

**Phase II Site
Investigation & Risk
Assessment Report**

Project Name: Reading

Location: Land on the South side of Portman Road,
Reading RG30 1DA

Client: Stonegate Homes Ltd

Project ID: JT0420

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SUMMARY

The site comprises a vacant plot of land and is proposed to be developed with 5½ storey building for 26/28 residential units with associated car parking areas

Geological records indicate the site to be underlain by Taplow Gravel over White Chalk Subgroup.

A desk study was carried out by Phlorum Limited in September 2020 and indicates that the site has a history of being a field, part of a Hospital and partly residential.

A single phase intrusive investigation was carried out by ST Consult. All areas of the site were accessible during the fieldwork

The soils encountered comprised up to 3m thickness of Made Ground underlain by a thin layer of Taplow Gravel over Chalk.

Groundwater was encountered and standing at about 3.0m bgl.

Given the significant thickness of Made Ground encountered, and for the proposed 5½ storey building, it is likely that piled foundations, rather than shallow foundations, would be the preferred solution

The sulphate content of natural soil was found to fall within Class DS-1. The ACEC classification for the site is AC-1.

Suspended floor slabs are advised.

Detailed information on the proposed development, such as detailed final layout, loadings and serviceability limits was not provided. Accordingly, where geotechnical design advice is provided it is on the prescriptive basis allowed for by Eurocode 7: employing conventional and conservative design rules.

Although the results of the chemical analysis, and the generic human health risk assessment carried out based on the proposed development, indicate that there is generally no significant risk to the proposed redevelopment and future receptors, a potential risk from the presence of genotoxic PAHs is indicated by the test results from one sample. It has not been possible to evaluate this potential risk as detailed proposals for any soft landscaping are not currently available. The risk assessment should be revisited once the details are known. However, due to the physical makeup of the made ground encountered at the site, these materials are not considered physically suitable to be retained in garden or soft landscaping areas. It is therefore recommended that an appropriate thickness of the made ground is removed and replaced with an equivalent thickness of clean cover in any garden or soft landscaping areas; this action would effectively deal with any potential risk from the identified PAHs.

The desk study did not identify any potential land gas sources in the form of landfill sites within 250m of the site, and no visual or olfactory evidence of petroleum hydrocarbon contamination was noted across the site. However, given the site history and the thickness of the Made Ground encountered, it is recommended that gas monitoring is carried out targeting the Made Ground material.

Organic contaminants present in the soils, particularly PAH's could affect plastic underground water supply pipes. Guidance should be sought from the relevant companies regarding any proposed plant in the affected area. Many water supply companies now require higher specification pipe on contaminated sites, even following remediation.

The contamination screening values used are valid at the time of writing but may be subject to change and any such changes will have implications for the assessments based on them. Their validity should be confirmed at the time of site development.

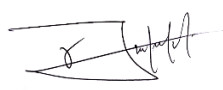
As with any site, areas of contamination not identified during investigation works may come to light during the course of redevelopment. Accordingly, a discovery strategy must be in place during the redevelopment to ensure that any hitherto unknown contamination is identified and dealt with in an appropriate manner. Depending on the nature of any such contamination, it may prove necessary to reassess the remedial strategy for the site. The presence of contamination may affect the classification of waste soils, or the potential for their re-use.

A formal remediation strategy and verification plan should be agreed with the regulatory authorities prior to commencement of any remedial works.

The investigation was conducted and this report has been prepared for the sole internal use and reliance of Stonegate Homes (Reading) Ltd and their appointed Engineers. This report shall not be relied upon or transferred to any other

parties without the express written authorisation of Southern Testing Laboratories Ltd. If an unauthorised third party comes into possession of this report they rely on it at their peril and the authors owe them no duty of care and skill.

The findings and opinions conveyed via this investigation report are based on information obtained from a variety of sources as detailed within this report, and which Southern Testing Laboratories Ltd. believes are reliable. Nevertheless, Southern Testing Laboratories Ltd. cannot and does not guarantee the authenticity or reliability of the information it has obtained from others.

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A INTRODUCTION

1 Authority

Our authority for carrying out this work is contained in an ST Consult Project Order form completed by Mr James Harding of Stonegate Homes (Reading) Ltd and dated 21st June 2021.

2 Location

The site is located approximately 0.5km to the northwest of Reading West Railway station in Reading Berkshire. The approximate National Grid Reference of the site is SU 69721 73679. The site location is indicated on Figure 1 within Appendix A.

3 Proposed Construction

It is proposed to construct 5½ storey building for 26/28 residential units with associated car parking areas. Ground loadings have not been given.

For the purposes of the contamination risk assessment, the proposed development land use is classified as Residential without consumption of Homegrown Produce, CLEA Model Ref [1] / C4SL Report Ref [2].

The gas sensitivity of the proposed development is rated as High CIRIA C665 Ref [3].

4 Object

This is a Phase II geotechnical and contamination (risk estimation and evaluation) investigation (Tier 1).

The object of the investigation was to assess foundation bearing conditions and other soil parameters relevant to the proposed development, and to assess the likely nature and extent of soil, groundwater and soil gas contamination on the site.

5 Scope

This report presents our exploratory hole logs and test results and our interpretation of these data.

A UXO risk assessment was not requested within our brief for the investigation.

As with any site there may be differences in soil conditions between exploratory hole positions.

This report is not an engineering design and the figures and calculations contained in the report should be used by the Engineer, taking note that variations will apply, according to variations in design loading, in techniques used, and in site conditions. Our figures therefore should not supersede the Engineer's design.

The ground/site investigation has been completed with reference to BS 5930 Ref [4] and BS 10175 Ref [5].

Waste Classification of soils has not been included within the brief for the investigation.

The findings and opinions conveyed via this investigation report are based on information obtained from a variety of sources as detailed within this report, and which Southern Testing Laboratories Ltd. believes are reliable. Nevertheless, Southern Testing Laboratories Ltd. cannot and does not guarantee the authenticity or reliability of the information it has obtained from others.

The investigation was conducted and this report has been prepared for the sole internal use and reliance of Stonegate Homes (Reading) Ltd and their appointed Engineers. This report shall not be relied upon or transferred to any other parties without the express written authorisation of Southern Testing Laboratories Ltd. If an unauthorised third party comes into possession of this report they rely on it at their peril and the authors owe them no duty of care and skill.

The recommendations contained in this report may not be appropriate to alternative development schemes.

Detailed information on the proposed development, such as detailed final layout, loadings and serviceability limits was not provided. Accordingly, where geotechnical design advice is provided it is on the prescriptive basis allowed for by Eurocode 7: employing conventional and conservative design rules.

The contamination screening values used are valid at the time of writing but may be subject to change and any such changes will have implications for the assessments based on them. Their validity should be confirmed at the time of site development.

B DESK STUDY AND WALKOVER SURVEY

6 Desk Study

A Phase 1 desk study report, dated 25th September 2020 and referenced 9879, has been undertaken by Phlorum Limited. The reader is referred to this document for a full review. The text below provides a brief summary of the site and environmental settings. It is noted that the desk study report was not made available to ST Consult prior to the intrusive investigation.

6.1 Geology

The British Geological Survey Map covering the site indicates that the site geology consists of Taplow Gravel Member over Seaford Chalk Formation & Newhaven Chalk Formation (undifferentiated).

6.1.1 Taplow Gravel Member

The Taplow Gravel Member comprises deposits of sands and gravels with subordinate layers of finer grained clayey and silty sands. Lenses of silt, clay or peat may also be present. This is one of a sequence of River Terrace Deposits associated with the Thames. These gravels were laid down in a large braided river channel and can be quite variable in their composition.

River Terrace Deposits were commonly worked in the past, often on a piecemeal basis in 'borrow pits' as well as larger mineral workings. Old pits may have been infilled with poor quality or waste materials, and can contain contamination.

6.1.2 White Chalk Subgroup (Newhaven Chalk Formation & Seaford Chalk Formation)

The Newhaven Chalk Formation is characterised by firm white chalk with common marl seams and widely spaced flint bands, and by numerous inclined conjugate shear fractures, normally slickensided and frequently containing sheet flint. In eastern Kent an overlying secondary unit, the Margate Chalk Member, is typically homogenous with no marl seams and few flints.

The Seaford Chalk Formation comprises a fairly homogeneous white chalk with regular and conspicuous flint bands. These flints are commonly laterally very continuous and traceable over large distances. Some of the flints can be very large. A few marl seams are present within the lower parts of the formation.

The White Chalk outcrop in particular is frequently highly fractured and highly permeable, and usually has good infiltration characteristics. On the other hand, Chalk Head, highly weathered Chalk and Chalk under a low permeability superficial cover may have very poor infiltration characteristics.

Chalk is slightly soluble in water and, while it has excellent bearing properties when unweathered, this solubility can lead to deep weathering and softening, and the upper layers of chalk often have an irregular boundary with overlying strata

The Chalk may be softened by solution to a depth of 5 to 15 metres and bearing capacities and engineering properties improve with depth. Where there is an outcrop of impermeable soil overlying the chalk there may be a dramatically increased solution effect due to concentrated surface water flow to the Chalk close to the outcrop boundary.

Solution features are common in the Chalk, and these can present significant difficulties to development on affected sites.

6.2 Hydrology and Hydrogeology

The site is underlain by a bedrock of Newhaven Chalk Formation & Seaford Chalk Formation and Taplow Gravel superficial deposit. The Chalk strata is classified as Principal Aquifer with High to Very High permeability and the Taplow Gravel as Secondary A Aquifer.

The site is not located within Groundwater Source Protection Zone. However, there is there is a single groundwater abstraction point at 210m.

There are no surface water features or surface water abstraction points within 500m of the site.

7 Site History

The history of the site has been detailed in the Land Contamination Preliminary Risk Assessment report produced by Phlorum Limited with a summary presented below.

1881

The site is shown as an agricultural field. Part of Battle House buildings is shown located in the southeast corner of site. An infirmary including a fever hospital and union workhouse are situated within 100m to east of the site with a number of properties situated southeast including Battle Terrace and Battle Cottage. Battle House was situated immediately south of the site and along a road (Oxford Road), fields were situated beyond this. The land immediately to the west is mapped as liable to flood.

1897

The hospital grounds appears to have been expanded with part of one of the buildings in the northeast corner of the site. An infectious diseases hospital is also shown within 100m north of the site and the hospital to the east had been extended further. A large residential area has been developed south of Oxford Road as well as an Inn on Oxford Road where Battle Cottage was previously situated.

1910

The northern section of site is labelled as a 'workhouse', and a tramway is shown along Oxford Road, and a library and Elm Park Hall in the southwest of site.

1932

The site and the surrounding area is labelled as Battle Hospital circa 1932 and a club now bounded the site to the south. The land labelled as liable to the flood had begun to be developed approximately 100m northwest of the site with unnamed buildings likely associated with the hospital. There an inscription 'Saxon Skeleton Shield-boss & Spearhead found A.D.1893' relating to a location indicated just to the east of the site..

1959

The building overlapping the northern section of site appears to have been extended and the portion of building associated with Battle House which was situated in the southwest corner of site appears to have been demolished. Earthwork is shown on the eastern part of the site. A tennis courts shown on the land to west of site.

1971/1974

The land to the west (previously mapped as liable to flood had been developed with a very large building likely to be associated with the hospital. However, no significant changes to the site are shown.

1991-2014

At some point between 1991 and 2001 the on-site building had been demolished and between 2005 and 2006 (Google Earth image), the hospital buildings beyond the site boundaries to the east and north were demolished. Sometime around 2009, the Tesco superstore was built and the current residential buildings beyond the eastern boundary of the site were built. Sometime around 2014, the current 5-storey block of flats immediately to the north of the site was constructed.

8 Site Description

8.1 General Site Description and Boundaries

The site is rectangular in shape and comprises a vacant plot of land located on the southern side of the western end of Curzon Street in Reading. It is bounded to the west by pedestrian walk way beyond which is Tesco and other commercial units. The site is bounded to the east by private residential buildings with private gardens and to the north by Curzon Street beyond which is 5-storey block of flats. To the south is Curzon Club.

The site is currently fenced and access is via Curzon Street and through a padlocked gate on the northern boundary of the site.

8.2 Topography and Drainage

The site is generally flat at about 39m AOD and locally sloping slightly to the north and west. The ground level along the eastern boundary is slightly raised relative to the rest of the site.

No man-hole covers were apparent on the site.

8.3 Vegetation

At the time of the investigation, the site was covered with grass and shrubs. Two matured trees were noted in the south-western and south-eastern corners of the site.

8.4 Buildings and Land Use on Site and Nearby

At the time of the investigation, there were no buildings on the site. A concrete base assumed to the remains of one the previous structures was noted near the northern section of the site. A concrete foundation with associated decommissioned electric cables assumed to be related to the historic electric substation was noted along the eastern boundary of the site.

There was evidence of fly-tipping waste (including plastic bags containing domestic wastes from neighbouring houses to east) on the site.

The surrounding area comprises a mixture residential and commercial land uses.

8.5 Inaccessible Site Areas

All areas of the site were accessible during site works.

8.6 Site Photographs

A series of photographs showing the site and surrounding areas is included in Appendix G.

C PRELIMINARY SITE MODELS

9 Conceptual Engineering Geological Ground Model

From the desk study information and walkover undertaken at this site the following conceptual ground model has been formulated.

Data Source	Comments
Geology	The recorded soils beneath the site comprise White Chalk Subgroup with a superficial covering of Taplow Gravel. The gravel is anticipated to be in the region of 4-5m in thickness. Made Ground is expected to be present. In general, shallow trench fill foundations could potentially be adopted for the site, subject to the findings of a Ground Investigation. Where significant thickness of Made Ground is present on site, deepening of the foundations may be required.
Former Site Use	The historic use of the site suggests that unknown made ground or footings of historical buildings could be present. Founding on these materials could result in potential structural issues including differential settlement.
Groundwater	The depth to groundwater on site is currently unknown but it is anticipated to be within the Taplow Gravel strata within the depth of 3 – 5m bgl. The desk study also indicates a high to Moderate risk rating for the site from groundwater flooding.
Surface Water	The site is not at risk from surface water flooding.
Potential Geo-hazards	The desk study indicates a very low hazard rating for the site from chalk dissolution. However, some risk must be accepted when developing sites on chalk. Drainage design should take this into consideration.

On the basis of the available information the geotechnical categorization for the proposed structure(s) is considered to fall within Geotechnical Category 1 – Small relatively simple structure with negligible risk; Eurocode 7 Ref [6].

10 Geoenvironmental Conceptual Site Model

In the context of this report, the conceptual model summarises the potential pollutant linkages identified for the site and forms the basis of the risk assessment for the site. The preliminary model comprises the potential sources of contamination, receptors that could be harmed and exposure pathways identified from the desk study and walkover survey. These potential linkages form the basis upon which the investigation is designed and reported.

10.1 Potential Sources of Contamination

The desk study indicates that the site has a historic use as a field, a small section for residential use and also part of the wider historic hospital buildings.

A summary of potential sources of contamination identified in the desk study is presented below.

10.1.1 On-Site Sources

Potential Source	Potential Contaminants
Previously demolished Hospital buildings/structures	Asbestos
Made Ground	A wide range of potential contaminants including metals/metalloids, polycyclic aromatic hydrocarbons, petroleum hydrocarbons and asbestos

10.1.2 Off-Site Sources

The site may be impacted by contamination migrating from beyond the site boundary. The following potential off-site sources have been identified.

Potential Source	Distance from Site Boundary	Direction	Potential Contaminants	Likely hazard to Site
Hospital (1898 to 1910)	3-10	E	A wide range of potential contaminants including metals/metalloids, polycyclic aromatic hydrocarbons, petroleum hydrocarbons and asbestos	Very Low
Electricity Substation	14	NE	PCBs	Very Low
Workhouse (1898 to 1910)	66/71	SE/E	Metals/metalloids, polycyclic aromatic hydrocarbons, petroleum hydrocarbons and asbestos	Very Low
Car Garage	101	SE	Metals/metalloids, polycyclic aromatic hydrocarbons, petroleum hydrocarbons and asbestos	Very Low
Tanks (1990-1993)	120	E	Petroleum Hydrocarbons	Very Low
Tin Works	216	E	Metals/metalloids, polycyclic aromatic hydrocarbons, petroleum hydrocarbons and asbestos	Very Low

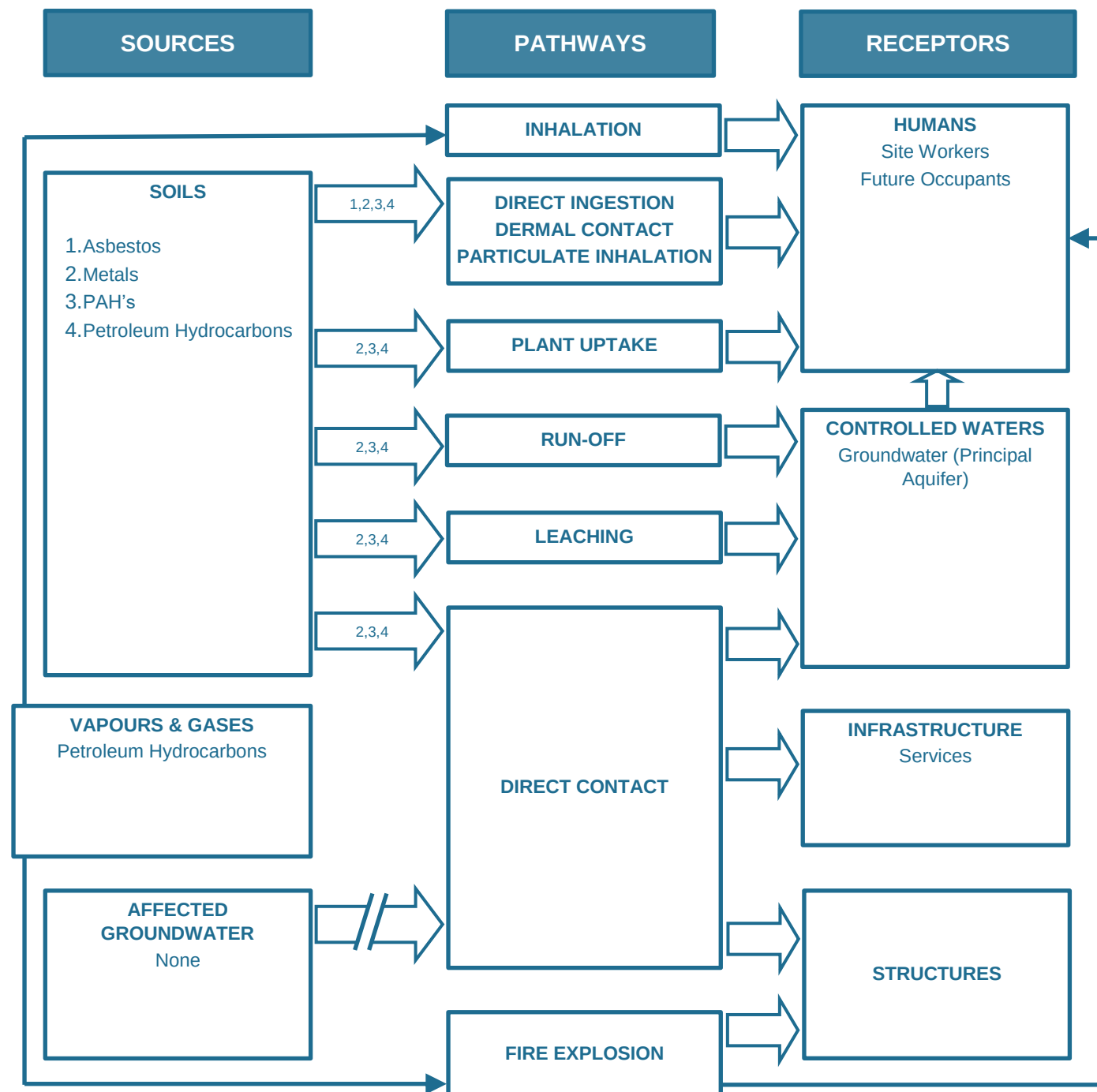
Only mobile phases of contaminants from the identified off-site sources could impact the site via vapour/gas and groundwater pathways.

