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Report on

GEOENVIRONMENTAL INVESTIGATION REPORT

St Giles, Lancing

Southern
Brighouse
Midlands
Sheffield
Teesside
Thames Gateway

For

Crest Nicholson (South East) Limited and the Bank of Scotland as Agent, Lender and Security Trustee

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GEOENVIRONMENTAL INVESTIGATION REPORT

ST GILES
LANCING

1 INTRODUCTION

jnpgroup (geoenvironmental) were instructed by Crest Nicholson (South East) Limited and the Bank of Scotland as agent, lender and security trustee to carry out a ground investigation of a site known as St Giles (hereinafter referred to as 'the site'). The offer to carry out the works was contained in **jnpgroup** email reference MQ45509 E006 dated 22 January 2007 to Mark Lee of Crest Nicholson (South East). The instruction to proceed was received from Mark Lee in an email dated 28 January 2008.

This report is confidential and has been prepared solely for the benefit of Crest Nicholson (South East) Limited and the Bank of Scotland as agent, lender and security trustee and those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed by **jnpgroup**. Should any third party wish to use or rely upon the contents of the report, written approval must be sought from **jnpgroup** a charge may be levied against such approval. **jnpgroup** accepts no responsibility or liability for the consequences of this document being used for any purpose or project other than for which it was commissioned, and: this document to any third party with whom an agreement has not been executed. The works detailed in this report, including conclusions, are subject to limitations which are included in Appendix G.

It is understood that the existing buildings on site will be demolished and redeveloped with a number of new residential properties up to four storeys high with private gardens.

Any comments given are based on the understanding that the proposed development will be as detailed above. This report has been prepared following review of a previous desk study undertaken on the site by Atkins 'St Giles, Elm Grove, Lancing - Desk Study Report' (*Report Ref: 2007082/5051725/ElmGrove/R001/Rev0*) dated March 2007, and a site investigation undertaken by **jnpgroup** which took place on 27 and 28 February 2008. We understand that this report has been assigned to Crest Nicholson (South East) Limited. The details contained within this report reflect the site conditions prevailing at that time. **jnpgroup** warrants the accuracy of this report up to and including that date. Additional information, improved practices or changes in legislation may necessitate this report having to be reviewed in whole or in part after that date. If necessary, this report should be referred back to **jnpgroup** for re-assessment and, if necessary, re-appraisal.

The purpose of the investigation was to address geotechnical and geoenvironmental issues relating to a proposed residential end-use of the site. The scope of work comprised a review of desk study research undertaken by Atkins together with an intrusive investigation, laboratory testing and ground gas monitoring and groundwater level monitoring. This report contains details of the site, the work and laboratory testing undertaken, strata encountered, geotechnical and chemical laboratory test results and provides an interpretative assessment of the ground conditions with regards to geotechnical issues and contaminated land.

2 SITE DESCRIPTION

The site is located off Elm Grove, Lancing, West Sussex, approximately 370m to the south-west of Lancing station, (see Figure 1 Key Plan). The centre of the site can be located by National Grid Reference (NGR) TQ 178 039. The site covers an area of approximately 0.20 hectares.

Currently a disused day care centre is present on site. This building occupies the majority of the site. A number of out buildings are present on the east of the site surrounded by hardstanding comprising asphalt and paving. The northern and southern fringes of the site comprise small areas of grass situated amongst patios and pathways. There are a number of mature trees on the boundary of the site. The site is accessed off Elm Grove along the western boundary. The site is surrounded in all compass directions by residential housing with public open space and private gardens.

For full details of the site setting at the time of investigation, reference should be made to jnpgroup Drawing ME50141 D301 in Appendix A.

3 GEOLOGY, HYDROLOGY AND HYDROGEOLOGY

3.1 Geology

Reference to the 1:50,000 scale Published British Geological Survey (BGS) Map Sheet 318/333 'Brighton and Worthing' 'solid and drift' edition indicates the site to be underlain by Aeolian deposits of remobilised sand and silty clay with rare pebbles overlying the Lambeth Group. This in turn is underlain by the Newhaven Chalk Formation. The site is located near a geological boundary which indicates that the Lambeth Group may not be present beneath the Aeolian deposits. The solid geology is indicated to be dipping gently to the south.

The Atkins Report States that:

- There is no hazard potential for ground dissolution stability hazards.
- There is a very low hazard potential for landslide ground stability hazards.

- There is a low hazard potential for compressible ground stability hazards, running sand ground stability hazards, shrinking or swelling clay ground stability hazards and shallow mining hazards.

3.2 Hydrology

The nearest surface water feature, identified as the English Channel, is located approximately 450m to the south of the site at NGR TQ 179 035. The Atkins Report states that there are no surface watercourses classified under the General Assessment (GQA) Scheme within 1km radius of the site.

3.3 Hydrogeology

The Atkins Report states that the southern tip of the site is underlain by a Minor Aquifer (Lambeth Group) and the remainder of the site is underlain by a Major Aquifer (Chalk).

The Environment Agency defines a Minor Aquifer as:-

'These can be fractured or potentially fractured rocks, which do not have a high primary permeability, or other formations of variable permeability including unconsolidated deposits. Although not producing large quantities of water for abstraction, they are important for local supplies and in supplying base flow to rivers'

The Environment Agency defines a Major Aquifer as:-

'These are highly permeable formations usually with a known or probable presence of significant fracturing. They may be highly productive and able to support large abstractions for public water supply and other purposes.'

The overlying soils are classified as having a high leaching potential, although this is uncertain as a worst case vulnerability classification is assumed by the Environment Agency (EA) for restored mineral workings and urban areas.

The Atkins Report states there are no ground water abstraction licenses within 1km of the site.

The site's proximity to groundwater Source Protection Zones (SPZs) was determined by reference to the Atkins Report. The site does not lie within a Source Protection Zone and that there are no boundaries located within 1km of the site.

4 SITE HISTORY

The Atkins report states there is mixed information regarding the former use of the site. It is understood the site was used in the 1970s as a home for the physically disabled and was more recently in use as a day care centre for the disabled.

5 INFORMATION HELD BY STATUTORY AUTHORITIES

This section details any relevant information held in the registers maintained by statutory bodies as identified in the Atkins Report.

5.1 Waste Management Facilities

The Atkins Report identifies four registered waste transfer sites and four registered waste treatment or disposal sites within 1km of the site. The details of the nearest two are as follows:

- A scrap yard is located approximately 253m to the west of the site (NGR TQ 175 040). The license status of the site is detailed as 'license lapsed/cancelled/defunct/not applicable/surrendered/cancelled'.
- A registered waste transfer site is located 411m to the west of the site (NGR TQ 174 039). In November 2000 the site was authorised to accept degradable household/commercial and industrial waste. The site is still operational as far as known.

5.2 Integrated Pollution Prevention and Controls

The Atkins Report identified one integrated prevention pollution control license within 1km of the site, the details are as follows:

- Sussex Waste Recycling Limited Energy Recovery Facility is located approximately 363m to the west of the site (NGR TQ 174 039). The application for combustion is effective.

5.3 Local Authority Pollution Prevention and Control Permits

The Atkins Report identifies nine Local Authority Pollution Prevention and Control Permits within 1km of the site. The details of the two nearest are as follows:-

- Graham Wood Limited, located approximately 163m to the west of the site (NGR TQ 176 039). This application for PG6/23 Coating of metal and plastic is authorised.
- Finecast Precision, located approximately 172m to the west of the site (NGR TQ 176 039). This application for PG2/7 Zinc and zinc alloy processes was either refused or cancelled.

5.4 Pollution Incidents to Controlled Waters

The Atkins Report identifies twenty nine pollution incidents to controlled waters within 1km of the site. The nearest was a Category 3- Minor Incident occurred 536m to the south-west of the site (NGR TQ 175 035) in March 1999. The receiving water was an unidentified river and the pollutant was described as 'kerosene'.

5.5 Substantiated Pollution Incident Register

The Atkins Report identified three incidents within 1km of the site. The nearest was an incident that occurred in July 2006 approximately 341m to the west of the site. The pollutant was recorded as dust and classed as Category 4 no impact to water, Category 2 significant impact to air and Category 3 minor incident to land.

5.6 Discharge Consents

The Atkins Report identifies forty-four discharge consents within 1km of the site, the nearest three are summarised as follows:-

- 368m to the west of the site, issued March 1969 to discharge surface water into a freshwater river. The status of the consent has lapsed (under Environment Act 1995, Schedule 23).
- 382m to the west of the site, issued February 1968 to discharge surface water into a freshwater river. The status of the consent is Pre National Rivers Authority Legislation where issue date <01/09/1969.
- 384m to the west of the site, issued May 1967 to discharge surface water into a freshwater river. The status of the consent is Pre National Rivers Authority Legislation where issue date <01/09/1969.

5.7 Contemporary Trade Directory Entries

The Atkins Report identifies one hundred and twenty contemporary trade directory entries within 500m of the site, the details of the nearest three are as follows:

- Seismic Services and Technologies Limited, located approximately 25m to the south-west of the site (NGR TQ 177 039).
- Robell Limited, located approximately 26m to the west of the site (NGR TQ 177 039).
- Gas Tec, located approximately 64m to the east of the site (NGR TQ 179 039).

5.8 Fuel Sites

The Atkins Report identifies one fuel station entry within 1km of the site, located 964m to the north of the site (NGR TQ 177 039). The status of the site is closed.

5.9 Radon

The Atkins Report states that the Health Protection Agency identified less than 1% of homes above the action level. The British Geological Survey Information Services Group indicates that no radon protection measures are necessary. Reference to BRE211 'Radon: guidance on protective measures for new dwellings' indicates that the site does not lie within an area where geological information indicates that basic radon protection may be required.

5.10 Environmentally Sensitive Areas

The Atkins Report does not identify any environmentally sensitive areas with 1km of the site.

6 FIELDWORK AND MONITORING

The intrusive fieldwork by jnpgroup was carried out on 27 and 28 February 2008 and comprised 8 No. windowless sampler boreholes and 8 No. dynamic probe holes. Three return gas and groundwater level monitoring visits were undertaken during a period from 5th March to 18th March 2008. Soakaway testing was undertaken in 2 No. windowless sampler boreholes on the 11th March 2008. All site work was completed under the instruction and supervision of jnpgroup, with the ground investigation procedures and sample descriptions based on BS 5930 (1999) 'Code of Practice for Site Investigations' and BS 10175 (2001) "Investigation of potentially contaminated sites - code of practice". The locations of the exploratory holes are shown on jnpgroup Drawing No. ME50141 D301 in Appendix A. The exploratory hole records are presented in Appendix B. The full details of the fieldwork undertaken are summarised in the following sections.

6.1 Windowless Sampler Boreholes

Eight windowless sampler boreholes (designated WS1 to WS8) were sunk on 27 and 28 February 2008 to depths of 5m bgl at various locations across the site.

The technique uses a lightweight tracked rig to advance a borehole by 1m intervals using 1m long steel sampler tubes at diameters of 100mm reducing to 70mm. The soils are then recovered from each sampler tube as continuous core samples, which are then logged and sub-sampled on site. Environmental soil samples were generally taken from each Made Ground material together with any materials suspected of containing elevated concentrations of contaminants, based on visual and olfactory evidence. The environmental samples comprised a small plastic tub and an amber glass jar. Bulk and small tub samples were also taken from selected materials encountered for laboratory geotechnical testing.

Two holes were installed with 19mm gas monitoring standpipes (WS3 and WS6) and two holes were installed with 50mm gas monitoring standpipes (WS1 and WS5). All holes with installations were

completed with flush fitting steel covers installed in at ground level. The remaining sampler holes were backfilled with arisings and the ground surface left in a safe and tidy manner.

For full details of the depth of each windowless sampler hole, strata encountered, samples taken, information on groundwater encountered, results of any in-situ testing and any other relevant information, reference should be made to the windowless sampler logs presented in Appendix B.

6.2 Dynamic Probe Holes

Eight dynamic probe holes (denoted DP1 to DP8) were undertaken adjacent to each sampler hole on 27 and 28 February 2008 to depths of between 5.00m and 8.00m bgl. The technique uses the same lightweight rig to advance a steel probe, with the number of blows per each advance of 100mm recorded as N_{100}. The method used was 'super heavyweight' as defined by BS 1377 (1991) 'Methods of Test for Soils for Civil Engineering Purposes' Part 9. The blow counts are equivalent to Standard Penetration Test blowcounts, therefore 3 x N_{100} is equivalent to SPT 'N' value. The dynamic probing results are presented following the exploratory hole logs in Appendix B.

6.3 Percolation Tests

Infiltration tests were undertaken in two of the windowless sampler boreholes (WS1 and WS5) in order to assess the infiltration rates of the soils underlying the site. The tests were undertaken in accordance with NHBC 5.3. The results of these tests are presented in Appendix C.

6.4 Monitoring

Gas monitoring was undertaken on three occasions at weekly intervals (5, 11 and 18 March 2008) after the completion of the fieldwork.

Gas monitoring involved the measurement of methane (CH_4), carbon dioxide (CO_2) and oxygen (O_2), together with atmospheric pressure, downhole pressure and flow rates using a Gas Data GFM430 gas meter. After the measurement of gas levels, the depth to any groundwater within the standpipe was recorded. The gas and groundwater monitoring results are presented in Appendix D.

7 LABORATORY TESTING

7.1 Geotechnical

A programme of laboratory testing was scheduled by **jnpgroup** to determine the geotechnical properties of selected soil samples obtained from the investigation. The details of the geotechnical testing are summarised below:

Table 1 Summary of Geotechnical Laboratory Testing Suites

Determinant	No
Water soluble sulphate and pH	6
Atterberg limits including moisture content	10
Particle size distribution	2
Moisture Content	11

Tests were carried out in accordance with BS1377 (1990) "Methods of test for Soils for civil engineering purposes". The results of the geotechnical testing are presented in Appendix E.

7.2 Environmental

A programme of chemical laboratory testing was scheduled by jnpgroup on selected soil samples taken from various depths in the Made Ground recovered from the windowless sampler holes. 8No. disturbed soil samples were collected from discrete horizons with the potential to retain contaminants. The samples were placed into suitable containers for the required chemical analysis.

All samples were transported, on the day of collection, to Derwentside Environmental Testing Services in Consett which is accredited under UKAS and MCerts. The following table summarises the contaminants scheduled:

Table 2 Summary of Soil Chemical Laboratory Testing Suites

Determinant	No
Metals and semi-metals (arsenic, water soluble boron, cadmium, chromium (total and hex), copper, lead, mercury, nickel, selenium and zinc)	8
16 USEPA Polycyclic Aromatic Hydrocarbons (PAH)	8
Monohydric Phenols	8
Cyanide (total and free)	8
pH Units	8
Thiocyanate	8
Total sulphate	8
Sulphide	8
Total sulphur	8

The results of the laboratory chemical testing are summarised in Section 12 and presented in full in Appendix F.

8 GROUND AND GROUNDWATER CONDITIONS

8.1 Strata Encountered

The ground conditions encountered during the intrusive investigation were generally consistent with the published geological map. Aeolian deposits were not encountered however. All exploratory holes

encountered a variable thickness of Made Ground which overlies both granular and cohesive Head Deposits. Chalk was encountered in one located (WS5) at a depth of 4.60m bgl.

A summary of the strata encountered during the investigation is shown in the table below and described in the following sections, but for full details and descriptions, reference should be made to the exploratory hole records presented in Appendix B.

Table 3 Strata Encountered

Stratum	Depth to Top (m bgl)	Depth to Base (m bgl)	Thickness (m)
Topsoil (WS6 and WS7)	Ground Level	0.30 – 0.40	0.30 – 0.40
Made Ground (including Hardstanding) WS1, WS2, WS3, WS4, WS5, WS8	Ground level	0.30 – 1.00	0.30 – 1.00
Head Deposits All Exploratory Holes	0.30 – 1.00	4.60 - >5.00*	>4.00* – >4.70*
Newhaven Chalk Formation (WS5)	4.60	5.00*	>0.40*

* Base not encountered

8.2 Topsoil

Topsoil was encountered in WS6 and WS7 to depths of 0.30m and 0.40m bgl respectively. Materials generally comprised soft brown gravelly clay. The gravel comprised angular to sub-rounded fine to coarse flint. Roots and rootlets throughout were recorded in WS6.

8.3 Made Ground (Including Hardstanding)

Made Ground was encountered in all exploratory hole locations except WS6 and WS7 to a maximum depth of 1.00m bgl. Materials generally comprised soft gravelly clay with some asphalt, concrete, brick, sandstone and slag fragments. The gravel comprised angular to sub-rounded fine to coarse flint, quartzite and chalk. Asphalt was encountered in WS1 and WS2 to depths of 0.15m bgl. WS8 was excavated beneath concrete paving slabs beneath which the Made Ground comprised a fine to coarse sand and angular to rounded fine to coarse gravel. WS2 encountered two bands of concrete at 0.15m bgl and 0.60m bgl. A grey sub-angular to rounded fine to coarse flint gravel was recorded beneath the concrete.

8.4 Head Deposits

Head Deposits were encountered in all exploratory holes at depths of between 0.30m bgl and 1.00m bgl to 4.60m bgl in WS5 and to the base of WS1 to WS4 at 5.00m bgl. The deposits generally comprised:

- Soft to firm sandy gravelly clay. The gravel comprised angular to sub-rounded fine to coarse flint and chalk.
- Loose to dense clayey sandy angular to rounded fine to coarse chalk and flint gravel.

- Medium dense gravelly fine to coarse sand. The gravel comprised angular to rounded fine to coarse flint.

A firm slightly gravelly sandy silt was recorded in WS3 between 4.00 and 4.90m bgl.

The particle size distributions of two samples of Head Deposits were determined. The samples contained 63% and 67% gravel, 31% and 36% sand and 2% and 3% fines (< 63mm).

