shown in the recommendations given in NHBC Standards, Chapter 4.2, April 2010, "Building near Trees" and it is considered that this document is relevant in this situation.

6.4 Piled Foundations

In the event that the use of conventional spread foundations proves either impracticable or uneconomical due to the size and depth of foundation required, then a piled foundation will be required. In these ground conditions, it is considered that some form of bored and in-situ cast concrete piled foundation with reinforced concrete ground beams should prove satisfactory.

The construction of a piled foundation is a specialist activity and the advice of a reputable contractor, familiar with the type of soil and groundwater conditions encountered at this site should be sought prior to finalising the foundation design. The actual pile working load will depend on the particular type of pile chosen and method of installation adopted.

To achieve the full bearing value a pile should penetrate the bearing stratum by at least five times the pile diameter.

Where piles are to be constructed in groups the bearing value of each individual pile should be reduced by a factor of about 0.8 and a calculation made to check the factor of safety against block failure.

Driven piles could also be used and would develop much higher working loads approximately 2.5 to 3 times higher than bored piles of a similar diameter at the same depth. However, the close proximity of adjacent buildings will in all probability preclude their use due to noise and vibration.

6.5 Basement Retaining Walls

Several methods of retaining wall construction could be considered. These may include retaining structures cast in an underpinning sequence, or the use of temporary or sacrificial works to facilitate the retaining structure's construction. The excavation of the basement must not compromise the integrity of adjacent structures.

To facilitate support of the excavation, consideration could be given to a contiguous, secant or a sheet piled wall. Generally, cantilevered piled walls have an open face to embedded ratio of about one to two, i.e. a supported face three metres in height would require a penetration into the ground of about six metres below the base of the excavation. Should the piled retaining wall be purely an unsupported cantilever, then it is likely that quite deep section sheet piles or large diameter bored piles would be required.

The section of the sheet or the diameter of the piles could be reduced by installing a braced waling to the wall. Piles placed as part of the permanent works would be propped by the roof to the basement and would not be acting purely as a cantilevered support in the long term.

To reduce the likelihood of loss of ground if a sheet piled wall was adopted when removing the sheets, it is considered that the sheet piles should be incorporated into the final wall design. Assuming that the earth retaining wall will be propped, i.e. have its base slab and first floor slab cast in place soon after excavation, it is unlikely that full if any earth pressures will act on the wall while it is not propped. The greatest force acting on the wall, in the short term, is likely

to be from the hydrostatic head should water percolate and be retained to the rear of the earth retaining structure.

Given the unknown depth of the proposed new floor slab (and therefore unknown founding material); the design parameters for each element of soil recorded in the relevant exploratory holes are provided in Table B. The depth of pile penetration can be calculated once structural details of the proposed basement are known.

Table B : Summary of design parameters for proposed basement foundation

Founding Material	Depth to top	Description	Critical Angle of Shearing Resistance (°) (Φ'_{crit})[1]	Coefficient active pressure (Ka)	Coefficient passive resistance (Kp)
Bagshot beds	0.75 to 0.80 (116.55 to 119.10mOD)	Dense clayey silty SAND	35	0.27	3.69

Notes:

1. Calculated using guidance from BS8002
2. As the depth and structural details of the proposed basement are unknown these values should be used as guidance only

The amount of movement will depend upon a number of factors including the construction timetable, ultimate loads and critically, the depth of the final excavation. Consideration should therefore be given to providing heave protection measures to the floor slab and foundations to mitigate this.

The main phase of uplift or heave will come immediately following the excavation of the basement when the greatest elastic rebound of the soil (caused by the loss of the overburden pressure) will occur. Heave can be reduced by proceeding with the excavation in stages and observing and recording any movement that occurs over a set period of time using strain gauges or similar following the guidance from Boscardin and Cording (1989).

It may be advantageous to delay the construction until an adequate proportion of the uplift has occurred. Once this monitoring period has elapsed and a suitably qualified engineer is confident that the majority of uplift has occurred, basement construction can commence.

These processes and other ways of dealing with ground movements are described at length in BS8004 (British Standard Code of Practice for Foundations).

6.6 Floor Slabs

It is understood from the structural engineer that a raft foundation is the preferred option for the development. Within the zone of influence of trees, either retained or removed, the raft should incorporate either underfloor voids or suitable depths of compressible material in accordance with NHBC requirements, for soils with medium volume change potential.

6.7 Excavations

Shallow excavations for foundations and services are likely to require nominal side support in the short term and groundwater is unlikely to be encountered in significant quantities once any accumulated surface water has been removed. Deeper and longer excavations below approximately 1.0m below existing ground level will require close side support and some seepages of groundwater could be encountered.

No particular difficulties are envisaged in removing such water by conventional internal pumping methods from open sumps.

Normal safety precautions should be taken if excavations are to be entered.

6.8 Chemical Attack on Buried Concrete

The results presented on Table 3 show the soil samples to have water soluble sulphate contents of up to 0.07g/litre associated with slightly acidic to acidic pH values. The samples of Made Ground tested indicated water soluble sulphate contents of up to 0.11g/litre associated with slightly alkaline to alkaline pH values.

In these conditions, it is considered that deterioration of buried concrete due to sulphate or acid attack is unlikely to occur. The final design of buried concrete according to Tables C1 and C2 of BRE Special Digest 1:2005 should be in accordance with Class DS-1 conditions.

p.p. SITE ANALYTICAL SERVICES LIMITED

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A M Davidson BSc (Hons) MSc DIC
Environmental Engineer

