

A GROUND INVESTIGATION REPORT FOR PROPOSED STUDENT ACCOMMODATION AT:

43 LONDON STREET, READING, RG1 4PS



CLIENT:	M K Build Limited
ENGINEER:	MMC (JPSE Construction Limited)
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AF Howland Associates Limited
The Old Exchange
Newmarket Road
Cringleford
Norwich
NR4 6UF

Tel: 01603 250754
Email: admin@howland.co.uk
Website: www.howland.co.uk

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1. INTRODUCTION

A F Howland Associates Limited was instructed by M K Build Limited (the “Client”) to carry out a ground investigation at 43 London Street, Reading, RG1 4PS (Drawing 21.173/01). This was required to provide information on the subsoil conditions and relevant geotechnical and geo-environmental parameters for the proposed redevelopment of the site for student accommodation. This is understood to involve the part or complete demolition of existing buildings and the construction of 21 flats with associated service enclosures, parking and landscaping.

The investigation was also required to address condition 23 of planning approval referenced 191043 with Reading Borough Council.

The proposals are presented on Douglas Stephen Partnership drawings LSR 011 to LSR 017, LSR 020 and LSR 030 to 036, which are included in Appendix E for reference.

This report provides the factual details of the fieldwork and laboratory testing undertaken during the investigation and discusses the findings with respect to the proposed development. The report follows on from a Phase I Environmental Risk Assessment Report (Aviron Associates Limited, 2019), which should be referred to for the background data pertinent to the scheme.

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2. BACKGROUND

2.1 SITE DESCRIPTION

The site is located off London Street in the centre of Reading at National Grid reference 471842, 173149.

The site lay within a mixed residential and commercial area and comprised a dental practice (43 London Street), an adjoining chapel and a car park.

2.2 GENERAL GEOLOGY

Geological mapping (BGS, 2021) indicates the site to be underlain by bedrock geology of Chalk, comprising the undifferentiated formations of the Seaford and Newhaven Chalk, overlain by superficial sand and gravel deposits of the Taplow Gravel Member.

The **Chalk** is a white very pure carbonate debris of microfossil skeletal material laid down during the Cretaceous Period. The Chalk is naturally fissured and since it is water soluble these may be open as a result of solution, producing dissolution features, and therefore very high secondary permeability. Where sand and gravel overlies actively forming dissolution features it tends to move downward under gravity to fill any developing void in the underlying chalk. The result is loosening of the overlying material which can become destabilised by one, or all, of the following three factors:

- the addition of water which can result in the washing away of fine material,
- vibrations causing an increase in density, or
- loading due to a building or construction above.

This eventually results in subsidence at the surface. A more clayey or weakly cemented material may be able to bridge temporarily over a developing solution pipe, preventing progressive loosening of overlying deposits. A cavity may form in this scenario which could be destabilised by the above factors and cause the cavity to migrate upwards. The resulting collapse can be sudden.

Additionally, Chalk is very susceptible to freeze-thaw action and its upper levels may show the evidence of severe disruption and fracturing as a result of the climatic changes in the geologic past. Besides an increase in the frequency of fracturing this disruption also allowed an increase in the moisture content producing a softer material, generally referred to as 'putty chalk'.

The Chalk has been historically mined in Reading. In some parts of the city the mines pose a continuing subsidence hazard. It is not known if the site is underlain by old workings but mines have been found within the surrounding area and the full extent of mines within the city has not been recorded.

The **Taplow Gravel Member** is a river terrace deposit and comprises sand and gravel, locally with lenses of silt, clay or peat. It was derived from chalk and younger Eocene deposits during the Pleistocene and laid down while rivers were flowing with greater discharges than today. Subsequent readjustment has left these deposits as terraces along valley sides or as lag deposits along the floor of present day valleys. They comprise a superficial sequence of flint, sand and gravel, locally displaying vertical sorting. Terraces may be capped by finer alluvium, but often this has been removed by later erosion. Towards the edges of the terraces the material has often been reworked and transported so that it may be found draped over lower levels than those at which it was originally deposited.

3. FIELDWORK

Fieldwork was carried out on 6, 7 and 8 July 2021 and comprised two cable percussive boreholes, five windowless dynamic sampling holes, five dynamic probes, three dynamic cone penetrometer tests and two falling head permeability tests.

The exploratory hole positions were set out in general accordance with the requirements of the Client, as shown approximately on Drawing 21.173/02. The National Grid references, and the elevation of the location relative to Ordnance Datum, were measured using a Hemisphere S320 VRS GPS (RTK) system by AFHA.

A cable avoidance tool (CAT) was used to sweep the locations of the exploratory hole positions and the immediate surrounding area to locate any potential services and the position adjusted as necessary. A starter pit was also excavated by hand at the borehole, windowless dynamic sampling hole and dynamic probe locations to provide direct inspection for services.

Sampling, soil descriptions and *in situ* tests were carried out in accordance with BS EN1997-2:2007 Eurocode 7 and its UK National Annex supported by BS 5930:2015 (BSI, 2015). Representative specialist environmental samples were also collected for subsequent laboratory analysis. The environmental samples were placed in dedicated containers, stored in cool boxes and delivered to a UKAS accredited facility for analysis of possible contaminants.

The **boreholes**, referenced BH01 and BH02, were taken to 15 m and 25 m depth respectively, using conventional cable percussive techniques ('shell and auger') in 150 mm diameter casing. Disturbed samples were taken for potential laboratory analysis, and also to allow for later inspection of the materials encountered, and to facilitate accurate logging. Standard penetration tests (SPT) were carried out using a split barrel sampler (SPT). The SPT N-value was taken as the number of blows for 300 mm of penetration, following a seating drive of 150 mm or 25 blows.

The **windowless dynamic sampling holes**, referenced WS01 to WS05, were advanced with a tracked dynamic sampling rig to a depth of 3.45 m below ground level (bgl). The sampling system utilises a 63.5 kg weight falling a distance of 750 mm to drive rods and sampling tubes into the ground, these are then extracted and the continuous samples

described and subsampled for possible laboratory testing. Standard penetration tests (SPT) were also carried out at regular intervals using a split barrel sampler. The N-value was taken as the number of blows for 300 mm of penetration, following a seating drive of 150 mm or 25 blows.

The **dynamic probes**, referenced DP01 to DP05, were carried out following procedures described in BS 1377: 1990 until 5.0 m bgl. The equipment utilises a 15 cm² cone with 32 mm diameter driving rods, which are driven into the ground by a percussion hammer weighing 63.5 kg falling a distance of 0.75 m. The number of blows N100 are recorded for each 100 mm penetration of the probe and plotted against depth. Following each metre of penetration, a torque wrench is used to turn the driving rods through one revolution and the measured torque is recorded.

The **dynamic cone penetrometer (DCP) tests**, referenced DCP01, DCP02 and DCP03, were carried out with and held equipment utilising an 8 kg hammer dropped through a height of 575 mm. The tests were taken to a depth of 1.1 m bgl. The dropped weight hammers a cone with an angle of 60° and maximum diameter of 20 mm into the ground to determine the in-situ California Bearing Ratio (CBR). The instrument is held vertically and the hammer raised to the specified height and left to drop freely. Readings were taken of the penetration rate per blow. After completing the test, the DCP is removed by tapping the hammer upwards against the handle.

The CBR value was calculated based on the following:

$$\text{TRL equation: } \log_{10} (\text{CBR}) = 2.48 - 1.057 \times \log_{10} (\text{penetration rate})$$

Following completion of the DCP tests the soil was excavated to the depth limit of the test and the sequence of deposits sampled and described.

The **falling head permeability tests** were carried out in accordance with the procedures given in BS EN1997-2:2007 Eurocode 7 and its UK National Annex supported by BS 5930: 2015+A1:2020. Two tests were undertaken in BH02. However, in most instances the test is not a measure of true permeability which can only be gained where a head of water is naturally present within the test section. The results should therefore be taken as indicative.

The exploratory holes were monitored for **groundwater** ingress during advance. Upon encountering groundwater, work was temporarily halted to allow the level to stabilise, recording the water level after a period of twenty minutes. To allow for gas monitoring, slotted standpipe piezometers were installed in windowless dynamic sampling holes WS01, WS02, WS03 and WS05. These comprised a 50 mm diameter slotted PVC access tube, which was surrounded by a granular filter and sealed at the top by bentonite. A gas bung was attached to the top of each installation to allow monitoring to take place.

Subsequent to the completion of the fieldwork, AFHA returned to site six times to carry out **gas and water monitoring** between 16 July and 20 August 2021. Gas monitoring was carried out using a Geotechnical Instruments GA5000 portable gas analyser, in general accordance with the guidelines presented in CIRIA C665 (Wilson et al, 2007) and BS 8576:2013 and involved the following steps:

- Average flow was monitored for a period of one minute,
- gases (CH₄, CO₂, O₂, CO and H₂S) were monitored for a minimum period of three minutes, if any significant readings were noted ($\geq 0.5\%$ CH₄, $\geq 2.0\%$ CO₂); the period was extended to ten minutes,
- over the respective monitoring period, gas readings were logged every thirty seconds.

Details of the strata encountered, the sampling and *in situ* testing are shown on records appended to this report.

4. LABORATORY TESTING

4.1 GENERAL

Subsequent to the fieldwork, a programme of laboratory testing was carried out to provide additional quantitative data on the materials encountered. The laboratory tests were completed in accordance with the procedures laid down in the pertinent British Standards unless stated otherwise and consisted of:

- Particle size distribution
- Dry density / saturation moisture content
- Sulphate content and pH value
- Total sulphur content
- Contamination testing

4.2 TEST PROCEDURES

4.2.1 Particle size distribution

A quantitative assessment of the particle size distribution of the soil down to the fine grained sand size is made according to BS EN ISO 17892: Part 4: 2016: clause 5.2. In this the percentage of certain sized fractions of the soil are found by determining the weight retained on a variety of sieve sizes through which the material is allowed to pass. The combined silt and clay fraction is determined by the difference between the sum of the retained weights and the original sample weight. Variations of the test procedure allow the silt and clay fraction to be removed from the coarser fraction by wet sieving during which the fine material is washed from the surface of the coarser material.

4.2.2 Dry density/saturation moisture content of chalk

The determination of the dry density and saturation moisture content of chalk is carried out in accordance with BS 1377: Part 2: 1990: clause 3.3. The test is based on the determination of the dry density of a lump of chalk, using the immersion in water method. A calculation is made from this of the potential moisture content at saturation, assuming a particle density of 2.7 Mg m^{-3} .

4.2.3 Sulphate content and pH value

In order to aid the evaluation of any aggressive tendency of the subsoil or groundwater to buried concrete, the pH, water soluble and total sulphate concentrations in a number of samples were determined using in-house procedures based on other methodologies.

The pH of a groundwater sample or a soil filtrate was established electrometrically according to BS 1377: Part 3: 1990: clause 9.5, while water soluble sulphate and groundwater sulphate were determined using procedures based on Standard Methods for the Examination of Water and Wastewater Part 3120 B – 21st Edition (AWWA & WEF, 2005). This requires the preparation of a soil extract using deionised water at a 2:1 ratio. The filtered extract of the soil, or a water sample, are then injected into an ion exchange chromatograph with a conductivity detector. The samples are compared against commercially available standards to evaluate the sulphate concentration.

The total sulphate content of a soil was measured on a filtrate following digestion of the soil by 10% hydrochloric acid, as shown by BS 1377: Part 3: 1990: clause 5.5 and TRL 447 (Reid *et al* 2005). Subsequently the soil filtrate is introduced into ICP-OES equipment to determine sulphate concentration.

4.2.4 Total sulphur content

To aid the evaluation of aggressive tendency of the subsoil to buried concrete as a result of its pyritic potential, the total potential sulphate content can be determined from the relationship between the total (acid soluble) sulphate content and the amount of total sulphur present. The total sulphur content is determined by a laboratory in-house methodology based on Standard Methods for the Examination of Water and Wastewater Part 3120 B – 21st Edition (AWWA & WEF, 2005).

A dried portion of the soil is extracted at 115 °C for 75 minutes using 100% aqua regia. The digest solution is filtered and analysed by ICP-OES. The results are expressed as % S, and include water soluble and acid soluble sulphates and total reduced sulphur, as well as insoluble sulphates and organic sulphur.

4.2.5 Contamination testing

In order to determine the presence of other chemical contamination not otherwise naturally present in the ground, a signature suite of tests was undertaken to provide data on a broad mix of inorganic and organic potential contaminants. This comprised the total

content of antimony, arsenic, beryllium, cadmium, chromium, chromium VI, lead, mercury, selenium, copper, nickel, vanadium, zinc and cyanide, together with speciated polycyclic aromatic hydrocarbons (PAH), pH, phenols and the organic matter content.

The samples were also subject to specific hydrocarbon analysis in the form of total petroleum hydrocarbons using the Criteria Working Group (CWG) suite. This provides the split between the aliphatic and aromatic fractions in the C5 to C35 ranges. It also includes specified hydrocarbons: benzene, toluene, ethylbenzene, xylenes (collectively known as BTEX) and methyl tertiary butyl ether (MTBE).

Each sample was subject to asbestos screening.

The samples were tested using a variety of analytical techniques, and carried out to MCERTS accredited methods, where applicable, or to UKAS accredited or other acceptable methodologies, which are fully listed in the relevant appended test report.

5. SITE GEOLOGY AND GEOTECHNICAL CONDITION

5.1 SOILS

The investigation found a similar sequence of soils across the site comprising shallow made ground underlain by granular soils with chalk at depth. The findings are in general accord with sequence mapped by the BGS and have been interpreted as superficial deposits of the Taplow Gravel Member underlain by the Chalk (Drawing 21.173/03).

Made ground

Made ground was found across the site to depths of between 1.5 and 2.1 m and comprised a surface covering of tarmac typically underlain by silty gravelly sand which included fragments of brick, concrete, glass, slate, clinker and metal.

In situ standard penetration tests (SPTs) returned N-values between 2 to 7, indicating a very loose or loose condition.

Taplow Gravel

Underlying the made ground, granular soil comprising brown and/or orange brown slightly silty and very sandy flint gravel was present. Within the gravel there were occasional flint cobbles, clay lenses and shell fragments.

In situ SPTs returned N-values from 5 to 34, indicating a typical medium dense condition but sometimes loose at first.

Chalk

Structureless Chalk was present from about 5 m depth to full extent of the investigation. It was typically recovered as cream to off-white clayey slightly sandy silt with some gravel sized fragments of very weak and weak low density chalk. Occasional brown staining and flints were noted throughout. With depth the recovered chalk fragments comprised very weak and weak low and medium density chalk.

In situ SPT tests carried out within the chalk returned N-values ranging from 7 increasing with depth to 50.

Laboratory testing of chalk samples reported saturation moisture contents of 26 and 28% and dry densities of 1.53 and 1.58 Mg/m³, consistent with a low or medium density chalk.

The condition of the chalk, as it was recovered from the boreholes, was graded as Dm according CIRIA C574 (Lord *et al*, 2002). It is probable that the chalk becomes structured with depth and of medium density but the drilling method makes this identification difficult.

Dynamic probing

With the exception of DP01, the probes recorded similar resistance profiles across the site. Low resistance to penetration was recorded within the made ground and moderate resistance within the underlying gravels. Equivalent SPT N values within the made ground were typically in the range of 0 to 5 and between 10 to >30 within the underlying natural gravel.

DP01 recorded poorer ground conditions with very low resistance to penetration to about 4.0 m depth. Coincidentally the nearby dynamic windowless sample hole WS01 recorded loose conditions to 3.0 m depth.

5.2 PERMEABILITY

The falling head tests carried out within BH02 reported estimated indicative permeabilities of $1.30 \times 10^{-5} \text{ ms}^{-1}$ and $6.81 \times 10^{-4} \text{ ms}^{-1}$ for the natural gravel and chalk respectively.

5.3 CHEMICAL CONSIDERATIONS

Risks to construction materials can be assessed primarily using the sulphate and pH results according to the recommendations of Building Research Establishment Special Digest 1 (BRE, 2005). These analyses were undertaken in order to evaluate any aggressive tendency of the soil and can be summarised as follows:

- pH values between 7.9 and 9.8,
- water soluble sulphate (SO₄) concentrations from less than 0.01 to 0.05 g/l⁻¹.

In addition to the above the samples of made ground recorded:

- acid soluble sulphate (SO₄) of 0.03 and 0.07%,
- total sulphur values of less than 0.02 and 0.03%.

The sulphur determinations were made to complement the sulphate testing according to the recommendations of Building Research Special Digest 1 (BRE, 2005). This establishes if a material is pyritic and uses a relationship between total sulphur, acid soluble and water soluble sulphate, and Total Potential Sulphate (TPS), to determine whether it is necessary to increase the Design Sulphate (DS) class. These produced oxidisable sulphide (OS) values that were below the 0.3% trigger concentration, which suggests the made ground does not contain pyrites.

5.4 GROUNDWATER

Groundwater was struck at 10.2 and 12.0 m depth within boreholes BH01 and BH02 respectively, rising to 7.1 and 8.4 m depth within twenty minutes. However, observations reported during advancement of the holes will have been affected by the permeability of the ground, the rate of progress of the hole and the techniques in operation. The general procedures used do not allow precise measurements of the groundwater conditions, but give only a general guide to the overall situation. Fluctuations in any groundwater table will also occur as a result of seasonal or climatic effects, as well as other outside influences.

Gas monitoring standpipes were installed in WS01, WS02, WS03 and WS05 and were also monitored for groundwater subsequent to completion of the fieldwork. However, in this instance, none was recorded.

5.5 GROUND GAS

The results of ground gas monitoring are summarised within Table 1 below and the full results are presented in Appendix D.

The results show low concentrations of carbon dioxide and methane with low flow rates. The maximum carbon dioxide and methane concentrations recorded were 2.5% and 0.1 % respectively. Oxygen levels ranged between 17.0 and 20.8% and the maximum peak flow rate recorded was 0.1 l/hr.

Window sample reference	Response zone (m bgl)/strata	No. of monitoring occasions	Peak methane (%)	Peak carbon dioxide (%)	Range of oxygen levels (%)	Peak flow (l/hr)	Shallowest water level (metres below ground level)	Range of atmospheric pressure during monitoring (mb)
WS01	2.0 – 2.4 G	6	0.1	0.6	19.4-20.5	0.1	DRY	1002 - 1023
WS02	1.8 – 2.8 G	6	0.1	2.5	17.0-20.6	0.0	DRY	1001 - 1022
WS03	1.8 – 2.8 G	6	0.0	0.3	19.8-20.7	-0.1	DRY	1002 - 1023
WS05	1.5– 2.5 MG/G	6	0.0	0.8	19.3-20.8	0.1	DRY	1001 - 1021

Key: G = gravel, MG = Made ground

Table 1: Summary of gas and vapour monitoring results

6. ENGINEERING INTERPRETATION

6.1 GENERAL

The proposed development involves the part or complete demolition of existing buildings and the construction of 21 flats with associated services enclosures, parking and landscaping. The proposals are presented on Douglas Stephen Partnership drawings LSR 011 to LSR 017, LSR 020 and LSR 030 to 036, which are included in Appendix E for reference.

The comments and recommendations contained in the report are based on the data obtained from the relevant exploratory holes and associated laboratory testing. Extrapolation between and to other parts of the site is considered within the light of the geological setting as interpreted, but no responsibility can be accepted for varying geological and geotechnical conditions from those on which the report is based. It should be noted that the solutions discussed are based on assumed design information and must be subject to a more complete assessment once the construction details are finalised.

6.2 GROUND MODEL

Underlying an approximate 2 m thickness of made ground, the investigation typically found medium dense very sandy gravel of the Taplow Gravel Member. Structureless chalk, graded as Dm according CIRIA C574, was present from about 5 m depth.

Groundwater was recorded during fieldwork at depths from about 7.0 m.

The presence of dissolution features or man-made cavities should not be discounted considering the location of the site. Dynamic probe DP01 found 'very loose' soil to 4.0 m depth although it improved beyond this.

6.3 FOUNDATIONS

It is understood that a piled solution is preferred and this would mitigate against the risk of difficult ground conditions associated with potential for dissolution features and mining cavities, although, the toe of the pile should be taken below the groundwater level. This would transfer vertical working loads below any potential metastable sediments on the

understanding that inundation of these would have already taken place due to the influence of groundwater.

Some guidance is presented on the most likely piling systems that may be considered, with the relative advantages and disadvantages discussed below.

It is likely that a traditional bored system could be utilised although this would require temporary casing to be taken through the made ground. A more suitable option to overcome the need to provide casing would be provided by auger injected pile systems in which the concrete or grout is placed down the hollow stem of a continuous flight auger (CFA). In particular, these do not require the use of temporary casing and do not develop excessive vibration. However, they are sensitive to construction technique and it would be essential to ensure that adequate supervision and control is employed to prevent defects developing in the pile.

Consideration could also be given to screw piles. The advantage of screw piles over other piling systems is that they can be designed for both tension and compression loads. They can be installed with low noise and no vibration and there are no soil arisings to dispose of. A specialist contractor would be able to provide a site specific design.

The load capacity of a pile is sensitive to the type of pile as well as its geometry and a piled solution is appropriately designed by specialist contractors. However, a provisional assessment of the piled foundation for a typical CFA or similar cast *in situ* pile following the approach advocated by the Federation of Piling Specialists as based on that presented in Lord *et al* (2002) suggests that a lower limit on the ultimate base resistance, q_u , for cast *in situ* and CFA piles acting into chalk can be given by:

$$q_u = 200 N \quad (\text{Equation 1})$$

Where,

N is the standard penetration test N-value

While an estimate of the shaft resistance, $\bar{\tau}_{sf}$, may be made from the empirical relationship:

$$\bar{\tau}_{sf} = k \cdot \tan \delta' \cdot (\bar{\sigma}_v') \quad (\text{Equation 2})$$

Where,

$k \cdot \tan \delta'$ is an empirical factor for which a value of 0.45 can be taken for CFA and similar cast *in situ* piles

$\bar{\sigma}_v'$ is the average vertical effective stress over the pertinent shaft length

From this, the safe working load on a pile acting into chalk may be given by:

$$q_a = \frac{1 \cdot (q_u \times A_b)}{F_b} + \frac{\bar{\tau}_{sf} \times A_s}{F_s} \quad (\text{Equation 3})$$

Where,

A_b is the base area of the pile

F_b is the factor of safety on the end bearing component

A_s is the area of the pile relevant for friction

F_s is the factor is safety on the skin friction component

Based on the encountered ground conditions, the capacity of a provisional 10 m long pile of 350 mm diameter acting into the chalk through which an average SPT N- value of 15 is assumed over the length of the shaft and an SPT N-value of 25 is assumed at the base is given below. For simplicity skin friction (either positive or negative) within the upper 5.0 m of made ground/superficial deposits has been ignored and groundwater is assumed to be at 7 m below ground level.

From equation 3:

$$\begin{aligned} q_a &= \frac{200 \times 25 \times \pi \times 0.175^2}{2.5} + \frac{0.45 \times 135 \times \pi \times 0.35 \times 5}{2.5} \\ &= 192 + 134 \\ &= \mathbf{326 \text{ kN}} \end{aligned}$$

Various factors used in the example are also influenced by the individual piling system and the construction technique used, and should be modified accordingly in the final design. Nonetheless, the actual capacity of the pile will largely depend on its geometry for any

given soil profile and construction technique, so that significant changes in capacity may be made by varying either the type of pile, the length, the diameter or pile type.

It is generally assumed that settlement would be no greater than 10 mm for an appropriately designed pile constructed in accordance with accepted best practice. Nonetheless, consideration should be given to adequate pile testing in order to confirm any design assumptions. In particular, special care should be given to the effects of group behaviour both with regard to working load, and settlement when interpreting the performance of single piles from tests or previous experience.

When designing piled foundations, due regard should also be given to the potential for differing ground conditions caused by mining cavities. Where mining cavities are suspected to have been encountered during piling, pile tests could be undertaken and/or the pile extended to greater depth. Piles should not be designed to depths greater than the available ground information without additional investigation.

6.4 RETAINING STRUCTURES

6.4.1 General

The proposals show the buildings to be partially constructed below ground and the design will require a retaining wall to be integrated within the construction. Thus, depending on the eventual design and construction, the wall will create a face of approximately 3 m in the made ground and underlying natural sand and gravel.

