

37 HAMILTON ROAD, TWICKENHAM

Phase III Geoenvironmental Investigation

Client
Hamilton Lofts Limited

Agent
Frendcastle Management Ltd

Report No. 3719-2

5 June 2012

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**37 HAMILTON ROAD,
TWICKENHAM**

**Phase III Geoenvironmental
Investigation**

Synopsis

A second phase of investigation has been carried out at 37 Hamilton Road in Twickenham on the instructions of Hamilton Lofts Limited. Technical direction was provided by Consulting Engineers Messrs. Barnard & Associates.

A desk study^[1] and previous preliminary intrusive investigation^[2] of the site has been undertaken and this report should be read in conjunction with these.

The purpose of this investigation was to confirm the ground conditions and to provide recommendations in respect of foundation design and other geotechnical and geoenvironmental matters for the proposed residential development.

Three boreholes and a series of windowless sampler holes were carried out, supported by a program of in situ and laboratory testing.

The results indicate that either pad or piled foundations could be utilised and appropriate preliminary and design data is provided for both options. Chemical analysis has found some contamination at shallow depth and to a lesser extent at depth. It is proposed to use a simple "cover system" for remediation at this site

1

Site description

The site consists of light industrial units, garages and storage with hardstanding in between.

The archive study^[1] contains a detailed description of the site to which the reader is referred.

In addition, the site plan is reproduced at Figure 1 of Appendix E to illustrate the general layout of the site.

2

Development proposals

The proposed development comprises the refurbishment of the existing main building and its division into flats and the construction of low rise residential houses to replace the units along the eastern boundary.

The main building will utilize a combination of existing/ retained foundations and new footings as shown at Figure 2 of Appendix E, which also shows the proposed layout.

3

Geology

Published records of the British Geological Survey indicated the site to lie on Langley Silt overlying Kempton Park Gravel with the solid geology comprising London Clay.

4

Field work

The extent of the field work was agreed with the Clients representative and comprised three boreholes drilled by light percussive techniques to a maximum depth of 20.45 m. In addition a series of continuous open drive windowless sampler holes were carried out. Specifically around contamination previously found in the first phase of investigation and the existing underground fuel storage tank (UST). The locations undertaken are all those that can be safely undertaken due to the large number of existing live underground services at this site, with WSD and F not being possible. The borehole locations are shown on Figure 1 of Appendix E.

Representative soil and water samples were recovered from the borehole for subsequent laboratory examination and testing; whilst Standard Penetration Tests (SPT) were carried out as appropriate. Details of the strata encountered are provided on the Borehole Records at Appendix A; together with particulars of the samples recovered, groundwater observations and SPT results. A profile of the SPT data against depth is provided at Figure 3 of Appendix E.

Standpipes were installed in three of the holes for subsequent monitoring groundwater and ground gas levels. In addition purged water samples were recovered for laboratory testing. Groundwater and ground gas monitoring results are provided at Appendix C.

In situ California Bearing Ratio (CBR) tests were undertaken at shallow depth in five locations the results of this testing is provided at Appendix B.

5

Laboratory testing

The following laboratory tests were conducted on samples recovered during the field work:-

- Natural moisture content and organic content: to assess the in situ condition of the soil.
- Liquid and Plastic Limits: to classify cohesive soil into behavioural groups
- Particle size distribution by sieve analysis to classify granular material.
- Soluble sulphate concentration and pH value: for the specification of buried concrete.
- Triaxial compression and consolidation tests on undisturbed samples.
- Contaminants as defined by the desk study and previous phase of works^[1,2]:-

Arsenic, cadmium, chromium, lead, mercury, selenium, copper, nickel, zinc,

Total monohydric phenols

Speciated total petroleum hydrocarbons (TPH)

Speciated Polyaromatic hydrocarbons (PAH)

Polychlorinated Byphenols (PCB)

Volatile Organic Compounds (VOC)

Semi Volatile Organic Compounds (SVOC)

Asbestos Presence

Results of these tests are presented at Appendix D. The variation of shear strength with depth is shown on Figure 4 at Appendix E.

6

Ground conditions

6.1

Stratigraphy

The stratigraphy of the site as revealed by the investigation is described in detail at Appendix A and in general terms hereafter.

6.1.1

Made Ground

Underlying the hardstanding Made Ground was found at all locations and was highly variable from a brick rubble through a sandy gravel and also a sandy clay with gravel. Various amounts of man made detritus were found in the Made Ground. Made Ground was proved to between 0.25 and 1.6m thick.

6.1.2

Langley Silt

An layer of brown sandy clay was found in BHC, WSA, E & G and is considered to represent Langley Silt. It was visually assessed to be in a soft occasional firm consistency.

6.1.3

Kempton Park Gravel

Kempton Park Gravel was proved in all exploratory holes. It was generally found to be a brown sandy gravel sometimes clayey at the top and with occasional clay layers within. Some of the windowless sampler holes were terminated in this material, although those of sufficient depth and the boreholes proved it to between 4.3 & 5.3m depth. A hydrocarbon odour was only noted in WSG from 2.2 to 2.35m depth.

6.1.4

London Clay

London Clay lay beneath the Kempton Park Gravel and was proved to the limit of investigation. It initially comprised a brown silty clay with some grey laminations and orange brown sandy silt pockets. This is considered to represent the weathered London Clay and was encountered at the contact with the overlying gravel. A fissured dark grey silty clay with some sand lenses, consistent with the unweathered part of the formation, was then encountered.

The clay was visually assessed to be in a stiff condition becoming very stiff with depth, which was confirmed by laboratory testing.

6.2

Groundwater

Groundwater was encountered at some 3m depth within the Kempton Park Gravel. Details of all groundwater observations are provided on the appropriate Borehole Records at Appendix A.

Subsequent monitoring of the standpipes installed in the borehole found groundwater to be at some 2¾m depth.

7

Discussion

7.1

General

The investigation has revealed some fill material to be present. It is possible that other pockets of fill material may also be present; perhaps deeper, of different character or associated with the remains of underground construction; even though not detected by this investigation.

All remains of underground obstructions should be removed prior to redevelopment to enable the new foundations to be constructed without hindrance and to perform satisfactorily.

The ground conditions encountered in the boreholes at shallow depth are not suitable for the construction of spread foundations; due to the soft and variable in nature of the Langley Silt. However, the depth to Kempton Park Gravel is such that foundation can be constructed on this material.

7.2

Spread foundations

The ground conditions encountered comprised Made Ground overlying Langley Silt and Kempton Park Gravel. Made Ground is inherently variable in both composition and compaction and cannot be recommended for foundations. The impersistent nature of the Langley Silt also makes it unsuitable for use as a bearing strata. However, the Kempton Park Gravel was found at depth acceptable to conventional foundation construction. A minimum foundation depth of 0.8m is recommended increasing to 2.1m where the Made Ground and or Langley Silt is thicker. These depths allow for a minimum penetration in the gravel of 200mm beneath the Langley Silt/ Made Ground to allow for possible disturbance at the contact.

A net allowable bearing capacity of 225 kPa is recommended for square pad foundations up to 2.5m side of strip footing up to 1.2m width.

It may theoretically be possible to use narrow strip footings or small pads to carry light structural loads. However, we recommend that a minimum width of 0.6m be employed for strip footings and a minimum side of 0.9m for pad foundations to minimise the risk of overstress of any locally weaker material.

The total settlement of spread foundations acting at the allowable bearing capacity and maximum anticipated size is unlikely to exceed some 15mm. Differential settlement between adjacent footings of similar size, geometry and loading is not expected to exceed approximately half the total.

It should be noted that the main building will comprise a combination of existing and new foundations with the existing structure. Settlement of the existing foundations will be long since complete and the new foundations will inevitably undergo settlement. Therefore this may cause structural distress to the building. It should be ensured that the building and withstand this variations in settlements. If this is not possible underpinning of the existing/retained foundations may be required. Piled foundations may also be required support the new foundations. As with spread foundation it should be ensured that the existing structure can within stand any differential settlements, preliminary discussions with respect to piled foundation at provided at Section 7.3.

7.3

Piled foundations

Either driven or bored piles would be suitable in the ground conditions encountered at this site. However, compared with bored piling, construction of driven piles generates greater noise and vibration which may not be acceptable in this environment. In particular, high levels of ground - borne vibrations could damage nearby structures. Consideration of the various advantages and disadvantages of the different pile types suggests CFA piles to be preferred. They avoid many of the installation difficulties that would otherwise be experienced; particularly the need for casing through the fill and gravels and the need to control groundwater inflows. Piles constructed by CFA are therefore recommended and parameters for their preliminary design are provided in Tables 1 and 2.

Table 1: Preliminary design parameters for CFA piles - Shaft friction

Stratum	Typical depth, m	Ultimate unit shaft friction
All material	0.0 - 2.0	Ignore
Kempton Park Gravel	2.0- 5.0	Increases linearly from 20 to 45 kPa
London Clay	5.0 - 20.0	Increases linearly from 55 to 110 kPa

It is assumed that no shaft friction (either positive or negative) will be generated in the Made Ground.

Table 2: Preliminary design parameters for CFA piles - End bearing capacity

Stratum	Typical depth, m	Ultimate unit end bearing capacity
London Clay	5.0 - 20.0	Increases linearly from 825 to 1650 kPa

It is assumed that no shaft friction, either positive or negative will be generated within the Made Ground. An adhesion factor of 0.6 between the London Clay and the pile was used to derive the shaft friction values given in Table 1. For the River Terrace Gravel, a value of 1.0 is assumed for the coefficient of earth pressure at rest (K_0) as the gravel is assumed to be slightly over-consolidated. The ratio between the lateral earth pressure (K_s) and K_0 is taken as 0.9 for bored piles. For CFA piles the angle of friction between pile shaft and soil is assumed to be equal to the angle of internal friction of the soil itself (ϕ'), because the construction method produces relatively little disturbance of the gravel.

Factors of safety must be applied to the ultimate loads calculated from Tables 1 & 2. A value of 3.0 is recommended for both shaft friction and end bearing unless successful pile load tests confirm a lower value to be appropriate.

Based on the information obtained a typical CFA pile of 300 mm diameter, bored to 12 m depth, will have an allowable load capacity of approximately 210 kN. allowing a factor of safety of 3.0. Settlement at the toe of a single pile is not expected to exceed some 3 - 5 mm since the working load will be carried wholly in shaft friction.

Evidently it would be possible to utilise other pile types and different geometries. Further advice could be given on the load capacity for any other configuration which may be under consideration.

The actual load capacity achieved in practice depends upon the precise installation procedures. Advice should therefore be sought from specialist contractors to verify the load capacity and settlement characteristics of their particular piles in the ground conditions revealed by this investigation.

7.4

Ground floor slabs

As stated in Section 7.2, Made Ground will not form a reliable bearing stratum and is prone to large and unpredictable settlement. Therefore suspended ground floor construction should be adopted.

7.5

Excavations

The Made Ground and the River Terrace Gravel should be regarded as inherently unstable and will undermine the potentially stable Langley Silt. Some apparent stability may be present immediately on excavation, but this must not be relied upon. All excavations should therefore be supported at all times unless battered to a safe angle of repose. Provision of adequate support to ensure stability is especially important for the safety of personnel when required to work in or close to excavations. It should be ensured that neighboring structures (roads or buildings) do not suffer any loss of support from nearby excavations.

Temporary and permanent works should be designed to resist the additional lateral earth pressures arising from superimposed loads in addition to those generated by the soil itself without significant deformation.

Groundwater observations during the investigation indicated that water is expected to be below the depth of expected constriction activities.

7.6

Access roads and parking areas

Five California Bearing Ratio (CBR) tests were undertaken at shallow depth on the Made Ground. The results of these tests are presented in Appendix B and indicate values of 1.0 to 4.0%

It is recommended that flexible construction techniques such as block paving or wholly bituminous materials are employed due to the variation in CBR value and the likelihood of post-construction movement. This type of construction is better able to accommodate movement and can be more easily realigned should deformations become unacceptable. After treatment as described above, a design CBR value of 1½% should be adopted.

7.7

Contamination

7.7.1

Solid phase

Contaminant testing was undertaken on selected soil samples and the results compared with the limited number of CLEA^[3] Soil Guideline Values (SGVs) that have been published to date. Where available analytes have been compared to Generic Assessment Criteria (GAC) compiled by Land Quality Management (LQM) and the Chartered Institute of Environmental Health (CIEH)^[4]. Considering the proposed end use of the site the most applicable SGV for comparison is considered to be a residential land use. The appropriate values are given in with the results in Appendix D.

In all the samples tested for metals the SGV was not exceeded for the proposed use.

Samples were tested for hydrocarbons being, Polyaromatic Hydrocarbons (PAH) and Total Petroleum Hydrocarbons (TPH). Laboratory testing was undertaken for TPH, banded hydrocarbons and speciated petroleum hydrocarbons. The vast majority of the results were found to be below the detection limits, however exceedances were found for some determinands within the PAH suite, especially Benzo (a) Pyrene at a number of locations.

Phenols were not detected above the limit of detection for the test in any sample as were the samples analysed for volatile and semi volatile organic compounds (VOC & SVOC)

No asbestos fibers were detected.

Based on the detected concentrations there is not considered to be any significant risk from soil concentration based on the proposed land use where the contamination is covered by buildings or hard standing. As this will block the pathway for contamination in a source -pathway- receptor model. However, where soft landscaping/gardens are to be provided remediation will be required. It is considered that a simple cover system as defined by the NHBC^[5] can be utilized. Based on the levels of contamination encountered in the tests results a capping layer of 505mm thickness will be required of which 175mm of clean imported topsoil will be required. A geotextile break layer should be provided at the base of the capping layer to discourage digging beyond this depth. All material used within the capping layer and in the topsoil should have concentrations of contaminants below the trigger concentrations defined on the existing tests result sheets, apart from B(a)P where the figure must be below 0.6mg/kg.

On completion of the remediation the thickness of capping layer should be confirmed as should the chemical constituents of the capping and topsoil at a rate of 1 sample per garden area of equivalent is recommended. The results used to produce a validation and completion report for the site.

A hydrocarbon odour was noted at some 2.2m depth in WSE. However, the laboratory analysis has found that all the specific fraction of hydrocarbon contamination are below the appropriate trigger levels. WSC, E & G were undertaken around the deep contamination encountered in the first phase of works. These boreholes only encountered the contamination levels to be below trigger concentration as described above and thus remediation is not expected to be warranted.

The other windowless sampler holes were undertaken around the underground tank locations and all results were below detection limits.

As it is not proposed to remove any contamination at this site. It is therefore recommended that all buildings are gas protected to prevent the possibility of nuisance hydrocarbon odours entering the buildings.

Appropriate health and safety precautions, such as detailed in HS(G)66^[6] and elsewhere, must be followed by the construction workforce and others who may come into contact with contaminated soil. These should be agreed with the Health and Safety Executive and are likely to include, but not be restricted to, the following:-

- maintain good standards of personal hygiene.
- wear personal protective clothing that is changed and cleaned frequently to eliminate skin contact.
- prevent ingestion by using washing and changing facilities at all break times.
- not eating, drinking or smoking between break times.
- control the spread of dust and airborne mists to prevent inhalation.

7.7.2

Aqueous phase

Five samples soil were subject to leachate analysis. All the results of leachate analysis were below detection limits. In addition two sets of purged groundwater samples were recovered from each standpipe. All the results were below appropriate trigger concentrations and remediation to protect the groundwater is not expected to be required.

7.7.3

Gas phase

Standpipes were installed in three of the boreholes and three monitoring visits carried out to take readings of flow rate, methane, carbon dioxide, oxygen, atmospheric pressure and groundwater levels. The results are presented at Appendix C.

These show no detectable flow rate, methane emissions or levels of carbon dioxide with slightly depressed oxygen levels. Therefore gas protection should be unnecessary.

7.8

Buried concrete

Laboratory tests yielded a maximum soluble sulphate concentration of 1.36 g/l which results in a Design Sulphate Class^[6] of DS-2 for the site, the equivalent test for water was found to be less onerous.

The groundwater is considered to be mobile and all pH determinations were in excess of 6.5.
Therefore the Aggressive Chemical Environment for Concrete, ACEC, is classed as AC-2.

Adrian Smith
AP GEOTECHNICS LTD.
5th June 2011

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PROCEDURAL NOTES for GROUND INVESTIGATIONS

General

This report is based upon data obtained from field descriptions of the strata and examination of the samples by an engineer, together with the results of in situ and laboratory tests as appropriate. Responsibility cannot be accepted for variations in ground conditions between and around any of the exploratory points that is not revealed by the data. Whilst the report may offer an opinion on the ground conditions between exploratory points and below the depth of investigation, this is for guidance only and no liability is accepted for its accuracy.

