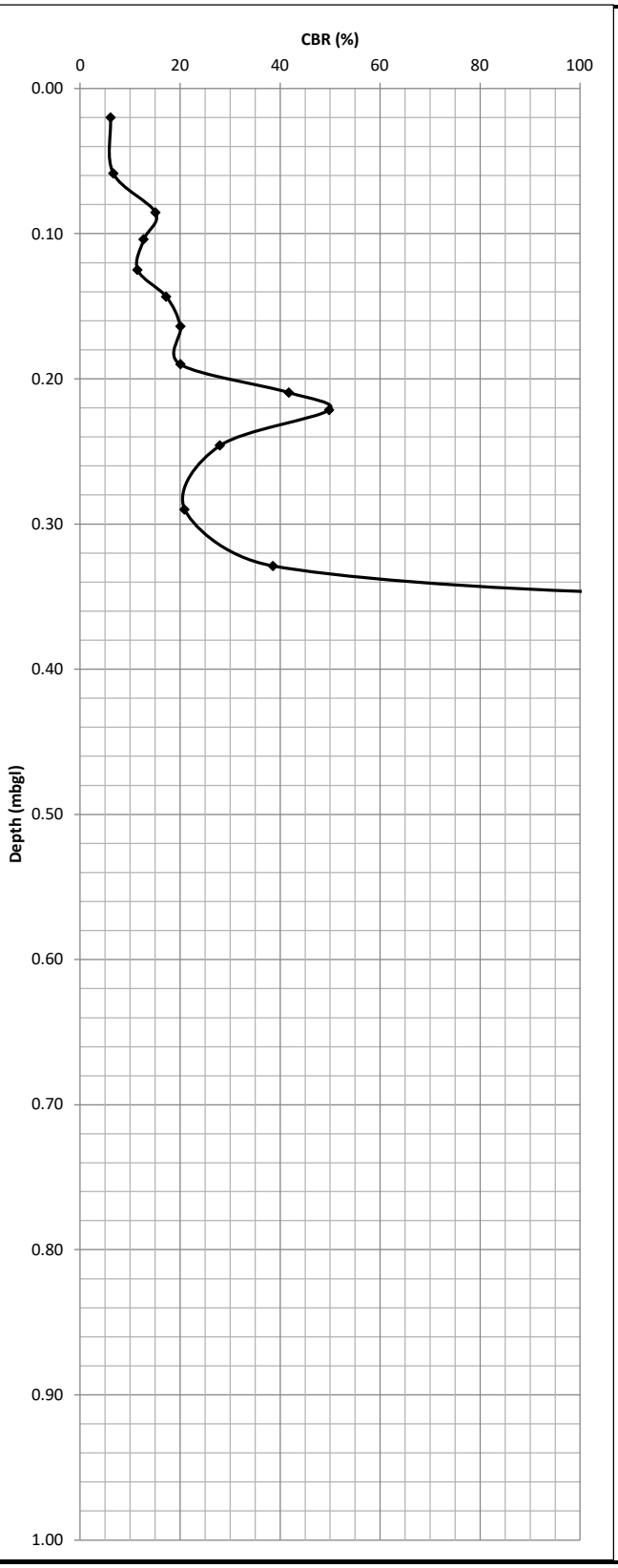
ASHDOWN SITE INVESTIGATION LTD

TRL Dynamic Cone Penetrometer Record

SITE Four Housing Courts, Lansdowne Road, London **Project Ref.** P16180

Test Location Reference	WS05
Depth of Start of Test (mbgl)	0.00

No. Blows	Total Blows	Reading (mm)	Depth (mbgl)	CBR%
DCP Zero Reading		60	0.00	
1	1	100	0.04	6
1	2	137	0.08	7
1	3	154	0.09	15
1	4	174	0.11	13
1	5	196	0.14	12
1	6	211	0.15	17
2	8	237	0.18	20
2	10	263	0.20	20
2	12	276	0.22	42
2	14	287	0.23	50
4	18	325	0.27	28
4	22	375	0.32	21
4	26	403	0.34	39
4	30	413	0.35	115
8	38	420	0.36	348
8	46	425	0.37	496



Notes: CBR Value calculated in accordance with the TRRL equation given in TRL Road Note 8.

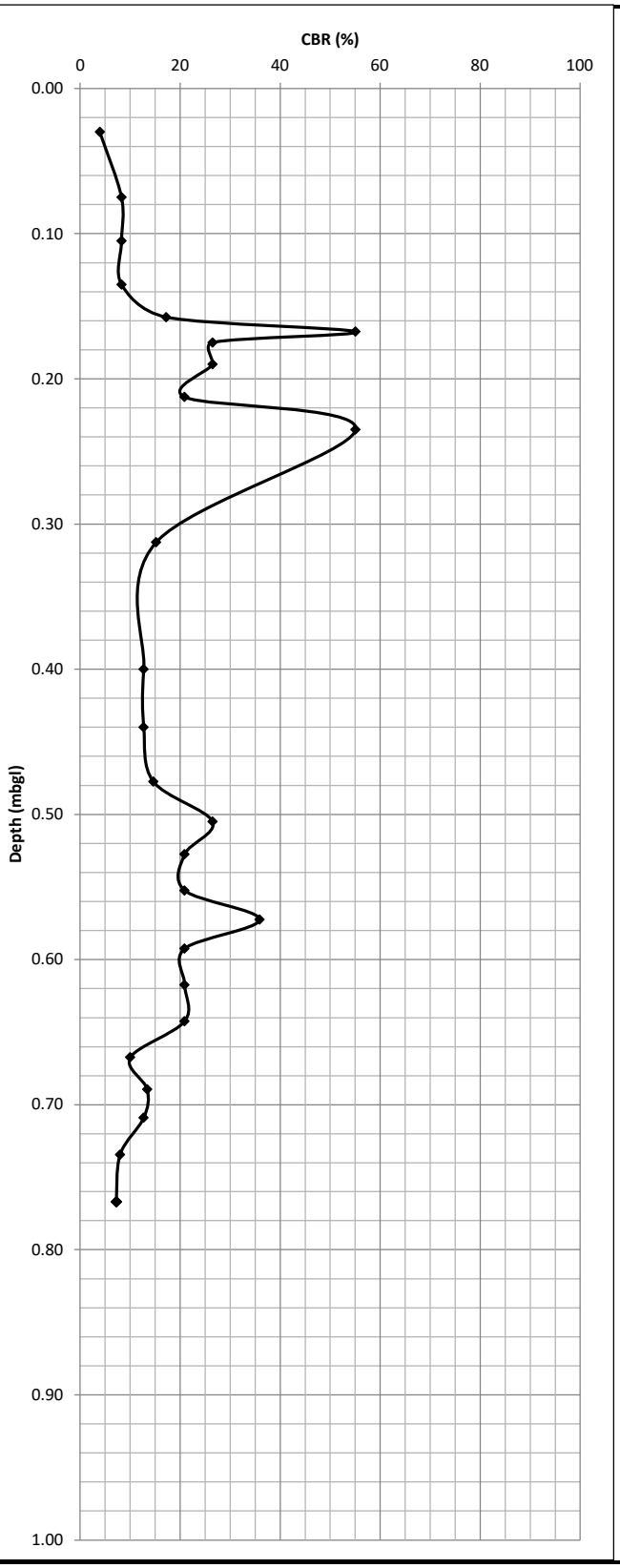
ASHDOWN SITE INVESTIGATION LTD

TRL Dynamic Cone Penetrometer Record

SITE Four Housing Courts, Lansdowne Road, London **Project Ref.** P16180

Test Location Reference	**WS12**
Depth of Start of Test (mbgl)	0.00

No. Blows	Total Blows	Reading (mm)	Depth (mbgl)	CBR%
DCP Zero Reading		50	0.00	
1	1	110	0.06	4
1	2	140	0.09	8
1	3	170	0.12	8
1	4	200	0.15	8
1	5	215	0.17	17
1	6	220	0.17	55
1	7	230	0.18	26
2	9	250	0.20	26
2	11	275	0.23	21
4	15	295	0.25	55
8	23	430	0.38	15
2	25	470	0.42	13
2	27	510	0.46	13
2	29	545	0.50	15
2	31	565	0.52	26
2	33	590	0.54	21
2	35	615	0.57	21
2	37	630	0.58	36
2	39	655	0.61	21
2	41	680	0.63	21
2	43	705	0.66	21
1	44	730	0.68	10
1	45	749	0.70	13
1	46	769	0.72	13
1	47	800	0.75	8
1	48	834	0.78	7



