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ACADEMY EAST
HILLCREST SCHOOL
RYE ROAD, HASTINGS
EAST SUSSEX

FACTUAL AND INTERPRETATIVE REPORT ON THE GROUND INVESTIGATION

Report No. LW21008 February 2010

Report prepared for the benefit of:

East Sussex County Council
County Hall
St. Anne's Crescent
Lewes
East Sussex
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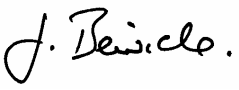
FACTUAL REPORT	
Prepared By:  **Lucy Griffiths BSc**	Approved By:  **John Bewick BSc MSc CEng CEnv MICE**
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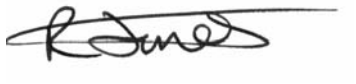
Prepared By:  **Rebecca Jones BSc FGS**	Approved By:  **John Bewick BSc MSc CEng CEnv MICE**
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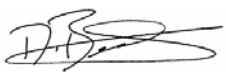
Prepared By:  **Alex Minchell-Bewick BSc MSc DIC AIEMA**	Approved By:  **Darren Beesley BSc MSc AIEMA**

ACADEMY EAST
HILLCREST SCHOOL
RYE ROAD, HASTINGS
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1. EXECUTIVE SUMMARY

It is proposed to redevelop the main school building (Block B) of the Hillcrest School, Rye Road, Hastings, East Sussex to provide new Academy East buildings with associated soft and hard landscaping areas.

Ashdown Site Investigation Limited was commissioned to carry out a ground investigation, geotechnical assessment and Phase 2 contamination risk assessment of the Site by East Sussex County Council.

Desk Study

A desk study of the school was undertaken previously by Ashdown Site Investigation Ltd (report ref LW20096/ds June 2009). The desk study identified a number of potential pollutant linkages on Site relating to end users and controlled waters. The following risks to end users were identified;

- moderate risk was identified from petroleum hydrocarbon contamination associated oil storage tanks on Site;
- moderate risk of generation and migration of landfill gas from a backfilled former pond in the vicinity of Block A; and
- low or very low risks of contamination associated with made and worked ground, an electricity sub station and car parking on Site.

The Site is underlain by the Ashdown Formation which is classified as a minor aquifer of high vulnerability to pollution. The Site does not lie within an Environment Agency Source Protection Zone with regard the extraction of water for potable supply and no abstractions were reported in the vicinity of the Site. A low risk to the underlying minor aquifer was identified from the potential contamination sources recorded on Site.

The desk study recommended a ground investigation to profile geology beneath the Site and establish geotechnical parameters for structural design, together with targeted investigation of the identified contamination sources, chemical testing of near surface soils and installation and monitoring (gas and groundwater) of standpipes.

Ground Investigation

The ground investigation confirmed the underlying soils to comprise a relatively shallow thickness of made ground, generally between 0.7-1.3m. Locally made ground was recorded to 2.4m and 2.8m below ground level. The made ground generally comprised either a silty clay containing a variable quantity of gravel of flint, chert, ironstone, clinker, siltstone and sandstone, or a silty sandy gravel with variable proportions of flint, roadstone, crystalline rock, brick, slate and quartzite.

Alluvium was recorded locally in the location of the former pond. Beneath the made ground and alluvium the investigation encountered the Ashdown Formation deposits.

Groundwater was recorded as slow seepages within a number of the boreholes at depths of between 0.30m and 6.2m during the intrusive works. Standing water depths of between 0.00m and 6.69m were recorded during the monitoring programme.

Geotechnical Assessment

It is recommended that precautions against shrinkage and heave for any foundation system constructed within the cohesive soils should assume a medium volume change potential and take into account current guidance such as that given by the National House Builders Council (NHBC). The undisturbed sandstone and mudstone deposits of the Ashdown Formation may be considered to be non plastic and hence non shrinkable.

A net allowable bearing capacity of 250kN/m^2 may be assumed for the construction of spread (pad or strip) foundations up to 1.0m across bearing within the soils of the Ashdown Formation. The Ashdown Formation soils would provide support to piled foundations by combination of side adhesion and end bearing. Indicative working loads are included in the body of the report. A DS-1 Design Sulphate Class and an AC-2z ACEC classification should be assumed as a minimum for the design of concrete in contact with the ground at the Site.

Excavations beneath the water table, and particularly in the more granular soils, will require positive drainage to maintain both adequately dry working conditions and excavation stability. Where encountered, ingress of perched water or surface runoff should be adequately managed by pumping from sumps. It is expected that excavations within the Ashdown Formation soils will be stable in the short term. However where excavations are required through the deep made ground, alluvial and more granular soils they should be assumed to be subject to short term instability.

An equilibrium CBR of 3% may be assumed for preliminary design of pavement bearing on Ashdown Formation soils. The subgrade is likely to be susceptible to frost heave.

Negligible soakage was recorded during the course of soakage tests made in the near surface deposits of the Ashdown Formation. It is likely that drainage of the site would require the construction of peak flow storage tanks, or possibly an on-site balancing pond, connected via attenuated drainage pipes to mains surface water drainage or open water courses.

Contamination Status Assessment

No elevated levels of chemical contamination were identified by the investigation, and as such no specific remedial action is considered necessary for landscaping areas.

To date, three gas monitoring visits have been undertaken at the Site. Peak levels of carbon dioxide of up to 6.2% were recorded, while peak concentrations

of methane of 7.0% were recorded in WS1. A peak gas flow rate of 11.1l/hr was recorded by the monitoring combined with reduced oxygen concentrations. WS1 was located within the area of the former pond identified by the desk study. The investigation recorded alluvium at this position to a depth of 2.5m below ground level.

It is considered that further gas monitoring at the Site will be required. CIRIA Report C665 provides guidance on the period and frequency of monitoring for assessing gas risks to buildings. Table 5.5b in the guidance states that for a site with a moderate gas generation potential, for a moderately sensitive end use, 9 monitoring visits should be undertaken over a 6 month period. This would require a further 6 visits to be completed over the next 4 months.

Quantitative conceptual models have been prepared indicating the presence of significant pollutant linkages in relation to human health (gas risk) and the absence of pollutant linkages with regards controlled waters. These are presented in Table 9 and as Figure 4.

It is advised that the local authority has ultimate jurisdiction over contamination assessment, and, as such, they must be involved in discussions relating to the scope of the investigation works undertaken and the conclusions drawn.

2. INTRODUCTION

It is proposed to redevelop the main school building (Block B) of the Hillcrest School, Rye Road, Hastings, East Sussex to provide new Academy East buildings with associated soft and hard landscaping areas.

Ashdown Site Investigation Limited was commissioned to carry out a ground investigation and combined geotechnical and contamination risk assessment of the Site by Mr James White of:

East Sussex County Council
County Hall
St. Anne's Crescent
Lewes
East Sussex
BN7 1UE

Instructions to proceed were confirmed by Purchase Order number 4500205904A, which was received from the client, East Sussex County Council, in a letter dated 8th January 2010, reference JW/JS/7026.

The purpose of the works was to:

i. assess ground and groundwater conditions prevailing at the Site;
ii. provide geotechnical information to assist others in undertaking the design of foundations, ground floors, retaining walls, road pavements and soakaways;
iii. test for the presence of potentially hazardous contamination and gas in the ground;
iv. provide a quantitative contamination risk assessment; and
v. provide a quantitative site specific conceptual model.

This report should be read in conjunction with the Desk Study Report undertaken at the Site by Ashdown Site Investigation (Report Ref: LW20096/ds, dated June 2009).

The analysis and discussions contained in this report are based on the ground conditions encountered during the recent site work together with the findings from a programme of laboratory analyses, a walkover survey, reference to historical Ordnance Survey maps and published geological and environmental information from various sources. The latter have been obtained from interrogation of database information compiled by Groundsure Limited. The possibility of a variation in ground and groundwater conditions away from the positions investigated should not be overlooked. Groundwater conditions can vary both seasonally and due to other effects.

It is noted that the investigation was undertaken and the report prepared specifically for the Client's project and the recommendations given may not be appropriate to alternative schemes. The copyright for the report and licence for use shall remain vested in Ashdown Site Investigation Limited (the Company) who disclaim all responsibility or liability (whether at common law or under the express

or implied terms of the Contract between the Company and the Client) for any loss or damage of whatever nature in the event that this report is relied on by a third party, or is issued in circumstances or for projects for which it was not originally commissioned, or where the exploratory hole records and test results contained therein are interpreted by anyone other than the Company.

The general methodology adopted for the investigation of the Site follows the guidance published within:

- BS10175:2001 Investigation of Potentially Contaminated Sites - Code of Practice;
- BS5930:1999: Code of Practice for Site Investigations;
- CLR11 - Model Procedures for the Management of Land Contamination;
- PPS23 Planning and Pollution Control;
- Environment Agency Research and Development Publication 20, 1999 “Methodology for the Derivation of Remedial Targets for Soil and Groundwater to protect water resources”.

The risk assessment presented in this report follows ‘source-pathway-receptor’ techniques for the determination of whether a site is contaminated, which are standard practice in the UK; being intrinsic to the Contaminated Land (England) Regulations 2000 - Part 2A of the Environmental Protection Act 1990.

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

This report is not intended to be either an ecological or archaeological assessment. An appropriate specialist should be consulted about any concerns that may arise in this regard.

3. FACTUAL REPORT

3.1 Site Details

3.1.1 Site Location and Walkover Survey

Hillcrest School is located on the eastern side of Rye Road, Hastings, East Sussex and is centred on the approximate Ordnance Survey national grid reference TQ 841 121. A site location plan and site plan are presented as Figure 1 and Figure 2 respectively.

The Site is bounded by Rye Road and residential properties to the west, by two covered reservoirs and a field to the east, Red Lake County Primary School to the south and residential properties to the north. The Site is occupied by a number of school buildings, a sports centre, grassed areas, roadways, car parking, hard surfaced playgrounds and tennis courts, grass covered playing fields, an all weather pitch and a disused red gravel playing field.

The school is located on the side of a steep valley, with a slope rising generally from Rye Road across the Site by some 6m west to east. There is a significantly greater fall in slope north to south across the Site. The slope is broken by a number of terraces. The general slope across the Site falls in a south west direction.

Entry onto the Site is via Rye Road, which is set some 4m below the level of the main school building on Site (B Block).

B Block
B Block was built in 1953. It is a part one, part two storey brick built building centrally located on Site. A boiler room for the Site and a water tower (for grey water use) are located within this building. The boiler room, at the time of the walkover survey, contained two large above ground oil storage tanks, understood to be empty at the time, that previously held fuel oil for heating systems on Site. It is understood that the boilers on Site are now gas powered. Access within this area was restricted due to lighting conditions, however, ground cover immediately adjacent to the outside of the boiler room showed no signs of oil staining or spillages. The location of the boiler room is indicated on Figure 2.

A Block
A Block was constructed during the 1960s. It is located down slope (approximately 3m to 4m) from B Block set in a dip on Site. A playground and temporary classroom accommodation are located to the rear (north) of A Block with a substantial wooded area beyond. It was understood from discussions with the caretaker on Site that the playground to the rear of A Block is located on a former pond.

L Block and C Block
These are brick built buildings constructed in the 1980s and 1990s located at an elevated level (approx1m to 2m) above and to the east of B Block.

Sports Centre
The sports centre and associated car parking on site is located at an elevated position (approx 3m to 4m) above and to the north of B Block. The sports centre was constructed during the 1980s.

Electricity Sub Station
A small electricity substation and transformer are located on Site on the south western boundary adjacent to residential housing. It is understood that all power to Site comes via this unit. Some oil staining was noted on the ground within the sub station enclosure during the walkover survey.

Playgrounds, Playing Fields, Pitches and Tennis Courts
The locations of the numerous recreational areas on Site are shown on Figure 2. The red gravel pitch on the southernmost extent of the Site is in a state of disrepair and no longer in use as a sports pitch. As mentioned previously, the play ground to the rear of A Block is understood to be located over a former pond.

3.1.2 Expected Geology

Table 1 shows the stratigraphic unit that may be anticipated on-site. In preparing the table reference has been made to the British Geological Survey 1:50,000 series scale map Sheet 320/321 (Hastings and Dungeness), the British Geological Survey lexicon of named rock units. These show details of the geology likely to be encountered below and in the vicinity of the Site.

Table 1. Anticipated Geological Strata

Type	Stratum	Age
Bedrock and Solid Geology	Ashdown Formation	Ryazanian

Ashdown Formation

The Ashdown Formation usually consists of siltstones and silty fine-grained sandstones with subordinate amounts of finely-bedded mudstone and mudstone arranged in rhythmic units ("cyclothems") commonly divided by thin pebble beds. In southeast Sussex, around Hastings, the argillaceous parts of the "cyclothems" are well-developed and represented by an argillaceous part of the Ashdown Formation comprising dark grey finely-bedded mudstones and mudstones, commonly patchily red-stained, with abundant iron carbonate pellets (sideritic mudstones and sphaerosiderite nodules) at some levels. The geology immediately underlying the Site is shown to comprise mudstone.

3.2 Ground Investigation

3.2.1 Introduction

The ground investigation comprised the excavation of a series of cable percussion and windowless sampler boreholes. The fieldwork was carried out between 15th and 25th January 2010. The exploratory hole locations are shown on the Site Plan (Figure 2).

Descriptions of the strata encountered and comments on groundwater conditions are shown in the exploratory hole records given in Appendix A. Notes to assist in the interpretation of the records are also contained in the appendix.

3.2.2 Investigation and Sampling Strategy

The investigation comprised a mixture of targeted sampling in areas identified as posing or being subject to potentially significant risks by the desk study and walkover survey work, together with non targeted sampling over other areas to provide spatial coverage. The following table provides a summary of the rationale behind the positioning of certain exploratory holes.

The pattern and density of sampling adopted is considered adequate for a quantitative assessment of the extent of contamination at the Site. The results from the ground investigation, together with the desk study work, provide information allowing preparation of a quantitative risk assessment.

Table 2. Sampling Location Rationale

Exploratory Hole	**Reason for positioning**
WS1	Borehole WS1 was located to investigate the presence of a former pond over the northern part of the site. At this location only, firm becoming soft clay, judged to represent Alluvium associated with the pond, was recorded to a depth of 2.50m.
WS3 and BH3	Located in designated parking area
WS5	Located adjacent to oil tanks
WS7	Located adjacent to substation

3.2.3 Methodology

3.2.3.1 Cable Percussion Boreholes

Six boreholes (designated BH1 to BH6) were bored to depths of between 5.60m and 10.0m below ground level.

The drilling and in situ testing procedures adopted during the cable percussion borehole investigation are outlined in Appendix A.

3.2.3.2 Windowless Sampler Boreholes

Sixteen boreholes (designated WS1 to WS15, including WS5 and WS5a) were drilled to depths of up to 3.0m below ground level.

Windowless sampler boreholes are formed by a series of 1.0m long hollow steel tubes, ranging in diameter from 35mm to 100mm, driven into the ground by means of a track-mounted drop weight. The sampler is extracted from the ground using a hydraulically operated jack. The enclosed sample is recovered in 1.0m long perspex liners which are sub-sampled for detailed examination and laboratory testing.

3.2.4 Sampling

Undisturbed and disturbed samples of soil were taken at the depths shown in the exploratory hole records and collected in either plastic liners, plastic bags or amber jars fitted with gas tight lids. Water samples were collected in plastic bottles. On collection, amber jars, were stored in cool boxes with cooling blocks to maintain temperatures below 4°C and transferred to refrigerators upon return to the office until forwarded to the external accredited laboratory.

3.2.5 In Situ Testing

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

Standard Penetration Test

Standard penetration testing (SPT) was carried out within the boreholes for the assessment of the relative density/strength of granular soils/rock and to assist interpretation of the strength of cohesive soils.

Results from the standard penetration testing are plotted in Figure 3.

DPSH Dynamic Probe (Super Heavy) Testing

Dynamic probe testing was carried out adjacent to windowless sampler boreholes WS4, WS5a, WS9 and WS11. The dynamic probing was undertaken in accordance with BS EN ISO 22476-2:2005 using a super heavy probing geometry.

Undrained Shear Strength

Undrained shear strength determinations were made in situ within the cohesive soils using a Geonor hand shear vane as part of the window sampling investigation.

Additionally undrained shear strength determinations were made within samples of the cohesive soils held in the windowless sampler tubes using a hand penetrometer. Although samples taken by the window sampling technique cannot be regarded as undisturbed for testing, penetrometer testing can provide a useful indication of the strength of the material.

Soakage Testing

Falling head soakage testing was attempted in boreholes BH2, BH4 and BH6 at a depth of 3.0m within the Ashdown Formation. The tests were carried out in general accordance with the Kent County Council Guidelines. No soakage was recorded from any of the boreholes.

3.2.6 Installations

Gas and groundwater monitoring standpipes were installed to depths of between 1.60m and 10.0m in eight boreholes. Descriptions of the installation are shown in the exploratory hole records given in Appendix A.

The concentrations of gases and depth to groundwater were recorded within the standpipes on three separate occasions between 28th January 2010 and 12th February 2010 as part of the monitoring programme. The readings are presented in Appendix A.

3.3 Laboratory testing

Results from the laboratory tests are provided in Appendix B.

3.3.1 Geotechnical Testing

Geotechnical testing was undertaken by Ashdown Site Investigation Ltd in accordance with the methods given in BS1377:1990 Parts 1 to 8 'Methods of test for soils for civil engineering purposes'.

Notes to assist with the interpretation of the tests are contained within Appendix B.

The types and numbers of tests carried out are detailed in the following table. The significance of the results is discussed further in Section 4.

Table 3. Geotechnical testing

Type of test	No. of samples tested
Moisture Content	28
Atterberg Limits	18
Triaxial Compression	9
Laboratory Shear Vane	9

3.3.2 Chemical Testing

Chemical testing of selected samples was scheduled by Ashdown Site Investigation Ltd, and was undertaken by a laboratory with recognised (UKAS and MCERTS) accreditation for quality control.

The types and numbers of tests undertaken are detailed in the following table. The rationale for testing is discussed further in Section 5.

Table 4. Chemical testing

Determinand	No. of samples tested
Arsenic	18
Cadmium	18
Chromium	18
Lead	18
Mercury	18
Nickel	18
Selenium	18
Copper	18
Zinc	18
Hexavalent Chromium	18
Water Soluble Boron	18
pH	28
Organic Matter	18
Speciated PAH	18
PCB	2
Total Petroleum Hydrocarbons	2
Water Soluble Sulphate	10

3.4 Ground Conditions

3.4.1 Stratigraphy

3.4.1.1 Surface Covering

For the most part the exploratory holes were excavated through a surface cover of topsoil some 150mm to 500mm in thickness.

Within boreholes BH3, BH5, WS1, WS3, WS5, WS5a, WS8 and WS10, tarmacadam overlying concrete and/or hardcore some 150mm to 300mm in total thickness was recorded. Borehole WS14 was excavated through a surface cover of hardcore comprising pink sand and gravel of crystalline rock.

No specific surfacing materials were recorded at borehole WS15, which was located at the far southern end of the site on the edge of the playing field.

3.4.1.2 Made Ground

Made ground, generally comprising silty clay containing a variable quantity of gravel of flint, chert, ironstone, clinker, siltstone and sandstone was recorded to depths of between 0.7m and 2.8m within boreholes BH6, WS7, WS9, WS12 and WS14.

Within boreholes BH3, WS1, WS3 and WS15, silty sandy gravel made ground soils containing variable proportions of flint, roadstone, crystalline rock, brick, slate and quartzite was recorded to depths of between 0.3m and 1.1m below existing ground level.

The depth of made ground, where encountered, was relatively shallow, generally being between 0.7m and 1.3m. The exceptions to the latter were in boreholes WS12 and WS14 where made ground was present to depths of 2.4 and 2.8m, respectively. The varying depth of made ground is considered most likely to be associated with terracing of the site to form level areas during construction.

Below the made ground soils in WS12, an organic rich clay layer possibly representing relict topsoil was recorded between 2.30m and 2.40m depth.

3.4.1.3 Alluvium

In borehole WS1 only, firm clay becoming soft with depth, was found to extend below the made ground to a depth of 2.50m below ground level. These deposits are judged to represent Alluvium considered to be associated with the pond which formerly occupied the northern area of the site.

3.4.1.4 Ashdown Formation

Underlying the made ground, and Alluvium in WS1, the investigation entered undisturbed silty clays progressing into subordinate horizons of hard clays/weak mudstones, siltstones and fine grained sandstone deposits, which continued to the full depth of the investigation.

These soils are considered to represent the Ashdown Formation deposits indicated on the published geological map.

3.4.2 Stability and Groundwater Conditions

The cable percussion boreholes were cased to depths of between 1.8m and 3.0m below ground level.

With the exception of boreholes WS1 and WS15, which recorded instability, the window sampler boreholes remained stable during the short period of the investigation.

Groundwater was recorded as slow seepages within a number of the boreholes at depths of between 0.30m and 6.2m during the period of the intrusive works.

Standing water depths of between 0.00m (WS11) and 6.69m (BH5) below ground level were recorded in the standpipes during the monitoring programme carried out following their installation.

4. GEOTECHNICAL ASSESSMENT

At the time of preparation of this report it is understood that several development options are being considered.

The geotechnical assessment has been prepared in connection with the development options shown on the drawings prepared by r h partnership (Reference BSS01 001 revision 0, BSS01 002 revision 0, BSS01 011 revision 0, BSS01 012 revision 0, BSS01 015 revision 0, BSS01 016 revision 0 and BSS01 017 revision 0)

In summary these drawings indicate the proposed development to comprise the construction of a new building (in various layouts) together with new soft and hard landscaped areas.

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

4.1 Foundations

4.1.1 Soil Shrinkage/Heave Potential

The cohesive soils of the made ground, Alluvium and Ashdown Formation have been classified as clays of low to high plasticity and with modified plasticity indices in the range of 8% to 31% the soils may be expected to exhibit up to a medium volume change potential.

It is recommended that precautions against shrinkage and heave for any foundation system constructed within the cohesive soils should assume a medium volume change potential and take into account current guidance such as that given by the National House Builders Council (NHBC).

The undisturbed sandstone and mudstone deposits of the Ashdown Formation 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. All detailed foundation design including assessment of minimum founding depths for spread foundations, requirements for sleeving or reinforcing of piled foundations and requirements for placement of void formers must take into account the volume change potential of the soil and the presence of trees (previous, present and proposed). In this connection attention is drawn to the presence of a wooded area at the northern end of the site and numerous trees along the central part of the eastern boundary.

4.1.2 Spread Foundations

The depth of made ground soils was found to be variable across the site, with made ground not being encountered at some locations and being recorded to depths of up to 2.8m (WS14). It is considered that the greatest thickness of made ground is likely to represent fill placed during the earlier cut and fill operations used to create the numerous level terraces present across the site.

Any made ground should be regarded as potentially variable in nature and state of compaction and, as such, unsuitable as a founding medium for shallow footings. New footings should therefore be constructed to bear below the made ground and any soils disturbed by the construction or removal of any previously existing foundations and services.

Similarly the Alluvium recorded in borehole WS1 to a depth of 2.5m should be regarded as unsuitable as a founding medium due to its low shear strength and potential for highly compressible materials to be present.

For design purposes, a net allowable bearing capacity of 250kN/m^2 may be assumed for the construction of spread (pad or strip) foundations up to 1.0m across bearing within the very stiff soils and weak rock of the Ashdown Formation. The quoted bearing capacity is expected to limit settlement to less than 25mm. Subject to any precautions required to protect against the effects of soil shrinkage or heave, a minimum depth to formation of 1m should be adopted.

4.1.3 Piled Foundations

It is considered that the Ashdown Formation would provide support to piled foundations by 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 will have to accommodate the presence of groundwater and the weak rock horizons encountered.

Dependant on the method employed it is considered likely that driving displacement (driven) piles through the very stiff clays and weak rock horizons would prove disruptive to nearby properties and their occupants and as such is unlikely to be permitted.

For the purposes of this initial discussion and for reasons given above, consideration has been given to the adoption of cast in situ piles (e.g. CFA). The use of CFA piles would prove beneficial as this method does not require casing or the use of bentonite slurries. However, there are certain practical constraints that should be taken into account in the selection of pile type when considering the incorporation of pile reinforcement.

Illustrative calculations to determine working loads for the axially loaded piles have been undertaken for a single pile acting in compression and the results are

presented in the following table. Available capacities may vary for piles acting in tension.

The competency of the soil profile used for these calculations has been based on the examination of the recovered samples and the results of in situ and laboratory testing. For the purpose of the calculations a modelled ground profile comprising very stiff to hard clays has been adopted. In consideration of the depth of made ground encountered and the medium volume change potential of the natural clay soils the benefit of shaft resistance within the upper 3m has been discounted.

Table 5. Illustrative axially loaded pile capacities

Working Loads of Piles (kN)			
Length	**Size (mm)**		
(m)	300	400	500
8	210	300	410
10	270	385	515

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. The benefit of shaft resistance within the upper 3m 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 be sought at the earliest opportunity. Piling specifications should be obtained from specialist contractors with reference to their particular products as this may affect the calculated capacity.

The selection of piling techniques should not only consider attainable pile capacities but also consider access constraints applicable to particular plant and potential vibration effects on existing structures.

4.2 Groundwater

Groundwater was encountered at depths of between ground level and 6.69m during the period of the intrusive works and subsequent monitoring visits. It is noted that it is not clear what has caused the particularly shallow water level recorded in WS11, where water stood at ground level. It is possible that it truly represents a shallow water table in this area due to the cutting of a terrace to form the playing field – at this location the ground surface lies approximately 3 metres below that of the surrounding land. Alternatively it may be the result of the

accumulation of runoff from the surrounding higher ground in an area underlain by low permeability soils.

Excavations beneath the water table, and particularly in the more granular soils, will require positive drainage to maintain adequately dry working conditions and excavation stability. Where encountered, ingress of perched water, or surface runoff should be adequately managed by pumping from sumps.

4.3 Stability of Excavations

It is expected that excavations within the Ashdown Formation soils will be stable in the short term. However where excavations are required through the deep made ground, alluvial and more granular soils they should be assumed to be subject to short term instability. Where stable excavations are required they should be suitably supported or side slopes battered back to a safe angle of repose.