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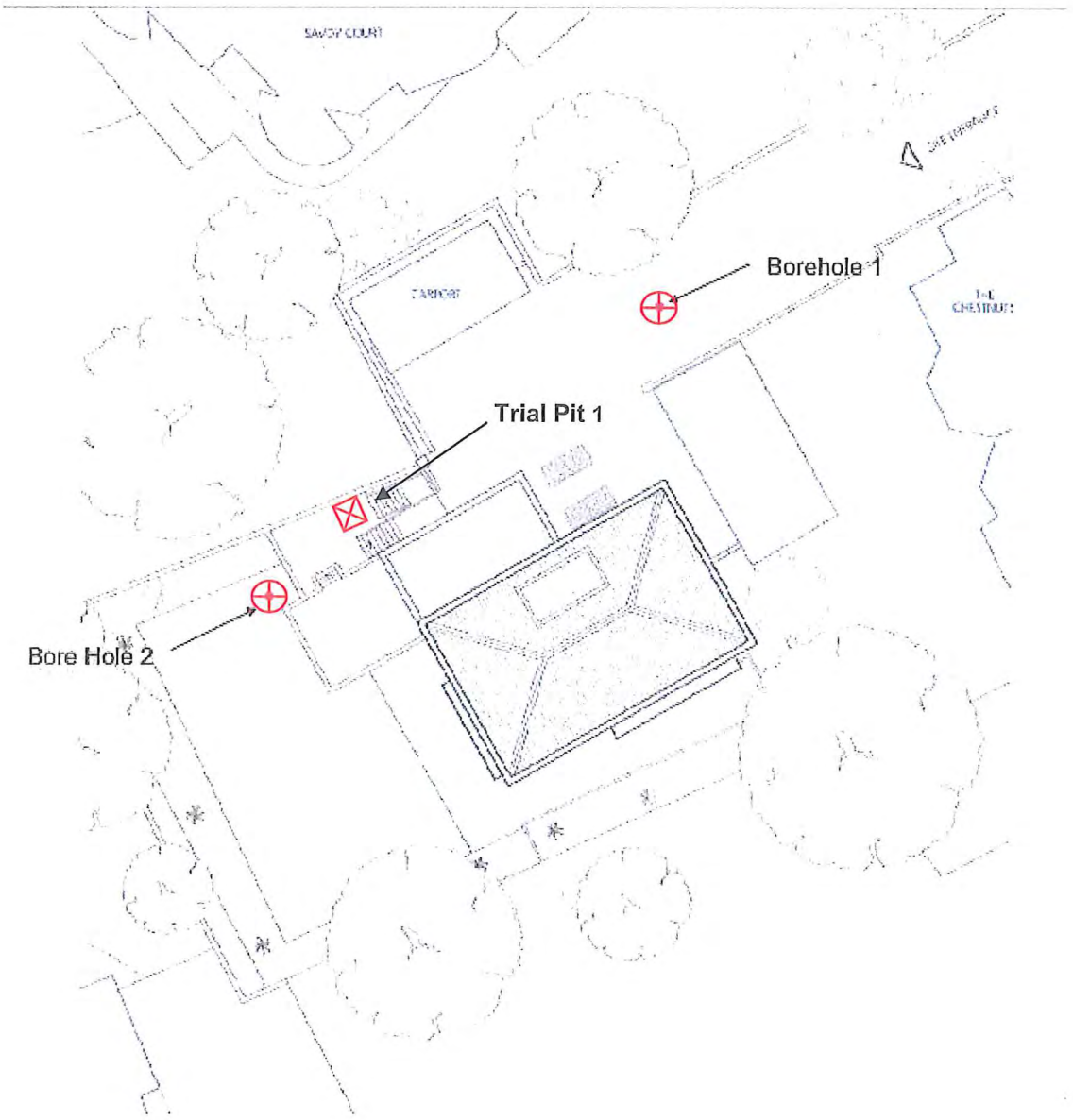
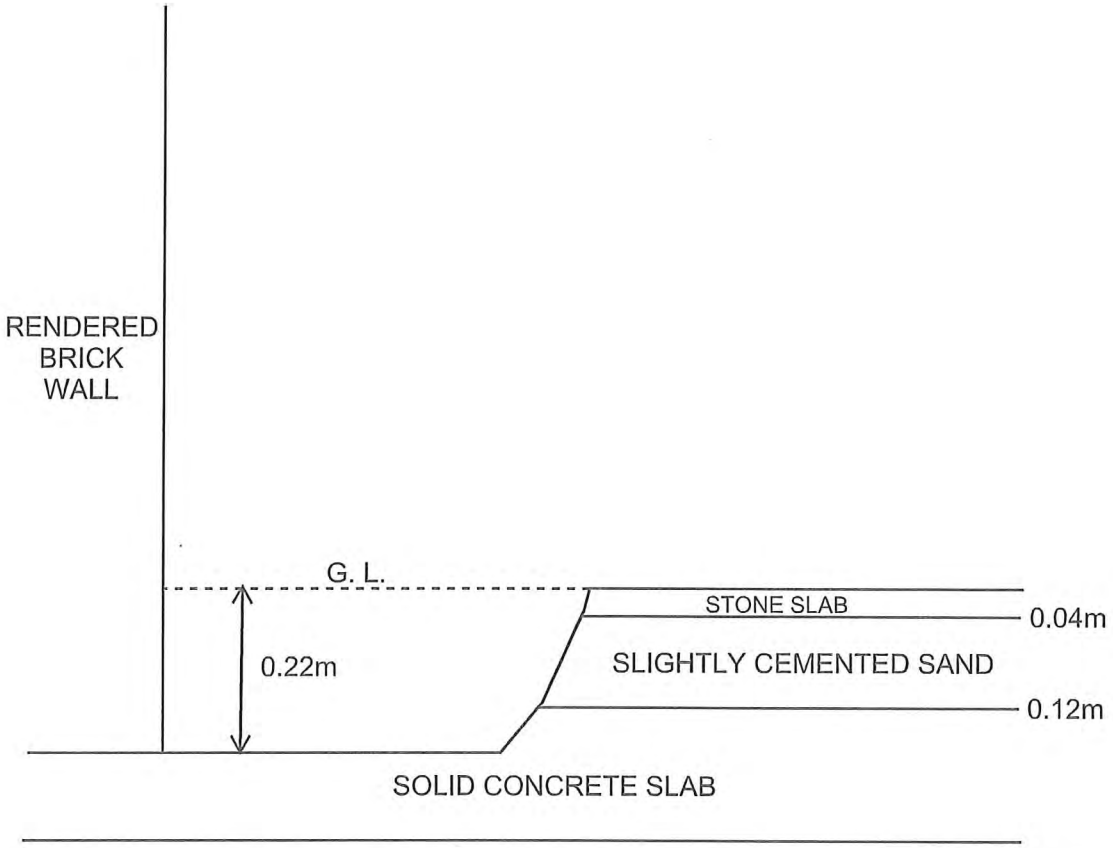
	Site Analytical Services Ltd.	REF: 14/22714
	LOCATION: 17 Branch Hill, London, NW3 7NA	FIG: 1
	TITLE: Site Sketch Plan DATE: Nov' 2014	SCALE: NTS



S A S	Site Analytical Services Ltd.	REF: 14/22714
	LOCATION: Branch Hill, Hampstead, London, NW3	FIG: 2
	TITLE: Trial Pit 1 DATE: October 2014	SCALE: NTS



TRIAL PIT TERMINATED AT 0.22m BELOW GROUND LEVEL DUE TO CONCRETE

APPENDIX `A'

Borehole / Trial Pit Logs

Site Analytical Services Ltd.

Site	Borehole Number
17 BRANCH HILL, LONDON, NW3 7NA	BH1

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
ROTARY PERCUSSION	128mm cased to 0.00m	119.90	MR ADAM KAYE	1422714
	Location	**Dates**	**Engineer**	**Sheet**
	TQ 260 862	10/10/2014	ENGINEERS HASKINS ROBINSON WATERS	1/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					119.85	(0.05)	Brick paving		
					119.80	0.05			
0.25	D1					(0.05)	Soft sand underlay		
						0.10			
0.50	D2					(0.70)	MADE GROUND: Brick rubble, concrete cobbles with brick and concrete crush and silty sand.		
0.75	D3				119.10				
						0.80	Loose yellowish brown clayey silty fine grained SAND		
1.00-1.45	CPT N=9		DRY	1,2/2,2,3,2					
1.00	D4					(1.10)			
1.75	D5				118.00	1.90			
2.00-2.45	U1			60 blows			Stiff mottled brown silty sandy CLAY		
						(0.80)			
					117.20	2.70			
2.75	D6						Medium dense mottled brown/yellow laminated clayey silty fine grained SAND.		
3.00-3.45	SPT N=9		DRY	1,2/2,2,3,2					
3.00	D7								
3.75	D8								
4.00-4.45	SPT N=15		DRY	1,2/3,3,4,5					
4.00	D9								
4.75	D10								
5.00-5.45	SPT N=17		DRY	1,3/4,4,4,5					
5.00	D11								
6.00	D12								
6.50-6.95	SPT N=18		DRY	2,3/4,5,4,5		(7.80)			
6.50	D13								▼1
7.50	D14								
8.00	D15			Water strike(1) at 8.00m, rose to 7.20m in 20 mins.					▽1
8.00-8.45	SPT N=11		7.20	2,3/2,3,3,3					
9.00	D16								
9.50-9.95	SPT N=12		7.20	2,3/3,3,3,3					
9.50	D17								

Remarks
D = Disturbed Sample
U = Undisturbed 100mm diameter sample
C = Dynamic cone penetration test
S = Standard cone penetration test
Groundwater was encountered at 8.00m and rose to 7.20m after a 20 minute rest period.

Scale (approx)	Logged By
1:50	

Figure No.
1422714.BH1

Site Analytical Services Ltd.