There are a number of options for support of the face, although the choice of those used will depend not only on the actual conditions, but on contractor's preferences and specialisation. The choice of method used will also impact on assumed values of the coefficient of active and lateral earth pressure used during design.

Options for the retaining walls are to;

- excavate the exposed face to a suitable batter and construct any footings in front of the slope, with due allowance for working close to unsupported soils and then backfill behind a constructed wall such that the backfill is adequately compacted to provide the necessary support to foundations acting into the supported section,

- to provide pre-driven temporary sheet piles on the line of the wall and then construct the retaining wall against the sheets, prior to their removal. This would minimise the necessary volume of excavated soils and imported backfill, or
- utilise a line of permanent cantilever piles which would provide the retaining wall and support for vertical structural loads from the structure in general. An advantage of this option is that the founding depth of the piles would provide a local resistance to the potential uplift loads as a result of the unloading caused by the excavation.

Significant free groundwater is not anticipated over the face of the made ground. However, localised seepages are possible. The retaining wall should be designed to withstand water pressures that may form behind the structure.

6.4.2 Characteristic soil parameters

The retained soil is mostly expected to comprise made ground and medium dense sand and gravel. The underlying Chalk was encountered from about 5 m depth.

Made ground is an inherently variable material and is not recommended as a backfill. Where made ground is present, the retained soil should be cut back to an angle no greater than 60 degrees and the soil replaced with a wedge of granular soil. For the retaining wall design parameters presented below, the granular soil has been assumed to comprise a well-graded sandy gravel.

For natural gravel, an assumed weight density value of about 18 kNm^{-3} is appropriate when considering soils are above the water table. Following the methodology presented in BS 8002:2015 (BSI, 2015), the characteristic critical state effective angle of shearing resistance can be estimated from:

$$\varphi'_{cv,k} = 30^\circ + \varphi'_{ang} + \varphi'_{PSD}$$

Where,

φ'_{ang} is the contribution from particle angularity, and
 φ'_{PSD} is the contribution from particle grading.

Using a grading contribution of 2° , and an angularity contribution of 2° , a critical state effective angle of shearing resistance of 34° is appropriate for the gravel.

The characteristic peak effective angle of shearing resistance can be estimated from:

$$\varphi'_{pk,k} = \varphi'_{cv,k} + \varphi'_{dil}$$

Where,

φ'_{dil} is the contribution from soil dilatancy

Adopting a design density index of around 35% (assuming a lower end of a medium dense condition), a characteristic peak effective angle of shearing resistance of 35° is appropriate for the natural gravel.

The characteristic parameters are summarised in Table 2 below.

It should be noted that natural materials are variable in character and condition and the values in Table 2 may vary not only as a result of variability of soils, but also by the context in which the parameter will apply. Any analysis would be enhanced by a sensitivity analysis on the parameters as a means to determine the impact of the uncertainty of each.

Characteristic Parameter	Gravelly Sand
Weight density, γ_k (above the water table)	18 kNm ⁻³
Critical state effective angle of shearing resistance, $\varphi_{cv,k}$	34°
Peak effective angle of shearing resistance, $\varphi_{pk,k}$	35°

Table 2 Characteristic values for retaining wall design assuming sandy gravel backfill

6.5 EXCAVATIONS

Shallow excavations are likely to remain dry would probably be free-standing for limited periods, although some ravelling may develop in the made ground and loose natural soils but this, and the overall stability of any excavation in general may be improved by applying a batter to the sidewalls.

Deeper excavations will require positive support to enable work in close proximity of the sidewalls. In the absence of groundwater, the natural medium dense sand could provide temporary stability sufficient to allow the installation of the support after excavation.

6.6 HARDSTANDING

It is proposed to create areas of hardstanding (Sims Court and Sims Square) and car parking. The strength of the subgrade material is a principal factor in determining the thickness of the proposed pavement and can be assessed from the California Bearing Ratio (CBR) derived from results of DCP testing of the formation materials.

The near-surface soils comprise made ground composed of granular soils. The results from the DCP testing reported CBR values in the range of 4.1 to 46%.

The values indicate that the made ground would generally form a good foundation for the hardstanding as long as it is prepared using sound construction practices and based on a lower bound design CBR of 4%. However, made ground is an inherently variable material it is recommended that the formation level should be subject to *in situ* testing to determine actual CBR values prior to pavement construction. It may also be prudent to include a layer of geotextile within the sub-base to provide stiffness and reduce the effects of differential settlement. If a change in levels results in the granular soil being present at formation then a CBR value of 20% could be assumed.

6.7 DRAINAGE

Preliminary infiltration testing within the natural gravel and chalk suggests a moderate to good rate. However, whilst it is not known what the prevalence of dissolution features is in the site area, guidance states that soakaways should be sited at least 20 m away from any foundations given the possibility of them being present or new ones being initiated (CIRIA C574 - Lord *et al*, 2002).

6.8 BURIED CONCRETE

Chemical analyses were undertaken in order to evaluate any aggressive tendency of the soil to buried concrete. The pH results indicate alkaline conditions, while the sulphate results corresponded with a design sulphate class of **DS-1** according to Building Research Establishment Special Digest 1 (BRE, 2005).

The Digest identifies a number of different site categories, which include those with 'natural' soil conditions, those that have been subject to 'brownfield' development, and

also sites which contain pyrite bearing ground that will be subject to future disturbance and could result in pyritic oxidation.

Given the site history, a 'brownfield' condition has been adopted for this purpose, while the laboratory test results suggests that pyritic conditions are unlikely to be present within the made ground. The Digest also shows that it is necessary to consider other factors related to the environment into which the concrete will be placed i.e. the pH of the soil and the mobility of the groundwater table. It is then possible to assign an ACEC (aggressive chemical environment for concrete) class.

Groundwater was encountered at depth, and as the pH is higher than 6.5 in a 'brownfield' setting the guidelines indicate that an ACEC classification of **AC-1** would be appropriate for buried concrete.

7. QUANTITATIVE CONTAMINATION RISK ASSESSMENT

7.1 GENERAL

The proposed development involves the construction of 21 flats with associated landscaping, including private gardens. The proposals are presented on Douglas Stephen Partnership drawings LSR 011 to LSR 017, LSR 020 and LSR 030 to 036, which are included in Appendix E for reference.

The Phase 1 Environmental Risk Assessment report concluded the historical and current use of the site was unlikely to have resulted in significant contamination (Aviron Associates Limited, 2019). However, made ground was expected on site and there were various historical sources of potential contamination within the surrounding area.

Backfill to existing retaining structures on site and infill at a nearby historic mill location were identified as a potential sources of ground gas.

The quantitative risk assessment presented below is intended to establish the potential risk to human end-users, construction workers and controlled waters. Human health risk is based on long-term chronic exposure pathways, and is not directly applicable to short-term contact such as that experienced by construction workers. Nevertheless, without any current UK guidelines that allow an assessment of the potential risk to workers from contaminated soils the approaches used provide an applicable assessment criteria.

7.2 HUMAN HEALTH RISK ASSESSMENT

7.2.1 Assessment Methodology

Six samples of the made ground and one sample of natural soil were analysed and the results are presented within Appendix C as report referenced 21-08873.

The results have been assessed against human health guideline values applying a conservative 'residential with plant uptake' scenario for the proposed setting and a soil organic matter of 1.0 %. For metals, unless otherwise stated, the guideline values relate to an assumed soil organic matter of 6.0 %.

The GAC used in the assessment have been produced by Land Quality Management Limited (LQM) in association with the Chartered Institute of Environmental Health (CIEH)

(LQM, 2015) and which are referred to as 'suitable for use levels' (S4ULs). The S4ULs provide GAC values from a risk based approach to human exposure through the pathways of inhalation, ingestion, and dermal contact which have been derived using the CLEA software version 1.06 and Environment Agency guidance (Environment Agency, 2009a, 2009b, and 2009c). When relevant S4ULs were unavailable, such as in the case of cyanide and lead, the results were compared to alternative 'soil screening values' (SSVs) or comparable guideline values. For cyanide, the SSV was derived by WS Atkins Consultants Limited (W S Atkins, 2017), using the ATRISK soil programme. In this case the residential land use category was selected with a soil organic matter of 6%. For lead, Category 4 Screening Levels (C4SLs) were used, which have been developed by Department for Environment, Food and Rural Affairs (DEFRA, 2014), using the Environment Agency Contaminated Land Exposure Assessment (CLEA) model. The derivation of C4SLs uses the concept of a low level of toxicological concern (LLTC), which represents the estimated concentration of a contaminant that would pose an 'acceptably low' risk to human health. These allow a higher (though still 'acceptably low') level of risk while maintaining a precautionary approach. A conservative residential scenario has again been used for the assessment.

The risk from the release of asbestos fibres from asbestos containing soil (ACS)¹ has been considered in accordance with the approach provided in CIRIA C733 (2014). Asbestos refers to six fibrous minerals that are known to cause serious health effects when inhaled into the lung. The main forms are chrysotile (white asbestos), amosite (brown asbestos) and crocidolite (blue asbestos)².

7.2.2 Results

The results can be summarised as follows:

- Two samples reported concentrations of lead above the C4SL threshold of 200 mg/kg.
- A single sample reported a concentration of arsenic above the GAC.
- Concentrations of all other heavy metals/metalloids were below their respective GAC.

¹ Asbestos containing soil (ACS) is any soil found to contain asbestos fibres and/or bulk asbestos containing material (ACM)

² The colours associated with the different asbestos types are apparent in their natural state and should not be used to identify asbestos in soils which is likely to be discoloured by the surrounding matrix

- A single sample reported concentrations of polyaromatic hydrocarbons (PAHs) above the GAC.
- Concentrations of petroleum hydrocarbons (TPH), BTEX³, MTBE⁴ and phenols were all below were below their respective GAC and most were below the limit of detection.
- Asbestos fibres or asbestos containing materials were not detected.

7.2.3 Discussion.

Most samples tested had concentrations of potential contaminants below the relevant screening levels. However elevated concentrations lead, arsenic and PAHs have been found within the made ground at two locations. A band of “ashy” material at WS01 was found to have a lead concentration of 497 mg/kg along with elevated concentrations of various PAHs including a benzo(a)pyrene concentration of 8.6 mg/kg compared with the GAC of 2.2 mg/kg. A sample from BH02 had an arsenic concentration of 45 mg/kg compared with GAC of 37 mg/kg and a lead concentration of 329 mg/kg.

However, the results suggest that the contamination is not widespread and is likely to be localised. It is also understood that the construction proposals involve lowering existing ground levels and thus removing soil from the site. The proposed depth of excavation across the site ranges between 2 and 5.2 m below existing ground level, equivalent to a ground level of between 39.7 and 41.0 m above Ordnance Datum (aOD). The ground level at the base of the made ground ranged between 42.2 and 43.1 m aOD. This indicates that all made ground will be removed during construction.

The site can therefore be considered suitable for the proposed residential use.

7.3 CONTROLLED WATERS RISK ASSESSMENT

No significant leachable or mobile contamination was found during the investigation. It is highly unlikely that there is significant leachable or mobile contamination on site that may migrate to the underlying aquifers or nearby river/watercourses.

³ benzene, toluene, ethylbenzene and xylene

⁴ Methyl tert-butyl ether

7.4 CONSTRUCTION WORKER ASSESSMENT

An assessment of risk to construction workers suggests that only chemical contamination of acute toxicity might represent an unacceptable risk to the health of construction workers but which should be managed through health and safety procedures, such as wearing gloves and washing hands before eating.

7.5 WATER SUPPLY PIPE ASSESSMENT

An assessment of the laboratory results with respect to UKWIR guidance (2010) suggests that the concentrations of PAH, and petroleum hydrocarbons within the made ground are likely be above threshold values for polyethylene (PE) and polyvinyl chloride (PVC) pipes.

7.6 GROUND GAS RISK ASSESSMENT

Backfill to existing retaining structures on site and infill at a nearby historical mill have been identified as a potential sources of ground gas (Aviron Associates Limited, 2019). The maximum depth of backfill on site was 2.1 m, did not contain significant organic material and is therefore discounted as a source of ground gas.

Regardless, soil gas may occur as a result of the degradation of organic matter in buried landfill or within organic material. The gas composition varies according to the type and phase of breakdown at any given time. Initially, carbon dioxide may be predominant, with significant quantities of hydrogen also being evolved. Methane (about 65%) and carbon dioxide (about 35%) are the major constituents produced during anaerobic/methanogenic phases of decomposition. Methane and carbon dioxide can develop explosive or flammable mixes with oxygen, or can cause oxygen depletion and act as an asphyxiate.

The risks associated with ground gases have been assessed in general accordance with BS 8485:2015 and CIRIA C665 (Wilson et al, 2007). These describe a characterisation system and provide a risk based approach designed to allow gas protection measures to be selected appropriately. The characterisation process begins by the calculation of a borehole hazardous gas flow rate (Q_{hg}) or gas screening value (GSV), both calculated in the same manner. Q_{hg} is derived from the maximum recorded borehole flow (l/hr) and maximum concentration of a particular ground gas (% (v/v)), either methane or carbon dioxide.

The Q_{hg} is calculated as follows:

$$Q_{hg} = q \left(\frac{C_{hg}}{100} \right)$$

Where,

q = borehole flow rate and,
 C_{hg} = maximum gas concentration.

For example, monitoring data giving a maximum flow rate of 3.5 l/hr and a maximum concentration of 4.0 % (v/v) methane would have a Q_{hg} of 0.14 l/hr [3.5 x (4.0/100)].

The Q_{hg} is then used to assign a characteristic situation to the site. These range from CS1 to CS6 and correspond with a very low to very high risk as shown in Table 2 of BS8485:2015.

In order to inform a choice of ground gas protection measures, BS 8485:2015 uses a pre-determined building type and the determined characteristic situation to derive a gas protection score. This takes into account the differing types of development which may occur on a given site and their relative sensitivities. The development proposed here fits building type B:

- Type B – private or commercial property with central building management control of any alterations to the building or its uses but limited or no central building management control of the maintenance of the building, including gas protection measures. Multiple occupancy. Small to medium size rooms with passive ventilation.

After the derivation of the gas protection score, gas protection measures, comprising structural barriers, ventilation measures and gas protection membranes, are chosen to meet the required score for the development. Each protection measure has its own score. This allows greater flexibility and choice over the gas protection measures employed in order to take into account construction methods or other site constraints. Gas protection scores and associated protection measures can be found in Tables 4 – 7 of BS 8485:2015.

The maximum recorded concentration of carbon dioxide was 2.5% (v/v) with a borehole flow of 0.1 l/hr. The maximum recorded concentration methane was 0.1% (v/v). Based upon the calculation above, the Q_{hg} for carbon dioxide is given as 0.0025 l/hr. This suggests that there is a very low risk from both methane and carbon dioxide, which corresponds to Characteristic Situation (CS) 1, and therefore gives a gas protection score of zero.

7.7 CONCEPTUAL MODEL

The conceptual model is presented below and risk management and remediation measures are discussed in Section 8, where appropriate. Risk assessment classification is appended.

Source of Contamination	Pathway	Receptor	Probability and Reasoning	Consequence and Reasoning	Risk Classification
Potentially contaminated soils (historical and recent use)	Direct contact, inhalation, ingestion	Human end-users	Unlikely – made ground found with localised contamination by lead, arsenic and PAHs. However, construction proposals involve the reduction of existing ground levels within the area of the proposed gardens and thus removing the made ground and potential source of contamination	Medium – chronic damage to human health	Low Risk
		Construction workers	Low likelihood – made ground found with localised elevated concentrations of PAH, lead and arsenic	Mild – potential short-term exposure can be managed with PPE and adoption of good hygiene practices	Low Risk
	Percolation of leachate / mobile contaminants	Groundwater	Unlikely – significant mobile or leachable contamination not found	Medium – secondary and principal aquifers underlying the site. Not within a source protection zone	Low Risk
		Surface water		Medium – no surface water features on site but River Kennet nearby	Low Risk
	Direct contact	Buried concrete	Unlikely – soils classify as DS-1 and ACEC- 1 (BRE, 2005)	Mild – damage to buildings/structures	Very Low Risk
	Permeation through water supply pipes	Human end-users	Low likelihood – localised areas of PAHs and petroleum hydrocarbons present within the made ground	Medium – chronic damage to human health	Low/Moderate Risk
Ground gas and vapours	Gas migration through permeable strata, ingress and accumulation in structures	Human end-users	Unlikely – no sources of ground gas or vapours have been found on site. Ground gas monitoring reported low concentrations of methane and carbon dioxide. Site classifies as CS-1. No ground gas precautions required.	Severe – acute risk to potential end users	Low/Moderate Risk¹
		Structures			
Radon Gas		Human end-users	Unlikely – site outside of radon affected area	Medium – chronic risk to human end users	Low Risk

Notes: ¹ a moderate/low risk has been determined based on the probability and consequence however, based on the lack of a ground gas source the risk is likely to be low or negligible.

Table 3 –Revised Conceptual Site Model



8. RISK MANAGEMENT AND MITIGATION MEASURES

8.1 INTRODUCTION

The review of risk and assessment of appropriate remediation is based on the presence of a “source-pathway-receptor” scenario. In the absence of the linkage, the risk is eliminated. The discussion below is based on the findings of the investigation. If any suspected contamination is encountered during the construction phase, then this should be evaluated and appropriate action taken.

8.2 HUMAN END-USERS

Made ground was found across the site and analysis of potential contaminants has shown there is localised contamination by lead, arsenic and PAHs, posing a potential risk to human end-users. However, construction proposals involve excavations of between 2 and 5.2 m depth below existing ground thus removing the made ground (see Section 7.2.3 for proposed levels). In removing the potential source of contamination, the pollutant linkage is broken and a low risk to human health is concluded.

Therefore, no further investigation or mitigation is required.

8.3 CONSTRUCTION WORKERS

The concentrations of chemical contaminants recorded within the made ground do not necessarily pose a short-term risk to construction workers and can be addressed by using standard personal protective equipment, including gloves, when handling soils and usual hygiene precautions such as washing hands before eating.

8.4 BUILDINGS, SERVICES & STRUCTURES

Very low concentrations of substances that are aggressive to concrete were identified. A very low risk to buildings is concluded.

Localised concentrations of PAHs and petroleum hydrocarbons have been recorded within the made ground. It is recommended that buried water supply pipework is laid in a clean

surround or within the natural ground. If supply pipes remain in contact with made ground they should be upgraded to barrier pipe in agreement with the local water utility provider.

8.5 CONTROLLED WATERS

Concentrations of potential soil contamination levels were found to be low. Mobile contamination or leachate with significant concentrations of contaminants is unlikely from the made ground. A low risk to controlled waters is concluded.

8.6 GROUND GAS

The risk assessment indicates that the gas regime corresponds to Characteristic Situation 1 and therefore no further work is required to mitigate the effects of hazardous ground gas.

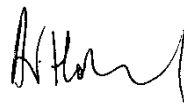
9. SUMMARY

1. The investigation typically found made ground to 2 m depth underlain by medium dense very sandy gravel of the Taplow Gravel Member. Structureless chalk, graded as Dm according CIRIA C574, was present from about 5 m depth.
2. Groundwater was recorded during fieldwork from depths of about 7.0 m.
3. The presence of dissolution features or man-made cavities should not be discounted considering the location of the site. Dynamic probe DP01 found 'very loose' soil to 4.0 m depth.
4. A piled foundation would mitigate against the risk of difficult ground conditions associated with potential for dissolution features and mining cavities. A provisional pile analysis suggests a pile capacity of about 325 kN for a 350 mm diameter CFA pile taken to 10 m depth.
5. The final pile design should be determined by specialist contractors using experience from similar piling systems in similar ground conditions. Alternatively, consideration should be given to adequate pile testing in order to confirm any design assumptions.
6. The retaining walls could be constructed against a battered face with adequately compacted backfill, against temporary pre-driven sheet piles or by the use of pre-installed cantilever system of permanent piles that could also be used to carry structural load.
7. Shallow excavations are likely to remain mostly dry and stable in the short-term situation. Deeper excavations will require positive support to enable work in close proximity of the sidewalls.
8. The results of the DCP tests show that that the made ground would generally form a good foundation for the proposed hardstanding based on a design CBR of 4%. However, as made ground is an inherently variable material it is recommended that the formation level should be subject to *in situ* testing to determine actual CBR values. If natural granular soil is present at formation then a CBR value of 20% could be assumed.
9. A design sulphate class of DS-1 and an ACEC classification of AC-1 can be adopted for buried concrete.

10. Localised concentrations of lead, arsenic, PAHs have been recorded within the made ground. However, the made ground is to be removed as part of the development proposals and therefore the risk to human health is eliminated. Hydrocarbons are also present in made ground at levels that may permeate water supply pipes. If made ground remains along water supply pipe routes then these should be deepened into the natural ground or placed within a clean surround.
11. No potential sources of ground gas have been found. Monitoring recorded low concentrations of carbon dioxide and methane and low flow; corresponding to Characteristic Situation 1. Gas protection measures are not required.
12. The site is considered suitable for the proposed use. No further investigation or mitigation is required. If any suspected contamination is encountered during development specialist advice should be taken with respect to appropriate actions.