Ten Atterberg Limit analyses undertaken on samples of the Head Deposits gave plasticity indices ranging from 14% to 21%, indicating that the samples were generally clays of low plasticity (with respect to BS 5930, 1999) and of low volume change potential (with respect to NHBC Chapter 4.2). A plasticity chart is presented as Figure 4.

8.5 Newhaven Chalk Formation

The Newhaven Chalk Formation was encountered in WS5 at a depth of 4.60m bgl. The base of the stratum was not encountered. Materials comprised a structureless reworked chalk composed of creamy white gravelly clay. The gravel comprised angular to sub-angular fine to coarse chalk and flint and is classified as Grade Dm.

8.6 Groundwater

No groundwater strikes were recorded during drilling. However the soils in WS1 were recorded as being wet at 4.90m bgl, WS2 was recorded as being wet at 4.50m bgl, WS3 was recorded as wet at 4.00m bgl and WS7 was recorded as damp at 4.50m bgl. During the monitoring period, groundwater levels within the boreholes were recorded at depths of between 3.90m bgl and 4.96m bgl (WS1, WS3 and WS6). WS5 remained dry at 5.00m bgl during the monitoring period. The water level results during the monitoring period are presented in Appendix D.

8.7 Visual and Olfactory Evidence of Contamination

No significant evidence of contamination was recorded during the fieldwork in soils or groundwater.

8.8 Gas Conditions

During the three monitoring visits atmospheric pressures ranged from between 990mb and 1036mb. Methane was not recorded in any of the boreholes and a maximum concentration of carbon dioxide of 2.7% was recorded. All monitoring boreholes recorded negligible flow rates. Full details of the gas concentrations and flow rates recorded during the monitoring period are presented in Appendix D.

9 UK CONTAMINATED LAND LEGISLATIVE FRAMEWORK

9.1 Legislation on Contaminated Land

Part IIA of the Environmental Protection Act, 1990, which was enacted by Section 57 of the Environment Act 1995 and the associated Contaminated Land (England) Regulations 2000 (SI 2000/227) was introduced on 1 April 2000. It created a new statutory regime for the identification and remediation of land where contamination poses an unacceptable risk to human health and the environment.

Part IIA provides a statutory definition of contaminated land:

"any land which appears to the Local Authority in whose area it is situated to be in such a condition by reason of substances in, on or under the land, that significant harm is being caused, or that there is a significant possibility of significant harm being caused, or that pollution of controlled waters is being or is likely to be caused".

Controlled waters are considered to be all groundwaters, inland surface waters and estuarine and coastal waters.

To determine whether land falls under the Part IIA definition of contaminated land the site should be evaluated in the context of a risk based framework. The assessment of contaminated land is typically a two-phase process which is initially based on a qualitative assessment of the likelihood of complete pollution linkages, with a quantitative element which seeks to determine the degree and the significance of the harm. Land is only defined as 'Contaminated Land' if a "significant pollutant linkage" is present.

A pollutant linkage must comprise the following:

Source - a contaminant at a concentration capable of causing adverse health or environmental effects.

Receptor - there must be a human or environmental receptor present, which may be at risk of harm or impact from the source.

Pathway - there must be an exposure pathway through which the receptor comes into contact with the contamination source.

The responsible authority then needs to consider whether the identified pollution linkage:

- is resulting in significant harm being caused to the receptor in the pollutant linkage;
- presents a significant possibility of significant harm being caused to that receptor;

- is resulting in the pollution of controlled waters, which constitute the receptor; or is likely to result in such pollution.

If a pollutant linkage is demonstrated, then the Part IIA legislation provides powers for remedial action to be enforced by the Local Authority in whose area the contaminated land is situated.

10 CONCEPTUAL MODEL

10.1 General

This section uses information from field observations and historical maps to provide a conceptual model and qualitative assessment of the potential risks posed to human health and environmental receptors from potential on-site and off-site sources of contamination. The assessment is presented as a 'source-pathway-receptor' model in accordance with Part IIA of the Environmental Protection Act 1990. The conceptual model has been developed assuming that the site will be redeveloped for a residential with gardens end use.

10.2 Potential Sources of Contamination

Potential On-site Sources of Contamination

- In the 1970s the site was a home for the physically disabled and was more recently used as a day care centre of the disabled.
- A boiler room and incinerator room are located on the southern aspect of the building. Hence incinerator residues may present a potential source of metals and PAH.
- An underground oil tank is recorded by Atkins as being located south of the boiler room. Hence hydrocarbons may be a potential source of contamination.

Potential Off-Site Sources of Contamination

- There are no potential off-site sources of contamination. The site is surrounded by residential properties and their associated gardens.

10.3 Receptors

The site is to be redeveloped for residential housing with private gardens. In addition the site overlies a Minor Aquifer (Lambeth Group) and a Major Aquifer (Newhaven Chalk Formation). The primary receptors, considered to be potentially at risk from any identified contamination are as follows:

Human Health

- Construction workers during the redevelopment phase
- Residential end users

Controlled Waters

- The Lambeth Group beneath the site is classified as a Minor Aquifer and the Newhaven Chalk Formation is classified as a Major Aquifer. Groundwater stored in these aquifers is a potential receptor to site derived contamination.
- The nearest controlled surface water, the English Channel, is located 450m to the south of the site. Due to its distance from the site we do not consider this to be a receptor at risk of impact from site derived contamination.

10.4 Pathways

Potential contaminant migration pathways considered relevant to the site are:-

Human Health

- Ingestion of contaminated soils and dust particles.
- Direct physical contact with near surface soils and contaminated dust particles.
- Inhalation of wind blown contaminated dust.
- Inhalation of vapours and gases, migrating vertically into the atmosphere.
- Inhalation of vapours and gases, migrating vertically into buildings and confined spaces.
- Consumption of vegetables cultivated in contaminated soils.

Controlled Waters

- Leaching of contaminants in Made Ground.

10.5 Pollutant Linkages

A 'pollutant linkage' describes the relationship between a contaminant, a pathway and a receptor, a 'pollutant' being the contaminant in a pollutant linkage. A contaminant, pathway and receptor must all be present for a pollutant linkage to exist, which forms the basis for determination that a piece of land is Contaminated Land. Potential sources, pathways and receptors have been assessed. The following table summarises the significant pollutant linkages potentially active at the site.

Table 4 Source Pathway Receptor Linkages for Human Health Risk Assessment

Source	Pathway	Receptor
Contaminated soils	Ingestion of soil	On site female child – 6yrs old
		On site construction worker
	Ingestion of household dust	On site female child – 6yrs old
	Ingestion of contaminated vegetables	On site female child – 6yrs old
	Ingestion of soil attached to vegetables	On site female child – 6yrs old
	Dermal contact	On site female child – 6yrs old
		On site construction worker

Source	Pathway	Receptor
	Dermal contact with household dust	On site female child – 6yrs old
	Inhalation of fugitive soil dust	On site construction worker
		On site female child – 6yrs old
	Inhalation of fugitive household dust	On site construction worker
	Inhalation of vapours outside	On site female child – 6yrs old
		On site construction worker
	Inhalation of vapours inside	On site female child – 6yrs old
Contaminated Soils	Leaching Mechanisms	Groundwater stored in the underlying aquifers.

The conceptual model has been refined and the plausible pollutant linkages evaluated against generic criteria in accordance with CLR 11 – 'Model Procedures for the Management of Land Contamination'.

11 QUANTITATIVE RISK ASSESSMENT

11.1 Human Health

Qualitative assessment of risks may be sufficient in many cases to eliminate the possibility of significant pollutant linkages. However, quantitative risk assessment is formally required to determine whether there is a 'significant possibility of significant harm being caused'. Part IIA recommends that 'authoritative and scientifically based guideline values for concentrations of the potential pollutants in or under the land' be used to quantify the risk posed by contamination.

11.1.1 CLEA Soil Guideline Values

The UK technical guidance for assessing risks to human health and controlled waters is split into two parts, both issued by the Environment Agency (EA). The Contaminated Land Exposure Assessment (CLEA) framework produced by the EA can be used to assess potential risks to human health, while a separate tiered methodology has been produced by the UK Environment Agency for assessment of controlled waters (EA, 1999).

The CLEA model (DEFRA and EA, 2002) incorporates a range of pathways for modelling human exposure to soil contaminants. These include ingestion of soil and dust, dermal contact with soil and dust and inhalation of dust and vapour (outdoor and indoor vapour inhalation). Soil guideline values (SGV) for key contaminants have been produced by the EA, along with toxicological guideline values relating to intake thresholds. To date SGVs have been published for relatively few metals (arsenic, cadmium, chromium, lead, mercury, nickel, selenium) and organics (toluene, ethylbenzene and phenol) and toxicity values have been published for twenty three contaminants. Where SGVs are unavailable the EA have recommended that guidance published within the Contaminated Land Reports (CLR 7 – 10) is used to assess the risks to human health.

11.1.2 Dutch Levels

Where DEFRA have not published an assessment of toxicological data and intake values (TOX report) to allow a satisfactory CLEA assessment, reference has been made to the Dutch Ministry of Housing, Spatial Planning and the Environment circular dated 4th February 2000 on intervention levels for soil remediation. Although these values have no formal status in the UK, they do offer a broad means of assessing the risk from contaminant concentrations in soil. The Dutch levels are based upon a framework comprising two threshold values of increasing concentration. These are defined as the target level (DTV), which are a reference below which soil is not considered contaminated and the Intervention level (DIV) which is a threshold value above which there is considered to be serious contamination.

11.2 Soil Chemistry

The following table compares soil concentrations with the published Soil Guideline Values (SGVs) and Dutch Intervention Values (DIV):

Table 5 Comparison of Soil Chemical Test Results with Guideline Values

Determinant	Maximum Measured Concentration (mg/kg)	CLEA SGV Residential with Plant Uptake (mg/kg)	Location of Exceedances	Concentration (mg/kg)
Arsenic	9	20	-	-
Cadmium	1.0	2	-	-
Chromium (total)	22	130	-	-
Mercury	<D.L.*	8	-	-
Lead	770	450	WS2 @ 0.40m	770
Nickel	16	50	-	-
Selenium	0.3	35	-	-
Phenols (Total)	<D.L.*	78	-	-
Determinant	**Maximum Measured Concentration (mg/kg)**	**DIV (mg/kg)**	**Location of Exceedances**	**Concentration (mg/kg)**
Copper	58	190	-	-
Zinc	560	720	-	-
PAH (Total)	<D.L.*	40	-	-

Notes: *Below analytical detection limits

When the levels of determinants recorded are compared to DIVs, no exceedances are recorded.

When the levels of determinants recorded are compared to their respective SGVs a single exceedance of lead is recorded. A concentration of 770mg/kg was recorded in WS2 at a depth of 0.40m bgl which exceeds the SGV of 450mg/kg. CLR 7 'Assessment of Risks to Human Health from Contaminated Land' within 'Appendix A' of the document states the following:

- If the calculated upper bound 95th percentile value is less than the Soil Guideline Value, then the mean value test has been passed and the site may be considered not to present a significant possibility of significant harm to human health in the context of Part IIA.

The mean of the eight samples tested is 263.50mg/kg and the calculated geometric mean is 251.97mg/kg which is below the SGV for lead of 450mg/kg. Therefore lead passes the statistical analysis and no remedial measures will be required.

11.2.1 Summary

On the basis of the testing undertaken and statistical analysis and risk assessment of the lead concentrations, we do not consider that a risk to human health is present from elevated concentrations of metals or organcis in near surface soils. In addition visual and olfactory evidence of contamination was not encountered in soils or groundwater during the investigation. Hence remedial actions at the site are not considered necessary

11.3 Controlled Waters

The concentrations of contaminants recorded in soil are not considered to be elevated with the exception of an exceedance of the SGV for lead in WS2. In addition visual or olfactory evidence of contamination was not encountered during the investigation. We do not consider that the concentrations of contaminants recorded in the Made Ground present a risk to controlled waters via leaching mechanisms.

12 GAS PROTECTION REQUIREMENTS

12.1 Ground Gas

New guidance has recently been published (CIRIA C665 "Assessing Risks Posed by Hazardous Ground Gases to Buildings") by the National House-Building Association (NHBC) on characterizing gassing sites specifically for low rise housing developments with a clear ventilated underfloor void (Situation B) (Boyle and Witherington, 2006).

During the gas monitoring period methane was not recorded. However elevated concentrations of carbon dioxide were recorded.

The level of gas protection is determined by comparing the measured gas emission rates to generic 'Traffic Lights' which comprise: -

- "Typical Maximum Concentrations" for initial screening purposes
- Risk based "Gas Screening Values" (GSVs) for consideration where the typical maximum concentrations are exceeded

The GSV is calculated using the following equation: -

Maximum gas concentration (%) x worst case borehole flow rate (l/h).

The maximum CO_2 concentrations, the maximum flow rate and the gas screening values for each borehole are summarised in the table below.

Table 6 Calculated GSVs

Location	Maximum CO_2 Concentration (% v/v)	Maximum Flow Rate (l/h)	Gas Screening Value (l/h)
WS1	1.7	<0.1	0.17
WS3	2.7	<0.1	0.27
WS5	0.7	<0.1	0.07
WS6	2.2	<0.1	0.22

The ground investigation has identified a maximum carbon dioxide concentration of 2.7% vol. (in WS3) and a worst case flow rate of <0.1l/h, giving a maximum site specific GSV of 0.27l/h. Using the maximum carbon dioxide concentration and maximum GSV, Table 7 determines the gas characterisation in across the site under a low rise housing with residential housing scenario providing that a ventilated sub-floor void is incorporated into the structure.

Table 7 NHBC Traffic Light System for 150mm Void (Situation B)

Traffic light	Methane		Carbon dioxide	
	Typical maximum concentration (% v/v)	Gas screening value (GSV) (litres / hour)	Typical maximum concentration (% v/v)	Gas screening value (GSV) (litres per hour)
Green	1	0.16	5	0.78
Amber 1	5	0.63	10	1.56
Amber 2	20	1.56	30	3.13
Red				

Notes: The gas protection requirements for each Traffic Light is summarised in Box 8.4 on page 112 of CIRIA C665.

12.2 Interpretation

The maximum GSV of 0.27l/h places the site into 'Green'. A 'Green' determination requires no special gas protection measures.

This guidance is given provided that all houses constructed on site have suspended floors with ventilated sub-floor voids. No additional gas protection measures are considered necessary.

Where ground bearing slabs are to be adopted no gas protection measures are required.

12.3 Radon

Radon protection is not required.

13 GEOTECHNICAL ENGINEERING ASSESSMENT

13.1 Proposed Redevelopment

It is understood that the existing buildings on site will be demolished and redeveloped with a number of new residential properties up to four storeys with private gardens.

13.2 Shallow Foundations

Conventional shallow foundations would be suitable and should be placed in the firm clay / silt or medium dense sand at a minimum depth of 0.75m. An allowable bearing capacity of 100kPa would be appropriate, based on the lower strength of the clay. Foundations will need to be deepened in accordance with NHBC Chapter 4.2 where the plots are in the influence zone of existing, felled or proposed trees, assuming soils of low volume change potential. Where sand or gravel is encountered at founding depth, there is no need to deepen foundations. However, to avoid potential differential settlement where foundations span from clay to sand and / or gravel, foundations should be locally reinforced.

13.3 Ground Slabs

The underlying soils are shrinkable and consequently have the potential for heave. Therefore a suspended floor should be used incorporating a suitable underfloor void, based on the recommendations in NHBC Chapter 4.2, assuming soils of low volume change potential.

13.4 Road Pavement Design

The site is underlain by a variable occasionally thick layer of low strength Made Ground, where a CBR value of less than 2% would be appropriate, in accordance with Highways Agency Design Manual for Roads and Bridges HD25/94. This would require a full pavement construction thickness of at least 600mm if the road is to be adopted. Where natural Head Deposit clays are present at formation level, then a CBR of 4% would be appropriate. These low plasticity soils should not be overworked and therefore rolling should be kept to a minimum.

The Head Deposits locally recorded plasticity indices less then 15%. These soils may therefore be frost susceptible (Croney and Jacobs, 1967) and should not be used within the upper 450mm of road foundation.

13.5 Solution Features

The WS Atkins desk study states that there is no risk of solution features. Building Control at Adur District Council stated that they are not aware of any subsidence resulting from solution features in their area. No obvious signs of structural distress was evident in the existing building. In light of these facts, jnpgroup consider that there is a low risk of ground instability from solution features at this site and no special precautions need to be adopted in this regard, other than the siting of soakaways at least 10m from any structures.

13.6 Chemical Considerations for Buried Concrete

Chemical analysis of six samples of the Head Deposits recorded water-soluble sulphate concentrations (SO_4 in 2:1 soil aqueous extract) of between 10mg/l and 30mg/l with pH values of between 7.9 and 8.2. Groundwater was encountered within the monitoring standpipes, consequently a mobile groundwater regime is assumed. On this basis and in accordance with BRE SD1 (2005) "Concrete in aggressive ground" a Design Sulphate Class of DS1 with an ACEC of AC-1 would apply for all buried concrete.

14 SOAKAWAY DRAINAGE

Falling head tests were undertaken in WS1 and WS5 generally in accordance with NHBC 5.3. The test results indicate that the granular Head Deposits are considered to be suitable for soakaway drainage. A lower bound infiltration rate of 5.6×10^{-5} ms^{-1} was recorded. Table 8 shows the area which can be drained from 1 pre-cast concrete ring soakaway of various depths and diameters, placed in a square granular filled trench. A porosity of 30% has been assumed for the granular backfill. The inflow data has been calculated using BRE365 with r = 0.40 and a ten year return period storm.

Table 8 Preliminary Soakaway Design

Diameter (mm)	Trench width (m)	Depth (m)	Area (m^2)
1200	1.50	1.00	70
1200	1.50	2.00	140
1500	2.00	1.00	110
1500	2.00	2.00	220
1800	2.00	1.00	125
1800	2.00	2.00	255

This table is provided for guidance only and detailed design would need to be undertaken by specialist drainage engineers based on the information in this report.