Where personnel access is required to any excavation its stability should be assessed by a suitably qualified and experienced responsible person. For general guidance it is recommended that personnel access to unsupported excavations greater than 1.2m depth should be prohibited.

Particular attention must be paid to ensuring the stability of adjacent structures, slopes and neighbouring sites during any excavation works.

4.4 Aggressivity to Concrete

In view of the soils encountered beneath the site it is considered that ‘natural ground conditions’ may be assumed for the purposes of assessing the aggressivity of the chemical environment for concrete classification (ACEC class). Given the noted occurrence of groundwater, ‘mobile groundwater’ conditions should also be assumed.

Chemical analysis of the soil indicates a sulphate content falling into Design Sulfate Class DS-1 of Table C1 of the Building Research Establishment Special Digest No 1 “Concrete in aggressive ground”, 2005. The results of the pH tests indicate that the underlying soils are acidic to alkaline.

In accordance with the BRE digest, a DS-1 Design Sulfate Class and an AC-2z ACEC classification should be assumed as a minimum for the design of concrete in contact with the ground at the site.

4.5 Ground Floors

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

It is recommended that ground bearing floor slabs be employed only for non sensitive areas. Where ground bearing slabs are used differential movement

between both the floor slab and structural walls and across the floor slab itself should be anticipated. It is therefore recommended that ground bearing floors should be fully debonded from structural load bearing walls and suitably reinforced top and bottom to enable spanning of soft spots. Formations should be adequately proof rolled and any excessively soft materials excavated and replaced with a suitable engineered fill. The detailing of services through or under ground bearing floors should incorporate flexible connections and, where appropriate, enhanced falls.

4.6 Pavement Design

The former Department of the Environment, Transport and the Regions Design Manual for Roads and Bridges, Volume 7 (Pavement Design & Maintenance), Section 2, Part 2 1994 provides a useful correlation between soil type and equilibrium (long term) CBR values. This guidance suggests a design equilibrium CBR value of 1% to 4% applicable to the natural soils for the construction of thin (300mm) pavement in average construction conditions and assuming a low groundwater table.

Based upon review of the test results and the quoted guidance it is suggested that for the Ashdown Formation soils a CBR value of 3% may be adopted for preliminary pavement design.

All formations should be proof rolled and any very loose, bulky, soft, degradable or otherwise unsuitable materials thus identified should be removed and replaced with well compacted granular fill. Prepared subgrades should be protected from severe adverse weather by ensuring they are graded to falls to prevent ponding, and they should be reasonably protected from trafficking during construction.

The subgrade should be assumed to be susceptible to frost heave.

If new roads are to be adopted the local highway authority should be consulted with reference to the acceptability of the proposed figures prior to designs being finalised and construction undertaken.

4.7 Retaining Structures

It is recommended that retaining structures should be designed using effective shear strength parameters. Suggested unfactored effective stress parameters for use in design are provided in the following table.

Table 6. Unfactored Effective Stress Design Parameters

Stratum	**Internal Angle of Shearing Resistance (°)**	**Cohesion (kN/m^2)**	**Unit Weight (kN/m^3)**
Made Ground	25	0	18.5
Alluvium	22	0	18.0
Ashdown Formation (clays)	25	0	19.5
Ashdown Formation (weak rock)	30	0	21.0

Excavations - Stability of Cut Slopes

To minimise the risk of slope instability, temporary cut slopes, where required, should ideally be limited to the narrowest practicable bay widths, preferably working by progressive cutting and backfilling of narrow bays. Short lengths of open slope face will have a greater degree of stability as they will have some support by arching.

Should cuttings be made below the standing water level they must be expected to be unstable and prone to collapse.

Temporary slopes should be cut to as shallow a gradient as is practicable; ideally a maximum slope gradient of 1(v):2(h) may be assumed to be appropriate, although a shallower gradient will, of course, attract less risk.

The slopes should be regularly inspected for evidence of movement or distress.

Temporary faces should be left open for the minimum period possible. Care should be taken during construction to prevent the crests of temporary slopes from being loaded (e.g. haulage traffic should be routed away from the crest).

Specific measures to prevent ponding at the top of the slope, and to prevent water flowing down the face of the excavation should be adopted.

4.8 Drainage

In situ soakage testing was undertaken at three locations in accordance with 'The Soakaway Design Guide' published by Kent County Council (July 2000). During a 30 minute observation period of the falling head soakage tests carried out in boreholes BH2, BH4 and BH6 no fall in the water level was recorded. The results of the test indicate the near surface soils of the Ashdown Formation have a negligible infiltration rate.

Soakage into the Ashdown Formation soils is likely to be by fissure flow. For soakaways to work they would therefore have to be in contact with fissures, the location and continuity of which cannot be predicted.

In the absence of such fissures it is likely that drainage of the site would require the construction of peak flow storage tanks, or possibly an on-site balancing pond, connected via attenuated drainage pipes to mains surface water drainage or open water courses.

Wherever soakage into soakaways, open water courses or existing public storm water drainage systems is proposed, the Environment Agency and Local Authority, respectively, must be consulted in relation to consent for discharge of water from rooftops, areas of hardstanding and roadways.

5. PHASE 2 CONTAMINATION ASSESSMENT

5.1 Basis of Risk Assessment

In consideration of the potential sources identified by the desk study report (Report Ref: LW20096/ds) the following commonly occurring significant contaminants have been considered for assessment: arsenic; cadmium; chromium; lead (including lead compounds); mercury; nickel; selenium, petroleum hydrocarbons, polycyclic biphenyls (PCB), and polycyclic aromatic hydrocarbons (PAH). The polycyclic aromatic hydrocarbons were speciated into the sixteen individual compounds specified by the United States Environmental Protection Agency (USEPA).

Soils

The results from the majority of the analyses can be assessed by way of careful consideration of the proposed end use as well as physical features of the soil type and wider environment as part of a quantitative 'Contaminated Land Exposure Assessment' or 'CLEA model' assessment.

Quantitative risk assessment using the CLEA model is the method preferred by the regulatory authorities in the UK to assist in determining the contamination status of soils in terms of risk to human health.

Gas

The assessment of the results of the standpipe monitoring has been undertaken in general accordance with the guidance contained within CIRIA C665 "Assessing risks posed by hazardous ground gases to buildings" (2007).

5.2 Analysis of Contamination Test Results

Results from the chemical (contamination) testing are summarised in Appendix B.

A quantitative assessment of the results of this investigation has been undertaken comparing soil contaminant concentrations on Site against Soil Screening Values generated by Ashdown Site Investigation Ltd using the CLEA Model, published by the Environment Agency. For further information on the derivation of these values see the notes in Appendix C. The chemical data used within the CLEA model is also summarised within Appendix C. The data was obtained from various sources including guidance documents published by the Environment Agency and other statutory bodies.

In view of the proposed development a preliminary assessment of the results of the soil testing has been undertaken comparing contaminant concentrations recorded on Site against soil screening values calculated using the default "Residential" land use as set out in Science Report SC050021/SR3, January 2009, but without the pathways associated with ingestion of site grown vegetables and ingestion of soil attached to vegetables. The critical receptor for this land use

is considered to be a young female child resident on Site from birth to age 6. Exposure routes that are considered include the potential for direct ingestion of the soil, the outdoor and indoor ingestion of dust and the potential inhalation of dust and vapours.

This preliminary approach is considered to represent an extremely conservative assessment of risk to the proposed end users of the development, as such any exceedance of these values does not automatically indicate that an unacceptable risk is present. Should no elevated contaminant concentrations be recorded above the residential soil screening values then no risk will be considered to be present.

Statistical Analysis

Statistical analysis of the data set has been undertaken in line with guidance set out in 'Comparing Soil Contamination Data with a Critical Concentration' report, published by the CIEH/ CL:AIRE (May 2008). The report replaces the (now withdrawn) guidance set out in CLR7.

The CIEH/CL:AIRE guidance provides a framework for assessing measured contaminant concentrations on a Site against user defined critical concentrations – or indicators of risk.

Under a planning scenario, the null hypothesis tested is whether the true population mean is greater than a "critical concentration". The critical concentration used within this assessment is the relevant screening value for the proposed end use.

The null hypothesis can be rejected if it can be shown (with a sufficient degree of confidence) that the true population mean lies below the critical concentration. The confidence level recommended within the guidance is 95% i.e. the statistical evidence must show that there is 95% likelihood that the true population mean lies below the critical concentration. In this instance the Site is considered suitable for the proposed use.

Where there is insufficient evidence to reject the null hypothesis, further risk assessment and/or remediation may be necessary.

Guidance on comparing soil contamination data with a critical concentration are provided in Appendix C. The summary sheets from the statistical analysis are also presented in Appendix C.

As with any statistical assessment, the number of samples considered will impact confidence in the data set, the results presented and any conclusions made. This assessment was based on a total of 15 soil samples collected from the near surface soils (topsoil and shallow made ground) at depths of between 0.2m to 0.7m at the locations provided on Figure 2. The soils within the data set are considered to have a pH of 8 and an organic content of 1%.

5.2.1 Metal and Semi-Metal Contamination

The following table summarises the calculated soil screening values along with sample means and 95th percentile upper confidence limits. Discussion of the data is presented beneath the table.

Table 7. Soil Screening Values and Upper Confidence Limits for Zootoxic Metal and Semi-Metal Contaminants

Contaminant	Soil Screening Value (mg/kg)	Sample Mean (mg/kg)	95% Upper Confidence Limit (mg/kg)	Can H_o be rejected	Evidence against H_o (%)
Arsenic	35	6.64	9.29	Yes	100
Cadmium	79	0.25	0.25	Yes	100
Chromium III	3000	16.78	25.92	Yes	100
Lead	246	52.13	156.05	Yes	99
Mercury	268	0.25	0.25	Yes	100
Nickel	130	12.58	21.24	Yes	100
Selenium	595	0.25	0.25	Yes	100
Chromium VI	4.3	1.00	1.00	Yes	100

The testing of the shallow made ground and topsoil has not recorded any significantly elevated concentrations of the metals tested for, with the exception of single marginally elevated lead concentration. Three samples of undisturbed soils (WS1 at 0.9m, WS5a at 0.4m and BH6 at 0.5m) were also tested and did not record any significantly elevated concentrations of the metals tested.

5.2.2 Organic Contamination

5.2.2.1 Polycyclic Aromatic Hydrocarbons (PAHs)

Polycyclic Aromatic Hydrocarbons (PAHs) are a group of chemicals that contain two or more benzene rings fused together. The samples tested recorded concentrations of total PAHs of up to 5.05mg/kg.

Individual PAH compounds exhibit a range of physical properties and human toxicities and therefore, where they are present, a risk assessment cannot effectively be made against the total PAH concentration.

To allow an assessment to be made, the PAH concentrations within the soil samples were speciated to give concentrations of 16 individual PAHs defined by the United States Environmental Protection Agency (USEPA).

Benzo(a)pyrene and Naphthalene

Benzo(a)pyrene is recognised as a significant carcinogen and is normally considered to be the primary driver for remediation where PAH contamination is identified. It is typically a product of partly combusted fuel (soot/ exhaust residue) and it is also common in tarmacadam road pavement, coal tar, coal ash and clinker. Where it is not associated with fuel spills and, where found associated with ashy soils or tarmacadam, for example, it may not be especially volatile. As such whilst PAH in soil can be hazardous by inhalation, this is usually as dust and particles in smoke, rather than as vapours. It tends to bind readily to soils and therefore will not easily leach to groundwater, thus minimising the risk of its migration through the ground.

Naphthalene is most commonly associated with the distillation of coal tar and as such is often associated with the presence of clinker and tarmacadam road pavement. Naphthalene is the lightest PAH and consequently has a higher volatility than others. It is less tightly bound to soils than benzo(a)pyrene and therefore exhibits greater mobility.

The following table summarises the calculated soil screening values along with sample means and 95th percentile upper confidence limits. Discussion of the data is presented beneath the table.

Table 8. Soil Screening Values and Upper Confidence Limits for naphthalene and benzo(a)pyrene

Contaminant	Soil Screening Value (mg/kg)	Sample Mean (mg/kg)	95% Upper Confidence Limit (mg/kg)	Can H_o be rejected	Evidence against H_o (%)
Naphthalene*	1.6	0.01	0.01	Yes	100
Benzo(a)pyrene*	1.0	0.10	0.25	Yes	100

* Based on a SOM concentration of 1%

The testing has not recorded any significantly elevated concentrations of PAH contamination within the near surface soils (shallow made ground and topsoil). The three samples of undisturbed soils (WS1 at 0.9m, WS5a at 0.4m and BH6 at 0.5m) tested also recorded no significant concentrations of PAH.

5.2.2.2 Petroleum Hydrocarbons

None of the soils encountered during the investigation recorded any visual or olfactory evidence of petroleum hydrocarbon contamination.

Samples from WS5a, located adjacent to the oil fired boiler room, and WS3, located within a car park, were tested for total concentrations of petroleum hydrocarbons. Neither sample recorded any detectable concentrations of petroleum hydrocarbons.

5.2.2.3 Polychlorinated Biphenyls (PCB)

PCBs are a family of chemicals that were used in electrical components, such as transformers, switchgear and capacitors, because of their good electrical insulation properties, fire resistance and chemical stability. They were found to affect the immune system and to cause cancer and liver damage. In Britain their use declined rapidly in the 1970s. As a result of their toxicity and persistence in the environment they have been banned internationally since 1986. It should be assumed that any transformer or capacitor made before 1976 contains PCBs and that PCBs may still be present in components manufactured between 1976 and 1986.

Two samples taken from WS7 (at 0.1m and 0.5m depth), located adjacent to the electrical sub station were tested for the presence of PCBs. No concentrations above the detection limit of the test were recorded in either sample.

5.2.3 Ground gas risk assessment

Monitoring of the gas concentrations within the 8 standpipes installed across the Site was carried out on three occasions between 28th January 2010 and 12th February 2010. All of the visits were undertaken during periods of falling and low atmospheric pressure.

Peak concentrations of methane of 7.0% and carbon dioxide of 6.2%, and a peak flow rate of 11.1l/hr were recorded by the monitoring.

The peak concentration of methane of 7.0% was recorded in the standpipe installed at WS1 in the location of the backfilled pond on Site, together with a peak carbon dioxide concentration of 1.5% The investigation at this position recorded alluvium to a depth of 2.5m below ground level. Gas flow rates of up to 5.8l/hr were recorded within the standpipe along with reduced oxygen concentrations.

The peak level of carbon dioxide of up to 6.2% was recorded in BH3. The highest flow rate of 11.1l/hr was recorded within WS7.

Elevated concentrations of methane of up to 0.9% were also recorded within WS12 with peak flow rates at that location of up to 6.2l/hr. The investigation recorded reworked soils to a depth of 2.4m below ground level at this location.

It is considered that further gas monitoring at the Site will be required. CIRIA Report C665 provides guidance on the duration and frequency of monitoring for assessing gas risks to buildings. Table 5.5b in the guidance states that for a site with a moderate gas generation potential, for a moderately sensitive end use, 9 monitoring visits should be undertaken over a 6 month period. This would require a further 6 visits to be completed over the next 4 months.

On the basis of the monitoring undertaken to date it is likely that buildings may need to have protective measures incorporated into their design. In line with the guidance, the actual protective requirements should be determined on completion of the additional monitoring.

5.3 Quantitative Contamination Risk Assessment

5.3.1 Quantitative Contamination Risk Assessment for Human Health

A quantitative conceptual model of the risk to human health has been prepared based upon the following information.

5.3.1.1 Identified Sources

The following sources that have the potential to pose a significant risk to human health have been recorded by the investigation undertaken at the Site:

- Elevated concentrations of methane and carbon dioxide recorded within the standpipes.

5.3.1.2 Pathways

Pathways by which the above source could reasonably be expected to come into contact with potential receptors are:

a) Inhalation of soil gases.

5.3.1.3 Assessment of Risk to Human Health

On the basis of the monitoring undertaken to date there is considered to be a low to moderate risk to end users from ground gas. Further monitoring is recommended to provide a robust data set on which to base a risk assessment and inform design requirements to protect buildings on Site.

5.3.1.4 Conceptual Model

A quantitative human health risk assessment conceptual model is presented in the following table. The model has been constructed based on the proposed development of the Site for a new school with associated soft landscaped and recreation areas.

A diagrammatic representation of the quantitative contamination risk assessment conceptual model is presented as Figure 4.

Table 9. Quantitative Human Health Conceptual Model - Pollutant Linkages and Assessment of Risk

Contaminant Source	Potential Pathway(s)	Assessment of Risk to Human Health
Elevated concentrations of ground gases recorded within the standpipes	Inhalation of soil gases.	Low to moderate

5.3.2 Quantitative Contamination Risk Assessment for Controlled Water

5.3.2.1 Identified Sources

The chemical testing undertaken on soils as a part of the investigation has not recorded any contamination that would be considered to present a risk to human health or controlled waters.

5.3.2.2 Assessment of Risk to Controlled water

In the absence of any significant sources of contamination at the Site there is considered to be no risk to controlled waters. The conceptual model (presented in Figure 4) shows the absence of pollutant linkages for controlled water receptors.

5.4 Risks to Other Potential Receptors

The elevated ground gases identified at the Site by this investigation may present risks to other potential on-site receptors such as construction workers. This is discussed briefly below. General guidance is also provided with regards to potential contamination sources not recorded by the investigation but that may be encountered as a part of the construction process.

5.4.1 Construction Workers

The presence of elevated concentrations of ground gases may pose a specific risk to construction workers, particularly where deep or covered excavations are undertaken. Any works which may involve entering enclosed excavations should be covered by a specific risk assessment.

In general as a minimum and in accordance with industry best practise all ground-workers should be issued with the appropriate PPE and should be instructed in safe working methods. As a precaution instructions should also be given in the recognition of potentially hazardous materials, including oily and odorous soil and water and discoloured or fibrous substances. Any oil-like substances contacting the skin must be washed off immediately using an appropriate cleanser. Operatives should be warned to avoid contact between hands and mouth before washing. The consumption of food and smoking must be confined to designated clean areas. Suitable welfare (washing) facilities should be provided.

5.4.2 Services

The risk of damage to services is considered to be low. However, it is considered that the service provider's requirements represent the most informed decision when it comes to the protection of their services. It is recommended that the developer should contact all service providers with regard to specific precautions they may require.

5.4.3 Planting

The elements boron, copper and zinc are considered to be essentially non-toxic to humans and as such have not been incorporated into published guidance relating to the CLEA Model. Together with nickel, they do however have the potential to impair the growth of plants and to adversely affect aquatic life.

None of samples tested recorded significantly elevated concentrations of these elements.

Made ground may become dusty where it is exposed and may not readily support the growth of plants. A horticulturist should be consulted with regard to any specific planting schemes.

5.5 Discovery Strategy

Although no significantly elevated concentrations of the contaminants tested for were recorded within the soils at the Site, it is recommended that stripped formations should be inspected by an appropriate person to confirm the materials exposed are similar to those recorded by the investigation.

Particular attention should be paid to the inspection of the stripped formation beneath and in the vicinity the boiler room and storage tank on Site. If evidence of petroleum hydrocarbon is recorded by the inspection chemical testing and possibly a further risk assessment may be required.

In addition, should materials not previously identified or suspected of being 'contaminants' be encountered during the course of the works advice should be sought immediately on their identification and how they should be treated.

If necessary the newly identified contaminants will be subject to a revised risk assessment and remediation strategy.

5.6 Handling and Disposal of Waste and Quality of Imported Materials

5.6.1 Waste Management

Soils and other materials taken for disposal should be handled, transferred and disposed of as controlled waste in accordance with the requirements of the Waste Management, Duty of Care Regulations. Copies of 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.

The Site Waste Management Plans Regulations, 2008, require a site waste management plan to be prepared and implemented by clients and principal contractors for all construction projects with an estimated cost greater than £300,000 excluding VAT. The plans must record details of the construction project, estimates of the types and quantities of waste that will be produced, and confirmation of the actual waste types generated and how they have been managed. More detailed reporting requirements apply to projects exceeding £500,000.

5.6.2 Quality of Imported Soils

Full details of the source of any imported soils should be documented (including topsoil). Any material from a potentially contaminated (e.g. industrial) site should be rejected. It is recommended that chemical (contamination) testing results are obtained and supplied for comment prior to accepting the soils on Site. As a minimum the contaminants tested for should include arsenic, cadmium, chromium, lead, mercury, nickel, selenium and the polycyclic aromatic hydrocarbon benzo(a)pyrene. The material should be free from petroleum hydrocarbons, and contain no significant quantity of putrescible material (incl. wood or paper). Materials must comply with current CLEA guidance for the proposed end use of the Site.

It is stressed that the quality of any materials imported onto the Site is critical to the successful completion of any remediation works.

6. CONCLUSIONS

The following conclusions present a summary of the main findings of the investigation. However, no reliance should be placed on any point of the conclusions until the whole of the report has been read as other sections of the report may put into context the information contained herein.

6.1 Geotechnical Assessment

- The ground investigation confirmed the underlying soils to comprise a variable thickness of made ground, locally overlying Alluvium at the location of WS1. The investigation confirmed the site was underlain by deposits of the Ashdown Formation.

- Groundwater was recorded at various depths of between ground level and 6.69m during the period of the intrusive works and subsequent monitoring visits.

- Precautions against shrinkage and heave for any foundation system constructed within the cohesive soils should assume a medium volume change potential and take into account current guidance such as that given by the National House Builders Council (NHBC). The undisturbed sandstone and mudstone deposits of the Ashdown Formation may be considered to be non plastic and hence non shrinkable.

- A net allowable bearing capacity of 250kN/m^2 may be assumed for the construction of spread (pad or strip) foundations up to 1.0m across bearing within the Ashdown Formation soils.

- It is considered that soils of the Ashdown Formation would provide support to piled foundations by a combination of side adhesion (skin friction) and end bearing. Indicative working loads are included in the body of the report.

- Excavations beneath the water table, and particularly in the more granular soils, will require positive drainage to maintain both adequately dry working conditions and excavation stability. Where encountered, ingress of perched water or surface runoff should be adequately managed by pumping from sumps.

- It is expected that excavations within the Ashdown Formation soils will be stable in the short term. However where excavations are required through the deep made ground, alluvial and more granular soils they should be assumed to be subject to short term instability.

- A DS-1 Design Sulfate Class and an AC-2z ACEC classification should be assumed as a minimum for the design of concrete in contact with the ground at the site.

- In view of the variable thickness of made ground and the presence of soils of up to medium volume change potential, it is recommended that ground floors be suspended for all sensitive structures.

- An equilibrium CBR of 3% may be assumed for the preliminary design of pavement bearing on the Ashdown Formation soils. The subgrade is likely to be susceptible to frost heave.

- Retaining structures should be designed using effective shear strength parameters.

- Negligible soakage was recorded during the course of soakage tests made in the near surface deposits of the Ashdown Formation. it is likely that drainage of the site would require the construction of peak flow storage tanks, or possibly an on-site balancing pond, connected via attenuated drainage pipes to mains surface water drainage or open water courses.

6.2 Contamination Status Assessment

- With the exception of a single marginally elevated concentration of lead recorded at one investigation location, the chemical testing and statistical analysis of the results undertaken has not identified contaminants at levels in excess of soil screening values for a residential end use. The use of residential screening values is considered to provide a conservative risk assessment for the proposed continued school use. In the absence of any exceedences of the residential screening values, no risk is considered to be present for the end users of the Site.

- Elevated concentrations of carbon dioxide and methane gas and elevated gas flow rates have been recorded by gas monitoring undertaken to date on the Site.

- In line with guidance on assessing gas risk to new buildings, it is considered that further gas monitoring will be required (6 visits over 4 months), to provide a robust data set on which to base decisions relating to appropriate protective requirements for buildings.

- A quantitative conceptual model has been prepared of the complete pollutant linkages that have been identified in relation to human health and controlled waters. This is presented in Table 9 and Figure 4.

- It is advised that the local authority has ultimate jurisdiction over contamination assessment, and, as such, they must be involved in discussions relating to the scope of the investigation works undertaken and the conclusions drawn, along with any specific proposals for remedial action.

Ashdown Site Investigation Limited
February 2010

APPENDIX A

Exploratory Hole Notes

Light Cable Percussion or Shell and Auger Boring Procedure

In Situ Testing Notes

Exploratory Hole Records

DPSH Continuous Dynamic Probe N100 v Depth Profile

Summary of Borehole Falling Head Soakage Tests

Summary of Gas Analyses and Water Depths

NOTES FOR THE INTERPRETATION OF EXPLORATORY HOLE RECORDS

1 Symbols and abbreviations

Samples

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

In situ Testing

S Standard penetration test (SPT): In the borehole record the depth of the test is that at the start of the normal 450mm penetration, the number of blows to achieve the standard penetration of 300mm (the "N" value) is shown after the test index letter, but the seating blows through the initial 150mm penetration are not reported unless the full penetration of 450mm cannot be achieved. In the latter case, the symbols below are added to the test index letter:-
S* Seating blows only
S** Blow count includes seating blows
S++ No penetration
So 'Split spoon' SPT sampler sank under its own weight.
The test is usually completed when the number of blows reaches 50. The depths of both the top and bottom of the test drive are shown in the sample column on the Borehole Record. If a sample is not recovered in the sampler, a disturbed sample is taken on completion of the test drive. Both are given the same depth as the top of the SPT test drive.

C Standard Penetration Test (SPT) conducted usually in coarse granular soils or weak rocks using the same procedure as for the SPT but with a 50mm diameter, 60º apex solid cone fitted in place of the sampler. Variations in test results are indicated by the same symbols as for the SPT (above). Where a bulk disturbed sample is taken, it is given the same depth as the top of the SPT.

V Vane Test: Undrained shear strength (cohesion) (kN/m^2) shown within the SPT column.
V* Shear strength >130kPa

H Hand penetrometer Test: Undrained shear strength (cohesion) (kN/m^2) shown within the SPT column.
H* Shear strength >225kPa

M Mackintosh Probe Penetration Test: Number of blows for 300mm penetration shown under SPT column. A very approximately correlation with the SPT "N" value can be obtained by dividing the number of blows by 10. The results should however be used with caution.

