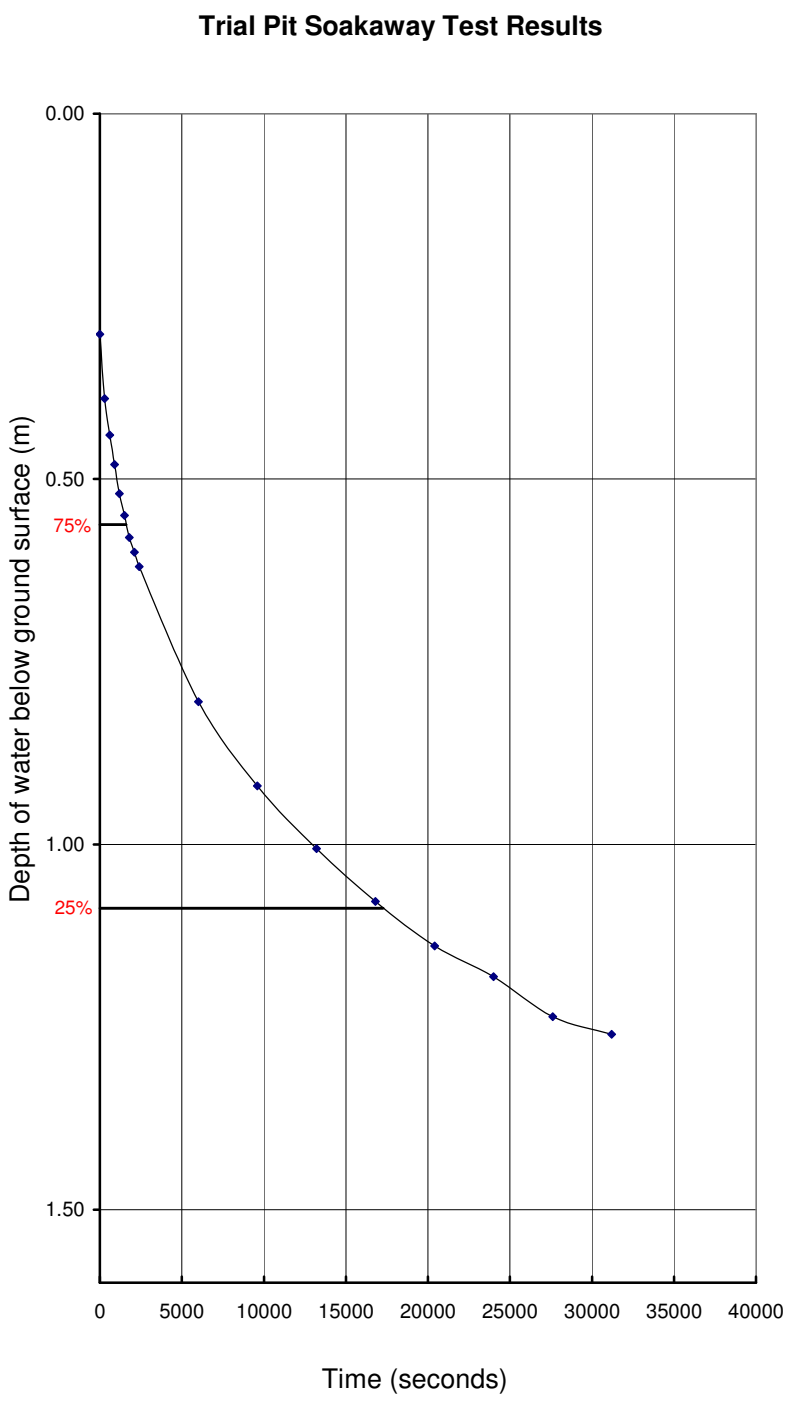
Trial Pit Soakaway Test to BRE Digest 365

Location	TP5 (i)	**Test No**	Test 1
Client	BDW Trading Limited	**Length of Trial Pit (m)**	1.41
Job Number	25459	**Width of Trial Pit (m)**	0.45
Date	29.08.12	**Water level at start (mbgl)**	0.3
Operator	MOS / OP	**Depth to Base of Trial Pit (m)**	1.35

Time (Secs)	Water level (mbgl)
0	0.30
300	0.39
600	0.44
900	0.48
1200	0.52
1500	0.55
1800	0.58
2100	0.6
2400	0.62
6000	0.805
9600	0.92
13200	1.006
16800	1.078
20400	1.139
24000	1.181
27600	1.236
31200	1.26



Results

V_{p75-25} (m^3)	0.10
a_{p50} (m^2)	2.59
t_{p75} (s)	1600.00
t_{p25} (s)	17275.00
t_{p75-25} (s)	15675.00
Infiltration Rate (m/s)	2.46E-06

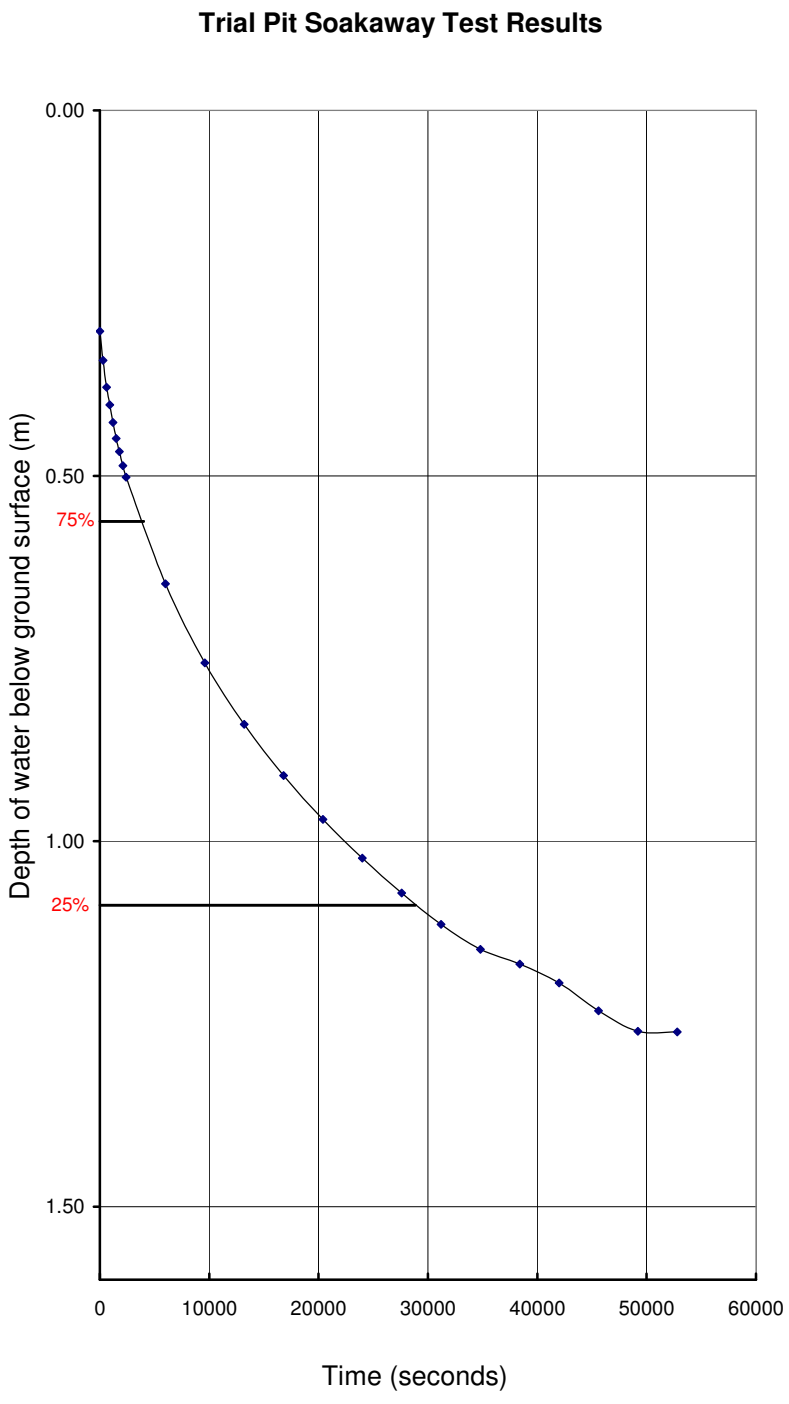
Calculations based on 30% pososity of backfill shingle

Figure
Appendix H

Trial Pit Soakaway Test to BRE Digest 365

Location	TP5 (i)	**Test No**	Test 2
Client	BDW Trading Limited	**Length of Trial Pit (m)**	1.41
Job Number	25459	**Width of Trial Pit (m)**	0.45
Date	30.08.12 - 31.08.12	**Water level at start (mbgl)**	0.3
Operator	MOS / OP	**Depth to Base of Trial Pit (m)**	1.35

Time (Secs)	Water level (mbgl)
0	0.30
300	0.34
600	0.38
900	0.40
1200	0.43
1500	0.449
1800	0.467
2100	0.486
2400	0.502
6000	0.648
9600	0.756
13200	0.84
16800	0.91
20400	0.97
24000	1.023
27600	1.071
31200	1.114
34800	1.148
38400	1.168
42000	1.194
45600	1.232
49200	1.26
52800	1.261



Results

V_{p75-25} (m^3)	0.10
a_{p50} (m^2)	2.59
t_{p75} (s)	4000.00
t_{p25} (s)	28850.00
t_{p75-25} (s)	24850.00
Infiltration Rate (m/s)	1.55E-06

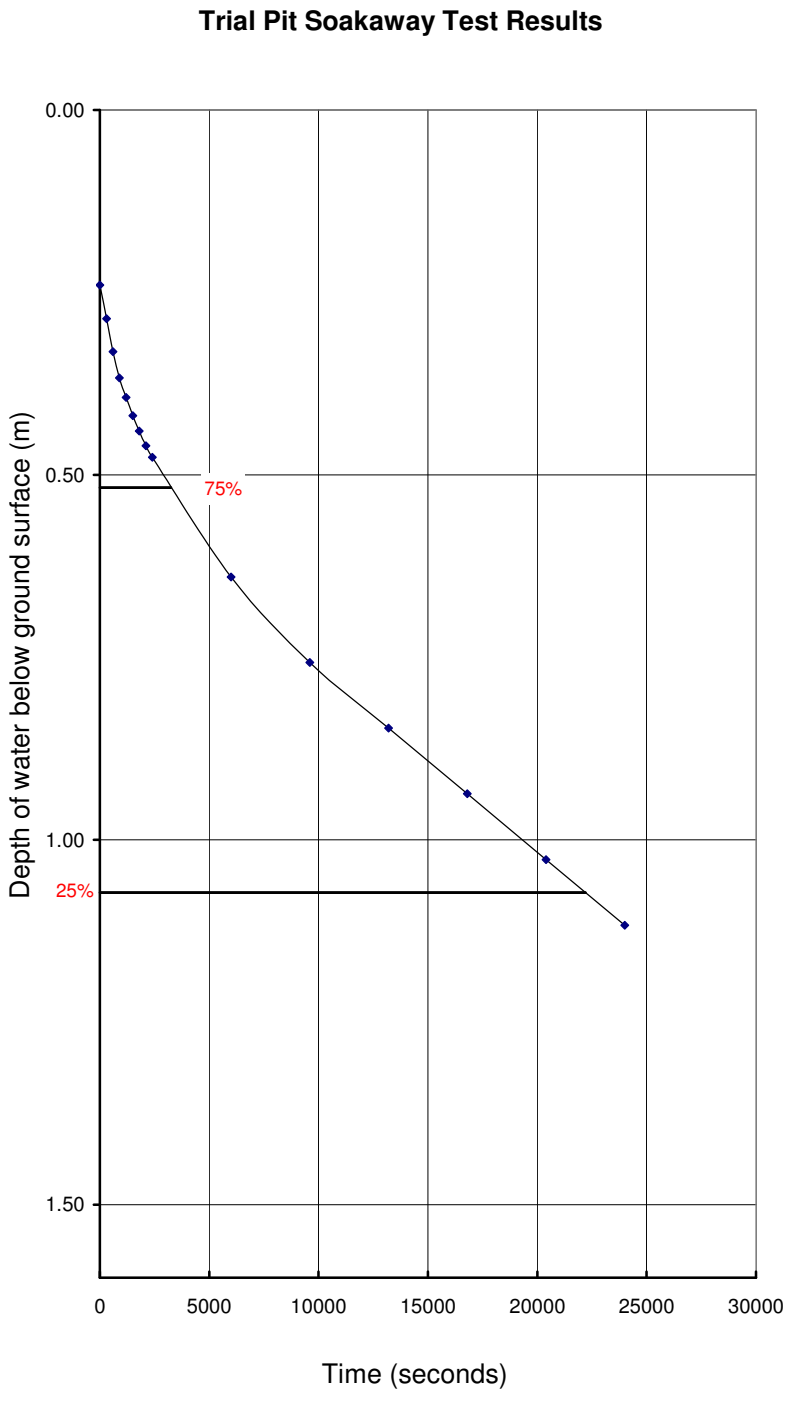
Calculations based on 30% pososity of backfill shingle

Figure
Appendix H

Trial Pit Soakaway Test to BRE Digest 365

Location	TP5 (i)	**Test No**	Test 3
Client	BDW Trading Limited	**Length of Trial Pit (m)**	1.41
Job Number	25459	**Width of Trial Pit (m)**	0.45
Date	31.08.12	**Water level at start (mbgl)**	0.24
Operator	MOS	**Depth to Base of Trial Pit (m)**	1.35

Time (Secs)	Water level (mbgl)
0	0.24
300	0.29
600	0.33
900	0.37
1200	0.39
1500	0.419
1800	0.44
2100	0.46
2400	0.476
6000	0.64
9600	0.757
13200	0.847
16800	0.937
20400	1.027
24000	1.117



Results

V_{p75-25} (m^3)	0.11
a_{p50} (m^2)	2.70
t_{p75} (s)	3250.00
t_{p25} (s)	22200.00
t_{p75-25} (s)	18950.00
Infiltration Rate (m/s)	2.07E-06

Calculations based on 30% pososity of backfill shingle

Red text denotes inferred data

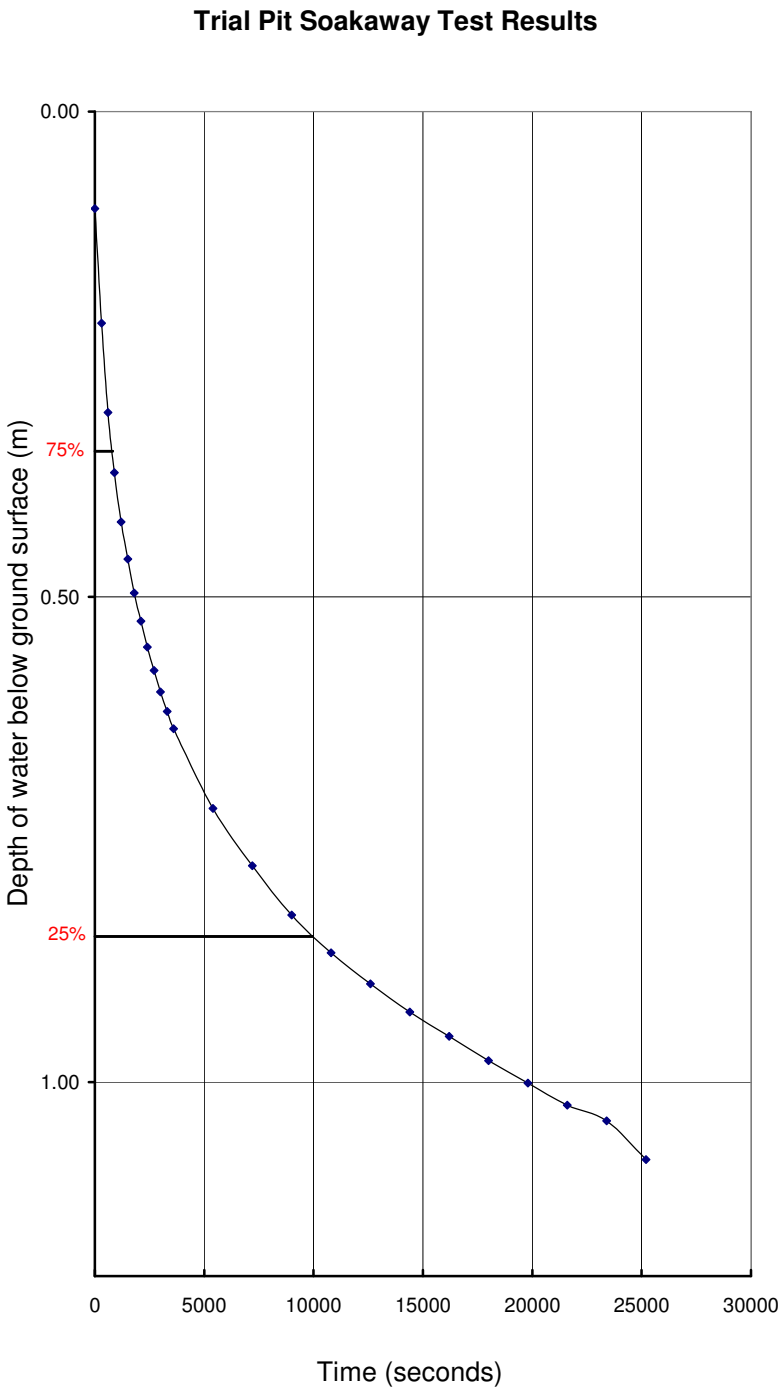
Figure

Appendix H

Trial Pit Soakaway Test to BRE Digest 365

Location	TP6 (i)	**Test No**	Test 1
Client	BDW Trading Limited	**Length of Trial Pit (m)**	1.35
Job Number	25459	**Width of Trial Pit (m)**	0.45
Date	30.08.12	**Water level at start (mbgl)**	0.1
Operator	MOS	**Depth to Base of Trial Pit (m)**	1.10

Time (Secs)	Water level (mbgl)
0	0.10
300	0.22
600	0.31
900	0.37
1200	0.42
1500	0.461
1800	0.496
2100	0.525
2400	0.552
2700	0.576
3000	0.598
3300	0.618
3600	0.636
5400	0.718
7200	0.777
9000	0.828
10800	0.867
12600	0.899
14400	0.928
16200	0.953
18000	0.978
19800	1.001
21600	1.024
23400	1.04
25200	1.08



Results

V_{p75-25} (m^3)	0.09
a_{p50} (m^2)	2.41
t_{p75} (s)	825.00
t_{p25} (s)	9950.00
t_{p75-25} (s)	9125.00
Infiltration Rate (m/s)	4.15E-06

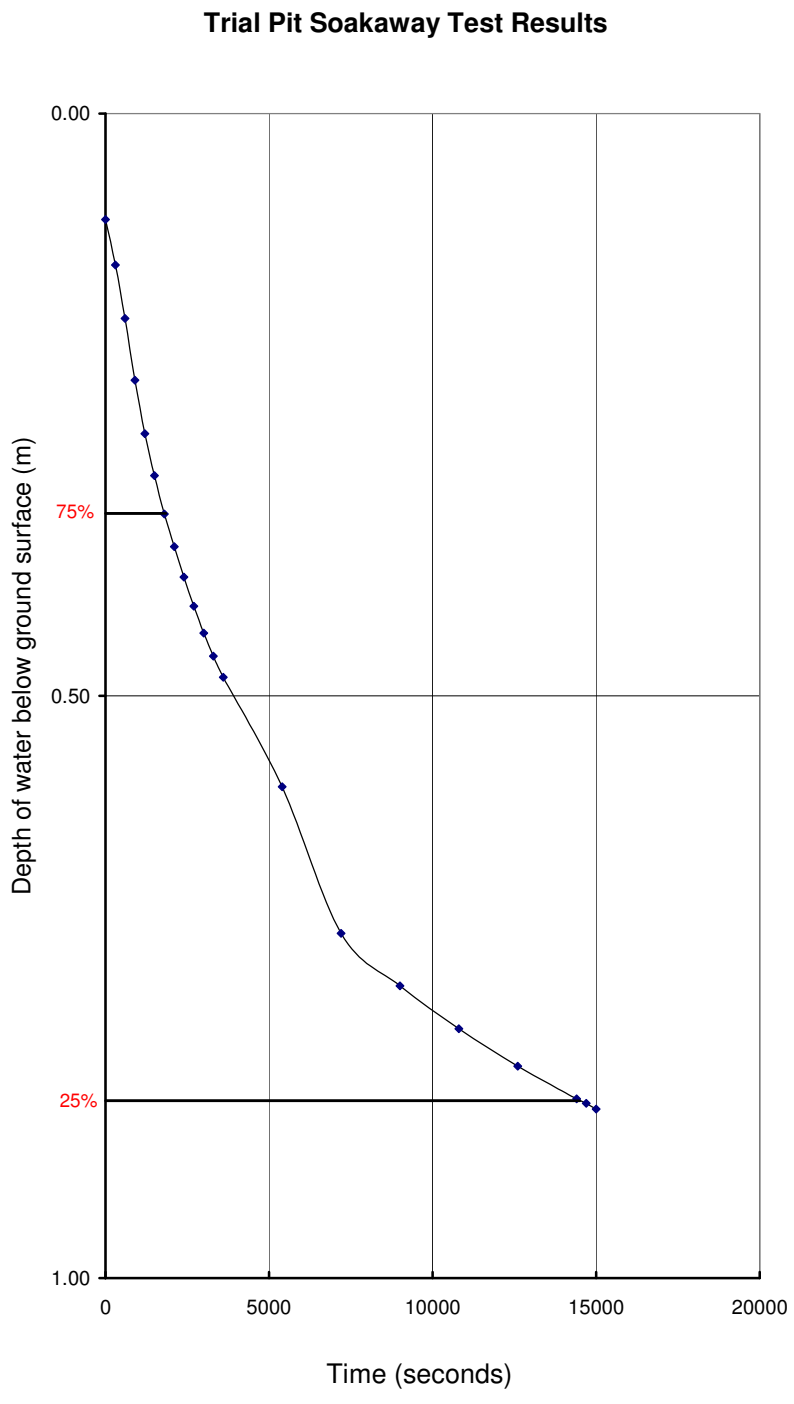
Calculations based on 30% pososity of backfill shingle

Figure
Appendix H

Trial Pit Soakaway Test to BRE Digest 365

Location	TP6 (i)	**Test No**	Test 2
Client	BDW Trading Limited	**Length of Trial Pit (m)**	1.35
Job Number	25459	**Width of Trial Pit (m)**	0.45
Date	31.08.12	**Water level at start (mbgl)**	0.091
Operator	MOS	**Depth to Base of Trial Pit (m)**	1.10

Time (Secs)	Water level (mbgl)
0	0.09
300	0.13
600	0.18
900	0.23
1200	0.28
1500	0.311
1800	0.344
2100	0.372
2400	0.398
2700	0.423
3000	0.446
3300	0.466
3600	0.484
5400	0.578
7200	0.704
9000	0.749
10800	0.786
12600	0.818
14400	0.846
14700	0.85
15000	0.855



Results

V_{p75-25} (m^3)	0.09
a_{p50} (m^2)	2.42
t_{p75} (s)	1850.00
t_{p25} (s)	14500.00
t_{p75-25} (s)	12650.00
Infiltration Rate (m/s)	3.00E-06

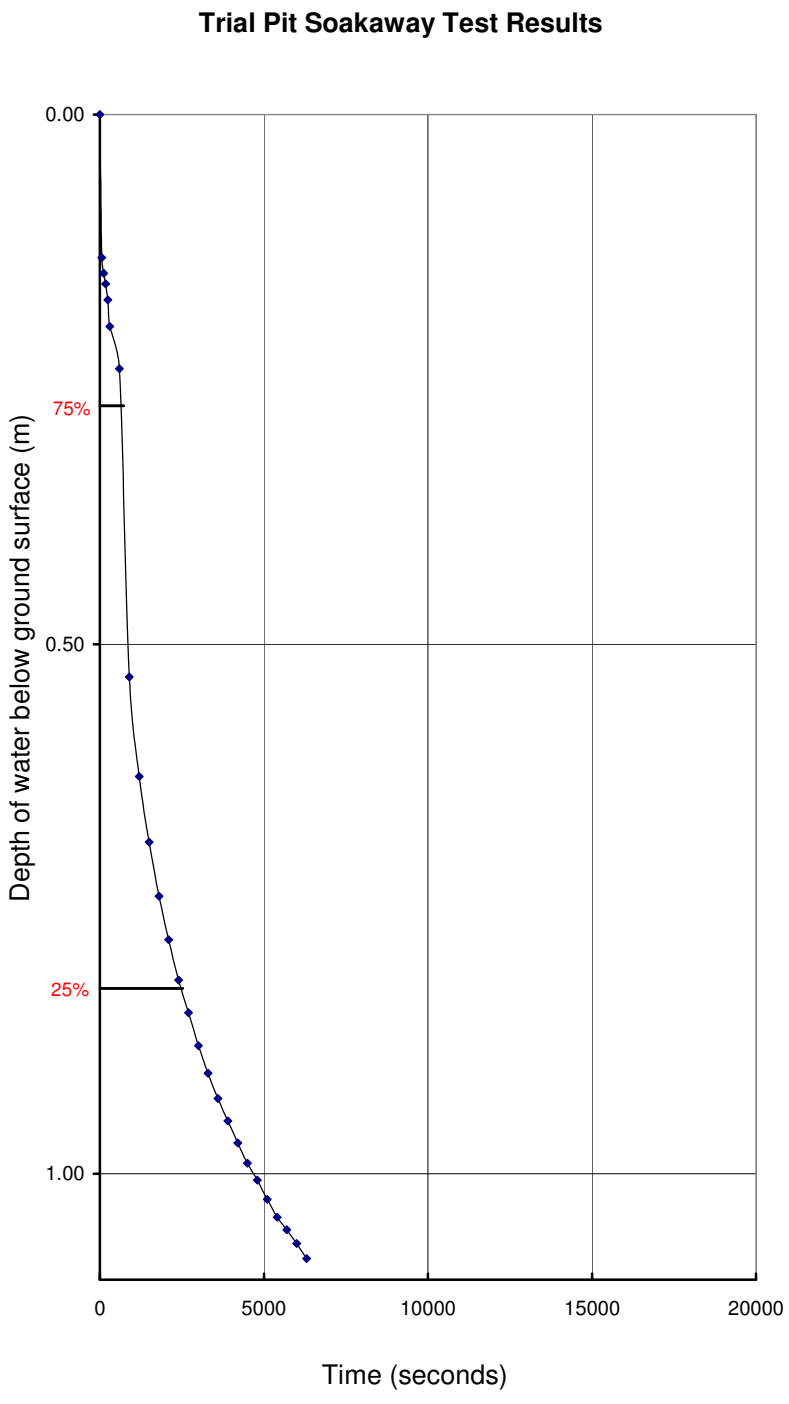
Calculations based on 30% pososity of backfill shingle

Figure
Appendix H

Trial Pit Soakaway Test to BRE Digest 365

Location	TP6 (i)	**Test No**	Test 3
Client	BDW Trading Limited	**Length of Trial Pit (m)**	1.35
Job Number	25459	**Width of Trial Pit (m)**	0.45
Date	03.09.12	**Water level at start (mbgl)**	0
Operator	MOS / BC	**Depth to Base of Trial Pit (m)**	1.10

Time (Secs)	Water level (mbgl)
0	0.00
60	0.14
120	0.15
180	0.16
240	0.18
300	0.2
600	0.24
900	0.531
1200	0.625
1500	0.687
1800	0.738
2100	0.779
2400	0.817
2700	0.848
3000	0.879
3300	0.905
3600	0.929
3900	0.95
4200	0.971
4500	0.99
4800	1.006
5100	1.024
5400	1.041
5700	1.053
6000	1.066
6300	1.08



Results

V_{p75-25} (m^3)	0.10
a_{p50} (m^2)	2.59
t_{p75} (s)	725.00
t_{p25} (s)	2525.00
t_{p75-25} (s)	1800.00
Infiltration Rate (m/s)	2.15E-05

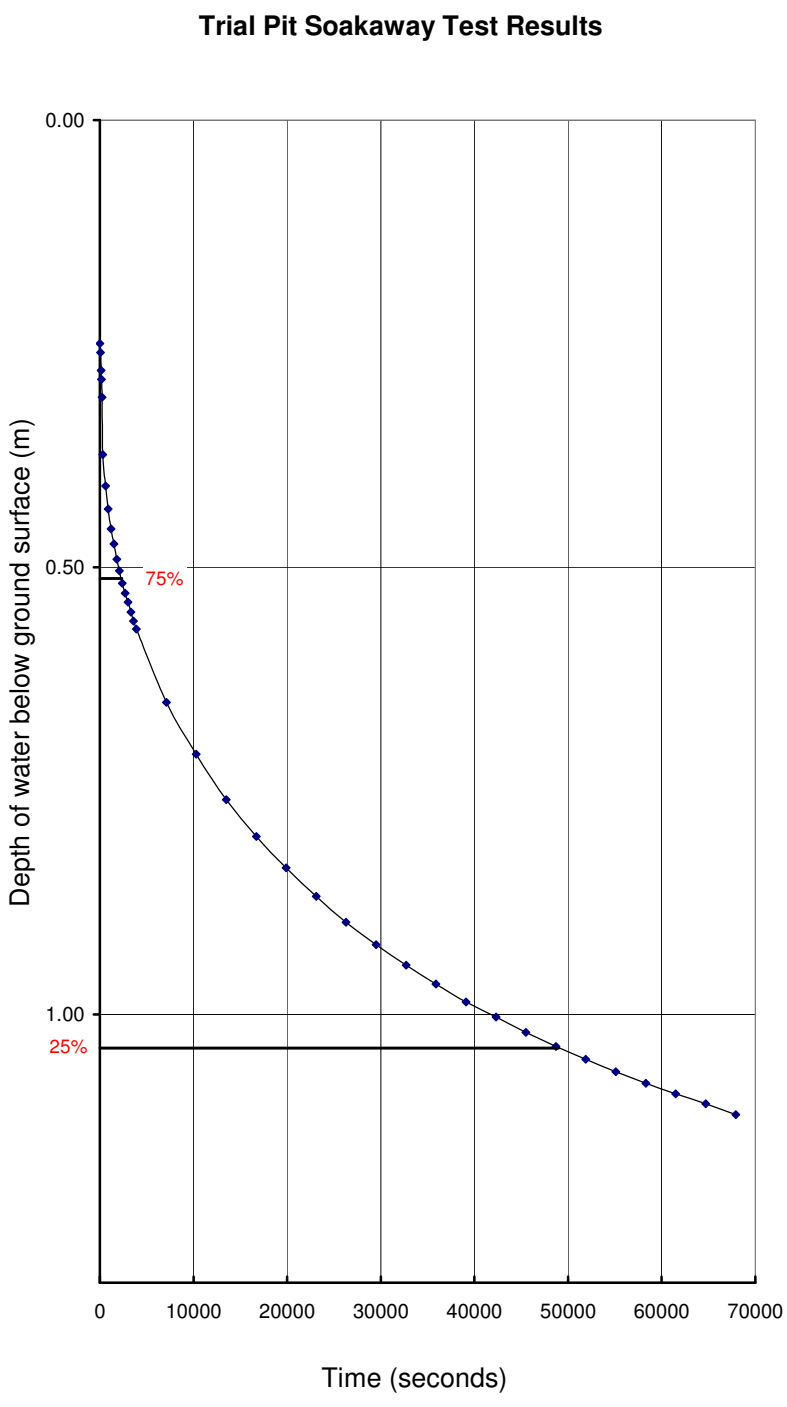
Calculations based on 30% pososity of backfill shingle

Figure
Appendix H

Trial Pit Soakaway Test to BRE Digest 365

Location	TP7 (i)	**Test No**	Test 1
Client	BDW Trading Limited	**Length of Trial Pit (m)**	1.32
Job Number	25459	**Width of Trial Pit (m)**	0.45
Date	03.09.12	**Water level at start (mbgl)**	0.25
Operator	MOS / BC	**Depth to Base of Trial Pit (m)**	1.30

Time (Secs)	Water level (mbgl)
0	0.25
60	0.26
120	0.28
180	0.29
240	0.31
300	0.374
600	0.409
900	0.435
1200	0.457
1500	0.474
1800	0.491
2100	0.504
2400	0.518
2700	0.529
3000	0.539
3300	0.55
3600	0.56
3900	0.569
7100	0.651
10300	0.709
13500	0.76
16700	0.801
19900	0.836
23100	0.868
26300	0.897
29500	0.92
32700	0.95
35900	0.97
39100	0.99
42300	1.003
45500	1.020
48700	1.036
51900	1.050
55100	1.064
58300	1.077
61500	1.089
64700	1.10
67900	1.112



Results

V_{p75-25} (m^3)	0.09
a_{p50} (m^2)	2.45
t_{p75} (s)	2350.00
t_{p25} (s)	49000.00
t_{p75-25} (s)	46650.00
Infiltration Rate (m/s)	8.18E-07

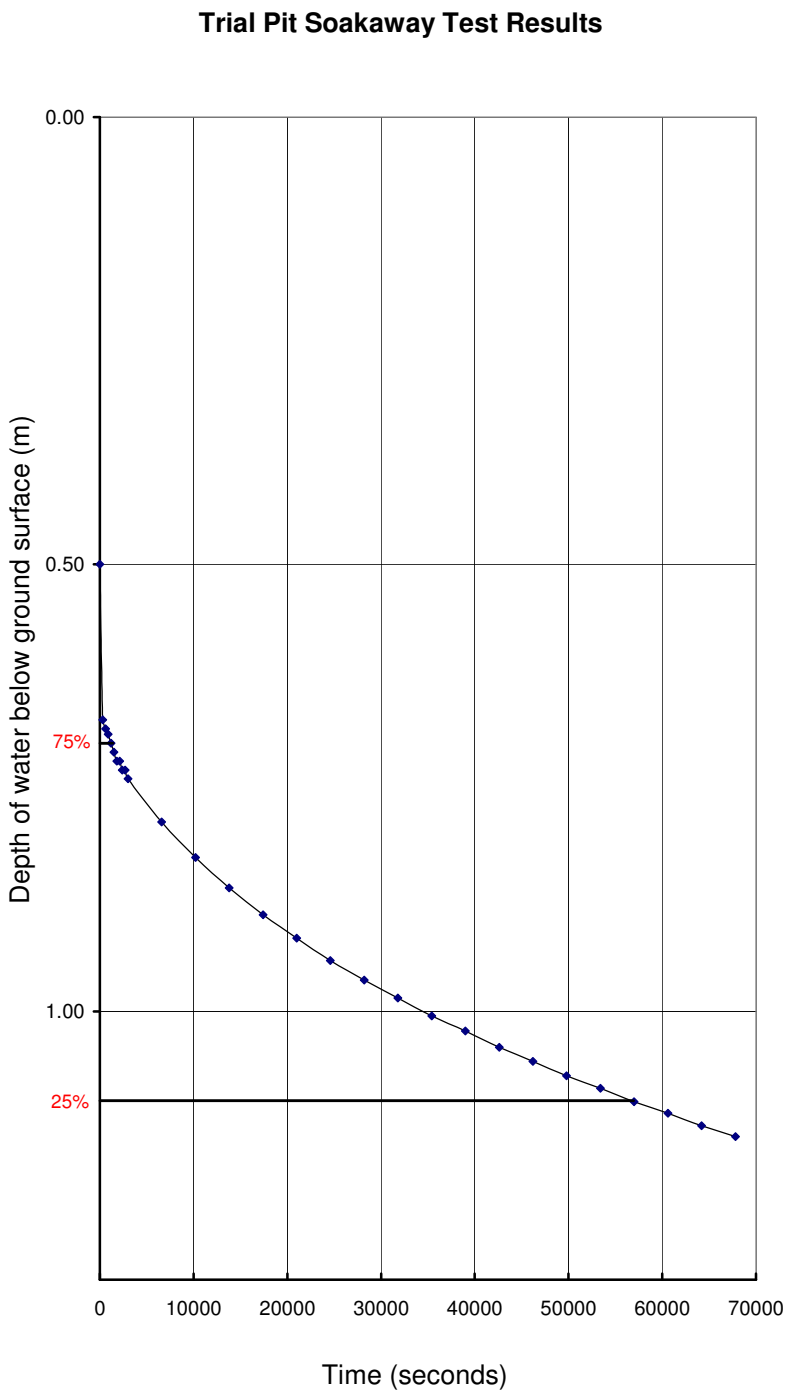
Calculations based on 30% pososity of backfill shingle

Figure
Appendix H

Trial Pit Soakaway Test to BRE Digest 365

Location	TP7 (i)	**Test No**	Test 2
Client	BDW Trading Limited	**Length of Trial Pit (m)**	1.32
Job Number	25459	**Width of Trial Pit (m)**	0.45
Date	04.09.12 - 05.09.12	**Water level at start (mbgl)**	0.5
Operator	MOS / BC	**Depth to Base of Trial Pit (m)**	1.30

Time (Secs)	Water level (mbgl)
0	0.50
300	0.67
600	0.68
900	0.69
1200	0.70
1500	0.71
1800	0.72
2100	0.72
2400	0.73
2700	0.73
3000	0.74
6600	0.788
10200	0.828
13800	0.862
17400	0.892
21000	0.918
24600	0.943
28200	0.965
31800	0.985
35400	1.005
39000	1.022
42600	1.04
46200	1.056
49800	1.072
53400	1.086
57000	1.10
60600	1.11
64200	1.13
67800	1.14



Results

V_{p75-25} (m^3)	0.07
a_{p50} (m^2)	2.01
t_{p75} (s)	1400.00
t_{p25} (s)	56950.00
t_{p75-25} (s)	55550.00
Infiltration Rate (m/s)	6.38E-07

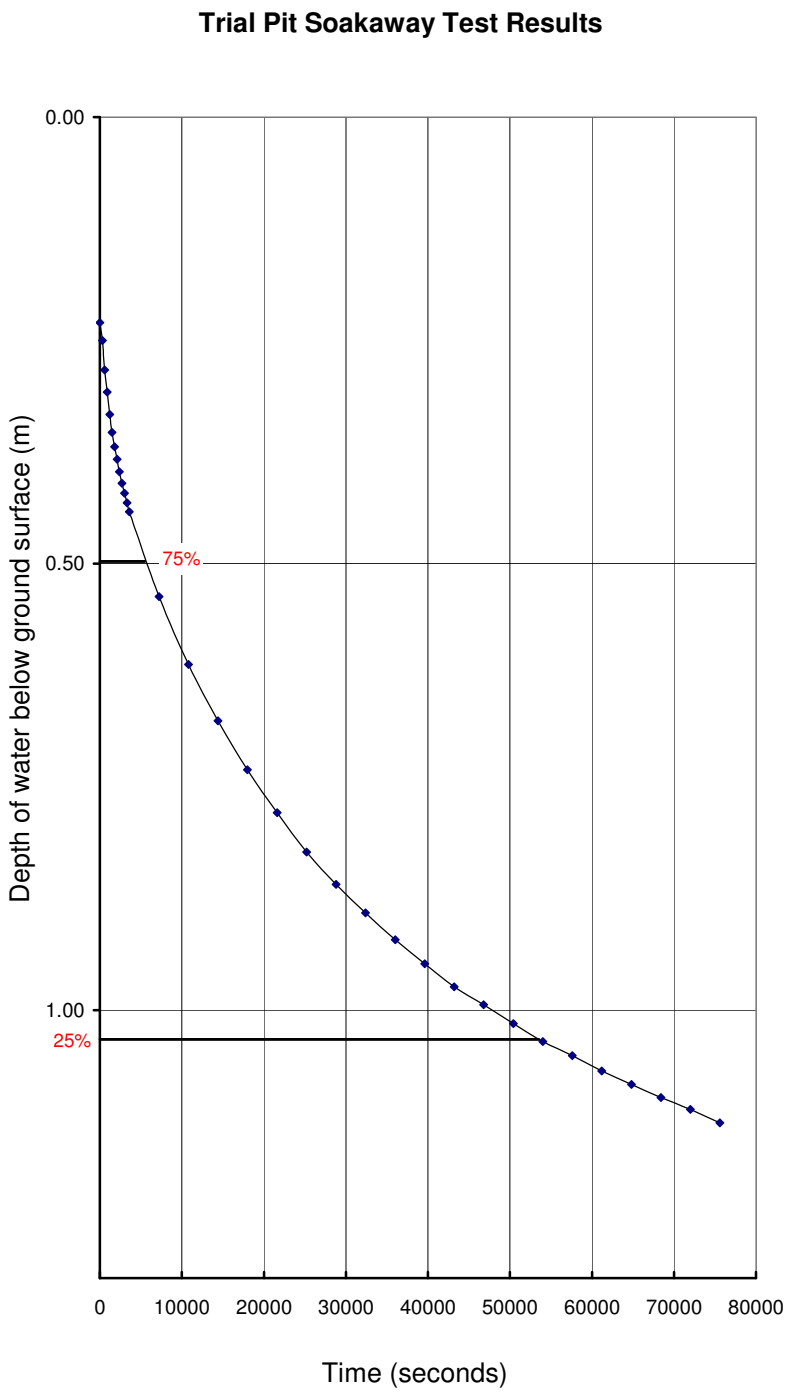
Calculations based on 30% pososity of backfill shingle

Figure
Appendix H

Trial Pit Soakaway Test to BRE Digest 365

Location	TP7 (i)	**Test No**	Test 3
Client	BDW Trading Limited	**Length of Trial Pit (m)**	1.32
Job Number	25459	**Width of Trial Pit (m)**	0.45
Date	05.09.12 - 06.09.12	**Water level at start (mbgl)**	0.23
Operator	MOS	**Depth to Base of Trial Pit (m)**	1.30

Time (Secs)	Water level (mbgl)
0	0.23
300	0.25
600	0.28
900	0.31
1200	0.33
1500	0.353
1800	0.369
2100	0.383
2400	0.397
2700	0.41
3000	0.421
3300	0.432
3600	0.442
7200	0.537
10800	0.613
14400	0.676
18000	0.731
21600	0.779
25200	0.823
28800	0.859
32400	0.891
36000	0.921
39600	0.948
43200	0.974
46800	0.994
50400	1.02
54000	1.04
57600	1.05
61200	1.07
64800	1.083
68400	1.098
72000	1.111
75600	1.126



Results

V_{p75-25} (m^3)	0.10
a_{p50} (m^2)	2.49
t_{p75} (s)	5475.00
t_{p25} (s)	53500.00
t_{p75-25} (s)	48025.00
Infiltration Rate (m/s)	7.98E-07

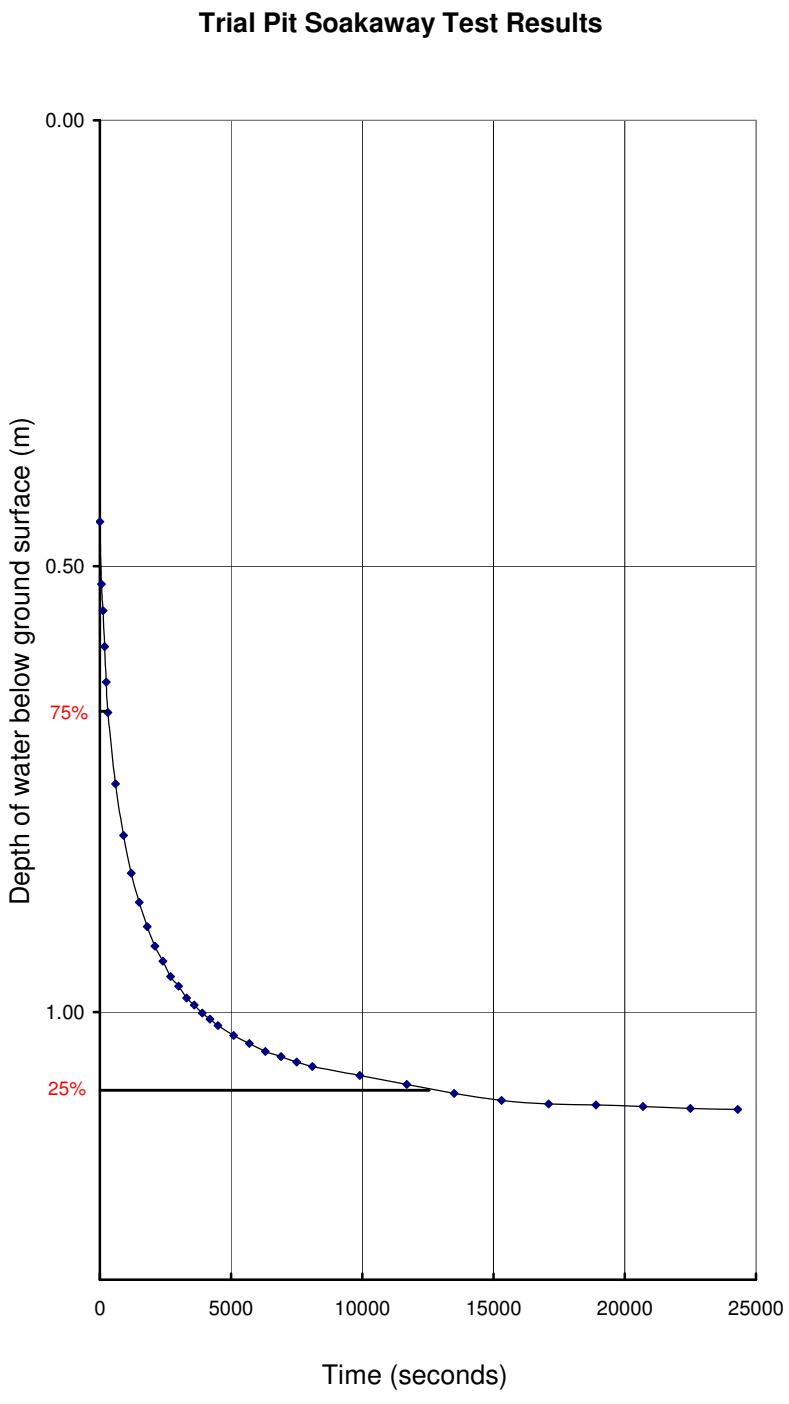
Calculations based on 30% pososity of backfill shingle

Figure
Appendix H

Trial Pit Soakaway Test to BRE Digest 365

Location	TP8 (i)	**Test No**	Test 1
Client	BDW Trading Limited	**Length of Trial Pit (m)**	1.4
Job Number	25459	**Width of Trial Pit (m)**	0.45
Date	03.09.12 - 04.09.12	**Water level at start (mbgl)**	0.45
Operator	MOS / BC	**Depth to Base of Trial Pit (m)**	1.30

Time (Secs)	Water level (mbgl)
0	0.45
60	0.52
120	0.55
180	0.59
240	0.63
300	0.664
600	0.744
900	0.802
1200	0.844
1500	0.877
1800	0.904
2100	0.926
2400	0.943
2700	0.96
3000	0.971
3300	0.984
3600	0.992
3900	1.001
4200	1.008
4500	1.015
5100	1.026
5700	1.035
6300	1.044
6900	1.05
7500	1.056
8100	1.06
9900	1.07
11700	1.08
13500	1.09
15300	1.099
17100	1.103
18900	1.104
20700	1.106
22500	1.108
24300	1.109



Results

V_{p75-25} (m^3)	0.08
a_{p50} (m^2)	2.20
t_{p75} (s)	250.00
t_{p25} (s)	12550.00
t_{p75-25} (s)	12300.00
Infiltration Rate (m/s)	2.97E-06