Site	Borehole Number
17 BRANCH HILL, LONDON, NW3 7NA	BH1

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
ROTARY PERCUSSION	128mm cased to 0.00m	119.90	MR ADAM KAYE	1422714
	Location	**Dates**	**Engineer**	**Sheet**
	TQ 260 862	10/10/2014	ENGINEERS HASKINS ROBINSON WATERS	2/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						(7.80)			
10.50	D18				109.40	10.50	Medium dense bright orange to mottled grey slightly clayey silty fine grained SAND		
11.00-11.45 11.00	SPT N=28 D19		7.20	3,4/6,7,7,8		(1.50)			
12.00	D20				107.90	12.00	Dense dark grey clayey silty fine grained SAND		
12.50-12.95 12.50	SPT N=32 D21		7.20	5,6/7,8,8,9		(3.00)			
13.75	D22								
14.55-15.00 14.55	SPT N=34 D23		7.20	4,7/8,8,9,9	104.90	15.00	Complete at 15.00m		

Remarks

Scale (approx)	Logged By
1:50	

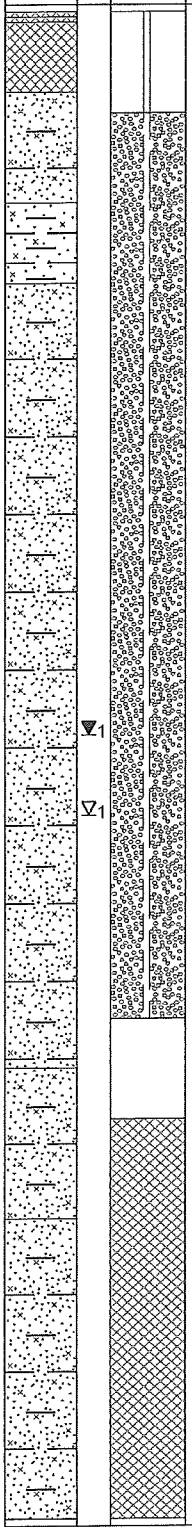
Figure No. 1422714.BH1

Site Analytical Services Ltd.

Site	Borehole Number
17 BRANCH HILL, LONDON, NW3 7NA	BH1

Installation Type	Dimensions	Client	Job Number
Single Installation	Internal Diameter of Tube [A] = 128 mm	MR ADAM KAYE	1422714

Location	Ground Level (mOD)	Engineer	Sheet
TQ 260 862	119.90	ENGINEERS HASKINS ROBINSON WATERS	1/1



Groundwater Strikes During Drilling

Date	Time	Depth Struck (m)	Casing Depth (m)	Inflow Rate	Readings 5 min	Readings 10 min	Readings 15 min	Readings 20 min	Depth Sealed (m)
10/10/14		8.00						7.20	

Groundwater Observations During Drilling

Date	Start of Shift Time	Start of Shift Depth Hole (m)	Start of Shift Casing Depth (m)	Start of Shift Water Depth (m)	Start of Shift Water Level (mOD)	End of Shift Time	End of Shift Depth Hole (m)	End of Shift Casing Depth (m)	End of Shift Water Depth (m)	End of Shift Water Level (mOD)

Instrument Groundwater Observations

Inst. [A] Type : Standpipe

Date	Instrument [A] Time	Instrument [A] Depth (m)	Instrument [A] Level (mOD)	Remarks

Remarks
Lockable cover set in concrete.

Site Analytical Services Ltd.

Site 17 BRANCH HILL, LONDON, NW3 7NA			**Borehole Number** BH2
Boring Method CONTINUOUS FLIGHT AUGER	**Casing Diameter** 100mm cased to 0.00m	**Ground Level (mOD)** 117.30	**Client** MR ADAM KAYE	**Job Number** 1422714
	Location TQ2 60 862	**Dates** 10/10/2014	**Engineer** ENGINEERS HASKINS ROBINSON WATERS	**Sheet** 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						(0.25)	MADE GROUND: Grass surface over soft silty sand with small gravel sized brick rubble.		
					117.05	0.25			
0.25	D1					(0.50)	MADE GROUND: Brown silty sand with brick fragments.		
0.50	D2				116.55	0.75			
0.75	D3						Medium firm becoming stiff mottled light brown/grey/orange silty sandy CLAY.		
1.00	D4								
1.00	V1 74								
1.50	D6					(1.95)			
1.50	V2 97								
2.00	D7								
2.00	V3 129								
2.50	V4 130+								
2.50	D8				114.60	2.70			
3.00	V5 130+						Stiff mottled light brown/grey/orange silty sandy CLAY .		
3.00	D9								
3.50	D10								
3.50	V6 130+					(2.30)			
4.00	D1								
4.00	V7 130+								
4.50	D12								
4.50	V8 130+								▽1
5.00	D13			Water strike(1) at 5.00m.	112.30	5.00	Wet light brown/yellow/orange/grey silty SAND		
5.00-5.11	M1 100/110					(1.00)			
6.00-6.10	M2 100/100				111.30	6.00			
6.00	D14						Complete at 6.00m		

Remarks
Groundwater encountered at 5.00m
M = Mackintosh Probe - Blows/penetration (mm)
V = Vane test - result in kPa
D = Disturbed sample

Scale (approx)	Logged By
1:50	

Figure No. 1422714.BH2

Site Analytical Services Ltd.

Standard Penetration Test Results

Site : 17 BRANCH HILL, LONDON, NW3 7NA

Client : MR ADAM KAYE

Engineer: ENGINEERS HASKINS ROBINSON WATERS

Job Number 1422714

Sheet 1 / 1

Borehole Number	Base of Borehole (m)	End of Seating Drive (m)	End of Test Drive (m)	Test Type	Seating Blows per 75mm		Blows for each 75mm penetration				Result	Comments
					1	2	1	2	3	4		
BH1	1.00	1.15	1.45	CPT	1	2	2	2	3	2	N=9	
BH1	3.00	3.15	3.45	SPT	1	2	2	2	3	2	N=9	
BH1	4.00	4.15	4.45	SPT	1	2	3	3	4	5	N=15	
BH1	5.00	5.15	5.45	SPT	1	3	4	4	4	5	N=17	
BH1	6.50	6.65	6.95	SPT	2	3	4	5	4	5	N=18	
BH1	8.00	8.15	8.45	SPT	2	3	2	3	3	3	N=11	
BH1	9.50	9.65	9.95	SPT	2	3	3	3	3	3	N=12	
BH1	11.00	11.15	11.45	SPT	3	4	6	7	7	8	N=28	
BH1	12.50	12.65	12.95	SPT	5	6	7	8	8	9	N=32	
BH1	14.55	14.70	15.00	SPT	4	7	8	8	9	9	N=34	

Site Analytical Services Ltd.

Site: 17 BRANCH HILL, LONDON, NW3 7NA			Trial Pit Number: TP1
Excavation Method: HAND DUG PIT	Dimensions: 300mm x 300mm	Ground Level (mOD): 117.40	Client: MR ADAM KAYE	Job Number: 1422714
	Location: TQ 260 862	Dates: 10/10/2014	Engineer: ENGINEERS HASKINS ROBINSON WATERS	Sheet: 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				117.36	(0.04)	Stone slab		
				117.28	0.04			
				117.18	(0.08)	Slightly cemented SAND		
					0.12			
					(0.10)	Solid concrete slab		
					0.22			
						Complete at 0.22m		

Plan

Remarks

Pit terminated at request of the engineer due to the presence of concrete

Scale (approx)	Logged By	Figure No.
1:50		1422714.TP1

APPENDIX `B'

Laboratory Test and Groundwater Monitoring Data

Site Analytical Services Ltd.

Ref: 14/22714

UNDRAINED TRIAXIAL COMPRESSION TEST

LOCATION 17 Branch Hill, London, NW3 7NA

BH/TP No.	MOISTURE CONTENT	BULK DENSITY	LATERAL PRESSURE	COMPRESSIVE STRENGTH	COHESION	ANGLE OF SHEARING RESISTANCE	DEPTH
	%	Mg/m^3	kN/m^2	kN/m^2	kN/m^2	degrees	m
BH1	15	2.12	50	276	138		2.25

Table 1

Site Analytical Services Ltd.

Ref: 14/22714

PLASTICITY INDEX & MOISTURE CONTENT DETERMINATIONS

LOCATION 17 Branch Hill, London, NW3 7NA

BH/TP No.	Depth m	Natural Moisture %	Liquid Limit %	Plastic Limit %	Plasticity Index %	Passing 425 µm %	Class
BH2	1.00	25	44	21	23	100	CI
	2.50	20	45	17	28	100	CI
	3.50	22	44	19	25	100	CI

Table 2

Site Analytical Services Ltd.