P Perth Penetrometer Test: See Insitu Testing Notes in Appendix C for full description. Number of blows for 300mm penetration shown under SPT column. In sand the number of blows is approximately equivalent to the SPT "N" value.

2 Soil Description

Description and classification of soils has been carried out using as a general basis the British Standard Code of Practice for Site Investigation (BS5930: 1999).

When composite soils have been described, the following terms are used to indicate the various proportions of the subsidiary constituents present (refer to **Note*** below):

with a trace/ occasional	up to 10% (approximately)
with a little	10% to 25% (approximately)
with some	25% to 35% (approximately)
with many/ much	35% to 50% (approximately)
and	approximately 50%

Cohesive Soils

The consistency of clay given in the Report is based on both visual inspection of the samples and results of in situ and/or laboratory strength tests when carried out.

The classification of consistency is made on the following basis:

Consistency of Clay	**Undrained Shear Strength (cohesion)**
Very soft	Less than 20 kN/m^2
Soft	20 to 40 kN/m^2
Soft to Firm	40 to 50 kN/m^2
Firm	50 to 75 kN/m^2
Firm to Stiff	75 to 100 kN/m^2
Stiff	100 to 150 kN/m^2
Very Stiff (hard)	Greater than 150 kN/m^2

Note*: All soils possessing cohesion and plasticity will be described as CLAY.

It is recognised that any granular soil that has in excess of approximately 35% fines (clay and silt) can often be expected to behave as a cohesive soil despite the dominance of silt, sand and/or gravel particles within the soil mass.

To reflect this, it is the soil type that dominates the behaviour of the soil mass that appears on the exploratory hole records.

Granular Soils

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

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

Chalk

Chalk description generally follows the guidance on chalk classification offered by the Construction Industry Research and Information Association (CIRIA) Project Report 11, ‘Foundations in Chalk’. This is based on assessment of chalk density, discontinuity spacing and aperture, and the proportion of intact chalk to silt of chalk (putty chalk). An assessment of the chalk as a structured or structureless material will be made where possible.

LIGHT CABLE PERCUSSION OR
SHELL AND AUGER BORING PROCEDURE

1. Boring

The method used in this country for boring in soil for site investigation purposes was formerly known as "Shell-and Auger" boring. This term has now been largely superseded by the description Light Cable Percussion Boring. The method consist of using a steel tube (the shell) in cohesionless deposits such as sands and gravels and a clay cutter in cohesive soils in order to excavate a borehole; very hard soils, boulders or other hard obstructions are excavated by firm chiselling then removing the fragments using the shell. The shell, chisel and clay cutter are usually operated by raising and lowering them on a wire rope.

Where unstable ground conditions make it necessary and where it is important to avoid cross contamination of strata the borehole is protected by lining it with a steel casing.

2. Undisturbed Samples - 100 mm diameter.

Undisturbed samples of cohesive soils can be taken with a 100mm internal diameter open drive (U100) sampler. The sampler is driven into the soil at the bottom of the borehole by the impact of a jarring link placed above the sample tube. The number of blows required to drive the tube the full length of 450mm is recorded. This number is taken in conjunction with the depth of the sample and can be used to give a rough indication of the consistency of the soil and likelihood for sample disturbance by the sampling process.

After taking a sample the drive head and cutting shoe are unscrewed from the sample tube and any wet and disturbed soil removed from either end. The sample tube is then sealed with wax and push-fit or screwed-on end caps are secured. The samples are then transported to the laboratory for examination and testing.

3. (a) Standard Penetration Test (SPT) (using “split spoon” attachment)

A thick walled tube of 50mm external diameter is driven into the cohesionless deposit by a 63.5kg sliding hammer falling freely through 760mm. The SPT N-value is the number of blows required to drive the tube 300mm after an initial penetration of 150mm. This number gives a measure of the relative density of the deposit and can be used to estimate a wide variety of key geotechnical properties of the material.

Although not an accepted method of testing cohesive soils, the following table can be used in estimating their consistencies:

Description	N-value
Soft	0-4
Firm	4-8
Stiff	8-30
Hard	>30

(b) Standard Penetration Test (SPT) (using cone attachment)

In gravel and cobble deposits the open drive “spoon” of the SPT may be replaced by a 60 cone. The test is performed in a similar manner to the SPT but no sample is obtained. The N-values of both types of tests have been found to closely correlate.

4. Disturbed Samples

Disturbed samples are taken at appropriate depths so that together with the undisturbed samples there is a representative sample at the top of each change in stratum and thereafter at regular intervals down the borehole until the next change in stratum occurs.

5. Ground Water Levels

Borehole water levels are observed at the beginning and end of each days work and at any other relevant time. Any other water bearing strata are noted. The rise in groundwater level where seepage occurs is monitored at 5 minute intervals over a minimum 15 minute period.

IN-SITU TESTING NOTES

Standard Penetration Testing

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

The sampler is driven into the deposits at the base of the borehole by means of a 65kg hammer falling freely through 760mm.

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

(BS 5930:1999 Code of Practice for Site Investigations)

Dynamic Probe Testing

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

The DPSH (super heavy) dynamic probing rig drives a 35mm diameter rod with a 20cm^2 area, 90º end cone into the ground by means of a 63.5kg hammer that falls freely through a distance of 0.75m. The number of blows per 100mm penetration (N_{100}) is recorded. The results can provide a useful indication of the relative strength of the material. (British Standard Methods of test for Soils for civil engineering purposes BS1377: Part 9: 1990, Test 3.2).

A tentative correlation with the Standard Penetration Test (SPT) N value can be made summing three consecutive the N_{100} blow counts.

Perth Penetrometer Test

In this test a hardened stainless steel rod is driven into the deposit by a 9.5kg sliding hammer falling freely through 600mm. After an initial penetration of 150mm the number of blows required to drive the rod a further 300mm is recorded. In sand the Perth blow count gives a close correlation to the "N-value" that could be expected from a standard penetration test (SPT) made in similar materials. The results are less reliable in coarser grained materials but can give an indication of their engineering properties.

Undrained Shear Strength

Undrained shear strength determinations are made in situ within the cohesive soils using a Geonor hand shear vane or (usually in the case of window sampler boreholes) a hand penetrometer. The test records the undrained shear strength (cohesion) in kN/m^2. The shear vane records a maximum shear strength of 130 kN/m^2 and the hand penetrometer records a maximum shear strength of 250 kN/m^2. (BS 5930:1999 Code of Practice for Site Investigations)

California Bearing Ratio Test

In this test a hand held Farnell cone penetrometer apparatus is pushed into the deposits for the estimation of the California bearing ratio of the subgrade (for use in pavement design). The test equipment is design for the estimation of the bearing ratio of fine grained soils (clay and silt) only and is unsuitable for use in coarse grained soils and rock. (BS 5930:1999 Code of Practice for Site Investigations)

Gas Survey

The gas spike survey consists of driving a 30mm diameter steel spike 1.0m into the ground, removing the spike and inserting a probe into the hole so formed. Where possible the gap around the probe is sealed against air ingress by heeling-in the soft surface materials. Readings for the proportion of O_2, CO_2 and CH_4 (methane) are taken using an infra red gas analyser. The spike survey is a prospecting tool used primarily to test for the presence of gas and should be not used to prove the absence of gas.

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Borehole No.: BH1

Site Name: Academy East, Hillcrest School, Hastings, East Sussex

Job No.: LW21008

Start Date: 15/01/2010 | End Date: 18/01/2010

Standpipe Installation	Sample Type	Depths From (m)	Depths To (m)	U100 Blows / SPT 'N'	SPT vs Depth N (10, 30, 50)	Legend	Depth / Reduced Level	Strata Descriptions
							0.00	Ground Level
	D	0.30						Topsoil with rootlets.
	D	0.50					0.50	
	D	1.00						Stiff to very stiff orange brown, yellow and grey mottled silty sandy CLAY with occasional fine to coarse gravel of ironstone and sandstone. (Ashdown Formation)
	U	1.20	1.65	60			1.60	
	D	1.75					1.90	Very stiff to hard pale grey and orange mottled silty CLAY. (Ashdown Formation)
	U	2.00	2.45	90				Hard brown silty CLAY with occasional partings/beds of orange brown sandstone. (Ashdown Formation)
	D	2.75					2.80	
	D S*	3.00	3.15	50				Weak brown silty SANDSTONE. (Ashdown Formation)
	D S*	4.00	4.15	52				
	D S**	5.00	5.23	71				
	W	6.50					6.50	
	U	6.50	6.95	100				Hard grey silty CLAY/weak MUDSTONE with some orange and grey speckling, bands of brown silty clay and fine to medium gravel of sandstone. (Ashdown Formation)
	D	7.50						
	D S*	8.00	8.15	52				
	D S*	9.50	9.65	58			10.00	

Remarks:

Borehole cased to 3.0m depth.
Chiselling techniques used to advance borehole through hard stratum between 3.0m and 10.0m for 8 hours.

Slow groundwater seepage noted at 0.8m depth, no rise recorded in 30 minutes.
Groundwater encountered at 6.5m depth, rising to 6.0m in 25 minutes.
Standing water depth at 6.0m on completion of borehole.

Standpipe installed to 10.0m depth; 10.0m to 1.0m slotted pipe with gravel surround; 1.0m to ground level plain pipe with bentonite seal; completed with gas tap and security cover concreted flush with ground surface.

Excavation Method: Cable Percussion

Borehole Diameter: 150mm

Casing Diameter: 150mm

Made By: MA

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Borehole No.: BH2

Site Name: Academy East, Hillcrest School, Hastings, East Sussex

Job No.: LW21008

Start Date: 18/01/2010 | End Date: 19/01/2010

Standpipe Installation	Sample Type	Depths From (m)	Depths To (m)	U100 Blows / SPT 'N'	SPT vs Depth N 10 30 50	Legend	Depth / Reduced Level	Strata Descriptions
							0.00	Ground Level
							0.25	Topsoil.
	D	0.30						Weak orange and yellow brown silty fine gravel of SANDSTONE. (Ashdown Formation)
	D	0.50						
	D	1.00						becoming pale yellow brown below 1.0m depth.
	D S**	1.20	1.50	58			1.90	
	D S	2.00	2.45	20			2.60	Stiff pale blue grey and brown silty sandy CLAY. (Ashdown Formation)
	D S	3.00	3.45	31			3.50	Stiff to very stiff blue grey silty CLAY with some red mottling. (Ashdown Formation)
	U	4.00	4.45	60				Very stiff to hard grey fissured silty CLAY with occasional red staining along fissures. (Ashdown Formation)
	D	4.75						
	U	5.00	5.45	80			5.40	
	D	5.75						Hard grey fissured silty CLAY/weak MUDSTONE with occasional beds of weak pale brown sandstone and gravel of chert and ironstone. (Ashdown Formation)
	D S*	6.50	6.65	50			6.80	
	D S*	8.00	8.15	53				Weak pale orange brown, brown and dark orange brown mottled fine SANDSTONE with occasional dark grey staining. (Ashdown Formation)
	D S*	9.50	9.58	50			9.50	
								End of Borehole

Remarks:
Borehole dry and stable on completion.

Chiselling techniques used to advance borehole through hard stratum between 5.4m and 9.5m for 4.5 hours.

Excavation Method: Cable Percussion

Borehole Diameter: 150mm

Casing Diameter: 150mm

Made By: MA

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Borehole No.: BH3

Site Name: Academy East, Hillcrest School, Hastings, East Sussex

Job No.: LW21008

Start Date: 19/01/2010 | End Date: 20/01/2010

Standpipe Installation	Sample Type	Depths From (m)	Depths To (m)	U100 Blows / SPT 'N'	SPT vs Depth N (10, 30, 50)	Legend	Depth / Reduced Level	Strata Descriptions
							0.00	Ground Level
	D	0.30					0.30	Tarmacadam (200mm) over, Fine to coarse gravel of roadstone (Hardcore).
	D	0.50						MADE GROUND: Dark grey silty fine to coarse gravel of flint and crystalline rock.
	D	1.00					1.10	
	D S**	1.20	1.35	50				Weak orange brown and grey mottled silty fine SANDSTONE. (Ashdown Formation)
	D S	2.00	2.45	30			2.00	
	D S**	3.00	3.23	48				Very stiff to hard grey blue silty sandy (fine) CLAY with some orange staining. (Ashdown Formation)
	D S*	4.00	4.08	50			4.00	
	D S*	5.00	5.08	50				Weak to moderately weak orange brown silty SANDSTONE. (Ashdown Formation)
	W	5.00					5.00	
	D S*	5.60	5.68	50				Moderately weak pale brown fine SANDSTONE with dark orange brown iron staining. (Ashdown Formation)
							5.60	End of Borehole

Remarks:

Borehole cased to 1.8m depth.
Chiselling techniques used to advance through hard stratum between 1.1m and 5.6m for 5 hours.

Groundwater encountered at 5.0m depth, rising to 4.6m in 15 minutes.
Standing water depth at 4.6m on completion of borehole.

Standpipe installed to 5.6m depth; 5.6m to 1.0m slotted pipe with gravel surround; 1.0m to ground level plain pipe with bentonite seal; completed with gas tap and security cover concreted flush with ground surface.

Excavation Method: Cable Percussion

Borehole Diameter: 150mm

Casing Diameter: 150mm

Made By: MA

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Borehole No.: BH4

Site Name: Academy East, Hillcrest School, Hastings, East Sussex

Job No.: LW21008

Start Date: 21/01/2010 | End Date: 22/01/2010

Standpipe Installation	Samples and Testing: Sample Type	Depths: From (m)	Depths: To (m)	U100 Blows / SPT 'N'	SPT vs Depth (N: 10, 30, 50)	Strata: Legend	Depth / Reduced Level	Strata Descriptions
							0.00	Ground Level
	D	0.30					0.40	Topsoil.
	D	0.50						Stiff dark orange brown and grey mottled silty CLAY with occasional fine to coarse gravel of ironstone and sandstone. (Ashdown Formation)
	D	1.00						
	U	1.20	1.65	80			1.40	
	D	1.75						Stiff to very stiff orange brown and grey mottled fissured silty CLAY with occasional fine to medium gravel of siltstone/sandstone. (Ashdown Formation) becoming hard CLAY/weak MUDSTONE below 2.0m depth.
	U	2.00	2.45	80			2.70	
	D	2.75						Weak orange brown and grey mottled silty SANDSTONE. (Ashdown Formation) becoming grey with some orange brown mottling below 3.0m depth.
	D S*	3.00	3.15	52				
	U	4.00	4.45	100				
	D	4.75						
	D S*	5.00	5.15	70			5.80	with dark orange brown iron staining along fractures at 5.6m depth.
	W	6.00						Weak orange brown silty fine SANDSTONE. (Ashdown Formation)
	D S*	6.50	6.58	50			7.80	
	D S*	8.00	8.15	51				Hard/weak brown with grey and orange brown speckling silty CLAY/MUDSTONE. (Ashdown Formation)
	D S*	9.50	9.58	50			9.50	
								End of Borehole

Remarks:

Borehole cased to 1.8m depth.

Chiselling techniques used to advance through hard stratum between 3.0m and 9.5m for 5.5 hours.

Groundwater encountered at 6.2m depth, rising to 6.0m in 45 minutes. Standing water depth at 6.0m on completion of borehole.

Excavation Method: Cable Percussion

Borehole Diameter: 150mm

Casing Diameter: 150mm

Made By: MA

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Borehole No.: BH5

Site Name: Academy East, Hillcrest School, Hastings, East Sussex

Job No.: LW21008

Start Date: 22/01/2010 | End Date: 23/01/2010

Standpipe Installation	Sample Type	Depths From (m)	Depths To (m)	U100 Blows / SPT 'N'	SPT vs Depth N (10, 30, 50)	Legend	Depth / Reduced Level	Strata Descriptions
							0.00	Ground Level
	D	0.30					0.35	Tarmacadam (100mm) over, Concrete (100mm) over, MADE GROUND: Dark grey silty sandy medium to coarse gravel of flint and occasional crystalline rock and concrete. (Hardcore)
	D	0.50					1.00	
	D	1.00					1.30	Stiff orange brown and pale grey brown mottled silty sandy CLAY with much medium to coarse gravel of sandstone. (Ashdown Formation)
	U	1.20	1.65	70				Stiff pale grey silty CLAY and coarse gravel of SANDSTONE. (Ashdown Formation)
	D	1.75						Very stiff dark grey fissured silty CLAY with some red and yellow brown mottling. (Ashdown Formation)
	U	2.00	2.45	50				
	D	2.75						becoming hard CLAY/weak MUDSTONE below 3.0m depth.
	U	3.00	3.45	70				
	D	3.75					4.00	
	D S*	4.00	4.08	50				Hard orange brown and grey mottled very silty CLAY/weak MUDSTONE with some beds of silty fine SANDSTONE. (Ashdown Formation)
	D S*	5.00	5.15	50				with a band of pale brown grey silty CLAY at 5.0m depth.
	D S**	6.50	6.73	69			6.50	Weak to moderately weak dark orange brown silty SANDSTONE. (Ashdown Formation)
	D S*	7.00	7.08	50			7.00	
								End of Borehole

Remarks:

Borehole cased to 1.8m depth.

Borehole dry on completion.

Chiselling techniques used to advance through hard stratum between 4.0m and 7.0m for 4.5 hours.

Standpipe installed to 7.0m depth; 7.0m to 1.0m slotted pipe with gravel surround; 1.0m to ground level plain pipe with bentonite seal; completed with gas tap and security cover concreted flush with ground surface.

Excavation Method: Cable Percussion

Borehole Diameter: 150mm

Casing Diameter: 150mm

Made By: MA

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Borehole No.: BH6

Site Name: Academy East, Hillcrest School, Hastings, East Sussex

Job No.: LW21008

Start Date: 24/01/2010 | End Date: 25/01/2010

Standpipe Installation	Samples and Testing: Sample Type	Depths: From (m)	Depths: To (m)	U100 Blows / SPT 'N'	SPT vs Depth (N, 10, 30, 50)	Strata: Legend	Depth / Reduced Level	Strata Descriptions
							0.00	Ground Level
	D	0.30					0.30	Topsoil.
	D	0.50					0.70	MADE GROUND/Reworked: Brown silty clay with occasional coarse gravel of ironstone and fine to medium gravel of chert.
	D	1.00						Stiff orange brown and grey mottled silty sandy (fine) CLAY with occasional fine to medium gravel of sandstone. (Ashdown Formation)
	U	1.20	1.65	50			1.80	
	D	1.75						Stiff to very stiff brown and pale grey silty CLAY. (Ashdown Formation)
	U	2.00	2.45	50			2.80	
	D	2.75						Weak to moderately weak pale brown silty fine SANDSTONE. (Ashdown Formation)
	D S*	3.00	3.15	51				
	D S*	4.00	4.08	50				
	D S**	5.00	5.23	58			5.40	
	D	5.50						Hard dark grey/black silty CLAY/weak MUDSTONE with occasional red staining. (Ashdown Formation)
	U	6.00	6.45	100				
	D	6.95						
	U	7.50	7.95	100				
	D	8.20					8.30	
	D	8.50						Weak to moderately weak orange brown silty fine SANDSTONE with occasoinal grey and red brown staining. (Ashdown Formation)
	D S*	9.00	9.15	55				
	D S*	10.00	10.08	50			10.00	

Remarks:
Borehole cased to 1.8m depth.

Borehole dry on completion.

Chiselling techniques used to advance through hard strata between 2.8m and 5.4m for 2 hours; and 8.3m to 10.0m for 2 hours.

Excavation Method: Cable Percussion

Borehole Diameter: 150mm

Casing Diameter: 150mm

Made By: MA

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Borehole No.: WS1

Site Name: Academy East, Hillcrest School, Hastings, East Sussex

Job No.: LW21008

Start Date: 15/01/2010 | End Date: 15/01/2010

Standpipe Installation	Samples and Testing: Sample Type	Depths: From (m)	Depths: To (m)	Vane/ Pen Test N Value	Strata: Legend	Depth / Reduced Level	Strata Descriptions
						0.00	Ground Level
						0.15	Tarmacadam (50mm) over, Concrete (100mm).
	J	0.40				0.60	MADE GROUND: Pale brown very sandy fine to coarse gravel of brick.
	J	0.70				0.80	MADE GROUND: Pale grey and orange brown mottled silty clay with occasional horizons of black organic matter.
	J	0.90					Firm to stiff grey silty CLAY with occasional beds of pale grey siltstone. (Alluvium)
	D H	1.00		90			
							becoming firm below 1.5m depth.
	D H	2.00		50			
							becoming soft towards base.
	D H	2.40		35		2.50	
							Weak pale grey/cream and orange brown mottled SILTSTONE. (Ashdown Formation)
	D	3.00				3.00	
							End of Borehole

Remarks:
Borehole sides squeezing.

Groundwater ponding at base of borehole.

Standpipe installed to 3.0m depth; 3.0m to 1.0m slotted pipe with gravel surround; 1.0m to ground level plain pipe with bentonite seal; completed with gas tap and security cover concreted flush with ground surface.

Excavation Method: Window Sampler

Borehole Diameter: Various

Made By: TH

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Borehole No.: WS2

Site Name: Academy East, Hillcrest School, Hastings, East Sussex

Job No.: LW21008

Start Date: 19/01/2010 | End Date: 19/01/2010

Standpipe Installation	Samples and Testing				Strata		
	Sample Type	Depths From (m)	Depths To (m)	Vane/ Pen Test N Value	Legend	Depth / Reduced Level	Strata Descriptions
						0.00	Ground Level
	J	0.10				0.20	Topsoil.
	J	0.50				0.70	Stiff pale brown and pale grey mottled slightly sandy CLAY with occasional fine gravel of weak sandstone. (Ashdown Formation)
							End of Borehole

Remarks:
No further progress below 0.7m depth - too hard.

Borehole dry and stable on completion.

Excavation Method: Hand Auger

Borehole Diameter:

Made By: PC

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Borehole No.: WS3

Site Name: Academy East, Hillcrest School, Hastings, East Sussex

Job No.: LW21008

Start Date: 15/01/2010 | End Date: 18/01/2010

Standpipe Installation	Samples and Testing				Strata		
	Sample Type	Depths From (m)	Depths To (m)	Vane/ Pen Test N Value	Legend	Depth / Reduced Level	Strata Descriptions
						0.00	Ground Level
							Tarmacadam.
						0.30	
	J	0.35				0.40	MADE GROUND: Pink fine to coarse sand and subangular fine to coarse gravel of siltstone. (Hardcore)
	J	0.45					MADE GROUND: Dark grey sandy medium to coarse gravel of slate and flint.
							becoming very sandy below 0.7m depth.
	J	0.80				0.90	
	J	1.00				1.00	MADE GROUND: Orange medium to coarse sand with a little rounded fine to medium gravel of flint.
							End of Borehole

Remarks:
No further progress below 1.0m depth - obstruction.

Borehole dry and stable on completion.

Excavation Method: Window Sampler

Borehole Diameter: Various

Made By: PC

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Borehole No.: WS4

Site Name: Academy East, Hillcrest School, Hastings, East Sussex

Job No.: LW21008

Start Date: 15/01/2010 | End Date: 15/01/2010

Standpipe Installation	Samples and Testing: Sample Type	Depths: From (m)	Depths: To (m)	Vane/ Pen Test N Value	DPSH Profile Blows/100mm (5 , 15 , 25)	Strata: Legend	Depth / Reduced Level	Strata Descriptions
							0.00	Ground Level
	J	0.10					0.15	Topsoil.
	J H	0.50		170				Stiff brown slightly friable silty CLAY with occasional gravel of ironstone. (Ashdown Formation) becoming very stiff below 0.5m depth.
	D	0.60					0.70	
	H	0.90		250				Very stiff/hard pale grey and orange brown silty CLAY with occasional medium to coarse gravel of weak sandstone. (Ashdown Formation)
	D V	1.00		>130				
	D H	1.50		250				
	D V	2.00		>130				
	D H	2.40		>250			2.40	
								End of Borehole

Remarks:
No further progress below 2.4m depth - too hard.

Borehole dry and stable on completion.

Excavation Method: Window Sampler

Borehole Diameter: Various

Made By: PC

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Borehole No.: WS5

Site Name: Academy East, Hillcrest School, Hastings, East Sussex

Job No.: LW21008

Start Date: 15/01/2010 | End Date: 15/01/2010

Standpipe Installation	Samples and Testing				Strata		
	Sample Type	Depths From (m)	Depths To (m)	Vane/ Pen Test N Value	Legend	Depth / Reduced Level	Strata Descriptions
						0.00	Ground Level
						0.30	Tarmacadam (50mm) over, Concrete.
							End of Borehole

Remarks:
No further progress below 0.3m depth - obstruction.

Borehole dry and stable on completion.

Borehole relocated to position WS5A.

Excavation Method: Window Sampler

Borehole Diameter: Various

Made By: PC

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Borehole No.: WS5A

Site Name: Academy East, Hillcrest School, Hastings, East Sussex

Job No.: LW21008

Start Date: 15/01/2010 | End Date: 15/01/2010

Standpipe Installation	Sample Type	Depths From (m)	Depths To (m)	Vane/ Pen Test N Value	DPSH Profile Blows/100mm (5 , 15 , 25)	Legend	Depth / Reduced Level	Strata Descriptions
							0.00	Ground Level
							0.30	Tarmacadam (50mm) over, Concrete.
	J	0.40						Very stiff/hard pale grey brown and pale orange brown mottled very silty CLAY with much angular medium to coarse gravel of weak siltstone. (Ashdown Formation)
	H	0.50		250				
	J	0.60						
	H	0.90		>250				
	J D V	1.00		>130				
	D	1.40						
	H	1.50		>250				with much dark orange brown staining below 1.5m depth.
	D	1.80					1.80	
								End of Borehole

Remarks:

No further progress below 1.8m depth - too hard.

Borehole dry and stable on completion.

Excavation Method: Window Sampler

Borehole Diameter: Various

Made By: PC

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Lewes, East Sussex
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Borehole No.: WS6

Site Name: Academy East, Hillcrest School, Hastings, East Sussex

Job No.: LW21008

Start Date: 19/01/2010 | End Date: 19/01/2010

Standpipe Installation	Samples and Testing				Strata		
	Sample Type	Depths From (m)	Depths To (m)	Vane/ Pen Test N Value	Legend	Depth / Reduced Level	Strata Descriptions
						0.00	Ground Level
	J	0.10				0.15	Topsoil.
	J	0.20					Firm to stiff orange brown and pale grey slightly sandy CLAY with some tabular fine to medium gravel of weak sandstone. (Ashdown Formation)
	J	0.70				0.80	
							End of Borehole

Remarks:
No further progress below 0.8m depth - too hard.

