

Berewood, Town Park Phase B

Ground Investigation Report



Report for:

WYG

CS-J-0161

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03	31/10/19	Issue 3 – Inclusion of full set of geotechnical results	Craig Pennell	James Dodd	Mike Nicolas

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EXECUTIVE SUMMARY

Project Information	
Project details	This Ground Investigation report has been prepared by T&P Regeneration Ltd (T&P) on behalf of WYG for Berewood, Town Park Phase B PO7 3DG / NGR: 467459, 108954.
Site description and current land use	The site irregular in shape comprising 4N° irregularly shaped open grass fields currently used as public open space. An additional area situated centrally within the site which was previously used as a farming compound and comprises two small open grass areas bounded by hedge rows and trees. The site is approximately 13 hectares (ha).
Proposed development	The proposed development comprises the construction of the construction of a model boating lake/pond with sport field areas and public open space.
Ground Investigation	
Scope of work	An intrusive ground investigation was undertaken on the 6th and 20th August 2019, comprising the following: - Excavation of 4N° trial pits to a maximum depth of 3.20 metres below ground level (mbgl). - Infiltration testing within 1N° trial pits. - Drilling of 7N° windowless soil sampling boreholes. - Drilling of 1N° cable percussive borehole. Access across the central field of the site was hindered due to rutted ground and the presence of tall foliage. Furthermore, it was not possible to access the eastern portion of the site on the first day of the ground investigation due to the presence of a large recreation park located on the southern boundary and the prohibition of construction vehicles within the newly constructed residential estate located to the north of the site. A subsequent site visit allowed entry to the eastern portion of the site.
Ground conditions	Made ground was encountered within exploratory locations TP03 and TP04 with a reported thickness of between 0.45 and 1.10m. Made ground was generally found to comprise sandy, silty gravel with a medium to high cobble content, which included brick, glass and bitumen fragments. Topsoil was encountered in the majority exploratory locations. In general, the topsoil was found to comprise soft to firm light brown slightly gravelly clay which, given the agricultural setting of the site, is likely to have been reworked through ploughing and crop cultivation. The generally soft to firm clay of the weathered portion of the London Clay Formation was encountered within the majority of exploratory hole location during the ground investigation with top depths ranging between 0.20mbgl (below topsoil) and 1.0mbgl. Below depths of between 2.80 and 4.60mbgl the clay of the London Clay Formation becomes stiff to very stiff. No significant visible or olfactory evidence of contamination was encountered during the ground investigation.
Groundwater	Groundwater was encountered within BH01, WS02 and WS06 during the ground investigation with depths to groundwater ranging between 3.30mbgl and 7.30mbgl. Groundwater was not encountered in any of the other exploratory hole locations during the ground investigation.
Considerations and Recommendations for Further Work	
Considerations	- A Desk Study has not been carried-out for the site area. As such, there may be problematic areas undiscovered. - Many areas within the former farming compound have not been investigated and maybe concealing a thickness of made ground. - Infiltration testing was not undertaken in full accordance with BRE Digest DG-365 (2016) as it was not possible to complete three infiltration tests within the soakaway location in the time available.

Recommendations	<u>Engineering</u> • Infiltration testing highlighted that soakaways may offer a viable mechanism for surface water management on site. Supplementary testing should therefore be undertaken to provide results in full accordance with BRE365 prior to detailed soakaway design. • Should any exceptionally soft spots or oversized material be noted during construction, they should be removed and replaced with compacted granular fill for road construction. <u>General</u> • Discussions should be held with local landfill/soil waste treatment facilities to agree material classification/pre-treatment required for any soils to be disposed off-site as a result of proposed construction works. • Ground workers should remain vigilant for visible and olfactory signs of contamination following demolition of on-site buildings. • Ground workers should be vigilant for potential UXO and seek immediate professional advice if anything suspicious is encountered during groundworks. • A site-specific health and safety plan should be prepared to inform on risks posed from the previous site use and mitigations for ground workers developing the site e.g. requirements for appropriate PPE, hygiene practices, environmental monitoring and requirements for mitigation measures during construction works. • A copy of this report should be provided to the relevant regulatory authorities to confirm that they are in agreement with the report findings.
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1 INTRODUCTION

1.1 Contract Details

Following instruction from WYG ('the client'), an intrusive ground investigation was undertaken for a proposed area of public open space and sports fields on the land south of Parker Drive, Waterloooville (the 'site').

1.2 Proposed Development

Information presented to T&P Regeneration Ltd (T&P) indicates that the proposed development is intended to comprise the construction of 1N^o model boating lake/pond, sports fields and areas of public open space (planning application number: APP/18/01317). A development layout plan is included in Appendix A although it is understood this may be subject to change following completion of master planning.

1.3 Objectives

The purpose of the assessment is to establish geotechnical conditions of the site to aid design for the future development while presenting contamination data in a factual format.

1.4 Scope of Works

The scope of work was defined by the client, as set out in the T&P proposal and client correspondence. Broadly, this includes:

- Intrusive ground investigation comprising trial pitting, windowless dynamic sampling and cable percussive drilling;
- Completion of in situ TRL DCP tests;
- Completion of infiltration testing;
- Collection of soil samples for chemical and geotechnical laboratory testing; and,
- Presentation of geotechnical information to assist with foundation design.

1.5 Report Limitations

The recommendations, interpretations and conclusions of this report are based on the historical and current site conditions reported by database and mapping sources as supplemented with information gathered during on-site visits. No responsibility can be accepted for the accuracy of third-party information including reference data contained within site specific database reports. Due to the inherent variability of the ground conditions between exploratory hole positions interpretations are accurate only for the date of the investigation works.

2 SITE INFORMATION AND SETTING

2.1 Site Location

Site location information is summarised in Table 2.1. A Site Location Plan is presented within Appendix A.

Table 2.1 Site Location Information

Information	Description
Full postal address	Land south of Park Drive Berewood Waterlooville PO7 3DG
National Grid Reference (NGR)	467459, 108954

2.2 Site Description

A summary of pertinent site information is provided in Table 2.2 with reference to information in previous reports.

Table 2.2 Summary of Site Information

Information	Description
Site description including current site use and area (ha)	The site and its boundary is irregular in shape comprising 4N° irregularly shaped open grass fields currently used as public open space. An additional area situated centrally within the site which was previously used as a farming compound and comprises two small open grass areas bounded by hedge rows and trees. The site is approximately 13 hectares (ha).
Surrounding land uses	North A new residential development is located off the northern boundary.
	South The site is bounded by a recreation park and open grass land that leads onto London Road.
	East To the east of the site is an open grass area that opens onto the site and an area used for allotments.
	West To the west of the site is open farmland.
Site access	The site was accessed off Plant Farm Avenue located in the north-western corner of the site. Access across the site was hindered by tall foliage found across the entirety of the central field of the site. Furthermore, deep ruts in the topsoil and sub-soil were noted across the central field creating movement issues for on-site plant.
Ground cover (%)	The site ground cover comprises: - Soft landscaping (grass/planting) (82%) - Gravel (2%) - Hard landscaping – tarmac/concrete (<1%) - Dense vegetation (15%)
Site elevation and topography	The site elevation ranges between 46 and 55 metres Above Ordnance Datum (mAOD). The site is generally level with a gentle slope down towards the north. A depression in the form of a pond or a tributary is located centrally within the historic farming compound.
Site boundaries	North The northern boundary is comprised of Plant Farm Avenue In the western area and Laxton Leaze in the eastern area.
	South A large recreation park is located along the southern boundary, bounded by a newly constructed 1m tall fence.
	East Public open space is located along the whole length of the eastern boundary with an area sectioned off for allotments. With the exception of the shoring

Information	Description	
		around the allotments no shoring or fencing is found along POS section of the boundary.
	West	Open farmland is present along the western boundary.
Significant on-site features	A depression in the form of a pond or tributary was observed within the farming compound located centrally within the site boundary.	

3 SCOPE OF WORK

3.1 Summary of Fieldwork

An intrusive ground investigation was undertaken on the 6th and 20th August 2019, comprising the following:

- Excavation of 4N^o trial pits;
- Infiltration testing within 1N^o trial pits;
- Drilling of 7N^o dynamic windowless soil sampling boreholes;
- *In situ* TRL DCP tests in 9N^o locations;

The work was completed in general accordance with BS5930¹.

An exploratory location plan is presented in Appendix A. A selection of photographs is provided within Appendix B. Exploratory logs are presented in Appendix C.

3.2 Exploratory Locations and Access Restrictions

A summary of exploratory locations with supporting rationale is provided in Table 3.1.

Table 3.1 Rationale for Exploratory Locations

Exploratory location(s)	Rationale/justification
TP01	As per client's specification
TP02	Soakaway test (client's specification)
TP03 – TP04	Investigating the former farm track/path (client's specification)
BH01 and WS03	Location of model boating lake/pond (client's specification)
WS01 – WS02 & WS04 – WS07	As per client's specification

Access across the central field of the site was hindered due to rutted ground and the presence of tall foliage. Furthermore, it was not possible to access the eastern portion of the site on the first day of the ground investigation due to the presence of a large recreation park located on the southern boundary and the prohibition of construction vehicles within the newly constructed residential estate located to the north of the site. A subsequent site visit allowed entry to the eastern portion of the site.

3.3 Trial Pits

T&P supervised the excavation of 4N^o trial pits (TP01 – TP04) using a tracked 8 Tonne excavator. The trial pits were terminated at depths ranging between 0.85 and 3.20 metres below ground level (mbgl) either as directed by the client's specification or due to maximum trial pit depth reached. Trial pits were backfilled with arisings compacted in suitable layers with the surface layers and topsoil replaced last.

¹ BS5930. Code of Practice for Ground Investigations. 2015.

3.4 Dynamic Windowless Soil Sampling Boreholes

T&P supervised the drilling of 7N° windowless sample boreholes (WS01 – WS07) which were terminated at a depth of 5.0mbgl in accordance with the client's specification. *In situ* standard penetration testing (SPT) was undertaken at 1.0m intervals or with noted changes in geology.

3.5 Cable Percussion Boreholes

T&P supervised the drilling of 1N° cable percussive borehole (BH01) which was terminated at a depth of 15mbgl.

3.6 TRL Dynamic Cone Penetrometer Tests

T&P supervised the completion of 9N° dynamic probes using an *in situ* TRL Dynamic Cone Penetrometer (TRL DCP) probe at the locations of the majority of exploratory hole positions (WS01-WS07, BH01 and TP01-TP02). Test results are included in Appendix D.

3.7 Infiltration Testing

T&P supervised infiltration testing within 1N° of the trial pits (TP02) which was undertaken in accordance with the client's specification. Test results are included within Appendix F.

4 SUMMARY OF GROUND CONDITIONS

4.1 Recorded Ground Conditions

The geological sequence encountered during the ground investigation is summarised in Table 4.1 and described further in the following sub-sections. Ground conditions were found to broadly correspond with published geological information. Exploratory logs are included in Appendix C.

Table 4.1 Summary of Ground Conditions

Top depth range (mbgl)	Base depth range (mbgl)	Exploratory holes	Area of site	General description/comments
Ground level	0.20-0.50	TP01-TP02 & WS01-WS07	General	Soft to firm light brown gravelly occasionally sandy CLAY. Gravel is subangular to subrounded fine to coarse of flint, chert and rare glass, bitumen and brick. (TOPSOIL & REWORKED TOPSOIL)
Ground level	0.45-1.10	TP03-TP04	Central	Light brown, black and grey silty sandy GRAVEL with medium to high cobble content. Gravel is angular to subrounded fine to coarse of flint, brick, glass, bitumen and chalk. (MADE GROUND)
0.20-1.10	0.55-4.60	TP03-TP04, WS01-WS02 & WS07	Central and central southern areas of the site	Very soft to firm bluish grey and orange to orange mottled grey CLAY with fibrous peat traces, root traces and occasional angular to subrounded fine to coarse gravel of flint and chalk. Rare glass, coal and brick fragments were found at depths no greater than 1.0mbgl. (REWORKED LONDON CLAY FORMATION)
0.20-1.0	0.85-5.0	BH01, TP01-TP03 & WS01-WS07	General	Soft to firm orangish brown occasionally mottled grey slightly sandy CLAY. (WEATHERED LONDON CLAY FORMATION)
2.80-4.60	3.20-15.0	BH01, TP01, WS02-WS03, WS05 & WS07	General	Stiff to very stiff grey CLAY. (LONDON CLAY FORMATION)

4.1.1 Made ground

Made ground was encountered within exploratory locations TP03 and TP04 located in the central area of the site along the old farm track with a reported thickness of between 0.45 and 1.10m. Made ground was generally found to comprise sandy, silty gravel with a medium to high cobble content, which included brick, glass and bitumen fragments.

4.1.2 *Topsoil*

Topsoil was encountered in the majority exploratory locations with a typical thickness ranging between 0.20 and 0.50m and locally up to 0.50m in the vicinity of WS05 on the eastern boundary. In general, the topsoil was found to comprise soft to firm light brown slightly gravelly clay which, given the agricultural setting of the site, is likely to have been reworked through ploughing and crop cultivation.

4.1.3 *Reworked London Clay Formation*

The reworked London Clay Formation was encountered in a number of trial pit and windowless sample positions with depths ranging between 0.20 and 1.0mbgl and locally up to 2.60mbgl in the vicinity of WS07. The reworked deposits generally comprised soft to firm slightly gravelly to gravelly clay with the gravel component generally comprising flint, chalk and rare glass, bitumen and brick fragments.

4.1.4 *Bedrock Geology – London Clay Formation*

The generally soft to firm clay of the weathered portion of the London Clay Formation was encountered within the majority of exploratory hole location during the ground investigation with top depths ranging between 0.20mbgl (below topsoil) and 1.0mbgl. Below depths of between 2.80 and 4.60mbgl the clay of the London Clay Formation becomes stiff to very stiff.

4.1.5 *Evidence of Contamination*

With the exception of made ground within TP03 and TP04 and the rare red brick, glass and bitumen fragments within the topsoil across the site, no significant visible or olfactory evidence of any contamination was noted during the ground investigation.

4.1.6 *Below Ground Structures and Obstructions*

No below ground structures or obstructions were encountered during the ground investigation.

4.2 **Groundwater**

Groundwater was encountered within BH01, WS02 and WS06 during the ground investigation with depths to groundwater ranging between 3.30mbgl and 7.30mbgl. Groundwater was not encountered in any of the other exploratory hole locations during the ground investigation.

5 SUMMARY OF LABORATORY ANALYSES

5.1 Geotechnical Testing

The geotechnical testing deemed necessary to adequately characterise the site from a geotechnical perspective in the context of the proposed development is summarised in Table 5.1.

Samples from the investigation were forwarded to a UKAS accredited laboratory. Complete results are provided in Appendix D.

Table 5.1 Summary of Geotechnical Testing

Test	Notes	Quantity
Moisture content	-	6 soils
Atterberg limits	-	6 soils
Remoulded CBR (including soaking)	-	4 soils
Geochemical analysis BRE SD1 Suite	pH, Sulphur, Chloride, Nitrate, 2:1 water soluble Sulphate, Magnesium, Total Sulphate	6 soils

5.2 Chemical Testing – Soil

The soil testing deemed necessary to adequately characterise the site from a contamination perspective in the context of the conceptual site model and proposed development is summarised in Table 5.2.

Additional asbestos testing have been added to the suite as a result of the discovery of an area of significant made ground around TP03 and TP04.

Samples from the investigation were forwarded to a UKAS and MCERTS accredited laboratory. Complete chemical results are provided in Appendix E.

Table 5.2 Summary of Chemical Testing

Test type	Quantity
<i>Soils</i>	
Arsenic, Boron, Cadmium, Chromium, Lead, Mercury, Nickel, Copper, Zinc, Selenium, Phenols and US EPA 16 Polycyclic Aromatic Hydrocarbons.	5 soils
Asbestos screening/ID	2 soils
TPH CWG including benzene, toluene, ethylbenzene and xylenes (BTEX)	2 soil

6 INFILTRATION TESTING

6.1 Summary of Field Testing

Infiltration testing was undertaken within 1N° trial pits (TP02) at approximate assumed deep soakaway formation level (i.e. 2m below existing level) to assess the viability of using traditional soakaway drainage within the proposed development. Graphical representations of the data are contained within Appendix F.

The trial pit was positioned as per the client's specification as show on the exploratory hole location plan contained within Appendix A. Infiltration tests were not completed in areas of the site where made ground was encountered.

The infiltration testing and subsequent calculation of soil infiltration rates were carried out in general accordance with the methodologies detailed within BRE 365².

Ideally, to fully comply with the BRE methodology, infiltration tests should be undertaken a minimum of three times. However, due to the limited time available and the slow infiltration rates encountered, it was not possible to complete the repeat testing. Therefore, the results for these tests should be considered as preliminary only and may not be a suitable basis for final drainage design.

6.2 Soil Infiltration Rate Calculations

The infiltration rates (F) have been calculated in accordance with BRE Digest DG-365 (2016). A summary of the results of the infiltration tests and calculated infiltration rates is provided in Table 6.1.

Table 6.1 Summary of Calculated Infiltration Rates

Exploratory Location	Date	Total Measured water level change (m)	Time Period (mins)	Calculated infiltration rate (m/s)
TP02 (T1)	02/07/19	0.11	116	3.01E-06

6.3 Discussion

The calculated infiltration rates indicate the soils beneath the site have relatively poor infiltration characteristics which is reflective of the clay encountered within the shallow weathered London Clay Formation.

Based upon the test results and site observations it is considered that traditional soakaways are unlikely to offer a viable solution for surface water discharge. However, further testing comprising three repeat tests is required to confirm this.

² Soakaway Design BRE Digest DG-365 (2016).

7 COMMENTS ON ENGINEERING DESIGN

7.1 General

Eurocode 7 (Section 2)³ advocates the use of geotechnical categorisation of the proposed structures to establish the design requirements. Information presented to T&P indicates that the proposed development is to comprise the construction of a model boating lake/pond with a number of small ancillary structures. At this stage it is unknown what the magnitude of the desired loadings will be.

In consideration of the available information on the development proposals, for the purposes of this investigation the proposed structures have been classified as follows:

- Geotechnical category 1: Strip or piled foundations, roads, pavements, car parks, retaining walls below 2m, small excavations for drainage works, with the proposed housing development considered to be within this category.

7.2 Summary of Geotechnical Parameters

Stratum thicknesses and geotechnical parameters for the strata encountered in the investigation are summarised in the following sections. The level of confidence in the derived parameters is provided in Table 7.1.

Table 7.1 Confidence Levels

Key	Description
value	High level of confidence - based on information from investigation.
value	Medium level of confidence - based on published data.
value	Low level of confidence – more data required if parameter to be used in design.

7.2.1 London Clay Formation

The design thicknesses and geotechnical parameters for use in the London Clay Formation are described in Table 7.2.

Table 7.2 Summary of Geotechnical Parameters – London Clay Formation

Parameter	Units	Min	Max	Design	Comments
Top Depth	mbgl	0.20	1.10	0.30	Generally, the top depth was recorded at 0.30mbgl.
Base Depth	mbgl	0.85	>15.0	>15.0	Base not proven
Thickness	m	>0.65	>13.9	>13.90	Thickness not proven
Moisture Content	%	17	29	23	-
Liquid Limit	%	35	55	45	-
Plastic Limit	%	18	25	22	-
Plasticity Index	-	Not plastic	33	33	-
% passing 425µm sieve	%	0	2	N/A	-

³ BS EN 1997 – Part 2. Geotechnical Design.

Parameter	Units	Min	Max	Design	Comments
Modified Plasticity Index	-	Not plastic	33	33	Based on current NHBC guidance, results are indicative of soils of a medium volume change potential
Undrained shear Strength	kPa	25	110	50	Determined from hand shear vanes. Indicative of clay of medium to high strength
Standard Penetration Resistance	N Value	4	41	19	High value likely due to an obstruction during testing, therefore excluded from the dataset.
Modulus of volume compressibility	m ² /MN	0.1	0.3	0.3	Derived from published data.
Skempton Consolidation Factor μ	-	1	1	1	Worst case value so should provide a conservative design.
pH	-	7.2	7.9	-	
Water soluble sulphate (SO ₄ ²⁻)	mg/l	400	100	350	Design value should be worst case if less than 5 samples. If between 5 and 9 samples – the mean of the highest 2 should be used for design. If 10 or more results – mean of the highest 20% of the results should be used (rounded to nearest 100mg/l). (Ref = BRE Special Digest 1).
Acid soluble sulphate (SO ₄ ²⁻)	%	0.05	<0.01	0.05	-
Total Sulphur	%	0.02	<0.01	0.02	-
Total Potential Sulphate	%	0.06	0.03	0.06	-
Oxidisable Sulphide	%	0.01	<0.01	0.01	-

7.3 Construction Considerations

7.3.1 Subsurface Concrete

Based on the pH values, water soluble sulphate and SD1 suite concentrations recorded by the chemical and geotechnical laboratory analysis, together with the calculated oxidisable sulphide⁴, a DS2-AC1s design mix concrete should be suitable for buried structures placed within the shallow soils when compared against the BRE⁵ assessment levels.

7.3.2 Floor Slabs

The results of the investigation indicate that the cohesive soils on site are of medium volume change potential. As such, proprietary suspended ground floor slabs should be designed with a minimum 250mm void based upon NHBC guidance.

⁵ BRE Special Digest 1:2005 – Third edition – Concrete in aggressive ground.

7.3.3 *Building Near Trees*

Soils of the London Clay Formation are likely to be of medium-volume change potential. Based upon the volume change potential and in accordance with NHBC guidelines the minimum founding depth of traditional foundations would be 0.90mbgl. At this stage due to the medium volume change potential provision should be made for the use of void formers where shallow strip foundations are to be placed at a depth greater than 1.50mbgl due to the influence of existing trees. However, the impact of any new planting associated with future potential development of the site should take into account the volume change potential of the soils.