Ref: 14/22714

SULPHATE & pH DETERMINATIONS

LOCATION 17 Branch Hill, London, NW3 7NA

BH/TP No.	DEPTH BELOW GL m	SOIL SULPHATES AS SO_4 TOTAL %	SOIL SULPHATES AS SO_4 WATER SOL g/l	WATER SULPHATES AS SO_4 g/l	pH	CLASS	SOIL - 2mm %
BH2	2.00		0.07		4.0	DS-1	100
	4.00		0.04		4.2	DS-1	100
	6.00		0.04		5.3	DS-1	100

Classification – Tables C1 and C2 : BRE Special Digest 1 : 2005

Site Analytical Services Ltd.

Ref: 14/22714

GROUNDWATER MONITORING

LOCATION	17 Branch Hill, London, NW3 7NA
MONITORING DATE	24th October 2014

BOREHOLE REF:		**BH1**
Water Level	(m.bgl)	7.11
Depth to base of well	(m.bgl)	8.31

Table 4

Site Analytical Services Ltd.

Laboratory Test Results

Site : 17 BRANCH HILL, LONDON, NW3 7NA

Client : MR ADAM KAYE

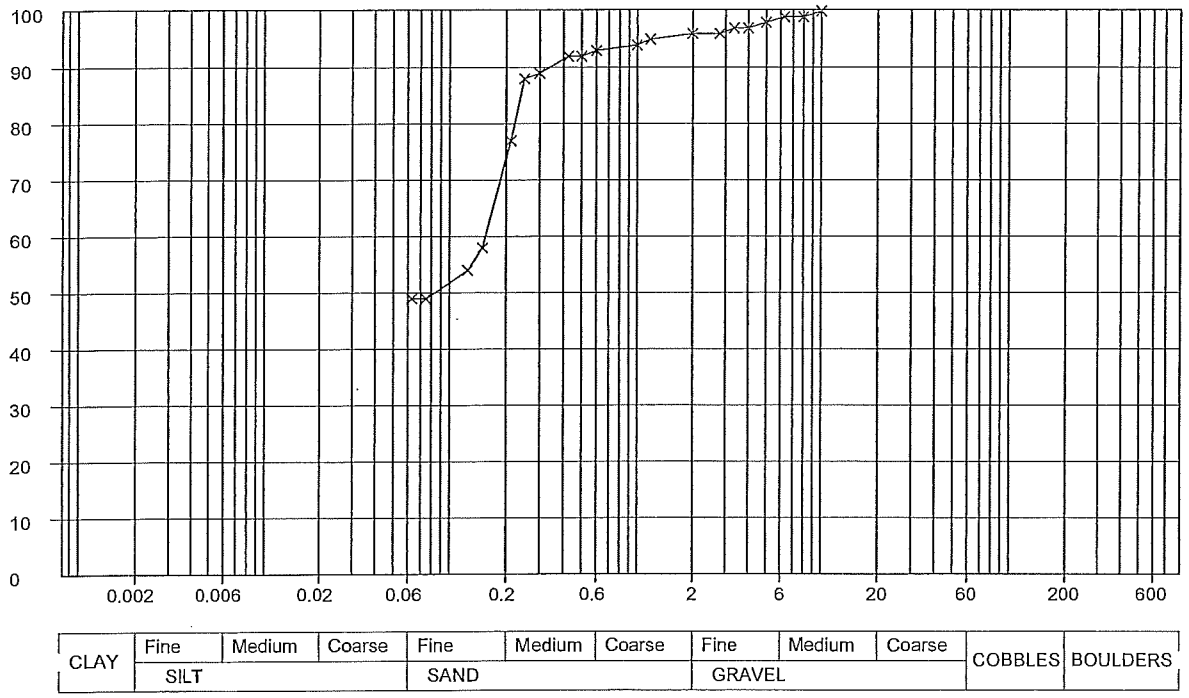
Engineer: ENGINEERS HASKINS ROBINSON WATERS

Job Number 1422714

Sheet 1/6

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Description
BH1	1.00	D4	



Sieve / Particle Size	% Passing
10 mm	100.0
8 mm	99.0
6.3 mm	99.0
5 mm	98.0
4 mm	97.0
3.35 mm	97.0
2.8 mm	96.0
2 mm	96.0
1.18 mm	95.0
1 mm	94.0
600 µm	93.0
500 µm	92.0
425 µm	92.0
300 µm	89.0
250 µm	88.0
212 µm	77.0
150 µm	58.0
125 µm	54.0
75 µm	49.0
63 µm	49.0

Grading Analysis	
D85	239.0 µm
D60	155.6 µm
D10	<63.0 µm
Uniformity Coefficient	-

Particle Proportions	
Cobbles + Boulders	-
Gravel	4.0%
Sand	47.0%
Silt	-
Clay	-

Method of Preparation : BS 1377:PART 1:1990:7.3 Initial preparation 1990:7.4.5 Particle size tests

Method of Test : BS 1377:PART 2:1990:9 Determination of particle size distribution

Remarks :

Site Analytical Services Ltd.

Laboratory Test Results

Site : 17 BRANCH HILL, LONDON, NW3 7NA

Client : MR ADAM KAYE

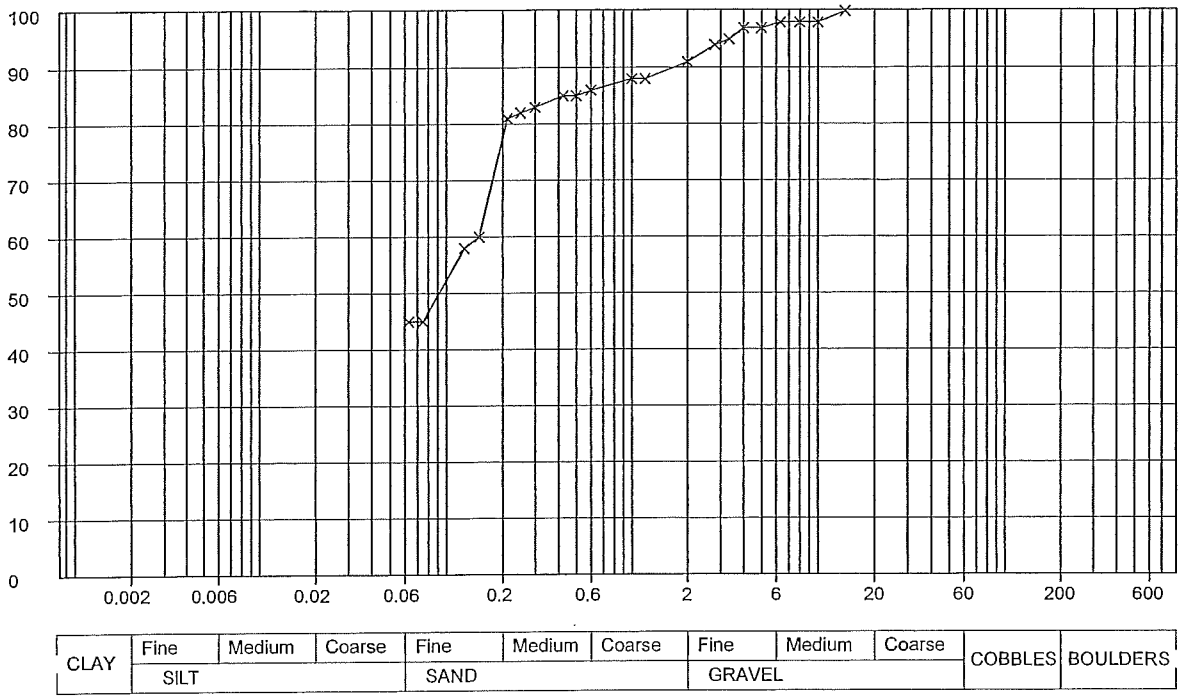
Engineer: ENGINEERS HASKINS ROBINSON WATERS

Job Number 1422714

Sheet 2/6

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Description
BH1	3.00	D8	



Sieve / Particle Size	% Passing
14 mm	100.0
10 mm	98.0
8 mm	98.0
6.3 mm	98.0
5 mm	97.0
4 mm	97.0
3.35 mm	95.0
2.8 mm	94.0
2 mm	91.0
1.18 mm	88.0
1 mm	88.0
600 µm	86.0
500 µm	85.0
425 µm	85.0
300 µm	83.0
250 µm	82.0
212 µm	81.0
150 µm	60.0
125 µm	58.0
75 µm	45.0
63 µm	45.0

Grading Analysis	
D85	500.0 µm
D60	150.0 µm
D10	<63.0 µm
Uniformity Coefficient	-

Particle Proportions	
Cobbles + Boulders	-
Gravel	9.0%
Sand	46.0%
Silt	-
Clay	-

Method of Preparation : BS 1377:PART 1:1990:7.3 Initial preparation 1990:7.4.5 Particle size tests

Method of Test : BS 1377:PART 2:1990:9 Determination of particle size distribution

Remarks :

Site Analytical Services Ltd.