Drilling procedure

Boring by light cable percussion drilling allows the ground conditions to be reasonably well established. However, a certain amount of disturbance is inevitable and some mixing of soils can occur.

Sampling procedure

"Undisturbed" samples of predominantly cohesive soils are taken with a 100mm diameter open tube sampler, generally in accordance with BS 5930: 1999.

Where appropriate, or where an undisturbed sample is unsuccessful, disturbed samples are recovered and sealed into polythene bags.

Groundwater samples are taken when water is encountered in sufficient quantity.

Standard penetration tests

The test is conducted generally in accordance with BS 1377: Part 9: 1990. The sampler tube is subject to a seating drive of 150mm into the soil at the base of the borehole. Results are given on the Borehole Records as the number of blows required to drive the sampler tube a further 300mm and this is known as the "N" value. Where the driving resistance is such that full penetration is not achieved, the test is generally terminated after 50 blows and the actual distance penetrated is recorded.

Groundwater

Groundwater observations necessarily reflect the conditions encountered at the time of the exploratory work. Long term monitoring of standpipes is usually required to establish an equilibrium water level since the normal rate of boring is too fast to permit steady state conditions to be achieved.

Groundwater levels are subject to variations caused by changes in drainage conditions and seasonal climatic changes.

Water may necessarily be added to advance the bore whilst casing may be required to maintain an open hole. These can both mask subsequent groundwater observations and are therefore noted on the individual Borehole Record.

APPENDICES

A Borehole Records

Symbols and Abbreviations
Borehole Records

B Standpipe Records

Gas Emissions and Water Levels

C Laboratory Test Results

Summary of Geotechnical Tests
Contaminants in Soil
Contaminants in Leachate
Contaminants in Water

D Figures

Figure 1 Site Plan
Figure 2 Proposed Site Plan
Figure 3 SPT Profile
Figure 4 Shear Strength Profile

APPENDIX A

BOREHOLE RECORDS

SYMBOLS and ABBREVIATIONS

Samples

Undisturbed

- U Standard open drive "undisturbed"
102mm dia. in boreholes
38mm dia. in trial pits, window sampler
and hand auger
- T Thin wall open drive
- P Piston
- C CBR mould

Disturbed

- D Small
- B Bulk
- C Contaminants: plastic tub
- J brown glass jar
- W Water

In situ tests

- SPT Standard Penetration Test, open shoe
- CPT solid cone
- N value is number of blows for 300mm penetration.
- Blow count also given as seating drive followed by four increments of 75mm.

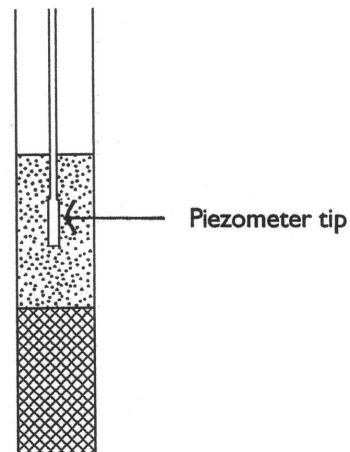
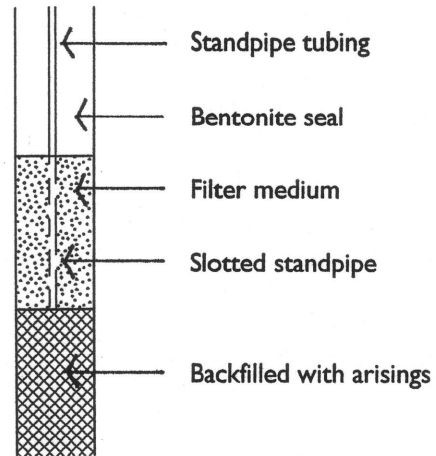
- V () Vane test (c_u kPa)
- P () Hand penetrometer (c_u kg/cm²)
- M () Mexe probe (CBR %)

Water records

- ∇₁ Standing level
- ∇₁ Depth encountered

suffix identifies separate strikes

Standpipes



Boring Method Cable Percussion	Casing Diameter 150mm cased to 5.80m	Ground Level (mOD)	Client Hamilton Lofts Ltd	Job Number 3719
	Location See Site Plan	Dates 06/02/2012- 08/02/2012	Engineer Frendcastle Management Limited	Sheet 1/3

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10	J1					0.10	CONCRETE		
0.25	J2					0.10 - 0.15	MADE GROUND: Hardcore, brick fragments and flint gravel in a light grey sandy matrix		
0.50	J3					0.15 - 0.20	MADE GROUND: Earthenware, concrete and brick fragments within a black sandy matrix of ash		
1.00-1.45	SPT N=14 B4	1.00	DRY	4,6/3,4,4,3		0.20 - 0.45	MADE GROUND: Earthenware, glass and brick fragments ...75mm clay pipe at 0.35m within a brown fine sand matrix		
2.00-2.32	SPT 42/170 B5	2.00	1.70	6,15/19,23		1.10 - 1.55	Dense brown medium SAND and GRAVEL of medium to coarse rounded to angular flint		
3.00-3.45	SPT N=39 B6	3.00	2.70	3,6/12,9,7,11		(3.75)			
4.00-4.45	SPT N=28 B7	4.00	3.40	6,7/8,7,7,6					
5.00-5.45	SPT(C) N=20 B8	5.00	4.20	3,6/7,5,4,4		5.30	Stiff fissured grey CLAY		
6.50-6.95	U9								
6.95	C10								
8.00-8.45	U11	5.80	DRY	30 blows					
8.45	C12								
9.50-9.95	U13	5.80	DRY	30 blows					

Remarks Chiselling from 0.00m to 1.00m for 1.5 hours. Water added from 1.55m to 5.30m.	Scale (approx)	Logged By
	1:50	MM
	Figure No. 3719.BHA	

Boring Method Cable Percussion	Casing Diameter 150mm cased to 5.80m	Ground Level (mOD)	Client Hamilton Lofts Ltd	Job Number 3719
	Location See Site Plan	Dates 06/02/2012-08/02/2012	Engineer Frendcastle Management Limited	Sheet 2/3

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
9.95	C14						Stiff fissured grey CLAY		
11.00-11.45	SPT(C) N=27	5.80	DRY	2,4/4,6,8,9					
12.10-12.25	B15						Mudstone 12.10-12.25m		
12.50-12.95	U16	5.80	DRY	40 blows					
12.95	C17								
14.00-14.45	SPT(C) N=30	5.80	DRY	3,5/6,7,8,9					
15.50-15.95	U18	5.80	DRY	45 blows		(15.15)			
15.95	C19								
17.00-17.45	SPT(C) N=41	5.80	DRY	4,6/8,9,11,13					
18.50-18.95	U20	5.80	DRY	55 blows					
18.95	C21								
20.00-20.45	SPT(C) N=41	5.80	DRY	4,6/7,8,12,14					





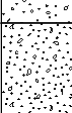
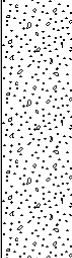
Remarks Chiselling from 12.10m to 12.25m for 0.75 hours.	Scale (approx)	Logged By
	1:50	MM
	Figure No. 3719.BHA	

Boring Method Cable Percussion	Casing Diameter 150mm cased to 5.80m	Ground Level (mOD)	Client Hamilton Lofts Ltd	Job Number 3719
	Location See Site Plan	Dates 06/02/2012- 08/02/2012	Engineer Frendcastle Management Limited	Sheet 3/3

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						(15.15) 20.45	Stiff fissured grey CLAY Complete at 20.45m		

Remarks	Scale (approx) 1:50	Logged By MM
	Figure No. 3719.BHA	

Boring Method Cable Percussion	Casing Diameter 150mm cased to 5.50m	Ground Level (mOD)	Client Hamilton Lofts Ltd	Job Number 3719
	Location See Site Plan	Dates 09/02/2012- 10/02/2012	Engineer Frendcastle Management Limited	Sheet 1/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.65	J1			09/02/2012:DRY 10/02/2012:DRY 10/02/2012:		0.65	CONCRETE		
1.00-1.45 1.00-1.45	SPT N=18 B2	1.00 1.00	DRY DRY	2,3/2,4,5,7		0.95	MADE GROUND: Hardcore, brick and concrete fragments within a red brown sandy matrix with medium flint gravel		
2.00-2.45 2.00-2.45	SPT N=16 B3	2.00 2.00	DRY DRY	4,6/5,3,3,5		1.60 (0.50)	Compact brown slightly clayey SAND and GRAVEL of medium to coarse flint		
2.00-2.45 2.00-2.45	SPT N=16 B3	2.00 2.00	DRY DRY	4,6/5,3,3,5		2.10 (0.70)	Compact brown very clayey silty SAND and GRAVEL of medium to coarse flint		
3.00-3.45 3.00-3.45	SPT N=45 B4	3.00 3.00	DRY DRY	2,4/8,10,13,14		2.80	Dense brown coarse SAND and GRAVEL of fine to medium flint with occasional flint cobbles		
3.60	W7			Water strike(1) at 3.60m, sealed at 5.20m.					
4.00-4.45 4.00-4.45	SPT N=32 B5	4.00 4.00	3.60 DRY	3,5/8,6,9,9		(2.40)			
5.00-5.45 5.00-5.45	SPT N=21 B6	5.00 5.00	3.60 3.60	2,4/7,6,4,4		5.20	Stiff to very stiff fissured brown grey CLAY		
6.00-6.45	U8	5.50	DRY	20 blows					
6.45	C9								
7.50-7.95	U10	5.50	DRY	25 blows					
7.95	C11								
9.00-9.45	U12	5.50	DRY	35 blows					
9.45	C13								













Remarks Chiselling from 0.00m to 1.00m for 2.50 hours. Water added from 3.00m to 4.50m.	Scale (approx)	Logged By
	1:50	MM
	Figure No. 3719.BHB	

Boring Method Cable Percussion	Casing Diameter 150mm cased to 5.50m	Ground Level (mOD)	Client Hamilton Lofts Ltd	Job Number 3719
	Location See Site Plan	Dates 09/02/2012-10/02/2012	Engineer Frendcastle Management Limited	Sheet 2/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
10.50-10.95	SPT(C) N=27	5.50	DRY	2,4/5,6,7,9			Stiff to very stiff fissured brown grey CLAY		
12.00-12.45	U14	5.50	DRY	40 blows					
12.45	C15					(10.25)			
13.50-13.95	SPT(C) N=33	5.50	DRY	2,4/6,8,9,10					
15.00-15.45	U16	5.50	DRY	45 blows					
15.45	C17					15.45			
							Complete at 15.45m		

Remarks	Scale (approx) 1:50	Logged By MM
	Figure No. 3719.BHB	

Boring Method Cable Percussion	Casing Diameter 150mm cased to 5.50m	Ground Level (mOD)	Client Hamilton Lofts Ltd	Job Number 3719
	Location See Site Plan	Dates 13/02/2012- 14/02/2012	Engineer Frendcastle Management Limited	Sheet 1/3

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.15 0.25 0.35	J1 J2 F3			13/02/2012:DRY		(0.05) 0.05 (0.10) 0.15 (0.10) 0.25 (0.10) 0.35 (0.25) 0.60	TARMAC CONCRETE MADE GROUND: Hardcore and brick rubble with flint gravel MADE GROUND: Black crushed clinker Soft brown very silty CLAY		
1.00-1.45 1.00-1.36	SPT(C) N=50 B4	1.00	DRY	8,11/17,16,17			Brown and orange brown slightly clayey medium to coarse SAND and GRAVEL of medium to coarse flint with occasional flint cobbles		
2.00-2.45 2.00-2.45	SPT(C) N=45 B5	2.00	1.70	6,9/11,18,9,7		(3.70)	...brown silt bind 2.6-2.85m		
3.00-3.45 3.00-3.45	SPT(C) N=29 B6	3.00	2.80	3,6/7,7,8,7					
3.80	W12								
4.00-4.45 4.00-4.45	SPT(C) N=24 B7	4.00	3.20	2,4/8,9,3,4		4.30	Stiff becoming very stiff fissured brown grey CLAY		
5.00-5.45	U8								
5.45	C9								
6.50-6.95	SPT(C) N=24	4.80	DRY	2,3/4,6,6,8					
7.50-7.95	SPT(C) N=25	4.80	DRY	2,4/4,5,7,9					
8.00-8.45	U10	4.80	DRY	30 blows					
8.45	C11								

Remarks Chiselling from 0.00m to 1.00m for 1.50 hours. Water added from 1.50m to 4.00m.	Scale (approx)	Logged By
	1:50	MM
	Figure No. 3719.BHC	

Boring Method Cable Percussion	Casing Diameter 150mm cased to 5.50m	Ground Level (mOD)	Client Hamilton Lofts Ltd	Job Number 3719
	Location See Site Plan	Dates 13/02/2012- 14/02/2012	Engineer Frendcastle Management Limited	Sheet 2/3

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
11.00-11.45	U13						Stiff becoming very stiff fissured brown grey CLAY		
11.45	C14								
12.50-12.95	SPT(C) N=28	4.80	DRY	2,4/5,7,7,9					
14.00-14.45	U15	4.80	DRY	40 blows					
14.45	C16								
15.50-15.95	SPT(C) N=36	4.80	DRY	3,4/6,8,10,12		(16.15)			
17.00-17.45	U17	4.80	DRY	45 blows					
17.45	C18								
18.50-18.95	SPT(C) N=45	4.80	DRY	3,6/7,10,12,16					


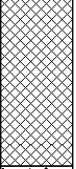
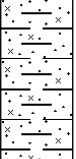
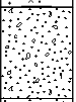
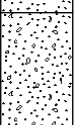
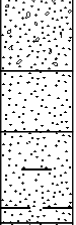
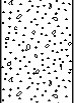

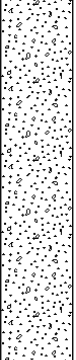
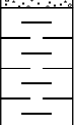
Remarks	Scale (approx) 1:50	Logged By MM
	Figure No. 3719.BHC	

Boring Method Cable Percussion	Casing Diameter 150mm cased to 5.50m	Ground Level (mOD)	Client Hamilton Lofts Ltd	Job Number 3719
	Location See Site Plan	Dates 13/02/2012- 14/02/2012	Engineer Frendcastle Management Limited	Sheet 3/3

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
20.00-20.25	U19	4.80	DRY	50 blows		(16.15)	Stiff becoming very stiff fissured brown grey CLAY	— — —	
20.45	C20					20.45	Complete at 20.45m		



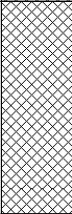






Remarks	Scale (approx) 1:50	Logged By MM
	Figure No. 3719.BHC	

Excavation Method Drive-in Window Sampler	Dimensions	Ground Level (mOD)	Client Hamilton Lofts Ltd	Job Number 3719
	Location See Site Plan	Dates 08/02/2012	Engineer Frendcastle Management Limited	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.00-1.00	L1		90% recovery		(0.10)	TARMAC			
					0.10	MADE GROUND: Concrete and brick fragments within a black and brown clayey sand matrix with flint gravel			
1.00-2.00	L2		90% recovery		(0.55)	Soft brown silty sandy CLAY			
					0.65				
					(0.55)	Brown medium SAND and GRAVEL of fine to medium angular flint			
					1.20				
2.00-3.00	L3		100% recovery		(0.30)	Brown fine SAND			
					1.50				
					(0.05)	Brown medium SAND and GRAVEL of fine to medium angular flint			
					1.55				
3.00-4.00	L4		Water strike(1) at 3.00m. 90% recovery		(0.60)	Brown fine to medium SAND			
					2.15				
					(0.20)	Brown very clayey SAND with occasional flint gravel			
					2.35				
4.00-5.00	L5		90% recovery		(0.30)	Light brown medium SAND and GRVAEL of fine to medium angular flint			
					2.65				
					(1.95)	Stiff brown grey CLAY			
4.60									
					(0.40)				
					5.00				



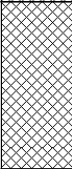
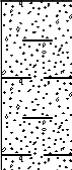


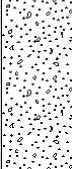
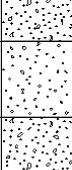
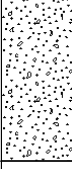
Remarks Standpipe installed at 3.0m, cover Strata lengths approximately where recovery <100%	Scale (approx)	Logged By
	1:25	MM
	Figure No. 3719.WSA	

