

15th August 2022

Our ref : CSG/17590

PSK Ltd
1st Floor
Greenhill House
90-93 Crosscrow Street
London
EC1M 6BF

For the attention of J.Venes Esq.,

Dear Sir,

Re: Stadium Way, Reading, Berkshire RG30 6BX: Site Investigation

SECTION 1 INTRODUCTION

- 1.01 In accordance with your instructions, we visited the above site during July and August 2022.
- 1.02 The purpose of our visit was to carry out an investigation into the subsoil conditions in order to assess the suitability of the site for the development of a new commercial estate.
- 1.03 The comments and opinions expressed are based purely on the conditions encountered and the subsequent laboratory testing. The locations of the excavations have been assessed on site.
- 1.04 Some special condition may be present on site that, to date, has not been encountered within the scope of the site investigation works and therefore will not have been taken into account within this report.
- 1.05 All ground water recordings or their absence relate to short term observations and do not allow for fluctuations due to seasonal or other effects.

SECTION 2 DESCRIPTION OF SITE

- 2.01 The site is formed by an existing car park and road system with existing commercial units to the south. The site is laid to hard landscaping.
- 2.02 The site is surrounded by railway land and commercial land.

SECTION 3 FIELDWORK

- 3.01 In order to assess the site, the proposals have been made to assess both the shallow and deeper soils profiles in order to enable the design of potentially traditional foundations or piled foundations should this option become unviable. In order to complete these works, the following site investigation works were implemented.

- 4No Dynamic Competitor Rig boreholes were sunk immediately outside the footprint of the proposed structure in order to assess soils, complete insitu testing, recover samples and record the soil profile. The depth of these boreholes were identified as 4.00 metres deep. The date of these works was recorded as July & August 2022.
- Laboratory Testing – July & August 2022.

3.02 The location of these works is indicated on the site plan-forming appendix one.

3.03 The various strata encountered were noted and are recorded on the borehole logs forming appendix two.

3.04 Full ranges of samples were recovered as noted and retained for subsequent laboratory testing.

SECTION 4 LABORATORY TESTING

4.01 All samples were tested in accordance with BS:1377:1990, methods for test for civil engineering purposes.

4.02 Selected samples were recovered to determine their Atterberg Limits, Particle Size Distribution Testing, Hand Penetrometer testing, Soluble Sulphate value and pH.

4.03 The results of this laboratory testing are enclosed and form appendix three

SECTION 5 SITE INFORMATION

5.01 The site has been reviewed and we can confirm that the geology within the site is as follows :-

Table 1 Geological Profile

Stratum	Description	Depth, Range	Thickness, Range
Made Ground	Concrete	0.13-0.26m	0.13-0.26m
	Loose to compact brown grey clay FILL with black staining and rare brick fragments	1.00	0.80m
	Loose to compact brown clayey gravel FILL	0.50	0.35m
	Loose to compact brown chalky clay FILL with black staining and rare brick fragments	1.70	1.20m
SUPERFICIAL DEPOSITS	Soft grey very silty CLAY	0.50-1.80m	0.24-0.40m
TAPLOW GRAVEL	Loose light brown saturated silty claybound SAND & GRAVEL	1.40-1.60m	0.90-1.47m
	Medium dense brown SAND & GRAVEL	3.00m+	1.20-1.40m+
Ground Water ∴ Groundwater has been identified at a depth of between 1.31m to 2.42 metres. No long term monitoring has been completed.			

SECTION 6 **RESULTS**

- 6.01 By inspection of the borehole logs and from a visual assessment of the samples recovered, a scheme of laboratory testing has been undertaken. The results are enclosed within appendix three and prove the following:
- 6.02 Laboratory testing has been undertaken in accordance with BS 1377:1990, (Methods for Tests for Soils for Civil Engineering Purposes), the results of which are enclosed.
- 6.03 Included within the laboratory testing was sulphate analysis, which can determine the use of sulphate resisting cement within the foundation design for the development. The results are enclosed and prove the classification in accordance with AEC to be DS-1/AC-1S.
- 6.04 Atterberg Limits tests proved the clay soils to be of intermediate plasticity, (PI=14-25%), which indicates a moderate susceptibility to movement associated with moisture content change.
- 6.05 SPT N-Values have been completed within the boreholes completed at the site. It is confirmed within the borehole logs forming appendix two of this report that SPT N-Values of between 9-50+ were achieved. This would indicate an approximate allowable bearing capacity of between 90kN/m² to 500kN/m² would be recognized. If groundwater is present within close proximity to the proposed founding depths, any allowable bearing capacity identified as a result of calculations undertaken as a result of the site investigation should be halved.
- Where groundwater has been identified, as a measurement, as the proposed width of the foundation below the proposed depth of the foundation, any allowable bearing capacity should be halved.
- 6.06 Particle Size Distribution Testing has been completed on the made ground at the site in order to assess the granular content of the soils. Based on the information gained, we can confirm that the soils tested contained less than 35% fines and as such, can be considered non shrinkable when subjected to moisture content change.

SECTION 7 **CONCLUSIONS**

- 7.01 Any new foundations should be seated at a depth of as a minimum, 0.90 meters below the site level to overcome the impact of weathering. In order for foundations to be seated in materials suitable for the proposed foundations, factors will influence the design which are as follows, (although, this list is not exhaustive) :-
- Any new foundations should be seated in a uniform geotechnical material with regards possible volume change, future movements and differential settlements based on variable soils.
 - Allowable bearing capacity.
 - The proposed development.
 - Groundwater.
 - Trees.
 - Topography, and
 - Solution Features.
- 7.02 The upper superficial geology at the site is identified as a made ground which includes soft Clays. These include materials which are unlikely to support the loading of the proposed structures. The underlying geology is identified as a loose granular soils which again exhibit poor strength characteristics and allowable bearing capacity values of between 40-60kN/m² to depths of around 1.70 metres. Groundwater has been identified within this granular soil which would effectively halve the allowable bearing capacity to between 20-30kN/m². This stratum is unsuitable for use in foundation design.