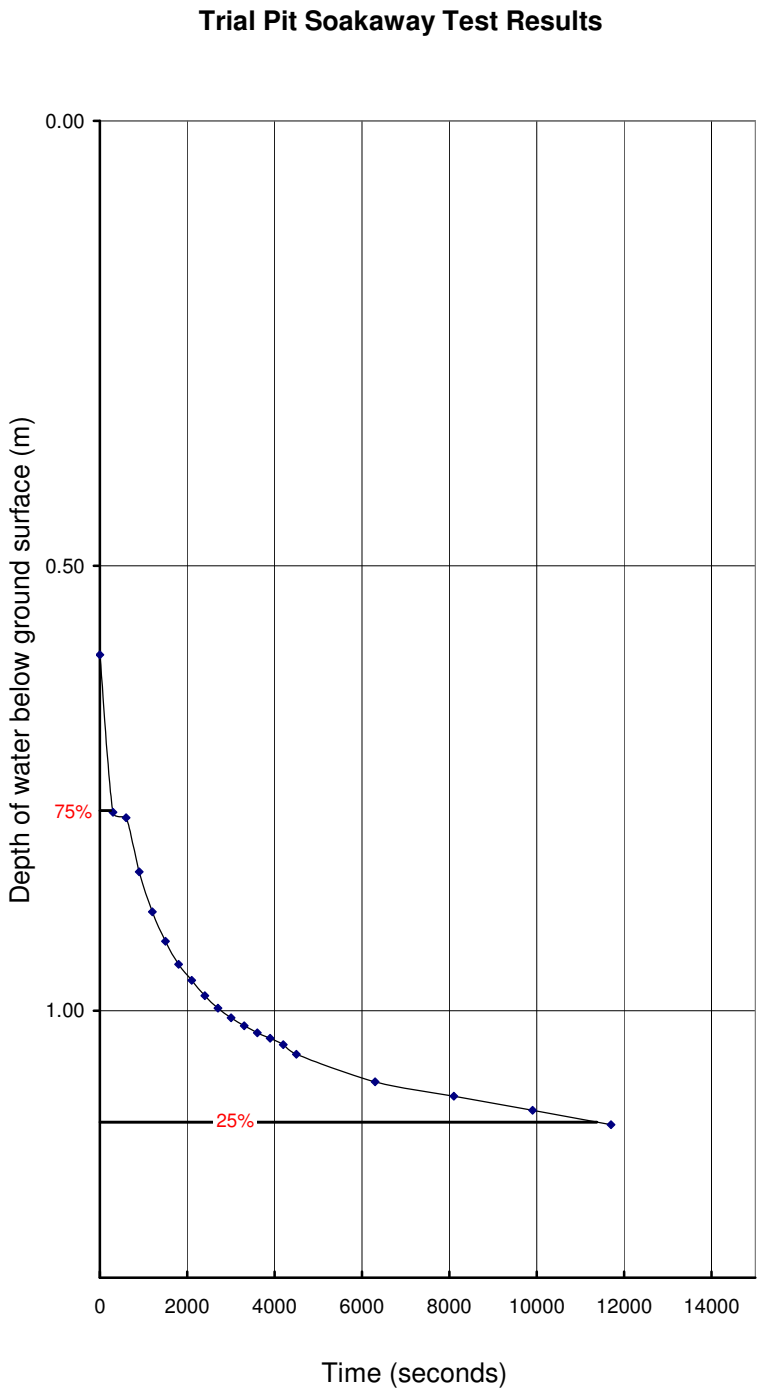
Calculations based on 30% pososity of backfill shingle

Figure
Appendix H

Trial Pit Soakaway Test to BRE Digest 365

Location	TP8 (i)	**Test No**	Test 2
Client	BDW Trading Limited	**Length of Trial Pit (m)**	1.4
Job Number	25459	**Width of Trial Pit (m)**	0.45
Date	04.09.12	**Water level at start (mbgl)**	0.6
Operator	MOS / OP	**Depth to Base of Trial Pit (m)**	1.30

Time (Secs)	Water level (mbgl)
0	0.60
300	0.78
600	0.78
900	0.84
1200	0.89
1500	0.922
1800	0.948
2100	0.966
2400	0.983
2700	0.997
3000	1.008
3300	1.017
3600	1.025
3900	1.031
4200	1.038
4500	1.049
6300	1.08
8100	1.096
9900	1.112
11700	1.128



Results

V_{p75-25} (m^3)	0.07
a_{p50} (m^2)	1.93
t_{p75} (s)	250.00
t_{p25} (s)	11375.00
t_{p75-25} (s)	11125.00
Infiltration Rate (m/s)	3.09E-06

Calculations based on 30% pososity of backfill shingle

Red text denotes inferred data

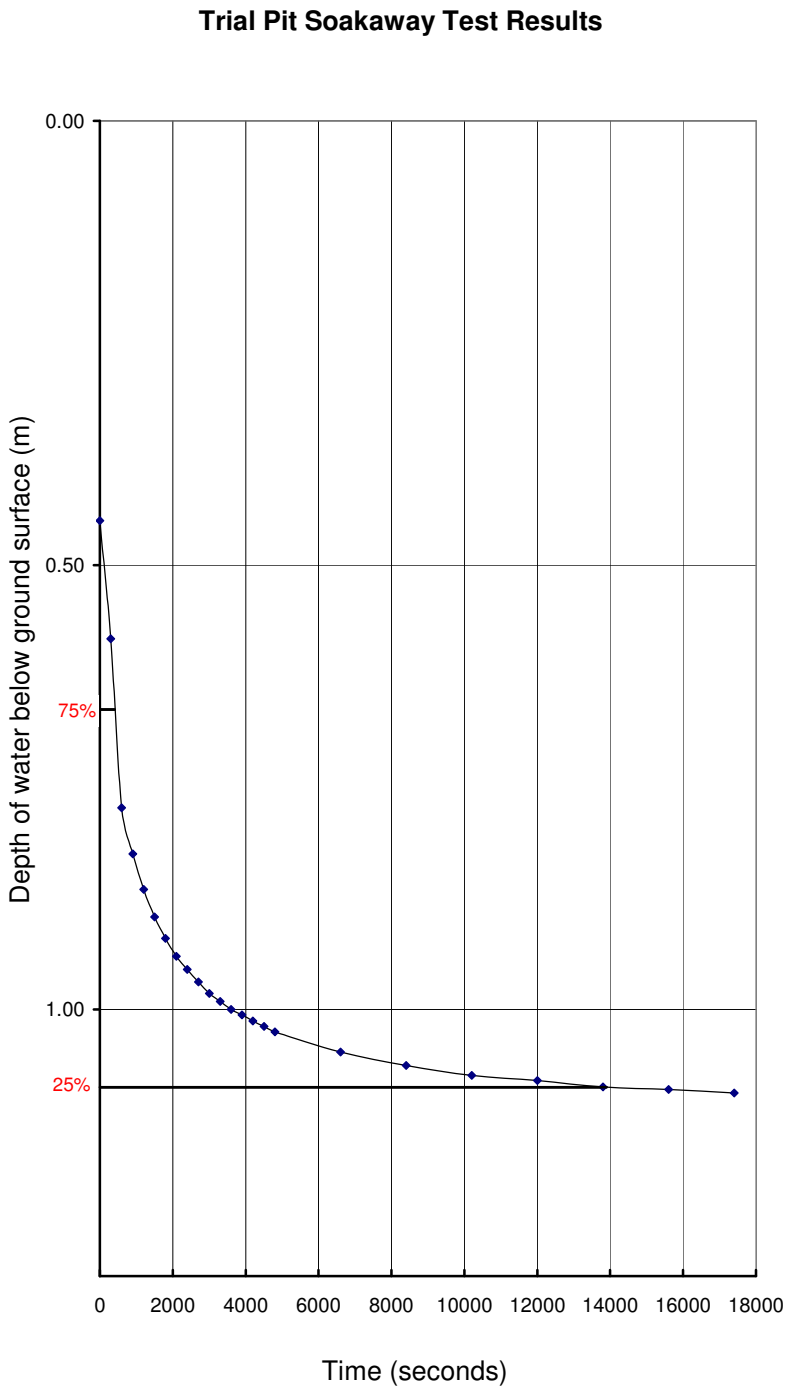
Figure

Appendix H

Trial Pit Soakaway Test to BRE Digest 365

Location	TP8 (i)	**Test No**	Test 3
Client	BDW Trading Limited	**Length of Trial Pit (m)**	1.4
Job Number	25459	**Width of Trial Pit (m)**	0.45
Date	04.09.12 - 05.09.12	**Water level at start (mbgl)**	0.45
Operator	MOS / OP	**Depth to Base of Trial Pit (m)**	1.30

Time (Secs)	Water level (mbgl)
0	0.45
300	0.58
600	0.77
900	0.83
1200	0.87
1500	0.896
1800	0.92
2100	0.94
2400	0.955
2700	0.969
3000	0.982
3300	0.991
3600	1
3900	1.006
4200	1.013
4500	1.019
4800	1.025
6600	1.048
8400	1.063
10200	1.074
12000	1.08
13800	1.087
15600	1.09
17400	1.094



Results

V_{p75-25} (m^3)	0.08
a_{p50} (m^2)	2.20
t_{p75} (s)	400.00
t_{p25} (s)	13900.00
t_{p75-25} (s)	13500.00
Infiltration Rate (m/s)	2.70E-06

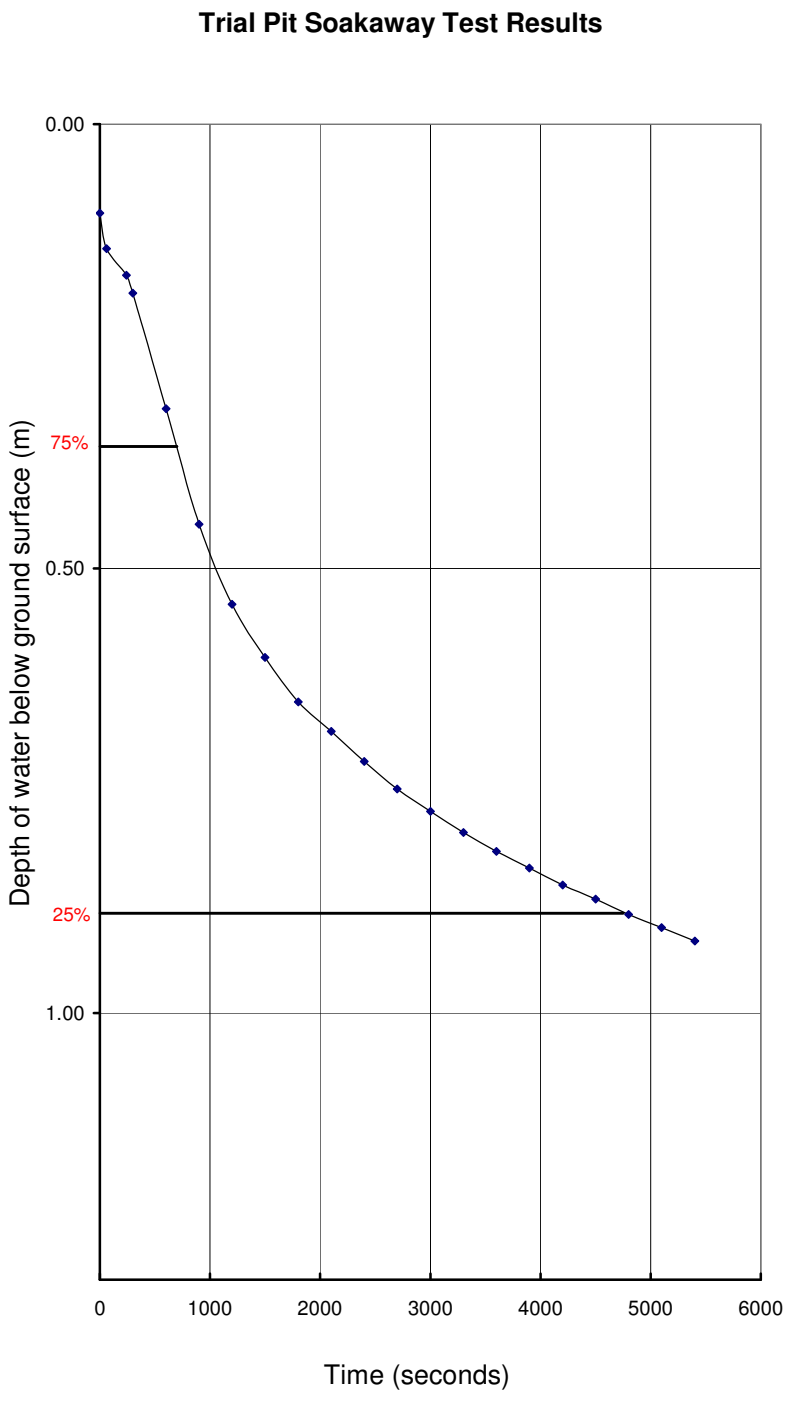
Calculations based on 30% pososity of backfill shingle

Figure
Appendix H

Trial Pit Soakaway Test to BRE Digest 365

Location	TP9 (i)	**Test No**	Test 1
Client	BDW Trading Limited	**Length of Trial Pit (m)**	1.35
Job Number	25459	**Width of Trial Pit (m)**	0.45
Date	04.09.12	**Water level at start (mbgl)**	0.1
Operator	MOS / OP	**Depth to Base of Trial Pit (m)**	1.15

Time (Secs)	Water level (mbgl)
0	0.10
60	0.14
240	0.17
300	0.19
600	0.32
900	0.45
1200	0.54
1500	0.6
1800	0.65
2100	0.683
2400	0.717
2700	0.748
3000	0.773
3300	0.797
3600	0.818
3900	0.837
4200	0.856
4500	0.872
4800	0.889
5100	0.904
5400	0.919



Results

V_{p75-25} (m^3)	0.10
a_{p50} (m^2)	2.50
t_{p75} (s)	700.00
t_{p25} (s)	4750.00
t_{p75-25} (s)	4050.00
Infiltration Rate (m/s)	9.46E-06

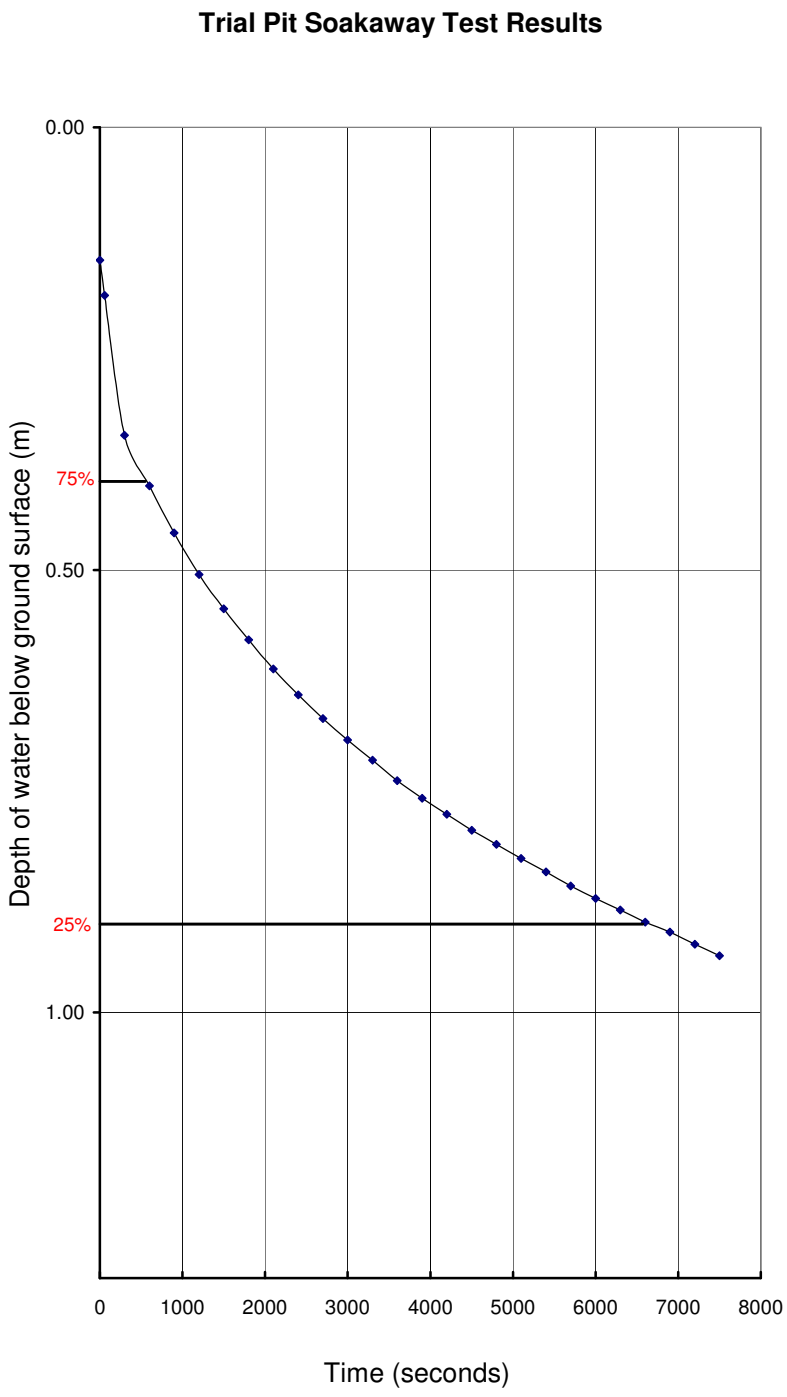
Calculations based on 30% pososity of backfill shingle

Figure
Appendix H

Trial Pit Soakaway Test to BRE Digest 365

Location	TP9 (i)	**Test No**	Test 2
Client	BDW Trading Limited	**Length of Trial Pit (m)**	1.35
Job Number	25459	**Width of Trial Pit (m)**	0.45
Date	04.09.12	**Water level at start (mbgl)**	0.15
Operator	MOS / OP	**Depth to Base of Trial Pit (m)**	1.15

Time (Secs)	Water level (mbgl)
0	0.15
60	0.19
300	0.35
600	0.41
900	0.46
1200	0.505
1500	0.544
1800	0.579
2100	0.612
2400	0.641
2700	0.668
3000	0.692
3300	0.715
3600	0.738
3900	0.758
4200	0.776
4500	0.794
4800	0.81
5100	0.826
5400	0.841
5700	0.857
6000	0.871
6300	0.884
6600	0.898
6900	0.909
7200	0.92
7500	0.94



Results

V_{p75-25} (m^3)	0.09
a_{p50} (m^2)	2.41
t_{p75} (s)	550.00
t_{p25} (s)	6575.00
t_{p75-25} (s)	6025.00
Infiltration Rate (m/s)	6.28E-06

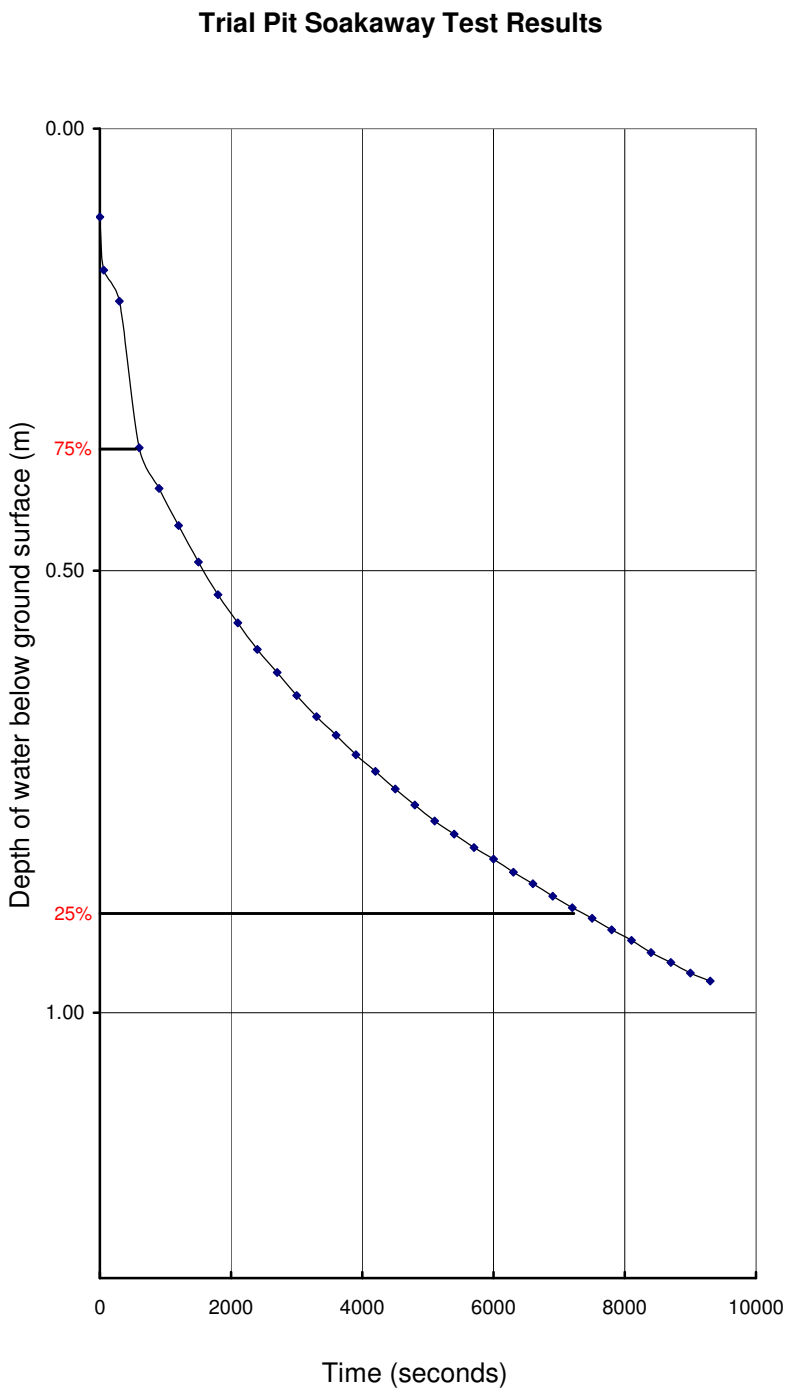
Calculations based on 30% pososity of backfill shingle

Figure
Appendix H

Trial Pit Soakaway Test to BRE Digest 365

Location	TP9 (i)	**Test No**	Test 3
Client	BDW Trading Limited	**Length of Trial Pit (m)**	1.35
Job Number	25459	**Width of Trial Pit (m)**	0.45
Date	04.09.12 - 05.09.12	**Water level at start (mbgl)**	0.1
Operator	MOS / OP / BC	**Depth to Base of Trial Pit (m)**	1.15

Time (Secs)	Water level (mbgl)
0	0.10
60	0.16
300	0.20
600	0.36
900	0.41
1200	0.449
1500	0.49
1800	0.527
2100	0.559
2400	0.589
2700	0.615
3000	0.641
3300	0.665
3600	0.686
3900	0.708
4200	0.727
4500	0.747
4800	0.765
5100	0.783
5400	0.798
5700	0.813
6000	0.826
6300	0.841
6600	0.854
6900	0.868
7200	0.88
7500	0.89
7800	0.91
8100	0.92
8400	0.932
8700	0.943
9000	0.955
9300	0.964



Results

V_{p75-25} (m^3)	0.10
a_{p50} (m^2)	2.50
t_{p75} (s)	550.00
t_{p25} (s)	7225.00
t_{p75-25} (s)	6675.00
Infiltration Rate (m/s)	5.74E-06

Calculations based on 30% pososity of backfill shingle

Figure
Appendix H

APPENDIX I
GROUND GAS / GROUNDWATER MONITORING DATA

IN-SITU GAS MONITORING RESULTS

[Pressures]	Previous	During	Start	End	Equipment Used & Remarks
Round 1	Constant	Constant	1018	1020	Dipmeter + GA2000 + Weather: Clear & Sunny + Ground: Dry + Wind: Strong + Air Temp: 16DegC
Round 2	Rising	Rising	1008	1009	Dipmeter + GA2000 + Weather: Overcast + Ground: Damp + Wind: Medium + Air Temp: 7DegC
Round 3	Falling	Falling	1005	1005	Dipmeter + GFM-40 + Weather: Overcast & Sunny + Ground: Dry + Wind: Medium

Exploratory Position ID	Monitoring Round	Measured Installation Depth (mbgl)	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	PID (ppm)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	
BH1	1	4.18	19/09/2012	1018	1018	$0.0_{(SS)}$	DRY	0.6	0.1	19.8	-	0.2	0.0	0.0	
BH1	1	---	15 secs	-	-	$0.0_{(SS)}$	-	0.8	0.1	19.1	-	0.2	0.0	0.0	
BH1	1	---	30 secs	-	-	$0.0_{(SS)}$	-	0.6	0.1	19.1	-	0.2	0.0	0.0	
BH1	1	---	60 secs	-	-	$0.0_{(SS)}$	-	0.6	0.1	19.1	-	0.0	0.0	0.0	
BH1	1	---	90 secs	-	-	$0.0_{(SS)}$	-	0.6	0.1	19.4	-	0.0	0.0	0.0	
BH1	1	---	120 secs	-	-	$0.0_{(SS)}$	-	0.6	0.1	19.4	-	0.0	0.0	0.0	
BH1	1	---	180 secs	-	-	$0.0_{(SS)}$	-	0.6	0.1	19.4	-	0.0	0.0	0.0	
BH1	1	---	240 secs	-	-	$0.0_{(SS)}$	-	0.6	0.1	19.4	-	0.0	0.0	0.0	
BH1	1	---	300 secs	-	-	$0.0_{(SS)}$	-	0.6	0.1	19.4	-	0.0	0.0	0.0	
BH1	1	---	360 secs	-	-	$0.0_{(SS)}$	-	0.6	0.1	19.4	-	0.0	0.0	0.0	
BH1	1	---	420 secs	-	-	$0.0_{(SS)}$	-	0.6	0.1	19.4	-	0.0	0.0	0.0	
BH1	2 (2)	4.22	05/10/2012	1004	1008	$0.0_{(SS)}$	DRY	0.0	0.0	20.4	-	0.0	0.0	0.0	
BH1	2 (2)	---	15 secs	-	-	$0.0_{(SS)}$	-	1.1	0.0	18.5	-	0.0	0.0	0.0	
BH1	2 (2)	---	30 secs	-	-	$0.0_{(SS)}$	-	1.1	0.0	18.5	-	0.0	0.0	0.0	
BH1	2 (2)	---	60 secs	-	-	$0.0_{(SS)}$	-	1.1	0.0	18.5	-	0.0	0.0	0.0	
BH1	2 (2)	---	90 secs	-	-	$0.0_{(SS)}$	-	1.1	0.0	18.5	-	0.0	0.0	0.0	
BH1	2 (2)	---	120 secs	-	-	$0.0_{(SS)}$	-	1.1	0.0	18.5	-	0.0	0.0	0.0	
BH1	2 (2)	---	180 secs	-	-	$0.0_{(SS)}$	-	1.1	0.0	18.5	-	0.0	0.0	0.0	

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

RSK Environment Ltd
18 Frogmore Road
Hemel Hempstead
Hertfordshire
HP3 9RT

Compiled By	Date	Checked By	Date	Contract Ref:
	24/10/12			25459

Contract: **NIAB - Phase 1**

IN-SITU GAS MONITORING RESULTS

Exploratory Position ID	Monitoring Round	Installation Depth (mbgl)	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	PID (ppm)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	
BH1	2 (2)	---	240 secs	-	-	0.0(SS)	-	1.1	0.0	18.5	-	0.0	0.0	0.0	
BH1	2 (2)	---	300 secs	-	-	0.0(SS)	-	1.1	0.0	18.5	-	0.0	0.0	0.0	
BH1	2 (2)	---	360 secs	-	-	0.0(SS)	-	1.1	0.0	18.5	-	0.0	0.0	0.0	
BH1	2 (2)	---	420 secs	-	-	0.0(SS)	-	1.1	0.0	18.5	-	0.0	0.0	0.0	
BH1	3 (3)	4.25	11/10/2012	1004	1000	0.0(SS)	DRY	0.0	0.0	20.9	0.0	-	-	-	
BH1	3 (3)	---	15 secs	-	-	0.0(SS)	-	1.7	0.0	19.9	0.0	-	-	-	
BH1	3 (3)	---	30 secs	-	-	0.0(SS)	-	1.7	0.0	19.2	0.0	-	-	-	
BH1	3 (3)	---	60 secs	-	-	0.0(SS)	-	1.7	0.0	19.1	0.0	-	-	-	
BH1	3 (3)	---	90 secs	-	-	0.0(SS)	-	1.8	0.0	19.0	0.0	-	-	-	
BH1	3 (3)	---	120 secs	-	-	0.0(SS)	-	1.8	0.0	19.0	0.0	-	-	-	
BH1	3 (3)	---	180 secs	-	-	0.0(SS)	-	1.7	0.0	19.1	0.0	-	-	-	
BH2	1	---	19/09/2012	1018	1018	0.3(SS)	-	0.8	0.0(I)	20.1	0.0(I)	0.3	0.0	0.0	
BH2	1	---	15 secs	1018	1018	0.3(SS)	-	0.8	0.0	20.0	0.0	0.2	0.0	0.0	
BH2	1	---	30 secs	1018	1018	0.3(SS)	-	0.8	0.0	20.0	0.0	0.0	0.0	0.0	
BH2	1	---	60 secs	1018	1018	0.3(SS)	-	0.8	0.0	20.0	0.0	0.0	0.0	0.0	
BH2	1	---	90 secs	1018	1018	0.3(SS)	-	0.8	0.0	20.0	0.0	0.0	0.0	0.0	
BH2	1	---	120 secs	1018	1018	0.3(SS)	-	0.8	0.0	20.0	0.0	0.0	0.0	0.0	
BH2	1	---	180 secs	1018	1018	0.3(SS)	-	0.8	0.0	20.0	0.0	0.0	0.0	0.0	
BH2	1	---	240 secs	1018	1018	0.3(SS)	-	0.8	0.0	20.0	0.0	0.0	0.0	0.0	
BH2	1	---	300 secs	1018	1018	0.3(SS)	-	0.8	0.0	20.0	0.0	0.0	0.0	0.0	
BH2	1	---	360 secs	1018	1018	0.3(SS)	-	0.8	0.0	20.0	0.0	0.0	0.0	0.0	
BH2	1	---	420 secs	1018	1018	0.3(SS)	-	0.8	0.0	20.0	0.0	0.0	0.0	0.0	
BH2	2	---	05/10/2012	1008	1008	0.4(I)	-	0.0	0.0	20.8	0.0	0.0	0.0	0.0	
BH2	2	---	15 secs	1018	1018	0.0(SS)	-	0.5	0.0	19.9	0.0	-	-	-	

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IN-SITU GAS MONITORING RESULTS

Exploratory Position ID	Monitoring Round	Installation Depth (mbgl)	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	PID (ppm)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	
BH2	2	---	30 secs	1018	1018	$0.0_{(SS)}$	-	0.5	0.0	19.9	0.0	-	-	-	
BH2	2	---	60 secs	1018	1018	$0.0_{(SS)}$	-	0.5	0.0	19.9	0.0	-	-	-	
BH2	2	---	90 secs	1018	1018	$0.0_{(SS)}$	-	0.5	0.0	19.8	0.0	-	-	-	
BH2	2	---	120 secs	1018	1018	$0.0_{(SS)}$	-	0.5	0.0	19.9	0.0	-	-	-	
BH2	2	---	180 secs	1018	1018	$0.0_{(SS)}$	-	0.5	0.0	19.9	0.0	-	-	-	
BH2	2	---	240 secs	1018	1018	$0.0_{(SS)}$	-	0.5	0.0	19.9	0.0	-	-	-	
BH2	2	---	300 secs	1018	1018	$0.0_{(SS)}$	-	0.5	0.0	19.9	0.0	-	-	-	
BH2	2	---	360 secs	1018	1018	$0.0_{(SS)}$	-	0.5	0.0	19.9	0.0	-	-	-	
BH2	2	---	420 secs	1018	1018	$0.0_{(SS)}$	-	0.5	0.0	19.9	0.0	-	-	-	
BH2	3	---	11/10/2012	1005	1005	$0.0_{(I)}$	-	0.3	0.0	20.9	0.0	-	-	-	
BH2	3	---	15 secs	1005	1005	$0.0_{(SS)}$	-	$1.7_{(SS)}$	$0.0_{(SS)}$	$20.9_{(SS)}$	$0.0_{(SS)}$	-	-	-	
BH2	3	---	30 secs	1005	1005	$0.0_{(SS)}$	-	1.8	0.0	20.0	0.0	-	-	-	
BH2	3	---	60 secs	1005	1005	$0.0_{(SS)}$	-	1.8	0.0	19.5	0.0	-	-	-	
BH2	3	---	90 secs	1005	1005	$0.0_{(SS)}$	-	1.8	-	19.4	-	-	-	-	
BH2	3	---	120 secs	1005	1005	$0.0_{(SS)}$	-	1.8	-	19.3	-	-	-	-	
BH2	3	---	180 secs	1005	1005	$0.0_{(SS)}$	-	1.7	-	19.3	-	-	-	-	
BH2	3	---	240 secs	1005	1005	$0.0_{(SS)}$	-	1.7	-	19.4	-	-	-	-	
BH2	3	---	300 secs	1005	1005	$0.0_{(SS)}$	-	1.7	-	19.4	-	-	-	-	
BH2	3	---	360 secs	1005	1005	$0.0_{(SS)}$	-	1.7	-	19.4	-	-	-	-	
BH2	3	---	420 secs	1005	1005	$0.0_{(SS)}$	-	1.7	-	19.4	-	-	-	-	
BH3	2 (2)	3.23	05/10/2012	-	1009	$0.0_{(SS)}$	1.44	0.0	0.0	20.6	0.0	0.0	0.0	0.0	
BH3	2 (2)	---	15 secs	-	-	$0.0_{(SS)}$	-	0.7	0.0	19.4	0.0	-	0.0	0.0	
BH3	2 (2)	---	30 secs	-	-	$0.0_{(SS)}$	-	0.7	0.0	19.4	0.0	-	0.0	0.0	
BH3	2 (2)	---	60 secs	-	-	$0.0_{(SS)}$	-	0.7	0.0	19.4	0.0	-	0.0	0.0	

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

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Compiled By	Date	Checked By	Date	Contract Ref:
	24/10/12			**25459**

Contract: **NIAB - Phase 1**

IN-SITU GAS MONITORING RESULTS

Exploratory Position ID	Monitoring Round	Installation Depth (mbgl)	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	PID (ppm)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	
BH3	2 (2)	---	90 secs	-	-	$0.0_{(SS)}$	-	0.7	0.0	19.4	0.0	-	0.0	0.0	
BH3	2 (2)	---	120 secs	-	-	$0.0_{(SS)}$	-	0.7	0.0	19.3	0.0	-	0.0	0.0	
BH3	2 (2)	---	180 secs	-	-	$0.0_{(SS)}$	-	0.7	0.0	19.4	0.0	-	0.0	0.0	
BH3	2 (2)	---	240 secs	-	-	$0.0_{(SS)}$	-	0.7	0.0	19.3	0.0	-	0.0	0.0	
BH3	2 (2)	---	300 secs	-	-	$0.0_{(SS)}$	-	0.7	0.0	19.3	0.0	-	0.0	0.0	
BH3	2 (2)	---	360 secs	-	-	$0.0_{(SS)}$	-	0.7	0.0	19.3	0.0	-	0.0	0.0	
BH3	2 (2)	---	420 secs	-	-	$0.0_{(SS)}$	-	0.7	0.0	19.3	0.0	-	0.0	0.0	
BH3	3 (3)	3.50	11/10/2012	-	1008	$0.0_{(SS)}$	1.58	0.0	-	20.7	-	-	0.0	-	
BH3	3 (3)	---	15 secs	-	-	$0.0_{(SS)}$	-	1.4	-	19.4	-	-	-	-	
BH3	3 (3)	---	30 secs	-	-	$0.0_{(SS)}$	-	1.5	-	18.2	-	-	-	-	
BH3	3 (3)	---	60 secs	-	-	$0.0_{(SS)}$	-	1.5	-	17.9	-	-	-	-	
BH3	3 (3)	---	90 secs	-	-	$0.0_{(SS)}$	-	1.5	-	17.9	-	-	-	-	
BH3	3 (3)	---	120 secs	-	-	$0.0_{(SS)}$	-	1.5	-	17.9	-	-	-	-	
BH3	3 (3)	---	180 secs	-	-	$0.0_{(SS)}$	-	1.5	-	17.9	-	-	-	-	
BHG	1	4.32	19/09/2012	1018	1018	$-0.1_{(SS)}$	2.12	0.2	0.0	20.2	0.0	0.3	0.0	0.0	
BHG	1	---	15 secs	-	-	$-0.1_{(SS)}$	-	0.2	0.0	20.2	0.0	0.0	0.0	0.0	
BHG	1	---	30 secs	-	-	$-0.1_{(SS)}$	-	0.2	0.0	20.2	0.0	0.0	0.0	0.0	
BHG	1	---	60 secs	-	-	$-0.1_{(SS)}$	-	0.2	0.0	20.3	0.0	0.0	0.0	0.0	
BHG	1	---	90 secs	-	-	$-0.1_{(SS)}$	-	0.2	0.0	20.3	0.0	0.0	0.0	0.0	
BHG	1	---	120 secs	-	-	$-0.1_{(SS)}$	-	0.2	0.0	20.3	0.0	0.0	0.0	0.0	
BHG	1	---	180 secs	-	-	$-0.1_{(SS)}$	-	0.1	0.0	20.3	0.0	0.0	0.0	0.0	
BHG	1	---	240 secs	-	-	$-0.1_{(SS)}$	-	0.2	0.0	20.3	0.0	0.0	0.0	0.0	
BHG	1	---	300 secs	-	-	$-0.1_{(SS)}$	-	0.2	0.0	20.2	0.0	0.0	0.0	0.0	
BHG	1	---	360 secs	-	-	$-0.1_{(SS)}$	-	0.2	0.0	20.2	0.0	0.0	0.0	0.0	

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

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IN-SITU GAS MONITORING RESULTS

Exploratory Position ID	Monitoring Round	Installation Depth (mbgl)	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	PID (ppm)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	
BHG	1	---	420 secs	-	-	$-0.1_{(SS)}$	-	0.2	0.0	20.2	0.0	0.0	0.0	0.0	
BHG	2 (2)	4.31	05/10/2012	1008	1008	$0.0_{(SS)}$	2.15	0.0	0.0	20.8	0.0	0.0	0.0	0.0	
BHG	2 (2)	---	15 secs	-	-	$0.0_{(SS)}$	-	0.3	0.0	19.6	0.0	0.0	0.0	0.0	
BHG	2 (2)	---	30 secs	-	-	$0.0_{(SS)}$	-	0.3	0.0	19.9	0.0	0.0	0.0	0.0	
BHG	2 (2)	---	60 secs	-	-	$0.0_{(SS)}$	-	0.3	0.0	20.0	0.0	0.0	0.0	0.0	
BHG	2 (2)	---	90 secs	-	-	$0.0_{(SS)}$	-	0.3	0.0	20.0	0.0	0.0	0.0	0.0	
BHG	2 (2)	---	120 secs	-	-	$0.0_{(SS)}$	-	0.2	0.0	20.0	0.0	0.0	0.0	0.0	
BHG	2 (2)	---	180 secs	-	-	$0.0_{(SS)}$	-	0.2	0.0	20.1	0.0	0.0	0.0	0.0	
BHG	2 (2)	---	240 secs	-	-	$0.0_{(SS)}$	-	0.2	0.0	20.1	0.0	0.0	0.0	0.0	
BHG	2 (2)	---	300 secs	-	-	$0.0_{(SS)}$	-	0.1	0.0	20.1	0.0	0.0	0.0	0.0	
BHG	2 (2)	---	360 secs	-	-	$0.0_{(SS)}$	-	0.1	0.0	20.1	0.0	0.0	0.0	0.0	
BHG	2 (2)	---	420 secs	-	-	$0.0_{(SS)}$	-	0.1	0.0	20.2	0.0	0.0	0.0	0.0	
BHG	3 (3)	4.58	11/10/2012	1003	1003	$0.0_{(SS)}$	2.40	0.3	0.0	20.9	0.0	-	-	-	
BHG	3 (3)	---	15 secs	-	-	$0.0_{(SS)}$	-	1.7	0.0	20.0	0.0	-	-	-	
BHG	3 (3)	---	30 secs	-	-	$0.0_{(SS)}$	-	1.8	0.0	19.5	0.0	-	-	-	
BHG	3 (3)	---	60 secs	-	-	$0.0_{(SS)}$	-	1.8	0.0	19.4	0.0	-	-	-	
BHG	3 (3)	---	90 secs	-	-	$0.0_{(SS)}$	-	1.8	0.0	19.3	0.0	-	-	-	
BHG	3 (3)	---	120 secs	-	-	$0.0_{(SS)}$	-	1.8	0.0	19.3	0.0	-	-	-	
BHG	3 (3)	---	180 secs	-	-	$0.0_{(SS)}$	-	1.7	0.0	19.4	0.0	-	-	-	
BHG	3 (3)	---	240 secs	-	-	$0.0_{(SS)}$	-	1.7	0.0	19.4	0.0	-	-	-	
BHG	3 (3)	---	300 secs	-	-	$0.0_{(SS)}$	-	1.7	0.0	19.4	0.0	-	-	-	
BHG	3 (3)	---	360 secs	-	-	$0.0_{(SS)}$	-	1.7	0.0	19.4	0.0	-	-	-	
BHG	3 (3)	---	420 secs	-	-	$0.0_{(SS)}$	-	1.7	0.0	19.4	0.0	-	-	-	
BHK	1	4.05	19/09/2012	1018	1018	$0.0_{(SS)}$	1.97	1.3	0.1	19.8	1.0	0.0	0.0	0.0	

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

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Contract: **NIAB - Phase 1**

IN-SITU GAS MONITORING RESULTS

Exploratory Position ID	Monitoring Round	Installation Depth (mbgl)	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	PID (ppm)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	
BHK	1	---	15 secs	-	-	$0.0_{(SS)}$	-	1.3	0.1	19.5	1.0	0.0	0.0	0.0	
BHK	1	---	30 secs	-	-	$0.0_{(SS)}$	-	1.4	0.1	19.5	1.0	0.0	0.0	0.0	
BHK	1	---	60 secs	-	-	$0.0_{(SS)}$	-	1.3	0.1	19.5	1.0	0.0	0.0	0.0	
BHK	1	---	90 secs	-	-	$0.0_{(SS)}$	-	1.3	0.1	19.5	1.0	0.0	0.0	0.0	
BHK	1	---	120 secs	-	-	$0.0_{(SS)}$	-	1.4	0.1	19.5	1.0	0.0	0.0	0.0	
BHK	1	---	180 secs	-	-	$0.0_{(SS)}$	-	1.5	0.1	19.5	1.0	0.0	0.0	0.0	
BHK	1	---	240 secs	-	-	$0.0_{(SS)}$	-	1.7	0.1	19.4	1.0	0.0	0.0	0.0	
BHK	1	---	300 secs	-	-	$0.0_{(SS)}$	-	1.8	0.1	19.3	1.0	0.0	0.0	0.0	
BHK	1	---	360 secs	-	-	$0.0_{(SS)}$	-	1.8	0.1	19.3	1.0	0.0	0.0	0.0	
BHK	1	---	420 secs	-	-	$0.0_{(SS)}$	-	1.8	0.1	19.3	1.0	0.0	0.0	0.0	
BHK	2 (2)	4.04	05/10/2012	1009	1008	$0.2_{(SS)}$	2.06	0.2	0.0	20.8	-	0.0	0.0	0.0	
BHK	2 (2)	---	15 secs	-	-	$0.2_{(SS)}$	-	0.7	0.0	19.8	-	0.0	0.0	0.0	
BHK	2 (2)	---	30 secs	-	-	$0.2_{(SS)}$	-	1.3	0.0	19.1	-	0.0	0.0	0.0	
BHK	2 (2)	---	60 secs	-	-	$0.2_{(SS)}$	-	1.3	0.0	19.1	-	0.0	0.0	0.0	
BHK	2 (2)	---	90 secs	-	-	$0.2_{(SS)}$	-	1.3	0.0	19.1	-	0.0	0.0	0.0	
BHK	2 (2)	---	120 secs	-	-	$0.2_{(SS)}$	-	1.2	0.0	19.1	-	0.0	0.0	0.0	
BHK	2 (2)	---	180 secs	-	-	$0.2_{(SS)}$	-	1.3	0.0	19.1	-	0.0	0.0	0.0	
BHK	2 (2)	---	240 secs	-	-	$0.2_{(SS)}$	-	1.2	0.0	19.1	-	0.0	0.0	0.0	
BHK	2 (2)	---	300 secs	-	-	$0.2_{(SS)}$	-	1.2	0.0	19.1	-	0.0	0.0	0.0	
BHK	2 (2)	---	360 secs	-	-	$0.2_{(SS)}$	-	1.2	0.0	19.1	-	0.0	0.0	0.0	
BHK	2 (2)	---	420 secs	-	-	$0.2_{(SS)}$	-	1.2	0.0	19.1	-	0.0	0.0	0.0	
BHK	3 (3)	4.30	11/10/2012	-	1006	$-0.1_{(SS)}$	2.38	0.1	0.0	20.7	0.0	-	-	-	
BHK	3 (3)	---	15 secs	-	-	$-0.1_{(SS)}$	-	3.2	0.0	19.2	0.0	-	-	-	
BHK	3 (3)	---	30 secs	-	-	$-0.1_{(SS)}$	-	3.3	0.0	18.4	0.0	-	-	-	
BHK	3 (3)	---	60 secs	-	-	$-0.1_{(SS)}$	-	3.3	0.0	18.2	0.0	-	-	-	

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

RSK Environment Ltd
18 Frogmore Road
Hemel Hempstead
Hertfordshire
HP3 9RT

Compiled By	Date	Checked By	Date	Contract Ref:
	24/10/12			**25459**

Contract: **NIAB - Phase 1**

IN-SITU GAS MONITORING RESULTS

Exploratory Position ID	Monitoring Round	Installation Depth (mbgl)	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	PID (ppm)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	
BHK	3 (3)	---	90 secs	-	-	$-0.1_{(SS)}$	-	3.4	0.0	18.1	0.0	-	-	-	
BHK	3 (3)	---	120 secs	-	-	$-0.1_{(SS)}$	-	3.4	0.0	18.1	0.0	-	-	-	
BHK	3 (3)	---	180 secs	-	-	$-0.1_{(SS)}$	-	3.5	0.0	18.0	0.0	-	-	-	
BHK	3 (3)	---	240 secs	-	-	$-0.1_{(SS)}$	-	3.5	0.0	18.0	0.0	-	-	-	
BHK	3 (3)	---	300 secs	-	-	$-0.1_{(SS)}$	-	3.5	0.0	18.0	0.0	-	-	-	
WS3	1	3.21	19/09/2012	1018	1018	$0.2_{(SS)}$	DRY	0.0	0.1	20.3	0.0	0.0	0.0	0.0	
WS3	1	---	15 secs	-	-	$0.2_{(SS)}$	-	0.6	0.1	20.2	1.0	0.0	0.0	0.0	
WS3	1	---	30 secs	-	-	$0.2_{(SS)}$	-	0.7	0.1	20.2	1.0	0.0	0.0	0.0	
WS3	1	---	60 secs	-	-	$0.2_{(SS)}$	-	0.8	0.1	20.2	1.0	0.0	0.0	0.0	
WS3	1	---	90 secs	-	-	$0.2_{(SS)}$	-	0.7	0.1	20.2	1.0	0.0	0.0	0.0	
WS3	1	---	120 secs	-	-	$0.2_{(SS)}$	-	0.7	0.1	20.2	1.0	0.0	0.0	0.0	
WS3	1	---	180 secs	-	-	$0.2_{(SS)}$	-	0.6	0.1	20.3	1.0	0.0	0.0	0.0	
WS3	1	---	240 secs	-	-	$0.2_{(SS)}$	-	0.6	0.1	20.3	1.0	0.0	0.0	0.0	
WS3	1	---	300 secs	-	-	$0.2_{(SS)}$	-	0.5	0.1	20.4	1.0	0.0	0.0	0.0	
WS3	1	---	360 secs	-	-	$0.2_{(SS)}$	-	0.4	0.1	20.5	1.0	0.0	0.0	0.0	
WS3	1	---	420 secs	-	-	$0.2_{(SS)}$	-	0.4	0.1	20.5	1.0	0.0	0.0	0.0	
WS3	2 (2)	3.18	05/10/2012	1004	1008	$0.3_{(SS)}$	2.92	1.1	0.0	19.6	-	-	-	-	
WS3	2 (2)	---	15 secs	-	-	$0.3_{(SS)}$	-	1.1	0.0	19.6	-	-	-	-	
WS3	2 (2)	---	30 secs	-	-	$0.3_{(SS)}$	-	1.1	0.0	19.5	-	-	-	-	
WS3	2 (2)	---	60 secs	-	-	$0.3_{(SS)}$	-	1.2	0.0	19.5	-	-	-	-	
WS3	2 (2)	---	90 secs	-	-	$0.3_{(SS)}$	-	1.2	0.0	19.5	-	-	-	-	
WS3	2 (2)	---	120 secs	-	-	$0.3_{(SS)}$	-	1.1	0.0	19.4	-	-	-	-	
WS3	2 (2)	---	180 secs	-	-	$0.3_{(SS)}$	-	1.0	0.0	19.5	-	-	-	-	
WS3	2 (2)	---	240 secs	-	-	$0.3_{(SS)}$	-	0.9	0.0	19.5	-	-	-	-	

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

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Hemel Hempstead
Hertfordshire
HP3 9RT