The identified historic potential sources of contamination such as the Hospital, workhouse, tanks and Tin Works were defunct some 20 – 50 years ago and their locations redeveloped. It is therefore not considered likely that potential contaminants from these sources would impact on the site.

Given the relative distance from site to the identified current potential sources of contamination and the nature of these activities (car garage and electric substation), it is considered unlikely that any potential contaminants from these sources would impact on the site.

10.2 Pollutant Linkages and Conceptual Site Model Summary

The following diagram shows the potential pollutant linkages identified for the site and summarises the preliminary conceptual model:



// Denotes potential pollutant linkage not complete.

D GROUND INVESTIGATION

11 Strategy and Method

The strategy adopted for the intrusive investigation comprised the following:

Activity / Method	Purpose	Max Depth Range (mbgl)	Installations / Notes
BH1-2 Cable Percussive	Boreholes to assess deeper ground conditions and allow SPT's and samples for geotechnical testing.	10/20.0	50mm diameter standpipe installed within BH2 to 5m bgl.
TP1-3 & SK01-SK02 JCB 3CX	Trial pit to investigate the shallow ground conditions and allow for assessment of soakage potential using the BRE365 method.	2.0 / 3.0	BRE365 Soakage carried out in SK02.

Exploratory hole locations were decided by ST Consult and are shown in Figure 2 in Appendix A.

In-situ test and sampling methods descriptions employed are given in Appendix B together with the test results.

SPT Energy Ratio certificates and a Summary Table of SPT N Values is provided within Appendix B.

12 Weather Conditions

The trial pit investigation was carried out on 1st July 2021 and the borehole investigation on 12th July 2021. The weather on both occasions were generally dry with intermittent sunshine.

13 Soils as Found

The soils encountered are described in detail in the attached exploratory hole logs (Appendix A), but in general comprised a covering of Made Ground over Taplow Gravel over Chalk. A summary is given below.

Depth (m)	Thickness (m)	Soil Type	Description
1.2/3.0	1.2/3.0	Made Ground	Variable Made Ground comprising loose dark brown clayey sandy Gravel, soft black slightly sandy gravelly Clay, loose black very silty slightly clayey gravelly fine to coarse Sand, black ashy gravelly fine to coarse Sand. Gravel consists of fine to coarse angular to flint, concrete roadstone brick, recycled aggregates, ceramic, clinker, slate fragment, broken glass, metal, plastic sheet and fabric.
2.9/3.0	0.5/0.7	Taplow Gravel (Sand & Gravel)	Variable strata comprising medium dense brown slightly clayey very sandy Gravel and very gravelly Sand.
20	Not proven	Chalk	Structureless CHALK composed of white slightly Gravelly clayey SILT (Grade Dm) and silty GRAVEL (Grade Dc). Gravel is weak chalk and flint.

The natural soils found are generally in accordance with those anticipated.

13.1 Visual and Olfactory Evidence of Contamination

Visual evidence of significant thickness of Made Ground was encountered in the exploratory holes across the site. Made Ground materials can contain a wide range of contaminants including metals/metalloids, polycyclic aromatic hydrocarbons, petroleum hydrocarbons and asbestos.

These occurrences are discussed in Section E.

14 Groundwater Observations

Groundwater was observed in the exploratory holes as follows:

Hole ID	Water Strike Depth (m)	Comment	Stratum
BH1	4.0	Rose to 3.5m in 20 minutes	Chalk
BH2	4.6	Rose to 4.4m in 20 minutes. Groundwater level was recorded at 3.0m bgl, 1 week after borehole installation	Chalk

E DISCUSSION OF GEOTECHNICAL TEST RESULTS AND RECOMMENDATIONS

15 Geotechnical Laboratory Tests

The following geotechnical laboratory testing was carried out on selected samples in order to aid material classification and characterise soil properties. The test method references and results are given in Appendix C.

Laboratory Test	Number of Samples Tested	Stratum
Moisture Content	3	Made Ground (x1), Chalk (x2)
Atterberg Limit	3	Made Ground (x1), Chalk (x2)
Particle Size Distribution (Wet Sieve)	3	Taplow Gravel
pH & Sulphate	3	Taplow Gravel (x1), Chalk (x2)
Saturation Moisture Content	1	Chalk

16 Soil Classification and Properties

16.1 Made Ground

The made ground materials beneath the site were found to be variable and comprise loose dark brown slightly clayey slightly sandy Gravel, soft black very silty slightly sandy slightly gravelly Clay, loose black very silty slightly clayey gravelly Sand, and loose black ashy gravelly Sand. These contained various anthropogenic materials, including concrete roadstone brick, recycled aggregates, ceramic, clinker, slate fragment, broken glass, metal, plastic sheet and fabric.

16.2 Taplow Gravel Member

These deposits were seen to be medium dense brown slightly clayey very sandy Gravel and very gravelly Sand.

The materials had the following range of particle size distribution results.

Hole ID / Depth (m)	Clay/Silt (%)	Sand (%)	Gravel (%)	Cobbles (%)
SK02 @ 1.5	10	48	42	0
SK02 @ 2.0	6	17	76	0
TP2 @ 2.7	3	25	72	0

Three of the tested samples had very low fines content and are likely to be fairly free-draining. Other more clayey materials will have substantially lower permeabilities.

16.3 White Chalk Subgroup

The Chalk at this site was recovered generally as Structureless CHALK composed of white slightly gravelly clayey SILT (Grade Dm) and silty GRAVEL (Grade Dc). Becoming more gravelly with depth. Gravel is weak chalk and flint. These chalk soils typically have negligible swelling and shrinkage properties.

16.4 Summary of Geotechnical Parameters

Soil Type: Chalk

Parameters	Range	Suggested Design Value
SPT (N Value)	4 – 50	21
Effective Angle of Friction, ϕ' (degrees)	-	35
Bulk Density (Mg/m ³)	2.04 – 2.16	
Dry Density (Mg/m ³)	1.6 – 1.73	
Saturation Moisture Content (%)	21 - 26	

17 Groundwater Levels

Groundwater levels vary considerably from season to season and year to year, often rising close to the ground surface in wet or winter weather, and falling in periods of drought. Post fieldwork monitoring carried out in the borehole a week after the fieldwork recorded groundwater level at 3.0m bgl.

18 Soakaways

Soakage testing was carried out in trial pit SK02 within the Taplow Gravel at 2.0m bgl. Another test was attempted in trial pit SK01 but was abandoned due to the pit side collapse.

The BRE paper DG365, Ref [7] describes a method for site testing to determine soil infiltration rates at the proposed site of a soakaway. The in-situ test method is described in Appendix B.

The test location is shown on the attached site plan Figure 2, in Appendix A. The full results of the soakage tests are presented within Appendix B.

The DG365 Ref [7], states that each pit should be allowed to drain three times to near empty, with filling on the same or consecutive days. Two repeat tests were carried out in SK02.

The infiltration rate from each trial hole is summarised in the table below. The soakage rate in this report is expressed as $\text{l/m}^2/\text{minute}$, which is a convenient rate to use. The BRE use a unit of m/sec , which is the value in $\text{l/m}^2/\text{minute}$ divided by 60,000.

Test ID	Test Depth (mbgl)	Filling No.	Design Infiltration Rate		Notes
			$\text{l/m}^2/\text{minute}$	m/sec	
SK02	2.0	1	2.57	4.28×10^{-5}	Due to time constraints, a third test was not carried out.
		2	1.90	3.16×10^{-5}	

Note: The Design Infiltration Rate is the lowest of the three test results at each location.

Where three fillings have not been carried out, a reduction factor should be applied to the result to provide a design infiltration rate.

The results indicate that the use of soakaways on the site could be effective. A soakage rate of $1.90 \text{ l/m}^2/\text{minute}$ ($3.16 \times 10^{-5} \text{ m/s}$) could be considered for initial soakage design within the Taplow Gravel.

As with all soakaways situated on chalk strata a minimum distance should be maintained from all buildings and other settlement sensitive structures, (see CIRIA C574) and due consideration should be given to the possible presence of natural and man-made cavities.

Saturation Moisture Content of Chalk analysis carried out on a single sample taken from the site classified the chalk as Medium density with SMC (saturation moisture content of 21-26%). As recommended by CIRIA C574, for medium density chalk, the soakaway should be sited at least 5m away from any building. Further distance, where available, is recommended.

18.1 General Guidance on Design of Soakaways

Any soakaway scheme may require the approval of the Environment Agency, Building Control and, where applicable, the adopting Highways Authority.

Soakaways are used to store the immediate surface water run-off from hard surfaced areas, such as roof or car parks, and allow for efficient infiltration into the adjacent soil. They should be designed to discharge their stored water sufficiently quickly to provide the necessary capacity to receive run-off from a subsequent storm. The time taken for discharge depends upon the soakaway shape and size, and the surrounding soil's infiltration characteristics.

Groundwater levels can vary considerably from season to season and year to year, often rising in wet or winter weather, and falling in periods of drought. As such, a high groundwater table may affect the storage capacity of soakaways. In addition, it should be noted that an unsaturated zone may be required between the base of soakaways and the groundwater table, by the Environment Agency. Longer term monitoring may be required to establish actual groundwater levels as part of the planning approval process.

The design of soakaways can be square, circular (conventional) or trench excavations, and may be rubble filled, perforated precast concrete ring units, plastic cells or any similar structure that collects rainwater and run-off and allow discharge directly into the ground. Depending on the geological conditions, and depth at which suitable infiltration is achieved, soakaways can also be deep bored.

Long-term maintenance and inspection must be considered during the design and construction process. Maintenance of silt traps, gully pots and interceptors will improve the long-term performance of soakaways. The use of wet well chambers within the soakaway system can further assist in pollutant trapping and extending the operating life of soakaways.

Generally, roof and surface run-off should not significantly impact on groundwater quality and subject to appropriate approvals from the Environment Agency could be discharged directly to soakaways. However, although again subject to approvals from the Environment Agency, paved surface run-off for larger trafficked areas should generally be passed through a suitable form of oil interception device prior to discharge to the soakaway.

Care must be taken to ensure that the discharge of large volumes of surface run-off into the soil does not disrupt the existing sub-surface drainage patterns. Similarly in areas of sloping topography, consideration should be given to the siting of soakaways to avoid potential discharge and or flooding of down slope areas.

Soakaways should not normally be constructed closer than 5m to buildings.

19 Sulphates and Acidity

Chemical analysis of the underlying soils has been undertaken to establish the aggressive chemical environment for concrete in accordance with the BRE Special Digest 1, Ref [8]. The site category determined is that of a brownfield location except those containing pyrites (or potential pyrites), as the underlying soils comprises Taplow Gravel and White Chalk Subgroup.

Taplow Gravel

A pH value of 7.8 indicating alkaline condition and soluble sulphate concentration of 29 mg/l were recorded within the superficial Deposits.

The Design Sulphate Class is DS-1. Groundwater should be assumed to be mobile. The ACEC site classification is AC-1.

Chalk

The recorded pH values in the Chalk are in the range 8.0 to 8.5 indicating alkaline conditions and sulphate concentrations are 29 and 240 mg/l.

The Design Sulphate Class is DS-1. Groundwater should be assumed to be mobile. The ACEC site classification is AC-1.

20 Foundation and Bearing Capacity

The investigation has identified significant thickness of made ground (up to 3m). The Made Ground is variable and overlies a relatively thin layer of Taplow Gravel. The Sand and Gravel in turn is underlain by Chalk.

The Taplow Gravel deposits are generally medium dense slightly clayey Sand and Gravel and would be an appropriate founding stratum for relatively lightly loaded structures.

Given the significant thickness of Made Ground encountered, and for the proposed 5½ storey building, it is likely that piled foundations, rather than shallow foundations, would be the preferred solution.

21 Piling

As with any piling scheme, discussions should be held with selected piling contractors to discuss the technical and financial merits of their various systems. With respect to overall resources, the equipment available should be appropriate for the soils described and anticipated and be able to achieve the depths and diameters considered with an appropriate safety margin.

Noting that standing water level was measured at 3.0m bgl, the specialist contractor should take appropriate measures to ensure that his system caters for the ingress of groundwater.

From the viewpoint of pile type and given the close proximity of adjacent structures, a bored pile solution is considered to be a more appropriate pile type. In terms of bored piles and, noting the presence of potentially unstable soils (made ground and sandy gravels), and groundwater, a continuous flight auger grout injected pile (CFA) would be best suited to the ground conditions encountered. Careful monitoring during construction of these pile types is however required.

It should be noted that subsurface obstructions could be encountered in the form of old foundations, accordingly allowances for their removal/breaking out should be made when carrying out piling works and excavations.

For the purpose of providing preliminary estimates of pile capacities, we have assumed the following crude soil model, which is based on the findings of our borehole.

Depth to base (mbgl)	Soil Type
GL - 3.0	Made Ground/ Sand & Gravel – nil skin friction assumed
3.0 – 20	Chalk

We enclose a table (Table P1) of preliminary pile designs for cfa piles based on the results of the SPT tests carried out in Appendix D.

On the basis of the pile capacities given in Table P1, it is estimated that a 350mm diameter pile with a toe set at around 10m BGL would have a safe allowable load of 210kN.

The above noted pile capacities are for individually loaded piles. It is anticipated that the final design will be subject to more detailed calculations and structural analysis; as such our preliminary assumed parameters and calculated values should therefore not supersede the Engineer's or specialist piling Contractors final design.

22 Floor Slabs

Allowance should be made for fully suspended ground floor slabs due to the presence of made ground.

23 Settlement

Generally, settlements of correctly constructed piles should be acceptable.

24 Excavations and Dewatering

Statutory support will be required in all excavations where personnel must work.

Where excavation is proposed in close proximity to existing structures care will need to be taken to avoid undermining existing foundations.

25 Road Construction

Based on the significant thickness of Made Ground present on site, it is anticipated that some of the materials will be excavated and replaced with compacted soil. It is anticipated that proposed pavement areas will be formed on compacted granular materials.

The most important element of any road construction is drainage and attention must be given not only to the drainage of the subsoil but to the various layers of construction. To this end, the formation should be shaped to a camber or crossfall to allow water movement out of the sub-base. Silty soils soften extremely quickly if allowed to become wet or if they are excavated below the water table and this softening can give rise to a very substantial increase in costs.

Sub-base and coarse capping materials tend to segregate during placing operations, particularly when end tipped. On soft clay subgrades this can lead to punching and softening of the formation. The use of a layer of sand or geofabric will minimise the problem.

The formation should be proof rolled and any soft spots found should be excavated and replaced with compacted granular material. The surface of the formation should then be compacted, prior to laying the road sub base.

Construction traffic should be kept off formations and it is often advisable to leave a protective layer of soil above formation level until the last moment before placing the sub-base.

The formation should be considered potentially frost-susceptible.

F DISCUSSION OF GEOENVIRONMENTAL TEST RESULTS AND RECOMMENDATIONS

26 Analytical Framework

There is no single methodology that covers all the various aspects of the assessment of potentially contaminated land and groundwater. Therefore, the analytical framework adopted for this investigation is made up of a number of procedures, which are outlined below. All of these are based on a Risk Assessment methodology centred on the identification and analysis of Source – Pathway – Receptor linkages.

The CLEA model Ref [1], provides a methodology for quantitative assessment of the long-term risks posed to human health by exposure to contaminated soils. Toxicological data is used to calculate a Soil Guideline Value (SGV) for an individual contaminant, based on the proposed site use; these represent minimal risk concentrations and may be used as screening values.

In the absence of any published SGVs for certain substances, Southern Testing have derived or adopted Tier 1 screening values for initial assessment of the soil, based on available current UK guidance including the LQM/CIEH S4UL's Ref [9] and CL:AIRE Soil Generic Assessment Criteria Ref [10]. In addition, in 2014, DEFRA Ref [11] published the results of a research programme to develop screening values to assist decision making under Part 2A of the Environmental Protection Act. Category 4 screening levels were published for 6 substances, with reference to human health risk only. This guidance includes revisions of the CLEA exposure parameters, presenting parameters for public open space land use scenarios, and also of the toxicological approach. The screening levels represent a low risk scenario, based on a 'Low Level of Toxicological Concern' rather than the 'Minimal Risk' of CLEA, and the analytical results of this investigation may be considered relative to these levels.

Site-specific assessments are undertaken wherever possible and/or applicable.

CLEA requires a statistical treatment of the test results to take into account the normal variations in concentration of potential contaminants in the soil and allow comparisons to be made with published guidance.

The results of any groundwater analyses are compared to relevant quality criteria, e.g. Environmental Quality Standards (EQS) or Drinking Water Standards (DWS).

Ground gases are assessed in accordance with the guidance given in CIRIA C665 Ref [3] and BS8485 Ref [12].

The contamination screening values used are valid at the time of writing but may be subject to change and any such changes will have implications for the assessments based upon them. Their validity should be confirmed at the time of site development.

27 Site Investigation – Soils

27.1 Sampling Regime

The number of sample locations was intended to provide general coverage.

27.2 Testing

At the time of the investigation, the findings of Phase 1 report were not made available to ST Consult. The scheduled tests were based on observations made on site and to provide general screening of the soils on site. Therefore, the following tests were selected.

Test Suite	Number of Samples	Soil Tested
STL Key Contamination Suite	7	Made Ground
Asbestos Screen	7	Made Ground
TPH CWG	2	Made Ground

The test results are presented in full in Appendix E. A summary and discussion of the significance of the results and identified contamination sources is given below.

27.3 Test Results and Identified Contamination Sources

27.3.1 General Contaminants

The results of the key contaminant tests have been analysed in accordance with the CLEA methodology. The samples have been grouped into a single populations comprising of made ground. For each parameter in the population the sample mean is calculated and compared to a Tier 1 screening value. If the sample mean exceeds the screening value, the soil may be regarded as contaminated and further assessment may be required. If neither the sample mean nor any single value exceeds the screening value, the soil may be regarded as not contaminated, though further confirmatory assessment may be required. Where any single parameter value exceeds the screening value but the sample mean does not, further statistical analysis may be applied to that parameter if the available data is suitable. Such analysis would include an assessment of the Normality of the distribution of the data, consideration of the presence of outliers, and the calculation of a UCL estimate of the mean.

Summary data is presented in the tables below and the laboratory analysis is included in Appendix E. The screening values and source notes are presented in Table 1 “Tier 1 Screening Values” at the front of Appendix E.

Soil Type: Made Ground

Contaminants	Units	No of Samples Tested	Range	Sample Mean	Residential without Homegrown Produce Consumption Tier 1 Screening Values
Arsenic (As)	mg/kg	7	21 - 39	26	40
Cadmium (Cd)	mg/kg	7	<0.2	0.20	85
Trivalent Chromium (CrIII)*	mg/kg	7	19 - 28	22	910
Hexavalent Chromium (CrVI)	mg/kg	7	<4	4.0	6
Lead (Pb)	mg/kg	7	100 - 230	147	310
Mercury (Hg)	mg/kg	7	<0.3 - 1.7	0.63	9.2
Selenium (Se)	mg/kg	7	<1	1.0	430
Nickel (Ni)	mg/kg	7	21 - 39	28	180
Copper (Cu)	mg/kg	7	32 - 66	48	7,100
Zinc (Zn)	mg/kg	7	93 - 160	117	40,000
Phenol	mg/kg	7	<1	1.0	440
Benzo(a)pyrene (BaP)	mg/kg	7	<0.05 - 2.9	1.6	2.6
Naphthalene	mg/kg	7	<0.05	0.05	2.3-13
Total Cyanide (CN)	mg/kg	7	<1	1.0	/
Acidity (pH values)	pH units	7	7.9 - 9.2	8.2	/
Soil Organic Matter	%	7	1.2 - 4.8	2.8	/

* Assumed as Total Cr minus CrVI

None of the determinands analysed exceeded the assessment criteria for residential without home-grown produce consumption land use with the exception of one sample (SK02 0.4m), where a concentration of BaP of 2.9mg/kg was recorded. The sample mean concentration is below the assessment criterion.