Due to the medium-volume change potential of the soils, foundations will be susceptible to the influence of trees. It is recommended the findings of this report are considered in conjunction with an arboricultural survey and the recommendations given by the NHBC regarding the over deepening of foundations in the vicinity of trees.

7.3.4 *Deep Excavations*

Made and natural ground were generally found to be stable during the intrusive ground investigation. Man entry into any excavations should be avoided where possible. However, if entry into excavations is required, the excavation sides should be adequately shored and supported or battered back to a safe angle in accordance with appropriate temporary works design.

7.3.5 *Groundwater*

Groundwater was encountered within BH01, WS02 and WS06 during the ground investigation with depths to groundwater ranging between 3.30mbgl and 7.30mbgl. Recorded groundwater observations were generally noted as seepages. Groundwater was not encountered in any of the other exploratory hole locations during the ground investigation.

7.3.6 *Buried Utilities*

It is recommended that existing live services are accurately located by careful hand digging and liaison undertaken with the utility companies with regard any required works in these areas. The services should be clearly marked and taken into account in the construction design process.

Excavation in close proximity to live services will need to ensure that the excavation walls are stable or appropriately battered to a safe angle. Temporary slope stability works and pumping of groundwater may be required in any deep excavations.

7.3.7 *Earthworks and Material Handling*

Currently it is anticipated that site levels will be raised and lowered in different areas of the development based on development information supplied by the client. A plan showing areas of ground development across the site can be viewed in Appendix A. To minimise the requirement for material to be moved off-site, it is likely that re-use of existing soils will be required as part of redevelopment proposals. Should earthworks be required, an earthworks specification will be necessary to ensure the appropriate management and reuse of the existing soils.

7.3.8 *Road Construction*

The *in situ* TRL DCP test results recorded CBR results across the site ranging from 2.3% - 55.1% at assumed formation level.

Based on the test results a design CBR value of 2.5% is recommended subject to firm cohesive soils being encountered at formation level. It should be noted however that where revealed the clay soils are moisture sensitive and will be prone to deterioration to give lower CBR values if

left exposed during periods of wet weather. In such circumstances the use of geotextile at the base of construction may be prudent to reduce the potential loss of granular sub-base if placed during periods of inclement weather.

Furthermore, made ground was revealed along the redundant farm track located in the central area of the site, which would be unlikely to be suitable to remain beneath adoptable roads, with very low and variable related CBR values. Where it is observed at formation level it should be excavated and replaced with compacted granular fill.

Typical adoptable road construction thicknesses for a CBR of 2.5% are given below based on current guidance⁶:

- Foundation Class 1 – 550mm capping.
- Foundation Class 2 – 450mm sub-base.
- Foundation Class 3 – 340mm sub-base.
- 350mm Foundation Class 2 sub-base with 250mm Foundation Class 1 capping.
- 290mm Foundation Class 3 sub-base with 250mm Foundation Class 1 capping.

The thicknesses given above may be reduced subject to surface modulus performance testing following placement of the materials.

In total 4N^o laboratory remoulded CBR tests were undertaken on samples either at assumed approximate formation level or within natural soils. A copy of the test report can be found in Appendix E. CBR values between 0.47% and 3.7% were recorded by the remoulded testing.

Based on the soils description and considering the CBR testing it is advised that CBR values of 1-2.5% are assumed for design purposes subject to London Clay Formation being encountered at formation level. Greater design CBR values may be achieved following *in situ* testing prior to or during construction phase that may reduce the required thickness of roadway construction.

Where revealed, clay soils will be prone to deterioration if left exposed during periods of wet weather to give lower CBR values of <1%. Therefore, due to the potential for such circumstances, adopting a lower CBR design value of 2% may be more realistic and the use of geotextile at the base of construction may be prudent to reduce the potential loss of granular sub-base, if placed during periods of inclement weather.

Made ground was locally revealed along the redundant farm track located in the central area of the site and was up to 1.10mbgl thick, which would not be suitable to remain beneath adoptable roads. Where it is observed at formation it should be excavated and replaced with compacted granular fill.

7.4 Preliminary Foundation Recommendations

The proposed development is to comprise 1No model boating lake/pond, sports fields and areas of public open space with ancillary buildings. Loadings are unknown at this stage however it has been assumed that maximum line loads will be approximately 50kN/m.

The ground conditions across site were found to be generally consistent with topsoil and reworked topsoil underlain by soft to firm becoming stiff clay of the London Clay Formation. Made ground was identified beneath a redundant farm track and it appears to be limited to that area.

⁶ Interim Advice Note 73/06 Revision 1 (2009)

Engineer's observations and *in situ* testing within the London Clay Formation indicate an undrained shear strength of between 25 and 110kPa. Therefore, a typical value of 50kPa has been used for preliminary design purposes.

Based on the above and taking into account the NHBC guidance it is considered that traditional shallow strip foundations placed at the minimum depth of 0.90mbgl within the firm clay be designed for an allowable bearing capacity of 100kPa for acceptable settlement. Higher bearing capacities may be achieved by taking foundations into stiff material encountered at greater depth.

8 CONSIDERATIONS AND RECOMMENDATIONS

8.1 Considerations

The following uncertainties/data gaps have been identified which may require further consideration:

- Exploratory holes were positioned in accordance with the Client's instructions.
- Infiltration testing was not undertaken in full accordance with BRE Digest DG-365 (2016) as it was not possible to complete three infiltration tests within the soakaway location in the time available.

8.2 Recommendations

8.2.1 Engineering

- Infiltration testing highlighted that soakaways may offer a viable mechanism for surface water management on site. Supplementary testing should therefore be undertaken to provide results in full accordance with BRE365 prior to detailed soakaway design.
- Should any exceptionally soft spots or oversized material be noted during construction, they should be removed and replaced with compacted granular fill for road construction.

8.2.2 General

- Discussions should be held with local landfill/soil waste treatment facilities to agree material classification/pre-treatment required for any soils to be disposed off-site as a result of proposed construction works.
- Ground workers should remain vigilant for visible and olfactory signs of contamination following demolition of on-site buildings.
- A site-specific health and safety plan should be prepared to inform on risks posed from the previous site use and mitigations for ground workers developing the site e.g. requirements for appropriate PPE, hygiene practices, environmental monitoring and requirements for mitigation measures during construction works.
- A copy of this report should be provided to the relevant regulatory authorities to confirm that they are in agreement with the report findings.

Appendix A – Drawings

— Site Boundary



Base Map

Company: -
DWG Title: -
DWG Number: -
Date: -

-	-	-	-	-
Drawn	Checked	Amendment	Date	Rev.
WYG				Client
Berewood - Town Park Phase B				Project
Site Location Plan				Title
Scale	Date	Drawn by	Check by	Rev.
1:10000@A4	30/07/19	AW	CP	-



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Tel: 0117 927 7756

Email: info@tp-regen.co.uk

Scale	Date	Drawn by	Check by	Rev.	Drawing No.
1:10000@A4	30/07/19	AW	CP	-	CS-J-0161-01-001



- Rotary Borehole Locations (BH1)
- Windowless Sampling Locations (WS01 - WS07)
- Trial Pit Locations (TP01 - TP04)
- ◆ TRL Locations (TRL01 - TRL10)
- Site Boundary

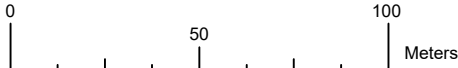


Base Map
Company: - Mayer Brown Limited
DWG Title: - Proposed GI Test Locations
DWG Number: - GTWVILL_TP2/SK/06
Date: - July 2019

Drawn	Checked	Amendment	Date	Rev.	Client
WYG					
Berewood - Town Park Phase B					Project
Exploratory Hole Location Plan					Title
Scale	Date	Drawn by	Check by	Rev.	Drawing No.
1:2000@A3	12/08/19	AW	CP	-	CS-J-0161-01-002

T&P
Regen

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- Rotary Borehole Locations (BH1)
- Windowless Sampling Locations (WS01 - WS07)
- Trial Pit Locations (TP01 - TP04)
- ◆ TRL Locations (TRL01 - TRL10)
- Site Boundary



Base Map
Company: -
DWG Title: -
DWG Number: -
Date: -

Drawn	Checked	Amendment	Date	Rev.	Client
WYG					
Berewood - Town Park Phase B					
Exploratory Hole Location Plan					
Scale	Date	Drawn by	Check by	Rev.	Drawing No.
1:2000@A3	12/08/19	AW	CP	-	CS-J-0161-01-002



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Appendix B – Photographs



Plate 1 – TP01 – Trial pit



Plate 2 – TP01 – Trial pit spoil



Plate 3 – TP02 – Trial pit



Plate 4 – TP02 – Trial pit spoil



Plate 5 – TP03 – Trial pit



Plate 6 – TP03 – Trial pit spoil



Plate 7 – TP04 – Trial pit



Plate 8 – TP04 – Trial pit spoil

Berewood, Town Park Phase B
Ground Investigation Report



Plate 9 – WS01 cores



Plate 10 – WS02 cores



Plate 11 – WS03 cores



Plate 12 – WS04 cores



Plate 13 – WS05 cores



Plate 14 – WS06 cores



Plate 15 – WS07 cores

Appendix C – Exploratory Logs

T&P Regen www.tandpregeneration.co.uk	Contract Name: Berewood - Town Park Phase B		Client: WYG			Borehole ID: BH01								
	Contract Number: CS-J-0161	Date Started: 06-08-2019	Logged By: CP	Checked By: JD	Status: FINAL	Sheet 1 of 2								
	Easting:	Northing:	Ground Level:	Plant Used: Dando 2000	Print Date: 25-09-2019	Scale: 1:50								
Cable Percussion Borehole Log														
Weather: Sunny/Windy			Termination: Specified depth reached		SPT Hammer: N/R, Energy Ratio: N/R									
Samples & In Situ Testing			Strata Details					Groundwater						
Depth	Sample ID	Test Result	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description		Water Strike	Backfill / Installation					
0.50 - 1.00	B1	SPT(S) 1.20m, N=11 (1,2/2,3,3,3)		(0.50)		Firm orangish brown very sandy CLAY. (WEATHERED LONDON CLAY FORMATION)	1							
1.00	D2													
1.20 - 1.65	D3													
				(2.30)			2							
2.50	D4			2.80		Firm to stiff grey slightly sandy silty CLAY. (WEATHERED LONDON CLAY FORMATION)	3							
3.00 - 3.45	D5	SPT(S) 3.00m, N=16 (2,3/3,3,5,5)		(1.20)										
3.00 - 3.50	B6			4.00		Stiff grey CLAY. (LONDON CLAY FORMATION)	4							
4.00	D7	U8 = 100 Blows												
4.00 - 4.45	U8													
4.50	D9													
5.00 - 5.45	D10	SPT(S) 5.00m, N=23 (2,3/5,6,6,6)					5							
5.00 - 5.50	B11													
5.50	D12													
6.00 - 6.45	U13	U13 = 100 Blows					6							
7.00	D14	SPT(S) 7.00m, N=24 (2,3/5,6,6,7)		(10.30)		At 7.00mbgl: 10-30mm calcareous mudstone band.	7							
7.00 - 7.45	D15													
7.00 - 7.50	B16													
8.00 - 8.45	U17	U17 = 100 Blows					8							
8.50	D18					Below 8.50mbgl: Becomes very stiff.								
9.00 - 9.45	D19	SPT(S) 9.00m, N=35 (3,4/6,7,10,12)					9							
9.00 - 9.50	B20													
10.00	D21						10							
Sample Key: B = Bulk Disturbed D = Small Disturbed U = Undisturbed Open-Drive W = Water G = Gas ES = Environmental Soil EW = Environmental Water														
Start & End of Shift Observations					Borehole Diameter		Casing Diameter		Remarks:					
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth	Dia (mm)	Groundwater seepage noted at 7.30mbgl.					
06-08-2019	11:30	0.00	0.00		15.00	150	3.00	150						
Chiselling					Installation				Water Strikes					
From (m)	To (m)	Duration	Remarks		Top (m)	Base (m)	Type	Dia (mm)	Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
T&P Regeneration CP Template										Issue Number: 1		Issue Date: June 2016		

 www.tandpregeneration.co.uk		Contract Name: Berewood - Town Park Phase B		Client: WYG			Borehole ID: BH01							
		Contract Number: CS-J-0161	Date Started: 06-08-2019	Logged By: CP	Checked By: JD	Status: FINAL	Sheet 2 of 2							
Cable Percussion Borehole Log		Easting:	Northing:	Ground Level:	Plant Used: Dando 2000	Print Date: 25-09-2019	Scale: 1:50							
Weather: Sunny/Windy			Termination: Specified depth reached			SPT Hammer: N/R, Energy Ratio: N/R								
Samples & In Situ Testing				Strata Details				Groundwater						
Depth	Sample ID	Test Result	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description		Water Strike	Backfill / Installation					
11.00 - 11.45 11.00 - 11.50	D22 B23	SPT(S) 11.00m, N=31 (3,5/6,7,9,9)				Stiff grey CLAY. (LONDON CLAY FORMATION)		11						
11.50	D24							12						
13.00 13.00 - 13.45	D25 D26	SPT(S) 13.00m, N=41 (3,5/7,9,10,15)						13						
14.50 14.50 - 14.95	D27 U28	U28 = 100 Blows		14.30 (0.70)		Stiff to very stiff grey very silty CLAY. (LONDON CLAY FORMATION)		14						
15.00	D29			15.00		End of Borehole at 15.00m		15						
								16						
								17						
								18						
								19						
								20						
Sample Key: B = Bulk Disturbed D = Small Disturbed U = Undisturbed Open-Drive W = Water G = Gas ES = Environmental Soil EW = Environmental Water														
Start & End of Shift Observations					Borehole Diameter		Casing Diameter		Remarks:					
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth	Dia (mm)	Groundwater seepage noted at 7.30mbgl.					
06-08-2019	16:00	15.00	3.00		15.00	150	3.00	150						
Chiselling					Installation				Water Strikes					
From (m)	To (m)	Duration	Remarks		Top (m)	Base (m)	Type	Dia (mm)	Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
T&P Regeneration CP Template Issue Number: 1 Issue Date: June 2016														

T&P Regen www.tandpregeneration.co.uk	Contract Name: Berewood - Town Park Phase B		Client: WYG			Trial Pit ID: TP01		
	Contract Number: CS-J-0161	Date Started: 06-08-2019	Logged By: CP	Checked By: JD	Status: FINAL	Sheet 1 of 1		
	Easting: 467364	Northing: 108934	Ground Level:	Plant Used: Kubota 8 ton	Print Date: 25-09-2019	Scale: 1:25		
Trial Pit Log		Weather: Sunny/Windy		Termination: Refusal		Stability: Stable		
Samples & In Situ Testing			Strata Details				Water	Backfill
Depth	Sample ID	Test Result	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description		
0.00 - 0.20	ES1	HV 0.80m, 70 / 45kPa		0.20		Soft light brown slightly gravelly silty CLAY. Gravel is subangular to subrounded fine to coarse of flint and occasional chalk. (TOPSOIL)	1	
0.30 - 0.60	ES2			(0.90)		Stiff orangish brown mottled grey sandy CLAY (WEATHERED LONDON CLAY FORMATION)		
0.70 - 0.80	D3					Below 0.80mbgl: Becomes firm and very sandy.		
1.10 - 1.30	D4					1.10		
2.90 - 3.00	D5			(1.70)		Below 1.70mbgl: Becomes sandy.		
		2.80	Soft bluish grey sandy silty CLAY. (LONDON CLAY FORMATION)			3		
		(0.40)	Below 3.00mbgl: Becomes thinly laminated.					
				3.20		End of Trial Pit at 3.20m	4	
							5	
Sample Key: B = Bulk Disturbed D = Small Disturbed U = Undisturbed Open-Drive W = Water G = Gas ES = Environmental Soil EW = Environmental Water								
Remarks: Groundwater not encountered.						Dimensions:		
						Length: 3.00m		
						Width: 0.60m		
						Orientation: °		
						Groundwater Details		
						Depth encountered (m)	Remarks	
T&P Regeneration TP Template Issue Number: 1 Issue Date: June 2016								

T&P Regen www.tandpregeneration.co.uk	Contract Name: Berewood - Town Park Phase B			Client: WYG			Trial Pit ID: TP02						
	Contract Number: CS-J-0161		Date Started: 06-08-2019		Logged By: CP		Checked By: JD		Status: FINAL				
	Easting: 467390		Northing: 108900		Ground Level:		Plant Used: Kubota 8 ton		Print Date: 25-09-2019				
Trial Pit Log								Scale: 1:25					
Weather: Sunny/Windy				Termination: Specified depth reached				Stability: Stable					
Samples & In Situ Testing				Strata Details						Water	Backfill		
Depth	Sample ID	Test Result	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description							
0.00 - 0.30	ES1	HV 1.00m, 38 / 21kPa		(0.30)		REWORKED TOPSOIL: Soft light brown slightly gravelly silty CLAY with rare cobbles. Gravel is subangular to subrounded fine to coarse of flint and rare chalk. Cobbles are angular to subangular of chalk.				1			
0.30 - 0.60	ES2			0.30		Firm dark orangish brown slightly sandy CLAY. (WEATHERED LONDON CLAY FORMATION)							
				(0.30)									
				0.60		Soft orangish brown mottled grey sandy CLAY. (WEATHERED LONDON CLAY FORMATION)							
1.00 1.00	B4 D3			(1.50)						2			
						Below 1.60mbgl: Becomes very sandy clay.							
1.80	D5			2.10		End of Trial Pit at 2.10m				3			
												4	
										5			
Sample Key: B = Bulk Disturbed D = Small Disturbed U = Undisturbed Open-Drive W = Water G = Gas ES = Environmental Soil EW = Environmental Water													
Remarks: Groundwater not encountered. Infiltration test carried out in trial pit.						Dimensions: Length: 2.00m Width: 0.60m Orientation: ° 							
						Groundwater Details							
						Depth encountered (m) Remarks							
						T&P Regeneration TP Template Issue Number: 1 Issue Date: June 2016							

T&P Regen www.tandpregeneration.co.uk	Contract Name: Berewood - Town Park Phase B		Client: WYG			Trial Pit ID: TP03		
	Contract Number: CS-J-0161	Date Started: 06-08-2019	Logged By: CP	Checked By: JD	Status: FINAL	Sheet 1 of 1		
	Easting: 467416	Northing: 108826	Ground Level:	Plant Used: Kubota 8 ton	Print Date: 25-09-2019	Scale: 1:25		
Trial Pit Log								
Weather: Sunny/Windy			Termination: Specified depth reached			Stability: Stable		
Samples & In Situ Testing			Strata Details				Water	Backfill
Depth	Sample ID	Test Result	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description		
0.00 - 0.45	ES1			(0.45)		MADE GROUND: Brown, black and grey sandy GRAVEL with medium cobble content. Gravel is angular to subangular fine to coarse of brick, bitumen, flint, glass and chalk. Cobbles are angular to subrounded of brick and flint.	1	
0.55 - 0.85	B2			0.45		Firm brown and white slightly sandy gravelly silty CLAY. Gravel is angular to subrounded fine to coarse of flint and chalk.		
0.55 - 0.85	D3			0.55		(REWORKED LONDON CLAY FORMATION)		
0.55 - 0.85	ES4			(0.30)		Soft to firm orangish brown slightly sandy CLAY. (WEATHERED LONDON CLAY FORMATION)		
				0.85		End of Trial Pit at 0.85m	2	
							3	
							4	
							5	
Sample Key: B = Bulk Disturbed D = Small Disturbed U = Undisturbed Open-Drive W = Water G = Gas ES = Environmental Soil EW = Environmental Water								
Remarks: Groundwater not encountered.						Dimensions:		
						Length: 1.40m		
						Width: 0.70m		
						Orientation: °		
						Groundwater Details		
						Depth encountered (m)	Remarks	
T&P Regeneration TP Template Issue Number: 1 Issue Date: June 2016								



Berewood - Town Park Phase B

WYG

TP04

CS-J-0161

06-08-2019

CP

JD

FINAL

Sheet 1 of 1

Trial Pit Log

467416

108893

Kubota 8 ton

25-09-2019

1:25

Weather: Sunny/Windy

Termination: Specified depth reached

Stability: Stable

Sample Key: B = Bulk Disturbed D = Small Disturbed U = Undisturbed Open-Drive W = Water G = Gas ES = Environmental Soil EW = Environmental Water

Remarks:

Groundwater not encountered.