- 7.03 It would appear that the only viable founding material identified within the site is recorded as the underlying 'slightly denser' granular soil encountered at between 1.60-1.80 metres. The allowable bearing capacity taking into account the underlying granular soil is between 60-130kN/m² which again is fairly poor in strength.
- 7.04 Considering the above factors, we would suggest that the optimum foundation solution for the site will form a system of piles and ground beams as a result of the logistics of excavating soils in saturated loose soils to depth with pumping and shoring of works involved in that excavation.
- 7.05 In order for a pile foundation solution to be designed a deep borehole will be required. We would envisage that a borehole should be taken to a depth of 20 metres to facilitate this.
- 7.06 All foundations should be designed by a suitably qualified engineer with regard loading for the proposed structure.

I hope the foregoing is sufficient for your requirements, although please do not hesitate to contact us should require any further information regarding the above.

Yours Faithfully



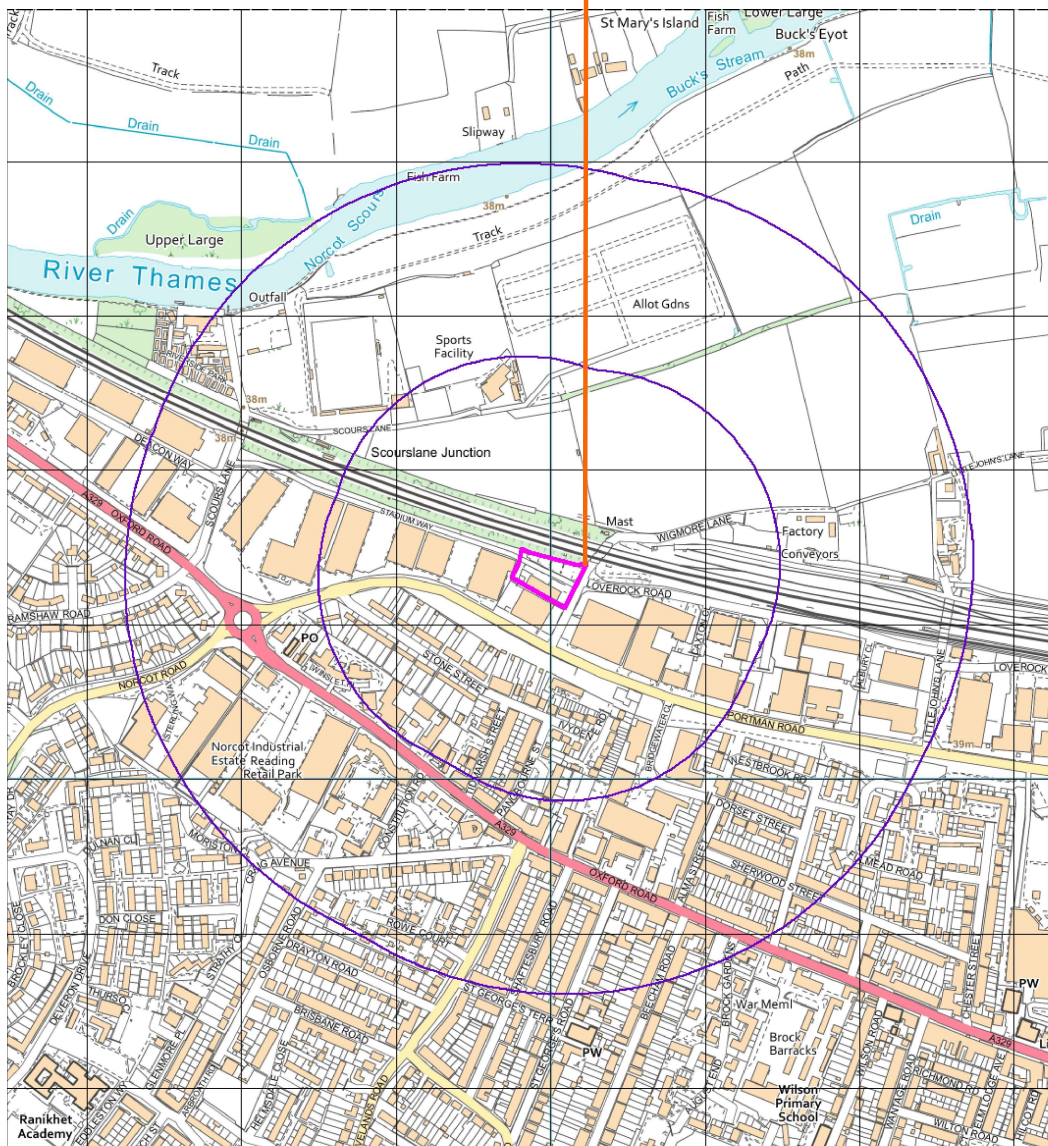
C.S.Gray M.Sc
Contract Engineer

Stadium Way, Reading, Berkshire RG30 6BX

Location Plan

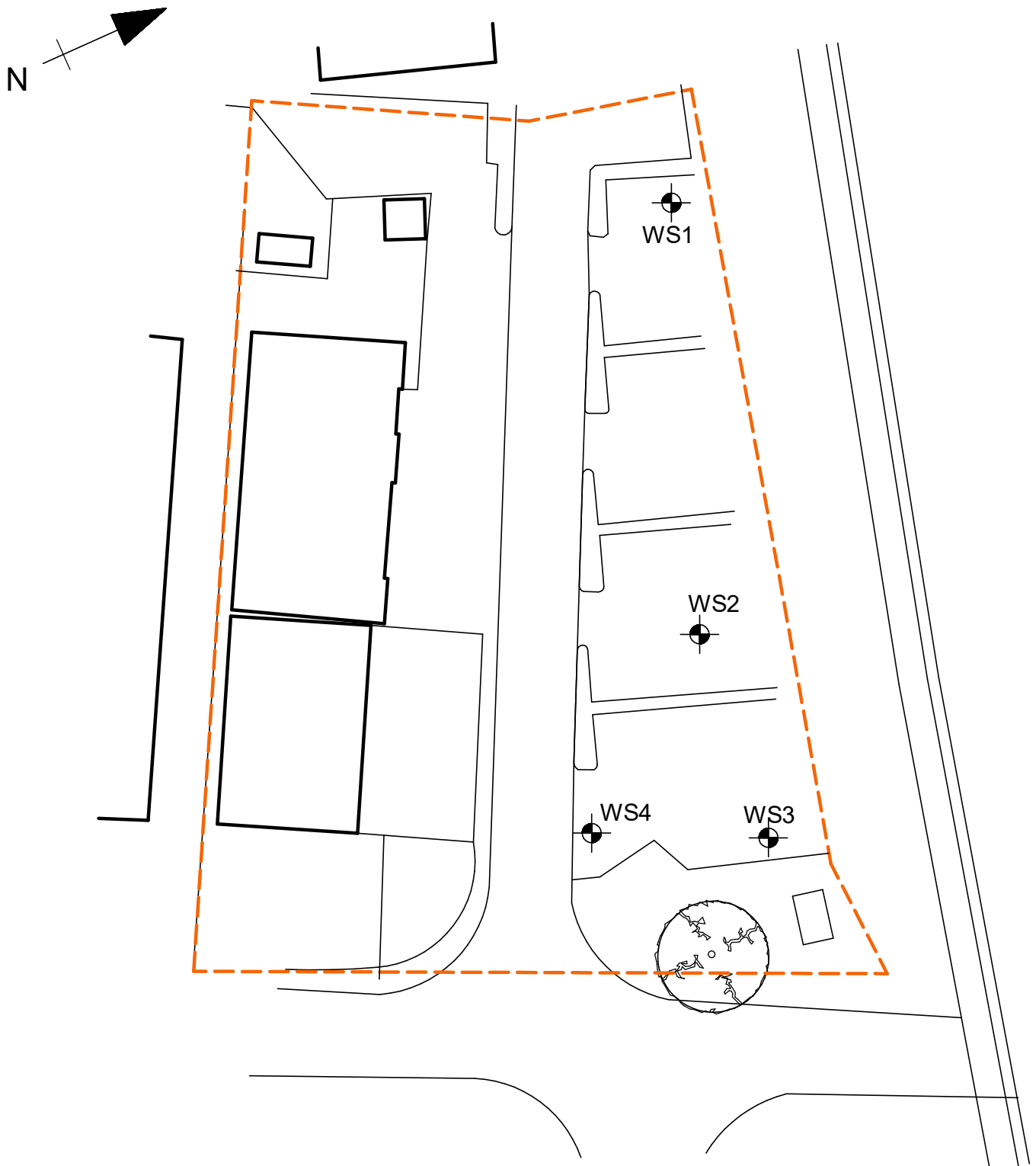


The Site



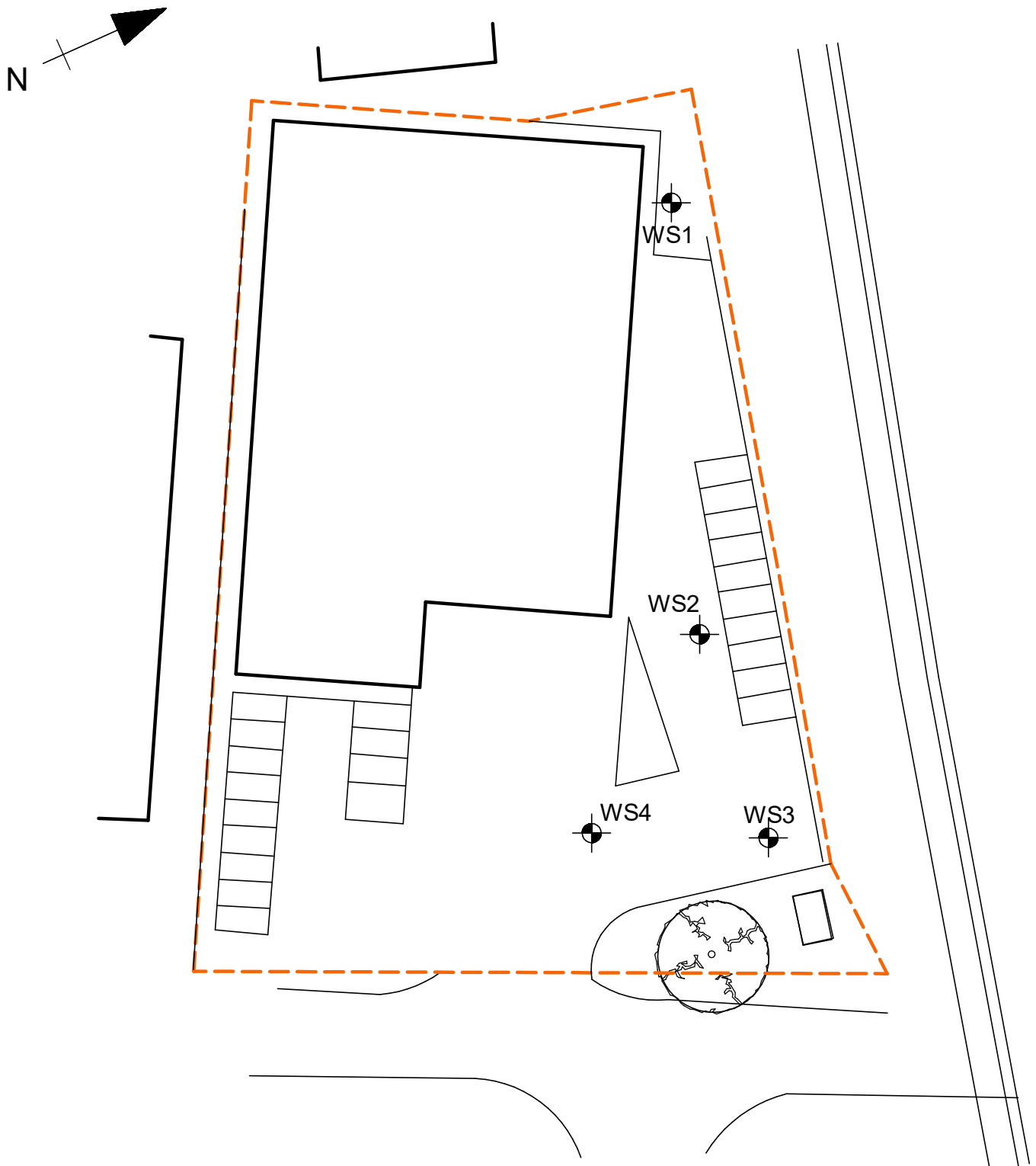
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Existing Site Plan