Excavation Method Drive-in Window Sampler	Dimensions 0.10mm to PRELIMINARY - Driller's description only 0.20mm to Standpipe installed at 3.0m, cover 0.30mm to Logged through mylar liner	Ground Level (mOD) 3.0m, cover liner	Client Hamilton Lofts Ltd	Job Number 3719
	Location See Site Plan	Dates 08/02/2012	Engineer Frendcastle Management Limited	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-1.00	L1		80% recovery		(0.10)	TARMAC		
					0.10	MADE GROUND: Dark brown sandy gravel of medium to coarse angular to rounded flint and brick fragments		
1.00-2.00	L2		70% recovery		(0.60)			
					0.70	MADE GROUND: Red brick fragments		
2.00-3.00	L3		80% recovery		(0.70)			
					1.40	Light brown medium SAND and GRAVEL of fine to medium flint		
3.00-4.00	L4		Water strike(1) at 3.00m. 80% recovery		(0.85)			
					2.25	Brown slightly clayey SAND		
					2.50	Brown sandy CLAY with rare flint gravel		
					2.75	Light brown medium SAND and GRAVEL of fine to medium angular flint		∇1
					(0.75)			
					3.50	Red brown and brown slightly clayey SAND		
					(0.25)			
					3.75	Light brown SAND and GRAVEL of fine to medium flint		
					(0.25)			
					4.00	Complete at 4.00m		









Remarks Borehole collapsed back to 3.0m when casing removed Strata lengths approximately where recovery <100%	Scale (approx)	Logged By
	1:25	MM
	Figure No. 3719.WSB	

Excavation Method Drive-in Window Sampler	Dimensions	Ground Level (mOD)	Client Hamilton Lofts Ltd	Job Number 3719
	Location See Site Plan	Dates 08/02/2012	Engineer Frendcastle Management Limited	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-1.00	L1		90% recovery		(0.20) 0.20	TARMAC		
					(0.65) 0.85	MADE GROUND: Yellow, light brown, black and red brown brick fragments within a brown sand matrix		
1.00-2.00	L2		80% recovery		(0.55) 1.40	MADE GROUND: Concrete and brick fragments within a light brown sand matrix with medium flint gravel		
					(0.90) 2.30	Light brown clayey SAND and GRAVEL of fine to medium rounded to angular flint		
2.00-3.00	L3		80% recovery		(0.65) 2.95	Brown clayey fine SAND with rare rounded flint gravel		
					(0.80) 3.75	Brown fine to medium SAND and GRAVEL of fine to medium angular flint		∇1
3.00-4.00	L4		Water strike(1) at 3.00m. 80% recovery		(0.25) 4.00	Brown sandy GRAVEL of angular medium flint		
					(0.70) 4.70	Brown fine SAND and GRAVEL of fine to medium angular flint		
4.00-5.00	L5		90% recovery		(0.30) 5.00	Soft grey CLAY		

Remarks Borehole collapsed back to 3.0m Strata lengths approximately where recovery <100%	Scale (approx)	Logged By
	1:25	MM
	Figure No. 3719.WSC	

Excavation Method Drive-in Window Sampler	Dimensions	Ground Level (mOD)	Client Hamilton Lofts Ltd	Job Number 3719
	Location See Site Plan	Dates 08/02/2012	Engineer Frendcastle Management Limited	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-1.00	L1		80% recovery		(0.10)	TARMAC		
					0.10	MADE GROUND: Brick fragments in a yellow, red brown and brown sandy clay matrix		
1.00-2.00	L2		80% recovery		(0.35)	MADE GROUND: Flint gravel and clinker fragments within a brown and black sandy clay matrix		
					0.45	Very soft brown silty CLAY		
2.00-3.00	L3		90% recovery		(0.55)	Light brown medium SAND and GRAVEL of fine to medium angular flint		
					1.00	Brown fine to medium SAND		
3.00-4.00	L4		Water strike(1) at 3.00m. 80% recovery		(0.70)	Light brown medium SAND and GRAVEL of fine to medium angular flint		∇1
					1.70	Firm to stiff brown grey CLAY		
4.00-5.00	L5		90% recovery		(1.15)			
					2.85			
					(0.45)			
					3.30			
					(1.30)			
					4.60			
					(0.40)			
					5.00			

Remarks Borehole collapsed back to 3.0m Strata depths approximate where recovery <100%	Scale (approx)	Logged By
	1:25	MM
	Figure No. 3719.WSE	

Excavation Method Drive-in Window Sampler	Dimensions	Ground Level (mOD)	Client Hamilton Lofts Ltd	Job Number 3719
	Location See Site Plan	Dates 08/02/2012	Engineer Frendcastle Management Limited	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.00-1.00	L1		90% recovery		(0.20) 0.20	TARMAC			
					(0.30) 0.10	MADE GROUND: Firm brown clay with flint			
					(0.25) 0.15	MADE GROUND: Black crushed clinker			
					(0.25) 0.10	MADE GROUND: Soft brown and grey brown sandy clay with flint gravel			
1.00-2.00	L2		70% recovery		1.00 (0.90) 0.10	Soft orange brown silty CLAY			
2.00 2.00-3.00	J1 L3		80% recovery		1.90 (0.30) 0.20	Light brown medium SAND and GRAVEL of fine to medium angular flint			
2.30	J2				(0.15) 0.10	Green grey and black clayey SAND emitting a strong hydrocarbonous odour			
2.60	J3				2.35 (0.85) 0.50	Light brown medium SAND and GRAVEL of fine to medium angular flint			
3.00-4.00	L4		Water strike(1) at 3.00m. 90% recovery		3.20 (0.80) 0.40	Orange brown coarse SAND with occasional flint gravel			
					4.00	Complete at 4.00m			

Remarks Standpipe installed at 3.0m, cover Strata lengths approximately where recovery <100%	Scale (approx)	Logged By
	1:25	MM
	Figure No. 3719.WSG	

APPENDIX B

IN SITU CBR TEST RESULTS

CALIFORNIA BEARING RATIO

Project: 37 HAMILTON ROAD, TWICKENHAM
 Client: HAMILTON LOFTS LTD.
 Agent: Frenncastle Management Ltd.

Project No: 3719
 Sheet No: 1/5

Loc'n	Sample	Depth (m)
CBR I		0.5

Description
MADE GROUND: Brick rubble with some sandy clay

Sample Preparation
In situ
Undisturbed
Remoulded
Recompacted
2.5kg
4.5kg

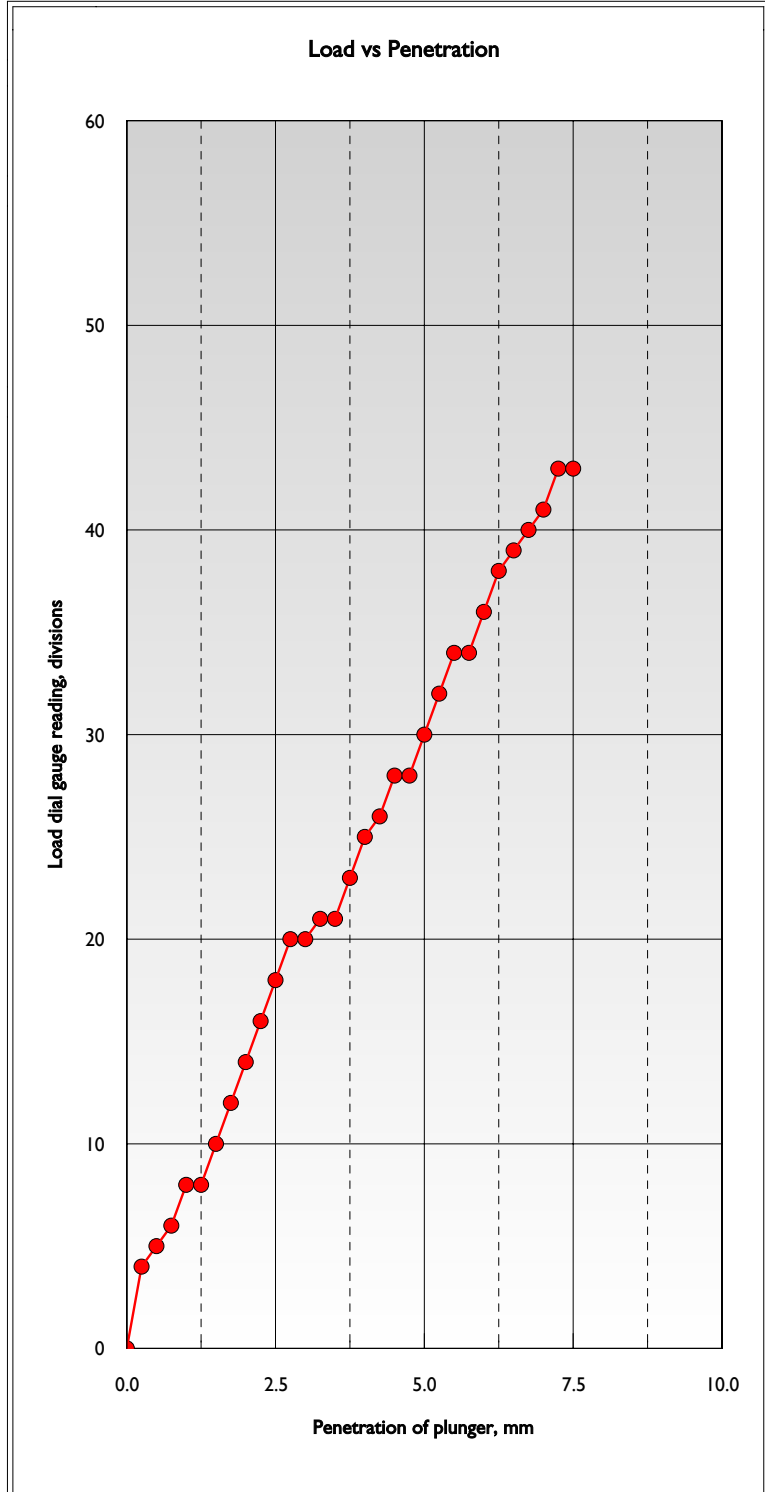
Penetration mm	Load Dial Gauge, div	
	top	bottom
0.00	0	
0.25	4	
0.50	5	
0.75	6	
1.00	8	
1.25	8	
1.50	10	
1.75	12	
2.00	14	
2.25	16	
2.50	18	
2.75	20	
3.00	20	
3.25	21	
3.50	21	
3.75	23	
4.00	25	
4.25	26	
4.50	28	
4.75	28	
5.00	30	
5.25	32	
5.50	34	
5.75	34	
6.00	36	
6.25	38	
6.50	39	
6.75	40	
7.00	41	
7.25	43	
7.50	43	

Surcharge, kg	9
Seating Load, N	50
Proving Ring Factor, N/div	26.327

Particles larger than 20 mm may be present within the test area.

CBR at 2.5mm = (Dial reading x ring factor)/132.4

CBR at 5.0mm = (Dial reading x ring factor)/199.6



Moisture Cont. %	Density, Mg/m ³		% retained at 20mm
	Bulk	Dry	

C B R	Top	Bottom
	3.6	
	4.0	

CALIFORNIA BEARING RATIO

Project: 37 HAMILTON ROAD, TWICKENHAM
 Client: HAMILTON LOFTS LTD.
 Agent: Frenncastle Management Ltd.

Project No: 3719
 Sheet No: 2/5

Loc'n	Sample	Depth (m)
CBR 2		0.5

Description
MADE GROUND: Brick rubble with some sandy clay

Sample Preparation
In situ
Undisturbed
Remoulded
Recompacted
2.5kg
4.5kg

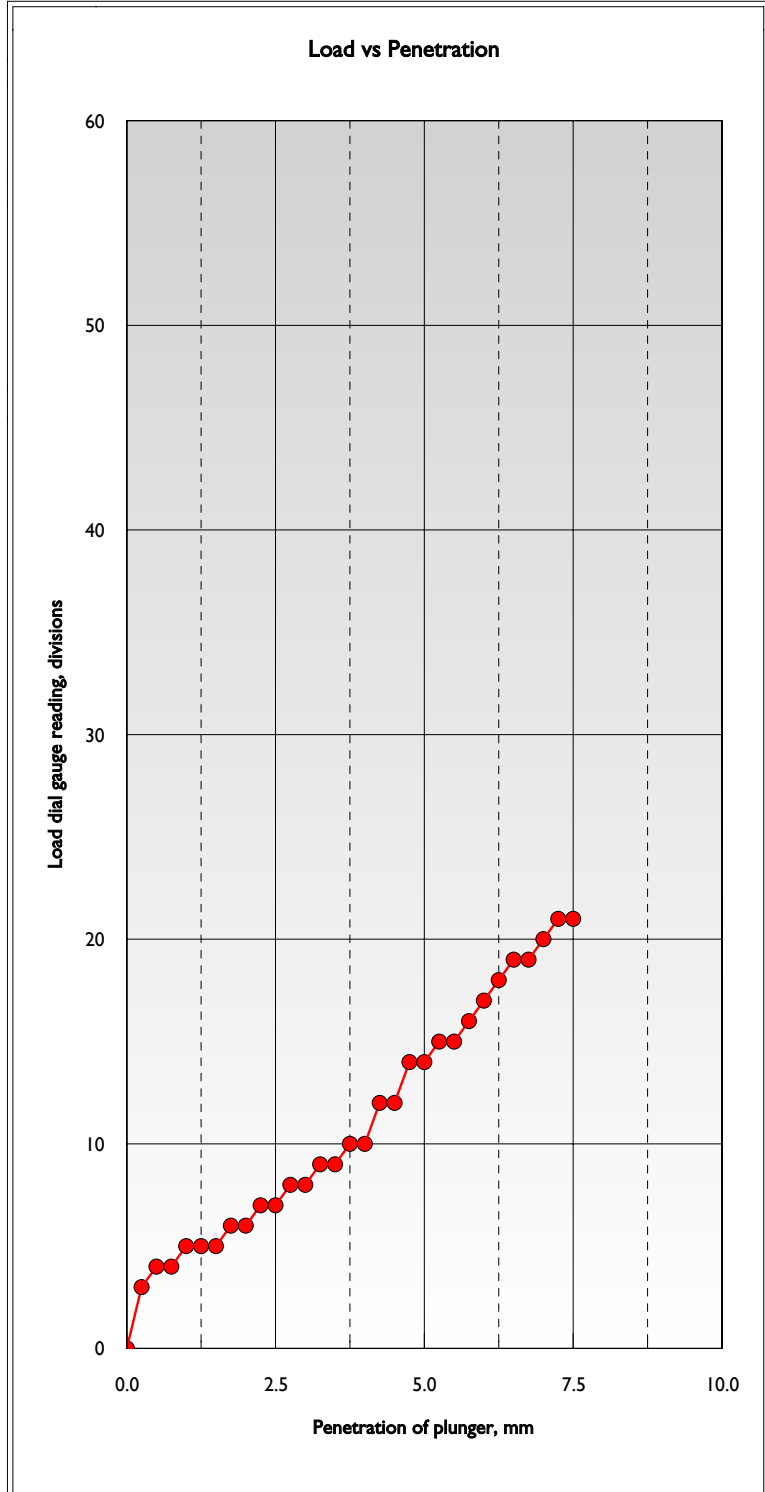
Penetration mm	Load Dial Gauge, div	
	top	bottom
0.00	0	
0.25	3	
0.50	4	
0.75	4	
1.00	5	
1.25	5	
1.50	5	
1.75	6	
2.00	6	
2.25	7	
2.50	7	
2.75	8	
3.00	8	
3.25	9	
3.50	9	
3.75	10	
4.00	10	
4.25	12	
4.50	12	
4.75	14	
5.00	14	
5.25	15	
5.50	15	
5.75	16	
6.00	17	
6.25	18	
6.50	19	
6.75	19	
7.00	20	
7.25	21	
7.50	21	

Surcharge, kg	9
Seating Load, N	50
Proving Ring Factor, N/div	26.327

Particles larger than 20 mm may be present within the test area.

CBR at 2.5mm = (Dial reading x ring factor)/132.4

CBR at 5.0mm = (Dial reading x ring factor)/199.6



Moisture Cont. %	Density, Mg/m ³		% retained at 20mm
	Bulk	Dry	

C B R	Top	Bottom
	1.4	
	1.8	

CALIFORNIA BEARING RATIO

Project: 37 HAMILTON ROAD, TWICKENHAM
 Client: HAMILTON LOFTS LTD.
 Agent: Frenncastle Management Ltd.