Compiled By	Date	Checked By	Date	Contract Ref:
	24/10/12			**25459**

Contract: **NIAB - Phase 1**

IN-SITU GAS MONITORING RESULTS

Exploratory Position ID	Monitoring Round	Installation Depth (mbgl)	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	PID (ppm)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	
WS3	2 (2)	---	300 secs	-	-	$0.3_{(SS)}$	-	0.9	0.0	19.6	-	-	-	-	
WS3	2 (2)	---	360 secs	-	-	$0.3_{(SS)}$	-	0.8	0.0	19.6	-	-	-	-	
WS3	2 (2)	---	420 secs	-	-	$0.3_{(SS)}$	-	0.8	0.0	19.6	-	-	-	-	
WS3	3 (3)	5.44	11/10/2012	-	1006	$0.0_{(SS)}$	2.87	0.3	0.0	20.7	0.0	-	-	-	
WS3	3 (3)	---	15 secs	-	-	$0.0_{(SS)}$	-	2.1	0.0	19.9	0.0	-	-	-	
WS3	3 (3)	---	30 secs	-	-	$0.0_{(SS)}$	-	2.2	0.0	19.3	0.0	-	-	-	
WS3	3 (3)	---	60 secs	-	-	$0.0_{(SS)}$	-	2.2	0.0	19.3	0.0	-	-	-	
WS3	3 (3)	---	90 secs	-	-	$0.0_{(SS)}$	-	2.2	0.0	19.3	0.0	-	-	-	
WS3	3 (3)	---	120 secs	-	-	$0.0_{(SS)}$	-	2.2	0.0	19.3	0.0	-	-	-	
WS3	3 (3)	---	180 secs	-	-	$0.0_{(SS)}$	-	2.2	0.0	19.3	0.0	-	-	-	
WS3	3 (3)	---	240 secs	-	-	$0.0_{(SS)}$	-	2.2	0.0	19.3	0.0	-	-	-	
WS3	3 (3)	---	300 secs	-	-	$0.0_{(SS)}$	-	2.2	0.0	19.3	0.0	-	-	-	
WS3	3 (3)	---	360 secs	-	-	$0.0_{(SS)}$	-	2.2	0.0	19.3	0.0	-	-	-	
WS3	3 (3)	---	420 secs	-	-	$0.0_{(SS)}$	-	2.2	0.0	19.3	0.0	-	-	-	
WS17	1	2.95	19/09/2012	1020	1020	$0.1_{(SS)}$	DRY	1.7	0.0	19.5	0.0	-	-	-	
WS17	1	---	15 secs	-	-	$0.1_{(SS)}$	-	1.7	0.0	19.5	0.0	-	-	-	
WS17	1	---	30 secs	-	-	$0.1_{(SS)}$	-	1.8	0.0	19.2	0.0	-	-	-	
WS17	1	---	60 secs	-	-	$0.1_{(SS)}$	-	2.0	0.0	19.1	0.0	-	-	-	
WS17	1	---	90 secs	-	-	$0.1_{(SS)}$	-	2.1	0.1	19.0	1.0	-	-	-	
WS17	1	---	120 secs	-	-	$0.1_{(SS)}$	-	2.4	0.1	18.8	2.0	-	-	-	
WS17	1	---	180 secs	-	-	$0.1_{(SS)}$	-	2.7	0.1	18.7	2.0	-	-	-	
WS17	1	---	240 secs	-	-	$0.1_{(SS)}$	-	2.9	0.1	18.6	2.0	-	-	-	
WS17	1	---	300 secs	-	-	$0.1_{(SS)}$	-	2.9	0.1	18.6	2.0	-	-	-	
WS17	1	---	360 secs	-	-	$0.1_{(SS)}$	-	2.9	0.1	18.6	2.0	-	-	-	

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

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	24/10/12			**25459**

Contract: **NIAB - Phase 1**

IN-SITU GAS MONITORING RESULTS

Exploratory Position ID	Monitoring Round	Installation Depth (mbgl)	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	PID (ppm)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	
WS17	1	---	420 secs	-	-	$0.1_{(SS)}$	-	2.9	0.1	18.6	2.0	-	-	-	
WS17	2 (2)	2.95	05/10/2012	1383	1009	$0.0_{(SS)}$	1.88	0.1	0.0	20.2	0.0	0.0	0.0	0.0	
WS17	2 (2)	---	15 secs	-	-	$0.0_{(SS)}$	-	0.3	0.0	20.2	0.0	-	0.0	0.0	
WS17	2 (2)	---	30 secs	-	-	$0.0_{(SS)}$	-	0.4	0.0	20.2	0.0	-	0.0	0.0	
WS17	2 (2)	---	60 secs	-	-	$0.0_{(SS)}$	-	0.8	0.0	19.7	0.0	-	0.0	0.0	
WS17	2 (2)	---	90 secs	-	-	$0.0_{(SS)}$	-	0.9	0.0	19.6	0.0	-	0.0	0.0	
WS17	2 (2)	---	120 secs	-	-	$0.0_{(SS)}$	-	1.3	0.0	19.2	0.0	-	0.0	0.0	
WS17	2 (2)	---	180 secs	-	-	$0.0_{(SS)}$	-	1.4	0.0	18.9	0.0	-	0.0	0.0	
WS17	2 (2)	---	240 secs	-	-	$0.0_{(SS)}$	-	1.5	0.0	18.8	0.0	-	0.0	0.0	
WS17	2 (2)	---	300 secs	-	-	$0.0_{(SS)}$	-	1.5	0.0	18.8	0.0	-	0.0	0.0	
WS17	2 (2)	---	360 secs	-	-	$0.0_{(SS)}$	-	1.4	0.0	18.9	0.0	-	0.0	0.0	
WS17	2 (2)	---	420 secs	-	-	$0.0_{(SS)}$	-	1.3	0.0	18.9	0.0	-	0.0	0.0	
WS17	3 (3)	2.90	11/10/2012	-	1005	$0.0_{(SS)}$	1.85	0.2	-	21.3	-	-	-	-	
WS17	3 (3)	---	15 secs	-	-	$0.0_{(SS)}$	-	0.6	-	20.6	-	-	-	-	
WS17	3 (3)	---	30 secs	-	-	$0.0_{(SS)}$	-	0.6	-	20.5	-	-	-	-	
WS17	3 (3)	---	60 secs	-	-	$0.0_{(SS)}$	-	0.7	-	20.4	-	-	-	-	
WS17	3 (3)	---	90 secs	-	-	$0.0_{(SS)}$	-	0.9	-	20.2	-	-	-	-	
WS17	3 (3)	---	120 secs	-	-	$0.0_{(SS)}$	-	1.1	-	20.0	-	-	-	-	
WS17	3 (3)	---	180 secs	-	-	$0.0_{(SS)}$	-	1.4	-	19.6	-	-	-	-	
WS17	3 (3)	---	240 secs	-	-	$0.0_{(SS)}$	-	1.6	-	19.6	-	-	-	-	
WS17	3 (3)	---	300 secs	-	-	$0.0_{(SS)}$	-	1.7	-	19.3	-	-	-	-	
WS17	3 (3)	---	360 secs	-	-	$0.0_{(SS)}$	-	1.7	-	19.3	-	-	-	-	
WSH	1	2.33	19/09/2012	1018	1018	$0.0_{(SS)}$	DRY	2.7	0.1	19.1	1.0	0.7	0.0	0.0	
WSH	1	---	15 secs	-	-	$0.0_{(SS)}$	-	2.8	0.1	19.0	1.0	0.0	0.0	0.0	

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

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IN-SITU GAS MONITORING RESULTS

Exploratory Position ID	Monitoring Round	Installation Depth (mbgl)	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	PID (ppm)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	
WSH	1	---	30 secs	-	-	$0.0_{(SS)}$	-	3.1	0.1	18.8	1.0	0.0	0.0	0.0	
WSH	1	---	60 secs	-	-	$0.0_{(SS)}$	-	3.4	0.1	18.8	1.0	0.0	0.0	0.0	
WSH	1	---	90 secs	-	-	$0.0_{(SS)}$	-	3.5	0.1	18.8	1.0	0.0	0.0	0.0	
WSH	1	---	120 secs	-	-	$0.0_{(SS)}$	-	3.6	0.1	18.7	1.0	0.0	0.0	0.0	
WSH	1	---	180 secs	-	-	$0.0_{(SS)}$	-	3.6	0.1	18.8	1.0	0.0	0.0	0.0	
WSH	1	---	240 secs	-	-	$0.0_{(SS)}$	-	3.5	0.1	18.9	1.0	0.0	0.0	0.0	
WSH	1	---	300 secs	-	-	$0.0_{(SS)}$	-	3.3	0.1	18.9	1.0	0.0	0.0	0.0	
WSH	1	---	360 secs	-	-	$0.0_{(SS)}$	-	3.3	0.1	19.0	1.0	0.0	0.0	0.0	
WSH	1	---	420 secs	-	-	$0.0_{(SS)}$	-	3.2	0.1	19.0	1.0	0.0	0.0	0.0	
WSH	2 (2)	2.39	05/10/2012	-	1008	$0.0_{(SS)}$	DRY	0.0	0.0	19.9	-	0.0	0.0	0.0	
WSH	2 (2)	---	15 secs	-	-	$0.0_{(SS)}$	-	1.3	0.0	19.1	-	-	0.0	0.0	
WSH	2 (2)	---	30 secs	-	-	$0.0_{(SS)}$	-	2.9	0.0	18.7	-	-	0.0	0.0	
WSH	2 (2)	---	60 secs	-	-	$0.0_{(SS)}$	-	3.3	0.0	18.4	-	-	0.0	0.0	
WSH	2 (2)	---	90 secs	-	-	$0.0_{(SS)}$	-	3.4	0.0	18.4	-	-	0.0	0.0	
WSH	2 (2)	---	120 secs	-	-	$0.0_{(SS)}$	-	3.4	0.0	18.4	-	-	0.0	0.0	
WSH	2 (2)	---	180 secs	-	-	$0.0_{(SS)}$	-	3.4	0.0	18.4	-	-	0.0	0.0	
WSH	2 (2)	---	240 secs	-	-	$0.0_{(SS)}$	-	3.3	0.0	18.4	-	-	0.0	0.0	
WSH	2 (2)	---	300 secs	-	-	$0.0_{(SS)}$	-	3.4	0.0	18.4	-	-	0.0	0.0	
WSH	2 (2)	---	360 secs	-	-	$0.0_{(SS)}$	-	3.3	0.0	18.4	-	-	0.0	0.0	
WSH	2 (2)	---	420 secs	-	-	$0.0_{(SS)}$	-	3.3	0.0	18.4	-	-	0.0	0.0	
WSH	3 (3)	2.70	11/10/2012	1004	1005	$0.0_{(SS)}$	DRY	0.1	0.0	20.8	0.0	-	-	-	
WSH	3 (3)	---	15 secs	-	-	$0.0_{(SS)}$	-	3.5	0.0	19.2	0.0	-	-	-	
WSH	3 (3)	---	30 secs	-	-	$0.0_{(SS)}$	-	3.5	0.0	18.6	0.0	-	-	-	
WSH	3 (3)	---	60 secs	-	-	$0.0_{(SS)}$	-	3.7	0.0	18.4	0.0	-	-	-	
WSH	3 (3)	---	90 secs	-	-	$0.0_{(SS)}$	-	4.0	0.0	18.2	0.0	-	-	-	

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

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	24/10/12			**25459**

Contract: **NIAB - Phase 1**

IN-SITU GAS MONITORING RESULTS

Exploratory Position ID	Monitoring Round	Installation Depth (mbgl)	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	PID (ppm)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	
WSH	3 (3)	---	120 secs	-	-	$0.0_{(SS)}$	-	4.1	0.0	18.1	0.0	-	-	-	
WSH	3 (3)	---	180 secs	-	-	$0.0_{(SS)}$	-	4.2	0.0	18.0	0.0	-	-	-	
WSH	3 (3)	---	240 secs	-	-	$0.0_{(SS)}$	-	4.2	0.0	18.0	0.0	-	-	-	

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

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Contract: **NIAB - Phase 1**

APPENDIX J
LABORATORY CERTIFICATES FOR SOIL ANALYSIS

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 12/03975
Issue Number: 1 **Date:** 17 September, 2012

Client:
RSK Environment Ltd Hemel
18 Frogmore Road
Hemel Hempstead
Hertfordshire
UK
HP3 9RT

Project Manager: Nigel Austin / Ben Coulston
Project Name: NIAB Phase 1
Project Ref: 25459
Order No: Not specified
Date Samples Received: 03/09/12
Date Instructions Received: 04/09/12
Date Analysis Completed: 17/09/12

Prepared by:
Melanie Marshall
Laboratory Coordinator

Approved by:
Iain Haslock
Analytical Consultant

Notes - Soil analysis
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 inert stones >10mm are removed or excluded from the sample prior to analysis and reported results corrected to a whole sample basis. For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis.
Notes - General
Subscript "A" indicates analysis performed on the sample as received, "D" indicates analysis performed on dried & crushed sample.
All analysis is performed on the dried and crushed sample for samples with Matrix Code 7 and this supercedes any "A" subscripts. Superscript "M" indicates method accredited to MCERTS. Results in italics are associated with a control limit flag.
A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling.
Predominant Matrix Codes - 1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER.
Samples with Matrix Code 7 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our MCERTS accreditation.
Secondary Matrix Codes - A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal, E = contains roots/twigs.
IS indicates Insufficient sample for analysis. NDP indicates No Determination Possible. NAD indicates No Asbestos Detected.
Superscript # indicates method accredited to ISO 17025.
Analytical results reflect the quality of the sample at the time of analysis only.
Opinions and interpretations expressed are outside the scope of our accreditation.

MCERTS THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME
UKAS TESTING 1247

Envirolab Job Number: 12/03975

Client Project Name: NIAB Phase 1

Client Project Ref: 25459

Lab Sample ID	12/03975/1	12/03975/2	12/03975/3	12/03975/4	12/03975/5	12/03975/6	12/03975/7	12/03975/8	Units	Method ref
Client Sample No										
Client Sample ID	TP1	TP2	TP3	TP4	TP5	TP6	TP7	TP8		
Depth to Top	0.10	0.20	0.10	0.20	0.10	0.20	0.20	0.10		
Depth To Bottom	0.20	0.30			0.30		0.30	0.20		
Date Sampled	30-Aug-12	30-Aug-12	28-Aug-12	28-Aug-12	30-Aug-12	28-Aug-12	30-Aug-12	30-Aug-12		
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES		
Sample Matrix Code	6AE	6AE	6AE	6AE	6E	5	6AE	4E		
Asbestos in soil$_A^{\#}$	NAD	-	NAD	-	-	-	NAD	-		A-T-045
Organic matter$_D^{M\#}$	-	-	-	-	-	1.0	-	-	% w/w	A-T-032 OM
Arsenic$_D^{M\#}$	7	6	5	5	8	4	9	9	mg/kg	A-T-024
Cadmium$_D^{M\#}$	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.4	<0.5	mg/kg	A-T-024
Copper$_D^{M\#}$	32	23	19	23	31	9	16	13	mg/kg	A-T-024
Chromium$_D^{\#}$	43	45	40	47	44	37	31	22	mg/kg	A-T-024
Lead$_D^{M\#}$	154	51	37	41	92	15	41	23	mg/kg	A-T-024
Mercury$_D$	0.49	0.38	0.29	0.39	0.52	<0.17	<0.17	<0.17	mg/kg	A-T-024
Nickel$_D^{M\#}$	37	34	31	35	39	24	28	20	mg/kg	A-T-024
Selenium$_D^{M\#}$	3	<1	<1	<1	<1	<1	<1	<1	mg/kg	A-T-024
Zinc$_D^{M\#}$	121	86	57	66	79	55	57	45	mg/kg	A-T-024

Envirolab Job Number: 12/03975

Client Project Name: NIAB Phase 1

Client Project Ref: 25459

Lab Sample ID	12/03975/1	12/03975/2	12/03975/3	12/03975/4	12/03975/5	12/03975/6	12/03975/7	12/03975/8	Units	Method ref
Client Sample No										
Client Sample ID	TP1	TP2	TP3	TP4	TP5	TP6	TP7	TP8		
Depth to Top	0.10	0.20	0.10	0.20	0.10	0.20	0.20	0.10		
Depth To Bottom	0.20	0.30			0.30		0.30	0.20		
Date Sampled	30-Aug-12	30-Aug-12	28-Aug-12	28-Aug-12	30-Aug-12	28-Aug-12	30-Aug-12	30-Aug-12		
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES		
Sample Matrix Code	6AE	6AE	6AE	6AE	6E	5	6AE	4E		
PAH 16										
Acenaphthylene$_A^{\#}$	-	<0.01	<0.01	-	-	<0.01	-	<0.01	mg/kg	A-T-019s
Anthracene$_A^{\#}$	-	<0.01	<0.01	-	-	<0.01	-	0.04	mg/kg	A-T-019s
Benzo(a)anthracene$_A^{M\#}$	-	0.06	0.02	-	-	<0.01	-	0.12	mg/kg	A-T-019s
Benzo(a)pyrene$_A^{M\#}$	-	0.07	0.01	-	-	<0.01	-	0.08	mg/kg	A-T-019s
Benzo(b)fluoranthene$_A$	-	0.16	0.04	-	-	<0.01	-	0.18	mg/kg	A-T-019s
Benzo(ghi)perylene$_A^{M\#}$	-	0.09	0.01	-	-	<0.01	-	0.09	mg/kg	A-T-019s
Benzo(k)fluoranthene$_A$	-	0.05	<0.01	-	-	<0.01	-	0.04	mg/kg	A-T-019s
Chrysene$_A^{M\#}$	-	0.08	0.02	-	-	<0.01	-	0.14	mg/kg	A-T-019s
Dibenzo(ah)anthracene$_A$	-	<0.01	<0.01	-	-	<0.01	-	<0.01	mg/kg	A-T-019s
Fluoranthene$_A^{M\#}$	-	0.08	<0.01	-	-	<0.01	-	0.29	mg/kg	A-T-019s
Fluorene$_A^{M\#}$	-	<0.01	<0.01	-	-	<0.01	-	<0.01	mg/kg	A-T-019s
Indeno(123-cd)pyrene$_A^{\#}$	-	0.06	<0.01	-	-	<0.01	-	0.06	mg/kg	A-T-019s
Naphthalene$_A^{M\#}$	-	<0.01	<0.01	-	-	<0.01	-	<0.01	mg/kg	A-T-019s
Phenanthrene$_A^{M\#}$	-	<0.01	<0.01	-	-	<0.01	-	0.17	mg/kg	A-T-019s
Pyrene$_A^{M\#}$	-	0.07	0.01	-	-	<0.01	-	0.22	mg/kg	A-T-019s
Total PAH$_A$	-	0.72	0.12	-	-	<0.01	-	1.43	mg/kg	A-T-019s

Envirolab Job Number: 12/03975

Client Project Name: NIAB Phase 1

Client Project Ref: 25459

Lab Sample ID	12/03975/9	12/03975/10	12/03975/11	12/03975/12	12/03975/13	12/03975/14	12/03975/15	12/03975/16	Units	Method ref
Client Sample No										
Client Sample ID	TP10	TP11	TP13	TP14	TP34	TP35	TP36	TP37		
Depth to Top	0.20	0.10	0.20	0.10	0.20	0.10	0.10	0.10		
Depth To Bottom		0.20	0.30	0.20				0.20		
Date Sampled	30-Aug-12	30-Aug-12	30-Aug-12	30-Aug-12	29-Aug-12	29-Aug-12	29-Aug-12	29-Aug-12		
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES		
Sample Matrix Code	5A	6AE	6AE	4A	6AE	6A	6AE	6AE		
Asbestos in soil$_A^{\#}$	NAD	-	NAD	NAD	-	-	-	NAD		A-T-045
Organic matter$_D^{M\#}$	2.2	-	-	-	3.2	-	-	-	% w/w	A-T-032 OM
Arsenic$_D^{M\#}$	10	9	10	9	8	10	9	9	mg/kg	A-T-024
Cadmium$_D^{M\#}$	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	<0.5	mg/kg	A-T-024
Copper$_D^{M\#}$	18	16	14	15	24	33	19	22	mg/kg	A-T-024
Chromium$_D^{\#}$	24	22	18	20	26	29	34	28	mg/kg	A-T-024
Lead$_D^{M\#}$	34	35	30	46	46	62	33	40	mg/kg	A-T-024
Mercury$_D$	<0.17	<0.17	<0.17	<0.17	0.56	0.27	<0.17	0.21	mg/kg	A-T-024
Nickel$_D^{M\#}$	21	21	19	18	19	20	23	18	mg/kg	A-T-024
Selenium$_D^{M\#}$	<1	<1	<1	<1	<1	<1	<1	<1	mg/kg	A-T-024
Zinc$_D^{M\#}$	59	54	45	45	49	62	52	46	mg/kg	A-T-024
Triazine Herbicides (x11)	-	-	-	Appended	-	-	-	Appended		Subcon
Pyrethroid (Pyrethrin) Insecticides (x6)	-	-	-	Appended	-	-	-	Appended		Subcon

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Client Project Ref: 25459

Lab Sample ID	12/03975/9	12/03975/10	12/03975/11	12/03975/12	12/03975/13	12/03975/14	12/03975/15	12/03975/16	Units	Method ref
Client Sample No										
Client Sample ID	TP10	TP11	TP13	TP14	TP34	TP35	TP36	TP37		
Depth to Top	0.20	0.10	0.20	0.10	0.20	0.10	0.10	0.10		
Depth To Bottom		0.20	0.30	0.20				0.20		
Date Sampled	30-Aug-12	30-Aug-12	30-Aug-12	30-Aug-12	29-Aug-12	29-Aug-12	29-Aug-12	29-Aug-12		
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES		
Sample Matrix Code	5A	6AE	6AE	4A	6AE	6A	6AE	6AE		
Pest-c										
Mevinphos	-	-	-	<50	-	-	-	<50	µg/kg	Subcon
Dichlorvos	-	-	-	<50	-	-	-	<50	µg/kg	Subcon
alpha-Hexachlorocyclohexane (HCH)	-	-	-	<50	-	-	-	<50	µg/kg	Subcon
Diazinon	-	-	-	<50	-	-	-	<50	µg/kg	Subcon
gamma-Hexachlorocyclohexane (HCH / Lindane)	-	-	-	<50	-	-	-	<50	µg/kg	Subcon
Heptachlor	-	-	-	<50	-	-	-	<50	µg/kg	Subcon
Aldrin	-	-	-	<50	-	-	-	<50	µg/kg	Subcon
beta-Hexachlorocyclohexane (HCH)	-	-	-	<50	-	-	-	<50	µg/kg	Subcon
Methyl Parathion	-	-	-	<50	-	-	-	<50	µg/kg	Subcon
Malathion	-	-	-	<50	-	-	-	<50	µg/kg	Subcon
Fenitrothion	-	-	-	<50	-	-	-	<50	µg/kg	Subcon
Heptachlor Epoxide	-	-	-	<50	-	-	-	<50	µg/kg	Subcon
Parathion	-	-	-	<50	-	-	-	<50	µg/kg	Subcon
p,p-DDE	-	-	-	<50	-	-	-	<50	µg/kg	Subcon
p,p-DDT	-	-	-	<50	-	-	-	<50	µg/kg	Subcon
p,p-Methoxychlor	-	-	-	<50	-	-	-	<50	µg/kg	Subcon
p,p-TDE (DDD)	-	-	-	<50	-	-	-	<50	µg/kg	Subcon
o,p-DDE	-	-	-	<50	-	-	-	<50	µg/kg	Subcon
o,p-DDT	-	-	-	<50	-	-	-	<50	µg/kg	Subcon
o,p-Methoxychlor	-	-	-	<50	-	-	-	<50	µg/kg	Subcon
o,p-TDE (DDD)	-	-	-	<50	-	-	-	<50	µg/kg	Subcon
Endosulphan I	-	-	-	<50	-	-	-	<50	µg/kg	Subcon
Endosulphan II	-	-	-	<50	-	-	-	<50	µg/kg	Subcon
Endosulphan Sulphate	-	-	-	<50	-	-	-	<50	µg/kg	Subcon
Endrin	-	-	-	<50	-	-	-	<50	µg/kg	Subcon
Ethion	-	-	-	<50	-	-	-	<50	µg/kg	Subcon
Dieldrin	-	-	-	<50	-	-	-	<50	µg/kg	Subcon
Azinphos-methyl	-	-	-	<50	-	-	-	<50	µg/kg	Subcon

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Lab Sample ID	12/03975/9	12/03975/10	12/03975/11	12/03975/12	12/03975/13	12/03975/14	12/03975/15	12/03975/16	Units	Method ref
Client Sample No										
Client Sample ID	TP10	TP11	TP13	TP14	TP34	TP35	TP36	TP37		
Depth to Top	0.20	0.10	0.20	0.10	0.20	0.10	0.10	0.10		
Depth To Bottom		0.20	0.30	0.20				0.20		
Date Sampled	30-Aug-12	30-Aug-12	30-Aug-12	30-Aug-12	29-Aug-12	29-Aug-12	29-Aug-12	29-Aug-12		
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES		
Sample Matrix Code	5A	6AE	6AE	4A	6AE	6A	6AE	6AE		
PAH 16										
Acenaphthylene$_A^{\#}$	-	<0.01	-	<0.01	-	0.02	-	0.01	mg/kg	A-T-019s
Anthracene$_A^{\#}$	-	<0.01	-	<0.01	-	0.02	-	<0.01	mg/kg	A-T-019s
Benzo(a)anthracene$_A^{M\#}$	-	0.03	-	0.03	-	0.28	-	0.18	mg/kg	A-T-019s
Benzo(a)pyrene$_A^{M\#}$	-	0.03	-	0.02	-	0.27	-	0.18	mg/kg	A-T-019s
Benzo(b)fluoranthene$_A$	-	0.08	-	0.06	-	0.53	-	0.39	mg/kg	A-T-019s
Benzo(ghi)perylene$_A^{M\#}$	-	0.03	-	0.02	-	0.35	-	0.22	mg/kg	A-T-019s
Benzo(k)fluoranthene$_A$	-	0.02	-	<0.01	-	0.15	-	0.11	mg/kg	A-T-019s
Chrysene$_A^{M\#}$	-	0.05	-	0.03	-	0.42	-	0.26	mg/kg	A-T-019s
Dibenzo(ah)anthracene$_A$	-	<0.01	-	<0.01	-	0.03	-	0.02	mg/kg	A-T-019s
Fluoranthene$_A^{M\#}$	-	0.04	-	0.02	-	0.64	-	0.38	mg/kg	A-T-019s
Fluorene$_A^{M\#}$	-	<0.01	-	<0.01	-	<0.01	-	<0.01	mg/kg	A-T-019s
Indeno(123-cd)pyrene$_A^{\#}$	-	0.02	-	<0.01	-	0.15	-	0.14	mg/kg	A-T-019s
Naphthalene$_A^{M\#}$	-	<0.01	-	<0.01	-	<0.01	-	<0.01	mg/kg	A-T-019s
Phenanthrene$_A^{M\#}$	-	<0.01	-	<0.01	-	0.26	-	0.12	mg/kg	A-T-019s
Pyrene$_A^{M\#}$	-	0.04	-	0.03	-	0.55	-	0.33	mg/kg	A-T-019s
Total PAH$_A$	-	0.34	-	0.20	-	3.68	-	2.34	mg/kg	A-T-019s

Envirolab Job Number: 12/03975

Client Project Name: NIAB Phase 1

Client Project Ref: 25459

Lab Sample ID	12/03975/17	12/03975/18	12/03975/19	12/03975/20	12/03975/21	12/03975/22	12/03975/23	12/03975/24	Units	Method ref
Client Sample No										
Client Sample ID	TPD	TPI	TPL	TPO	TP1 (I)	TP2 (I)	TP3 (I)	TP4 (I)		
Depth to Top	0.10	0.20	0.30	0.30	0.10	0.20	0.20	0.10		
Depth To Bottom	0.20									
Date Sampled	30-Aug-12	28-Aug-12	29-Aug-12	28-Aug-12	28-Aug-12	28-Aug-12	28-Aug-12	29-Aug-12		
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES		
Sample Matrix Code	6AE	6AE	6AE	6A	6E	6AE	6AE	6E		
Asbestos in soil$_A^{\#}$	-	-	NAD	-	-	-	-	NAD		A-T-045
Organic matter$_D^{M\#}$	-	-	-	-	6.6	-	-	2.5	% w/w	A-T-032 OM
Arsenic$_D^{M\#}$	8	8	8	7	8	7	6	7	mg/kg	A-T-024
Cadmium$_D^{M\#}$	<0.5	1.5	0.6	<0.5	<0.5	<0.5	<0.5	<0.5	mg/kg	A-T-024
Copper$_D^{M\#}$	18	20	24	20	33	23	22	13	mg/kg	A-T-024
Chromium$_D^{\#}$	24	29	31	29	42	34	34	26	mg/kg	A-T-024
Lead$_D^{M\#}$	40	46	44	59	67	55	51	25	mg/kg	A-T-024
Mercury$_D$	0.25	0.27	0.36	0.51	0.47	0.34	0.58	0.28	mg/kg	A-T-024
Nickel$_D^{M\#}$	22	26	29	24	40	29	27	20	mg/kg	A-T-024
Selenium$_D^{M\#}$	<1	<1	<1	<1	1	<1	<1	<1	mg/kg	A-T-024
Zinc$_D^{M\#}$	49	59	214	62	80	65	63	50	mg/kg	A-T-024
Triazine Herbicides (x11)	-	-	-	-	-	-	Appended	-		Subcon
Pyrethroid (Pyrethrin) Insecticides (x6)	-	-	-	-	-	-	Appended	-		Subcon

Lab Sample ID	12/03975/17	12/03975/18	12/03975/19	12/03975/20	12/03975/21	12/03975/22	12/03975/23	12/03975/24	Units	Method ref
Client Sample No										
Client Sample ID	TPD	TPI	TPL	TPO	TP1 (I)	TP2 (I)	TP3 (I)	TP4 (I)		
Depth to Top	0.10	0.20	0.30	0.30	0.10	0.20	0.20	0.10		
Depth To Bottom	0.20									
Date Sampled	30-Aug-12	28-Aug-12	29-Aug-12	28-Aug-12	28-Aug-12	28-Aug-12	28-Aug-12	29-Aug-12		
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES		
Sample Matrix Code	6AE	6AE	6AE	6A	6E	6AE	6AE	6E		
Pest-c										
Mevinphos	-	-	-	-	-	-	<50	-	µg/kg	Subcon
Dichlorvos	-	-	-	-	-	-	<50	-	µg/kg	Subcon
alpha-Hexachlorocyclohexane (HCH)	-	-	-	-	-	-	<50	-	µg/kg	Subcon
Diazinon	-	-	-	-	-	-	<50	-	µg/kg	Subcon
gamma-Hexachlorocyclohexane (HCH / Lindane)	-	-	-	-	-	-	<50	-	µg/kg	Subcon
Heptachlor	-	-	-	-	-	-	<50	-	µg/kg	Subcon
Aldrin	-	-	-	-	-	-	<50	-	µg/kg	Subcon
beta-Hexachlorocyclohexane (HCH)	-	-	-	-	-	-	<50	-	µg/kg	Subcon
Methyl Parathion	-	-	-	-	-	-	<50	-	µg/kg	Subcon
Malathion	-	-	-	-	-	-	<50	-	µg/kg	Subcon
Fenitrothion	-	-	-	-	-	-	<50	-	µg/kg	Subcon
Heptachlor Epoxide	-	-	-	-	-	-	<50	-	µg/kg	Subcon
Parathion	-	-	-	-	-	-	<50	-	µg/kg	Subcon
p,p-DDE	-	-	-	-	-	-	<50	-	µg/kg	Subcon
p,p-DDT	-	-	-	-	-	-	<50	-	µg/kg	Subcon
p,p-Methoxychlor	-	-	-	-	-	-	<50	-	µg/kg	Subcon
p,p-TDE (DDD)	-	-	-	-	-	-	<50	-	µg/kg	Subcon
o,p-DDE	-	-	-	-	-	-	<50	-	µg/kg	Subcon
o,p-DDT	-	-	-	-	-	-	<50	-	µg/kg	Subcon
o,p-Methoxychlor	-	-	-	-	-	-	<50	-	µg/kg	Subcon
o,p-TDE (DDD)	-	-	-	-	-	-	<50	-	µg/kg	Subcon
Endosulphan I	-	-	-	-	-	-	<50	-	µg/kg	Subcon
Endosulphan II	-	-	-	-	-	-	<50	-	µg/kg	Subcon
Endosulphan Sulphate	-	-	-	-	-	-	<50	-	µg/kg	Subcon
Endrin	-	-	-	-	-	-	<50	-	µg/kg	Subcon
Ethion	-	-	-	-	-	-	<50	-	µg/kg	Subcon
Dieldrin	-	-	-	-	-	-	<50	-	µg/kg	Subcon
Azinphos-methyl	-	-	-	-	-	-	<50	-	µg/kg	Subcon

Envirolab Job Number: 12/03975

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Lab Sample ID	12/03975/17	12/03975/18	12/03975/19	12/03975/20	12/03975/21	12/03975/22	12/03975/23	12/03975/24	Units	Method ref
Client Sample No										
Client Sample ID	TPD	TPI	TPL	TPO	TP1 (I)	TP2 (I)	TP3 (I)	TP4 (I)		
Depth to Top	0.10	0.20	0.30	0.30	0.10	0.20	0.20	0.10		
Depth To Bottom	0.20									
Date Sampled	30-Aug-12	28-Aug-12	29-Aug-12	28-Aug-12	28-Aug-12	28-Aug-12	28-Aug-12	29-Aug-12		
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES		
Sample Matrix Code	6AE	6AE	6AE	6A	6E	6AE	6AE	6E		
PAH 16										
Acenaphthylene$_A^{\#}$	<0.01	-	<0.01	<0.01	<0.01	-	-	-	mg/kg	A-T-019s
Anthracene$_A^{\#}$	<0.01	-	<0.01	<0.01	<0.01	-	-	-	mg/kg	A-T-019s
Benzo(a)anthracene$_A^{M\#}$	0.02	-	0.04	0.04	0.03	-	-	-	mg/kg	A-T-019s
Benzo(a)pyrene$_A^{M\#}$	0.02	-	0.06	0.03	0.03	-	-	-	mg/kg	A-T-019s
Benzo(b)fluoranthene$_A$	0.05	-	0.12	0.07	0.06	-	-	-	mg/kg	A-T-019s
Benzo(ghi)perylene$_A^{M\#}$	0.01	-	0.07	0.03	0.03	-	-	-	mg/kg	A-T-019s
Benzo(k)fluoranthene$_A$	0.01	-	0.03	0.02	0.01	-	-	-	mg/kg	A-T-019s
Chrysene$_A^{M\#}$	0.03	-	0.07	0.07	0.04	-	-	-	mg/kg	A-T-019s
Dibenzo(ah)anthracene$_A$	<0.01	-	<0.01	<0.01	<0.01	-	-	-	mg/kg	A-T-019s
Fluoranthene$_A^{M\#}$	0.01	-	0.06	0.08	0.03	-	-	-	mg/kg	A-T-019s
Fluorene$_A^{M\#}$	<0.01	-	<0.01	<0.01	<0.01	-	-	-	mg/kg	A-T-019s
Indeno(123-cd)pyrene$_A^{\#}$	0.01	-	0.02	<0.01	<0.01	-	-	-	mg/kg	A-T-019s
Naphthalene$_A^{M\#}$	<0.01	-	<0.01	<0.01	<0.01	-	-	-	mg/kg	A-T-019s
Phenanthrene$_A^{M\#}$	<0.01	-	<0.01	0.03	<0.01	-	-	-	mg/kg	A-T-019s
Pyrene$_A^{M\#}$	0.02	-	0.06	0.07	0.03	-	-	-	mg/kg	A-T-019s
Total PAH$_A$	0.19	-	0.52	0.44	0.24	-	-	-	mg/kg	A-T-019s

Envirolab Job Number: 12/03975

Client Project Name: NIAB Phase 1

Client Project Ref: 25459

Lab Sample ID	12/03975/25	12/03975/26	12/03975/27	12/03975/28	12/03975/29				Units	Method ref
Client Sample No										
Client Sample ID	TP5 (I)	TP6 (I)	TP7 (I)	TP8 (I)	TP9 (I)					
Depth to Top	0.20	0.20	0.20	0.10	0.20					
Depth To Bottom										
Date Sampled	29-Aug-12	29-Aug-12	29-Aug-12	29-Aug-12	30-Aug-12					
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES					
Sample Matrix Code	6AE	6E	6AE	6A	6EA					
Asbestos in soil$_A^{\#}$	-	-	-	-	NAD					A-T-045
Organic matter$_D^{M\#}$	-	-	-	-	3.4				% w/w	A-T-032 OM
Arsenic$_D^{M\#}$	9	14	7	7	9				mg/kg	A-T-024
Cadmium$_D^{M\#}$	<0.5	0.5	<0.5	<0.5	<0.5				mg/kg	A-T-024
Copper$_D^{M\#}$	14	19	21	21	23				mg/kg	A-T-024
Chromium$_D^{\#}$	26	33	34	31	32				mg/kg	A-T-024
Lead$_D^{M\#}$	24	43	34	30	47				mg/kg	A-T-024
Mercury$_D$	<0.17	0.38	0.22	0.30	0.36				mg/kg	A-T-024
Nickel$_D^{M\#}$	21	24	20	21	20				mg/kg	A-T-024
Selenium$_D^{M\#}$	<1	1	<1	<1	<1				mg/kg	A-T-024
Zinc$_D^{M\#}$	48	57	51	47	52				mg/kg	A-T-024

Envirolab Job Number: 12/03975

Client Project Name: NIAB Phase 1

Client Project Ref: 25459

Lab Sample ID	12/03975/25	12/03975/26	12/03975/27	12/03975/28	12/03975/29				Units	Method ref
Client Sample No										
Client Sample ID	TP5 (I)	TP6 (I)	TP7 (I)	TP8 (I)	TP9 (I)					
Depth to Top	0.20	0.20	0.20	0.10	0.20					
Depth To Bottom										
Date Sampled	29-Aug-12	29-Aug-12	29-Aug-12	29-Aug-12	30-Aug-12					
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES					
Sample Matrix Code	6AE	6E	6AE	6A	6EA					
PAH 16										
Acenaphthylene$_A^{\#}$	<0.01	-	-	-	<0.01				mg/kg	A-T-019s
Anthracene$_A^{\#}$	<0.01	-	-	-	<0.01				mg/kg	A-T-019s
Benzo(a)anthracene$_A^{M\#}$	0.02	-	-	-	0.18				mg/kg	A-T-019s
Benzo(a)pyrene$_A^{M\#}$	0.01	-	-	-	0.18				mg/kg	A-T-019s
Benzo(b)fluoranthene$_A$	0.04	-	-	-	0.36				mg/kg	A-T-019s
Benzo(ghi)perylene$_A^{M\#}$	0.01	-	-	-	0.19				mg/kg	A-T-019s
Benzo(k)fluoranthene$_A$	0.01	-	-	-	0.09				mg/kg	A-T-019s
Chrysene$_A^{M\#}$	0.03	-	-	-	0.27				mg/kg	A-T-019s
Dibenzo(ah)anthracene$_A$	<0.01	-	-	-	0.01				mg/kg	A-T-019s
Fluoranthene$_A^{M\#}$	0.03	-	-	-	0.40				mg/kg	A-T-019s
Fluorene$_A^{M\#}$	<0.01	-	-	-	<0.01				mg/kg	A-T-019s
Indeno(123-cd)pyrene$_A^{\#}$	<0.01	-	-	-	0.13				mg/kg	A-T-019s
Naphthalene$_A^{M\#}$	<0.01	-	-	-	<0.01				mg/kg	A-T-019s
Phenanthrene$_A^{M\#}$	<0.01	-	-	-	0.15				mg/kg	A-T-019s
Pyrene$_A^{M\#}$	0.03	-	-	-	0.34				mg/kg	A-T-019s
Total PAH$_A$	0.20	-	-	-	2.31				mg/kg	A-T-019s

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 12/03993
Issue Number: 2 **Date:** 25 September, 2012

Client:
RSK Environment Ltd Hemel
18 Frogmore Road
Hemel Hempstead
Hertfordshire
UK
HP3 9RT

Project Manager: Nigel Austin / Ben Coulston / Oliver Pengilly
Project Name: NIAB Phase 1
Project Ref: 25459
Order No: Not specified
Date Samples Received: 05/09/12
Date Instructions Received: 05/09/12
Date Analysis Completed: 25/09/12

Prepared by:
Melanie Marshall
Laboratory Coordinator

Approved by:
Iain Haslock
Analytical Consultant

Notes - Soil analysis
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 inert stones >10mm are removed or excluded from the sample prior to analysis and reported results corrected to a whole sample basis. For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis.
Notes - General
Subscript "A" indicates analysis performed on the sample as received, "D" indicates analysis performed on dried & crushed sample.
All analysis is performed on the dried and crushed sample for samples with Matrix Code 7 and this supercedes any "A" subscripts. Superscript "M" indicates method accredited to MCERTS. Results in italics are associated with a control limit flag.
A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling.
Predominant Matrix Codes - 1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER.
Samples with Matrix Code 7 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our MCERTS accreditation.
Secondary Matrix Codes - A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal, E = contains roots/twigs.
IS indicates Insufficient sample for analysis. NDP indicates No Determination Possible. NAD indicates No Asbestos Detected.
Superscript # indicates method accredited to ISO 17025.
Analytical results reflect the quality of the sample at the time of analysis only.
Opinions and interpretations expressed are outside the scope of our accreditation.

mCERTS THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME
UKAS TESTING 1247

Envirolab Job Number: 12/03993

Client Project Name: NIAB Phase 1

Client Project Ref: 25459

Lab Sample ID	12/03993/1	12/03993/2	12/03993/3	12/03993/4	12/03993/5	12/03993/6	12/03993/7	12/03993/8	Units	Method ref
Client Sample No										
Client Sample ID	TP9	TP12	TP15	TP16	TP17	TP18	TP19	TP20		
Depth to Top	0.10	0.20	0.10	0.15	0.10	0.15	0.10	0.20		
Depth To Bottom	0.20	0.30		0.25	0.20		0.20			
Date Sampled	31-Aug-12	31-Aug-12	31-Aug-12	31-Aug-12	31-Aug-12	31-Aug-12	31-Aug-12	31-Aug-12		
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil		
Sample Matrix Code	4AE	4AE	4AE	4AE	4AE	4AE	4AE	4AE		
Asbestos in soil$_A^{\#}$	NAD	-	-	-	-	NAD	NAD	-		A-T-045
pH$_D^{M\#}$	-	-	-	-	-	-	8.04	-	pH	A-T-031s
Sulphate (water sol 2:1)$_D^{M\#}$	-	-	-	-	-	-	<0.01	-	g/l	A-T-026s
Organic matter$_D^{M\#}$	-	-	-	-	-	2.8	-	-	% w/w	A-T-032 OM
Arsenic$_D^{M\#}$	10	10	11	8	9	10	12	8	mg/kg	A-T-024
Cadmium$_D^{M\#}$	1.5	1.3	1.5	1.3	1.2	1.3	1.6	1.2	mg/kg	A-T-024
Copper$_D^{M\#}$	20	14	19	16	15	19	19	12	mg/kg	A-T-024
Chromium$_D^{\#}$	24	24	24	25	25	29	27	24	mg/kg	A-T-024
Lead$_D^{M\#}$	38	31	42	35	31	40	40	24	mg/kg	A-T-024
Mercury$_D$	<0.17	<0.17	0.20	0.21	0.19	0.21	0.33	0.47	mg/kg	A-T-024
Nickel$_D^{M\#}$	24	19	21	19	19	23	24	20	mg/kg	A-T-024
Selenium$_D^{M\#}$	<1	<1	<1	<1	<1	<1	<1	<1	mg/kg	A-T-024
Zinc$_D^{M\#}$	57	46	58	52	48	59	65	48	mg/kg	A-T-024

Envirolab Job Number: 12/03993

Client Project Name: NIAB Phase 1

Client Project Ref: 25459

Lab Sample ID	12/03993/1	12/03993/2	12/03993/3	12/03993/4	12/03993/5	12/03993/6	12/03993/7	12/03993/8	Units	Method ref
Client Sample No										
Client Sample ID	TP9	TP12	TP15	TP16	TP17	TP18	TP19	TP20		
Depth to Top	0.10	0.20	0.10	0.15	0.10	0.15	0.10	0.20		
Depth To Bottom	0.20	0.30		0.25	0.20		0.20			
Date Sampled	31-Aug-12	31-Aug-12	31-Aug-12	31-Aug-12	31-Aug-12	31-Aug-12	31-Aug-12	31-Aug-12		
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil		
Sample Matrix Code	4AE	4AE	4AE	4AE	4AE	4AE	4AE	4AE		
PAH 16										
Acenaphthene$_A^{M\#}$	-	<0.01	<0.01	-	-	0.13	<0.01	-	mg/kg	A-T-019s
Acenaphthylene$_A^{\#}$	-	<0.01	<0.01	-	-	<0.01	<0.01	-	mg/kg	A-T-019s
Anthracene$_A^{\#}$	-	<0.01	<0.01	-	-	0.05	<0.01	-	mg/kg	A-T-019s
Benzo(a)anthracene$_A^{M\#}$	-	0.07	0.02	-	-	0.04	0.02	-	mg/kg	A-T-019s
Benzo(a)pyrene$_A^{M\#}$	-	0.03	0.02	-	-	0.02	0.01	-	mg/kg	A-T-019s
Benzo(b)fluoranthene$_A$	-	0.08	0.07	-	-	0.08	0.07	-	mg/kg	A-T-019s
Benzo(ghi)perylene$_A^{M\#}$	-	0.03	0.04	-	-	0.04	0.03	-	mg/kg	A-T-019s
Benzo(k)fluoranthene$_A$	-	0.02	0.02	-	-	0.01	0.02	-	mg/kg	A-T-019s
Chrysene$_A^{M\#}$	-	0.08	0.04	-	-	0.08	0.05	-	mg/kg	A-T-019s
Dibenzo(ah)anthracene$_A$	-	<0.01	<0.01	-	-	<0.01	<0.01	-	mg/kg	A-T-019s
Fluoranthene$_A^{M\#}$	-	0.12	0.07	-	-	0.15	0.07	-	mg/kg	A-T-019s
Fluorene$_A^{M\#}$	-	<0.01	<0.01	-	-	0.07	<0.01	-	mg/kg	A-T-019s
Indeno(123-cd)pyrene$_A^{\#}$	-	0.02	0.02	-	-	0.01	0.01	-	mg/kg	A-T-019s
Naphthalene$_A^{M\#}$	-	<0.01	0.13	-	-	0.04	<0.01	-	mg/kg	A-T-019s
Phenanthrene$_A^{M\#}$	-	0.02	0.03	-	-	0.21	0.03	-	mg/kg	A-T-019s
Pyrene$_A^{M\#}$	-	0.09	0.06	-	-	0.12	0.06	-	mg/kg	A-T-019s
Total PAH$_A$	-	0.57	0.53	-	-	1.05	0.37	-	mg/kg	A-T-019s

Envirolab Job Number: 12/03993

Client Project Name: NIAB Phase 1

Client Project Ref: 25459

Lab Sample ID	12/03993/9	12/03993/10	12/03993/11	12/03993/12	12/03993/13	12/03993/14	12/03993/15	12/03993/16	Units	Method ref
Client Sample No										
Client Sample ID	TP21	TP22	TP23	TP24	TP25	TP26	TP27	TP28		
Depth to Top	0.20	0.10	0.20	0.20	0.20	0.10	0.30	0.10		
Depth To Bottom	0.30		0.30	0.30		0.20				
Date Sampled	31-Aug-12	31-Aug-12	31-Aug-12	31-Aug-12	31-Aug-12	31-Aug-12	31-Aug-12	31-Aug-12		
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil		
Sample Matrix Code	4ABE	6AE	6E	6AE	4E	4E	4AE	4AE		
Asbestos in soil$_A^{\#}$	NAD	-	NAD	NAD	-	-	-	NAD		A-T-045
pH$_D^{M\#}$	-	-	-	-	-	-	-	-	pH	A-T-031s
Sulphate (water sol 2:1)$_D^{M\#}$	-	-	-	-	-	-	-	-	g/l	A-T-026s
Organic matter$_D^{M\#}$	3.2	-	-	-	2.5	-	-	-	% w/w	A-T-032 OM
Arsenic$_D^{M\#}$	8	8	8	10	12	12	10	7	mg/kg	A-T-024
Cadmium$_D^{M\#}$	1.3	1.4	1.4	1.1	1.4	1.2	1.1	1.2	mg/kg	A-T-024
Copper$_D^{M\#}$	14	15	18	13	16	16	15	19	mg/kg	A-T-024
Chromium$_D^{\#}$	26	28	31	26	30	27	26	24	mg/kg	A-T-024
Lead$_D^{M\#}$	25	28	41	29	41	45	37	31	mg/kg	A-T-024
Mercury$_D$	0.24	0.26	0.37	<0.17	0.26	0.27	0.22	0.17	mg/kg	A-T-024
Nickel$_D^{M\#}$	21	23	24	17	21	17	16	17	mg/kg	A-T-024
Selenium$_D^{M\#}$	<1	<1	<1	<1	<1	<1	<1	<1	mg/kg	A-T-024
Zinc$_D^{M\#}$	53	52	58	39	50	42	38	38	mg/kg	A-T-024
Triazine Herbicides (x11)	-	-	-	Appended	-	-	-	-		Subcon
Pyrethroid (Pyrethrin) Insecticides (x6)	-	-	-	Appended	-	-	-	-		Subcon