Dimensions:

Length: 2.00m

Width: 0.70m

Orientation: °

Groundwater Details

Depth encountered (m)

Remarks

T&P Regeneration TP Template

Issue Number: 1

Issue Date: June 2016

T&P Regen www.tandpregeneration.co.uk		Contract Name: Berewood - Town Park Phase B			Client: WYG			Borehole ID: WS01		
		Contract Number: CS-J-0161	Date Started: 06-08-2019	Logged By: CP	Checked By: JD	Status: FINAL	Sheet 1 of 1			
Windowless Sample Borehole Log		Easting: 467285	Northing: 108977	Ground Level:	Plant Used: Competitor Dart	Print Date: 25-09-2019	Scale: 1:25			
Weather: Sunny/Windy				Termination: Refusal			SPT Hammer: N/R, Energy Ratio: N/R			
Samples & In Situ Testing				Strata Details				Groundwater		
Depth	Sample ID	Windowless Sample Recovery	Test Result	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	Backfill / Installation	
0.00 - 0.20	ES1	0.00 - 1.00 = 100%					Firm light brown gravelly silty CLAY. Gravel is subangular to subrounded fine to coarse of flint. (TOPSOIL)			
0.20 - 0.60	ES2				0.20 (0.40)		Firm dark orangish brown slightly sandy CLAY with rare angular fine to medium coal gravel. (REWORKED LONDON CLAY FORMATION)			
					0.60		Firm orangish brown slightly sandy CLAY. (WEATHERED LONDON CLAY FORMATION)			
1.00 - 1.20	D3	1.00 - 2.00 = 90%	SPT() 1.00m, N=9 (2,2/2,3,2,2)					1		
1.80 - 2.00	D4		SPT() 2.00m, N=13 (2,2/2,3,4,4)		0.60					
		2.00 - 3.00 = 100%			(2.60)				2	
		3.00 - 4.00 = 100%	SPT() 3.00m, N=18 (3,4/4,5,4,5)		3.20		Soft to firm bluish grey slightly sandy CLAY. (WEATHERED LONDON CLAY FORMATION)	3		
		4.00 - 5.00 = 90%	SPT() 4.00m, N=19 (2,4/4,5,5,5)		(1.80)			4		
							Below 4.50mbgl: Becomes sandy.			
			SPT() 5.00m, N=35 (5,6/7,9,9,10)		5.00		End of Borehole at 5.00m	5		
Sample Key: B = Bulk Disturbed D = Small Disturbed U = Undisturbed Open-Drive W = Water G = Gas ES = Environmental Soil EW = Environmental Water										
Start & End of Shift Observations					Borehole Diameter		Casing Diameter		Remarks:	
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth	Dia (mm)	Borehole dipped prior to back filling. Groundwater water not detected.	
Water Strikes					Installation					
Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks	Top (m)	Base (m)	Type	Dia (mm)	
T&P Regeneration WS Template Issue Number: 1 Issue Date: June 2016										

 www.tandpregeneration.co.uk Windowless Sample Borehole Log	Contract Name: Berewood - Town Park Phase B			Client: WYG			Borehole ID: WS02				
	Contract Number: CS-J-0161		Date Started: 06-08-2019		Logged By: CP		Checked By: JD		Status: FINAL		
	Easting: 467287		Northing: 108843		Ground Level:		Plant Used: Competitor Dart		Print Date: 25-09-2019		
									Scale: 1:25		
Weather: Sunny/Windy				Termination: Refusal				SPT Hammer: N/R, Energy Ratio: N/R			
Samples & In Situ Testing					Strata Details					Groundwater	
Depth	Sample ID	Windowless Sample Recovery	Test Result	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description		Water Strike	Backfill / Installation	
0.00 - 0.20	ES1	0.00 - 1.00 = 90%			0.20		Firm light brown slightly gravelly silty CLAY. Gravel is subangular to subrounded fine to coarse of flint, chalk and rare brick. (REWORKED TOPSOIL)				
0.30 - 0.60	ES2				(0.80)		Firm to stiff brown and dark brown slightly gravelly CLAY. Gravel is angular to subrounded fine to coarse of flint, chalk, glass and brick. (REWORKED LONDON CLAY FORMATION)				
1.00 - 1.20	D3	1.00 - 2.00 = 900%	SPT() 1.00m, N=9 (2,2/2,2,3,2)		1.00		Firm orangish brown CLAY. (WEATHERED LONDON CLAY FORMATION)	1			
		2.00 - 3.00 = 100%	SPT() 2.00m, N=9 (1,2/2,2,3,2)		2.10		Soft to firm orangish brown mottled brown sandy CLAY. (WEATHERED LONDON CLAY FORMATION)	2			
		3.00 - 4.00 = 90%	SPT() 3.00m, N=10 (1,2/2,2,3,3)		(2.20)			3			
		4.00 - 5.00 = 90%	SPT() 4.00m, N=16 (2,3/3,4,4,5)		4.30		Soft bluish grey very sandy CLAY. (LONDON CLAY FORMATION)	4			
					(0.70)		Below 4.60mbgl: Becomes thinly laminated.				
			SPT() 5.00m, N=15 (2,2/3,4,4,4)		5.00		End of Borehole at 5.00m	5			
Sample Key: B = Bulk Disturbed D = Small Disturbed U = Undisturbed Open-Drive W = Water G = Gas ES = Environmental Soil EW = Environmental Water											
Start & End of Shift Observations					Borehole Diameter		Casing Diameter		Remarks:		
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth	Dia (mm)	Borehole dipped prior to back filling. Groundwater water recorded at 3.30mbgl.		
Water Strikes					Installation						
Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks	Top (m)	Base (m)	Type	Dia (mm)		
T&P Regeneration WS Template Issue Number: 1 Issue Date: June 2016											

T&P Regen www.tandpregeneration.co.uk		Contract Name: Berewood - Town Park Phase B			Client: WYG			Borehole ID: WS03						
		Contract Number: CS-J-0161		Date Started: 06-08-2019		Logged By: CP		Checked By: JD		Status: FINAL				
		Easting: 467190		Northing: 109002		Ground Level:		Plant Used: Competitor Dart		Print Date: 25-09-2019				
Windowless Sample Borehole Log					Scale: 1:25									
Weather: Sunny/Windy					Termination: Refusal					SPT Hammer: N/R, Energy Ratio: N/R				
Samples & In Situ Testing					Strata Details					Groundwater				
Depth	Sample ID	Windowless Sample Recovery	Test Result	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description			Water Strike	Backfill / Installation			
0.00 - 0.20	ES1	0.00 - 1.00 = 100%			0.20		Soft light brown slightly sandy silty CLAY with rare medium subrounded to rounded gravel of chalk.							
0.30 - 0.60	ES2				(0.40)		Firm light orangish brown mottled light orangish grey slightly sandy CLAY. (WEATHERED LONDON CLAY FORMATION)							
					0.60		Soft to firm orange mottled grey CLAY with rare subrounded to rounded medium gravel of mudstone. (WEATHERED LONDON CLAY FORMATION)							
1.00 - 1.20	D3	1.00 - 2.00 = 100%	SPT() 1.00m, N=6 (1,1/1,1,2,2)							1				
1.80 - 2.00	D4	2.00 - 3.00 = 100%	SPT() 2.00m, N=9 (2,1/2,2,3,2)	(2.80)						2				
3.00 - 3.20	D5	3.00 - 4.00 = 100%	SPT() 3.00m, N=18 (3,4/4,5,4,5)		3.40		Firm bluish grey slightly sandy CLAY. (LONDON CLAY FORMATION)			3				
3.80 - 4.00	D6	4.00 - 5.00 = 100%	SPT() 4.00m, N=19 (3,4/4,4,5,6)	(1.60)						4				
			SPT() 5.00m, N=35 (5,7/7,9,9,10)		5.00		End of Borehole at 5.00m			5				
Sample Key: B = Bulk Disturbed D = Small Disturbed U = Undisturbed Open-Drive W = Water G = Gas ES = Environmental Soil EW = Environmental Water														
Start & End of Shift Observations														
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth	Dia (mm)	Remarks:					
									Borehole dipped prior to back filling. Groundwater water not detected.					
Water Strikes														
Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks	Top (m)	Base (m)	Type	Dia (mm)					
Installation														
T&P Regeneration WS Template Issue Number: 1 Issue Date: June 2016														

Contract Name: Berewood - Town Park Phase B			Client: WYG			Borehole ID: WS04
Contract Number: CS-J-0161	Date Started: 20-08-2019	Logged By: CP	Checked By: JD	Status: FINAL	Sheet 1 of 1	
Easting:	Northing:	Ground Level:	Plant Used: Competitor Dart	Print Date: 25-09-2019	Scale: 1:25	
Termination: Specified depth reached			SPT Hammer: N/R, Energy Ratio: N/R			

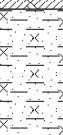
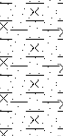
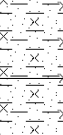
Samples & In Situ Testing				Strata Details				Groundwater	
Depth	Sample ID	Windowless Sample Recovery	Test Result	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	Backfill / Installation
0.00 - 0.30	ES1	0.00 - 1.00 = 100%			(0.30)		Soft brown slightly gravelly CLAY with grass top. Gravel is subangular to subrounded fine to medium of chalk and flint. (TOPSOIL)		
0.30 - 0.60	ES2				0.30		Firm to stiff orangish brown slightly silty CLAY. (WEATHERED LONDON CLAY FORMATION)		
0.90 - 1.00	D3	1.00 - 2.00 = 100%	HV 0.80m, 110 / 22kPa SPT() 1.00m, N=12 (1,2/3,2,3,4)		(4.70)			1	
1.20 - 1.40	D4		HV 1.30m, 87 / 22kPa						
		2.00 - 3.00 = 100%	SPT() 2.00m, N=13 (2,3/2,3,4,4)					2	
		3.00 - 4.00 = 90%	SPT() 3.00m, N=15 (3,3/2,4,4,5)					3	
		4.00 - 5.00 = 80%	SPT() 4.00m, N=18 (4,4/3,4,5,6)					4	
			SPT() 5.00m, N=35 (7,6/8,8,9,10)		5.00		End of Borehole at 5.00m	5	

Sample Key: B = Bulk Disturbed D = Small Disturbed U = Undisturbed Open-Drive W = Water G = Gas ES = Environmental Soil EW = Environmental Water										
Start & End of Shift Observations					Borehole Diameter		Casing Diameter		Remarks:	
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth	Dia (mm)		
										Groundwater not encountered.
Water Strikes					Installation					
Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks	Top (m)	Base (m)	Type	Dia (mm)	

T&P Regeneration WS Template

Issue Number: 1

Issue Date: June 2016

 www.tandpregeneration.co.uk Windowless Sample Borehole Log	Contract Name: Berewood - Town Park Phase B			Client: WYG			Borehole ID: WS05							
	Contract Number: CS-J-0161		Date Started: 20-08-2019		Logged By: CP		Checked By: JD		Status: FINAL					
	Easting:		Northing:		Ground Level:		Plant Used: Competitor Dart		Print Date: 25-09-2019					
									Scale: 1:25					
Weather: Sunny					Termination: Specified depth reached					SPT Hammer: N/R, Energy Ratio: N/R				
Samples & In Situ Testing					Strata Details							Groundwater		
Depth	Sample ID	Windowless Sample Recovery	Test Result	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description				Water Strike	Backfill / Installation		
0.10 - 0.30	ES1	0.00 - 1.00 = 100%	SPT() 1.00m, N=9 (1,2/1,2,3,3) HV 1.10m, 25 / 5kPa		(0.50)		Firm brown slightly gravelly CLAY. Gravel is angular to subrounded fine to coarse of flint and chalk with rare fragments of glass, brick, bitumen and coal. (REWORKED TOPSOIL)				1			
0.50 - 0.70	ES2	1.00 - 2.00 = 100%			0.50		Firm orangish brown slightly sandy silty CLAY. (WEATHERED LONDON CLAY FORMATION)							
0.90 - 1.00	D3					Below 0.90mbgl: Becomes soft.								
1.20 - 1.40	D4													
		2.00 - 3.00 = 100%	SPT() 2.00m, N=12 (3,3/2,3,3,4)		(2.90)		Below 2.10mbgl: Becomes silty.				2			
		3.00 - 4.00 = 90%			SPT() 3.00m, N=17 (5,5/5,4,4,4)		3.40		Below 3.30mbgl: Becomes very soft.				3	
		4.00 - 5.00 = 100%					SPT() 4.00m, N=18 (4,4/4,4,5,5)		(1.60)		Below 3.90mbgl: Becomes sandy.			
3.70 - 3.90	D5		Below 4.20mbgl: Becomes stiff.											
			Below 4.50mbgl: Becomes very silty.											
			SPT() 5.00m, N=38 (3,6/6,10,11,11)		5.00		End of Borehole at 5.00m				5			
Sample Key: B = Bulk Disturbed D = Small Disturbed U = Undisturbed Open-Drive W = Water G = Gas ES = Environmental Soil EW = Environmental Water														
Start & End of Shift Observations					Borehole Diameter		Casing Diameter		Remarks:					
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth	Dia (mm)	Groundwater not encountered.					
Water Strikes						Installation								
Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks	Top (m)	Base (m)	Type	Dia (mm)					
T&P Regeneration WS Template Issue Number: 1 Issue Date: June 2016														



www.tandpregeneration.co.uk

Contract Name:

Berewood - Town Park Phase B

Contract Number:

CS-J-0161

Date Started:

20-08-2019

Logged By:

CP

Client:

WYG

Checked By:

JD

Status:

FINAL

Borehole ID:

WS06

Sheet 1 of 1

Windowless Sample Borehole Log

Easting:

Northing:

Ground Level:

Plant Used:

Competitor Dart

Print Date:

25-09-2019

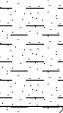
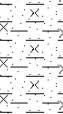
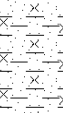
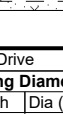
Scale:

1:25

Weather: Sunny

Termination: Specified depth reached

SPT Hammer: N/R, Energy Ratio: N/R

Samples & In Situ Testing				Strata Details				Groundwater	
Depth	Sample ID	Windowless Sample Recovery	Test Result	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	Backfill / Installation
0.10 - 0.40	ES1	0.00 - 1.00 = 100%			(0.40)		Very soft dark brown slightly sandy CLAY with grass top. (TOPSOIL)		
0.40 - 0.60	ES2				0.40		Soft orangish brown mottled grey sandy CLAY with rare subrounded to rounded medium gravel of mudstone. (WEATHERED LONDON CLAY FORMATION)		
0.90 - 1.00	D3	1.00 - 2.00 = 100%	SPT() 1.00m, N=4 (0,1/1,1,1,1)		(1.80)		Below 0.80mbgl: Becomes soft.	1	
1.50 - 1.70	D4						Below 1.50mbgl: Becomes very sandy and grey.		
		2.00 - 3.00 = 100%	SPT() 2.00m, N=13 (2,3/3,3,3,4)		2.20		Below 1.90mbgl: Becomes extremely soft.	2	
2.50 - 2.70	D5	3.00 - 4.00 = 100%	SPT() 3.00m, N=16 (3,4/3,4,4,5)		(2.80)		Below 2.50mbgl: Becomes stiff.	3	
		4.00 - 5.00 = 50%	SPT() 4.00m, N=18 (3,4/4,4,5,5)				Below 4.50mbgl: Becomes very stiff and slightly sandy.	4	
			SPT() 5.00m, N=20 (3,5/4,5,5,6)		5.00		End of Borehole at 5.00m	5	

Sample Key:

B = Bulk Disturbed

D = Small Disturbed

U = Undisturbed Open-Drive

W = Water

G = Gas

ES = Environmental Soil

EW = Environmental Water

Start & End of Shift Observations

Borehole Diameter

Casing Diameter

Remarks:

Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth	Dia (mm)

Water Strikes

Installation

Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks	Top (m)	Base (m)	Type	Dia (mm)

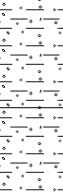
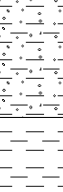
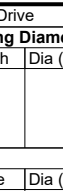
Groundwater encountered at approximately 3.50mbgl.

T&P Regeneration WS Template

Issue Number: 1

Issue Date: June 2016

 www.tandpregeneration.co.uk Windowless Sample Borehole Log	Contract Name: Berewood - Town Park Phase B		Client: WYG			Borehole ID: WS07	
	Contract Number: CS-J-0161	Date Started: 20-08-2019	Logged By: CP	Checked By: JD	Status: FINAL	Sheet 1 of 1	
	Easting:	Northing:	Ground Level:	Plant Used: Competitor Dart	Print Date: 25-09-2019	Scale: 1:25	
Weather: Sunny		Termination: Specified depth reached			SPT Hammer: N/R, Energy Ratio: N/R		

Samples & In Situ Testing				Strata Details				Groundwater	
Depth	Sample ID	Windowless Sample Recovery	Test Result	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	Backfill / Installation
0.00 - 0.20	ES1	0.00 - 1.00 = 90%	SPT() 1.00m, N=5 (1,1/1,2,1,1)		0.20		Soft brown CLAY with frequent fragments plant fragments.	1	
0.30 - 0.60	ES2	1.00 - 2.00 = 80%			1.70		Soft to firm brown mottled orangish gravelly CLAY. Gravel is angular to subrounded fine to coarse of flint and chalk. (REWORKED LONDON CLAY FORMATION)		
0.90 - 1.00	D3				1.90		At 0.60mbgl: Black fibrous fabric (suspected asbestos). At 0.80mbgl: frequent plant fragments.		
1.50 - 1.70	D4				2.60		Soft bluish grey and orange slightly gravelly CLAY with frequent fibrous peat traces. Gravel is angular to subrounded fine to coarse of flint. (REWORKED LONDON CLAY FORMATION)		
2.30 - 2.50	D5		2.00 - 3.00 = 70%	3.40		Very soft yellowish grey CLAY with occasional fibrous peat traces. (REWORKED LONDON CLAY FORMATION)	2		
2.70 - 2.90	D6	4.60			Soft to firm orange mottled grey CLAY with root traces. (POSSIBLE RELICT TOPSOIL)				
		5.00			Below 3.80mbgl: Becomes firm to stiff.				
		3.00 - 4.00 = 80%	SPT() 3.00m, N=7 (1,1/1,2,2,2)		1.20			3	
					2.40				
					3.60				
					4.80				
		4.00 - 5.00 = 80%	SPT() 4.00m, N=13 (2,2/2,3,3,5)		1.20			4	
					2.40				
					3.60				
					4.80				
		5.00 - 6.00 = 80%	SPT() 5.00m, N=25 (5,5/5,6,6,8)		1.20			5	
					2.40				
					3.60				
					4.80				
End of Borehole at 5.00m									

Sample Key: B = Bulk Disturbed D = Small Disturbed U = Undisturbed Open-Drive W = Water G = Gas ES = Environmental Soil EW = Environmental Water

Start & End of Shift Observations					Borehole Diameter		Casing Diameter		Remarks:
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)	
									Groundwater not encountered.
Water Strikes					Installation				
Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks	Top (m)	Base (m)	Type	Dia (mm)

T&P Regeneration WS Template Issue Number: 1 Issue Date: June 2016

Appendix D – Geotechnical Results

T & P Regeneration

Unit 4
Brunel Lock Development
Smeaton Road
Bristol
BS1 6SE
For the attention of Craig Pennell

Report No: B23229
Issue No 01

LABORATORY TEST REPORT

Project Name		BEREWOOD	
Project Number		B23229	Date samples received
Your Ref		CS-J-0161	Date written instructions received
Purchase Order			Date testing commenced
			15/08/2019
			16/09/2019
			16/09/2019
Please find enclosed the results as summarised below			
Figure / Table	Test Quantity	Description	ISO 17025 Accredited
1	5	BRE Suite - Soil	Yes
App S1	~	Sample Descriptions - Soil	N/A
App S2	~	Deviating Samples - Soil	N/A
App S3	~	Summary of In-House Analytical Test Methods - Soil	N/A
Remarks :			
Issued by : Stephen Langman		Date of Issue : 10/10/2019	Key to symbols used in this report
Approved Signatories :  10/10/2019		S/C : Testing was sub-contracted	
G Wilson (JMD/Laboratories Director), S Langman (Laboratory Coordinator)			
Unless we are notified to the contrary, samples will be disposed after a period of one month from this date. The results reported relate to samples received in the laboratory only. All results contained in this report are provisional unless signed by an approved signatory This report should not be reproduced except in full without the written approval of the laboratory. Under multisite accreditation the testing contained in this report may have been performed at another Terra Tek laboratory. The enclosed results remain the property of Terra Tek Limited and we reserve the right to withdraw our report if we have not received cleared funds in accordance with our standard terms and conditions Only those results indicated in this report are UKAS accredited and any opinions or interpretations expressed are outside the scope of UKAS accreditation. Feedback on the this report may be left via our website www.terratek.co.uk/contact-us			



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Offices in Airdrie, Birmingham, Belfast and Chesham

Head Office : 62 Rochsolloch Road, Airdrie, ML6 9BG

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES				SiteBEREWOOD																Contract NoCS-J-0161			
				Client																			
				Engineer																			
Sample Identification				Lab Sample ID	Sulphate (acid soluble as SO4) %	Sulphate (water soluble in 2:1 extract) as SO4 g/l	pH	Total Sulphur %															
Hole	Depth m	Sample Ref	Sample Type																				
BH01	1.00		D	400155	<0.01	0.03	7.6	<0.01															
TP03	0.55-0.85		B	400167	0.02	0.04	7.9	<0.01															
WS01	1.00-1.20		T	400137	0.05	0.03	7.2	0.02															
WS02	1.00-1.20		T	400139	0.02	0.03	7.8	<0.01															
TP01	1.10-1.30		B	400173	0.01	0.01	7.4	<0.01															
Limits of Detection Terra Tek Analysis Method Accreditation M=Mcerts U=UKAS N=No accreditation					0.01 TP171 M	0.01 TP169 M	~ TP019 M	0.01 TP129 M															
Originator	Checked & Approved		BRE SD1 SUITE - SOIL																Tk Figure 1 Sheet 1 of 1				
TH	S. Langman 10/10/2019																						