Project No: 3719
 Sheet No: 3/5

Loc'n	Sample	Depth (m)
CBR 3		0.5

Description
MADE GROUND: Brick rubble with some sandy clay

Sample Preparation	
In situ	
Undisturbed	
Remoulded	
Recompacted	2.5kg
	4.5kg

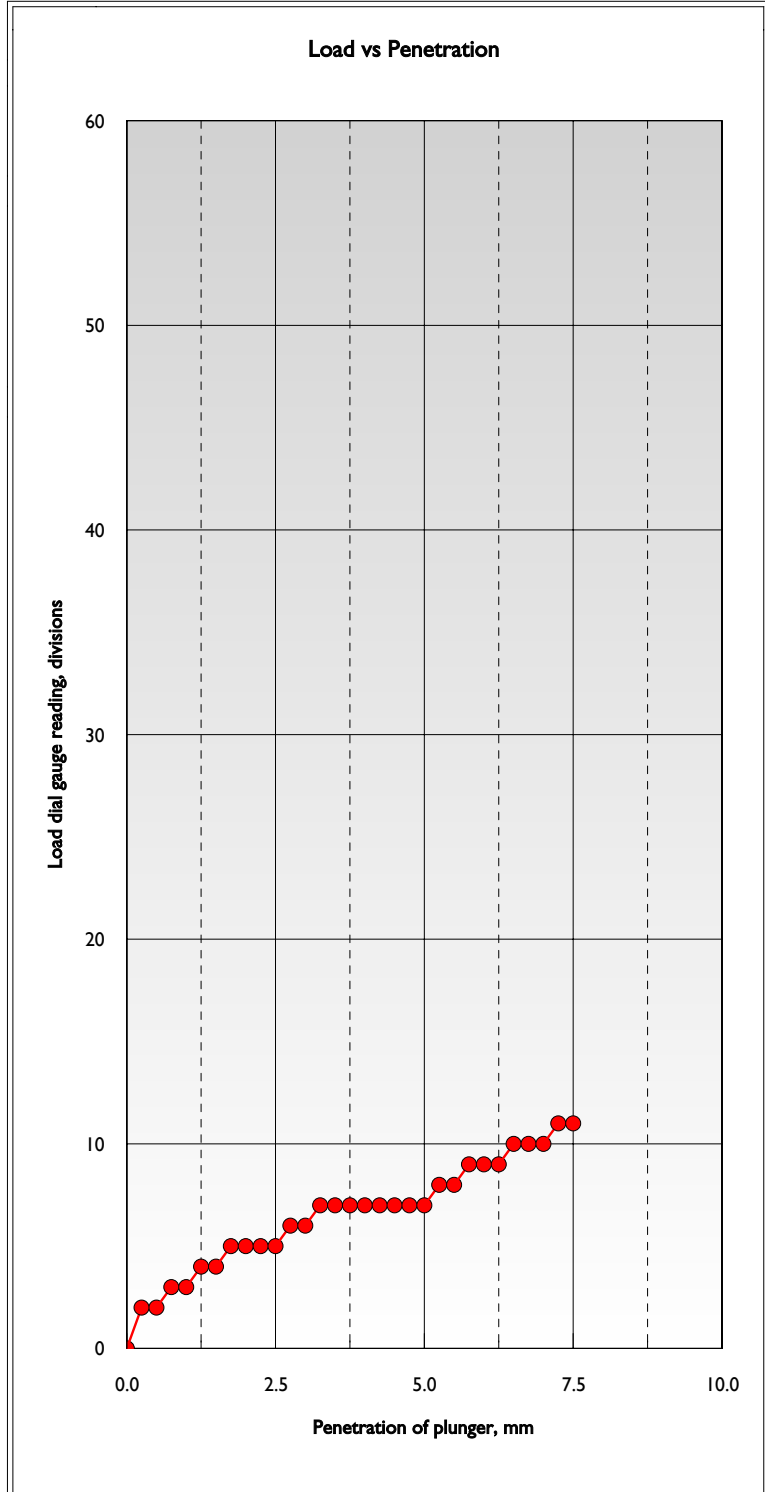
Penetration mm	Load Dial Gauge, div	
	top	bottom
0.00	0	
0.25	2	
0.50	2	
0.75	3	
1.00	3	
1.25	4	
1.50	4	
1.75	5	
2.00	5	
2.25	5	
2.50	5	
2.75	6	
3.00	6	
3.25	7	
3.50	7	
3.75	7	
4.00	7	
4.25	7	
4.50	7	
4.75	7	
5.00	7	
5.25	8	
5.50	8	
5.75	9	
6.00	9	
6.25	9	
6.50	10	
6.75	10	
7.00	10	
7.25	11	
7.50	11	

Surcharge, kg	9
Seating Load, N	50
Proving Ring Factor, N/div	26.327

Particles larger than 20 mm may be present within the test area.

CBR at 2.5mm = (Dial reading x ring factor)/132.4

CBR at 5.0mm = (Dial reading x ring factor)/199.6



Moisture Cont. %	Density, Mg/m ³		% retained at 20mm
	Bulk	Dry	

C B R	Top	Bottom
	1.0	
	0.9	

CALIFORNIA BEARING RATIO

Project: 37 HAMILTON ROAD, TWICKENHAM
 Client: HAMILTON LOFTS LTD.
 Agent: Frenncastle Management Ltd.

Project No: 3719
 Sheet No: 4/5

Loc'n	Sample	Depth (m)
CBR 4		0.5

Description
MADE GROUND: Brick rubble with some sandy clay

Sample Preparation
In situ
Undisturbed
Remoulded
Recompacted
2.5kg
4.5kg

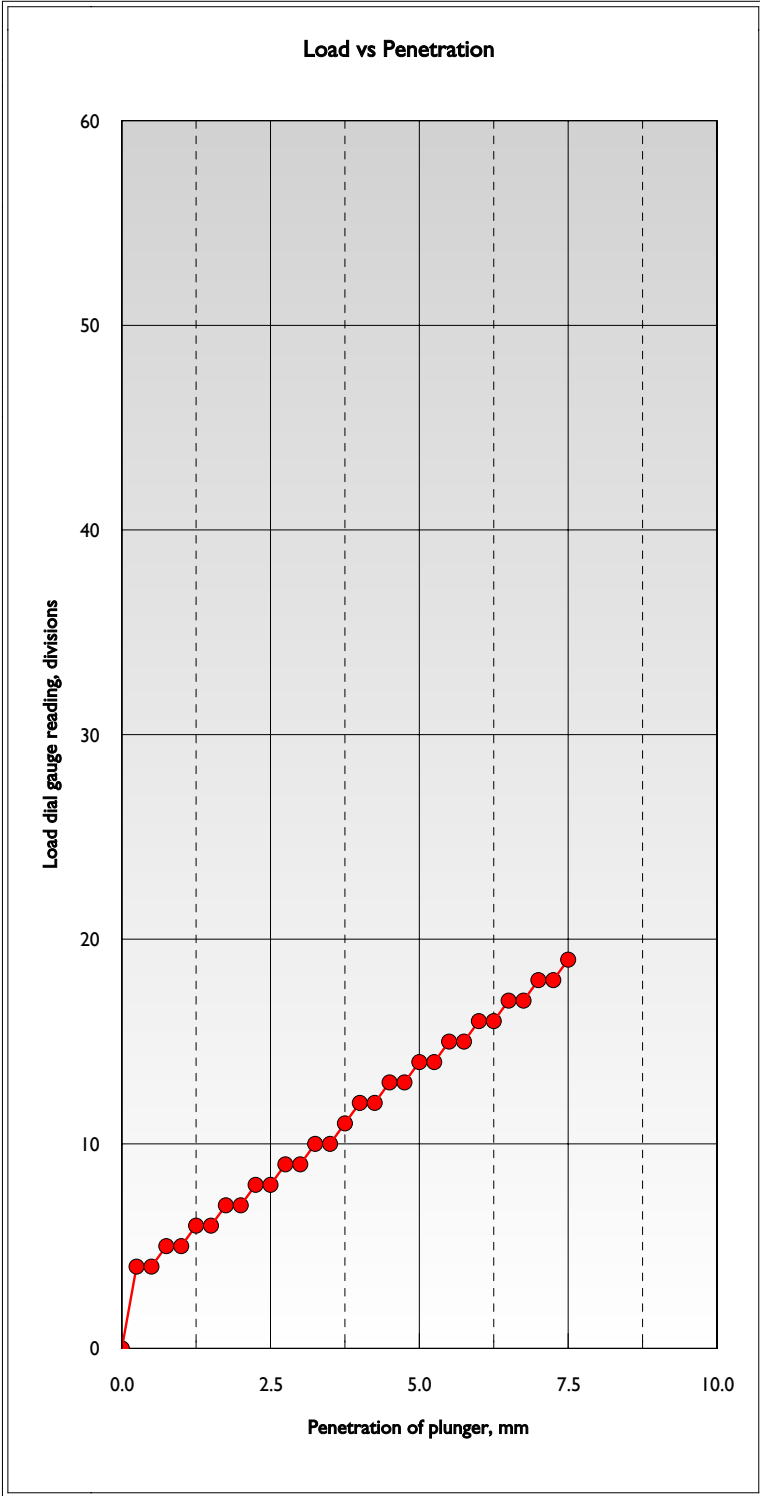
Penetration mm	Load Dial Gauge, div	
	top	bottom
0.00	0	
0.25	4	
0.50	4	
0.75	5	
1.00	5	
1.25	6	
1.50	6	
1.75	7	
2.00	7	
2.25	8	
2.50	8	
2.75	9	
3.00	9	
3.25	10	
3.50	10	
3.75	11	
4.00	12	
4.25	12	
4.50	13	
4.75	13	
5.00	14	
5.25	14	
5.50	15	
5.75	15	
6.00	16	
6.25	16	
6.50	17	
6.75	17	
7.00	18	
7.25	18	
7.50	19	

Surcharge, kg	9
Seating Load, N	50
Proving Ring Factor, N/div	26.327

Particles larger than 20 mm may be present within the test area.

CBR at 2.5mm = (Dial reading x ring factor)/132.4

CBR at 5.0mm = (Dial reading x ring factor)/199.6



Moisture Cont. %	Density, Mg/m ³		% retained at 20mm
	Bulk	Dry	

C B R	Top	Bottom
	1.6	
	1.8	

CALIFORNIA BEARING RATIO

Project: 37 HAMILTON ROAD, TWICKENHAM
 Client: HAMILTON LOFTS LTD.
 Agent: Frenncastle Management Ltd.

Project No: 3719
 Sheet No: 5/5

Loc'n	Sample	Depth (m)
CBR 5		0.5

Description
MADE GROUND: Brick rubble with some sandy clay

Sample Preparation
In situ
Undisturbed
Remoulded
Recompacted
2.5kg
4.5kg

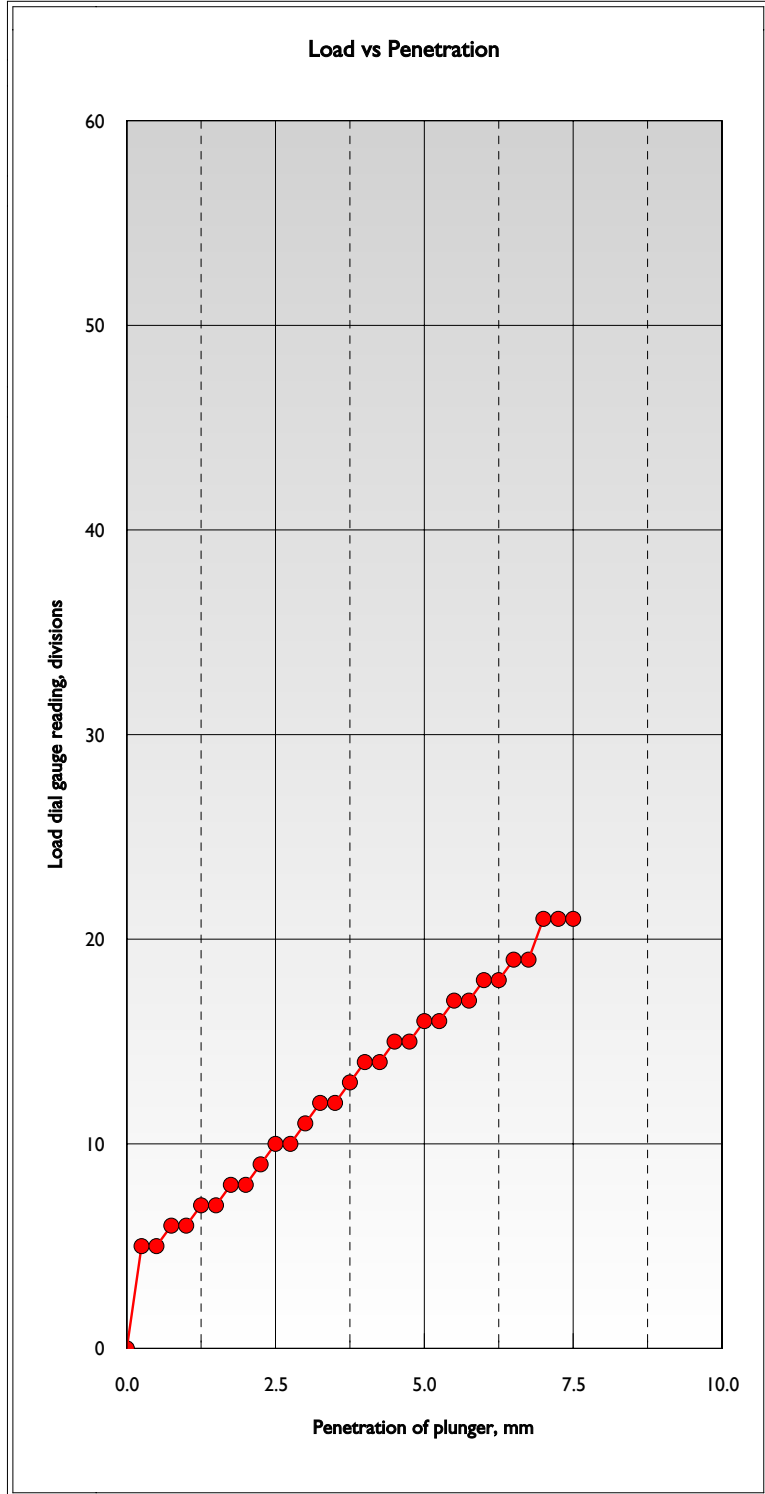
Penetration mm	Load Dial Gauge, div	
	top	bottom
0.00	0	
0.25	5	
0.50	5	
0.75	6	
1.00	6	
1.25	7	
1.50	7	
1.75	8	
2.00	8	
2.25	9	
2.50	10	
2.75	10	
3.00	11	
3.25	12	
3.50	12	
3.75	13	
4.00	14	
4.25	14	
4.50	15	
4.75	15	
5.00	16	
5.25	16	
5.50	17	
5.75	17	
6.00	18	
6.25	18	
6.50	19	
6.75	19	
7.00	21	
7.25	21	
7.50	21	

Surcharge, kg	9
Seating Load, N	50
Proving Ring Factor, N/div	26.327

Particles larger than 20 mm may be present within the test area.

CBR at 2.5mm = (Dial reading x ring factor)/132.4

CBR at 5.0mm = (Dial reading x ring factor)/199.6



Moisture Cont. %	Density, Mg/m ³		% retained at 20mm
	Bulk	Dry	

C B R	Top	Bottom
	2.0	
	2.1	

APPENDIX C

STANDPIPE RECORDS

STANDPIPE RECORDS

GAS EMISSIONS AND WATER LEVELS

Project: 37 HAMILTON ROAD, TWICKENHAM
 Client: HAMILTON LOFTS LTD.
 Agent: Frenncastle Management Ltd.