Notes: CBR Value calculated in accordance with the TRRL equation given in TRL Road Note 8.

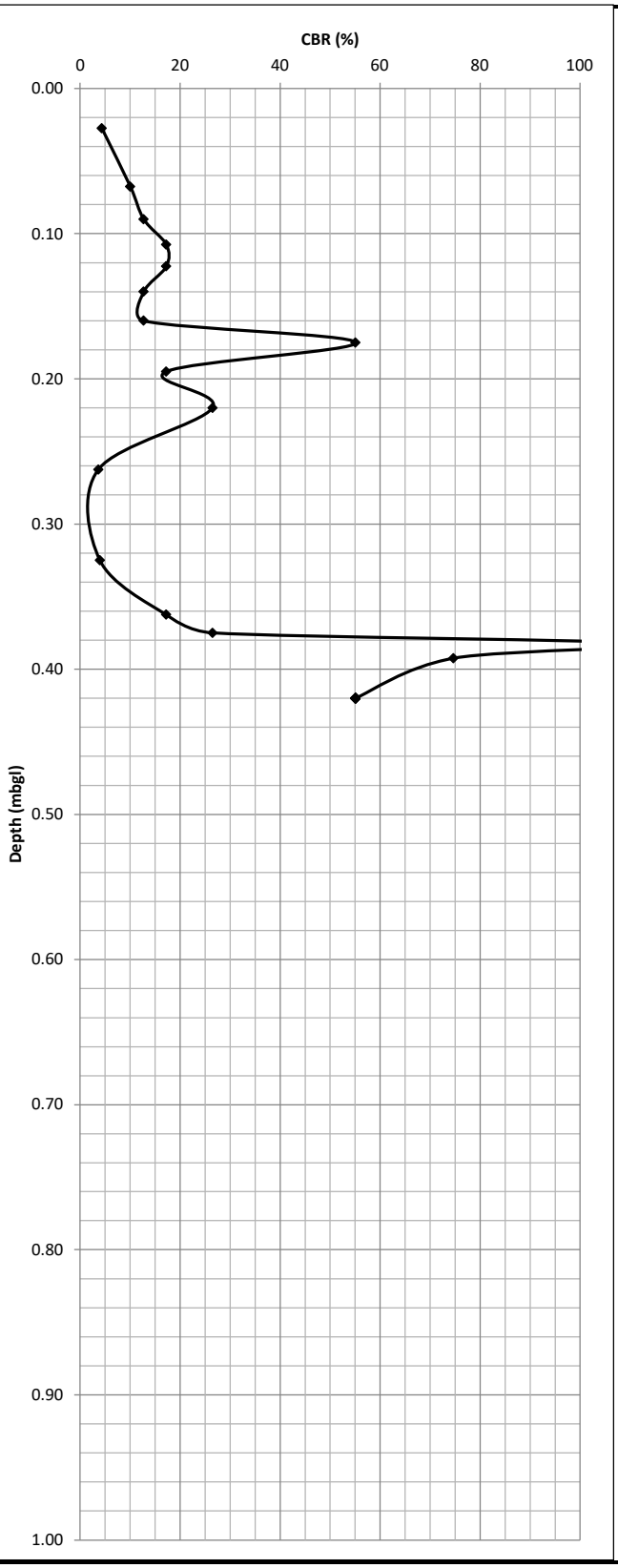
ASHDOWN SITE INVESTIGATION LTD

TRL Dynamic Cone Penetrometer Record

SITE Four Housing Courts, Lansdowne Road, London **Project Ref.** P16180

Test Location Reference	TP01
Depth of Start of Test (mbgl)	0.00

No. Blows	Total Blows	Reading (mm)	Depth (mbgl)	CBR%
DCP Zero Reading		40	0.00	
1	1	95	0.06	4
1	2	120	0.08	10
1	3	140	0.10	13
1	4	155	0.12	17
1	5	170	0.13	17
1	6	190	0.15	13
1	7	210	0.17	13
2	9	220	0.18	55
2	11	250	0.21	17
2	13	270	0.23	26
1	14	335	0.30	4
1	15	395	0.36	4
1	16	410	0.37	17
1	17	420	0.38	26
2	19	425	0.39	115
4	23	440	0.40	75
8	31	480	0.44	55



Notes: CBR Value calculated in accordance with the TRRL equation given in TRL Road Note 8.