For this assessment, Benzo(a)pyrene is used as a surrogate marker for all genotoxic PAH's, in line with HPA guidance Ref [13]. The test data has been compared with the concentration limits reported for the Culp study, as recommended by HPA, and found to be consistent with that approach.

27.3.2 Asbestos Containing Materials

No asbestos containing materials were detected in the samples analysed and none were observed in the exploratory holes. However, it should be noted that the exploratory holes are of small size relative to the area investigated. Therefore, the samples obtained may not reflect the full composition of the soils on the site, and there is always the potential for pockets of asbestos or for asbestos containing materials to be present, which have not been detected in the sampling.

It is also our experience that asbestos containing materials are quite often encountered in buried pockets and beneath slabs (sometimes adhering to the concrete) on older sites.

27.3.3 Organic Contaminants

The following table/s summarise/s the results of the analysis for TPH/ BTEX.

Hydrocarbon Substance or Fraction	Measured Concentrations in mg/kg (µg/kg)		Residential without Homegrown Produce Consumption Tier 1 Screening Values (1% SOM)
	TP1 1.0m	TP2 0.4m	
BTEX	< 1.0	< 1.0	
Benzene	< 1.0	< 1.0	0.38
Toluene	< 1.0	< 1.0	880 ^{vap} (869)
Ethylbenzene	< 1.0	< 1.0	83
Xylenes	< 1.0	< 1.0	79
MTBE	< 1.0	< 1.0	73
Aliphatics			
EC5-EC6	< 0.001	< 0.001	42
>EC6-EC8	< 0.001	< 0.001	100
>EC8-EC10	< 0.001	< 0.001	27
>EC10-EC12	< 1.0	< 1.0	130
>EC12-EC16	< 2.0	< 2.0	1100
>EC16-EC35	< 8.0	< 8.0	65000
Aromatics			
EC5-EC7 (Benzene)	< 0.001	< 0.001	370
>EC7-EC8 (Toluene)	< 0.001	< 0.001	860
>EC8-EC10	< 0.001	< 0.001	47
>EC10-EC12	< 1.0	< 1.0	250
>EC12-EC16	< 2.0	< 2.0	1800
>EC16-EC21	15	14	1900
>EC21-EC35	39	38	1900

The results indicate that none of the samples recorded concentrations above the tolerable limits for long-term exposure with regards to human health.

28 Site Investigation – Waters

Due to the site's setting, the underlying Principal Aquifer is considered to be the most sensitive controlled waters receptor in the vicinity of the site. Groundwater sampling and testing was not initially included in our scope of work, as ST Consult was made to understand that the Phase 1 report did not highlight any potential contamination issues for the site. A copy of the Phase 1 report produced by others was not made available prior to the Phase II investigation.

Due to the nature and thickness of the Made Ground encountered on site and given that site is underlain by a Principal Aquifer, leachate analysis has been carried out on two Made Ground samples to determine whether there is leachable contamination present at a concentration that could pose any potential risk to the quality of the underlying aquifer.

Given that there is a single groundwater abstraction point at 210m of the site, the target concentrations (Ct) have been based on UK Drinking Water Standards (UKDWS). In the absence of UKDWS, Environmental Quality Standard (EQS) values have been adopted.

28.1 Testing (Leachate Analysis)

Based on our preliminary conceptual understanding of the site and observations made on site, the following contaminants of concern were tested.

- Polycyclic Aromatic Hydrocarbons
- Metals/Metalloids
- Phenols
- Sulphate/chloride

The test results are presented in full in Appendix E. A summary and discussion of the significance of the results and identified contamination sources is given below.

28.1.1 Test Results and Identified Contamination

The recorded leachate concentrations for PAHs, phenols, mercury, free cyanide, sulphide, cadmium, mercury and selenium were recorded below the laboratory detection limit. The contaminant concentrations recorded above the laboratory detection limits are presented in the table below.

Contaminants	Units	Measured Concentrations		Target Concentration (Ct)*
		TP2 @ 1.2m	SK01 @ 0.5m	
Arsenic (dissolved)	µg/l	7.2	6.6	10
Boron (dissolved)	ug/l	30	82	1000
Chromium (dissolved)	µg/l	0.7	0.6	10
Copper (dissolved)	µg/l	7.9	6.4	2000
Iron (dissolved)	mg/l	0.41	0.32	200
Lead (dissolved)	ug/l	3.2	1.1	10
Nickel (dissolved)	µg/l	2.6	4.0	20
Zinc (dissolved)	µg/l	7.5	7.9	3000
Ammoniacal Nitrogen	µg/l	42	42	50
Sulphate	mg/l	1.29	8.1	250
Chloride	mg/l	2.7	3.2	250
Acidity (pH values)	pH units	8.0	7.9	6-9

*UKDWS

The leachable contaminant concentrations measured in the Made Ground are below the target concentrations. .

29 Site Investigation - Gas

There are no landfill sites within 250m of the site. No visual or olfactory evidence of petroleum hydrocarbon contamination was noted across the site. Made Ground (up to 3m thickness) with no significant degradable or methanogenic materials was encountered in the exploratory holes across the site.

Gas monitoring was not included in the scope of the investigation. Given the site history and the thickness of the Made Ground encountered, it is recommended that gas monitoring is carried out targeting the Made Ground material as the potential source of ground gas on site.

30 Water Supply Pipework, Drainage and Sewage Pipes

The suites of chemical analysis carried out on the soil samples were not specifically to address risk to water supply pipes or drain & sewer pipes.

For this site, analysis for extended volatile organic compounds, ethers, nitrobenzene, ketones, aldehydes and amines were not considered applicable based on the historical use of this site. Therefore, these may not be required for a water supply pipes risk assessment.

The results of TPH analysis carried out for this site indicate that the recorded concentrations were within the threshold values for PE and PVC pipes. Concentrations of SVOCs recorded (in the form of PAHs) are generally in excess of the thresholds for plastic water supply pipes. However, it is noted that the lighter PAH's such as Naphthalene are absent.

Similarly, the results of the chemical analysis for PAH, TPH and BTEX are within the threshold values for use of PE and PVC pipe on drain & sewer drainage systems.

The local water supply authority should be consulted with regard to the presence of PAHs and may request additional analysis, or require protection for water supply pipes.

31 Summary of Identified Contamination

Genotoxic PAHs, represented by BaP, were recorded at a concentration above the adopted screening criterion in one sample of made ground.

32 Risk Evaluation

The object of the risk evaluation is to assess the pollution linkages for specific contaminant groups considered in the conceptual model, identify any unacceptable risks and, therefore establish whether there is a need for further investigation and/or remedial action.

The risks are considered in the context of the specific development proposals for the site and, therefore, the conclusions may not be appropriate for alternative schemes.

32.1 PAHs in Made Ground

Detailed proposals for any soft landscaping within the proposed development are not available at the time of writing, and the risk associated with the presence of PAH cannot be assessed

32.2 Revised Conceptual Model

The preliminary site model has been refined in light of the findings of this investigation and is summarised below.

Metals	Petroleum Hydrocarbons	Polycyclic Aromatic Hydrocarbons	Land Gas	Asbestos	Pathways	Receptors
N	N	N	n/a	N	Ingestion and inhalation of contaminated soil and dust	Human Health
N	N	P	N	n/a	Dermal contact with contaminated soil and dust	
N	N	N	P	n/a	Inhalation of vapours or gases	
N	N	N	n/a	n/a	Uptake into edible fruit and vegetables	
N	N	N	n/a	n/a	Surface water run-off into surface water features	Water Environment
N	N	N	n/a	n/a	Migration through ground into surface water or groundwater	
N	N	N	N	n/a	Off-site migration of contaminated groundwater	
N	N	N	N	n/a	Vegetation on site growing in contaminated soil	Flora and Fauna
N	N	N	n/a	n/a	Aquatic life in affected waters	
N	N	P	n/a	n/a	Contact with contaminated soils	Building materials / buried services
N	N	N	N	n/a	Fire or explosion	

Key:

- Y Pollutant linkage likely
- N Pollutant linkage not likely
- P Pollutant linkage possible
- n/a Pathway not applicable to contaminant

32.3 Relevant Pollutant Linkages

No Relevant Pollutant Linkages for which remedial action will be required have been identified in the revised conceptual model.

Possible pollutant linkages have been identified in respect of potential land gas associated with the presence of the made ground, and also the presence of genotoxic PAHs. Further work is recommended in respect of these unresolved issues.

In addition, due to the physical makeup of the made ground encountered at the site, removal of the made ground and placement of a suitable thickness of clean cover in any garden or soft landscaping areas is recommended.

33 Soil Waste Management

33.1 Re-use of Soils

It is anticipated that the arisings from groundworks on this site will comprise Made Ground and natural soils.

Clean natural arisings from groundworks may be re-used on site without further testing, where there is a definite use for such materials, e.g. raising levels or construction of landscaping layers or bunds as set out in the approved plans for the development.

Treated contaminated soils may be reused on site under an appropriate Materials Management Plan, where certain criteria are met, in accordance with the CL:AIRE Definition of Waste Code of Practice, Ref [13].

33.2 Disposal of Soils

Some soils will require removal from site and disposal to suitably licensed landfills. Different guidelines and charges will apply to different waste classifications. As waste producers, the Developer holds responsibilities under the various governing regulations, particularly the Waste Duty of Care Code of Practice under the Environmental Protection Act 1990, Ref [14].

The results of the chemical analysis indicate that the Made Ground could be classified as Non-Hazardous waste. Following the excavation and stockpiling the excavated material, it is recommended that a further soil sampling and testing is carried out to enable a detailed waste classification for off-site disposal or transfer. Waste Acceptance Criteria (WAC) testing will be required to confirm an inert classification.

There are strict requirements in place for the accurate description of wastes using EWC codes and, therefore, it is essential that materials that would be given different descriptions (e.g. blacktop, made ground and natural soils), as well as those with different classifications, are carefully segregated during excavation and storage on site. This will also ensure the most cost effective disposal. Mixing these materials can give rise to significant difficulties in disposal and also substantially increase costs.

Soil arisings may be transferred to other development sites under a Materials Management Plan, where certain criteria are met, in accordance with the CL:AIRE Definition of Waste Code of Practice Ref [13].

All soils leaving site will need to be pre-treated. Waste minimisation by selective excavation is a recognised form of pre-treatment.

34 Discussion and Conclusions

The soils encountered on site comprises up to 3m thickness of Made Ground underlain by Sand & Gravel of Taplow Gravel Member over Chalk. The Made Ground was found to contain deleterious materials including concrete roadstone brick, recycled aggregates, ceramic, clinker, slate fragment, broken glass, metal, plastic sheet and fabric.

Although the results of the chemical analysis and the generic human health risk assessment carried out based on the proposed development, indicate that there is generally no significant risk to the to the proposed redevelopment and future receptors, a potential risk from the presence of genotoxic PAHs is indicated by the test results from one sample. It has not been possible to evaluate this potential risk as detailed proposals for any soft landscaping are not currently available. The risk assessment should be revisited once the details are known. However, due to the physical makeup of the made ground encountered at the site, these materials are not considered physically suitable to be retained in garden or soft landscaping areas. It is therefore recommended that an appropriate thickness of the made ground is removed and replaced with an equivalent thickness of clean cover in any garden or soft landscaping areas; this action would effectively deal with any potential risk from the identified PAHs.

The desk study did not identify any potential land gas sources in the form of landfill sites within 250m of the site, and no visual or olfactory evidence of petroleum hydrocarbon contamination was noted across the site. However, given the site history and the thickness of the Made Ground encountered, it is recommended that gas monitoring is carried out targeting the Made Ground material.

Organic contaminants present in the soils, particularly PAH's could affect plastic underground water supply pipes. Guidance should be sought from the relevant companies regarding any proposed plant in the affected area. Many water supply companies now require higher specification pipe on contaminated sites, even following remediation.

As with any site, areas of contamination not identified during site investigation works may come to light in the course of redevelopment. Accordingly, a discovery strategy must be in place during the redevelopment to ensure that any hitherto unknown contamination is identified and dealt with in an appropriate manner. Depending on the nature of any such contamination, it may prove necessary to reassess the remedial strategy for the site.

A formal remediation strategy and verification plan should be agreed with the regulatory authorities prior to commencement of any remedial works.

35 General Guidance

Allowance should be made for experienced verification of any remedial works.

It may be that specific local requirements apply to this site, of which we are not aware at this time.

In general terms, the workforce and general public should be protected from contact with contaminated material. There is a range of relevant documents published by the Health and Safety Executive, and organisations such as CIRIA, and the BRE.

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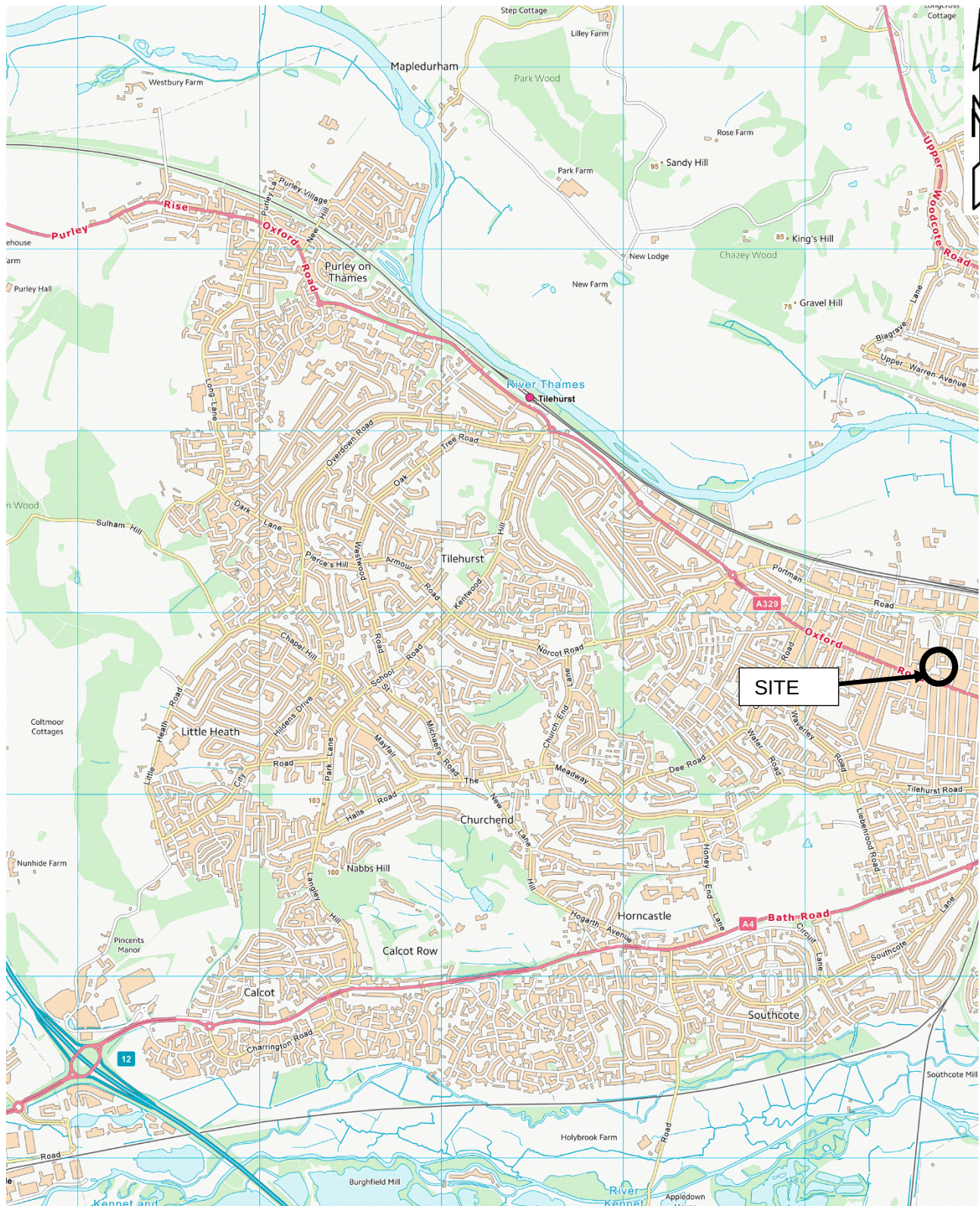
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A collage of six images related to geotechnical engineering. Top left: A large white pipe and a colorful soil profile map. Top middle: A close-up of a soil sample in a sieve. Top right: A pressure gauge and a red drilling rig. Bottom left: A worker in a high-visibility suit operating a machine. Bottom middle: A red truck with 'Southern' on the side and various equipment. Bottom right: A person using a tool to examine soil.

APPENDIX A

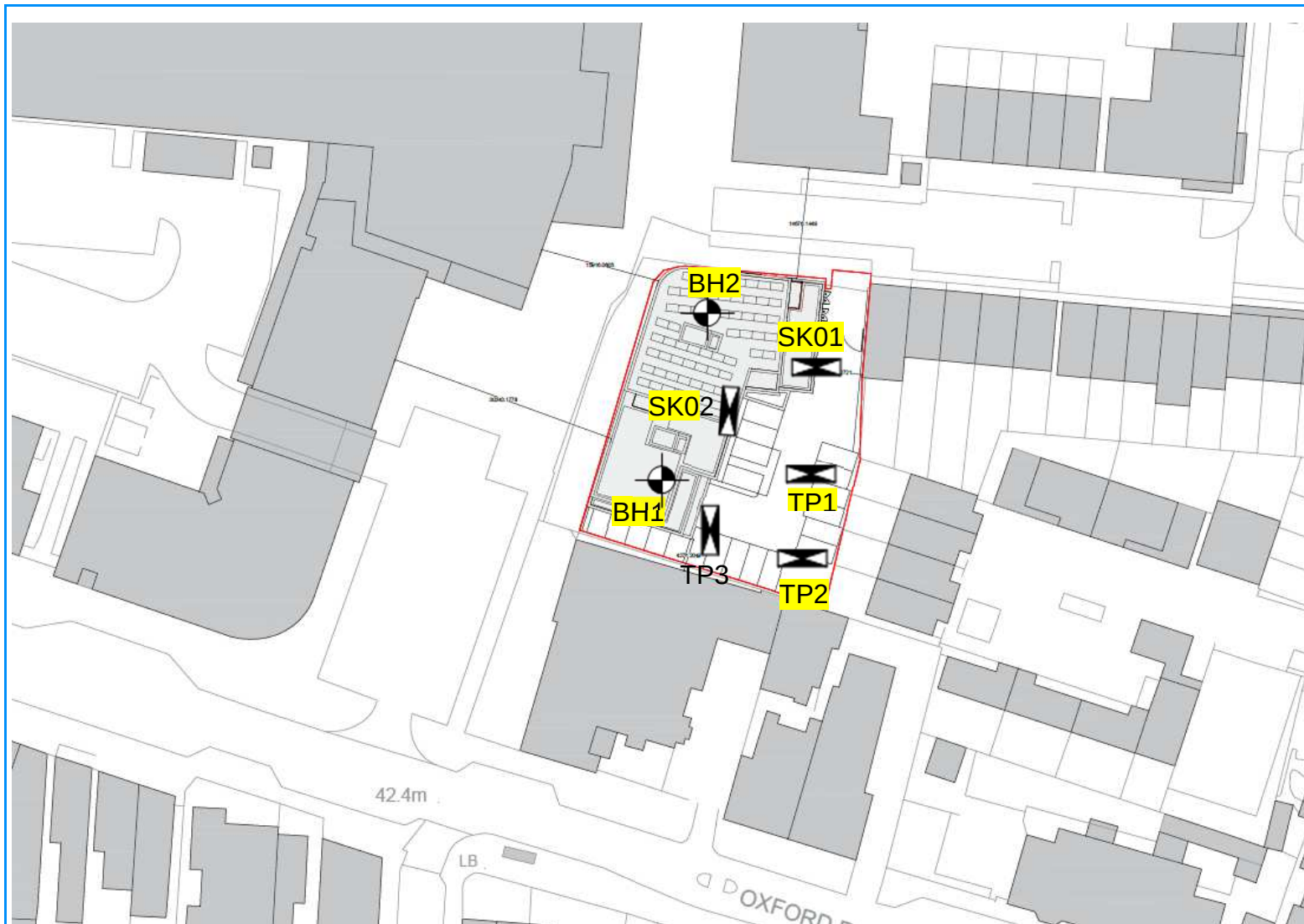
Site Plans and Exploratory Hole Logs





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Site:	Land on the South side of Portman Road, Reading RG30 1DA	Project ID	JT0420
Figure 1	Site Location Plan	Date:	19/08/2021



NB: Positions of exploratory holes / test positions are only indicative unless dimensioned.