Project No: 3719
 Sheet No: 1/1

Date		Measurement	Units	Location							
07/03/2012				BH A		WS A		WS G			
Weather conditions				Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady
Temp. °C	16	Flow rate	l/hr	0.0	0.0	0.0	0.0	0.0	0.0		
Atmos. mb	1028	Methane	%	0.0	0.0	0.0	0.0	0.0	0.0		
		Carbon dioxide	%	0.0	0.0	0.0	0.0	0.0	0.0		
Cloud	10%	Carbon monoxide	ppm	0	0	0	0	0	0		
Sun	90%	Hydrogen sulphide	ppm	0	0	0	0	0	0		
Rainfall	nil	Oxygen	%	19.7	19.5	19.5	19.2	19.6	19.6		
		Water level	m bgl	2.76		2.82		2.73			

Date		Measurement	Units	Location							
21/03/2012				BH A		WS A		WS G			
Weather conditions				Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady
Temp. °C	6	Flow rate	l/hr	0.0	0.0	0.0	0.0	0.0	0.0		
Atmos. mb	998	Methane	%	0.0	0.0	0.0	0.0	0.0	0.0		
		Carbon dioxide	%	0.0	0.0	0.0	0.0	0.0	0.0		
Cloud	70%	Carbon monoxide	ppm	0	0	0	0	0	0		
Sun	30%	Hydrogen sulphide	ppm	0	0	0	0	0	0		
Rainfall	nil	Oxygen	%	19.8	19.6	19.9	19.7	19.6	19.5		
		Water level	m bgl	2.77		2.83		2.81			

Date		Measurement	Units	Location							
11/04/2012				BH A		WS A		WS G			
Weather conditions				Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady
Temp. °C	9	Flow rate	l/hr	0.0	0.0	0.0	0.0	0.0	0.0		
Atmos. mb	1005	Methane	%	0.0	0.0	0.0	0.0	0.0	0.0		
		Carbon dioxide	%	0.0	0.0	0.0	0.0	0.0	0.0		
Cloud	10%	Carbon monoxide	ppm	0	0	0	0	0	0		
Sun	90%	Hydrogen sulphide	ppm	0	0	0	0	0	0		
Rainfall	nil	Oxygen	%	19.7	19.5	19.5	19.2	19.6	19.6		
		Water level	m bgl	2.75		2.79		2.72			

Date		Measurement	Units	Location							
				BH A		WS A		WS G			
Weather conditions				Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady
Temp. °C		Flow rate	l/hr								
Atmos. mb		Methane	%								
		Carbon dioxide	%								
Cloud		Carbon monoxide	ppm								
Sun		Hydrogen sulphide	ppm								
Rainfall		Oxygen	%								
		Water level	m bgl								

Readings taken with GA 2000 manufactured by Geotechnical Instruments Ltd.

APPENDIX D

LABORATORY TEST RESULTS

SUMMARY OF GEOTECHNICAL TESTS

Project: 37 HAMILTON ROAD, TWICKENHAM
Client: HAMILTON LOFTS LTD.
Agent: Frenccastle Management Ltd.

Project No: 3114
Sheet No: 1/2

Location	Sample No	Depth m	Description	CLASSIFICATION				TRIAXIAL COMPRESSION - TOTAL STRESS				CHEMICAL															
				Natural Moisture Content %	Liquid Limit %	Plastic Limit %	Plast Index %	Passing 425µm %	Mod. Plast. Index %	Class	Type	Moisture Content %	Bulk Density Mg/m ³	Radial Stress kPa	Deviator Stress kPa	Cohesion cu, kPa assuming Øu = 0	Cohesion cu, kPa Øu, deg	Water g/l	Soil (Sol) g/l	pH							
BHA	J3	0.50	MADE GROUND: Brick rubble																								
	U9	6.50	Stiff fissured dark grey silty CLAY with some brown mottling																								
	U11	8.00	Stiff fissured dark grey silty CLAY with some brown mottling																								
	U16	12.50	Very stiff fissured dark grey silty CLAY with some brown mottling																								
	U20	18.50	Very stiff fissured dark grey silty CLAY with some brown mottling																								
BHB	B2	1.00	MADE GROUND: Hardcore with some sandy clay and gravel																								
	W7	3.60	Groundwater																								
	U8	6.00	Stiff brown grey fissured silty CLAY																								
	U10	7.50	Very stiff fissured brown grey silty CLAY																								

Note: Soil Classification based upon unmodified Plasticity Index

SUMMARY OF GEOTECHNICAL TESTS

Project: 37 HAMILTON ROAD, TWICKENHAM
Client: HAMILTON LOFTS LTD.
Agent: Frenccastle Management Ltd.

Project No: 3114
Sheet No: 2/2

Location	Sample No	Depth m	Description	CLASSIFICATION					TRIAXIAL COMPRESSION - TOTAL STRESS					CHEMICAL								
				Natural Moisture Content %	Liquid Limit %	Plastic Limit %	Plast Index %	Passing 425µm %	Mod. Plast. Index %	Class	Type	Moisture Content %	Bulk Density Mg/m ³	Radial Stress kPa	Deviator Stress kPa	Cohesion cu, kPa assuming Øu = 0	Cohesion Øu, deg	Water g/l	Soil (Sol) g/l	pH		
BHB	U14	12.00	Very stiff fissured brown grey silty CLAY									UU 102	28	2.01	240	302	151					
	U16	15.00	Very stiff fissured brown grey silty CLAY									UU 102	29	2.02	300	298	149			0.36	7.21	
BHC	F3	0.35	Soft brown very silty CLAY	32	48	21	27	96	28													
	U8	5.00	Stiff fissured brown grey silty CLAY									UU 102	30	1.96	100	216	108			0.86	7.16	
	U10	8.00	Stiff fissured brown grey silty CLAY									UU 102	29	1.98	160	202	101					
	U13	11.00	Stiff fissured brown grey silty CLAY									UU 102	28	1.99	220	236	118			0.32	7.11	
	U15	14.00	Stiff fissured brown grey silty CLAY									UU 102	28	2.02	280	244	122					
	U17	17.00	Very stiff fissured brown grey silty CLAY									UU 102	28	2.04	340	352	176			0.18	7.05	
	U19	20.00	Very stiff fissured brown grey silty CLAY									UU 102	28	2.03	400	424	212					

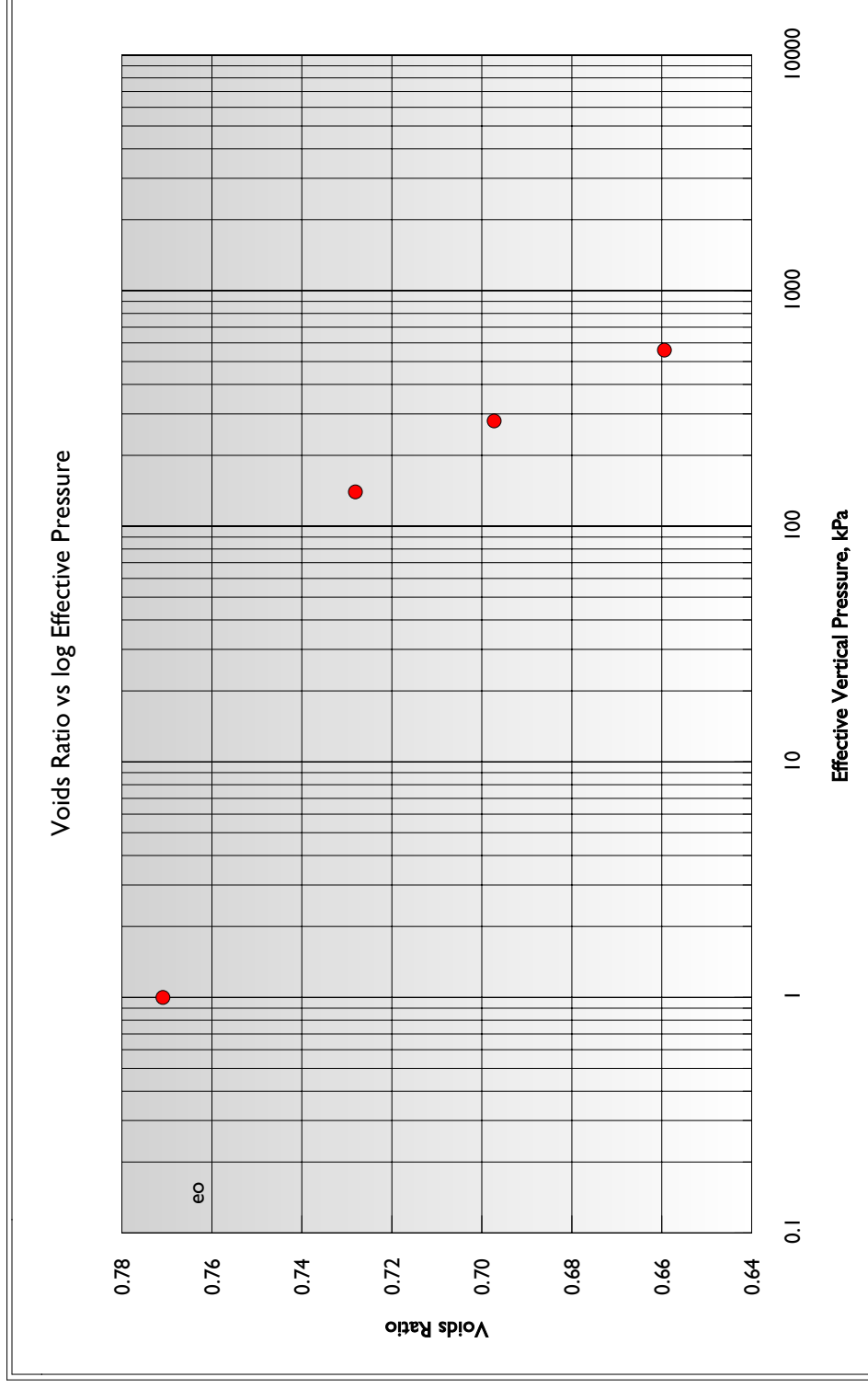
Note: Soil Classification based upon unmodified Plasticity Index

ONE - DIMENSIONAL CONSOLIDATION TEST

Project: 37 HAMILTON ROAD, TWICKENHAM
 Client: HAMILTON LOFTS LTD.

Project No: 3719
 Sheet No. 1/3

Borehole	Sample	Depth, m		
A	U9	6.50		
Description				
Stiff orange brown silty CLAY with occasional fine sand horizons				
Specific Gravity	Moisture Cont. %	Dry Density Mg/m ³		
2.730 measured	start 25 finish 23	1.542		
Pressure kPa	Coefficient of Consolidation m ² /year	Coefficient of Compressibility m ² /MN		
0	0.522	0.173		
140	0.450	0.128		
280	0.310	0.080		
560	0.295	0.086		

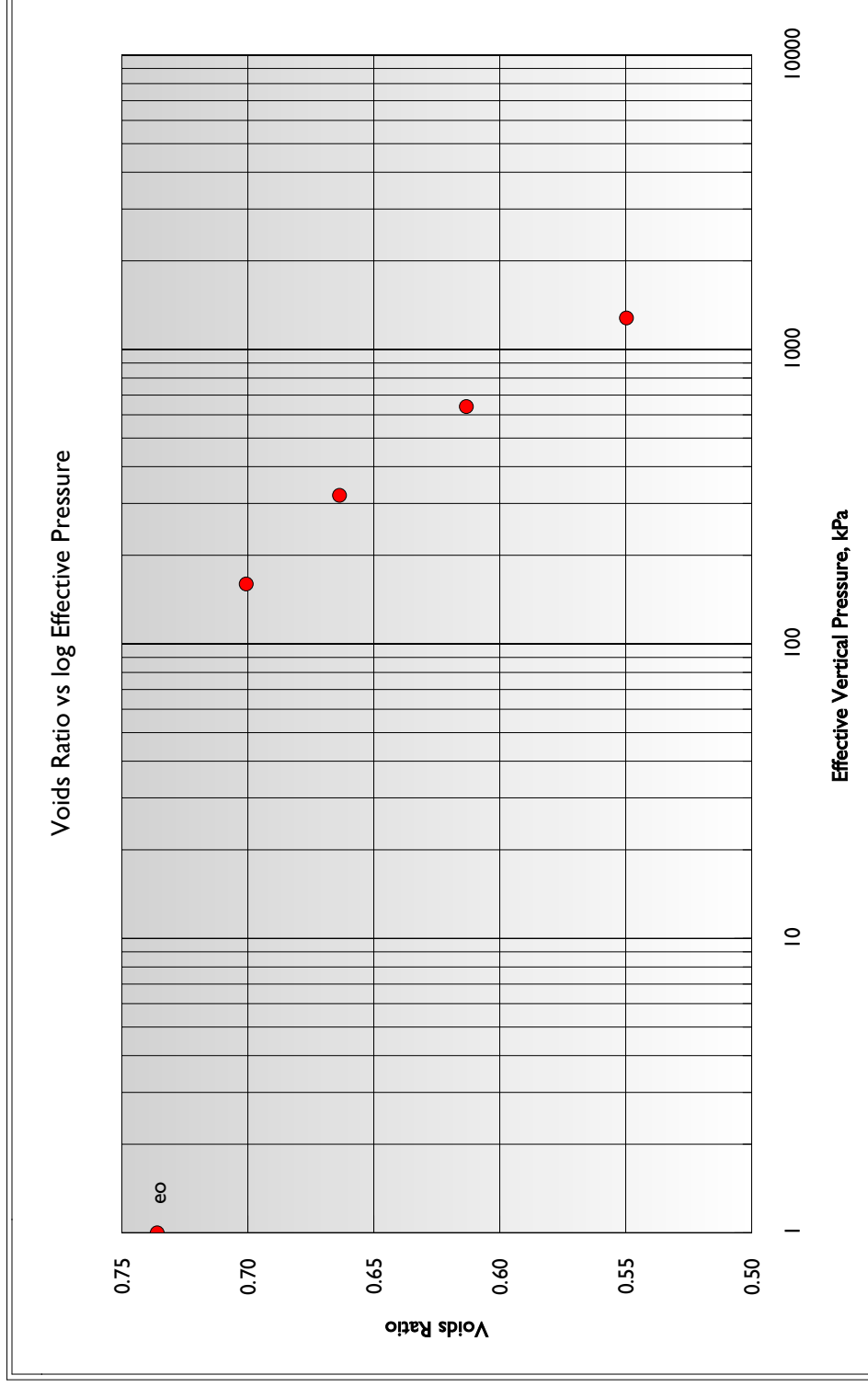


ONE - DIMENSIONAL CONSOLIDATION TEST

Project: 37 HAMILTON ROAD, TWICKENHAM
 Client: HAMILTON LOFTS LTD.

Project No: 3719
 Sheet No. 2/3

Borehole	Sample	Depth, m		
B	U8	6.00		
Description				
Stiff orange brown silty CLAY with occasional fine sand horizons				
Specific Gravity	Moisture Cont. %	Dry Density Mg/m ³		
2.730 measured	start 24 finish 22	1.573		
Pressure kPa	Coefficient of Consolidation m ² /year	Coefficient of Compressibility m ² /MN		
0	0.522	0.127		
160	0.450	0.136		
320	0.310	0.095		
640	0.295	0.062		
1280				

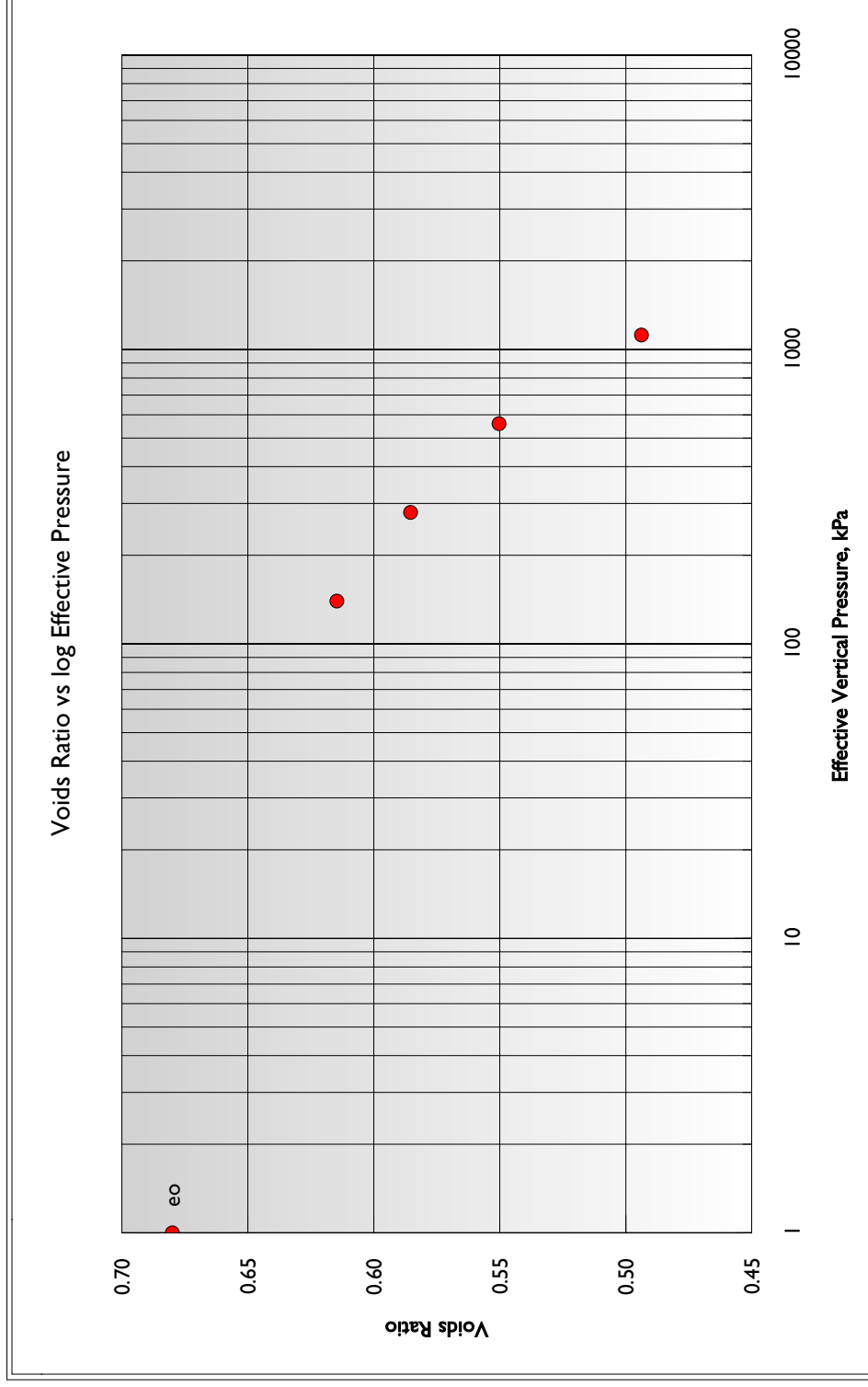


ONE - DIMENSIONAL CONSOLIDATION TEST

Project: 37 HAMILTON ROAD, TWICKENHAM
 Client: HAMILTON LOFTS LTD.