The Environment Agency generally require a freeboard of 1m between the base of any soakaway drainage and the water table. The results of the groundwater monitoring indicate a laterally discontinuous water table at about 4m bgl. Groundwater occurrence appears to be sporadic in the Head Deposits. The Environment Agency also generally only accept roof drainage over major aquifers such as the chalk. In addition, soakaway drainage in chalk needs to be placed at least 10m from any structures. We would recommend early consultation with the Environment Agency regarding the feasibility of soakaways.

The infiltration test results are presented in Appendix C.

15 CONCLUSIONS

15.1 Land Quality

On the basis of the testing undertaken and the statistical analysis and risk assessment of the lead concentrations in WS2, we do not consider that a risk to human health is present from elevated concentrations of metals in near surface soils. Hence remedial actions at the site are not considered necessary and that the site is suitable for its proposed end use of residential housing with private gardens.

Assessment of contamination on site was limited to accessible areas at the time of investigation. Hence **jnpgroup** recommend further works to be undertaken following demolition of the structures on site. this should comprise a visual inspection of soils by **jnpgroup** following removal of hardstanding and a watching brief by groundworkers.

Surplus soils should be managed in accordance with waste management regulations if off-site disposal is preferred. **jnpgroup** can provide guidance on this during the relevant phase of works.

15.2 Geotechnical

The reader is referred to Section 13 and 14 which must be reviewed in its entirety.

15.3 Soakaway Drainage

The test results indicate that the granular Head Deposits are considered to be suitable for soakaway drainage. A lower bound infiltration rate of 5.6×10^{-5} ms^{-1} was recorded. The Environment Agency generally require a freeboard of 1m between the base of any soakaway and the water table. The results of the groundwater monitoring indicate that a laterally continuous water table is not present beneath the site. Groundwater occurrence appears to be sporadic in the Head Deposits. The Environment Agency also generally only accept roof drainage over major aquifers such as the chalk. In

addition, soakaway drainage in chalk needs to be placed at least 10m from any structures. We would recommend early consultation with the Environment Agency regarding the feasibility of soakaways.

15.4 Gas Protection Measures

Gas protection measures are not required for new build.

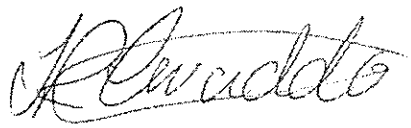
The above paragraphs are brief summaries intended for guidance only and should not be read out of context of the sections which deal with the issues in detail. Any design decisions must be based on the information in these detailed sections and not on these brief summaries.

Prepared by



SALLY RODHAM BSc (Hons) MSc
Assistant Geoenvironmental Engineer

Approved by



JIM TWADDLE BSc FGS
Associate

16 REFERENCES

BRE : 2005 : Special Digest 1 : Concrete in Aggressive Ground. Building Research Establishment.

BS 1377 : 1990 : Methods of Test for soils for civil engineering purposes. British Standards Institution, London.

BS 5930 : 1999 : Code of practice for site investigations. British Standards Institution, London.

BS 10175 : 2001 : Investigation of potentially contaminated sites - code of practice. British Standards

Croney D and J C Jacobs : 1967 : The frost susceptibility of soils and road materials. RRL Report LR90. Transport Research Laboratory (formerly Road Research Laboratory), Crowthorne

CIRIA C659 : 2006 Assessing Risks Posed by Hazardous Ground Gases to Buildings. CIRIA, LondonDEFRA and EA (2002). SGV 1. Soil Guideline Values for Arsenic Contamination. Environment Agency, Bristol.

DEFRA and EA (2002). SGV 3. Soil Guideline Values for Cadmium Contamination. Environment Agency, Bristol.

DEFRA and EA (2002). SGV 4. Soil Guideline Values for Chromium Contamination. Environment Agency, Bristol.

DEFRA and EA (2002). SGV 5. Soil Guideline Values for Compounds of inorganic mercury contamination. Environment Agency, Bristol.

DEFRA and EA (2002). SGV 7. Soil Guideline Values for Nickel Contamination. Environment Agency, Bristol.

DEFRA and EA (2002). SGV 9. Soil Guideline Values for Selenium Contamination. Environment Agency, Bristol.

DEFRA and EA (2002). SGV 10. Soil Guideline Values for Lead Contamination. Environment Agency, Bristol.

DEFRA and EA (2002). Assessment of risks to human health from contaminated land, An overview of the development of the soil guideline values and related research. R & D Publication CLR 7. Environment Agency, Bristol.

FIGURES

1 Key Plan

2 Plasticity Chart

Figure 1

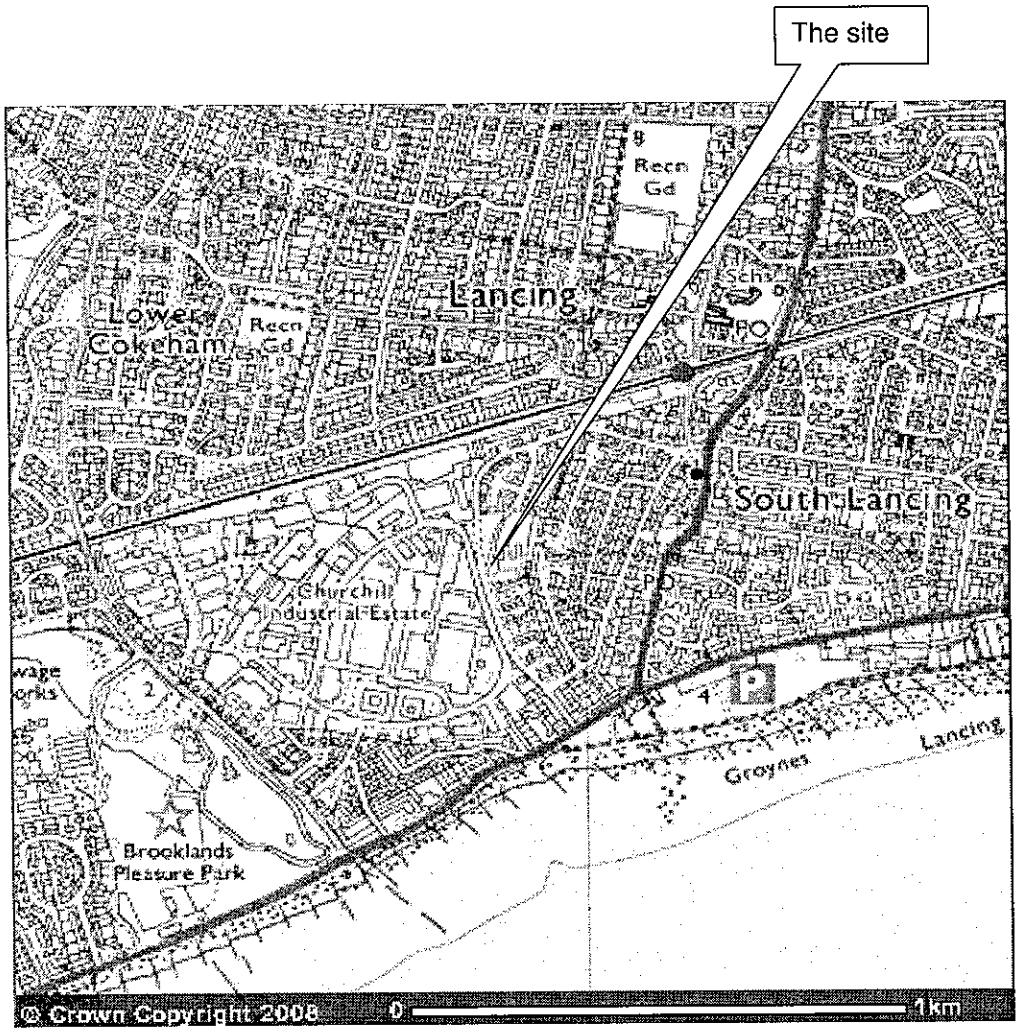
Project:

St Giles

Project No:

ME50141

forward thinking jnpgroup Consulting Engineers



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Figure

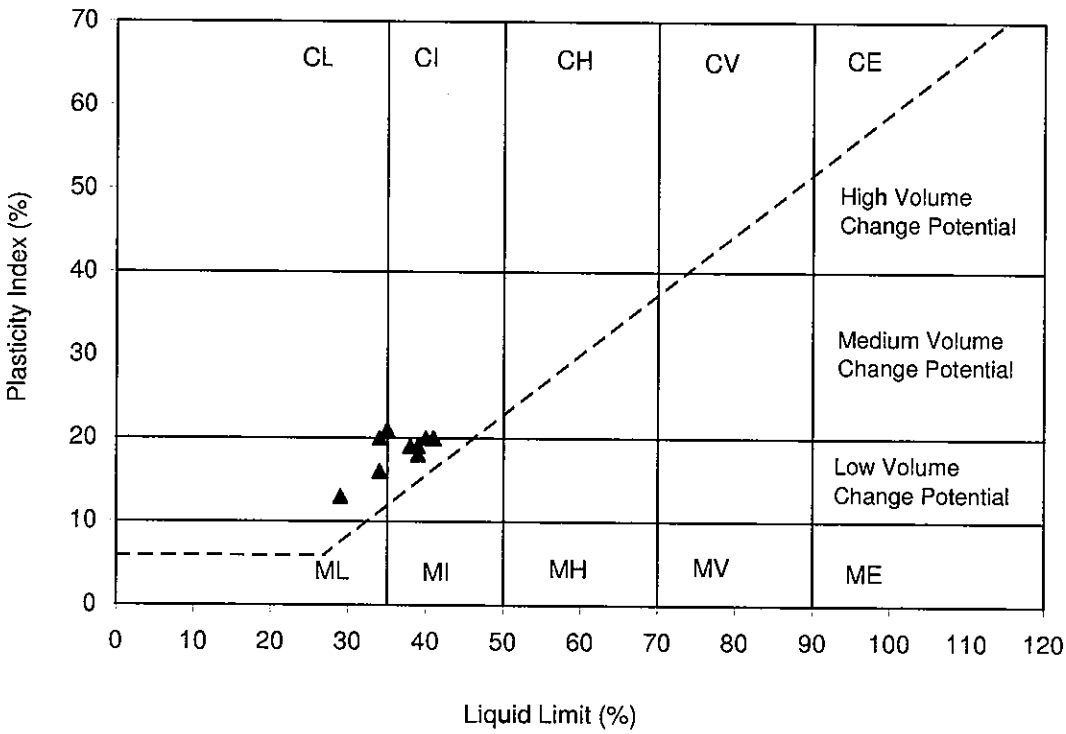
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Key:
C Clay M Silt

L Low plasticity
I Intermediate plasticity
H High plasticity
V Very high plasticity
E Extremely high plasticity



▲ Aeolian Deposits

– – – A Line

QD052 Issue A

APPENDIX A

Drawing ME50141 D301 Exploratory Hole Location Plan

Health and Safety Notes: N/A



Notes:-

1. All working dimensions to be checked on site.

2. Do not scale.

3. Any discrepancies between drawings of different scales, and between drawings and specification where appropriate to be notified to The Engineer for decision.

4. Copyright reserved. This drawing may only be used for The Client and location specified in the title block. It may not be copied or disclosed to any third party without the prior written consent of jnpgroup.

5. Prior to any work being commenced on site, The Engineer should be contacted regarding the current status or regulatory technical approval of this drawing.

Key:

Windowless sampler holes jnpgroup February 2008

Rev.	Date	Amendment	By	Chk.

Status: Reference Only

jnpgroup
Consulting Engineers

Client: Crest Nicholson (SE) Ltd & the Bank of Scotland as Agent, Lender & Security Trustee

Job: St Giles Elm Grove

Title: Exploratory Hole Location Plan

Drawn By	AJ	Date	Feb 08
Eng. Check			
Tech. Check			
Scale	1:500		

BM TRADA ISO 9001:2000

Drawing No.: ME50141-D301

Rev.

APPENDIX B

Exploratory Hole Records and Dynamic Probes

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Borehole No
WS1
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Hole Type
St Giles (Final)	ME50141 Rev A		WLS
Location: TQ 178 039		Level: -	Scale 1:30
Client: Crest Nicholson (South East) Limited		Dates: 27/02/2008	Logged By SR

Well	Water Strikes	Samples & In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m AOD)	Legend	Stratum Description
					0.15			ASPHALT (MADE GROUND)
		0.50	ES					Soft brown orange gravelly CLAY with some asphalt, concrete metal and slag fragments. Gravel is angular to sub-rounded fine to coarse flint and quartzite. (MADE GROUND)
					1.00			Soft brown slightly sandy slightly gravelly CLAY. Gravel is angular to sub-rounded fine to coarse flint. (HEAD DEPOSITS)
					1.20			Firm brown slightly gravelly CLAY. Gravel is sub-rounded medium flint. (HEAD DEPOSITS)
		1.50	D					
		2.00	D					
		2.50	D					
					2.70			Firm orange brown CLAY. (HEAD DEPOSITS)
		3.50	D					
		4.50	D					
	▽				4.90			Loose orange brown clayey sandy angular to rounded fine to coarse chalk and flint GRAVEL. (HEAD DEPOSITS)
					5.00			End of Borehole at 5.00 m

Type Results

Remarks: Hand dug to 1.20m bgl.
Dynamic Probe undertaken adjacent to hole (DP1).
Wet at 4.90m bgl.
50mm standpipe installed to 5.00m bgl. Response Zone 1.00 - 5.00m bgl.

AGS

HoleBASE III (Ed 4W) Standard Borehole Log V2 dated 21st Nov 03

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Borehole No
WS2
Sheet 1 of 1

Project Name: St Giles (Final)	Project No.: ME50141 Rev A	Co-ords: -	Hole Type: WLS
Location: TQ 178 039		Level: -	Scale: 1:30
Client: Crest Nicholson (South East) Limited		Dates: 27/02/2008	Logged By: SR

Well	Water Strikes	Samples & In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m AOD)	Legend	Stratum Description
					0.15			ASPHALT (MADE GROUND)
					0.30			CONCRETE (MADE GROUND)
		0.40	ES					Soft brown sandy gravelly CLAY. Gravel is angular to sub-rounded fine to coarse flint, quartzite and chalk. (MADE GROUND)
					0.60			
					0.70			CONCRETE (MADE GROUND)
					0.80			Grey sub-angular to rounded fine to coarse flint GRAVEL (sub-base). (MADE GROUND)
		1.20	D					Soft brown slightly gravelly CLAY. Gravel is sub-angular and sub-rounded coarse flint. Rootlets present. (HEAD DEPOSITS)
		1.70-2.00	B		1.80			Medium dense orange very gravelly fine to coarse SAND. Gravel is angular to rounded fine to coarse flint. (HEAD DEPOSITS)
					2.15			Medium dense orange fine to coarse SAND. (HEAD DEPOSITS)
		2.50-3.00	B					
					3.00			Medium dense orange very gravelly fine to coarse SAND. Gravel is angular to rounded fine to coarse flint. (HEAD DEPOSITS)
		3.90	D		3.85			Firm becoming very soft pale brown CLAY. (HEAD DEPOSITS)
	▽				4.50			Very loose brown gravelly fine to coarse SAND. Gravel is angular to rounded fine to coarse flint. (HEAD DEPOSITS)
		4.50-5.00	B					
					5.00			End of Borehole at 5.00 m

Type | Results

Remarks: Hand dug to 1.20m bgl.
Dynamic Probe undertaken adjacent to hole (DP2).
Wet at 4.50m bgl.
Backfilled with arisings on completion.

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HoleBASE III (Std 400) Standard Borehole Log 02 dated 27th Nov 03

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Borehole No
WS3
Sheet 1 of 1

Project Name: St Giles (Final)	Project No.: ME50141 Rev A	Co-ords: -	Hole Type: WLS
Location: TQ 178 039		Level: -	Scale: 1:30
Client: Crest Nicholson (South East) Limited		Dates: 27/02/2008	Logged By: SR

Well	Water Strikes	Samples & In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m AOD)	Legend	Stratum Description
		0.20	ES					Soft brown gravelly CLAY. Gravel is angular and sub-angular fine to medium brick and flint. Roots and rootlets throughout. (MADE GROUND)
		0.50	D		0.50			Firm orange slightly gravelly CLAY. Gravel is sub-angular to rounded fine to medium flint. (HEAD DEPOSITS)
					1.00			Soft brown slightly gravelly CLAY. Gravel is sub-angular to rounded fine to coarse flint. (HEAD DEPOSITS)
		1.60	D		1.55			Soft brown gravelly CLAY. Gravel is angular to sub-rounded fine to coarse flint. (HEAD DEPOSITS)
					1.85			Medium dense pale brown slightly silty gravelly fine to coarse SAND. Gravel is sub-angular to rounded fine to coarse flint. (HEAD DEPOSITS)
					2.00			
		2.00-2.50	B					Dense orange slightly clayey very sandy angular to rounded fine to coarse flint GRAVEL. (HEAD DEPOSITS)
					2.70			Dense becoming medium dense at 3.00m pale brown orange gravelly fine to coarse SAND. Gravel is sub-rounded medium flint. (HEAD DEPOSITS)
		2.70-3.50	B					
	▽				4.00			Firm pale brown orange mottled slightly gravelly sandy SILT. Gravel is sub-angular to rounded fine flint. (HEAD DEPOSITS)
		4.20	D					
					4.90			Medium dense orange silty fine to medium SAND. (HEAD DEPOSITS)
					5.00			End of Borehole at 5.00 m

Type | Results

Remarks: Hand dug to 1.20m bgl.
Dynamic Probe undertaken adjacent to hole (DP3).
Wet at 4.00m bgl.
19mm standpipe installed to 5.00m bgl. Response Zone 1.00 - 5.00m bgl.