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES				Site BEREWOOD					Contract No E13009/1		
				Client							
				Engineer							
Sample Identification						Temperature on receipt °C	PRIMARY MATRIX	Secondary Matrix	Additional matrix	% Loss at 30C	% Retained 2mm
Exploratory Hole	Depth m	Sample Ref	Sample Type								
WS01	1.00-1.20		T	400137	19/08/19	14.0	Clayey SAND	Fine gravel		91.7	✓
WS02	1.00-1.20		T	400139	19/08/19	14.0	Sandy CLAY			12.7	✓
BH01	1.00		D	400155	08/08/19	14.0	Sandy CLAY	Fine gravel		14.3	✓
TP03	0.55-0.85		B	400167	15/08/19	14.0	CLAY	Fine gravel		17.3	✓
TP01	1.10-1.30		B	400173	15/08/19	14.0	Clayey SAND			17.2	✓
Notes Terra Tek are accredited for clay, sand and loam matrix types only, where they constitute the major component of the sample. Other coarse granular materials such as gravel, are not accredited where they comprise the major component of the sample. Results are expressed on a dry-weight basis (samples dried at 30°C ± 5°C) except where stated. The laboratory removes any material > 2mm prior to analysis. The quantity and nature of the material is shown as the secondary and additional matrix types in the above table. Where a parameter cannot be determined in house it is our policy to use a UKAS/MCERTS accredited laboratory wherever possible. Terra Tek will assume responsibility for the quality of subcontracted tests and the performance of the subcontractor chosen. Where there is no known UKAS/MCERTS laboratory for a particular parameter, a laboratory listed within the Terra Tek Approved Subcontractors List, which is subject to performance assessment, will be selected.											
Originator	Checked & Approved	SAMPLE DESCRIPTIONS							Appendix S1		
TGH	S. Langren 10/10/2019										
									Sheet 1 of 1		

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES				Site BEREWOOD		Contract No CS-J-0161							
				Client Engineer									
Sample Identification				Lab Sample ID	Date Sampled	Deviating conditions						Preservatives used	
Exploratory Hole	Depth m	Sample Ref	Sample Type			Sampling date has not been provided	Exceeded maximum holding time for selected test(s)	Presence of headspace in sample vial	Poorly fitting cap or lid	Damaged container			
WS01	1.00-1.20		T	400137	19/08/19								
WS02	1.00-1.20		T	400139	19/08/19								
BH01	1.00		D	400155	08/08/19								
TP03	0.55-0.85		B	400167	15/08/19								
TP01	1.10-1.30		B	400173	15/08/19								
NOTES 1 Results reported for samples classified as deviating may be compromised. Deviation types are shown as "X" or "Yes" in the table above. 2 The absence of "X" or "Yes" in the table above indicates no reported deviations. 3 Deviations due to use of incorrect sample container are shown on result tables. 4 Deviating results are indicated within result tables.													
Originator		Checked & Approved		DEVIATING SAMPLES - SOIL								 Appendix S2 Sheet 1 of 1	
TGH		<i>S. Langman</i> 10/10/2019											

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES		SiteBEREWOOD		Contract NoCS-J-0161	
		Client			
		Engineer			
Method Code	Reference	Description of Method	ISO17025 Accredited	MCERTS Accredited	Wet/Dry Sample Tested
GP001	BS1377, Part 3, 1990: Soils for Civil Engineering Purposes.	Preparation of soil samples for chemical analysis	Yes	Yes	N/A
GP012	BS EN 12457-3: Characterisation of Waste - Compliance test for leaching of granular waste materials and sludges (two-stage batch test)	Preparation of soil samples for two-stage leachate test			Dry
TP019	BS1377, Part 3, 1990: Soils for Civil Engineering Purposes.	Determination of pH in 2.5:1 water/soil extract using pH meter.	Yes	Yes	Dry
TP032	MAFF Book 427: The Analysis of Agricultural Materials: Method 8	Determination of water soluble boron by colorimetry	Yes		Dry
TP040	APHA/AWWA, 19th edition: Method 3500Cr-D	Determination of hexavalent chromium by colorimetry.	Yes		Dry
TP041	BS1377, Part 3, 1990: Soils for Civil Engineering Purposes.	Determination of organic matter by titrimetry.	Yes		Dry
TP042	BS1377, Part 3, 1990: Soils for Civil Engineering Purposes.	Determination of loss on ignition at 50-440°C by gravimetry	Yes	Yes	Dry
TP045	GACHAMJA A.M. Chromatography and Analysis: 1992 9-11 (modified)	Determination of polyaromatic hydrocarbons extractable in dichloromethane, by GC/MS	Yes	Yes	Dry
TP046	MEWAM method: Phenols in water and Effluents: 4-aminoantipyrine method	Determination of monohydric phenols by steam distillation/colorimetry	Yes	Yes	Dry
TP047	MEWAM method: Cyanide in Waters etc	Determination of free cyanide by steam distillation/colorimetry	Yes		Dry
TP048	MEWAM method: Cyanide in Waters etc	Determination of total cyanide by steam distillation/colorimetry.	Yes	Yes	Dry
TP049	MEWAM method: Cyanide in Waters etc	Determination of complex cyanide by calculation	Yes		Dry
TP050	MEWAM method: Determination of Thiocyanate ,1985	Determination of thiocyanate by colorimetry	Yes	Yes	Dry
TP051	USEPA Method 9030B	Determination of acid soluble sulphides by steam distillation/colorimetry.	Yes	Yes	Wet
TP067	TNRCC Method 1005: 2001 (modified)	Determination of pentane/acetone extractable petroleum hydrocarbons (C8 - C40) by GC/FID	Yes	Yes	Wet
TP072	In-house documented method	Determination of ammoniacal nitrogen by colorimetry			Dry
TP073	In-house documented method	Determination of anionic detergent (MBAS) by colorimetry			Dry
TP074	In-house documented method	Determination of water soluble fluoride by ion selective electrode			Dry
TP098	BS1377, Part 3, 1990: Soils for Civil Engineering Purposes.	Determination of acid soluble chloride by titrimetry			Dry
TP099	BS1377, Part 3, 1990: Soils for Civil Engineering Purposes.	Determination of water soluble chloride by titrimetry	Yes	Yes	Dry
Notes 1. Terra Tek (Birmingham) are MCERTS accredited for clay, sand & loam matrix types only, where they constitute the major component of the sample. Other coarse granular materials, ie gravel, are not accredited where they comprise the major component of the sample. 2. Results are expressed on a dry-weight basis (samples dried at 30°C ± 5°C) except where stated. 3. The laboratory removes any material >2mm prior to analysis. The quantity and nature of any material removed from samples is recorded and the information is available on request. 4. The laboratory records the date of analysis of each parameter. This information is available on request. 5. Where a parameter cannot be determined in house it is our policy to use a UKAS/MCERTS accredited laboratory wherever possible. Terra Tek will assume responsibility for the quality of subcontracted tests and the performance of the subcontractor chosen. Where there is no known UKAS/MCERTS laboratory for a particular parameter, a laboratory listed within the Terra Tek Approved Subcontractors list, which is subject to performance assessment, will be selected.					
Originator	Checked & Approved	SUMMARY OF IN-HOUSE ANALYTICAL TEST METHODS (SOIL)		Tk Appendix S3	
N/A	N/A				
Sheet 1 of 2					

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES		SiteBEREWOOD		Contract NoCS-J-0161	
		Client			
		Engineer			
Method Code	Reference	Description of Method	ISO17025 Accredited	MCERTS Accredited	Wet/Dry Sample Tested
TP100	Wisconsin DNR Modified GRO method, Method for Determining Gasoline Range Organics	Determination of Volatile Petroleum Hydrocarbons/GRO.	Yes	Yes	Wet
TP110	USEPA Methods 8082A & 3665A	Determination of Total & Speciated 7 PCB Congeners by GC/MS SIM	Yes	Yes	Wet
TP114	BS1377, Part 3, 1990: Soils for Civil Engineering Purposes.	Determination of carbonate in soil (rapid titration method)			Dry
TP126	TNRCC Method 1006 (modified)	Extracted petroleum hydrocarbons from TP067 split into aromatic and aliphatic fractions. Analysed by GC/FID.	Yes		Wet
TP129	In-house documented method	Determination of total sulphur by ICP-OES spectroscopy	Yes	Yes	Dry
TP134	In-house documented method	Determination of water soluble chloride by titrimetry	Yes	Yes	Dry
TP135	USEPA Methods 8100 & 8270D. In-house method TP045	Determination of polyaromatic hydrocarbons extractable in dichloromethane, by GC/MS (with concentration stage)			Dry
TP137	BS7755: Section 3.9: 1995/ISO 11466:1995	Determination of acid extractable metals in soil by ICP-OES	Selected	Selected	Dry
TP145	USEPA Methods 3550C & 8270D	Determination of Semi-Volatile Organic Compounds by GC/MS	Yes	Yes	Wet
TP147	USEPA Methods 8082A & 3665A	Determination of total & speciated WHO 12 PCB Congeners by GC/MS SIM.			Wet
TP150	USEPA Methods 8081B & 8141B	Determination of pesticides and herbicides in soil by GC/MS SIM			Dry
TP152	USEPA Method 556	Determination of carbonyls by GC/MS.			Wet
TP154	USEPA Method 5021. Wisconsin DNR modified GRO method	Determination of volatiles in by GC/MS headspace	Yes	Selected	Wet
TP158	USEPA Method 1671	Determination of glycols by GC/FID DI			Wet
TP169	In-house documented method	Determination of water soluble sulphate in 2:1 water/soil extract by ICP-OES spectroscopy	Yes	Yes	Dry
TP171	In-house documented method	Determination of acid soluble sulphate by ICP-OES spectroscopy	Yes	Yes	Dry
TP178	In-house documented method	Determination of water soluble nitrate by ion selective electrode			Dry
Notes 1. Terra Tek (Birmingham) are MCERTS accredited for clay, sand & loam matrix types only, where they constitute the major component of the sample. Other coarse granular materials, ie gravel, are not accredited where they comprise the major component of the sample. 2. Results are expressed on a dry-weight basis (samples dried at 30°C ± 5°C) except where stated. 3. The laboratory removes any material >2mm prior to analysis. The quantity and nature of any material removed from samples is recorded and the information is available on request. 4. The laboratory records the date of analysis of each parameter. This information is available on request. 5. Where a parameter cannot be determined in house it is our policy to use a UKAS/MCERTS accredited laboratory wherever possible. Terra Tek will assume responsibility for the quality of subcontracted tests and the performance of the subcontractor chosen. Where there is no known UKAS/MCERTS laboratory for a particular parameter, a laboratory listed within the Terra Tek Approved Subcontractors list, which is subject to performance assessment, will be selected.					
Originator	Checked & Approved	SUMMARY OF IN-HOUSE ANALYTICAL TEST METHODS (SOIL)		Tk Appendix S3	
N/A	N/A				
					Sheet 2 of 2

T & P Regeneration

Unit 4
Brunel Lock Development
Smeaton Road
Bristol
BS1 6SE
For the attention of Craig Pennell

Report No: B23318
Issue No 02

LABORATORY TEST REPORT

Project Name		BEREWOOD	
Project Number		B23318	Date samples received 27/08/2019
Your Ref		CS-J-0161	Date written instructions received 16/09/2019
Purchase Order			Date testing commenced 16/09/2019
Please find enclosed the results as summarised below			
Figure / Table	Test Quantity	Description	ISO 17025 Accredited
1	1	BRE Suite - Soil	Yes
App S1	~	Sample Descriptions - Soil	N/A
App S2	~	Deviating Samples - Soil	N/A
App S3	~	Summary of In-House Analytical Test Methods - Soil	N/A
Remarks :			
Issued by : Stephen Langman		Date of Issue : 11/10/2019	Key to symbols used in this report S/C : Testing was sub-contracted
Approved Signatories :  11/10/2019			
G Wilson (JMD/Laboratories Director), S Langman (Laboratory Coordinator)			
Unless we are notified to the contrary, samples will be disposed after a period of one month from this date. The results reported relate to samples received in the laboratory only. All results contained in this report are provisional unless signed by an approved signatory This report should not be reproduced except in full without the written approval of the laboratory. Under multisite accreditation the testing contained in this report may have been performed at another Terra Tek laboratory. The enclosed results remain the property of Terra Tek Limited and we reserve the right to withdraw our report if we have not received cleared funds in accordance with our standard terms and conditions Only those results indicated in this report are UKAS accredited and any opinions or interpretations expressed are outside the scope of UKAS accreditation. Feedback on the this report may be left via our website www.terratek.co.uk/contact-us			



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Terra Tek Ltd is registered in Scotland No. 121594
Offices in Airdrie, Birmingham, Belfast and Chesham

Head Office : 62 Rochsolloch Road, Airdrie, ML6 9BG

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES				SiteBEREWOOD																Contract NoCS-J-0161			
				Client																			
				Engineer																			
Sample Identification				Lab Sample ID	Sulphate (acid soluble as SO4) %	Sulphate (water soluble in 2:1 extract) as SO4 g/l	pH	Total Sulphur %															
Hole	Depth m	Sample Ref	Sample Type																				
WS05	1.20-1.40		T	701277	<0.01	0.03	7.5	<0.01															
Limits of Detection Terra Tek Analysis Method Accreditation M=Mcerts U=UKAS N=No accreditation					0.01 TP171 M	0.01 TP169 M	~ TP019 M	0.01 TP129 M															
Originator		Checked & Approved		BRE SD1 SUITE - SOIL																TK Figure 1 Sheet 1 of 1			
TH		S. Langman 11/10/2019																					

 TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES				Site BEREWOOD						Contract No E13009/1	
				Client							
				Engineer							
Sample Identification				Lab Sample ID	Date Sampled	Temperature on receipt °C	PRIMARY MATRIX	Secondary Matrix	Additional matrix	% Loss at 30C	% Retained 2mm
Exploratory Hole	Depth m	Sample Ref	Sample Type								
WS05	1.20-1.40		T	701277	15/08/19	10.4	CLAY	Fine gravel		20.8	7
Notes Terra Tek are accredited for clay, sand and loam matrix types only, where they constitute the major component of the sample. Other coarse granular materials such as gravel, are not accredited where they comprise the major component of the sample. Results are expressed on a dry-weight basis (samples dried at 30°C ± 5°C) except where stated. The laboratory removes any material > 2mm prior to analysis. The quantity and nature of the material is shown as the secondary and additional matrix types in the above table. Where a parameter cannot be determined in house it is our policy to use a UKAS/MCERTS accredited laboratory wherever possible. Terra Tek will assume responsibility for the quality of subcontracted tests and the performance of the subcontractor chosen. Where there is no known UKAS/MCERTS laboratory for a particular parameter, a laboratory listed within the Terra Tek Approved Subcontractors List, which is subject to performance assessment, will be selected.											
Originator	Checked & Approved	SAMPLE DESCRIPTIONS							Appendix S1		
TH	S. Langren 11/10/2019										

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES				Site BEREWOOD		Contract No CS-J-0161						
				Client								
				Engineer								
Sample Identification				Lab Sample ID	Date Sampled	Deviating conditions						Preservatives used
Exploratory Hole	Depth m	Sample Ref	Sample Type			Sampling date has not been provided	Exceeded maximum holding time for selected test(s)	Presence of headspace in sample vial	Poorly fitting cap or lid	Damaged container		
WS05	1.20-1.40		T	701277	15/08/19							
NOTES 1 Results reported for samples classified as deviating may be compromised. Deviation types are shown as "X" or "Yes" in the table above. 2 The absence of "X" or "Yes" in the table above indicates no reported deviations. 3 Deviations due to use of incorrect sample container are shown on result tables. 4 Deviating results are indicated within result tables.												
Originator	Checked & Approved	DEVIATING SAMPLES - SOIL									 Appendix S2 Sheet 1 of 1	
TGH	<i>S. Langman</i> 11/10/2019											

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES		SiteBEREWOOD		Contract NoCS-J-0161	
		Client			
		Engineer			
Method Code	Reference	Description of Method	ISO17025 Accredited	MCERTS Accredited	Wet/Dry Sample Tested
GP001	BS1377, Part 3, 1990: Soils for Civil Engineering Purposes.	Preparation of soil samples for chemical analysis	Yes	Yes	N/A
GP012	BS EN 12457-3: Characterisation of Waste - Compliance test for leaching of granular waste materials and sludges (two-stage batch test)	Preparation of soil samples for two-stage leachate test			Dry
TP019	BS1377, Part 3, 1990: Soils for Civil Engineering Purposes.	Determination of pH in 2.5:1 water/soil extract using pH meter.	Yes	Yes	Dry
TP032	MAFF Book 427: The Analysis of Agricultural Materials: Method 8	Determination of water soluble boron by colorimetry	Yes		Dry
TP040	APHA/AWWA, 19th edition: Method 3500Cr-D	Determination of hexavalent chromium by colorimetry.	Yes		Dry
TP041	BS1377, Part 3, 1990: Soils for Civil Engineering Purposes.	Determination of organic matter by titrimetry.	Yes		Dry
TP042	BS1377, Part 3, 1990: Soils for Civil Engineering Purposes.	Determination of loss on ignition at 50-440°C by gravimetry	Yes	Yes	Dry
TP045	GACHAMJA A.M. Chromatography and Analysis: 1992 9-11 (modified)	Determination of polyaromatic hydrocarbons extractable in dichloromethane, by GC/MS	Yes	Yes	Dry
TP046	MEWAM method: Phenols in water and Effluents: 4-aminoantipyrine method	Determination of monohydric phenols by steam distillation/colorimetry	Yes	Yes	Dry
TP047	MEWAM method: Cyanide in Waters etc	Determination of free cyanide by steam distillation/colorimetry	Yes		Dry
TP048	MEWAM method: Cyanide in Waters etc	Determination of total cyanide by steam distillation/colorimetry.	Yes	Yes	Dry
TP049	MEWAM method: Cyanide in Waters etc	Determination of complex cyanide by calculation	Yes		Dry
TP050	MEWAM method: Determination of Thiocyanate ,1985	Determination of thiocyanate by colorimetry	Yes	Yes	Dry
TP051	USEPA Method 9030B	Determination of acid soluble sulphides by steam distillation/colorimetry.	Yes	Yes	Wet
TP067	TNRCC Method 1005: 2001 (modified)	Determination of pentane/acetone extractable petroleum hydrocarbons (C8 - C40) by GC/FID	Yes	Yes	Wet
TP072	In-house documented method	Determination of ammoniacal nitrogen by colorimetry			Dry
TP073	In-house documented method	Determination of anionic detergent (MBAS) by colorimetry			Dry
TP074	In-house documented method	Determination of water soluble fluoride by ion selective electrode			Dry
TP098	BS1377, Part 3, 1990: Soils for Civil Engineering Purposes.	Determination of acid soluble chloride by titrimetry			Dry
TP099	BS1377, Part 3, 1990: Soils for Civil Engineering Purposes.	Determination of water soluble chloride by titrimetry	Yes	Yes	Dry
Notes 1. Terra Tek (Birmingham) are MCERTS accredited for clay, sand & loam matrix types only, where they constitute the major component of the sample. Other coarse granular materials, ie gravel, are not accredited where they comprise the major component of the sample. 2. Results are expressed on a dry-weight basis (samples dried at 30°C ± 5°C) except where stated. 3. The laboratory removes any material >2mm prior to analysis. The quantity and nature of any material removed from samples is recorded and the information is available on request. 4. The laboratory records the date of analysis of each parameter. This information is available on request. 5. Where a parameter cannot be determined in house it is our policy to use a UKAS/MCERTS accredited laboratory wherever possible. Terra Tek will assume responsibility for the quality of subcontracted tests and the performance of the subcontractor chosen. Where there is no known UKAS/MCERTS laboratory for a particular parameter, a laboratory listed within the Terra Tek Approved Subcontractors list, which is subject to performance assessment, will be selected.					
Originator	Checked & Approved	SUMMARY OF IN-HOUSE ANALYTICAL TEST METHODS (SOIL)		Tk Appendix S3	
N/A	N/A				
Sheet 1 of 2					

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES		SiteBEREWOOD		Contract NoCS-J-0161	
		Client			
		Engineer			
Method Code	Reference	Description of Method	ISO17025 Accredited	MCERTS Accredited	Wet/Dry Sample Tested
TP100	Wisconsin DNR Modified GRO method, Method for Determining Gasoline Range Organics	Determination of Volatile Petroleum Hydrocarbons/GRO.	Yes	Yes	Wet
TP110	USEPA Methods 8082A & 3665A	Determination of Total & Speciated 7 PCB Congeners by GC/MS SIM	Yes	Yes	Wet
TP114	BS1377, Part 3, 1990: Soils for Civil Engineering Purposes.	Determination of carbonate in soil (rapid titration method)			Dry
TP126	TNRCC Method 1006 (modified)	Extracted petroleum hydrocarbons from TP067 split into aromatic and aliphatic fractions. Analysed by GC/FID.	Yes		Wet
TP129	In-house documented method	Determination of total sulphur by ICP-OES spectroscopy	Yes	Yes	Dry
TP134	In-house documented method	Determination of water soluble chloride by titrimetry	Yes	Yes	Dry
TP135	USEPA Methods 8100 & 8270D. In-house method TP045	Determination of polyaromatic hydrocarbons extractable in dichloromethane, by GC/MS (with concentration stage)			Dry
TP137	BS7755: Section 3.9: 1995/ISO 11466:1995	Determination of acid extractable metals in soil by ICP-OES	Selected	Selected	Dry
TP145	USEPA Methods 3550C & 8270D	Determination of Semi-Volatile Organic Compounds by GC/MS	Yes	Yes	Wet
TP147	USEPA Methods 8082A & 3665A	Determination of total & speciated WHO 12 PCB Congeners by GC/MS SIM.			Wet
TP150	USEPA Methods 8081B & 8141B	Determination of pesticides and herbicides in soil by GC/MS SIM			Dry
TP152	USEPA Method 556	Determination of carbonyls by GC/MS.			Wet
TP154	USEPA Method 5021. Wisconsin DNR modified GRO method	Determination of volatiles in by GC/MS headspace	Yes	Selected	Wet
TP158	USEPA Method 1671	Determination of glycols by GC/FID DI			Wet
TP169	In-house documented method	Determination of water soluble sulphate in 2:1 water/soil extract by ICP-OES spectroscopy	Yes	Yes	Dry
TP171	In-house documented method	Determination of acid soluble sulphate by ICP-OES spectroscopy	Yes	Yes	Dry
TP178	In-house documented method	Determination of water soluble nitrate by ion selective electrode			Dry
Notes 1. Terra Tek (Birmingham) are MCERTS accredited for clay, sand & loam matrix types only, where they constitute the major component of the sample. Other coarse granular materials, ie gravel, are not accredited where they comprise the major component of the sample. 2. Results are expressed on a dry-weight basis (samples dried at 30°C ± 5°C) except where stated. 3. The laboratory removes any material >2mm prior to analysis. The quantity and nature of any material removed from samples is recorded and the information is available on request. 4. The laboratory records the date of analysis of each parameter. This information is available on request. 5. Where a parameter cannot be determined in house it is our policy to use a UKAS/MCERTS accredited laboratory wherever possible. Terra Tek will assume responsibility for the quality of subcontracted tests and the performance of the subcontractor chosen. Where there is no known UKAS/MCERTS laboratory for a particular parameter, a laboratory listed within the Terra Tek Approved Subcontractors list, which is subject to performance assessment, will be selected.					
Originator	Checked & Approved	SUMMARY OF IN-HOUSE ANALYTICAL TEST METHODS (SOIL)		Tk Appendix S3 Sheet 2 of 2	
N/A	N/A				