Project No: 3719
 Sheet No. 3/3

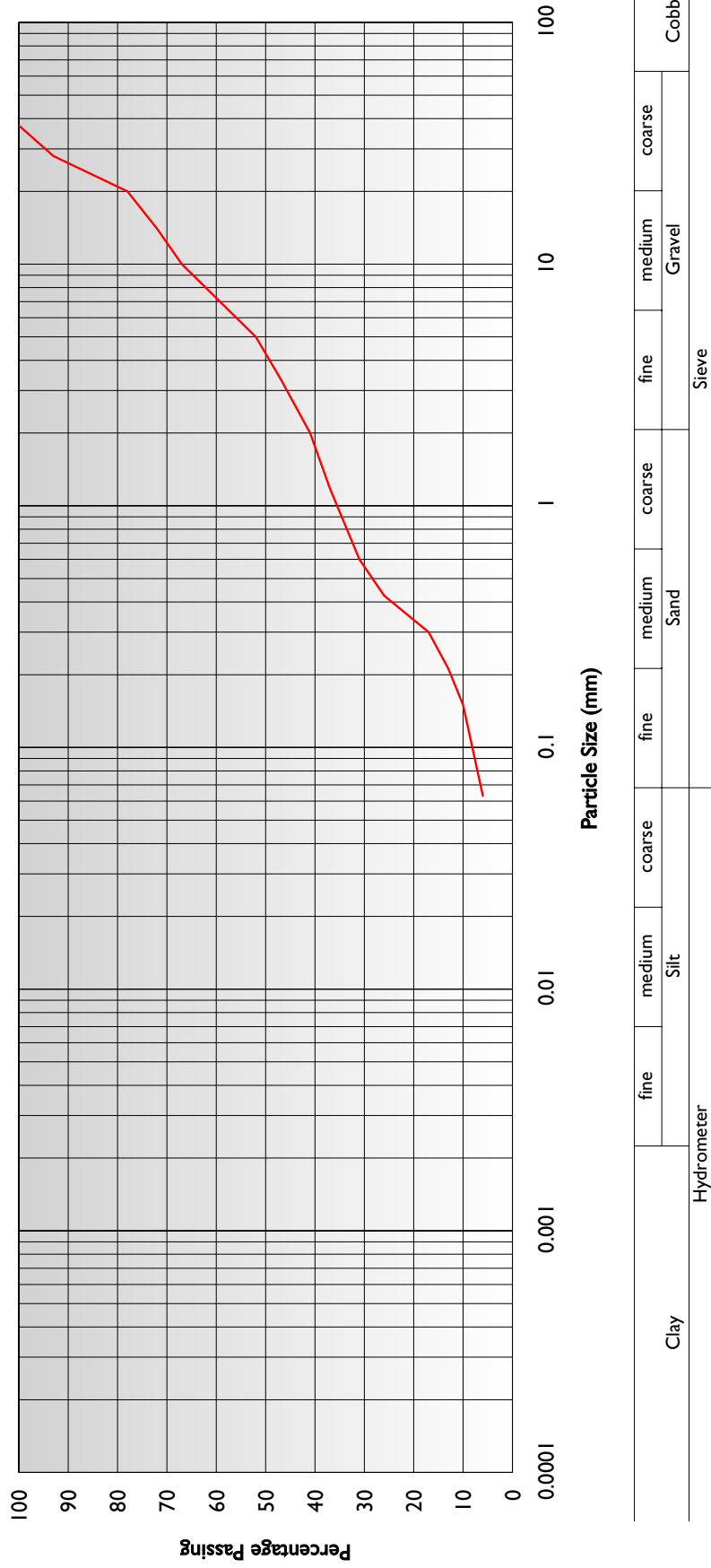
Borehole	Sample	Depth, m
C	U8	5.00
Description		
Stiff orange brown mottled light grey silty CLAY		
Specific Gravity	Moisture Cont. %	Dry Density Mg/m ³
2.730 measured	start 24 finish 22	1.625
Pressure kPa	Coefficient of Consolidation m ² /year	Coefficient of Compressibility m ² /MN
0	0.522	0.278
140	0.450	0.129
280	0.310	0.079
560	0.295	0.065
1120		



PARTICLE SIZE DISTRIBUTION

Project: 37 HAMILTON ROAD, TWICKENHAM
 Client: HAMILTON LOFTS LTD.

Project No: 3719
 Sheet No: 1/2



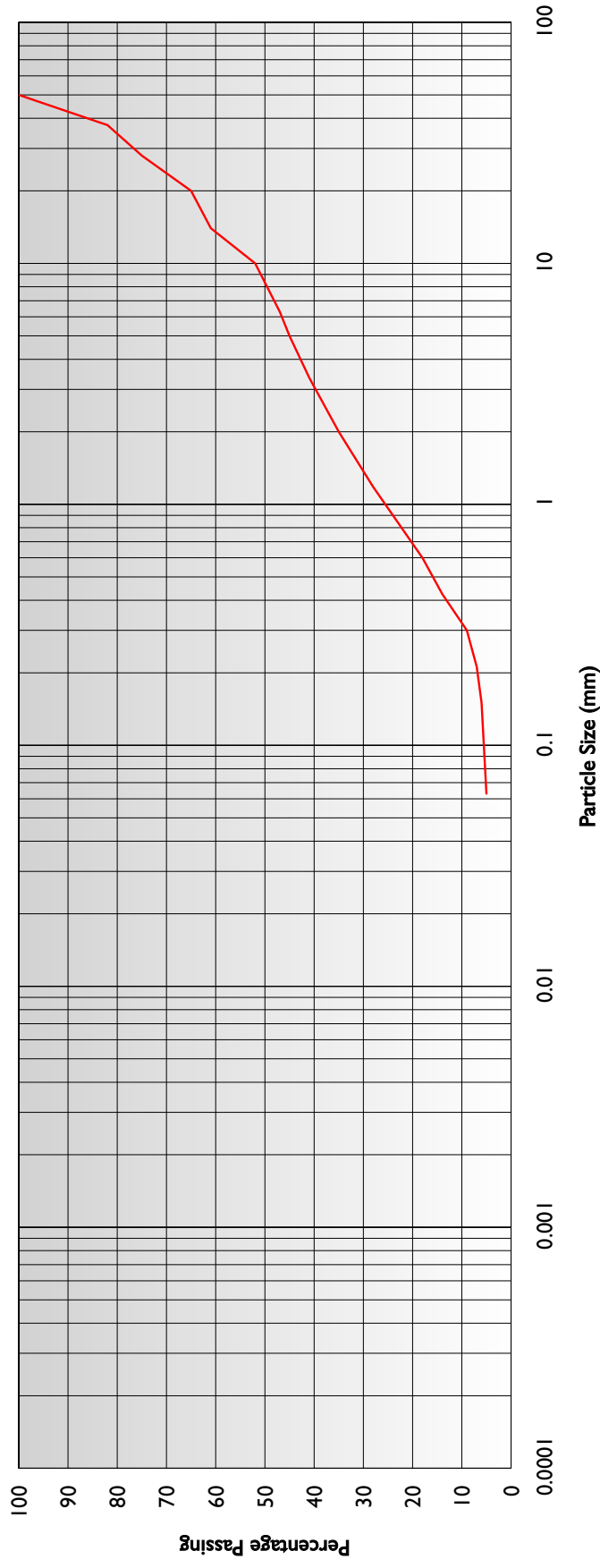
Location: **BHA**
 Sample: **B5**
 Depth, m: **4.00**

Description:-
 Orange brown medium to coarse SAND and fine to coarse GRAVEL

PARTICLE SIZE DISTRIBUTION

Project: 37 HAMILTON ROAD, TWICKENHAM
 Client: HAMILTON LOFTS LTD.

Project No: 3719
 Sheet No: 2/2



Clay				Hydrometer				Sieve				Cobbles
				fine	medium	coarse	coarse	fine	medium	coarse	coarse	

Location: **BHC**
 Sample: **B6**
 Depth, m: **3.00**

Description:-
 Orange brown medium to coarse SAND and fine to coarse
GRAVEL

CONTAMINANTS IN SOIL

Project: 37 HAMILTON ROAD, TWICKENHAM
 Client: HAMILTON LOFTS LTD.
 Agent: Frenccastle Management Ltd.

Project No: 3719
 Sheet No: 1/2

Location	Sample	Depth m	Arsenic	Cadmium	Chromium	Lead	Mercury inorganic	Nickel	Copper	Zinc	Selenium	Boron water sol.	PAH screen	Phenols tot monohydric	Organic content %	TPH by GCMS					pH value	
																C8 - C10	C10 - C12	C12 - C16	C16 - C21	C21 - C35		Total C8 - C35
BHA	J3	0.50	8.4	1.0	40	37	<0.5	15	18	44	0.7	<0.5	0.2	<1								7.05
	B4	1.00	8.0	<0.5	36	52	<0.5	9	17	18	<0.5	<0.5	<0.5	<0.5								<5
BHB	B2	1.00	<5	<0.5	27	14	<0.5	8	8	18	<0.5	<0.5	0.3	<1								<5
BHC	J2	0.25	7.6	1.0	40	37	<0.5	15	18	44	0.7	<0.5	0.2	<1								7.16
		0.40	11.2	<0.5	14	105	<0.5	19	21	27	<0.5	<0.5	<0.5	0.2	<1							
WSA		0.80	9.8	<0.5	7	41	<0.5	17	19	25	<0.5	<0.5	0.2	<1								
		0.50	10.4	<0.5	34	17	<0.5	16	10	33	<0.5	<0.5	<0.5	0.4	<1							
WSB		1.00	14.2	<0.5	11	14	<0.5	32	16	14	<0.5	<0.5	<0.5	<1								7.09
		GAC ¹	residential		3	627			2330	3750	291		210									
	commercial		348	8840				71700	665000	192000		1100000										
CLEA ²	residential		32				170	130			350											
		commercial		640			3600	1800			13000											

Notes

- LOM/CIEH GAC given at 1% soil organic matter
- CLEA SGVs given at 6% soil organic matter

All units are mg/kg dry weight of soil unless otherwise stated, except for pH which is dimensionless

Exceptions denoted thus: Residential XX
 Commercial XX

CONTAMINANTS IN SOIL

Project: 37 HAMILTON ROAD, TWICKENHAM
Client: HAMILTON LOFTS LTD.
Agent: Frenccastle Management Ltd.

Project No: 3719
Sheet No: 2/2

Location	Sample	Depth m	Arsenic	Cadmium	Chromium	Lead	Mercury inorganic	Nickel	Copper	Zinc	Selenium	Boron water sol.	PAH screen	Phenols tot monohydric	Organic content %	TPH by GCMS						pH value		
																C8 - C10	C10 - C12	C12 - C16	C16 - C21	C21 - C35	Total C8 - C35			
WSC		0.50	11.6	<0.5	37	126	<0.5	17	26	20	<0.5	<0.5	<0.5	<0.5	<1						<5	7.11		
		1.10	12.1	<0.5	17	87	<0.5	15	20	15	<0.5	<0.5	<0.5	<0.5	<0.5							<5		
WSE		0.60	8.9	<0.5	14	29	<0.5	26	14	14	<0.5	<0.5	<0.5	<0.5	<1						<5	7.09		
		0.30	15.6	<0.5	19	291	<0.5	21	17	19	<0.5	<0.5	<0.5	<0.5	<1						<5			
WSG		0.80	14.2	<0.5	16	94	<0.5	19	16	14	<0.5	<0.5	<0.5	<0.5	<1						<5			
GAC ¹	residential			3	627				2330	3750		291		210										
	commercial			348	8840				71700	665000		192000		1100000										
CLEA ²	residential		32				170	130			350													
	commercial		640				3600	1800			13000													

Notes

- LQM/CIEH GAC given at 1% soil organic matter
- CLEA SGVs given at 6% soil organic matter

All units are mg/kg dry weight of soil unless otherwise stated, except for pH which is dimensionless

Exceptions denoted thus: Residential XX
 Commercial XX

CONTAMINANTS IN SOIL

Project: 37 HAMILTON ROAD, TWICKENHAM
 Client: HAMILTON LOFTS LTD.
 Agent: Frenccastle Management Ltd.

Project No: 3719
 Sheet No: 1/1

Speciated Total Petroleum Hydrocarbons (Aromatic / Aliphatic Split with BTEX)												
Determinand	Location Sample Depth, m	BHA	BHB	BHC	BHC	W5B	W5C	W5G	W5G	LQM/CIEH GAC		
		J3 0.50	B2 1.00	J2 0.25	F3 0.35	0.70	0.50	0.40	2.25	residential	commercial	
Concentration, mg/kg												
Aromatic Hydrocarbons												
C5 - C7	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	65	13	28000
>C7 - C8	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	120	22	59000
>C8 - C10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	27	9	3700
>C10 - C12	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	3.2	<0.1	69	13	17000
>C12 - C16	<0.1	1.6	<0.1	<0.1	<0.1	<0.1	<0.1	8.4	<0.1	140	23	36000
>C16 - C21	1.2	1.8	<0.1	11	<0.1	<0.1	9	25.8	<0.1	250	46	28000
>C21 - C35	1.8	3.5	<0.1	13	<0.1	<0.1	10	107.2	<0.1	890	370	28000
Total Aromatic Hydrocarbons	3.0	6.9	<5	24	<5	<5	19	144.6	<5			
Aliphatic Hydrocarbons												
C5 - C6	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	30	740	3400
>C6 - C8	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	73	2300	8300
>C8 - C10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	19	320	2100
>C10 - C12	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.5	<0.1	93	2200	10000
>C12 - C16	<0.1	3.9	<0.1	3.6	<0.1	<0.1	<0.1	1.2	<0.1	740	11000	61000
>C16 - C21	0.9	4.2	<0.1	5.6	<0.1	<0.1	7	1.9	<0.1	45000	260000	1600000
>C21 - C35	1.5	4.6	<0.1	22	<0.1	<0.1	13	16.1	<0.1			
Total Aliphatic Hydrocarbons	2.4	12.7	<5	31.2	<5	<5	20.0	19.7	<5			
Total Petroleum Hydrocarbons	5.4	19.6	<5	55.2	<5	<5	39	164.3	<5			
BTEX												
Benzene								<10	<10	330	70	95000
Toluene								<10	<10	610000	120000	4400000
Ethyl Benzene								<10	<10	350000	90000	2800000
Xylenes*								<10	<10	230000	160000	2600000
Concentration, µg/kg												

Notes

Total = Sum of compounds above detection limit.