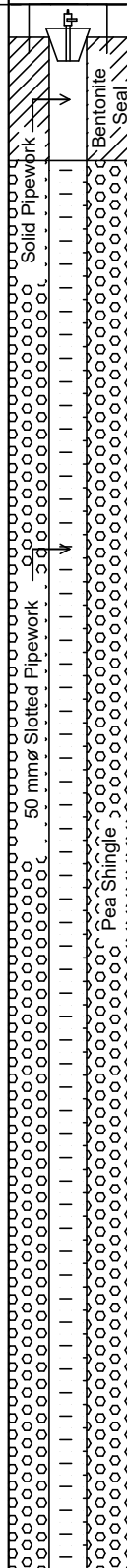
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Proposed Site Plan



Stadium Way, Reading, Berkshire RG30 6BX

Window Sample One

Description Of Stratum	Legend	Depth	Thickness (m)	Water Level	Samples			S.P.T N-Value or Vane Strength	VOC's (ppm)	Installations	Casing Depth, (m)				
					No	Type	Depth (m)								
Tarmac		0.06	0.06	Water level at 1.31m on completion	1	U	0.26-1.00	N=15			1.00				
Concrete		0.26	0.20												
Soft grey very silty CLAY		0.50	0.24												
Loose light brown saturated silty claybound SAND & GRAVEL			0.90		2	U	1.00-2.00								
		1.40													
Soft to firm grey moderately silty slightly sandy CLAY		1.80	0.40		3	U	2.00 - 3.00								
Medium dense brown SAND & GRAVEL			1.20												
Borehole Complete at 3.00m		3.00						N=24							

Remarks

Key : U - Undisturbed Sample
(100mm diameter)

B - Bulk Sample
 - Water Struck

D - Disturbed Sample
 - Water Standing

W - Water Sample
T - Chemical Tub

N - SPT N-Value
V - Vane Test, (kN.m²)

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Window Sample Two

Description Of Stratum	Legend	Depth	Thickness (m)	Water Level	Samples			S.P.T N-Value or Vane Strength	VOC's (ppm)	Installations	Casing Depth, (m)
					No	Type	Depth (m)				
Tarmac		0.08	0.08	Water level at 1.38m on completion	1	U	0.02-1.00				
Concrete		0.15	0.07								
Loose to compact brown clayey gravel FILL			0.35								
		0.50									
Loose to compact brown chalky clay FILL with black staining and rare brick fragments			1.20		2	U	1.00-2.00	N=4			1.00
Medium dense brown SAND & GRAVEL		1.70	1.30		3	U	2.00 - 3.00	N=12			
Borehole Complete at 3.00m Roots to 1.60m		3.00						N=12			

Remarks

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W - Water Sample
T - Chemical Tub

N - SPT N-Value
V - Vane Test, (kN.m²)

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Window Sample Three

Description Of Stratum	Legend	Depth	Thickness (m)	Water Level	Samples			S.P.T N-Value or Vane Strength	VOC's (ppm)	Installations	Casing Depth, (m)
					No	Type	Depth (m)				
Tarmac		0.05	0.05	Water level at 1.37m on completion	1	U	0.15-1.00	N=6			1.00
Concrete		0.13	0.08								
Loose to medium dense brown slightly claybound SAND & GRAVEL			1.47								
					2	U	1.00-2.00				
		1.60			3	U	2.00 - 3.00	N=17			
Dense brown SAND & GRAVEL			1.40								
Borehole Complete at 3.00M		3.00						N=17			

Remarks

 Key : U - Undisturbed Sample
 (100mm diameter)

 B - Bulk Sample
 - Water Struck

 D - Disturbed Sample
 - Water Standing

 W - Water Sample
 T - Chemical Tub

 N - SPT N-Value
 V - Vane Test, (kN.m²)

Stadium Way, Reading, Berkshire RG30 6BX

Window Sample Four

Description Of Stratum		Legend	Depth	Thickness (m)	Water Level	Samples			S.P.T N-Value or Vane Strength	VOC's (ppm)	Installations	Casing Depth, (m)
						No	Type	Depth (m)				
	Tarmac		0.10	0.10	Water level at 2.42m on completion	1	U	0.15-1.00	N=19			1.00
	Concrete		0.20	0.10								
	Loose to compact brown grey clay FILL with black staining and rare brick fragments			0.80								
1.0			1.00									
	Medium dense brown slightly claybound SAND & GRAVEL			0.70								
			1.70									
	Dense brown SAND & GRAVEL			1.30	3	U	2.00 - 3.00	N=26				
2.0												
3.0	Borehole Complete at 3.00M		3.00						N=22			

Remarks

Key : U - Undisturbed Sample
(100mm diameter)

B - Bulk Sample
 - Water Struck

D - Disturbed Sample
 - Water Standing

W - Water Sample
T - Chemical Tub

N - SPT N-Value
V - Vane Test, (kN.m²)

LOCATION Stadium Way (Loverock Road) Reading, Berkshire. RG30 6BX

SULPHATE ANALYSIS

Excavation Location Number	Depth (m)	Sample	Concentrations of Soluble Sulphate			Classification	pH
			Soil		Groundwater		
			Total SO4 (%)	SO4 in 2:1 Water:soil (g/l)			
WS1	1.00	L1		0.36		DS-1 / AC-1s	8.23
WS4	1-1.7	L2		0.25		DS-1 / AC-1s	7.99