T & P Regeneration

Unit 4
Brunel Lock Development
Smeaton Road
Bristol
BS1 6SE
For the attention of Craig Pennell

Report No: B23318
Issue No 01

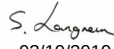
LABORATORY TEST REPORT

Project Name		BEREWOOD	
Project Number		B23318	Date samples received
Your Ref		CS-J-0161	Date written instructions received
Purchase Order			Date testing commenced
			27/08/2019
			16/09/2019
			16/09/2019
Please find enclosed the results as summarised below			
Figure / Table	Test Quantity	Description	ISO 17025 Accredited
1	1	Summary of Geotechnical Tests	Yes
2	1	Atterberg Limit	Yes
Remarks :			
Issued by : Stephen Langman		Date of Issue : 03/10/2019	Key to symbols used in this report S/C : Testing was sub-contracted
Approved Signatories :  03/10/2019 G Wilson (JMD/Laboratories Director), S Langman (Laboratory Coordinator)			
Unless we are notified to the contrary, samples will be disposed after a period of one month from this date. The results reported relate to samples received in the laboratory only. All results contained in this report are provisional unless signed by an approved signatory This report should not be reproduced except in full without the written approval of the laboratory. Under multisite accreditation the testing contained in this report may have been performed at another Terra Tek laboratory. The enclosed results remain the property of Terra Tek Limited and we reserve the right to withdraw our report if we have not received cleared funds in accordance with our standard terms and conditions Only those results indicated in this report are UKAS accredited and any opinions or interpretations expressed are outside the scope of UKAS accreditation. Feedback on the this report may be left via our website www.terratek.co.uk/contact-us			



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Offices in Airdrie, Birmingham, Belfast and Chesham

Head Office : 62 Rochsolloch Road, Airdrie, ML6 9BG

 TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES				Site BEREWOOD												Contract No CS-J-0161				
				Client																
				Engineer																
Sample Identification				Lab Sample ID	Non Engineering Sample Description	Moisture Content	Atterberg limits					Particle Density	Density		Total Stress			Other Tests		
Exploratory Hole	Depth m	Sample Ref	Sample Type				Liquid Limit	Plastic Limit	Plasticity Index	Percentage retained 425µm	Atterberg Classification		Bulk	Dry	Shear Strength	Apparent Cohesion C	Angle of Shearing Resistance Phi			
WS05	1.20-1.40		T	701277	Brown slightly sandy CLAY.	29	55	22	33	0	CH	Mg/m³	Mg/m³	Mg/m³	kPa	kPa		BRE SD1 Suite		
Notes					Opinions and interpretations are outside the scope of UKAS accreditation		UKAS Accredited Test Y/N		Test details are given on the 'Notes on Laboratory Procedures' sheet										See individual report sheets	
Originator		Approved		SUMMARY OF GEOTECHNICAL TESTS														 Figure 1 Sheet 1 of 1		
PM		 03/10/2019																		



Site BEREWOOD

Client

Engineer

Contract No. CS-J-0161

Hole ID WS05

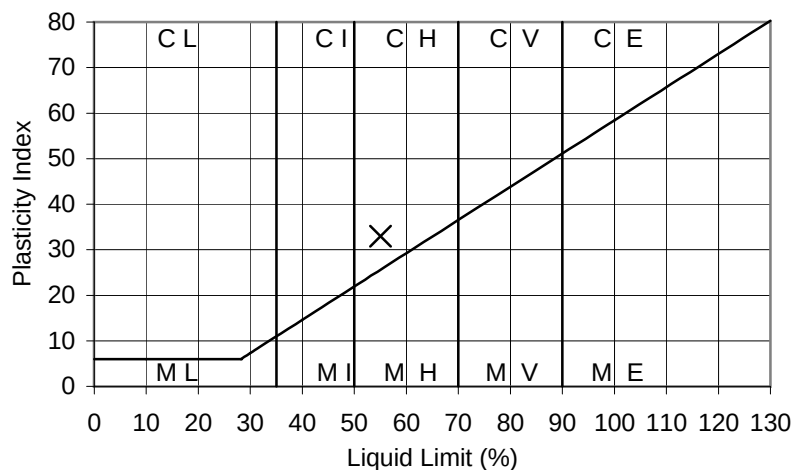
Sample Ref

Depth (m) 1.20-1.40

Sample Type T

Non Engineering Description : Brown slightly sandy CLAY.

Preparation : Sample as received



Results :

As Received Moisture Content : (BS1377:Part 2:Clause 3:1990)	29 %
Percentage retained on 425µm sieve :	0 %
Liquid Limit :	55 %
Plastic Limit :	22 %
Plasticity Index :	33
Equivalent moisture content of material passing 425µm sieve :	29 %
Liquidity Index :	0.21

Originator

Checked & Approved

IG

S. Langdon
03/10/2019

**Liquid Limit (One Point Cone Penetrometer Method)
Plastic Limit, Plasticity Index & Liquidity Index**

BS 1377:Part 2:Clause 4.4:1990

BS 1377:Part 2:Clause 5:1990



Figure 2

Sheet 1 of 1

T & P Regeneration

Unit 4
Brunel Lock Development
Smeaton Road
Bristol
BS1 6SE
For the attention of Craig Pennell

Report No: B23229
Issue No 02

LABORATORY TEST REPORT

Project Name		BEREWOOD	
Project Number		B23229	Date samples received 15/08/2019
Your Ref		CS-J-0161	Date written instructions received 16/09/2019
Purchase Order			Date testing commenced 16/09/2019
Please find enclosed the results as summarised below			
Figure / Table	Test Quantity	Description	ISO 17025 Accredited
1	~	Summary of Geotechnical Tests	See Report
2 - 6	5	Atterberg Limit	Yes
7 - 8	2	California Bearing Ratio	Yes
Remarks :			
Issued by : Stephen Langman		Date of Issue : 14/10/2019	Key to symbols used in this report S/C : Testing was sub-contracted
Approved Signatories :  14/10/2019 G Wilson (JMD/Laboratories Director), S Langman (Laboratory Coordinator)			
Unless we are notified to the contrary, samples will be disposed after a period of one month from this date. The results reported relate to samples received in the laboratory only. All results contained in this report are provisional unless signed by an approved signatory This report should not be reproduced except in full without the written approval of the laboratory. Under multisite accreditation the testing contained in this report may have been performed at another Terra Tek laboratory. The enclosed results remain the property of Terra Tek Limited and we reserve the right to withdraw our report if we have not received cleared funds in accordance with our standard terms and conditions Only those results indicated in this report are UKAS accredited and any opinions or interpretations expressed are outside the scope of UKAS accreditation. Feedback on the this report may be left via our website www.terratek.co.uk/contact-us			



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Head Office : 62 Rochsolloch Road, Airdrie, ML6 9BG

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES				Site BEREWOOD													Contract No CS-J-0161		
				Client															
				Engineer															
Sample Identification				Lab Sample ID	Non Engineering Sample Description	Moisture Content	Atterberg limits					Particle Density	Density		Total Stress			Other Tests	
Exploratory Hole	Depth m	Sample Ref	Sample Type				Liquid Limit	Plastic Limit	Plasticity Index	Percentage retained 425µm	Atterberg Classification		Bulk	Dry	Shear Strength	Apparent Cohesion C	Angle of Shearing Resistance Phi		
BH01	1.00		D	400155	Brown weathered MUDSTONE.	15	41	21	20	0	CI							BRE SD1 Suite	
TP01	1.10-1.30		B	400173	Brown weathered MUDSTONE.	28		non plastic	~	2								BRE SD1 Suite	
TP03	0.55-0.85		B	400167	Brown weathered MUDSTONE.	19	35	17	18	0	CL							CBR,BRE SD1 Suite	
TP04	1.10-1.30		B	400169	Brown weathered MUDSTONE.	11												CBR	
WS01	1.00-1.20		T	400137	Brown weathered MUDSTONE.	20	55	25	30	0	CH							BRE SD1 Suite	
Notes				Opinions and interpretations are outside the scope of UKAS accreditation		UKAS Accredited Test Y/N		Test details are given on the 'Notes on Laboratory Procedures' sheet										See individual report sheets	
								Y	Y	Y	Y	Y	-	Y	Y	Y	Y		
Originator		Approved		SUMMARY OF GEOTECHNICAL TESTS														Tk Figure 1 Sheet 1 of 2	
PM		S. Langren 14/10/2019																	

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES				Site BEREWOOD												Contract No CS-J-0161			
Client																			
Engineer																			
Sample Identification				Lab Sample ID	Non Engineering Sample Description	Moisture Content	Atterberg limits					Particle Density	Density		Total Stress			Other Tests	
Exploratory Hole	Depth m	Sample Ref	Sample Type				Liquid Limit	Plastic Limit	Plasticity Index	Percentage retained 425µm	Atterberg Classification		Bulk	Dry	Shear Strength	Apparent Cohesion C	Angle of Shearing Resistance Phi		
WS02	1.00-1.20		T	400139	Brown weathered MUDSTONE	%	%	%	%	%	CI	Mg/m³	Mg/m³	Mg/m³	kPa	kPa		BRE SD1 Suite	
Notes Opinions and interpretations are outside the scope of UKAS accreditation					UKAS Accredited Test Y/N		Test details are given on the 'Notes on Laboratory Procedures' sheet											See individual report sheets	
Originator		Approved		SUMMARY OF GEOTECHNICAL TESTS														Tk Figure 1 Sheet 2 of 2	
PM		S. Langman 14/10/2019																	



Site BEREWOOD

Contract No. CS-J-0161

Client

Hole ID BH01

Engineer

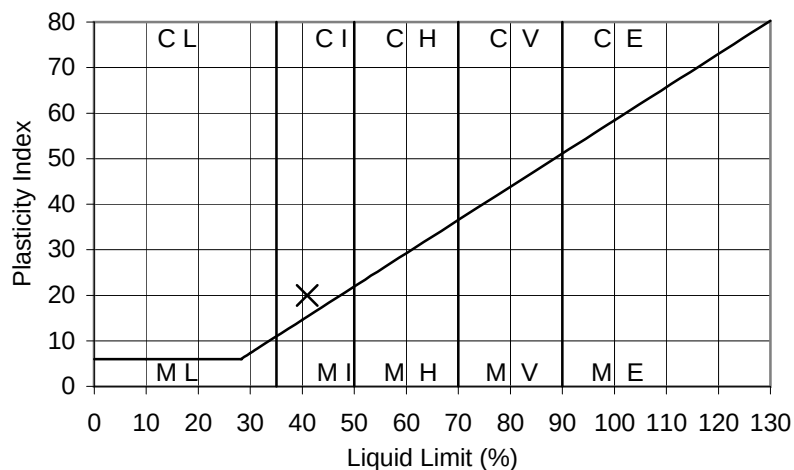
Sample Ref

Depth (m) 1.00

Sample Type D

Non Engineering Description : Brown weathered MUDSTONE.

Preparation : Sample as received



Results :

As Received Moisture Content : (BS1377:Part 2:Clause 3:1990)	15 %
Percentage retained on 425µm sieve :	0 %
Liquid Limit :	41 %
Plastic Limit :	21 %
Plasticity Index :	20
Equivalent moisture content of material passing 425µm sieve :	15 %
Liquidity Index :	-0.30

Originator

Checked & Approved

IG

S. Langdon
14/10/2019

**Liquid Limit (One Point Cone Penetrometer Method)
Plastic Limit, Plasticity Index & Liquidity Index**

BS 1377:Part 2:Clause 4.4:1990

BS 1377:Part 2:Clause 5:1990



Figure 2

Sheet 1 of 1



Site BEREWOOD

Client

Engineer

Contract No. CS-J-0161

Hole ID TP01

Sample Ref

Depth (m) 1.10-1.30

Sample Type B

Non Engineering Description : Brown weathered MUDSTONE.

Preparation : Sample as received

Sample was determined to be Non-Plastic after preparation

Results :

As Received Moisture Content : (BS1377:Part 2:Clause 3:1990)

28 %

Percentage retained on 425µm sieve :

2 %

Equivalent moisture content of material passing 425µm sieve :

29 %

Originator

Checked &
Approved

IG

S. Langdon
14/10/2019

Plastic Limit

BS 1377:Part 2:Clause 5:1990



Figure 3

Sheet 1 of 1



Site BEREWOOD

Client

Engineer

Contract No. CS-J-0161

Hole ID TP03

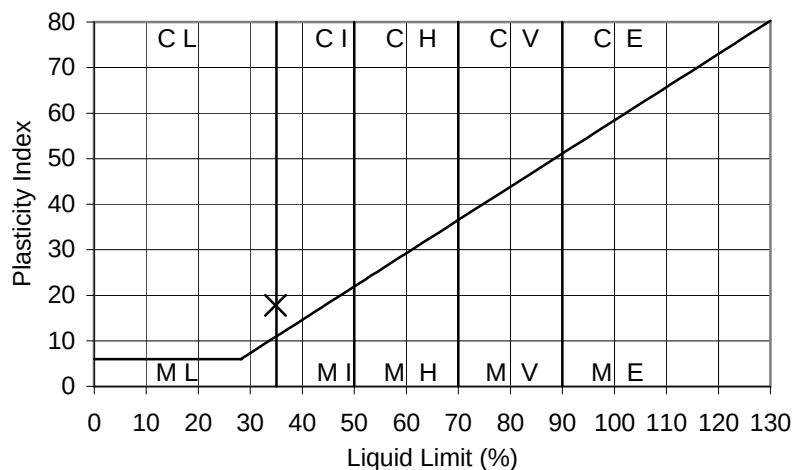
Sample Ref

Depth (m) 0.55-0.85

Sample Type B

Non Engineering Description : Brown weathered MUDSTONE.

Preparation : Sample as received



Results :

As Received Moisture Content : (BS1377:Part 2:Clause 3:1990)	19 %
Percentage retained on 425µm sieve :	0 %
Liquid Limit :	35 %
Plastic Limit :	17 %
Plasticity Index :	18
Equivalent moisture content of material passing 425µm sieve :	19 %
Liquidity Index :	0.11

Originator

Checked & Approved

SB

S. Langdon
14/10/2019

**Liquid Limit (One Point Cone Penetrometer Method)
Plastic Limit, Plasticity Index & Liquidity Index**

BS 1377:Part 2:Clause 4.4:1990

BS 1377:Part 2:Clause 5:1990



Figure 4

Sheet 1 of 1



Site BEREWOOD

Client

Engineer

Contract No. CS-J-0161

Hole ID WS01

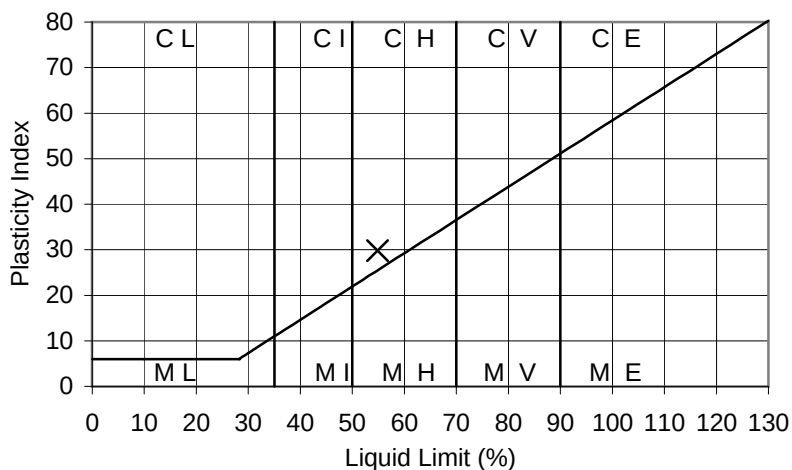
Sample Ref

Depth (m) 1.00-1.20

Sample Type T

Non Engineering Description : Brown weathered MUDSTONE.

Preparation : Sample as received



Results :

As Received Moisture Content : (BS1377:Part 2:Clause 3:1990) 20 %
 Percentage retained on 425µm sieve : 0 %
 Liquid Limit : 55 %
 Plastic Limit : 25 %
 Plasticity Index : 30

Equivalent moisture content of material passing 425µm sieve : 20 %
 Liquidity Index : -0.17

Originator

Checked & Approved

IG

S. Langdon
14/10/2019

**Liquid Limit (One Point Cone Penetrometer Method)
Plastic Limit, Plasticity Index & Liquidity Index**

BS 1377:Part 2:Clause 4.4:1990

BS 1377:Part 2:Clause 5:1990



Figure 5

Sheet 1 of 1



Site BEREWOOD

Client

Engineer

Contract No. CS-J-0161

Hole ID WS02

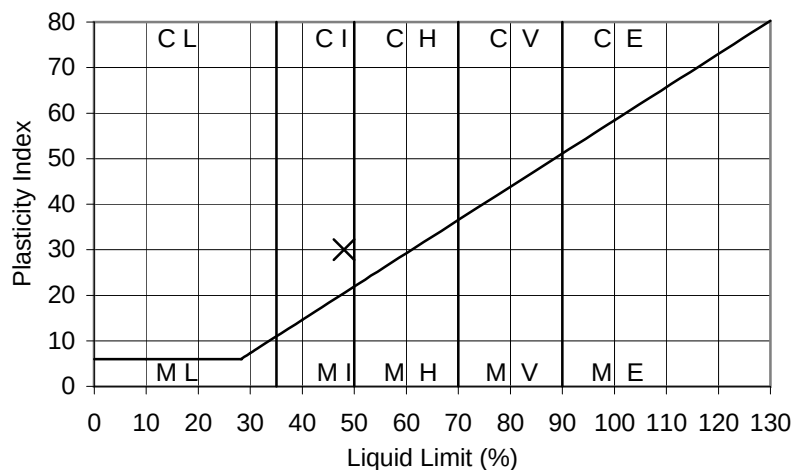
Sample Ref

Depth (m) 1.00-1.20

Sample Type T

Non Engineering Description : Brown weathered MUDSTONE

Preparation : Sample as received



Results :

As Received Moisture Content : (BS1377:Part 2:Clause 3:1990) 17 %
 Percentage retained on 425µm sieve : 0 %
 Liquid Limit : 48 %
 Plastic Limit : 18 %
 Plasticity Index : 30
 Equivalent moisture content of material passing 425µm sieve : 17 %
 Liquidity Index : -0.03

Originator

Checked & Approved

JH

S. Langdon
14/10/2019

**Liquid Limit (One Point Cone Penetrometer Method)
Plastic Limit, Plasticity Index & Liquidity Index**

BS 1377:Part 2:Clause 4.4:1990

BS 1377:Part 2:Clause 5:1990



Figure 6

Sheet 1 of 1

Site BEREWOOD

Client

Engineer

Contract No **CS-J-0161**

Hole ID TP03

Sample No

Depth (m) 0.55-0.85

Sample Type B

Non Engineering Description: Brown weathered MUDSTONE.