Site:	Land on the South side of Portman Road Reading RG30 1DA	Project Id:	JT0420
Figure 2	Site Location Plan	Date:	30/07/2021

Key to Exploratory Hole Logs, Plans and Sections

Backfill Symbols		Pipe Symbols		Principal Soil Types		Principal Rock Types		Drilling Records	
Arisings		Plain Pipe		Topsoil		Mudstone		Water Strike	
Concrete		Slotted Pipe		Made Ground		Claystone		Depth Water Rose	
Blacktop		Piezometer		Clay		Siltstone		Total Core Recovery (%) [TCR]	
Bentonite		Piezometer Tip		Silt		Sandstone		Solid Core Recovery (%) [SCR]	
Gravel Filter		Filter Tip		Sand		Limestone		Rock Quality Index (%) RQD]	
Sand Filter		Extensometer		Gravel		Chalk		Fracture Index (fractures / m) [FI]	
		Inclinometers		Peat					

All soil and rock descriptions are in general accordance with BS5930 2015, BS EN ISO 14688-1:2002+A1:2013 and BS EN ISO 14689-1:2003. Chalk descriptions are also based on CIRIA C574 and "Logging the Chalk – R.N. Mortimer 2015". The Geology Code is only provided where a positive identification of the sample strata has been made.

Location / Method Identifiers		In-situ Test Location / Method	
BH	Borehole (undefined)	DP	Dynamic Probe
CP	Cable Percussive	CPT	Cone Penetration Test
RC	Rotary Core	CBR	In-situ CBR Test
RO	Rotary Open Hole	DCP	CBR using Dynamic Cone Penetrometer
ODC	Rotary Odex/Symmetrix drilling cased	CBRT	CBR using TRL Probe
CP+RC	Cable Percussive to Rotary Core	PB	Plate Bearing Test
SNC	Sonic	SPT (S)	Standard Penetration Test (Split Barrel Sampler)
CFA	Continuous Flight Auger	SPT (C)	Standard Penetration Test (Solid Cone)
FA	Flight Auger	N	SPT Result
VC	Vibro Core	-/-	Blows/Penetration (mm) after seating drive
WLS+RC	Windowless (Dynamic) Sampler to Rotary Core	-*/-	Total Blows / Penetration (mm)
WLS	Windowless Sampler	()	Extrapolated Value
WS	Window Sampler	PPT	Perth Penetration (In-House Method - Equivalent N Value)
HA	Hand Auger	HP / UCS	Strength from Hand Penetrometer (kN/m ²)
C	Road / Pavement Core	IVN	Strength from Hand Vane ((kN/m ²) P = peak, R = residual
IP	Inspection Pit (Hand Excavation)	PID	Photo Ionisation Detector (ppm)
TP	Trial Pit (Machine Excavated)	MEXE	Mexi-Cone CBR (%)
OP	Observation Pit (Supported Excavation Hand or Machine)		

Samples / Test Type	
B	Bulk Sample
BLK	Block Sample
C	Core Sample
CBRS	CBR Mould Sample
D	Small Disturbed Sample
ES	Environmental Sample (Soil)
EW	Environmental Sample (Water)
GS	Environmental Sample (Gas)

Samples / Test Type	
SPTLS	Standard Penetration Test Split Barrel Sample
TW	Thin Wall Push In Sample (e.g. Shelby Sampler)
U	Undisturbed Open Drive Sample (blows to take)
UT	Thin Wall Undisturbed Open Drive Sample (blows to take)
W	Water Sample (Geotechnical)
SP	Sample from Stockpile
P	Piston Sample
AMAL	Amalgamated Sample

 www.southerntesting.co.uk tel:01342 333100 www.stconsult.co.uk tel:01604 500020				Start - End Date		Project ID:		Hole Type:		BH1		
				12/07/2021		JT0420		CP		Sheet 1 of 2		
Project Name: Reading				Remarks:		Co-ordinates:		Level:		Logger:		
										CJB		
Location: Portman Road, Reading				Groundwater struck at 4m bgl as slow seepage, rising 3.5m bgl after 20 minutes. Exploratory hole backfilled with arisings and bentonite pellets on completion.								
Client: Stonegate Homes Ltd												
Well	Water Strikes	Samples and Insitu Testing			Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description			
		Depth (m bgl)	Type	Results								
		0.30	D						MADE GROUND consisting of loose dark brown slightly clayey slightly sandy GRAVEL. Gravel consists of fine to medium subrounded to subangular concrete, flint, roadstone and recycled aggregates.			1
	0.50	D			(1.00)		1.00					
	1.00	D						MADE GROUND consisting of soft black very silty slightly sandy slightly gravelly organic-rich CLAY. Gravel consists of fine subangular to angular flint and concrete.			2	
	1.10 - 1.60	B			(1.40)		2.40					
	1.10	SPT(C)	N=5 (1,/1,1,1,2)					MADE GROUND consisting of loose black very silty slightly clayey gravelly fine to coarse SAND. Gravel consists of fine subrounded to subangular concrete and medium to coarse angular flint.			3	
	2.00 - 2.40	B			(0.60)		3.00					
	2.00	SPT(C)	N=2 (1,/0,1,0,1)			(0.50)		3.50	MADE GROUND Structureless CHALK composed of white slightly gravelly clayey SILT. Gravel consists of fine to medium subrounded to chalk and coarse angular flint. [CIRIA Grade Dm]			4
	3.00 - 3.40	B			(2.00)		5.50					
	3.00	SPT(C)	N=10 (2,1/2,3,2,3)					WHITE CHALK SUB GROUP Structureless CHALK composed of white slightly gravelly clayey SILT. Gravel consists of fine to medium subrounded to angular chalk. [CIRIA Grade Dm]			5	
	3.50 - 3.95	SPTLS					6					
	3.50	SPT(S)	N=8 (2,2/2,3,1,2)					WHITE CHALK SUB GROUP Structureless CHALK composed of greyish white slightly clayey silty GRAVEL. Gravel consists of fine to coarse subangular chalk and flint. [CIRIA Grade Dc]			7	
	4.50 - 4.95	SPTLS					8					
	4.50	SPT(S)	N=6 (1,1/1,2,2,1)					WHITE CHALK SUB GROUP			9	
	5.00 - 5.40	B					10					
	5.50 - 5.95	SPTLS						WHITE CHALK SUB GROUP			10	
	5.50	SPT(S)	N=4 (1,1/1,1,1,1)									
	7.00 - 7.45	SPTLS						WHITE CHALK SUB GROUP				
7.00	SPT(S)	N=6 (1,1/1,1,2,2)										
7.50 - 7.90	B						WHITE CHALK SUB GROUP					
8.50 - 8.95	SPTLS											
8.50	SPT(S)	N=12 (2,3/4,3,2,3)					WHITE CHALK SUB GROUP					
10.00	SPTLS											

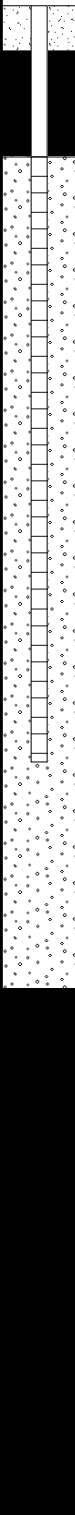
Hole Details		Casing Details		Waterstrike (m bgl)						Standing/Chiselling (m bgl)			
Depth (m bgl)	Dia. (mm)	Depth (m bgl)	Dia. (mm)	Date	Depth Strike	Depth Casing	Depth Sealed	Rose to:	Time (mins)	From	To	Time	Remarks
10.00	150	20.00	150		4.00	2.50		3.50	20				

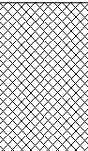
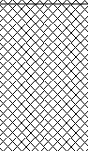
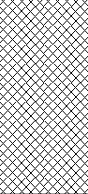
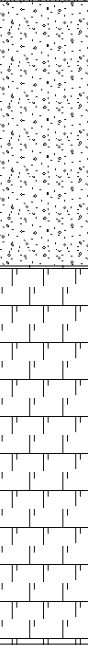
CJB

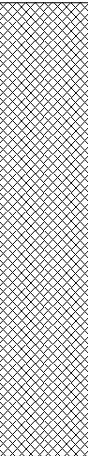
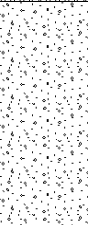
Client:	Stonegate Homes Ltd
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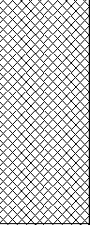
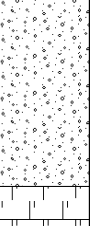
Well	Water Strikes	Samples and Insitu Testing			Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description	
		Depth (m bgl)	Type	Results						
			SPT(S)	N=19 (4,5/4,4,5,6)					Structureless CHALK composed of greyish white slightly clayey silty GRAVEL. Gravel consists of fine to coarse subangular chalk and flint. [CIRIA Grade Dc] WHITE CHALK SUB GROUP	
	10.50 - 10.90	B								11
	11.50 - 11.95	SPTLS								
	11.50	SPT(S)	N=20 (6,6/5,5,4,6)							12
	13.00 - 13.45	SPTLS								
	13.00	SPT(S)	N=50 (8,9/12,10,13,15)							13
	13.50 - 13.90	B								
										14
	14.50 - 14.95	SPTLS								
	14.50	SPT(S)	N=46 (10,10/10,12,12,12)	(14.50)						15
	16.00 - 16.45	SPTLS								
	16.00	SPT(S)	N=43 (9,9/11,9,11,12)						16	
	17.00 - 17.40	B								
	17.50	SPTLS								
		SPT(S)	N=46 (10,10/10,12,12,12)						18	
	19.00 - 19.45	SPTLS								
	19.00	SPT(S)	N=49 (10,11/11,10,12,16)						19	
								20.00	End of Borehole at 20.00m	20

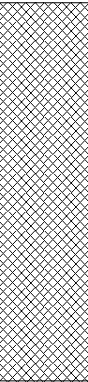
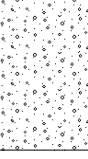
Hole Details		Casing Details		Waterstrike (m bgl)						Standing/Chiselling (m bgl)			
Depth (m bgl)	Dia. (mm)	Depth (m bgl)	Dia. (mm)	Date	Depth Strike	Depth Casing	Depth Sealed	Rose to:	Time (mins)	From	To	Time	Remarks
10.00	150	20.00	150		4.00	2.50		3.50	20				

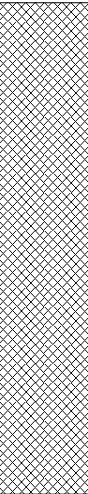
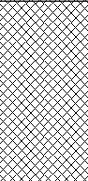
Southern Testing ST Consult					Start - End Date		Project ID:		Hole Type:		BH2		
www.southerntesting.co.uk tel:01342 333100 www.stconsult.co.uk tel:01604 500020					13/07/2021		JT0420		CP		Sheet 1 of 1		
Project Name:		Reading			Remarks:		Co-ordinates:		Level:		Logger:		
											CJB		
Location:		Portman Road, Reading			Groundwater struck at 4.6m bgl as slow seepage, rising 4.4m bgl after 20 minutes. Exploratory hole installed with 50mm monitoring pipe to 5m bgl and comprises 1m plain and 4m slotted.								
Client:		Stonegate Homes Ltd											
Well	Water Strikes	Samples and Insitu Testing			Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description				
		Depth (m bgl)	Type	Results									
		0.30	D			(0.80)			MADE GROUND consisting of loose dark brown slightly clayey slightly sandy GRAVEL. Gravel consists of fine to medium subrounded to subangular concrete flint roadstone and recycled aggregates.				
		0.50	D					0.80					
		1.00	D			(0.80)			MADE GROUND MADE GROUND consisting of: soft black very silty slightly sandy slightly gravelly organic-rich CLAY. Gravel consists of fine subangular to angular flint and concrete.				
		1.10 - 1.60	B					1.60					
		1.10	SPT(C)	N=4 (1,1/1,1,1,1)									
		2.00 - 2.40	B			(0.80)		2.40	MADE GROUND Soft to firm brown slightly gravelly sandy CLAY. Gravel consists of fine subrounded to angular flint and rare chalk.				
		2.00	SPT(C)	N=6 (1,2/2,1,1,2)				2.90					
		2.50 - 2.90	B			(0.50)			MADE GROUND Medium dense light brown very clayey slightly sandy GRAVEL. Gravel consists of fine to coarse subrounded to angular flint and chert.				
		2.50	SPT(C)	N=10 (2,2/3,3,2,2)									
		3.00	SPTLS SPT(C)	N=17 (4,4/4,4,4,5)						TAPLOW GRAVEL Structureless CHALK composed of greyish brown slightly gravelly clayey SILT. Gravel consists of fine subangular chalk. [CIRIA Grade Dm]			
		3.50 - 3.90	B					5.00					
		4.00	SPTLS SPT(C)	N=10 (2,2/3,3,2,2)		(2.10)			WHITE CHALK SUB GROUP Structureless CHALK composed of greyish white slightly clayey silty GRAVEL. Gravel consists of fine subangular to angular chalk and rare fine angular flint. [CIRIA Grade Dc]				
		5.00	SPTLS SPT(C)	N=12 (2,2/4,3,3,2)									
		6.00 - 6.40	B						WHITE CHALK SUB GROUP				
		6.50	SPTLS SPT(C)	N=13 (3,4/2,4,3,4)									
		8.00	SPTLS SPT(C)	N=10 (3,4/2,2,3,3)		(5.00)							
		9.50	SPTLS SPT(C)	N=16 (4,4/3,4,3,6)									
10.00								End of Borehole at 10.00m					
Hole Details		Casing Details		Waterstrike (m bgl)						Standing/Chiselling (m bgl)			
Depth (m bgl)	Dia. (mm)	Depth (m bgl)	Dia. (mm)	Date	Depth Strike	Depth Casing	Depth Sealed	Rose to:	Time (mins)	From	To	Time	Remarks
20.00	150				4.60	2.80		4.40	20				

				Start - End Date: 01/07/2021		Project ID: JT0420		Machine Type: JCB		SK01 Sheet 1 of 1	
Project Name: Reading				Remarks:		Co-ordinates:		Level (m AOD):		Logger: RJ	
Location: Portman Road, Reading				Soakage testing was abandoned due to pit collapse.							
Client: Stonegate Homes Ltd											
Samples and Insitu Testing			Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description				
Depth (m)	Type	Results									
2.50				(0.40)		0.40	Made Ground comprising dark brown slightly clayey gravelly Sand. Gravel is fine to coarse angular to subangular flint, brick and concrete. MADE GROUND	1			
				(0.90)			Made Ground comprising brown gravelly Sand. Gravel is fine to coarse angular to subangular flint, brick, ceramic and fabric. MADE GROUND				
				(0.70)		1.30	Brown slightly clayey very gravelly fine to coarse SAND. Gravel is fine to coarse angular to subangular flint. TAPLOW GRAVEL Black plastic bag filled with waste soil in the southeastern face of the pit. Pit collapsed during soakage testing.	2			
						2.00	Structureless CHALK composes of white silty GRAVEL. Gravel is weak chalk and flint. [CIRIA Grade Dc] WHITE CHALK SUB GROUP				
3.00				(1.00)		3.00	Pit terminated at 3.00m.	3			
								4			
Pit Dimension (m)			Pit Stability:					Water Strikes:			
Width:	0.60		unstable					Pit dry			
Length:											
Depth:	3.00										

				Start - End Date: 01/07/2021		Project ID: JT0420		Machine Type: JCB		SK02 Sheet 1 of 1	
Project Name: Reading				Remarks:		Co-ordinates:		Level (m AOD):		Logger: RJ	
Location: Portman Road, Reading											
Client: Stonegate Homes Ltd											
Samples and Insitu Testing			Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description				
Depth (m)	Type	Results									
0.40	ES			(1.20)		1.20	Made Ground comprising dark brown gravelly fine to coarse Sand. Gravel is fine to coarse angular to subangular flint, brick and concrete. MADE GROUND		1		
1.50	D			(0.60)		1.80	Brown slightly clayey very gravelly fine to coarse SAND. Gravel is fine to coarse angular to subangular flint. TAPLOW GRAVEL				
2.00	D			(0.20)		2.00	Orangish brown slightly clayey very sandy fine to coarse angular to subangular flint GRAVEL. Sand is fine to coarse. TAPLOW GRAVEL		2		
							Pit terminated at 2.00m.		3		
									4		
Pit Dimension (m)			Pit Stability:				Water Strikes:				
Width:	0.60		Stable				Pit dry				
Length:											
Depth:	2.00										

				Start - End Date: 01/07/2021		Project ID: JT0420		Machine Type: JCB		TP1 Sheet 1 of 1	
Project Name: Reading				Remarks:		Co-ordinates:		Level (m AOD):		Logger: RJ	
Location: Portman Road, Reading											
Client: Stonegate Homes Ltd											
Samples and Insitu Testing			Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description				
Depth (m)	Type	Results									
0.30	ES			(0.60)		0.60	Made Ground comprising dark brown slightly clayey gravelly Sand. Gravel is fine to coarse angular to subangular flint, brick and concrete. MADE GROUND		1		
1.00	ES						Made Ground comprising brown gravelly Sand. Gravel is fine to coarse angular to subangular flint and brick. MADE GROUND				
1.50	D			(1.70)		2.30	Brown slightly clayey very sandy fine to coarse angular to subangular flint GRAVEL. TAPLOW GRAVEL		2		
						2.80	Structureless CHALK composes of white silty GRAVEL. Gravel is weak chalk and flint. [CIRIA Grade Dc] WHITE CHALK SUB GROUP				
				(0.20)		3.00	Pit terminated at 3.00m.				
Pit Dimension (m)			Pit Stability:				Water Strikes:				
Width:	0.60		stable				Pit dry				
Length:											
Depth:	3.00										

				Start - End Date: 01/07/2021		Project ID: JT0420		Machine Type: JCB		TP2 Sheet 1 of 1	
Project Name: Reading				Remarks:		Co-ordinates:		Level (m AOD):		Logger: RJ	
Location: Portman Road, Reading											
Client: Stonegate Homes Ltd											
Samples and Insitu Testing			Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description				
Depth (m)	Type	Results									
0.40	ES			(1.00)		1.00	Made Ground comprising brown gravelly Sand with occasional roots, fabric and plastic. Gravel is fine to coarse angular to subangular flint, concrete and brick. MADE GROUND		1		
1.20	ES			(1.60)		2.60	Made Ground comprising dark brown gravelly Sand with cobble of red brick (demolition rubble) and plastic sheet. Gravel is fine to coarse angular to subangular flint, brick, concrete, ceramic, clinker, coal, slate fragment and glass fragment. MADE GROUND		2		
2.70	D			(0.40)		3.00	Orangish brown slightly clayey very sandy fine to coarse angular to subangular flint GRAVEL. Sand is fine to coarse. TAPLOW GRAVEL		3		
							Pit terminated at 3.00m.		4		
Pit Dimension (m)			Pit Stability:				Water Strikes:				
Width:	0.60		stable				Pit dry				
Length:											
Depth:	3.00										

				Start - End Date: 01/07/2021		Project ID: JT0420		Machine Type: JCB		TP3 Sheet 1 of 1	
Project Name: Reading				Remarks:		Co-ordinates:		Level (m AOD):		Logger: RJ	
Location: Portman Road, Reading											
Client: Stonegate Homes Ltd											
Samples and Insitu Testing			Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description				
Depth (m)	Type	Results									
0.50	ES			(1.30)		1.30	Made Ground comprising dark brown slightly gravelly fine to coarse Sand with polyethene bag and metal. Gravel is fine to coarse angular to subangular flint, brick and clinker. MADE GROUND		1		
1.50	ES			(0.50)		1.80	Made Ground comprising black ashy gravelly fine to Sand with occasional metal bar and broken glass bottle. Gravel is fine to coarse angular to subangular flint, brick and ceramic. MADE GROUND				
				(0.20)		2.00	Brown slightly clayey very gravelly fine to coarse SAND. Gravel is fine to coarse angular to subangular flint. TAPLOW GRAVEL		2		
							Pit terminated at 2.00m.		3		
									4		
Pit Dimension (m)			Pit Stability:				Water Strikes:				
Width:		0.60	stable				Pit dry				
Length:											
Depth:		2.00									

APPENDIX B

Field Sampling and In-Situ Test Methods and Results



B

Soil and Rock Descriptions

All soil and rock descriptions are in general accordance with BS5930 Ref [4].