LOCATION Stadium Way (Loverock Road) Reading, Berkshire. RG30 6BX

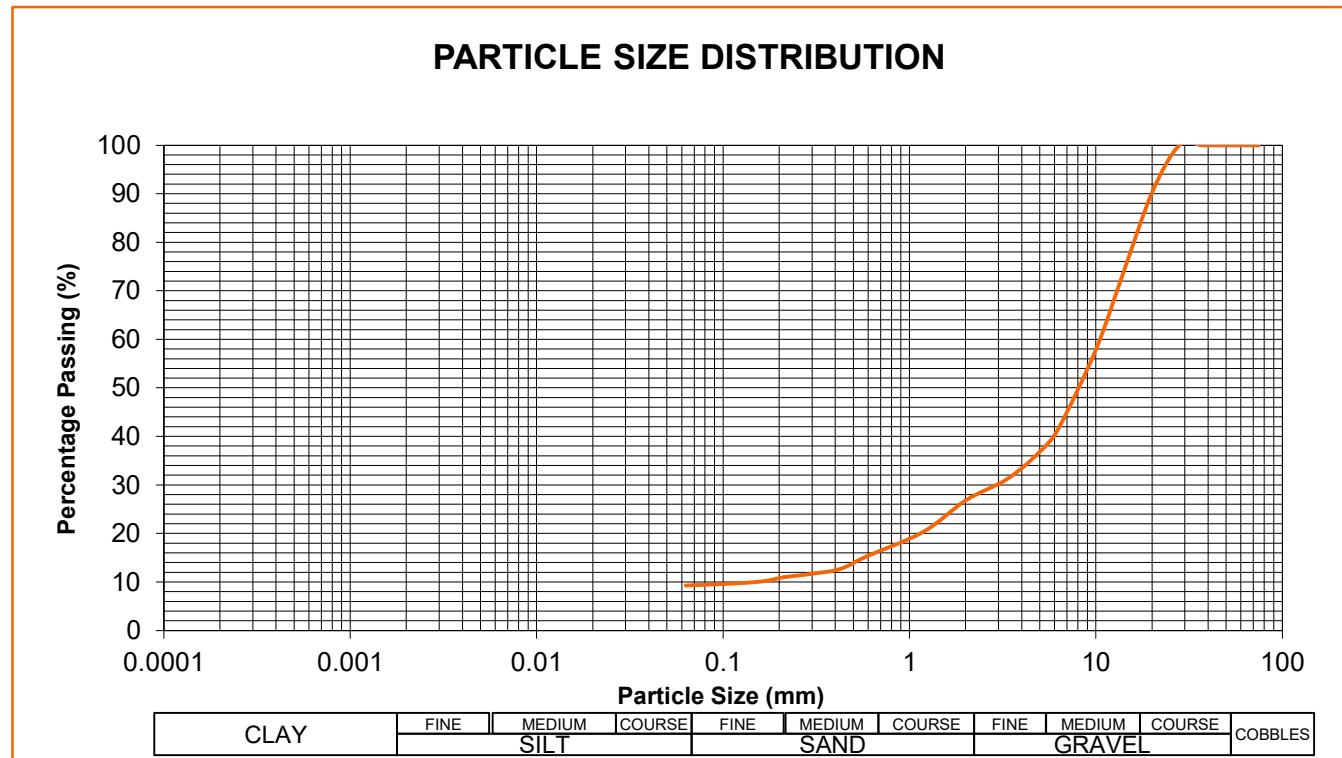
ATTERBERG LIMITS TEST DATA

Excavation Location Number	Depth (m)	Sample	Natural Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Group Symbol	Ammended Plasticity Index (%)	Desiccation Profile	Percentage Retained on 425 Micron Sieve (%)
WS1	1.00	L1	15	35	14	21	MI	14	Slight	35
WS1	1.50	L2	30	46	20	26	CI	25	No	2

LOCATION Stadium Way (Loverock Road) Reading, Berkshire. RG30 6BX

 Location : **WS1** Depth : **2.50 m** Sampe No: Initial Mass: 700 g

Sieve Size (mm)	Weight Retained (g)	Percent Retained (%)	Total Passing (%)
75		0	100
63		0	100
50		0	100
37.50		0	100
28.00		0	100
20.00	68	10	90
14.00	116	17	74
10.00	110	16	58
6.30	114	16	42
5.00	34	5	37
3.35	39	6	31
2.00	31	4	27
1.180	46	7	20
0.600	34	5	15
0.425	19	3	13
0.300	7	1	12
0.212	5	1	11
0.150	7	1	10
0.063	5	1	9


 Fines (%) = **9** Sands (%) = **18** Gravels (%) = **73** Cobbles (%) = **0**
British Standard Sieve Test 5930:1990 as Per Test 7a



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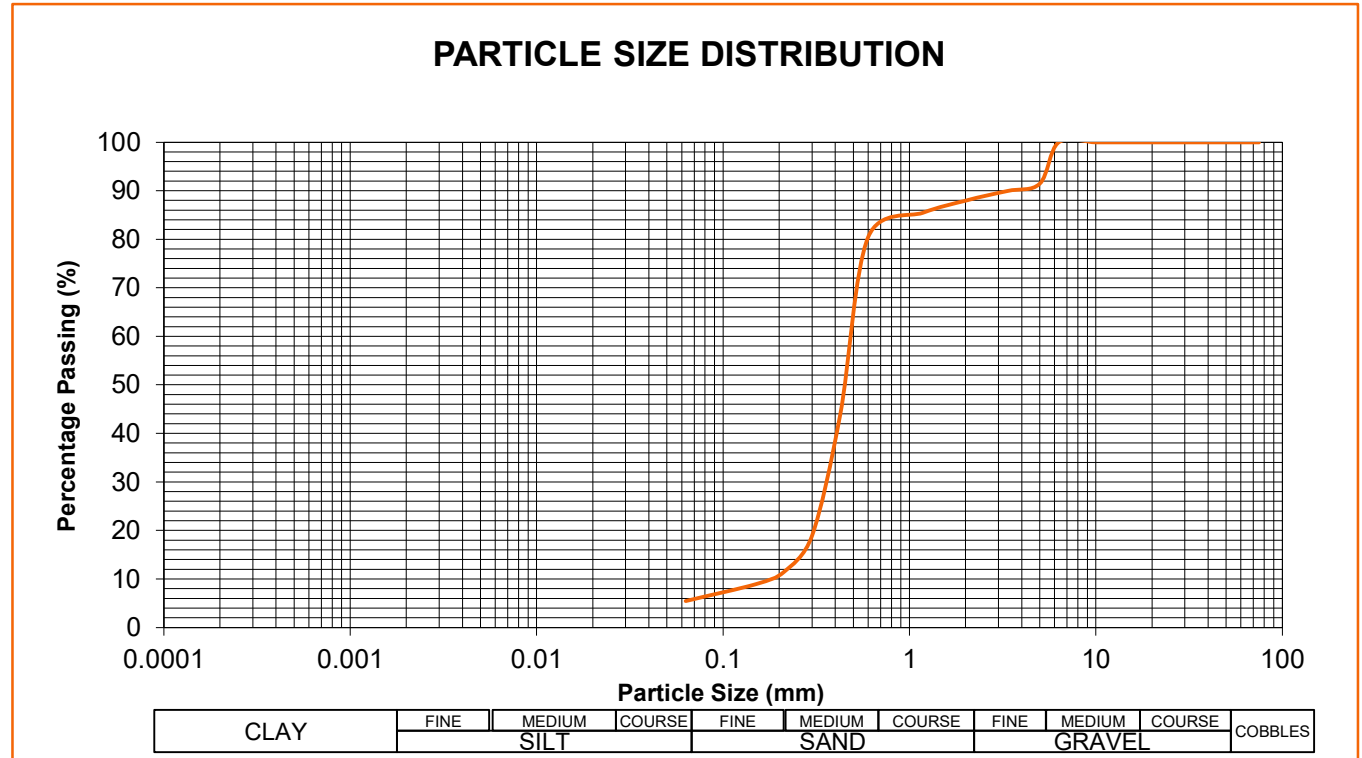
Geotechnical Assessments | Environmental Assessments | Desktop Studies | Contamination Analysis