M S Horne
BSc (Hons) MSc FGS GMICE



Eur Ing Dr A F Howland
MSc PhD DIC CEng FIMMM CGeol FGS GMICE

A F HOWLAND ASSOCIATES
7 July 2022

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APPENDIX B: EXPLORATORY HOLE AND FIELD TEST RECORDS

Cable percussive boreholes

Windowless dynamic sample holes

Dynamic Probes

Dynamic cone penetrometer tests

Falling head tests



KEY

U	Nominal 70 mm or 100 mm diameter undisturbed open tube sample
X blows	The associated figure 'X' is the number of blows to drive the sample tube over the given depth range
XF	Undisturbed sample not recovered after 'X' number of blows to drive the sample tube
B	Bulk disturbed sample
D	Small disturbed sample
ES	Environmental sample
W	Water sample
L	Plastic liner sample (from windowless sample)
SPT	Standard penetration test using a split spoon sampler
SPT (C)	Standard penetration test using 60 degree solid cone
X,X/X,X,X,X	Blows per increment during the standard penetration test. The initial value relates to the seating drive (150 mm) and the remaining four to the 75 mm increments of the test length
N=X	SPT blow count 'N' given by the summation of the blows 'X' required to drive the full test length (300 mm)
X*/Y	Incomplete standard penetration test where the seating drive could not be completed. The blows 'X' represent the total blows for the given length of seating drive 'Y' (mm)
X/Z	Incomplete standard penetration test where the seating drive was achieved but the full test length was not. The blows 'X' represent the total blows for the given test length 'Z' (mm)
<u>dd/mm/yy: 1.0</u>	Date, water level at the borehole depth at the end of shift
<u>dd/mm/yy: dry</u>	and the start of the following shift

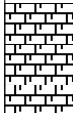
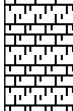
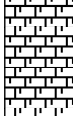
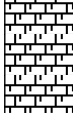
Each sample type is numbered sequentially with depth and relates to the depth range quoted

All depths and measurements are given in metres, except as noted

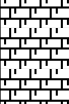
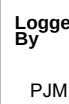
Strata descriptions compiled by visual examination of samples obtained after BS EN1997-2:2007 Eurocode 7 and its UK National Annex supported by BS 5930:2015+A1:2020 and modified in accordance with laboratory test results where applicable



 A F Howland Associates Geotechnical Engineers							Site 43 London Street, Reading, RG1 4PS		Borehole Number BH01
Machine : Dando 4000 Method : Cable Percussion		Casing Diameter 150mm cased to 13.50m		Ground Level (mOD) 44.01		Client M K Build Limited		Job Number 21.173	
		Location 471829 E 173143 N		Dates 05/07/2021-07/07/2021		Engineer		Sheet 1/2	
Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10-0.50 0.20-0.50	B1 ES1				43.81	(0.20) 0.20	MADE GROUND (Tarmac 100 mm over sandy flint and brick sub-base)		
0.50-0.90 0.50-1.00	ES2 B2				43.51	(0.30) 0.50	MADE GROUND (Brown slightly silty gravelly sand. Gravel is subangular to subrounded fine to coarse flint with some brick and concrete fragments. Occasional slate and clinker fragments)		
1.20-1.65 1.20-1.65	SPT N=7 D1		DRY	3,3/3,1,1,2		(1.10)	MADE GROUND (Brown clayey gravelly sand. Gravel is subangular to subrounded fine to coarse flint with some brick, breeze block and concrete fragments) ...concrete from 0.95 m to 1.15 m		
2.00-2.45 2.00-2.45	SPT N=13 D2	1.50	DRY	2,3/3,3,3,4	42.41	1.60 (0.40)	Loose brown slightly silty fine to coarse SAND and GRAVEL. Gravel is subangular to subrounded fine to coarse flint with occasional cobbles		
3.00-3.45 3.00-3.50	SPT N=33 B3	3.00	DRY	3,10/7,7,9,10	42.01	2.00	Medium dense brown slightly silty very sandy subangular to subrounded fine to coarse flint GRAVEL with occasional cobbles and shell fragments		
4.00-4.45 4.00-4.50	SPT N=22 B4	4.00	DRY	3,5/5,5,6,6			...dense from 3.0 m to 4.0 m		
5.00-5.45 5.00-5.45 5.00-6.00	SPT N=29 D3 B5	5.00	DRY	3,4/5,7,11,6	39.21	4.80	Structureless CHALK; recovered as cream to off-white clayey slightly sandy gravelly SILT. Gravel is very weak and weak, low density off white subangular to subrounded. Occasional brown staining and rinded flints throughout. (Grade Dm)		
6.00-6.45 6.00-6.45	SPT N=10 D4	5.00	DRY	2,2/2,2,2,4			...with occasional dark brown staining		
7.00-7.20	D5								
7.50-7.95 7.50	SPT N=14 D6	7.50	DRY	1,2/2,3,4,5					
7.95-8.50	D7						...with occasional dark grey staing on clasts		
9.00-9.45 9.00-9.45	SPT N=17 D8	9.00	DRY	3,3/4,4,5,4		(8.70)			
Remarks 1. Location CAT scanned prior to excavation 2. Hand dug inspection pit to 1.20 m 3. Groundwater struck at 10.20 m and rose to 7.10 m in 20 mins 4. SPT Hammer Energy Ratio = % 5. Borehole backfilled with arisings on completion								Scale (approx) 1:50	Logged By PJM
								Figure No. 21.173.BH01	

 A F Howland Associates Geotechnical Engineers						Site 43 London Street, Reading, RG1 4PS			Borehole Number BH01	
Machine : Dando 4000 Method : Cable Percussion		Casing Diameter 150mm cased to 13.50m		Ground Level (mOD) 44.01		Client M K Build Limited		Job Number 21.173		
		Location 471829 E 173143 N		Dates 05/07/2021-07/07/2021		Engineer		Sheet 2/2		
Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	
10.00-10.20	D9	10.50	7.10	moderate(1) at 10.20m, rose to 7.10m in 20 mins, sealed at 10.50m. 3,4/3,5,4,6			Structureless CHALK; recovered as cream to off-white clayey slightly sandy gravelly SILT. Gravel is very weak and weak, low density off white subangular to subrounded. Occasional brown staining and rinded flints throughout. (Grade Dm) ...with rare black flecks		▽1	
10.50-10.95	D10									
10.50-10.95	SPT N=18									
11.50-11.70	D11	12.00	DRY	2,5/5,4,5,6			...with rare moderately weak to weak chalk gravel and cobbles			
12.00-12.45	SPT N=20									
12.00-12.45	D12									
13.00-13.20	D13	13.50	DRY	3,5/8,8,10,12	30.51	13.50	Structureless CHALK; recovered as cream to off-white clayey slightly sandy gravelly SILT. Gravel is very weak and weak, low density and medium density off white subangular to subrounded. Occasional brown staining and rinded flints throughout. (Grade Dm)			
13.50-13.95	SPT N=38									
13.50-13.95	D14									
14.50-14.95	SPT N=49	13.50	8.20	3,7/9,11,13,16	29.01	15.00	Complete at 15.00m			
14.50-14.95	D15									
Remarks								Scale (approx) 1:50	Logged By PJM	
								Figure No. 21.173.BH01		

 A F Howland Associates Geotechnical Engineers							Site 43 London Street, Reading, RG1 4PS		Borehole Number BH02
Machine : Dando 4000 Method : Cable Percussion		Casing Diameter 150mm cased to 18.00m		Ground Level (mOD) 44.41		Client M K Build Limited		Job Number 21.173	
		Location 471854 E 173148 N		Dates 06/07/2021-08/07/2021		Engineer		Sheet 1/3	
Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.20-0.50 0.20-0.50	B1 ES1				44.26	(0.15) 0.15	MADE GROUND (Tarmac 150 mm over sandy flint and brick sub-base)		
0.60-1.00 0.60-1.20	ES2 B2				43.81	(0.45) 0.60	MADE GROUND (Dark brown mottled dark grey slightly clayey gravelly sand. Gravel is subangular to subrounded fine to coarse flint with some brick and concrete fragments. Occasional clinker)		
1.20-1.65 1.20-1.65	SPT N=5 D1		DRY	1,1/1,1,1,2		(1.50)	MADE GROUND (Dark grey slightly silty gravelly sand. Gravel is subangular to subrounded fine to coarse flint with occasional chalk and brick fragments)		
2.00-2.45 2.00-2.20 2.10-2.30	SPT N=19 D2 ES3	1.50	DRY	1,2/3,3,5,8	42.31	2.10	Medium dense brown slightly silty very sandy subangular to subrounded fine to coarse flint GRAVEL with occasional cobbles		
3.00-3.45 3.00-3.50	SPT N=30 B3	3.00	DRY	3,5/6,7,8,9					
4.00-4.45 4.00-4.45	SPT N=16 B4	4.00	DRY	2,5/4,3,4,5		(3.40)			
5.00-5.45 5.00-5.45	SPT N=18 D3	5.00	DRY	6,8/6,5,4,3					
				07/07/2021:5.50m 08/07/2021:DRY	38.91	5.50	Structureless CHALK; recovered as cream to off-white clayey slightly sandy gravelly SILT. Gravel is very weak and weak, low density off white subangular to subrounded. Occasional brown staining and rinded flints throughout. (Grade Dm)		
6.10-6.55 6.10-6.55	SPT N=7 D4	6.10	DRY	2,3/2,2,2,1					
7.00-7.20	D5								
7.50-7.95 7.50-7.95	SPT N=13 D6	7.50	DRY	1,2/2,3,3,5					
8.50-8.70	D7								▼2
9.00-9.45 9.00-9.45	SPT N=14 D8	9.00	DRY	2,3/2,3,4,5 seepage(1) at 9.70m, no rise after 20 mins, sealed at 10.50m.		(8.00)			▼1
Remarks 1. Location CAT scanned prior to excavation 2. Hand dug inspection pit to 1.20 m 3. Groundwater seepage at 9.70 m and rose to 9.70 m in 20 mins 4. Groundwater struck at 12.00 m and rose to 8.40 m in 20 mins 5. SPT Hammer Energy Ratio = % 6. Falling head test carried out at 3.0 m and at 6.10 m 7. Borehole backfilled with arisings on completion								Scale (approx) 1:50	Logged By PJM
								Figure No. 21.173.BH02	

 A F Howland Associates Geotechnical Engineers						Site 43 London Street, Reading, RG1 4PS			Borehole Number BH02		
Machine : Dando 4000 Method : Cable Percussion		Casing Diameter 150mm cased to 18.00m		Ground Level (mOD) 44.41		Client M K Build Limited			Job Number 21.173		
		Location 471854 E 173148 N		Dates 06/07/2021-08/07/2021		Engineer			Sheet 2/3		
Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description			Legend	Water
10.00-10.20	D9						Structureless CHALK; recovered as cream to off-white clayey slightly sandy gravelly SILT. Gravel is very weak and weak, low density off white subangular to subrounded. Occasional brown staining and rinded flints throughout. (Grade Dm)				
10.50-10.95 10.50-10.95	SPT N=21 D10	10.50	DRY	1,2/5,5,4,7							
11.50-11.70	D11						...with rare moderately weak to weak chalk gravel and cobbles				
12.00-12.45 12.00-12.45	D12 SPT N=21	12.00	DRY	moderate(2) at 12.00m, rose to 8.40m in 20 mins, sealed at 13.50m. 3,3/4,4,6,7							
13.00-13.20	D13						Structureless CHALK; recovered as cream to off-white clayey slightly sandy gravelly SILT. Gravel is very weak and weak, low and medium density off white subangular to subrounded. Occasional brown staining and rinded flints throughout. (Grade Dm)				
13.50-13.95 13.50-13.95	SPT N=50 D14	13.50	8.50	3,6/15,28,7	30.91	13.50					
14.50-14.70	D15						...with flint cobbles				
15.00-15.45 15.00-15.45	SPT N=50 D16	15.00	DRY	7,9/9,11,14,16							
16.00-16.20	D17						...with rare moderately weak to weak chalk gravel and some flints				
16.50-16.95 16.50-16.95	SPT N=50 D18	16.50	DRY	6,9/12,16,16,6							
17.50-17.70	D19										
18.00-18.45 18.00-18.45	SPT N=50 D20	18.00	DRY	6,13/20,14,16							
19.00-19.20	D21										
19.50-19.95	D22					(11.50)					
Remarks								Scale (approx) 1:50		Logged By PJM	
								Figure No. 21.173.BH02			

 A F Howland Associates Geotechnical Engineers						Site 43 London Street, Reading, RG1 4PS			Borehole Number BH02	
Machine : Dando 4000 Method : Cable Percussion		Casing Diameter 150mm cased to 18.00m		Ground Level (mOD) 44.41		Client M K Build Limited		Job Number 21.173		
		Location 471854 E 173148 N		Dates 06/07/2021-08/07/2021		Engineer		Sheet 3/3		
Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	
20.50-20.70	D23	18.00	DRY	7,11/21,14,15			Structureless CHALK; recovered as cream to off-white clayey slightly sandy gravelly SILT. Gravel is very weak and weak, low and medium density off white subangular to subrounded. Occasional brown staining and rinded flints throughout. (Grade Dm)			
21.00-21.45 21.00-21.45	SPT N=50 D24						...with abundant flints to 22 m			
22.00-22.20	D25						...with orange brown silty sand pocket ...with rare moderately weak to weak chalk gravel and cobbles			
22.50-22.95 22.50-22.95	SPT N=50 D26	18.00	DRY	5,7/10,11,14,15	...becoming off-white					
23.50-23.70	D27	18.00	19.50	08/07/2021:19.50m 09/07/2021:8.20m 9,14/16,20,14 09/07/2021:8.20m	19.41		25.00	...with rare moderately weak to weak chalk gravel and cobbles		
24.50-24.95	D28							Complete at 25.00m		
24.50-24.95	SPT N=50									
Remarks								Scale (approx) 1:50	Logged By PJM	
								Figure No. 21.173.BH02		



A F Howland Associates Geotechnical Engineers

Site

43 London Street, Reading, RG1 4PS

Number
WS01

Excavation Method
Windowless Dynamic
Sampling

Dimensions
87mm to 2.00m
75mm to 3.00m

Ground Level (mOD)
44.02

Client
M K Build Limited

**Job
Number**
21.173

Location
471835 E 173143 N

Dates
08/07/2021

Engineer

Sheet
1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.30-0.70	B1			43.77	(0.25) 0.25	MADE GROUND (Tarmac 100 mm over sandy flint and brick sub-base)		
0.70-0.80 0.70-1.20	ES1 B2			43.32 43.22	(0.45) 0.70 (0.10) 0.80	MADE GROUND (Brown slightly silty gravelly sand. Gravel is subangular to subrounded fine to coarse flint with some brick and concrete fragments. Occasional glass pieces)		
1.20-1.65 1.20-1.65 1.20-1.65	SPT N=2 D1 ES2		1,1/0,1,0,1		(1.00)	MADE GROUND (Dark grey to black silty slightly ashy gravelly sand. Gravel is subangular to subrounded fine to coarse flint with occasional brick and glass)		
2.00-2.45 2.00-2.45	SPT N=5 D2		1,0/1,0,1,3	42.22	1.80	Loose brown slightly silty very sandy subangular to subrounded fine to coarse flint GRAVEL with occasional cobbles		
2.50-3.00	D3				(1.65)			
3.00-3.45	SPT N=34		2,8/7,8,10,9			...becoming dense		
			08/07/2021:DRY	40.57	3.45	Complete at 3.45m		

Remarks

1. Location CAT scanned prior to excavation
2. Hand dug inspection pit to 1.20 m
3. No groundwater encountered
4. Slotted Standpipe installed to 2.40 m
5. SPT Hammer Energy Ratio = 94.56 %

**Scale
(approx)**
1:25

**Logged
By**
PJM

Figure No.
21.173.WS01



Site
43 London Street, Reading, RG1 4PS

**Borehole
Number**
WS01

Installation Type
Single Installation

Dimensions
Internal Diameter of Tube [A] = 50 mm

Client	M K Build Limited
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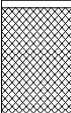
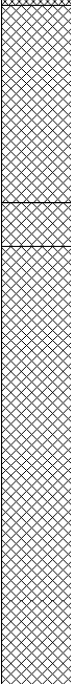
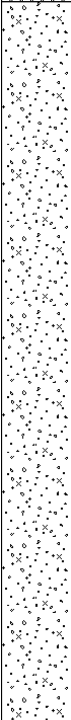
Job Number
21.173

Location
471835 E 173143 N

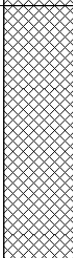
Ground Level (mOD)	44 02
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Engineer

Sheet
1/1

Legend	Water	Instr (A)	Level (mOD)	Depth (m)	Description	Groundwater Strikes During Drilling													
  			43.82	0.20	Concrete	Date	Time	Depth Struck (m)	Casing Depth (m)	Inflow Rate	Readings				Depth Sealed (m)				
										5 min	10 min	15 min	20 min						
						Groundwater Observations During Drilling													
						Date	Start of Shift					End of Shift							
							Time	Depth Hole (m)	Casing Depth (m)	Water Depth (m)	Water Level (mOD)	Time	Depth Hole (m)	Casing Depth (m)	Water Depth (m)	Water Level (mOD)			
						08/07/21							3.45		DRY				
						Instrument Groundwater Observations													
						Inst. [A] Type : Slotted Standpipe													
Date	Instrument [A]			Remarks															
	Time	Depth (m)	Level (mOD)																
16/07/21 22/07/21 29/07/21 05/08/21 12/08/21 20/08/21	12:53 11:23 11:20 11:41 12:19 10:56	DRY DRY DRY DRY DRY DRY																	

Remarks

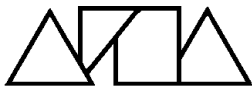
 A F Howland Associates Geotechnical Engineers					Site 43 London Street, Reading, RG1 4PS			Number WS02		
Excavation Method Windowless Dynamic Sampling		Dimensions 87mm to 2.00m 75mm to 3.00m		Ground Level (mOD) 44.24		Client M K Build Limited		Job Number 21.173		
		Location 471844 E 173144 N		Dates 08/07/2021		Engineer		Sheet 1/1		
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description		Legend	Water	
0.20-0.75 0.20-0.75	B1 ES1		1,1/1,1,1,2	44.04	(0.20) 0.20	MADE GROUND (Tarmac 100 mm over sandy flint and brick sub-base)				
					(0.55)	MADE GROUND (Dark grey slightly silty gravelly sand. Gravel is subangular to subrounded fine to coarse flint with some brick fragments)				
0.75-1.20 0.75-1.20	B2 ES2				43.49	0.75	MADE GROUND (Dark brown clayey gravelly sand. Gravel is subangular to subrounded fine to coarse flint with rare chalk and brick fragments)			
1.20-1.65 1.20-1.65	SPT N=5 D1					(0.85)				
1.60-1.80 1.60-2.00	ES3 D2				42.64	1.60	Medium dense light brown slightly silty very sandy subangular to subrounded fine to coarse flint GRAVEL with occasional clay lenses			
2.00-2.45 2.00-2.45	SPT N=25 D3					(1.85)	...clay lenses absent			
2.60-3.00	D4						...becoming brown			
3.00-3.45 3.00-3.45	SPT N=29 D5									
						08/07/2021:DRY	40.79	3.45	Complete at 3.45m	
Remarks 1. Location CAT scanned prior to excavation 2. Hand dug inspection pit to 1.20 m 3. No groundwater encountered 4. Slotted Standpipe installed to 2.80 m 5. SPT Hammer Energy Ratio = 94.56 %									Scale (approx) 1:25	Logged By PJM
									Figure No. 21.173.WS02	

					A F Howland Associates Geotechnical Engineers					Site 43 London Street, Reading, RG1 4PS					Borehole Number WS02	
Installation Type Single Installation					Dimensions Internal Diameter of Tube [A] = 50 mm					Client M K Build Limited					Job Number 21.173	
					Location 471844 E 173144 N			Ground Level (mOD) 44.24		Engineer					Sheet 1/1	
Legend	Water	Instr (A)	Level (mOD)	Depth (m)	Description	Groundwater Strikes During Drilling										
			44.04	0.20	Concrete	Date	Time	Depth Struck (m)	Casing Depth (m)	Inflow Rate	Readings				Depth Sealed (m)	
										5 min	10 min	15 min	20 min			
					Groundwater Observations During Drilling											
					Date	Start of Shift					End of Shift					
						Time	Depth Hole (m)	Casing Depth (m)	Water Depth (m)	Water Level (mOD)	Time	Depth Hole (m)	Casing Depth (m)	Water Depth (m)	Water Level (mOD)	
					08/07/21							3.45		DRY		
					Instrument Groundwater Observations											
					Inst. [A] Type : Slotted Standpipe											
					Date	Instrument [A]			Remarks							
						Time	Depth (m)	Level (mOD)								
16/07/21 22/07/21 29/07/21 05/08/21 12/08/21 20/08/21	12:41 11:14 11:12 11:32 12:11 10:47	DRY DRY DRY DRY DRY DRY														
			42.44	1.80	Bentonite Seal											
			41.44	2.80	Slotted Standpipe											

Remarks

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A F Howland Associates Geotechnical Engineers

Site
43 London Street, Reading, RG1 4PS

Number
WS03

Excavation Method Windowless Dynamic Sampling	Dimensions 87mm to 2.00m 75mm to 3.00m	Ground Level (mOD) 43.97	Client M K Build Limited	Job Number 21.173
	Location 471850 E 173155 N	Dates 07/07/2021	Engineer	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.20-0.50 0.20-0.70	ES1 B1				(0.70)	MADE GROUND (Tarmac 100 mm over sandy flint and brick sub-base)		
0.70-1.00 0.70-1.00	B2 ES2			43.27	0.70	MADE GROUND (Brown slightly silty gravelly sand. Gravel is subangular to subrounded fine to coarse flint with some brick and concrete fragments. Occasional glass pieces)		
1.20-1.65 1.20-1.50	SPT N=8 D1		1,0/2,1,3,2		(0.80)			
1.50-2.00	D2			42.47	1.50	Loose brown slightly silty very sandy subangular to subrounded fine to coarse flint GRAVEL with occasional cobbles		
2.00-2.45 2.00-2.45	SPT N=13 D3		3,3/4,3,3,3		(1.95)			
3.00-3.45 3.00-3.45	SPT N=30 D4		3,5/8,7,7,8			...becoming moderately dense		
			07/07/2021:DRY	40.52	3.45	Complete at 3.45m		

Remarks

1. Location CAT scanned prior to excavation
2. Hand dug inspection pit to 1.20 m
3. No groundwater encountered
4. Slotted Standpipe installed to 2.80 m
5. SPT Hammer Energy Ratio = 94.56%

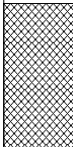
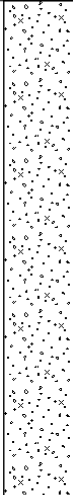
Scale (approx)
1:25

Logged By
PJM

Figure No.
21.173.WS03

 A F Howland Associates Geotechnical Engineers					Site 43 London Street, Reading, RG1 4PS					Borehole Number WS03					
Installation Type Single Installation			Dimensions Internal Diameter of Tube [A] = 50 mm			Client M K Build Limited			Job Number 21.173						
			Location 471850 E 173155 N		Ground Level (mOD) 43.97		Engineer		Sheet 1/1						
Legend	Water	Instr (A)	Level (mOD)	Depth (m)	Description	Groundwater Strikes During Drilling									
			43.77	0.20	Concrete	Date	Time	Depth Struck (m)	Casing Depth (m)	Inflow Rate	Readings				Depth Sealed (m)
										5 min	10 min	15 min	20 min		
					Groundwater Observations During Drilling										
					Date	Start of Shift					End of Shift				
						Time	Depth Hole (m)	Casing Depth (m)	Water Depth (m)	Water Level (mOD)	Time	Depth Hole (m)	Casing Depth (m)	Water Depth (m)	Water Level (mOD)
					07/07/21							3.45		DRY	
					Instrument Groundwater Observations										
					Inst. [A] Type : Slotted Standpipe										
					Date	Instrument [A]			Remarks						
						Time	Depth (m)	Level (mOD)							
16/07/21 22/07/21 29/07/21 05/08/21 12/08/21 20/08/21	11:57 11:03 11:02 11:21 12:02 10:30	DRY DRY DRY DRY DRY DRY													
			42.17	1.80	Bentonite Seal										
			41.17	2.80	Slotted Standpipe										

Remarks

 A F Howland Associates Geotechnical Engineers					Site 43 London Street, Reading, RG1 4PS			Number WS04	
Excavation Method Windowless Dynamic Sampling		Dimensions 87mm to 2.00m 75mm to 3.00m		Ground Level (mOD) 44.55		Client M K Build Limited		Job Number 21.173	
		Location 471858 E 173150 N		Dates 07/07/2021		Engineer		Sheet 1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description		Legend	Water
0.20-0.50	B1			44.05	(0.50)	MADE GROUND (Tarmac 150 mm over sandy flint and brick sub-base)			
0.50-1.00	B2				0.50	MADE GROUND (Dark grey slightly silty gravelly sand. Gravel is subangular to subrounded fine to coarse flint with occasional brick fragments) ...red brick absent			
1.20-1.65 1.20-1.50	SPT N=4 D1				(1.30)				
1.50-1.80	D2					...becoming clayey with rare fine brick fragments ...becoming orange brown			
1.80-2.30	D3	3,3/3,4,5,5		42.75	1.80	Medium dense brown slightly silty very sandy subangular to subrounded fine to coarse flint GRAVEL with occasional cobbles			
2.00-2.45	SPT N=17					...becoming light brown			
2.50-3.00	B3				(1.65)				
3.00-3.45 3.00-3.45	SPT N=21 D4								
			07/07/2021:DRY	41.10	3.45	Complete at 3.45m			
Remarks 1. Location CAT scanned prior to excavation 2. Hand dug inspection pit to 1.20 m 3. No groundwater encountered 4. Backfilled with ariaings 5. SPT Hammer Energy Ratio = 94.56%									
								Scale (approx) 1:25	Logged By PJM
								Figure No. 21.173.WS04	

 A F Howland Associates Geotechnical Engineers					Site 43 London Street, Reading, RG1 4PS			Number WS05	
Excavation Method Windowless Dynamic Sampling		Dimensions 87mm to 2.00m 75mm to 3.00m		Ground Level (mOD) 44.71		Client M K Build Limited		Job Number 21.173	
		Location 471855 E 173141 N		Dates 07/07/2021		Engineer		Sheet 1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description		Legend	Water
0.30-0.80	B1			44.41	(0.30)	MADE GROUND (Tarmac 100 mm over sandy flint and brick sub-base)			
					0.30	MADE GROUND (Dark grey silty gravelly sand. Gravel is subangular to subrounded fine to coarse flint and brick with occasional concrete)			
0.80-1.20	B2			43.91	(0.50)				
					0.80	MADE GROUND (Dark greyish brown slightly clayey gravelly sand. Gravel is subangular to subrounded fine to coarse flint and brick with occasional concrete, metal and glass)			
1.20-1.65 1.20-1.60	SPT N=5 D1		1,1/1,1,1,2		(0.80)				
1.60-2.00	D2			43.11	1.60	Medium dense orange brown mottled brown slightly silty very sandy subangular to subrounded fine to coarse flint GRAVEL with occasional cobbles			
2.00-2.45 2.00-2.70	SPT N=10 D3		2,2/2,2,3,3		(1.85)				
2.70-3.45	D4					...becoming light brown			
3.00-3.45	SPT N=24		4,6/6,5,6,7						
			07/07/2021:DRY	41.26	3.45	Complete at 3.45m			