GAC given at 1% soil organic matter

*Results given as total of (ortho), (meta) and (para) xylene. SGV given is the lowest permissible value for any xylene compound

Exceptions denoted thus:

Residential

XX

Commercial

XX

CONTAMINANTS IN SOIL

Project: 37 HAMILTON ROAD, TWICKENHAM
 Client: HAMILTON LOFTS LTD.
 Agent: Frenccastle Management Ltd.

Project No: 3289
 Sheet No: 1/1

Speciated Polyaromatic Hydrocarbons by GCMS															
Determinand	Location Sample Depth, m	BHA	BHB	BHC	BHC	BHC	WSA	WSB	WSC	WSG	WSG	WSG	LQM/CIEH GAC ³		
		J3	B2	J2	F3	F3	0.40	0.70	0.50	0.40	2.25	residential		commercial	
Concentration, mg/kg															
PAH															
Naphthalene	<0.1	<0.1	0.9	<0.1	<0.1	<0.1	0.9	<0.1	<0.1	<0.1	<0.1	<0.1	1.5	4.1	200
Acenaphthylene	<0.1	<0.1	1.2	<0.1	<0.1	<0.1	5.2	<0.1	<0.1	<0.1	<0.1	<0.1	170	28	84000
Acenaphthene	<0.1	<0.1	2.6	<0.1	<0.1	<0.1	5.1	<0.1	<0.1	<0.1	<0.1	<0.1	210	34	85000
Fluorene	<0.1	<0.1	2.2	<0.1	<0.1	<0.1	3.6	<0.1	<0.1	<0.1	<0.1	<0.1	160	27	64000
Phenanthrene	<0.1	<0.1	3.1	<0.1	<0.1	<0.1	11.0	<0.1	<0.1	<0.1	<0.1	<0.1	92	16	22000
Anthracene	<0.1	<0.1	4.6	<0.1	<0.1	<0.1	7.2	<0.1	<0.1	<0.1	<0.1	<0.1	2300	380	530000
Fluoranthene	<0.1	<0.1	0.9	<0.1	<0.1	<0.1	6.7	<0.1	<0.1	<0.1	<0.1	<0.1	260	52	23000
Pyrene	<0.1	<0.1	2.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	560	110	54000
Benzo(a)anthracene	0.7	<0.1	3.2	<0.1	<0.1	<0.1	0.3	<0.1	<0.1	<0.1	<0.1	<0.1	3.1	2.5	90
Chrysene	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.5	<0.1	<0.1	<0.1	<0.1	<0.1	6.0	2.6	140
Benzo(b)fluoranthene	<0.1	<0.1	3.1	<0.1	<0.1	<0.1	0.3	<0.1	<0.1	<0.1	<0.1	<0.1	5.6	3.5	100
Benzo(k)fluoranthene	<0.1	<0.1	2.2	<0.1	<0.1	<0.1	3.6	<0.1	<0.1	<0.1	<0.1	<0.1	8.5	6.8	140
Benzo(a)pyrene	0.3	<0.1	1.9	<0.1	<0.1	<0.1	2.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.83	0.6	14
Indeno(123-cd)pyrene	1.1	<0.1	1.8	<0.1	<0.1	<0.1	1.8	<0.1	<0.1	<0.1	<0.1	<0.1	3.2	1.8	60
Dibenzo(ah)anthracene	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.76	0.76	13
Benzo(ghi)perylene	<0.1	<0.1	1.5	<0.1	<0.1	<0.1	3.7	<0.1	<0.1	<0.1	<0.1	<0.1	44	70	650
Total PAH	2.1	<0.1	31.87	<0.1	<0.1	<0.1	51.95	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		

Notes

1. Total PAH = Sum of EPA16 identified components
2. The results are expressed as mg/kg dry weight soil after correction for moisture content
3. GAC given at 1% soil organic matter

Exceptions denoted thus:

Residential	XX
Commercial	XX

CONTAMINANTS IN SOIL

Project: 37 HAMILTON ROAD, TWICKENHAM
 Client: HAMILTON LOFTS LTD.
 Agent: Frenndcastle Management Ltd.

Project No: 3719
 Sheet No: 1/2

Semi-Volatile Organic Compounds by GC-MS										
	Location Sample Depth, m	WSA 0.50	WSC 1.00	WSE 0.60						
Determinand	Concentration, µg/kg									
Pyridine	<10	<10	<10							
Aniline	<10	<10	<10							
Phenol	<10	<10	<10							
Bis(2-chloroethyl)ether	<10	<10	<10							
1,3-Dichlorobenzene	<10	<10	<10							
1,4-Dichlorobenzene	<10	<10	<10							
1,2-Dichlorobenzene	<10	<10	<10							
2-Methylphenol	<10	<10	<10							
Hexachloroethane	<10	<10	<10							
3-Methylphenol	<10	<10	<10							
Nitrobenzene	<10	<10	<10							
Isophorone	<10	<10	<10							
2-Nitrophenol	<10	<10	<10							
2,4-Dimethylphenol	<10	<10	<10							
Bis(2-chloroethoxy)methane	<10	<10	<10							
2,4-Dichlorophenol	<10	<10	<10							
1,3,4-Trichlorobenzene	<10	<10	<10							
Naphthalene	<10	<10	<10							
4-Chloroaniline	<10	<10	<10							
Hexachloro-1,3-butadiene	<10	<10	<10							
4-Chloro-3-methylphenol	<10	<10	<10							
2-Methylnaphthalene	<10	<10	<10							
1-Methylnaphthalene	<10	<10	<10							
Hexachlorocyclopentadiene	<10	<10	<10							
2,4,6-Trichlorophenol	<10	<10	<10							
2,4,5-Trichlorophenol	<10	<10	<10							
2-Chloronaphthalene	<10	<10	<10							
2-Nitroaniline	<10	<10	<10							
1,4-Dinitrobenzene	<10	<10	<10							
Dimethylphthalate	<10	<10	<10							
Acenaphthylene	<10	<10	<10							
1,3-Dinitrobenzene	<10	<10	<10							
3-Nitroaniline	<10	<10	<10							
Acenaphthene	<10	<10	<10							
Dibenzofuran	<10	<10	<10							
2,4-Dinitrotoluene	<10	<10	<10							
2,3,4,6-Tetrachlorophenol	<10	<10	<10							

CONTAMINANTS IN SOIL

Project: 37 HAMILTON ROAD, TWICKENHAM
 Client: HAMILTON LOFTS LTD.
 Agent: Frenncastle Management Ltd.

Project No: 3719
 Sheet No: 2/2

Semi-Volatile Organic Compounds by GC-MS									
	Location Sample Depth, m	WSA	WSC	WSE					
Determinand	0.50	1.00	0.60						
	Concentration, µg/kg								
2,3,5,6-Tetrachlorophenol	<10	<10	<10						
Diethylphthalate	<10	<10	<10						
Fluorene	<10	<10	<10						
Diphenylamine	<10	<10	<10						
Azobenzene	<10	<10	<10						
4-Bromophenyl phenyl ether	<10	<10	<10						
Hexachlorobenzene	<10	<10	<10						
Pentachlorophenol	<10	<10	<10						
Phenanthrene	<10	<10	<10						
Anthracene	<10	<10	<10						
Fluoranthene	<10	<10	<10						
Pyrene	<10	<10	<10						
Benzylbutylphthalate	<10	<10	<10						
Bis(2-ethylhexyl)adipate	<10	<10	<10						
Benzo(a)anthracene	<10	<10	<10						
Chrysene	<10	<10	<10						
Bis(2-ethylhexyl)phthalate	<10	<10	<10						
Di-n-octylphthalate	<10	<10	<10						
Benzo(b)fluoranthene	<10	<10	<10						
Benzo(k)fluoranthene	<10	<10	<10						
Benzo(a)pyrene	<10	<10	<10						
Indeno(1,2,3-cd)pyrene	<10	<10	<10						
Dibenz(a,h)anthracene	<10	<10	<10						
Benzo(ghi)perylene	<10	<10	<10						

Notes

1. The results are expressed as µg/kg dry weight soil after correction for moisture content

CONTAMINANTS IN SOIL

Project: 37 HAMILTON ROAD, TWICKENHAM
 Client: HAMILTON LOFTS LTD.
 Agent: Frenncastle Management Ltd.

Project No: 3719
 Sheet No: 1/1

Volatile Organic Compounds by GC-MS										
Location Sample Depth, m	WSA	WSC	WSE							
0.50	1.00	0.60								
Determinand	Concentration, µg/kg									
Benzene	<10	<10	<10							
Toluene	<10	<10	<10							
Ethylbenzene	<10	<10	<10							
m & p-xylene	<10	<10	<10							
o-xylene	<10	<10	<10							
cis 1,2-dichloroethene	<10	<10	<10							
1,1-dichloroethane	<10	<10	<10							
Chloroform	<10	<10	<10							
Carbontetrachloride	<10	<10	<10							
1,1,1-trichloroethane	<10	<10	<10							
Trichloroethylene	<10	<10	<10							
Tetrachloroethylene	<10	<10	<10							
1,1,1,2-tetrachloroethane	<10	<10	<10							
1,1,2,2-tetrachloroethane	<10	<10	<10							
Chlorobenzene	<10	<10	<10							
Bromobenzene	<10	<10	<10							
Bromodichloromethane	<10	<10	<10							
Methylethylbenzene	<10	<10	<10							
1,1-dichloro-1-propene	<10	<10	<10							
1,2-dichloroethane	<10	<10	<10							
2,2-dichloropropane	<10	<10	<10							
Bromochloromethane	<10	<10	<10							
trans 1,2-dichloroethene	<10	<10	<10							
Dibromomethane	<10	<10	<10							
1,2-dichloropropane	<10	<10	<10							
cis 1,3-dichloro-1-propene	<10	<10	<10							
trans 1,3-dichloro-1-propene	<10	<10	<10							
1,1,2-trichloroethane	<10	<10	<10							
Dibromochloromethane	<10	<10	<10							
1,3-dichloropropane	<10	<10	<10							
Dibromoethane	<10	<10	<10							
Styrene	<10	<10	<10							
Propylbenzene	<10	<10	<10							
2-chlorotoluene	<10	<10	<10							
1,2,4-trimethylbenzene	<10	<10	<10							
4-chlorotoluene	<10	<10	<10							
tert-butylbenzene	<10	<10	<10							
1,3,5-trimethylbenzene	<10	<10	<10							
1-methylpropylbenzene	<10	<10	<10							
o-Cymene	<10	<10	<10							
1,4-dichlorobenzene	<10	<10	<10							
Sec-butylbenzene	<10	<10	<10							
1,2-dibromo-3-chloropropane	<10	<10	<10							
Hexachlorobutadiene	<10	<10	<10							
1,2,3-trichlorobenzene	<10	<10	<10							
1,2,4-trichlorobenzene	<10	<10	<10							
1,3-dichlorobenzene	<10	<10	<10							
1,2-dichlorobenzene	<10	<10	<10							

CONTAMINANTS IN LEACHATE

Project: 37 HAMILTON ROAD, TWICKENHAM
 Client: HAMILTON LOFTS LTD.
 Agent: Frenncastle Management Ltd.

Project No: 3719
 Sheet No: 1/1

Speciated Total Petroleum Hydrocarbons (Aromatic / Aliphatic Split with BTEX)									
Determinand	Location Sample Depth, m	BHA J3 0.50	BHB B2 1.00	BHC F3 0.35	WSC 0.50	WSG 0.40	WSG 2.25	Concentration, µg/l	
Aromatic Hydrocarbons									
>C5 - C7		<10	<10	<10	<10	<10	<10	<10	<10
>C7 - C8		<10	<10	<10	<10	<10	<10	<10	<10
>C8 - C10		<10	<10	<10	<10	<10	<10	<10	<10
>C10 - C12		<10	<10	<10	<10	<10	<10	<10	<10
>C12 - C16		<10	<10	<10	<10	<10	<10	<10	<10
>C16 - C21		<10	<10	<10	<10	<10	<10	<10	<10
>C21 - C35		<10	<10	<10	<10	<10	<10	<10	<10
Total Aromatic Hydrocarbons		<10	<10	<10	<10	<10	<10	<10	<10
Aliphatic Hydrocarbons									
>C5 - C6		<10	<10	<10	<10	<10	<10	<10	<10
>C6 - C8		<10	<10	<10	<10	<10	<10	<10	<10
>C8 - C10		<10	<10	<10	<10	<10	<10	<10	<10
>C10 - C12		<10	<10	<10	<10	<10	<10	<10	<10
>C12 - C16		<10	<10	<10	<10	<10	<10	<10	<10
>C16 - C21		<10	<10	<10	<10	<10	<10	<10	<10
>C21 - C35		<10	<10	<10	<10	<10	<10	<10	<10
Total Aliphatic Hydrocarbons		<10	<10	<10	<10	<10	<10	<10	<10
Total Petroleum Hydrocarbons		<10	<10	<10	<10	<10	<10	<10	<10
BTEX									
Benzene									
Toluene									
Ethyl Benzene									
Xylenes*									

Notes
 Total = Sum of compounds above detection limit.
 *Results given as total of (ortho), (meta) and (para) xylene.

CONTAMINANTS IN LEACHATE

Project: 37 HAMILTON ROAD, TWICKENHAM
 Client: HAMILTON LOFTS LTD.
 Agent: Frenccastle Management Ltd.

Project No: 2680
 Sheet No: 1/1

Speciated Polyaromatic Hydrocarbons by GCMS													
Determinand	Location Sample Depth, m	BHC J2 0.25	WSA 0.40	WSG 0.40	Concentration, µg/l						UK Drinking Water	EQS Fresh Water	
PAH													
Naphthalene		<0.01	<0.01	<0.01	<0.01								10
Acenaphthylene		<0.01	<0.01	<0.01	<0.01								
Acenaphthene		<0.01	<0.01	<0.01	<0.01								
Fluorene		<0.01	<0.01	<0.01	<0.01								
Phenanthrene		<0.01	<0.01	<0.01	<0.01								
Anthracene		<0.01	<0.01	<0.01	<0.01								
Fluoranthene		<0.01	<0.01	<0.01	<0.01								
Pyrene		<0.01	<0.01	<0.01	<0.01								
Benzo(a)anthracene		<0.01	<0.01	<0.01	<0.01								
Chrysene		<0.01	<0.01	<0.01	<0.01								
Benzo(b)fluoranthene		<0.01	<0.01	<0.01	<0.01								
Benzo(k)fluoranthene		<0.01	<0.01	<0.01	<0.01								
Benzo(a)pyrene		<0.01	<0.01	<0.01	<0.01								
Indeno(123-cd)pyrene		<0.01	<0.01	<0.01	<0.01								
Dibenzo(ah)anthracene		<0.01	<0.01	<0.01	<0.01								
Benzo(ghi)perylene		<0.01	<0.01	<0.01	<0.01								
Total PAH		<0.01	<0.01	<0.01	<0.01								

Notes

1. Total PAH = Sum of 16 identified components

Exceptions denoted thus:

XX exceeds Drinking Water Standard
XX exceeds Environmental Quality Standard

CONTAMINANTS IN WATER

Project: 37 HAMILTON ROAD, TWICKENHAM
 Client: HAMILTON LOFTS LTD.
 Agent: Frenncastle Management Ltd.

Project No: 3719
 Sheet No: 1/1
 Sampled on: 7th March 2012

Location	Sample	Depth m	Arsenic	Cadmium	Chromium	Lead	Mercury Inorganic	Nickel	Copper	Zinc	Selenium	Boron	PAH screen	Phenols tot. monolydic	TPH by GCMS						pH value	
															C8 - C10	C10 - C12	C12 - C16	C16 - C21	C21 - C35	Total C8 - C35		
BHA	s/p		<5	<1	<5	<1	<0.1	<5	<5	<5	<5	362		<0.5								7.08
WSA	s/p		<5	<1	<5	<1	0.1	5	<5	<5	<5	482		<0.5								7.12
WSG	s/p		<5	<1	<5	<1	<0.1	6	<5	<5	<5	198		<0.5								7.15
UK Drinking Water			10	5	50	25	1	50	2000	5000	10	1000		0.5								
EQS freshwater			50	5	5-250 ¹	4-250 ¹	1	50-200 ¹	1-28 ¹	8-500 ¹	-	2000		30								

Notes

1. Depends on hardness, use lower value if unknown

All units are µg/l unless otherwise stated, except for pH which is dimensionless

Exceptions denoted thus:

United Kingdom Drinking Water

XX

Environmental Quality Standards freshwater

XX

CONTAMINANTS IN WATER

Project: 37 HAMILTON ROAD, TWICKENHAM
 Client: HAMILTON LOFTS LTD.
 Agent: Frenndcastle Management Ltd.