Envirolab Job Number: 12/03993

Client Project Name: NIAB Phase 1

Client Project Ref: 25459

Lab Sample ID	12/03993/9	12/03993/10	12/03993/11	12/03993/12	12/03993/13	12/03993/14	12/03993/15	12/03993/16	Units	Method ref
Client Sample No										
Client Sample ID	TP21	TP22	TP23	TP24	TP25	TP26	TP27	TP28		
Depth to Top	0.20	0.10	0.20	0.20	0.20	0.10	0.30	0.10		
Depth To Bottom	0.30		0.30	0.30		0.20				
Date Sampled	31-Aug-12	31-Aug-12	31-Aug-12	31-Aug-12	31-Aug-12	31-Aug-12	31-Aug-12	31-Aug-12		
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil		
Sample Matrix Code	4ABE	6AE	6E	6AE	4E	4E	4AE	4AE		
Pest-c										
Mevinphos	-	-	-	<50	-	-	-	-	µg/kg	Subcon
Dichlorvos	-	-	-	<50	-	-	-	-	µg/kg	Subcon
alpha-Hexachlorocyclohexane (HCH)	-	-	-	<50	-	-	-	-	µg/kg	Subcon
Diazinon	-	-	-	<50	-	-	-	-	µg/kg	Subcon
gamma-Hexachlorocyclohexane (HCH / Lindane)	-	-	-	<50	-	-	-	-	µg/kg	Subcon
Heptachlor	-	-	-	<50	-	-	-	-	µg/kg	Subcon
Aldrin	-	-	-	<50	-	-	-	-	µg/kg	Subcon
beta-Hexachlorocyclohexane (HCH)	-	-	-	<50	-	-	-	-	µg/kg	Subcon
Methyl Parathion	-	-	-	<50	-	-	-	-	µg/kg	Subcon
Malathion	-	-	-	<50	-	-	-	-	µg/kg	Subcon
Fenitrothion	-	-	-	<50	-	-	-	-	µg/kg	Subcon
Heptachlor Epoxide	-	-	-	<50	-	-	-	-	µg/kg	Subcon
Parathion (Ethyl Parathion)	-	-	-	<50	-	-	-	-	µg/kg	Subcon
p,p-DDE	-	-	-	<50	-	-	-	-	µg/kg	Subcon
p,p-DDT	-	-	-	<50	-	-	-	-	µg/kg	Subcon
p,p-Methoxychlor	-	-	-	<50	-	-	-	-	µg/kg	Subcon
p,p-TDE (DDD)	-	-	-	<50	-	-	-	-	µg/kg	Subcon
o,p-DDE	-	-	-	<50	-	-	-	-	µg/kg	Subcon
o,p-DDT	-	-	-	<50	-	-	-	-	µg/kg	Subcon
o,p-Methoxychlor	-	-	-	<50	-	-	-	-	µg/kg	Subcon
o,p-TDE (DDD)	-	-	-	<50	-	-	-	-	µg/kg	Subcon
Endosulphan I	-	-	-	<50	-	-	-	-	µg/kg	Subcon
Endosulphan II	-	-	-	<50	-	-	-	-	µg/kg	Subcon
Endosulphan Sulphate	-	-	-	<50	-	-	-	-	µg/kg	Subcon
Endrin	-	-	-	<50	-	-	-	-	µg/kg	Subcon
Ethion	-	-	-	<50	-	-	-	-	µg/kg	Subcon
Dieldrin	-	-	-	<50	-	-	-	-	µg/kg	Subcon
Azinphos-methyl	-	-	-	<50	-	-	-	-	µg/kg	Subcon

Envirolab Job Number: 12/03993

Client Project Name: NIAB Phase 1

Client Project Ref: 25459

Lab Sample ID	12/03993/9	12/03993/10	12/03993/11	12/03993/12	12/03993/13	12/03993/14	12/03993/15	12/03993/16	Units	Method ref
Client Sample No										
Client Sample ID	TP21	TP22	TP23	TP24	TP25	TP26	TP27	TP28		
Depth to Top	0.20	0.10	0.20	0.20	0.20	0.10	0.30	0.10		
Depth To Bottom	0.30		0.30	0.30		0.20				
Date Sampled	31-Aug-12	31-Aug-12	31-Aug-12	31-Aug-12	31-Aug-12	31-Aug-12	31-Aug-12	31-Aug-12		
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil		
Sample Matrix Code	4ABE	6AE	6E	6AE	4E	4E	4AE	4AE		
PAH 16										
Acenaphthene$_A^{M\#}$	-	<0.01	-	<0.01	-	<0.01	-	1.14	mg/kg	A-T-019s
Acenaphthylene$_A^{\#}$	-	<0.01	-	<0.01	-	<0.01	-	<0.01	mg/kg	A-T-019s
Anthracene$_A^{\#}$	-	<0.01	-	<0.01	-	<0.01	-	4.75	mg/kg	A-T-019s
Benzo(a)anthracene$_A^{M\#}$	-	0.01	-	<0.01	-	<0.01	-	4.23	mg/kg	A-T-019s
Benzo(a)pyrene$_A^{M\#}$	-	<0.01	-	<0.01	-	<0.01	-	2.38	mg/kg	A-T-019s
Benzo(b)fluoranthene$_A$	-	0.02	-	<0.01	-	0.03	-	3.87	mg/kg	A-T-019s
Benzo(ghi)perylene$_A^{M\#}$	-	0.01	-	<0.01	-	<0.01	-	1.37	mg/kg	A-T-019s
Benzo(k)fluoranthene$_A$	-	<0.01	-	<0.01	-	<0.01	-	1.35	mg/kg	A-T-019s
Chrysene$_A^{M\#}$	-	<0.01	-	<0.01	-	0.01	-	4.60	mg/kg	A-T-019s
Dibenzo(ah)anthracene$_A$	-	<0.01	-	<0.01	-	<0.01	-	0.21	mg/kg	A-T-019s
Fluoranthene$_A^{M\#}$	-	0.03	-	0.02	-	0.06	-	12.4	mg/kg	A-T-019s
Fluorene$_A^{M\#}$	-	<0.01	-	<0.01	-	<0.01	-	1.94	mg/kg	A-T-019s
Indeno(123-cd)pyrene$_A^{\#}$	-	<0.01	-	<0.01	-	<0.01	-	1.06	mg/kg	A-T-019s
Naphthalene$_A^{M\#}$	-	<0.01	-	<0.01	-	<0.01	-	0.31	mg/kg	A-T-019s
Phenanthrene$_A^{M\#}$	-	<0.01	-	<0.01	-	0.03	-	17.1	mg/kg	A-T-019s
Pyrene$_A^{M\#}$	-	0.02	-	0.02	-	0.05	-	9.48	mg/kg	A-T-019s
Total PAH$_A$	-	0.10	-	0.03	-	0.18	-	66.2	mg/kg	A-T-019s

Envirolab Job Number: 12/03993

Client Project Name: NIAB Phase 1

Client Project Ref: 25459

Lab Sample ID	12/03993/17	12/03993/18	12/03993/19	12/03993/20	12/03993/21	12/03993/22	12/03993/23	12/03993/24	Units	Method ref
Client Sample No										
Client Sample ID	TP29	TP30	TP31	TP32	TP33	TP38	TP39	TP9		
Depth to Top	0.10	0.10	0.10	0.30	0.20	0.30	0.10	1.50		
Depth To Bottom	0.20	0.30	0.20				0.20			
Date Sampled	31-Aug-12	31-Aug-12	31-Aug-12	31-Aug-12	31-Aug-12	31-Aug-12	31-Aug-12	31-Aug-12		
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil		
Sample Matrix Code	4AE	6E	6AE	4E	6E	4E	6AE	4A		
Asbestos in soil$_A^{\#}$	-	-	NAD	-	-	NAD	-	-		A-T-045
pH$_D^{M\#}$	-	-	-	-	-	8.31	-	8.95	pH	A-T-031s
Sulphate (water sol 2:1)$_D^{M\#}$	-	-	-	-	-	<0.01	-	<0.01	g/l	A-T-026s
Organic matter$_D^{M\#}$	-	-	-	-	3.8	-	2.8	-	% w/w	A-T-032 OM
Arsenic$_D^{M\#}$	12	5	6	7	7	7	9	-	mg/kg	A-T-024
Cadmium$_D^{M\#}$	1.6	1.2	1.4	1.5	1.5	1.4	1.3	-	mg/kg	A-T-024
Copper$_D^{M\#}$	25	20	21	18	23	14	14	-	mg/kg	A-T-024
Chromium$_D^{\#}$	25	28	29	32	35	24	26	-	mg/kg	A-T-024
Lead$_D^{M\#}$	33	24	28	26	34	22	28	-	mg/kg	A-T-024
Mercury$_D$	0.22	0.29	0.29	0.21	0.29	0.29	0.24	-	mg/kg	A-T-024
Nickel$_D^{M\#}$	21	19	22	24	24	22	21	-	mg/kg	A-T-024
Selenium$_D^{M\#}$	<1	<1	<1	1	1	<1	<1	-	mg/kg	A-T-024
Zinc$_D^{M\#}$	42	40	42	39	50	37	47	-	mg/kg	A-T-024
Triazine Herbicides (x11)	-	-	-	Appended	-	-	Appended	-		Subcon
Pyrethroid (Pyrethrin) Insecticides (x6)	-	-	-	Appended	-	-	Appended	-		Subcon

Envirolab Job Number: 12/03993

Client Project Name: NIAB Phase 1

Client Project Ref: 25459

Lab Sample ID	12/03993/17	12/03993/18	12/03993/19	12/03993/20	12/03993/21	12/03993/22	12/03993/23	12/03993/24	Units	Method ref
Client Sample No										
Client Sample ID	TP29	TP30	TP31	TP32	TP33	TP38	TP39	TP9		
Depth to Top	0.10	0.10	0.10	0.30	0.20	0.30	0.10	1.50		
Depth To Bottom	0.20	0.30	0.20				0.20			
Date Sampled	31-Aug-12	31-Aug-12	31-Aug-12	31-Aug-12	31-Aug-12	31-Aug-12	31-Aug-12	31-Aug-12		
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil		
Sample Matrix Code	4AE	6E	6AE	4E	6E	4E	6AE	4A		
Pest-c										
Mevinphos	-	-	-	<50	-	-	<50	-	µg/kg	Subcon
Dichlorvos	-	-	-	<50	-	-	<50	-	µg/kg	Subcon
alpha-Hexachlorocyclohexane (HCH)	-	-	-	<50	-	-	<50	-	µg/kg	Subcon
Diazinon	-	-	-	<50	-	-	<50	-	µg/kg	Subcon
gamma-Hexachlorocyclohexane (HCH / Lindane)	-	-	-	<50	-	-	<50	-	µg/kg	Subcon
Heptachlor	-	-	-	<50	-	-	<50	-	µg/kg	Subcon
Aldrin	-	-	-	<50	-	-	<50	-	µg/kg	Subcon
beta-Hexachlorocyclohexane (HCH)	-	-	-	<50	-	-	<50	-	µg/kg	Subcon
Methyl Parathion	-	-	-	<50	-	-	<50	-	µg/kg	Subcon
Malathion	-	-	-	<50	-	-	<50	-	µg/kg	Subcon
Fenitrothion	-	-	-	<50	-	-	<50	-	µg/kg	Subcon
Heptachlor Epoxide	-	-	-	<50	-	-	<50	-	µg/kg	Subcon
Parathion (Ethyl Parathion)	-	-	-	<50	-	-	<50	-	µg/kg	Subcon
p,p-DDE	-	-	-	<50	-	-	<50	-	µg/kg	Subcon
p,p-DDT	-	-	-	<50	-	-	<50	-	µg/kg	Subcon
p,p-Methoxychlor	-	-	-	<50	-	-	<50	-	µg/kg	Subcon
p,p-TDE (DDD)	-	-	-	<50	-	-	<50	-	µg/kg	Subcon
o,p-DDE	-	-	-	<50	-	-	<50	-	µg/kg	Subcon
o,p-DDT	-	-	-	<50	-	-	<50	-	µg/kg	Subcon
o,p-Methoxychlor	-	-	-	<50	-	-	<50	-	µg/kg	Subcon
o,p-TDE (DDD)	-	-	-	<50	-	-	<50	-	µg/kg	Subcon
Endosulphan I	-	-	-	<50	-	-	<50	-	µg/kg	Subcon
Endosulphan II	-	-	-	<50	-	-	<50	-	µg/kg	Subcon
Endosulphan Sulphate	-	-	-	<50	-	-	<50	-	µg/kg	Subcon
Endrin	-	-	-	<50	-	-	<50	-	µg/kg	Subcon
Ethion	-	-	-	<50	-	-	<50	-	µg/kg	Subcon
Dieldrin	-	-	-	<50	-	-	<50	-	µg/kg	Subcon
Azinphos-methyl	-	-	-	<50	-	-	<50	-	µg/kg	Subcon

Envirolab Job Number: 12/03993 **Client Project Name: NIAB Phase 1**

Client Project Ref: 25459

Lab Sample ID	12/03993/17	12/03993/18	12/03993/19	12/03993/20	12/03993/21	12/03993/22	12/03993/23	12/03993/24	Units	Method ref
Client Sample No										
Client Sample ID	TP29	TP30	TP31	TP32	TP33	TP38	TP39	TP9		
Depth to Top	0.10	0.10	0.10	0.30	0.20	0.30	0.10	1.50		
Depth To Bottom	0.20	0.30	0.20				0.20			
Date Sampled	31-Aug-12	31-Aug-12	31-Aug-12	31-Aug-12	31-Aug-12	31-Aug-12	31-Aug-12	31-Aug-12		
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil		
Sample Matrix Code	4AE	6E	6AE	4E	6E	4E	6AE	4A		
PAH 16										
Acenaphthene$_A^{M\#}$	<0.01	-	<0.01	-	<0.01	<0.01	-	-	mg/kg	A-T-019s
Acenaphthylene$_A^{\#}$	<0.01	-	<0.01	-	<0.01	<0.01	-	-	mg/kg	A-T-019s
Anthracene$_A^{\#}$	0.01	-	<0.01	-	<0.01	<0.01	-	-	mg/kg	A-T-019s
Benzo(a)anthracene$_A^{M\#}$	0.08	-	0.04	-	0.05	<0.01	-	-	mg/kg	A-T-019s
Benzo(a)pyrene$_A^{M\#}$	0.11	-	0.04	-	0.04	<0.01	-	-	mg/kg	A-T-019s
Benzo(b)fluoranthene$_A$	0.22	-	0.10	-	0.10	<0.01	-	-	mg/kg	A-T-019s
Benzo(ghi)perylene$_A^{M\#}$	0.14	-	0.07	-	0.06	<0.01	-	-	mg/kg	A-T-019s
Benzo(k)fluoranthene$_A$	0.07	-	0.02	-	0.02	<0.01	-	-	mg/kg	A-T-019s
Chrysene$_A^{M\#}$	0.14	-	0.07	-	0.06	<0.01	-	-	mg/kg	A-T-019s
Dibenzo(ah)anthracene$_A$	<0.01	-	<0.01	-	<0.01	<0.01	-	-	mg/kg	A-T-019s
Fluoranthene$_A^{M\#}$	0.17	-	0.11	-	0.11	<0.01	-	-	mg/kg	A-T-019s
Fluorene$_A^{M\#}$	<0.01	-	<0.01	-	<0.01	<0.01	-	-	mg/kg	A-T-019s
Indeno(123-cd)pyrene$_A^{\#}$	0.09	-	0.03	-	0.04	<0.01	-	-	mg/kg	A-T-019s
Naphthalene$_A^{M\#}$	<0.01	-	0.02	-	<0.01	<0.01	-	-	mg/kg	A-T-019s
Phenanthrene$_A^{M\#}$	0.07	-	0.06	-	0.02	<0.01	-	-	mg/kg	A-T-019s
Pyrene$_A^{M\#}$	0.15	-	0.10	-	0.10	<0.01	-	-	mg/kg	A-T-019s
Total PAH$_A$	1.25	-	0.67	-	0.58	<0.01	-	-	mg/kg	A-T-019s

Envirolab Job Number: 12/03993

Client Project Name: NIAB Phase 1

Client Project Ref: 25459

Lab Sample ID	12/03993/33	12/03993/52							Units	Method ref
Client Sample No										
Client Sample ID	TP33	TP28								
Depth to Top	3.50									
Depth To Bottom		0.10								
Date Sampled	31-Aug-12	03-Sep-12								
Sample Type	Soil	Soil								
Sample Matrix Code	5	4AE								
pH_D M#	8.14	-							pH	A-T-031s
Sulphate (water sol 2:1)$_D$ M#	0.12	-							g/l	A-T-026s

Envirolab Job Number: 12/03993

Client Project Name: NIAB Phase 1

Client Project Ref: 25459

Lab Sample ID	12/03993/33	12/03993/52							Units	Method ref
Client Sample No										
Client Sample ID	TP33	TP28 repeat								
Depth to Top	3.50									
Depth To Bottom		0.10								
Date Sampled	31-Aug-12	03-Sep-12								
Sample Type	Soil	Soil								
Sample Matrix Code	5	4AE								
PAH 16										
Acenaphthene$_A^{M\#}$	-	0.06							mg/kg	A-T-019s
Acenaphthylene$_A^{\#}$	-	<0.01							mg/kg	A-T-019s
Anthracene$_A^{\#}$	-	0.07							mg/kg	A-T-019s
Benzo(a)anthracene$_A^{M\#}$	-	*0.15*							mg/kg	A-T-019s
Benzo(a)pyrene$_A^{M\#}$	-	*0.07*							mg/kg	A-T-019s
Benzo(b)fluoranthene$_A$	-	0.15							mg/kg	A-T-019s
Benzo(ghi)perylene$_A^{M\#}$	-	0.06							mg/kg	A-T-019s
Benzo(k)fluoranthene$_A$	-	0.04							mg/kg	A-T-019s
Chrysene$_A^{M\#}$	-	0.17							mg/kg	A-T-019s
Dibenzo(ah)anthracene$_A$	-	<0.01							mg/kg	A-T-019s
Fluoranthene$_A^{M\#}$	-	0.36							mg/kg	A-T-019s
Fluorene$_A^{M\#}$	-	0.06							mg/kg	A-T-019s
Indeno(123-cd)pyrene$_A^{\#}$	-	0.08							mg/kg	A-T-019s
Naphthalene$_A^{M\#}$	-	0.01							mg/kg	A-T-019s
Phenanthrene$_A^{M\#}$	-	0.29							mg/kg	A-T-019s
Pyrene$_A^{M\#}$	-	0.26							mg/kg	A-T-019s
Total PAH$_A$	-	1.84							mg/kg	A-T-019s

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 12/04076
Issue Number: 1 **Date:** 21 September, 2012

Client: RSK Environment Ltd Hemel
18 Frogmore Road
Hemel Hempstead
Hertfordshire
UK
HP3 9RT

Project Manager: Nigel Austin / Ben Coulston / Oliver Pengilly
Project Name: NIAB Phase 1
Project Ref: 25459
Order No: Not specified
Date Samples Received: 10/09/12
Date Instructions Received: 10/09/12
Date Analysis Completed: 21/09/12

Prepared by:

Melanie Marshall
Laboratory Coordinator

Approved by:

Liz Oliver
Project Coordinator

Notes - Soil analysis
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 inert stones >10mm are removed or excluded from the sample prior to analysis and reported results corrected to a whole sample basis. For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis.
Notes - General
Subscript "A" indicates analysis performed on the sample as received, "D" indicates analysis performed on dried & crushed sample.
All analysis is performed on the dried and crushed sample for samples with Matrix Code 7 and this supercedes any "A" subscripts. Superscript "M" indicates method accredited to MCERTS. Results in italics are associated with a control limit flag.
A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling.
Predominant Matrix Codes - 1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER.
Samples with Matrix Code 7 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our MCERTS accreditation.
Secondary Matrix Codes - A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal, E = contains roots/twigs.
IS indicates Insufficient sample for analysis. NDP indicates No Determination Possible. NAD indicates No Asbestos Detected.
Superscript # indicates method accredited to ISO 17025.
Analytical results reflect the quality of the sample at the time of analysis only.
Opinions and interpretations expressed are outside the scope of our accreditation.

MCERTS THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME
UKAS TESTING 1247

Envirolab Job Number: 12/04076

Client Project Name: NIAB Phase 1

Client Project Ref: 25459

Lab Sample ID	12/04076/1	12/04076/2	12/04076/3	12/04076/4	12/04076/5	12/04076/6	12/04076/7	12/04076/8	Units	Method ref
Client Sample No										
Client Sample ID	WSB	WSE	WSH	WS1	WS2	WS3	WS4	WS5		
Depth to Top	0.10	0.10	0.20	0.20	0.20	0.10	0.10	0.05		
Depth To Bottom	0.20	0.20	0.30	0.30			0.20	0.15		
Date Sampled	06-Sep-12	06-Sep-12	06-Sep-12	05-Sep-12	05-Sep-12	06-Sep-12	05-Sep-12	05-Sep-12		
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil		
Sample Matrix Code	5AE	6AE	5AE	6AE	6E	6AE	6E	5AE		
Asbestos in soil$_A^{\#}$	NAD	NAD	-	NAD	-	NAD	NAD	NAD		A-T-045
pH$_D^{M\#}$	6.92	-	7.34	-	-	-	7.34	-	pH	A-T-031s
Sulphate (water sol 2:1)$_D^{M\#}$	0.10	-	<0.01	-	-	-	0.02	-	g/l	A-T-026s
Organic matter$_D^{M\#}$	2.0	-	-	3.5	-	3.1	-	-	% w/w	A-T-032 OM
Arsenic$_D^{M\#}$	9	7	12	7	9	10	27	5	mg/kg	A-T-024
Cadmium$_D^{M\#}$	0.6	0.6	0.7	0.6	0.6	0.7	0.9	0.7	mg/kg	A-T-024
Copper$_D^{M\#}$	21	17	20	25	18	21	28	20	mg/kg	A-T-024
Chromium$_D^{\#}$	26	37	25	42	42	37	48	45	mg/kg	A-T-024
Lead$_D^{M\#}$	52	46	52	80	39	73	55	36	mg/kg	A-T-024
Mercury$_D$	0.19	0.26	<0.17	0.36	0.37	0.21	0.45	0.24	mg/kg	A-T-024
Nickel$_D^{M\#}$	20	28	24	35	36	29	45	34	mg/kg	A-T-024
Selenium$_D^{M\#}$	<1	<1	<1	<1	1	2	2	<1	mg/kg	A-T-024
Zinc$_D^{M\#}$	64	60	55	71	59	62	70	60	mg/kg	A-T-024

Envirolab Job Number: 12/04076

Client Project Name: NIAB Phase 1

Client Project Ref: 25459

Lab Sample ID	12/04076/1	12/04076/2	12/04076/3	12/04076/4	12/04076/5	12/04076/6	12/04076/7	12/04076/8	Units	Method ref
Client Sample No										
Client Sample ID	WSB	WSE	WSH	WS1	WS2	WS3	WS4	WS5		
Depth to Top	0.10	0.10	0.20	0.20	0.20	0.10	0.10	0.05		
Depth To Bottom	0.20	0.20	0.30	0.30			0.20	0.15		
Date Sampled	06-Sep-12	06-Sep-12	06-Sep-12	05-Sep-12	05-Sep-12	06-Sep-12	05-Sep-12	05-Sep-12		
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil		
Sample Matrix Code	5AE	6AE	5AE	6AE	6E	6AE	6E	5AE		
Pest-c										
Mevinphos	-	<50	-	-	-	-	-	-	µg/kg	Subcon
Dichlorvos	-	<50	-	-	-	-	-	-	µg/kg	Subcon
alpha-Hexachlorocyclohexane (HCH)	-	<50	-	-	-	-	-	-	µg/kg	Subcon
Diazinon	-	<50	-	-	-	-	-	-	µg/kg	Subcon
gamma-Hexachlorocyclohexane (HCH / Lindane)	-	<50	-	-	-	-	-	-	µg/kg	Subcon
Heptachlor	-	<50	-	-	-	-	-	-	µg/kg	Subcon
Aldrin	-	<50	-	-	-	-	-	-	µg/kg	Subcon
beta-Hexachlorocyclohexane (HCH)	-	<50	-	-	-	-	-	-	µg/kg	Subcon
Methyl Parathion	-	<50	-	-	-	-	-	-	µg/kg	Subcon
Malathion	-	<50	-	-	-	-	-	-	µg/kg	Subcon
Fenitrothion	-	<50	-	-	-	-	-	-	µg/kg	Subcon
Heptachlor Epoxide	-	<50	-	-	-	-	-	-	µg/kg	Subcon
Parathion	-	<50	-	-	-	-	-	-	µg/kg	Subcon
p,p-DDE	-	<50	-	-	-	-	-	-	µg/kg	Subcon
p,p-DDT	-	<50	-	-	-	-	-	-	µg/kg	Subcon
p,p-Methoxychlor	-	<50	-	-	-	-	-	-	µg/kg	Subcon
p,p-TDE (DDD)	-	<50	-	-	-	-	-	-	µg/kg	Subcon
o,p-DDE	-	<50	-	-	-	-	-	-	µg/kg	Subcon
o,p-DDT	-	<50	-	-	-	-	-	-	µg/kg	Subcon
o,p-Methoxychlor	-	<50	-	-	-	-	-	-	µg/kg	Subcon
o,p-TDE (DDD)	-	<50	-	-	-	-	-	-	µg/kg	Subcon
Endosulphan I	-	<50	-	-	-	-	-	-	µg/kg	Subcon
Endosulphan II	-	<50	-	-	-	-	-	-	µg/kg	Subcon
Endosulphan Sulphate	-	<50	-	-	-	-	-	-	µg/kg	Subcon
Endrin	-	<50	-	-	-	-	-	-	µg/kg	Subcon
Ethion	-	<50	-	-	-	-	-	-	µg/kg	Subcon
Dieldrin	-	<50	-	-	-	-	-	-	µg/kg	Subcon
Azinphos-methyl	-	<50	-	-	-	-	-	-	µg/kg	Subcon

Envirolab Job Number: 12/04076

Client Project Name: NIAB Phase 1

Client Project Ref: 25459

Lab Sample ID	12/04076/1	12/04076/2	12/04076/3	12/04076/4	12/04076/5	12/04076/6	12/04076/7	12/04076/8	Units	Method ref
Client Sample No										
Client Sample ID	WSB	WSE	WSH	WS1	WS2	WS3	WS4	WS5		
Depth to Top	0.10	0.10	0.20	0.20	0.20	0.10	0.10	0.05		
Depth To Bottom	0.20	0.20	0.30	0.30			0.20	0.15		
Date Sampled	06-Sep-12	06-Sep-12	06-Sep-12	05-Sep-12	05-Sep-12	06-Sep-12	05-Sep-12	05-Sep-12		
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil		
Sample Matrix Code	5AE	6AE	5AE	6AE	6E	6AE	6E	5AE		
PAH 16										
Acenaphthene$_A^{M\#}$	<0.01	<0.01	-	<0.01	-	-	<0.01	-	mg/kg	A-T-019s
Acenaphthylene$_A^{\#}$	<0.01	<0.01	-	<0.01	-	-	<0.01	-	mg/kg	A-T-019s
Anthracene$_A^{\#}$	<0.01	<0.01	-	<0.01	-	-	<0.01	-	mg/kg	A-T-019s
Benzo(a)anthracene$_A^{M\#}$	0.07	0.04	-	0.03	-	-	0.15	-	mg/kg	A-T-019s
Benzo(a)pyrene$_A^{M\#}$	0.07	0.07	-	0.04	-	-	0.15	-	mg/kg	A-T-019s
Benzo(b)fluoranthene$_A$	0.13	0.09	-	0.03	-	-	0.15	-	mg/kg	A-T-019s
Benzo(ghi)perylene$_A^{M\#}$	0.06	0.04	-	0.02	-	-	0.08	-	mg/kg	A-T-019s
Benzo(k)fluoranthene$_A$	0.03	0.01	-	0.01	-	-	0.05	-	mg/kg	A-T-019s
Chrysene$_A^{M\#}$	0.08	0.05	-	0.02	-	-	0.14	-	mg/kg	A-T-019s
Dibenzo(ah)anthracene$_A$	0.02	0.01	-	<0.01	-	-	0.02	-	mg/kg	A-T-019s
Fluoranthene$_A^{M\#}$	0.09	0.06	-	0.02	-	-	0.23	-	mg/kg	A-T-019s
Fluorene$_A^{M\#}$	<0.01	<0.01	-	<0.01	-	-	<0.01	-	mg/kg	A-T-019s
Indeno(123-cd)pyrene$_A^{\#}$	0.06	0.04	-	0.01	-	-	0.08	-	mg/kg	A-T-019s
Naphthalene$_A^{M\#}$	<0.01	<0.01	-	<0.01	-	-	<0.01	-	mg/kg	A-T-019s
Phenanthrene$_A^{M\#}$	<0.01	<0.01	-	<0.01	-	-	0.08	-	mg/kg	A-T-019s
Pyrene$_A^{M\#}$	0.08	0.05	-	0.02	-	-	0.20	-	mg/kg	A-T-019s
Total PAH$_A$	0.71	0.48	-	0.22	-	-	1.34	-	mg/kg	A-T-019s
Pyrethroids										
Cyfluthrin	-	<0.1	-	-	-	-	-	-	mg/kg	Subcon
Cyhalothrin	-	<0.1	-	-	-	-	-	-	mg/kg	Subcon
Cypermethrin	-	<0.1	-	-	-	-	-	-	mg/kg	Subcon
Deltamethrin	-	<0.1	-	-	-	-	-	-	mg/kg	Subcon
Fenvalerate	-	<0.1	-	-	-	-	-	-	mg/kg	Subcon
Permethrin	-	<0.1	-	-	-	-	-	-	mg/kg	Subcon

Envirolab Job Number: 12/04076

Client Project Name: NIAB Phase 1

Client Project Ref: 25459

Lab Sample ID	12/04076/1	12/04076/2	12/04076/3	12/04076/4	12/04076/5	12/04076/6	12/04076/7	12/04076/8	Units	Method ref
Client Sample No										
Client Sample ID	WSB	WSE	WSH	WS1	WS2	WS3	WS4	WS5		
Depth to Top	0.10	0.10	0.20	0.20	0.20	0.10	0.10	0.05		
Depth To Bottom	0.20	0.20	0.30	0.30			0.20	0.15		
Date Sampled	06-Sep-12	06-Sep-12	06-Sep-12	05-Sep-12	05-Sep-12	06-Sep-12	05-Sep-12	05-Sep-12		
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil		
Sample Matrix Code	5AE	6AE	5AE	6AE	6E	6AE	6E	5AE		
Triazines (x11)										
Ametryn	-	<0.2	-	-	-	-	-	-	mg/kg	Subcon
Atraton	-	<0.1	-	-	-	-	-	-	mg/kg	Subcon
Atrazine	-	<0.02	-	-	-	-	-	-	mg/kg	Subcon
Cyanazine	-	<0.02	-	-	-	-	-	-	mg/kg	Subcon
Prometon	-	<0.1	-	-	-	-	-	-	mg/kg	Subcon
Prometryn	-	<0.02	-	-	-	-	-	-	mg/kg	Subcon
Propazine	-	<0.02	-	-	-	-	-	-	mg/kg	Subcon
Simazine	-	<0.02	-	-	-	-	-	-	mg/kg	Subcon
Simetryn	-	<0.1	-	-	-	-	-	-	mg/kg	Subcon
Terbuthylazine	-	<0.02	-	-	-	-	-	-	mg/kg	Subcon
Terbutryn	-	<0.02	-	-	-	-	-	-	mg/kg	Subcon

Envirolab Job Number: 12/04076

Client Project Name: NIAB Phase 1

Client Project Ref: 25459

Lab Sample ID	12/04076/9	12/04076/10							Units	Method ref
Client Sample No										
Client Sample ID	WS6	WS7								
Depth to Top	0.10	0.10								
Depth To Bottom	0.20									
Date Sampled	06-Sep-12	05-Sep-12								
Sample Type	Soil	Soil								
Sample Matrix Code	6E	4AE								
Asbestos in soil$_A^{\#}$	NAD	-								A-T-045
Organic matter$_D^{M\#}$	2.8	-							% w/w	A-T-032 OM
Arsenic$_D^{M\#}$	7	9							mg/kg	A-T-024
Cadmium$_D^{M\#}$	0.8	0.8							mg/kg	A-T-024
Copper$_D^{M\#}$	19	16							mg/kg	A-T-024
Chromium$_D^{\#}$	43	27							mg/kg	A-T-024
Lead$_D^{M\#}$	44	33							mg/kg	A-T-024
Mercury$_D$	0.37	0.43							mg/kg	A-T-024
Nickel$_D^{M\#}$	32	22							mg/kg	A-T-024
Selenium$_D^{M\#}$	2	2							mg/kg	A-T-024
Zinc$_D^{M\#}$	61	54							mg/kg	A-T-024

Envirolab Job Number: 12/04076

Client Project Name: NIAB Phase 1

Client Project Ref: 25459

Lab Sample ID	12/04076/9	12/04076/10							Units	Method ref
Client Sample No										
Client Sample ID	WS6	WS7								
Depth to Top	0.10	0.10								
Depth To Bottom	0.20									
Date Sampled	06-Sep-12	05-Sep-12								
Sample Type	Soil	Soil								
Sample Matrix Code	6E	4AE								
PAH 16										
Acenaphthene$_A^{M\#}$	<0.01	-							mg/kg	A-T-019s
Acenaphthylene$_A^{\#}$	<0.01	-							mg/kg	A-T-019s
Anthracene$_A^{\#}$	0.02	-							mg/kg	A-T-019s
Benzo(a)anthracene$_A^{M\#}$	0.07	-							mg/kg	A-T-019s
Benzo(a)pyrene$_A^{M\#}$	0.07	-							mg/kg	A-T-019s
Benzo(b)fluoranthene$_A$	0.09	-							mg/kg	A-T-019s
Benzo(ghi)perylene$_A^{M\#}$	0.06	-							mg/kg	A-T-019s
Benzo(k)fluoranthene$_A$	0.05	-							mg/kg	A-T-019s
Chrysene$_A^{M\#}$	0.07	-							mg/kg	A-T-019s
Dibenzo(ah)anthracene$_A$	0.05	-							mg/kg	A-T-019s
Fluoranthene$_A^{M\#}$	0.07	-							mg/kg	A-T-019s
Fluorene$_A^{M\#}$	<0.01	-							mg/kg	A-T-019s
Indeno(123-cd)pyrene$_A^{\#}$	0.07	-							mg/kg	A-T-019s
Naphthalene$_A^{M\#}$	<0.01	-							mg/kg	A-T-019s
Phenanthrene$_A^{M\#}$	<0.01	-							mg/kg	A-T-019s
Pyrene$_A^{M\#}$	0.06	-							mg/kg	A-T-019s
Total PAH$_A$	0.70	-							mg/kg	A-T-019s

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 12/04180
Issue Number: 1 **Date:** 27 September, 2012

Client:
RSK Environment Ltd Hemel
18 Frogmore Road
Hemel Hempstead
Hertfordshire
UK
HP3 9RT

Project Manager: Nigel Austin / Ben Coulston / Oliver Pengilly
Project Name: NIAB Phase 1
Project Ref: 25459
Order No: Not specified
Date Samples Received: 14/09/12
Date Instructions Received: 14/09/12
Date Analysis Completed: 27/09/12

Prepared by:

Melanie Marshall
Laboratory Coordinator

Approved by:

Liz Oliver
Project Coordinator

Notes - Soil analysis
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 inert stones >10mm are removed or excluded from the sample prior to analysis and reported results corrected to a whole sample basis. For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis.
Notes - General
Subscript "A" indicates analysis performed on the sample as received, "D" indicates analysis performed on dried & crushed sample.
All analysis is performed on the dried and crushed sample for samples with Matrix Code 7 and this supercedes any "A" subscripts. Superscript "M" indicates method accredited to MCERTS. Results in italics are associated with a control limit flag.
A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling.
Predominant Matrix Codes - 1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER.
Samples with Matrix Code 7 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our MCERTS accreditation.
Secondary Matrix Codes - A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal, E = contains roots/twigs.
IS indicates Insufficient sample for analysis. NDP indicates No Determination Possible. NAD indicates No Asbestos Detected.
Superscript # indicates method accredited to ISO 17025.
Analytical results reflect the quality of the sample at the time of analysis only.
Opinions and interpretations expressed are outside the scope of our accreditation.

MCERTS THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME
UKAS TESTING 1247

Envirolab Job Number: 12/04180

Client Project Name: NIAB Phase 1

Client Project Ref: 25459

Lab Sample ID	12/04180/1	12/04180/2	12/04180/3	12/04180/4	12/04180/5	12/04180/6	12/04180/7	12/04180/8	Units	Method ref
Client Sample No										
Client Sample ID	WS8	WS9	WS10	WS11	WS12	WS13	WS14	WS15		
Depth to Top	0.30	0.10	0.20	0.40	0.20	0.30	0.10	0.20		
Depth To Bottom	0.40				0.30		0.20	0.30		
Date Sampled	07-Sep-12	07-Sep-12	10-Sep-12	07-Sep-12	10-Sep-12	07-Sep-12	07-Sep-12	10-Sep-12		
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES		
Sample Matrix Code	6A	4A	6A	6A	6A	6	6A	6AE		
Asbestos in soil$_A^{\#}$	NAD	NAD	-	-	NAD	NAD	NAD	NAD		A-T-045
Organic matter$_D^{M\#}$	1.6	-	-	2.2	-	2.4	-	-	% w/w	A-T-032 OM
Arsenic$_D^{M\#}$	9	9	7	8	6	8	7	6	mg/kg	A-T-024
Cadmium$_D^{M\#}$	1.3	1.6	1.3	1.3	1.4	1.5	1.5	1.3	mg/kg	A-T-024
Copper$_D^{M\#}$	14	19	14	14	13	14	14	12	mg/kg	A-T-024
Chromium$_D^{\#}$	20	21	20	20	23	23	22	22	mg/kg	A-T-024
Lead$_D^{M\#}$	29	44	25	33	24	29	23	20	mg/kg	A-T-024
Mercury$_D$	<0.17	<0.17	<0.17	<0.17	0.20	<0.17	0.19	<0.17	mg/kg	A-T-024
Nickel$_D^{M\#}$	18	19	18	17	20	18	19	18	mg/kg	A-T-024
Selenium$_D^{M\#}$	<1	<1	<1	<1	<1	<1	<1	<1	mg/kg	A-T-024
Zinc$_D^{M\#}$	47	57	46	45	41	55	46	42	mg/kg	A-T-024

Envirolab Job Number: 12/04180

Client Project Name: NIAB Phase 1

Client Project Ref: 25459

Lab Sample ID	12/04180/1	12/04180/2	12/04180/3	12/04180/4	12/04180/5	12/04180/6	12/04180/7	12/04180/8	Units	Method ref
Client Sample No										
Client Sample ID	WS8	WS9	WS10	WS11	WS12	WS13	WS14	WS15		
Depth to Top	0.30	0.10	0.20	0.40	0.20	0.30	0.10	0.20		
Depth To Bottom	0.40				0.30		0.20	0.30		
Date Sampled	07-Sep-12	07-Sep-12	10-Sep-12	07-Sep-12	10-Sep-12	07-Sep-12	07-Sep-12	10-Sep-12		
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES		
Sample Matrix Code	6A	4A	6A	6A	6A	6	6A	6AE		
PAH 16										
Acenaphthene$_A^{M\#}$	<0.01	<0.01	-	-	0.04	-	<0.01	<0.01	mg/kg	A-T-019s
Acenaphthylene$_A^{\#}$	<0.01	<0.01	-	-	<0.01	-	<0.01	<0.01	mg/kg	A-T-019s
Anthracene$_A^{\#}$	<0.01	<0.01	-	-	<0.01	-	<0.01	<0.01	mg/kg	A-T-019s
Benzo(a)anthracene$_A^{M\#}$	<0.01	0.03	-	-	<0.01	-	<0.01	<0.01	mg/kg	A-T-019s
Benzo(a)pyrene$_A^{M\#}$	<0.01	0.03	-	-	<0.01	-	<0.01	<0.01	mg/kg	A-T-019s
Benzo(b)fluoranthene$_A$	0.03	0.10	-	-	<0.01	-	<0.01	<0.01	mg/kg	A-T-019s
Benzo(ghi)perylene$_A^{M\#}$	<0.01	0.04	-	-	<0.01	-	<0.01	<0.01	mg/kg	A-T-019s
Benzo(k)fluoranthene$_A$	<0.01	<0.01	-	-	<0.01	-	<0.01	<0.01	mg/kg	A-T-019s
Chrysene$_A^{M\#}$	<0.01	0.06	-	-	<0.01	-	<0.01	<0.01	mg/kg	A-T-019s
Dibenzo(ah)anthracene$_A$	<0.01	<0.01	-	-	<0.01	-	<0.01	<0.01	mg/kg	A-T-019s
Fluoranthene$_A^{M\#}$	0.03	0.07	-	-	0.02	-	0.02	<0.01	mg/kg	A-T-019s
Fluorene$_A^{M\#}$	<0.01	<0.01	-	-	<0.01	-	<0.01	<0.01	mg/kg	A-T-019s
Indeno(123-cd)pyrene$_A^{\#}$	<0.01	<0.01	-	-	<0.01	-	<0.01	<0.01	mg/kg	A-T-019s
Naphthalene$_A^{M\#}$	0.02	<0.01	-	-	0.01	-	<0.01	0.02	mg/kg	A-T-019s
Phenanthrene$_A^{M\#}$	<0.01	0.03	-	-	0.02	-	<0.01	<0.01	mg/kg	A-T-019s
Pyrene$_A^{M\#}$	0.02	0.06	-	-	0.02	-	0.01	<0.01	mg/kg	A-T-019s
Total PAH$_A$	0.12	0.44	-	-	0.12	-	0.03	0.02	mg/kg	A-T-019s

Envirolab Job Number: 12/04180

Client Project Name: NIAB Phase 1

Client Project Ref: 25459

Lab Sample ID	12/04180/9	12/04180/10	12/04180/11	12/04180/12	12/04180/13	12/04180/14	12/04180/15	12/04180/16	Units	Method ref
Client Sample No										
Client Sample ID	WS16	WS17	WS18	WS19	WS20	WS21	WS22	WS23		
Depth to Top	0.10	0.05	0.20	0.10	0.60	0.05	0.20	0.50		
Depth To Bottom	0.20	0.15	0.30	0.20	0.70	0.15	0.30	0.60		
Date Sampled	07-Sep-12	12-Sep-12	12-Sep-12	10-Sep-12	12-Sep-12	12-Sep-12	12-Sep-12	12-Sep-12		
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES		
Sample Matrix Code	6A	6E	6AB	6	5A	6AB	6AB	5A		
Asbestos in soil$_A^{\#}$	-	-	NAD	-	-	-	NAD	-		A-T-045
Organic matter$_D^{M\#}$	1.4	-	-	-	0.3	-	2.6	0.5	% w/w	A-T-032 OM
Arsenic$_D^{M\#}$	8	17	14	15	9	5	8	6	mg/kg	A-T-024
Cadmium$_D^{M\#}$	1.3	1.7	1.7	1.6	1.3	1.3	1.4	1.2	mg/kg	A-T-024
Copper$_D^{M\#}$	11	56	23	20	7	18	27	9	mg/kg	A-T-024
Chromium$_D^{\#}$	17	31	35	31	11	28	24	19	mg/kg	A-T-024
Lead$_D^{M\#}$	23	76	48	49	6	24	31	7	mg/kg	A-T-024
Mercury$_D$	<0.17	0.22	<0.17	<0.17	0.22	0.18	<0.17	<0.17	mg/kg	A-T-024
Nickel$_D^{M\#}$	17	30	20	20	14	17	18	18	mg/kg	A-T-024
Selenium$_D^{M\#}$	<1	<1	<1	<1	<1	<1	<1	<1	mg/kg	A-T-024
Zinc$_D^{M\#}$	39	82	55	54	17	44	42	22	mg/kg	A-T-024

Envirolab Job Number: 12/04180

Client Project Name: NIAB Phase 1

Client Project Ref: 25459

Lab Sample ID	12/04180/9	12/04180/10	12/04180/11	12/04180/12	12/04180/13	12/04180/14	12/04180/15	12/04180/16	Units	Method ref
Client Sample No										
Client Sample ID	WS16	WS17	WS18	WS19	WS20	WS21	WS22	WS23		
Depth to Top	0.10	0.05	0.20	0.10	0.60	0.05	0.20	0.50		
Depth To Bottom	0.20	0.15	0.30	0.20	0.70	0.15	0.30	0.60		
Date Sampled	07-Sep-12	12-Sep-12	12-Sep-12	10-Sep-12	12-Sep-12	12-Sep-12	12-Sep-12	12-Sep-12		
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES		
Sample Matrix Code	6A	6E	6AB	6	5A	6AB	6AB	5A		
PAH 16										
Acenaphthene$_A^{M\#}$	-	-	-	-	-	-	<0.01	-	mg/kg	A-T-019s
Acenaphthylene$_A^{\#}$	-	-	-	-	-	-	<0.01	-	mg/kg	A-T-019s
Anthracene$_A^{\#}$	-	-	-	-	-	-	<0.01	-	mg/kg	A-T-019s
Benzo(a)anthracene$_A^{M\#}$	-	-	-	-	-	-	<0.01	-	mg/kg	A-T-019s
Benzo(a)pyrene$_A^{M\#}$	-	-	-	-	-	-	0.02	-	mg/kg	A-T-019s
Benzo(b)fluoranthene$_A$	-	-	-	-	-	-	0.05	-	mg/kg	A-T-019s
Benzo(ghi)perylene$_A^{M\#}$	-	-	-	-	-	-	0.03	-	mg/kg	A-T-019s
Benzo(k)fluoranthene$_A$	-	-	-	-	-	-	<0.01	-	mg/kg	A-T-019s
Chrysene$_A^{M\#}$	-	-	-	-	-	-	0.03	-	mg/kg	A-T-019s
Dibenzo(ah)anthracene$_A$	-	-	-	-	-	-	<0.01	-	mg/kg	A-T-019s
Fluoranthene$_A^{M\#}$	-	-	-	-	-	-	0.05	-	mg/kg	A-T-019s
Fluorene$_A^{M\#}$	-	-	-	-	-	-	<0.01	-	mg/kg	A-T-019s
Indeno(123-cd)pyrene$_A^{\#}$	-	-	-	-	-	-	<0.01	-	mg/kg	A-T-019s
Naphthalene$_A^{M\#}$	-	-	-	-	-	-	0.01	-	mg/kg	A-T-019s
Phenanthrene$_A^{M\#}$	-	-	-	-	-	-	0.02	-	mg/kg	A-T-019s
Pyrene$_A^{M\#}$	-	-	-	-	-	-	0.04	-	mg/kg	A-T-019s
Total PAH$_A$	-	-	-	-	-	-	0.26	-	mg/kg	A-T-019s

Envirolab Job Number: 12/04180

Client Project Name: NIAB Phase 1

Client Project Ref: 25459

Lab Sample ID	12/04180/17	12/04180/18	12/04180/19	12/04180/20	12/04180/21	12/04180/22	12/04180/23		Units	Method ref
Client Sample No										
Client Sample ID	WS24	WS24	WS10	WSM	BHK	BHG	WSM			
Depth to Top	0.40	0.10	0.80	0.10	0.00	0.00	0.30			
Depth To Bottom	0.50	0.20			0.50	0.50	0.40			
Date Sampled	10-Sep-12	10-Sep-12	10-Sep-12	06-Sep-12	28-Aug-12	28-Aug-12	06-Sep-12			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	5A	6	5	6ABE	6AE	4AE	4ABE			
Asbestos in soil$_A^{\#}$	-	-	-	NAD	-	-	-			A-T-045
Organic matter$_D^{M\#}$	-	-	-	-	-	-	0.9		% w/w	A-T-032 OM
Arsenic$_D^{M\#}$	10	6	8	11	7	9	9		mg/kg	A-T-024
Cadmium$_D^{M\#}$	1.7	1.5	1.9	1.6	1.7	1.5	1.7		mg/kg	A-T-024
Copper$_D^{M\#}$	12	15	14	23	20	18	14		mg/kg	A-T-024
Chromium$_D^{\#}$	28	28	37	26	28	24	26		mg/kg	A-T-024
Lead$_D^{M\#}$	11	25	13	42	32	42	18		mg/kg	A-T-024
Mercury$_D$	0.20	0.29	0.29	<0.17	0.25	<0.17	<0.17		mg/kg	A-T-024
Nickel$_D^{M\#}$	31	22	39	24	25	23	24		mg/kg	A-T-024
Selenium$_D^{M\#}$	<1	<1	<1	<1	<1	<1	<1		mg/kg	A-T-024
Zinc$_D^{M\#}$	40	54	42	88	77	54	54		mg/kg	A-T-024

Envirolab Job Number: 12/04180

Client Project Name: NIAB Phase 1

Client Project Ref: 25459

Lab Sample ID	12/04180/17	12/04180/18	12/04180/19	12/04180/20	12/04180/21	12/04180/22	12/04180/23		Units	Method ref
Client Sample No										
Client Sample ID	WS24	WS24	WS10	WSM	BHK	BHG	WSM			
Depth to Top	0.40	0.10	0.80	0.10	0.00	0.00	0.30			
Depth To Bottom	0.50	0.20			0.50	0.50	0.40			
Date Sampled	10-Sep-12	10-Sep-12	10-Sep-12	06-Sep-12	28-Aug-12	28-Aug-12	06-Sep-12			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	5A	6	5	6ABE	6AE	4AE	4ABE			
PAH 16										
Acenaphthene$_A^{M\#}$	-	0.61	-	<0.01	-	-	-		mg/kg	A-T-019s
Acenaphthylene$_A^{\#}$	-	0.02	-	<0.01	-	-	-		mg/kg	A-T-019s
Anthracene$_A^{\#}$	-	0.07	-	<0.01	-	-	-		mg/kg	A-T-019s
Benzo(a)anthracene$_A^{M\#}$	-	0.03	-	0.04	-	-	-		mg/kg	A-T-019s
Benzo(a)pyrene$_A^{M\#}$	-	0.02	-	0.06	-	-	-		mg/kg	A-T-019s
Benzo(b)fluoranthene$_A$	-	0.07	-	0.11	-	-	-		mg/kg	A-T-019s
Benzo(ghi)perylene$_A^{M\#}$	-	0.01	-	0.07	-	-	-		mg/kg	A-T-019s
Benzo(k)fluoranthene$_A$	-	0.02	-	0.02	-	-	-		mg/kg	A-T-019s
Chrysene$_A^{M\#}$	-	0.07	-	0.07	-	-	-		mg/kg	A-T-019s
Dibenzo(ah)anthracene$_A$	-	<0.01	-	<0.01	-	-	-		mg/kg	A-T-019s
Fluoranthene$_A^{M\#}$	-	0.15	-	0.08	-	-	-		mg/kg	A-T-019s
Fluorene$_A^{M\#}$	-	0.28	-	<0.01	-	-	-		mg/kg	A-T-019s
Indeno(123-cd)pyrene$_A^{\#}$	-	<0.01	-	0.03	-	-	-		mg/kg	A-T-019s
Naphthalene$_A^{M\#}$	-	0.03	-	<0.01	-	-	-		mg/kg	A-T-019s
Phenanthrene$_A^{M\#}$	-	0.30	-	0.03	-	-	-		mg/kg	A-T-019s
Pyrene$_A^{M\#}$	-	0.10	-	0.09	-	-	-		mg/kg	A-T-019s
Total PAH$_A$	-	1.79	-	0.61	-	-	-		mg/kg	A-T-019s

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Analytical Report

Envirolab Limited
7 & 8 Sandpits Business Park
Mottram Road
Hyde
Cheshire, SK14 3AR

Report No:	12-28634/1
Date Received:	06/09/2012
Date Tested:	07/09/2012 to 12/09/2012
Date Issued:	12/09/2012
Page:	1 of 1

For the attention of: Iain Haslock

By email

3 soil samples received from Envirolab Limited (O/N: 727895; Project: 12/03993) in 100ml amber glass jars were analysed as shown below. Analytical methods employed are available on request. Results are reported on an as received basis unless otherwise specified.