Laboratory Test Results

Site : 17 BRANCH HILL, LONDON, NW3 7NA

Client : MR ADAM KAYE

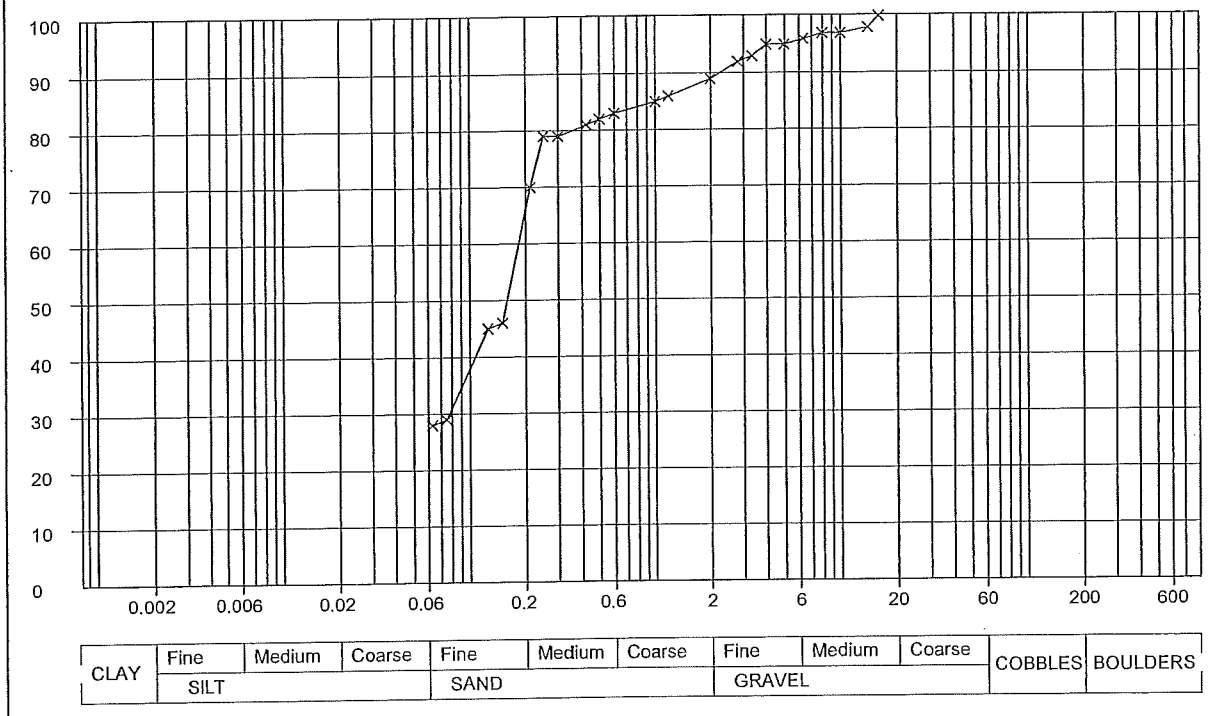
Engineer: ENGINEERS HASKINS ROBINSON WATERS

Job Number: 1422714

Sheet: 3/6

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Description
BH1	5.00	D12	



Sieve / Particle Size	% Passing
16 mm	100.0
14 mm	98.0
10 mm	97.0
8 mm	97.0
6.3 mm	96.0
5 mm	95.0
4 mm	95.0
3.35 mm	93.0
2.8 mm	92.0
2 mm	89.0
1.18 mm	86.0
1 mm	85.0
600 µm	83.0
500 µm	82.0
425 µm	81.0
300 µm	79.0
250 µm	79.0
212 µm	70.0
150 µm	46.0
125 µm	45.0
75 µm	29.0
63 µm	28.0

Grading Analysis	
D85	1.0 mm
D60	183.5 µm
D10	<63.0 µm
Uniformity Coefficient	-

Particle Proportions	
Cobbles + Boulders	-
Gravel	11.0%
Sand	61.0%
Silt	-
Clay	-

Method of Preparation : BS 1377:PART 1:1990:7.3 Initial preparation 1990:7.4.5 Particle size tests

Method of Test : BS 1377:PART 2:1990:9 Determination of particle size distribution

Remarks :

Site Analytical Services Ltd.

Laboratory Test Results

Site : 17 BRANCH HILL, LONDON, NW3 7NA

Client : MR ADAM KAYE

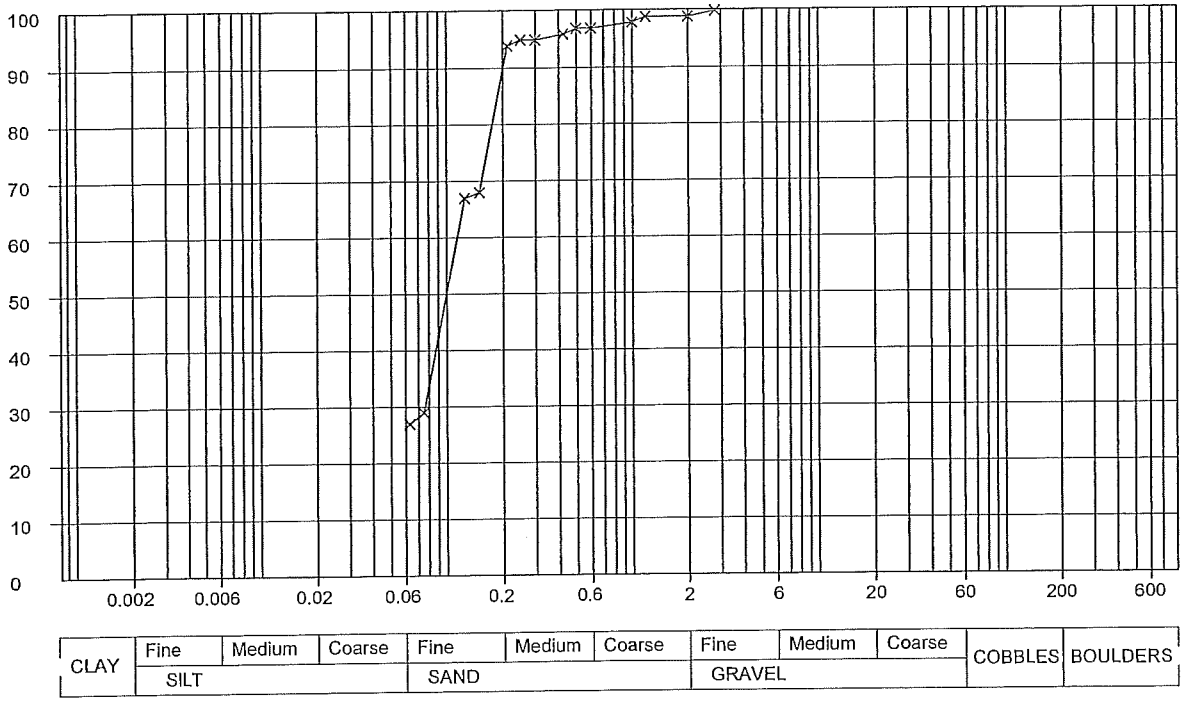
Engineer: ENGINEERS HASKINS ROBINSON WATERS