Appendix No. 3
Sheet No. 4
Job No. 17590
Date Jul-22

LOCATION Stadium Way (Loverock Road) Reading, Berkshire. RG30 6BX

Location : **WS2** Depth : **3.00 m** Sampe No: Initial Mass: 200 g

Sieve Size (mm)	Weight Retained (g)	Percent Retained (%)	Total Passing (%)
75		0	100
63		0	100
50		0	100
37.50		0	100
28.00		0	100
20.00		0	100
14.00		0	100
10.00		0	100
6.30		0	100
5.00	17	9	92
3.35	3	2	90
2.00	4	2	88
1.180	5	3	86
0.600	10	5	81
0.425	73	37	44
0.300	50	25	19
0.212	15	8	12
0.150	5	3	9
0.063	7	4	6



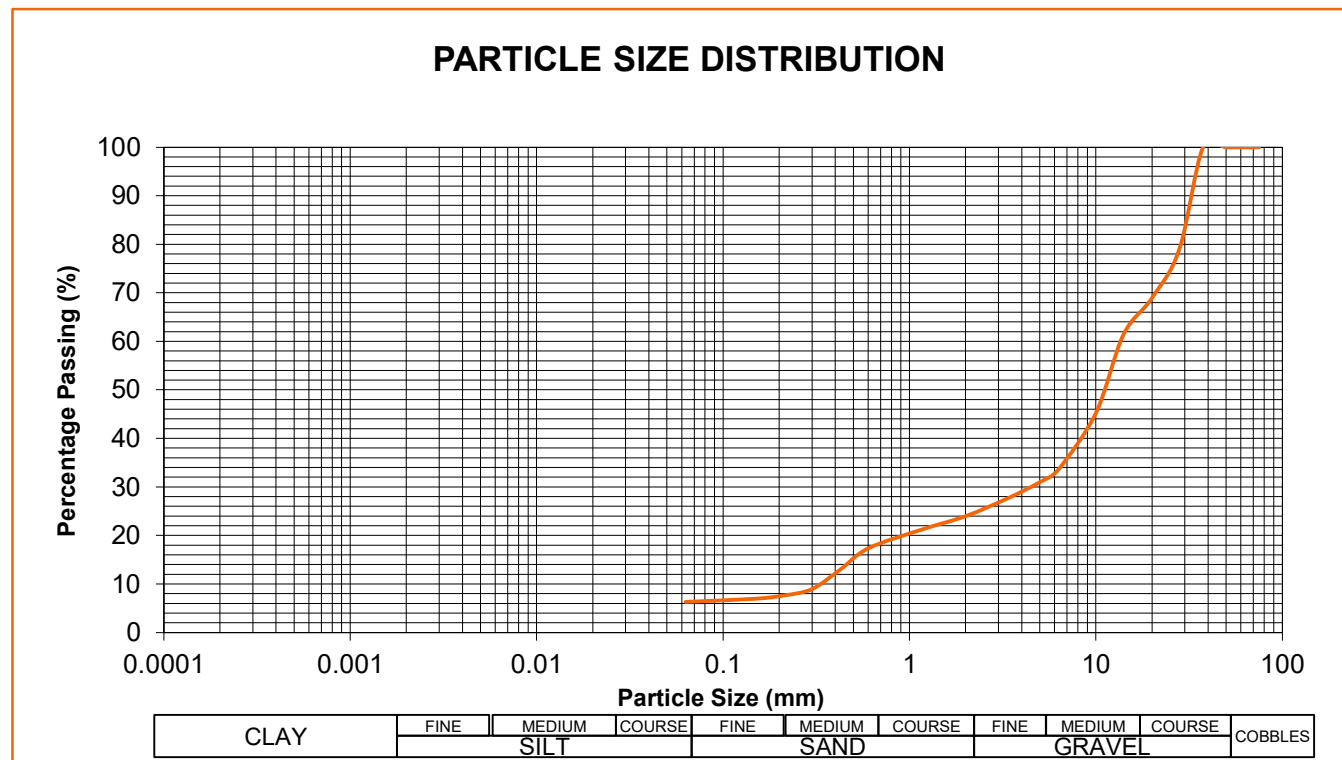
Fines (%) = **6** Sands (%) = **83** Gravels (%) = **12** Cobbles (%) = **0**