Preparation Details:

Specimen was prepared at natural moisture content

Compaction using 2.5kg compactive effort

Specimen Bulk Density 2.09 Mg/m³

Specimen Dry Density 1.78 Mg/m³

Mass of sample > 20 mm 1.3 %

Specimen Soaked

Test Details:

Top

Surcharge: 4.5 kg

Seating Load: 10 N

Moisture Content: 17 %

Base

4.5 kg

10 N

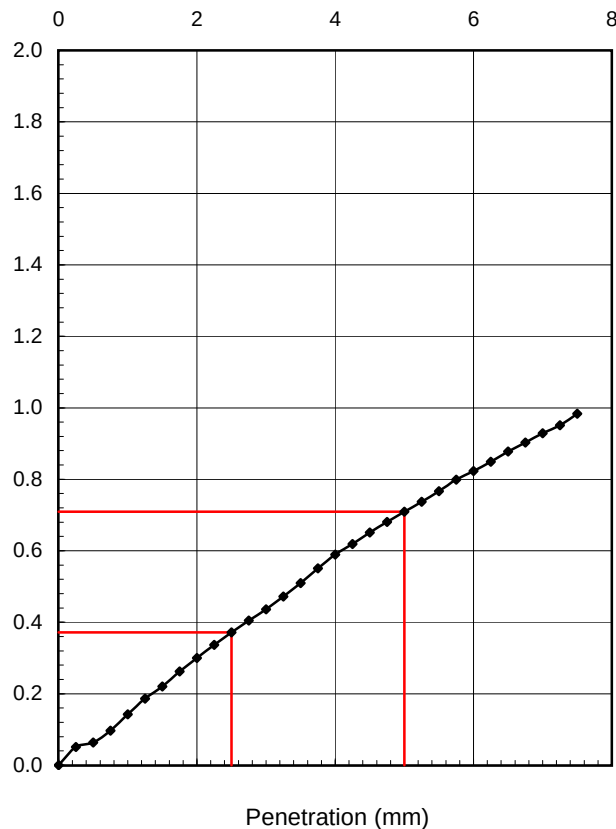
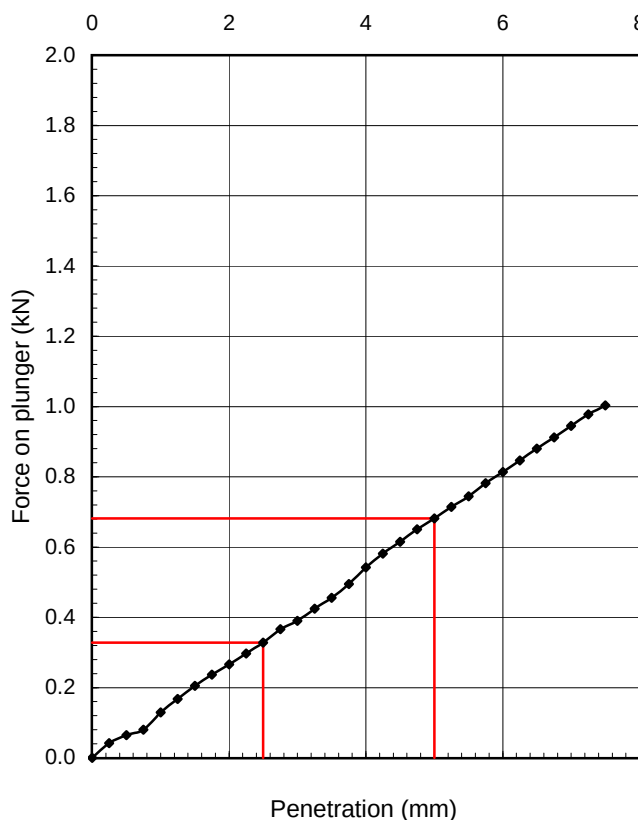
17 %

CBR Value: 3.4 %

3.5 %

Top of Specimen
Penetration (mm)

Base of Specimen
Penetration (mm)



Originator

Checked &
Approved

ME

S. Langren
14/10/2019

CALIFORNIA BEARING RATIO

BS1377 : Part 4 : Clause 7 : 1990



Figure 7

Sheet 1 of 1

Site BEREWOOD

Client

Engineer

Contract No **CS-J-0161**

Hole ID TP04

Sample No

Depth (m) 1.10-1.30

Sample Type B

Non Engineering Description: Brown weathered MUDSTONE.

Preparation Details:

Specimen was prepared at natural moisture content

Compaction using 2.5kg compactive effort

Specimen Bulk Density 1.88 Mg/m³

Specimen Dry Density 1.46 Mg/m³

Mass of sample > 20 mm 0.0 %

Specimen Soaked

Test Details:

Top

Surcharge: 4.5 kg

Seating Load: 10 N

Moisture Content: 28 %

Base

4.5 kg

10 N

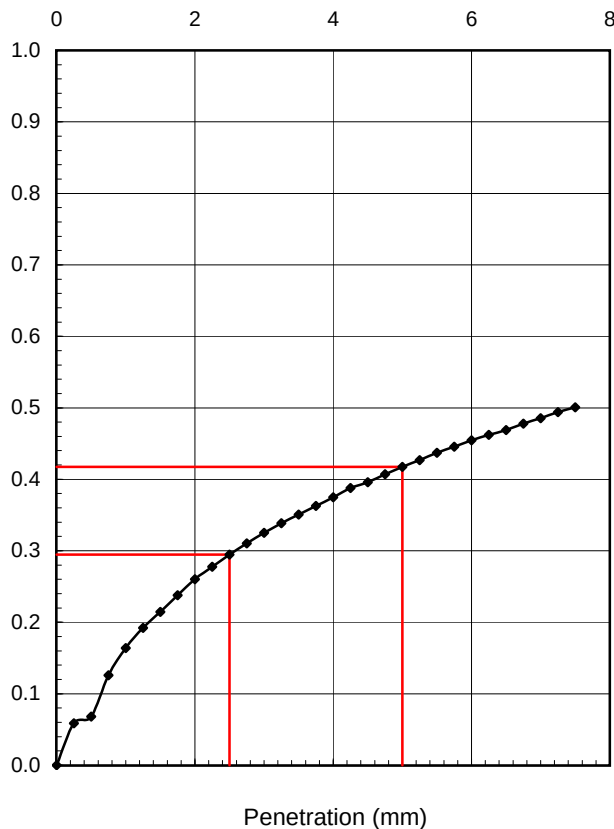
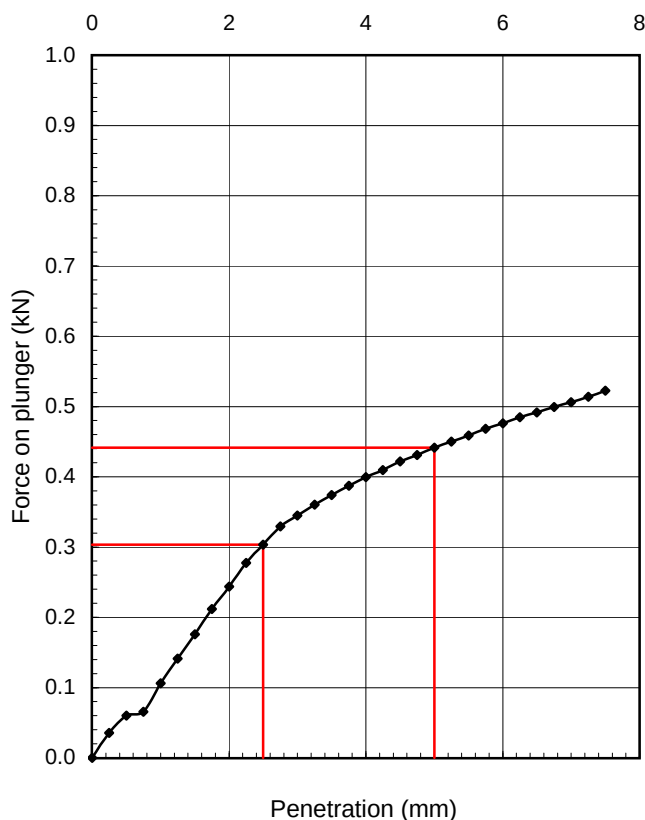
30 %

CBR Value: 2.3 %

2.2 %

Top of Specimen
Penetration (mm)

Base of Specimen
Penetration (mm)



Originator

Checked &
Approved

ME

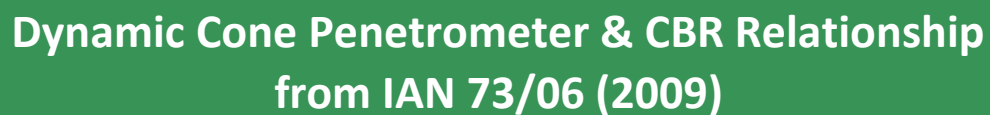
S. Langren
14/10/2019

CALIFORNIA BEARING RATIO

BS1377 : Part 4 : Clause 7 : 1990



Figure 8



The graph illustrates the relationship between CBR (%) and Depth (mm). The CBR value starts at 0% at 0 mm depth and increases sharply to about 15% at 100 mm depth. From 100 mm to 200 mm, the CBR value increases to approximately 25%. Between 200 mm and 300 mm, the CBR value rises to about 35%. From 300 mm to 400 mm, the CBR value increases to approximately 45%. Between 400 mm and 500 mm, the CBR value rises to about 55%. From 500 mm to 600 mm, the CBR value increases to approximately 65%. Between 600 mm and 700 mm, the CBR value rises to about 75%. From 700 mm to 800 mm, the CBR value increases to approximately 80%. Finally, between 800 mm and 900 mm, the CBR value rises to about 85%.

Depth (mm)	CBR (%)
0	0
10	5
20	10
30	15
40	20
50	25
60	30
70	35
80	40
90	45
100	50
110	55
120	60
130	65
140	70
150	75
160	80
170	85
180	80
190	75
200	70
210	65
220	60
230	55
240	50
250	45
260	40
270	35
280	30
290	25
300	20
310	15
320	10
330	5
340	0
350	5
360	10
370	15
380	20
390	25
400	30
410	35
420	40
430	45
440	50
450	55
460	60
470	65
480	70
490	75
500	80
510	85
520	80
530	75
540	70
550	65
560	60
570	55
580	50
590	45
600	40
610	35
620	30
630	25
640	20
650	15
660	10
670	5
680	0
690	5
700	10
710	15
720	20
730	25
740	30
750	35
760	40
770	45
780	50
790	55
800	60
810	65
820	70
830	75
840	80
850	85
860	80
870	75
880	70
890	65
900	60
910	55
920	50
930	45
940	40
950	35
960	30
970	25
980	20
990	15
1000	10

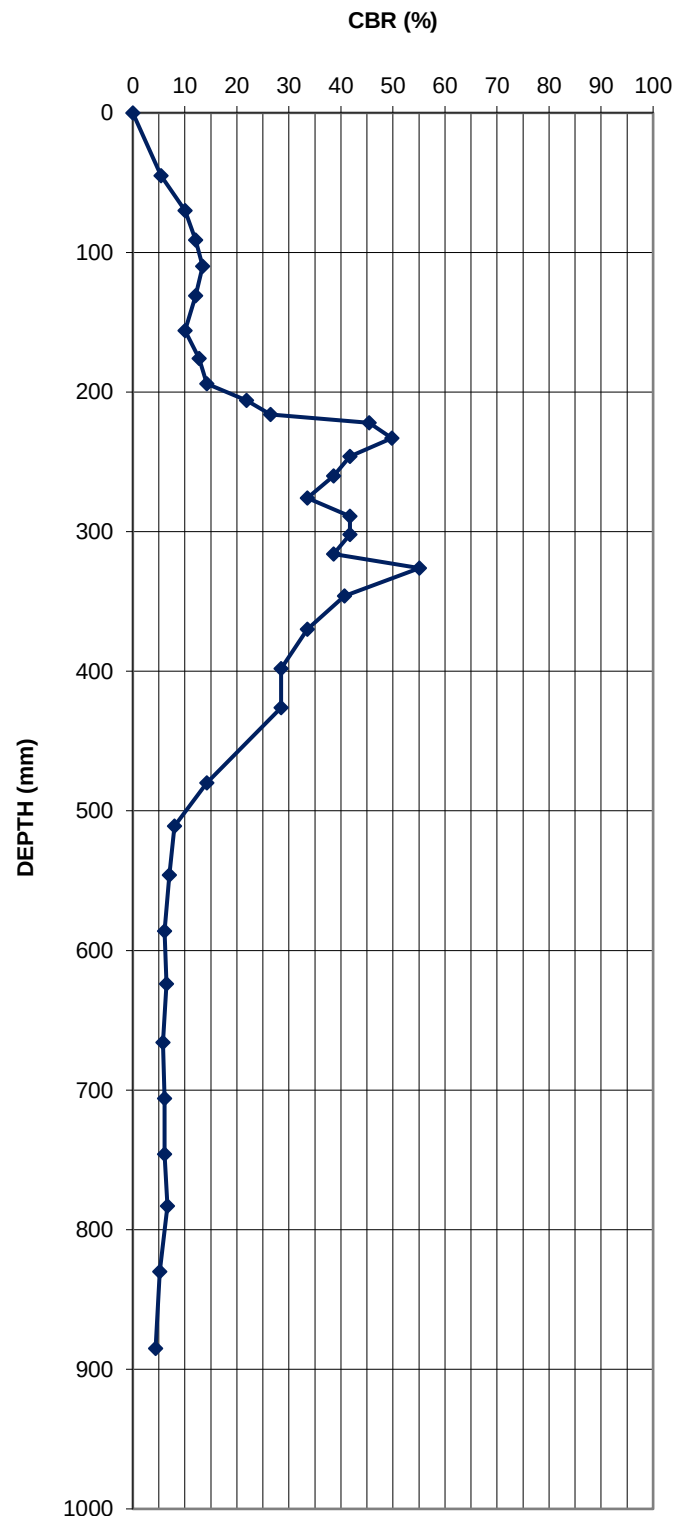
CBR correlation based on IAN 73/06: $\text{Log}_{10}(\text{CBR}) = 2.48 - 1.057 \times \text{Log}_{10}(\text{mm/blow})$

Dynamic Cone Penetrometer & CBR Relationship from IAN 73/06 (2009)

Project Name:	Berewood - Town Park Phase 2					Project ID:	CS-J-0161
Client:	WYG						
Hole ID:	TRL02	Date:	20-08-2019	Logged:	CP	Checked:	JD

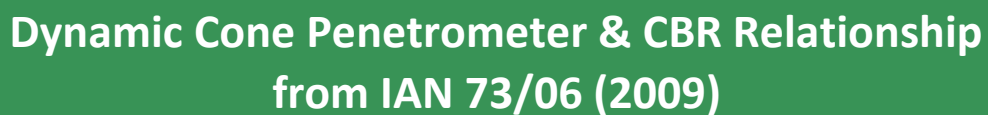
Initial scale reading (mm):	64	Datum - below ground level (bgl) (mm):	
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no. of Blows	scale reading (mm)	penet. - bgl (mm)	DCP (mm/blow)	CBR (%)
1	64	0	0	0.0
1	109	45	45	5.4
1	134	70	25	10.1
1	155	91	21	12.1
1	174	110	19	13.4
1	195	131	21	12.1
1	220	156	25	10.1
1	240	176	20	12.7
1	258	194	18	14.2
1	270	206	12	21.8
1	280	216	10	26.5
1	286	222	6	45.4
2	297	233	6	49.8
2	310	246	7	41.8
2	324	260	7	38.6
2	340	276	8	33.5
2	353	289	7	41.8
2	366	302	7	41.8
2	380	316	7	38.6
2	390	326	5	55.1
3	410	346	7	40.7
3	434	370	8	33.5
3	462	398	9	28.5
3	490	426	9	28.5
3	544	480	18	14.2
1	575	511	31	8.0
1	610	546	35	7.0
1	650	586	40	6.1
1	688	624	38	6.5
1	730	666	42	5.8
1	770	706	40	6.1
1	810	746	40	6.1
1	847	783	37	6.6
1	894	830	47	5.2
1	949	885	55	4.4



Remarks:

CBR correlation based on IAN 73/06: $\text{Log}_{10}(\text{CBR}) = 2.48 - 1.057 \times \text{Log}_{10}(\text{mm/blow})$



The graph illustrates the relationship between CBR (%) and Depth (mm). The CBR value starts at 0% at 0 mm depth, increases to a peak of approximately 10% at 100 mm depth, and then fluctuates between 5% and 10% down to 800 mm depth. The data points are as follows:

Depth (mm)	CBR (%)
0	0
10	5
20	8
30	10
40	10
50	10
60	10
70	10
80	10
90	10
100	10
110	10
120	10
130	10
140	10
150	10
160	10
170	10
180	10
190	10
200	10
210	10
220	10
230	10
240	10
250	10
260	10
270	10
280	10
290	10
300	10
310	10
320	10
330	10
340	10
350	10
360	10
370	10
380	10
390	10
400	10
410	10
420	10
430	10
440	10
450	10
460	10
470	10
480	10
490	10
500	10
510	10
520	10
530	10
540	10
550	10
560	10
570	10
580	10
590	10
600	10
610	10
620	10
630	10
640	10
650	10
660	10
670	10
680	10
690	10
700	10
710	10
720	10
730	10
740	10
750	10
760	10
770	10
780	10
790	10
800	10

CBR correlation based on IAN 73/06: $\text{Log}_{10}(\text{CBR}) = 2.48 - 1.057 \times \text{Log}_{10}(\text{mm/blow})$

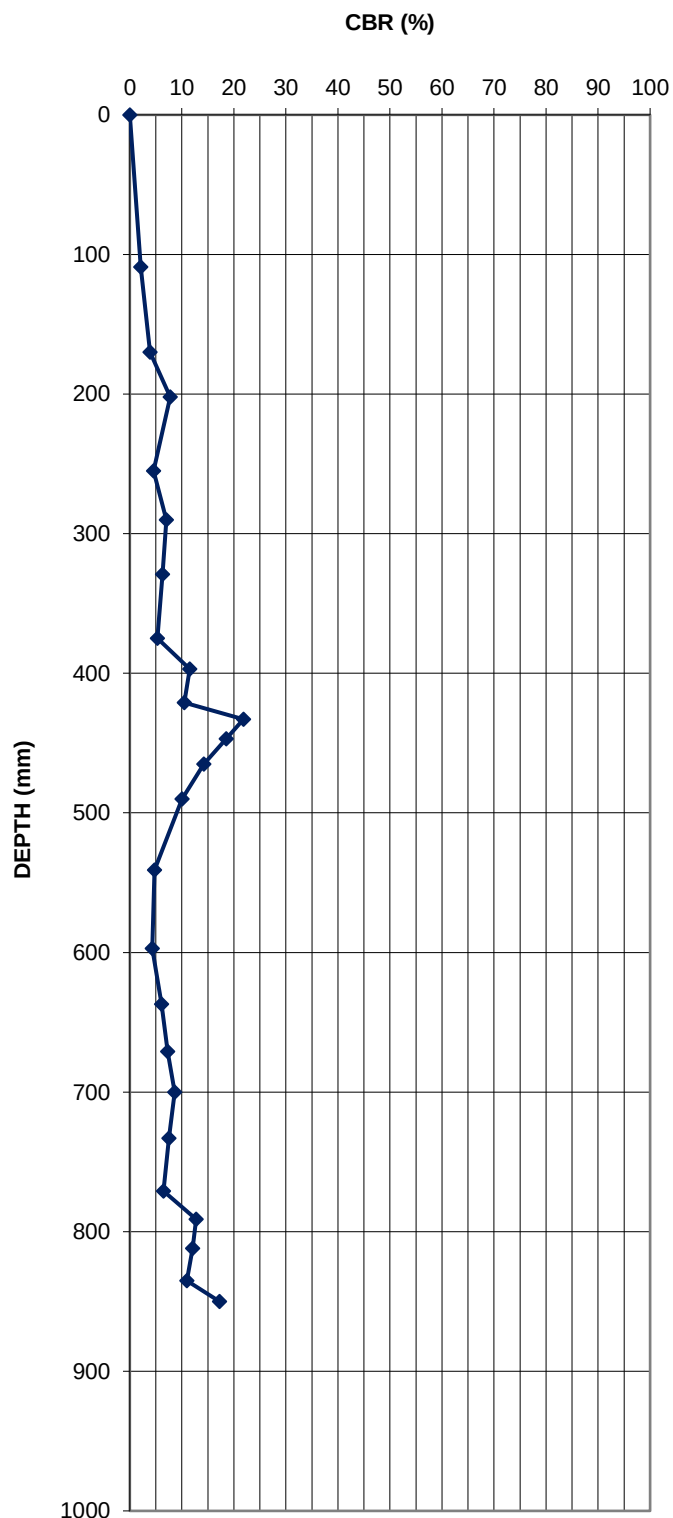
Dynamic Cone Penetrometer & CBR Relationship from IAN 73/06 (2009)

Project Name:	Berewood - Town Park Phase 2	Project ID:	CS-J-0161
---------------	------------------------------	-------------	-----------

Client:	WYG
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Hole ID:	TRL04	Date:	20-08-2019	Logged:	CP	Checked:	JD
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Initial scale reading (mm):	97	Datum - below ground level (bgl) (mm):	
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[illegible]

Remarks:

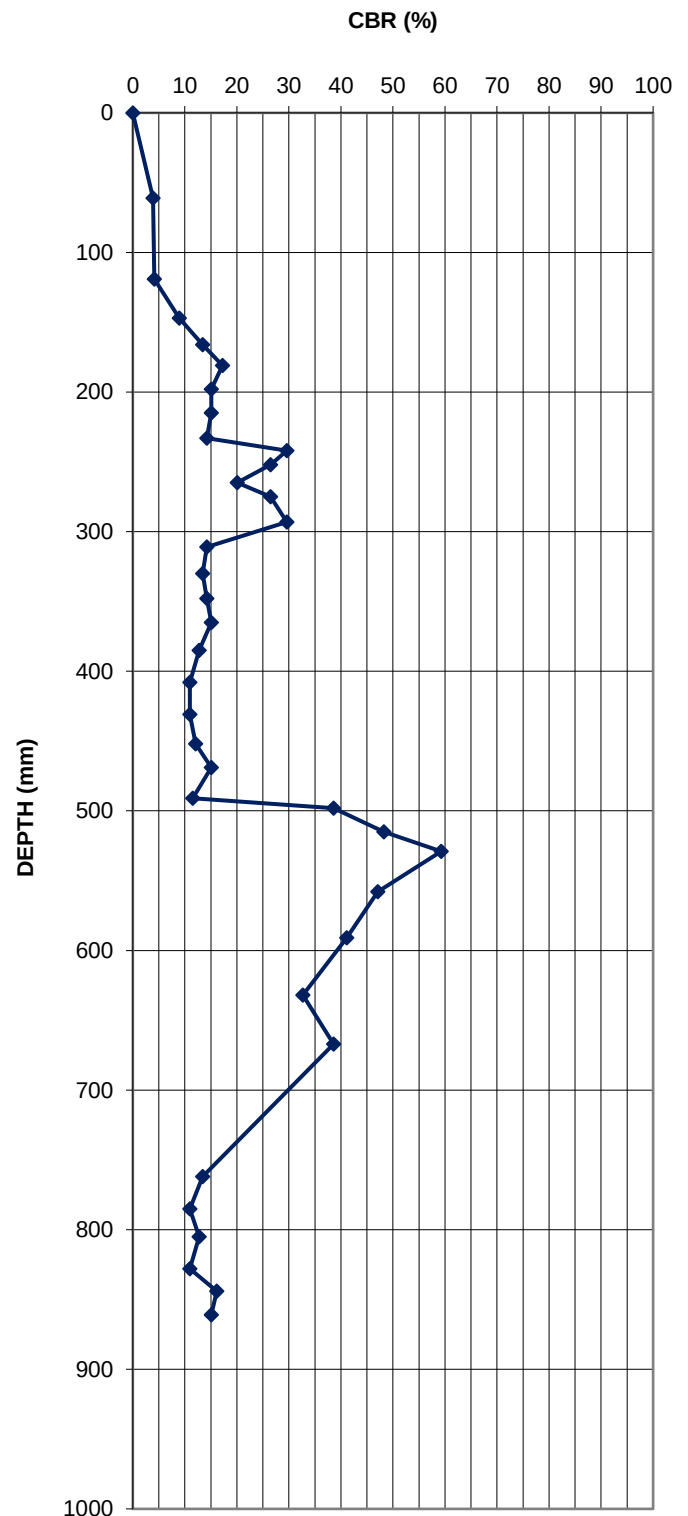
CBR correlation based on IAN 73/06: $\text{Log}_{10}(\text{CBR}) = 2.48 - 1.057 \times \text{Log}_{10}(\text{mm/blow})$