Site
43 London Street, Reading, RG1 4PS

**Borehole
Number**
WS05

Installation Type
Single Installation

Dimensions
Internal Diameter of Tube [A] = 50 mm

Client	M K Build Limited
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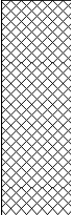
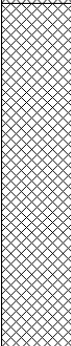
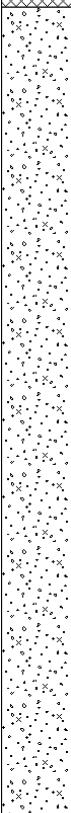
Job Number
21.173

Location
471855 E 173141 N

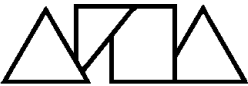
Ground Level (mOD)	44.71
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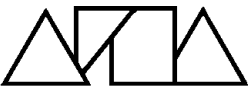
Engineer

Sheet
1/1

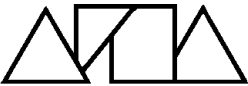
Legend	Water	Instr (A)	Level (mOD)	Depth (m)	Description	Groundwater Strikes During Drilling										
   			44.51	0.20	Concrete	Date	Time	Depth Struck (m)	Casing Depth (m)	Inflow Rate	Readings				Depth Sealed (m)	
											5 min	10 min	15 min	20 min		
						Groundwater Observations During Drilling										
						Date	Start of Shift					End of Shift				
							Time	Depth Hole (m)	Casing Depth (m)	Water Depth (m)	Water Level (mOD)	Time	Depth Hole (m)	Casing Depth (m)	Water Depth (m)	Water Level (mOD)
						07/07/21							3.45		dry	
						Instrument Groundwater Observations										
						Inst. [A] Type : Slotted Standpipe										
Date	Instrument [A]			Remarks												
	Time	Depth (m)	Level (mOD)													
16/07/21 22/07/21 29/07/21 05/08/21 12/08/21 20/08/21	11:47 10:54 10:54 11:06 11:55 10:20	DRY DRY DRY DRY DRY DRY														

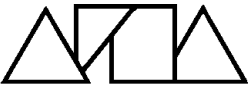
Remarks

 A F Howland Associates Geotechnical Engineers				Site 43 London Street, Reading, RG1 4PS				Probe Number DP01												
Machine : Premier Method : Dynamic Probing (Super Heavy)		Cone Dimensions Diameter 50mm, Angle 90°		Ground Level (mOD) 44.15		Client M K Build Limited		Job Number 21.173												
		Location 471837 E 173144 N		Dates 07/07/2021		Engineer		Sheet 1/1												
Depth (m)	Blows for Depth Increment	Field Records	Level (mOD)	Depth (m)	Blows for Depth Increment 02468101214161820															
		Starter pit to 1.0 m	44.15	0.00																
			43.65	0.50																
1.00-1.10	0		43.15	1.00																
1.10-1.20	1																			
1.20-1.30	0																			
1.30-1.40	1																			
1.40-1.50	0																			
1.50-1.60	0																			
1.60-1.70	0																			
1.70-1.80	0																			
1.80-1.90	0																			
1.90-2.00	1																			
2.00-2.10	1																			
2.10-2.20	0																			
2.20-2.30	1																			
2.30-2.40	1																			
2.40-2.50	0																			
2.50-2.60	0																			
2.60-2.70	0																			
2.70-2.80	1																			
2.80-2.90	0																			
2.90-3.00	0																			
3.00-3.10	1																			
3.10-3.20	0																			
3.20-3.30	0																			
3.30-3.40	0																			
3.40-3.50	1																			
3.50-3.60	0																			
3.60-3.70	0																			
3.70-3.80	0																			
3.80-3.90	1																			
3.90-4.00	0																			
4.00-4.10	2																			
4.10-4.20	3																			
4.20-4.30	3																			
4.30-4.40	3																			
4.40-4.50	4																			
4.50-4.60	3																			
4.60-4.70	3																			
4.70-4.80	3																			
4.80-4.90	2																			
4.90-5.00	2																			
Remarks 1. Location CAT scanned prior to excavation 2. Hand dug inspection pit to 1.00 m 3. No groundwater encountered 4. Hole backfilled with arisings on completion					Scale (approx) 1:40					Logged By PJM										
					Figure No. 21.173.DP01															

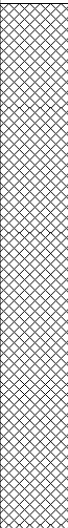
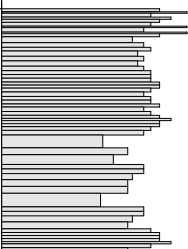
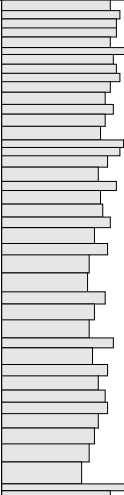
 A F Howland Associates Geotechnical Engineers				Site 43 London Street, Reading, RG1 4PS				Probe Number DP02							
Machine : Premier Method : Dynamic Probing (Super Heavy)		Cone Dimensions Diameter 50mm, Angle 90°		Ground Level (mOD) 44.34		Client M K Build Limited		Job Number 21.173							
		Location 471848 E 173144 N		Dates 07/07/2021		Engineer		Sheet 1/1							
Depth (m)	Blows for Depth Increment	Field Records	Level (mOD)	Depth (m)	Blows for Depth Increment 0 2 4 6 8 10 12 14 16 18 20										
		Starter pit to 1.0 m	44.34	0.00											
			43.84	0.50											
1.00-1.10	1		43.34	1.00											
1.10-1.20	0														
1.20-1.30	1														
1.30-1.40	0														
1.40-1.50	1														
1.50-1.60	1			42.84	1.50										
1.60-1.70	1														
1.70-1.80	1														
1.80-1.90	1														
1.90-2.00	5														
2.00-2.10	7			42.34	2.00										
2.10-2.20	9														
2.20-2.30	12														
2.30-2.40	16														
2.40-2.50	14														
2.50-2.60	16			41.84	2.50										
2.60-2.70	14														
2.70-2.80	14														
2.80-2.90	15														
2.90-3.00	16														
3.00-3.10	10			41.34	3.00										
3.10-3.20	12														
3.20-3.30	11														
3.30-3.40	9														
3.40-3.50	8			40.84	3.50										
3.50-3.60	9														
3.60-3.70	9														
3.70-3.80	9														
3.80-3.90	8														
3.90-4.00	9			40.34	4.00										
4.00-4.10	8														
4.10-4.20	10														
4.20-4.30	7														
4.30-4.40	6														
4.40-4.50	6														
4.50-4.60	8			39.84	4.50										
4.60-4.70	8														
4.70-4.80	7														
4.80-4.90	7														
4.90-5.00	7			39.34	5.00										
			38.84	5.50											
			38.34	6.00											
			37.84	6.50											
			37.34	7.00											
			36.84	7.50											
			36.34	8.00											
Remarks 1. Location CAT scanned prior to excavation 2. Hand dug inspection pit to 1.00 m 3. No groundwater encountered 4. Hole backfilled with arisings on completion								Scale (approx)		Logged By		Figure No. 21.173.DP02			
								1:40		PJM					

				A F Howland Associates Geotechnical Engineers				Site 43 London Street, Reading, RG1 4PS				Probe Number DP03				
Machine : Premier		Cone Dimensions Diameter 50mm, Angle 90°		Ground Level (mOD) 44.45		Client M K Build Limited				Job Number 21.173						
Method : Dynamic Probing (Super Heavy)		Location 471858 E 173153 N		Dates 07/07/2021		Engineer				Sheet 1/1						
Depth (m)	Blows for Depth Increment	Field Records	Level (mOD)	Depth (m)	Blows for Depth Increment 0 2 4 6 8 10 12 14 16 18 20											
		Starter pit to 1.0 m	44.45	0.00												
			43.95	0.50												
1.00-1.10	0		43.45	1.00												
1.10-1.20	1															
1.20-1.30	0															
1.30-1.40	0															
1.40-1.50	1															
1.50-1.60	1															
1.60-1.70	1															
1.70-1.80	1															
1.80-1.90	2															
1.90-2.00	4															
2.00-2.10	5															
2.10-2.20	4															
2.20-2.30	4															
2.30-2.40	3															
2.40-2.50	3															
2.50-2.60	4															
2.60-2.70	4															
2.70-2.80	4															
2.80-2.90	4															
2.90-3.00	5															
3.00-3.10	6															
3.10-3.20	7															
3.20-3.30	10															
3.30-3.40	9															
3.40-3.50	12															
3.50-3.60	11															
3.60-3.70	10															
3.70-3.80	11															
3.80-3.90	9															
3.90-4.00	9															
4.00-4.10	9															
4.10-4.20	9															
4.20-4.30	9															
4.30-4.40	8															
4.40-4.50	8															
4.50-4.60	6															
4.60-4.70	6															
4.70-4.80	7															
4.80-4.90	7															
4.90-5.00	6															

 A F Howland Associates Geotechnical Engineers				Site 43 London Street, Reading, RG1 4PS				Probe Number DP04							
Machine : Premier Method : Dynamic Probing (Super Heavy)		Cone Dimensions Diameter 50mm, Angle 90°		Ground Level (mOD) 44.83		Client M K Build Limited		Job Number 21.173							
		Location 471859 E 173142 N		Dates 07/07/2021		Engineer		Sheet 1/1							
Depth (m)	Blows for Depth Increment	Field Records	Level (mOD)	Depth (m)	Blows for Depth Increment 02468101214161820										
		Starter pit to 1.0 m	44.83	0.00											
			44.33	0.50											
1.00-1.10	0		43.83	1.00											
1.10-1.20	0														
1.20-1.30	0														
1.30-1.40	0														
1.40-1.50	1														
1.50-1.60	2			43.33	1.50										
1.60-1.70	2														
1.70-1.80	2														
1.80-1.90	3														
1.90-2.00	4														
2.00-2.10	4			42.83	2.00										
2.10-2.20	5														
2.20-2.30	4														
2.30-2.40	4														
2.40-2.50	6														
2.50-2.60	5			42.33	2.50										
2.60-2.70	6														
2.70-2.80	7														
2.80-2.90	6														
2.90-3.00	7														
3.00-3.10	7			41.83	3.00										
3.10-3.20	8														
3.20-3.30	6														
3.30-3.40	6														
3.40-3.50	7														
3.50-3.60	9			41.33	3.50										
3.60-3.70	8														
3.70-3.80	8														
3.80-3.90	9														
3.90-4.00	7														
4.00-4.10	7			40.83	4.00										
4.10-4.20	6														
4.20-4.30	5														
4.30-4.40	3														
4.40-4.50	3														
4.50-4.60	5			40.33	4.50										
4.60-4.70	7														
4.70-4.80	5														
4.80-4.90	5														
4.90-5.00	5			39.83	5.00										
			39.33	5.50											
			38.83	6.00											
			38.33	6.50											
			37.83	7.00											
			37.33	7.50											
			36.83	8.00											
Remarks 1. Location CAT scanned prior to excavation 2. Hand dug inspection pit to 1.00 m 3. No groundwater encountered 4. Hole backfilled with arisings on completion								Scale (approx) 1:40		Logged By PJM					
								Figure No. 21.173.DP04							

 A F Howland Associates Geotechnical Engineers				Site 43 London Street, Reading, RG1 4PS				Probe Number DP05							
Machine : Premier Method : Dynamic Probing (Super Heavy)		Cone Dimensions Diameter 50mm, Angle 90°		Ground Level (mOD) 44.39		Client M K Build Limited		Job Number 21.173							
		Location 471844 E 173140 N		Dates 07/07/2021		Engineer		Sheet 1/1							
Depth (m)	Blows for Depth Increment	Field Records	Level (mOD)	Depth (m)	Blows for Depth Increment 02468101214161820										
		Starter pit to 1.0 m	44.39	0.00											
			43.89	0.50											
1.00-1.10	0		43.39	1.00											
1.10-1.20	1														
1.20-1.30	0														
1.30-1.40	1														
1.40-1.50	0														
1.50-1.60	1			42.89	1.50										
1.60-1.70	1														
1.70-1.80	2														
1.80-1.90	1														
1.90-2.00	4														
2.00-2.10	5			42.39	2.00										
2.10-2.20	5														
2.20-2.30	7														
2.30-2.40	6														
2.40-2.50	5														
2.50-2.60	4			41.89	2.50										
2.60-2.70	3														
2.70-2.80	3														
2.80-2.90	3														
2.90-3.00	4														
3.00-3.10	3			41.39	3.00										
3.10-3.20	7														
3.20-3.30	10														
3.30-3.40	9														
3.40-3.50	8														
3.50-3.60	6			40.89	3.50										
3.60-3.70	6														
3.70-3.80	8														
3.80-3.90	8														
3.90-4.00	8														
4.00-4.10	7			40.39	4.00										
4.10-4.20	6														
4.20-4.30	8														
4.30-4.40	8														
4.40-4.50	7														
4.50-4.60	6			39.89	4.50										
4.60-4.70	6														
4.70-4.80	6														
4.80-4.90	6														
4.90-5.00	6			39.39	5.00										
			38.89	5.50											
			38.39	6.00											
			37.89	6.50											
			37.39	7.00											
			36.89	7.50											
			36.39	8.00											
Remarks 1. Location CAT scanned prior to excavation 2. Hand dug inspection pit to 1.00 m 3. No groundwater encountered 4. Hole backfilled with arisings on completion								Scale (approx) 1:40		Logged By PJM					
								Figure No. 21.173.DP05							

A F Howland Associates Geotechnical Engineers				Site 43 London Street, Reading, RG1 4PS		Trial Pit Number DCP01			
DCP Details Hammer weight - 8 kg Hammer drop - 575 mm Cone diameter - 20 mm Cone angle - 60 degrees Zero error - 0 mm Initial Penetration - 30 mm		Excavation Method Hand dug		Ground Level (mOD) 44.03		Client M K Build Limited		Job Number 21.173	
		Location 471843 E 173149 N		Dates 07/07/2021		Engineer		Sheet 1/1	
Depth (m)	Sample / Tests	Layer CBR % Value	CBR Value Per Blow 1 10 100	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	
0.10-0.80 0.10-0.80	D1 ES1	15			(0.80)	MADE GROUND (Tarmac 100 mm over slightly clayey silty gravelly sand. Gravel is brick concrete and clinker with subangular to rounded fine to coarse flint)			
0.80-1.00 0.80-1.00	D2 ES2		4.1						
			42.93	1.10	Complete at 1.10m				
Plan				Remarks 1. CBR % value equated from TRL method : (log (CBR) = 2.48 - 1.057 x log (penetration rate)) 2. Location CAT scanned prior to excavation 3. Hand dug inspection pit to 1.10 m 4. No groundwater encountered 5. Trial pit remained open and sidewalls stable during excavation. 6. Trial pit backfilled with arisings upon completion.					
				Scale (approx)		Logged By		Figure No.	
				1:10		SW		21.173.DCP01	

 A F Howland Associates Geotechnical Engineers				Site 43 London Street, Reading, RG1 4PS		Trial Pit Number DCP02			
DCP Details Hammer weight - 8 kg Hammer drop - 575 mm Cone diameter - 20 mm Cone angle - 60 degrees Zero error - 0 mm Initial Penetration - 10 mm		Excavation Method Hand dug		Ground Level (mOD) 43.94		Client M K Build Limited		Job Number 21.173	
		Location 471850 E 173155 N		Dates 07/07/2021		Engineer		Sheet 1/1	
Depth (m)	Sample / Tests	Layer CBR % Value	CBR Value Per Blow 1 10 100 1000	Level (mOD)	Depth (m) (Thickness)	Description		Legend	Water
						MADE GROUND (Tarmac 100 mm over slightly clayey silty gravelly sand. Gravel is brick concrete and clinker with subangular to rounded fine to coarse flint)			
		46			(0.70)				
				43.24	0.70	MADE GROUND (Light brown slightly clayey silty gravelly sand. Gravel is subangular to rounded flint. Occasional brick fragments)			
		16			(0.40)				
				42.84	1.10	Complete at 1.10m			
Plan .									

A F Howland Associates Geotechnical Engineers				Site 43 London Street, Reading, RG1 4PS		Trial Pit Number DCP03			
DCP Details Hammer weight - 8 kg Hammer drop - 575 mm Cone diameter - 20 mm Cone angle - 60 degrees Zero error - 0 mm Initial Penetration - 5 mm		Excavation Method Hand dug		Ground Level (mOD) 44.14		Client M K Build Limited		Job Number 21.173	
		Location 471844 E 173144 N		Dates 07/07/2021		Engineer		Sheet 1/1	
Depth (m)	Sample / Tests	Layer CBR % Value	CBR Value Per Blow 1 10 100	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	
		5.3	</						



A F Howland Associates Geotechnical Engineers

Site

43 London Street, Reading, RG1 4PS

Borehole Number

BH02

In Situ Permeability Type

Falling Head

Test No.

1

Ground Level (mOD)

44.41

Client

M K Build Limited

Job Number

21.173

Location

471854 E 173148 N

Dates

06/07/2021-
08/07/2021

Engineer

Sheet

1/2

Height of casing above ground level:	0.00 m
Depth to Base of Borehole:	3.00 m bgl
Depth to Base of Casing:	2.00 m bgl
Depth to equilibrium water level:	3.00 m bgl
Test Length L:	1.00 m
Diameter of Test Length D:	0.15 m
Area of Test Section:	0.0177 m ²
Intake Factor F: (after condition D, figure 6, BS5930:1990+A2:2010)	2.4205

PERMEABILITY (after Hvorslev, 1951)

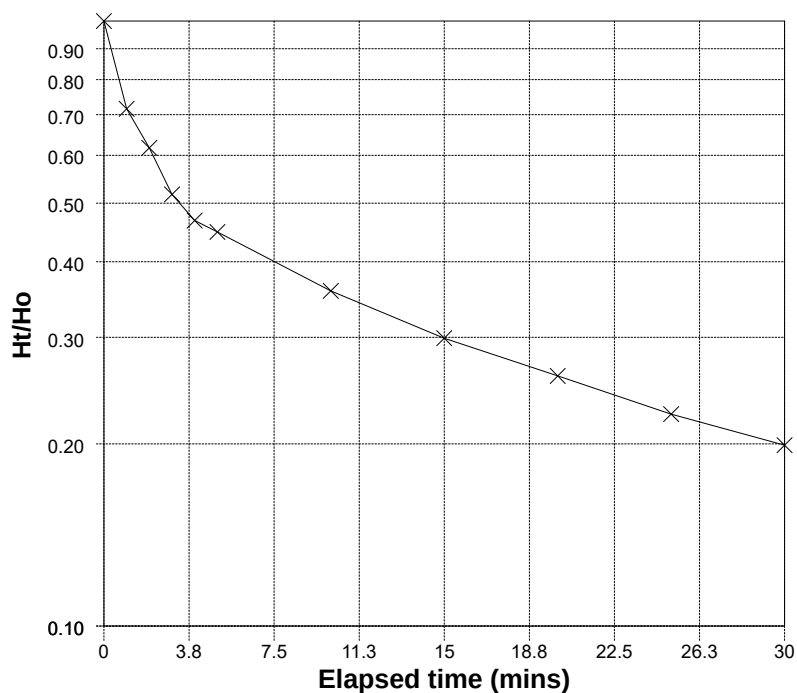
Basic Time Lag Analysis

The value T when $H_t/H_o = 0.37$ is the basic time lag, T

T = 9.33

k = 1.30E-05 ms⁻¹

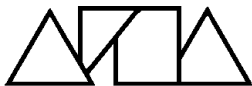
Elapsed time (mins)	Depth to water (m bgl)	Head of Water, H (m)	Ht / Ho
0.00	0.990	2.010	1.000
1.00	1.560	1.440	0.716
2.00	1.760	1.240	0.617
3.00	1.960	1.040	0.517
4.00	2.060	0.940	0.468
5.00	2.100	0.900	0.448
10.00	2.280	0.720	0.358
15.00	2.400	0.600	0.299
20.00	2.480	0.520	0.259
25.00	2.550	0.450	0.224
30.00	2.600	0.400	0.199



Remarks

1. Test carried out above water table therefore permeability rate to be taken as indicative only.

Key: bgl = Below Ground Level btoc = Below Top of Casing



A F Howland Associates Geotechnical Engineers

Site

43 London Street, Reading, RG1 4PS

Borehole Number

BH02

In Situ Permeability Type

Falling Head

Test No.

2

Ground Level (mOD)

44.41

Client

M K Build Limited

Job Number

21.173

Location

471854 E 173148 N

Dates

06/07/2021-
08/07/2021

Engineer

Sheet

2/2

Height of casing above ground level:	0.00 m
Depth to Base of Borehole:	6.10 m bgl
Depth to Base of Casing:	6.10 m bgl
Depth to equilibrium water level:	6.10 m bgl
Test Length L:	0.00 m
Diameter of Test Length D:	0.15 m
Area of Test Section:	0.0177 m ²
Intake Factor F: (after condition B, figure 6, BS5930:1990+A2:2010)	0.4125

PERMEABILITY (after Hvorslev, 1951)

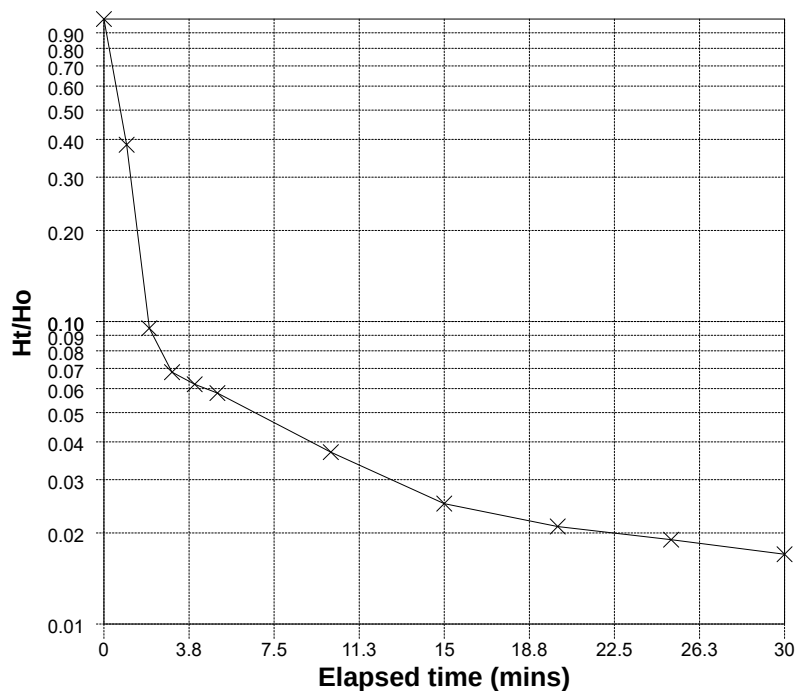
Basic Time Lag Analysis

The value T when $H_t/H_o = 0.37$ is the basic time lag, T

T = 1.05

k = 6.81E-04 ms⁻¹

Elapsed time (mins)	Depth to water (m bgl)	Head of Water, H (m)	Ht / Ho
0.00	1.260	4.840	1.000
1.00	4.240	1.860	0.384
2.00	5.640	0.460	0.095
3.00	5.770	0.330	0.068
4.00	5.800	0.300	0.062
5.00	5.820	0.280	0.058
10.00	5.920	0.180	0.037
15.00	5.980	0.120	0.025
20.00	6.000	0.100	0.021
25.00	6.010	0.090	0.019
30.00	6.020	0.080	0.017



Remarks

1. Test carried out above water table therefore permeability rate to be taken as indicative only.

Key: bgl = Below Ground Level btoc = Below Top of Casing

APPENDIX C: LABORATORY TESTING

Particle size distribution

Dry density / saturation moisture content

Sulphate, sulphur content and pH value

Contamination Testing





Site : 43 London Street, Reading, RG1 4PS

Client : M K Build Limited

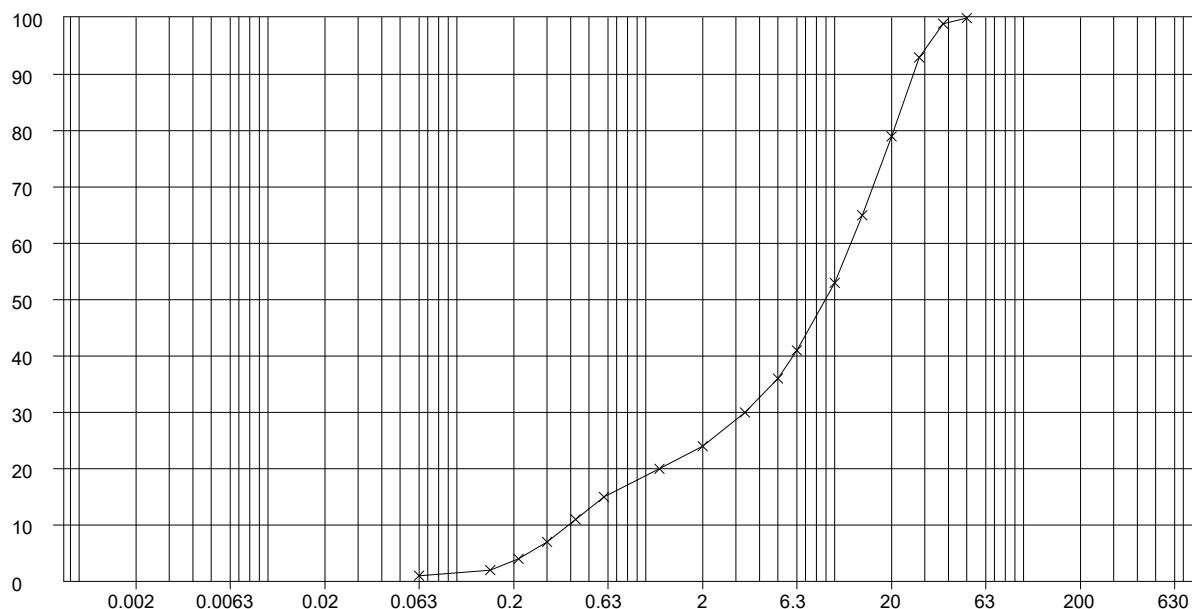
Engineer :

Job Number
21.173

Sheet
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DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Laboratory Description
BH01	3.00	B3	Brown very sandy GRAVEL.



Sieve / Particle Size	% Passing
50 mm	100.0
37.5 mm	99.0
28 mm	93.0
20 mm	79.0
14 mm	65.0
10 mm	53.0
6.3 mm	41.0
5 mm	36.0
3.35 mm	30.0
2 mm	24.0
1.18 mm	20.0
600 µm	15.0
425 µm	11.0
300 µm	7.0
212 µm	4.0
150 µm	2.0
63 µm	1.0

CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES	BOULDERS
	SILT			SAND			GRAVEL				

Grading Analysis	
D85	23.4 mm
D60	12.3 mm
D10	393.8 µm
Uniformity Coefficient	31.3

Particle Proportions	
Cobbles + Boulders	-
Gravel	76.0%
Sand	23.0%
Silt	-
Clay	-

Method of Preparation : BS EN ISO 17892:2016 Part 4. Determination of particle size distribution

Method of Test : BS EN ISO 17892: Part 4: 2016: Clause 5.2 Wet or dry sieve. Clause 5.4 Sedimentation by pipette

Remarks :



Site : 43 London Street, Reading, RG1 4PS

Client : M K Build Limited

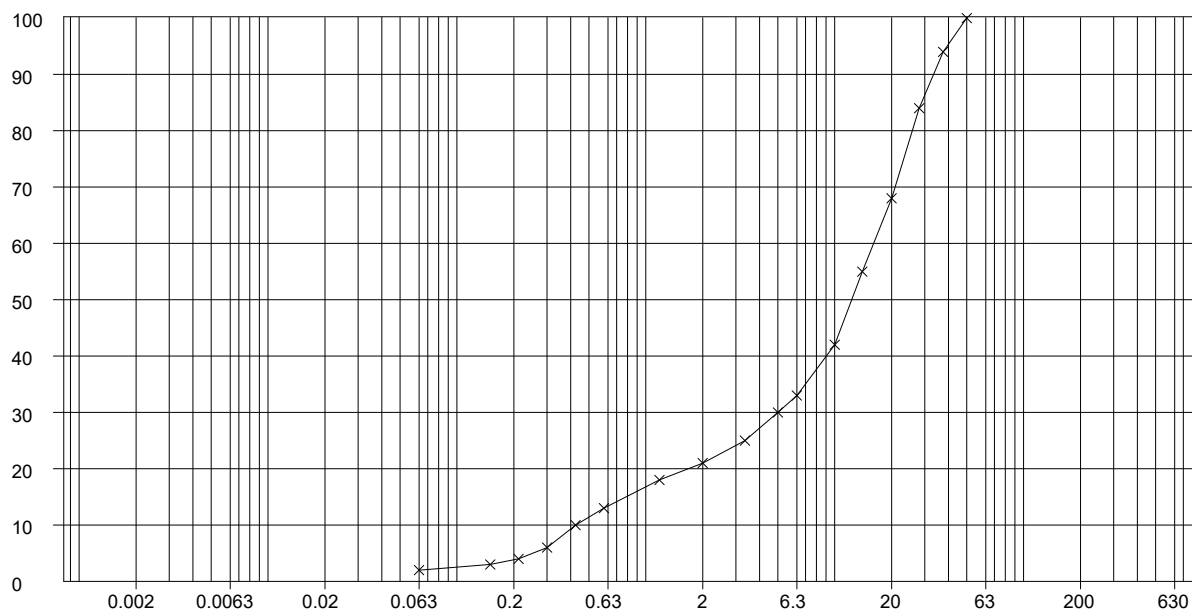
Engineer :

Job Number
21.173

Sheet
2/7

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Laboratory Description
BH02	3.00	B3	Light brown sandy GRAVEL.



Sieve / Particle Size	% Passing
50 mm	100.0
37.5 mm	94.0
28 mm	84.0
20 mm	68.0
14 mm	55.0
10 mm	42.0
6.3 mm	33.0
5 mm	30.0
3.35 mm	25.0
2 mm	21.0
1.18 mm	18.0
600 µm	13.0
425 µm	10.0
300 µm	6.0
212 µm	4.0
150 µm	3.0
63 µm	2.0

CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES	BOULDERS
	SILT			SAND			GRAVEL				

Grading Analysis	
D85	29.0 mm
D60	16.3 mm
D10	425.0 µm
Uniformity Coefficient	38.4

Particle Proportions	
Cobbles + Boulders	-
Gravel	79.0%
Sand	19.0%
Silt	-
Clay	-

Method of Preparation : BS EN ISO 17892:2016 Part 4. Determination of particle size distribution

Method of Test : BS EN ISO 17892: Part 4: 2016: Clause 5.2 Wet or dry sieve. Clause 5.4 Sedimentation by pipette

Remarks :



Laboratory Test Results

Site : 43 London Street, Reading, RG1 4PS

Client : M K Build Limited

Engineer :

Job Number
21.173

Sheet

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DETERMINATION OF PARTICLE SIZE DISTRIBUTION

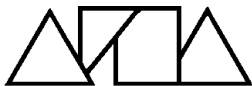
The figure displays a grading analysis graph and a corresponding data table. The graph plots the percentage of material passing through various sieve sizes (0.075 mm to 75 mm) against the sieve size. The data points are connected by a smooth curve, showing a well-graded material. The table below the graph provides the specific data points for each sieve size.

Sieve / Particle Size	% Passing
63 mm	100.0
50 mm	92.0
37.5 mm	88.0
28 mm	80.0
20 mm	72.0
14 mm	64.0
10 mm	56.0
6.3 mm	46.0
5 mm	41.0
3.35 mm	34.0
2 mm	26.0
1.18 mm	20.0
600 µm	14.0
425 µm	10.0
300 µm	6.0
212 µm	4.0
150 µm	3.0
63 µm	3.0

Method of Preparation : BS EN ISO 17892:2016 Part 4. Determination of particle size distribution

Method of Test : BS EN ISO 17892: Part 4: 2016: Clause 5.2 Wet or dry sieve. Clause 5.4 Sedimentation by pipette

Remarks :



Site : 43 London Street, Reading, RG1 4PS

Client : M K Build Limited

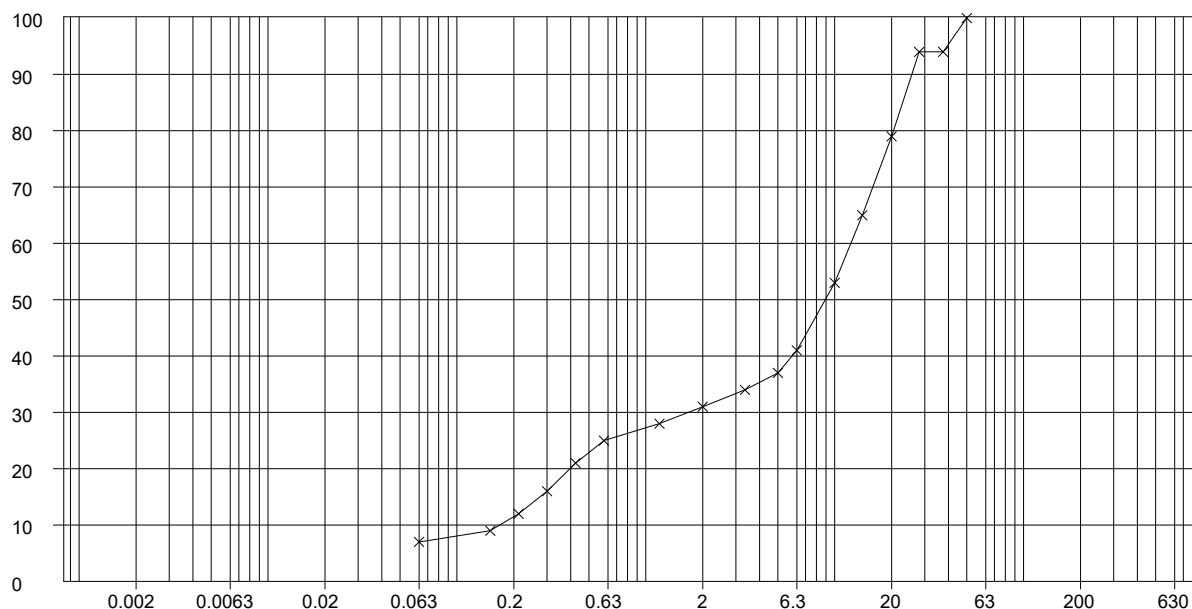
Engineer :

Job Number
21.173

Sheet
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DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Laboratory Description
WS01	2.50	D3	Brown very sandy GRAVEL.



Sieve / Particle Size	% Passing
50 mm	100.0
37.5 mm	94.0
28 mm	94.0
20 mm	79.0
14 mm	65.0
10 mm	53.0
6.3 mm	41.0
5 mm	37.0
3.35 mm	34.0
2 mm	31.0
1.18 mm	28.0
600 µm	25.0
425 µm	21.0
300 µm	16.0
212 µm	12.0
150 µm	9.0
63 µm	7.0

CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES	BOULDERS
	SILT			SAND			GRAVEL				

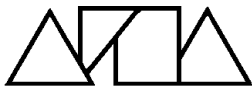
Grading Analysis	
D85	23.2 mm
D60	12.3 mm
D10	170.7 µm
Uniformity Coefficient	72.3

Particle Proportions	
Cobbles + Boulders	-
Gravel	69.0%
Sand	24.0%
Silt	-
Clay	-

Method of Preparation : BS EN ISO 17892:2016 Part 4. Determination of particle size distribution

Method of Test : BS EN ISO 17892: Part 4: 2016: Clause 5.2 Wet or dry sieve. Clause 5.4 Sedimentation by pipette

Remarks :



Site : 43 London Street, Reading, RG1 4PS

Client : M K Build Limited

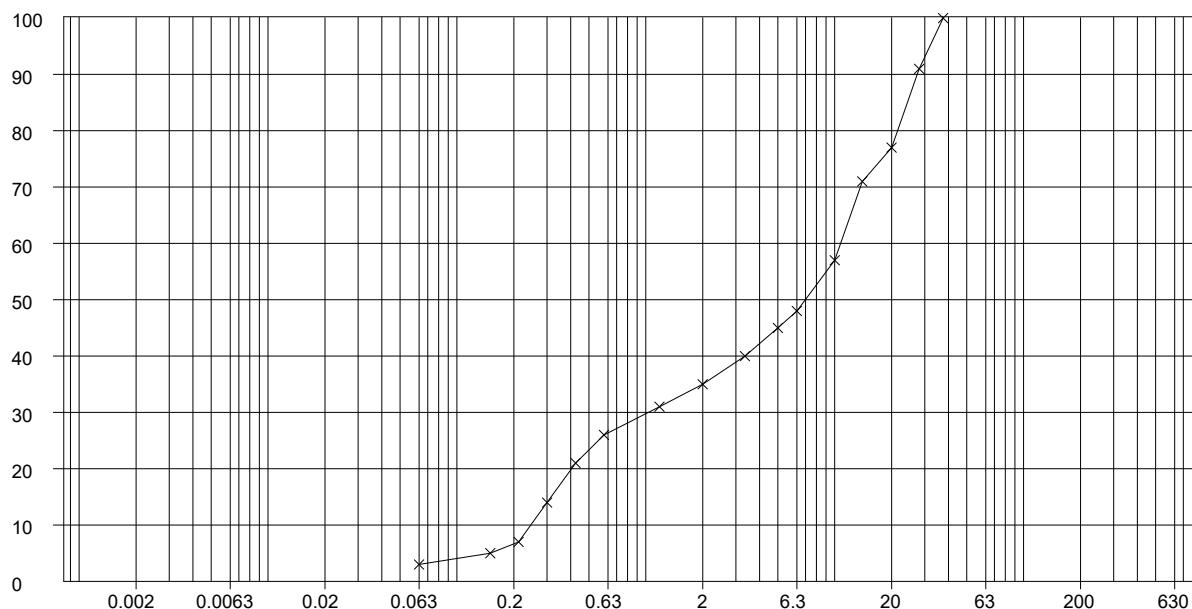
Engineer :

Job Number
21.173

Sheet
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DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Laboratory Description
WS02	2.60	D4	Brown very sandy GRAVEL.



Sieve / Particle Size	% Passing
37.5 mm	100.0
28 mm	91.0
20 mm	77.0
14 mm	71.0
10 mm	57.0
6.3 mm	48.0
5 mm	45.0
3.35 mm	40.0
2 mm	35.0
1.18 mm	31.0
600 µm	26.0
425 µm	21.0
300 µm	14.0
212 µm	7.0
150 µm	5.0
63 µm	3.0

CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES	BOULDERS
	SILT			SAND			GRAVEL				

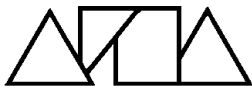
Grading Analysis	
D85	24.6 mm
D60	10.9 mm
D10	249.7 µm
Uniformity Coefficient	43.5

Particle Proportions	
Cobbles + Boulders	-
Gravel	65.0%
Sand	32.0%
Silt	-
Clay	-

Method of Preparation : BS EN ISO 17892:2016 Part 4. Determination of particle size distribution

Method of Test : BS EN ISO 17892: Part 4: 2016: Clause 5.2 Wet or dry sieve. Clause 5.4 Sedimentation by pipette

Remarks :



Site : 43 London Street, Reading, RG1 4PS

Client : M K Build Limited

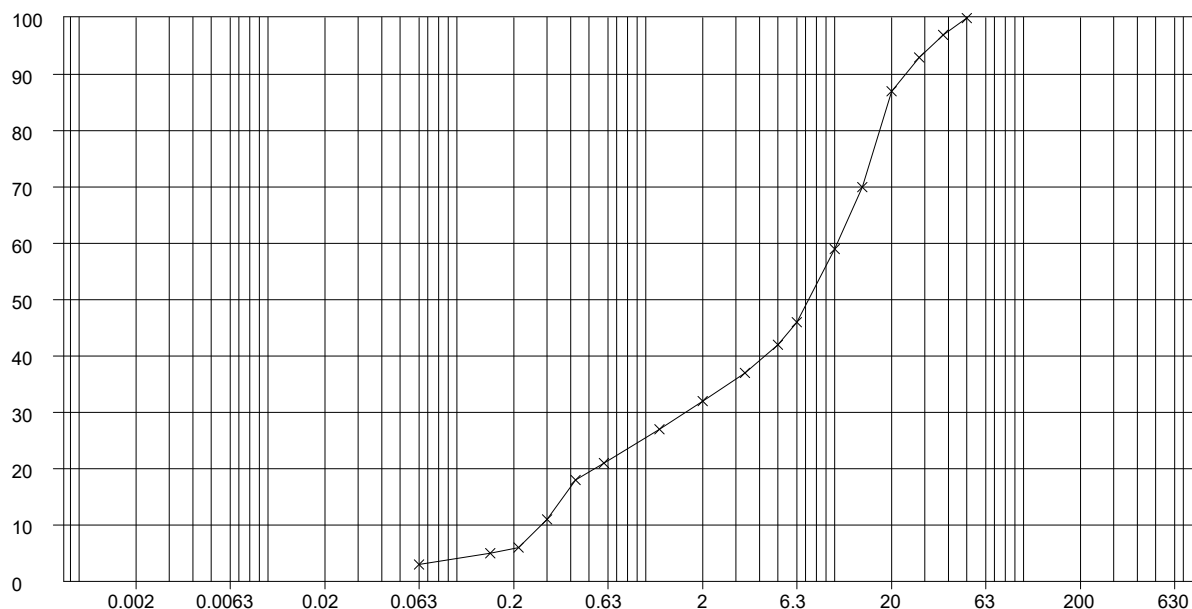
Engineer :

Job Number
21.173

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DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Laboratory Description
WS04	2.50	B3	Light brown very sandy GRAVEL.



Sieve / Particle Size	% Passing
50 mm	100.0
37.5 mm	97.0
28 mm	93.0
20 mm	87.0
14 mm	70.0
10 mm	59.0
6.3 mm	46.0
5 mm	42.0
3.35 mm	37.0
2 mm	32.0
1.18 mm	27.0
600 µm	21.0
425 µm	18.0
300 µm	11.0
212 µm	6.0
150 µm	5.0
63 µm	3.0

CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES	BOULDERS
	SILT			SAND			GRAVEL				

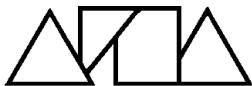
Grading Analysis	
D85	19.3 mm
D60	10.4 mm
D10	282.4 µm
Uniformity Coefficient	36.7

Particle Proportions	
Cobbles + Boulders	-
Gravel	68.0%
Sand	29.0%
Silt	-
Clay	-

Method of Preparation : BS EN ISO 17892:2016 Part 4. Determination of particle size distribution

Method of Test : BS EN ISO 17892: Part 4: 2016: Clause 5.2 Wet or dry sieve. Clause 5.4 Sedimentation by pipette

Remarks :



Site : 43 London Street, Reading, RG1 4PS

Client : M K Build Limited

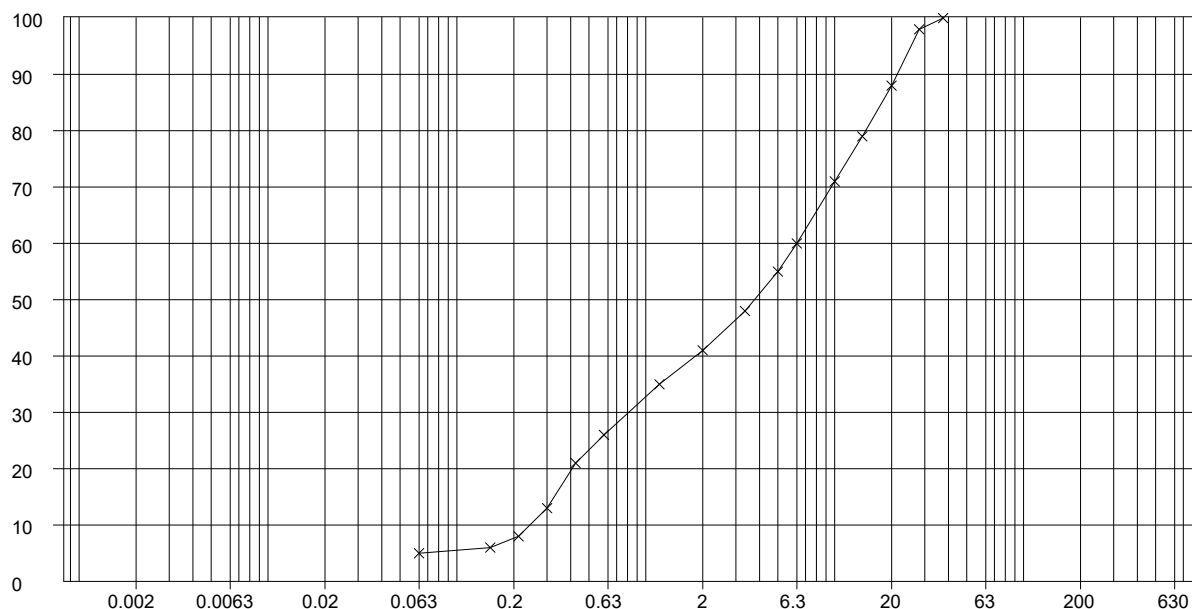
Engineer :

Job Number
21.173

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DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Laboratory Description
WS05	2.70	D4	Light brown very sandy GRAVEL.



Sieve / Particle Size	% Passing
37.5 mm	100.0
28 mm	98.0
20 mm	88.0
14 mm	79.0
10 mm	71.0
6.3 mm	60.0
5 mm	55.0
3.35 mm	48.0
2 mm	41.0
1.18 mm	35.0
600 µm	26.0
425 µm	21.0
300 µm	13.0
212 µm	8.0
150 µm	6.0
63 µm	5.0

CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES	BOULDERS
	SILT			SAND			GRAVEL				

Grading Analysis	
D85	18.0 mm
D60	6.3 mm
D10	247.2 µm
Uniformity Coefficient	25.5

Particle Proportions	
Cobbles + Boulders	-
Gravel	59.0%
Sand	36.0%
Silt	-
Clay	-

Method of Preparation : BS EN ISO 17892:2016 Part 4. Determination of particle size distribution

Method of Test : BS EN ISO 17892: Part 4: 2016: Clause 5.2 Wet or dry sieve. Clause 5.4 Sedimentation by pipette

Remarks :



A F Howland Associates
Geotechnical Engineers

Laboratory Test Results

Site : 43 London Street, Reading, RG1 4PS

Client : M K Build Limited

Engineer :

Job Number	
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21.173

Sheet

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DETERMINATION OF SATURATION MOISTURE CONTENT

Borehole/ Trial Pit	Depth (m)	Sample	Water Content %	Bulk Density (Mg/m³)	Dry Density (Mg/m³)	Saturation Moisture Content %	Porosity %	Laboratory Description
BH02	13.00	D13	28.4	1.96	1.53	28	43	White CHALK
BH02	22.00	D25	25.2	1.98	1.58	26	41	White CHALK.

Method of Preparation : BS 1377:PART 1:1990:7.3 and 7.4 Preparation of samples for classification tests

Method of Test : BS 1377:PART 2:1990:3 Determination of Saturation moisture content and water content 1990:7 Determination of density

Remarks :



Laboratory Test Results

Site : 43 London Street, Reading, RG1 4PS

Client : M K Build Limited

Engineer :

Job Number
21.173

Sheet

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DETERMINATION OF pH, SULPHATE CONTENT AND TOTAL SULPHUR OF SOIL AND GROUNDWATER

Method of Preparation : BS 1377:PART 1:1990:7.5 Preparation of soil for chemical tests

Method of Test : Laboratory in-house methods based on BS1377: Part 3 for ph and total sulphate and TRL 447 (2005) for total sulphate, Standard Methods for the Examination of Water and Wastewater Part 3120 B – 21st Edition (2005) for water soluble sulphate and total sulphur.

Remarks	: Classification relates to Design Sulphate Class of BRE Special Digest 1 (2005)
----------------	--



Barney Horne
AF Howland Associates Ltd
The Old Exchange
Newmarket Road
Cringleford
Norwich
Norfolk
NR4 6UF

Derwentside Environmental Testing Services Ltd
Unit 1
Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Kent
ME17 2JN
t: 01622 850410

DETS Report No: 21-08873

Site Reference: 43 London Street, Reading, RG1 4PS

Project / Job Ref: 21.173

Order No: BJH/21.173/00/01

Sample Receipt Date: 14/07/2021

Sample Scheduled Date: 14/07/2021

Report Issue Number: 1

Reporting Date: 22/07/2021

Authorised by:

Dave Ashworth
Technical Manager

Dates of laboratory activities for each tested analyte are available upon request.

Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.



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



Soil Analysis Certificate						
DETS Report No: 21-08873	Date Sampled	05/07/21	06/07/21	07/07/21	07/07/21	07/07/21
AF Howland Associates Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: 43 London Street, Reading, RG1 4PS	TP / BH No	BH01	BH02	BH02	WS01	WS01
Project / Job Ref: 21.173	Additional Refs	ES2	ES2	ES3	ES1	ES2
Order No: BJH/21.173/00/01	Depth (m)	0.50	0.60	2.10	0.70	1.20
Reporting Date: 22/07/2021	DETS Sample No	554624	554625	554626	554627	554628

Determinand	Unit	RL	Accreditation	(n)				
Asbestos Screen ^(S)	N/a	N/a	ISO17025	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected
pH	pH Units	N/a	MCERTS	8.6	8.4	8.2	8.0	8.2
Total Cyanide	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	< 2
Complex Cyanide	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	< 2
Free Cyanide	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	< 2
Thiocyanate as SCN	mg/kg	< 3	NONE	< 3	< 3	< 3	< 3	< 3
Organic Matter (SOM)	%	< 0.1	MCERTS	0.9	2.9	0.2	3.3	1.4
Antimony (Sb)	mg/kg	< 1	NONE	1.2	3.6	1.7	3.9	1.7
Arsenic (As)	mg/kg	< 2	MCERTS	9	45	12	22	11
Beryllium (Be)	mg/kg	< 0.5	MCERTS	< 0.5	1.2	< 0.5	1.2	< 0.5
Cadmium (Cd)	mg/kg	< 0.2	NONE	0.2	0.5	< 0.2	2.2	0.3
Chromium (Cr)	mg/kg	< 2	MCERTS	8	13	18	14	11
Chromium (hexavalent)	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	< 2
Copper (Cu)	mg/kg	< 4	MCERTS	11	54	9	86	27
Lead (Pb)	mg/kg	< 3	MCERTS	64	329	50	497	84
Mercury (Hg)	mg/kg	< 1	MCERTS	< 1	2	< 1	4.9	< 1
Nickel (Ni)	mg/kg	< 3	MCERTS	7	18	12	18	11
Selenium (Se)	mg/kg	< 2	MCERTS	< 3	< 3	< 3	< 3	< 3
Vanadium (V)	mg/kg	< 1	MCERTS	17	32	22	29	24
Zinc (Zn)	mg/kg	< 3	MCERTS	77	138	31	1580	152
Total Phenols (monohydric)	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	< 2
TPH - Aliphatic >C35 - C40	mg/kg	< 10	NONE	< 10	< 10	< 10	< 10	< 10
TPH - Aromatic >C35 - C40	mg/kg	< 10	NONE	< 10	26	< 10	15	< 10
TPH - Aliphatic / Aromatic (C6 - C40) - Total	mg/kg	< 42	NONE	< 42	83	< 42	254	< 42

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C. The Method Description page describes if the test is performed on the dried or as-received portion

Subcontracted analysis (S)

(n) Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation



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



Soil Analysis Certificate						
DETS Report No: 21-08873	Date Sampled	07/07/21	07/07/21			
AF Howland Associates Ltd	Time Sampled	None Supplied	None Supplied			
Site Reference: 43 London Street, Reading, RG1 4PS	TP / BH No	WS02	WS03			
Project / Job Ref: 21.173	Additional Refs	ES2	ES2			
Order No: BJH/21.173/00/01	Depth (m)	0.75	0.70			
Reporting Date: 22/07/2021	DETS Sample No	554629	554630			

Determinand	Unit	RL	Accreditation					
Asbestos Screen ^(S)	N/a	N/a	ISO17025	Not Detected	Not Detected			
pH	pH Units	N/a	MCERTS	7.8	7.8			
Total Cyanide	mg/kg	< 2	NONE	< 2	< 2			
Complex Cyanide	mg/kg	< 2	NONE	< 2	< 2			
Free Cyanide	mg/kg	< 2	NONE	< 2	< 2			
Thiocyanate as SCN	mg/kg	< 3	NONE	< 3	< 3			
Organic Matter (SOM)	%	< 0.1	MCERTS	1	2.2			
Antimony (Sb)	mg/kg	< 1	NONE	1.4	2			
Arsenic (As)	mg/kg	< 2	MCERTS	9	11			
Beryllium (Be)	mg/kg	< 0.5	MCERTS	< 0.5	0.5			
Cadmium (Cd)	mg/kg	< 0.2	NONE	< 0.2	0.2			
Chromium (Cr)	mg/kg	< 2	MCERTS	8	12			
Chromium (hexavalent)	mg/kg	< 2	NONE	< 2	< 2			
Copper (Cu)	mg/kg	< 4	MCERTS	23	32			
Lead (Pb)	mg/kg	< 3	MCERTS	71	72			
Mercury (Hg)	mg/kg	< 1	MCERTS	< 1	< 1			
Nickel (Ni)	mg/kg	< 3	MCERTS	9	12			
Selenium (Se)	mg/kg	< 2	MCERTS	< 3	< 3			
Vanadium (V)	mg/kg	< 1	MCERTS	19	25			
Zinc (Zn)	mg/kg	< 3	MCERTS	58	72			
Total Phenols (monohydric)	mg/kg	< 2	NONE	< 2	< 2			
TPH - Aliphatic >C35 - C40	mg/kg	< 10	NONE	< 10	< 10			
TPH - Aromatic >C35 - C40	mg/kg	< 10	NONE	< 10	< 10			
TPH - Aliphatic / Aromatic (C6 - C40) - Total	mg/kg	< 42	NONE	< 42	< 42			

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C. The Method Description page describes if the test is performed on the dried or as-received portion
Subcontracted analysis (S)



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



Soil Analysis Certificate - Speciated PAHs						
DETS Report No: 21-08873	Date Sampled	05/07/21	06/07/21	07/07/21	07/07/21	07/07/21
AF Howland Associates Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: 43 London Street, Reading, RG1 4PS	TP / BH No	BH01	BH02	BH02	WS01	WS01
Project / Job Ref: 21.173	Additional Refs	ES2	ES2	ES3	ES1	ES2
Order No: BJH/21.173/00/01	Depth (m)	0.50	0.60	2.10	0.70	1.20
Reporting Date: 22/07/2021	DETS Sample No	554624	554625	554626	554627	554628

Determinand	Unit	RL	Accreditation	(n)				
Naphthalene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	0.23	< 0.1
Acenaphthylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	0.45	< 0.1
Acenaphthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	0.14	< 0.1
Fluorene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	0.30	< 0.1
Phenanthrene	mg/kg	< 0.1	MCERTS	< 0.1	0.34	< 0.1	9.38	< 0.1
Anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	1.32	< 0.1
Fluoranthene	mg/kg	< 0.1	MCERTS	0.13	0.63	< 0.1	18.20	< 0.1
Pyrene	mg/kg	< 0.1	MCERTS	< 0.1	0.56	< 0.1	15.20	< 0.1
Benzo(a)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	0.43	< 0.1	8.90	< 0.1
Chrysene	mg/kg	< 0.1	MCERTS	< 0.1	0.44	< 0.1	8.77	< 0.1
Benzo(b)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	0.49	< 0.1	11	< 0.1
Benzo(k)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	0.17	< 0.1	4.13	< 0.1
Benzo(a)pyrene	mg/kg	< 0.1	MCERTS	< 0.1	0.31	< 0.1	8.60	< 0.1
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.1	MCERTS	< 0.1	0.17	< 0.1	4.71	< 0.1
Dibenz(a,h)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	0.95	< 0.1
Benzo(ghi)perylene	mg/kg	< 0.1	MCERTS	< 0.1	0.17	< 0.1	3.85	< 0.1
Coronene	mg/kg	< 0.1	NONE	< 0.1	< 0.1	< 0.1	1.51	< 0.1
Total Oily Waste PAHs	mg/kg	< 1	MCERTS	< 1	2.0	< 1	47.1	< 1
Total Dutch 10 PAHs	mg/kg	< 1	MCERTS	< 1	2.7	< 1	68.1	< 1
Total EPA-16 PAHs	mg/kg	< 1.6	MCERTS	< 1.6	3.7	< 1.6	96.2	< 1.6
Total WAC-17 PAHs	mg/kg	< 1.7	NONE	< 1.7	3.7	< 1.7	97.7	< 1.7

(n) Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation



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Rose Lane
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Maidstone
Kent ME17 2JN
Tel : 01622 850410



Soil Analysis Certificate - Speciated PAHs						
DETS Report No: 21-08873	Date Sampled	07/07/21	07/07/21			
AF Howland Associates Ltd	Time Sampled	None Supplied	None Supplied			
Site Reference: 43 London Street, Reading, RG1 4PS	TP / BH No	WS02	WS03			
Project / Job Ref: 21.173	Additional Refs	ES2	ES2			
Order No: BJH/21.173/00/01	Depth (m)	0.75	0.70			
Reporting Date: 22/07/2021	DETS Sample No	554629	554630			

Determinand	Unit	RL	Accreditation				
Naphthalene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1		
Acenaphthylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1		
Acenaphthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1		
Fluorene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1		
Phenanthrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1		
Anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1		
Fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1		
Pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1		
Benzo(a)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1		
Chrysene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1		
Benzo(b)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1		
Benzo(k)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1		
Benzo(a)pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1		
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1		
Dibenz(a,h)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1		
Benzo(ghi)perylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1		
Coronene	mg/kg	< 0.1	NONE	< 0.1	< 0.1		
Total Oily Waste PAHs	mg/kg	< 1	MCERTS	< 1	< 1		
Total Dutch 10 PAHs	mg/kg	< 1	MCERTS	< 1	< 1		
Total EPA-16 PAHs	mg/kg	< 1.6	MCERTS	< 1.6	< 1.6		
Total WAC-17 PAHs	mg/kg	< 1.7	NONE	< 1.7	< 1.7		



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Maidstone
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Soil Analysis Certificate - TPH LQM Banded

DETS Report No: 21-08873	Date Sampled	05/07/21	06/07/21	07/07/21	07/07/21	07/07/21
AF Howland Associates Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: 43 London Street, Reading, RG1 4PS	TP / BH No	BH01	BH02	BH02	WS01	WS01
Project / Job Ref: 21.173	Additional Refs	ES2	ES2	ES3	ES1	ES2
Order No: BJH/21.173/00/01	Depth (m)	0.50	0.60	2.10	0.70	1.20
Reporting Date: 22/07/2021	DETS Sample No	554624	554625	554626	554627	554628

Determinand	Unit	RL	Accreditation	(n)					
Aliphatic >C5 - C6	mg/kg	< 0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic >C6 - C8	mg/kg	< 0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Aliphatic >C8 - C10	mg/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	< 2	< 2
Aliphatic >C10 - C12	mg/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	< 2	< 2
Aliphatic >C12 - C16	mg/kg	< 3	MCERTS	< 3	< 3	< 3	< 3	< 3	< 3
Aliphatic >C16 - C35	mg/kg	< 10	MCERTS	14	< 10	< 10	< 10	< 10	< 10
Aliphatic >C35 - C44	mg/kg	< 10	NONE	< 10	< 10	< 10	< 10	< 10	< 10
Aliphatic (C5 - C44)	mg/kg	< 30	NONE	< 30	< 30	< 30	< 30	< 30	< 30
Aromatic >C5 - C7	mg/kg	< 0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic >C7 - C8	mg/kg	< 0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Aromatic >C8 - C10	mg/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	< 2	< 2
Aromatic >C10 - C12	mg/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	< 2	< 2
Aromatic >C12 - C16	mg/kg	< 2	MCERTS	< 2	7	< 2	4	< 2	< 2
Aromatic >C16 - C21	mg/kg	< 3	MCERTS	< 3	22	< 3	88	< 3	< 3
Aromatic >C21 - C35	mg/kg	< 10	MCERTS	< 10	27	< 10	148	< 10	< 10
Aromatic >C35 - C44	mg/kg	< 10	NONE	< 10	40	< 10	15	< 10	< 10
Aromatic (>C5 - C44)	mg/kg	< 30	NONE	< 30	97	< 30	254	< 30	< 30
Total >C5 - C44	mg/kg	< 60	NONE	< 60	97	< 60	254	< 60	< 60

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



Soil Analysis Certificate - TPH LQM Banded

DETS Report No: 21-08873	Date Sampled	07/07/21	07/07/21			
AF Howland Associates Ltd	Time Sampled	None Supplied	None Supplied			
Site Reference: 43 London Street, Reading, RG1 4PS	TP / BH No	WS02	WS03			
Project / Job Ref: 21.173	Additional Refs	ES2	ES2			
Order No: BJH/21.173/00/01	Depth (m)	0.75	0.70			
Reporting Date: 22/07/2021	DETS Sample No	554629	554630			

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



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Soil Analysis Certificate - BTEX / MTBE						
DETS Report No: 21-08873	Date Sampled	05/07/21	06/07/21	07/07/21	07/07/21	07/07/21
AF Howland Associates Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: 43 London Street, Reading, RG1 4PS	TP / BH No	BH01	BH02	BH02	WS01	WS01
Project / Job Ref: 21.173	Additional Refs	ES2	ES2	ES3	ES1	ES2
Order No: BJH/21.173/00/01	Depth (m)	0.50	0.60	2.10	0.70	1.20
Reporting Date: 22/07/2021	DETS Sample No	554624	554625	554626	554627	554628

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

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Rose Lane
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Maidstone
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Soil Analysis Certificate - BTEX / MTBE						
DETS Report No: 21-08873	Date Sampled	07/07/21	07/07/21			
AF Howland Associates Ltd	Time Sampled	None Supplied	None Supplied			
Site Reference: 43 London Street, Reading, RG1 4PS	TP / BH No	WS02	WS03			
Project / Job Ref: 21.173	Additional Refs	ES2	ES2			
Order No: BJH/21.173/00/01	Depth (m)	0.75	0.70			
Reporting Date: 22/07/2021	DETS Sample No	554629	554630			

Determinand	Unit	RL	Accreditation				
Benzene	ug/kg	< 2	MCERTS	< 2	< 2		
Toluene	ug/kg	< 5	MCERTS	9	< 5		
Ethylbenzene	ug/kg	< 2	MCERTS	< 2	< 2		
p & m-xylene	ug/kg	< 2	MCERTS	7	< 2		
o-xylene	ug/kg	< 2	MCERTS	3	< 2		
MTBE	ug/kg	< 5	MCERTS	< 5	< 5		



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Soil Analysis Certificate - Sample Descriptions

DETS Report No: 21-08873
AF Howland Associates Ltd
Site Reference: 43 London Street, Reading, RG1 4PS
Project / Job Ref: 21.173
Order No: BJH/21.173/00/01
Reporting Date: 22/07/2021

DETS Sample No	TP / BH No	Additional Refs	Depth (m)	Moisture Content (%)	Sample Matrix Description
554624	BH01	ES2	0.50	9.9	Brown gravelly sand with stones
554625	BH02	ES2	0.60	12.1	Brown sandy clay with stones
554626	BH02	ES3	2.10	3.4	Brown sandy gravel with stones
554627	WS01	ES1	0.70	13.8	Brown sandy clay with stones and concrete
554628	WS01	ES2	1.20	10.9	Brown sandy clay with stones and concrete
554629	WS02	ES2	0.75	9.9	Brown sandy clay with stones
554630	WS03	ES2	0.70	11.7	Brown sandy clay with stones

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

Insufficient Sample ^{I/S}

Unsuitable Sample ^{U/S}



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Soil Analysis Certificate - Methodology & Miscellaneous Information

DETS Report No: 21-08873

AF Howland Associates Ltd

Site Reference: 43 London Street, Reading, RG1 4PS

Project / Job Ref: 21.173

Order No: BJH/21.173/00/01

Reporting Date: 22/07/2021

Matrix	Analysed On	Determinand	Brief Method Description	Method No
Soil	D	Boron - Water Soluble	Determination of water soluble boron in soil by 2:1 hot water extract followed by ICP-OES	E012
Soil	AR	BTEX	Determination of BTEX by headspace GC-MS	E001
Soil	D	Cations	Determination of cations in soil by aqua-regia digestion followed by ICP-OES	E002
Soil	D	Chloride - Water Soluble (2:1)	Determination of chloride by extraction with water & analysed by ion chromatography	E009
Soil	AR	Chromium - Hexavalent	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry	E016
Soil	AR	Cyanide - Complex	Determination of complex cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Free	Determination of free cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Total	Determination of total cyanide by distillation followed by colorimetry	E015
Soil	D	Cyclohexane Extractable Matter (CEM)	Gravimetrically determined through extraction with cyclohexane	E011
Soil	AR	Diesel Range Organics (C10 - C24)	Determination of hexane/acetone extractable hydrocarbons by GC-FID	E004
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of saturated calcium sulphate followed by electrometric measurement	E022
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of water followed by electrometric measurement	E023
Soil	D	Elemental Sulphur	Determination of elemental sulphur by solvent extraction followed by GC-MS	E020
Soil	AR	EPH (C10 - C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH Product ID	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH TEXAS (C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID for C8 to C40. C6 to C8 by headspace GC-MS	E004
Soil	D	Fluoride - Water Soluble	Determination of Fluoride by extraction with water & analysed by ion chromatography	E009
Soil	D	Fraction Organic Carbon (FOC)	Determination of TOC by combustion analyser.	E027
Soil	D	Organic Matter (SOM)	Determination of TOC by combustion analyser.	E027
Soil	D	TOC (Total Organic Carbon)	Determination of TOC by combustion analyser.	E027
Soil	AR	Exchangeable Ammonium	Determination of ammonium by discrete analyser.	E029
Soil	D	FOC (Fraction Organic Carbon)	Determination of fraction of organic carbon by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	D	Loss on Ignition @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace	E019
Soil	D	Magnesium - Water Soluble	Determination of water soluble magnesium by extraction with water followed by ICP-OES	E025
Soil	D	Metals	Determination of metals by aqua-regia digestion followed by ICP-OES	E002
Soil	AR	Mineral Oil (C10 - C40)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge	E004
Soil	AR	Moisture Content	Moisture content; determined gravimetrically	E003
Soil	D	Nitrate - Water Soluble (2:1)	Determination of nitrate by extraction with water & analysed by ion chromatography	E009
Soil	D	Organic Matter	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	PAH - Speciated (EPA 16)	Determination of PAH compounds by extraction in acetone and hexane followed by GC-MS with the use of surrogate and internal standards	E005
Soil	AR	PCB - 7 Congeners	Determination of PCB by extraction with acetone and hexane followed by GC-MS	E008
Soil	D	Petroleum Ether Extract (PEE)	Gravimetrically determined through extraction with petroleum ether	E011
Soil	AR	pH	Determination of pH by addition of water followed by electrometric measurement	E007
Soil	AR	Phenols - Total (monohydric)	Determination of phenols by distillation followed by colorimetry	E021
Soil	D	Phosphate - Water Soluble (2:1)	Determination of phosphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Total	Determination of total sulphate by extraction with 10% HCl followed by ICP-OES	E013
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of sulphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of water soluble sulphate by extraction with water followed by ICP-OES	E014
Soil	AR	Sulphide	Determination of sulphide by distillation followed by colorimetry	E018
Soil	D	Sulphur - Total	Determination of total sulphur by extraction with aqua-regia followed by ICP-OES	E024
Soil	AR	SVOC	Determination of semi-volatile organic compounds by extraction in acetone and hexane followed by GC-MS	E006
Soil	AR	Thiocyanate (as SCN)	Determination of thiocyanate by extraction in caustic soda followed by acidification followed by addition of ferric nitrate followed by colorimetry	E017
Soil	D	Toluene Extractable Matter (TEM)	Gravimetrically determined through extraction with toluene	E011
Soil	D	Total Organic Carbon (TOC)	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	TPH CWG (ali: C5- C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C34, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C35. C5 to C8 by headspace GC-MS	E004
Soil	AR	TPH LQM (ali: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C35, C35-C44, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35, C35-C44)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C44. C5 to C8 by headspace GC-MS	E004
Soil	AR	VOCs	Determination of volatile organic compounds by headspace GC-MS	E001
Soil	AR	VPH (C6-C8 & C8-C10)	Determination of hydrocarbons C6-C8 by headspace GC-MS & C8-C10 by GC-FID	E001

D Dried
AR As Received

APPENDIX D: MONITORING RECORDS

Gas monitoring records





Ground Gas Monitoring Results

Site : 43 London Street, Reading, RG1 4PS

Client : M K Build Limited

Engineer :

Job Number
21.173

Sheet

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A F Howland Associates Geotechnical Engineers

Ground Gas Monitoring Results

Site : 43 London Street, Reading, RG1 4PS

Client : M K Build Limited

Engineer :