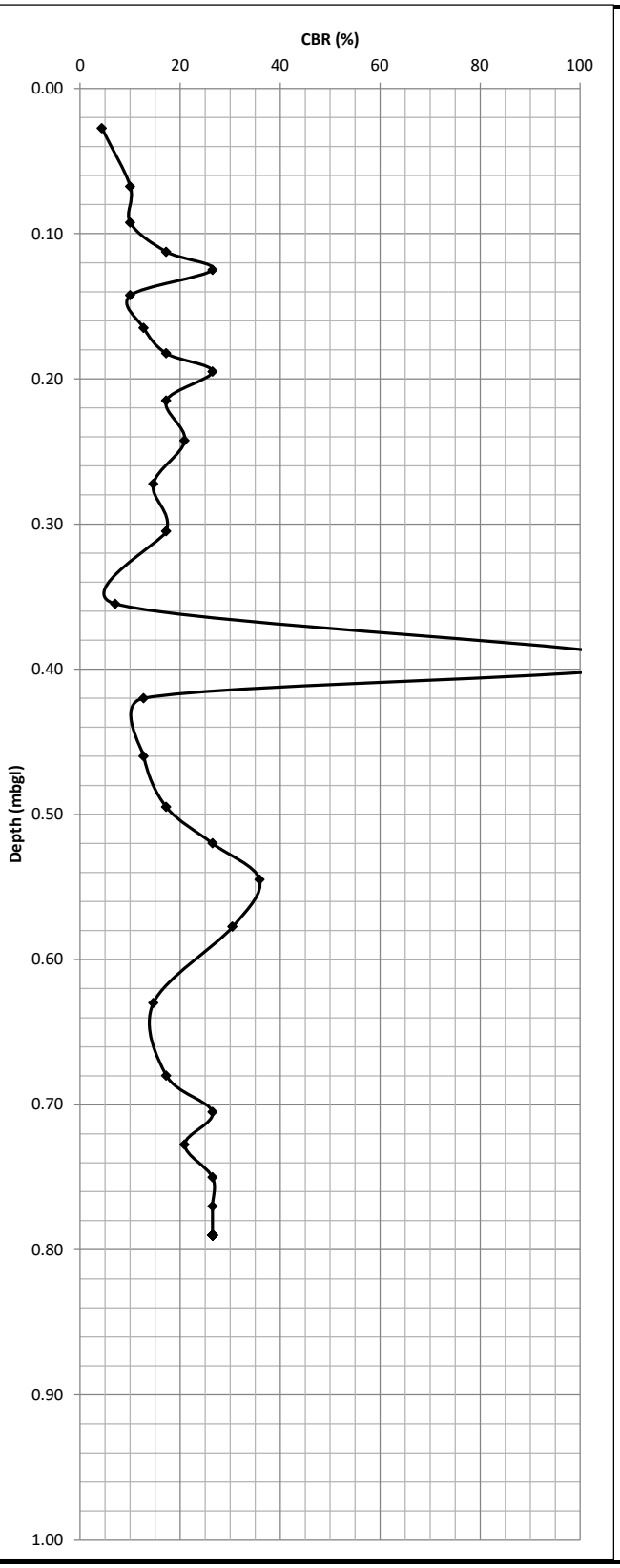
ASHDOWN SITE INVESTIGATION LTD

TRL Dynamic Cone Penetrometer Record

SITE Four Housing Courts, Lansdowne Road, London **Project Ref.** P16180

Test Location Reference	**TP02**
Depth of Start of Test (mbgl)	0.00

No. Blows	Total Blows	Reading (mm)	Depth (mbgl)	CBR%
DCP Zero Reading		80	0.00	
1	1	135	0.06	4
1	2	160	0.08	10
1	3	185	0.11	10
1	4	200	0.12	17
1	5	210	0.13	26
1	6	235	0.16	10
1	7	255	0.18	13
1	8	270	0.19	17
1	9	280	0.20	26
2	11	310	0.23	17
2	13	335	0.26	21
2	15	370	0.29	15
2	17	400	0.32	17
2	19	470	0.39	7
4	23	480	0.40	115
2	25	520	0.44	13
2	27	560	0.48	13
2	29	590	0.51	17
2	31	610	0.53	26
4	35	640	0.56	36
4	39	675	0.60	30
4	43	745	0.67	15
2	45	775	0.70	17
2	47	795	0.72	26
2	49	820	0.74	21
2	51	840	0.76	26
2	53	860	0.78	26
2	55	880	0.80	26



Notes: CBR Value calculated in accordance with the TRRL equation given in TRL Road Note 8.

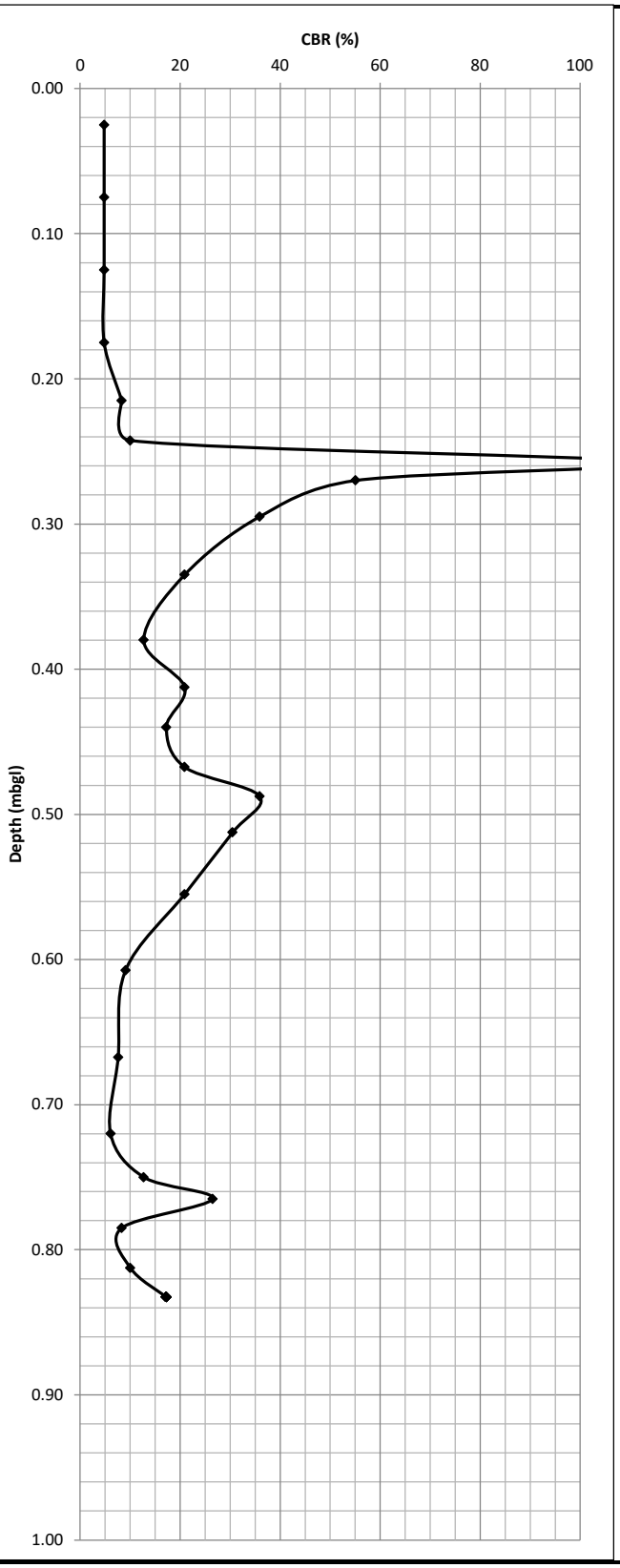
ASHDOWN SITE INVESTIGATION LTD

TRL Dynamic Cone Penetrometer Record

SITE Four Housing Courts, Lansdowne Road, London **Project Ref.** P16180

Test Location Reference	**TP03**
Depth of Start of Test (mbgl)	0.00

No. Blows	Total Blows	Reading (mm)	Depth (mbgl)	CBR%
DCP Zero Reading		70	0.00	
1	1	120	0.05	5
1	2	170	0.10	5
1	3	220	0.15	5
1	4	270	0.20	5
1	5	300	0.23	8
1	6	325	0.26	10
2	8	330	0.26	115
4	12	350	0.28	55
4	16	380	0.31	36
4	20	430	0.36	21
2	22	470	0.40	13
2	24	495	0.43	21
2	26	525	0.46	17
2	28	550	0.48	21
2	30	565	0.50	36
4	34	600	0.53	30
4	38	650	0.58	21
2	40	705	0.64	9
2	42	770	0.70	8
1	43	810	0.74	6
1	44	830	0.76	13
1	45	840	0.77	26
1	46	870	0.80	8
1	47	895	0.83	10
1	48	910	0.84	17



Notes: CBR Value calculated in accordance with the TRRL equation given in TRL Road Note 8.