Groundwater seepage noted below 0.3m depth.

Borehole stable on completion.

Excavation Method: Hand Auger

Borehole Diameter:

Made By: PC

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Lewes, East Sussex
BN7 3PF

Borehole No.: WS7

Site Name: Academy East, Hillcrest School, Hastings, East Sussex

Job No.: LW21008

Start Date: 15/01/2010 | End Date: 15/01/2010

Standpipe Installation	Sample Type	Depths From (m)	Depths To (m)	Vane/ Pen Test N Value	Legend	Depth / Reduced Level	Strata Descriptions
						0.00	Ground Level
	J	0.10				0.30	Topsoil with some medium gravel of flint.
	J	0.50				0.70	MADE GROUND: Pale brown silty clay with a little fine to medium gravel of flint and fine weak siltstone.
	J H	0.90		115			Stiff orange brown and pale grey mottled silty CLAY with some medium to coarse gravel of weak sandstone. (Ashdown Formation)
	D V	1.00		>130			
	D H	1.50		140		1.60	
	H	1.90		235			Very stiff pale grey, orange brown and red mottled CLAY. (Ashdown Formation)
	D V	2.00		>130		2.30	
	D H	2.50		>250		2.50	Hard orange CLAY with occasional veins of iron staining. (Ashdown Formation)
							End of Borehole

Remarks:

No further progress below 2.5m depth - too hard.

Borehole dry and stable on completion.

Standpipe installed to 2.5m depth; 2.5m to 1.0m slotted pipe with gravel surround; 1.0m to ground level plain pipe with bentonite seal; completed with gas tap and security cover concreted flush with ground surface.

Excavation Method: Window Sampler

Borehole Diameter: Various

Made By: PC

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Borehole No.: WS8

Site Name: Academy East, Hillcrest School, Hastings, East Sussex

Job No.: LW21008

Start Date: 15/01/2010 | End Date: 15/01/2010

Standpipe Installation	Samples and Testing: Sample Type	Depths: From (m)	Depths: To (m)	Vane/ Pen Test N Value	Strata: Legend	Depth / Reduced Level	Strata Descriptions
						0.00	Ground Level
						0.20	Tarmacadam.
	J	0.25				0.30	MADE GROUND: Dark grey sand and fine to coarse gravel of flint. (Hardcore)
	J D H	0.50		140			Stiff brown and pale grey mottled silty CLAY with some medium to coarse gravel of siltstone. (Ashdown Formation)
	H	0.90		235			
	D V	1.00		>130			becoming very stiff and pale brown below 1.0m depth.
	D H	1.50		>250			
	D V	2.00		>130			
	H	2.00		>250			
	D	2.50					
	D	3.00				3.00	
							End of Borehole

Remarks:
Borehole dry and stable on completion.

Excavation Method: Window Sampler

Borehole Diameter: Various

Made By: PC

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Borehole No.: WS9

Site Name: Academy East, Hillcrest School, Hastings, East Sussex

Job No.: LW21008

Start Date: 15/01/2010 | End Date: 15/01/2010

Standpipe Installation	Samples and Testing: Sample Type	Depths: From (m)	Depths: To (m)	Vane/ Pen Test N Value	DPSH Profile Blows/100mm (5 , 15 , 25)	Strata: Legend	Depth / Reduced Level	Strata Descriptions
							0.00	Ground Level
	J	0.20					0.40	Topsoil.
	J	0.60						MADE GROUND: Brown, orange brown, pale grey and brown grey silty clay with a little to some fine to coarse gravel of siltstone/sandstone and occasional chert.
	D	0.70						
	H	1.00		60			1.30	
	D	1.30						Very stiff/hard pale grey and orange brown very silty CLAY with some fine to coarse gravel/horizons of sandstone and black staining.
	J H	1.50		>250				
	D	2.00						becoming pale orange brown and pale grey clayey SILT with black staining below 2.1m depth.
	D	3.00					3.00	
								End of Borehole

Remarks:
Borehole dry and stable on completion.

Standpipe installed to 3.0m depth; 3.0m to 1.0m slotted pipe with gravel surround; 1.0m to ground level plain pipe with bentonite seal; completed with gas tap and security cover concreted flush with ground surface.

Excavation Method: Window Sampler

Borehole Diameter: Various

Made By: TH

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Borehole No.: WS10

Site Name: Academy East, Hillcrest School, Hastings, East Sussex

Job No.: LW21008

Start Date: 15/01/2010 | End Date: 15/01/2010

Standpipe Installation	Samples and Testing				Strata		
	Sample Type	Depths From (m)	Depths To (m)	Vane/ Pen Test N Value	Legend	Depth / Reduced Level	Strata Descriptions
						0.00	Ground Level
						0.15	Tarmacadam (20mm) over, Fine to coarse gravel of brick. (Hardcore)
	J	0.20					Stiff to very stiff grey and pale orange brown silty CLAY with occasional fine to medium gravel of siltstone. (Ashdown Formation)
	H	0.50		155			
	D H	1.00		>250			
						1.80	
	H	2.00		>250			Very stiff/hard pale grey and orange brown mottled silty CLAY. (Ashdown Formation)
						2.20	End of Borehole

Remarks:
No further progress below 2.2m depth - too hard.

Groundwater ponding at base of borehole.

Borehole stable on completion.

Excavation Method: Window Sampler

Borehole Diameter: Various

Made By: TH

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Swanborough
Lewes, East Sussex
BN7 3PF

Borehole No.: WS11

Site Name: Academy East, Hillcrest School, Hastings, East Sussex

Job No.: LW21008

Start Date: 19/01/2010 | End Date: 19/01/2010

Standpipe Installation	Samples and Testing: Sample Type	Depths: From (m)	Depths: To (m)	Vane/ Pen Test N Value	DPSH Profile Blows/100mm (5 , 15 , 25)	Strata: Legend	Depth / Reduced Level	Strata Descriptions
							0.00	Ground Level
	J	0.20					0.35	Topsoil.
	J	0.40						Weak orange brown and pale grey mottled thinly interlaminated SILTSTONE/SANDSTONE and MUDSTONE. (Ashdown Formation)
	D H	0.50		>250				
	D V	1.00		>130				
	D H	1.50		>250				
	V	1.60		>130			1.60	
								End of Borehole

Remarks:

No further progress below 1.6m depth - too dense.

Borehole dry and stable on completion.

Standpipe installed to 1.6m depth; 1.6m to 1.0m slotted pipe with gravel surround; 1.0m to ground level plain pipe with bentonite seal; completed with gas tap and security cover concreted flush with ground surface.

Excavation Method: Window Sampler

Borehole Diameter: Various

Made By: PC

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Lewes, East Sussex
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Borehole No.: WS12

Site Name: Academy East, Hillcrest School, Hastings, East Sussex

Job No.: LW21008

Start Date: 19/01/2010 | End Date: 19/01/2010

Standpipe Installation	Sample Type	Depths From (m)	Depths To (m)	Vane/ Pen Test N Value	Legend	Depth / Reduced Level	Strata Descriptions
						0.00	Ground Level
	J	0.15				0.30	Topsoil.
	J	0.40					MADE GROUND/Reworked: Pale orange brown slightly sandy silty clay with some fine to medium gravel of weak sandstone/siltstone. (Firm to stiff)
	H	0.50		140			
	D	0.60					
	J	1.00					
	D	1.50					
	J	2.00				2.30	
	J	2.35				2.40	Subsoil/Reworked: Firm dark grey very silty clay with many fragments of grass. (Possible relic topsoil)
	H	2.50		115			Stiff grey and orange mottled CLAY. (Ashdown Formation)
	D V	3.00		>130		3.00	
							End of Borehole

Remarks:
Borehole dry and stable on completion.

Standpipe installed to 3.0m depth; 3.0m to 1.0m slotted pipe with gravel surround; 1.0m to ground level plain pipe with bentonite seal; completed with gas tap and security cover concreted flush with ground surface.

Excavation Method: Window Sampler

Borehole Diameter: Various

Made By: PC

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Lewes, East Sussex
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Borehole No.: WS13

Site Name: Academy East, Hillcrest School, Hastings, East Sussex

Job No.: LW21008

Start Date: 19/01/2010 | End Date: 19/01/2010

Standpipe Installation	Samples and Testing				Strata		
	Sample Type	Depths From (m)	Depths To (m)	Vane/ Pen Test N Value	Legend	Depth / Reduced Level	Strata Descriptions
						0.00	Ground Level
	J	0.10					Topsoil.
						0.30	
	J	0.40					Very stiff/hard pale grey and orange brown mottled CLAY with some medium to coarse gravel of weak sandstone. (Ashdown Formation)
	H	0.50		>250			
	H	0.80		>250			
	D V	1.00		>130			
	D H	1.50		>250		1.60	
							Very stiff/hard pale grey and brown mottled thinly laminated silty CLAY with some medium to coarse gravel of mudstone/siltstone. (Ashdown Formation)
	D V	2.00		>130			
	D	2.30					
	H	2.50		>250			becoming thinly laminated mudstone below 2.5m depth.
						2.80	
	D	2.80					End of Borehole

Remarks:

No further progress below 2.8m depth - too hard.

Slight groundwater seepage noted at 2.0m depth.

Borehole dry and stable on completion.

Excavation Method: Window Sampler

Borehole Diameter: Various

Made By: PC

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Borehole No.: WS14

Site Name: Academy East, Hillcrest School, Hastings, East Sussex

Job No.: LW21008

Start Date: 19/01/2010 | End Date: 19/01/2010

Standpipe Installation	Samples and Testing: Sample Type	Depths: From (m)	Depths: To (m)	Vane/ Pen Test N Value	Strata: Legend	Strata: Depth / Reduced Level	Strata: Strata Descriptions
						0.00	Ground Level
	J	0.00	0.20			0.20	MADE GROUND: Pink coarse sand of crystalline rock (50mm) over, MADE GROUND: Black coarse sand and occasional fine gravel of clinker (50mm) over, MADE GROUND: Grey angular fine to medium gravel of siltstone.
	J H	0.50		60			MADE GROUND/Reworked: Pale brown and pale grey very silty clay with some angular fine to medium gravel of weak siltstone and flint. (Firm to stiff)
	D	0.70					
	J	1.00					
	D H	1.50		115			
	J	2.00					
	D H	2.50		100		2.80	
	J V	3.00		100		3.00	Stiff grey very silty CLAY with a little medium gravel of ironstone. (Ashdown Formation)
							End of Borehole

Remarks:
Borehole dry and stable on completion.

Excavation Method: Window Sampler

Borehole Diameter: Various

Made By: PC

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Lewes, East Sussex
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Borehole No.: WS15

Site Name: Academy East, Hillcrest School, Hastings, East Sussex

Job No.: LW21008

Start Date: 19/01/2010 | End Date: 19/01/2010

Standpipe Installation	Samples and Testing				Strata		
	Sample Type	Depths From (m)	Depths To (m)	Vane/ Pen Test N Value	Legend	Depth / Reduced Level	Strata Descriptions
						0.00	Ground Level
	J	0.15				0.30	MADE GROUND: Dark coarse sand with much angular medium gravel of quartzite, slate and clay tile. (Compact)
	J H	0.50		140		0.70	MADE GROUND/Reworked: Pale orange brown silty clay with occasional medium to coarse gravel of weak sandstone.
	H	0.80		60			MADE GROUND/Reworked: Grey silty clay.
	D V	1.00		70		1.10	
	H	1.40		140			Firm to stiff grey very silty CLAY. (Ashdown Formation)
	D	1.50					becoming stiff below 1.4m depth.
	D V	2.00		>130		2.10	
	D H	2.50		235			Very stiff/hard pale grey and red mottled CLAY with occasional fine calcite nodules. (Ashdown Formation)
	H	2.80		>250			
	D V	3.00		>130		3.00	
							End of Borehole

Remarks:
Groundwater seepage noted at 1.5m depth.
Standing groundwater at 1.7m depth on completion.

Borehole squeezing in silty clay soils between 0.7m and 2.1m depth.
Borehole collapsed to 1.7m depth on completion.

Excavation Method: Window Sampler

Borehole Diameter: Various

Made By: PC

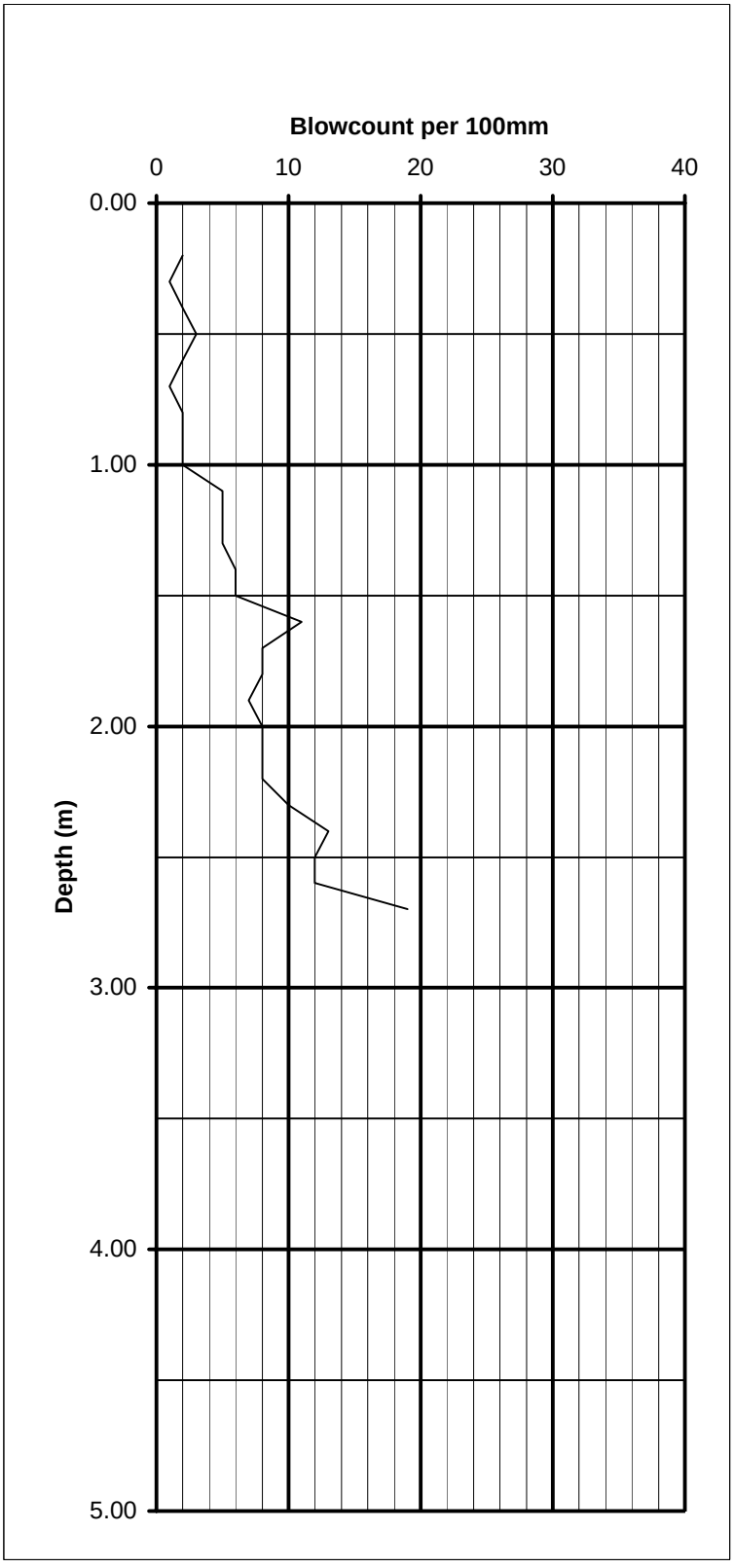
ASHDOWN SITE INVESTIGATION LTD

DPSH Continuous Dynamic Probe N_{100} vs Depth Profile

SITE Academy East, Hillcrest School, Hastings, East Sussex **Report Ref.** LW21008

DP No. WS4

Depth (m)	Blows	Torque (kgm)
0.00		
0.10		
0.20	2	
0.30	1	
0.40	2	
0.50	3	
0.60	2	
0.70	1	
0.80	2	
0.90	2	
1.00	2	
1.10	5	
1.20	5	
1.30	5	
1.40	6	
1.50	6	
1.60	11	
1.70	8	
1.80	8	
1.90	7	
2.00	8	
2.10	8	
2.20	8	
2.30	10	
2.40	13	
2.50	12	
2.60	12	
2.70	19	
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		



Comments

*Hammer bouncing - 80mm remaining on division.

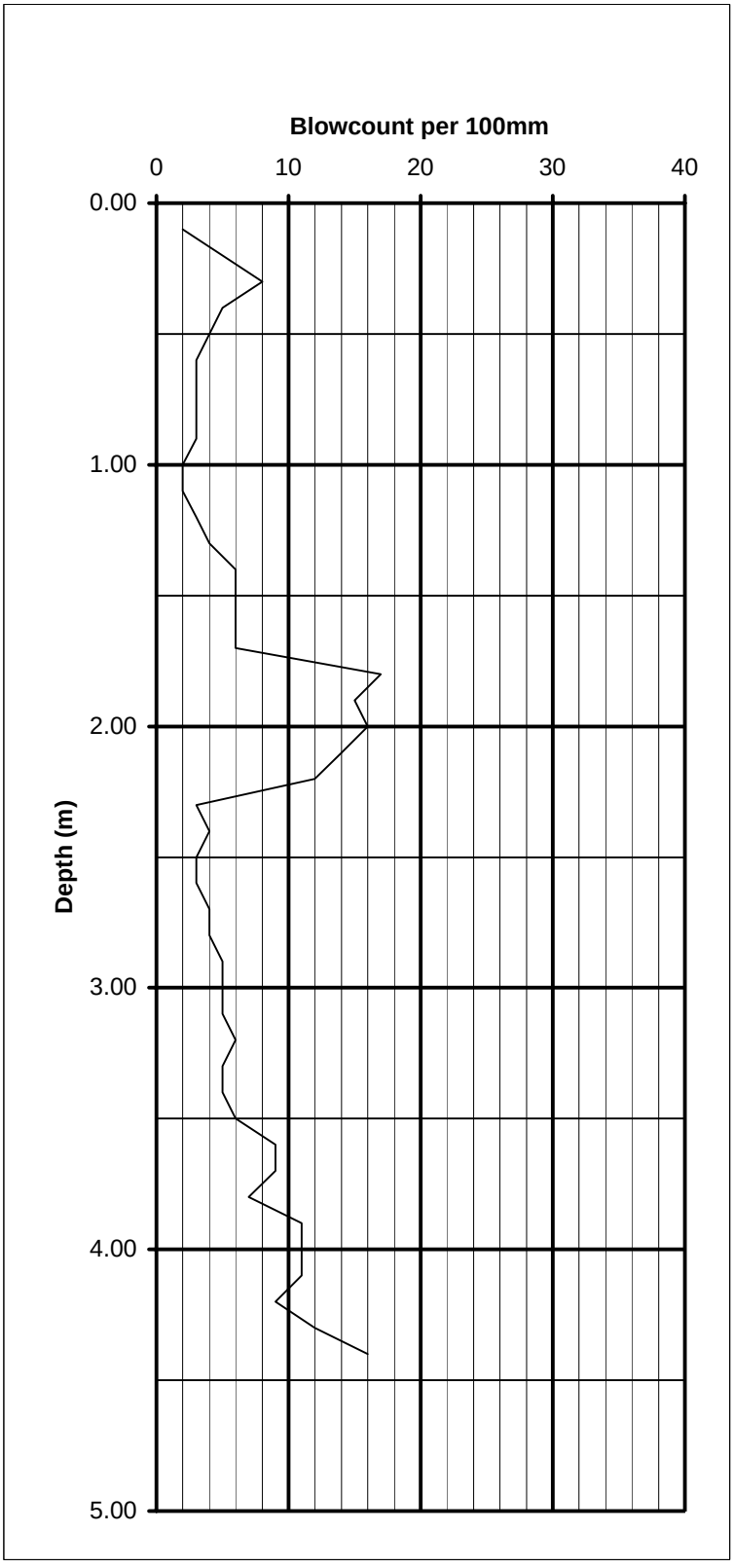
ASHDOWN SITE INVESTIGATION LTD

DPSH Continuous Dynamic Probe N_{100} vs Depth Profile

SITE Academy East, Hillcrest School, Hastings, East Sussex **Report Ref.** LW21008

DP No. WS5A

Depth (m)	Blows	Torque (kgm)
0.00		
0.10	2	
0.20	5	
0.30	8	
0.40	5	
0.50	4	
0.60	3	
0.70	3	
0.80	3	
0.90	3	
1.00	2	
1.10	2	
1.20	3	
1.30	4	
1.40	6	
1.50	6	
1.60	6	
1.70	6	
1.80	17	
1.90	15	
2.00	16	
2.10	14	
2.20	12	
2.30	3	
2.40	4	
2.50	3	
2.60	3	
2.70	4	
2.80	4	
2.90	5	
3.00	5	
3.10	5	
3.20	6	
3.30	5	
3.40	5	
3.50	6	
3.60	9	
3.70	9	
3.80	7	
3.90	11	
4.00	11	
4.10	11	
4.20	9	
4.30	12	
4.40	16	
4.50		
4.60		
4.70		
4.80		
4.90		
5.00		



Comments

*Hammer bouncing - 30mm remaining on division.

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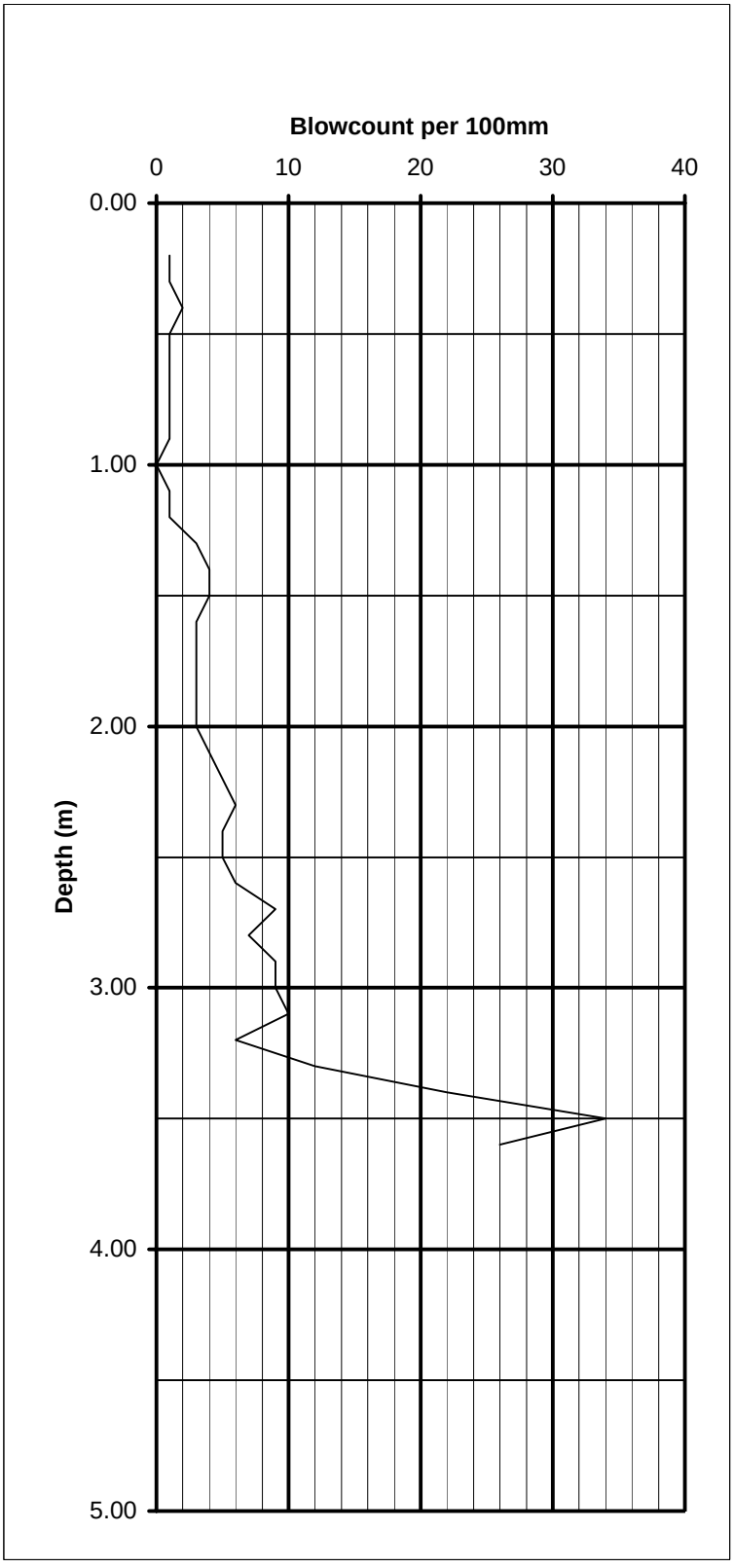
DPSH Continuous Dynamic Probe N_{100} vs Depth Profile

SITE Academy East, Hillcrest School, Hastings, East Sussex **Report Ref.** LW21008

DP No. WS9

Depth (m)	Blows	Torque (kgm)
0.00		
0.10		
0.20	1	
0.30	1	
0.40	2	
0.50	1	
0.60	1	
0.70	1	
0.80	1	
0.90	1	
1.00	0	
1.10	1	
1.20	1	
1.30	3	
1.40	4	
1.50	4	
1.60	3	
1.70	3	
1.80	3	
1.90	3	
2.00	3	
2.10	4	
2.20	5	
2.30	6	
2.40	5	
2.50	5	
2.60	6	
2.70	9	
2.80	7	
2.90	9	
3.00	9	
3.10	10	
3.20	6	
3.30	12	
3.40	22	
3.50	34	
3.60	26	
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		



Comments

*Hammer bouncing - 40mm remaining on division.