Laboratory reference			213294 12/03993/12 TP24 0.2-0.3m	213295 12/03993/20 TP32 0.3m 31/08	213296 12/03993/23 TP39 0.1-0.2m
cyfluthrin	*[68359-37-5]*	mg/kg	< 0.10	< 0.10	< 0.10
cyhalothrin	*[91465-08-6]*	mg/kg	< 0.10	< 0.10	< 0.10
cypermethrin	*[52315-07-8]*	mg/kg	< 0.10	< 0.10	< 0.10
deltamethrin	*[52918-63-5]*	mg/kg	< 0.10	< 0.10	< 0.10
fenvalerate	*[51630-58-1]*	mg/kg	< 0.10	< 0.10	< 0.10
permethrin	*[52645-53-1]*	mg/kg	< 0.10	< 0.10	< 0.10
atrazine	*[1912-24-9]*	mg/kg	< 0.02	< 0.02	< 0.02
cyanazine	*[21725-46-2]*	mg/kg	< 0.02	< 0.02	< 0.02
prometryn	*[7287-19-6]*	mg/kg	< 0.02	< 0.02	< 0.02
propazine	*[139-40-2]*	mg/kg	< 0.02	< 0.02	< 0.02
simazine	*[122-34-9]*	mg/kg	< 0.02	< 0.02	< 0.02
terbuthylazine	*[5915-41-3]*	mg/kg	< 0.02	< 0.02	< 0.02
terbutryn	*[886-50-0]*	mg/kg	< 0.02	< 0.02	< 0.02
ametryne	*[834-12-8]*	mg/kg	< 0.20	< 0.20	< 0.20
atraton	*[1610-17-9]*	mg/kg	< 0.10	< 0.10	< 0.10
prometon	*[1610-18-0]*	mg/kg	< 0.10	< 0.10	< 0.10
simetryn	*[1014-70-6]*	mg/kg	< 0.10	< 0.10	< 0.10

Marco Lattughi
Senior Operations Manager

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Analytical Report

Envirolab Limited
7 & 8 Sandpits Business Park
Mottram Road
Hyde
Cheshire, SK14 3AR

Report No:	12-28618/1
Date Received:	05/09/2012
Date Tested:	06/09/2012 to 12/09/2012
Date Issued:	12/09/2012
Page:	1 of 1

For the attention of: Iain Haslock

By email

3 soil samples received from Envirolab Limited (O/N: 727889; Project: 12/03975) in 100ml amber glass jars were analysed as shown below. Analytical methods employed are available on request. Results are reported on an as received basis unless otherwise specified.

Laboratory reference			213236 12/03975/12 TP14 0.1-0.2m	213237 12/03975/16 TP37 0.1-0.2m	213238 12/03975/23 TP3 0.2m 28/08
cyfluthrin	*[68359-37-5]*	mg/kg	< 0.10	< 0.10	< 0.10
cyhalothrin	*[91465-08-6]*	mg/kg	< 0.10	< 0.10	< 0.10
cypermethrin	*[52315-07-8]*	mg/kg	< 0.10	< 0.10	< 0.10
deltamethrin	*[52918-63-5]*	mg/kg	< 0.10	< 0.10	< 0.10
fenvalerate	*[51630-58-1]*	mg/kg	< 0.10	< 0.10	< 0.10
permethrin	*[52645-53-1]*	mg/kg	< 0.10	< 0.10	< 0.10
atrazine	*[1912-24-9]*	mg/kg	< 0.02	< 0.02	< 0.02
cyanazine	*[21725-46-2]*	mg/kg	< 0.02	< 0.02	< 0.02
prometryn	*[7287-19-6]*	mg/kg	< 0.02	< 0.02	< 0.02
propazine	*[139-40-2]*	mg/kg	< 0.02	< 0.02	< 0.02
simazine	*[122-34-9]*	mg/kg	< 0.02	< 0.02	< 0.02
terbuthylazine	*[5915-41-3]*	mg/kg	< 0.02	< 0.02	< 0.02
terbutryn	*[886-50-0]*	mg/kg	< 0.02	< 0.02	< 0.02
ametryne	*[834-12-8]*	mg/kg	< 0.20	< 0.20	< 0.20
atraton	*[1610-17-9]*	mg/kg	< 0.10	< 0.10	< 0.10
prometon	*[1610-18-0]*	mg/kg	< 0.10	< 0.10	< 0.10
simetryn	*[1014-70-6]*	mg/kg	< 0.10	< 0.10	< 0.10

Marco Lattughi
Senior Operations Manager

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

COMBINED FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 12/03975, 12/04076, 12/04180
Issue Number: 2 **Date:** 22 October, 2012

Client:
RSK Environment Ltd Hemel
18 Frogmore Road
Hemel Hempstead
Hertfordshire
UK
HP3 9RT

Project Manager: Nigel Austin / Ben Coulston
Project Name: NIAB Phase 1
Project Ref: 25459
Order No: Not specified
Date Samples Received: 03/09/12
Date Instructions Received: 04/09/12
Date Analysis Completed: 17/09/12

Prepared by:
Melanie Marshall
Laboratory Coordinator

Approved by:
Iain Haslock
Analytical Consultant

Notes - Soil analysis
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 inert stones >10mm are removed or excluded from the sample prior to analysis and reported results corrected to a whole sample basis. For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis.
Notes - General
Subscript "A" indicates analysis performed on the sample as received, "D" indicates analysis performed on dried & crushed sample.
All analysis is performed on the dried and crushed sample for samples with Matrix Code 7 and this supercedes any "A" subscripts. Superscript "M" indicates method accredited to MCERTS. Results in italics are associated with a control limit flag.
A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling.
Predominant Matrix Codes - 1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER.
Samples with Matrix Code 7 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our MCERTS accreditation.
Secondary Matrix Codes - A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal, E = contains roots/twigs.
IS indicates Insufficient sample for analysis. NDP indicates No Determination Possible. NAD indicates No Asbestos Detected.
Superscript # indicates method accredited to ISO 17025.
Analytical results reflect the quality of the sample at the time of analysis only.
Opinions and interpretations expressed are outside the scope of our accreditation.

MCERTS THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME
UKAS TESTING 1247

Envirolab Job Number: 12/03975, 12/04076, 12/04180

Client Project Name: NIAB Phase 1

Client Project Ref: 25459

Lab Sample ID	12/03975/17	12/03975/18	12/03975/19	12/03975/20	12/04076/1	12/04076/2	12/04076/3		Units	Method ref
Client Sample No										
Client Sample ID	TPD	TPI	TPL	TPO	WSB	WSE	WSH			
Depth to Top	0.10	0.20	0.30	0.30	0.10	0.10	0.20			
Depth To Bottom	0.20				0.20	0.20	0.30			
Date Sampled	30-Aug-12	28-Aug-12	29-Aug-12	28-Aug-12	06-Sep-12	06-Sep-12	06-Sep-12			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil	Soil	Soil			
Sample Matrix Code	6AE	6AE	6AE	6A	5AE	6AE	5AE			
Asbestos in soil$_A$ [#]	-	-	NAD	-	NAD	NAD	-			A-T-045
pH$_D$ [M#]					6.92	-	7.34		pH	A-T-031s
Sulphate (water sol 2:1)$_D$ [M#]					0.10	-	<0.01		g/l	A-T-026s
Organic matter$_D$ [M#]	-	-	-	-	2.0	-	-		% w/w	A-T-032 OM
Arsenic$_D$ [M#]	8	8	8	7	9	7	12		mg/kg	A-T-024
Cadmium$_D$ [M#]	<0.5	1.5	0.6	<0.5	0.6	0.6	0.7		mg/kg	A-T-024
Copper$_D$ [M#]	18	20	24	20	21	17	20		mg/kg	A-T-024
Chromium$_D$ [#]	24	29	31	29	26	37	25		mg/kg	A-T-024
Lead$_D$ [M#]	40	46	44	59	52	46	52		mg/kg	A-T-024
Mercury$_D$	0.25	0.27	0.36	0.51	0.19	0.26	<0.17		mg/kg	A-T-024
Nickel$_D$ [M#]	22	26	29	24	20	28	24		mg/kg	A-T-024
Selenium$_D$ [M#]	<1	<1	<1	<1	<1	<1	<1		mg/kg	A-T-024
Zinc$_D$ [M#]	49	59	214	62	64	60	55		mg/kg	A-T-024

Envirolab Job Number: 12/03975, 12/04076, 12/04180

Client Project Name: NIAB Phase 1

Client Project Ref: 25459

Lab Sample ID	12/04180/20	12/04180/21	12/04180/22	12/04180/23					Units	Method ref
Client Sample No										
Client Sample ID	WSM	BHK	BHG	WSM						
Depth to Top	0.10	0.00	0.00	0.30						
Depth To Bottom		0.50	0.50	0.40						
Date Sampled	06-Sep-12	28-Aug-12	28-Aug-12	06-Sep-12						
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES						
Sample Matrix Code	6ABE	6AE	4AE	4ABE						
Asbestos in soil$_A^{\#}$	NAD	-	-	-						A-T-045
Organic matter$_D^{M\#}$	-	-	-	0.9					% w/w	A-T-032 OM
Arsenic$_D^{M\#}$	11	7	9	9					mg/kg	A-T-024
Cadmium$_D^{M\#}$	1.6	1.7	1.5	1.7					mg/kg	A-T-024
Copper$_D^{M\#}$	23	20	18	14					mg/kg	A-T-024
Chromium$_D^{\#}$	26	28	24	26					mg/kg	A-T-024
Lead$_D^{M\#}$	42	32	42	18					mg/kg	A-T-024
Mercury$_D$	<0.17	0.25	<0.17	<0.17					mg/kg	A-T-024
Nickel$_D^{M\#}$	24	25	23	24					mg/kg	A-T-024
Selenium$_D^{M\#}$	<1	<1	<1	<1					mg/kg	A-T-024
Zinc$_D^{M\#}$	88	77	54	54					mg/kg	A-T-024

Envirolab Job Number: 12/03975, 12/04076, 12/04180 **Client Project Name: NIAB Phase 1**

Client Project Ref: 25459

Lab Sample ID	12/03975/17	12/03975/18	12/03975/19	12/03975/20	12/04076/1	12/04076/2	12/04076/3		Units	Method ref
Client Sample No										
Client Sample ID	TPD	TPI	TPL	TPO	WSB	WSE	WSH			
Depth to Top	0.10	0.20	0.30	0.30	0.10	0.10	0.20			
Depth To Bottom	0.20				0.20	0.20	0.30			
Date Sampled	30-Aug-12	28-Aug-12	29-Aug-12	28-Aug-12	06-Sep-12	06-Sep-12	06-Sep-12			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil	Soil	Soil			
Sample Matrix Code	6AE	6AE	6AE	6A	5AE	6AE	5AE			
PAH 16										
Acenaphthene$_A^{M\#}$	<0.01	-	<0.01	<0.01	<0.01	<0.01	-		mg/kg	A-T-019s
Acenaphthylene$_A^{\#}$	<0.01	-	<0.01	<0.01	<0.01	<0.01	-		mg/kg	A-T-019s
Anthracene$_A^{\#}$	<0.01	-	<0.01	<0.01	<0.01	<0.01	-		mg/kg	A-T-019s
Benzo(a)anthracene$_A^{M\#}$	0.02	-	0.04	0.04	0.07	0.04	-		mg/kg	A-T-019s
Benzo(a)pyrene$_A^{M\#}$	0.02	-	0.06	0.03	0.07	0.07	-		mg/kg	A-T-019s
Benzo(b)fluoranthene$_A$	0.05	-	0.12	0.07	0.13	0.09	-		mg/kg	A-T-019s
Benzo(ghi)perylene$_A^{M\#}$	0.01	-	0.07	0.03	0.06	0.04	-		mg/kg	A-T-019s
Benzo(k)fluoranthene$_A$	0.01	-	0.03	0.02	0.03	0.01	-		mg/kg	A-T-019s
Chrysene$_A^{M\#}$	0.03	-	0.07	0.07	0.08	0.05	-		mg/kg	A-T-019s
Dibenzo(ah)anthracene$_A$	<0.01	-	<0.01	<0.01	0.02	0.01	-		mg/kg	A-T-019s
Fluoranthene$_A^{M\#}$	0.01	-	0.06	0.08	0.09	0.06	-		mg/kg	A-T-019s
Fluorene$_A^{M\#}$	<0.01	-	<0.01	<0.01	<0.01	<0.01	-		mg/kg	A-T-019s
Indeno(123-cd)pyrene$_A^{\#}$	0.01	-	0.02	<0.01	0.06	0.04	-		mg/kg	A-T-019s
Naphthalene$_A^{M\#}$	<0.01	-	<0.01	<0.01	<0.01	<0.01	-		mg/kg	A-T-019s
Phenanthrene$_A^{M\#}$	<0.01	-	<0.01	0.03	<0.01	<0.01	-		mg/kg	A-T-019s
Pyrene$_A^{M\#}$	0.02	-	0.06	0.07	0.08	0.05	-		mg/kg	A-T-019s
Total PAH$_A$	0.19	-	0.52	0.44	0.71	0.48	-		mg/kg	A-T-019s
Pyrethroids										
Cyfluthrin					-	<0.1	-		mg/kg	Subcon
Cyhalothrin					-	<0.1	-		mg/kg	Subcon
Cypermethrin					-	<0.1	-		mg/kg	Subcon
Deltamethrin					-	<0.1	-		mg/kg	Subcon
Fenvalerate					-	<0.1	-		mg/kg	Subcon
Permethrin					-	<0.1	-		mg/kg	Subcon

Envirolab Job Number: 12/03975, 12/04076, 12/04180

Client Project Name: NIAB Phase 1

Client Project Ref: 25459

Lab Sample ID	12/04180/20	12/04180/21	12/04180/22	12/04180/23					Units	Method ref
Client Sample No										
Client Sample ID	WSM	BHK	BHG	WSM						
Depth to Top	0.10	0.00	0.00	0.30						
Depth To Bottom		0.50	0.50	0.40						
Date Sampled	06-Sep-12	28-Aug-12	28-Aug-12	06-Sep-12						
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES						
Sample Matrix Code	6ABE	6AE	4AE	4ABE						
PAH 16										
Acenaphthene$_A^{M\#}$	<0.01	-	-	-					mg/kg	A-T-019s
Acenaphthylene$_A^{\#}$	<0.01	-	-	-					mg/kg	A-T-019s
Anthracene$_A^{\#}$	<0.01	-	-	-					mg/kg	A-T-019s
Benzo(a)anthracene$_A^{M\#}$	0.04	-	-	-					mg/kg	A-T-019s
Benzo(a)pyrene$_A^{M\#}$	0.06	-	-	-					mg/kg	A-T-019s
Benzo(b)fluoranthene$_A$	0.11	-	-	-					mg/kg	A-T-019s
Benzo(ghi)perylene$_A^{M\#}$	0.07	-	-	-					mg/kg	A-T-019s
Benzo(k)fluoranthene$_A$	0.02	-	-	-					mg/kg	A-T-019s
Chrysene$_A^{M\#}$	0.07	-	-	-					mg/kg	A-T-019s
Dibenzo(ah)anthracene$_A$	<0.01	-	-	-					mg/kg	A-T-019s
Fluoranthene$_A^{M\#}$	0.08	-	-	-					mg/kg	A-T-019s
Fluorene$_A^{M\#}$	<0.01	-	-	-					mg/kg	A-T-019s
Indeno(123-cd)pyrene$_A^{\#}$	0.03	-	-	-					mg/kg	A-T-019s
Naphthalene$_A^{M\#}$	<0.01	-	-	-					mg/kg	A-T-019s
Phenanthrene$_A^{M\#}$	0.03	-	-	-					mg/kg	A-T-019s
Pyrene$_A^{M\#}$	0.09	-	-	-					mg/kg	A-T-019s
Total PAH$_A$	0.61	-	-	-					mg/kg	A-T-019s

Envirolab Job Number: 12/03975, 12/04076, 12/04180

Client Project Name: NIAB Phase 1

Client Project Ref: 25459

Lab Sample ID	12/04076/1	12/04076/2	12/04076/3						Units	Method ref
Client Sample No										
Client Sample ID	WSB	WSE	WSH							
Depth to Top	0.10	0.10	0.20							
Depth To Bottom	0.20	0.20	0.30							
Date Sampled	06-Sep-12	06-Sep-12	06-Sep-12							
Sample Type	Soil	Soil	Soil							
Sample Matrix Code	5AE	6AE	5AE							
Triazines (x11)										
Ametryn	-	<0.2	-						mg/kg	Subcon
Atraton	-	<0.1	-						mg/kg	Subcon
Atrazine	-	<0.02	-						mg/kg	Subcon
Cyanazine	-	<0.02	-						mg/kg	Subcon
Prometon	-	<0.1	-						mg/kg	Subcon
Prometryn	-	<0.02	-						mg/kg	Subcon
Propazine	-	<0.02	-						mg/kg	Subcon
Simazine	-	<0.02	-						mg/kg	Subcon
Simetryn	-	<0.1	-						mg/kg	Subcon
Terbuthylazine	-	<0.02	-						mg/kg	Subcon
Terbutryn	-	<0.02	-						mg/kg	Subcon

Lab Sample ID	12/04076/1	12/04076/2	12/04076/3						Units	Method ref
Client Sample No										
Client Sample ID	WSB	WSE	WSH							
Depth to Top	0.10	0.10	0.20							
Depth To Bottom	0.20	0.20	0.30							
Date Sampled	06-Sep-12	06-Sep-12	06-Sep-12							
Sample Type	Soil	Soil	Soil							
Sample Matrix Code	5AE	6AE	5AE							
Pest-c										
Mevinphos	-	<50	-						µg/kg	Subcon
Dichlorvos	-	<50	-						µg/kg	Subcon
alpha-Hexachlorocyclohexane (HCH)	-	<50	-						µg/kg	Subcon
Diazinon	-	<50	-						µg/kg	Subcon
gamma-Hexachlorocyclohexane (HCH / Lindane)	-	<50	-						µg/kg	Subcon
Heptachlor	-	<50	-						µg/kg	Subcon
Aldrin	-	<50	-						µg/kg	Subcon
beta-Hexachlorocyclohexane (HCH)	-	<50	-						µg/kg	Subcon
Methyl Parathion	-	<50	-						µg/kg	Subcon
Malathion	-	<50	-						µg/kg	Subcon
Fenitrothion	-	<50	-						µg/kg	Subcon
Heptachlor Epoxide	-	<50	-						µg/kg	Subcon
Parathion	-	<50	-						µg/kg	Subcon
p,p-DDE	-	<50	-						µg/kg	Subcon
p,p-DDT	-	<50	-						µg/kg	Subcon
p,p-Methoxychlor	-	<50	-						µg/kg	Subcon
p,p-TDE (DDD)	-	<50	-						µg/kg	Subcon
o,p-DDE	-	<50	-						µg/kg	Subcon
o,p-DDT	-	<50	-						µg/kg	Subcon
o,p-Methoxychlor	-	<50	-						µg/kg	Subcon
o,p-TDE (DDD)	-	<50	-						µg/kg	Subcon
Endosulphan I	-	<50	-						µg/kg	Subcon
Endosulphan II	-	<50	-						µg/kg	Subcon
Endosulphan Sulphate	-	<50	-						µg/kg	Subcon
Endrin	-	<50	-						µg/kg	Subcon
Ethion	-	<50	-						µg/kg	Subcon
Dieldrin	-	<50	-						µg/kg	Subcon
Azinphos-methyl	-	<50	-						µg/kg	Subcon

APPENDIX K
HUMAN HEALTH GENERIC ASSESSMENT CRITERIA

K1 – RESIDENTIAL END-USE

Generic assessment criteria for human health: residential scenario – private gardens

The human health generic assessment criteria (GAC) have been developed during a period of regulatory review and updating of the Contaminated Land Exposure Assessment (CLEA) project. Therefore, the Environment Agency (EA) is in the process of publishing updated reports relating to the CLEA project and the GAC presented in this document may change to reflect these updates. This issue was prepared following the publication of soil guideline value (SGV) reports and associated publications[(1)] for mercury, selenium, benzene, toluene, ethylbenzene and xylene in March 2009, arsenic and nickel in May 2009, cadmium and phenol in June 2009, dioxins, furans and dioxin-like polychlorinated biphenyls (PCBs) in September 2009. It was also produced following publication of GAC by LQM[(6)]. Where available, the published soil guideline values (SGV)[(1)] were used as the GAC. The GAC for lead is discussed separately below owing to it not being derived using the same approach as other compounds.

Lead GAC derivation

The Environment Agency SGV and Tox reports for lead were withdrawn in 2009. In addition, the provisional tolerable weekly intake data published in the Netherlands were withdrawn in 2010 owing to concerns that they were not suitably protective of human health. The withdrawn SGVs were based on a target blood lead concentration of 10µg/dl. In the absence of current guidelines many consultants continue to use the withdrawn SGV. However, as this is not considered sufficiently protective of human health, after attendance at the SOBRA summer workshop June 2011, RSK has revised its GAC and is currently undertaking a review of recent toxicological developments that will be used to refine this GAC further in the coming months. In the meantime, RSK has undertaken sensitivity analysis using the Society of Environmental Geochemistry and Health (SEGH) equation and the CLEA model to produce an interim GAC value. The results are summarised below:

- Using CLEA with the former provisional tolerable weekly intake (PTWI) (25 µg/kg bw), assuming 100% lead is bioavailable, produces a GAC of 212 mg/kg
- Using CLEA with the former PTWI, assuming 50% lead is bioavailable, produces a GAC of 478 mg/kg
- Using the SEGH equation amended for a blood target concentration of 5.6 µg/dl (equal to the LOAEL for IQ defects) gives a negative GAC number unless other factors such as child background blood concentration or delta are amended. Without undertaking further research into these numbers, RSK can present sensitivity analysis to demonstrate the sensitivity of these input parameters but cannot justify one parameter over another. The results are:
    - GAC between 39mg/kg and 99mg/kg if the value of delta (the slope or response of blood Pb versus soil and dust Pb relationship) only is amended from 5 to 2µg/dl/1000µg/g. The value of 2 was chosen as it is within the reasonable range quoted in the former SGV report
    - GAC between 244mg/kg and 610mg/kg if the geometric mean of blood lead concentration in young children is reduced from 3.4µg/dl to 2µg/dl. This decrease has been simulated on the basis that blood concentrations are likely to decrease over time across the UK owing to a ban on lead in petrol, lead within paint used internally and water pipe replacement. This decrease is considered reasonable as the site is a new development

so lead-based paints will not be used internally and lead water supply pipelines will be absent.

Therefore, given the results above RSK proposes to use a GAC of **300mg/kg** for a residential end use. This value is broadly in the middle of the range of sensitivity modelling results quoted above when background mean blood lead concentrations in children are reduced to reflect a new development. The value is also broadly in the middle of the range of sensitivity modelling results for a range of bioavailability of lead between 50% and 100%. This number is considered reasonably protective of human health while being practical for use.

GAC derivation for other metals and organic compounds

Model selection

Soil assessment criteria (SAC) were calculated using CLEA v1.06 and the supporting UK guidance[1–6]. Groundwater assessment criteria (GrAC) protective of human health via the inhalation pathway were derived using the RBCA 1.3b model. RSK has updated the inputs within RBCA to reflect the UK guidance[1–5]. The SAC and GrAC collectively are termed GAC.

Conceptual model

In accordance with EA Science Report SC050221/SR3[3], the residential with private garden scenario considers risks to a female child between the ages of 0 and 6 years old. In accordance with Box 3.1, SR3[3], the pathways considered for production of the SAC in the residential with gardens scenario are:

- direct soil and dust ingestion;
- consumption of home-grown produce;
- consumption of soil attached to home-grown produce;
- dermal contact with soil and indoor dust, and
- inhalation of indoor and outdoor dust and vapours.

Figure 1 is a conceptual model illustrating these linkages.

The pathway considered in production of the GrAC is the volatilisation of compounds from groundwater and subsequent vapour inhalation by residents while indoors. Figure 2 illustrates this linkage. Although the outdoor air inhalation pathway is also valid, this contributes little to the overall risks owing to the dilution in outdoor air. Within RBCA, the solubility limit of the determinant restricts the extent of volatilisation, which in turn drives the indoor air inhalation pathway. While the same restriction is not built into the CLEA model, the CLEA model output cells are flagged red where the soil saturation limit has been exceeded.

An assumption used in the CLEA model is that of simple linear partitioning of a chemical in the soil between the sorbed, dissolved and vapour phase[4]. The upper boundaries of this partitioning are represented by the aqueous solubility and pure saturated vapour concentration of the chemical. The CLEA software uses a traffic light system to identify when individual and/or combined assessment criteria exceed the lower of either the aqueous-based or the vapour based

saturation limits. Where model output cells are flagged red the soil or vapour saturation limit has been exceeded and further consideration of the SAC to be used within the assessment is required. One approach that could be adopted is to use the 'modelled' solubility saturation limit or vapour saturation limit of the compound as the SAC. However, as stated within the CLEA handbook[4] this is likely to not be practical in many cases because of the very low limits and, in any case, is highly conservative. Unless free-phase product is present, concentrations of the chemical are unlikely to be present at sufficient concentration to result in an exceedance of the health criteria value (HCV).

RSK has adopted an approach for petroleum hydrocarbons in accordance with LQM/CIEH[6] whereby the concentration modelled for each petroleum hydrocarbon fraction has been tabulated as the SAC with the corresponding solubility or vapour saturation limit given in brackets. Therefore, when using the SAC to screen laboratory analysis the assessor should take note if a given SAC has a corresponding solubility or vapour saturation limit (in brackets), and subsequently incorporate this piece of information within the screening analytical discussion. If further assessment is required following this process then an additional approach can be utilised as detailed within Section 4.12 of the CLEA model handbook[4], which explains how to calculate an effective assessment criterion manually.

Input selection

Chemical data was obtained from EA Report SC050021/SR7[5] and the health criteria values (HCV) from the UK TOX[1] reports where available. For SAC for total petroleum hydrocarbons (TPH) and polycyclic aromatic hydrocarbons (PAH), toxicological and chemical specific parameters were obtained from the LQM/CIEH report[6]. Similarly, toxicological and specific chemical parameters for the volatile organic compound 1,2,4-trimethylbenzene were obtained from EIC/AGS/CL:AIRE[7].

For total petroleum hydrocarbons (TPH), aromatic hydrocarbons C_5-C_8 were not modelled since benzene and toluene are being modelled separately. The aromatic C_8-C_9 hydrocarbon fraction comprises ethylbenzene, xylene and styrene. Since ethylbenzene and xylene are being modelled separately, the physical, chemical and toxicological data for this band has been taken from styrene.

Owing to the lack of UK-specific data, default information in the RBCA model was used to evaluate methyl tertiary butyl ether (MTBE). No published UK data was available for 1,3,5-trimethylbenzene, so information was obtained from the US EPA as in the RBCA model. RBCA uses toxicity data for the inhalation pathway in different units to the CLEA model and cannot consider separately the mean daily intake (MDI), occupancy periods or breathing rates. Therefore, the HCV in RBCA was amended to take account of:

- amendments to the MDI using Table 3.4 of SR2[2]
- a child weighing 13.3kg (average of 0–6 year old female in accordance with Table 4.6 of SR3[3]) and breathing 11.85m^3 (average daily inhalation rate for a 0–6-year old female in accordance with Table 4.14 of SR3[3]

1. The 50% rule (for petroleum hydrocarbons, trimethylbenzenes and MTBE)[2] where MDI data is not available but background exposure is considered important in the overall exposure.

Physical parameters

For the residential with private gardens scenario, the CLEA default building is a small two-storey terrace house with concrete ground-bearing slab. The house is assumed to have a 100m^2 private garden consisting of lawn, flowerbeds and incorporating a 20m^2 plot for growing fruit and vegetables consumed by the residents. SR3[3] notes this residential building type to be the most conservative in terms of protection from vapour intrusion. The building parameters are outlined in Table 5.

The parameters for a sandy loam soil type were used in line with SR3[3]. This includes a value of 6% for the percentage of soil organic matter (SOM) within the soil. In RSK's experience, this is rather high for many sites. To avoid undertaking site-specific risk assessments for this parameter, RSK has produced an additional set of SAC for an SOM of 1% and 2.5%. For the GrAC, the depth to groundwater was taken as 2.5m based on RSK's experience of assessing the volatilisation pathway from groundwater.

GAC

The SAC were produced using the input parameters in Tables 1 to 5 and the GrAC using input parameters in Table 6. The final selected GAC are presented by pathway in Table 7 and the combined GAC in Table 8.

Figure 1: Conceptual model for CLEA residential scenario – private gardens

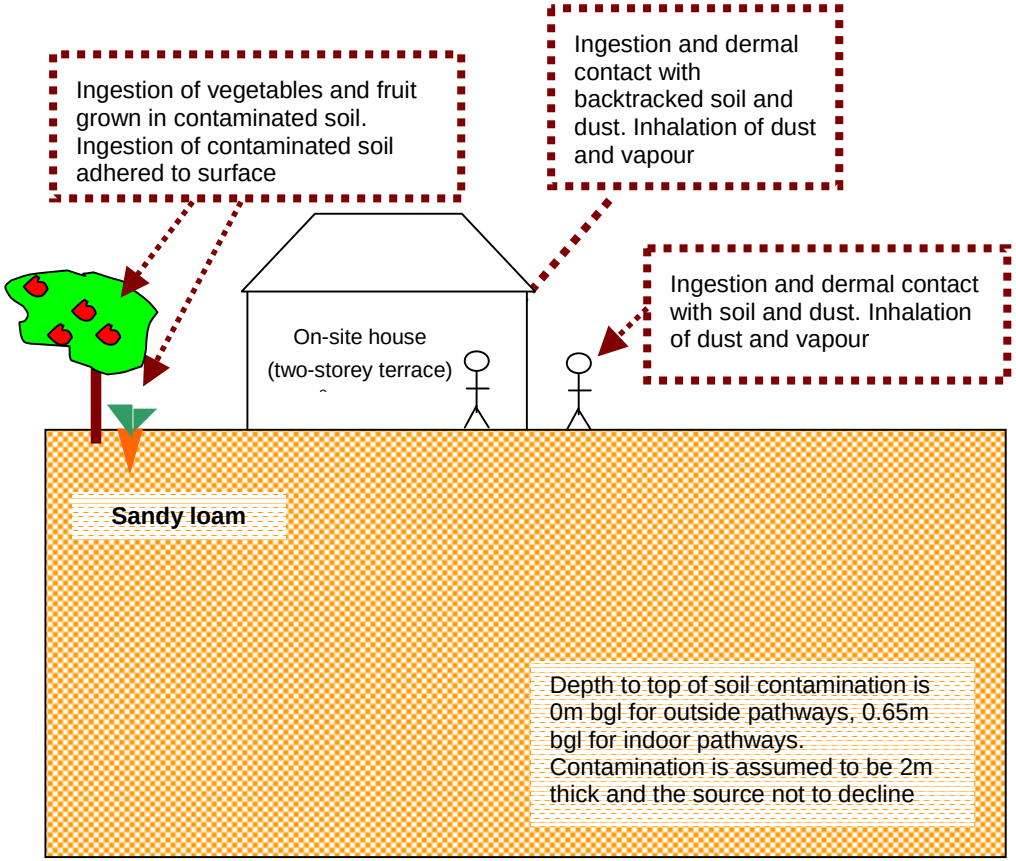

Table 1: Exposure assessment parameters for residential scenario - private gardens – inputs for CLEA model

Parameter	Value	Justification
Land use	Residential with homegrown produce	Chosen land use
Receptor	Female child age 1 to 6	Key generic assumption given in Box 3.1, report SC050021/SR3[3]
Building	Small terraced house	Key generic assumption given in Box 3.1, report SC050021/SR3. Two storey small terraced house chosen as it is the most conservative residential building type in terms of protection from vapor intrusion (Section 3.4.6, report SC050021/SR3)[3]
Soil type	Sandy Loam	Most common UK soil type (Section 4.3.1, From Table 3.1, report SC050021/SR3)[3]
Start AC (age class)	1	Range of age classes corresponding to key generic assumption that the critical receptor is a young female child aged zero to six. From Box 3.1, report SC050021/SR3[3]
End AC (age class)	6	
SOM (%)	6	Representative of sandy loamy soil according to EA guidance note dated January 2009 entitled 'Changes We Have Made to the CLEA Framework Documents'[8]
	1	To provide SAC for sites where SOM <6% as often observed by RSK
	2.5	
pH	7	Model default

Table 2: Residential with private gardens –home-grown produce data for CLEA model

	Consumption rate (g FW kg^{-1} BW day^{-1}) by age class						Dry weight conversion factor	Home-grown fraction (average)	Home-grown fraction (high end)	Soil loading factor	Preparation correction factor
Name	1	2	3	4	5	6	g DW g^{-1} FW	-	-	g g^{-1} DW	-
Green vegetables	7.12	6.85	6.85	6.85	3.74	3.74	0.096	0.05	0.33	1.00E-03	2.00E-01
Root vegetables	10.69	3.30	3.30	3.30	1.77	1.77	0.103	0.06	0.4	1.00E-03	1.00E+00
Tuber vegetables	16.03	5.46	5.46	5.46	3.38	3.38	0.21	0.02	0.13	1.00E-03	1.00E+00
Herbaceous fruit	1.83	3.96	3.96	3.96	1.85	1.85	0.058	0.06	0.4	1.00E-03	6.00E-01
Shrub fruit	2.23	0.54	0.54	0.54	0.16	0.16	0.166	0.09	0.6	1.00E-03	6.00E-01
Tree fruit	3.82	11.96	11.96	11.96	4.26	4.26	0.157	0.04	0.27	1.00E-03	6.00E-01
Justification	Table 4.17, SR3(3)						Table 6.3, SR3(3)	Table 4.19, SR3(3)		Table 6.3, SR3(3)	

Table 3: Residential with private gardens – land use data for CLEA model

Parameter	Unit	Age class					
		1	2	3	4	5	6
EF (soil and dust ingestion)	day yr^{-1}	180	365	365	365	365	365
EF (consumption of home-grown produce)	day yr^{-1}	180	365	365	365	365	365
EF (skin contact, indoor)	day yr^{-1}	180	365	365	365	365	365
EF (skin contact, outdoor)	day yr^{-1}	180	365	365	365	365	365
EF (inhalation of dust and vapour, indoor)	day yr^{-1}	365	365	365	365	365	365
EF (inhalation of dust and vapour, outdoor)	day yr^{-1}	365	365	365	365	365	365
Justification		Table 3.1, SR3[3]					
Occupancy period (indoor)	hr day^{-1}	23	23	23	23	19	19
Occupancy period (outdoor)	hr day^{-1}	1	1	1	1	1	1
Justification		Table 3.2, SR3[3]					
Soil to skin adherence factor (indoor)	mg cm^{-2} day^{-1}	6.00E-02	6.00E-02	6.00E-02	6.00E-02	6.00E-02	6.00E-02
Soil to skin adherence factor (outdoor)	mg cm^{-2} day^{-1}	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
Justification		Table 8.1, SR3[3]					
Soil and dust ingestion rate	g day^{-1}	1.00E-01	1.00E-01	1.00E-01	1.00E-01	1.00E-01	1.00E-01
Justification		Table 6.2, SR3[3]					

Of note, for **cadmium**, the exposure assessment for a residential land use is based on estimates representative of lifetime exposure AC1-18. This is because the TDI_{oral} and TDI_{inh} – are based on considerations of the kidney burden accumulated over 50 years. It is therefore reasonable to consider exposure not only in childhood but averaged over a longer time period. See the Environment Agency Science report: SC05002 / TOX 3 [1] and Science Report SC050021/Cadmium SGV [1] for more information.

Table 4: Residential with private gardens – receptor data for CLEA model

Parameter	Unit	Age Class						Justification
		1	2	3	4	5	6	
Body weight	kg	5.6	9.8	12.7	15.1	16.9	19.7	Table 4.6, SR3[3]
Body height	m	0.7	0.8	0.9	0.9	1	1.1	
Inhalation rate	m^3 day^{-1}	8.5	13.3	12.7	12.2	12.2	12.2	Table 4.14, SR3[3]
Max exposed skin fraction (indoor)	m^2 m^{-2}	0.32	0.33	0.32	0.35	0.35	0.33	Table 4.8, SR3[3]
Max exposed skin fraction (outdoor)	m^2 m^{-2}	0.26	0.26	0.25	0.28	0.28	0.26	

See cadmium note as per Table 3 above.

Table 5: Residential with private gardens – soil and building inputs for CLEA model

Parameter	Unit	Value	Justification
Soil properties for sandy loam			
Porosity, total	cm^3 cm^{-3}	0.53	Default soil type is sandy loam, Section 4.3.1, SR3[3] Parameters for sandy loam from Table 4.4, SR3[3]
Porosity, air filled	cm^3 cm^{-3}	0.20	
Porosity, water filled	cm^3 cm^{-3}	0.33	
Residual soil water content	cm^3 cm^{-3}	0.12	
Saturated hydraulic conductivity	cm s^{-1}	3.56E-03	
van Genuchten shape parameter (*m*)	-	3.20E-01	
Bulk density	g cm^{-3}	1.21	
Threshold value of wind speed at 10m	m s^{-1}	7.20	Default value taken from Section 9.2.2, SR3[3]
Empirical function (F_x) for dust model	-	1.22	Value taken from Section 9.2.2, SR3[3]
Ambient soil temperature	K	283	Annual average soil temperature representative of UK surface soils. Section 4.3.1, SR3[3]
Air dispersion model			
Mean annual wind speed (10m)	m s^{-1}	5.00	Default value taken from Section 9.2.2, SR3[3]
Air dispersion factor at height of 0.8m	g m^{-2} s^{-1} per kg m^{-3}	2400	Values for a 0.01 ha site, appropriate to a residential land use in Newcastle (most representative city for UK). (from Table 9.1, SR3)[3] Assumed child of 6 is not tall enough to reach 1.6m
Air dispersion factor at height of 1.6m	g m^{-2} s^{-1} per kg m^{-3}	0	
Fraction of site with hard or vegetative cover	m^2 m^{-2}	0.75	Section 3.2.6, SR3 [3] based on residential land use

Parameter	Unit	Value	Justification
Building properties for small terrace house with ground-bearing floor slab			
Building footprint	m^2	28	From Table 3.3 and 4.21, SR3[3]
Living space air exchange rate	hr^{-1}	0.50	
Living space height (above ground)	m	4.8	
Living space height (below ground)	m	0.0	Assumed no basement
Pressure difference (soil to enclosed space)	Pa	3.1	From Table 3.3, SR3[3]
Foundation thickness	m	0.15	
Floor crack area	cm^2	423	
Dust loading factor	$\mu g\ m^{-3}$	50	Default value for a residential site taken from Section 9.3, SR3[3]
Vapour model			
Default soil gas ingress rate	$cm^3\ s^{-1}$	25	Generic flow rate, Section 10.3, SR3[3]
Depth to top of source (beneath building)	cm	50	Section 3.2.6, SR3 [3] states source is 50cm below building or 65cm below ground surface
Depth to top of source (no building)	cm	0	Section 10.2, SR3 [3] assumes impact from 0m to 1m for outdoor inhalation pathway
Thickness of contaminant layer	cm	200	Model default for indoor air, Section 4.9, SR4[4]
Time average period for surface emissions	years	6	Time period of a 0 to 6 year old, Box 3.5, SR3[3]
User-defined effective air permeability	cm^2	3.05E-08	Calculated for sandy loam using equations in Appendix 1, SR3[3]

Figure 2: GrAC conceptual model for RBCA residential with private gardens scenario

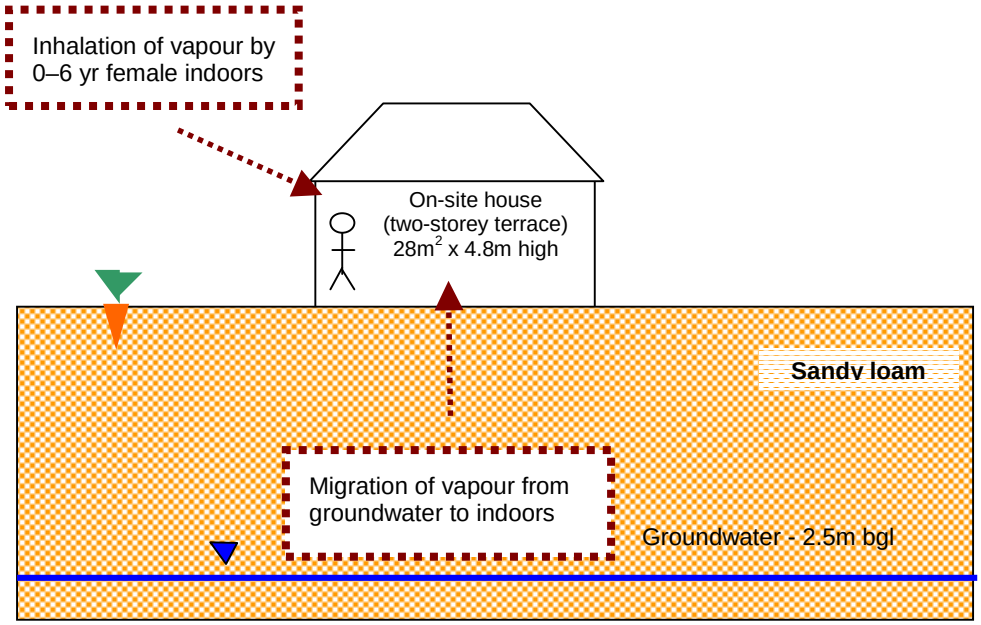

Table 6: Residential with private gardens – RBCA inputs

Parameter	Unit	Value	Justification
Receptor			
Averaging time	Years	6	From Box 3.1, SR3[3]
Receptor weight	kg	13.3	Average of CLEA 0–6 year old female data, Table 4.6, SR3[3]
Exposure duration	Years	6	From Box 3.1, report, SR3[3]
Exposure frequency	Days/yr	350	Weighted using occupancy period of 23 hours per day for 365 days of the year
Soil type – sandy loam			
Total porosity	-	0.53	CLEA value for sandy loam. Parameters for sandy loam from Table 4.4, SR3[3]
Volumetric water content	-	0.33	
Volumetric air content	-	0.20	
Dry bulk density	g cm^{-3}	1.21	
Vertical hydraulic conductivity	cm s^{-1}	3.56E-3	CLEA value for saturated conductivity of sandy loam, Table 4.4, SR3[3]
Vapour permeability	m^2	3.05E-12	Calculated for sandy loam using equations in Appendix 1, SR3[3]
Capillary zone thickness	m	0.1	Professional judgement

Parameter	Unit	Value	Justification
Fraction organic carbon	%	(i) 0.0348	Representative of sandy loam according to EA guidance note dated January 2009 entitled 'Changes We Have Made to the CLEA Framework Documents'[8]
		(ii) 0.0058	To provide SAC for sites where SOM < 6% as often observed by RSK
Building			
Building volume/area ratio	m	4.8	Table 3.3, SR3[3]
Foundation area	m^2	28	
Foundation perimeter	m	22	Calculated assuming building measures 7m x 4m to give 28m^2 foundation area
Building air exchange rate	d^{-1}	12	Table 3.3, SR3[3]
Depth to bottom of foundation slab	m	0.15	
Foundation thickness	m	0.15	
Foundation crack fraction	-	0.0151	Calculated from floor crack area of 423 cm^2 and building footprint of 28m^2 in Table 4.21, SR3[3]
Volumetric water content of cracks	-	0.33	Assumed equal to underlying soil type in assumption that cracks become filled with soil over time. Parameters for sandy loam from Table 4.4, SR3[3]
Volumetric air content of cracks	-	0.2	
Indoor/outdoor differential pressure	Pa	3.1	From Table 3.3, SR3[3]

References

1. Environment Agency (2009), 'Science Report SC050021/benzene SGV, toluene SGV, ethylbenzene SGV, xylene SGV, mercury SGV, selenium SGV, nickel SGV, arsenic SGV, cadmium SGV, phenol SGV, dioxins, furans and dioxin like PCBs SGVs', 'Supplementary information for the derivation of SGV for: benzene, toluene, ethylbenzene, xylene, mercury, selenium, nickel, arsenic, cadmium, phenol, dioxins, furans and dioxin- like PCBs', and 'Contaminants in soil: updated collation of toxicological data and intake values for humans: benzene, toluene, ethylbenzene, xylene, mercury, selenium, nickel, arsenic, cadmium, phenol, dioxins, furans and dioxin- like PCBs', March 2009, May 2009 and September 2009.