Anthropogenic soils ('made ground' or 'fill') describe materials which have been placed by man and can be divided into those composed of reworked natural soils and those composed of or containing man-made materials. 'Fill' is used to describe material placed in a controlled manner and 'made ground' is used to describe materials placed without strict engineering control.

The classification of materials such as topsoil is based on visual description only and should not be interpreted to mean that the material complies with criteria used in BS 3882 Ref [15].

Chalk descriptions are based on CIRIA C574 Ref [16] and Mortimore Ref [17].

The geology code is only provided on logs where a positive identification of the sample strata has been made.

Inspection Pit

Inspection pits are hand excavated from the surface (maximum depth 1.2 – 1.5m) using appropriate tools to locate and avoid existing buried services at exploratory hole positions. They are also regularly used as part of investigations on existing structures to expose and determine foundation detail.

Trial Pits and Trenches

Trial pits and trenches are unsupported excavations, mechanically excavated by machine to the required depth to enable visual examination, in situ testing and sampling as required from outside the excavation.

Standard Penetration Test (SPT)

The Standard Penetration Test (SPT) is specified in BS EN ISO 22476-3 Ref [18]. In this test, an open-ended tube is driven into the ground by blows from a free-falling hammer (with specified sizes, weights and distances).

The tube is seated by driving to a penetration of 150mm, or by 25 blows, whichever occurs first. It is then driven for a maximum of a further 300mm and the number of blows is termed the penetration resistance (N). If 300mm penetration cannot be achieved in 50 blows, the test drive is terminated and penetration depth is recorded.

When testing in gravels, a conical end piece is attached to the tube. The test is then called an SPT(C).

A classification of relative density descriptions as used on borehole logs, based upon uncorrected SPT N values, is given within BS5930 Ref [4] and set out as follows:

Classification based on uncorrected SPT N Value	Term
0 - 4	Very Loose
4 - 10	Loose
10 – 30	Medium Dense
30 – 50	Dense
Over 50	Very Dense

Disturbed Samples

Disturbed samples were taken from exploratory holes in general accordance with BS 5930 [4] and BS EN ISO 22475-1 Ref [19] as required and stored in appropriately labelled containers. Details of the type, size and depth of sample will be recorded within the exploratory hole record. Such samples can be regarded as being between Class 5 up to Class 3 quality depending upon their method of sampling.

Environmental Samples

Environmental samples were taken from the boreholes at regular intervals in the made ground and natural soils as indicated on the exploratory hole logs. The sampling strategy was in general accordance with BS10175 Ref [5] and BS ISO 18400 Refs [20], [21], [22], [23] & [24].

These samples were collected and stored in glass jars or plastic pots and transferred to the laboratory in cool boxes as appropriate to the proposed laboratory testing.

Headspace Analysis

Headspace testing utilising a 10.6eV Isobutylene calibrated photo-ionisation detector (PID) to determine the potential volatile content using the headspace methodology was undertaken on all environmental samples. Results are shown on the borehole logs.

Monitoring Well

A groundwater and/or ground gas monitoring well consists of a perforated pipe, which is installed in the ground. The standpipe is typically 50mm nominal in diameter and is installed in a lined borehole. It is perforated from the base with a sand/gravel surround through the soil horizon of interest to an appropriate depth below ground level. Above this there is a bentonite seal with solid pipework and is provided with an end cap or a gas valve at the top as appropriate.

Gas monitoring is carried out via the gas tap. Water sampling/purging can be undertaken by removing the gas tap and bung.

The well is usually completed at the surface with a flush cast iron cover or raised lockable cover.

Groundwater Monitoring – Dip Meter

The dip meter is used to measure standing water levels within boreholes. The probe is lowered into the borehole until the meter detects the groundwater with an audible 'beep'. The level is then read from the tape.

Soakage Tests (after BRE DG365 2016)

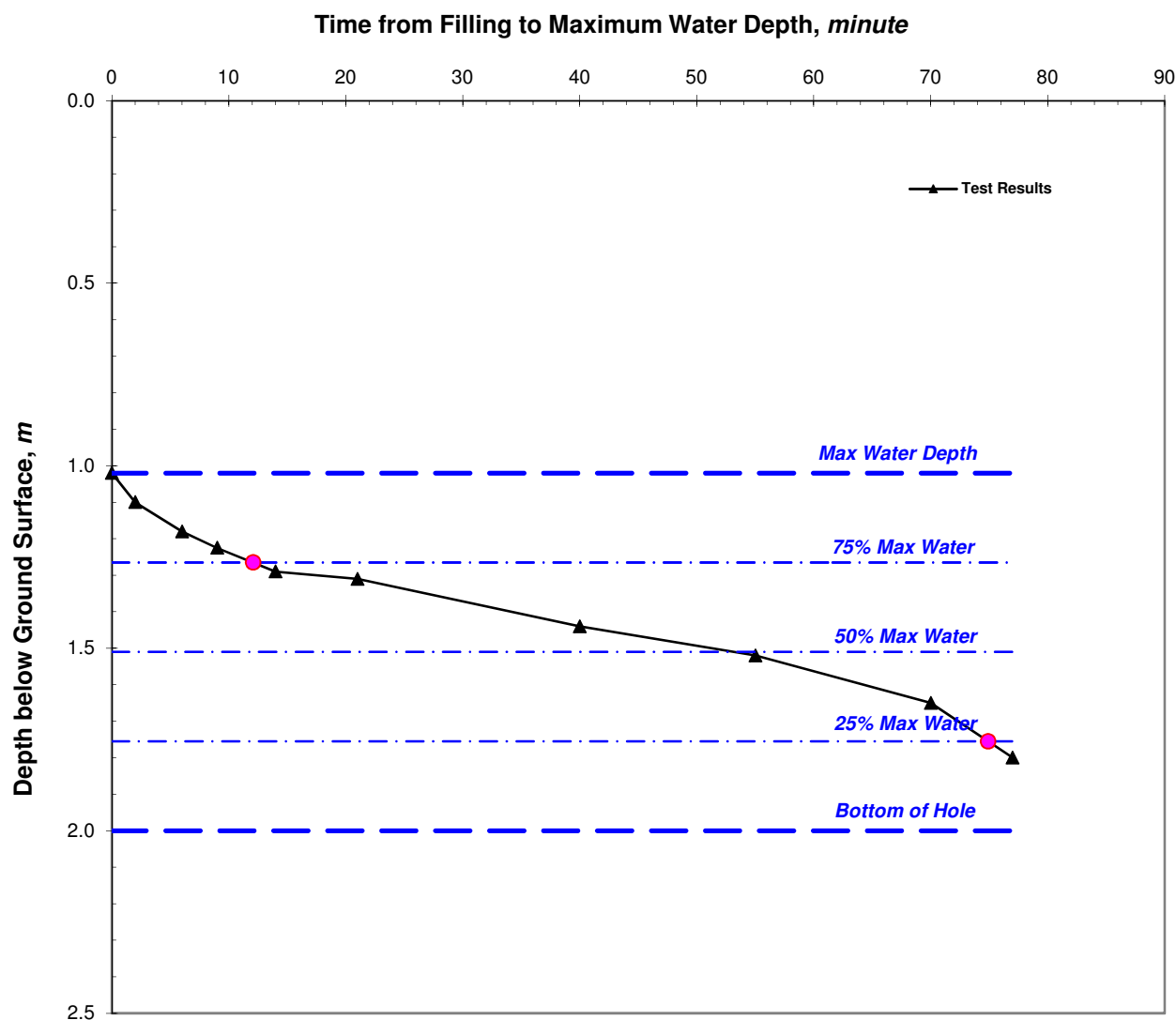
The BRE DG365 Ref [7] paper on soakaway design allows for the design of trench soakaways as well as traditional square and circular soakaways.

The test to measure the soil infiltration rate is carried out in pits which are excavated to the full depth of the proposed soakaway. The trial pits are filled and allowed to drain to empty or near empty, three times, on the same day or on consecutive days. Water levels are recorded against time. Where the sides are unstable the pit should be filled with granular material to provide stability during the test.

Calculated soakage rates are expressed as l/m²/minute, which is a convenient rate to use. The BRE use a unit of m/sec, which is the value in l/m²/minute divided by 60,000.

BRE Digest DG365 Soakage Test

Test Hole No: SK02
Test No: Test No 1 (Initial)



Pit Length, m	1.450	Depth to Water at Start of Test, m	1.020
Pit Width, m	0.720	Max Water Dropdown during Test, m	0.780
Depth to Pit Base, m	2.000	Total Soakage Test Time, min	77.0
Depth to Top of Permeable Soils, m		Mean Internal Discharge Area, m ²	3.171
Depth to Groundwater Surface, m		Discharge Rate, litre/min	8.143
Depth to Top of Granular Fill, m		Soakage Rate, litre/m ² /min	2.57
Voids Assumed for Granular Fill, %	100%	BRE Soil Infiltration Rate, m/sec	4.28E-05

Comments: 3" gravity feed using 1050 litres approx over 1 minute 30. Collapse after 1 minute, 2nd collapse after 4 minutes.
Pit was nearly emptied at finish of test.

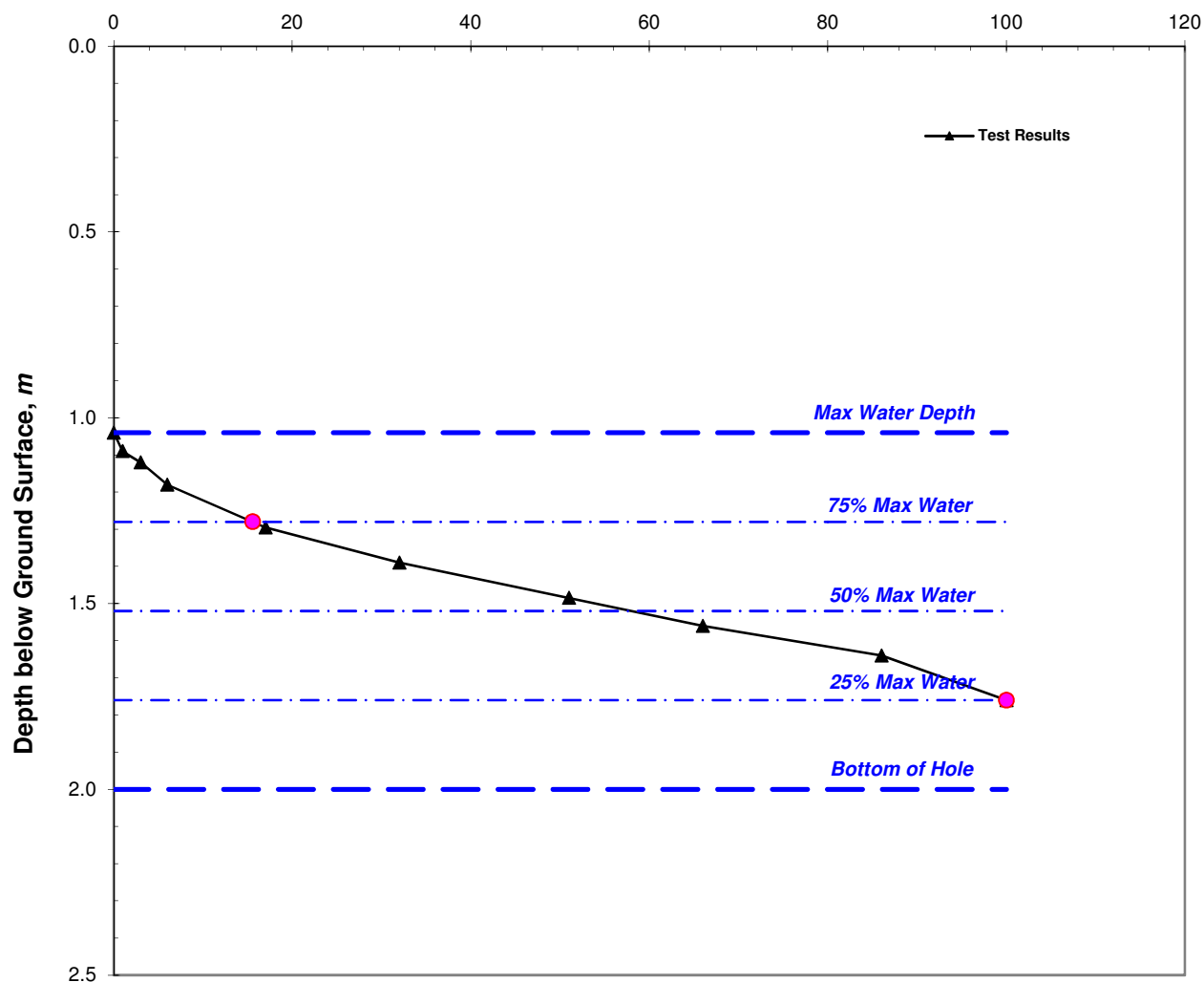
Client: Stonegate Homes Ltd	Job No: JT0420	Test Date: 01/Jul/2021
Site: Land on South side of Portman Road, Reading	Tested By: SS	Engineer: RJ
		Fig. S1

BRE Digest DG365 Soakage Test

Test Hole No: SK02

Test No: Test No 2 (Repeated)

Time from Filling to Maximum Water Depth, *minute*



Pit Length, m	1.450	Depth to Water at Start of Test, m	1.040
Pit Width, m	0.720	Max Water Dropdown during Test, m	0.720
Depth to Pit Base, m	2.000	Total Soakage Test Time, min	100.0
Depth to Top of Permeable Soils, m		Mean Internal Discharge Area, m ²	3.127
Depth to Groundwater Surface, m		Discharge Rate, litre/min	5.935
Depth to Top of Granular Fill, m		Soakage Rate, litre/m ² /min	1.90
Voids Assumed for Granular Fill, %	100%	BRE Soil Infiltration Rate, m/sec	3.16E-05

Comments: 3" gravity feed using 1050 litres approx over 1 minute 30. Collapse after 1 minute, 2nd collapse after 4 minutes.
Pit was nearly emptied at finish of test.

Client: Stonegate Homes Ltd	Job No: JT0420	Test Date: 01/Jul/2021
Site: Land on South side of Portman Road, Reading	Tested By: SS	Engineer: RJ
		Fig. S2

Summary Sheet

Results of BRE Digest DG365 Soakage Tests

Site : Land on South side of Portman Road, Reading				Job No : JT0420			
Client : Stonegate Homes Ltd				O S Reference : SU 69721 73679			
Tested By : SS				Engineer: RJ		Test Date : 01/Jul/2021	
Hole No	Test No	Hole Depth <i>m</i>	Soakage Rate for Each Test <i>litre/m²/min</i>	Soakage Rate for Each Hole <i>litre/m²/min m/sec</i>		Water Level at Finish of Test	Remarks
SK02	No 1	2.00	2.57	1.90	3.16E-5	Nearly empty pit.	3" gravity feed using 1050 litres approx over 1 minute 30. Collpase after 1 minute, 2nd collapse after 4 minutes.
SK02	No 2	2.00	1.90			Nearly empty pit.	3" gravity feed using 1050 litres approx over 1 minute 30. Collpase after 1 minute, 2nd collapse after 4 minutes.
Mean Value of All Calculated Soakage Rates :				1.90 <i>litre/m²/min</i>	3.16E-5 <i>m/sec</i>		