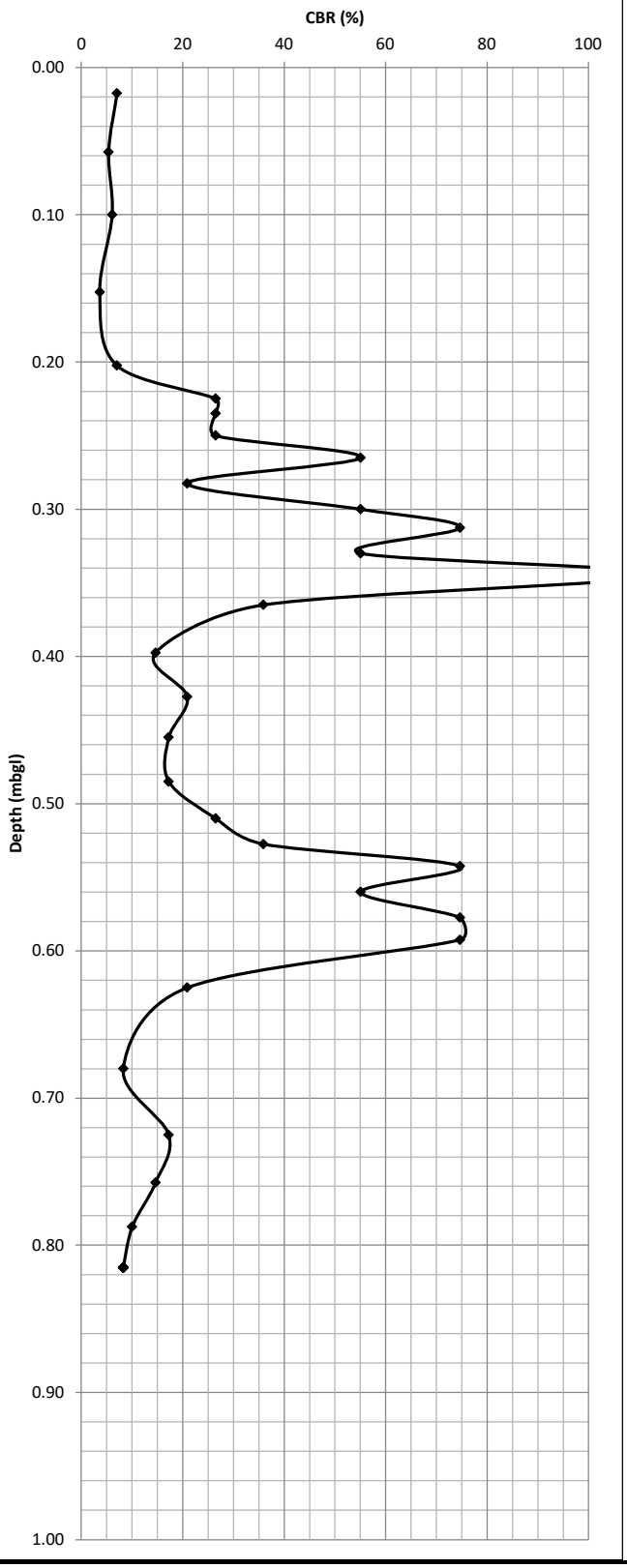
ASHDOWN SITE INVESTIGATION LTD

TRL Dynamic Cone Penetrometer Record

SITE Four Housing Courts, Lansdowne Road, London **Project Ref.** P16180

Test Location Reference	**TP04**
Depth of Start of Test (mbgl)	0.00

No. Blows	Total Blows	Reading (mm)	Depth (mbgl)	CBR%
DCP Zero Reading		80	0.00	
1	1	115	0.04	7
1	2	160	0.08	5
1	3	200	0.12	6
1	4	265	0.19	4
1	5	300	0.22	7
1	6	310	0.23	26
1	7	320	0.24	26
2	9	340	0.26	26
2	11	350	0.27	55
2	13	375	0.30	21
2	15	385	0.31	55
4	19	400	0.32	75
4	23	420	0.34	55
4	27	430	0.35	115
4	31	460	0.38	36
2	33	495	0.42	15
2	35	520	0.44	21
2	37	550	0.47	17
2	39	580	0.50	17
2	41	600	0.52	26
2	43	615	0.54	36
4	47	630	0.55	75
4	51	650	0.57	55
4	55	665	0.59	75
4	59	680	0.60	75
4	63	730	0.65	21
2	65	790	0.71	8
2	67	820	0.74	17
2	69	855	0.78	15
1	70	880	0.80	10
1	71	910	0.83	8



Notes: CBR Value calculated in accordance with the TRRL equation given in TRL Road Note 8.

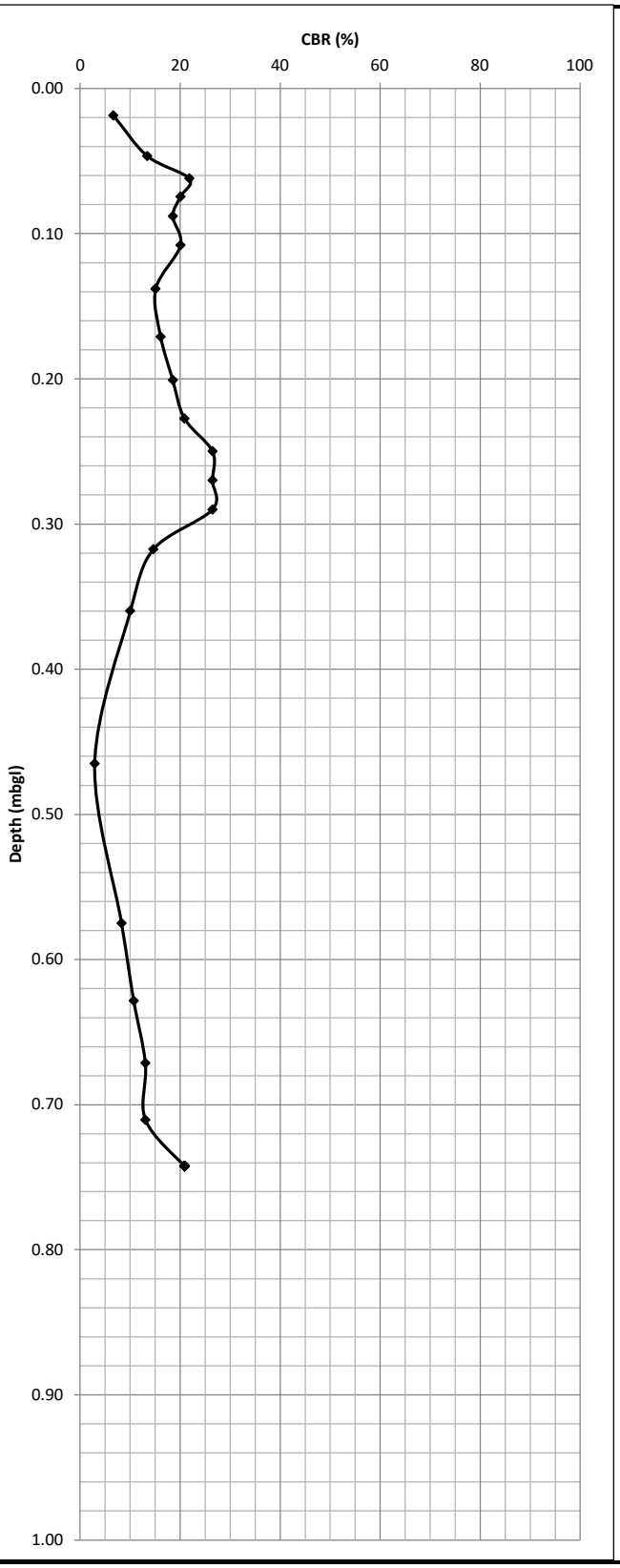
ASHDOWN SITE INVESTIGATION LTD

TRL Dynamic Cone Penetrometer Record

SITE Four Housing Courts, Lansdowne Road, London **Project Ref.** P16180

Test Location Reference	**TP05**
Depth of Start of Test (mbgl)	0.00

No. Blows	Total Blows	Reading (mm)	Depth (mbgl)	CBR%
DCP Zero Reading		65	0.00	
1	1	102	0.04	7
1	2	121	0.06	13
1	3	133	0.07	22
1	4	146	0.08	20
1	5	160	0.10	19
2	7	186	0.12	20
2	9	220	0.16	15
2	11	252	0.19	16
2	13	280	0.22	19
2	15	305	0.24	21
2	17	325	0.26	26
2	19	345	0.28	26
2	21	365	0.30	26
2	23	400	0.34	15
2	25	450	0.39	10
2	27	610	0.55	3
2	29	670	0.61	8
2	31	717	0.65	11
2	33	756	0.69	13
2	35	795	0.73	13
2	37	820	0.76	21



Notes: CBR Value calculated in accordance with the TRRL equation given in TRL Road Note 8.

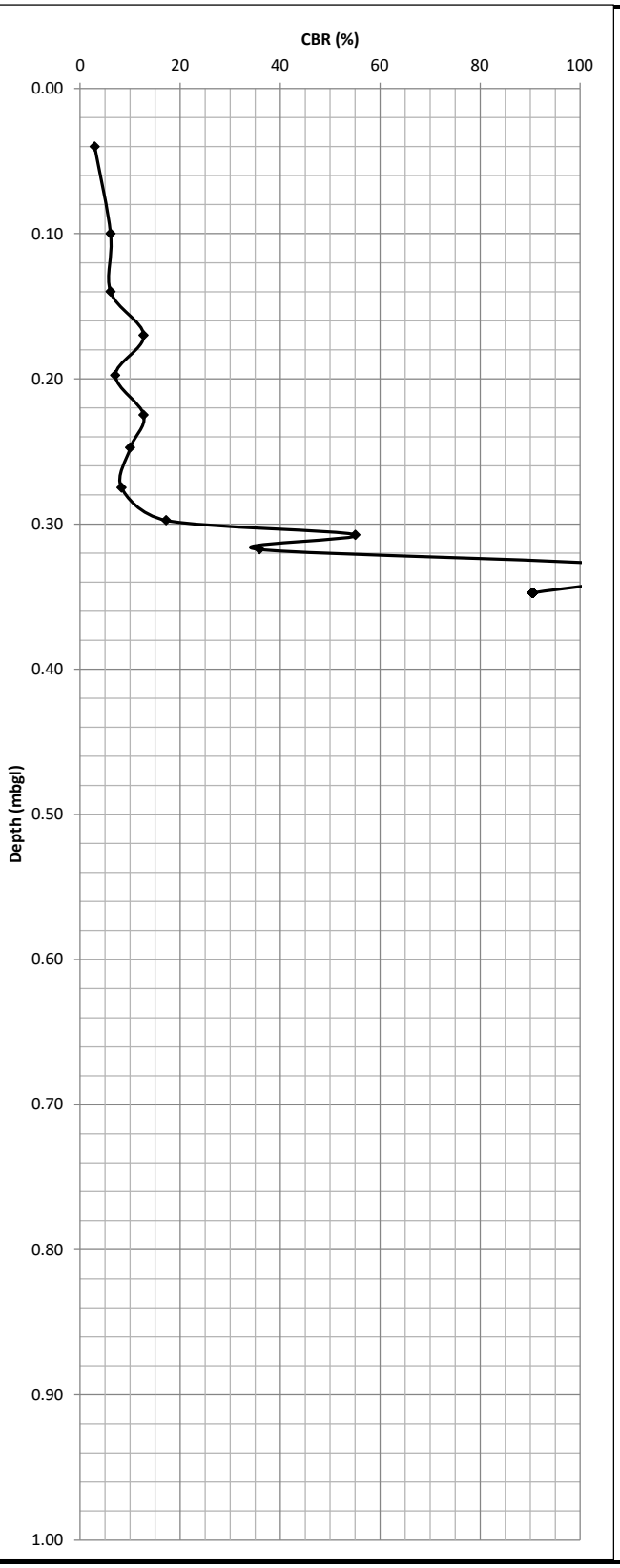
ASHDOWN SITE INVESTIGATION LTD

TRL Dynamic Cone Penetrometer Record

SITE Four Housing Courts, Lansdowne Road, London **Project Ref.** P16180

Test Location Reference	**TP06**
Depth of Start of Test (mbgl)	0.00

No. Blows	Total Blows	Reading (mm)	Depth (mbgl)	CBR%
DCP Zero Reading		70	0.00	
1	1	150	0.08	3
1	2	190	0.12	6
1	3	230	0.16	6
1	4	250	0.18	13
1	5	285	0.22	7
1	6	305	0.24	13
1	7	330	0.26	10
1	8	360	0.29	8
1	9	375	0.31	17
1	10	380	0.31	55
2	12	395	0.33	36
4	16	405	0.34	115
8	24	430	0.36	91



Notes: CBR Value calculated in accordance with the TRRL equation given in TRL Road Note 8.

Gas Concentrations and Groundwater Monitoring Results

Site Name:	Four Housing Courts, Lansdowne Road, London
Project Ref:	P16180

Position	Date	Time	Atmospheric Pressure (mbar)	Atmospheric Trend	Standing Water Depth (m bgl)	Flow Rate (l/hr)				Methane (%)				Carbon Dioxide (%)				Oxygen (%)				CO (ppm)	H_2S (ppm)
						Seconds				Seconds				Seconds				Seconds					
						15	30	45	60	15	30	45	60	15	30	45	60	15	30	45	60		
WS02	29/08/2023	11:54	1010	Falling	1.94	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	20.2	20.2	20.3	20.3	0	0
WS04	29/08/2023	11:59	1010	Falling	0.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	20.3	20.3	20.3	20.3	0	0
WS09	29/08/2023	12:25	1010	Falling	1.60	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	20.4	20.4	20.4	20.5	0	0
WS12	29/08/2023	12:12	1010	Falling	2.28	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	20.4	20.4	20.4	20.4	0	0
WS02	07/09/2023	14:43	1018	Falling	2.04	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.9	0.9	0.9	19.1	19.0	18.9	18.9	0	0
WS04	07/09/2023	14:38	1018	Falling	0.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.5	0.6	0.6	20.5	20.4	20.4	20.4	0	0
WS09	07/09/2023	14:52	1018	Falling	1.69	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.4	3.9	4.1	4.2	16.8	16.3	16.0	15.8	0	0
WS12	07/09/2023	14:58	1018	Falling	2.36	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3	0.3	0.3	20.4	20.5	20.6	20.6	0	0
WS02	12/09/2023	12:18	1010	Rising	2.11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.4	0.5	0.5	20.3	20.2	20.2	20.2	0	0
WS04	12/09/2023	13:05	1010	Rising	1.13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.7	0.7	0.7	20.3	20.2	20.2	20.2	0	0
WS09	12/09/2023	13:59	1010	Rising	1.77	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.6	5.9	5.9	6.0	15.7	15.6	15.5	15.5	0	0
WS12	12/09/2023	14:11	1010	Rising	2.41	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.7	0.7	0.7	20.1	20.1	20.1	20.1	0	0

APPENDIX C

Geotechnical Laboratory Test Results
Contamination Laboratory Test Results

ASHDOWN SITE INVESTIGATION LIMITED

Soil Classification Summary

Site Name:	Four Housing Courts, Landsdowne Road, London	Job No:	P16180

BH/TP No.	Depth (m)	Nat. Moist. Cont. (w %)	Equiv. Moist. Cont. (w_a %)	Atterberg Limits			Class'n	Cons. Index (I_c)	% passing 425 µm sieve	Visual Description of Sample
				W_l %	W_p %	I_p %				
BH01	1.20	28		43	25	18	ClM		25	MADE GROUND: Brown black gravelly sandy clay. Gravel is fine to coarse flint and concrete.
BH01	6.00	30		73	26	47	ClV	0.91*	100	Stiff grey slightly sandy CLAY.
BH02	10.00	27		76	25	51	ClV	0.96*	100	Stiff grey brown CLAY.
BH02	22.00	22		69	19	50	ClH	0.94*	100	Stiff grey brown slightly sandy CLAY.
BH03	2.00	15		46	15	31	ClM	1.00*	44	Very stiff brown gravelly slightly sandy CLAY. Gravel is fine to coarse flint.
BH03	13.50	31		87	28	59	ClV	0.95*	100	Stiff brown CLAY.
WS01	0.50	25		54	22	32	ClH		95	MADE GROUND: Brown slightly gravelly clay. Gravel is fine to medium flint and brick.
WS02	1.70	11		33	15	18	ClL		31	MADE GROUND: Dark brown gravelly slightly sandy clay. Gravel is fine to coarse flint.
WS05	0.70	39		71	28	43	ClV		100	MADE GROUND: Brown mottled grey clay.
WS06	1.10	22		45	18	27	ClM	0.85*	100	Stiff brown slightly sandy CLAY.

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

Soil Classification Summary

Site Name:	Four Housing Courts, Landsdowne Road, London	Job No:	P16180

BH/TP No.	Depth (m)	Nat. Moist. Cont. (w %)	Equiv. Moist. Cont. (w_a %)	Atterberg Limits			Class'n	Cons. Index (I_c)	% passing 425 µm sieve	Visual Description of Sample
				W_l %	W_p %	I_p %				
WS09	2.90	14		26	13	13	ClL	0.92*	96	Stiff brown slightly gravelly sandy CLAY. Gravel is fine to medium flint.
WS10	1.50	26		52	21	31	ClH	0.84*	100	Stiff brown slightly sandy CLAY.
WS11	1.40	37		43	16	27	ClM	0.22*	92	Very soft brown slightly gravelly slightly sandy CLAY. Gravel is fine to medium flint.
WS12	2.60	16		39	14	25	ClM	0.92*	56	Stiff brown gravelly slightly sandy CLAY. Gravel is fine flint.
TP01	0.80	9.8		49	21	28	ClM		38	MADE GROUND: Brown gravelly clay with fine roots. Gravel is fine to coarse flint and wood.
TP03	0.95	30		71	24	47	ClV		90	MADE GROUND: Brown slightly gravelly slightly sandy clay. Gravel is fine flint.
TP06	0.70	12		42	24	18	ClM		24	MADE GROUND: Brown gravelly sandy clay with fine roots. Gravel is fine to coarse flint and brick.

Test Method: Classification Tests BS1377: Part 2: 1990: Method 4.4, 5.3 and 5.4

* Consistency index based on natural moisture content and not the equivalent moisture content.

ASHDOWN SITE INVESTIGATION LIMITED

Quick Undrained Triaxial Summary

Site Name:	Four Housing Courts, Landsdowne Road, London	Job No:	P16180

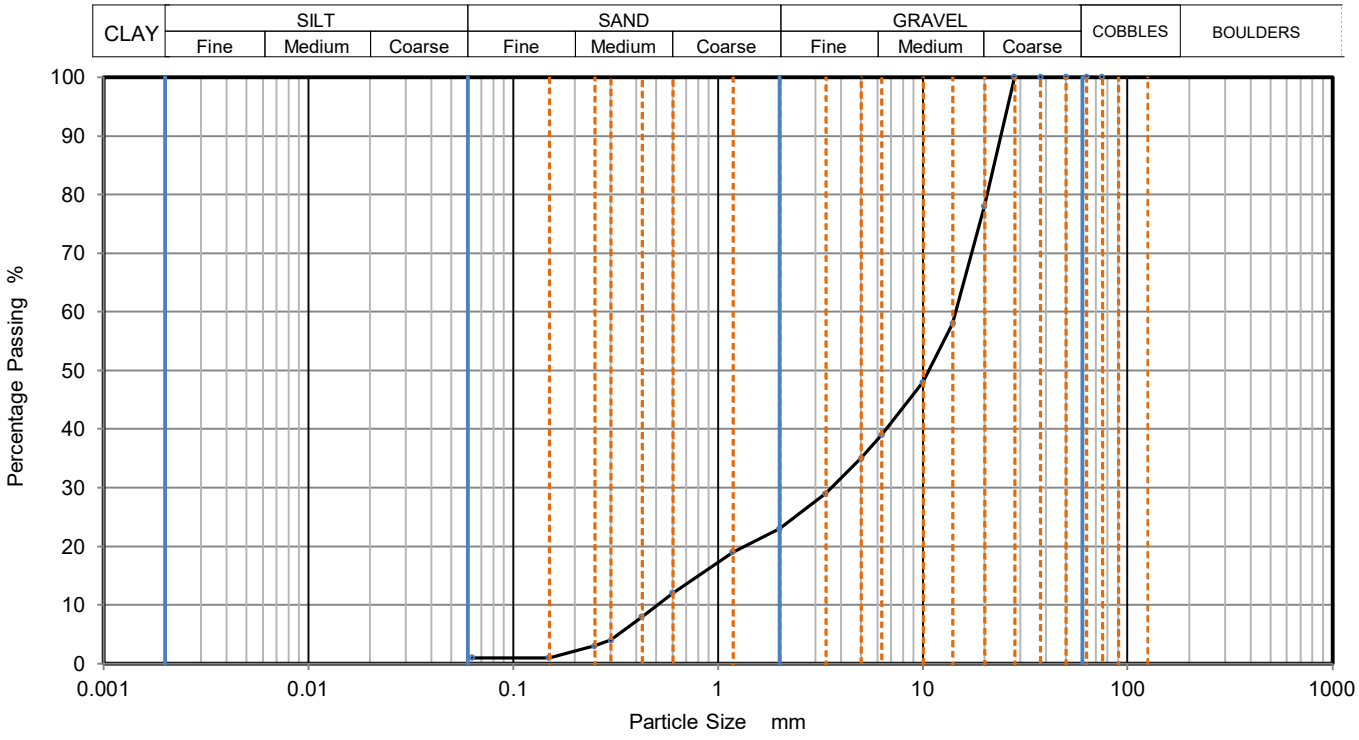
BH/TP No.	Depth (m)	Nat. Moist. Cont. (w %)	Undrained Triaxial Tests					Shear Vane Strength	Hand Pen. Strength	Visual Description of Sample
			Bulk Density	Sample Diameter	Cell Pressure	Max.Dev. Stress	Shear Strength			
			Mg/m3	mm	kPa	kPa	kPa	kPa	kPa	
BH01	4.00-4.45	30	1.94	103	80	55	28	105	120	Dark brown CLAY.
BH01	6.50-6.95	29	1.97	103	160	108	54	>130	145	Grey brown CLAY.
BH01	12.50-12.95	26	1.97	103	250	292	146	>130	225	Grey brown CLAY.
BH02	6.50-6.95	27	1.96	103	130	130	65	>130	145	Brown CLAY.
BH02	12.50-12.95	30	1.90	103	250	123	62	>130	190	Grey brown CLAY.
BH02	18.50-18.95	27	1.93	104	370	241	121	>130	195	Brown grey CLAY.
BH03	1.20-1.65	8.4	1.78	101						Orange brown gravelly sandy CLAY. Gravel is fine to coarse flint. Sample unsuitable for testing - too gravelly.
BH03	8.00-8.45	27	1.96	103	130	160	80	>130	190	Brown CLAY.