2. Environment Agency (2009), *Human health toxicological assessment of contaminants in soil. Science Report – Final SC050021/SR2*, January (Bristol: Environment Agency).

3. Environment Agency (2009), *Science Report – SC050021/SR3. Updated technical background to the CLEA model* (Bristol: Environment Agency).

4. Environment Agency (2009), Contaminated Land Exposure Assessment (CLEA) software, version 1.06.

5. Environment Agency (2008), *Science Report SC050021/SR7. Compilation of Data for Priority Organic Pollutants for Derivation of Soil Guideline Values* (Bristol: Environment Agency).

6. Chartered Institute for Environmental Health and Land Quality Management (2009), 'The LQM/CIEH Generic Assessment Criteria for Human Health', second edition.

7. CL:AIRE (2009), *Soil Generic Assessment Criteria for Human Health Risk Assessment* (London: CL:AIRE).

8. Changes made to the CLEA framework documents after the three-month evaluation period in 2008, released January 2009 by the Environment Agency.

GENERIC ASSESSMENT CRITERIA FOR HUMAN HEALTH - RESIDENTIAL WITH PRIVATE GARDENS

Table 7

Human Health Generic Assessment Criteria by Pathway for Residential Scenario - Private Gardens

Compound	Notes	GrAC (mg/l)	SAC Appropriate to Pathway SOM 1% (mg/kg)			Soil Saturation Limit (mg/kg)	SAC Appropriate to Pathway SOM 2.5% (mg/kg)			Soil Saturation Limit (mg/kg)	SAC Appropriate to Pathway SOM 6% (mg/kg)			Soil Saturation Limit (mg/kg)
			Oral	Inhalation	Combined		Oral	Inhalation	Combined		Oral	Inhalation	Combined	
Metals														
Arsenic	(b)(c)	-	3.24E+01	8.50E+01	-	NR	3.24E+01	8.50E+01	-	NR	3.24E+01	8.50E+01	-	NR
Cadmium	(b)	-	1.12E+01	1.85E+02	1.10E+01	NR	1.12E+01	1.85E+02	1.10E+01	NR	1.12E+01	1.85E+02	1.10E+01	NR
Chromium (III) - oxide		-	1.84E+04	3.55E+03	2.98E+03	NR	1.84E+04	3.55E+03	2.98E+03	NR	1.84E+04	3.55E+03	2.98E+03	NR
Chromium (VI) - hexavalent		-	1.02E+01	4.25E+00	3.21E+00	NR	1.02E+01	4.25E+00	3.21E+00	NR	1.02E+01	4.25E+00	3.21E+00	NR
Copper		-	2.66E+03	1.04E+04	2.33E+03	NR	2.66E+03	1.04E+04	2.33E+03	NR	2.66E+03	1.04E+04	2.33E+03	NR
Lead	(a)	-	3.00E+02	-	-	NR	3.00E+02	-	-	NR	3.00E+02	-	-	NR
Elemental Mercury (Hg^0)	(b)(d)	9.40E-03	-	1.70E-01	-	4.31E+00	-	4.24E-01	-	1.07E+01	-	1.02E+00	-	2.58E+01
Inorganic Mercury (Hg^{2+})	(b)	-	1.81E+02	2.55E+03	1.69E+02	NR	1.81E+02	2.55E+03	1.69E+02	NR	1.81E+02	2.55E+03	1.69E+02	NR
Methyl Mercury (Hg^{4+})	(b)	2.00E+01	1.39E+01	1.59E+01	7.40E+00	7.33E+01	1.39E+01	3.08E+01	9.55E+00	1.42E+02	1.39E+01	6.53E+01	1.14E+01	3.04E+02
Nickel	(b)(d)	-	5.31E+02	1.27E+02	-	NR	5.31E+02	1.27E+02	-	NR	5.31E+02	1.27E+02	-	NR
Selenium	(b)(c)	-	3.50E+02	-	-	NR	3.50E+02	NR	-	NR	3.50E+02	-	-	NR
Zinc	(c)	-	3.75E+03	2.55E+07	-	NR	3.75E+03	2.55E+07	-	NR	3.75E+03	2.55E+07	-	NR
Cyanide		-	2.66E+01	3.97E+00	3.68E+00	NR	2.66E+01	3.97E+00	3.68E+00	NR	2.66E+01	3.97E+00	3.68E+00	NR
Volatile Organic Compounds														
Benzene	(b)	7.20E+00	1.12E-01	2.69E-01	7.92E-02	1.22E+03	2.28E-01	4.99E-01	1.57E-01	2.26E+03	4.89E-01	1.04E+00	3.32E-01	4.71E+03
Toluene	(b)	1.90E+03	1.47E+02	6.26E+02	1.19E+02	8.69E+02	3.35E+02	1.38E+03	2.70E+02	1.92E+03	7.59E+02	3.14E+03	6.11E+02	4.36E+03
Ethylbenzene	(b)	2.60E+02	1.06E+02	1.70E+02	6.52E+01	5.18E+02	2.51E+02	3.98E+02	1.54E+02	1.22E+03	5.70E+02	9.32E+02	3.54E+02	2.84E+03
Xylene - m	(b)	8.40E+01	2.02E+02	5.56E+01	4.36E+01	6.25E+02	4.80E+02	1.31E+02	1.03E+02	1.47E+03	1.09E+03	3.07E+02	2.40E+02	3.46E+03
Xylene - o		1.00E+02	1.85E+02	5.98E+01	4.52E+01	4.78E+02	4.38E+02	1.40E+02	1.06E+02	1.12E+03	9.96E+02	3.27E+02	2.46E+02	2.62E+03
Xylene - p		8.70E+01	1.91E+02	5.34E+01	4.17E+01	5.76E+02	4.51E+02	1.26E+02	9.82E+01	1.35E+03	1.02E+03	2.94E+02	2.28E+02	3.17E+03
Total xylene		8.40E+01	2.02E+02	5.56E+01	4.36E+01	6.25E+02	4.80E+02	1.31E+02	1.03E+02	1.47E+03	1.09E+03	3.07E+02	2.40E+02	3.46E+03
Methyl t-Butyl ether		2.20E+03	1.75E+00	1.84E+02	1.75E+00	1.66E+04	3.68E+00	2.40E+02	3.67E+00	2.16E+04	7.41E+00	3.70E+02	7.37E+00	3.34E+04
Trichloroethene		1.80E+00	2.83E+00	1.10E-01	1.06E-01	1.54E+03	6.25E+00	2.30E-01	2.22E-01	3.22E+03	1.40E+01	5.11E-01	4.93E-01	7.14E+03
Tetrachloroethene		3.60E+00	1.06E+01	1.03E+00	9.36E-01	4.24E+02	2.44E+01	2.30E+00	2.10E+00	9.51E+02	5.55E+01	5.28E+00	4.82E+00	2.18E+03
1,1,1-Trichloroethane		2.60E+01	3.20E+02	6.33E+00	6.21E+00	1.43E+03	6.97E+02	1.29E+01	1.27E+01	2.92E+03	1.55E+03	2.84E+01	2.79E+01	6.39E+03
1,1,1,2 Tetrachloroethane		1.40E+01	5.19E+00	1.08E+00	8.93E-01	2.60E+03	1.22E+01	2.50E+00	2.08E+00	6.02E+03	2.78E+01	5.83E+00	4.82E+00	1.40E+04
1,1,2,2-Tetrachloroethane		1.40E+01	2.70E+00	2.76E+00	1.37E+00	2.67E+03	5.85E+00	5.65E+00	2.87E+00	5.46E+03	1.30E+01	1.24E+01	6.34E+00	1.20E+04
Carbon Tetrachloride		5.50E-02	1.05E+00	1.81E-02	1.79E-02	1.52E+03	2.41E+00	3.97E-02	3.93E-02	3.32E+03	5.44E+00	8.99E-02	8.92E-02	7.54E+03
1,2-Dichloroethane		3.00E-01	3.06E-02	6.46E-03	5.34E-03	3.41E+03	5.53E-02	9.32E-03	7.98E-03	4.91E+03	1.05E-01	1.60E-02	1.39E-02	8.43E+03
Vinyl Chloride		1.90E-02	3.69E-03	5.43E-04	4.73E-04	1.36E+03	6.64E-03	7.02E-04	6.35E-04	1.76E+03	1.21E-02	1.07E-03	9.86E-04	2.69E+03
1,2,4-Trimethylbenzene		7.50E-02	-	3.51E-01	-	5.57E+02	-	8.55E-01	-	1.36E+03	-	2.10E+00	-	3.25E+03
1,3,5-Trimethylbenzene		4.70E-02	1.45E+01	4.60E-01	4.56E-01	9.47E+01	3.47E+01	1.10E+00	1.09E+00	2.26E+02	7.94E+01	2.59E+00	2.56E+00	5.33E+02
Semi-Volatile Organic Compounds														
Acenaphthene		3.20E+00	2.18E+02	3.46E+03	2.05E+02	5.70E+01	5.08E+02	8.54E+03	4.79E+02	1.41E+02	1.06E+03	2.03E+04	1.01E+03	3.36E+02
Acenaphthylene		4.20E+00	1.78E+02	3.27E+03	1.68E+02	8.61E+01	4.17E+02	8.03E+03	3.97E+02	2.12E+02	8.90E+02	1.91E+04	8.51E+02	5.06E+02
Anthracene		2.10E-02	2.31E+03	1.08E+05	2.26E+03	1.17E+00	5.03E+03	2.65E+05	4.93E+03	2.91E+00	9.33E+03	6.15E+05	9.19E+03	6.96E+00
Benzo(a)anthracene		3.80E-03	7.00E+00	5.55E+00	3.10E+00	1.71E+00	8.98E+00	9.83E+00	4.69E+00	4.28E+00	1.01E+01	1.41E+01	5.88E+00	1.03E+01
Benzo(b)fluoranthene		2.00E-03	8.06E+00	1.79E+01	5.56E+00	1.22E+00	9.78E+00	1.97E+01	6.53E+00	3.04E+00	1.07E+01	2.05E+01	7.02E+00	7.29E+00
Benzo(g,h,i)perylene		2.60E-04	6.68E+01	1.27E+02	4.38E+01	1.54E-02	7.04E+01	1.32E+02	4.59E+01	3.85E-02	7.19E+01	1.34E+02	4.68E+01	9.23E-02
Benzo(k)fluoranthene		9.00E-04	1.25E+01	2.66E+01	8.51E+00	6.87E-01	1.44E+01	2.83E+01	9.56E+00	1.72E+00	1.53E+01	2.91E+01	1.00E+01	4.12E+00
Chrysene		2.00E-03	8.76E+00	1.95E+01	6.00E+00	4.40E-01	1.20E+01	2.45E+01	8.04E+00	1.10E+00	1.41E+01	2.72E+01	9.27E+00	2.64E+00
Dibenzo(a,h)anthracene		6.00E-04	1.19E+00	2.13E+00	7.62E-01	3.93E-03	1.33E+00	2.42E+00	8.58E-01	9.82E-03	1.39E+00	2.56E+00	9.03E-01	2.36E-02
Fluoranthene		2.30E-01	2.59E+02	2.69E+04	2.57E+02	1.89E+01	4.67E+02	6.23E+04	4.63E+02	4.73E+01	6.78E+02	1.28E+05	6.74E+02	1.13E+02
Fluorene		1.90E+00	1.70E+02	4.35E+03	1.63E+02	3.09E+01	3.91E+02	1.07E+04	3.77E+02	7.65E+01	8.00E+02	2.54E+04	7.76E+02	1.83E+02
Indeno(1,2,3-cd)pyrene		2.00E-04	4.58E+00	1.04E+01	3.18E+00	6.13E-02	5.74E+00	1.17E+01	3.85E+00	1.53E-01	6.37E+00	1.22E+01	4.19E+00	3.68E-01
Phenanthrene		5.30E-01	9.35E+01	5.04E+03	9.18E+01	3.60E+01	2.04E+02	1.23E+04	2.01E+02	8.96E+01	3.81E+02	2.86E+04	3.76E+02	2.14E+02
Pyrene		1.30E-01	5.69E+02	6.18E+04	5.63E+02	2.20E+00	1.05E+03	1.44E+05	1.04E+03	5.49E+00	1.56E+03	2.97E+05	1.56E+03	1.32E+01
Benzo(a)pyrene		3.80E-03	1.21E+00	2.62E+00	8.26E-01	9.11E-01	1.42E+00	2.81E+00	9.43E-01	2.28E+00	1.52E+00	2.90E+00	9.98E-01	5.46E+00
Naphthalene		1.90E+01	2.68E+01	1.64E+00	1.54E+00	7.64E+01	6.36E+01	3.93E+00	3.70E+00	1.83E+02	1.43E+02	9.27E+00	8.71E+00	4.32E+02
Phenol	(b)	-	4.51E+02	3.11E+02	1.84E+02	4.16E+04	9.38E+02	4.20E+02	2.90E+02	8.15E+04	2.04E+03	5.21E+02	4.15E+02	1.74E+05

Table 7

Human Health Generic Assessment Criteria by Pathway for Residential Scenario - Private Gardens

Compound	Notes	GrAC (mg/l)	SAC Appropriate to Pathway SOM 1% (mg/kg)			Soil Saturation Limit (mg/kg)	SAC Appropriate to Pathway SOM 2.5% (mg/kg)			Soil Saturation Limit (mg/kg)	SAC Appropriate to Pathway SOM 6% (mg/kg)			Soil Saturation Limit (mg/kg)
			Oral	Inhalation	Combined		Oral	Inhalation	Combined		Oral	Inhalation	Combined	
Total Petroleum Hydrocarbons														
Aliphatic hydrocarbons EC_5-EC_6		1.00E+01	4.79E+03	2.98E+01	2.97E+01	3.04E+02	1.08E+04	5.47E+01	5.46E+01	5.58E+02	2.35E+04	1.13E+02	1.13E+02	1.15E+03
Aliphatic hydrocarbons >EC_6-EC_8		5.40E+00	1.43E+04	7.27E+01	7.26E+01	1.44E+02	3.21E+04	1.62E+02	1.62E+02	3.22E+02	6.36E+04	3.72E+02	3.71E+02	7.36E+02
Aliphatic hydrocarbons >EC_8-EC_{10}		2.30E-01	1.46E+03	1.89E+01	1.88E+01	7.77E+01	2.44E+03	4.60E+01	4.58E+01	1.90E+02	3.30E+03	1.09E+02	1.08E+02	4.51E+02
Aliphatic hydrocarbons >EC_{10}-EC_{12}		3.40E-02	3.52E+03	9.34E+01	9.28E+01	4.75E+01	4.01E+03	2.32E+02	2.29E+02	1.18E+02	4.24E+03	5.57E+02	5.37E+02	2.83E+02
Aliphatic hydrocarbons >EC_{12}-EC_{16}		7.60E-04	4.37E+03	7.82E+02	7.44E+02	2.37E+01	4.40E+03	1.95E+03	1.69E+03	5.91E+01	4.41E+03	4.68E+03	3.03E+03	1.42E+00
Aliphatic hydrocarbons >EC_{16}-EC_{35}	(c)	-	4.51E+04	-	-	8.48E+00	6.38E+04	-	-	2.12E+01	7.61E+04	-	-	5.09E+01
Aliphatic hydrocarbons >EC_{35}-EC_{44}	(c)	-	4.51E+04	-	-	8.48E+00	6.38E+04	-	-	2.12E+01	7.61E+04	-	-	5.09E+01
Aromatic hydrocarbons >EC_8-EC_9 (styrene)		7.40E+00	1.66E+02	2.65E+02	1.33E+02	6.20E+02	3.92E+02	6.47E+02	3.16E+02	1.52E+03	8.50E+02	1.54E+03	7.02E+02	3.61E+03
Aromatic hydrocarbons >EC_9-EC_{10}		7.40E+00	5.55E+01	3.33E+01	2.69E+01	6.13E+02	1.31E+02	8.16E+01	6.54E+01	1.50E+03	2.84E+02	1.94E+02	1.51E+02	3.58E+02
Aromatic hydrocarbons >EC_{10}-EC_{12}		2.50E-01	7.97E+01	1.82E+02	6.91E+01	3.64E+02	1.86E+02	4.48E+02	1.62E+02	8.99E+02	3.87E+02	1.07E+03	3.46E+02	2.15E+03
Aromatic hydrocarbons >EC_{12}-EC_{16}		5.80E+00	1.40E+02	2.00E+03	1.38E+02	1.69E+02	3.13E+02	4.96E+03	3.08E+02	4.19E+02	6.01E+02	1.18E+04	5.93E+02	1.00E+03
Aromatic hydrocarbons >EC_{16}-EC_{21}	(c)	-	2.47E+02	-	-	5.37E+01	4.82E+02	-	-	1.34E+02	7.66E+02	-	-	3.21E+02
Aromatic hydrocarbons >EC_{21}-EC_{35}	(c)	-	8.88E+02	-	-	4.83E+00	1.11E+03	-	-	1.21E+01	1.22E+03	-	-	2.90E+01
Aromatic hydrocarbons >EC_{35}-EC_{44}	(c)	-	8.88E+02	-	-	4.83E+00	1.11E+03	-	-	1.21E+01	1.22E+03	-	-	2.90E+01

Notes:

'-' Generic assessment criteria not calculated owing to low volatility of substance and therefore no pathway, or an absence of toxicological data.

NR - the compound is not volatile and therefore a soil saturation limit not calculated within CLEA

EC - equivalent carbon. GrAC - groundwater assessment criteria. SAC - soil assessment criteria.

The CLEA model output is colour coded depending upon whether the soil saturation limit has been exceeded.

Calculated SAC exceeds soil saturation limit and may significantly effect the interpretation of any exceedances since the contribution of the indoor and outdoor vapour pathway to total exposure is >10%. This shading has also been used for the RBCA output where the theoretical solubility limit has been exceeded. The SAC has been set as the model calculated SAC with the saturation limits shown in brackets.

Calculated SAC exceeds soil saturation limit but will not effect the SSV significantly since the contribution of the indoor and outdoor vapour pathway to total exposure is <10%.

Calculated SAC does not exceed the soil saturation limit.

For consistency where the theoretical solubility limit within RBCA has been exceeded in production of the GrAC, these cellls have also been hatched red.

The SAC for organic compounds are dependant upon soil organic matter (SOM) (%) content. To obtain SOM from total organic carbon (TOC) (%) divide by 0.58. 1% SOM is 0.58% TOC. DL Rowell Soil Science: Methods and Applications, Longmans, 1994.

SAC for TPH fractions, polycyclic aromatic hydrocarbons, MTBE, BTEX and trimethylbenzene compounds were produced using an attenuation factor for the indoor air inhalation pathway of 10 to reduce conservatism associated with the vapour inhalation pathway, section 10.1.1, SR3

(a) Sensitivity analysis undertaken on SEGH equation and CLEA model, considered reasonable in absence of UK specific data

(b) GAC taken from the Environment Agency SGV reports published 2009.

(c) SAC for selenium, aliphatic and aromatic hydrocarbons >EC16 does not include inhalation pathway owing to absence of toxicity data. SAC for arsenic is only based on oral contribution (rather than combined) owing to the relative small contribution from inhalation in accordance with the SGV report. The same approach has been adopted for zinc.

(d) SAC for elemental mercury, chromium VI and nickel is based on the inhalation pathway only owing to an absence of toxicity for elemental mercury, in accordance with the SGV report for nickel and LQM report for chromium VI.

GENERIC ASSESSMENT CRITERIA FOR HUMAN HEALTH - RESIDENTIAL WITH PRIVATE GARDENS

Table 8
Human Health Generic Assessment Criteria for Residential Scenario - Private Gardens

Compound	GrAC for Groundwater (mg/l)	SAC for Soil SOM 1% (mg/kg)	SAC for Soil SOM 2.5% (mg/kg)	SAC for Soil SOM 6% (mg/kg)
Metals				
Arsenic	-	32	32	32
Cadmium	-	10	10	10
Chormium (III) - oxide	-	3,000	3,000	3,000
Chromium (VI) - hexavalent	-	4.3	4.3	4.3
Copper	-	2,300	2,300	2,300
Lead	-	300	300	300
Elemental Mercury (Hg^0)	0.009	0.17	0.42	1.0
Inorganic Mercury (Hg^{2+})	-	170	170	170
Methyl Mercury (Hg^{4+})	20	7.4	9.6	11
Nickel	-	130	130	130
Selenium	-	350	350	350
Zinc	-	3,800	3,800	3,800
Cyanide	-	3.7	3.7	3.7
Volatile Organic Compounds				
Benzene	7	0.079	0.157	0.33
Toluene	1,900	120	270	610
Ethylbenzene	260	65	154	350
Xylene - m	100	44	103	240
Xylene - o	87	45	106	250
Xylene - p	84	42	98	230
Total xylene	84	44	103	240
Methyl tertiary butyl ether (MTBE)	2,200	1.8	3.7	7.4
Trichloroethene	1.8	0.11	0.2	0.49
Tetrachloroethene	3.6	0.94	2.1	4.8
1,1,1-Trichloroethane	26	6.2	12.7	28
1,1,1,2Tetrachloroethane	14	0.89	2.1	4.8
1,1,2,2-Tetrachloroethane	14	1.4	2.87	6.3
Carbon Tetrachloride	0.055	0.018	0.039	0.089
1,2-Dichloroethane	0.30	0.0053	0.0080	0.014
Vinyl Chloride	0.019	0.00047	0.0006	0.001
1,2,4-Trimethylbenzene	0.075	0.35	0.85	2.1
1,3,5-Trimethylbenzene	0.047	0.46	1.1	2.6
Semi-Volatile Organic Compounds				
Acenaphthene	3.2	210	480	1,000
Acenaphthylene	4.2	170	400	850
Anthracene	0.021	2,300	4,900	9,200
Benzo(a)anthracene	0.0038	3.1	4.7	5.9
Benzo(b)fluoranthene	0.0020	5.6	6.5	7.0
Benzo(g,h,i)perylene	0.00026	44	46	47
Benzo(k)fluoranthene	0.00080	8.5	9.6	10
Chrysene	0.0020	6.0	8.0	9.3
Dibenzo(a,h)anthracene	0.00060	0.76	0.86	0.90
Fluoranthene	0.23	260	460	670
Fluorene	1.9	160	380	780
Indeno(1,2,3-cd)pyrene	0.0002	3.2	3.8	4.2
Phenanthrene	0.53	92	200	380
Pyrene	0.13	560	1,000	1,600
Benzo(a)pyrene	0.0038	0.83	0.94	1.0
Naphthalene	19	1.5	3.7	8.7
Phenol	-	180	290	420
Total Petroleum Hydrocarbons				
Aliphatic hydrocarbons EC_5-EC_6	10	30	55	110
Aliphatic hydrocarbons >EC_6-EC_8	5.4	73	160	370
Aliphatic hydrocarbons >EC_8-EC_{10}	0.23	19	46	110
Aliphatic hydrocarbons >EC_{10}-EC_{12}	0.034	93 (48)	230 (118)	540 (283)
Aliphatic hydrocarbons >EC_{12}-EC_{16}	0.00076	744 (24)	1,700 (59)	3,000 (142)
Aliphatic hydrocarbons >EC_{16}-EC_{35}	-	45,100 (8.48)	64,000 (21)	76,000
Aliphatic hydrocarbons >EC_{35}-EC_{44}	-	45,100 (8.48)	64,000 (21)	76,000
Aromatic hydrocarbons >EC_8-EC_9 (styrene)	7.4	130	316	700
Aromatic hydrocarbons >EC_9-EC_{10}	7.4	27	65	150
Aromatic hydrocarbons >EC_{10}-EC_{12}	25	69	160	346
Aromatic hydrocarbons >EC_{12}-EC_{16}	5.8	140	310	593
Aromatic hydrocarbons >EC_{16}-EC_{21}	-	250	480	770
Aromatic hydrocarbons >EC_{21}-EC_{35}	-	890	1,100	1,230
Aromatic hydrocarbons >EC_{35}-EC_{44}	-	890	1,100	1,230

Notes:

'-' Generic assessment criteria not calculated owing to low volatility of substance and therefore no pathway, or an absence of toxicological data.

EC - equivalent carbon. GrAC - groundwater assessment criteria. SAC - soil assessment criteria.

The SAC for organic compounds are dependent on Soil Organic Matter (SOM) (%) content. To obtain SOM from total organic carbon (TOC) (%) divide by 0.58. 1% SOM is 0.58% TOC. DL Rowell Soil Science: Methods and Applications, Longmans, 1994.

SAC for TPH fractions, polycyclic aromatic hydrocarbons, MTBE, BTEX and trimethylbenzene compounds were produced using an attenuation factor for the indoor air inhalation pathway of 10 to reduce conservatism associated with the vapour inhalation pathway, section 10.1.1, SR3.

The SAC has been set as the model calculated SAC with the saturation limit shown in brackets. For consistency where the GrAC exceeds the solubility limit, GrAC has been set at the solubility limit. The GrAC conservative since concentrations of the chemical are very unlikely to be at sufficient concentration to result in an exceedance of the health criteria value at the point of exposure (i.e. indoor air) provided free-phase product is absent.

K2 – COMMERCIAL END-USE

Generic assessment criteria for human health: commercial scenario

The human health generic assessment criteria (GAC) have been developed during a period of regulatory review and updating of the Contaminated Land Exposure Assessment (CLEA) project. Therefore, the Environment Agency (EA) is in the process of publishing updated reports relating to the CLEA project and the GAC presented in this document may change to reflect these updates. This issue was prepared following the publication of soil guideline value (SGV) reports and associated publications[(1)] for mercury, selenium, benzene, toluene, ethylbenzene and xylene in March 2009, arsenic and nickel in May 2009, cadmium and phenol in June 2009, dioxins, furans and dioxin-like polychlorinated biphenyls (PCBs) in September 2009. It was also produced following publication of GAC by LQM[(6)]. Where available, the published soil guideline values (SGV)[(1)] were used as the GAC. The GAC for lead is discussed separately below owing to it not being derived using the same approach as other compounds.

Lead GAC derivation

The Environment Agency SGV and Tox reports for lead were withdrawn in 2009. In addition, the provisional tolerable weekly intake data published in the Netherlands was also withdrawn in 2010 owing to concerns that it was not suitably protective of human health. The withdrawn SGV was based on a target blood lead concentration 10 μg/dl. In the absence of current guidelines, many consultants have continued to use the withdrawn SGV. However, as this is not considered sufficiently protective of human health RSK has revised its GAC for lead and is currently undertaking a review of recent toxicological developments that will be used to refine this GAC further in the coming months.

Variable	Description of variable	Units	Value in SGV10	Revised value for RSK GAC
T	Health criteria value – reduced owing to concern that 10ug/dl may not be suitably protective of human health	ug/dl	10	5
G	Geometric standard deviation for B typically in range of 1.8 to 2.1	-	2.0	1.8
B	Geometric mean of blood lead concentration in adult women. The value used in SGV10 was based on UK data from 1995 from women in an urban area aged 16–44. Data in the US has shown decreases from between 1.7 and 2.2 to 1ug/dl between the late 1980s/early 1990s and late 1990s/early 2000s for adult females between 17 and 45 years old. Lead concentrations in blood are likely to be decreasing in the UK owing to a ban on lead in internal paint, a ban on lead in fuel and replacement of lead pipes for water supply	ug/dl	2.3	1.0
n	Selected on the basis of the degree of protection needed for a population at risk at the target concentration (T); the default value is 95%	-	1.645	1.645
$AT_{S, D}$	Averaging time assuming exposure over working lifetime. The value has been revised to reflect 49 years in accordance with CLEA commercial scenario outlined in SR3	days	15695	17885
BKSF	Biokinetic slope factor	ug/dl per ug/day	0.4	0.4
IR_S	Soil ingestion rate (including soil-derived indoor dust). This value has been revised to reflect the CLEA commercial scenario outlined in SR3	g/day	0.040	0.050
$AF_{S, D}$	Absorption fraction (same for soil and dust)	-	0.12	0.12
$EF_{S, D}$	Exposure frequency – based on CLEA commercial conceptual model	days/yr	230	230
ED	Exposure duration. This value has been revised to reflect CLEA commercial conceptual model outlined in SR3	years	43	49

The methodology utilised for the adult receptor is the Adult Lead Methodology used in the USA, which is a similar equation to that used in production of the UK SGV outlined in R&D publication SGV10. Parameters within the equation are presented below and have been updated to reflect:

- a revised and more health protective target blood level
- more recent US data pertaining to the geometric blood lead concentration, which indicates decreasing concentrations from 1988 to 2004
- more recent US data regarding the geometric standard deviation (the measure of inter-individual variability in blood lead concentrations within the adult population).

Although the update is based on US data, RSK considers that background blood levels in the UK will also be decreasing owing to lead pipes being replaced, lead no longer being used in fuel and lead paints being banned from internal use. Furthermore, RSK has run the equation with varying inputs to ascertain its sensitivity to certain parameters. Using the parameters outlined above RSK obtains a GAC of **600mg/kg** for an adult in a commercial setting. A similar value is obtained if all input parameters remain equal to those used in production of the former SGV but the soil ingestion rate is increased to reflect 50mg/day reported for the commercial scenario in SR3.

GAC derivation for other metals and organic compounds

Model selection

Soil assessment criteria (SAC) were calculated for compounds where SGV have not been published using CLEA v1.06 and the supporting UK guidance[1–6]. Groundwater assessment criteria (GrAC) protective of human health via the inhalation pathway were derived using the RBCA 1.3b model. RSK has updated the inputs within RBCA to reflect the UK guidance[2–5]. The SAC and GrAC collectively are termed GAC.

Pathway selection

In accordance with EA Science Report SC050221/SR3[3] the commercial scenario considers risks to a female worker who works from the age of 16 to 65 years. It should be noted that this end use is not suitable for a workplace nursery but also may be appropriate for a sport centre or shopping centre where children are present. In accordance with Box 3.5, SR3[3] the pathways considered for production of the SAC in the commercial scenario are:

- direct soil and dust ingestion
- dermal contact with soil both indoor and outdoors
- indoor air inhalation from soil and vapour and outdoor inhalation of soil and vapour.

Figure 1 is a conceptual model illustrating these linkages.

The pathway considered in production of the GrAC is the volatilisation of compounds from groundwater and subsequent vapour inhalation by workers while indoors. Figure 2 illustrates this linkage. Although the outdoor air inhalation pathway is also valid, this contributes little to the overall risks owing to the dilution in outdoor air.

Within RBCA, the solubility limit of the determinant restricts the extent of volatilisation, which in turn drives the indoor air inhalation pathway. While the same restriction is not built into the CLEA model, the model output cells are flagged red where the soil saturation limit has been exceeded.

An assumption used in the CLEA model is that of simple linear partitioning of a chemical in the soil between the sorbed, dissolved and vapour phase[4]. The upper boundaries of this partitioning are represented by the aqueous solubility and pure saturated vapour concentration of the chemical. The CLEA software uses a traffic light system to identify when individual and/or combined assessment criteria exceed the lower of either the aqueous-based or the vapour-based saturation limits. Where model output cells are flagged red the soil or vapour saturation limit has been exceeded and further consideration of the SAC to be used within the assessment is required. One approach that could be adopted is to use the 'modelled' solubility saturation limit or vapour saturation limit of the compound as the SAC. However, as stated within the CLEA handbook[4] this is likely to be impractical in many cases because of the very low solubility/vapour saturation limits and, in any case, is highly conservative. Unless free-phase product is present, concentrations of the chemical are unlikely to be present at sufficient concentration to result in an exceedance of the health criteria value (HCV).

RSK has adopted an approach for petroleum hydrocarbons in accordance with LQM/CIEH[6] whereby the concentration modelled for each petroleum hydrocarbon fraction has been tabulated as the SAC with the corresponding solubility or vapour saturation limits given in brackets. Therefore, when using the SAC to screen laboratory analysis the assessor should take note if a given SAC has a corresponding solubility saturation or vapour saturation limit (in brackets), and subsequently incorporate this information within the screening analytical discussion. If further assessment is required following this process then an additional approach can be utilised as detailed within Section 4.12 of the CLEA model handbook[4] which explains how to calculate an effective assessment criterion manually.

Input selection

Chemical data was obtained from EA Report SC050021/SR7[5] and the health criteria values (HCV) from the UK TOX[1] reports where available. For SAC for total petroleum hydrocarbons (TPH) and polycyclic aromatic hydrocarbons (PAH), toxicological and specific chemical parameters were obtained from the LQM/CIEH report[6]. Similarly, toxicological and specific chemical parameters for the volatile organic compound 1,2,4-trimethylbenzene were obtained from EIC/AGS/CL:AIRE[7].

For TPH, aromatic hydrocarbons C_5–C_8 were not modelled since benzene and toluene are being modelled separately. The aromatic C_8-C_9 hydrocarbon fraction comprises ethylbenzene, xylene and styrene. As ethylbenzene and xylene are being modelled separately, the physical, chemical and toxicological data for this band have been taken from styrene.

Owing to the lack of UK-specific data, default information in the RBCA model was used to evaluate methyl tertiary butyl ether (MTBE). No published UK data was available for 1,3,5-trimethylbenzene, so information was obtained from the US EPA as in the RBCA model. RBCA

uses toxicity data for the inhalation pathway in different units to the CLEA model and cannot consider separately the mean daily intake (MDI), occupancy periods or breathing rates. Therefore, the HCV in RBCA was amended to take account of:

- an adult weighing 70kg and breathing 14.8m^3 air per day in accordance with the UK TOX reports[2] and SR3[3]
- the 50% rule (for petroleum hydrocarbons, trimethylbenzenes and MTBE)[2] where MDI data is not currently available but background exposure is considered important in the overall exposure.

Physical parameters

For the commercial end use, the CLEA default pre-1970s three-storey office building was used. SR3 notes this commercial building type to be the most conservative in terms of protection from vapour intrusion. The building parameters are outlined in Table 3.

The parameters for a sandy loam soil type were used in line with SR3[3]. This includes a value of 6% for the percentage of soil organic matter (SOM) within the soil. In RSK's experience, this is rather high for many sites. To avoid undertaking site-specific risk assessments for this parameter, RSK has produced an additional set of SAC for an SOM of 1% and 2.5%.

For the GrAC, the depth to groundwater was taken as 2.5m based on RSK's experience of assessing the volatilisation pathway from groundwater.

GAC

The SAC were produced using the input parameters in Tables 1, 2 and 3 and the GrAC using the input parameters in Table 4. The final selected GAC are presented by pathway in Table 5 with the combined GAC in Table 6.

Figure 1: Conceptual model for CLEA commercial scenario

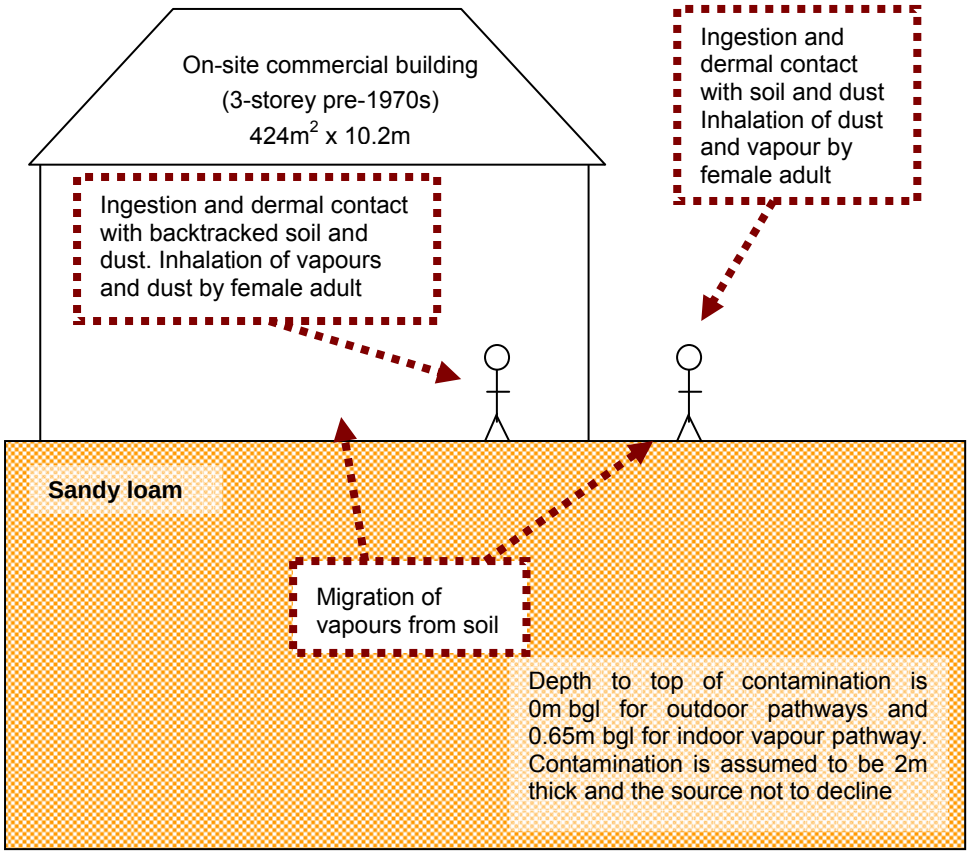

Table 1: Exposure assessment parameters for commercial scenario – inputs for CLEA model

Parameter	Value	Justification
Land use	Commercial	Chosen land use
Receptor	Female worker	Taken as female adult exposed over 49 years from age 16 to 65 years, Box 3.5, SR3[3]
Building	Office (pre-1970)	Key generic assumption given in Box 3.5, SR3[3]. Pre-1970s three-storey office building chosen as it is the most conservative in terms of protection from vapour intrusion (Section 3.4.6, SR3[3])
Soil type	Sandy loam	Most common UK soil type (Section 4.3.1, Table 4.4, SR3[3]). Table 4 presents soil-specific inputs
Start age class (AC)	17	AC corresponding to key generic assumption that the critical receptor is a working female adult exposed over a 49-year period from age 16 to 65 years. Assumption given in Box 3.5, SR3[3]. Data specific to AC exposure is presented in Table 2 and receptor specific in Table 3
End AC	17	
SOM (%)	6	Representative of sandy loam according to EA guidance note dated January 2009 entitled 'Changes We Have Made to the CLEA Framework Documents'[8]
	1	To provide SAC for sites where SOM < 6% as often observed by RSK
	2.5	
pH	7	Model default

Table 2: Commercial – receptor inputs for CLEA model

Parameter	Unit	Value	Justification
Exposure frequency (EF) (soil and dust ingestion)	day yr^{-1}	230	From Table 3.9, SR3[3]. The working week is assumed 45 hours including a 1-hour lunch break each day. Indoor and outdoor exposure are weighted by the frequency of time spent indoors and outdoors (8.3 hours a day and 0.7 hours a day respectively)
EF (dermal contact with dust. indoor)	day yr^{-1}	230	
EF (dermal contact with soil, outdoor)	day yr^{-1}	170	
EF (inhalation of dust and vapour, indoor)	day yr^{-1}	230	
EF (inhalation of dust and vapour, outdoor)	day yr^{-1}	170	
Occupancy period (indoor)	hr day^{-1}	8.3	Box 3.6, SR3[3]. Weighted average based on a nine-hour day including one-hour lunch being spent outside 75% of the year
Occupancy period (outdoor)	hr day^{-1}	0.7	
Soil to skin adherence factor (indoor and outdoor)	mg cm^{-2} day^{-1}	0.14	Table 8.1, SR3[3] for age class 17
Soil and dust ingestion rate	g day^{-1}	0.05	Table 6.2, SR3[3] for age class 17
Body weight	kg	70	Table 4.6, SR3[3] for female AC 17
Body height	m	1.6	Table 4.6, SR3[3] for female AC 17
Inhalation rate	m^3 day^{-1}	14.8	Table 4.14, SR3[3] for female AC 17
Max. exposed skin fraction (indoor and outdoors)	m^2 m^{-2}	0.08	Based on adult female assuming face and hands are exposed. Table 4.7, SR3[3]

Table 3: Commercial – soil, air and building inputs for CLEA model

Parameter	Unit	Value	Justification
Soil properties for sandy loam			
Porosity, total	$cm^3\ cm^{-3}$	0.53	Default soil type is sandy loam, Section 4.3.1, SR3[3]. Parameters for sandy loam from Table 4.4, SR3[3]
Porosity, air filled	$cm^3\ cm^{-3}$	0.20	
Porosity, water filled	$cm^3\ cm^{-3}$	0.33	
Residual soil water content	$cm^3\ cm^{-3}$	0.12	
Saturated hydraulic conductivity	$cm\ s^{-1}$	0.00356	
van Genuchten shape parameter (*m*)	-	0.3201	
Bulk density	$g\ cm^{-3}$	1.21	
Threshold value of wind speed at 10m	$m\ s^{-1}$	7.20	Default value taken from Section 9.2.2, SR3[3]
Empirical function (F_x) for dust model	-	1.22	Value taken from Section 9.2.2, SR3[3]
Ambient soil temperature	K	283	Annual average soil temperature of UK surface soils. Section 4.3.1, SR3[3]
Air dispersion model			
Mean annual wind speed (10m)	$m\ s^{-1}$	5.0	Default value taken from Section 9.2.2, SR3[3]
Air dispersion factor at height of 1.6m	$g\ m^{-2}\ s^{-1}$ per $kg\ m^{-3}$	120	From Table 9.1, SR3. Values for a 2ha site, appropriate to a commercial land use in Newcastle (most representative city for UK, section 9.2.1,SR3[3])
Fraction of site with hard or vegetative cover	$m^2\ m^{-2}$	0.8	Section 3.4.6 and 9.2.2, SR3[3] for average office such as that used in the commercial scenario
Building properties for office (pre-1970) with ground-bearing floor slab			
Building footprint	m^2	424	From Table 3.10, SR3[3]
Living space air exchange rate	hr^{-1}	1.0	
Living space height (above ground)	m	9.6	
Living space height (below ground)	m	0.0	Assumed no basement.
Pressure difference (soil to enclosed space)	Pa	4.4	From Table 3.10, SR3[3]
Foundation thickness	m	0.15	

Parameter	Unit	Value	Justification
Floor crack area	m^2	0.165	
Dust loading factor	$\mu g\ m^{-3}$	100	Default value for a commercial site taken from Section 9.3, SR3[3]
Vapour model			
Default soil gas ingress rate	$cm^3\ s^{-1}$	150	Section 10.3, report SC050021/SR3[3]
Depth to top of source (beneath building for indoor exposure)	cm	50	Section 3.4.6, SR3[3] states source is 50cm below building or 65cm below ground surface
Depth to top of source (outdoors)	cm	0	Section 10.2, SR3[3] assumes impact from 0-1m for outdoor inhalation pathway
Thickness of contaminant layer	cm	200	Model default for indoor air, Section 4.9, SR4[4]
Time average period for surface emissions	years	49	Working lifetime from 16–65 years. Key generic assumption given in Box 3.5, SR3[3]
User-defined effective air permeability	cm^2	3.05E-08	Calculated for sandy loam using equations in Appendix 1, SR3[3]

Figure 2: GrAC conceptual model for RBCA commercial scenario

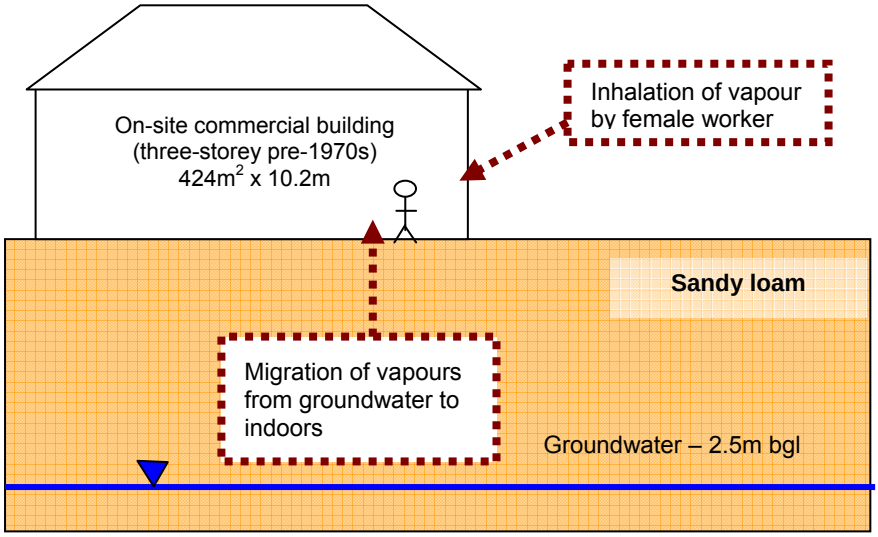

Table 4: Commercial – RBCA inputs

Parameter	Unit	Value	Justification
Receptor			
Averaging time	Years	49	From Box 3.5, SR3[3]
Receptor weight	kg	70	Female adult, Table 4.6, SR3[3]
Exposure duration	Years	49	From Box 3.5, SR3[3]
Exposure frequency	Days/yr	86.25	Weighted using occupancy period of 9 hours per day for 230 days of the year ((9hours x 230 days)/24 hours)
Soil type – sandy loam			
Total porosity	-	0.53	CLEA value for sandy loam. Parameters for sandy loam from Table 4.4, SR3[3]
Volumetric water content	-	0.33	
Volumetric air content	-	0.20	
Dry bulk density	g cm^{-3}	1.21	
Vertical hydraulic conductivity	cm s^{-1}	3.56E-3	CLEA value for saturated conductivity of sandy loam, Table 4.4, SR3[3]
Vapour permeability	m^2	3.05E-12	Calculated for sandy loam using equations in Appendix 1, SR3[3]
Capillary zone	m	0.1	Professional judgement

Parameter	Unit	Value	Justification
thickness			
Building			
Building volume/area ratio	m	9.6	Table 3.10, SR3[3]
Foundation area	m^2	424	Table 3.10, SR3[3]
Foundation perimeter	m	82.40	Based on square root of building area being 20.59m
Building air exchange rate	d^{-1}	24	Table 3.10, SR3[3]
Depth to bottom of foundation slab	m	0.15	
Foundation thickness	m	0.15	Table 3.10, SR3[3]
Foundation crack fraction	-	3.89E-04	Calculated from floor crack area of 0.165m^2 and building footprint of 424m^2 in Table 4.21, SR3[3]
Volumetric water content of cracks	-	0.33	Assumed equal to underlying soil type in assumption that cracks become filled with soil over time. Parameters for sandy loam from Table 4.4, SR3[3]
Volumetric air content of cracks	-	0.2	
Indoor/outdoor differential pressure	Pa	4.4	From Table 3.10, SR3[3]

References

1. Environment Agency (2009), 'Science Report SC050021/benzene SGV, toluene SGV, ethylbenzene SGV, xylene SGV, mercury SGV, selenium SGV, nickel SGV, arsenic SGV, cadmium SGV, phenol SGV, dioxins, furans and dioxin like PCBs SGVs', 'Supplementary information for the derivation of SGV for: benzene, toluene, ethylbenzene, xylene, mercury, selenium, nickel, arsenic, cadmium, phenol, dioxins, furans and dioxin- like PCBs', and 'Contaminants in soil: updated collation of toxicological data and intake values for humans: benzene, toluene, ethylbenzene, xylene, mercury, selenium, nickel, arsenic, cadmium, phenol, dioxins, furans and dioxin- like PCBs', March 2009, May 2009 and September 2009.

2. Environment Agency (2009), *Human health toxicological assessment of contaminants in soil. Science Report – Final SC050021/SR2*, January (Bristol: Environment Agency).

3. Environment Agency (2009), *Science Report – SC050021/SR3. Updated technical background to the CLEA model* (Bristol: Environment Agency).

4. Environment Agency (2009), Contaminated Land Exposure Assessment (CLEA) software, version 1.06.

5. Environment Agency (2008), *Science Report SC050021/SR7. Compilation of Data for Priority Organic Pollutants for Derivation of Soil Guideline Values* (Bristol: Environment Agency).

6. Chartered Institute for Environmental Health and Land Quality Management (2009), 'The LQM/CIEH Generic Assessment Criteria for Human Health', second edition.

7. CL:AIRE (2009), *Soil Generic Assessment Criteria for Human Health Risk Assessment* (London: CL:AIRE).

8. Changes made to the CLEA framework documents after the three-month evaluation period in 2008, released January 2009 by the Environment Agency.