Job Number 1422714

Sheet 4/6

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Description
BH1	9.50	D21	



Sieve / Particle Size	% Passing
2.8 mm	100.0
2 mm	99.0
1.18 mm	99.0
1 mm	98.0
600 µm	97.0
500 µm	97.0
425 µm	96.0
300 µm	95.0
250 µm	95.0
212 µm	94.0
150 µm	68.0
125 µm	67.0
75 µm	29.0
63 µm	27.0

Grading Analysis	
D85	188.1 µm
D60	113.8 µm
D10	<63.0 µm
Uniformity Coefficient	-

Particle Proportions	
Cobbles + Boulders	-
Gravel	1.0%
Sand	72.0%
Silt	-
Clay	-

Method of Preparation : BS 1377:PART 1:1990:7.3 Initial preparation 1990:7.4.5 Particle size tests

Method of Test : BS 1377:PART 2:1990:9 Determination of particle size distribution

Remarks :

Site Analytical Services Ltd.

Laboratory Test Results

Site : 17 BRANCH HILL, LONDON, NW3 7NA

Client : MR ADAM KAYE

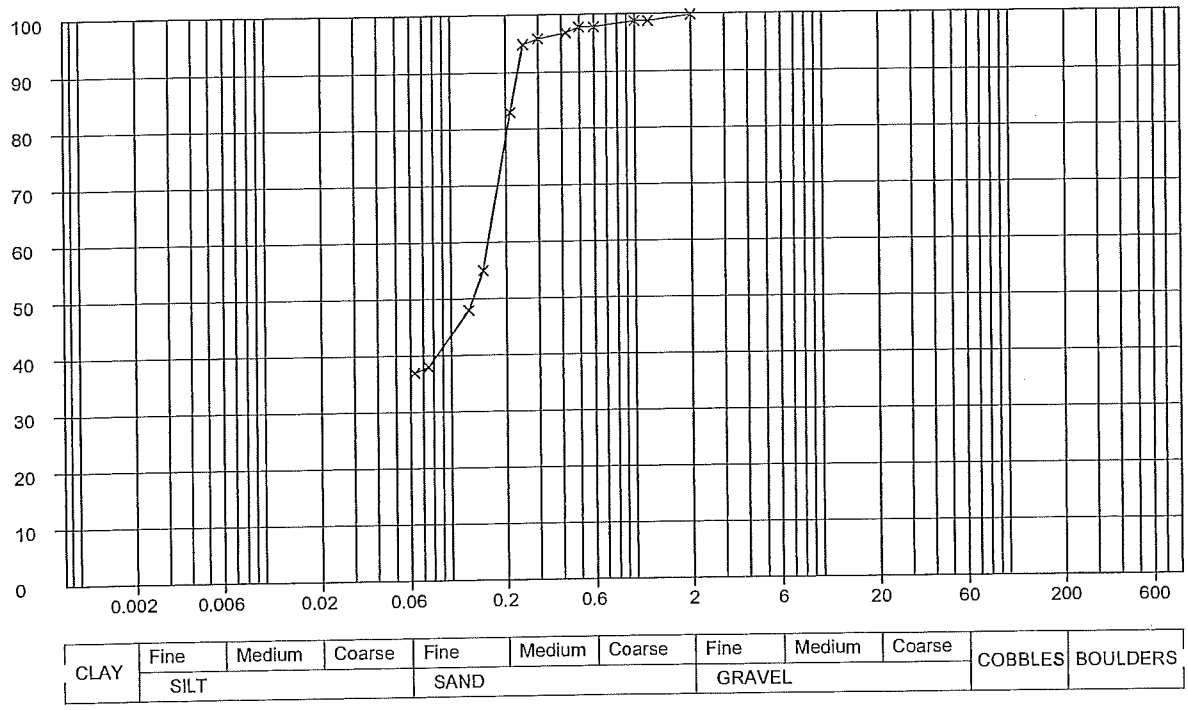
Engineer: ENGINEERS HASKINS ROBINSON WATERS

Job Number 1422714

Sheet 5/6

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Description
BH1	13.75	D29	



Sieve / Particle Size	% Passing
2 mm	100.0
1.18 mm	99.0
1 mm	99.0
600 µm	98.0
500 µm	98.0
425 µm	97.0
300 µm	96.0
250 µm	95.0
212 µm	83.0
150 µm	55.0
125 µm	48.0
75 µm	38.0
63 µm	37.0

Grading Analysis	
D85	217.9 µm
D60	159.6 µm
D10	<63.0 µm
Uniformity Coefficient	-

Particle Proportions	
Cobbles + Boulders	-
Gravel	-
Sand	63.0%
Silt	-
Clay	-

Method of Preparation : BS 1377:PART 1:1990:7.3 Initial preparation 1990:7.4.5 Particle size tests

Method of Test : BS 1377:PART 2:1990:9 Determination of particle size distribution

Remarks :

Site Analytical Services Ltd.

Laboratory Test Results

Site : 17 BRANCH HILL, LONDON, NW3 7NA

Client : MR ADAM KAYE

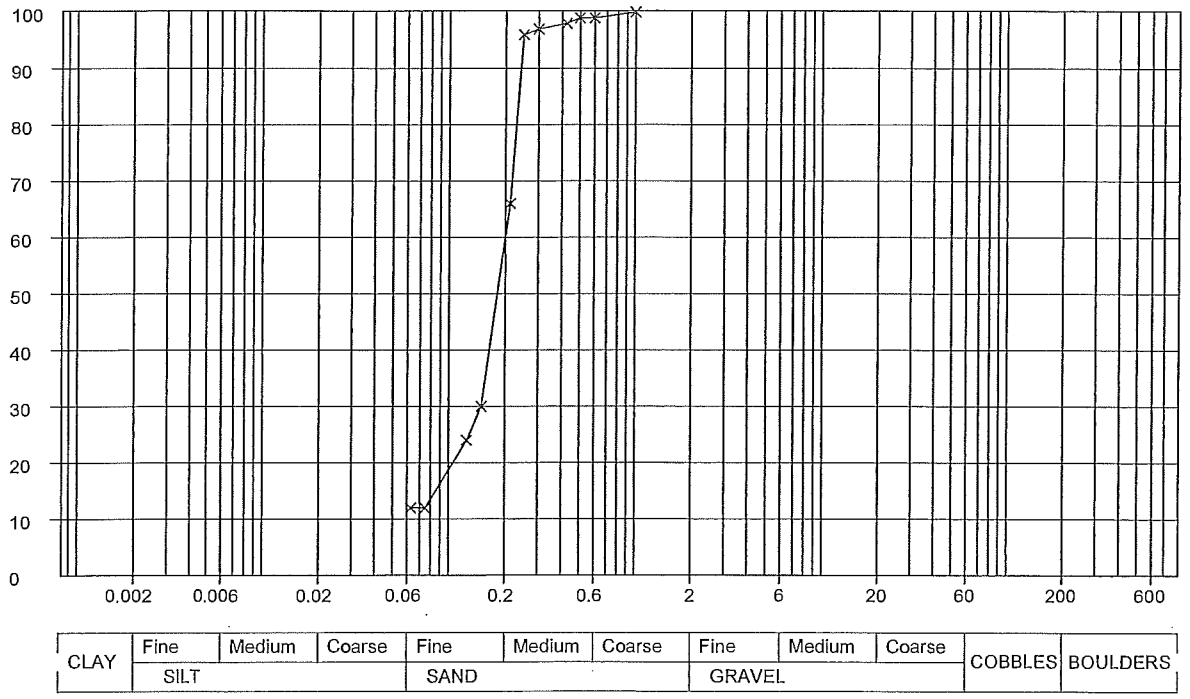
Engineer: ENGINEERS HASKINS ROBINSON WATERS