British Standard Sieve Test 5930:1990 as Per Test 7a

LOCATION Stadium Way (Loverock Road) Reading, Berkshire. RG30 6BX

 Location : **WS3** Depth : **1.00 m** Sampe No: Initial Mass: 300 g

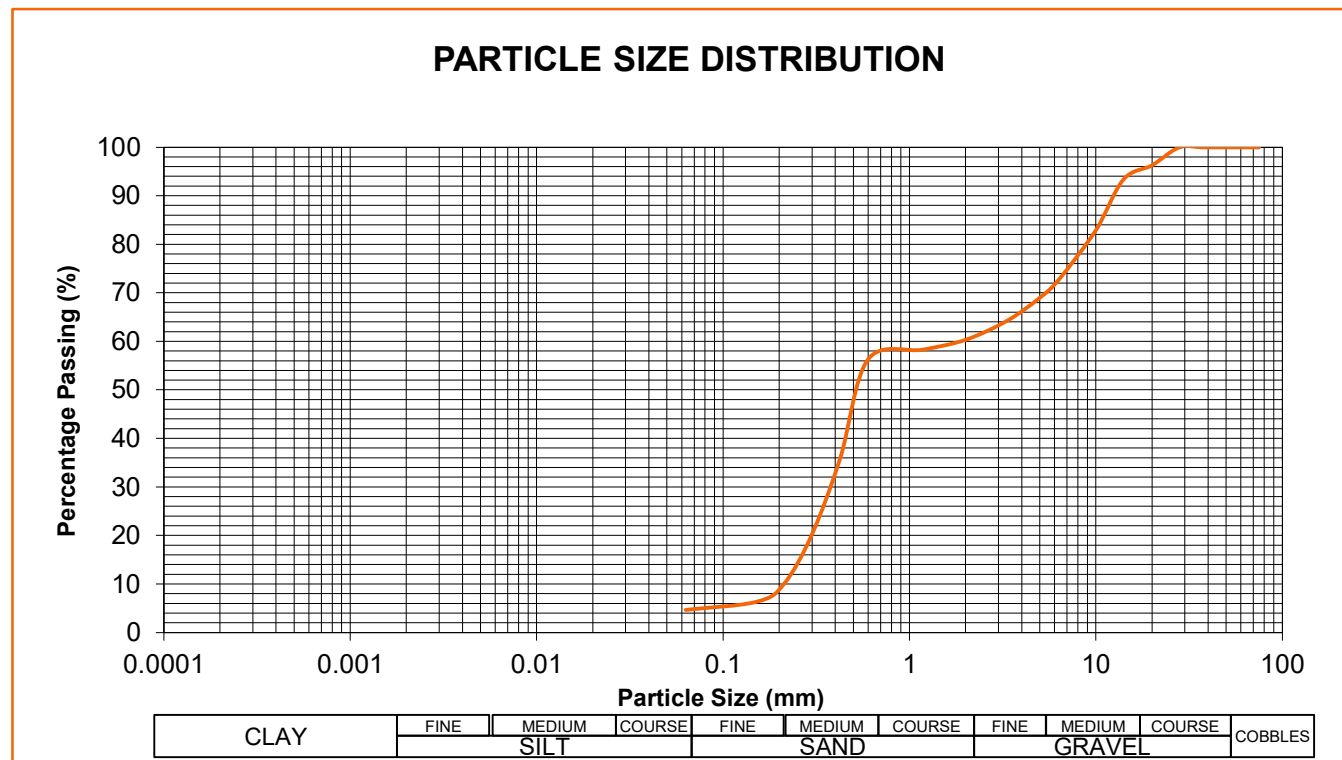
Sieve Size (mm)	Weight Retained (g)	Percent Retained (%)	Total Passing (%)
75		0	100
63		0	100
50		0	100
37.50		0	100
28.00	63	21	79
20.00	30	10	69
14.00	23	8	61
10.00	48	16	45
6.30	35	12	34
5.00	8	3	31
3.35	10	3	28
2.00	11	4	24
1.180	8	3	21
0.600	12	4	17
0.425	13	4	13
0.300	12	4	9
0.212	4	1	8
0.150	2	1	7
0.063	2	1	6


 Fines (%) = **6** Sands (%) = **18** Gravels (%) = **76** Cobbles (%) = **0**
British Standard Sieve Test 5930:1990 as Per Test 7a

LOCATION Stadium Way (Loverock Road) Reading, Berkshire. RG30 6BX

 Location : **WS3** Depth : **2.00 m** Sampe No: Initial Mass: 300 g

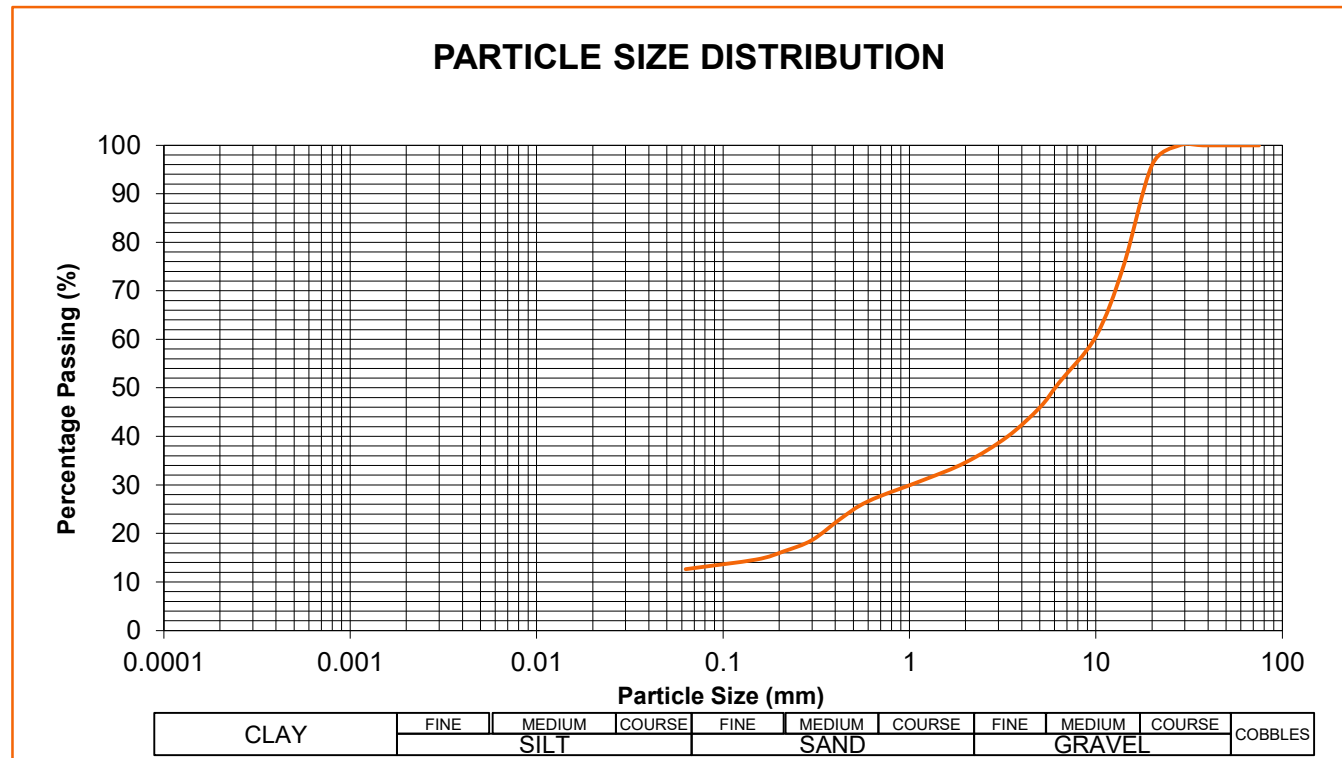
Sieve Size (mm)	Weight Retained (g)	Percent Retained (%)	Total Passing (%)
75		0	100
63		0	100
50		0	100
37.50		0	100
28.00		0	100
20.00	11	4	96
14.00	9	3	93
10.00	31	10	83
6.30	31	10	73
5.00	11	4	69
3.35	14	5	64
2.00	12	4	60
1.180	6	2	58
0.600	6	2	56
0.425	61	20	36
0.300	47	16	20
0.212	31	10	10
0.150	11	4	6
0.063	5	2	5