Project Name: Reading

Location: Portman Road, Reading

Client: Stonegate Homes Ltd

Project Number: JT0420

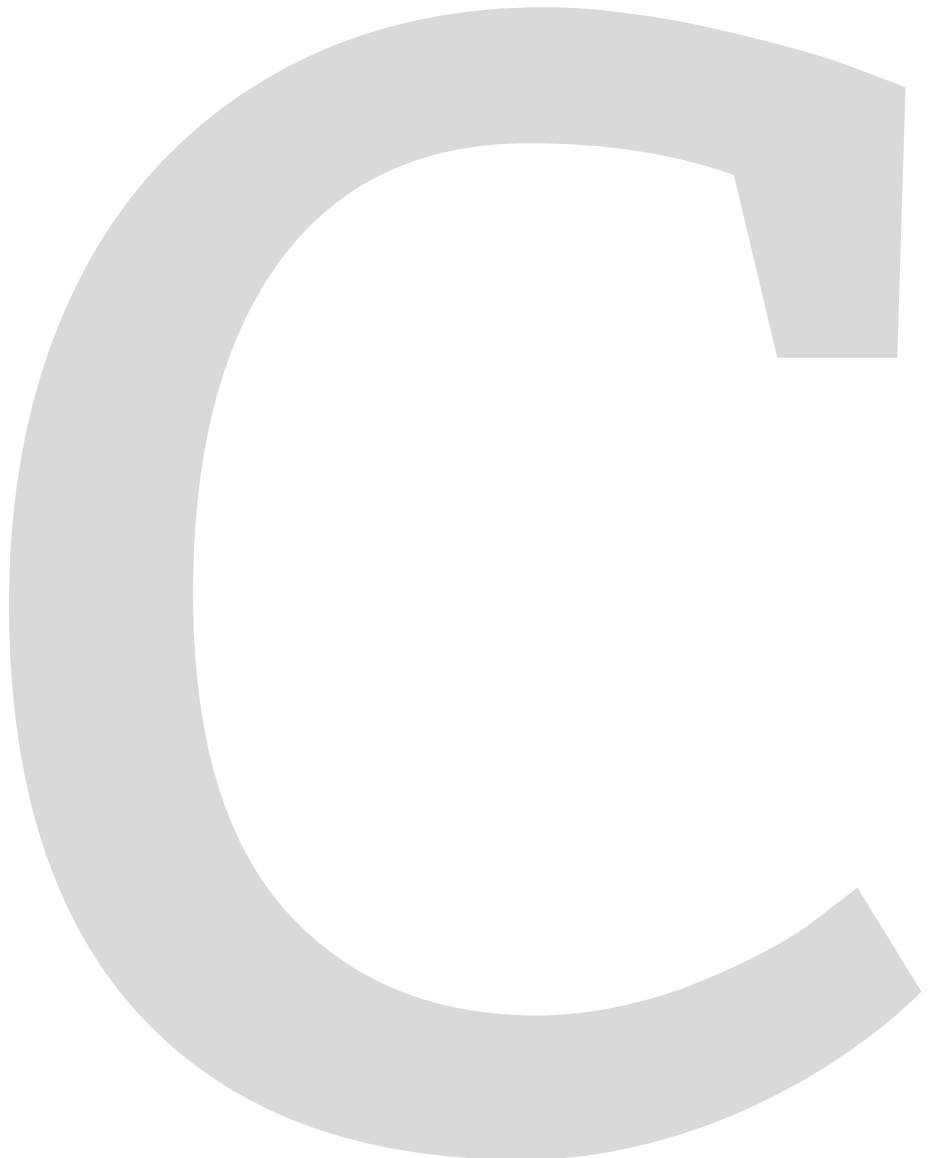
Engineer: RJ

STANDARD PENETRATION TEST RESULTS

Location ID	Test Depth (m bgl)	Test Type	Seating Blows/Penetration				Main Test Blows/Penetration								N Value	Reported Result
			SB1	SP1	SB2	SP2	MB1	MP1	MB2	MP2	MB3	MP3	MB4	MP4		
BH1	1.1	C	1	150			1	75	1	75	1	75	2	75	5	N=5 (1,1,1,1,2)
BH1	2	C	1	150			0	75	1	75	0	75	1	75	2	N=2 (1,0,1,0,1)
BH1	3	C	2	75	1	75	2	75	3	75	2	75	3	75	10	N=10 (2,1/2,3,2,3)
BH1	3.5	S	2	75	2	75	2	75	3	75	1	75	2	75	8	N=8 (2,2/2,3,1,2)
BH1	4.5	S	1	75	1	75	1	75	2	75	2	75	1	75	6	N=6 (1,1/1,2,2,1)
BH1	5.5	S	1	75	1	75	1	75	1	75	1	75	1	75	4	N=4 (1,1/1,1,1,1)
BH1	7	S	1	75	1	75	1	75	1	75	2	75	2	75	6	N=6 (1,1/1,1,2,2)
BH1	8.5	S	2	75	3	75	4	75	3	75	2	75	3	75	12	N=12 (2,3/4,3,2,3)
BH1	10	S	4	75	5	75	4	75	4	75	5	75	6	75	19	N=19 (4,5/4,4,5,6)
BH1	11.5	S	6	75	6	75	5	75	5	75	4	75	6	75	20	N=20 (6,6/5,5,4,6)
BH1	13	S	8	75	9	75	12	75	10	75	13	75	15	75	50	N=50 (8,9/12,10,13,15)
BH1	14.5	S	10	75	10	75	10	75	12	75	12	75	12	75	46	N=46 (10,10/10,12,12,12)
BH1	16	S	9	75	9	75	11	75	9	75	11	75	12	75	43	N=43 (9,9/11,9,11,12)
BH1	17.5	S	10	75	10	75	10	75	12	75	12	75	12	75	46	N=46 (10,10/10,12,12,12)
BH1	19	S	10	75	11	75	11	75	10	75	12	75	16	75	49	N=49 (10,11/11,10,12,16)
BH2	1.1	C	1	75	1	75	1	75	1	75	1	75	1	75	4	N=4 (1,1/1,1,1,1)
BH2	2	C	1	75	2	75	2	75	1	75	1	75	2	75	6	N=6 (1,2/2,1,1,2)
BH2	2.5	C	2	75	2	75	3	75	3	75	2	75	2	75	10	N=10 (2,2/3,3,2,2)
BH2	3	C	4	75	4	75	4	75	4	75	4	75	5	75	17	N=17 (4,4/4,4,4,5)
BH2	4	C	2	75	2	75	3	75	3	75	2	75	2	75	10	N=10 (2,2/3,3,2,2)
BH2	5	C	2	75	2	75	4	75	3	75	3	75	2	75	12	N=12 (2,2/4,3,3,2)
BH2	6.5	C	3	75	4	75	2	75	4	75	3	75	4	75	13	N=13 (3,4/2,4,3,4)
BH2	8	C	3	75	4	75	2	75	2	75	3	75	3	75	10	N=10 (3,4/2,2,3,3)
BH2	9.5	C	4	75	4	75	3	75	4	75	3	75	6	75	16	N=16 (4,4/3,4,3,6)

APPENDIX C

Geotechnical Laboratory Test Methods and Results



Classification Summary

BS1377-2 cl. 3.2, 3.3, 8.3 & BS1377-9 cl. 2.4 & BS EN ISO 17892-1, 2 & 3



Project Name		Land on the South side of Portman Road				Project Number		JT0420	
Client		Stonegate Homes Ltd			PE	RJ	Date Issued		14-Jul-21
Location	Depth m	Sample Type	Visual Description	Comments	Natural MC %	Particle Density Mg/m ³	Bulk Density Mg/m ³	Dry Density Mg/m ³	Saturation MC %
SK01	3.00	D	White coarse angular chalk GRAVEL.		26		2.06	1.64	24

Notes: Saturation Moisture Content of chalk test is carried out on intact fragments selected from the supplied sample. Particle density of chalk is assumed to be 2.7Mg/m³ unless otherwise stated above.

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Oct 14

PARTICLE SIZE DISTRIBUTION REPORT

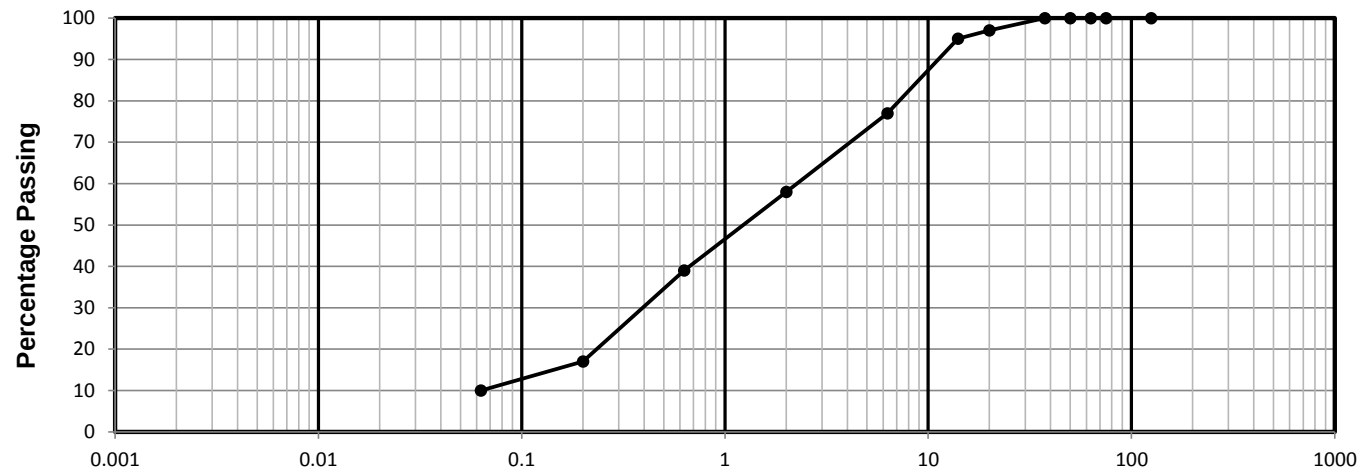
To BS1377-2 cl. 9.2-9.5



Project Name	Land on the South side of Portman Road			Project Number	JT0420
Client Name	Stonegate Homes Ltd	PE	RJ	Date Issued	14-Jul-21

Particle Size Distribution Chart

Particle Size	% Passing
125mm	100
75mm	100
63mm	100
50mm	100
37.5mm	100
20mm	97
14mm	95
6.3mm	77
2mm	58
630µm	39
200µm	17
63µm	10



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES
	SILT			SAND			GRAVEL			
10			48			42			0	

Visual Description of Sample:

Brown clayey/silty very gravelly fine to coarse SAND. Gravel consists of fine and medium subangular to rounded flint.

Particle Density (Assumed) Mg/m³

N/A

Coefficient of Uniformity

Test Methods:

Wet & Dry Grading BS1377-2
cl.9.2 & 9.3 & BS EN ISO 17892-4

Location

SK02

Depth (m)

1.50

Sample Type

D

Tested By

STL Lab

Checked By

Comments:

PARTICLE SIZE DISTRIBUTION REPORT

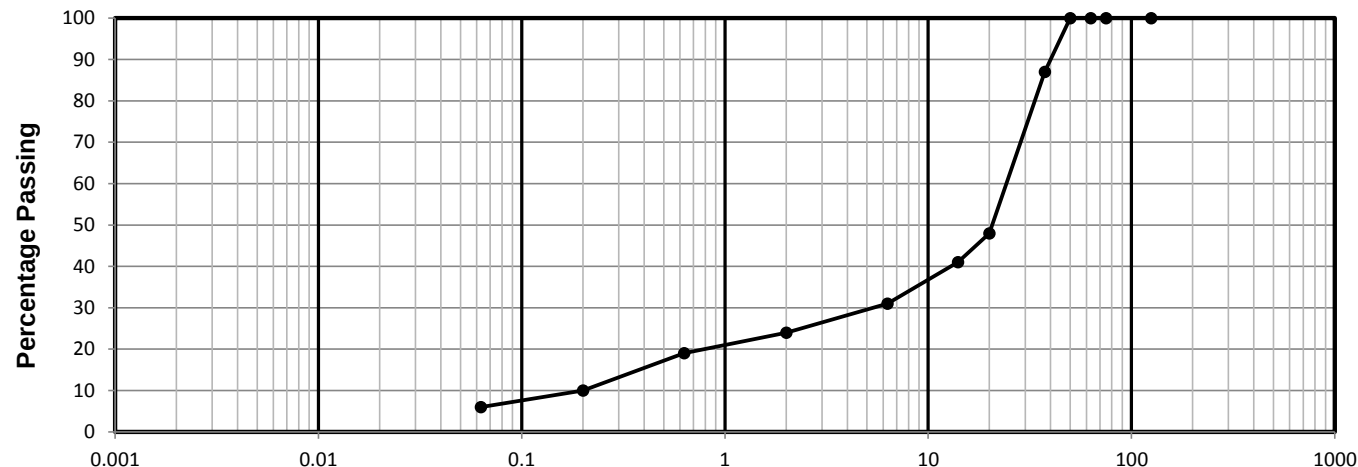
To BS1377-2 cl. 9.2-9.5



Project Name	Land on the South side of Portman Road			Project Number	JT0420
Client Name	Stonegate Homes Ltd	PE	RJ	Date Issued	14-Jul-21

Particle Size Distribution Chart

Particle Size	% Passing
125mm	100
75mm	100
63mm	100
50mm	100
37.5mm	87
20mm	48
14mm	41
6.3mm	31
2mm	24
630µm	19
200µm	10
63µm	6



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES
	SILT			SAND			GRAVEL			
6				17			76			0

Visual Description of Sample:

Brown clayey/silty sandy medium and coarse subangular and subrounded flint GRAVEL.

Particle Density (Assumed) Mg/m³ N/A

Coefficient of Uniformity 121

Test Methods:

Wet & Dry Grading BS1377-2
cl.9.2 & 9.3 & BS EN ISO 17892-4

Location SK02

Depth (m) 2.00

Sample Type D

Tested By STL Lab

Checked By

Comments:

PARTICLE SIZE DISTRIBUTION REPORT

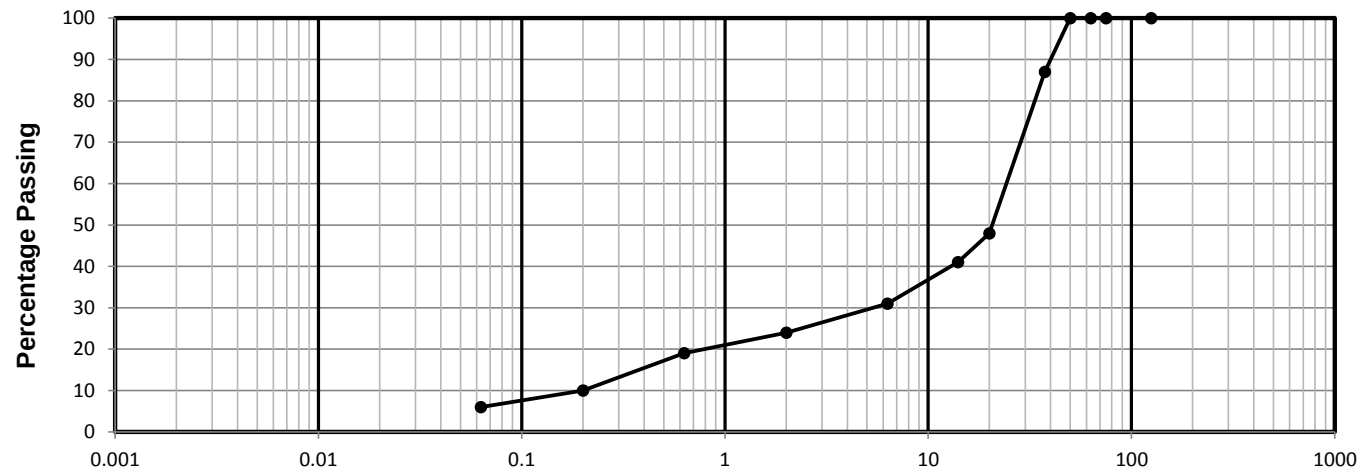
To BS1377-2 cl. 9.2-9.5



Project Name	Land on the South side of Portman Road			Project Number	JT0420
Client Name	Stonegate Homes Ltd	PE	RJ	Date Issued	14-Jul-21

Particle Size Distribution Chart

Particle Size	% Passing
125mm	100
75mm	100
63mm	100
50mm	100
37.5mm	87
20mm	48
14mm	41
6.3mm	31
2mm	24
630µm	19
200µm	10
63µm	6



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES
	SILT			SAND			GRAVEL			
6			17			76			0	

Visual Description of Sample:

Brown clayey/silty sandy medium and coarse subangular and subrounded flint GRAVEL.

Particle Density (Assumed) Mg/m³

N/A

Coefficient of Uniformity

121

Test Methods:

Wet & Dry Grading BS1377-2
cl.9.2 & 9.3 & BS EN ISO 17892-4

Location

SK02

Depth (m)

2.00

Sample Type

D

Tested By

STL Lab

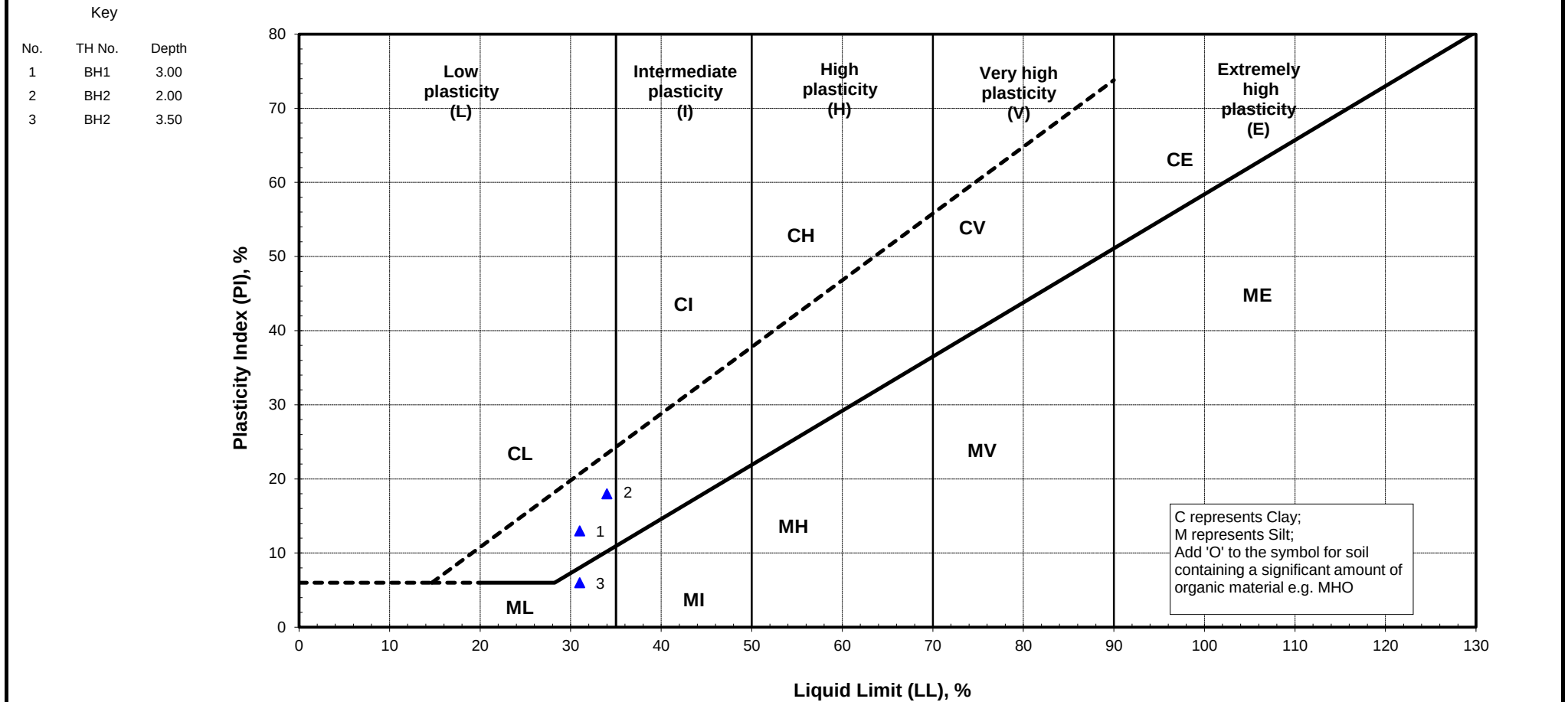
Checked By

Comments:

Plasticity Chart for Atterberg Limit Tests



Project Name	Land on the South side of Portman Road			Project Number	JT0420
Client Name	Stonegate Homes Ltd	PE	RJ	Date Issued	10-Aug-21



Liquid Limit		Plastic Limit		Plasticity Index	
Maximum Value	34	Maximum Value	25	Maximum Value	18
Minimum Value	31	Minimum Value	16	Minimum Value	6
Average Value	32	Average Value	20	Average Value	12

Project Name		Land on the South side of Portman Road					Project Number		JT0420	
Client		Stonegate Homes Ltd				PE	RJ	Date Issued		10-Aug-21
Location	Depth m	Sample Type	Visual Description	Comments	Natural MC %	Liquid Limit %	Plastic Limit %	Plasticity Index	Classi- fication	Passing 425 micron %
BH1	3.00	B	Soft to stiff brown patched brown black and white slightly sandy gravelly CLAY. Gravel consists of fine to coarse angular flint and chalk.	Sample passed through 425µm sieve	19	31	18	13	CL	57
BH2	2.00	B	Stiff brown sandy gravelly CLAY. Gravel consists of fine to coarse angular flint.	Sample passed through 425µm sieve	13	34	16	18	CL	43
BH2	3.50	B	Soft off white sandy gravelly CLAY. Gravel consists of fine and medium subrounded chalk.	Sample passed through 425µm sieve	28	31	25	6	ML	62

Southern Testing Laboratories Limited, East Grinstead is registered under BS EN ISO 9001 BSI ref: FS29280

Jun 13

Classification Summary

BS1377-2 cl. 3.2, 3.3, 8.3 & BS1377-9 cl. 2.4 & BS EN ISO 17892-1, 2 & 3

Project Name		Land on the South side of Portman Road				Project Number		JT0420	
Client		Stonegate Homes Ltd			PE	RJ	Date Issued		10-Aug-21
Location	Depth m	Sample Type	Visual Description	Comments	Natural MC %	Particle Density Mg/m ³	Bulk Density Mg/m ³	Dry Density Mg/m ³	Saturation MC %
BH1	7.50	B	Off white CHALK.		26		2.10	1.66	23
BH1	10.50	B	Off white CHALK.		25		2.16	1.73	21
BH2	6.00	B	Off white CHALK.		28		2.04	1.60	26

Notes: Saturation Moisture Content of chalk test is carried out on intact fragments selected from the supplied sample. Particle density of chalk is assumed to be 2.7Mg/m³ unless otherwise stated above.