Project No: 3719
 Sheet No: 1/1
 Sampled on: 7th March 2012

Speciated Total Petroleum Hydrocarbons (Aromatic / Aliphatic Split with BTEX)						
Determinand	Location Sample Depth, m	BHA s'pipe	WSA s'pipe	WSG s'pipe	Concentration, µg/l	
Aromatic Hydrocarbons						
>C5 - C7		<10	<10	<10		
>C7 - C8		<10	<10	<10		
>C8 - C10		<10	<10	<10		
>C10 - C12		<10	<10	<10		
>C12 - C16		<10	<10	<10		
>C16 - C21		<10	<10	<10		
>C21 - C35		<10	<10	<10		
Total Aromatic Hydrocarbons		<10	<10	<10		
Aliphatic Hydrocarbons						
>C5 - C6		<10	<10	<10		
>C6 - C8		<10	<10	<10		
>C8 - C10		<10	<10	<10		
>C10 - C12		<10	<10	<10		
>C12 - C16		<10	<10	<10		
>C16 - C21		<10	<10	<10		
>C21 - C35		<10	<10	<10		
Total Aliphatic Hydrocarbons		<10	<10	<10		
Total Petroleum Hydrocarbons		<10	<10	<10		
BTEX						
Benzene						
Toluene						
Ethyl Benzene						
Xylenes*						

Notes
 Total = Sum of compounds above detection limit.
 *Results given as total of (ortho), (meta) and (para) xylene.

CONTAMINANTS IN WATER

Project: 37 HAMILTON ROAD, TWICKENHAM
 Client: HAMILTON LOFTS LTD.
 Agent: Frenccastle Management Ltd.

Project No: 2680
 Sheet No: 1/1
 Sampled on: 7th March 2012

Speciated Polyaromatic Hydrocarbons by GCMS													
Determinand	Location Sample Depth, m	BHA s/pipe	WSA s/pipe	WSG s/pipe	Concentration, µg/l						UK Drinking Water	EQS Fresh Water	
PAH													
Naphthalene		<0.01	<0.01	<0.01	<0.01								10
Acenaphthylene		<0.01	<0.01	<0.01	<0.01								
Acenaphthene		<0.01	<0.01	<0.01	<0.01								
Fluorene		<0.01	<0.01	<0.01	<0.01								
Phenanthrene		<0.01	<0.01	<0.01	<0.01								
Anthracene		<0.01	<0.01	<0.01	<0.01								
Fluoranthene		<0.01	<0.01	<0.01	<0.01								
Pyrene		<0.01	<0.01	<0.01	<0.01								
Benzo(a)anthracene		<0.01	<0.01	<0.01	<0.01								
Chrysene		<0.01	<0.01	<0.01	<0.01								
Benzo(b)fluoranthene		<0.01	<0.01	<0.01	<0.01								
Benzo(k)fluoranthene		<0.01	<0.01	<0.01	<0.01								
Benzo(a)pyrene		<0.01	<0.01	<0.01	<0.01								0.01
Indeno(123-cd)pyrene		<0.01	<0.01	<0.01	<0.01								
Dibenzo(ah)anthracene		<0.01	<0.01	<0.01	<0.01								
Benzo(ghi)perylene		<0.01	<0.01	<0.01	<0.01								
Total PAH		<0.01	<0.01	<0.01	<0.01								

Notes

1. Total PAH = Sum of 16 identified components

Exceptions denoted thus:

XX exceeds Drinking Water Standard
XX exceeds Environmental Quality Standard

CONTAMINANTS IN WATER

Project: 37 HAMILTON ROAD, TWICKENHAM
Client: HAMILTON LOFTS LTD.
Agent: Frenncastle Management Ltd.

Project No: 3719
Sheet No: 1/1
Sampled on: 2 1st March 2012

Location	Sample	Depth	Arsenic	Cadmium	Chromium	Lead	Mercury	Nickel	Copper	Zinc	Selenium	Boron	PAH	Phenols	TPH by GC/MS						pH	
															C8 - C10	C10 - C12	C12 - C16	C16 - C21	C21 - C35	Total C8 - C35		Value
BHA	s/p		<5	<1	<5	<1	0.1	7	<5	<5	<5	380	screen	<0.5								7.12
WSA	s/p		<5	<1	<5	<1	0.1	5	<5	<5	<5	542	screen	<0.5								7.08
WSG	s/p		<5	<1	<5	<1	<0.1	5	<5	<5	<5	386	screen	<0.5								7.16
UK Drinking Water			10	5	50	25	1	50	2000	5000	10	1000		0.5								
EQS freshwater			50	5	5-250'	4-250'	1	50-200'	1-28'	8-500'	-	2000		30								

Notes

1. Depends on hardness, use lower value if unknown

All units are µg/l unless otherwise stated, except for pH which is dimensionless

Exceptions denoted thus:

United Kingdom Drinking Water

XX

Environmental Quality Standards freshwater

XX

CONTAMINANTS IN WATER

Project: 37 HAMILTON ROAD, TWICKENHAM
 Client: HAMILTON LOFTS LTD.
 Agent: Frenndcastle Management Ltd.

Project No: 3719
 Sheet No: 1/1
 Sampled on: 21st March 2012

Speciated Total Petroleum Hydrocarbons (Aromatic / Aliphatic Split with BTEX)						
Determinand	Location Sample Depth, m	BHA s'pipe	WSA s'pipe	WSG s'pipe	Concentration, µg/l	
Aromatic Hydrocarbons						
>C5 - C7		<10	<10	<10		
>C7 - C8		<10	<10	<10		
>C8 - C10		<10	<10	<10		
>C10 - C12		<10	<10	<10		
>C12 - C16		<10	<10	<10		
>C16 - C21		<10	<10	<10		
>C21 - C35		<10	<10	<10		
Total Aromatic Hydrocarbons		<10	<10	<10		
Aliphatic Hydrocarbons						
>C5 - C6		<10	<10	<10		
>C6 - C8		<10	<10	<10		
>C8 - C10		<10	<10	<10		
>C10 - C12		<10	<10	<10		
>C12 - C16		<10	<10	<10		
>C16 - C21		<10	<10	<10		
>C21 - C35		<10	<10	<10		
Total Aliphatic Hydrocarbons		<10	<10	<10		
Total Petroleum Hydrocarbons		<10	<10	<10		
BTEX						
Benzene						
Toluene						
Ethyl Benzene						
Xylenes*						

Notes

Total = Sum of compounds above detection limit.

*Results given as total of (ortho), (meta) and (para) xylene.

CONTAMINANTS IN WATER

Project: 37 HAMILTON ROAD, TWICKENHAM
 Client: HAMILTON LOFTS LTD.
 Agent: Frenccastle Management Ltd.

Project No: 2680
 Sheet No: 1/1
 Sampled on: 21st March 2012

Speciated Polyaromatic Hydrocarbons by GCMS													
Determinand	Location Sample Depth, m	BHA s/pipe	WSA s/pipe	WSG s/pipe	Concentration, µg/l						UK Drinking Water	EQS Fresh Water	
PAH													
Naphthalene		<0.01	<0.01	<0.01	<0.01								10
Acenaphthylene		<0.01	<0.01	<0.01	<0.01								
Acenaphthene		<0.01	<0.01	<0.01	<0.01								
Fluorene		<0.01	<0.01	<0.01	<0.01								
Phenanthrene		<0.01	<0.01	<0.01	<0.01								
Anthracene		<0.01	<0.01	<0.01	<0.01								
Fluoranthene		<0.01	<0.01	<0.01	<0.01								
Pyrene		<0.01	<0.01	<0.01	<0.01								
Benzo(a)anthracene		<0.01	<0.01	<0.01	<0.01								
Chrysene		<0.01	<0.01	<0.01	<0.01								
Benzo(b)fluoranthene		<0.01	<0.01	<0.01	<0.01								
Benzo(k)fluoranthene		<0.01	<0.01	<0.01	<0.01								
Benzo(a)pyrene		<0.01	<0.01	<0.01	<0.01								0.01
Indeno(123-cd)pyrene		<0.01	<0.01	<0.01	<0.01								
Dibenzo(ah)anthracene		<0.01	<0.01	<0.01	<0.01								
Benzo(ghi)perylene		<0.01	<0.01	<0.01	<0.01								
Total PAH		<0.01	<0.01	<0.01	<0.01								

Notes

I. Total PAH = Sum of 16 identified components

Exceptions denoted thus:

XX

exceeds Drinking Water Standard

XX

exceeds Environmental Quality Standard

APPENDIX E

FIGURES



37 Hamilton Road,
Twickenham

Fieldwork location plan

Scale unknown

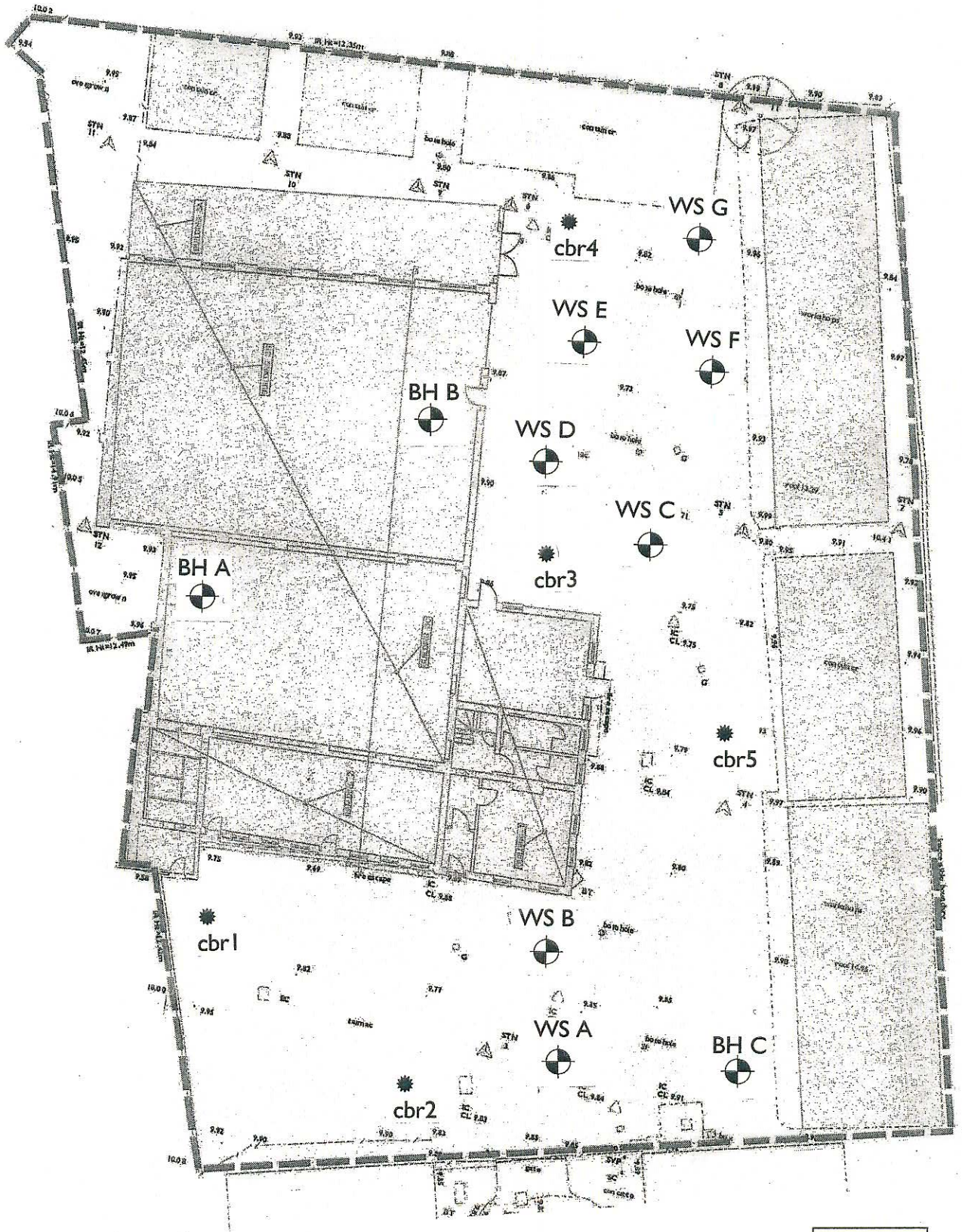


Figure 1

37 Hamilton Road, Twickenham

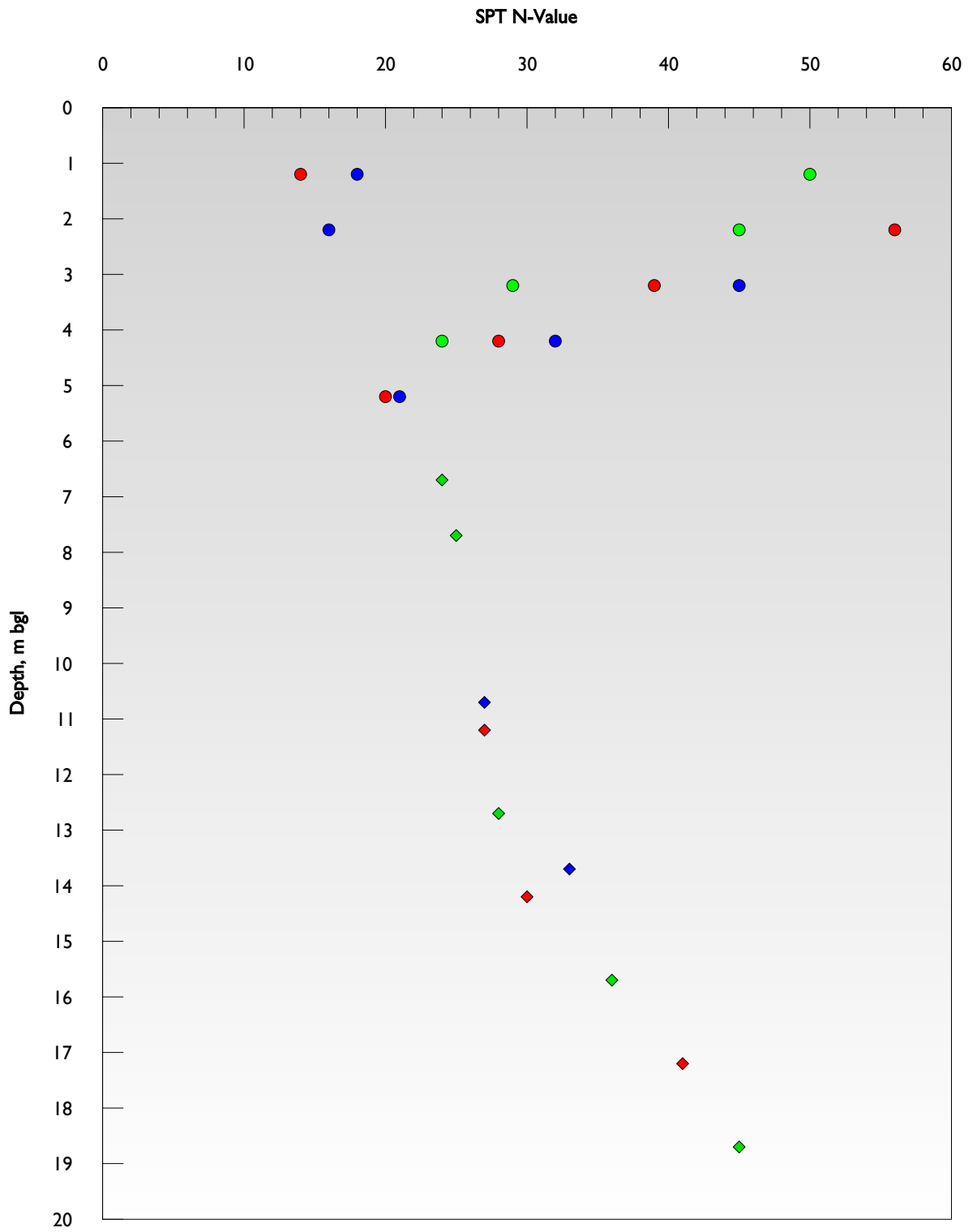
Proposed site plan

Scale unknown



Figure 2

SPT PROFILE
37 Hamilton Road, Twickenham



Cohesive strata shown as diamonds
Granular strata shown as circles
N values >50 extrapolated to 300mm penetration

◆ BHI ◆ BHB ◆ BHC

SHEAR STRENGTH PROFILE
37 HAMILTON ROAD, TWICKENHAM