Job Number 1422714

Sheet 6/6

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Description
BH2	5.00	D12	



Sieve / Particle Size	% Passing
1 mm	100.0
600 µm	99.0
500 µm	99.0
425 µm	98.0
300 µm	97.0
250 µm	96.0
212 µm	66.0
150 µm	30.0
125 µm	24.0
75 µm	12.0
63 µm	12.0

Grading Analysis	
D85	235.3 µm
D60	200.1 µm
D10	<63.0 µm
Uniformity Coefficient	-

Particle Proportions	
Cobbles + Boulders	-
Gravel	-
Sand	88.0%
Silt	-
Clay	-

Method of Preparation : BS 1377:PART 1:1990:7.3 Initial preparation 1990:7.4.5 Particle size tests

Method of Test : BS 1377:PART 2:1990:9 Determination of particle size distribution

Remarks :

Aubrey Davidson
Site Analytical Services Ltd
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33 River Road
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IG11 0EA

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Watford,
Herts,
WD18 8YS

t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

Analytical Report Number : 14-61886

Project / Site name:	17 Branch Hill	**Samples received on:**	23/10/2014
Your job number:	14-22714	**Samples instructed on:**	23/10/2014
Your order number:	20925	**Analysis completed by:**	30/10/2014
Report Issue Number:	1	**Report issued on:**	30/10/2014
Samples Analysed:	4 soil samples		

Signed: CCStone

Dr Claire Stone
Quality Manager
For & on behalf of i2 Analytical Ltd.

Signed: TPl

Thurstan Plummer
Organics Technical Manager
For & on behalf of i2 Analytical Ltd.

Other office located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland

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

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

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

Analytical Report Number: 14-61886
Project / Site name: 17 Branch Hill
Your Order No: 20925

Lab Sample Number				384687	384688	384689	384690	
Sample Reference				BH1	BH1	BH2	BH2	
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	
Depth (m)				0.25	0.50	0.50	0.75	
Date Sampled				23/10/2014	23/10/2014	23/10/2014	23/10/2014	
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Moisture Content	%	N/A	NONE	9.3	8.2	15	16	
Total mass of sample received	kg	0.001	NONE	0.64	0.61	0.58	0.62	
Whole Sample Crushed		N/A	NONE	Crushed	Crushed	Crushed	Crushed	
Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	Chrysotile- Loose fibres	Chrysotile- Insulation lagging	-	-	
Asbestos in Soil Screen	Type	N/A	ISO 17025	Detected	Detected	Not-detected	Not-detected	
General Inorganics								
pH	pH Units	N/A	MCERTS	9.1	9.0	8.6	8.4	
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1	< 1	
Complex Cyanide	mg/kg	1	NONE	< 1	< 1	< 1	< 1	
Free Cyanide	mg/kg	1	NONE	< 1	< 1	< 1	< 1	
Total Sulphate as SO_4	mg/kg	100	ISO 17025	1300	940	330	620	
Water Soluble Sulphate (Soil Equivalent)	g/l	0.0025	MCERTS	0.16	0.21	0.065	0.050	
Water Soluble Sulphate (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.081	0.11	0.033	0.025	
Sulphide	mg/kg	1	MCERTS	< 1.0	9.4	< 1.0	< 1.0	
Total Organic Carbon (TOC)	%	0.1	MCERTS	0.2	< 0.1	0.9	< 0.1	
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	
Acenaphthylene	mg/kg	0.1	MCERTS	< 0.10	0.31	< 0.10	< 0.10	
Acenaphthene	mg/kg	0.1	MCERTS	< 0.10	0.29	< 0.10	< 0.10	
Fluorene	mg/kg	0.1	MCERTS	< 0.10	0.45	< 0.10	< 0.10	
Phenanthrene	mg/kg	0.1	MCERTS	1.2	4.3	< 0.10	< 0.10	
Anthracene	mg/kg	0.1	MCERTS	0.46	1.2	< 0.10	< 0.10	
Fluoranthene	mg/kg	0.1	MCERTS	4.3	7.2	0.71	< 0.10	
Pyrene	mg/kg	0.1	MCERTS	3.7	5.8	0.61	< 0.10	
Benzo(a)anthracene	mg/kg	0.1	MCERTS	2.4	3.0	0.31	< 0.10	
Chrysene	mg/kg	0.05	MCERTS	2.2	3.0	0.36	< 0.05	
Benzo(b)fluoranthene	mg/kg	0.1	MCERTS	2.9	3.9	0.46	< 0.10	
Benzo(k)fluoranthene	mg/kg	0.1	MCERTS	1.7	1.6	0.31	< 0.10	
Benzo(a)pyrene	mg/kg	0.1	MCERTS	2.6	3.1	0.43	< 0.10	
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	MCERTS	1.2	1.4	< 0.10	< 0.10	
Dibenz(a,h)anthracene	mg/kg	0.1	MCERTS	0.20	0.23	< 0.10	< 0.10	
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	1.4	1.7	< 0.05	< 0.05	
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	1.6	MCERTS	24.2	37.4	3.19	< 1.60	

Analytical Report Number: 14-61886
Project / Site name: 17 Branch Hill
Your Order No: 20925

Lab Sample Number				384687	384688	384689	384690	
Sample Reference				BH1	BH1	BH2	BH2	
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	
Depth (m)				0.25	0.50	0.50	0.75	
Date Sampled				23/10/2014	23/10/2014	23/10/2014	23/10/2014	
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	12	11	18	6.4	
Boron (total)	mg/kg	1	MCERTS	8.4	6.6	9.2	13	
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	0.3	< 0.2	
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0	
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	26	21	42	50	
Copper (aqua regia extractable)	mg/kg	1	MCERTS	29	25	38	14	
Lead (aqua regia extractable)	mg/kg	1	MCERTS	220	180	410	19	
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	0.3	< 0.3	
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	16	14	15	15	
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	87	120	190	44	
Monoaromatics								
Benzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	
Toluene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	
p & m-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	
o-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	
Petroleum Hydrocarbons								
TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0	< 2.0	
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	< 8.0	< 8.0	< 8.0	< 8.0	
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	< 8.0	< 8.0	< 8.0	< 8.0	
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	< 10	< 10	< 10	< 10	
TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	2.7	< 2.0	< 2.0	
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	16	33	< 10	< 10	
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	24	37	< 10	< 10	
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	40	73	< 10	< 10	

Analytical Report Number : 14-61886

Project / Site name: 17 Branch Hill

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

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
384687	BH1	None Supplied	0.25	Brown sandy topsoil with rubble.
384688	BH1	None Supplied	0.50	Brown sandy topsoil with rubble.
384689	BH2	None Supplied	0.50	Brown clay and topsoil with gravel.
384690	BH2	None Supplied	0.75	Brown clay and topsoil with gravel.

Analytical Report Number : 14-61886

Project / Site name: 17 Branch Hill

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
BTEX and MTBE in soil	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073S-PL	W	MCERTS
Complex cyanide in soil	Determination of complex cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	NONE
Crush Whole Sample	Either: Client specific preparation instructions - sample(s) crushed whole prior to analysis; OR Sample unsuitable for standard preparation and therefore crushed whole prior to analysis.	In house method, applicable to dry samples only.	L019-UK	D	NONE
Free cyanide in soil	Determination of free cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	NONE
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	D	MCERTS
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
pH in soil	Determination of pH in soil by addition of water followed by electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L005-PL	W	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Stones not passing through a 10 mm sieve is determined gravimetrically and reported as a percentage of the dry weight. Sample results	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Sulphate, water soluble, in soil	Determination of water soluble sulphate by extraction with water followed by ICP-OES. Results reported corrected for extraction ratio (soil equivalent) as g/l and mg/kg; and upon the 2:1	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L038-PL	D	MCERTS
Sulphide in soil	Determination of sulphide in soil by acidification and heating to liberate hydrogen sulphide, trapped in an alkaline solution then assayed by ion selective electrode.	In-house method	L010-PL	D	MCERTS
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS

Analytical Report Number : 14-61886

Project / Site name: 17 Branch Hill

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Total organic carbon in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L023-PL	D	MCERTS
Total sulphate (as SO4 in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L038-PL	D	ISO 17025
TPHCWG (Soil)	Determination of pentane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method	L076-PL	W	MCERTS

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.
For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

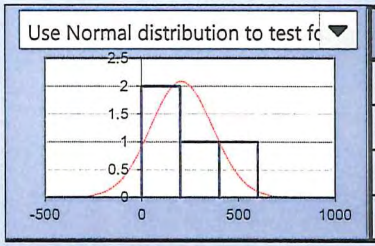
APPENDIX `C'

Statistical Analysis

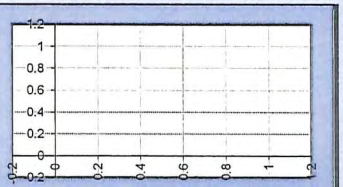
Test Results

Client/client ref: 17 Branch Hill | Site ref: 14/22714 | Date: 07-Nov-2014
Project ref: | Data description: | User details: A Davidson

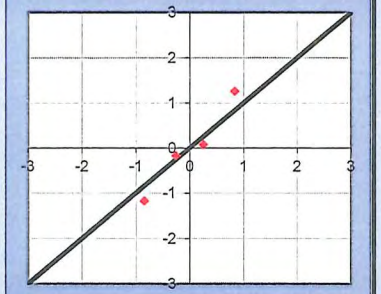
Dataset:	Pb
Sample mean, $\overline{x}$	207.25
Sample standard deviation, s	160.68
Sample size, n	4
Critical concentration, Cc	200



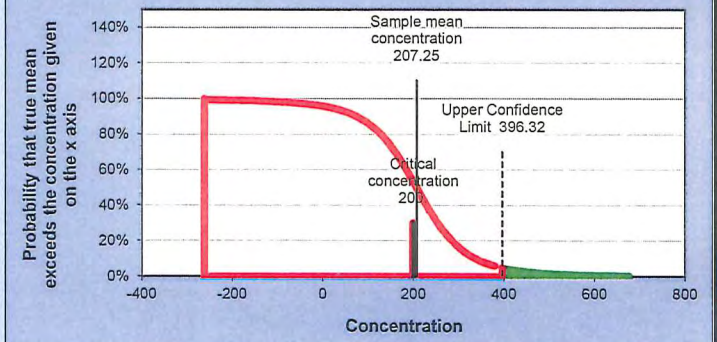
Outliers & non-detects	
Outliers present?	NO
Significance level	5%
Outliers removed?	0
Non-detects	0



Normality test	
Significance level:	5%
Normal distribution	
Use:	Auto: One-sample t-test



Test scenario:	Planning: is true mean lower than critical concentration (μ < Cc)?
Null hypothesis:	The true mean concentration is equal to or greater than the critical concentration: μ ≥ Cc
Alternative hypothesis:	The true mean concentration is less than the critical concentration: μ < Cc



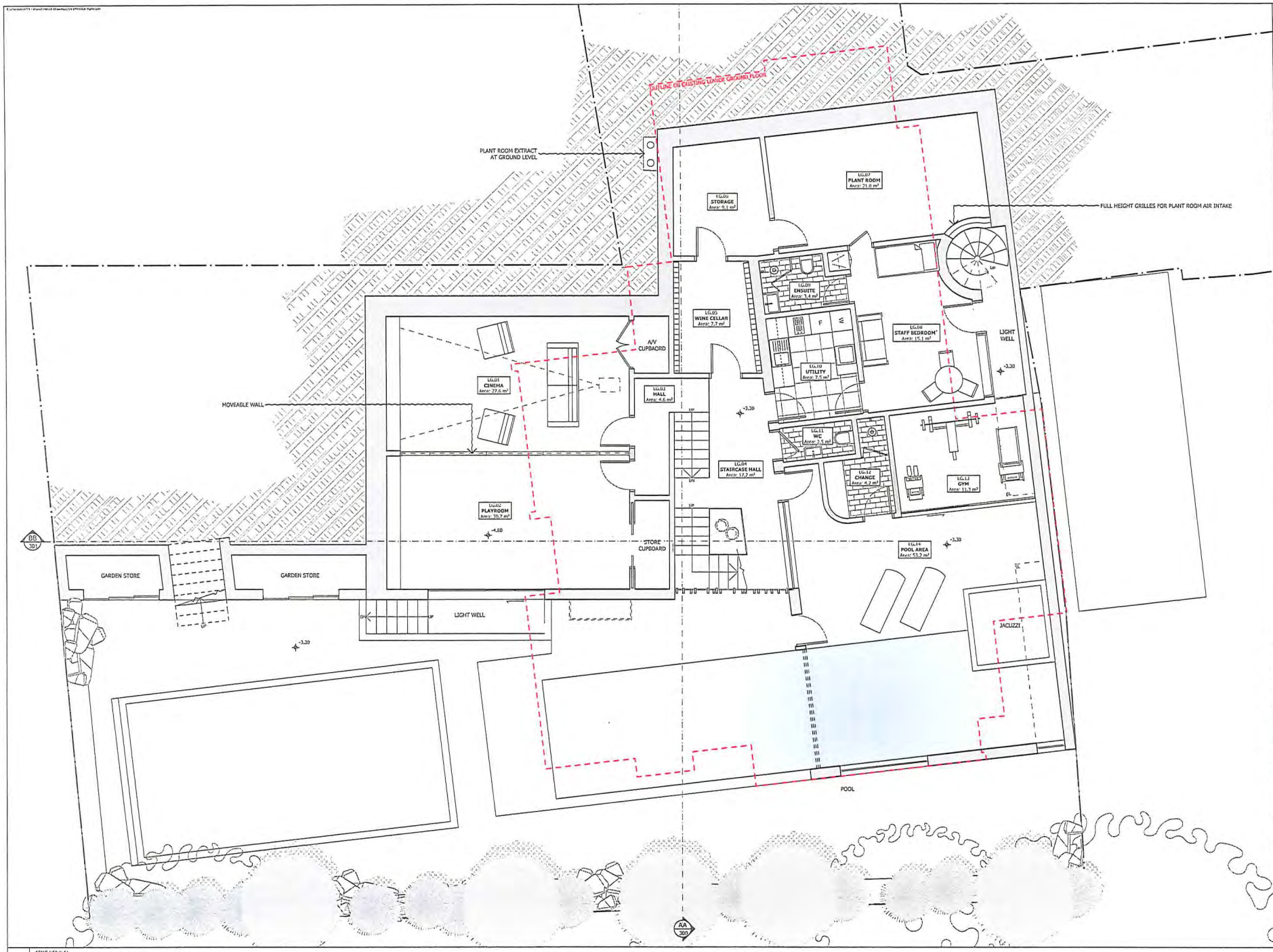
Evidence against Null hypothesis:	47%
Base decision on:	evidence level
Evidence level required:	95%
Balance of probability?	N/A
Reject Null Hypothesis?	No
μ ≥ Cc	

Back to data | Back to summary | Go to outlier test | Go to normality test

Site Analytical Services Ltd.

APPENDIX `D'

Proposed plans of the development



1 SCALE 1:50 @ A1

LOWER GROUND FLOOR - PROPOSED

DO NOT SCALE FROM THIS DRAWING

Figured dimensions only are to be taken from this drawing. All dimensions are to be checked on site before any work is put in hand.
If in doubt, ask.

All SHH drawings to be read in conjunction with relevant SHH Finishes, Sanitaryware, Lighting & Ironmongery schedules.

Any discrepancies to be highlighted to SHH prior to procurement and in good time.

Legends & Notes:

Rev	Date	Descriptor	Init.
[illegible]	30.12.2015	Issued for Information	HH

SHHARCHITECTS|INTERIORDESIGNERS
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Drawing Title:

020 General Arrangements

Lower Ground Floor

[Project number]/[DWG number_Revision]: (779)020_P01

Checked: