QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
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Tel : 01622 850410

MCERTS THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME
UKAS TESTING 4480

Waste Acceptance Criteria Analytical Certificate - BS EN 12457/3

QTS Environmental Report No: 14-24800	Date Sampled	11/09/14	
Site Analytical Services Ltd	Time Sampled	None Supplied	
Site Reference: 5-7 Lancaster Grove, London NW3 4HE	TP / BH No	BH2	
Project / Job Ref: 14/22518	Additional Refs	D1	
Order No: 20811	Depth (m)	0.25	
Reporting Date: 18/09/2014	QTSE Sample No	117663	

Determinand	Unit	MDL		Landfill Waste Acceptance Criteria Limits: Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill
TOC	%	< 0.1	1.9	3%	5%	6%
Loss on Ignition	%	< 0.01	4.90	--	--	10%
BTEX[MU]	mg/kg	< 0.05	< 0.05	6	--	--
Sum of PCBs	mg/kg	< 0.7	< 0.7	1	--	--
Mineral Oil	mg/kg	< 6	< 6	500	--	--
Total PAH[MU]	mg/kg	< 1.7	< 1.7	100	--	--
pH[MU]	pH Units	N/a	7.5	--	>6	--
Acid Neutralisation Capacity	mol/kg (+/-)	< 1	1.5	--	To be evaluated	To be evaluated

Eluate Analysis	2:1 mg/l	8:1 mg/l		Cumulative 10:1 mg/kg	Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg (mg/kg)		
Arsenic	0.01	< 0.01		< 0.2	0.5	2	25
Barium	0.03	0.03		0.3	20	100	300
Cadmium	< 0.0005	< 0.0005		< 0.02	0.04	1	5
Chromium	< 0.005	< 0.005		< 0.20	0.5	10	70
Copper	0.01	< 0.01		< 0.5	2	50	100
Mercury	< 0.005	< 0.005		< 0.01	0.01	0.2	2
Molybdenum	0.007	0.002		< 0.1	0.5	10	30
Nickel	< 0.007	< 0.007		< 0.2	0.4	10	40
Lead	< 0.005	< 0.005		< 0.2	0.5	10	50
Antimony	0.014	< 0.005		< 0.06	0.06	0.7	5
Selenium	< 0.005	< 0.005		< 0.1	0.1	0.5	7
Zinc	0.005	0.005		< 0.2	4	50	200
Chloride[U]	6	1		16	800	15000	25000
Fluoride[U]	1.5	0.8		9.1	10	150	500
Sulphate[U]	17	4		55	1000	20000	50000
TDS	164	113		1190	4000	60000	100000
Phenol Index	< 0.01	< 0.01		< 0.5	1	-	-
DOC	11.9	10		102	500	800	1000
Leach Test Information							
Sample Mass (kg)	0.20						
Dry Matter (%)	86						
Moisture (%)	16.4						
Stage 1							
Volume Eluate L2 (litres)	0.32						
Filtered Eluate VE1 (litres)	0.21						

Results are expressed on a dry weight basis, after correction for moisture content where applicable
Stated limits are for guidance only and QTS Environmental cannot be held responsible for any discrepencies with current legislation
M Denotes MCERTS accredited test
U Denotes ISO17025 accredited test

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Soil Analysis Certificate - Sample Descriptions	
QTS Environmental Report No: 14-24800	
Site Analytical Services Ltd	
Site Reference: 5-7 Lancaster Grove, London NW3 4HE	
Project / Job Ref: 14/22518	
Order No: 20811	
Reporting Date: 18/09/2014	

QTSE Sample No	TP / BH No	Additional Refs	Depth (m)	Moisture Content (%)	Sample Matrix Description
117662	BH1	D2	0.50	15.3	Light brown clayey sand with stones
117663	BH2	D1	0.25	14	Brown gravelly clay

Moisture content is part of procedure E003 & is not an accredited test
Insufficient Sample I/S
Unsuitable Sample U/S

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Soil Analysis Certificate - Methodology & Miscellaneous Information
QTS Environmental Report No: 14-24800
Site Analytical Services Ltd
Site Reference: 5-7 Lancaster Grove, London NW3 4HE
Project / Job Ref: 14/22518
Order No: 20811
Reporting Date: 18/09/2014

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

D Dried
AR As Received

APPENDIX `C'

Statistical Analysis

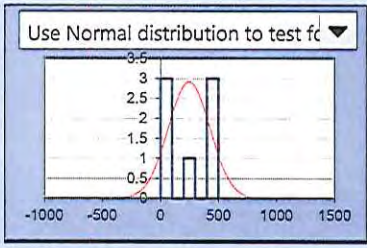
Test Results

Client/client ref: 14/22518
Project ref: Lancaster Grove

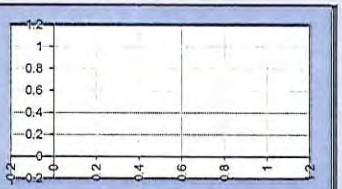
Site ref:
Data description:

Date: 09-Oct-2014
User details: A Davidson

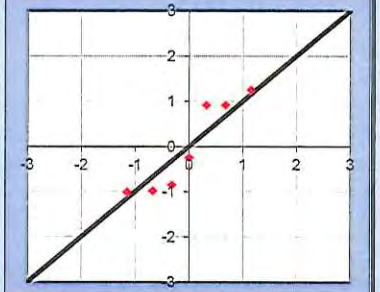
Dataset:	Pb
Sample mean, $\bar{x}$	245.43
Sample standard deviation, s	179.46
Sample size, n	7
Critical concentration, Cc	200



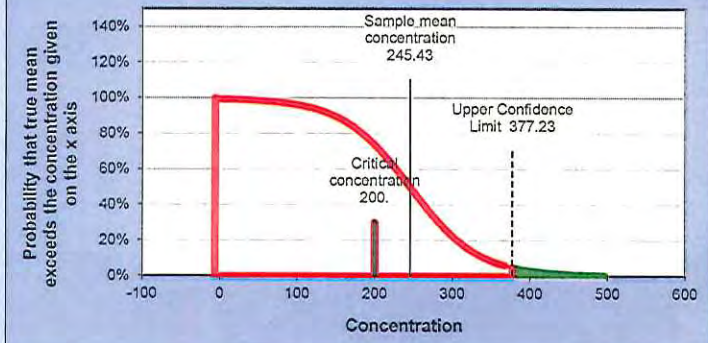
Outliers & non-detects	
Outliers present?	NO
Significance level	5%
Outliers removed?	1
Non-detects	0



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:	26%
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'

Applied Geotechnical Engineering Limited – Settlement Calculation

1.0 Introduction

In connection with the proposal to redevelop 7 Lancaster Grove, London NW3, including the construction of a basement, Applied Geotechnical Engineering Ltd (AGE) has been instructed by Site Analytical Services (SAS) on behalf of the client, to estimate the settlement of the perimeter pile wall under structural loadings. It is not required to consider the effects of heave arising from basement excavation in this assessment.

The proposed redevelopment is understood to include the demolition of the existing structure and construction of a new 4-storey building. On the basis of the information provided the basement depth is taken to be of the order of 4m.

2.0 Information Provided

The following relevant information has been used for these calculations:-

i) Preliminary SAS borehole logs in file '22518 Prelim Logs.pdf'.
ii) Architects drawings contained in file '140721 Pre-Application_5-7 Lancaster Grove.pdf'.
iii) Undrained triaxial test results in File 17429-Triaxial Summary
vi) Email correspondence SAS-AGE dated 10/9/14 to 7/10/14.

3.0 Anticipated Ground Conditions

The general ground surface in the area of the site is understood to be essentially level for practical purposes.

The published geological map (BGS 1:50 000 sheet 256: North London) indicates the site to be underlain by London Clay. On a developed site such as this Made Ground is also anticipated.

The level of the site, relative to Ordnance Datum, is not known. Site Datum (0.0mSD) will be taken at existing ground level.

A ground investigation has been undertaken at the site (Item 'i' in Section 2 above). This included two rotary percussion boreholes within which SPT tests were carried out and from which U100 samples were taken. The boreholes revealed 1m or less of Made Ground, overlying clay Head to a depth of 1.8m or less, overlying London Clay.

The results of the SPTs have been converted to undrained strength values by means of Stroud's correlation (Ref 1), and these have been plotted, together with the results of 4No undrained triaxial tests on 100mm samples, in Figure 1. From this figure the following undrained strength profile has been derived for the London Clay:-

$Cu = 60 + 11z$ (kPa) (Where z = depth below top of London Clay at 1m depth).