AGS

HoleBASE III [Bld 400] Standard Borehole Log V2 dated 27th Nov 03

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Borehole No
WS4
Sheet 1 of 1

Project Name: St Giles (Final)	Project No.: ME50141 Rev A	Co-ords: -	Hole Type: WLS
Location: TQ 178 039		Level: -	Scale: 1:30
Client: Crest Nicholson (South East) Limited		Dates: 27/02/2008	Logged By: SR

Well	Water Strikes	Samples & In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m AOD)	Legend	Stratum Description
		0.20	ES		0.30			Grass over soft brown gravelly CLAY. Gravel is angular to sub-rounded fine to coarse flint with some ash and glass fragments. Roots and rootlets present throughout. (MADE GROUND)
		0.40	D					Firm brown slightly gravelly CLAY. Gravel is sub-rounded and rounded fine flint. Roots and rootlets present to 1.00m bgl. (HEAD DEPOSITS)
		1.00	D					
					1.65			Firm brown gravelly CLAY. Gravel is sub-angular to rounded fine to coarse flint. (HEAD DEPOSITS)
		1.90	D		1.80			Firm brown CLAY. (HEAD DEPOSITS)
					2.30			Firm brown very gravelly CLAY. Gravel is angular to rounded fine to coarse flint. (HEAD DEPOSITS)
		2.50-2.90	B		2.50			Medium dense orange fine to coarse SAND. (HEAD DEPOSITS)
								2.90 - 3.00m Medium dense orange gravelly fine to coarse SAND. Gravel is angular to rounded fine to coarse flint.
					3.50			Medium dense becoming very loose at 4.40m very pale brown fine to coarse SAND with rare sub-angular medium flint. (HEAD DEPOSITS)
		3.50-4.00	B					
					5.00			End of Borehole at 5.00 m

Type | Results

Remarks: Hand dug to 1.20m bgl.
Dynamic Probe undertaken adjacent to hole (DP4).
No groundwater encountered.
Backfilled with arisings on completion.

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HoleBASE III (Bd 400) Standard Borehole Log v2 dated 27th Nov 03

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Borehole No
WS5
Sheet 1 of 1

Project Name: St Giles (Final)	Project No.: ME50141 Rev A	Co-ords: -	Hole Type: WLS
Location: TQ 178 039		Level: -	Scale: 1:30
Client: Crest Nicholson (South East) Limited		Dates: 27/02/2008	Logged By: SR

Well	Water Strikes	Samples & In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m AOD)	Legend	Stratum Description
		0.30	ES		0.40			Grass over soft brown slightly gravelly CLAY. Gravel is angular to sub-rounded fine to coarse flint and quartzite with some sandstone fragments. Roots and rootlets present throughout. (MADE GROUND)
		0.50	D					Soft brown slightly gravelly CLAY. Gravel is angular to sub-rounded fine to coarse flint and quartzite. (HEAD DEPOSITS)
		1.50	D					
		1.90	D		1.80			Firm orange slighlty gravelly very sandy CLAY. Gravel is sub-rounded medium flint. (HEAD DEPOSITS)
					2.00			Medium dense brown clayey sandy angular to sub-rounded fine to coarse flint GRAVEL. (HEAD DEPOSITS)
					2.40			Medium dense pale orange brown fine to coarse SAND. (HEAD DEPOSITS)
		2.50-3.00	B					
		3.00-4.00	B					
		4.70	D		4.60			Structureless CHALK composed of creamy white gravelly CLAY. Gravel is angular and sub-angular fine to coarse chalk and flint. Grade Dm (TARRANT CHALK MEMBER)
					5.00			End of Borehole at 5.00 m

Type	Results

Remarks: Hand dug to 1.20m bgl.
Dynamic Probe undertaken adjacent to hole (DP5).
No groundwater encountered.
50mm standpipe installed to 5.00m bgl. Response Zone 1.00 - 5.00m bgl.

AGS

HoleBASE III (Bd 400) Standard Borehole Log v2 dated 27th Nov 03

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Borehole No
WS6
Sheet 1 of 1

Project Name: St Giles (Final)	Project No.: ME50141 Rev A	Co-ords: -	Hole Type: WLS
Location: TQ 178 039		Level: -	Scale: 1:30
Client: Crest Nicholson (South East) Limited		Dates: 28/02/2008	Logged By: SR

Well	Water Strikes	Samples & In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m AOD)	Legend	Stratum Description
		0.35 0.40	ES D		0.30			Soft dark brown slightly gravelly CLAY. Gravel is sub-angular fine flint. Roots and rootlets throughout. (TOPSOIL)
		1.00	D		1.50			Firm orange brown gravelly CLAY with some black organic fragments. Gravel is sub-angular to rounded fine to coarse flint and chalk. Roots and rootlets throughout. (HEAD DEPOSITS)
		1.90	D		2.00			Firm orange brown mottled CLAY with rare rootlets. (HEAD DEPOSITS)
		2.50	D		2.65			Soft orange brown mottled slighlty sandy CLAY. (HEAD DEPOSITS)
		2.65-3.20	B		3.40			Soft dark orange brown slightly sandy very gravelly CLAY. Gravel is sub-angular to rounded fine to coarse flint. (HEAD DEPOSITS)
		3.50-4.00	B		4.50			Medium dense orange fine to coarse flint SAND and GRAVEL. (HEAD DEPOSITS)
					5.00			Medium dense orange gravelly fine to coarse SAND. Gravel is sub-angular and sub-rounded fine to coarse flint. (HEAD DEPOSITS)
								End of Borehole at 5.00 m

Type Results

Remarks: Hand dug to 1.20m bgl.
Dynamic Probe undertaken adjacent to hole (DP6).
No groundwater encountered.
19mm standpipe installed to 5.00m bgl. Repsonse Zone 1.00 - 5.00m bgl.

AGS

HoleBASE II (Rel 409) Standard Borehole Log v2 dated 27th Nov 03

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Borehole No
WS7
Sheet 1 of 1

Project Name: St Giles (Final)	Project No.: ME50141 Rev A	Co-ords: -	Hole Type: WLS
Location: TQ 178 039		Level: -	Scale: 1:30
Client: Crest Nicholson (South East) Limited		Dates: 28/02/2008	Logged By: SR

Well	Water Strikes	Samples & In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m AOD)	Legend	Stratum Description
		0.30	ES		0.40			Grass over soft brown gravelly CLAY. Gravel is angular to sub-rounded fine to coarse flint. (TOPSOIL)
		0.50	D					Firm brown gravelly CLAY. Gravel is sub-angular and sub-rounded fine to coarse flint and chalk. (HEAD DEPOSITS)
					1.10			Dense, locally medium dense crange very gravelly fine to coarse SAND. Gravel is angular to rounded fine to coarse flint and chalk. (HEAD DEPOSITS)
		1.50-2.00	B					
					2.40			Medium dense orange slightly gravelly fine to coarse SAND. Gravel is angular to sub-rounded fine to coarse flint. (HEAD DEPOSITS)
		2.50-3.00	B					
	▽				4.50			Firm orange brown gravelly CLAY. Gravel is angular to rounded fine to coarse flint and chalk. (HEAD DEPOSITS)
					5.00			End of Borehole at 5.00 m

Type Results

Remarks: Hand dug to 1.20m bgl.
Dynamic Probe undertaken adjacent to hole (DP7).
Damp at 4.50m bgl.
Backfilled with arisings on completion.

AGS

HoleBASE III (Rel.400) Standard Borehole Log v2 dated 27th Nov 03

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Borehole No
WS8
Sheet 1 of 1

Project Name: St Giles (Final)	Project No.: ME50141 Rev A	Co-ords: -	Hole Type: WLS
Location: TQ 178 039		Level: -	Scale: 1:30
Client: Crest Nicholson (South East) Limited		Dates: 28/02/2008	Logged By: SR

Well	Water Strikes	Samples & In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m AOD)	Legend	Stratum Description
								Paving over fine to coarse SAND and angular to rounded fine to coarse GRAVEL (sub-base). (MADE GROUND)
		0.40	ES		0.30			Firm brown gravelly CLAY. Gravel is angular to sub-rounded fine to coarse flint and chalk. (HEAD DEPOSITS)
		1.00	D					
		1.50	D					
		1.90	D		1.70			Firm becoming soft orange slightly sandy slightly gravelly CLAY. Gravel is angular to sub-rounded fine flint. (HEAD DEPOSITS)
		2.50	D					
		3.00-3.50	B		2.70			Medium dense orange slightly clayey sandy angular to rounded fine to coarse flint GRAVEL. (HEAD DEPOSITS)
					4.00			Loose pale orange slightly gravelly fine to coarse SAND. Gravel is angular to rounded fine flint. (HEAD DEPOSITS)
					5.00			End of Borehole at 5.00 m

1 2 3 4 5

Type Results

Remarks: Hand dug to 1.20m bgl.
Dynamic Probe undertaken adjacent to hole (DP8).
No groundwater encountered.
Backfilled with arisings on completion.

AGS

HoleBASE III (BS 5930) Standard Borehole Log V6 dated 27th Nov 08

Dynamic Probing Results

BS1377 Pt 9, clause 3.2

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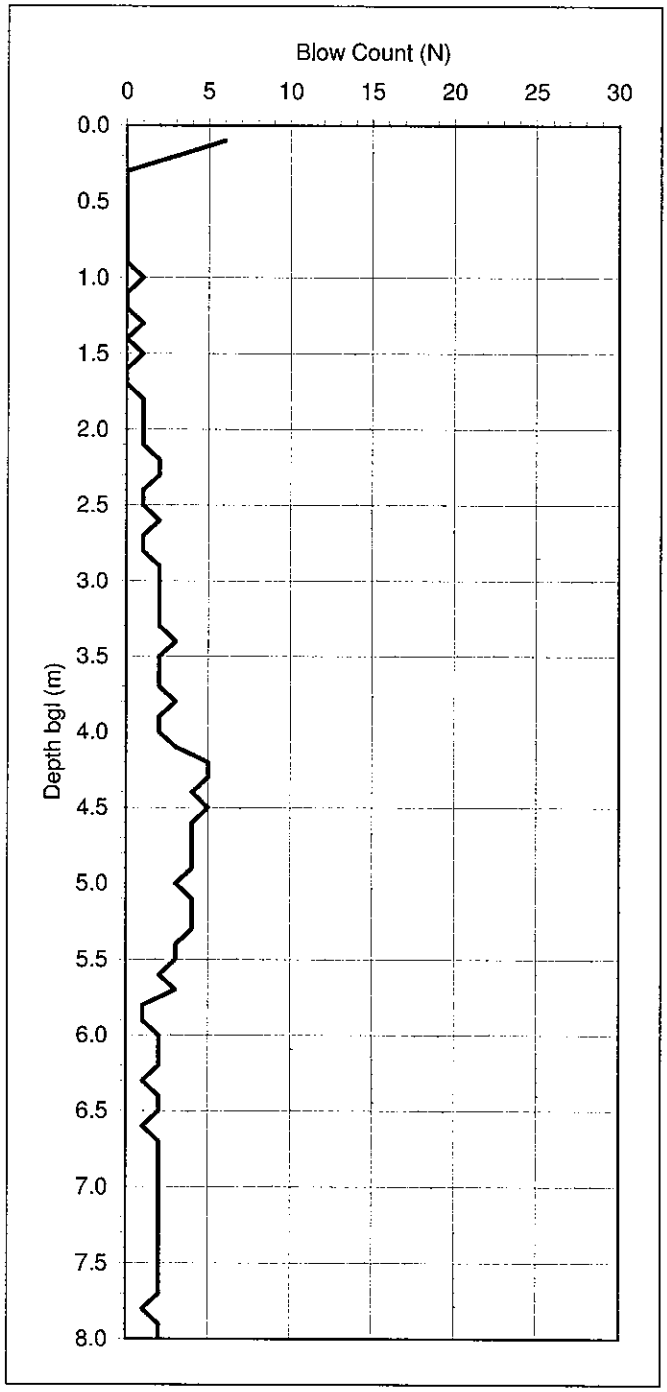
Site: St Giles
Project: ME50141

Probe No: DP1
Date: 27 Feb 08

Hammer mass (kg) 63.5
Fall height (mm) 750

Depth (m)	Blows N
0.1	6
0.2	3
0.3	
0.4	
0.5	
0.6	
0.7	
0.8	
0.9	
1.0	1
1.1	
1.2	
1.3	1
1.4	
1.5	1
1.6	
1.7	
1.8	1
1.9	1
2.0	1
2.1	1
2.2	2
2.3	2
2.4	1
2.5	1
2.6	2
2.7	1
2.8	1
2.9	2
3.0	2
3.1	2
3.2	2
3.3	2
3.4	3
3.5	2
3.6	2
3.7	2
3.8	3
3.9	2
4.0	2
4.1	3
4.2	5
4.3	5
4.4	4
4.5	5
4.6	4
4.7	4
4.8	4
4.9	4
5.0	3

Depth (m)	Blows N
5.1	4
5.2	4
5.3	4
5.4	3
5.5	3
5.6	2
5.7	3
5.8	1
5.9	1
6.0	2
6.1	2
6.2	2
6.3	1
6.4	2
6.5	2
6.6	1
6.7	2
6.8	2
6.9	2
7.0	2
7.1	2
7.2	2
7.3	2
7.4	2
7.5	2
7.6	2
7.7	2
7.8	1
7.9	2
8.0	2
8.1	
8.2	
8.3	
8.4	
8.5	
8.6	
8.7	
8.8	
8.9	
9.0	
9.1	
9.2	
9.3	
9.4	
9.5	
9.6	
9.7	
9.8	
9.9	
10.0	



Dynamic Probing Results

BS1377 Pt 9, clause 3.2

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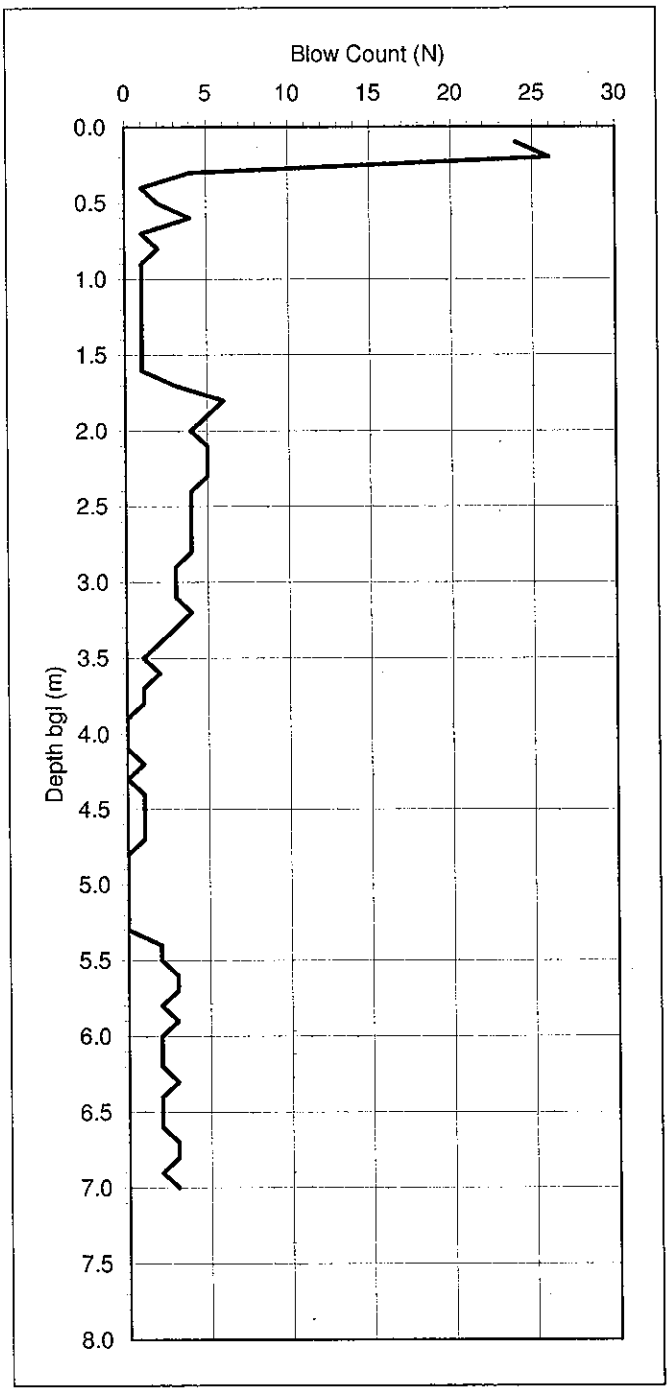
Site: St Giles
Project: ME50141

Probe No: DP2
Date: 27 Feb 08

Hammer mass (kg) 63.5
Fall height (mm) 750

Depth (m)	Blows N
0.1	24
0.2	26
0.3	4
0.4	1
0.5	2
0.6	4
0.7	1
0.8	2
0.9	1
1.0	1
1.1	1
1.2	1
1.3	1
1.4	1
1.5	1
1.6	1
1.7	3
1.8	6
1.9	5
2.0	4
2.1	5
2.2	5
2.3	5
2.4	4
2.5	4
2.6	4
2.7	4
2.8	4
2.9	3
3.0	3
3.1	3
3.2	4
3.3	3
3.4	2
3.5	1
3.6	2
3.7	1
3.8	1
3.9	
4.0	
4.1	
4.2	1
4.3	
4.4	1
4.5	1
4.6	1
4.7	1
4.8	
4.9	
5.0	

Depth (m)	Blows N
5.1	
5.2	
5.3	
5.4	2
5.5	2
5.6	3
5.7	3
5.8	2
5.9	3
6.0	2
6.1	2
6.2	2
6.3	3
6.4	2
6.5	2
6.6	2
6.7	3
6.8	3
6.9	2
7.0	3
7.1	
7.2	
7.3	
7.4	
7.5	
7.6	
7.7	
7.8	
7.9	
8.0	
8.1	
8.2	
8.3	
8.4	
8.5	
8.6	
8.7	
8.8	
8.9	
9.0	
9.1	
9.2	
9.3	
9.4	
9.5	
9.6	
9.7	
9.8	
9.9	
10.0	



Dynamic Probing Results

BS1377 Pt 9, clause 3.2

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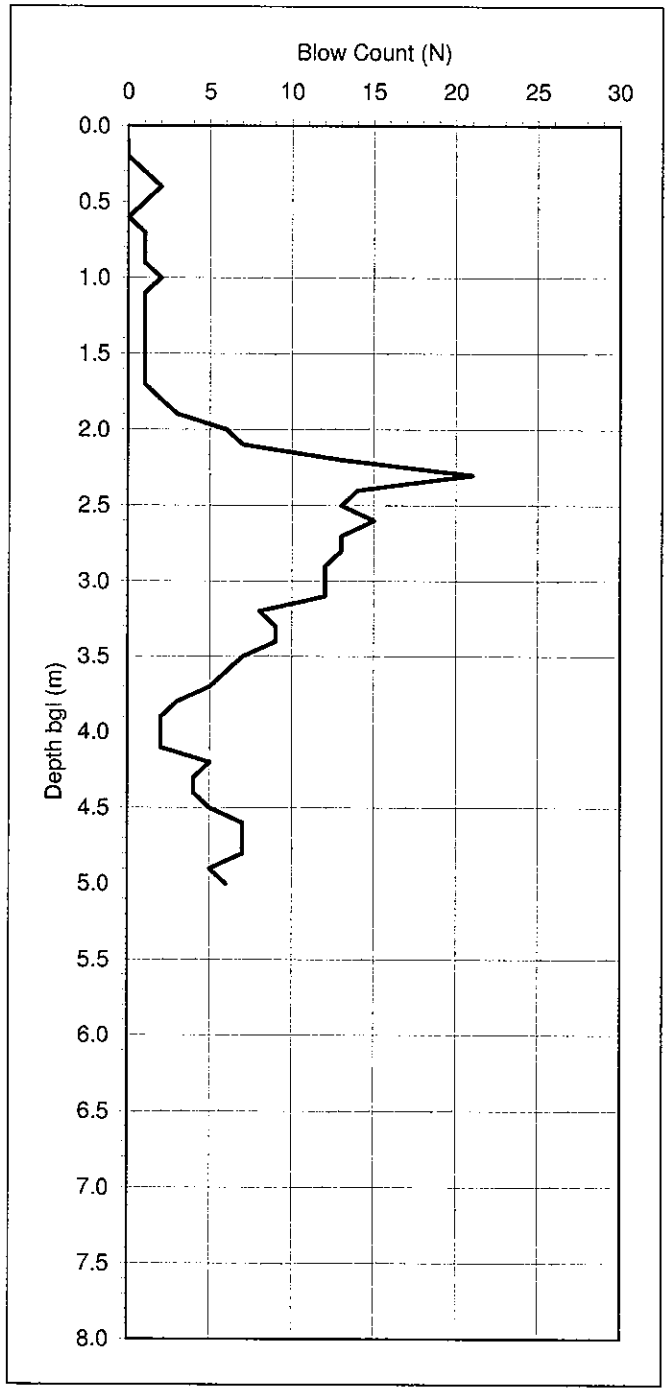
Site: St Giles
Project: ME50141

Probe No: DP3
Date: 27 Feb 08

Hammer mass (kg) 63.5
Fall height (mm) 750

Depth (m)	Blows N
0.1	
0.2	
0.3	1
0.4	2
0.5	1
0.6	
0.7	1
0.8	1
0.9	1
1.0	2
1.1	1
1.2	1
1.3	1
1.4	1
1.5	1
1.6	1
1.7	1
1.8	2
1.9	3
2.0	6
2.1	7
2.2	13
2.3	21
2.4	14
2.5	13
2.6	15
2.7	13
2.8	13
2.9	12
3.0	12
3.1	12
3.2	8
3.3	9
3.4	9
3.5	7
3.6	6
3.7	5
3.8	3
3.9	2
4.0	2
4.1	2
4.2	5
4.3	4
4.4	4
4.5	5
4.6	7
4.7	7
4.8	7
4.9	5
5.0	6

Depth (m)	Blows N
5.1	
5.2	
5.3	
5.4	
5.5	
5.6	
5.7	
5.8	
5.9	
6.0	
6.1	
6.2	
6.3	
6.4	
6.5	
6.6	
6.7	
6.8	
6.9	
7.0	
7.1	
7.2	
7.3	
7.4	
7.5	
7.6	
7.7	
7.8	
7.9	
8.0	
8.1	
8.2	
8.3	
8.4	
8.5	
8.6	
8.7	
8.8	
8.9	
9.0	
9.1	
9.2	
9.3	
9.4	
9.5	
9.6	
9.7	
9.8	
9.9	
10.0	



Dynamic Probing Results

BS1377 Pt 9, clause 3.2

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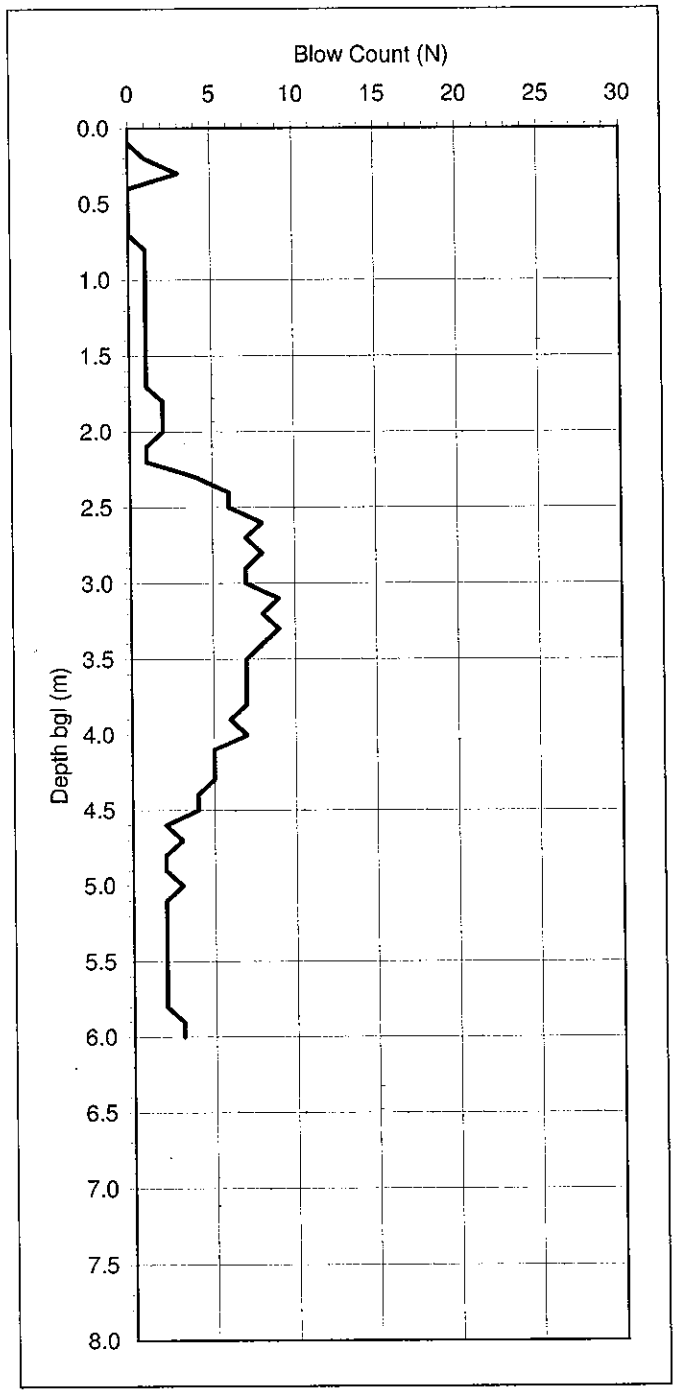
Site: St Giles
Project: ME50141

Probe No: DP4
Date: 27 Feb 08

Hammer mass (kg) 63.5
Fall height (mm) 750

Depth (m)	Blows N
0.1	
0.2	1
0.3	3
0.4	
0.5	
0.6	
0.7	
0.8	1
0.9	1
1.0	1
1.1	1
1.2	1
1.3	1
1.4	1
1.5	1
1.6	1
1.7	1
1.8	2
1.9	2
2.0	2
2.1	1
2.2	1
2.3	4
2.4	6
2.5	6
2.6	8
2.7	7
2.8	8
2.9	7
3.0	7
3.1	9
3.2	8
3.3	9
3.4	8
3.5	7
3.6	7
3.7	7
3.8	7
3.9	6
4.0	7
4.1	5
4.2	5
4.3	5
4.4	4
4.5	4
4.6	2
4.7	3
4.8	2
4.9	2
5.0	3

Depth (m)	Blows N
5.1	2
5.2	2
5.3	2
5.4	2
5.5	2
5.6	2
5.7	2
5.8	2
5.9	3
6.0	3
6.1	
6.2	
6.3	
6.4	
6.5	
6.6	
6.7	
6.8	
6.9	
7.0	
7.1	
7.2	
7.3	
7.4	
7.5	
7.6	
7.7	
7.8	
7.9	
8.0	
8.1	
8.2	
8.3	
8.4	
8.5	
8.6	
8.7	
8.8	
8.9	
9.0	
9.1	
9.2	
9.3	
9.4	
9.5	
9.6	
9.7	
9.8	
9.9	
10.0	



Dynamic Probing Results

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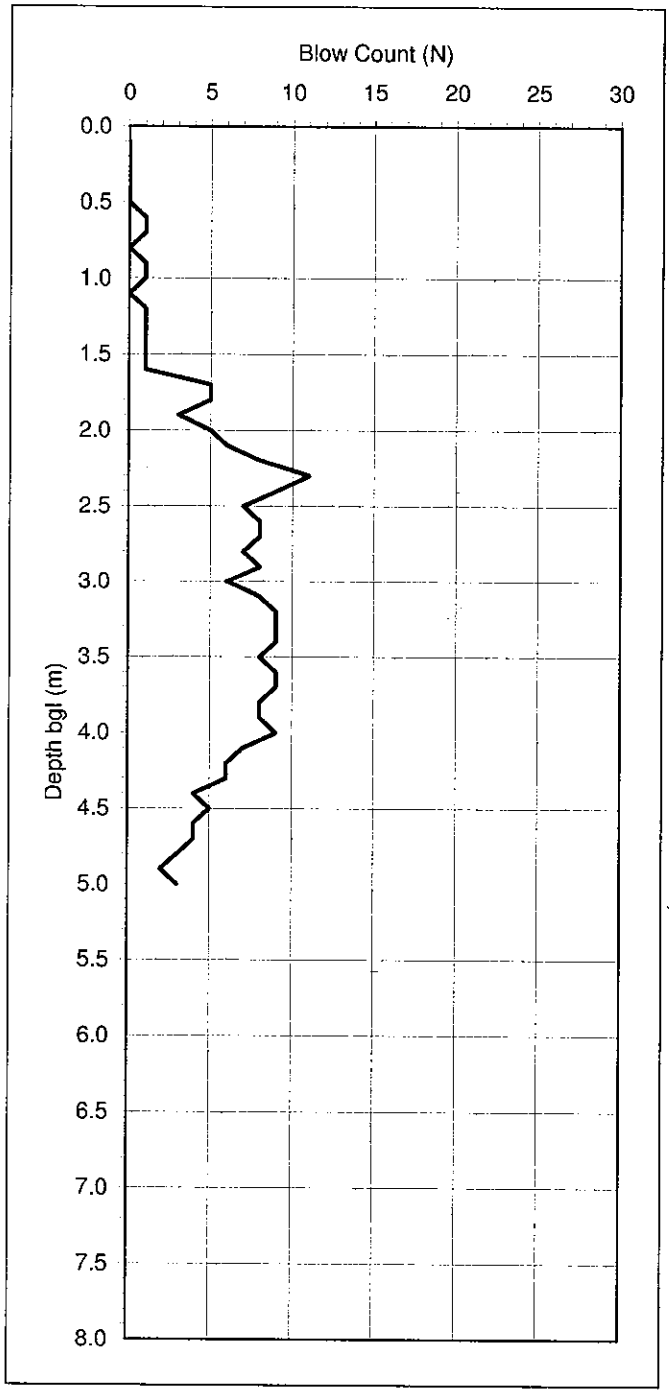
Site: St Giles
Project: ME50141

Probe No: DP5
Date: 27 Feb 08

Hammer mass (kg) 63.5
Fall height (mm) 750

Depth (m)	Blows N
0.1	
0.2	
0.3	
0.4	
0.5	
0.6	1
0.7	1
0.8	
0.9	1
1.0	1
1.1	
1.2	1
1.3	1
1.4	1
1.5	1
1.6	1
1.7	5
1.8	5
1.9	3
2.0	5
2.1	6
2.2	8
2.3	11
2.4	9
2.5	7
2.6	8
2.7	8
2.8	7
2.9	8
3.0	6
3.1	8
3.2	9
3.3	9
3.4	9
3.5	8
3.6	9
3.7	9
3.8	8
3.9	8
4.0	9
4.1	7
4.2	6
4.3	6
4.4	4
4.5	5
4.6	4
4.7	4
4.8	3
4.9	2
5.0	3

Depth (m)	Blows N
5.1	
5.2	
5.3	
5.4	
5.5	
5.6	
5.7	
5.8	
5.9	
6.0	
6.1	
6.2	
6.3	
6.4	
6.5	
6.6	
6.7	
6.8	
6.9	
7.0	
7.1	
7.2	
7.3	
7.4	
7.5	
7.6	
7.7	
7.8	
7.9	
8.0	
8.1	
8.2	
8.3	
8.4	
8.5	
8.6	
8.7	
8.8	
8.9	
9.0	
9.1	
9.2	
9.3	
9.4	
9.5	
9.6	
9.7	
9.8	
9.9	
10.0	



Dynamic Probing Results

BS1377 Pt 9, clause 3.2

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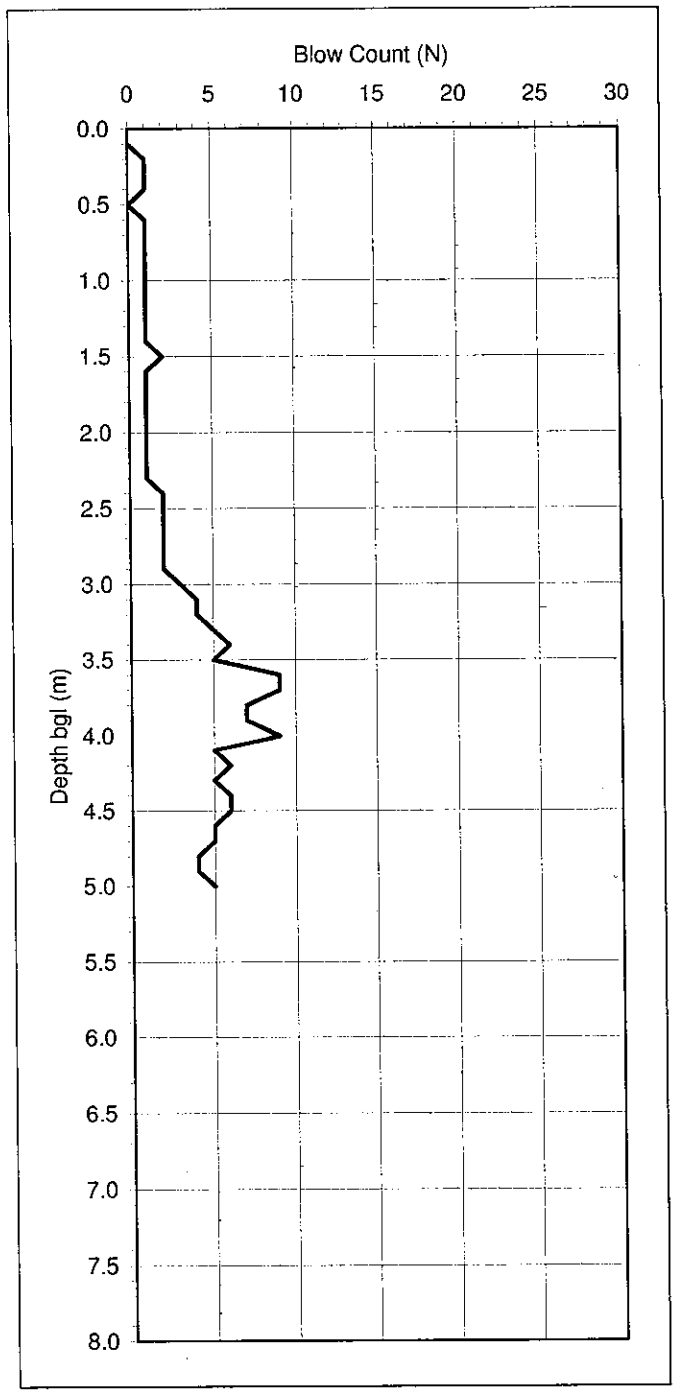
Site: St Giles
Project: ME50141

Probe No: DP6
Date: 27 Feb 08

Hammer mass (kg) 63.5
Fall height (mm) 750

Depth (m)	Blows N
0.1	
0.2	1
0.3	1
0.4	1
0.5	
0.6	1
0.7	1
0.8	1
0.9	1
1.0	1
1.1	1
1.2	1
1.3	1
1.4	1
1.5	2
1.6	1
1.7	1
1.8	1
1.9	1
2.0	1
2.1	1
2.2	1
2.3	1
2.4	2
2.5	2
2.6	2
2.7	2
2.8	2
2.9	2
3.0	3
3.1	4
3.2	4
3.3	5
3.4	6
3.5	5
3.6	9
3.7	9
3.8	7
3.9	7
4.0	9
4.1	5
4.2	6
4.3	5
4.4	6
4.5	6
4.6	5
4.7	5
4.8	4
4.9	4
5.0	5