Table 5

Human health generic assessment criteria by pathway for commercial scenario

Compound	Notes	GrAC (mg/l)	SAC appropriate to pathway SOM 1% (mg/kg)			Soil saturation limit (mg/kg)	SAC appropriate to pathway SOM 2.5% (mg/kg)			Soil saturation limit (mg/kg)	SAC appropriate to pathway SOM 6% (mg/kg)			Soil saturation limit (mg/kg)
			Oral	Inhalation	Combined		Oral	Inhalation	Combined		Oral	Inhalation	Combined	
Metals														
Arsenic	(b)(c)	-	6.35E+02	6.95E+02	-	NR	6.35E+02	6.95E+02	-	NR	6.35E+02	6.95E+02	-	NR
Cadmium	(b)	-	3.99E+02	3.87E+02	2.30E+02	NR	3.99E+02	3.87E+02	2.30E+02	NR	3.99E+02	3.87E+02	2.30E+02	NR
Chromium (III) - oxide		-	3.31E+05	3.34E+04	3.04E+04	NR	3.31E+05	3.34E+04	3.04E+04	NR	3.31E+05	3.34E+04	3.04E+04	NR
Chromium (VI) - hexavalent		-	2.01E+03	3.48E+01	3.42E+01	NR	2.01E+03	3.48E+01	3.42E+01	NR	2.01E+03	3.48E+01	3.42E+01	NR
Copper		-	1.78E+05	9.60E+04	7.17E+04	NR	1.78E+05	9.60E+04	7.17E+04	NR	1.78E+05	9.60E+04	7.17E+04	NR
Lead	(a)	-	6.00E+02	-	-	NR	6.00E+02	-	-		6.00E+02	-	-	NR
Elemental mercury (Hg^0)	(b)(d)	5.60E-02	-	1.84E+01	-	4.31E+00	-	4.57E+01	-	1.07E+01	-	1.09E+02	-	2.58E+01
Inorganic mercury (Hg^{2+})	(b)	-	4.41E+03	2.09E+04	3.64E+03	NR	4.41E+03	2.09E+04	3.64E+03		4.41E+03	2.09E+04	3.64E+03	NR
Methyl mercury (Hg^{4+})	(b)	1.00E+02	4.25E+02	2.73E+03	3.68E+02	7.33E+01	4.25E+02	4.97E+03	3.91E+02	1.42E+02	4.25E+02	9.41E+03	4.07E+02	3.04E+02
Nickel	(b)	-	2.22E+04	1.79E+03	-	NR	2.22E+04	1.79E+03	-	NR	2.22E+04	1.79E+03	-	NR
Selenium	(b)(c)	-	1.30E+04	-	-	NR	1.30E+04	-	-	NR	1.30E+04	-	-	NR
Zinc	(c)	-	6.67E+05	2.09E+08	-	NR	6.67E+05	2.09E+08	-	NR	6.67E+05	2.09E+08	-	NR
Cyanide		-	1.69E+04	1.95E+03	1.81E+03	NR	1.69E+04	1.95E+03	1.81E+03	NR	1.69E+04	1.95E+03	1.81E+03	NR
Volatile organic compounds														
Benzene	(b)	1.40E+02	5.53E+02	2.96E+01	2.81E+01	1.22E+03	5.53E+02	5.51E+01	5.01E+01	2.26E+03	5.53E+02	1.14E+02	9.47E+01	4.71E+03
Toluene	(b)	5.90E+02	4.25E+05	6.85E+04	5.90E+04	8.69E+02	4.25E+05	1.51E+05	1.11E+05	1.92E+03	4.25E+05	3.42E+05	1.89E+05	4.36E+03
Ethylbenzene	(b)	1.80E+02	1.91E+05	1.84E+04	1.68E+04	5.18E+02	1.91E+05	4.31E+04	3.51E+04	1.22E+03	1.91E+05	1.00E+05	6.57E+04	2.84E+03
Xylene - m	(b)	2.00E+02	3.43E+05	6.59E+03	6.46E+03	6.25E+02	3.43E+05	1.55E+04	1.48E+04	1.47E+03	3.43E+05	3.61E+04	3.27E+04	3.46E+03
Xylene - o	(b)	1.70E+02	3.43E+05	7.08E+03	6.94E+03	4.78E+02	3.43E+05	1.65E+04	1.58E+04	1.12E+03	3.43E+05	3.84E+04	3.46E+04	2.62E+03
Xylene - p	(b)	2.00E+02	3.43E+05	6.34E+03	6.22E+03	5.76E+02	3.43E+05	1.48E+04	1.42E+04	1.35E+03	3.43E+05	3.45E+04	3.14E+04	3.17E+03
Total xylene	(b)	2.00E+02	3.43E+05	6.59E+03	6.46E+03	6.25E+02	3.43E+05	1.55E+04	1.48E+04	1.47E+03	3.43E+05	3.61E+04	3.27E+04	3.46E+03
Methyl tertiary butyl ether (MTBE)		4.80E+04	9.53E+03	2.09E+04	8.21E+03	1.66E+04	9.53E+03	2.72E+04	8.55E+03	2.16E+04	9.53E+03	4.18E+04	8.93E+03	3.34E+04
Trichloroethene		3.60E+01	9.92E+03	1.19E+01	1.19E+01	1.54E+03	9.92E+03	2.49E+01	2.49E+01	3.22E+03	9.92E+03	5.54E+01	5.50E+01	7.14E+03
Tetrachloroethene		2.30E+02	2.65E+04	1.31E+02	1.31E+02	4.24E+02	2.65E+04	2.94E+02	2.91E+02	9.51E+02	2.65E+04	6.75E+02	6.58E+02	2.18E+03
1,1,1-Trichloroethane		1.30E+03	1.14E+06	7.01E+02	7.00E+02	1.43E+03	1.14E+06	1.43E+03	1.43E+03	2.92E+03	1.14E+06	3.14E+03	3.13E+03	6.39E+03
1,1,1,2 Tetrachloroethane		1.10E+03	1.10E+04	1.16E+02	1.15E+02	2.60E+03	1.10E+04	2.68E+02	2.62E+02	6.02E+03	1.10E+04	6.24E+02	5.91E+02	1.40E+04
1,1,2,2 Tetrachloroethane		1.10E+03	1.10E+04	2.98E+02	2.90E+02	2.67E+03	1.10E+04	6.10E+02	5.78E+02	5.46E+03	1.10E+04	1.34E+03	1.19E+03	1.20E+04
Carbon Tetrachloride (tetrachloromethane)		5.70E+00	2.70E+03	3.04E+00	3.04E+00	1.52E+03	2.70E+03	6.67E+00	6.65E+00	3.32E+03	2.70E+03	1.51E+01	1.50E+01	7.54E+03
1,2-Dichloroethane		6.10E+00	2.29E+02	7.14E-01	7.12E-01	3.41E+03	2.29E+02	1.03E+00	1.03E+00	4.91E+03	2.29E+02	1.77E+00	1.75E+00	8.43E+03
Vinyl Chloride (chloroethene)		4.10E-01	2.67E+01	6.31E-02	6.30E-02	1.36E+03	2.67E+01	8.16E-02	8.14E-02	1.76E+03	2.67E+01	1.25E-01	1.24E-01	2.69E+03
1,2,4-Trimethylbenzene		5.70E+01	-	4.17E+01	-	5.57E+02	-	9.89E+01	-	1.36E+03	-	2.19E+02	-	3.25E+03
1,3,5-Trimethylbenzene		3.80E+01	2.19E+04	4.71E+01	4.71E+01	9.47E+01	2.19E+04	1.12E+02	1.12E+02	2.26E+02	2.19E+04	2.63E+02	2.63E+02	5.33E+02
Semi-volatile organic compounds														
Acenaphthene		3.20E+00	1.10E+05	3.75E+05	8.49E+04	5.70E+01	1.10E+05	8.95E+05	9.77E+04	1.41E+02	1.10E+05	2.00E+06	1.04E+05	3.36E+02
Acenaphthylene		1.61E+01	1.10E+05	3.64E+05	8.43E+04	8.61E+01	1.10E+05	8.68E+05	9.74E+04	2.12E+02	1.10E+05	1.94E+06	1.04E+05	5.06E+02
Anthracene		2.10E-02	5.49E+05	1.19E+07	5.25E+05	1.17E+00	5.49E+05	2.49E+07	5.37E+05	2.91E+00	5.49E+05	4.38E+07	5.42E+05	6.96E+00
Benzo(a)anthracene		3.80E-03	2.52E+02	1.39E+02	8.95E+01	1.71E+00	2.52E+02	1.52E+02	9.48E+01	4.28E+00	2.52E+02	1.59E+02	9.74E+01	1.03E+01
Benzo(b)fluoranthene		2.00E-03	2.60E+02	1.63E+02	1.00E+02	1.22E+00	2.60E+02	1.67E+02	1.02E+02	3.04E+00	2.60E+02	1.69E+02	1.03E+02	7.29E+00
Benzo(g,h,i)perylene		2.60E-04	1.66E+03	1.08E+03	6.54E+02	1.54E-02	1.66E+03	1.09E+03	6.59E+02	3.85E-02	1.66E+03	1.10E+03	6.61E+02	9.23E-02
Benzo(k)fluoranthene		8.00E-04	3.66E+02	2.31E+02	1.41E+02	6.87E-01	3.66E+02	2.35E+02	1.43E+02	1.72E+00	3.66E+02	2.38E+02	1.44E+02	4.12E+00
Chrysene		2.00E-03	3.66E+02	2.20E+02	1.37E+02	4.40E-01	3.66E+02	2.29E+02	1.41E+02	1.10E+00	3.66E+02	2.34E+02	1.43E+02	2.64E+00
Dibenzo(a,h)anthracene		6.00E-04	3.29E+01	2.80E+01	1.27E+01	3.93E-03	3.29E+01	2.12E+01	1.29E+01	9.82E-03	3.29E+01	2.15E+01	1.30E+01	2.36E-02
Fluoranthene		2.30E-01	2.29E+04	2.01E+06	2.26E+04	1.89E+01	2.29E+04	2.89E+06	2.27E+04	4.73E+01	2.29E+04	3.52E+06	2.27E+04	1.13E+02
Fluorene		1.90E+00	7.31E+04	4.82E+05	6.35E+04	3.09E+01	7.31E+04	1.12E+06	6.87E+04	7.65E+01	7.31E+04	2.38E+06	7.10E+04	1.83E+02
Indeno(1,2,3-cd)pyrene		2.00E-04	1.57E+02	9.71E+01	6.00E+01	6.13E-02	1.57E+02	9.98E+01	6.11E+01	1.53E-01	1.57E+02	1.01E+02	6.17E+01	3.68E-01
Phenanthrene		5.30E-01	2.28E+04	5.67E+05	2.19E+04	3.60E+01	2.28E+04	1.16E+06	2.24E+04	8.96E+01	2.28E+04	1.98E+06	2.26E+04	2.14E+02
Pyrene		1.30E-01	5.49E+04	4.74E+06	5.42E+04	2.20E+00	5.49E+04	6.86E+06	5.44E+04	5.49E+00	5.49E+04	8.39E+06	5.45E+04	1.32E+01
Benzo(a)pyrene		3.80E-03	3.66E+01	2.30E+01	1.41E+01	9.11E-01	3.66E+01	2.35E+01	1.43E+01	2.28E+00	3.66E+01	2.38E+01	1.44E+01	5.46E+00
Naphthalene		1.90E+01	3.64E+04	2.05E+02	2.04E+02	7.64E+01	3.64E+04	4.90E+02	4.83E+02	1.83E+02	3.64E+04	1.15E+03	1.12E+03	4.32E+02
Phenol	(b)(e)	-	1.54E+06	3.16E+04	3.10E+04	4.16E+04	1.00E+06	3.57E+04	3.49E+04	8.15E+04	1.54E+06	3.85E+04	3.76E+04	1.74E+05
Total petroleum hydrocarbons														
Aliphatic hydrocarbons EC_5–EC_6		3.60E+01	4.77E+06	3.38E+03	3.39E+03	3.04E+02	4.77E+06	6.21E+03	6.21E+03	5.58E+02	4.77E+06	1.28E+04	1.28E+04	1.15E+03
Aliphatic hydrocarbons >EC_6–EC_8		5.40E+00	4.77E+06	8.26E+03	8.25E+03	1.44E+02	4.77E+06	1.84E+04	1.84E+04	3.22E+02	4.77E+06	4.21E+04	4.20E+04	7.36E+02
Aliphatic hydrocarbons >EC_8–EC_{10}		4.30E-01	9.53E+04	2.14E+03	2.13E+03	7.77E+01	9.53E+04	5.21E+03	5.14E+03	1.90E+02	9.53E+04	1.24E+04	1.19E+04	4.51E+02
Aliphatic hydrocarbons >EC_{10}–EC_{12}		3.40E-02	9.53E+04	1.06E+04	1.03E+04	4.75E+01	9.53E+04	2.62E+04	2.42E+04	1.18E+02	9.53E+04	6.25E+04	4.93E+04	2.83E+02

GENERIC ASSESSMENT CRITERIA FOR HUMAN HEALTH - COMMERCIAL

Table 5

Human health generic assessment criteria by pathway for commercial scenario

Compound	Notes	GrAC (mg/l)	SAC appropriate to pathway SOM 1% (mg/kg)			Soil saturation limit (mg/kg)	SAC appropriate to pathway SOM 2.5% (mg/kg)			Soil saturation limit (mg/kg)	SAC appropriate to pathway SOM 6% (mg/kg)			Soil saturation limit (mg/kg)
			Oral	Inhalation	Combined		Oral	Inhalation	Combined		Oral	Inhalation	Combined	
Aliphatic hydrocarbons >EC_{12}–EC_{16}		7.60E-04	9.53E+04	8.75E+04	6.08E+04	2.37E+01	9.53E+04	2.16E+05	8.26E+04	5.91E+01	9.53E+04	5.10E+05	9.50E+04	1.42E+02
Aliphatic hydrocarbons >EC_{16}–EC_{35}	(c)	-	1.59E+06	-	-	8.48E+00	1.76E+06	-	-	2.12E+01	1.83E+06	-	-	5.09E+01
Aliphatic hydrocarbons >EC_{35}–EC_{44}	(c)	-	1.59E+06	-	-	8.48E+00	1.76E+06	-	-	2.12E+01	1.83E+06	-	-	5.09E+01
Aromatic hydrocarbons >EC_{8}–EC_{9} (styrene)		6.50E+01	1.14E+05	3.00E+04	2.77E+04	6.20E+02	1.14E+05	7.30E+04	5.81E+04	1.52E+03	1.14E+05	1.73E+05	9.00E+04	3.61E+03
Aromatic hydrocarbons >EC_{9}–EC_{10}		6.50E+01	3.81E+04	3.76E+03	3.67E+03	6.13E+02	3.81E+04	9.16E+03	8.56E+03	1.50E+03	3.81E+04	2.17E+04	1.78E+04	3.58E+03
Aromatic hydrocarbons >EC_{10}–EC_{12}		2.50E+01	3.81E+04	2.03E+04	1.69E+04	3.64E+02	3.81E+04	4.97E+04	2.85E+04	8.99E+02	3.81E+04	1.17E+05	3.45E+04	2.15E+03
Aromatic hydrocarbons >EC_{12}–EC_{16}	(c)	5.80E+00	3.81E+04	2.15E+05	3.63E+04	1.69E+02	3.81E+04	5.05E+05	3.74E+04	4.19E+02	3.81E+04	1.09E+06	3.78E+04	1.00E+03
Aromatic hydrocarbons >EC_{16}–EC_{21}	(c)	-	2.82E+04	-	-	5.37E+01	2.83E+04	-	-	1.34E+02	2.84E+04	-	-	3.21E+02
Aromatic hydrocarbons >EC_{21}–EC_{35}	(c)	-	2.84E+04	-	-	4.83E+00	2.84E+04	-	-	1.21E+01	2.84E+04	-	-	2.90E+01
Aromatic hydrocarbons >EC_{35}–EC_{44}	(c)	-	2.84E+04	-	-	4.83E+00	2.84E+04	-	-	1.21E+01	2.84E+04	-	-	2.90E+01

Notes:

'-' Generic assessment criteria not calculated owing to low volatility of substance and therefore no pathway or an absence of toxicological data.

NR - the compound is not volatile and therefore a soil saturation limit not calculated within CLEA

EC - equivalent carbon. GrAC - groundwater screening value. SAC - soil screening value.

The CLEA model output is colour coded depending upon whether the soil saturation limit has been exceeded.

Calculated SAC exceeds soil saturation limit and may significantly affect the interpretation of any exceedances as the contribution of the indoor and outdoor vapour pathway to total exposure is >10%. This shading has also been used for the RBCA output where the theoretical solubility limit has been exceeded. The SAC has been set as the model calculated SAC with the saturation limits shown in brackets.

Calculated SAC exceeds soil saturation limit but the exceedance will not affect the SAC significantly as the contribution of the indoor and outdoor vapour pathway to total exposure is <10%.

Calculated SAC does not exceed the soil saturation limit.

For consistency where the theoretical solubility limit within RBCA has been exceeded in production of the GrAC, these cellls have also been hatched red and the GrAC set at the solubility limit.

The SAC for organic compounds are dependent upon soil organic matter (SOM) (%) content. To obtain SOM from total organic carbon (TOC) (%) divide by 0.58; 1% SOM is 0.58% TOC. DL Rowell Soil Science: Methods and Applications, Longmans, 1994.

SAC for TPH fractions, polycyclic aromatic hydrocarbons, MTBE, BTEX and trimethylbenzene compounds were produced using an attenuation factor for the indoor air inhalation pathway of 10 to reduce conservatism associated with the vapour inhalation pathway, section 10.1.1, SR3

(a) RSK Lead GAC obtained following sensitivity analysis of blood lead concentrations.

(b) GAC taken from the Environment Agency SGV reports published 2009.

(c) SAC for selenium, aliphatic and aromatic hydrocarbons >EC16 does not include inhalation pathway owing to absence of toxicity data. SAC for arsenic is only based on oral contribution (rather than combined) owing to the relative small contribution from inhalation in accordance with the SGV report. The same approach has been adopted for zinc.

(d) SAC for elemental mercury, chromium VI and nickel is based on the inhalation pathway only owing to an absence of toxicity for elemental mercury, in accordance with the SGV report for nickel and LQM report for chromium VI.

(e) The GAC for phenol is based on a threshold which is protective of acute direct skin contact with phenol (the figure in brackets is based on health effects following long-term exposure and is provided for illustration only).

GENERIC ASSESSMENT CRITERIA FOR HUMAN HEALTH - COMMERCIAL

Table 6
Selected human health generic assessment criteria for commercial scenario

Compound	GrAC for groundwater (mg/l)	SAC for soil SOM 1% (mg/kg)	SAC for soil SOM 2.5% (mg/kg)	SAC for soil SOM 6% (mg/kg)
Metals				
Arsenic	-	640	640	640
Cadmium	-	230	230	230
Chromium (III) - oxide	-	30,000	30,000	30,000
Chromium (VI) - hexavalent	-	35	35	35
Copper	-	72,000	72,000	72,000
Lead	-	600	600	600
Elemental mercury (Hg^0)	0.056	18 (4.3)	46 (11)	110 (26)
Inorganic mercury (Hg^{2+})	-	3,600	3,600	3,600
Methyl mercury (Hg^{4+})	100	370 (73)	391	410
Nickel	-	1,800	1,800	1,800
Selenium	-	13,000	13,000	13,000
Zinc	-	670,000	670,000	670,000
Cyanide	-	1,800	1,800	1,800
Volatile organic compounds				
Benzene	140	28	50	95
Toluene	590	59,000 (870)	110,000 (1,900)	189,000 (4,400)
Ethylbenzene	180	17,000 (520)	35,000 (1,200)	65,700 (2,800)
Xylene - m	200	6,500 (620)	15,000 (1,500)	32,700 (3,500)
Xylene - o	170	6,900 (480)	16,000 (1,100)	34,600 (2,600)
Xylene - p	200	6,200 (580)	14,000 (1,400)	31,400 (3,200)
Total xylene	200	6,500 (630)	15,000 (1,500)	32,700 (3,500)
Methyl tertiary butyl ether (MTBE)	48,000	8,200	8,600	8,900
Trichloroethene	36	12	25	55
Tetrachloroethene	230	130	1,400	660
1,1,1-Trichloroethane	1,300	700	1,400	3,100
1,1,1,2 Tetrachloroethane	1,100	120	260	590
1,1,2,2 Tetrachloroethane	1,100	290	580	1,200
Carbon tetrachloride (tetrachloromethane)	5.7	3.0	6.7	15
1,2-Dichloroethane	6.1	0.71	1.0	1.8
Vinyl chloride (chloroethene)	0.41	0.063	0.08	0.12
1,2,4-Trimethylbenzene	57	42	99	220
1,3,5-Trimethylbenzene	38	47	110	260
Semi-volatile organic compounds				
Acenaphthene	3.2	85,000 (57)	98,000 (141)	100,000
Acenaphthylene	16	84,000 (86)	97,000 (212)	100,000
Anthracene	0.021	530,000	540,000	540,000
Benzo(a)anthracene	0.0038	90	95	97
Benzo(b)fluoranthene	0.0020	100	100	100
Benzo(g,h,i)perylene	0.00026	650	660	660
Benzo(k)fluoranthene	0.00080	140	140	140
Chrysene	0.0020	140	140	140
Dibenzo(a,h)anthracene	0.00060	13	13	13
Fluoranthene	0.23	23,000	23,000	23,000
Fluorene	1.9	64,000 (31)	69,000	71,000
Indeno(1,2,3-cd)pyrene	0.00020	60	61	62
Phenanthrene	0.53	22,000	22,000	23,000
Pyrene	0.13	54,000	54,000	55,000
Benzo(a)pyrene	0.0038	14	14	14
Naphthalene	19	200 (76)	480 (183)	1100 (432)
Phenol	-	3,200 * (31,000)	3,200* (35,000)	3,200 * (38,000)
Total petroleum hydrocarbons				
Aliphatic hydrocarbons EC_5–EC_6	36	3,400 (304)	6,200 (558)	13,000 (1,150)
Aliphatic hydrocarbons >EC_6–EC_8	5.4	8,300 (144)	18,000 (322)	42,000 (736)
Aliphatic hydrocarbons >EC_8–EC_{10}	0.43	2,100 (78)	5,100 (190)	12,000 (451)
Aliphatic hydrocarbons >EC_{10}–EC_{12}	0.034	10,000 (48)	24,000 (118)	49,000 (283)
Aliphatic hydrocarbons >EC_{12}–EC_{16}	0.00076	61,000 (24)	83,000 (59)	91,000 (142)
Aliphatic hydrocarbons >EC_{16}–EC_{35}	-	1,000,000**	1,000,000**	1,000,000**
Aliphatic hydrocarbons >EC_{35}–EC_{44}	-	1,000,000**	1,000,000**	1,000,000**
Aromatic hydrocarbons >EC_8–EC_9 (styrene)	65	28,000 (620)	58,000 (1,500)	90,000 (3,600)
Aromatic hydrocarbons >EC_9–EC_{10}	65	3,700 (610)	8,600 (1,500)	18,000 (3,600)
Aromatic hydrocarbons >EC_{10}–EC_{12}	25	17,000 (364)	29,000 (899)	35,000 (2,150)
Aromatic hydrocarbons >EC_{12}–EC_{16}	5.8	36,000 (169)	37,000	38,000
Aromatic hydrocarbons >EC_{16}–EC_{21}	-	28,000	28,000	28,000
Aromatic hydrocarbons >EC_{21}–EC_{35}	-	28,000	28,000	28,000
Aromatic hydrocarbons >EC_{35}–EC_{44}	-	28,000	28,000	28,000

Notes:

'-' Generic assessment criteria not calculated owing to low volatility of substance and therefore no pathway or an absence of toxicological data.

** Denotes SAC calculated exceeds 100% contaminant. Hence 100% taken as SAC.

EC - equivalent carbon. GrAC - groundwater assessment criteria. SAC - soil assessment criteria.

* The GAC for phenol is based on a threshold which is protective of direct skin contact with phenol (the figure in brackets is based on health effects following long-term exposure and is provided for illustration only).

The SAC for organic compounds are dependent on soil organic matter (SOM) (%) content. To obtain SOM from total organic carbon (TOC) (%) divide by 0.58; 1% SOM is 0.58% TOC. DL Rowell Soil Science: Methods and Applications, Longmans, 1994.

SAC for TPH fractions, polycyclic aromatic hydrocarbons, MTBE, BTEX and trimethylbenzene compounds were produced using an attenuation factor for the indoor air inhalation pathway of 10 to reduce conservatism associated with the vapour inhalation pathway, section 10.1.1, SR3.

The SAC has been set as the model calculated SAC with the saturation limit shown in brackets. For consistency where the GrAC exceeds the solubility limit, GrAC has been set at the solubility limit. The GrAC are highly conservative as concentrations of the chemical are very unlikely to be at sufficient concentration to result in an exceedance of the health criteria value at the point of exposure (i.e. indoor air) provided free-phase product is absent.

APPENDIX L
GENERIC ASSESSMENT CRITERIA FOR PHYTOTOXIC EFFECTS

Several compounds can inhibit plant growth; hence it is important to have generic assessment criteria (GAC) to promote healthy plant growth. In the absence of other published GAC, the GAC have been obtained from legislation (UK and European) and guidance related to the use of sewage sludge on agricultural fields.

The Council of European Communities Sewage Sludge Directive (86/278/EEC) dated 1986, has been transposed into UK law by Statutory Instrument No. 1263, The Sludge (use in Agriculture) Regulations 1989 (Public Health England, Wales and Scotland), as ammended in 1990 and The Sludge (use in Agriculture) Regulations (Northern Ireland) SR No, 245, 1990. In addition the Department of Environment (DoE) produced a Code of Practice (CoP) (Updated 2nd Edition) in 2006 which provided guidance on the application of sewage sludge on agricultural land (however the status of this document is unclear as it is on the archive section of the Defra website).

The directive seeks to encourage the use of sewage sludge in agriculture and to regulate its use in such a way as to "***prevent harmful effects on soil, vegetation, animals and man".*** To this end, it prohibits the use of untreated sludge on agricultural land unless it is injected or incorporated into the soil. Treated sludge is defined as having undergone "biological, chemical or heat treatment, long-term storage or any other appropriate process so as significantly to reduce its fermentability and the health hazards resulting from its use". To provide protection against potential health risks from residual pathogens, sludge must not be applied to soil in which fruit and vegetable crops are growing, or less than ten months before fruit and vegetable crops are to be harvested. Grazing animals must not be allowed access to grassland or forage land less than three weeks after the application of sludge.

The specified limits of concentrations of selected elements in soil are presented in Table 4 of the updated 2nd Edition of the DoE Code of Practice and are designed to protect plant growth. It is noted that these values are more stringent than the values set in current UK regulations. However since they were ammended following recommendations from the Independent Scientific Committee in 1993. (MAFF/DOE 1993). The GAC are presented in Table 1.

Table 1: Generic assessment criteria

Determinant	Generic assessment criteria (mg/kg)			
	pH 5.0 < 5.5	pH 5.5 < 6.0	pH 6.0 < 7.0	pH >7.0
Zinc	200	200	200	300
Copper	80	100	135	200
Nickel	50	60	75	110
Lead	300	300	300	300
Cadmium	3	3	3	3
Mercury	1	1	1	1
Note: Only compounds with assessment criteria documented within the Directive 86/278/EEC have been included, although criteria for 5 additional compounds have been presented within the 2006 CoP.				

APPENDIX M
WATER SUPPLY PIPES

A range of pipe materials is available and careful selection, design and installation is required to ensure that water supply pipes are satisfactorily installed and meet the requirements of the Water Supply (Water Fittings) Regulations 1999 in England and Wales, the Byelaws 2000 in Scotland and the Northern Ireland Water Regulations. The regulations include a requirement to use only suitable materials when laying water pipes and laying water pipes without protection is not permitted at contaminated sites. The water supply company has a statutory duty to enforce the regulations.

Contaminants in the ground can pose a risk to potable water supply by permeating plastic water supply pipes. To fulfil their statutory obligation, UK water supply companies require robust evidence from developers to demonstrate either that the ground in which new plastic supply pipes will be laid is free from specific contaminants, or that the proposed remedial strategy will mitigate any existing risk. If these requirements cannot be demonstrated to the satisfaction of the relevant water company, it becomes necessary to specify an alternative pipe material on the whole development or specific zones.

In 2010, UK Water Industry Research (UKWIR) published *Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites* (Report Ref. No. 10/WM/03/21). This report reviewed previously published industry guidelines and threshold concentrations adopted by individual water supply companies.

The focus of the UKWIR research project was to develop clear and concise procedures, which provide consistency in the pipe selection decision process. It was intended to provide guidance that can be used to ensure compliance with current regulations and to prevent water supply pipe failing prematurely due to the presence of contamination.

Report 10/WM/03/21 concluded that in most circumstances only organic contaminants pose a potential risk to plastic pipe materials and Table 3.1 of the report provides threshold concentrations for PE and PVC pipes for the organic contaminants of concern. The report also makes recommendations for the procedures to be adopted in the design of site investigations and sampling strategies, and the assessment of data, to ensure that the ground through which water supply pipes will be laid is adequately characterised.

Risks to water supply pipes have therefore been assessed against the threshold concentrations for PE and PVC pipe specified in Table 3.1 of Report 10/WM/03/21, which have been adopted as the GAC for this linkage and are reproduced in Table A3 below.

Since water supply pipes are typically laid at a minimum depth of 750mm below finished ground levels, sample results from depths between 0.5m and 1.5m below finished level are generally considered suitable for assessing risks to water supply. Samples outside these depths can be used providing the strata is the same as that in which water supply pipes are likely to be located.

Report 10/WM/03/21 specifies that sampling should characterise the ground conditions to a minimum of 0.5m below the proposed depth of the pipe.

It should be noted that the assessment provided in this report is a guide and the method of assessment and recommendations should be checked with the relevant water supply company.

Table A3: Generic assessment criteria for water supply pipes

		Pipe material	
		GAC (mg/kg)	
	Parameter group	**PE**	**PVC**
1	Extended VOC suite by purge and trap or head space and GC-MS with TIC (Not including compounds within group 1a)	0.5	0.125
1a	• BTEX + MTBE	0.1	0.03
2	SVOCs TIC by purge and trap or head space and GC-MS with TIC (aliphatic and aromatic C_5–C_{10}) (Not including compounds within group 2e and 2f)	2	1.4
2e	• Phenols	2	0.4
2f	• Cresols and chlorinated phenols	2	0.04
3	Mineral oil C_{11}–C_{20}	10	Suitable
4	Mineral oil C_{21}–C_{40}	500	Suitable
5	Corrosive (conductivity, redox and pH)	Suitable	Suitable
Specific suite identified as relevant following site investigation			
2a	Ethers	0.5	1
2b	Nitrobenzene	0.5	0.4
2c	Ketones	0.5	0.02
2d	Aldehydes	0.5	0.02
6	Amines	Not suitable	Suitable
Notes: where indicated as 'suitable', the material is considered resistant to permeation or degradation and no threshold concentration has been specified by UKWIR.			

APPENDIX N
CERTIFICATES OF GEOTECHNICAL ANALYSIS

UKAS TESTING
No. 2652

Ben Coulston
RSK ENVIRONMENT LIMITED
18 Frogmore Road
Hemel Hempstead
Herts
HP3 9RT

STRUCTURAL SOILS LTD

SITE INVESTIGATION

SOIL, ROCK & MATERIAL TESTING

GEOTECHNICAL CONSULTANCY

CONTAMINATED LAND ASSESSMENT

2nd October 2012

TESTING REPORT

YOUR REF: 25459

SITE: NIAB PHASE 1

CERTIFICATE NUMBER: 582260

DATE SAMPLES RECEIVED: 10th September 2012
DATE TESTING COMMENCED: 10th September 2012

DATE OF SAMPLE DISPOSAL: 2nd November 2012

INSTRUCTIONS: Please carry out Moisture Content, Atterberg Limits, Particle Size Distribution, Quick Undrained Triaxial and Chemical Analysis tests on samples provided

I have pleasure in enclosing the test report for the above project that you submitted to us for testing.

Yours sincerely

Justin Barrett
Laboratory Manager

Enc.

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Hemel Hempstead
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HP3 9RT
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Glasgow

SUMMARY OF SOIL CLASSIFICATION TESTS

In accordance with clauses 3.2,4.3,4.4,5.3,5.4,7.2,8.2,8.3 of BS1377:Part 2:1990

Exploratory Position ID	Sample Ref	Sample Type	Depth (m)	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index %	% <425um	Description of Sample
BH1		D	1.40	28	78	31	47	100	Grey CLAY
BH1		U	2.50	31	77	29	48	100	Grey mottled brown CLAY
BH1		U	7.50	31	73	33	40	100	Grey CLAY
BH1		U	13.50	30	75	29	46	100	Grey CLAY
BH2		D	0.80	23	57	22	35	80	Brown mottled grey slightly sandy slightly gravelly CLAY
BH2		U	5.00	30	73	33	40	100	Brownish grey CLAY
BH2		U	11.00	30	70	32	38	100	Grey CLAY
BH3		D	2.40	15					Orangey brown clayey SAND

STRUCTURAL SOILS LTD

Contract:

NIAB Phase 1

Contract Ref:

582260

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of

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SUMMARY OF SOIL CLASSIFICATION TESTS

In accordance with clauses 3.2,4.3,4.4,5.3,5.4,7.2,8.2,8.3 of BS1377:Part 2:1990

Exploratory Position ID	Sample Ref	Sample Type	Depth (m)	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index %	% <425um	Description of Sample
BH3		U	5.50	28	74	23	51	100	Grey SILT/CLAY
BH3		U	11.40	33	76	33	43	100	Grey CLAY
BH3		U	14.50	31	76	34	42	100	Grey CLAY
BHG		U	9.50	29	69	30	39	100	Grey CLAY
BHG		U	14.50	29	76	30	46	100	Grey SILT
BHK		U	5.50	33	73	35	38	100	Grey mottled brown CLAY
BHK		U	11.50	29	75	31	44	100	Grey CLAY
BHK		U	14.50	29	75	33	42	100	Grey CLAY

STRUCTURAL SOILS LTD

Contract:

NIAB Phase 1

Contract Ref:

582260

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SUMMARY OF SOIL CLASSIFICATION TESTS

In accordance with clauses 3.2,4.3,4.4,5.3,5.4,7.2,8.2,8.3 of BS1377:Part 2:1990

Exploratory Position ID	Sample Ref	Sample Type	Depth (m)	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index %	% <425um	Description of Sample
TP2		D	3.00	32	78	28	50	100	Grey CLAY
TP3		D	1.00	32	77	31	46	100	Grey CLAY
TP3		D	2.00	33					Grey CLAY
TP17		D	1.50	8.8	24	14	10	10	Yellowish brown clayey sandy GRAVEL
TP18		D	1.50	21					Light grey sandy gravelly CLAY
TP20		D	2.00	19	27	12	15	26	Light grey mottled brown slightly gravelly sandy CLAY
TP27		D	1.50	16	27	15	12	80	Brown mottled grey sandy slightly gravelly CLAY
TPC		D	2.00	31	74	27	47	100	Grey mottled brown CLAY

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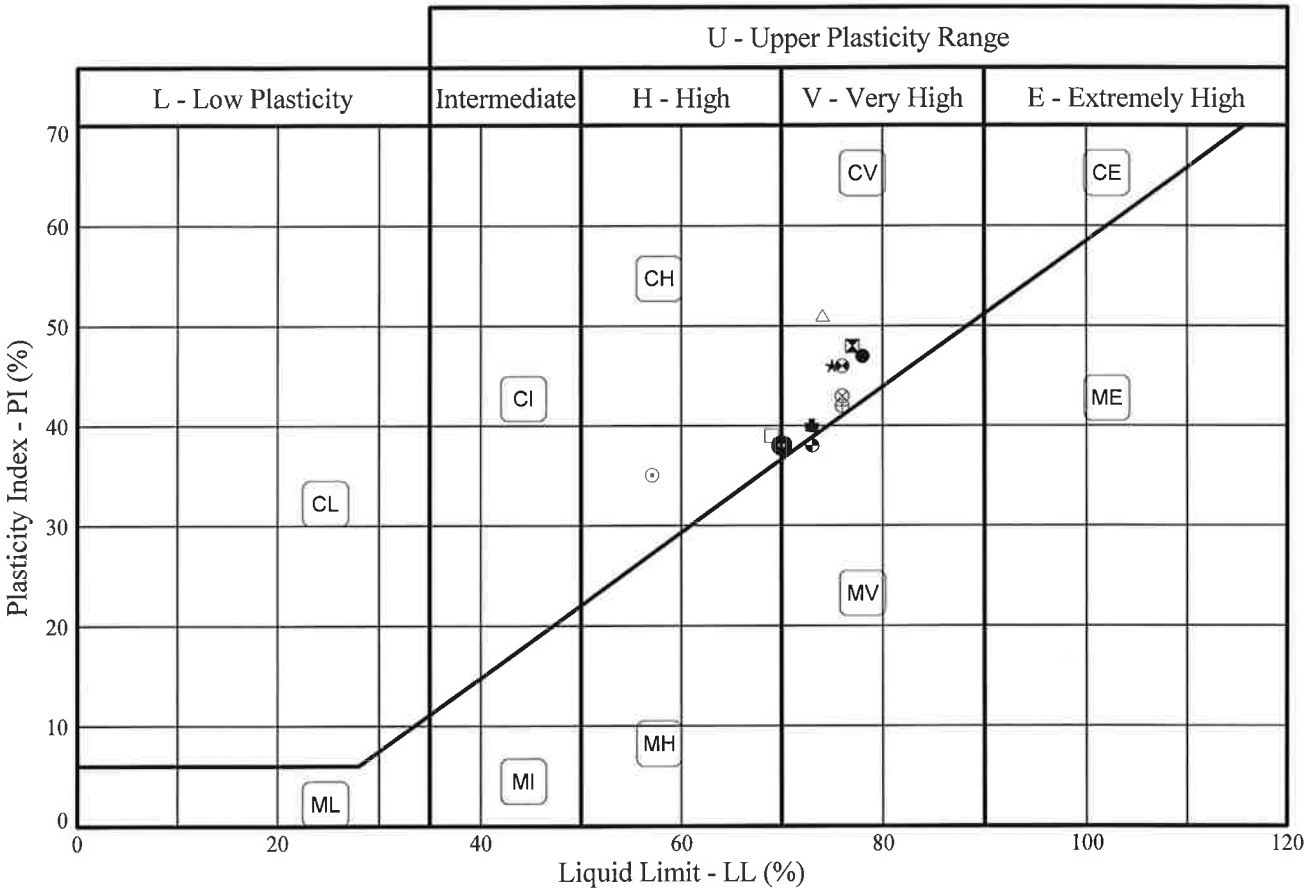
SUMMARY OF SOIL CLASSIFICATION TESTS

In accordance with clauses 3.2,4.3,4.4,5.3,5.4,7.2,8.2,8.3 of BS1377:Part 2:1990

Exploratory Position ID	Sample Ref	Sample Type	Depth (m)	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index %	% <425um	Description of Sample
TPC		D	2.50	33					Grey CLAY
TPD		D	2.50	31	69	26	43	100	Grey CLAY
TPO		D	1.00	29					Grey mottled brown CLAY
WS1		D	0.50	29	77	30	47	100	Brownish grey CLAY
WS18		D	0.70	19	27	18	9	72	Brown mottled grey slightly sandy slightly gravelly CLAY
WS20		D	1.00	9.8					Orangey brown clayey gravelly SAND
WS21		D	2.50	30	41	22	19	100	Grey slightly sandy SILT/CLAY
WS23		D	0.60	17					Brown sandy CLAY

PLASTICITY CHART - PI Vs LL

In accordance with clause 42.3 of BS5930:1999
Testing in accordance with BS1377-2:1990



Sample Identification				BS Test Method #	Preparation Method +	MC %	LL %	PL %	PI %	<425um %
	Exploratory Position ID	Sample	Depth (m)							
●	BH1	D	1.40	3.2/4.4/5.3/5.4	4.2.3	28	78	31	47	100
⊠	BH1	U	2.50	3.2/4.4/5.3/5.4	4.2.3	31	77	29	48	100
▲	BH1	U	7.50	3.2/4.4/5.3/5.4	4.2.3	31	73	33	40	100
★	BH1	U	13.50	3.2/4.4/5.3/5.4	4.2.3	30	75	29	46	100
⊙	BH2	D	0.80	3.2/4.4/5.3/5.4	4.2.4	23	57	22	35	80
✿	BH2	U	5.00	3.2/4.4/5.3/5.4	4.2.3	30	73	33	40	100
◉	BH2	U	11.00	3.2/4.4/5.3/5.4	4.2.3	30	70	32	38	100
△	BH3	U	5.50	3.2/4.4/5.3/5.4	4.2.3	28	74	23	51	100
⊗	BH3	U	11.40	3.2/4.4/5.3/5.4	4.2.3	33	76	33	43	100
⊕	BH3	U	14.50	3.2/4.4/5.3/5.4	4.2.3	31	76	34	42	100
□	BHG	U	9.50	3.2/4.4/5.3/5.4	4.2.3	29	69	30	39	100
⊖	BHG	U	14.50	3.2/4.4/5.3/5.4	4.2.3	29	76	30	46	100
◔	BHK	U	5.50	3.2/4.4/5.3/5.4	4.2.3	33	73	35	38	100

Tested in accordance with the following clauses of BS1377-2:1990.

3.2 - Moisture Content
4.3 - Cone Penetrometer Method
4.4 - One Point Cone Penetrometer Method
4.6 - One Point Casagrande Method
5.3 - Plastic Limit Method
5.4 - Plasticity Index

+ Tested in accordance with the following clauses of BS1377-2:1990.

4.2.3 - Natural State
4.2.4 - Wet Sieved

Key: * = Non standard test, NP = Non plastic.

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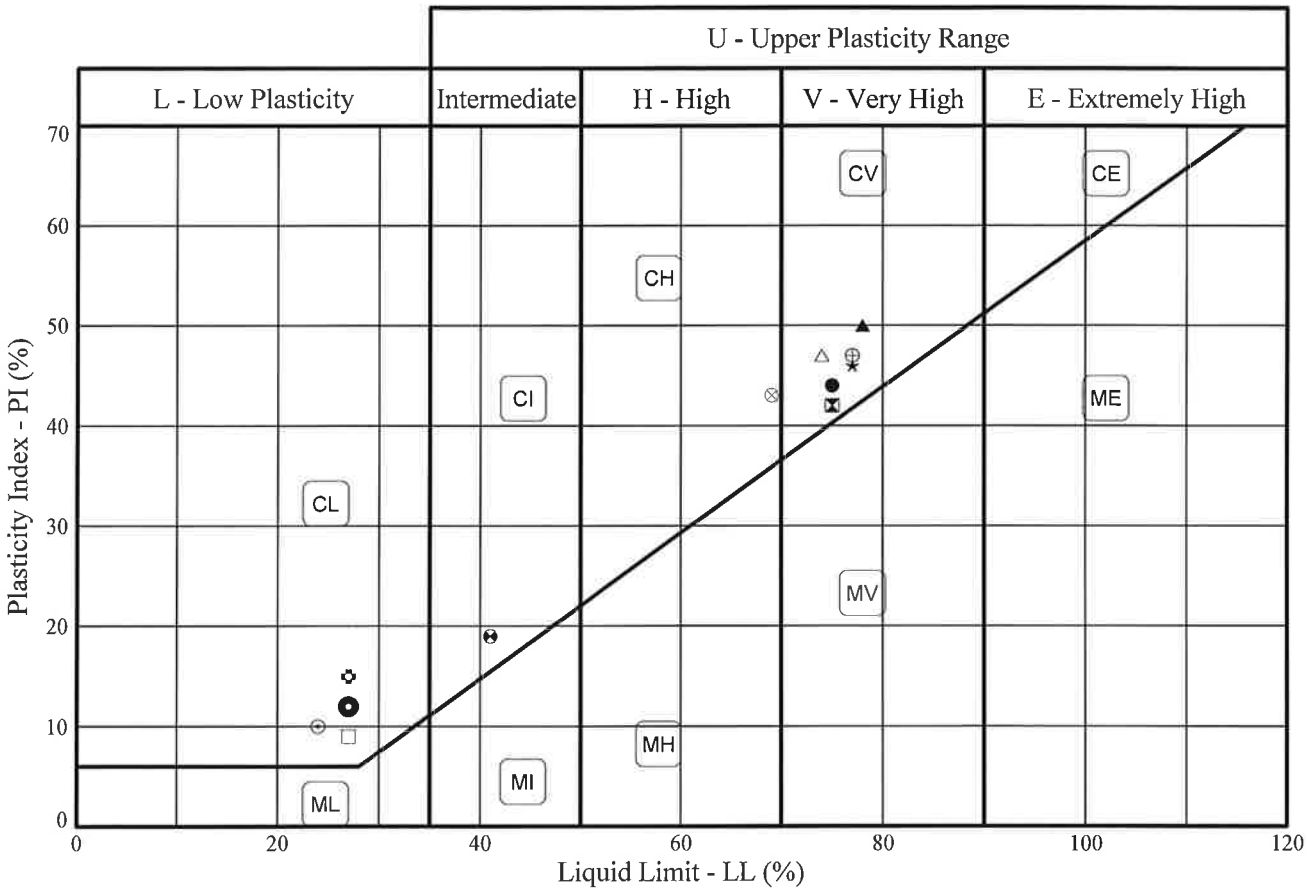
PLASTICITY CHART - PI Vs LL

In accordance with clause 42.3 of BS5930:1999
Testing in accordance with BS1377-2:1990



Sample Identification				BS Test Method #	Preparation Method +	MC	LL	PL	PI	<425um
	Exploratory Position ID	Sample	Depth (m)			%	%	%	%	%
●	BHK	U	11.50	3.2/4.4/5.3/5.4	4.2.3	29	75	31	44	100
⊠	BHK	U	14.50	3.2/4.4/5.3/5.4	4.2.3	29	75	33	42	100
▲	TP2	D	3.00	3.2/4.4/5.3/5.4	4.2.3	32	78	28	50	100
★	TP3	D	1.00	3.2/4.4/5.3/5.4	4.2.3	32	77	31	46	100
⊙	TP17	D	1.50	3.2/4.4/5.3/5.4	4.2.4	8.8	24	14	10	10
✿	TP20	D	2.00	3.2/4.4/5.3/5.4	4.2.4	19	27	12	15	26
◉	TP27	D	1.50	3.2/4.4/5.3/5.4	4.2.4	16	27	15	12	80
△	TPC	D	2.00	3.2/4.4/5.3/5.4	4.2.3	31	74	27	47	100
⊗	TPD	D	2.50	3.2/4.4/5.3/5.4	4.2.3	31	69	26	43	100
⊕	WS1	D	0.50	3.2/4.4/5.3/5.4	4.2.3	29	77	30	47	100
□	WS18	D	0.70	3.2/4.4/5.3/5.4	4.2.4	19	27	18	9	72
⊖	WS21	D	2.50	3.2/4.4/5.3/5.4	4.2.3	30	41	22	19	100

Tested in accordance with the following clauses of BS1377-2:1990.

3.2 - Moisture Content
4.3 - Cone Penetrometer Method
4.4 - One Point Cone Penetrometer Method
4.6 - One Point Casagrande Method
5.3 - Plastic Limit Method
5.4 - Plasticity Index

+ Tested in accordance with the following clauses of BS1377-2:1990.

4.2.3 - Natural State
4.2.4 - Wet Sieved

Key: * = Non standard test, NP = Non plastic.