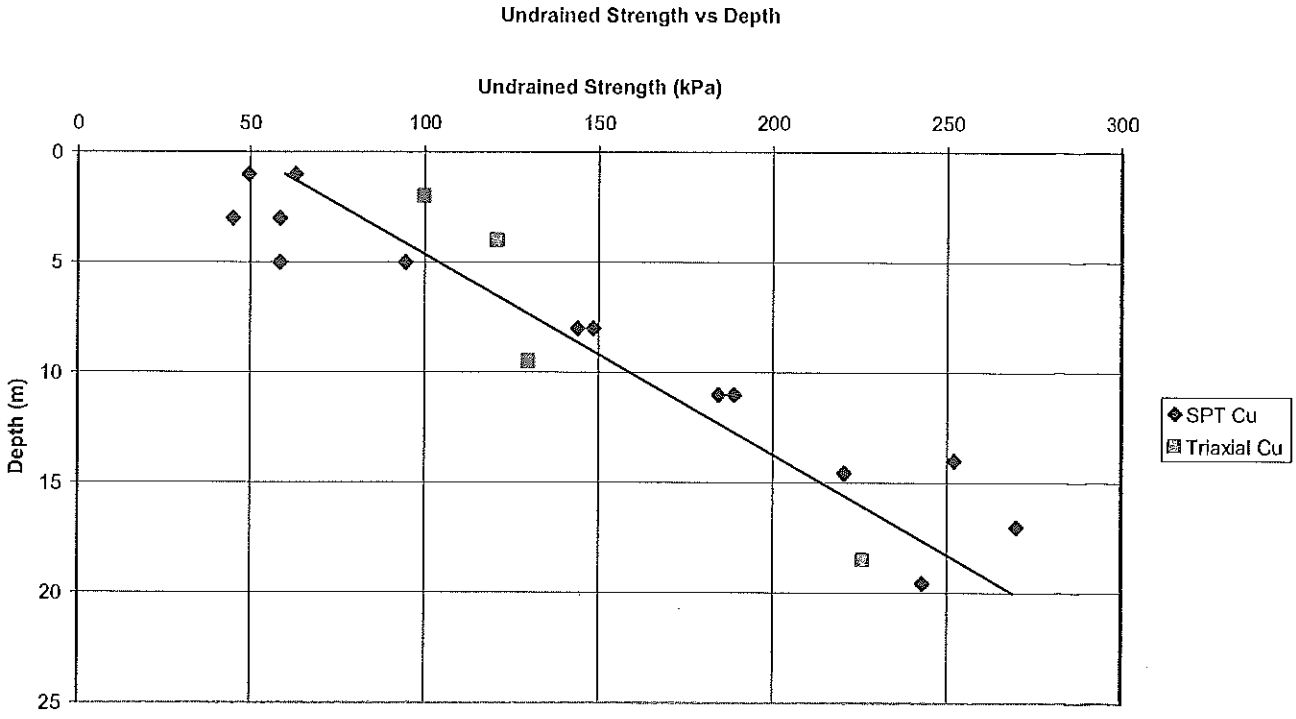


Figure 1 – Undrained strength vs Depth

4.0 Loads

No site-specific load data has been provided. A general building footprint pressure of 200kPa is to be adopted, of which 50% is to be taken as imposed uniformly on the perimeter pile wall.

On the basis of the architects drawings (Item 'ii' in Section 2 above) the building footprint is estimated to occupy 300m^2, therefore the gross building load is taken as 60 000kN, of which 50% (30 000kN) will be imposed on the perimeter basement wall. The length of that wall is estimated to be 75m, therefore the vertical loading on the perimeter wall is estimated to be 400kN/m run.

It is understood that the wall is to be constructed of bored piles of 300-400mm diameter. It has been assumed, for the purpose of this exercise only, that the perimeter pile wall will be formed of contiguous 400mm piles at 500mm centres. The load per pile in this scenario is therefore 200kN.

A minimum overall Factor of Safety of 3.0 has been specified for the piles.

On the basis of the above loading and geometry information, a standard vertical load design has been carried out, this indicates, for the purposes of this exercise only, that piles will be required to penetrate to 6.5m below the excavation level in order to carry the vertical load.

5.0 Estimated pile settlement

The settlement of the piles forming the perimeter pile wall has been estimated in two stages; in the first the settlement of a single pile is calculated by the method of Vardanega et al (Ref 2), the group effects caused by the neighbouring piles in the wall are then taken into account using the 'Piglet' software.

The settlement (w) of a single pile in London Clay, in response to vertical load, is given by the equation (Ref 2):-

$$w = D\,[2.38 \times \gamma_{M=2}/M^{5/3} + 2Cu/(M.E_c) \times (L/D)^2]$$

Where:-
D = Pile diameter (taken as 0.4m)
$\gamma_{M=2}$ = shear strain at Cu/2 (taken as 0.008)
M = Cu mobilisation factor (taken as 5.26, on the basis of the pile design)
Cu = mean undrained strength along the pile shaft
Ec = Young's modulus of concrete (taken as 2E7kPa).
L = pile length, taken as 9.5m.

The single pile settlement calculated by this method is 1.0mm.

The pile group software 'Piglet' has been used to determine the effect of loading a line of such piles, as compared to a single pile. It is found that, for the particular geometry in this case, a pile wall settles approximately 4 x single-pile-settlement, ie 4mm.

6.0 Conclusions

On the basis of the information, and assumptions, above, it is estimated that the settlement of the perimeter pile walls due solely to the vertical wall loading will be of the order of 4mm. No account is taken in these calculation of the effect of heave due to basement excavation.

References:

1 Stroud M A (1989) 'The standard penetration test – its application and interpretation'. In 'Penetration testing in the UK', Thomas Telford pub.

2 Vardanega PJ, Williamson MG and Bolton MD (2012) 'Bored pile design in stiff clay II: mechanisms and uncertainty'. Geotechnical Engineering v165 GE4.