Depth (m)	Blows N
5.1	
5.2	
5.3	
5.4	
5.5	
5.6	
5.7	
5.8	
5.9	
6.0	
6.1	
6.2	
6.3	
6.4	
6.5	
6.6	
6.7	
6.8	
6.9	
7.0	
7.1	
7.2	
7.3	
7.4	
7.5	
7.6	
7.7	
7.8	
7.9	
8.0	
8.1	
8.2	
8.3	
8.4	
8.5	
8.6	
8.7	
8.8	
8.9	
9.0	
9.1	
9.2	
9.3	
9.4	
9.5	
9.6	
9.7	
9.8	
9.9	
10.0	



Dynamic Probing Results

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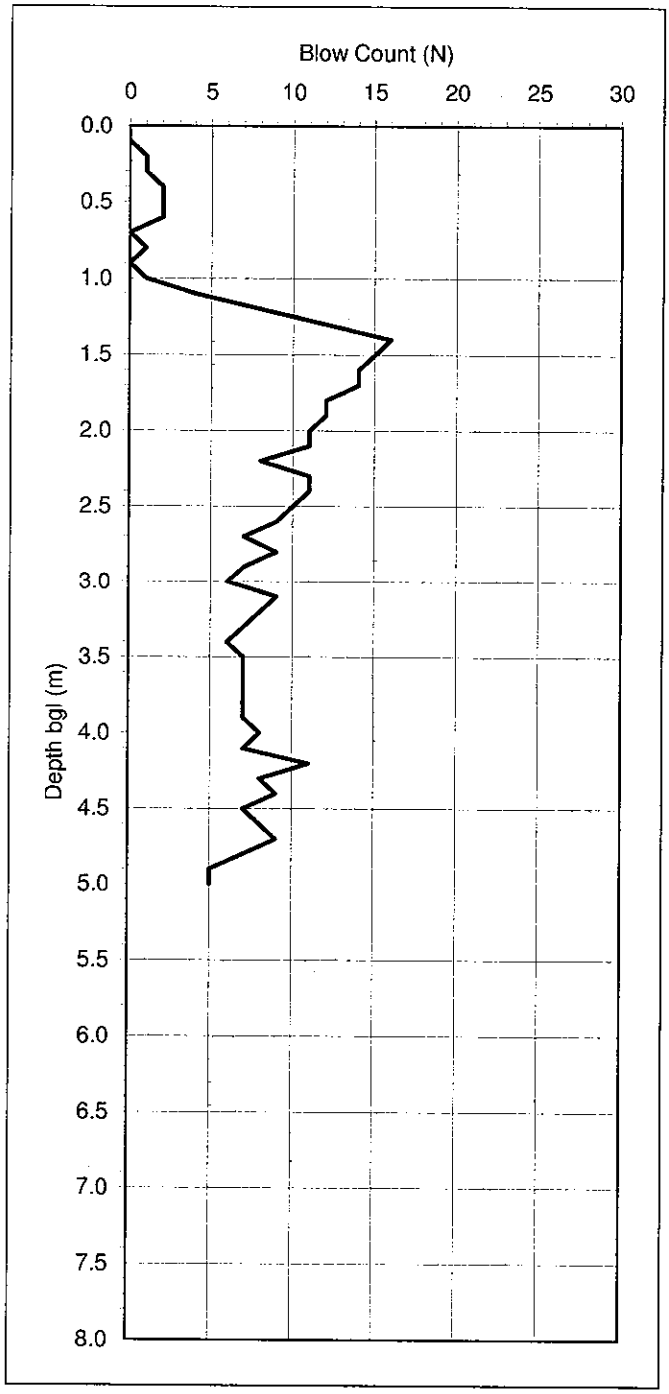
Site: St Giles
Project: ME50141

Probe No: DP7
Date: 27 Feb 08

Hammer mass (kg) 63.5
Fall height (mm) 750

Depth (m)	Blows N
0.1	
0.2	1
0.3	1
0.4	2
0.5	2
0.6	2
0.7	
0.8	1
0.9	
1.0	1
1.1	4
1.2	8
1.3	12
1.4	16
1.5	15
1.6	14
1.7	14
1.8	12
1.9	12
2.0	11
2.1	11
2.2	8
2.3	11
2.4	11
2.5	10
2.6	9
2.7	7
2.8	9
2.9	7
3.0	6
3.1	9
3.2	8
3.3	7
3.4	6
3.5	7
3.6	7
3.7	7
3.8	7
3.9	7
4.0	8
4.1	7
4.2	11
4.3	8
4.4	9
4.5	7
4.6	8
4.7	9
4.8	7
4.9	5
5.0	5

Depth (m)	Blows N
5.1	
5.2	
5.3	
5.4	
5.5	
5.6	
5.7	
5.8	
5.9	
6.0	
6.1	
6.2	
6.3	
6.4	
6.5	
6.6	
6.7	
6.8	
6.9	
7.0	
7.1	
7.2	
7.3	
7.4	
7.5	
7.6	
7.7	
7.8	
7.9	
8.0	
8.1	
8.2	
8.3	
8.4	
8.5	
8.6	
8.7	
8.8	
8.9	
9.0	
9.1	
9.2	
9.3	
9.4	
9.5	
9.6	
9.7	
9.8	
9.9	
10.0	



Dynamic Probing Results

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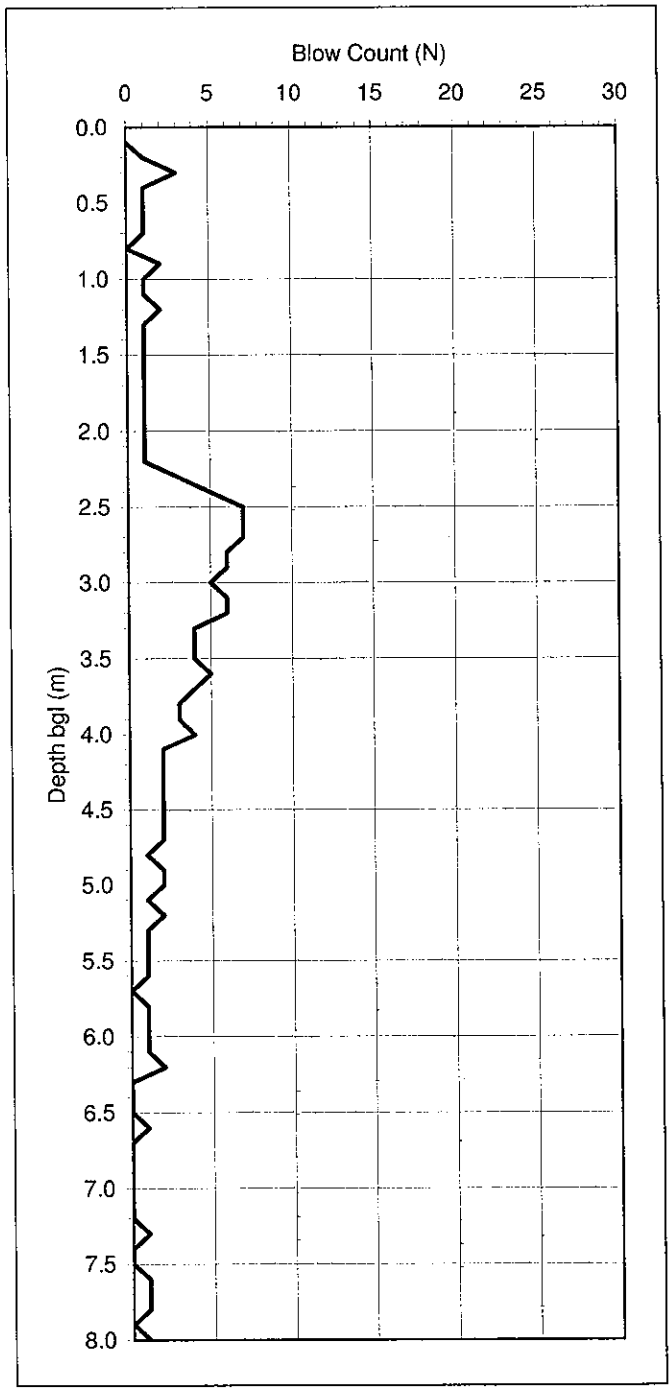
Site: St Giles
Project: ME50141

Probe No: DP8
Date: 27 Feb 08

Hammer mass (kg) 63.5
Fall height (mm) 750

Depth (m)	Blows N
0.1	
0.2	1
0.3	3
0.4	1
0.5	1
0.6	1
0.7	1
0.8	
0.9	2
1.0	1
1.1	1
1.2	2
1.3	1
1.4	1
1.5	1
1.6	1
1.7	1
1.8	1
1.9	1
2.0	1
2.1	1
2.2	1
2.3	3
2.4	5
2.5	7
2.6	7
2.7	7
2.8	6
2.9	6
3.0	5
3.1	6
3.2	6
3.3	4
3.4	4
3.5	4
3.6	5
3.7	4
3.8	3
3.9	3
4.0	4
4.1	2
4.2	2
4.3	2
4.4	2
4.5	2
4.6	2
4.7	2
4.8	1
4.9	2
5.0	2

Depth (m)	Blows N
5.1	1
5.2	2
5.3	1
5.4	1
5.5	1
5.6	1
5.7	
5.8	1
5.9	1
6.0	1
6.1	1
6.2	2
6.3	
6.4	
6.5	
6.6	1
6.7	
6.8	
6.9	
7.0	
7.1	
7.2	
7.3	1
7.4	
7.5	
7.6	1
7.7	1
7.8	1
7.9	
8.0	1
8.1	
8.2	
8.3	
8.4	
8.5	
8.6	
8.7	
8.8	
8.9	
9.0	
9.1	
9.2	
9.3	
9.4	
9.5	
9.6	
9.7	
9.8	
9.9	
10.0	



APPENDIX C

Variable Head Test Results

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CV32 5SY
Tel 01926 889955
Fax 01926 451745
geoenvironmental@jnpgroup.co.uk

forward thinking jnpgroup Consulting Engineers

SOIL INFILTRATION TEST

Project: St Giles

Project No: ME50141

Test Location: WS1 Test No: 1 Date: 11 Mar 2008

Water level during test

Time mins	Depth m bgl
0	4.680
1	4.690
3	4.710
5	4.715
7	4.720
11	4.720
15	4.720
19	4.720
23	4.720
29	4.720
34	4.720
40	4.720

Borehole dimensions

depth (m)	4.86
dia (m)	0.10

$$f = \frac{V_p}{\alpha_p \times t_p}$$

f = soil infiltration rate

Vp = volume of water from 75% to 25% effective depth

αp = Internal surface area at 50% effective depth

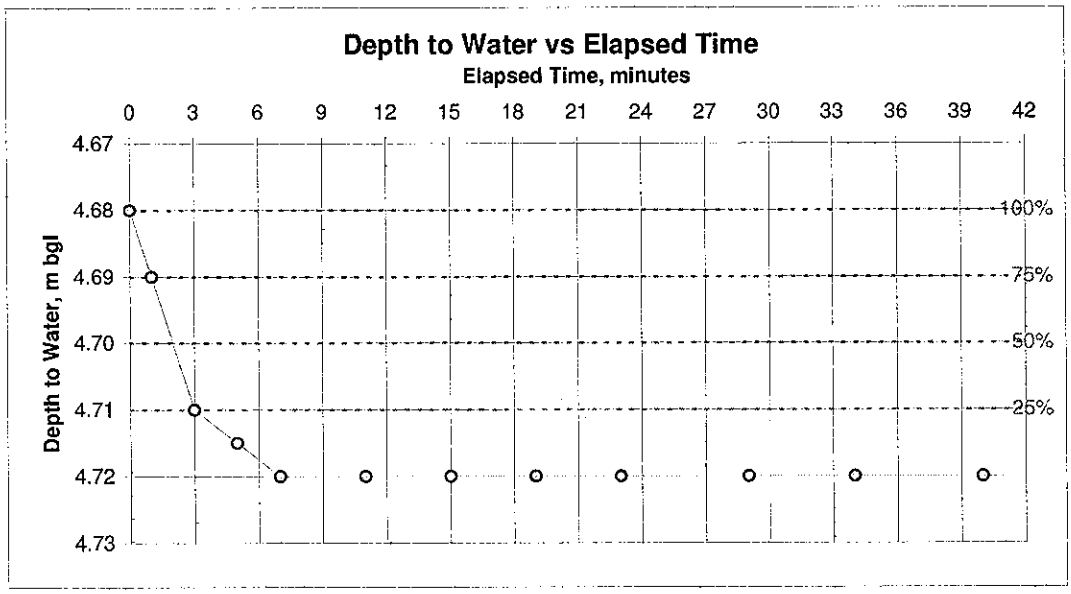
tp = time for the water level to fall from 75% to 25% effective depth

time at 75% effective depth (mins) 1

time at 25% effective depth (mins) 3

(from graph)

Calculated Soil Infiltration Rate = 2.3E-05 m/sec



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SOIL INFILTRATION TEST

Project: St Giles

Project No: ME50141

Test Location: WS1 Test No: 2 Date: 11 Mar 2008

Water level during test

Time mins	Depth m bgl
0	4.650
0.1	4.660
1	4.670
1.45	4.680
2.45	4.690
5	4.700

Borehole dimensions

depth (m)	4.86
dia (m)	0.10

$$f = \frac{V_p}{\alpha_p \times t_p}$$

f = soil infiltration rate

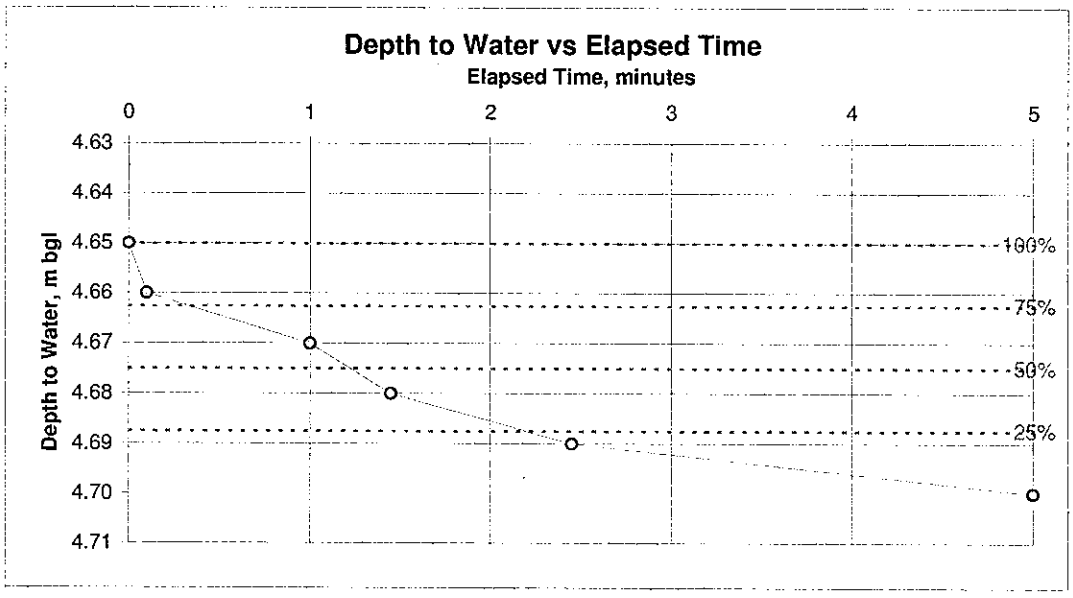
Vp = volume of water from 75% to 25% effective depth

αp = Internal surface area at 50% effective depth

tp = time for the water level to fall from 75% to 25% effective depth

time at 75% effective depth (mins)	0.2
time at 25% effective depth (mins) (from graph)	2.45

Calculated Soil Infiltration Rate = 2.2E-05 m/sec



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SOIL INFILTRATION TEST

Project: St Giles

Project No: ME50141

Test Location: WS5 Test No: 1 Date: 11 Mar 2008

Water level during test

Time mins	Depth m bgl
0	3.580
1	3.950
2	4.010
3	4.170
4	4.220
6	4.290
8	4.360
12	4.450
16	4.500
21	4.540
26	4.570
36	4.600
51	4.650
71	4.660
109	4.660

Borehole dimensions

depth (m)	5.01
dia (m)	0.10

$$f = \frac{V_p}{\alpha_p \times t_p}$$

f = soil infiltration rate

Vp = volume of water from 75% to 25% effective depth

αp = Internal surface area at 50% effective depth

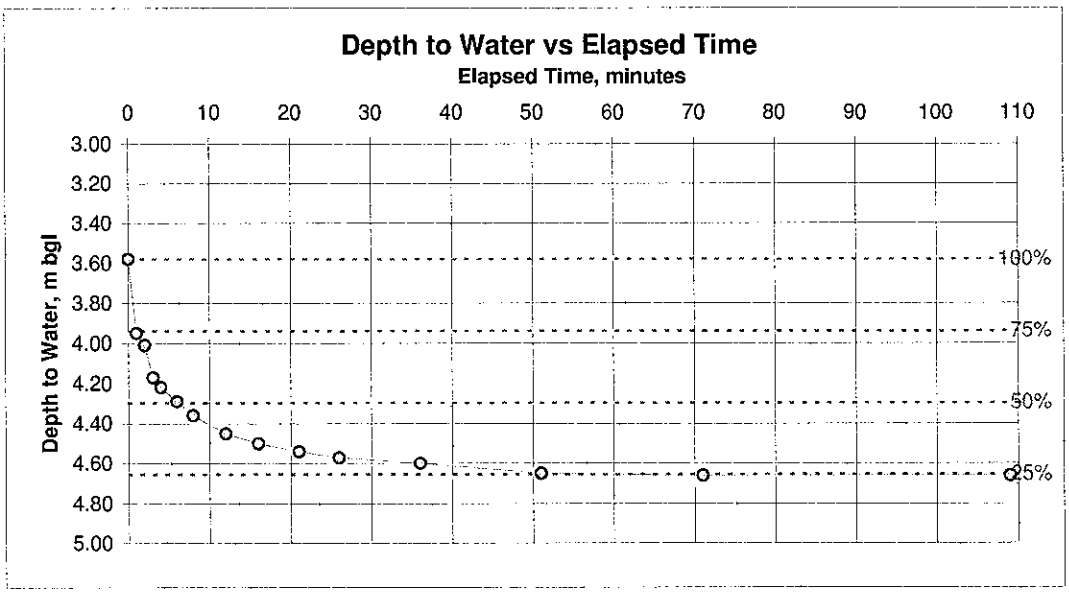
tp = time for the water level to fall from 75% to 25% effective depth

time at 75% effective depth (mins) 1

time at 25% effective depth (mins) 50

(from graph)

Calculated Soil Infiltration Rate = 5.0 E-03 m/sec



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Consulting Engineers

SOIL INFILTRATION TEST

Project: St Giles

Project No: ME50141

Test Location: WS5 Test No: 2 Date: 11 Mar 2008

Water level during test

Time mins	Depth m bgl
0	1.300
1	2.650
2	3.000
3	3.220
4	3.380
5	3.520
6	3.680
8	3.850
10	3.980
12	4.090
14	4.160
17	4.230
20	4.320
23	4.370
28	4.440
33	4.510
38	4.550
48	4.580

Borehole dimensions

depth (m)	5.01
dia (m)	0.10

$$f = \frac{V_p}{\alpha_p \times t_p}$$

f = soil infiltration rate

Vp = volume of water from 75% to 25% effective depth

αp = Internal surface area at 50% effective depth

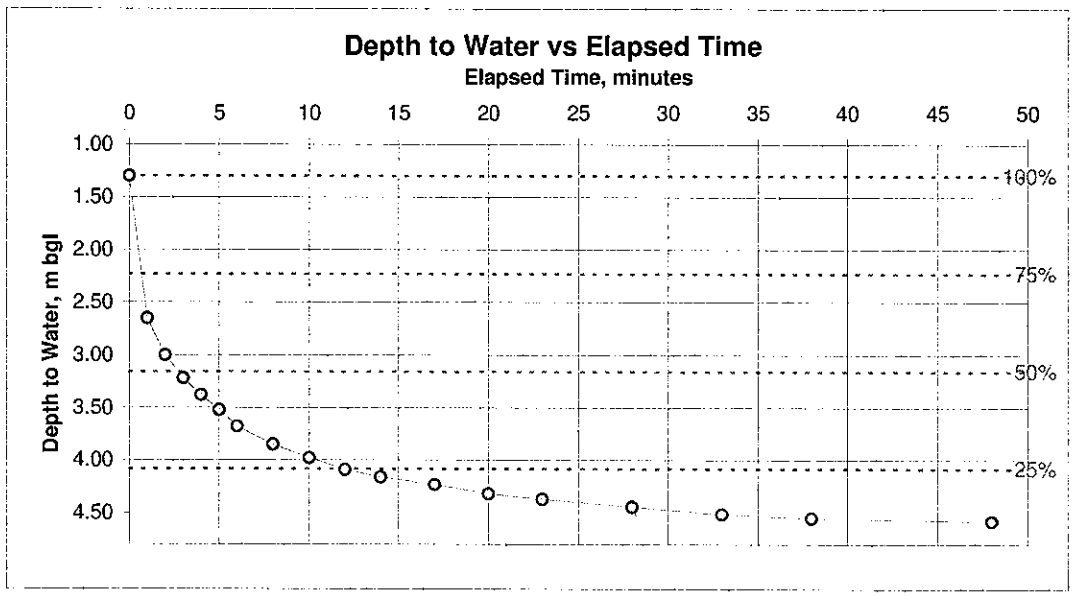
tp = time for the water level to fall from 75% to 25% effective depth

time at 75% effective depth (mins) 0.5

time at 25% effective depth (mins) 12

(from graph)

Calculated Soil Infiltration Rate = 2.□ E-05 m/sec



APPENDIX D

Gas Monitoring Results

GAS MONITORING DATA

forward thinking jnpgroup Consulting Engineers

Site: St Giles

Operator: CH

Project: ME50141

Date: 05 Mar 2008

Weather Sunny

Monitoring Location	Standpipe diameter (mm)	Standpipe Depth (m bgl)	Water Level (m bgl)	Atmos. Pressure (mb)	Differential Pressure (mb)	Ave Flow Rate (litres/hr)	Temp (°C)	Reading Duration (s)	CH_4 (% v/v)	CO_2 (% v/v)	O_2 (% v/v)	CO (ppm)	H_2S (ppm)
WS1	50	4.80	4.70	1036	0	0.0	8	10	0.0	0.9	20.7	0	0
								20	0.0	1.3	20.1	0	0
								30	0.0	1.1	20.0	0	0
								45	0.0	1.3	20.1	0	0
								60	0.0	1.5	19.8	0	0
								90	0.0	0.8	20.2	0	0
								120	0.0	1.3	20.1	0	0
								180	0.0	1.0	20.0	0	0
								240	0.0	0.8	20.6	0	0
								300	0.0	1.7	19.7	0	0
								360	0.0	1.1	20.1	0	0

GAS MONITORING DATA

forward thinking jnpgroup Consulting Engineers

Site: St Giles | **Operator:** CH

Project: ME50141 | **Date:** 05 Mar 2008 | **Weather** Sunny

Monitoring Location	Standpipe diameter (mm)	Standpipe Depth (m bgl)	Water Level (m bgl)	Atmos. Pressure (mb)	Differential Pressure (mb)	Ave Flow Rate (litres/hr)	Temp (°C)	Reading Duration (s)	CH_4 (% v/v)	CO_2 (% v/v)	O_2 (% v/v)	CO (ppm)	H_2S (ppm)
WS3	19	5.00	3.94	1034	0	0.0	8	10	0.0	0.9	21.0	0	0
								20	0.0	1.3	20.0	0	0
								30	0.0	1.4	19.7	0	0
								45	0.0	1.5	19.6	0	0
								60	0.0	1.7	19.5	0	0
								90	0.0	1.9	19.3	0	0
								120	0.0	2.1	19.1	0	0
								180	0.0	2.3	18.9	0	0
								240	0.0	2.3	18.8	0	0
								300	0.0	2.3	18.8	0	0

GAS MONITORING DATA

forward thinking jnpgroup Consulting Engineers

Site: St Giles

Operator: CH

Project: ME50141

Date: 05 Mar 2008

Weather Sunny

Monitoring Location	Standpipe diameter (mm)	Standpipe Depth (m bgl)	Water Level (m bgl)	Atmos. Pressure (mb)	Differential Pressure (mb)	Ave Flow Rate (litres/hr)	Temp (°C)	Reading Duration (s)	CH_4 (% v/v)	CO_2 (% v/v)	O_2 (% v/v)	CO (ppm)	H_2S (ppm)
WS5	50	5.00	DRY	1034	0	0.0	8	10	0.0	0.3	21.1	0	0
								20	0.0	0.4	20.9	0	0
								30	0.0	0.4	20.8	0	0
								45	0.0	0.5	20.7	0	0
								60	0.0	0.5	20.7	0	0
								90	0.0	0.5	20.7	0	0
								120	0.0	0.5	20.7	0	0
								180	0.0	0.5	20.7	0	0
								240	0.0	0.5	20.6	0	0
								300	0.0	0.5	20.6	0	0

GAS MONITORING DATA

forward thinking jnpgroup Consulting Engineers

Site: St Giles

Operator: CH

Project: ME50141

Date: 05 Mar 2008

Weather Sunny

Monitoring Location	Standpipe diameter (mm)	Standpipe Depth (m bgl)	Water Level (m bgl)	Atmos. Pressure (mb)	Differential Pressure (mb)	Ave Flow Rate (litres/hr)	Temp (°C)	Reading Duration (s)	CH_4 (% v/v)	CO_2 (% v/v)	O_2 (% v/v)	CO (ppm)	H_2S (ppm)
WS6	19	5.00	4.96	1034	0	0.0	8	10	0.0	0.8	21.0	0	0
								20	0.0	1.3	20.2	0	0
								30	0.0	1.4	19.9	0	0
								45	0.0	1.4	19.8	0	0
								60	0.0	1.4	19.8	0	0
								90	0.0	1.4	19.7	0	0
								120	0.0	1.5	19.7	0	0
								180	0.0	1.6	19.5	0	0
								240	0.0	1.8	19.2	0	0
								300	0.0	1.9	19.1	0	0
								360	0.0	1.9	19.1	0	0

GAS MONITORING DATA

forward thinking jnpgroup Consulting Engineers

Site: St Giles | **Operator:** CH

Project: ME50141 | **Date:** 11 Mar 2008 | **Weather** Rain

Monitoring Location	Standpipe diameter (mm)	Standpipe Depth (m bgl)	Water Level (m bgl)	Atmos. Pressure (mb)	Differential Pressure (mb)	Ave Flow Rate (litres/hr)	Temp (°C)	Reading Duration (s)	CH_4 (% v/v)	CO_2 (% v/v)	O_2 (% v/v)	CO (ppm)	H_2S (ppm)
WS1	50	4.85	4.73	990	0	0.0	9	10	0.0	0.6	21.0	0	0
								20	0.0	0.7	20.7	0	0
								30	0.0	0.8	20.6	0	0
								45	0.0	0.9	20.5	0	0
								60	0.0	0.6	20.6	0	0
								90	0.0	0.5	20.8	0	0
								120	0.0	0.9	20.4	0	0
								180	0.0	0.8	20.4	0	0
								240	0.0	0.5	20.7	0	0
								300	0.0	0.4	20.9	0	0

GAS MONITORING DATA

forward thinking jnpgroup Consulting Engineers

Site: St Giles

Operator: CH

Project: ME50141

Date: 11 Mar 2008

Weather Rain

Monitoring Location	Standpipe diameter (mm)	Standpipe Depth (m bgl)	Water Level (m bgl)	Atmos. Pressure (mb)	Differential Pressure (mb)	Ave Flow Rate (litres/hr)	Temp (°C)	Reading Duration (s)	CH_4 (% v/v)	CO_2 (% v/v)	O_2 (% v/v)	CO (ppm)	H_2S (ppm)
WS3	19	5.01	3.93	992	0	0.0	9	10	0.0	1.5	20.7	0	0
								20	0.0	2.1	19.4	0	0
								30	0.0	2.2	18.9	0	0
								45	0.0	2.2	18.8	0	0
								60	0.0	2.3	18.8	0	0
								90	0.0	2.3	18.7	0	0
								120	0.0	2.5	18.7	0	0
								180	0.0	2.6	18.6	0	0
								240	0.0	2.7	18.6	0	0
								300	0.0	2.7	18.6	0	0

GAS MONITORING DATA

forward thinking jnpgroup Consulting Engineers

Site: St Giles

Operator: CH

Project: ME50141

Date: 11 Mar 2008

Weather Rain

Monitoring Location	Standpipe diameter (mm)	Standpipe Depth (m bgl)	Water Level (m bgl)	Atmos. Pressure (mb)	Differential Pressure (mb)	Ave Flow Rate (litres/hr)	Temp (°C)	Reading Duration (s)	CH_4 (% v/v)	CO_2 (% v/v)	O_2 (% v/v)	CO (ppm)	H_2S (ppm)
WS5	50	5.01	DRY	990	0	0.0	9	10	0.0	0.1	21.1	0	0
								20	0.0	0.2	21.1	0	0
								30	0.0	0.2	21.1	0	0
								45	0.0	0.2	21.1	0	0
								60	0.0	0.2	21.1	0	0
								90	0.0	0.2	21.1	0	0
								120	0.0	0.2	21.1	0	0
								180	0.0	0.2	21.0	0	0
								240	0.0	0.2	21.1	0	0
								300	0.0	0.3	21.0	0	0
								360	0.0	0.3	21.0	0	0

GAS MONITORING DATA

forward thinking jnpgroup Consulting Engineers

Site: St Giles

Operator: CH

Project: ME50141

Date: 11 Mar 2008

Weather Rain

Monitoring Location	Standpipe diameter (mm)	Standpipe Depth (m bgl)	Water Level (m bgl)	Atmos. Pressure (mb)	Differential Pressure (mb)	Ave Flow Rate (litres/hr)	Temp (°C)	Reading Duration (s)	CH_4 (% v/v)	CO_2 (% v/v)	O_2 (% v/v)	CO (ppm)	H_2S (ppm)
WS6	19	5.03	4.80	990	0	0.0	9	10	0.0	0.9	20.9	0	0
								20	0.0	1.6	20.0	0	0
								30	0.0	1.6	19.7	0	0
								45	0.0	1.6	19.6	0	0
								60	0.0	1.6	19.5	0	0
								90	0.0	1.7	19.5	0	0
								120	0.0	1.8	19.4	0	0
								180	0.0	1.9	19.3	0	0
								240	0.0	2.1	19.0	0	0
								300	0.0	2.2	18.9	0	0
								360	0.0	2.2	18.9	0	0

GAS MONITORING DATA

forward thinking jnpgroup Consulting Engineers

Site: St Giles

Operator: CW

Project: ME50141

Date: 18 Mar 2008

Weather Overcast

Monitoring Location	Standpipe diameter (mm)	Standpipe Depth (m bgl)	Water Level (m bgl)	Atmos. Pressure (mb)	Differential Pressure (mb)	Ave Flow Rate (litres/hr)	Temp (°C)	Reading Duration (s)	CH_4 (% v/v)	CO_2 (% v/v)	O_2 (% v/v)	CO (ppm)	H_2S (ppm)
WS1	50	5.00	4.95	1025	0	0.0	8	15	0.0	0.3	20.7	0	0
								30	0.0	0.3	20.6	0	0
								60	0.0	0.8	20.0	0	0
								120	0.0	0.8	20.0	0	0
								180	0.0	0.8	20.1	0	0
WS3	19	4.60	3.90	1024	0	0.0	8	15	0.0	0.7	20.2	0	0
								30	0.0	2.4	17.9	0	0
								60	0.0	2.5	17.5	0	0
								120	0.0	2.7	18.3	0	0
								180	0.0	2.7	18.8	0	0
								240	0.0	2.7	18.8	0	0

GAS MONITORING DATA

forward thinking jnpgroup Consulting Engineers

Site: St Giles

Operator: CW

Project: ME50141

Date: 18 Mar 2008

Weather Overcast

Monitoring Location	Standpipe diameter (mm)	Standpipe Depth (m bgl)	Water Level (m bgl)	Atmos. Pressure (mb)	Differential Pressure (mb)	Ave Flow Rate (litres/hr)	Temp (°C)	Reading Duration (s)	CH_4 (% v/v)	CO_2 (% v/v)	O_2 (% v/v)	CO (ppm)	H_2S (ppm)
WS5	50	4.70	DRY	1024	0	0.0	8	15	0.0	0.4	20.1	0	0
								30	0.0	0.7	19.9	0	0
								60	0.0	0.7	19.9	0	0
								120	0.0	0.6	20.0	0	0
								180	0.0	0.6	20.0	0	0
WS6	19	5.00	4.80	1025	0	0.0	8	15	0.0	1.9	19.6	0	0
								30	0.0	2.1	19.2	0	0
								60	0.0	2.1	19.2	0	0
								120	0.0	2.0	19.2	0	0
								180	0.0	2.0	19.4	0	0
								240	0.0	1.9	19.5	0	0

APPENDIX E

Geotechnical Laboratory Test Results

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BUREAU VERITAS

UKAS TESTING 0199

TEST REPOR

Determination of Particle Size Distribution

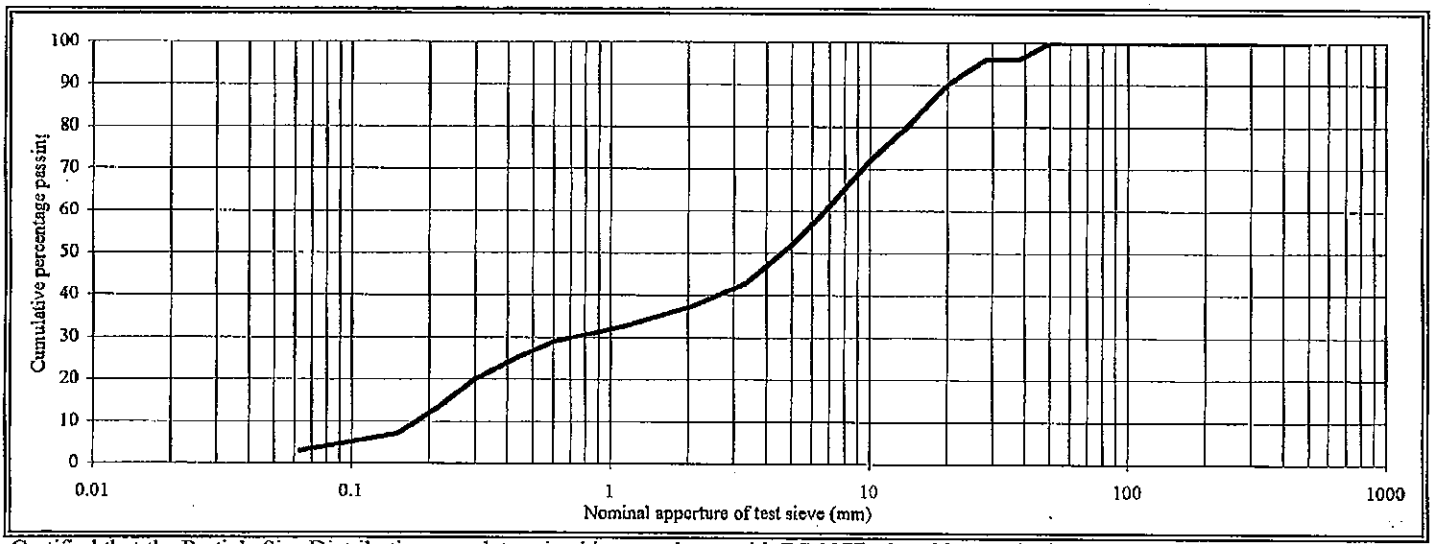
Client:	JNP Group	Report No:	50132727/08/3
Client Address:	4-12 Morton Street	Our Ref:	DAM0016798
	Leamington Spa	Lab Ref:	45069951
	Warks		
Postcode:	CV32 5SY		
Contact:	Emma Small	Location:	WS6
		Depth (m):	3.50
Site:	St. Giles		
Sampled by:	Client	Date Sampled:	Not Given
Sampled from:	Site	Date Received:	06.03.08
Supplier:	Client	Sample Type:	Bulk
Source:	Site	Sample Mass (kg):	2.7

Description: Orange SAND and gravel

Specification: Not Required

Comments:

SIEVE ANALYSIS		
BS Sieve (mm)	Passing (%)	Material Specification
500	100	
300	100	
125	100	
100	100	
90	100	
75	100	
63	100	
50	100	
37.5	96	
28	96	
20	90	
14	80	
10	72	
6.3	58	
5	52	
3.35	43	
2	37	
1.18	33	
0.600	29	
0.425	25	
0.300	20	
0.212	13	
0.150	7	
0.063	3	



Certified that the Particle Size Distribution was determined in accordance with BS 1377 - 2 : 1990, Method 9.2
Method of Preparation: BS 1377 - 1 & 2 : 1990

Page: 1 of 1
Date: 19.03.08

Signed: M. Carr

For and on behalf of Bureau Veritas Laboratories
a trading division of Bureau Veritas B&I Ltd

[✓] M. Carr - Dept Sect Manager
[ ] L. McGreevy - Dept Sect Manager
[ ] D. Berrill - Laboratory Manager

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BUREAU VERITAS

UKAS TESTING 0199

TEST REPOR

Determination of Particle Size Distribution

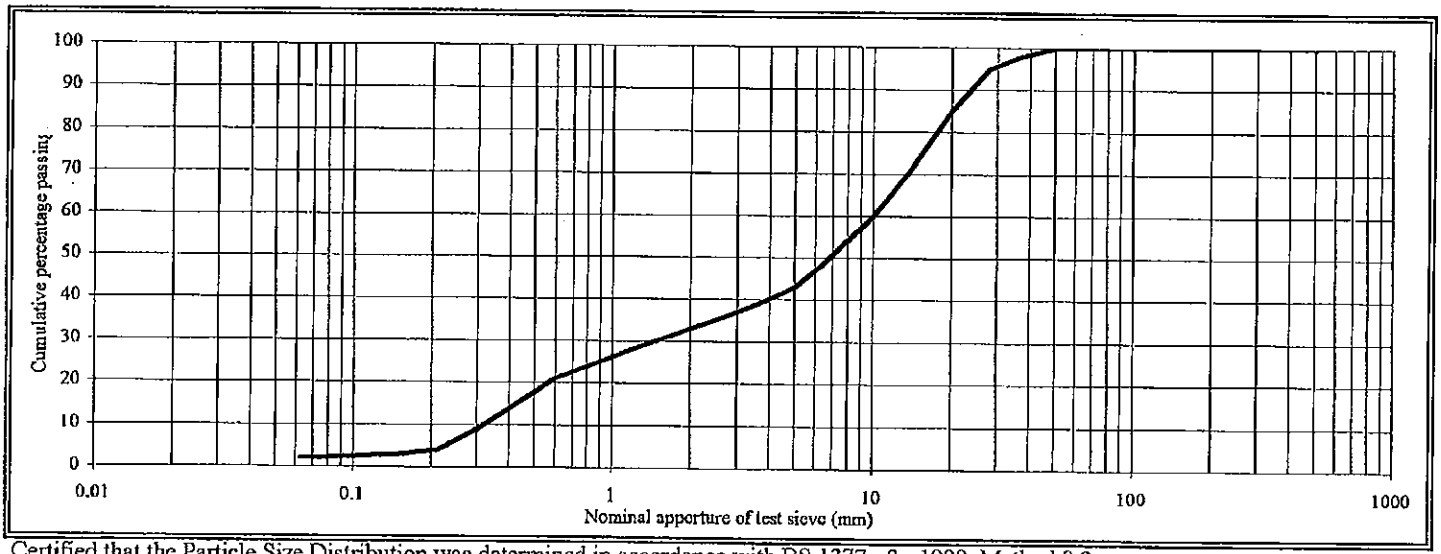
Client:	JNP Group	Report No:	50132727/08/4
Client Address:	4-12 Morton Street	Our Ref:	DAM0016798
	Leamington Spa	Lab Ref:	45069953
	Warks		
Postcode:	CV32 5SY		
Contact:	Emma Small	Location:	WS7
		Depth (m):	1.50
Site:	St. Giles		
Sampled by:	Client	Date Sampled:	Not Given
Sampled from:	Site	Date Received:	06.03.08
Supplier:	Client	Sample Type:	Bulk
Source:	Site	Sample Mass (kg):	5.4

Description: Orange SAND and gravel

Specification: Not Required

Comments:

SIEVE ANALYSIS		
BS Sieve (mm)	Passing (%)	Material Specification
500	100	
300	100	
125	100	
100	100	
90	100	
75	100	
63	100	
50	100	
37.5	98	
28	95	
20	85	
14	71	
10	60	
6.3	48	
5	43	
3.35	38	
2	33	
1.18	28	
0.600	21	
0.425	15	
0.300	9	
0.212	4	
0.150	3	
0.063	2	



Certified that the Particle Size Distribution was determined in accordance with BS 1377 - 2 : 1990, Method 9.2
Method of Preparation: BS 1377 - 1 & 2 : 1990

Page: 1 of 1
Date: 19.03.08

Signed: M. Carr

For and on behalf of Bureau Veritas Laboratories
a trading division of Bureau Veritas B&I Ltd

[✓] M. Carr - Dept Sect Manager
[ ] L. McGreevy - Dept Sect Manager
[ ] D. Berrill - Laboratory Manager

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BUREAU VERITAS

UKAS TESTING
0199

TEST REPOR

Determination of Moisture Content and Atterberg Limits

Client:	JNP Group	Report No:	50132727/08/1
Client Address:	4-12 Morton Street	Our Ref:	DAM0016798
	Leamington Spa		
	Warks	Supplier:	Client
Postcode:	CV32 5SY	Sampled by:	Client
Contact:	Emma Small	Date Sampled:	Not Given
		Date Received:	06.03.08
Site:	St. Giles	Tested From:	06.03.08 to 13.03.08
		Sample Type:	Bulk

Test Results:

Laboratory Reference	Location	Depth (m)	Description	Moisture Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	% Passing 425µm (Estimated)
45069934	WS1	1.5	Soft brown slightly sandy CLAY	25	35	21	14	100
45069935	WS1	2.0	Soft to firm orange brown slightly sandy CLAY	23	-	-	-	-
45069936	WS1	2.5	Firm brown slightly sandy CLAY	26	-	-	-	-
45069937	WS1	3.5	Firm orange brown slightly sandy CLAY	22	-	-	-	-
45069938	WS1	4.5	Soft to firm orange brown slightly sandy CLAY with rare gravel	21	-	-	-	-
45069939	WS2	1.2	Soft brown CLAY with silt	22	38	19	19	100
45069940	WS3	0.5	Soft brown CLAY with silt	25	41	20	21	100
45069941	WS3	1.6	Soft brown CLAY with occasional gravel	21	34	16	18	82
45069942	WS4	0.4	Soft brown CLAY with silt	23	34	20	14	100
45069943	WS4	1.0	Soft brown CLAY with silt	23	40	20	20	100

Sample Preparation: As Received

* Washed over 425µm BS Test Sieve

** Actual % passing 425µm from separate grading analysis

Certified that the laboratory testing was carried out in accordance with BS 1377-2: 1990: Method 3.2, 4.4 and 5

Page: 1 of 1
Date: 17.03.08

Signed M. Carr

For and on behalf of Bureau Veritas Laboratories
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BUREAU VERITAS

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TEST REPOR

Determination of Moisture Content and Atterberg Limits

Client:	JNP Group	Report No:	50132727/08/2
Client Address:	4-12 Morton Street	Our Ref:	DAM0016798
	Leamington Spa		
	Warks	Supplier:	Client
Postcode:	CV32 5SY	Sampled by:	Client
Contact:	Emma Small	Date Sampled:	Not Given
		Date Received:	06.03.08
Site:	St. Giles	Tested From:	06.03.08 to 13.03.08
		Sample Type:	Bulk

Test Results:

Laboratory Reference	Location	Depth (m)	Description	Moisture Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	% Passing 425µm (Estimated)
45069944	WS5	1.50	Soft brown CLAY with silt	23	39	19	20	100
45069946	WS6	0.40	Firm brown CLAY with silt and occasional gravel	19	-	-	-	-
45069947	WS6	1.00	Firm orange brown slightly sandy CLAY	22	-	-	-	-
45069948	WS6	1.90	Soft brown CLAY with silt	23	39	18	21	100
45069949	WS6	2.50	Soft to firm orange brown slightly sandy CLAY	23	-	-	-	-
45069950	WS6	2.65	Firm orange brown sandy gravelly CLAY	8.4	-	-	-	-
45069952	WS7	0.50	Soft brown CLAY with silt and occasional gravel	18	38	19	19	95
45069954	WS8	1.00	Soft to firm orange brown slightly sandy CLAY	22	-	-	-	-
45069955	WS8	1.50	Firm orange brown slightly sandy CLAY	23	-	-	-	-
45069956	WS8	1.90	Soft to firm orange brown slightly sandy CLAY with occasional gravel	22	-	-	-	-
45069957	WS8	2.50	Swoft orange brown CLAY with silt	19	29	13	16	100

Sample Preparation: As Received

* Washed over 425µm BS Test Sieve

** Actual % passing 425µm from separate grading analysis

Certified that the laboratory testing was carried out in accordance with BS 1377-2: 1990: Method 3.2, 4.4 and 5

Page: 1 of 1
Date: 17.03.08

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APPENDIX F

Chemical Laboratory Test Results

Summary of Chemical Analysis
Soil Samples

Our Ref: 08-17880
Client Ref: ME50141
Contract Title: St Giles

		Lab No.	121827	121828	121829	121830	121831	121832
		Sample Ref	WS1	WS2	WS3	WS4	WS5	WS6
		Depth	0.50	0.40	0.20	0.20	0.30	0.35
		Other Ref	ES 1	ES 1	ES 1	ES 1	ES 1	ES 1
		Sample Type						
Test	Units	DETSxx						
Arsenic	mg/kg	DETS 042#	9	9	9	8	8	7
Cadmium	mg/kg	DETS 042	0.8	1.0	0.9	0.7	0.7	0.7
Chromium	mg/kg	DETS 042	17	19	22	18	18	19
Hexavalent Chromium	mg/kg	DETS 038*	< 1	< 1	< 1	< 1	< 1	< 1
Copper	mg/kg	DETS 042	58	37	38	17	23	16
Lead	mg/kg	DETS 042	390	770	330	210	250	62
Mercury	mg/kg	DETS 081*	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Nickel	mg/kg	DETS 042	11	14	16	13	13	13
Selenium	mg/kg	DETS 042	< 0.3	0.3	< 0.3	< 0.3	< 0.3	0.3
Zinc	mg/kg	DETS 042#	310	560	240	97	150	70
Boron (water soluble)	mg/kg	DETS 020#	0.4	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Thiocyanate	mg/kg	DETS 025	1.3	< 1.0	< 1.0	< 1.0	2.6	< 1.0
Cyanide total	mg/kg	DETS 067#	0.4	< 0.1	0.2	< 0.1	< 0.1	0.2
Cyanide free	mg/kg	DETS 067#	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Sulphide	mg/kg	DETS 024#	< 10	< 10	20	16	< 10	< 10
Total Sulphate as SO4	%	DETS 075#	0.07	0.15	0.09	0.05	0.09	0.04
Total Sulphur as S	%	DETS 064*	0.03	0.05	0.04	0.02	0.03	0.01
pH		DETS 008#	9.2	8.4	8.6	8.6	9.8	8.9
Acenaphthene	mg/kg	DETS 050	< 0.1	< 0.1	0.1	< 0.1	< 0.1	< 0.1
Acenapthylene	mg/kg	DETS 050	0.1	0.3	< 0.1	0.1	0.1	0.3
Anthracene	mg/kg	DETS 050	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(a)anthracene	mg/kg	DETS 050	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(a)pyrene	mg/kg	DETS 050	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(b)fluoranthene	mg/kg	DETS 050	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(k)fluoranthene	mg/kg	DETS 050	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(g,h,i)perylene	mg/kg	DETS 050	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Chrysene	mg/kg	DETS 050	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Dibenzo(a,h)anthracene	mg/kg	DETS 050	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluoranthene	mg/kg	DETS 050	< 0.1	0.2	< 0.1	< 0.1	< 0.1	< 0.1
Fluorene	mg/kg	DETS 050	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Indeno(1,2,3-c,d)pyrene	mg/kg	DETS 050	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Napthalene	mg/kg	DETS 050	0.1	0.1	0.2	0.2	0.2	0.2
Phenanthrene	mg/kg	DETS 050	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Pyrene	mg/kg	DETS 050	< 0.1	0.1	< 0.1	< 0.1	0.2	< 0.1
PAH	mg/kg	DETS 050	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Phenol - Monohydric	mg/kg	DETS 067#	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3

Summary of Chemical Analysis
Soil Samples

Our Ref: 08-17880
Client Ref: ME50141
Contract Title: St Giles

		Lab No.	121833	121834
		Sample Ref	WS7	WS8
		Depth	0.30	0.40
		Other Ref	ES 1	ES 1
		Sample Type		
Test	Units	DETSxx		
Arsenic	mg/kg	DETS 042#	9	7
Cadmium	mg/kg	DETS 042	0.7	0.7
Chromium	mg/kg	DETS 042	22	21
Hexavalent Chromium	mg/kg	DETS 038*	< 1	< 1
Copper	mg/kg	DETS 042	21	12
Lead	mg/kg	DETS 042	49	47
Mercury	mg/kg	DETS 081*	< 0.3	< 0.3
Nickel	mg/kg	DETS 042	16	14
Selenium	mg/kg	DETS 042	< 0.3	< 0.3
Zinc	mg/kg	DETS 042#	61	56
Boron (water soluble)	mg/kg	DETS 020#	< 0.2	< 0.2
Thiocyanate	mg/kg	DETS 025	1.8	< 1.0
Cyanide total	mg/kg	DETS 067#	0.3	0.4
Cyanide free	mg/kg	DETS 067#	< 0.1	< 0.1
Sulphide	mg/kg	DETS 024#	< 10	< 10
Total Sulphate as SO4	%	DETS 075#	0.03	0.03
Total Sulphur as S	%	DETS 064*	0.01	0.01
pH		DETS 008#	8.9	8.8
Acenaphthene	mg/kg	DETS 050	< 0.1	< 0.1
Acenapthylene	mg/kg	DETS 050	< 0.1	< 0.1
Anthracene	mg/kg	DETS 050	0.7	< 0.1
Benzo(a)anthracene	mg/kg	DETS 050	< 0.1	2.1
Benzo(a)pyrene	mg/kg	DETS 050	< 0.1	< 0.1
Benzo(b)fluoranthene	mg/kg	DETS 050	< 0.1	< 0.1
Benzo(k)fluoranthene	mg/kg	DETS 050	< 0.1	< 0.1
Benzo(g,h,i)perylene	mg/kg	DETS 050	< 0.1	< 0.1
Chrysene	mg/kg	DETS 050	< 0.1	< 0.1
Dibenzo(a,h)anthracene	mg/kg	DETS 050	< 0.1	< 0.1
Fluoranthene	mg/kg	DETS 050	< 0.1	< 0.1
Fluorene	mg/kg	DETS 050	0.3	< 0.1
Indeno(1,2,3-c,d)pyrene	mg/kg	DETS 050	< 0.1	< 0.1
Napthalene	mg/kg	DETS 050	0.2	< 0.1
Phenanthrene	mg/kg	DETS 050	< 0.1	< 0.1
Pyrene	mg/kg	DETS 050	< 0.1	< 0.1
PAH	mg/kg	DETS 050	< 5.0	< 5.0
Phenol - Monohydric	mg/kg	DETS 067#	< 0.3	< 0.3

APPENDIX G

Limitations

1 NOTES ON LIMITATIONS

1.1 Geo-environmental Investigations

The investigation of the site has been carried out to provide sufficient information concerning the bearing capacity of the cohesive strata around the footings of the existing buildings and beneath the footprint of the proposed new build houses. The exploratory holes undertaken, which investigate only a small volume of the ground in relation to the size of the site can only provide a general indication of site conditions. The opinions provided and recommendations given in this report are based on the ground conditions apparent at the site of each of the exploratory holes. There may be exceptional ground conditions elsewhere on the site which have not been disclosed by this investigation and which have therefore not been taken into account in this report. The comments made on groundwater conditions are based on observations made at the time that site work was carried out. It should be noted that groundwater levels will vary owing to seasonal and weather related effects. The scope of the investigation was selected on the basis of the specific development proposed by the Client and may be inappropriate to another form of development or scheme.



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