Test Method: Quick Undrained Triaxial Test BS1377: Part 7: 1990	Sheet No. 1

ASHDOWN SITE INVESTIGATION LIMITED

Particle Size Distribution

Site Name:	Four Housing Courts, Landsdowne Road, London	Job No.:	P16180
Soil Description:	Very sandy slightly clayey GRAVEL.	Borehole/Pit No.	BH01
Test Method	BS1377:Part2:1990, Clause 9.2	Depth (m)	2.75



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100	0.0200	
63	100	0.0060	
50	100	0.0020	
37.5	100		
28	100		
20	78		
14	58		
10	48		
6.3	39		
5	35		
3.35	29		
2	23		
1.18	19		
0.6	12		
0.425	8		
0.3	4		
0.25	3		
0.15	1		
0.063	1		

Dry Mass of sample (g)	587

Sample Proportions	% dry mass
Very coarse	0
Gravel	77
Sand	22
Fines <0.063mm	1

Grading Analysis		
D_{100}	mm	28.000
D_{60}	mm	14.508
D_{30}	mm	3.581
D_{10}	mm	0.505
Uniformity Coefficient		28.7
Curvature Coefficient		1.8

Remarks

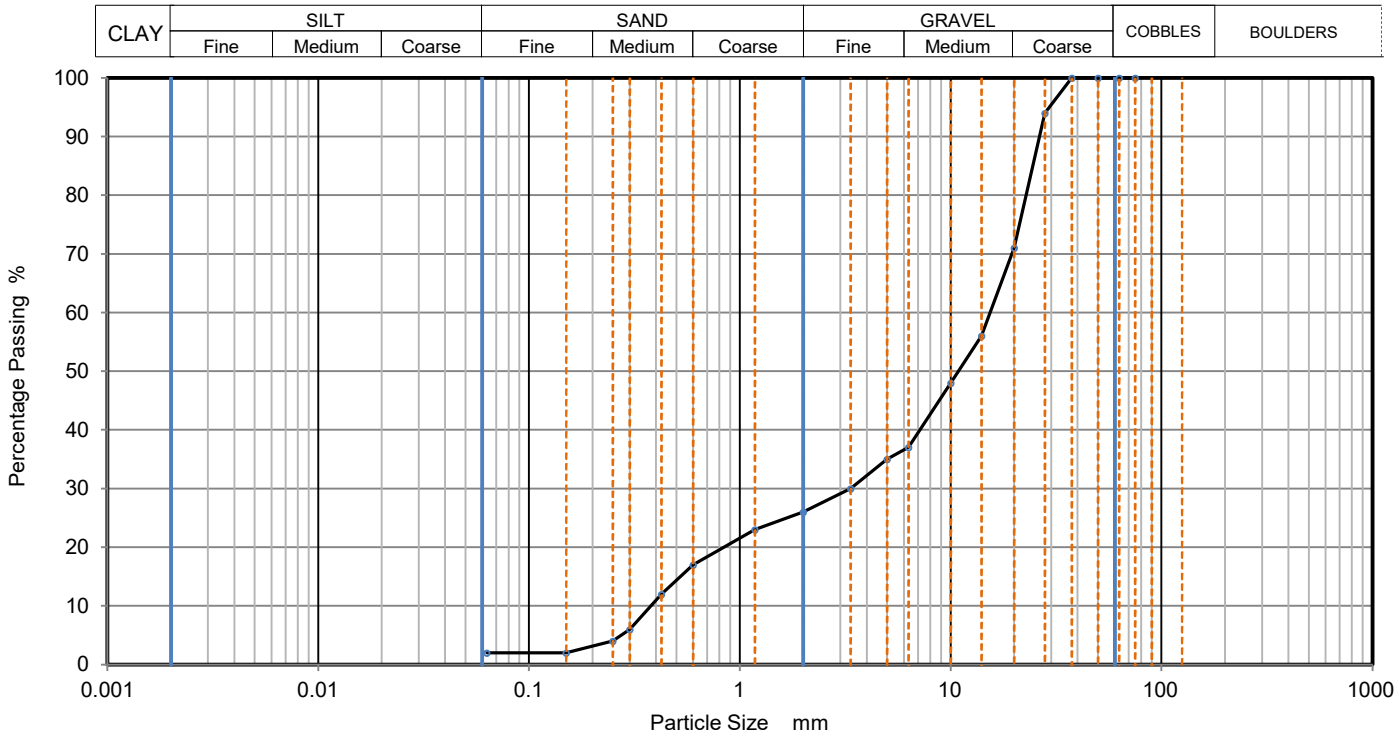
Preparation and testing in accordance with BS1377 unless noted below

Sheet No.: 1

ASHDOWN SITE INVESTIGATION LIMITED

Particle Size Distribution

Site Name:	Four Housing Courts, Landsdowne Road, London	Job No.:	P16180
Soil Description:	Very sandy slightly clayey GRAVEL.	Borehole/Pit No.	BH02
Test Method	BS1377:Part2:1990, Clause 9.2	Depth (m)	1.75



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100	0.0200	
63	100	0.0060	
50	100	0.0020	
37.5	100		
28	94		
20	71		
14	56		
10	48		
6.3	37		
5	35		
3.35	30		
2	26		
1.18	23		
0.6	17		
0.425	12		
0.3	6		
0.25	4		
0.15	2		
0.063	2		

Dry Mass of sample (g)	727

Sample Proportions	% dry mass
Very coarse	0
Gravel	74
Sand	24
Fines <0.063mm	2

Grading Analysis		
D_{100}	mm	37.500
D_{60}	mm	15.397
D_{30}	mm	3.350
D_{10}	mm	0.378
Uniformity Coefficient		40.7
Curvature Coefficient		1.9

Remarks

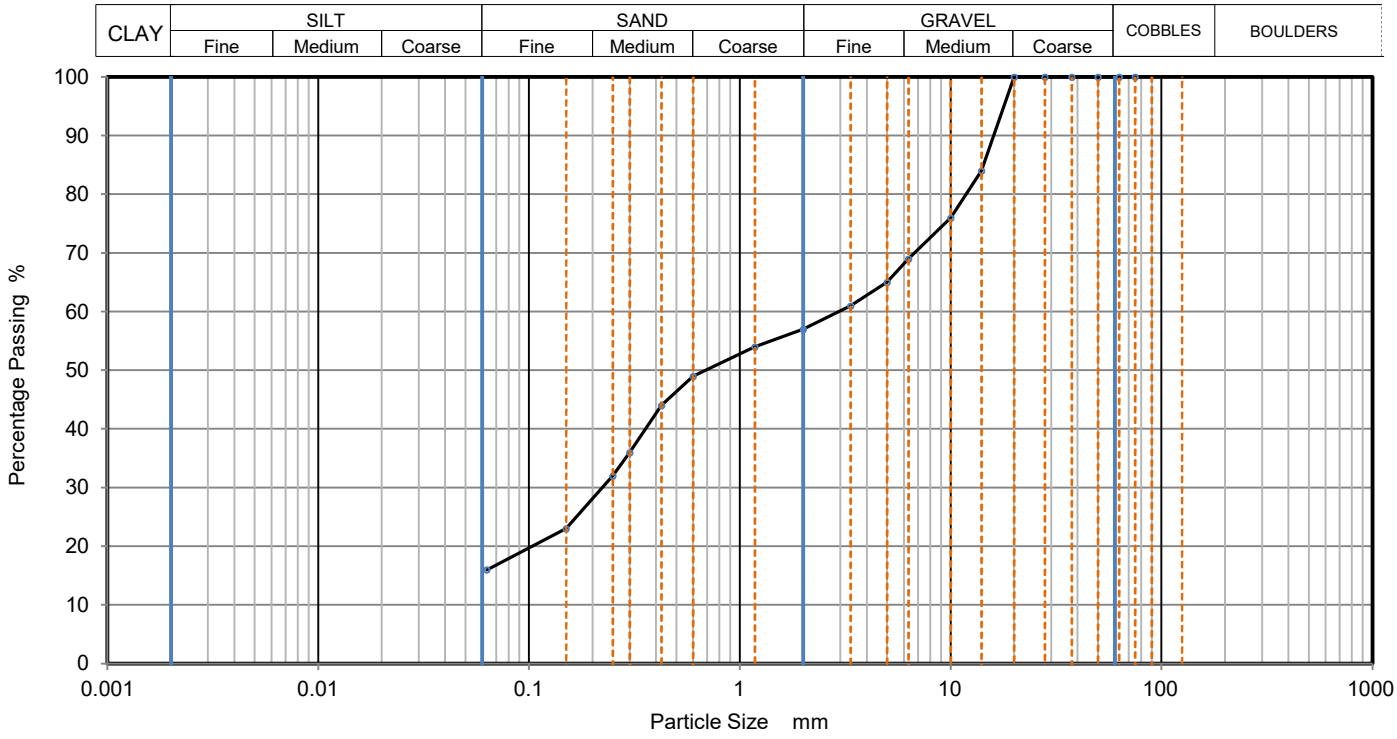
Preparation and testing in accordance with BS1377 unless noted below

Sheet No.: 2

ASHDOWN SITE INVESTIGATION LIMITED

Particle Size Distribution

Site Name:	Four Housing Courts, Landsdowne Road, London	Job No.:	P16180
Soil Description:	Very sandy clayey GRAVEL.	Borehole/Pit No.	WS03
Test Method	BS1377:Part2:1990, Clause 9.2	Depth (m)	1.3-1.5



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100	0.0200	
63	100	0.0060	
50	100	0.0020	
37.5	100		
28	100		
20	100		
14	84		
10	76		
6.3	69		
5	65		
3.35	61		
2	57		
1.18	54		
0.6	49		
0.425	44		
0.3	36		
0.25	32		
0.15	23		
0.063	16		

Dry Mass of sample (g)	393

Sample Proportions	% dry mass
Very coarse	0
Gravel	43
Sand	41
Fines <0.063mm	16

Grading Analysis		
D_{100}	mm	20.000
D_{60}	mm	2.945
D_{30}	mm	0.223
D_{10}	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

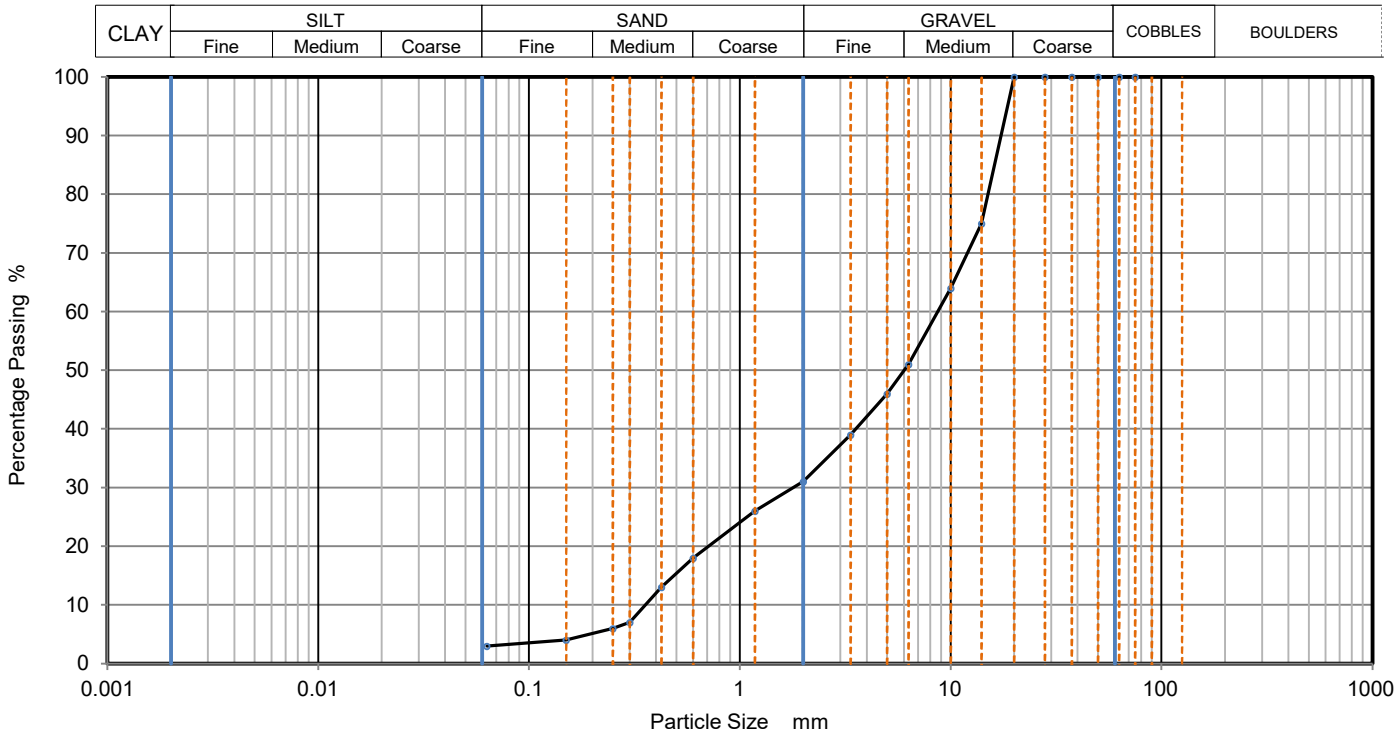
Preparation and testing in accordance with BS1377 unless noted below

Sheet No.: 3

ASHDOWN SITE INVESTIGATION LIMITED

Particle Size Distribution

Site Name:	Four Housing Courts, Landsdowne Road, London	Job No.:	P16180
Soil Description:	Very sandy slightly clayey GRAVEL.	Borehole/Pit No.	WS07
Test Method	BS1377:Part2:1990, Clause 9.2	Depth (m)	2.70



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100	0.0200	
63	100	0.0060	
50	100	0.0020	
37.5	100		
28	100		
20	100		
14	75		
10	64		
6.3	51		
5	46		
3.35	39		
2	31		
1.18	26		
0.6	18		
0.425	13		
0.3	7		
0.25	6		
0.15	4		
0.063	3		

Dry Mass of sample (g) 596

Sample Proportions	% dry mass
Very coarse	0
Gravel	69
Sand	28
Fines <0.063mm	3

Grading Analysis		
D_{100}	mm	20.000
D_{60}	mm	8.675
D_{30}	mm	1.800
D_{10}	mm	0.357
Uniformity Coefficient		24.3
Curvature Coefficient		1

Remarks

Preparation and testing in accordance with BS1377 unless noted below

Sheet No.: 4