 Fines (%) = **5** Sands (%) = **56** Gravels (%) = **40** Cobbles (%) = **0**
British Standard Sieve Test 5930:1990 as Per Test 7a

LOCATION Stadium Way (Loverock Road) Reading, Berkshire. RG30 6BX

 Location : **WS4** Depth : **1.50 m** Sampe No: Initial Mass: 300 g

Sieve Size (mm)	Weight Retained (g)	Percent Retained (%)	Total Passing (%)
75		0	100
63		0	100
50		0	100
37.50		0	100
28.00		0	100
20.00	12	4	96
14.00	63	21	75
10.00	43	14	61
6.30	29	10	51
5.00	15	5	46
3.35	18	6	40
2.00	16	5	35
1.180	11	4	31
0.600	13	4	27
0.425	11	4	23
0.300	13	4	19
0.212	7	2	16
0.150	5	2	15
0.063	6	2	13


 Fines (%) = **13** Sands (%) = **22** Gravels (%) = **65** Cobbles (%) = **0**
British Standard Sieve Test 5930:1990 as Per Test 7a



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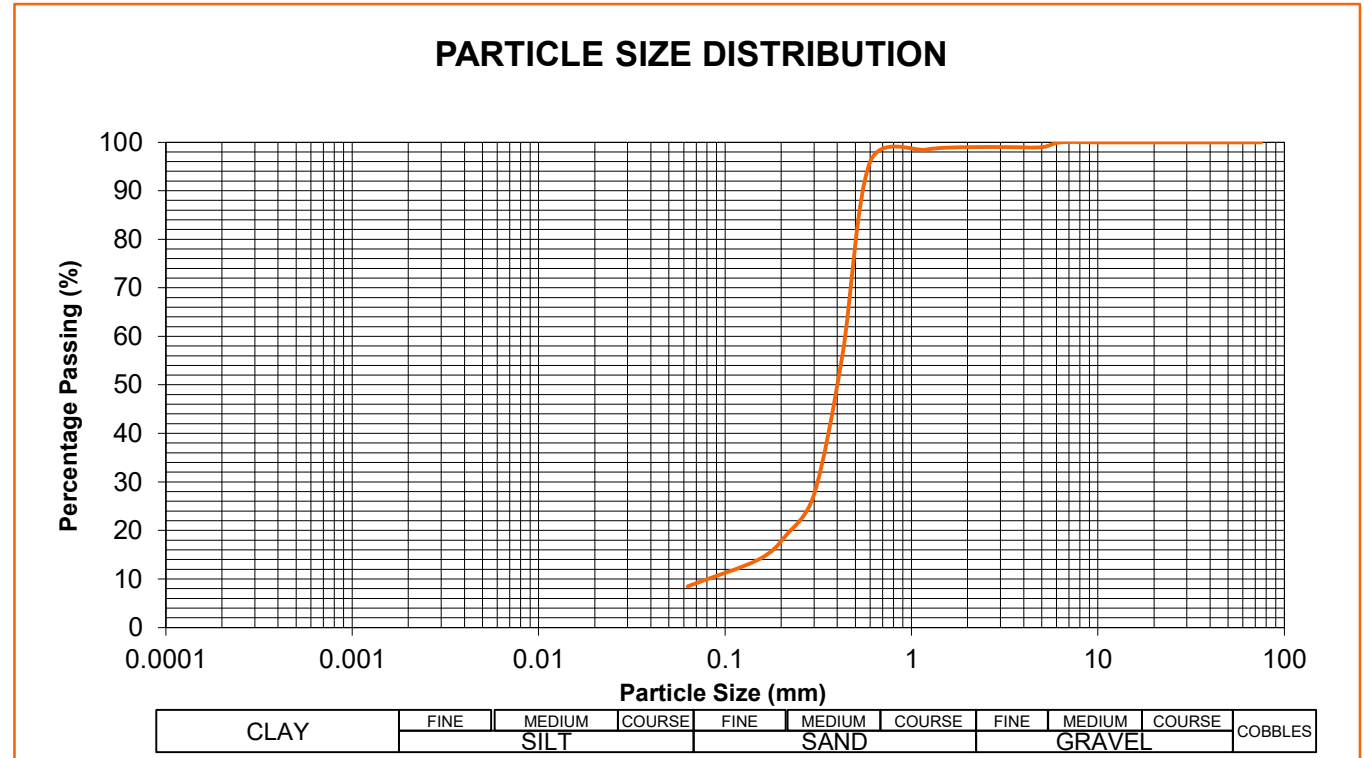
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Appendix No. 3
Sheet No. 8
Job No. 17590
Date Jul-22

LOCATION Stadium Way (Loverock Road) Reading, Berkshire. RG30 6BX

Location : **WS4** Depth : **3.00 m** Sampe No: Initial Mass: 200 g

Sieve Size (mm)	Weight Retained (g)	Percent Retained (%)	Total Passing (%)
75		0	100
63		0	100
50		0	100
37.50		0	100
28.00		0	100
20.00		0	100
14.00		0	100
10.00		0	100
6.30		0	100
5.00	2	1	99
3.35	0	0	99
2.00	0	0	99
1.180	1	1	99
0.600	5	3	96
0.425	80	40	56
0.300	57	29	28
0.212	17	9	19
0.150	10	5	14
0.063	11	6	9



Fines (%) = **9** Sands (%) = **91** Gravels (%) = **1** Cobbles (%) = **0**

British Standard Sieve Test 5930:1990 as Per Test 7a