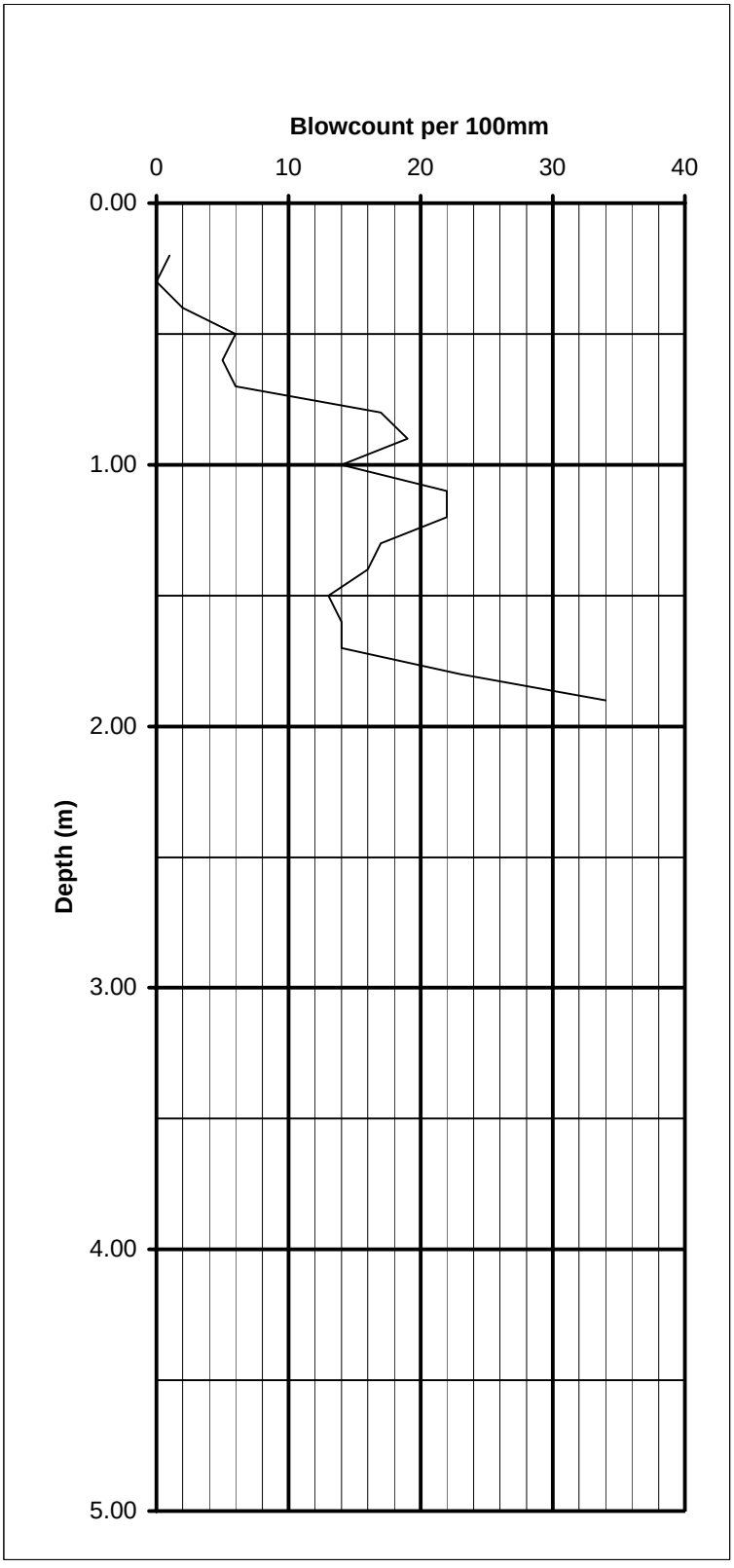
ASHDOWN SITE INVESTIGATION LTD

DPSH Continuous Dynamic Probe N_{100} vs Depth Profile

SITE Academy East, Hillcrest School, Hastings, East Sussex **Report Ref.** LW21008

DP No. WS11

Depth (m)	Blows	Torque (kgm)
0.00		
0.10		
0.20	1	
0.30	0	
0.40	2	
0.50	6	
0.60	5	
0.70	6	
0.80	17	
0.90	19	
1.00	14	
1.10	22	
1.20	22	
1.30	17	
1.40	16	
1.50	13	
1.60	14	
1.70	14	
1.80	23	
1.90	34	
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		



Comments

*Hammer bouncing - 30mm remaining on division.

ASHDOWN SITE INVESTIGATION LIMITED

Site: Academy East, Hillcrest School, Hastings, East Sussex.	Report No.: LW21008 Sheet No.: 1 of 1

SUMMARY OF BOREHOLE FALLING HEAD SOAKAGE TEST

Borehole **BH2**	
Time (mins)	Depth to water (m)
0	0.00
1	0.00
2	0.00
4	0.00
8	0.00
15	0.00
30	0.00
Borehole Depth (m)	3.00
Casing Depth (m)	2.00
Borehole Diameter (m)	0.17
Casing Diameter (m)	0.15

Borehole **BH4**	
Time (mins)	Depth to water (m)
0	0.00
1	0.00
2	0.00
4	0.00
8	0.00
15	0.00
30	0.00
Borehole Depth (m)	3.00
Casing Depth (m)	2.00
Borehole Diameter (m)	0.17
Casing Diameter (m)	0.15

Borehole **BH6**	
Time (mins)	Depth to water (m)
0	0.00
1	0.00
2	0.00
4	0.00
8	0.00
15	0.00
30	0.00
Borehole Depth (m)	3.00
Casing Depth (m)	2.00
Borehole Diameter (m)	0.17
Casing Diameter (m)	0.15

ASHDOWN SITE INVESTIGATION LIMITED

Site:	Academy East, Hillcrest School, Hastings, East Sussex.	Report No.:	LW21008
		Sheet No.:	1 of 2

SUMMARY OF GAS ANALYSES AND WATER DEPTHS

BH1

Date	Methane (%)		Carbon Dioxide (%)		Oxygen (%)		Carbon monoxide	Hydrogen Sulphide	Gas Pressure	Emission Rate	Standing Water Depth	Atmospheric Pressure (mb)	
	Peak	Static	Peak	Static	Min.	Static	(ppm)	(ppm)	(mb)	(l/hr)	(m bgl)	On-site	Trend
28/01/10	0.1	0.1	0.2	0.2	20.7	20.7	0	0	0	1.8	5.40	995	Falling
04/02/10	0.0	0.0	1.9	1.9	12.8	12.8	6	0	0	0.0	3.54	989	Falling
12/02/10	0.0	0.0	2.0	2.0	10.3	10.3	10	0	0	0.0	5.67	1003	Falling

BH3

Date	Methane (%)		Carbon Dioxide (%)		Oxygen (%)		Carbon monoxide	Hydrogen Sulphide	Gas Pressure	Emission Rate	Standing Water Depth	Atmospheric Pressure (mb)	
	Peak	Static	Peak	Static	Min.	Static	(ppm)	(ppm)	(mb)	(l/hr)	(m bgl)	On-site	Trend
28/01/10	0.0	0.0	6.2	6.2	12.6	12.7	3	0	0	0.2	4.50	995	Falling
04/02/10	0.0	0.0	2.1	2.1	13.4	13.4	0	0	0	0.0	4.56	989	Falling
12/02/10	0.0	0.0	1.4	1.4	14.9	14.9	0	0	0	0.0	4.50	1003	Falling

BH5

Date	Methane (%)		Carbon Dioxide (%)		Oxygen (%)		Carbon monoxide	Hydrogen Sulphide	Gas Pressure	Emission Rate	Standing Water Depth	Atmospheric Pressure (mb)	
	Peak	Static	Peak	Static	Min.	Static	(ppm)	(ppm)	(mb)	(l/hr)	(m bgl)	On-site	Trend
28/01/10	0.0	0.0	2.2	2.2	18.8	18.9	0	0	0	0.0	DRY	995	Falling
04/02/10	0.0	0.0	1.3	1.3	17.3	17.3	0	0	0	0.7	DRY	990	Falling
12/02/10	0.0	0.0	0.5	0.5	19.9	19.9	0	0	0	0.0	6.69	1003	Falling

WS1

Date	Methane (%)		Carbon Dioxide (%)		Oxygen (%)		Carbon monoxide	Hydrogen Sulphide	Gas Pressure	Emission Rate	Standing Water Depth	Atmospheric Pressure (mb)	
	Peak	Static	Peak	Static	Min.	Static	(ppm)	(ppm)	(mb)	(l/hr)	(m bgl)	On-site	Trend
28/01/10	6.9	6.8	1.5	1.3	4.1	4.2	103	0	0	5.8	1.71	995	Falling
04/02/10	7.0	7.0	1.2	1.2	1.3	1.3	24	0	0	0.0	1.70	989	Falling
12/02/10	6.6	6.6	1.0	1.0	1.8	1.8	0	0	0	0.0	1.39	1003	Falling

WS7

Date	Methane (%)		Carbon Dioxide (%)		Oxygen (%)		Carbon monoxide	Hydrogen Sulphide	Gas Pressure	Emission Rate	Standing Water Depth	Atmospheric Pressure (mb)	
	Peak	Static	Peak	Static	Min.	Static	(ppm)	(ppm)	(mb)	(l/hr)	(m bgl)	On-site	Trend
28/01/10	0.0	0.0	3.6	3.6	12.8	12.8	6	0	0	11.1	2.34	995	Falling
04/02/10	0.0	0.0	3.6	3.4	10.4	10.4	0	0	0	6.2	2.33	989	Falling
12/02/10	0.0	0.0	3.9	3.9	7.9	7.9	0	0	0	0.0	2.24	1003	Falling

WS9

Date	Methane (%)		Carbon Dioxide (%)		Oxygen (%)		Carbon monoxide	Hydrogen Sulphide	Gas Pressure	Emission Rate	Standing Water Depth	Atmospheric Pressure (mb)	
	Peak	Static	Peak	Static	Min.	Static	(ppm)	(ppm)	(mb)	(l/hr)	(m bgl)	On-site	Trend
28/01/10	0.1	0.1	1.8	1.8	9.6	9.6	10	0	0	0.3	1.29	995	Falling
04/02/10	0.0	0.0	1.9	1.9	10.4	10.4	2	0	0	4.2	1.45	989	Falling
12/02/10	0.0	0.0	2.5	2.5	5.7	5.7	0	0	0	0.0	1.45	1003	Falling

WS11

Date	Methane (%)		Carbon Dioxide (%)		Oxygen (%)		Carbon monoxide	Hydrogen Sulphide	Gas Pressure	Emission Rate	Standing Water Depth	Atmospheric Pressure (mb)	
	Peak	Static	Peak	Static	Min.	Static	(ppm)	(ppm)	(mb)	(l/hr)	(m bgl)	On-site	Trend
28/01/10	0.0	0.0	3.5	3.5	13.3	13.3	41	0	0	7.5	0.10	995	Falling
04/02/10	*	*	*	*	*	*	*	*	*	*	GL	989	Falling
12/02/10	*	*	*	*	*	*	*	*	*	*	GL	1003	Falling

ASHDOWN SITE INVESTIGATION LIMITED

Site:	Academy East, Hillcrest School, Hastings, East Sussex.	Report No.:	LW21008
		Sheet No.:	2 of 2

SUMMARY OF GAS ANALYSES AND WATER DEPTHS

WS12													
Date	Methane (%)		Carbon Dioxide (%)		Oxygen (%)		Carbon monoxide	Hydrogen Sulphide	Gas Pressure	Emission Rate	Standing Water Depth	Atmospheric Pressure (mb)	
	Peak	Static	Peak	Static	Min.	Static	(ppm)	(ppm)	(mb)	(l/hr)	(m bgl)	On-site	Trend
28/01/10	0.9	0.4	3.1	3.0	13.7	13.7	44	0	0	5.1	0.79	995	Falling
04/02/10	0.4	0.4	1.4	1.4	17.7	17.7	24	0	0	6.2	0.88	990	Falling
12/02/10	0.3	0.3	1.6	1.6	18.1	18.1	30	0	0	0.0	0.85	1003	Falling

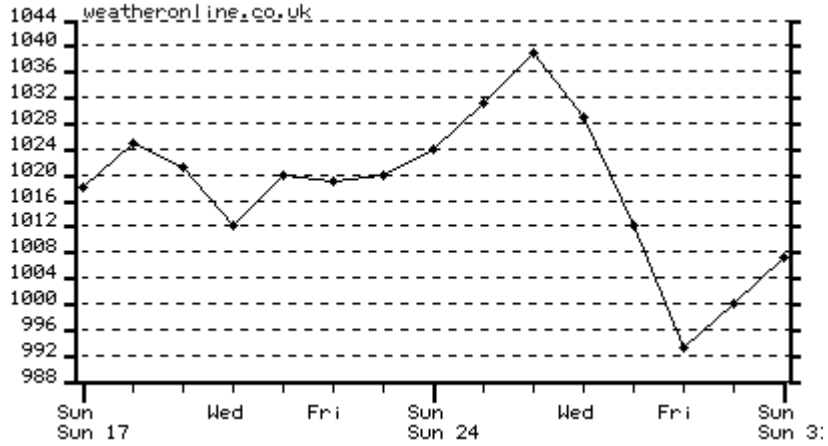
Remarks: Readings taken using an infra red gas analyser.
Emission rate measured using a flow pod attached to infra red gas analyser.
* Groundwater level too high to take gas readings.

Weather Conditions:

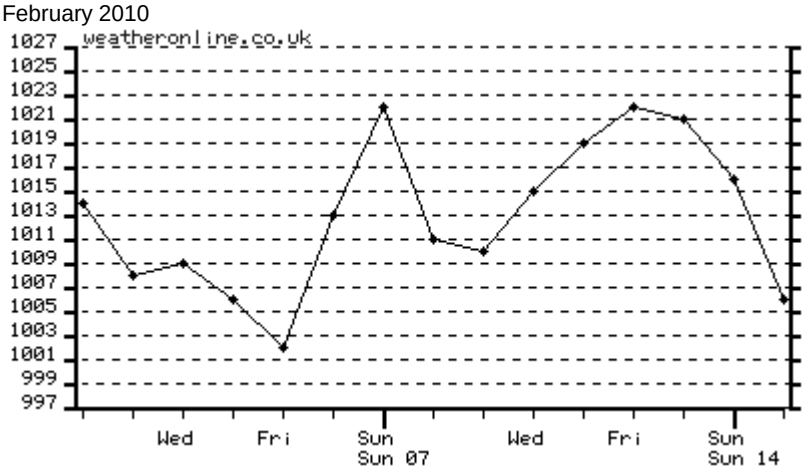
28/01/10 – Cloudy/ cold
04/02/10 – Rain/ cold
12/02/10 – Overcast/ cold

Pressure Trends

January 2010



February 2010



APPENDIX B

Geotechnical Laboratory Testing Notes

Laboratory Test Results

i) Geotechnical Testing

ii) Contamination Testing

GEOTECHNICAL LABORATORY TESTING NOTES

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

Fine grained soil is tested to determine its liquid and plastic limits, which are moisture contents that define boundaries between material consistency states. These tests are used to evaluate indices used for soil identification and to help determine the shrinkage and swelling characteristics of the soil under conditions of changing moisture content.

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

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

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

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

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

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

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

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

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

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

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

GEOTECHNICAL LABORATORY TESTING NOTES

One Dimensional Consolidation Tests

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

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

Dry Density / Moisture Content Relationship (Compaction) Testing

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

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

California Bearing Ratio

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

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

Chemical Testing

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

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

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

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			Sheet No.:	1 of 3

SOIL CLASSIFICATION AND LABORATORY TEST SUMMARY

BH/ TP No.	Depth Of Sample m	Type Of Sample	Visual Description of Sample	Atterberg Limits LL %	Atterberg Limits PL %	Atterberg Limits PI %	Classification	% passing 425µm sieve	Water Cont. %	Undrained Triaxial Tests: Bulk Density Mg/m^3	Undrained Triaxial Tests: Specimen Diameter mm	Undrained Triaxial Tests: Cell Pressure kPa	Max. Dev. Stress kPa	Shear Strength kPa	Remarks
BH 1	1.00	D	Yellow brown and grey mottled silty CLAY.	38	20	18	CI	100	21						
	1.20	U	Pale grey and orange brown mottled silty CLAY with gravel of siltstone and lenses of sand.						23	2.01	103	100	318	159	HP: 170, 170, 185 kPa
BH 2	2.00	D	Orange brown and grey silty CLAY.	40	20	20	CI	100	16						
	4.00	U	Grey silty CLAY.						14	2.12	103	125	277	139	HP: >250 kPa SV: >130 kPa
	5.00	U	Grey CLAY/MUDSTONE.						14	2.18	103	150	339	170	HP: >250 kPa SV: >130 kPa
BH 4	1.00	D	Orange-brown and pale grey mottled silty CLAY.	36	18	18	CI	100	16						
	1.20	U	Orange-brown and pale grey mottled silty CLAY with gravel of siltstone.						16	2.10	103	100	287	144	HP: 250, 250, >250 kPa SV: >130 kPa
	2.00	U	Orange-brown and grey sandy silty CLAY/MUDSTONE.						13						Unsuitable for undrained triaxial test – collapsed on preparation.

ASHDOWN SITE INVESTIGATION LTD	Site:	Hillcrest School, Rye Road, Hastings, East Sussex	Report No.:	LW21008
			Sheet No.:	2 of 3

SOIL CLASSIFICATION AND LABORATORY TEST SUMMARY

BH/ TP No.	Depth Of Sample m	Type Of Sample	Visual Description of Sample	Atterberg Limits LL %	PL %	PI %	Classification	% passing 425µm sieve	Water Cont. %	Undrained Triaxial Tests: Bulk Density Mg/m^3	Specimen Diameter mm	Cell Pressure kPa	Max. Dev. Stress kPa	Shear Strength kPa	Remarks
BH 5	1.20	U	Grey slightly silty CLAY with intrusions of pale grey clay.						23	2.03	103	100	172	86	HP: 130, 235, 250 kPa SV: 126 kPa
	1.75	D	Grey with brown mottled silty CLAY.	49	21	28	CI	100	23						
	2.00	U	Grey and orange silty CLAY.						22	2.07	103	100	196	98	HP: 235, 235, 250 kPa SV: >130 kPa
	3.00	U	Purple grey CLAY/MUDSTONE.						10	2.17	103	100	312	156	HP: >250 kPa SV: >130 kPa
BH 6	1.20	U	Orange and grey mottled silty CLAY with gravel of siltstone.						23	2.14	103	100	174	87	HP: 60, 75, 100 kPa SV: 38 kPa
	2.00	U	Brown and pale grey silty CLAY.						17	2.17	103	100	298	149	HP: 155, 250, 250 kPa SV: 60 kPa

ASHDOWN SITE INVESTIGATION LTD

Site: Hillcrest School, Rye Road, Hastings, East Sussex	Report No.: LW21008 Sheet No.: 3 of 3

SOIL CLASSIFICATION SUMMARY

BH/TP No.	Depth *m*	Moist. Cont. %	Atterberg Limits LL %	PL %	PI %	% Passing 425 *μm* sieve	Class'n	Visual Description of Sample
WS1	2.00	25	32	18	14	100	CL	Grey silty alluvial CLAY.
WS4	0.60	26	44	24	20	100	CI	Brown silty CLAY with occasional roots (< 2mm).
	1.50	15	33	18	15	100	CL	Orange brown pale grey and dark brown mottled silty CLAY.
WS5a	1.00	13	26	18	8	100	CL	Grey orange brown mottled very silty CLAY.
WS7	1.00	25	36	18	18	100	CI	Brown dark brown, orange brown and grey brown silty CLAY.
WS8	2.00	18	53	22	31	100	CH	Grey silty CLAY with lenses of orange brown silty clay.
WS9	0.70	21	31	17	14	100	CL	MADE GROUND: Dark brown and orange brown silty clay with occasional fine roots (< 1mm).
	2.00	14	28	17	11	89	CL	Orange brown pale grey mottled very silty CLAY with gravel of sandstone.
WS10	1.00	16	33	18	15	93	CL	Orange brown and grey very silty CLAY with gravel of siltstone.
WS12	1.00	23	39	23	16	100	CI	MADE GROUND/Reworked: Orange brown and pale grey silty clay.
WS13	2.00	19	38	21	17	100	CI	Orange brown pale grey mottled and black streaked silty CLAY.
WS14	0.70	17	32	17	15	94	CL	MADE GROUND/Reworked: Brown silty clay with gravel of flint.
	3.00	27	41	20	21	100	CI	Brown and dark brown silty CLAY.
WS15	1.00	25	33	16	17	96	CL	Brown grey silty CLAY with gravel of flint.

Remarks:

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2683 2683

THE ENVIRONMENTAL LABORATORY LTD

F.A.O. David Harris
Ashdown Site Investigation Limited
The Old Dairy, Swanborough Farm
Swanborough, Lewes,
East Sussex, BN7 9PF

Reporting Date: 05/02/10

ANALYTICAL REPORT No. AR24937

Samples Received By:-	Laboratory Courier
Samples Received:-	28/01/10
Your Job No:	LW21008
Site Location:	Hillcrest School, Hastings
No Samples Received:-	26

Report Checked By:-

Steve Knight
Director

Authorised By:-

Cliff P.V. Knight BSc, EurChem, CChem FRSC
Managing Director

Any comments, opinions, or interpretations expressed herein are outside the scope of UKAS accreditation (Accreditation Number 2683)

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2683 2683

ANALYTICAL REPORT No. AR24937

Location: Hillcrest School, Hastings

Your Job No: LW21008

Reporting Date: 05/02/10

F.A.O. David Harris
Ashdown Site Investigation Limited
The Old Dairy, Swanborough Farm
Swanborough, Lewes,
East Sussex, BN7 9PF

	Characteristic	Silt loam	Silt loam	Silt clay loam	Silt clay loam	Clay loam	Clay	Silt loam	Silt clay loam	Silt loam	Sandy silt loam
Soils											
	TP/BH	WS7	WS3	WS1	WS5a	WS5a	WS8	WS9	WS9	WS12	WS14
	Depth (m)	0.50	0.35	0.70	0.40	1.40	0.30	0.60	1.30	0.40	GL - 0.20
	Our ref	46924	46925	46926	46927	46928	46929	46930	46931	46932	46933
Arsenic**	(mg/kg)	7.7	<5	7.6	13.2	n/t	6.3	7.6	n/t	7.6	6.3
Cadmium**	(mg/kg)	<0.5	<0.5	<0.5	<0.5	n/t	<0.5	<0.5	n/t	<0.5	<0.5
Chromium**	(mg/kg)	14	7	14	5	n/t	15	16	n/t	16	7
Lead**	(mg/kg)	39	6	26	15	n/t	15	16	n/t	21	378
Mercury**	(mg/kg)	<0.5	<0.5	<0.5	<0.5	n/t	<0.5	<0.5	n/t	<0.5	<0.5
Nickel**	(mg/kg)	8	3	11	3	n/t	20	8	n/t	12	10
Copper**	(mg/kg)	20	5	17	9	n/t	14	12	n/t	17	97
Zinc**	(mg/kg)	52	11	36	22	n/t	52	51	n/t	49	140
Selenium	(mg/kg)	<0.5	<0.5	<0.5	<0.5	n/t	<0.5	<0.5	n/t	<0.5	<0.5
Water Soluble Boron	(mg/kg)	0.8	<0.5	0.9	<0.5	n/t	<0.5	<0.5	n/t	<0.5	1.0
Hexavalent Chromium	(mg/kg)	<2	<2	<2	<2	n/t	<2	<2	n/t	<2	<2
pH Value**	(Units)	7.3	8.7	7.9	9.4	6.2	7.2	10.1	8.4	6.4	8.0
Water Soluble Sulphate	(mg/l as SO_4)	n/t	n/t	n/t	n/t	41	n/t	n/t	46	<10	<10
Soil Organic Matter*	(%)	0.4	<0.1	0.3	<0.1	n/t	<0.1	0.4	n/t	0.3	1.0
Total Petroleum Hydrocarbons**	(mg/kg)	n/t	<5	n/t	<5	n/t	n/t	n/t	n/t	n/t	n/t
PCB 28**	(µg/kg)	<10	n/t	n/t	n/t	n/t	n/t	n/t	n/t	n/t	n/t
PCB 52**	(µg/kg)	<10	n/t	n/t	n/t	n/t	n/t	n/t	n/t	n/t	n/t
PCB 101**	(µg/kg)	<10	n/t	n/t	n/t	n/t	n/t	n/t	n/t	n/t	n/t
PCB 118**	(µg/kg)	<10	n/t	n/t	n/t	n/t	n/t	n/t	n/t	n/t	n/t
PCB 138**	(µg/kg)	<10	n/t	n/t	n/t	n/t	n/t	n/t	n/t	n/t	n/t
PCB 153**	(µg/kg)	<10	n/t	n/t	n/t	n/t	n/t	n/t	n/t	n/t	n/t
PCB 180**	(µg/kg)	<10	n/t	n/t	n/t	n/t	n/t	n/t	n/t	n/t	n/t

All results expressed on dry weight basis

** - MCERTS accredited test

* = UKAS accredited test

MP

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2683 2683

ANALYTICAL REPORT No. AR24937

Location: Hillcrest School, Hastings

Your Job No: LW21008

Reporting Date: 05/02/10

F.A.O. David Harris
Ashdown Site Investigation Limited
The Old Dairy, Swanborough Farm
Swanborough, Lewes,
East Sussex, BN7 9PF