Dynamic Cone Penetrometer & CBR Relationship from IAN 73/06 (2009)

Project Name:	Berewood - Town Park Phase 2					Project ID:	CS-J-0161
Client:	WYG						
Hole ID:	TRL05	Date:	20-08-2019	Logged:	CP	Checked:	JD

Initial scale reading (mm):	75	Datum - below ground level (bgl) (mm):	
-----------------------------	----	--	--

no. of Blows	scale reading (mm)	penet. - bgl (mm)	DCP (mm/blow)	CBR (%)
1	75	0	0	0.0
1	136	61	61	3.9
1	194	119	58	4.1
1	222	147	28	8.9
1	241	166	19	13.4
1	256	181	15	17.3
1	273	198	17	15.1
1	290	215	17	15.1
1	308	233	18	14.2
1	317	242	9	29.6
1	327	252	10	26.5
1	340	265	13	20.1
1	350	275	10	26.5
2	368	293	9	29.6
1	386	311	18	14.2
1	405	330	19	13.4
1	423	348	18	14.2
1	440	365	17	15.1
1	460	385	20	12.7
1	483	408	23	11.0
1	506	431	23	11.0
1	527	452	21	12.1
1	544	469	17	15.1
1	566	491	22	11.5
1	573	498	7	38.6
3	590	515	6	48.3
3	604	529	5	59.3
5	633	558	6	47.1
5	666	591	7	41.1
5	707	632	8	32.7
5	742	667	7	38.6
5	837	762	19	13.4
1	860	785	23	11.0
1	880	805	20	12.7
1	903	828	23	11.0
1	919	844	16	16.1
1	936	861	17	15.1



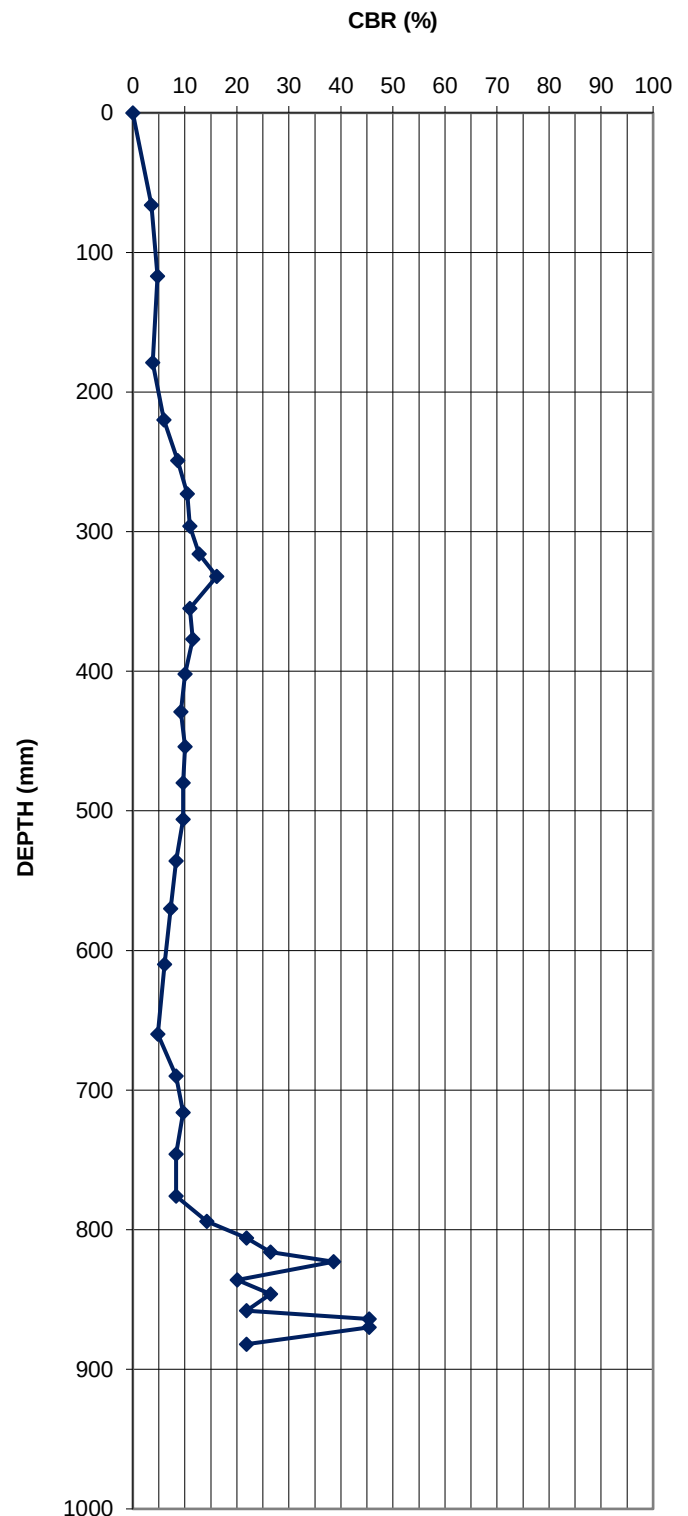
Remarks:

Dynamic Cone Penetrometer & CBR Relationship from IAN 73/06 (2009)

Project Name:	Berewood - Town Park Phase 2					Project ID:	CS-J-0161
Client:	WYG						
Hole ID:	TRL06	Date:	20-08-2019	Logged:	CP	Checked:	JD

Initial scale reading (mm):	54	Datum - below ground level (bgl) (mm):	
-----------------------------	----	--	--

no. of Blows	scale reading (mm)	penet. - bgl (mm)	DCP (mm/blow)	CBR (%)
1	54	0	0	0.0
1	120	66	66	3.6
1	171	117	51	4.7
1	233	179	62	3.8
1	274	220	41	6.0
1	303	249	29	8.6
1	327	273	24	10.5
1	350	296	23	11.0
1	370	316	20	12.7
1	386	332	16	16.1
1	409	355	23	11.0
1	431	377	22	11.5
1	456	402	25	10.1
1	483	429	27	9.3
1	508	454	25	10.1
1	534	480	26	9.6
1	560	506	26	9.6
1	590	536	30	8.3
1	624	570	34	7.3
1	664	610	40	6.1
1	714	660	50	4.8
1	744	690	30	8.3
1	770	716	26	9.6
1	800	746	30	8.3
1	830	776	30	8.3
1	848	794	18	14.2
1	860	806	12	21.8
1	870	816	10	26.5
1	877	823	7	38.6
1	890	836	13	20.1
1	900	846	10	26.5
1	912	858	12	21.8
1	918	864	6	45.4
1	924	870	6	45.4
1	936	882	12	21.8



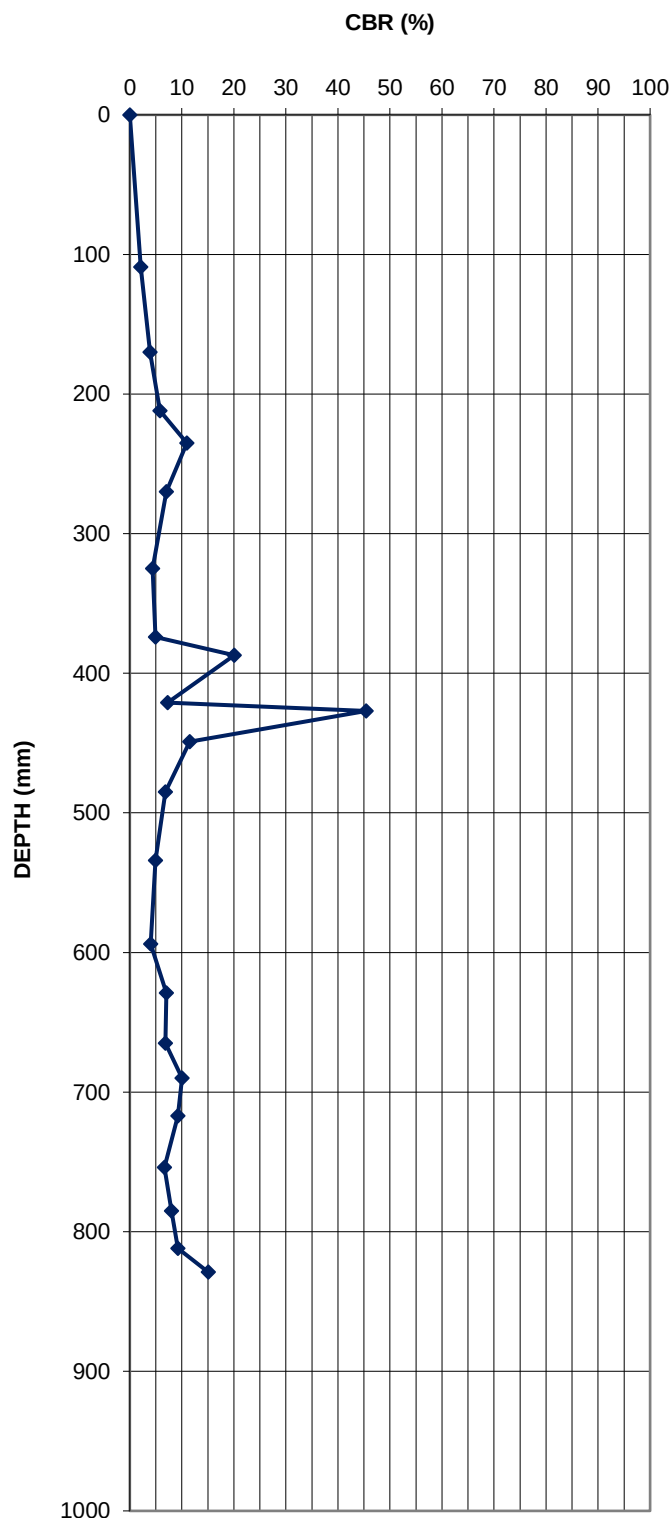
Remarks:

CBR correlation based on IAN 73/06: $\text{Log}_{10}(\text{CBR}) = 2.48 - 1.057 \times \text{Log}_{10}(\text{mm/blow})$

Dynamic Cone Penetrometer & CBR Relationship from IAN 73/06 (2009)

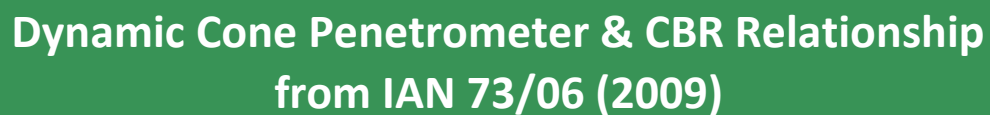
Project Name:	Berewood - Town Park Phase 2					Project ID:	CS-J-0161
Client:	WYG						
Hole ID:	TRL07	Date:	20-08-2019	Logged:	CP	Checked:	JD

Initial scale reading (mm):	107	Datum - below ground level (bgl) (mm):	
-----------------------------	-----	--	--

[illegible]

Remarks:

CBR correlation based on IAN 73/06: $\text{Log}_{10}(\text{CBR}) = 2.48 - 1.057 \times \text{Log}_{10}(\text{mm/blow})$



Initial scale reading (mm):	111	Datum - below ground level (bgl) (mm):	
-----------------------------	-----	--	--

The graph illustrates the relationship between CBR (%) and Depth (mm) for a road construction project. The CBR value starts at 0% at 0 mm depth and increases to approximately 8.5% at 830 mm depth. The data points are as follows:

Depth (mm)	CBR (%)
0	0
20	0
40	0
60	0
80	0
100	0
120	0
140	0
160	0
180	0
200	0
220	0
240	0
260	0
280	0
300	0
320	0
340	0
360	0
380	0
400	0
420	0
440	0
460	0
480	0
500	0
520	0
540	0
560	0
580	0
600	0
620	0
640	0
660	0
680	0
700	0
720	0
740	0
760	0
780	0
800	0
820	0
830	8.5

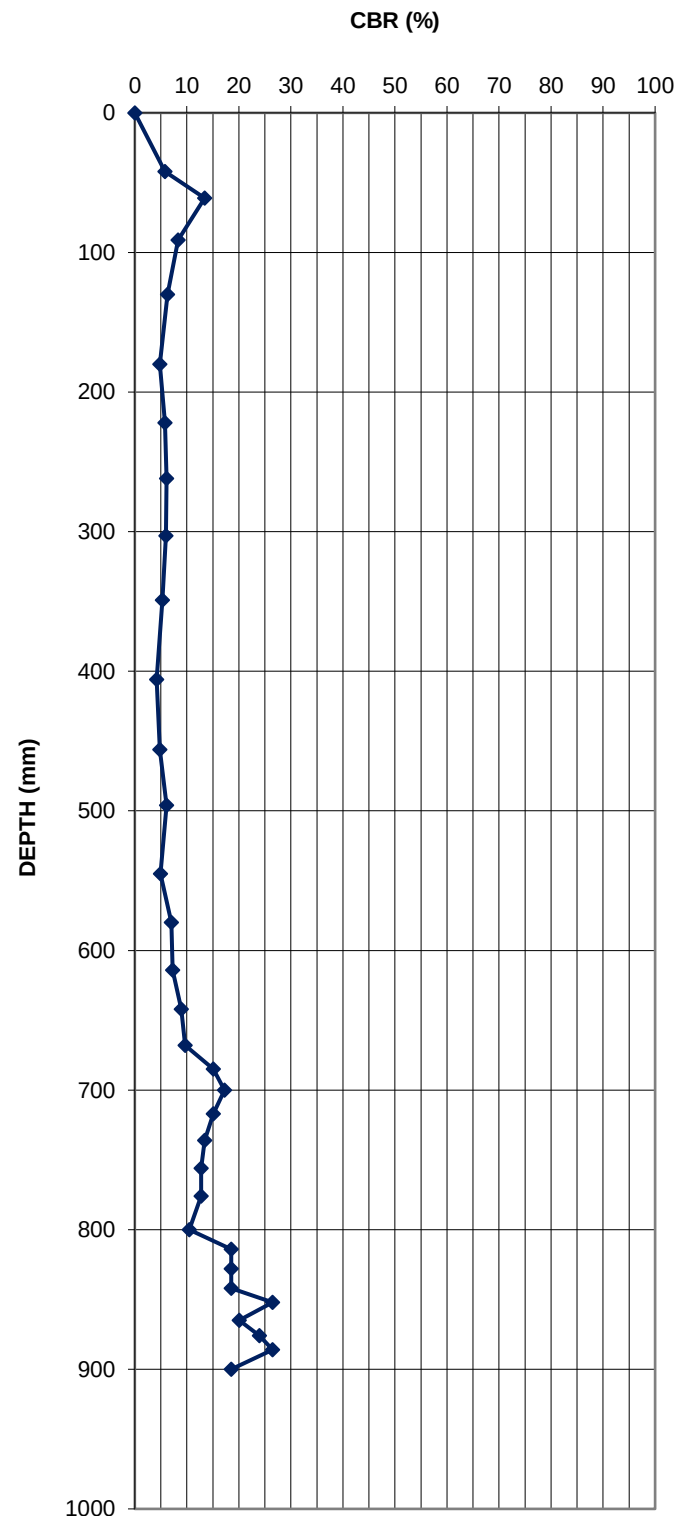
CBR correlation based on IAN 73/06: $\text{Log}_{10}(\text{CBR}) = 2.48 - 1.057 \times \text{Log}_{10}(\text{mm/blow})$

Dynamic Cone Penetrometer & CBR Relationship from IAN 73/06 (2009)

Project Name:	Berewood - Town Park Phase 2					Project ID:	CS-J-0161
Client:	WYG						
Hole ID:	TRL09	Date:	20-08-2019	Logged:	CP	Checked:	JD

Initial scale reading (mm):	44	Datum - below ground level (bgl) (mm):	
-----------------------------	----	--	--

no. of Blows	scale reading (mm)	penet. - bgl (mm)	DCP (mm/blow)	CBR (%)
1	44	0	0	0.0
1	86	42	42	5.8
1	105	61	19	13.4
1	135	91	30	8.3
1	174	130	39	6.3
1	224	180	50	4.8
1	266	222	42	5.8
1	306	262	40	6.1
1	347	303	41	6.0
1	393	349	46	5.3
1	450	406	57	4.2
1	500	456	50	4.8
1	540	496	40	6.1
1	589	545	49	4.9
1	624	580	35	7.0
1	658	614	34	7.3
1	686	642	28	8.9
1	712	668	26	9.6
1	729	685	17	15.1
1	744	700	15	17.3
1	761	717	17	15.1
1	780	736	19	13.4
1	800	756	20	12.7
1	820	776	20	12.7
1	844	800	24	10.5
1	858	814	14	18.6
1	872	828	14	18.6
1	886	842	14	18.6
1	896	852	10	26.5
1	909	865	13	20.1
1	920	876	11	23.9
1	930	886	10	26.5
1	944	900	14	18.6



Remarks:

CBR correlation based on IAN 73/06: $\text{Log}_{10}(\text{CBR}) = 2.48 - 1.057 \times \text{Log}_{10}(\text{mm/blow})$

Appendix E – Chemical Results



Unit A2
Windmill Road
Ponswood Industrial Estate
St Leonards on Sea
East Sussex
TN38 9BY
Telephone: (01424) 718618

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info@elab-uk.co.uk

THE ENVIRONMENTAL LABORATORY LTD

Analytical Report Number: 19-24380

Issue: 1

Date of Issue: 16/08/2019

Contact: Craig Pennell

Customer Details: T & P Regeneration Ltd (Smeaton Road)
Unit 4
Brunel Lock Development
Bristol
BS1 6SE

Quotation No: Q15-00390

Order No: 5934

Customer Reference: CS-J-0161

Date Received: 09/08/2019

Date Approved: 16/08/2019

Details: Berewood - Town Park Phase B

Approved by:

Mike Varley, Technical Manager

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

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Sample Summary

Report No.: 19-24380, issue number 1

Elab No.	Client's Ref.	Date Sampled	Date Scheduled	Description	Deviations
181278	TP01 1 0.00 - 0.20	06/08/2019	13/08/2019		
181279	TP01 2 0.30 - 0.60	06/08/2019	13/08/2019		
181280	TP02 1 0.00 - 0.30	06/08/2019	13/08/2019		
181281	TP02 2 0.30 - 0.60	06/08/2019	13/08/2019		
181282	TP03 1 0.00 - 0.45	06/08/2019	13/08/2019	Silty loam	
181283	TP03 4 0.55 - 0.85	06/08/2019	13/08/2019		
181284	TP04 1 0.20 - 0.40	06/08/2019	13/08/2019		
181285	TP04 2 0.70 - 1.10	06/08/2019	13/08/2019	Silty loam	
181286	TP04 5 1.10 - 1.30	06/08/2019	13/08/2019		
181287	WS01 1 0.00 - 0.20	06/08/2019	13/08/2019		
181288	WS01 2 0.20 - 0.60	06/08/2019	13/08/2019		
181289	WS02 1 0.00 - 0.20	06/08/2019	13/08/2019		
181290	WS02 2 0.30 - 0.60	06/08/2019	13/08/2019		
181291	WS03 1 0.00 - 0.20	06/08/2019	13/08/2019	Silty loam	
181292	WS03 2 0.30 - 0.60	06/08/2019	13/08/2019	Silty clayey loam	
181293	BH01 0.00 - 0.30	06/08/2019	13/08/2019		
181294	BH01 0.30 - 0.60	06/08/2019	13/08/2019		

Results Summary

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Report No.: 19-24380, issue number 1

ELAB Reference	181282	181285	181291	181292
Customer Reference	1	2	1	2
Sample ID				
Sample Type	SOIL	SOIL	SOIL	SOIL
Sample Location	TP03	TP04	WS03	WS03
Sample Depth (m)	0.00 - 0.45	0.70 - 1.10	0.00 - 0.20	0.30 - 0.60
Sampling Date	06/08/2019	06/08/2019	06/08/2019	06/08/2019