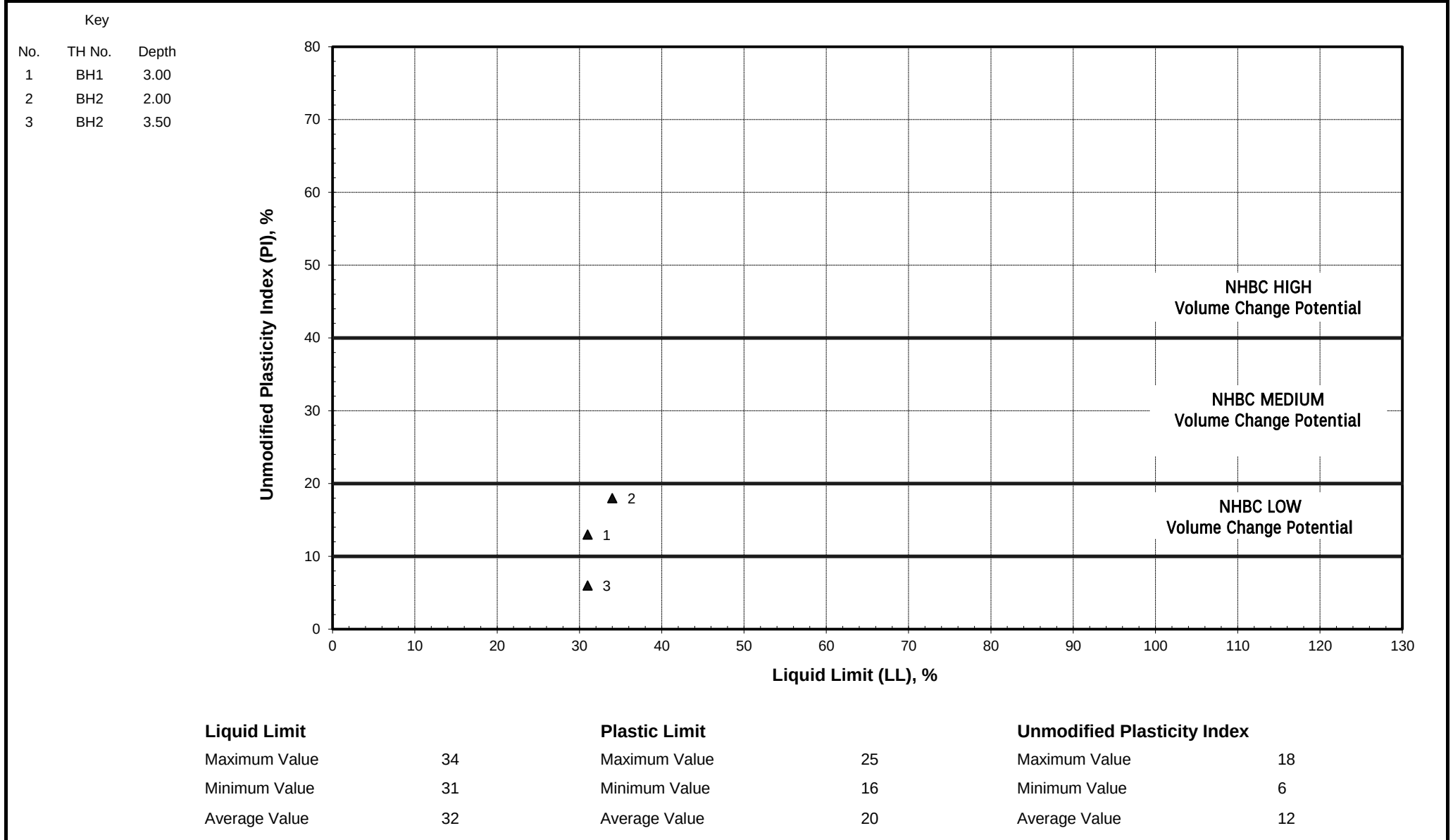
Southern Testing Laboratories Limited, East Grinstead is registered under BS EN ISO 9001 BSI ref: FS29280

Oct 14

NHBC Classification for Volume Change Potential



Project Name	Land on the South side of Portman Road			Project Number	JT0420
Client Name	Stonegate Homes Ltd	PE	RJ	Date Issued	10-Aug-21



CHEMICAL & ELECTROCHEMICAL TESTING SUMMARY

To BS1377-3 cl 5.6 & 9.5

Project Name		Land on the South side of Portman Road					Project Number		JT0420	
Client		Stonegate Homes Ltd				PE	RJ	Date Issued		10-Aug-21
TH No.	Depth m	Sample Type	Visual Description	Comments	Passing 2mm %	pH Value	Soil Sulphate 2:1 Water Extract		Groundwater Sulphate	
							g/l SO ₃	BRE mg/l SO ₄	g/l SO ₃	BRE mg/l SO ₄
BH1	3.50	SPTLS	Off white patched dark brown sandy slightly gravelly CLAY. Gravel consists of fine and medium angular and subangular chalk and flint.		54	8.0	0.20	240		
BH2	2.50	B	Soft brown patched white sandy very gravelly CLAY. Gravel consists of fine to coarse subangular and subrounded flint and chalk.		39	7.8	0.02	29		
BH2	8.00	SPTLS	Off white fine to coarse angular and subangular chalk and flint GRAVEL.		19	8.5	0.02	29		

Southern Testing Laboratories Limited, East Grinstead is registered under BS EN ISO 9001 FS29280

Jun 13

The samples above may have been crushed to pass a 2mm sieve. Samples dried at 50°C.

N.D. = Not Detected

Page: 1

A collage of six small images related to geotechnical engineering: a large pipe, a soil profile with a probe, a worker in a yellow safety suit, a red truck with 'Southern' on the side, a person using a tool on soil, and a close-up of soil and a probe.

APPENDIX D

Geotechnical Figures and Tables



Site : Land on South side of Portman Road, Reading
Job No : JT0420

Client : Stonegate Homes Ltd
Date : 04/08/21

Table : P-1

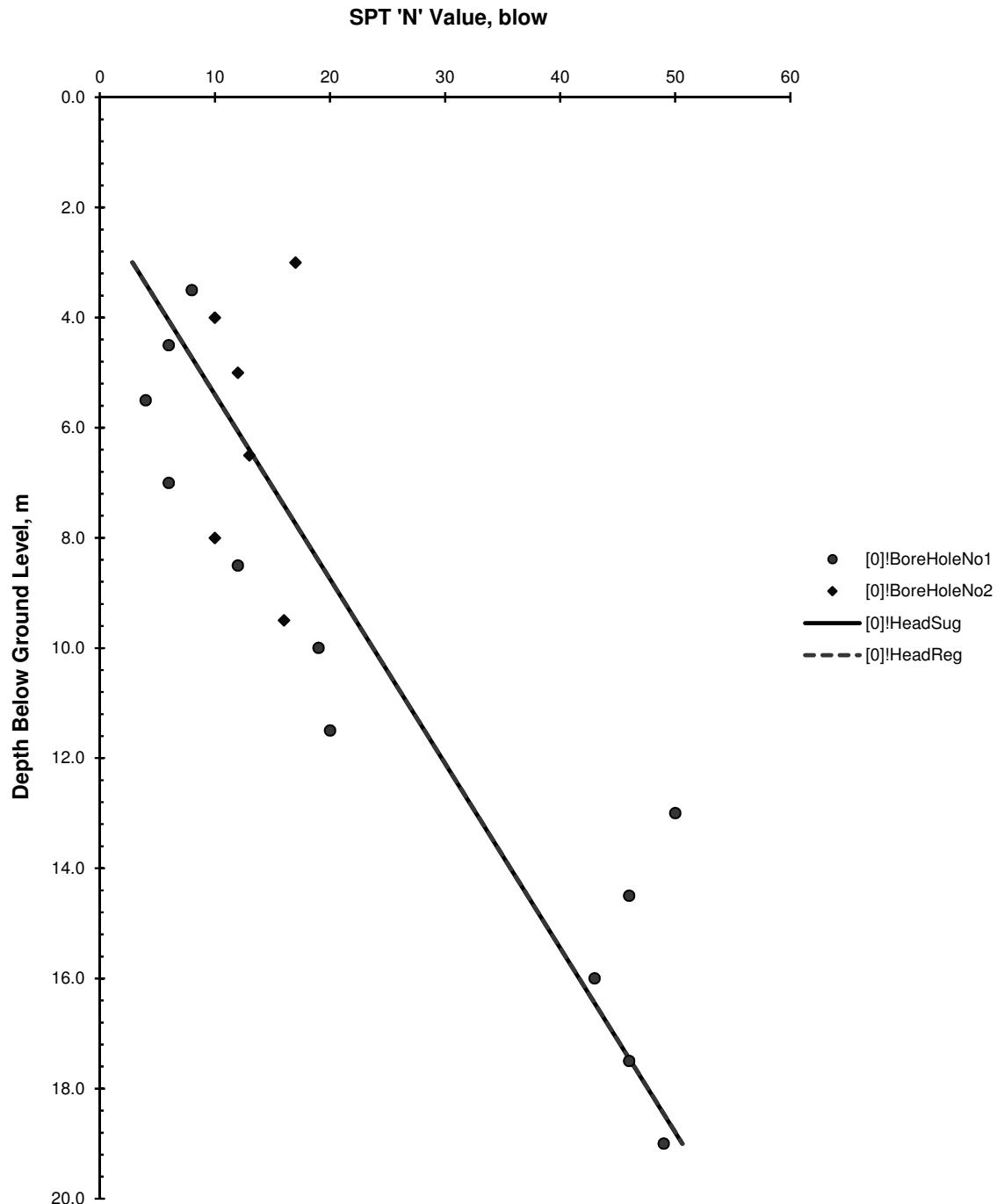
Bearing Capacity for CFA Piles in Chalk

Pile Length m	Ultimate Skin Friction, <i>kN</i>						Ultimate Base Resistance, <i>kN</i>						Allowable Load, <i>kN</i>					
	Pile Diameter, mm						Pile Diameter, mm						Pile Diameter, mm					
	300	350	400	450	500	600	300	350	400	450	500	600	300	350	400	450	500	600
9.0	76	89	102	115	127	153	293	399	522	660	815	1174	135	175	215	265	320	435
10.0	104	121	139	156	173	208	336	457	597	755	932	1342	165	210	265	320	380	520
11.0	136	158	181	204	226	271	369	503	657	831	1026	1477	195	250	310	375	445	605
12.0	172	200	229	258	286	344	397	540	705	893	1102	1587	225	290	355	425	505	680
13.0	212	247	283	318	353	424	424	577	754	954	1178	1697	255	330	405	485	570	770
14.0	257	299	342	385	428	513	445	606	792	1002	1237	1781	280	360	455	545	640	850
15.0	305	356	407	458	509	611	445	606	792	1002	1237	1781	300	385	480	585	695	915
16.0	358	418	478	538	597	717	445	606	792	1002	1237	1781	320	410	510	615	735	985
17.0	416	485	554	623	693	831	445	606	792	1002	1237	1781	345	435	540	650	770	1045
18.0	477	557	636	716	795	954	445	606	792	1002	1237	1781	370	465	570	685	815	1095
19.0	543	633	724	814	905	1086	445	606	792	1002	1237	1781	395	495	605	725	855	1145
20.0	613	715	817	919	1021	1226	445	606	792	1002	1237	1781	425	530	645	770	905	1205

- Note: 1. Nil skin friction on the pile shaft within made ground or fill was assumed to a depth of 3m.
2. Skin friction effects from soil overlying chalk were ignored to a depth of 3m.
3. The chalk was assumed below a depth of 3m, with ground water table at 3m
4. The allowable load with underline represents Maximum working load for an allowable concrete stress of 8.75MPa.
5. The factors of safety adopted for calculating allowable loads are in accordance with *CIRIA Project Report 11*.

THE ABOVE FIGURES MUST NOT SUPERCEDE THE ENGINEER'S DESIGN

SPT 'N' Value vs Depth Below Ground Level



Linear Regression of the Test Results : Slope = 2.99 blow/m, Zero intercept = -6 blow
Suggested Line for Pile Design : Slope = 2.99 blow/m, Zero intercept = -6 blow

Client: Stonegate Homes Ltd	Site: Land on South side of Portman Road, Reading		
Job No: JT0420	Date: 04/08/2021		Figure 1 SPT12

Site : Land on South side of Portman Road, Reading
Job No : JT0420

Client : Stonegate Homes Ltd
Date : 16/08/21

Table : P-1

Bearing Capacity for CFA Piles in Chalk

Pile Length m	Ultimate Skin Friction, kN						Ultimate Base Resistance, kN						Allowable Load, kN					
	Pile Diameter, mm						Pile Diameter, mm						Pile Diameter, mm					
	300	350	400	450	500	600	300	350	400	450	500	600	300	350	400	450	500	600
6.0	19	22	25	29	32	38	167	227	296	375	463	667	60	80	100	125	155	215
7.0	34	40	45	51	57	68	209	284	371	470	580	836	80	110	135	170	205	285
8.0	53	62	71	80	88	106	251	342	447	565	698	1005	105	140	175	215	260	360
9.0	76	89	102	115	127	153	293	399	522	660	815	1174	135	175	215	265	320	435
10.0	104	121	139	156	173	208	336	457	597	755	932	1342	165	210	265	320	380	520
11.0	136	158	181	204	226	271	369	503	657	831	1026	1477	195	250	310	375	445	605
12.0	172	200	229	258	286	344	397	540	705	893	1102	1587	225	290	355	425	505	680
13.0	212	247	283	318	353	424	424	577	754	954	1178	1697	255	330	405	485	570	770
14.0	257	299	342	385	428	513	445	606	792	1002	1237	1781	280	360	455	545	640	850
15.0	305	356	407	458	509	611	445	606	792	1002	1237	1781	300	385	480	585	695	915
16.0	358	418	478	538	597	717	445	606	792	1002	1237	1781	320	410	510	615	735	985
17.0	416	485	554	623	693	831	445	606	792	1002	1237	1781	345	435	540	650	770	1045
18.0	477	557	636	716	795	954	445	606	792	1002	1237	1781	370	465	570	685	815	1095
19.0	543	633	724	814	905	1086	445	606	792	1002	1237	1781	395	495	605	725	855	1145
20.0	613	715	817	919	1021	1226	445	606	792	1002	1237	1781	425	530	645	770	905	1205

- Note: 1. Nil skin friction on the pile shaft within made ground or fill was assumed to a depth of 3m.
2. Skin friction effects from soil overlying chalk were ignored to a depth of 3m.
3. The chalk was assumed below a depth of 3m, with ground water table at 3m
4. The allowable load with underline represents Maximum working load for an allowable concrete stress of 8.75MPa.
5. The factors of safety adopted for calculating allowable loads are in accordance with *CIRIA Project Report 11*.

THE ABOVE FIGURES MUST NOT SUPERCEDE THE ENGINEER'S DESIGN

APPENDIX E

Contamination Laboratory Test Methods and Results



These screening values are valid at the time of writing but may be subject to change and any such changes will have implications for the assessments based on them. Their validity should be confirmed at the time of site development.

Table 1 – Tier 1 Screening Values

Contaminant	Units	Proposed Land Use					
		Residential with home grown produce consumption	Residential without home grown produce consumption	Open Space * (Residential)	Open Space * (Park)	Allotments	Commercial / Industrial
Arsenic (As) [2]	mg/kg	37	40	79	170	43	640
Cadmium (Cd) [2]	mg/kg	11	85	120	555	1.9	190
Trivalent Chromium (CrIII) [2]	mg/kg	910	910	1,500	33,000	18,000	8600
Hexavalent Chromium (CrVI) [2]	mg/kg	6	6	7.7	220	1.8	33
Lead (Pb) [3]	mg/kg	200	310	630	1300	80	2330
Mercury (Hg) [1,2,7]	mg/kg	7.6-11	9.2-15	40	68-71	6.0	29-320
Selenium (Se) [2]	mg/kg	250	430	1,100	1,800	88	12,000
Nickel (Ni) [2,4]	mg/kg	130	180	230	800	53	980
Copper (Cu) [2,4]	mg/kg	2,400	7,100	12,000	44,000	520	68,000
Zinc (Zn) [2,4]	mg/kg	3,700	40,000	81,000	170,000	620	730,000
Phenol [1,2]	mg/kg	120-380	440-1200	440-1300	440-1300	23-83	440-1300
Benzo[a]pyrene [1,5]	mg/kg	1.7-2.4	2.6	4.9	10	0.67-2.7	36
Naphthalene [1,2]	mg/kg	2.3-1.3	2.3-13	77-430*	77-430*	4.1-24	77-430*
Total Cyanide (CN) [6]	mg/kg	/	/	/	/	/	/
Free Cyanide [6]	mg/kg	/	/	/	/	/	/
Complex Cyanides [6]	mg/kg	/	/	/	/	/	/
Thiocyanate [6]	mg/kg	/	/	/	/	/	/

Notes:

* Open Space levels calculated on the basis of the exposure modelling developed in the C4SL research.

+ Screening values constrained to saturation limit. Higher values may be acceptable on a site specific basis.

[1] Where ranges of values are given for organic contaminants the screening value is dependent on the Soil +Organic Matter.

[2] LQM/CIEH S4UL (2014). Copyright Land Quality Management Ltd. reproduced with permission; Publication Number S4UL 3116. All rights reserved.

[3] C4SL (DEFRA 2014).

[4] Copper, Zinc and Nickel may have phototoxic effects at the given concentrations. Alternative criteria should be adopted for importation of Topsoil or other soils for cultivation. BS3882:2015 and BS8601:2013 suggest values of 200 to 300mg/kg for Zn, 100 to 200mg/kg for Cu, and 60 to 110mg/kg for Ni, for topsoil and subsoil, depending on pH.

[5] Based on the Surrogate Marker approach and modelled using the modified exposure parameters of C4SL but retaining 'minimal risk' HCV.

[6] Screening criteria derived on a site specific basis if test results indicate.

[7] S4UL for Methyl Mercury, higher concentrations may be tolerable if inorganic mercury is the only species present. Lower concentrations apply for elemental Mercury.

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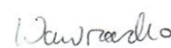
f: 01923 237404

e: reception@i2analytical.com

Analytical Report Number : 21-85143

Project / Site name:	Land on the South of Portman Road Reading RG30 1DA	Samples received on:	05/07/2021
Your job number:	JT0420	Samples instructed on/ Analysis started on:	05/07/2021
Your order number:		Analysis completed by:	15/07/2021
Report Issue Number:	1	Report issued on:	15/07/2021
Samples Analysed:	7 soil samples		

Signed:



Joanna Wawrzeczko
Technical Reviewer (Reporting Team)
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

Analytical Report Number: 21-85143

Project / Site name: Land on the South of Portman Road Reading RG30 1DA

Lab Sample Number				1927755	1927756	1927757	1927758	1927759
Sample Reference				TP1	TP1	TP2	TP2	TP3
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.30	1.00	0.40	1.20	0.50
Date Sampled				01/07/2021	01/07/2021	01/07/2021	01/07/2021	01/07/2021
Time Taken				1020	1020	1150	1150	1300
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	9.7	9.6	8.5	8.2	8.6
Total mass of sample received	kg	0.001	NONE	1.0	1.0	1.0	1.0	1.0

Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected
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General Inorganics

pH - Automated	pH Units	N/A	MCERTS	8.1	8.1	8.1	7.9	8.1
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.0088	0.013	0.029	0.077	0.039
Sulphide	mg/kg	1	MCERTS	4.0	4.1	2.6	14	4.7
Organic Matter	%	0.1	MCERTS	2.6	1.5	4.2	4.8	3.9

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
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Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	0.56	0.56	0.80	0.52	0.77
Anthracene	mg/kg	0.05	MCERTS	< 0.05	0.20	0.27	< 0.05	0.21
Fluoranthene	mg/kg	0.05	MCERTS	1.5	1.4	2.6	1.5	2.1
Pyrene	mg/kg	0.05	MCERTS	1.3	1.1	2.4	1.3	2.1
Benzo(a)anthracene	mg/kg	0.05	MCERTS	1.1	1.0	2.0	1.3	1.6
Chrysene	mg/kg	0.05	MCERTS	1.0	0.90	1.7	1.2	1.6
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	1.4	0.98	2.4	1.6	2.2
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	0.65	0.49	1.2	0.76	1.2
Benzo(a)pyrene	mg/kg	0.05	MCERTS	1.3	0.79	2.3	1.4	2.2
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	0.65	0.37	1.0	0.62	1.0
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	0.29
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	0.80	0.36	1.2	0.68	1.2

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	10.3	8.14	17.9	10.8	16.4
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Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	21	25	23	26	24
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	21	20	19	20	21
Copper (aqua regia extractable)	mg/kg	1	MCERTS	48	50	43	49	50
Lead (aqua regia extractable)	mg/kg	1	MCERTS	140	230	100	130	180
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	0.7	1.7	< 0.3	< 0.3	0.8
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	23	26	21	35	26
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	120	99	98	93	160

Analytical Report Number: 21-85143

Project / Site name: Land on the South of Portman Road Reading RG30 1DA

Lab Sample Number				1927755	1927756	1927757	1927758	1927759
Sample Reference				TP1	TP1	TP2	TP2	TP3
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.30	1.00	0.40	1.20	0.50
Date Sampled				01/07/2021	01/07/2021	01/07/2021	01/07/2021	01/07/2021
Time Taken				1020	1020	1150	1150	1300
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					

Monoaromatics & Oxygenates

Benzene	µg/kg	1	MCERTS	-	< 1.0	< 1.0	-	-
Toluene	µg/kg	1	MCERTS	-	< 1.0	< 1.0	-	-
Ethylbenzene	µg/kg	1	MCERTS	-	< 1.0	< 1.0	-	-
p & m-xylene	µg/kg	1	MCERTS	-	< 1.0	< 1.0	-	-
o-xylene	µg/kg	1	MCERTS	-	< 1.0	< 1.0	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	< 1.0	< 1.0	-	-

Petroleum Hydrocarbons

TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	-	< 0.001	< 0.001	-	-
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	-	< 0.001	< 0.001	-	-
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	-	< 0.001	< 0.001	-	-
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	-	< 1.0	< 1.0	-	-
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	-	< 2.0	< 2.0	-	-
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	-	< 8.0	< 8.0	-	-
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	-	< 8.0	< 8.0	-	-
TPH-CWG - Aliphatic > EC35 - EC44	mg/kg	8.4	NONE	-	< 8.4	< 8.4	-	-
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	-	< 10	< 10	-	-
TPH-CWG - Aliphatic (EC5 - EC44)	mg/kg	10	NONE	-	< 10	< 10	-	-

TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	-	< 0.001	< 0.001	-	-
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	-	< 0.001	< 0.001	-	-
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	-	< 0.001	< 0.001	-	-
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	-	< 1.0	< 1.0	-	-
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	-	< 2.0	< 2.0	-	-
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	-	15	14	-	-
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	-	39	38	-	-
TPH-CWG - Aromatic > EC35 - EC44	mg/kg	8.4	NONE	-	< 8.4	< 8.4	-	-
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	-	54	52	-	-
TPH-CWG - Aromatic (EC5 - EC44)	mg/kg	10	NONE	-	54	52	-	-

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number: 21-85143

Project / Site name: Land on the South of Portman Road Reading RG30 1DA

Lab Sample Number				1927760	1927761
Sample Reference				SK01	SK02
Sample Number				None Supplied	None Supplied
Depth (m)				0.50	0.40
Date Sampled				01/07/2021	01/07/2021
Time Taken				1030	1100
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status		
Stone Content	%	0.1	NONE	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	9.5	7.9
Total mass of sample received	kg	0.001	NONE	1.0	1.0

Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected
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General Inorganics

pH - Automated	pH Units	N/A	MCERTS	8.0	9.2
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.031	0.38
Sulphide	mg/kg	1	MCERTS	4.2	3.3
Organic Matter	%	0.1	MCERTS	1.5	1.2

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0
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Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	0.46	0.73
Anthracene	mg/kg	0.05	MCERTS	< 0.05	0.23
Fluoranthene	mg/kg	0.05	MCERTS	0.44	3.0
Pyrene	mg/kg	0.05	MCERTS	0.37	3.1
Benzo(a)anthracene	mg/kg	0.05	MCERTS	0.31	2.3
Chrysene	mg/kg	0.05	MCERTS	0.26	1.8
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	2.8
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	1.2
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	2.9
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	1.1
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	0.25
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	1.5

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	1.84	21.0
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Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	39	22
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	28	23
Copper (aqua regia extractable)	mg/kg	1	MCERTS	66	32
Lead (aqua regia extractable)	mg/kg	1	MCERTS	120	130
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	39	24
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	130	120

Analytical Report Number: 21-85143

Project / Site name: Land on the South of Portman Road Reading RG30 1DA

Lab Sample Number				1927760	1927761
Sample Reference				SK01	SK02
Sample Number				None Supplied	None Supplied
Depth (m)				0.50	0.40
Date Sampled				01/07/2021	01/07/2021
Time Taken				1030	1100
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status		
Monoaromatics & Oxygenates					
Benzene	µg/kg	1	MCERTS	-	-
Toluene	µg/kg	1	MCERTS	-	-
Ethylbenzene	µg/kg	1	MCERTS	-	-
p & m-xylene	µg/kg	1	MCERTS	-	-
o-xylene	µg/kg	1	MCERTS	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	-

Petroleum Hydrocarbons

TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	-	-
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	-	-
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	-	-
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	-	-
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	-	-
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	-	-
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	-	-
TPH-CWG - Aliphatic > EC35 - EC44	mg/kg	8.4	NONE	-	-
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	-	-
TPH-CWG - Aliphatic (EC5 - EC44)	mg/kg	10	NONE	-	-

TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	-	-
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	-	-
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	-	-
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	-	-
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	-	-
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	-	-
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	-	-
TPH-CWG - Aromatic > EC35 - EC44	mg/kg	8.4	NONE	-	-
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	-	-
TPH-CWG - Aromatic (EC5 - EC44)	mg/kg	10	NONE	-	-

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number : 21-85143

Project / Site name: Land on the South of Portman Road Reading RG30 1DA

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
1927755	TP1	None Supplied	0.3	Brown loam with gravel and vegetation.
1927756	TP1	None Supplied	1	Brown loam and sand with gravel and vegetation.
1927757	TP2	None Supplied	0.4	Brown loam with gravel and vegetation.
1927758	TP2	None Supplied	1.2	Brown loam with gravel and vegetation.
1927759	TP3	None Supplied	0.5	Brown loam with gravel and vegetation.
1927760	SK01	None Supplied	0.5	Brown loam and sand with gravel and vegetation.
1927761	SK02	None Supplied	0.4	Brown loam with gravel and vegetation.

Analytical Report Number : 21-85143

Project / Site name: Land on the South of Portman Road Reading RG30 1DA

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazine followed by colorimetry.	In-house method	L080-PL	W	MCERTS
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
Organic matter (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Sulphide in soil	Determination of sulphide in soil by acidification and heating to liberate hydrogen sulphide, trapped in an alkaline solution then assayed by ion selective electrode.	In-house method	L010-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L088/76-PL	W	MCERTS
TPH in (Soil)	Determination of TPH bands by HS-GC-MS/GC-FID	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	NONE
D.O. for Gravimetric Quant if Screen/ID positive	Dependent option for Gravimetric Quant if Screen/ID positive scheduled.	In house asbestos methods A001 & A006.	A006-PL	D	NONE



Analytical Report Number : 21-85143

Project / Site name: Land on the South of Portman Road Reading RG30 1DA

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
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For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.

For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.

Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.



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Analytical Report Number : 21-91151

Project / Site name:	Land on the South of Portman Road Reading RG30 1DA	Samples received on:	05/07/2021
Your job number:	JT0420	Samples instructed on/ Analysis started on:	04/08/2021
Your order number:		Analysis completed by:	09/08/2021
Report Issue Number:	1	Report issued on:	09/08/2021
Samples Analysed:	2 leachate samples		

Signed: *Karolina Marek*

Karolina Marek
PL Head of Reporting Team
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.



Analytical Report Number: 21-91151

Project / Site name: Land on the South of Portman Road Reading RG30 1DA

Lab Sample Number				1963019	1963020
Sample Reference				TP2	SK01
Sample Number				None Supplied	None Supplied
Depth (m)				1.20	0.50
Date Sampled				01/07/2021	01/07/2021
Time Taken				1150	1030
Analytical Parameter (Leachate Analysis)				Units	Limit of detection Accreditation Status

General Inorganics

pH	pH Units	N/A	ISO 17025	8.0	7.9
Electrical Conductivity	µS/cm	10	ISO 17025	68	100
Free Cyanide	µg/l	10	ISO 17025	< 10	< 10
Sulphate as SO ₄	µg/l	100	ISO 17025	1290	8100
Sulphide	µg/l	5	NONE	< 5.0	< 5.0
Chloride	mg/l	0.15	ISO 17025	2.7	3.2
Ammoniacal Nitrogen as N	µg/l	15	NONE	42	42
Chemical Oxygen Demand (Settled)	mg/l	2	ISO 17025	19	19

Phenols by HPLC

Catechol	µg/l	0.5	NONE	< 0.5	< 0.5
Resorcinol	µg/l	0.5	NONE	< 0.5	< 0.5
Ethylphenol & Dimethylphenol	µg/l	0.5	NONE	< 0.5	< 0.5
Cresols	µg/l	0.5	NONE	< 0.5	< 0.5
Naphthols	µg/l	0.5	NONE	< 0.5	< 0.5
Isopropylphenol	µg/l	0.5	NONE	< 0.5	< 0.5
Phenol	µg/l	0.5	NONE	< 0.5	< 0.5
Trimethylphenol	µg/l	0.5	NONE	< 0.5	< 0.5

Total Phenols

Total Phenols (HPLC)	µg/l	3.5	NONE	< 3.5	< 3.5
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Speciated PAHs

Naphthalene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	NONE	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/l	0.01	NONE	< 0.01	< 0.01
Benzo(ghi)perylene	µg/l	0.01	NONE	< 0.01	< 0.01

Total PAH

Total EPA-16 PAHs	µg/l	0.2	NONE	< 0.2	< 0.2
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Analytical Report Number: 21-91151

Project / Site name: Land on the South of Portman Road Reading RG30 1DA

Lab Sample Number				1963019	1963020
Sample Reference				TP2	SK01
Sample Number				None Supplied	None Supplied
Depth (m)				1.20	0.50
Date Sampled				01/07/2021	01/07/2021
Time Taken				1150	1030
Analytical Parameter (Leachate Analysis)	Units	Limit of detection	Accreditation Status		

Heavy Metals / Metalloids

Arsenic (dissolved)	µg/l	1	ISO 17025	7.2	6.6
Boron (dissolved)	µg/l	10	ISO 17025	30	82
Cadmium (dissolved)	µg/l	0.08	ISO 17025	< 0.08	< 0.08
Chromium (dissolved)	µg/l	0.4	ISO 17025	0.7	0.6
Copper (dissolved)	µg/l	0.7	ISO 17025	7.4	6.9
Iron (dissolved)	mg/l	0.004	ISO 17025	0.41	0.32
Lead (dissolved)	µg/l	1	ISO 17025	3.2	1.1
Mercury (dissolved)	µg/l	0.5	ISO 17025	< 0.5	< 0.5
Nickel (dissolved)	µg/l	0.3	ISO 17025	2.6	4.0
Selenium (dissolved)	µg/l	4	ISO 17025	< 4.0	< 4.0
Zinc (dissolved)	µg/l	0.4	ISO 17025	7.5	7.9

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number : 21-91151

Project / Site name: Land on the South of Portman Road Reading RG30 1DA

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
NRA Leachate Prep	10:1 extract with de-ionised water shaken for 24 hours then filtered.	In-house method based on National Rivers Authority	L020-PL	W	NONE
Metals by ICP-OES in leachate	Determination of metals in leachate by acidification followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Boron in leachate	Determination of boron in leachate. Sample acidified and followed by ICP-OES.	In-house method based on MEWAM	L039-PL	W	ISO 17025
Phenols, speciated, in leachate, by HPLC	Determination of speciated phenols by HPLC.	In house method based on Blue Book Method.	L030-PL	W	NONE
Electrical conductivity at 20oC of leachate	Determination of electrical conductivity in leachate by electrometric measurement.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L031-PL	W	ISO 17025
Free cyanide in leachate	Determination of free cyanide by distillation followed by colorimetry.	In-house method	L080-PL	W	ISO 17025
Speciated EPA-16 PAHs in leachate	Determination of PAH compounds in leachate by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L102B-PL	W	NONE
pH at 20oC in leachate	Determination of pH in leachate by electrometric measurement.	In house method.	L005-PL	W	ISO 17025
Sulphide in leachate	Determination of sulphide in leachate by ion selective electrode.	In-house method	L010-PL	W	NONE
Sulphate in leachates	Determination of sulphate in leachate by acidification followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Ammoniacal Nitrogen as N in leachate	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the discrete analyser (colorimetric) salicylate/nitroprusside method.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	NONE
Chloride in leachate	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260.	L082-PL	W	ISO 17025
Chemical Oxygen Demand in Leachate (Settled)	Determination of settled COD in leachate by reflux oxidation with acidified K ₂ Cr ₂ O ₇ followed by colorimetry.	HACH DR/890 Colorimeter Procedures Manual (48470-22) (Ref 0170.2)	L065-PL	W	ISO 17025

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.

For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.

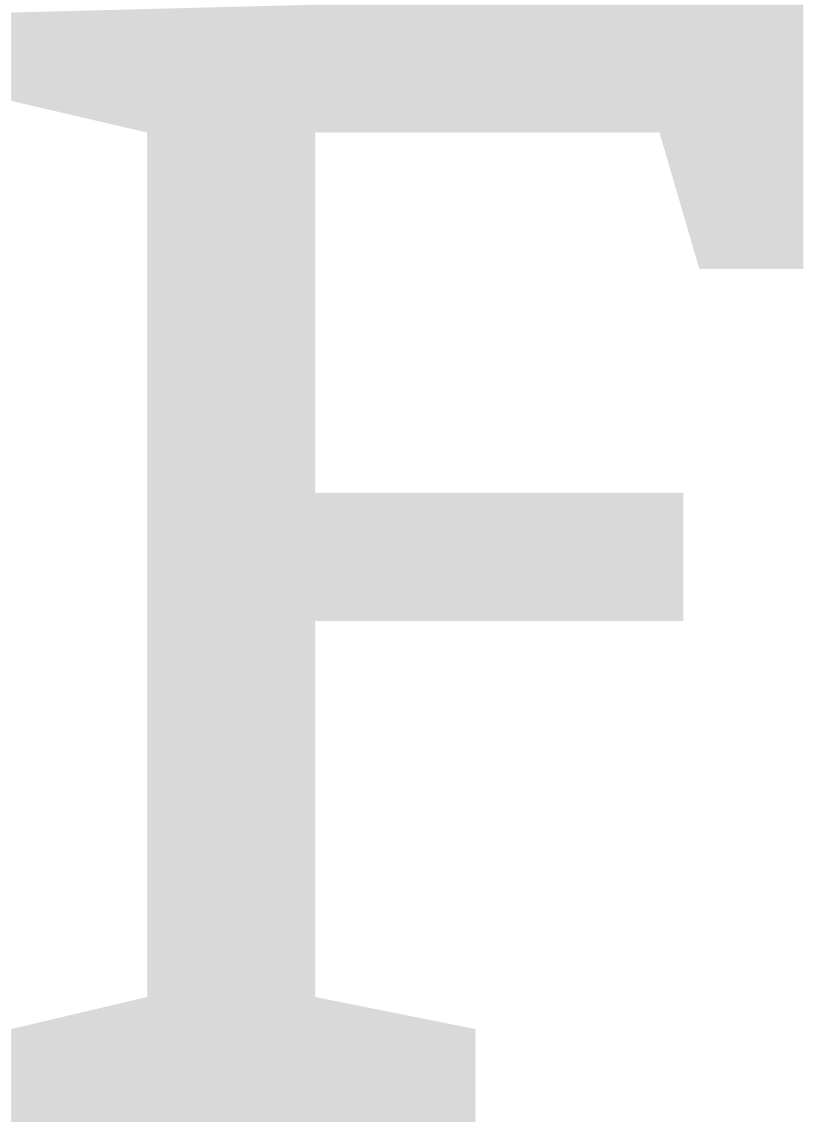
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.



APPENDIX F

Monitoring Data





Project Name		Project No		Tech		Date		Equipment Used				
Reading		JT0420		SS		20 July 2021		GFM436/TIGER VOC				

Well No	BH2	Atm Press mb temp	1016	Flow l/hr	Max:	0.0	Diff Pressure (Pa)	Max:	0
			23°C		Min:	0.0		Min:	0
Well Depth (m)	5.14	Groundwater level from GL (m)	3.00	VOC ppm	Max:	0.5	LEL %	Max:	0.0
					Min:	0.5		Min:	0.0

	Time (Seconds)											
	30	60	90	120	180	240	300	360	420	480	540	600
O ₂	15.6	15.6	15.7	15.7	15.9	15.9	15.9					
CO ₂	6.9	6.9	6.8	6.7	6.5	6.4	6.4					
CH ₄	0.0	0.0	0.0	0.0	0.0	0.0	0.0					

Remarks/Weather							CO ppm	Max: 0 Min: 0	H ₂ S ppm	Max: 0 Min: 0
8:56, dry, hot, sunny, overgrown grass										

Well No		Atm Press mb temp		Flow l/hr	Max:		Diff Pressure (Pa)	Max:	
					Min:			Min:	
Well Depth (m)		Groundwater level from GL (m)		VOC ppm	Max:		LEL %	Max:	
					Min:			Min:	

	Time (Seconds)											
	30	60	90	120	180	240	300	360	420	480	540	600
O ₂												
CO ₂												
CH ₄												

Remarks/Weather							CO ppm	Max: Min:	H ₂ S ppm	Max: Min:

Well No		Atm Press mb temp		Flow l/hr	Max:		Diff Pressure (Pa)	Max:	
					Min:			Min:	
Well Depth (m)		Groundwater level from GL (m)		VOC ppm	Max:		LEL %	Max:	
					Min:			Min:	

	Time (Seconds)											
	30	60	90	120	180	240	300	360	420	480	540	600
O ₂												
CO ₂												
CH ₄												

Remarks/Weather							CO	Max:	H ₂ S	Max:

APPENDIX G

Photographs



G



TP1



TP1 Arisings



TP2



TP2 Arisings



TP3



TP3 Arisings



SK01



SK01 Arisings



SK02



SK02 Arisings



Site entrance



Site view facing southwest



Site view, facing south



Site view, facing east



Site view facing north



Site view, facing northwest



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ISO 9001
Quality
Management
Systems
CERTIFIED

FS 29280

ISO 14001
Environmental
Management
CERTIFIED

EMS 506775

ISO 45001
Occupational
Health and Safety
Management
CERTIFIED

OHS 506776