	Characteristic	Silt clay loam	Silt loam	Silt loam	Silt loam	Silt clay loam	Silt loam	Silt loam	Silt clay loam	Silt loam	Sandy silt loam
Soils											
	TP/BH	WS14	WS1	WS7	BH3	BH3	BH6	WS4	WS11	WS12	WS15
	Depth (m)	0.50	0.90	0.10	0.50	1.20	0.50	0.10	0.20	0.15	0.15
	Our ref	46934	46935	46936	46937	46938	46940	46941	46942	46943	46944
Arsenic**	(mg/kg)	7.4	9.5	7.7	<5	n/t	6.9	6.6	10.2	9.1	<5
Cadmium**	(mg/kg)	<0.5	<0.5	<0.5	<0.5	n/t	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium**	(mg/kg)	15	13	18	41	n/t	17	16	21	22	8
Lead**	(mg/kg)	24	136	49	11	n/t	42	34	17	50	13
Mercury**	(mg/kg)	<0.5	<0.5	<0.5	<0.5	n/t	<0.5	<0.5	<0.5	<0.5	<0.5
Nickel**	(mg/kg)	12	8	9	35	n/t	9	10	22	12	7
Copper**	(mg/kg)	16	17	18	18	n/t	11	19	21	17	27
Zinc**	(mg/kg)	57	144	67	38	n/t	53	43	61	57	42
Selenium	(mg/kg)	<0.5	<0.5	<0.5	<0.5	n/t	<0.5	<0.5	<0.5	<0.5	<0.5
Water Soluble Boron	(mg/kg)	<0.5	0.7	1.0	<0.5	n/t	0.6	0.8	<0.5	0.9	0.6
Hexavalent Chromium	(mg/kg)	<2	<2	<2	<2	n/t	<2	<2	<2	<2	<2
pH Value**	(Units)	7.2	9.5	7.4	8.8	8.5	7.8	5.8	5.7	6.0	7.9
Water Soluble Sulphate	(mg/l as SO_4)	n/t	n/t	n/t	n/t	38	n/t	n/t	n/t	n/t	n/t
Soil Organic Matter*	(%)	0.3	0.5	0.4	0.7	n/t	0.5	0.4	<0.1	0.4	0.6
Total Petroleum Hydrocarbons**	(mg/kg)	n/t	n/t	n/t	n/t	n/t	n/t	n/t	n/t	n/t	n/t
PCB 28**	(µg/kg)	n/t	n/t	<10	n/t	n/t	n/t	n/t	n/t	n/t	n/t
PCB 52**	(µg/kg)	n/t	n/t	<10	n/t	n/t	n/t	n/t	n/t	n/t	n/t
PCB 101**	(µg/kg)	n/t	n/t	<10	n/t	n/t	n/t	n/t	n/t	n/t	n/t
PCB 118**	(µg/kg)	n/t	n/t	<10	n/t	n/t	n/t	n/t	n/t	n/t	n/t
PCB 138**	(µg/kg)	n/t	n/t	<10	n/t	n/t	n/t	n/t	n/t	n/t	n/t
PCB 153**	(µg/kg)	n/t	n/t	<10	n/t	n/t	n/t	n/t	n/t	n/t	n/t
PCB 180**	(µg/kg)	n/t	n/t	<10	n/t	n/t	n/t	n/t	n/t	n/t	n/t

All results expressed on dry weight basis

** - MCERTS accredited test

* = UKAS accredited test

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UKAS TESTING 2683 mCERTS 2683

ANALYTICAL REPORT No. AR24937

Location: Hillcrest School, Hastings

Your Job No: LW21008

Reporting Date: 05/02/10

F.A.O. David Harris
Ashdown Site Investigation Limited
The Old Dairy, Swanborough Farm
Swanborough, Lewes,
East Sussex, BN7 9PF

Soils

		Characteristic	Silt loam	Clay loam	Sandy clay loam	Silt loam
		TP/BH	WS9	BH4	BH5	BH1
		Depth (m)	0.20	1.75	1.00	1.75
		Our ref	46945	46946	46948	46949
Arsenic**	(mg/kg)		7.8	n/t	n/t	n/t
Cadmium**	(mg/kg)		<0.5	n/t	n/t	n/t
Chromium**	(mg/kg)		20	n/t	n/t	n/t
Lead**	(mg/kg)		84	n/t	n/t	n/t
Mercury**	(mg/kg)		<0.5	n/t	n/t	n/t
Nickel**	(mg/kg)		11	n/t	n/t	n/t
Copper**	(mg/kg)		19	n/t	n/t	n/t
Zinc**	(mg/kg)		151	n/t	n/t	n/t
Selenium	(mg/kg)		<0.5	n/t	n/t	n/t
Water Soluble Boron	(mg/kg)		2.0	n/t	n/t	n/t
Hexavalent Chromium	(mg/kg)		<2	n/t	n/t	n/t
pH Value**	(Units)		7.9	6.0	6.6	5.3
Water Soluble Sulphate	(mg/l as SO_4)		n/t	43	45	<10
Soil Organic Matter*	(%)		0.6	n/t	n/t	n/t

All results expressed on dry weight basis
** - MCERTS accredited test
* = UKAS accredited test
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THE ENVIRONMENTAL LABORATORY LTD

Unit A2, Windmill Road, Ponswood Industrial Estate, St Leonards On Sea, East Sussex, TN38 9BY
Tel: 01424 718618 Fax: 01424 729911

ANALYTICAL REPORT No. AR24937

Location: Hillcrest School, Hastings

Your Job No: LW21008

Reporting Date: 05/02/10

F.A.O. David Harris
Ashdown Site Investigation Limited
The Old Dairy, Swanborough Farm
Swanborough, Lewes,
East Sussex, BN7 9PF

Soils

	Characteristic	Silt loam	Silt loam	Silt clay loam	Silt clay loam	Clay	Silt loam	Silt loam	Sandy silt loam	Silt clay loam	Silt loam
	TP/BH	WS7	WS3	WS1	WS5a	WS8	WS9	WS12	WS14	WS14	WS1
	Depth (m)	0.50	0.35	0.70	0.40	0.30	0.60	0.40	GL - 0.20	0.50	0.90
	Our ref	46924	46925	46926	46927	46929	46930	46932	46933	46934	46935
Naphthalene	(mg/kg)	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01
Acenaphthylene	(mg/kg)	0.04	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01
Acenaphthene	(mg/kg)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluorene	(mg/kg)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Phenanthrene	(mg/kg)	0.31	0.03	0.06	<0.01	<0.01	<0.01	<0.01	0.10	<0.01	<0.01
Anthracene	(mg/kg)	0.05	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	0.04	<0.01	<0.01
Fluoranthene	(mg/kg)	0.77	0.06	0.27	<0.01	<0.01	<0.01	<0.01	0.17	<0.01	0.04
Pyrene	(mg/kg)	0.59	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.14	<0.01	<0.01
Benz(a)anthracene	(mg/kg)	0.27	0.02	0.09	<0.01	<0.01	<0.01	<0.01	0.11	<0.01	0.02
Chrysene	(mg/kg)	0.36	0.03	0.12	<0.01	<0.01	<0.01	<0.01	0.12	<0.01	0.03
Benzo(b)fluoranthene	(mg/kg)	0.31	0.02	0.11	<0.01	<0.01	<0.01	<0.01	0.11	<0.01	0.03
Benzo(k)fluoranthene	(mg/kg)	0.31	0.02	0.11	<0.01	<0.01	<0.01	<0.01	0.13	<0.01	0.03
Benzo(a)pyrene	(mg/kg)	0.34	0.02	0.11	<0.01	<0.01	<0.01	<0.01	0.15	<0.01	0.03
Indeno(123-cd)pyrene	(mg/kg)	0.21	0.01	0.08	<0.01	<0.01	<0.01	<0.01	0.09	<0.01	0.02
Dibenz(ah)anthracene	(mg/kg)	0.09	<0.01	0.03	<0.01	<0.01	<0.01	<0.01	0.04	<0.01	<0.01
Benzo(ghi)perylene	(mg/kg)	0.24	0.02	0.08	<0.01	<0.01	<0.01	<0.01	0.11	<0.01	0.02
Total PAH	(mg/kg)	3.92	0.24	1.09	<0.01	<0.01	<0.01	<0.01	1.33	<0.01	0.22

All results expressed on dry weight basis

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ANALYTICAL REPORT No. AR24937

Location: Hillcrest School, Hastings

Your Job No: LW21008

Reporting Date: 05/02/10

F.A.O. David Harris
Ashdown Site Investigation Limited
The Old Dairy, Swanborough Farm
Swanborough, Lewes,
East Sussex, BN7 9PF

Soils

	Characteristic	Silt loam	Silt loam	Silt loam	Silt loam	Silt clay loam	Silt loam	Sandy silt loam	Silt loam
	TP/BH	WS7	BH3	BH6	WS4	WS11	WS12	WS15	WS9
	Depth (m)	0.10	0.50	0.50	0.10	0.20	0.15	0.15	0.20
	Our ref	46936	46937	46940	46941	46942	46943	46944	46945
Naphthalene	(mg/kg)	0.01	<0.01	<0.01	0.02	<0.01	0.01	<0.01	<0.01
Acenaphthylene	(mg/kg)	0.02	<0.01	<0.01	0.05	<0.01	0.01	<0.01	0.01
Acenaphthene	(mg/kg)	<0.01	<0.01	<0.01	0.03	<0.01	<0.01	<0.01	<0.01
Fluorene	(mg/kg)	<0.01	<0.01	<0.01	0.03	<0.01	<0.01	<0.01	<0.01
Phenanthrene	(mg/kg)	0.12	<0.01	0.03	0.41	<0.01	0.05	<0.01	0.08
Anthracene	(mg/kg)	0.04	<0.01	<0.01	0.11	<0.01	0.01	<0.01	0.03
Fluoranthene	(mg/kg)	0.41	<0.01	0.09	1.01	<0.01	0.16	0.04	0.26
Pyrene	(mg/kg)	0.39	<0.01	0.08	0.81	<0.01	0.13	<0.01	0.20
Benz(a)anthracene	(mg/kg)	0.22	<0.01	0.05	0.40	<0.01	0.07	0.02	0.11
Chrysene	(mg/kg)	0.27	<0.01	0.06	0.47	<0.01	0.09	0.03	0.13
Benzo(b)fluoranthene	(mg/kg)	0.19	<0.01	0.04	0.32	<0.01	0.08	0.02	0.09
Benzo(k)fluoranthene	(mg/kg)	0.23	<0.01	0.05	0.39	<0.01	0.09	0.03	0.10
Benzo(a)pyrene	(mg/kg)	0.24	<0.01	0.05	0.40	<0.01	0.08	0.03	0.11
Indeno(123-cd)pyrene	(mg/kg)	0.15	<0.01	0.03	0.24	<0.01	0.05	0.02	0.06
Dibenz(ah)anthracene	(mg/kg)	0.06	<0.01	0.01	0.09	<0.01	0.02	<0.01	0.03
Benzo(ghi)perylene	(mg/kg)	0.18	<0.01	0.04	0.27	<0.01	0.06	0.02	0.08
Total PAH	(mg/kg)	2.54	<0.01	0.52	5.05	<0.01	0.90	0.20	1.28

All results expressed on dry weight basis

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Tel: 01424 718618 Fax: 01424 729911

ANALYTICAL REPORT No. AR24937

Location: Hillcrest School, Hastings

2683

Your Job No: LW21008

Reporting Date: 05/02/10

F.A.O. David Harris
Ashdown Site Investigation Limited
The Old Dairy, Swanborough Farm
Swanborough, Lewes,
East Sussex, BN7 9PF

Waters

		TP/BH	BH3	BH4
		Depth	5.00	6.00
		Our ref	46939	46947
pH Value*	(Units)		7.9	7.3
Sulphate*	(mg/l)		56	19

* = UKAS Accredited test

PRB

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SAMPLE RECEIPT AND TEST DATES

Our Analytical Report Number	AR24937
Your Job No:	LW21008
Sample Receipt Date:	28/01/10
Reporting Date:	05/02/10
Registered:	28/01/10
Prepared:	29/01/10
Analysis complete:	05/02/10

TEST METHOD SUMMARY

PARAMETER	Analysis Undertaken on	Date Tested	Method Number	Technique
Arsenic**	Air dried sample	02/02/10	118	ICPMS
Cadmium**	Air dried sample	02/02/10	118	ICPMS
Chromium**	Air dried sample	02/02/10	118	ICPMS
Lead**	Air dried sample	02/02/10	118	ICPMS
Mercury**	Air dried sample	02/02/10	118	ICPMS
Nickel**	Air dried sample	02/02/10	118	ICPMS
Copper**	Air dried sample	02/02/10	118	ICPMS
Zinc**	Air dried sample	02/02/10	118	ICPMS
Selenium	Air dried sample	02/02/10	118	ICPMS
Water Soluble Boron	Air dried sample	02/02/10	202	Colorimetry
Hexavalent Chromium	As submitted sample	02/02/10	110	Colorimetry
pH Value**	Air dried sample	03/02/10	113	Probe
Soil Organic Matter*	Air dried sample	03/02/10	111	Titration
Speciated PAH	As submitted sample	01/02/10	133	GCMS
Water Soluble Sulphate	Air dried sample	03/02/10	209	Colorimetry AA3
Total Petroleum Hydrocarbons**	As submitted sample	01/02/10	117	Gas Chromatography
PCB 28**	Air dried sample	03/02/10	120	GCMS
PCB 52**	Air dried sample	03/02/10	120	GCMS
PCB 101**	Air dried sample	03/02/10	120	GCMS
PCB 118**	Air dried sample	03/02/10	120	GCMS
PCB 138**	Air dried sample	03/02/10	120	GCMS
PCB 153**	Air dried sample	03/02/10	120	GCMS
PCB 180**	Air dried sample	03/02/10	120	GCMS

* = UKAS Accredited test

** - MCERTS Accredited test

Determinands not marked with * or ** are non accredited

MCERTS accreditation covers samples which are predominantly sand, clay, loam or combinations of these three soil types

Any comments, opinions, or interpretations expressed herein are outside the scope of UKAS accreditation (Accreditation Number 2683)

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THE ENVIRONMENTAL LABORATORY LTD

WATER SAMPLE RECEIPT AND TEST DATES

Our Analytical Report Number	AR24937
Your Job No:	LW21008
Sample Receipt Date:	28/01/10
Reporting Date:	05/02/10
Registered:	28/01/10
Prepared:	29/01/10
Analysis complete:	05/02/10

WATER TEST METHOD SUMMARY

PARAMETER	Method Number	Technique
pH Value*	113	Electrometric
Sulphate*	131	Ion Chromatography

* = UKAS Accredited test
Determinands not marked with * are not accredited

Any comments, opinions, or interpretations expressed herein are outside the scope of UKAS accreditation (Accreditation Number 2683)

APPENDIX C

Notes on Contaminated Land Exposure Assessment (CLEA)

Statistical Assessment Notes – Comparing Contamination Data with Critical Concentration

CLEA Model Chemical Data Inputs

Statistical Analysis Summary Sheets

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Notes on the Contaminated Land Exposure Assessment & Calculation of Soil Screening Values

Assessing risk to human health using the CLEA Model

Background to the CLEA Model

The Environment Agency and DEFRA published the Contaminated Land Exposure Assessment (CLEA) model in 2002. The methodology for the generation of assessment criteria was set out within Contaminated Land Reports (CLR) 7 to 10.

Toxicological data reports (TOX documents) for 23 individual contaminants were also published between 2002 and 2004 for use within the CLEA model.

Following the release of the TOX documents the Environment Agency published a series of Soil Guideline Values (SGVs) for the contaminants arsenic, cadmium, chromium, lead, mercury, nickel, selenium, phenol, toluene and ethylbenzene. SGVs are generic assessment criteria developed for three land uses, the assumptions for each land use were included within the CLR reports.

The generic land uses considered were:

- Residential (with and without plant uptake/vegetable growing)
- Allotments
- Commercial and Industrial

The SGVs can be used as preliminary screening values for sites which fit with the conceptual model (assumptions) of the generic land uses.

The CLEA UK version of the model was released in 2005. This model could be used to generate more detailed and site specific assessment criteria. The CLEA UK model could also be used to generate generic assessment criteria for sites which lie outside of the generic land uses.

Current Guidance

In August 2008 the CLR 7 to 10 documents were officially 'withdrawn' by the Environment Agency along with published SGV reports.

Three new guidance documents were released, replacing the withdrawn CLR7-CLR10 documents, these were:

"*Guidance on Comparing Soil Contamination Data with a Critical Concentration",* CIEH/CL:AIRE (May 2008) – replacing CLR7;
"Human health toxicological assessment of contaminants in soil (Science Report SC050021/SR2)" Environment Agency, August 2008 – replacing CLR9; and,
"Updated technical background to the CLEA model (Science Report SC050021/SR3)" , Environment Agency, August 2008 - replacing CLR10

A revised version of the CLEA UK software model (ver 1.04) was also released in conjunction with the revised guidance. The latest version of the model uses purely deterministic calculations to derive assessment criteria.

The Environment Agency website (www.environment-agency.go.uk) presents the latest guidance. They advise that the current schedule of work includes the review, revision if necessary and re-issue of the TOX reports previously published. As each new TOX report is published, the previous one will be withdrawn.

In the absence of official government figures for some of the contaminants Ashdown Site Investigation Ltd have used the CLEA model to generate Soil Screening Values (SSVs) for a number of the priority contaminants. Where possible the chemical data used to generate these figures has

been taken from reports published by the Environment Agency, where no data exists, reference has been made to other published data.

Discussion on Adjustment of Background Daily Intake of Contaminants for Child Targets

As exposure to soils is unlikely to be the sole means through which people may be exposed to a contaminant a background exposure or Mean Daily Intake (MDI) is calculated for each contaminant. Adjustment factors for the MDI are included within Science Report SC050021/SR2 in order to take into consideration the different bodyweights and respiration rates for different age classes.

The starting principle for deriving SSVs is that they are set so that the Average Daily Exposure (ADE) from soils plus the MDI equals the Tolerable Daily Intake (TDI) for that contaminant.

Where the MDI is equal to 50% or greater than TDI then exposure from soils is to be allowed to contribute up to 50% of the TDI when deriving SSVs. When calculating an SSV, this portion of the TDI is referred to as the Tolerable Daily Soil Intake (TDSI).

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Notes on the "Guidance on Comparing Soil Contamination Data with a Critical Concentration" (CIEH & CL: AIRE, May 2008)

The Chartered Institute of Environmental Health & CL:AIRE, have published updated guidance on the statistical assessment of contaminated land data, "*Guidance on Comparing Soil Contamination Data with a Critical Concentration" (May 2008).* This is an update to previous guidance published within Contaminated Land Report CLR7 (Defra, 2002).

The CIEH/CL:AIRE guidance forms part of a package of proposed improved UK guidance highlighted in the Defra discussion paper, "*Assessing risks from land contamination –a proportionate approach. Soil guideline values: The Way Forward (CLAN 06/2006)". This discussion paper discussed* the role and use of SGVs for managing the risks associated with soil contamination.

The guidance states that its overall aim is to "increase understanding amongst stakeholders of the role that statistics can play in quantifying the uncertainty attached to estimates of the mean concentration of contaminants in soil, thereby creating a more informed basis for regulatory decision-making".

The initial question, on which the guidance is based, is whether the Site under consideration is to be assessed under the Planning System or under Part 2A of the Environmental Protection Act 1990. The key questions asked when considering contaminant concentrations vary depending on the scenario under consideration. The key questions will generally be:

- **Planning Scenario** – "can we confidently say that the level of contamination on this land is low relative to some appropriate measure of risk?" or "that the level of contamination is lower than the critical concentration" (alternative hypothesis).

- **Part 2A Scenario** – "can we confidently say that the level of contamination on this land is high relative to some appropriate measure of risk?" or "that the level of contamination is higher than the critical concentration" (alternative hypothesis).

Within the guidance, to 'answer' the relevant question above, a null hypothesis has been outlined for each scenario, which, if rejected with a high degree of confidence, means that the alternative hypothesis can be accepted. The null hypothesis for a planning scenario is that the soils contain levels of contamination above the critical concentration (i.e. the soils are assumed to be unsuitable for use until proven otherwise). Under the Part 2A scenario, the null hypothesis is that the soils contain levels of contamination below the critical concentration (i.e. the land is assumed not to fall within Part 2A legislation until proved otherwise).

For the planning scenario the null hypothesis may be rejected if it is considered that the 95th percentile of the normally distributed population as a whole lies below the critical concentration i.e. there is a 95% probability that your true population mean lies below the critical concentration. A lower probability of the true mean lying below the critical concentration may be used, but deviation from the standard 95% requires justification.

For the Part 2A scenario the null hypothesis may be rejected if it can be shown that the lower 95th percentile lies above the critical concentration. If the lower 95th percentile lies below the critical concentration but the true population mean lies above the critical concentration further assessment should be undertaken before the Site can be classified under Part 2A.

Guidance on the treatment of outliers (results that are not representative of a sample population), is also provided in the report. The guidance confirms that outliers should only be excluded from the dataset where they are either demonstrably the result of an error that can be identified and explained, or clearly indicate that more than one soil population exists within the dataset.

Where an individual result is recognised as a 'statistical outlier' or 'contamination hot-spot' within the data set (and where the critical concentration for that contaminant is exceeded), remediation work and or further investigation may be required.

CLEA Model Chemical Data Inputs

Chemical	Chemical Type	Oral HCV						Inhalation HCV					
		Type	µg kg^{-1} BW day^{-1}	Notes	Compare with oral exposure	Compare with dermal exposure	Compare with inhalation exposure	Type	µg kg^{-1} BW day^{-1}	Notes	Compare with oral exposure	Compare with dermal exposure	Compare with inhalation exposure
Arsenic	inorganic	ID	0.3	Environment Agency, 2009. Soil Guidance Values for arsenic in soil.	Yes	Yes	No	ID	0.002	Environment Agency, 2009. Soil Guidance Values for arsenic in soil.	No	No	Yes
Cadmium	inorganic	TDI	0.36	Environment Agency, 2009. Soil Guidance Values for cadmium in soil.	Yes	Yes	No	TDI	0.0014	Environment Agency, 2009. Soil Guidance Values for cadmium in soil.	No	No	Yes
Chromium (III)	inorganic	TDI	150	LQM/CIEH GAC 2nd Edition (2009)	Yes	Yes	No	TDI	0.1	LQM/CIEH GAC 2nd Edition (2009)	No	No	Yes
Chromium (VI)	inorganic	TDI	1	LQM/CIEH GAC 2nd Edition (2009)	Yes	Yes	No	ID	0.0001	LQM/CIEH GAC 2nd Edition (2009)	No	No	Yes
Lead	inorganic	TDI	3.57	JECFA, 2000: Safety Evaluation of Certain Food Additives and Contaminants	Yes	Yes	No	TDI	0.071	EPAQS, 1998. Lead. Departmeynn of the Environment, Trnasport and the Regions. Expert Panel on Air Quality Standards. London: The Stationary Office. ISBN 0117534471	No	No	Yes
Mercury (Inorganic)	inorganic	TDI	2	Environment Agency, 2009. Soil Guidance Values for mercury in soil.	Yes	Yes	No	TDI	0.06	Environment Agency, 2009. Soil Guidance Values for mercury in soil.	No	No	Yes
Nickel	inorganic	TDI	12	Environment Agency, 2009. Soil Guidance Values for nickel in soil.	Yes	Yes	Yes	TDI	0.006	Environment Agency, 2009. Soil Guidance Values for nickel in soil.	No	No	Yes
Selenium	inorganic	TDI	6.4	Environment Agency, 2009. Soil Guidance Values for selenium in soil.	Yes	Yes	Yes	NR	0	No Inhalation HCV	No	No	No
Benzo(a)pyrene	organic	ID	0.02	Environment Agency, 2002. Contaminants in soil: Collation of toxicological data and intake values for humans - benzo(a)pyrene, TOX 2	Yes	Yes	No	ID	0.00007	Environment Agency, 2002. Contaminants in soil: Collation of toxicological data and intake values for humans - benzo(a)pyrene, TOX 2	No	No	Yes
Naphthalene	organic	TDI	20	Environment Agency, 2003. Contaminants in soil: Collation of toxicological data and intake values for humans - napthalene, TOX 20	Yes	Yes	No	TDI	0.86	Environment Agency, 2003. Contaminants in soil: Collation of toxicological data and intake values for humans - napthalene, TOX 20	Yes	No	Yes

Chemical	Chemical Type	Combine oral and inhalation AC	Oral MDI for Adults		Inhalation MDI for adults		Air-water partition coefficient (K_{aw})		Diffusion coefficient in air	
			µg day^{-1}	Notes	µg day^{-1}	Notes	cm^3 cm^{-3}	Notes (measured or calculated at 283K unless stated)	m^2 s^{-1}	Notes (measured or calculated at 283K unless stated)
Arsenic	inorganic	No	NR	index dose used	NR	index dose used	NR	Inorganic Chemical	NR	Inorganic Chemical
Cadmium	inorganic	Yes	13.4	Environment Agency, 2009. Soil Guidance Values for cadmium in soil.	0.02	Environment Agency, 2009. Soil Guidance Values for cadmium in soil.	NR	Inorganic Chemical	NR	Inorganic Chemical
Chromium (III)	inorganic	Yes	60.2	LQM/CIEH GAC 2nd Edition (2009)	0.27	LQM/CIEH GAC 2nd Edition (2009)	NR	0	NR	0
Chromium (VI)	inorganic	Yes	6.7	LQM/CIEH GAC 2nd Edition (2009)	NR	LQM/CIEH GAC 2nd Edition (2009)	NR	0	NR	0
Lead	inorganic	Yes	31	Environment Agency, 2002. Contaminants in soil: Collation of toxicological data and intake values for humans - lead, TOX 6	2	Department of the Environment, Transport and the Regions. Air Quality Information Archive, http://www.aeat.co.uk/netcen/aqarchive/nonauto/pbdata.html	NR	Inorganic Chemical	NR	Inorganic Chemical
Mercury (Inorganic)	inorganic	Yes	1	Environment Agency, 2009. Soil Guidance Values for mercury in soil.	0	Environment Agency, 2009. Soil Guidance Values for mercury in soil.	NR	Inorganic Chemical	NR	Inorganic Chemical
Nickel	inorganic	No	130	Environment Agency, 2009. Soil Guidance Values for nickel in soil.	0.06	Environment Agency, 2009. Soil Guidance Values for nickel in soil.	NR	Inorganic Chemical	NR	Inorganic Chemical
Selenium	inorganic	NR	35	Environment Agency, 2009. Soil Guidance Values for selenium in soil.	0.06	Environment Agency, 2009. Soil Guidance Values for selenium in soil.	NR	Inorganic Chemical	NR	Inorganic Chemical
Benzo(a)pyrene	organic	Yes	NR	index dose used	NR	index dose used	0.00000176	Environment Agency, 2008. Science Report - SC050021/SR7	0.00000438	Environment Agency, 2008. Science Report - SC050021/SR7
Naphthalene	organic	Yes	7	Environment Agency, 2003. Contaminants in soil: Collation of toxicological data and intake values for humans - napthalene, TOX 20	2.8	TOX20	0.00662	Environment Agency, 2008. Science Report - SC050021/SR7	0.00000652	Environment Agency, 2008. Science Report - SC050021/SR7