Determinand	Codes	Units	LOD				
Soil sample preparation parameters							
Material removed	N	%	0.1	n/t	9.2	< 0.1	< 0.1
Description of Inert material removed	N		0	n/t	Stones	None	None
Metals							
Arsenic	M	mg/kg	1	n/t	12.3	5.9	12.3
Cadmium	M	mg/kg	0.5	n/t	< 0.5	< 0.5	< 0.5
Chromium	M	mg/kg	5	n/t	39.5	27.2	49.9
Copper	M	mg/kg	5	n/t	9.9	8.6	8.5
Lead	M	mg/kg	5	n/t	24.6	28.1	13.8
Mercury	M	mg/kg	0.5	n/t	< 0.5	< 0.5	< 0.5
Nickel	M	mg/kg	5	n/t	11.3	9.6	17.9
Selenium	M	mg/kg	1	n/t	< 1.0	< 1.0	< 1.0
Zinc	M	mg/kg	5	n/t	64.7	59.5	52.7
Anions							
Water Soluble Sulphate	M	g/l	0.02	n/t	0.04	0.03	0.04
Inorganics							
Hexavalent Chromium	N	mg/kg	0.8	n/t	< 0.8	< 0.8	< 0.8
Water Soluble Boron	N	mg/kg	0.5	n/t	0.7	0.6	< 0.5
Miscellaneous							
pH	M	pH units	0.1	n/t	7.5	6.7	7.8
Total Organic Carbon	N	%	0.01	n/t	0.20	1.8	< 0.01
Phenols							
Phenol	M	mg/kg	1	n/t	< 1	< 1	< 1
M,P-Cresol	N	mg/kg	1	n/t	< 1	< 1	< 1
O-Cresol	N	mg/kg	1	n/t	< 1	< 1	< 1
3,4-Dimethylphenol	N	mg/kg	1	n/t	< 1	< 1	< 1
2,3-Dimethylphenol	M	mg/kg	1	n/t	< 1	< 1	< 1
2,3,5-trimethylphenol	M	mg/kg	1	n/t	< 1	< 1	< 1
Total Monohydric Phenols	N	mg/kg	5	n/t	< 5	< 5	< 5



Results Summary

2683

Report No.: 19-24380, issue number 1

ELAB Reference	181282	181285	181291	181292
Customer Reference	1	2	1	2
Sample ID				
Sample Type	SOIL	SOIL	SOIL	SOIL
Sample Location	TP03	TP04	WS03	WS03
Sample Depth (m)	0.00 - 0.45	0.70 - 1.10	0.00 - 0.20	0.30 - 0.60
Sampling Date	06/08/2019	06/08/2019	06/08/2019	06/08/2019

Determinand	Codes	Units	LOD				
Polyaromatic hydrocarbons							
Naphthalene	M	mg/kg	0.1	n/t	< 0.1	< 0.1	< 0.1
Acenaphthylene	M	mg/kg	0.1	n/t	< 0.1	< 0.1	< 0.1
Acenaphthene	M	mg/kg	0.1	n/t	< 0.1	< 0.1	< 0.1
Fluorene	M	mg/kg	0.1	n/t	< 0.1	< 0.1	< 0.1
Phenanthrene	M	mg/kg	0.1	n/t	< 0.1	< 0.1	< 0.1
Anthracene	M	mg/kg	0.1	n/t	< 0.1	< 0.1	< 0.1
Fluoranthene	M	mg/kg	0.1	n/t	< 0.1	< 0.1	< 0.1
Pyrene	M	mg/kg	0.1	n/t	< 0.1	0.1	< 0.1
Benzo(a)anthracene	M	mg/kg	0.1	n/t	< 0.1	< 0.1	< 0.1
Chrysene	M	mg/kg	0.1	n/t	< 0.1	< 0.1	< 0.1
Benzo(b)fluoranthene	M	mg/kg	0.1	n/t	< 0.1	0.1	< 0.1
Benzo(k)fluoranthene	M	mg/kg	0.1	n/t	< 0.1	0.1	< 0.1
Benzo(a)pyrene	M	mg/kg	0.1	n/t	< 0.1	< 0.1	< 0.1
Indeno(1,2,3-cd)pyrene	M	mg/kg	0.1	n/t	< 0.1	< 0.1	< 0.1
Dibenzo(a,h)anthracene	M	mg/kg	0.1	n/t	< 0.1	< 0.1	< 0.1
Benzo[g,h,i]perylene	M	mg/kg	0.1	n/t	< 0.1	< 0.1	< 0.1
Total PAH(16)	M	mg/kg	0.4	n/t	0.4	0.8	< 0.4
TPH CWG							
>C5-C6 Aliphatic	N	mg/kg	0.01	< 0.01	< 0.01	n/t	n/t
>C6-C8 Aliphatic	N	mg/kg	0.01	< 0.01	< 0.01	n/t	n/t
>C8-C10 Aliphatic	N	mg/kg	1	< 1.0	< 1.0	n/t	n/t
>C10-C12 Aliphatic	N	mg/kg	1	< 1.0	< 1.0	n/t	n/t
>C12-C16 Aliphatic	N	mg/kg	1	1.3	< 1.0	n/t	n/t
>C16-C21 Aliphatic	N	mg/kg	1	9.4	< 1.0	n/t	n/t
>C21-C35 Aliphatic	N	mg/kg	1	133	< 1.0	n/t	n/t
>C35-C40 Aliphatic	N	mg/kg	1	42.6	< 1.0	n/t	n/t
>C5-C7 Aromatic	N	mg/kg	0.01	< 0.01	< 0.01	n/t	n/t
>C7-C8 Aromatic	N	mg/kg	0.01	< 0.01	< 0.01	n/t	n/t
>C8-C10 Aromatic	N	mg/kg	1	< 1.0	< 1.0	n/t	n/t
>C10-C12 Aromatic	N	mg/kg	1	< 1.0	< 1.0	n/t	n/t
>C12-C16 Aromatic	N	mg/kg	1	< 1.0	< 1.0	n/t	n/t
>C16-C21 Aromatic	N	mg/kg	1	10.3	< 1.0	n/t	n/t
>C21-C35 Aromatic	N	mg/kg	1	229	< 1.0	n/t	n/t
>C35-C40 Aromatic	N	mg/kg	1	66.6	< 1.0	n/t	n/t
Total (>C5-C40) Ali/Aro	N	mg/kg	1	492	< 1.0	n/t	n/t



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Results Summary

Report No.: 19-24380, issue number 1

Asbestos Results

Analytical result only applies to the sample as submitted by the client. Any comments, opinions or interpretations (marked #) in this report are outside UKAS accreditation (Accreditation No2683). They are subjective comments only which must be verified by the client.

Elab No	Depth (m)	Clients Reference	Description of Sample Matrix #	Asbestos Identification	Gravimetric Analysis Total (%)	Gravimetric Analysis by ACM Type (%)	Free Fibre Analysis (%)	Total Asbestos (%)
181282	0.00 - 0.45	TP03 1	Brown sandy soil, stones, concrete, brick,	Amosite (fibre bundles)	n/t	n/t	n/t	n/t
181285	0.70 - 1.10	TP04 2	Brown sandy soil, stones, brick	No asbestos detected	n/t	n/t	n/t	n/t

Method Summary

Report No.: 19-24380, issue number 1

Parameter	Codes	Analysis Undertaken On	Date Tested	Method Number	Technique
Soil					
Hexavalent chromium	N	As submitted sample	14/08/2019	110	Colorimetry
pH	M	Air dried sample	16/08/2019	113	Electromeric
Aqua regia extractable metals	M	Air dried sample	14/08/2019	118	ICPMS
Phenols in solids	M	As submitted sample	14/08/2019	121	HPLC
PAH (GC-FID)	M	As submitted sample	14/08/2019	133	GC-FID
Water soluble anions	M	Air dried sample	14/08/2019	172	Ion Chromatography
Low range Aliphatic hydrocarbons soil	N	As submitted sample	15/08/2019	181	GC-MS
Low range Aromatic hydrocarbons soil	N	As submitted sample	15/08/2019	181	GC-MS
Water soluble boron	N	Air dried sample	14/08/2019	202	Colorimetry
Total organic carbon/Total sulphur	N	Air dried sample	16/08/2019	210	IR
Aliphatic hydrocarbons in soil	N	As submitted sample	14/08/2019	214	GC-FID
Aliphatic/Aromatic hydrocarbons in soil	N	As submitted sample	16/08/2019	214	GC-FID
Aromatic hydrocarbons in soil	N	As submitted sample	14/08/2019	214	GC-FID
Asbestos identification	U	Air dried sample	14/08/2019	PMAN	Microscopy

Tests marked N are not UKAS accredited

Report Information

Report No.: 19-24380, issue number 1

Key

U	hold UKAS accreditation
M	hold MCERTS and UKAS accreditation
N	do not currently hold UKAS accreditation
^	MCERTS accreditation not applicable for sample matrix
*	UKAS accreditation not applicable for sample matrix
S	Subcontracted to approved laboratory UKAS Accredited for the test
SM	Subcontracted to approved laboratory MCERTS/UKAS Accredited for the test
NS	Subcontracted to approved laboratory. UKAS accreditation is not applicable.
I/S	Insufficient Sample
U/S	Unsuitable sample
n/t	Not tested
<	means "less than"
>	means "greater than"

Soil sample results are expressed on an air dried basis (dried at < 30°C), and are uncorrected for inert material removed.

ELAB are unable to provide an interpretation or opinion on the content of this report.

The results relate only to the sample received.

PCB congener results may include any coeluting PCBs

Uncertainty of measurement for the determinands tested are available upon request

Unless otherwise stated, sample information has been provided by the client

Deviation Codes

a	No date of sampling supplied
b	No time of sampling supplied (Waters Only)
c	Sample not received in appropriate containers
d	Sample not received in cooled condition
e	The container has been incorrectly filled
f	Sample age exceeds stability time (sampling to receipt)
g	Sample age exceeds stability time (sampling to analysis)

Where a sample has a deviation code, the applicable test result may be invalid.

Sample Retention and Disposal

All soil samples will be retained for a period of one month

All water samples will be retained for 7 days following the date of the test report

Charges may apply to extended sample storage



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THE ENVIRONMENTAL LABORATORY LTD

Analytical Report Number: 19-24597

Issue: 1

Date of Issue: 04/09/2019

Contact: Craig Pennell

Customer Details: T & P Regeneration Ltd (Smeaton Road)
Unit 4
Brunel Lock Development
Bristol
BS1 6SE

Quotation No: Q15-00390

Order No: 5934-CS-J-0161

Customer Reference: CS-J-0161

Date Received: 22/08/2019

Date Approved: 04/09/2019

Details: Berewood - Town Park Phase B

Approved by:

Mike Varley, Technical Manager

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

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Sample Summary

Report No.: 19-24597, issue number 1

Elab No.	Client's Ref.	Date Sampled	Date Scheduled	Description	Deviations
182402	WS04 1 0.00 - 0.30	20/08/2019	28/08/2019	Silty loam	
182403	WS04 2 0.30 - 0.60	20/08/2019	28/08/2019		
182404	WS05 1 0.10 - 0.30	20/08/2019	28/08/2019		
182405	WS05 2 0.50 - 0.70	20/08/2019	28/08/2019		
182406	WS06 1 0.10 - 0.40	20/08/2019	28/08/2019		
182407	WS06 2 0.40 - 0.60	20/08/2019	28/08/2019		
182408	WS07 1 0.00 - 0.20	20/08/2019	28/08/2019	Silty clayey loam	
182409	WS07 2 0.30 - 0.60	20/08/2019	28/08/2019		

Results Summary

2683

Report No.: 19-24597, issue number 1

ELAB Reference	182402	182408
Customer Reference	1	1
Sample ID		
Sample Type	SOIL	SOIL
Sample Location	WS04	WS07
Sample Depth (m)	0.00 - 0.30	0.00 - 0.20
Sampling Date	20/08/2019	20/08/2019

Determinand	Codes	Units	LOD		
Soil sample preparation parameters					
Material removed	N	%	0.1	< 0.1	11.7
Description of Inert material removed	N		0	None	Stones
Metals					
Arsenic	M	mg/kg	1	11.2	15.2
Cadmium	M	mg/kg	0.5	< 0.5	< 0.5
Chromium	M	mg/kg	5	40.5	45.4
Copper	M	mg/kg	5	14.9	27.9
Lead	M	mg/kg	5	26.9	35.8
Mercury	M	mg/kg	0.5	< 0.5	< 0.5
Nickel	M	mg/kg	5	13.5	35.7
Selenium	M	mg/kg	1	< 1.0	< 1.0
Zinc	M	mg/kg	5	51.5	127
Anions					
Water Soluble Sulphate	M	g/l	0.02	0.04	0.04
Inorganics					
Hexavalent Chromium	N	mg/kg	0.8	< 0.8	< 0.8
Water Soluble Boron	N	mg/kg	0.5	< 0.5	1.2
Miscellaneous					
pH	M	pH units	0.1	8.1	7.6
Total Organic Carbon	N	%	0.01	1.4	2.5
Phenols					
Phenol	M	mg/kg	1	< 1	< 1
M,P-Cresol	N	mg/kg	1	< 1	< 1
O-Cresol	N	mg/kg	1	< 1	< 1
3,4-Dimethylphenol	N	mg/kg	1	< 1	< 1
2,3-Dimethylphenol	M	mg/kg	1	< 1	< 1
2,3,5-trimethylphenol	M	mg/kg	1	< 1	< 1
Total Monohydric Phenols	N	mg/kg	5	< 5	< 5
Polyaromatic hydrocarbons					
Naphthalene	M	mg/kg	0.1	< 0.1	< 0.1
Acenaphthylene	M	mg/kg	0.1	< 0.1	< 0.1
Acenaphthene	M	mg/kg	0.1	< 0.1	< 0.1
Fluorene	M	mg/kg	0.1	< 0.1	< 0.1
Phenanthrene	M	mg/kg	0.1	< 0.1	< 0.1
Anthracene	M	mg/kg	0.1	< 0.1	< 0.1
Fluoranthene	M	mg/kg	0.1	< 0.1	< 0.1
Pyrene	M	mg/kg	0.1	< 0.1	< 0.1
Benzo(a)anthracene	M	mg/kg	0.1	< 0.1	< 0.1
Chrysene	M	mg/kg	0.1	< 0.1	< 0.1
Benzo(b)fluoranthene	M	mg/kg	0.1	< 0.1	< 0.1
Benzo(k)fluoranthene	M	mg/kg	0.1	< 0.1	< 0.1
Benzo(a)pyrene	M	mg/kg	0.1	< 0.1	< 0.1
Indeno(1,2,3-cd)pyrene	M	mg/kg	0.1	< 0.1	< 0.1
Dibenzo(a,h)anthracene	M	mg/kg	0.1	< 0.1	< 0.1
Benzo[g,h,i]perylene	M	mg/kg	0.1	< 0.1	< 0.1
Total PAH(16)	M	mg/kg	0.4	< 0.4	< 0.4

Method Summary

Report No.: 19-24597, issue number 1

Parameter	Codes	Analysis Undertaken On	Date Tested	Method Number	Technique
Soil					
Hexavalent chromium	N	As submitted sample	29/08/2019	110	Colorimetry
pH	M	Air dried sample	04/09/2019	113	Electromeric
Aqua regia extractable metals	M	Air dried sample	29/08/2019	118	ICPMS
Phenols in solids	M	As submitted sample	29/08/2019	121	HPLC
PAH (GC-FID)	M	As submitted sample	29/08/2019	133	GC-FID
Water soluble anions	M	Air dried sample	29/08/2019	172	Ion Chromatography
Water soluble boron	N	Air dried sample	29/08/2019	202	Colorimetry
Total organic carbon/Total sulphur	N	Air dried sample	30/08/2019	210	IR

Tests marked N are not UKAS accredited

Report Information

Report No.: 19-24597, issue number 1

Key

U	hold UKAS accreditation
M	hold MCERTS and UKAS accreditation
N	do not currently hold UKAS accreditation
^	MCERTS accreditation not applicable for sample matrix
*	UKAS accreditation not applicable for sample matrix
S	Subcontracted to approved laboratory UKAS Accredited for the test
SM	Subcontracted to approved laboratory MCERTS/UKAS Accredited for the test
NS	Subcontracted to approved laboratory. UKAS accreditation is not applicable.
I/S	Insufficient Sample
U/S	Unsuitable sample
n/t	Not tested
<	means "less than"
>	means "greater than"

Soil sample results are expressed on an air dried basis (dried at < 30°C), and are uncorrected for inert material removed.

ELAB are unable to provide an interpretation or opinion on the content of this report.

The results relate only to the sample received.

PCB congener results may include any coeluting PCBs

Uncertainty of measurement for the determinands tested are available upon request

Unless otherwise stated, sample information has been provided by the client

Deviation Codes

-
- | | |
|---|--|
| a | No date of sampling supplied |
| b | No time of sampling supplied (Waters Only) |
| c | Sample not received in appropriate containers |
| d | Sample not received in cooled condition |
| e | The container has been incorrectly filled |
| f | Sample age exceeds stability time (sampling to receipt) |
| g | Sample age exceeds stability time (sampling to analysis) |

Where a sample has a deviation code, the applicable test result may be invalid.

Sample Retention and Disposal

All soil samples will be retained for a period of one month

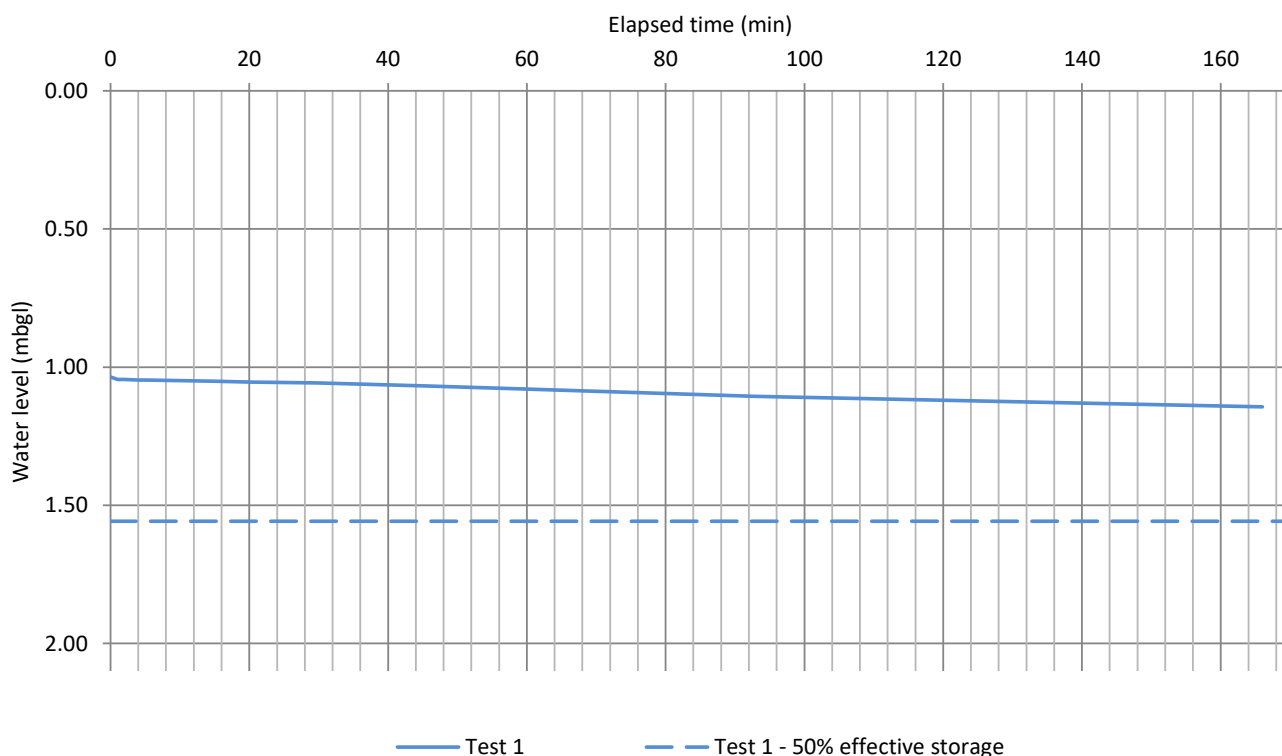
All water samples will be retained for 7 days following the date of the test report

Charges may apply to extended sample storage

Appendix F – Infiltration Results

Infiltration Test Results in Accordance with BRE Digest 365:2016

Project Name: Berewood - Town Park Phase 2						Project ID: CS-J-0161		
Client: WYG								
Hole ID: TP02						Test Date: 02-07-2019	Logged: CP	Checked: JA
Test 1		Test 2		Test 3		Soakaway Dimensions: Test 1 - Depth (m) Test 2 - Depth (m) Test 3 - Depth (m)		
Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)			
0	1.04							
1	1.04							
2	1.05							
3	1.05					Test 1	Test 2	Test 3
4	1.05					Depth to water at start of test (m)	1.04	
5	1.05					Depth to water at end of test (m)	1.14	
10	1.05					Total head drop (m)	0.11	
15	1.05					Depth to water at 75% level (m)	1.30	
20	1.05					Depth to water at 50% level (m)	1.56	
30	1.06					Depth to water at 25% level (m)	1.82	
45	1.07							
60	1.08					Base area of pit (m ²)	1.20	
93	1.11					Computed Internal Surface Area A _{p50} (m ²)	3.91	
166	1.14					Effective Storage Volume V _{p75-25} (m ³)	0.63	
						Elapsed time at 75% level (mins)	401	
						Elapsed time at 25% level (mins)	1287	
						50% discharge in 24 Hours	Yes	
						Soil infiltration rate <i>f</i> (m/s)	3.01E-06	
						Design soil infiltration rate <i>f</i> (m/s)	n/a (not BRE365 compliant)	



Remarks:

Where highlighted in red, results have been inferred from the graph.