Job Number
21.173

Sheet
2 / 4

BH/WS	Date / Time	Flow Pod (l/h)	CH4 (%)	Peak CH4 (%)	CH4 LEL (%)	CO2 (%)	PEAK CO2 (%)	O2 (%)	Min O2 (%)	Balance (%)	Baro (mb)	Rel Pressure (mb)	CO (ppm)	H2S (ppm)	Temp (°C)
WS01	16/07/2021 12:46:41	0.0	0.1	0.1	2.0	0.1	0.1	20.5	20.5	79.3	1023	0.2	1.0	1.0	22.3
WS01	16/07/2021 12:47:23		0.1	0.1	2.0	0.1	0.1	20.5	20.5	79.3			1.0	1.0	22.3
WS01	16/07/2021 12:47:54		0.1	0.1	2.0	0.1	0.1	20.5	20.5	79.3			1.0	1.0	22.3
WS01	16/07/2021 12:48:24		0.1	0.1	2.0	0.1	0.1	20.4	20.4	79.4			1.0	1.0	22.3
WS01	16/07/2021 12:48:54		0.1	0.1	2.0	0.1	0.1	20.4	20.4	79.4			1.0	1.0	22.3
WS01	16/07/2021 12:49:25		0.1	0.1	2.0	0.1	0.1	20.4	20.4	79.4			1.0	1.0	22.3
WS01	16/07/2021 12:49:55		0.1	0.1	2.0	0.1	0.1	20.4	20.4	79.4			1.0	1.0	22.3
WS01	22/07/2021 11:18:00	0.0	0.0	0.0	0.0	0.2	0.2	20.1	20.1	79.7	1020	-0.1	1.0	0.0	24.6
WS01	22/07/2021 11:18:00		0.0	0.0	0.0	0.2	0.2	20.0	20.0	79.8			1.0	0.0	24.6
WS01	22/07/2021 11:19:00		0.0	0.0	0.0	0.2	0.2	20.1	20.0	79.7			1.0	0.0	24.6
WS01	22/07/2021 11:19:00		0.0	0.0	0.0	0.2	0.2	20.1	20.1	79.7			1.0	0.0	24.6
WS01	22/07/2021 11:20:00		0.0	0.0	0.0	0.2	0.2	20.0	20.0	79.8			1.0	0.0	24.6
WS01	22/07/2021 11:20:00		0.0	0.0	0.0	0.2	0.2	20.0	20.0	79.8			1.0	0.0	24.6
WS01	22/07/2021 11:21:00		0.0	0.0	0.0	0.2	0.2	20.0	20.0	79.8			1.0	0.0	24.6
WS01	29/07/2021 11:16:00	0.0	0.0	0.0	0.0	0.2	0.2	20.1	20.1	79.7	1007	0.2	0.0	0.0	16.1
WS01	29/07/2021 11:16:00		0.0	0.0	0.0	0.2	0.2	20.1	20.1	79.7			0.0	0.0	16.1
WS01	29/07/2021 11:17:00		0.0	0.0	0.0	0.2	0.2	20.1	20.1	79.7			0.0	0.0	16.1
WS01	29/07/2021 11:17:00		0.0	0.0	0.0	0.2	0.2	20.1	20.1	79.7			0.0	0.0	16.1
WS01	29/07/2021 11:18:00		0.0	0.0	0.0	0.2	0.2	20.0	20.0	79.8			0.0	0.0	16.1
WS01	29/07/2021 11:18:00		0.0	0.0	0.0	0.2	0.2	20.0	20.0	79.8			0.0	1.0	16.1
WS01	29/07/2021 11:19:00		0.0	0.0	0.0	0.2	0.2	20.0	20.0	79.8			0.0	1.0	16.1
WS01	05/08/2021 11:36:00	0.1	0.0	0.0	0.0	0.4	0.4	19.4	19.4	80.2	1002	0.0	0.0	1.0	18.2
WS01	05/08/2021 11:36:00		0.0	0.0	0.0	0.4	0.4	19.5	19.5	80.1			0.0	1.0	18.2
WS01	05/08/2021 11:37:00		0.0	0.0	0.0	0.4	0.4	19.5	19.5	80.1			0.0	1.0	18.2
WS01	05/08/2021 11:37:00		0.0	0.0	0.0	0.4	0.4	19.5	19.5	80.1			0.0	1.0	18.2
WS01	05/08/2021 11:38:00		0.0	0.0	0.0	0.4	0.4	19.5	19.5	80.1			0.0	1.0	18.2
WS01	05/08/2021 11:38:00		0.0	0.0	0.0	0.4	0.4	19.5	19.5	80.1			0.0	1.0	18.2
WS01	05/08/2021 11:39:00		0.0	0.0	0.0	0.5	0.5	19.5	19.5	80.0			0.0	1.0	18.2
WS01	12/08/2021 12:14:00	0.0	0.0	0.0	0.0	0.5	0.5	19.8	19.8	79.7	1014	0.0	0.0	0.0	18.2
WS01	12/08/2021 12:14:00		0.0	0.0	0.0	0.5	0.5	19.8	19.8	79.7			0.0	0.0	18.2
WS01	12/08/2021 12:15:00		0.0	0.0	0.0	0.5	0.5	19.8	19.8	79.7			0.0	0.0	18.2
WS01	12/08/2021 12:15:00		0.0	0.0	0.0	0.6	0.6	19.8	19.8	79.6			0.0	0.0	18.2
WS01	12/08/2021 12:16:00		0.0	0.0	0.0	0.6	0.6	19.8	19.8	79.6			0.0	0.0	18.2
WS01	12/08/2021 12:16:00		0.0	0.0	0.0	0.6	0.6	19.7	19.7	79.7			0.0	1.0	18.2
WS01	12/08/2021 12:17:00		0.0	0.0	0.0	0.6	0.6	19.7	19.7	79.7			0.0	1.0	18.2
WS01	20/08/2021 10:51:00	0.0	0.0	0.0	0.0	0.4	0.4	19.7	19.7	79.9	1013	0.0	0.0	0.0	19.4
WS01	20/08/2021 10:52:00		0.0	0.0	0.0	0.4	0.4	19.7	19.7	79.9			0.0	0.0	19.4
WS01	20/08/2021 10:52:00		0.0	0.0	0.0	0.4	0.4	19.7	19.7	79.9			0.0	0.0	19.4
WS01	20/08/2021 10:53:00		0.0	0.0	0.0	0.5	0.5	19.6	19.6	79.9			0.0	0.0	19.4
WS01	20/08/2021 10:53:00		0.0	0.0	0.0	0.5	0.5	19.6	19.6	79.9			0.0	1.0	19.4
WS01	20/08/2021 10:54:00		0.0	0.0	0.0	0.5	0.5	19.5	19.5	80.0			0.0	0.0	19.4
WS01	20/08/2021 10:54:00		0.0	0.0	0.0	0.5	0.5	19.5	19.5	80.0			0.0	0.0	19.4
WS02	16/07/2021 12:30:39	0.0	0.1	0.1	2.0	0.1	0.1	20.6	20.6	79.2	1022	0.0	1.0	0.0	22.3
WS02	16/07/2021 12:31:33		0.0	0.0	0.0	0.1	0.1	20.6	20.6	79.3			1.0	0.0	22.3
WS02	16/07/2021 12:32:04		0.1	0.1	2.0	0.1	0.1	20.6	20.6	79.2			1.0	0.0	22.3
WS02	16/07/2021 12:32:34		0.1	0.1	2.0	0.1	0.1	20.6	20.6	79.2			1.0	0.0	22.3
WS02	16/07/2021 12:33:05		0.0	0.1	0.0	0.1	0.1	20.6	20.6	79.3			1.0	0.0	22.3
WS02	16/07/2021 12:33:35		0.0	0.1	0.0	0.1	0.1	20.5	20.5	79.4			1.0	0.0	22.3
WS02	16/07/2021 12:34:05		0.0	0.1	0.0	0.1	0.1	20.5	20.5	79.4			1.0	0.0	22.3
WS02	22/07/2021 11:08:00	0.0	0.0	0.0	0.0	0.4	0.4	20.0	20.0	79.6	1019	-0.1	1.0	0.0	24.6
WS02	22/07/2021 11:09:00		0.0	0.0	0.0	0.4	0.4	19.9	19.9	79.7			1.0	0.0	24.6
WS02	22/07/2021 11:09:00		0.0	0.0	0.0	0.5	0.5	19.8	19.8	79.7			1.0	0.0	24.6
WS02	22/07/2021 11:10:00		0.0	0.0	0.0	0.5	0.5	19.8	19.8	79.7			1.0	0.0	24.6
WS02	22/07/2021 11:10:00		0.0	0.0	0.0	0.5	0.5	19.7	19.7	79.8			0.0	0.0	24.6
WS02	22/07/2021 11:11:00		0.0	0.0	0.0	0.6	0.6	19.6	19.6	79.8			1.0	0.0	24.6
WS02	22/07/2021 11:11:00		0.0	0.0	0.0	0.6	0.6	19.6	19.6	79.8			0.0	0.0	24.6
WS02	29/07/2021 11:07:00	0.0	0.0	0.0	0.0	0.5	0.5	20.3	20.3	79.2	1006	0.0	0.0	0.0	16.1
WS02	29/07/2021 11:08:00		0.0	0.0	0.0	0.5	0.5	20.2	20.2	79.3			0.0	0.0	16.1
WS02	29/07/2021 11:08:00		0.0	0.0	0.0	0.5	0.5	20.2	20.2	79.3			0.0	0.0	16.1
WS02	29/07/2021 11:09:00		0.0	0.0	0.0	0.6	0.6	20.1	20.1	79.3			0.0	0.0	16.1
WS02	29/07/2021 11:09:00		0.0	0.0	0.0	0.6	0.6	20.1	20.1	79.3			0.0	0.0	16.1
WS02	29/07/2021 11:10:00		0.0	0.0	0.0	0.6	0.6	20.0	20.0	79.4			0.0	0.0	16.1
WS02	29/07/2021 11:10:00		0.0	0.0	0.0	0.6	0.6	20.0	20.0	79.4			0.0	0.0	16.1
WS02	05/08/2021 11:26:00	0.0	0.0	0.0	0.0	1.0	1.0	18.6	18.6	80.4	1001	-0.1	0.0	1.0	18.2
WS02	05/08/2021 11:26:00		0.0	0.0	0.0	1.0	1.0	18.6	18.6	80.4			0.0	1.0	18.2
WS02	05/08/2021 11:27:00		0.0	0.0	0.0	1.0	1.0	18.5	18.5	80.5			0.0	1.0	18.2
WS02	05/08/2021 11:27:00		0.0	0.0	0.0	1.1	1.1	18.5	18.5	80.4			0.0	1.0	18.2
WS02	05/08/2021 11:28:00		0.0	0.0	0.0	1.1	1.1	18.4	18.4	80.5			0.0	1.0	18.2
WS02	05/08/2021 11:28:00		0.0	0.0	0.0	1.2	1.2	18.4	18.4	80.4			0.0	1.0	18.2
WS02	05/08/2021 11:29:00		0.0	0.0	0.0	1.2	1.2	18.3	18.3	80.5			0.0	1.0	18.2
WS02	12/08/2021 12:06:00	0.0	0.0	0.0	0.0	1.2	1.2	18.9	18.9	79.9	1013	0.8	0.0	1.0	18.2
WS02	12/08/2021 12:07:00		0.0	0.0	0.0	1.2	1.2	18.9	18.9	79.9			0.0	1.0	18.2
WS02	12/08/2021 12:07:00		0.0	0.0	0.0	1.2	1.2	18.8	18.8	80.0			0.0	1.0	18.2
WS02	12/08/2021 12:08:00		0.0	0.0	0.0	1.3	1.3	18.7	18.7	80.0			0.0	1.0	18.2
WS02	12/08/2021 12:08:00		0.0	0.0	0.0	1.3	1.3	18.6	18.6	80.1			0.0	1.0	18.2
WS02	12/08/2021 12:09:00		0.0	0.0	0.0	1.4	1.4	18.5	18.5	80.1			0.0	1.0	18.2
WS02	12/08/2021 12:09:00		0.0	0.0	0.0	1.5	1.5	18.4	18.4	80.1			0.0	1.0	18.2
WS02	20/08/2021 10:34:00	0.0	0.0	0.0	0.0	1.6	1.6	18.2	18.2	80.2	1012	0.1	0.0	1.0	19.4
WS02	20/08/2021 10:34:00		0.0	0.0	0.0	1.5	1.5	18.2	18.2	80.3			0.0	0.0	19.4



A F Howland Associates Geotechnical Engineers

Ground Gas Monitoring Results

Site : 43 London Street, Reading, RG1 4PS

Client : M K Build Limited

Engineer :

Job Number

21.173

Sheet

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BH/WS	Date / Time	Flow Pod (l/h)	CH4 (%)	Peak CH4 (%)	CH4 LEL (%)	CO2 (%)	PEAK CO2 (%)	O2 (%)	Min O2 (%)	Balance (%)	Baro (mb)	Rel Pressure (mb)	CO (ppm)	H2S (ppm)	Temp (°C)
WS02	20/08/2021 10:35:00		0.0	0.0	0.0	1.6	1.6	18.2	18.2	80.2			0.0	1.0	19.4
WS02	20/08/2021 10:35:00		0.0	0.0	0.0	1.6	1.6	18.1	18.1	80.3			0.0	1.0	19.4
WS02	20/08/2021 10:36:00		0.0	0.0	0.0	1.7	1.7	18.0	18.0	80.3			0.0	1.0	19.4
WS02	20/08/2021 10:36:00		0.0	0.0	0.0	1.8	1.8	17.9	17.9	80.3			0.0	0.0	19.4
WS02	20/08/2021 10:37:00		0.0	0.0	0.0	1.9	1.9	17.8	17.8	80.3			0.0	1.0	19.4
WS02	20/08/2021 10:38:00		0.0	0.0	0.0	1.9	1.9	17.8	17.8	80.3			0.0	1.0	19.4
WS02	20/08/2021 10:38:00		0.0	0.0	0.0	1.9	1.9	17.7	17.7	80.4			0.0	1.0	19.4
WS02	20/08/2021 10:39:00		0.0	0.0	0.0	2.0	2.0	17.6	17.6	80.4			0.0	1.0	19.4
WS02	20/08/2021 10:39:00		0.0	0.0	0.0	2.1	2.1	17.5	17.5	80.4			0.0	1.0	19.4
WS02	20/08/2021 10:40:00		0.0	0.0	0.0	2.2	2.2	17.4	17.4	80.4			0.0	1.0	19.4
WS02	20/08/2021 10:40:00		0.0	0.0	0.0	2.3	2.3	17.3	17.3	80.4			0.0	1.0	19.4
WS02	20/08/2021 10:42:00		0.0	0.0	0.0	2.3	2.3	17.2	17.2	80.5			0.0	0.0	19.4
WS02	20/08/2021 10:42:00		0.0	0.0	0.0	2.4	2.4	17.2	17.2	80.4			0.0	0.0	19.4
WS02	20/08/2021 10:43:00		0.0	0.0	0.0	2.5	2.5	17.1	17.1	80.4			0.0	0.0	19.4
WS02	20/08/2021 10:43:00		0.0	0.0	0.0	2.5	2.5	17.0	17.0	80.5			0.0	0.0	19.4
WS02	20/08/2021 10:44:00		0.0	0.0	0.0	2.5	2.5	17.0	17.0	80.5			0.0	0.0	19.4
WS02	20/08/2021 10:44:00		0.0	0.0	0.0	2.5	2.5	17.0	17.0	80.5			0.0	1.0	19.4
WS02	20/08/2021 10:45:00		0.0	0.0	0.0	2.5	2.5	17.0	17.0	80.5			0.0	1.0	19.4
WS02	20/08/2021 10:45:00		0.0	0.0	0.0	2.5	2.5	17.0	17.0	80.5			0.0	0.0	19.4
WS03	16/07/2021 11:52:12	-0.1	0.0	0.1	0.0	0.1	0.1	20.1	20.1	79.8	1023	0.1	0.0	1.0	22.3
WS03	16/07/2021 11:53:00		0.0	0.0	0.0	0.1	0.1	20.1	20.1	79.8			0.0	0.0	22.3
WS03	16/07/2021 11:53:29		0.0	0.0	0.0	0.1	0.1	20.1	20.1	79.8			0.0	1.0	22.3
WS03	16/07/2021 11:53:59		0.0	0.0	0.0	0.1	0.1	20.1	20.1	79.8			0.0	1.0	22.3
WS03	16/07/2021 11:54:30		0.0	0.0	0.0	0.1	0.1	20.0	20.0	79.9			0.0	1.0	22.3
WS03	16/07/2021 11:55:00		0.0	0.0	0.0	0.1	0.1	20.0	20.0	79.9			0.0	1.0	22.3
WS03	16/07/2021 11:55:30		0.0	0.0	0.0	0.1	0.1	20.0	20.0	79.9			1.0	1.0	22.3
WS03	22/07/2021 10:58:00	0.0	0.0	0.0	0.0	0.1	0.1	20.1	20.1	79.8	1019	-0.1	1.0	1.0	24.6
WS03	22/07/2021 10:59:00		0.0	0.0	0.0	0.1	0.1	20.1	20.1	79.8			0.0	1.0	24.6
WS03	22/07/2021 11:00:00		0.0	0.0	0.0	0.1	0.1	20.1	20.1	79.8			1.0	1.0	24.6
WS03	22/07/2021 11:00:00		0.0	0.0	0.0	0.1	0.1	20.1	20.1	79.8			1.0	1.0	24.6
WS03	22/07/2021 11:01:00		0.0	0.0	0.0	0.1	0.1	20.1	20.1	79.8			1.0	1.0	24.6
WS03	22/07/2021 11:01:00		0.0	0.0	0.0	0.1	0.1	20.0	20.0	79.9			1.0	1.0	24.6
WS03	22/07/2021 11:02:00		0.0	0.0	0.0	0.1	0.1	20.0	20.0	79.9			1.0	1.0	24.6
WS03	29/07/2021 10:57:00	0.0	0.0	0.0	0.0	0.1	0.1	20.6	20.5	79.3	1007	-0.1	0.0	0.0	16.1
WS03	29/07/2021 10:58:00		0.0	0.0	0.0	0.1	0.1	20.5	20.5	79.4			0.0	0.0	16.1
WS03	29/07/2021 10:59:00		0.0	0.0	0.0	0.1	0.1	20.5	20.5	79.4			0.0	0.0	16.1
WS03	29/07/2021 10:59:00		0.0	0.0	0.0	0.1	0.1	20.5	20.5	79.4			0.0	0.0	16.1
WS03	29/07/2021 11:00:00		0.0	0.0	0.0	0.1	0.1	20.5	20.5	79.4			0.0	0.0	16.1
WS03	29/07/2021 11:00:00		0.0	0.0	0.0	0.1	0.1	20.5	20.5	79.4			0.0	0.0	16.1
WS03	29/07/2021 11:01:00		0.0	0.0	0.0	0.1	0.1	20.5	20.5	79.4			0.0	0.0	16.1
WS03	05/08/2021 11:10:00	0.0	0.0	0.0	0.0	0.1	0.1	20.3	20.3	79.6	1002	0.2	0.0	1.0	18.2
WS03	05/08/2021 11:17:00		0.0	0.0	0.0	0.1	0.1	20.3	20.3	79.6			0.0	1.0	18.2
WS03	05/08/2021 11:17:00		0.0	0.0	0.0	0.1	0.1	20.1	20.1	79.8			0.0	1.0	18.2
WS03	05/08/2021 11:18:00		0.0	0.0	0.0	0.1	0.1	20.1	20.1	79.8			0.0	1.0	18.2
WS03	05/08/2021 11:18:00		0.0	0.0	0.0	0.1	0.1	20.0	20.0	79.9			0.0	1.0	18.2
WS03	05/08/2021 11:19:00		0.0	0.0	0.0	0.2	0.2	19.9	19.9	79.9			0.0	1.0	18.2
WS03	05/08/2021 11:19:00		0.0	0.0	0.0	0.3	0.3	19.8	19.8	79.9			0.0	1.0	18.2
WS03	12/08/2021 11:58:00	0.0	0.0	0.0	0.0	0.1	0.1	20.7	20.7	79.2	1014	-0.2	0.0	1.0	18.2
WS03	12/08/2021 11:58:00		0.0	0.0	0.0	0.1	0.1	20.7	20.7	79.2			0.0	1.0	18.2
WS03	12/08/2021 11:59:00		0.0	0.0	0.0	0.1	0.1	20.7	20.7	79.2			0.0	1.0	18.2
WS03	12/08/2021 11:59:00		0.0	0.0	0.0	0.1	0.1	20.7	20.7	79.2			0.0	1.0	18.2
WS03	12/08/2021 12:00:00		0.0	0.0	0.0	0.1	0.1	20.7	20.7	79.2			0.0	1.0	18.2
WS03	12/08/2021 12:00:00		0.0	0.0	0.0	0.1	0.1	20.7	20.7	79.2			0.0	1.0	18.2
WS03	12/08/2021 12:01:00		0.0	0.0	0.0	0.1	0.1	20.7	20.6	79.2			0.0	1.0	18.2
WS03	20/08/2021 10:25:00	0.0	0.0	0.0	0.0	0.1	0.1	20.5	20.5	79.4	1012	-0.2	0.0	1.0	19.4
WS03	20/08/2021 10:25:00		0.0	0.0	0.0	0.1	0.1	20.5	20.5	79.4			0.0	1.0	19.4
WS03	20/08/2021 10:26:00		0.0	0.0	0.0	0.1	0.1	20.5	20.5	79.4			0.0	0.0	19.4
WS03	20/08/2021 10:26:00		0.0	0.0	0.0	0.1	0.1	20.5	20.5	79.4			0.0	1.0	19.4
WS03	20/08/2021 10:27:00		0.0	0.0	0.0	0.1	0.1	20.5	20.5	79.4			0.0	1.0	19.4
WS03	20/08/2021 10:27:00		0.0	0.0	0.0	0.1	0.1	20.5	20.5	79.4			0.0	1.0	19.4
WS03	20/08/2021 10:28:00		0.0	0.0	0.0	0.1	0.1	20.5	20.5	79.4			0.0	1.0	19.4
WS05	16/07/2021 11:42:08	0.0	0.0	0.0	0.0	0.1	0.1	20.5	20.5	79.4	1021	0.1	0.0	0.0	22.3
WS05	16/07/2021 11:43:08		0.0	0.0	0.0	0.1	0.1	20.5	20.5	79.4			0.0	0.0	22.3
WS05	16/07/2021 11:43:38		0.0	0.0	0.0	0.1	0.1	20.4	20.4	79.5			0.0	0.0	22.3
WS05	16/07/2021 11:44:08		0.0	0.0	0.0	0.1	0.1	20.4	20.4	79.5			0.0	0.0	22.3
WS05	16/07/2021 11:44:38		0.0	0.0	0.0	0.1	0.1	20.3	20.3	79.6			0.0	0.0	22.3
WS05	16/07/2021 11:45:08		0.0	0.0	0.0	0.1	0.1	20.3	20.3	79.6			0.0	0.0	22.3
WS05	16/07/2021 11:45:38		0.0	0.0	0.0	0.1	0.1	20.3	20.3	79.6			0.0	0.0	22.3
WS05	22/07/2021 10:48:00	0.0	0.0	0.0	0.0	0.1	0.1	20.3	20.3	79.6	1019	0.0	0.0	1.0	24.6
WS05	22/07/2021 10:49:00		0.0	0.0	0.0	0.1	0.1	20.3	20.3	79.6			0.0	1.0	24.6
WS05	22/07/2021 10:49:00		0.0	0.0	0.0	0.1	0.1	20.3	20.3	79.6			0.0	1.0	24.6
WS05	22/07/2021 10:50:00		0.0	0.0	0.0	0.1	0.1	20.2	20.2	79.7			0.0	1.0	24.6
WS05	22/07/2021 10:50:00		0.0	0.0	0.0	0.1	0.1	20.2	20.2	79.7			0.0	1.0	24.6
WS05	22/07/2021 10:51:00		0.0	0.0	0.0	0.1	0.1	20.2	20.2	79.7			0.0	1.0	24.6
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APPENDIX E: DRAWINGS

Drawing 21.173/01	Site Location Plan
Drawing 21.173/02	Exploratory Hole Location Plan
Drawing 21.173/03	Nominal Section
Drawings LSR 011 to LSR 017, LSR 020 and LSR 030 to 036	Consented Proposed Drawings (prepared by Douglas Stephen Partnership)





North



Circle indicates approximate location of site



Site: 43 London Street, Reading, RG1 4PS

SITE LOCATION PLAN

Client : M K Build Limited

Date : August 2021

Dwg : 21.173/01

Scale 1: 50,000 @ A4

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Key:



Borehole location and reference



Dynamic probe and reference



Windowless dynamic sampling location and reference



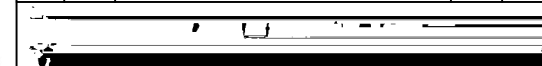
Windowless dynamic sampling and
Dynamic cone penetrometer location and reference



Dynamic cone penetrometer location and reference

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Rev	Date	Revision Description	Drwn	Chkd



A F Howland Associates Ltd
The Old Exchange
Newmarket Road
Cringelford
Norwich
NR4 6UF

Tel: 01603 250754 Fax: 01603 250749

web: www.howland.co.uk
mail: admin@howland.co.uk

Client: M K Build Limited

Site:

43 London Street, Reading, RG1 4PS

Job No.: 21.173

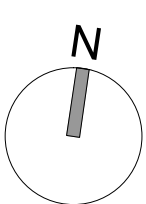
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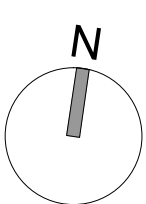
EXPLORATORY HOLE LOCATION PLAN

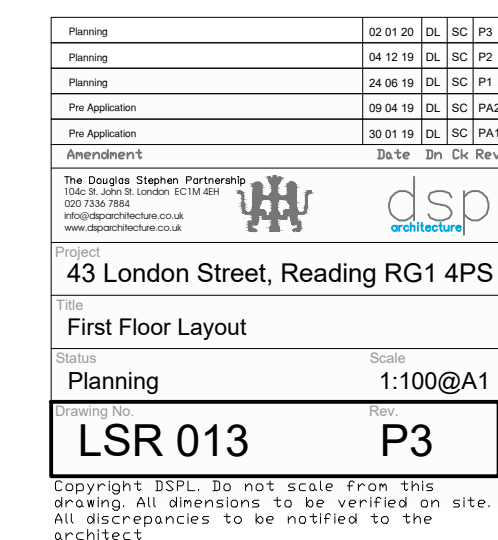
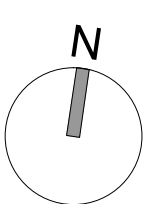
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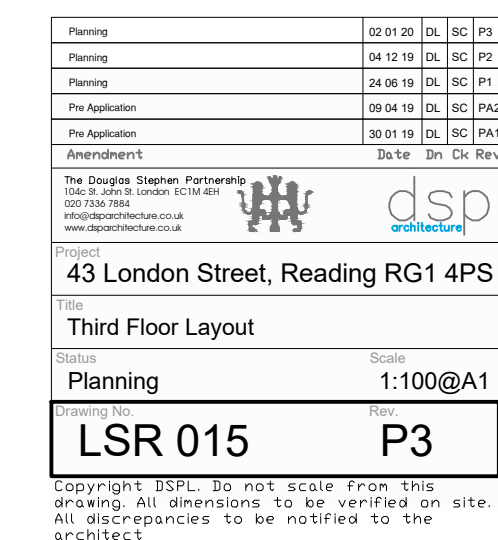
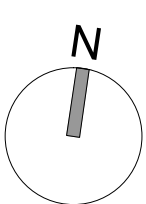