Chemical	Chemical Type	Diffusion coefficient in water		Relative molecular mass		Vapour pressure		Water solubility		Organic carbon - water partition coefficient (K_{oc})	
		$m^2 s^{-1}$	Notes (measured or calculated at 283K unless stated)	g mol^{-1}	Notes	Pa	Notes (measured or calculated at 283K and standard pressure unless stated)	mg L^{-1}	Notes (measured or calculated at 283K unless stated)	Log ($cm^3 g^{-1}$)	Notes
Arsenic	inorganic	NR	Inorganic Chemical	NR	Inorganic Chemical	NR	Inorganic Chemical	1250000	Environment Agency, 2009. Soil Guidance Values for arsenic in soil.	NR	Inorganic Chemical
Cadmium	inorganic	NR	Inorganic Chemical	NR	Inorganic Chemical	NR	Inorganic Chemical	1620000	Environment Agency, 2009. Soil Guidance Values for cadmium in soil.	NR	Inorganic Chemical
Chromium (III)	inorganic	NR	0	NR	0	NR	0	585000	LQM/CIEH GAC 2nd Edition (2009)	NR	LQM/CIEH GAC 2nd Edition (2009)
Chromium (VI)	inorganic	NR	0	NR	0	NR	0	2300000	LQM/CIEH GAC 2nd Edition (2009)	NR	LQM/CIEH GAC 2nd Edition (2009)
Lead	inorganic	NR	Inorganic Chemical	NR	Inorganic Chemical	NR	Inorganic Chemical	100000	0	NR	Inorganic Chemical
Mercury (Inorganic)	inorganic	NR	Inorganic Chemical	NR	Inorganic Chemical	NR	Inorganic Chemical	74000	Environment Agency, 2009. Soil Guidance Values for mercury in soil.	NR	Inorganic Chemical
Nickel	inorganic	NR	Inorganic Chemical	NR	Inorganic Chemical	NR	Inorganic Chemical	2500000	Environment Agency, 2009. Soil Guidance Values for nickel in soil.	NR	Inorganic Chemical
Selenium	inorganic	NR	Inorganic Chemical	NR	Inorganic Chemical	NR	Inorganic Chemical	2170000	Environment Agency, 2009. Soil Guidance Values for selenium in soil.	NR	Inorganic Chemical
Benzo(a)pyrene	organic	3.67E-10	Environment Agency, 2008. Science Report - SC050021/SR7	252.31	Environment Agency, 2008. Science Report - SC050021/SR7	0.00000002	Environment Agency, 2008. Science Report - SC050021/SR7	0.0038	Environment Agency, 2008. Science Report - SC050021/SR7	5.11	Environment Agency, 2008. Science Report - SC050021/SR7
Naphthalene	organic	5.16E-10	Environment Agency, 2008. Science Report - SC050021/SR7	128.17	Environment Agency, 2008. Science Report - SC050021/SR7	2.31	Environment Agency, 2008. Science Report - SC050021/SR7	19	Environment Agency, 2008. Science Report - SC050021/SR7	2.81	Environment Agency, 2008. Science Report - SC050021/SR7

Chemical	Chemical Type	Octanol - water partition coefficient (K_{ow})		Soil-water partition coefficient (K_d)		Dermal absorption fraction		Soil-plant availability correction	Root - shoot correction factor	Root - root store correction factor	Root - tuber correction factor	Root - fruit correction factor	Soil-to-plant concentration factor (green vegetables)		
		Log (dimensionless)	Notes	$cm^3\ g^{-1}$	Notes	dimensionless	Notes	dimensionless	dimensonless	dimensonless	dimensonless	dimensonless	mg g^{-1} plant (DW or FW basis) over mg g^{-1} DW soil	Type	Notes
Arsenic	inorganic	NR	Inorganic Chemical	500	Environment Agency, 2009. Soil Guidance Values for arsenic in soil.	0.03	Environment Agency, 2009. Soil Guidance Values for arsenic in soil.	5	0.5	0.5	0.5	0.5	0.00043	numeric fw	Environment Agency, 2009. Soil Guidance Values for arsenic in soil.
Cadmium	inorganic	NR	Inorganic Chemical	100	Environment Agency, 2009. Soil Guidance Values for cadmium in soil.	0.001	Environment Agency, 2009. Soil Guidance Values for cadmium in soil.	5	0.5	0.5	0.5	0.5	0.052	numeric fw	Environment Agency, 2009. Soil Guidance Values for cadmium in soil.
Chromium (III)	inorganic	NR	LQM/CIEH GAC 2nd Edition (2009)	4800	LQM/CIEH GAC 2nd Edition (2009)	0	LQM/CIEH GAC 2nd Edition (2009)	5	0.5	0.5	0.5	0.5	0.00003	numeric fw	LQM/CIEH GAC 2nd Edition (2009)
Chromium (VI)	inorganic	NR	LQM/CIEH GAC 2nd Edition (2009)	18	LQM/CIEH GAC 2nd Edition (2009)	0	LQM/CIEH GAC 2nd Edition (2009)	5	0.5	0.5	0.5	0.5	0.0002	numeric fw	LQM/CIEH GAC 2nd Edition (2009)
Lead	inorganic	NR	Inorganic Chemical	36000	RIVM report 711701 023, 2001. Technical evaluation of the Intervention Values for Soil/sediment and Groundwater	0	Environment Agency, 2009. Science Report Final SC050021/SR3	5	0.5	0.5	0.5	0.5	0	model	CLEA to estimate
Mercury (Inorganic)	inorganic	NR	Inorganic Chemical	500	Environment Agency, 2009. Soil Guidance Values for mercury in soil.	0	Environment Agency, 2009. Soil Guidance Values for mercury in soil.	5	0.5	0.5	0.5	0.5	0.0038	numeric fw	Environment Agency, 2009. Soil Guidance Values for mercury in soil.
Nickel	inorganic	NR	Inorganic Chemical	500	Environment Agency, 2009. Soil Guidance Values for nickel in soil.	0.005	Environment Agency, 2009. Soil Guidance Values for nickel in soil.	5	0.5	0.5	0.5	0.5	0.0038	numeric fw	Environment Agency, 2009. Soil Guidance Values for nickel in soil.
Selenium	inorganic	NR	Inorganic Chemical	50	Environment Agency, 2009. Soil Guidance Values for selenium in soil.	0	Environment Agency, 2009. Soil Guidance Values for selenium in soil.	50	0.5	0.5	0.5	0.5	0.0108	numeric fw	Environment Agency, 2009. Soil Guidance Values for selenium in soil.
Benzo(a)pyrene	organic	6.18	Environment Agency, 2008. Science Report - SC050021/SR7	NR	0	0.13	Environment Agency, 2009. Science Report Final SC050021/SR3	NR	NR	NR	NR	NR	0	model	CLEA to estimate
Naphthalene	organic	3.34	Environment Agency, 2008. Science Report - SC050021/SR7	NR	0	0.13	Environment Agency, 2009. Science Report Final SC050021/SR3	NR	NR	NR	NR	NR	0	model	CLEA to estimate

Chemical	Chemical Type	Soil-to-plant concentration factor (root vegetables)			Soil-to-plant concentration factor (tuber vegetables)			Soil-to-plant concentration factor (herbaceous fruit)			Soil-to-plant concentration factor (shrub fruit)			Soil-to-plant concentration factor (tree fruit)			Soil-to-dust transport factor ($g\ g^{-1}$ DW)	Sub-surface soil to indoor air correction factor (Dimensionless)
		mg g^{-1} plant (DW or FW basis) over mg g^{-1} DW soil	Type	Notes	mg g^{-1} plant (DW or FW basis) over mg g^{-1} DW soil	Type	Notes	mg g^{-1} plant (DW or FW basis) over mg g^{-1} DW soil	Type	Notes	mg g^{-1} plant (DW or FW basis) over mg g^{-1} DW soil	Type	Notes	mg g^{-1} plant (DW or FW basis) over mg g^{-1} DW soil	Type	Notes		
Arsenic	inorganic	0.0004	numeric fw	Environment Agency, 2009. Soil Guidance Values for arsenic in soil.	0.00023	numeric fw	Environment Agency, 2009. Soil Guidance Values for arsenic in soil.	0.00033	numeric fw	Environment Agency, 2009. Soil Guidance Values for arsenic in soil.	0.0002	numeric fw	Environment Agency, 2009. Soil Guidance Values for arsenic in soil.	0.0011	numeric fw	Environment Agency, 2009. Soil Guidance Values for arsenic in soil.	0.5	1
Cadmium	inorganic	0.029	numeric fw	Environment Agency, 2009. Soil Guidance Values for cadmium in soil.	0.031	numeric fw	Environment Agency, 2009. Soil Guidance Values for cadmium in soil.	0.016	numeric fw	Environment Agency, 2009. Soil Guidance Values for cadmium in soil.	0.0031	numeric fw	Environment Agency, 2009. Soil Guidance Values for cadmium in soil.	0.0014	numeric fw	Environment Agency, 2009. Soil Guidance Values for cadmium in soil.	0.5	1
Chromium (III)	inorganic	0.00003	numeric fw	LQM/CIEH GAC 2nd Edition (2009)	0.00003	numeric fw	LQM/CIEH GAC 2nd Edition (2009)	0.00003	numeric fw	LQM/CIEH GAC 2nd Edition (2009)	0.00003	numeric fw	LQM/CIEH GAC 2nd Edition (2009)	0.00003	numeric fw	LQM/CIEH GAC 2nd Edition (2009)	0.5	1
Chromium (VI)	inorganic	0.0001	numeric fw	LQM/CIEH GAC 2nd Edition (2009)	0.0001	numeric fw	LQM/CIEH GAC 2nd Edition (2009)	0.09	numeric fw	LQM/CIEH GAC 2nd Edition (2009)	0.0003	numeric fw	LQM/CIEH GAC 2nd Edition (2009)	0.09	numeric fw	LQM/CIEH GAC 2nd Edition (2009)	0.5	1
Lead	inorganic	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0.5	1
Mercury (Inorganic)	inorganic	0.0069	numeric fw	Environment Agency, 2009. Soil Guidance Values for mercury in soil.	0.0043	numeric fw	Environment Agency, 2009. Soil Guidance Values for mercury in soil.	0.001	numeric fw	Environment Agency, 2009. Soil Guidance Values for mercury in soil.	0.0011	numeric fw	Environment Agency, 2009. Soil Guidance Values for mercury in soil.	0.001	numeric fw	Environment Agency, 2009. Soil Guidance Values for mercury in soil.	0.5	1
Nickel	inorganic	4.3E-10	numeric fw	Environment Agency, 2009. Soil Guidance Values for nickel in soil.	0.0019	numeric fw	Environment Agency, 2009. Soil Guidance Values for nickel in soil.	0.0025	numeric fw	Environment Agency, 2009. Soil Guidance Values for nickel in soil.	0.0025	numeric fw	Environment Agency, 2009. Soil Guidance Values for nickel in soil.	0.0034	numeric fw	Environment Agency, 2009. Soil Guidance Values for nickel in soil.	0.5	1
Selenium	inorganic	0.00364	numeric fw	Environment Agency, 2009. Soil Guidance Values for selenium in soil.	0.00083	numeric fw	Environment Agency, 2009. Soil Guidance Values for selenium in soil.	0.00271	numeric fw	Environment Agency, 2009. Soil Guidance Values for selenium in soil.	0.003	numeric fw	Environment Agency, 2009. Soil Guidance Values for selenium in soil.	0.003	numeric fw	Environment Agency, 2009. Soil Guidance Values for selenium in soil.	0.5	1
Benzo(a)pyrene	organic	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0.5	1
Naphthalene	organic	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0.5	1

Statistical Analysis Summary Sheets

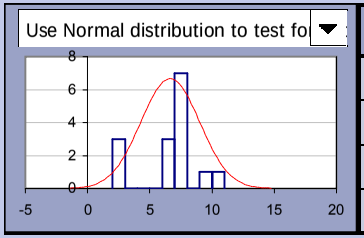
Test Results

Client/client ref:
Project ref: LW21008

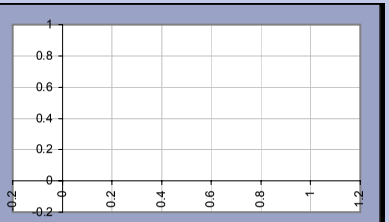
Site ref: Hillcrest School
Data description:

Date: 16-Feb-2010
User details: AB

Dataset:	Arsenic (mg/kg)
Sample mean, $\overline{X}$(mg/kg)	6.6367
Sample standard deviation, s	2.3561
Sample size, n	15
Critical concentration, Cc (mg/kg)	35



Outliers & non-detects	
Outliers present?	NO
Significance level	5%
Outliers removed?	0
Non-detects	3

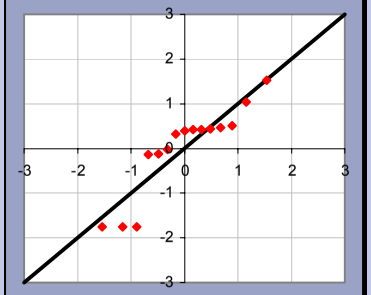


Normality test

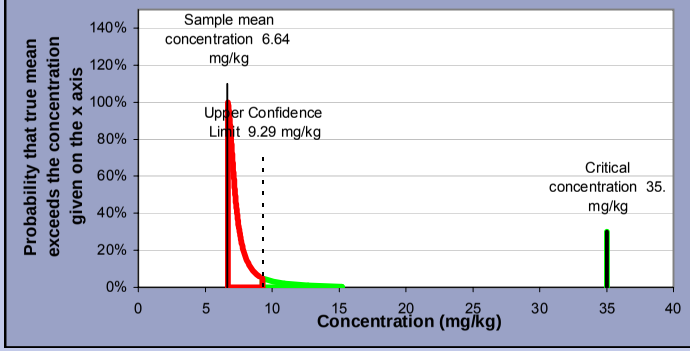
Significance level: 5%

Non-normal distribution

Use: Auto: Chebychev



Test scenario:	Planning: is true mean lower than critical concentration (μ < Cc)?
Null hypothesis:	The true mean concentration is equal to or greater than the critical concentration: μ≥ Cc
Alternative hypothesis:	The true mean concentration is less than the critical concentration: μ < Cc



Evidence against Null hypothesis:	100%
Base decision on:	evidence level
Evidence level required:	95%
Balance of probability?	N/A
Reject Null Hypothesis?	Yes

μ < Cc (re this dataset)

Back to data | Back to summary | Go to outlier test | Go to normality test

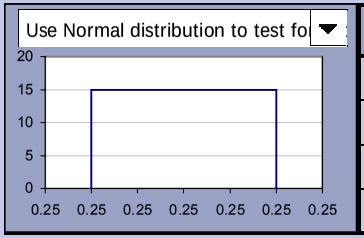
Test Results

Client/client ref:
Project ref: LW21008

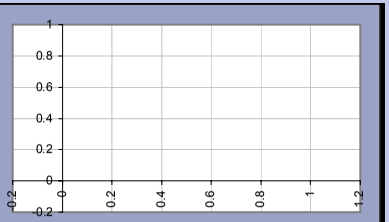
Site ref: Hillcrest School
Data description:

Date: 16-Feb-2010
User details: AB

Dataset:	Cadmium (mg/kg)
Sample mean, $\overline{X}$(mg/kg)	0.25
Sample standard deviation, s	0
Sample size, n	15
Critical concentration, Cc (mg/kg)	80



Outliers & non-detects	
Outliers present?	NO
Significance level	5%
Outliers removed?	0
Non-detects	15

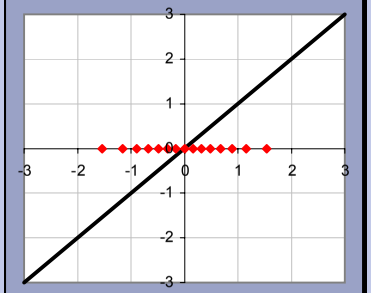


Normality test

Significance level: 5%

Single value distribution

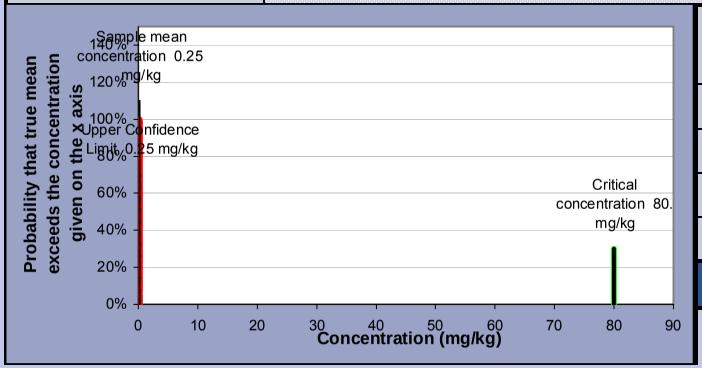
Use: Auto: Chebychev



Test scenario:

Planning: is true mean lower than critical concentration (μ < Cc)?

Null hypothesis:	The true mean concentration is equal to or greater than the critical concentration: μ≥ Cc
Alternative hypothesis:	The true mean concentration is less than the critical concentration: μ < Cc



Evidence against Null hypothesis:	100%
Base decision on:	evidence level
Evidence level required:	95%
Balance of probability?	N/A
Reject Null Hypothesis?	Yes

μ < Cc (re this dataset)

Back to data | Back to summary | Go to outlier test | Go to normality test

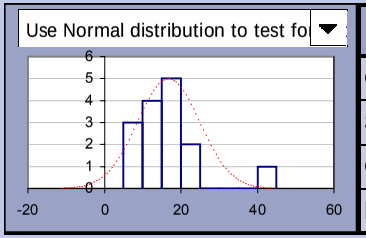
Test Results

Client/client ref:
Project ref: LW21008

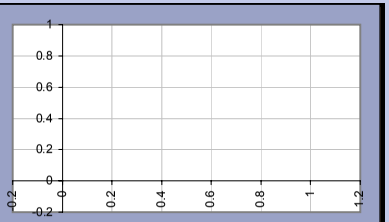
Site ref: Hillcrest School
Data description:

Date: 16-Feb-2010
User details: AB

Dataset:	Chromium (mg/kg)
Sample mean, $\overline{X}$(mg/kg)	16.782
Sample standard deviation, s	8.1186
Sample size, n	15
Critical concentration, Cc (mg/kg)	3000



Outliers & non-detects	
Outliers present?	YES
Significance level	5%
Outliers removed?	0
Non-detects	0

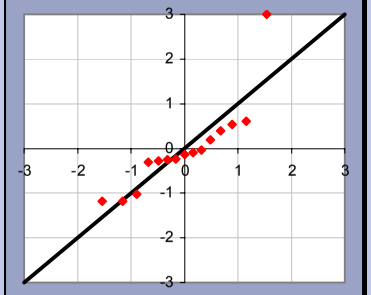


Normality test

Significance level: 5%

Non-normal distribution

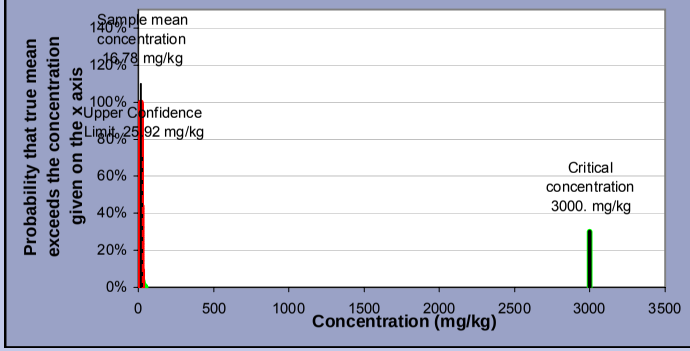
Use: Auto: Chebychev



Test scenario:

Planning: is true mean lower than critical concentration (μ < Cc)?

Null hypothesis:	The true mean concentration is equal to or greater than the critical concentration: μ≥ Cc
Alternative hypothesis:	The true mean concentration is less than the critical concentration: μ < Cc



Evidence against Null hypothesis:	100%
Base decision on:	evidence level
Evidence level required:	95%
Balance of probability?	N/A
Reject Null Hypothesis?	Yes

μ < Cc (re this dataset)

Back to data | Back to summary | Go to outlier test | Go to normality test

Test Results

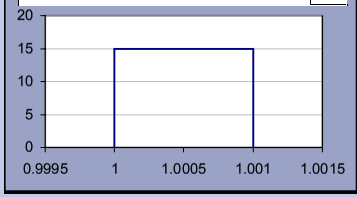
Client/client ref:
Project ref: LW21008

Site ref: Hillcrest School
Data description:

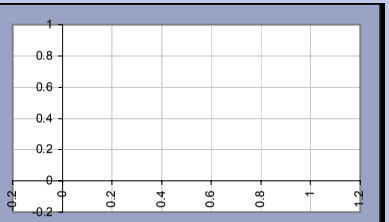
Date: 16-Feb-2010
User details: AB

Dataset:	Chromium VI (mg/kg)
Sample mean, $\overline{X}$(mg/kg)	1
Sample standard deviation, s	0
Sample size, n	15
Critical concentration, Cc (mg/kg)	4.3

Use Normal distribution to test fo



Outliers & non-detects	
Outliers present?	NO
Significance level	5%
Outliers removed?	0
Non-detects	15

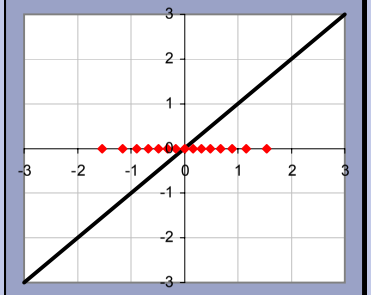


Normality test

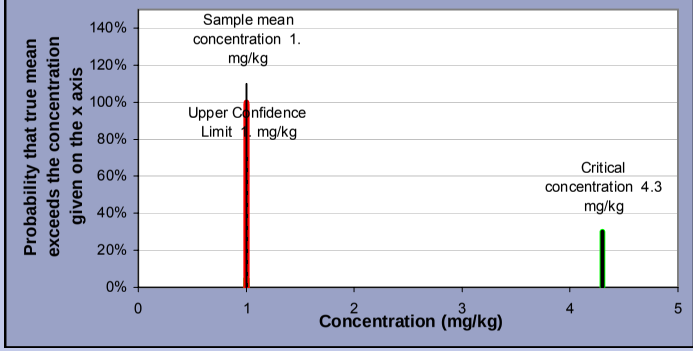
Significance level: 5%

Single value distribution

Use: Auto: Chebychev



Test scenario:	Planning: is true mean lower than critical concentration (μ < Cc)?
Null hypothesis:	The true mean concentration is equal to or greater than the critical concentration: μ≥ Cc
Alternative hypothesis:	The true mean concentration is less than the critical concentration: μ < Cc



Evidence against Null hypothesis:	100%
Base decision on:	evidence level
Evidence level required:	95%
Balance of probability?	N/A
Reject Null Hypothesis?	Yes

μ < Cc (re this dataset)

Back to data | Back to summary | Go to outlier test | Go to normality test

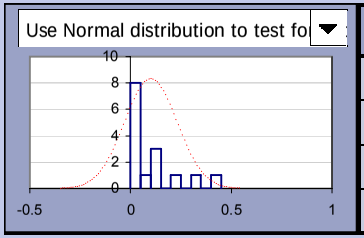
Test Results

Client/client ref:
Project ref: LW21008

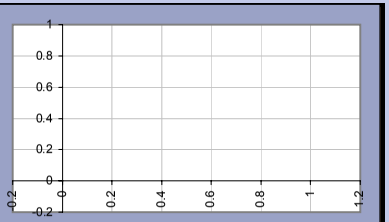
Site ref: Hillcrest School
Data description:

Date: 16-Feb-2010
User details: AB

Dataset:	B(a)P (mg/kg)
Sample mean, $\overline{X}$(mg/kg)	0.1008
Sample standard deviation, s	0.1305
Sample size, n	15
Critical concentration, Cc (mg/kg)	0.99



Outliers & non-detects	
Outliers present?	NO
Significance level	5%
Outliers removed?	0
Non-detects	6

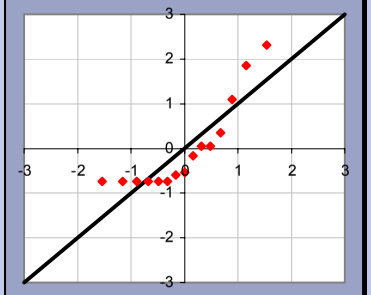


Normality test

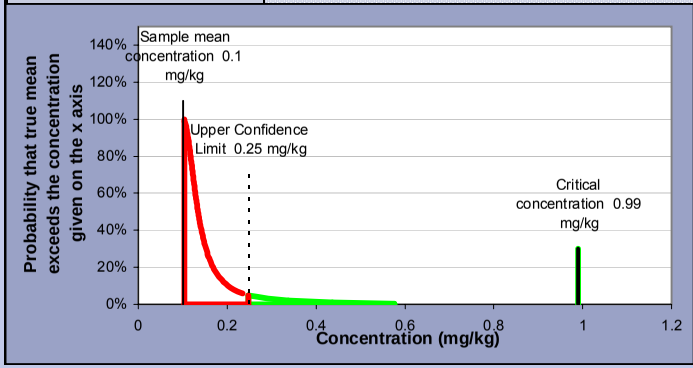
Significance level: 5%

Non-normal distribution

Use: Auto: Chebychev



Test scenario:	Planning: is true mean lower than critical concentration (μ < Cc)?
Null hypothesis:	The true mean concentration is equal to or greater than the critical concentration: μ≥ Cc
Alternative hypothesis:	The true mean concentration is less than the critical concentration: μ < Cc



Evidence against Null hypothesis:	100%
Base decision on:	evidence level
Evidence level required:	95%
Balance of probability?	N/A
Reject Null Hypothesis?	Yes

μ < Cc (re this dataset)

Back to data | Back to summary | Go to outlier test | Go to normality test

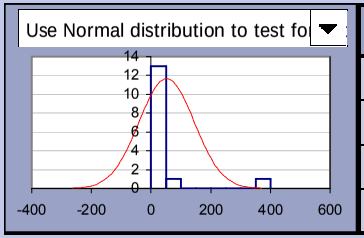
Test Results

Client/client ref:
Project ref: LW21008

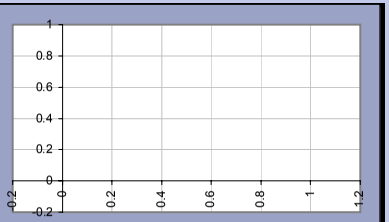
Site ref: Hillcrest School
Data description:

Date: 16-Feb-2010
User details: AB

Dataset:	Lead (mg/kg)
Sample mean, $\overline{X}$(mg/kg)	52.133
Sample standard deviation, s	92.334
Sample size, n	15
Critical concentration, Cc (mg/kg)	246



Outliers & non-detects	
Outliers present?	YES
Significance level	5%
Outliers removed?	0
Non-detects	0

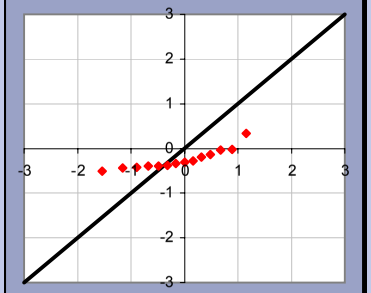


Normality test

Significance level: 5%

Non-normal distribution

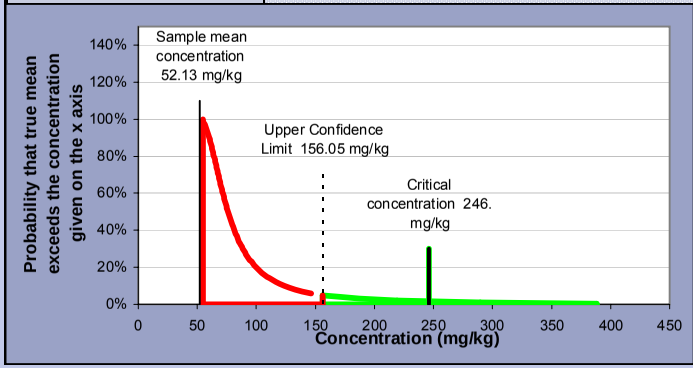
Use: Auto: Chebychev



Test scenario:

Planning: is true mean lower than critical concentration (μ < Cc)?

Null hypothesis:	The true mean concentration is equal to or greater than the critical concentration: μ≥ Cc
Alternative hypothesis:	The true mean concentration is less than the critical concentration: μ < Cc



Evidence against Null hypothesis:	99%
Base decision on:	evidence level
Evidence level required:	95%
Balance of probability?	N/A
Reject Null Hypothesis?	Yes

μ < Cc (re this dataset)

Back to data | Back to summary | Go to outlier test | Go to normality test

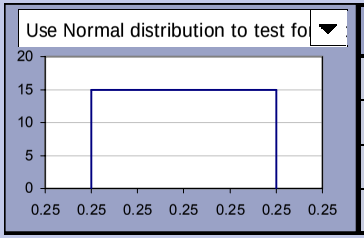
Test Results

Client/client ref:
Project ref: LW21008

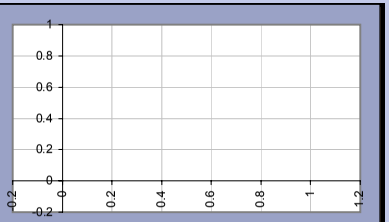
Site ref: Hillcrest School
Data description:

Date: 16-Feb-2010
User details: AB

Dataset:	Mercury (mg/kg)
Sample mean, $\overline{X}$ (mg/kg)	0.25
Sample standard deviation, s	0
Sample size, n	15
Critical concentration, Cc (mg/kg)	268



Outliers & non-detects	
Outliers present?	NO
Significance level	5%
Outliers removed?	0
Non-detects	15

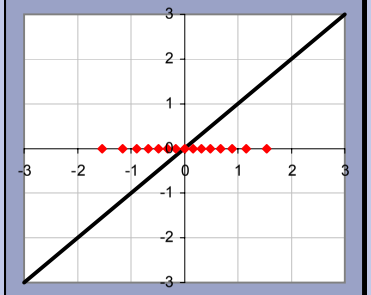


Normality test

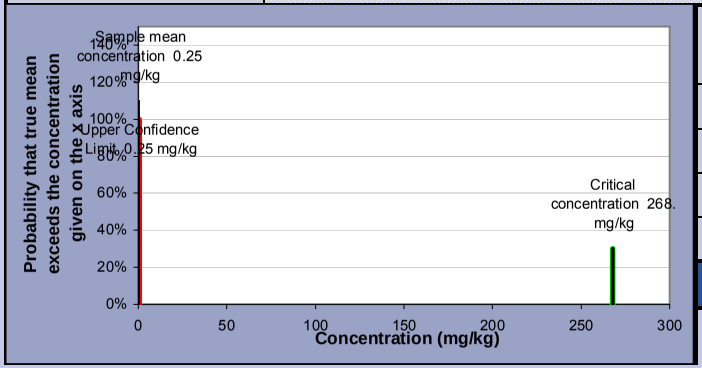
Significance level: 5%

Single value distribution

Use: Auto: Chebychev



Test scenario:	Planning: is true mean lower than critical concentration (μ < Cc)?
Null hypothesis:	The true mean concentration is equal to or greater than the critical concentration: μ ≥ Cc
Alternative hypothesis:	The true mean concentration is less than the critical concentration: μ < Cc



Evidence against Null hypothesis:	100%
Base decision on:	evidence level
Evidence level required:	95%
Balance of probability?	N/A
Reject Null Hypothesis?	Yes

μ < Cc (re this dataset)

Back to data | Back to summary | Go to outlier test | Go to normality test

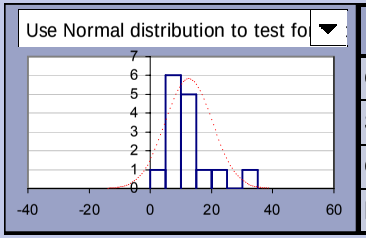
Test Results

Client/client ref:
Project ref: LW21008

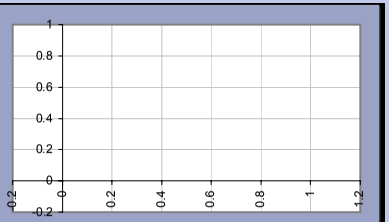
Site ref: Hillcrest School
Data description:

Date: 16-Feb-2010
User details: AB

Dataset:	Nickel (mg/kg)
Sample mean, $\overline{X}$(mg/kg)	12.58
Sample standard deviation, s	7.6927
Sample size, n	15
Critical concentration, Cc (mg/kg)	130



Outliers & non-detects	
Outliers present?	YES
Significance level	5%
Outliers removed?	0
Non-detects	0

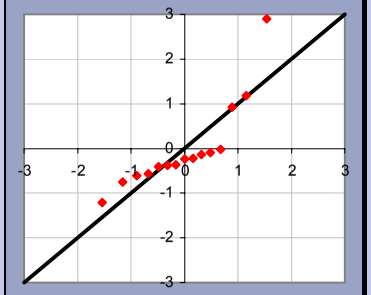


Normality test

Significance level: 5%

Non-normal distribution

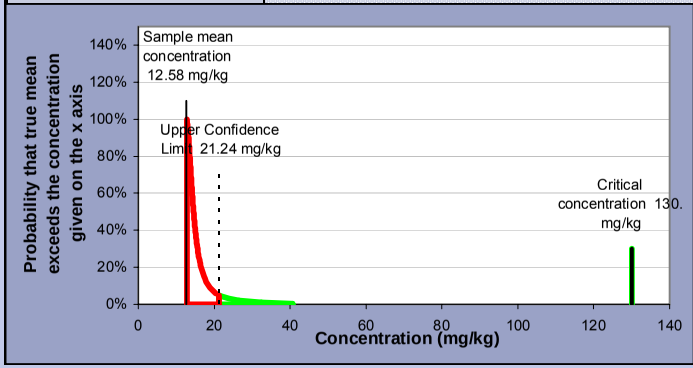
Use: Auto: Chebychev



Test scenario:

Planning: is true mean lower than critical concentration (μ < Cc)?

Null hypothesis:	The true mean concentration is equal to or greater than the critical concentration: μ≥ Cc
Alternative hypothesis:	The true mean concentration is less than the critical concentration: μ < Cc



Evidence against Null hypothesis:	**100%**
Base decision on:	evidence level
Evidence level required:	**95%**
Balance of probability?	N/A
Reject Null Hypothesis?	Yes

μ < Cc (re this dataset)

Back to data | Back to summary | Go to outlier test | Go to normality test

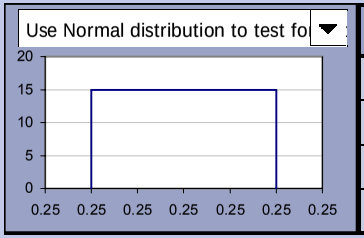
Test Results

Client/client ref:
Project ref: LW21008

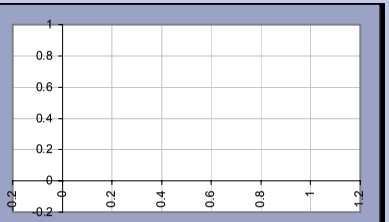
Site ref: Hillcrest School
Data description:

Date: 16-Feb-2010
User details: AB

Dataset:	Selenium (mg/kg)
Sample mean, $\overline{X}$ (mg/kg)	0.25
Sample standard deviation, s	0
Sample size, n	15
Critical concentration, Cc (mg/kg)	595



Outliers & non-detects	
Outliers present?	NO
Significance level	5%
Outliers removed?	0
Non-detects	15

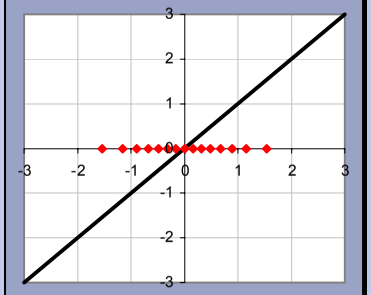


Normality test

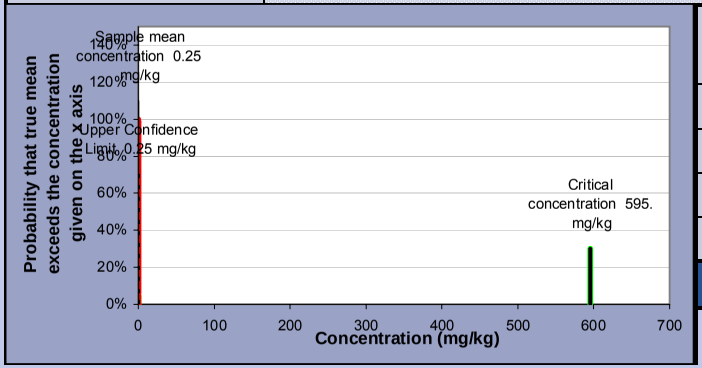
Significance level: 5%

Single value distribution

Use: Auto: Chebychev



Test scenario:	Planning: is true mean lower than critical concentration (μ < Cc)?
Null hypothesis:	The true mean concentration is equal to or greater than the critical concentration: μ ≥ Cc
Alternative hypothesis:	The true mean concentration is less than the critical concentration: μ < Cc



Evidence against Null hypothesis:	100%
Base decision on:	evidence level
Evidence level required:	95%
Balance of probability?	N/A
Reject Null Hypothesis?	Yes

μ < Cc (re this dataset)

Back to data | Back to summary | Go to outlier test | Go to normality test

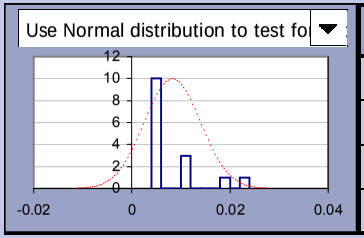
Test Results

Client/client ref:
Project ref: LW21008

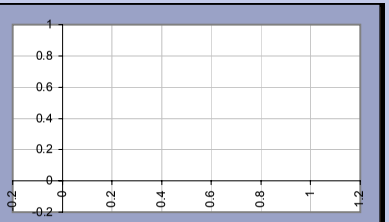
Site ref: Hillcrest School
Data description:

Date: 16-Feb-2010
User details: AB

Dataset:	Naphthalene (mg/kg)
Sample mean, $\overline{X}$(mg/kg)	0.0083
Sample standard deviation, s	0.0057
Sample size, n	15
Critical concentration, Cc (mg/kg)	1.6



Outliers & non-detects	
Outliers present?	YES
Significance level	5%
Outliers removed?	0
Non-detects	10

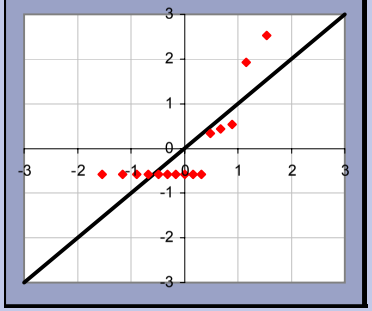


Normality test

Significance level: 5%

Non-normal distribution

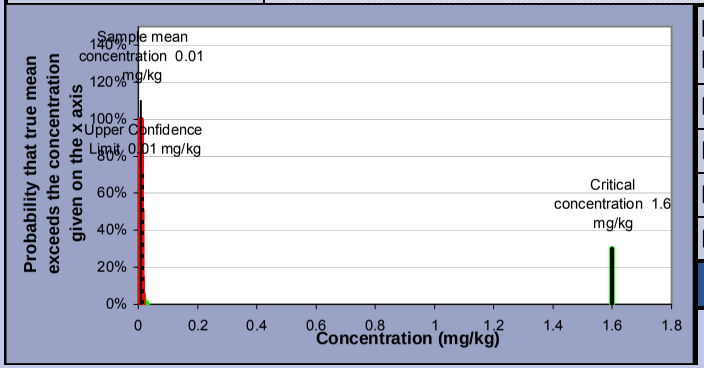
Use: Auto: Chebychev



Test scenario:

Planning: is true mean lower than critical concentration (μ < Cc)?

Null hypothesis:	The true mean concentration is equal to or greater than the critical concentration: μ≥ Cc
Alternative hypothesis:	The true mean concentration is less than the critical concentration: μ < Cc



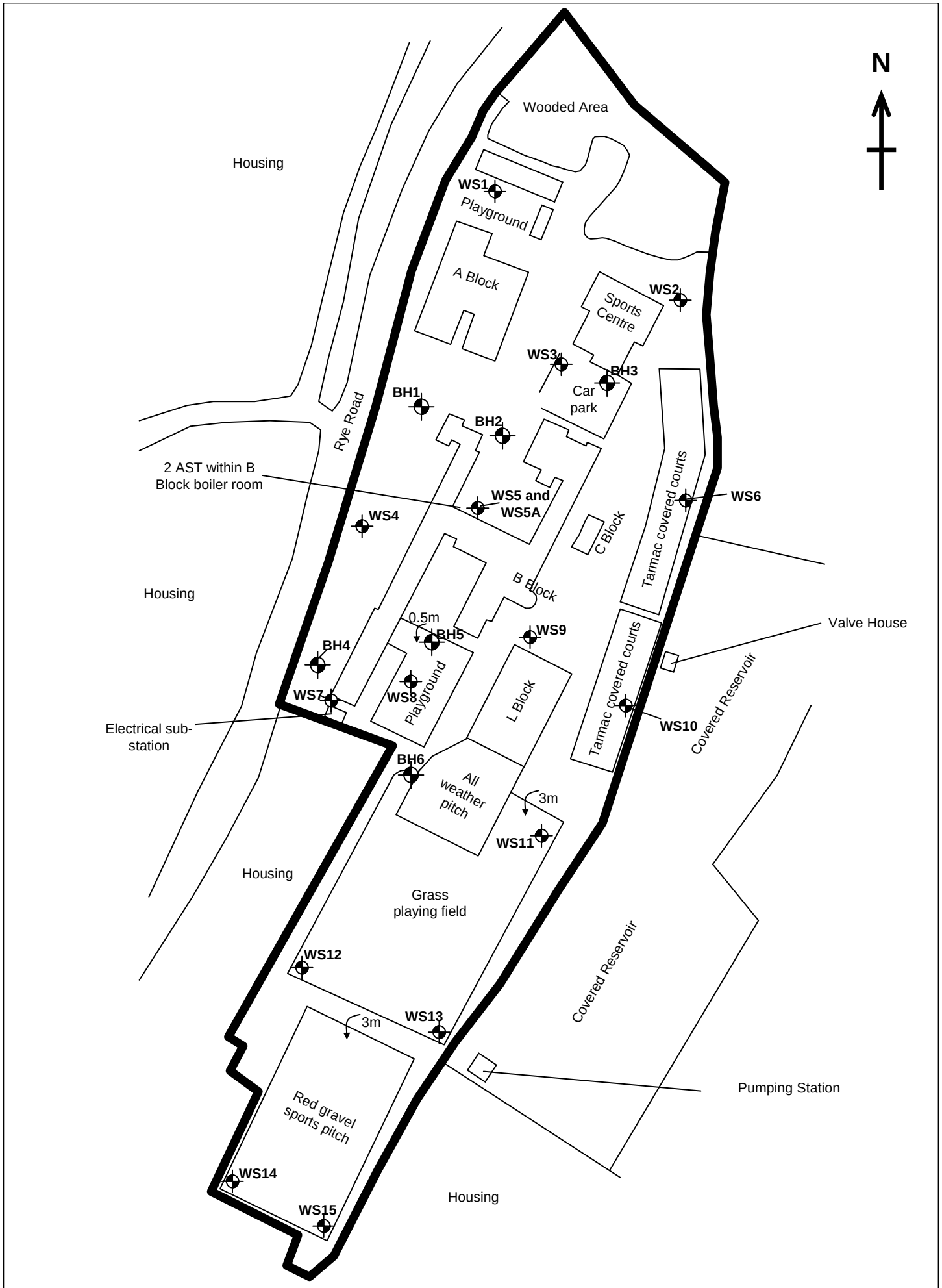
Evidence against Null hypothesis:	100%
Base decision on:	evidence level
Evidence level required:	95%
Balance of probability?	N/A
Reject Null Hypothesis?	Yes

μ < Cc (re this dataset)

Back to data | Back to summary | Go to outlier test | Go to normality test

FIGURES

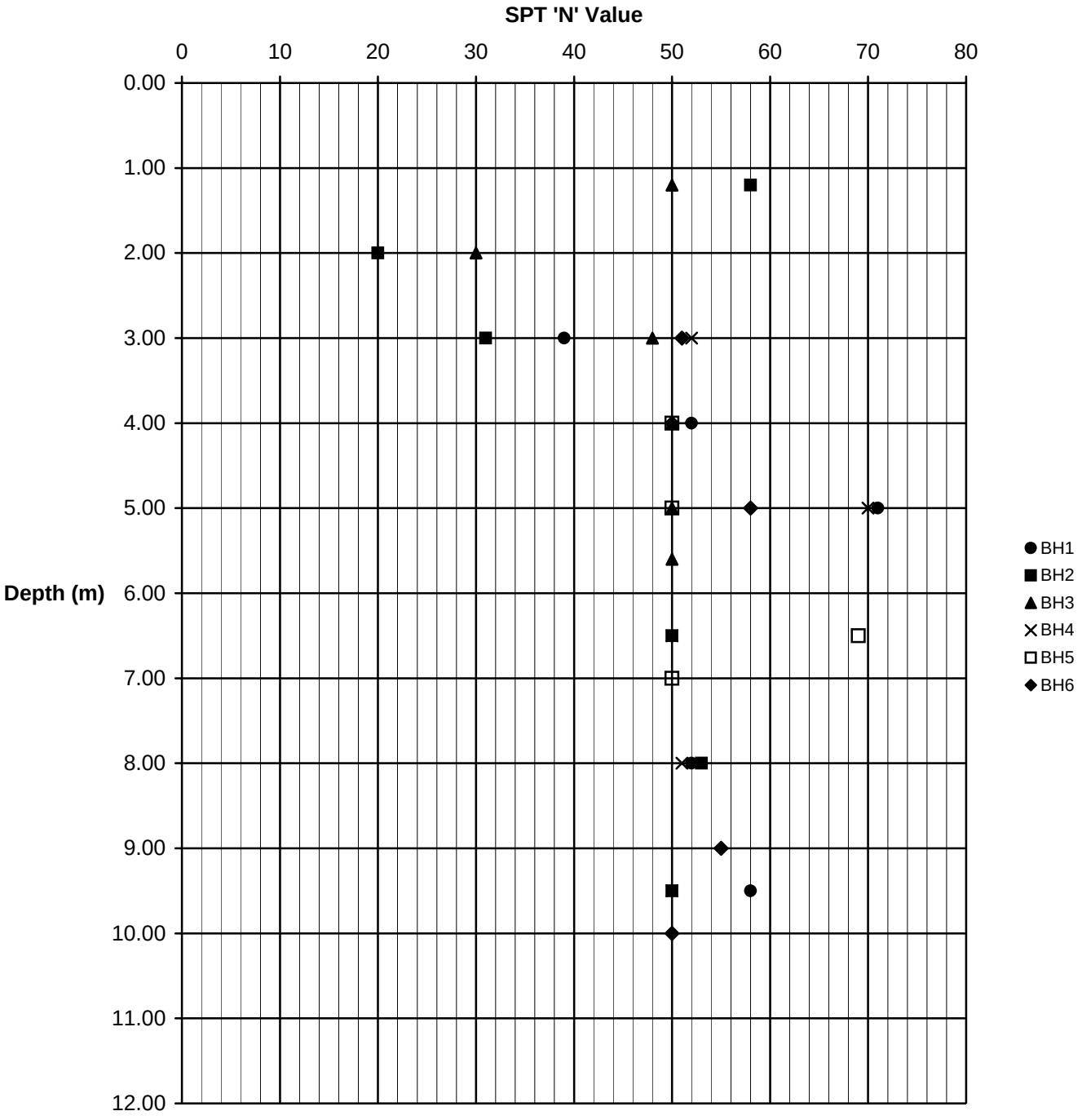
ASHDOWN SITE INVESTIGATION L·I·M·I·T·E·D	SITE: Academy East, Hillcrest School, Hastings, East Sussex	Site Location Plan Not To Scale	Figure 1 LW21008



ASHDOWN SITE INVESTIGATION L·I·M·I·T·E·D	SITE: Academy East, Hillcrest School, Hastings, East Sussex	Site Plan Not To Scale	Figure 2 LW21008

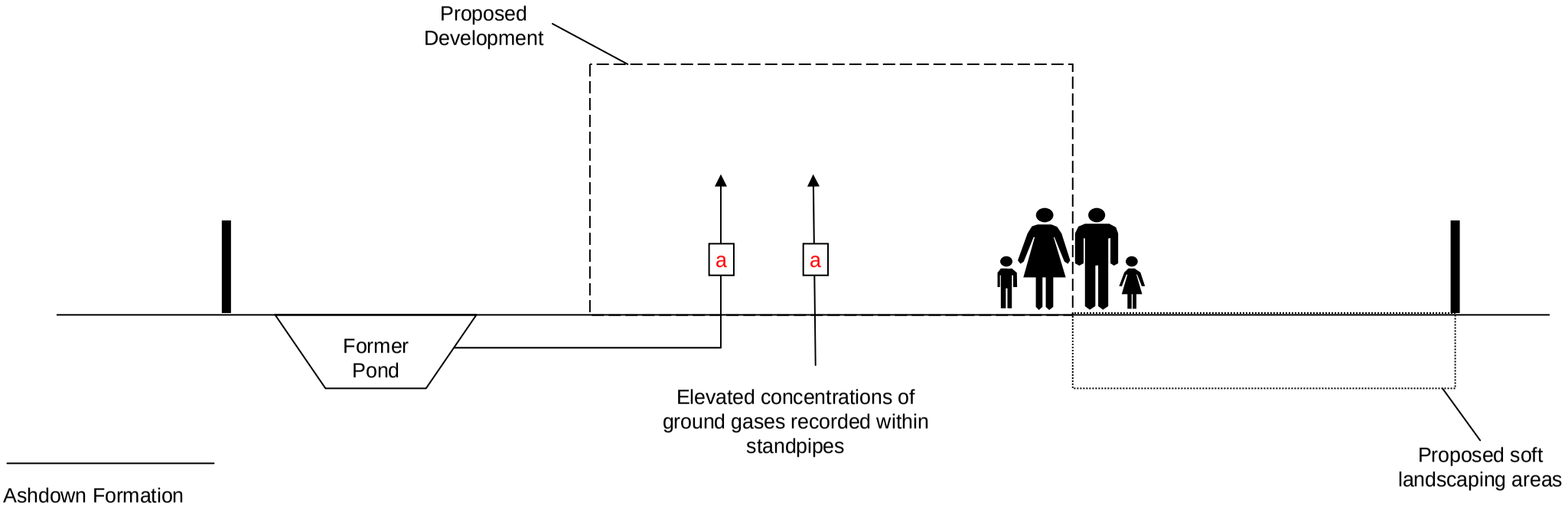
ASHDOWN SITE INVESTIGATION LIMITED

Site: Academy East, Hillcrest School, Hastings, East Sussex	Report No.:LW21008



SPT 'N' Value -v- Depth Plot

Figure 3



Sources

1. Elevated concentrations of ground gases recorded within the standpipes.

Pathways

a. Inhalation of soil gases.

Receptors

I. Human Health

ASHDOWN SITE INVESTIGATION L·I·M·I·T·E·D	SITE: Academy East, Hillcrest School, Hastings, East Sussex	Quantitative Conceptual Model. Not To Scale	Figure 4 LW21008