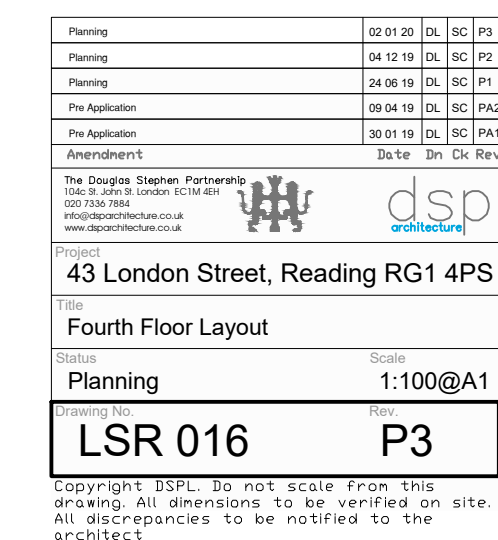
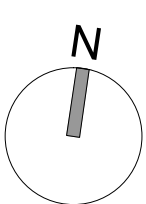


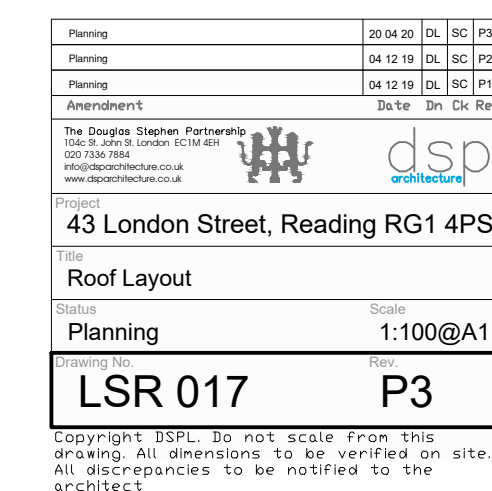
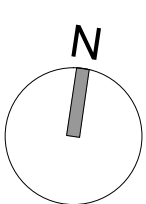




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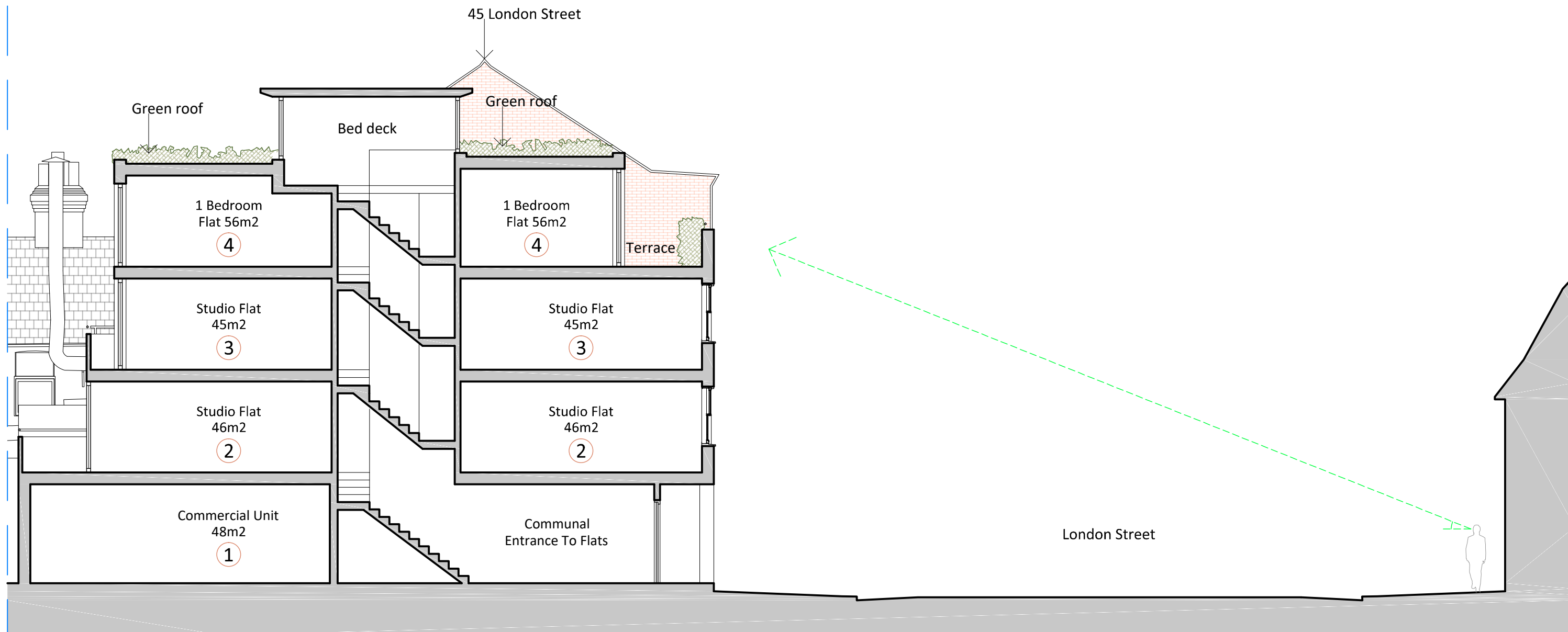






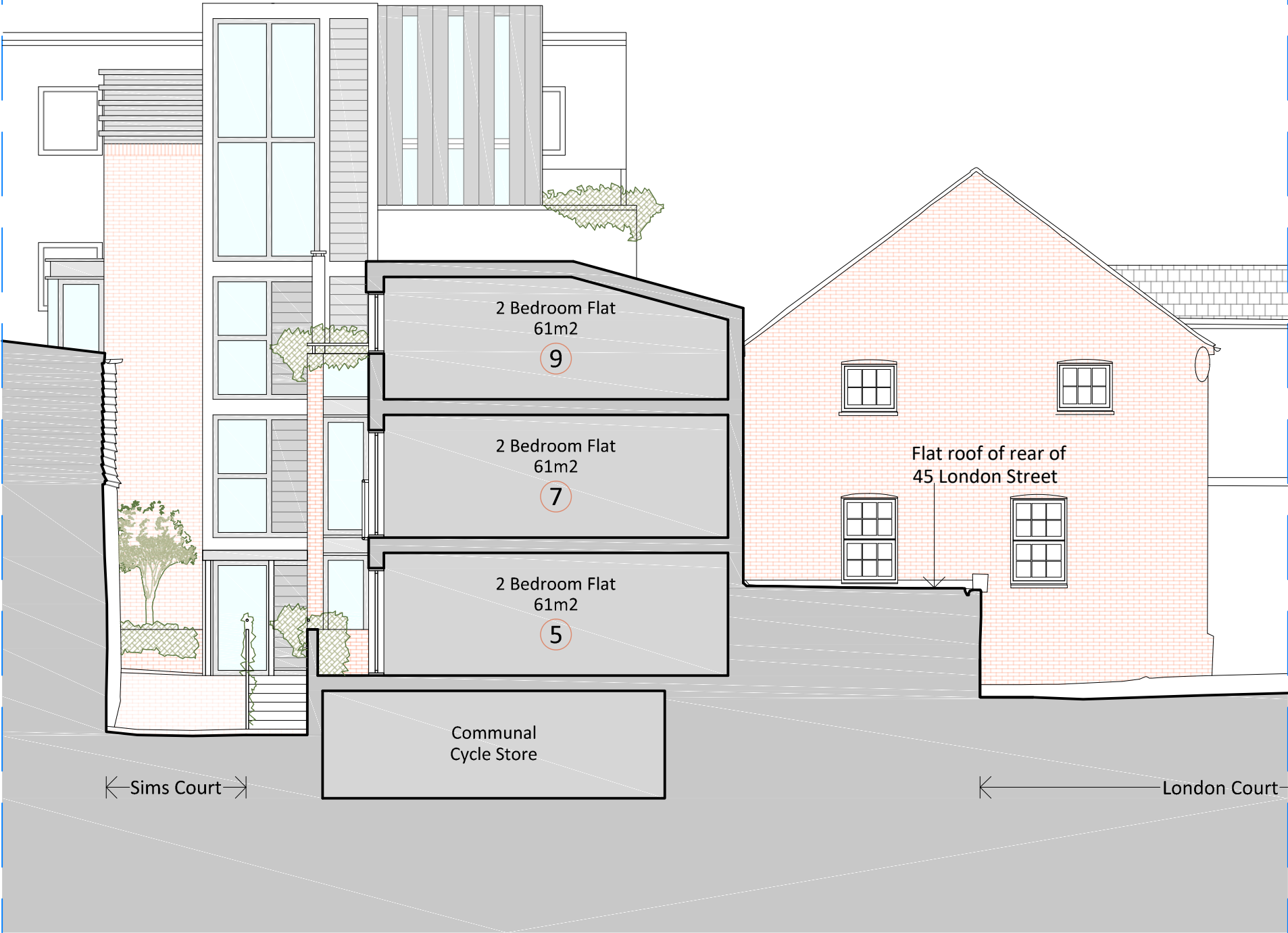
1 2 3 4 5m

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Pre Application	09 04 19	DL	SC	PA2
Pre Application	30 01 19	DL	SC	PA1
Amendment	Date	Dn	Ck	Rev
The Douglas Stephen Partnership 104c St. John St, London, EC1M 4EH 020 7336 7884 info@dsparchitecture.co.uk www.dsparchitecture.co.uk  dsp architecture				
Project 43 London Street, Reading RG1 4PS				
Title Proposed Cross Section AA				
Status Planning	Scale 1:100@A3			
Drawing No. LSR 030	Rev. P1			

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Planning	02 01 20	DL	SC	P3
Planning	04 12 19	DL	SC	P2
Planning	24 06 19	DL	SC	P1
Pre Application	09 04 19	DL	SC	PA2
Pre Application	30 01 19	DL	SC	PA1
Amendment	Date	Dn	Ck	Rev
The Douglas Stephen Partnership 104c St John St, London EC1M 4EH 020 7336 7884 info@dsparchitecture.co.uk www.dsparchitecture.co.uk  dsp architecture				
Project				
43 London Street, Reading RG1 4PS				
Title				
Proposed Cross Section BB				
Status		Scale		
Planning		1:100@A3		
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LSR 031		P3		

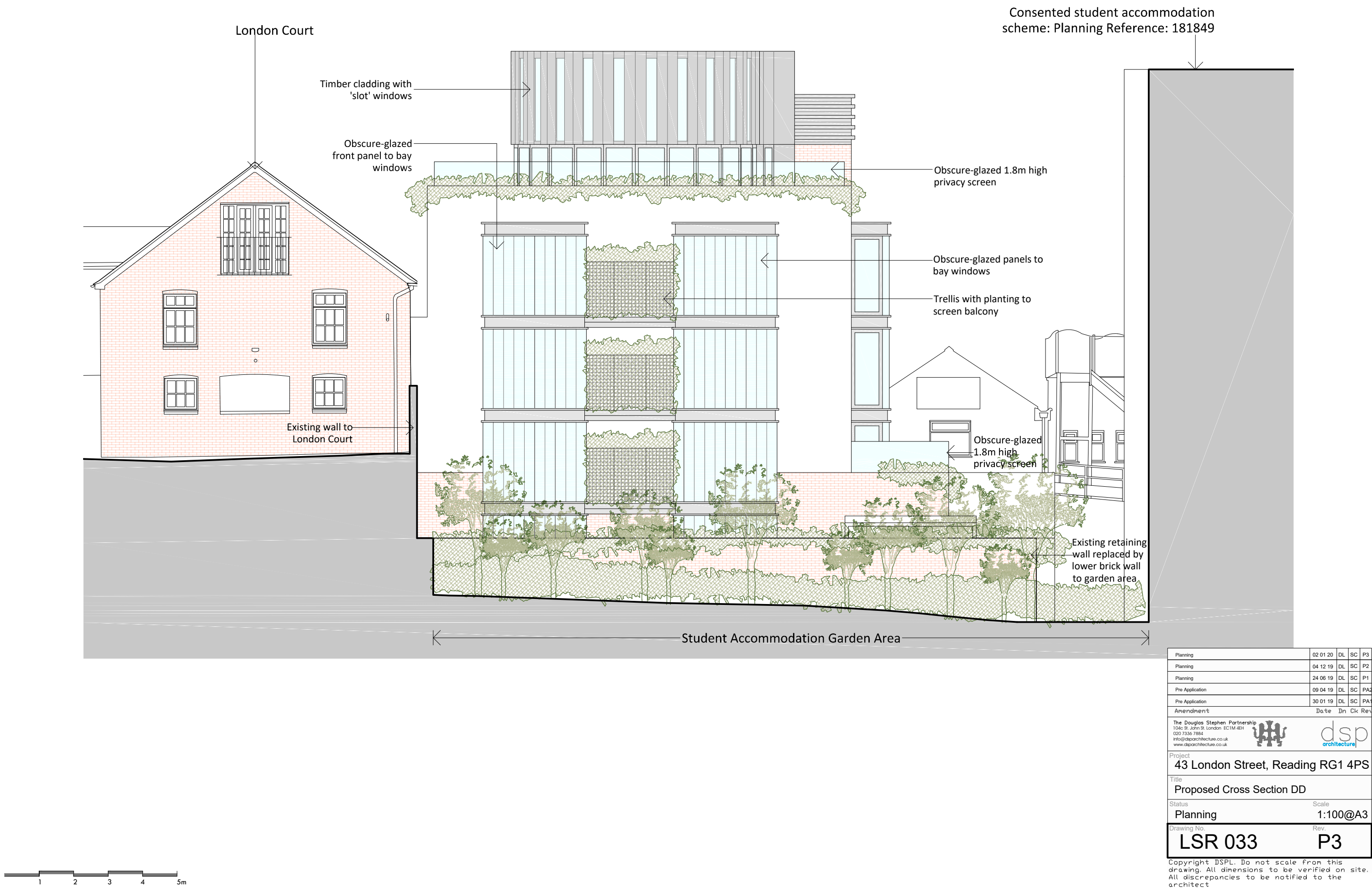
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Consented student accommodation
scheme: Planning Reference: 181849



Planning	02 01 20	DL	SC	P3
Planning	04 12 19	DL	SC	P2
Planning	24 06 19	DL	SC	P1
Pre Application	09 04 19	DL	SC	PA2
Pre Application	30 01 19	DL	SC	PA1
Amendment	Date	Dn	Ck	Rev
The Douglas Stephen Partnership 104c St. John St, London, EC1M 4EH 020 7336 7884 info@dsparchitecture.co.uk www.dsparchitecture.co.uk  dsp architecture				
Project 43 London Street, Reading RG1 4PS				
Title Proposed Cross Section CC				
Status Planning	Scale 1:100@A3			
Drawing No. LSR 032	Rev. P3			

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Planning	04 12 19	DL	SC	P2
Planning	24 06 19	DL	SC	P1
Pre Application	09 04 19	DL	SC	PA2
Pre Application	30 01 19	DL	SC	PA1
Amendment	Date	Dn	Ck	Rev
The Douglas Stephen Partnership 104c St. John St, London EC1M 4EH 020 7336 7884 info@dsparchitecture.co.uk www.dsparchitecture.co.uk  dsp architecture				
Project 43 London Street, Reading RG1 4PS				
Title Proposed Cross Section DD				
Status Planning	Scale 1:100@A3			
Drawing No. LSR 033		Rev. P3		
Copyright DSPL. Do not scale from this drawing. All dimensions to be verified on site. All discrepancies to be notified to the architect				



Planning	24 06 19	DL	SC	P1
Pre Application	09 04 19	DL	SC	PA2
Pre Application	30 01 19	DL	SC	PA1
Amendment	Date	Dn	Ck	Rev
The Douglas Stephen Partnership 104c St. John St, London, EC1M 4EH 020 7336 7884 info@dsarchitecture.co.uk www.dsarchitecture.co.uk  				
Project 43 London Street, Reading RG1 4PS				
Title Proposed Cross Section EE				
Status Planning	Scale 1:100@A3			
Drawing No. LSR 034	Rev. P1			

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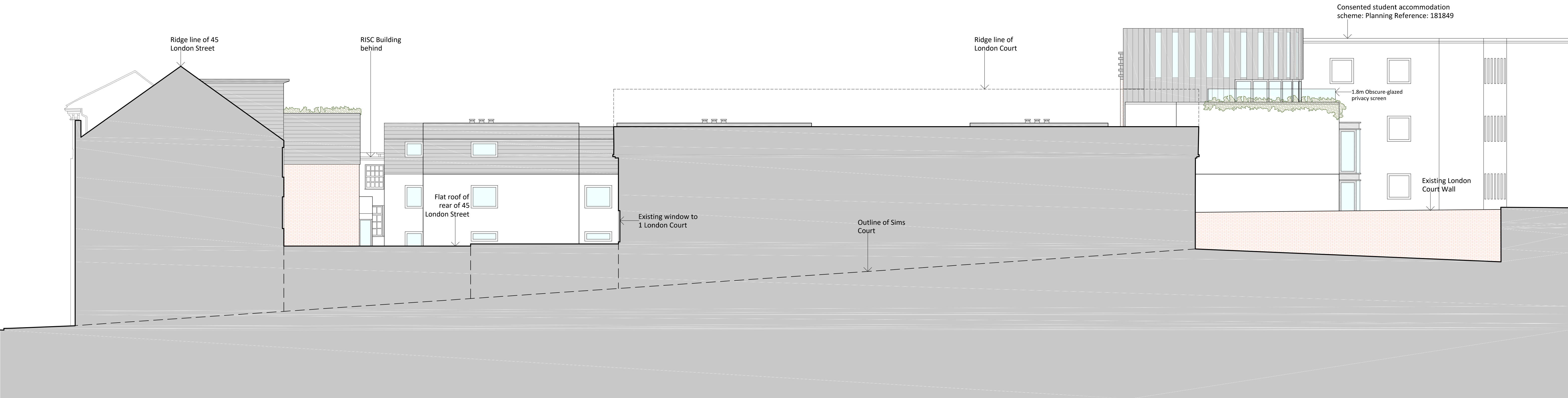
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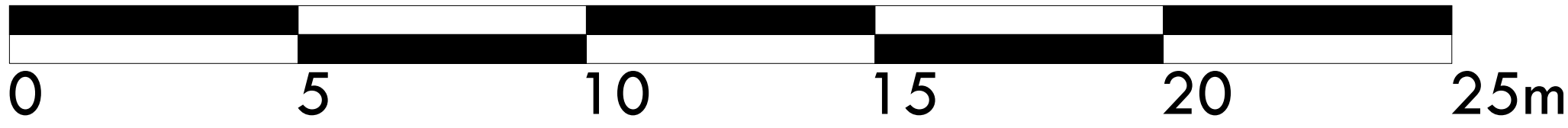
PROPOSED LONG SECTION GG



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Planning	04/12/19	DL	BC	P2
Planning	26/09/19	DL	BC	P1
Pre-Application	09/04/19	DL	BC	PAG
Pre-Application	20/01/19	DL	BC	PAA
Amendments				
The Glasgow School Partnership The Glasgow School Partnership 01753 755100 www.glasgow-school-partnership.co.uk				
43 London Street, Reading RG1 4PS				
Proposed Long Section FF and GG				
Planning				
Planning Ref:				
LSR 035				
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PROPOSED LONG SECTION HH



Planning	02.01.20	DL	SC	P3
Planning	04.12.19	DL	SC	P2
Planning	20.09.19	DL	SC	P1
Pre-Application	09.04.19	DL	SC	PA2
Pre-Application	30.01.19	DL	SC	PA1
Approved/Refused				
The Douglas Stephen Partnership 100-102a London Road Reading RG1 1AA www.douglasstephen.co.uk		 		
43 London Street, Reading RG1 4PS				
Proposed Long Section HH				
Planning			Scale	1:100@A1
LSR 036		P3		
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APPENDIX F: RISK ASSESSMENT CLASSIFICATION

Classification	Definition	Examples
High Likelihood	There is a pollution linkage and an event which would either appear very likely in the short term and almost inevitable over the long term, or, there is evidence at the receptor of harm or pollution.	Free product visible on surface of sensitive water body or in the soil. On site or adjacent gassing 'landfill site'.
Likely	There is a pollution linkage and all the elements are present and in the right place which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short term and likely over the long term.	Potentially contaminative land use i.e. 'Brownfield' site, fuel storage depot, factory, petrol station etc. Sensitive receptors to be introduced as part of site redevelopment. Potentially infilled land identified on site or off-site with credible migration pathway.
Low Likelihood	There is a pollution linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such event would take place, and is less likely in the shorter term.	Potential source of contamination identified i.e. historical land use as allotments or domestic above ground fuel storage tanks, areas of burning garden waste. Possible off-site infilled land.
Unlikely	There is a pollution linkage but circumstances are such that it is improbable that an event would occur even in the very long term.	No significant potential sources of contamination identified e.g. 'Greenfield' site. No potential sources of ground gas.

TABLE E1: CLASSIFICATION OF PROBABILITY

Classification	Definition	Examples
Severe	Short term (acute) risk to human health. Short term risk of pollution of sensitive water resource. Catastrophic damage to buildings/property. A short term risk to a particular ecosystem.	High concentrations of cyanide on the surface of an informal recreation area. Major spillage of contaminants from site into controlled water. Credible source of ground gas.
Medium	Chronic damage to Human Health. Pollution of sensitive water resources. A significant change in a particular ecosystem, or organism forming part of such ecosystem.	Concentrations of a contaminant from site exceeds the generic, or site specific assessment criteria. Leaching of contaminants from a site to a Secondary or Principal aquifer.
Mild	Pollution of non-sensitive water resources. Significant damage to buildings/structures and crops ("significant harm" as defined in the Circular on Contaminated Land, DETR, 2000). Damage to sensitive buildings/structures or the environment.	Concentrations of a contaminant do not exceed the generic, or site specific assessment criteria. Pollution of non-classified groundwater. Damage to building rendering it unsafe to occupy (e.g. foundation damage resulting in instability).
Minor	Harm, although not necessarily significant harm, which may result in a financial loss, or expenditure to resolve. Non-permanent health effects to human health (easily prevented by means such as Personal Protective Equipment, etc).	The presence of contaminants at such concentrations that protective equipment is required during site works. The loss of plants in a landscaping scheme.

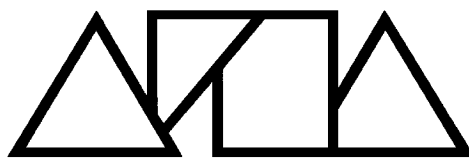
TABLE E2: CLASSIFICATION OF CONSEQUENCE

Classification	Definition
Very High Risk	There is a high probability that severe harm could arise to a designated receptor from an identified hazard or there is evidence that severe harm is occurring. The risk, if realised, is likely to result in a substantial liability. Urgent investigation and remediation will be required.
High Risk	Harm or chronic damage is likely to arise to a designated receptor from an identified hazard. Investigation is required and remediation is likely to be required to ensure the site is suitable for a proposed use.
Moderate Risk	It is possible that harm or chronic damage could arise to a designated receptor from an identified hazard. However, it is relatively unlikely that any such harm would be severe. Investigation and remediation are likely to be required to ensure the site is suitable for a proposed use.
Low/Moderate Risk	It is possible that harm or chronic damage could arise to a designated receptor from an identified hazard. Investigation is likely to be required. However, circumstances are such that investigation may prove the consequence to be mild and the site suitable for use without remediation.
Low Risk	It is possible that harm could arise to a designated receptor from an identified hazard but it is likely that this harm, if realised, would at worst be mild. Investigation is unlikely to be required.
Very Low Risk	There is a low possibility that harm could arise to a receptor. In the event of such harm being realised it is not likely to be severe. Investigation is not required.

TABLE E3: DESCRIPTION OF RISK

		CONSEQUENCE			
		Severe	Medium	Mild	Minor
PROBABILITY	High likelihood	Very High	High	Moderate	Low/Moderate
	Likely	High	Moderate	Low/Moderate	Low
	Low likelihood	Moderate	Low/Moderate	Low	Very Low
	Unlikely	Low/Moderate	Low	Very Low	Very Low

TABLE E4: DETERMINATION OF RISK



A F Howland Associates

The Old Exchange
Newmarket Road
Cringleford
Norwich
NR4 6UF

Tel: 01603 250754

Fax: 01603 250749

Email: admin@howland.co.uk

www: <http://www.howland.co.uk>