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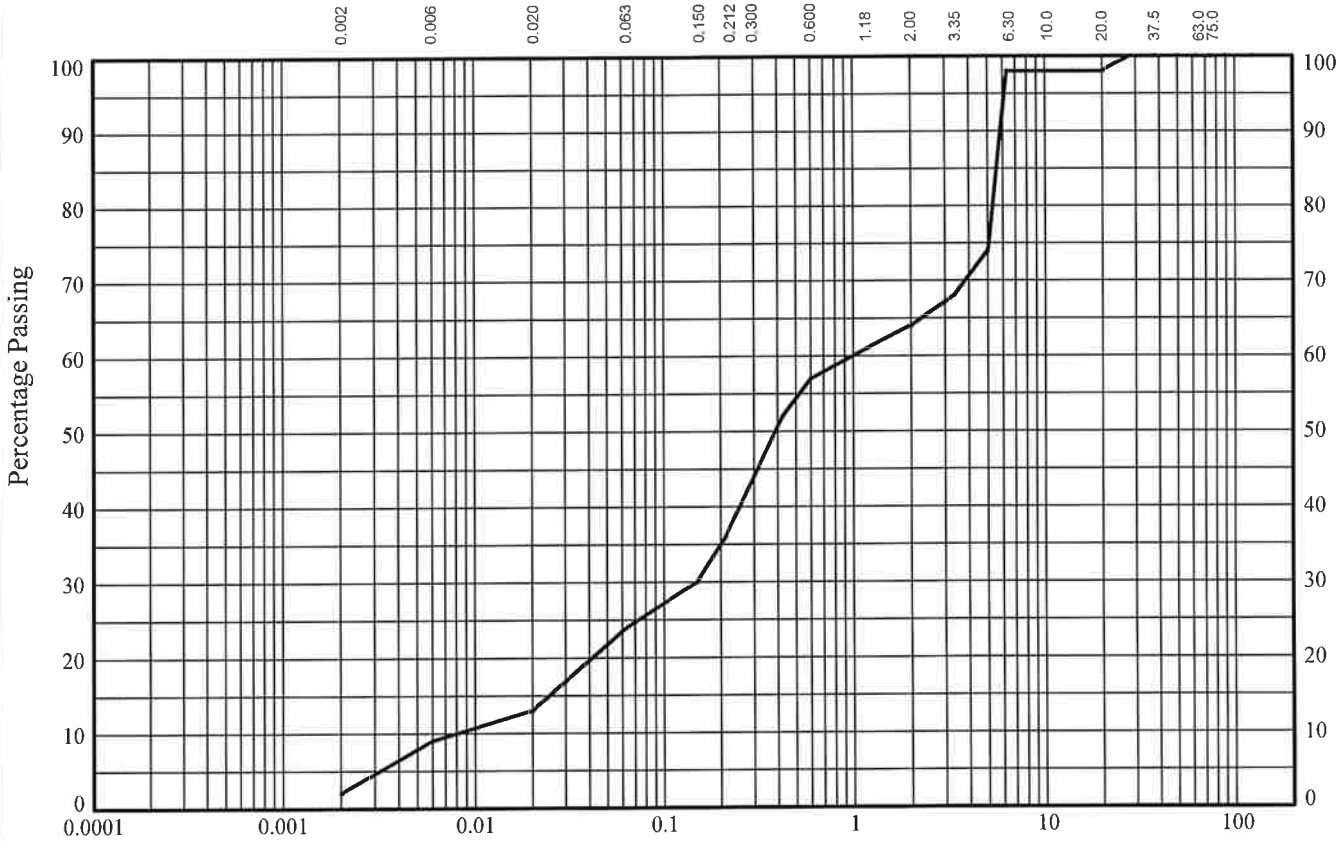
PARTICLE SIZE DISTRIBUTION TEST

In accordance with clauses 9.2,9.4 of BS1377:Part 2:1990

Borehole : **BH3** Sample Ref: Sample Type: **B** Depth (m): **1.60**



CLAY	fine	medium	coarse	fine	medium	coarse	fine	medium	coarse	COBBLES
	SILT			SAND			GRAVEL			

BS Test Sieve (mm)	Percentage Passing
125	100
90	100
75	100
63	100
50	100
37.5	100
28	100
20	98
14	98
10	98
6.3	98
5	74
3.35	68
2	64
1.18	61
0.6	57
0.425	52
0.3	44
0.212	36
0.15	30
0.063	24

Particle Diameter	Percentage Passing
0.02	**13**
0.006	**9**
0.002	**2**

Soil Fraction	Sieve Percentage
GRAVEL	**36**
SAND	**40**
SILT	**22**
CLAY	**2**

Soil Description:
Yellowish brown and grey silty gravelly SAND

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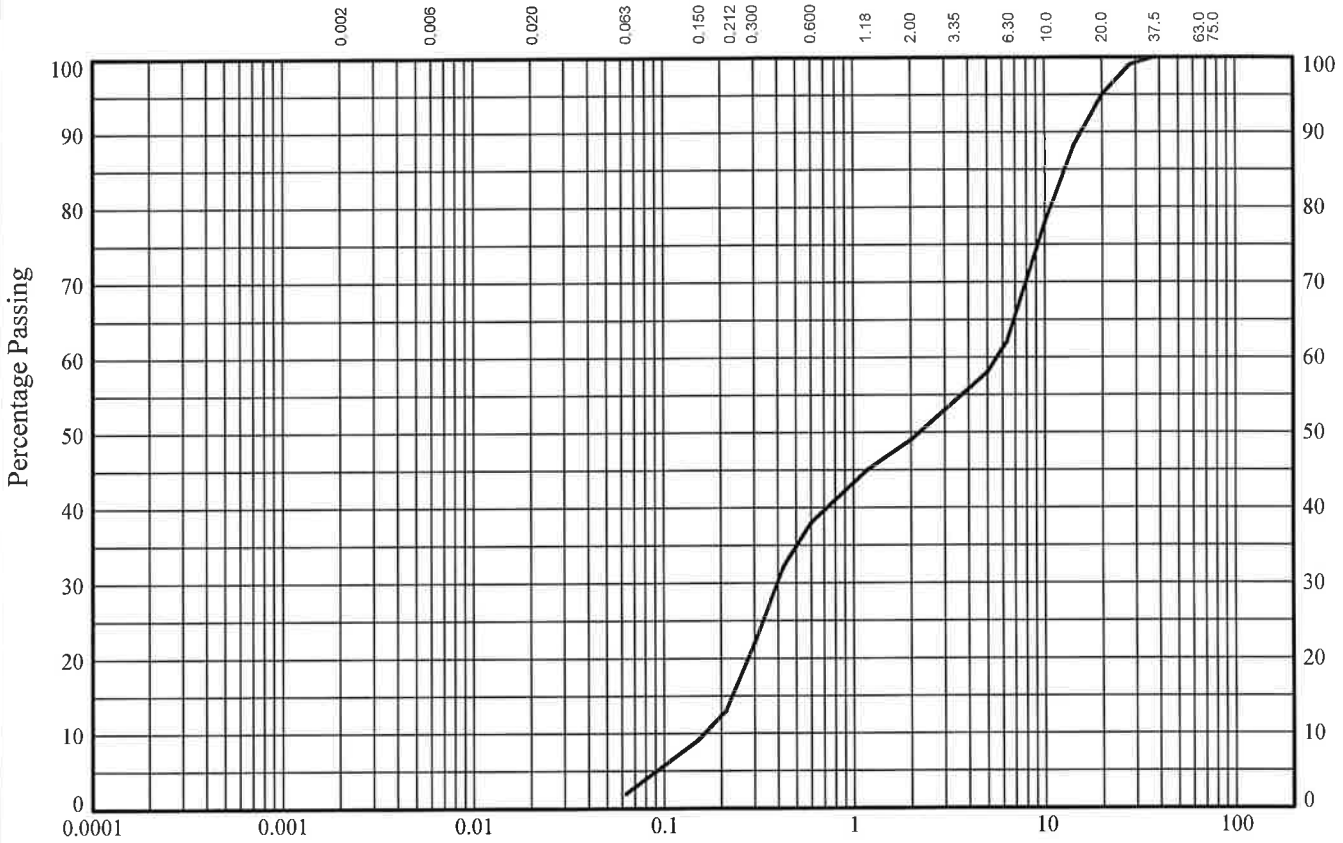
PARTICLE SIZE DISTRIBUTION TEST

In accordance with clauses 9.2,9.5 of BS1377:Part 2:1990

Borehole : **BHG** Sample Ref: Sample Type: **B** Depth (m): **2.00**



CLAY	fine	medium	coarse	fine	medium	coarse	fine	medium	coarse	COBBLES
	SILT			SAND			GRAVEL			

BS Test Sieve (mm)	Percentage Passing
125	100
90	100
75	100
63	100
50	100
37.5	100
28	99
20	95
14	88
10	78
6.3	62
5	58
3.35	54
2	49
1.18	45
0.6	38
0.425	32
0.3	22
0.212	13
0.15	9
0.063	2

Particle Diameter	Percentage Passing

Soil Fraction	Sieve Percentage
GRAVEL	**51**
SAND	**47**
SILT/CLAY	**2**

Soil Description:
Brown slightly clayey very sandy GRAVEL

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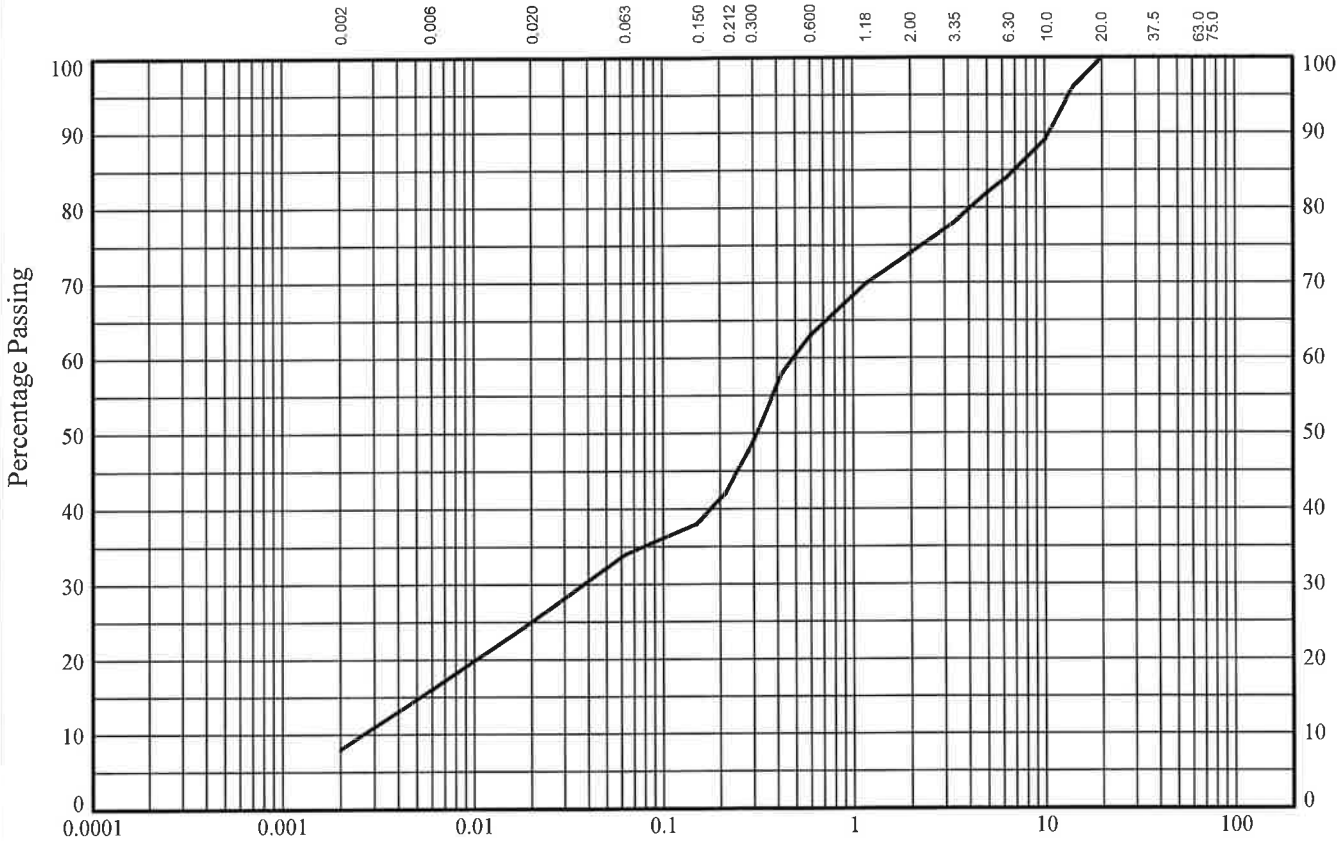
PARTICLE SIZE DISTRIBUTION TEST

In accordance with clauses 9.2,9.4 of BS1377:Part 2:1990

Borehole : **BHK** Sample Ref: Sample Type: **B** Depth (m): **3.50**



CLAY	fine	medium	coarse	fine	medium	coarse	fine	medium	coarse	COBBLES
	SILT			SAND			GRAVEL			

BS Test Sieve (mm)	Percentage Passing
125	100
90	100
75	100
63	100
50	100
37.5	100
28	100
20	100
14	96
10	89
6.3	84
5	82
3.35	78
2	74
1.18	70
0.6	63
0.425	58
0.3	49
0.212	42
0.15	38
0.063	34

Particle Diameter	Percentage Passing
0.02	**25**
0.006	**16**
0.002	**8**

Soil Fraction	Sieve Percentage
GRAVEL	**26**
SAND	**40**
SILT	**26**
CLAY	**8**

Soil Description:
Brown and grey gravelly clayey silty SAND

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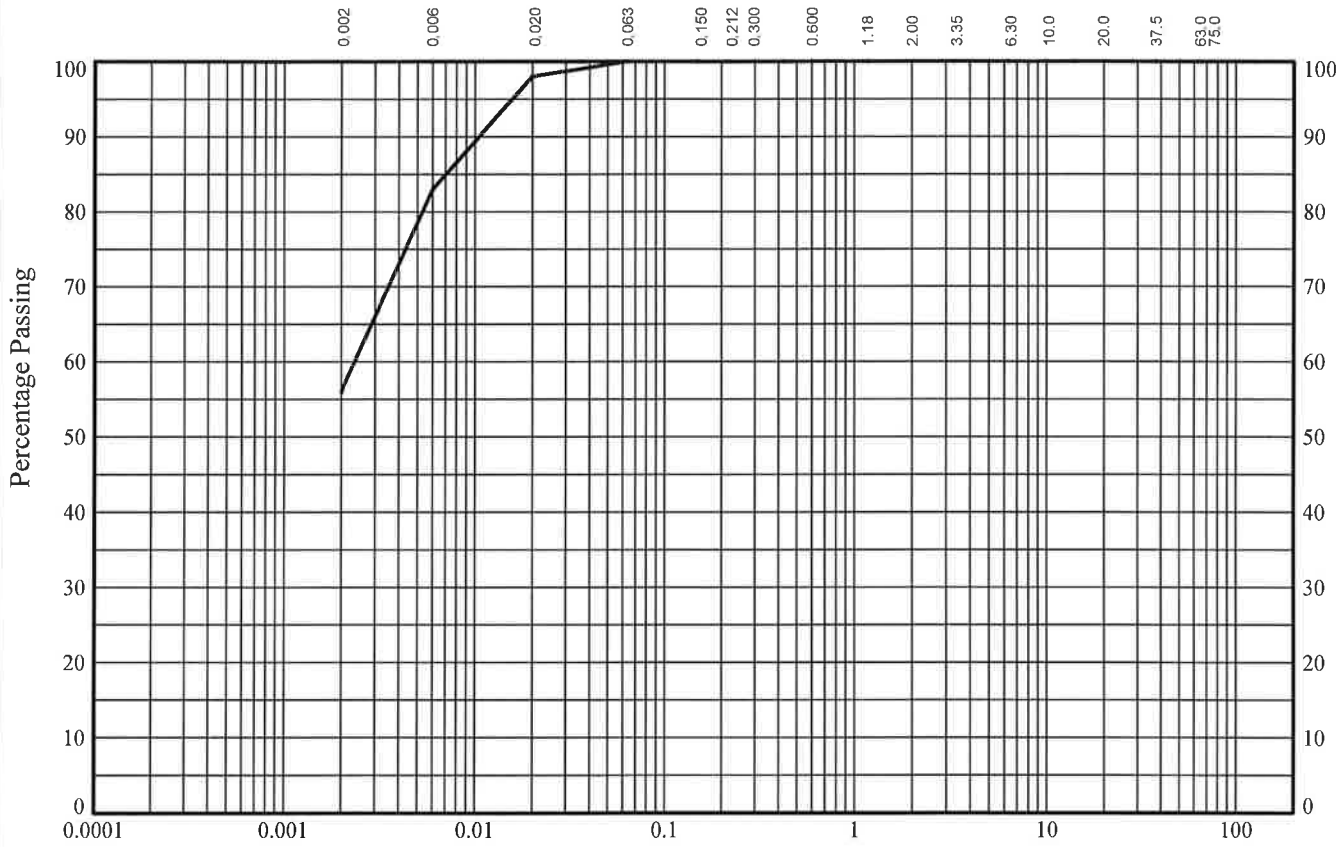
PARTICLE SIZE DISTRIBUTION TEST

In accordance with clauses 9.2,9.4 of BS1377:Part 2:1990

Trial Pit : **TP2(i)** Sample Ref: Sample Type: **D** Depth (m): **1.20**



CLAY	fine	medium	coarse	fine	medium	coarse	fine	medium	coarse	COBBLES
	SILT			SAND			GRAVEL			

BS Test Sieve (mm)	Percentage Passing
125	100
90	100
75	100
63	100
50	100
37.5	100
28	100
20	100
14	100
10	100
6.3	100
5	100
3.35	100
2	100
1.18	100
0.6	100
0.425	100
0.3	100
0.212	100
0.15	100
0.063	100

Particle Diameter	Percentage Passing
0.02	**98**
0.006	**83**
0.002	**56**

Soil Fraction	Sieve Percentage
GRAVEL	**0**
SAND	**0**
SILT	**44**
CLAY	**56**

Soil Description:
Grey mottled brown SILT/CLAY

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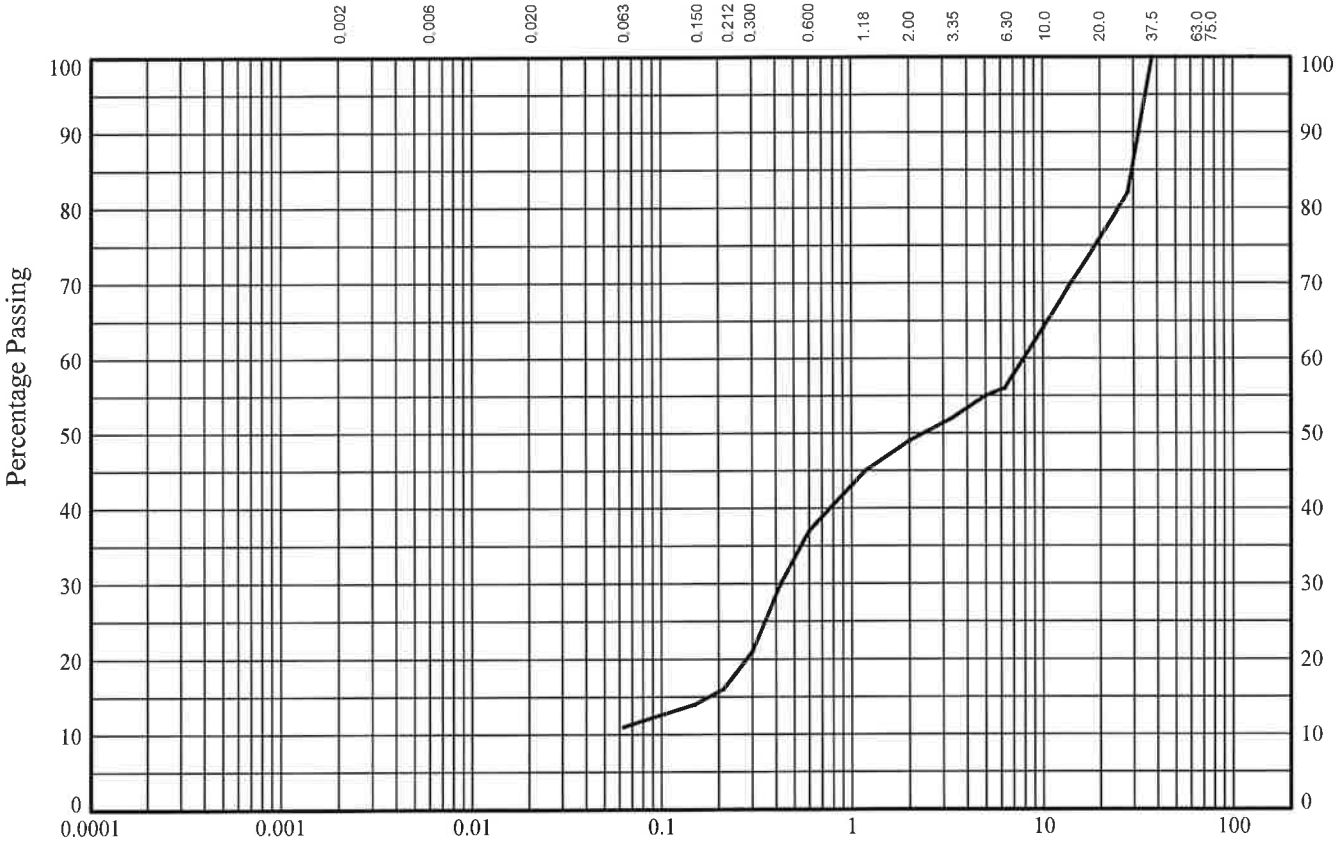
PARTICLE SIZE DISTRIBUTION TEST

In accordance with clauses 9.2,9.5 of BS1377:Part 2:1990

Trial Pit : **TP8** Sample Ref: Sample Type: **D** Depth (m): **1.20**



CLAY	fine	medium	coarse	fine	medium	coarse	fine	medium	coarse	COBBLES
	SILT			SAND			GRAVEL			

BS Test Sieve (mm)	Percentage Passing
125	100
90	100
75	100
63	100
50	100
37.5	100
28	82
20	76
14	70
10	64
6.3	56
5	55
3.35	52
2	49
1.18	45
0.6	37
0.425	30
0.3	21
0.212	16
0.15	14
0.063	11

Particle Diameter	Percentage Passing

Soil Fraction	Sieve Percentage
GRAVEL	**51**
SAND	**38**
SILT/CLAY	**11**

Soil Description:
Yellowish brown silty clayey very sandy GRAVEL

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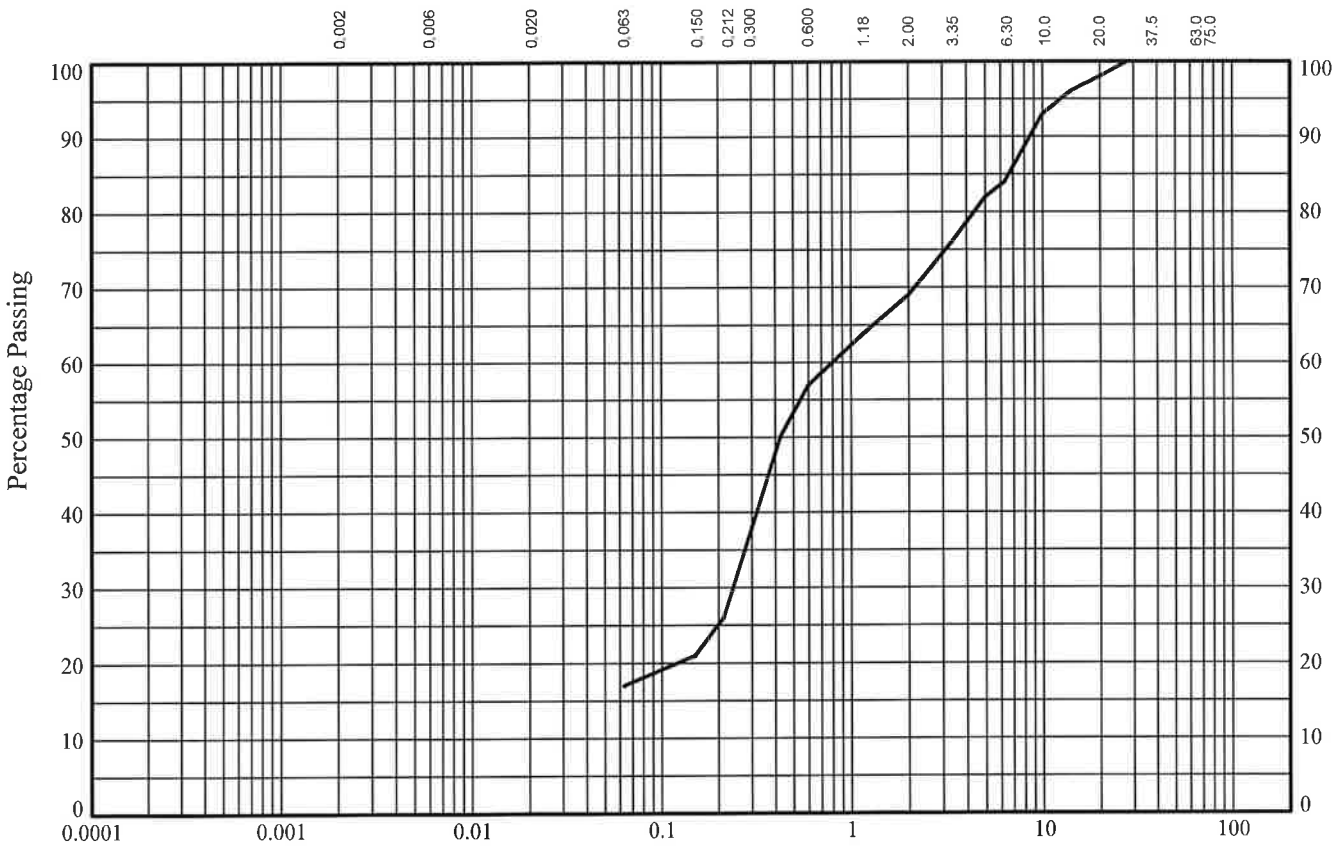
PARTICLE SIZE DISTRIBUTION TEST

In accordance with clauses 9.2,9.5 of BS1377:Part 2:1990

Trial Pit : **TP9(i)** Sample Ref: Sample Type: **D** Depth (m): **0.90**



CLAY	fine	medium	coarse	fine	medium	coarse	fine	medium	coarse	COBBLES
	SILT			SAND			GRAVEL			

BS Test Sieve (mm)	Percentage Passing
125	100
90	100
75	100
63	100
50	100
37.5	100
28	100
20	98
14	96
10	93
6.3	84
5	82
3.35	76
2	69
1.18	64
0.6	57
0.425	50
0.3	38
0.212	26
0.15	21
0.063	17

Particle Diameter	Percentage Passing

Soil Fraction	Sieve Percentage
GRAVEL	**31**
SAND	**52**
SILT/CLAY	**17**

Soil Description:
Yellowish brown clayey gravelly SAND

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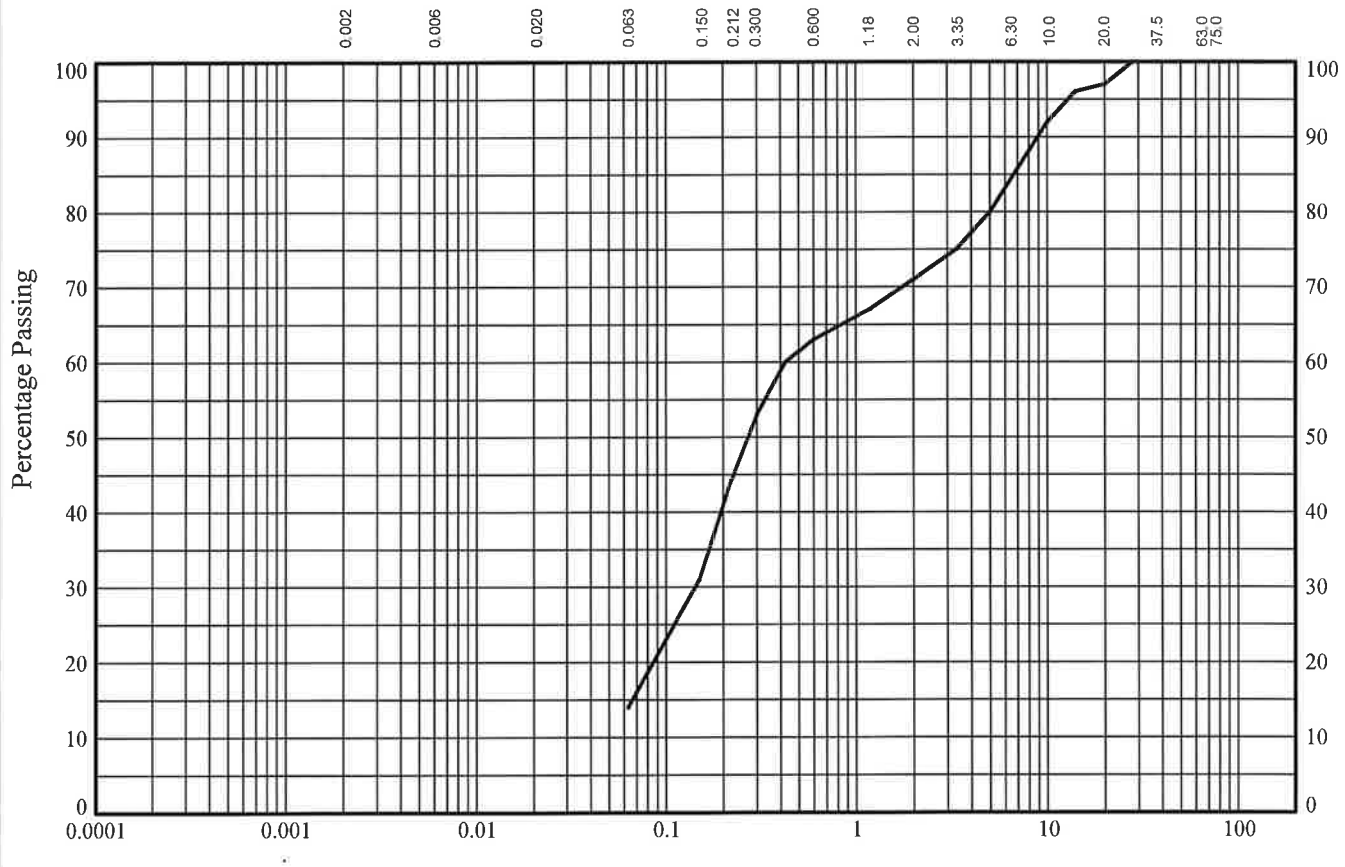
PARTICLE SIZE DISTRIBUTION TEST

In accordance with clauses 9.2,9.5 of BS1377:Part 2:1990

Trial Pit : **TP32** Sample Ref: Sample Type: **D** Depth (m): **1.20**



CLAY	fine	medium	coarse	fine	medium	coarse	fine	medium	coarse	COBBLES
	SILT			SAND			GRAVEL			

BS Test Sieve (mm)	Percentage Passing
125	100
90	100
75	100
63	100
50	100
37.5	100
28	100
20	97
14	96
10	92
6.3	84
5	80
3.35	75
2	71
1.18	67
0.6	63
0.425	60
0.3	53
0.212	43
0.15	31
0.063	14

Particle Diameter	Percentage Passing

Soil Fraction	Sieve Percentage
GRAVEL	**29**
SAND	**57**
SILT/CLAY	**14**

Soil Description:
Orangey brown clayey gravelly SAND

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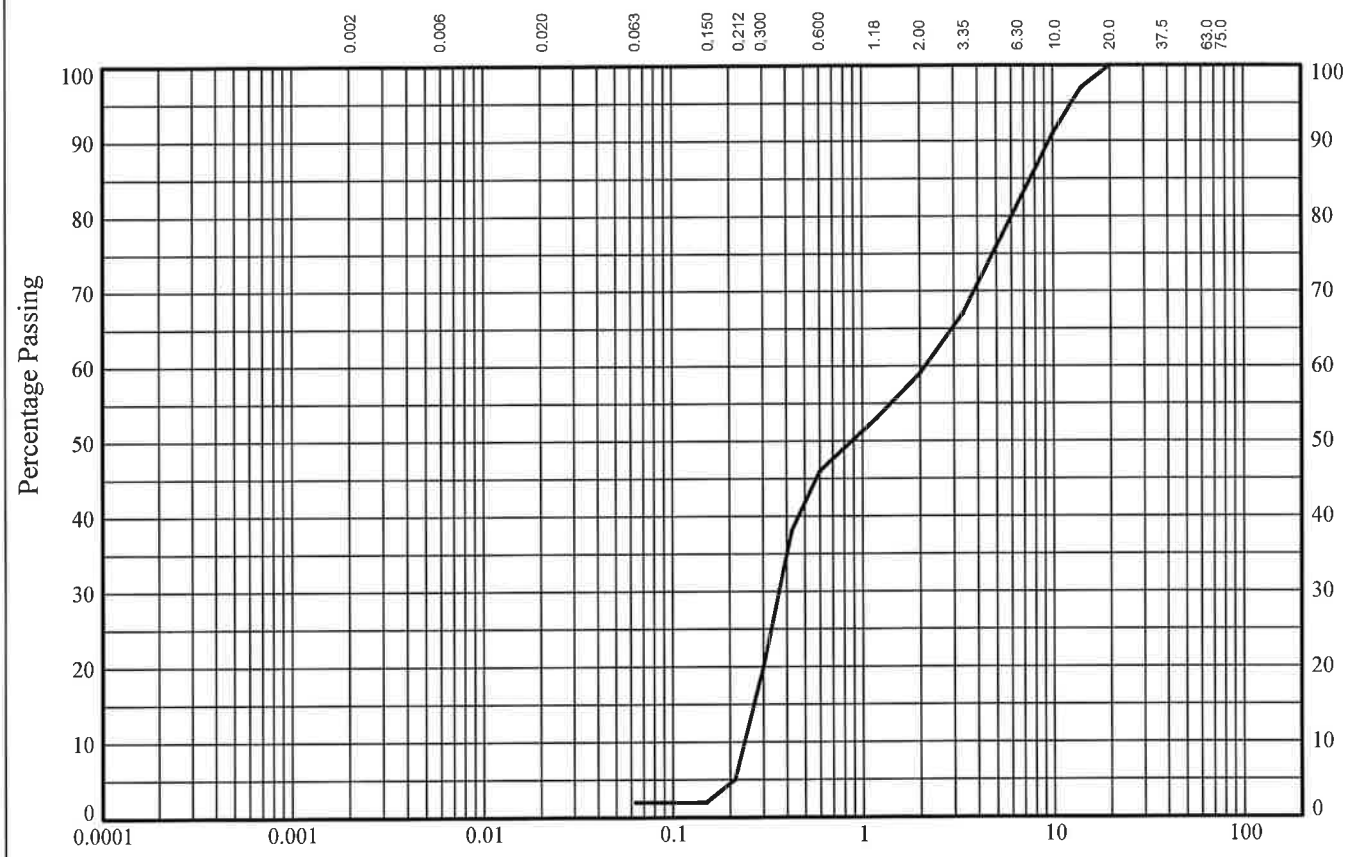
PARTICLE SIZE DISTRIBUTION TEST

In accordance with clauses 9.2,9.5 of BS1377:Part 2:1990

Trial Pit : **TP34** Sample Ref: Sample Type: **D** Depth (m): **1.50**



CLAY	fine	medium	coarse	fine	medium	coarse	fine	medium	coarse	COBBLES
	SILT			SAND			GRAVEL			

BS Test Sieve (mm)	Percentage Passing
125	100
90	100
75	100
63	100
50	100
37.5	100
28	100
20	100
14	97
10	91
6.3	81
5	76
3.35	67
2	59
1.18	53
0.6	46
0.425	38
0.3	20
0.212	5
0.15	2
0.063	2

Particle Diameter	Percentage Passing

Soil Fraction	Sieve Percentage
GRAVEL	**41**
SAND	**57**
SILT/CLAY	**2**

Soil Description:
Orangey brown clayey gravelly SAND

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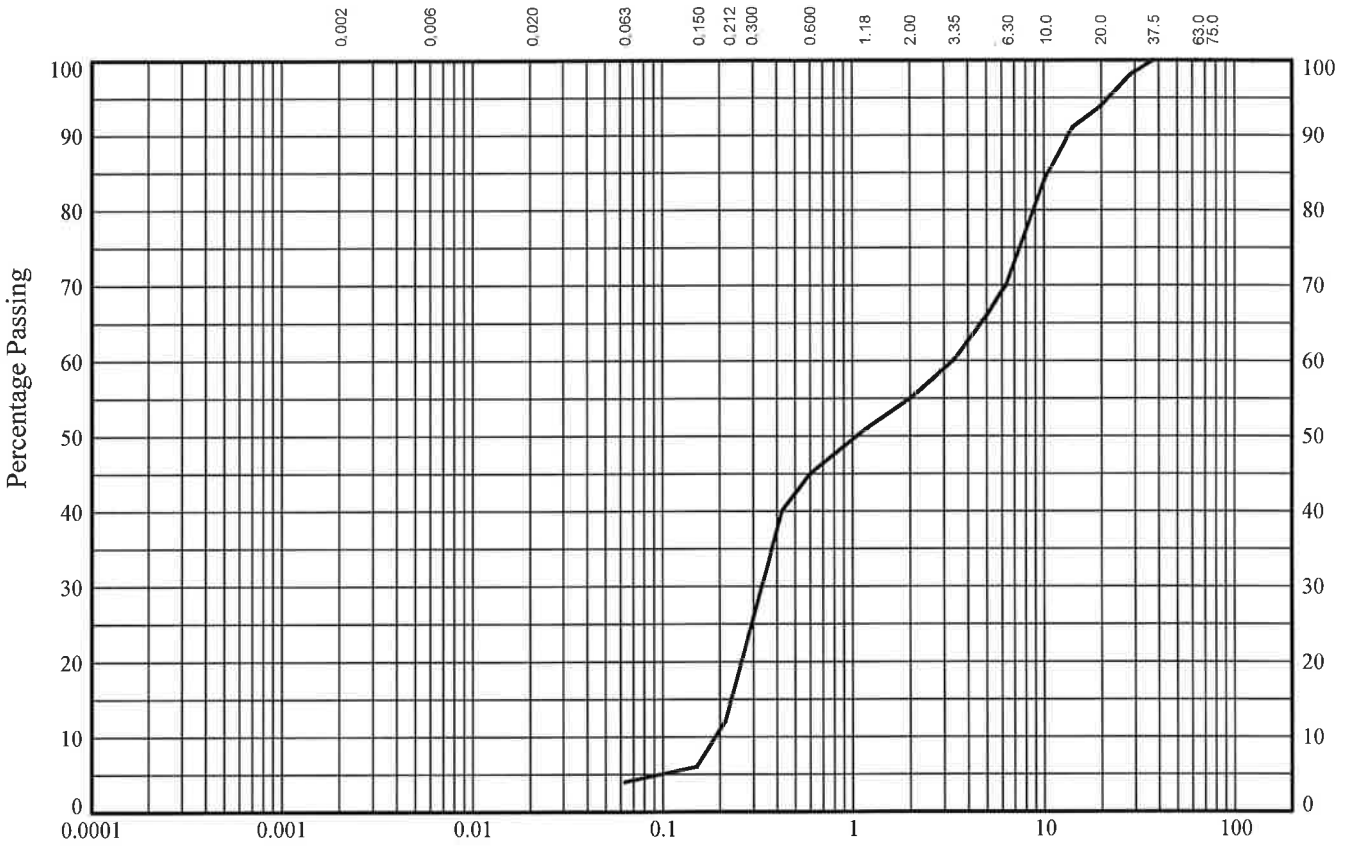
PARTICLE SIZE DISTRIBUTION TEST

In accordance with clauses 9.2,9.5 of BS1377:Part 2:1990

Trial Pit : **TP36** Sample Ref: Sample Type: **D** Depth (m): **2.00**



CLAY	fine	medium	coarse	fine	medium	coarse	fine	medium	coarse	COBBLES
	SILT			SAND			GRAVEL			

BS Test Sieve (mm)	Percentage Passing
125	100
90	100
75	100
63	100
50	100
37.5	100
28	98
20	94
14	91
10	84
6.3	70
5	66
3.35	60
2	55
1.18	51
0.6	45
0.425	40
0.3	26
0.212	12
0.15	6
0.063	4

Particle Diameter	Percentage Passing

Soil Fraction	Sieve Percentage
GRAVEL	**45**
SAND	**51**
SILT/CLAY	**4**

Soil Description:
Brown slightly clayey gravelly SAND

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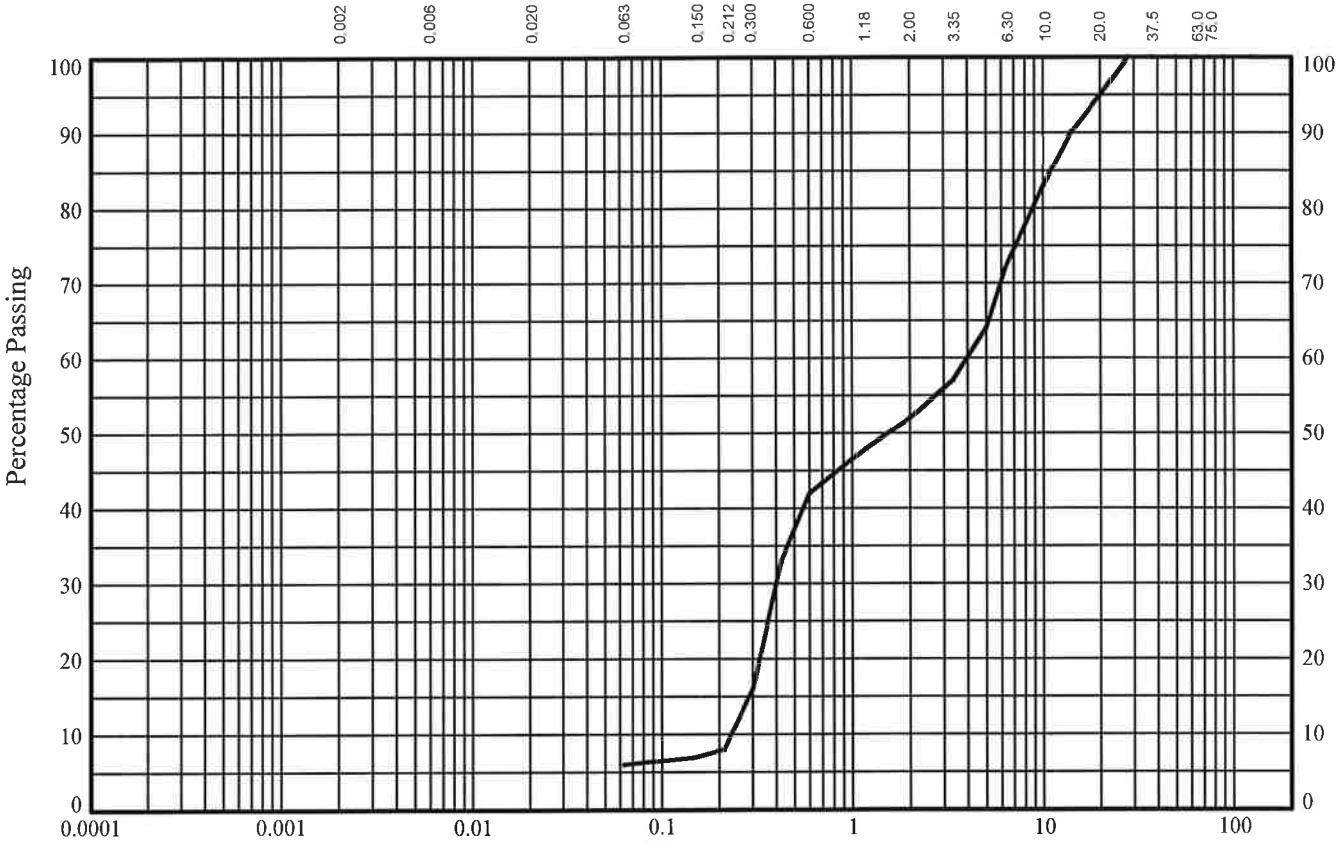
PARTICLE SIZE DISTRIBUTION TEST

In accordance with clauses 9.2,9.5 of BS1377:Part 2:1990

Trial Pit : **TP37** Sample Ref: Sample Type: **D** Depth (m): **1.30**



CLAY	fine	medium	coarse	fine	medium	coarse	fine	medium	coarse	COBBLES
	SILT			SAND			GRAVEL			

BS Test Sieve (mm)	Percentage Passing
125	100
90	100
75	100
63	100
50	100
37.5	100
28	100
20	95
14	90
10	83
6.3	72
5	64
3.35	57
2	52
1.18	48
0.6	42
0.425	33
0.3	16
0.212	8
0.15	7
0.063	6

Particle Diameter	Percentage Passing

Soil Fraction	Sieve Percentage
GRAVEL	**48**
SAND	**46**
SILT/CLAY	**6**

Soil Description:
Yellowish brown clayey SAND/GRAVEL

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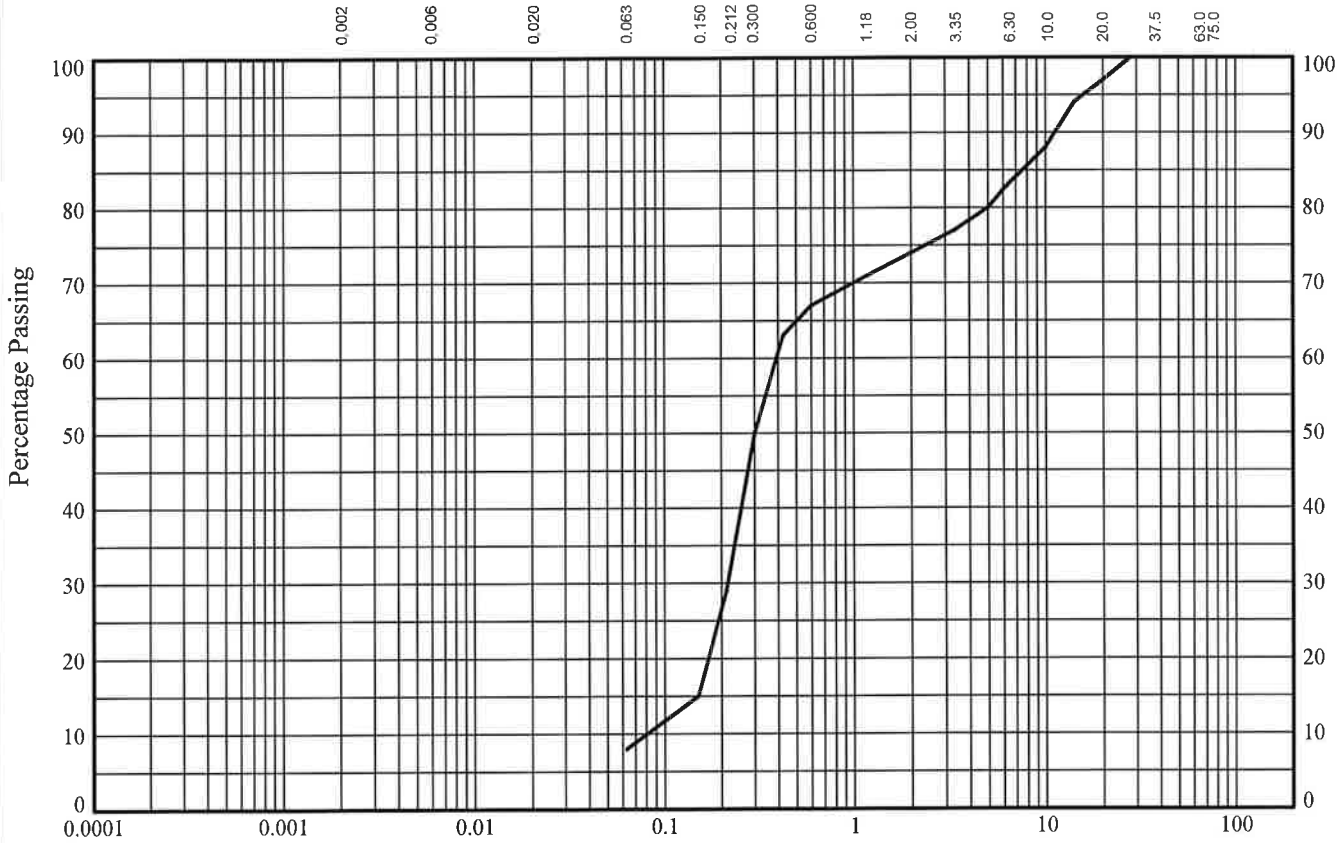
PARTICLE SIZE DISTRIBUTION TEST

In accordance with clauses 9.2,9.5 of BS1377:Part 2:1990

Window Sample : **WS20** Sample Ref: Sample Type: **D** Depth (m): **2.00**



CLAY	fine	medium	coarse	fine	medium	coarse	fine	medium	coarse	COBBLES
	SILT			SAND			GRAVEL			

BS Test Sieve (mm)	Percentage Passing
125	100
90	100
75	100
63	100
50	100
37.5	100
28	100
20	97
14	94
10	88
6.3	83
5	80
3.35	77
2	74
1.18	71
0.6	67
0.425	63
0.3	50
0.212	29
0.15	15
0.063	8

Particle Diameter	Percentage Passing

Soil Fraction	Sieve Percentage
GRAVEL	**26**
SAND	**66**
SILT/CLAY	**8**

Soil Description:
Orangey brown clayey gravelly SAND

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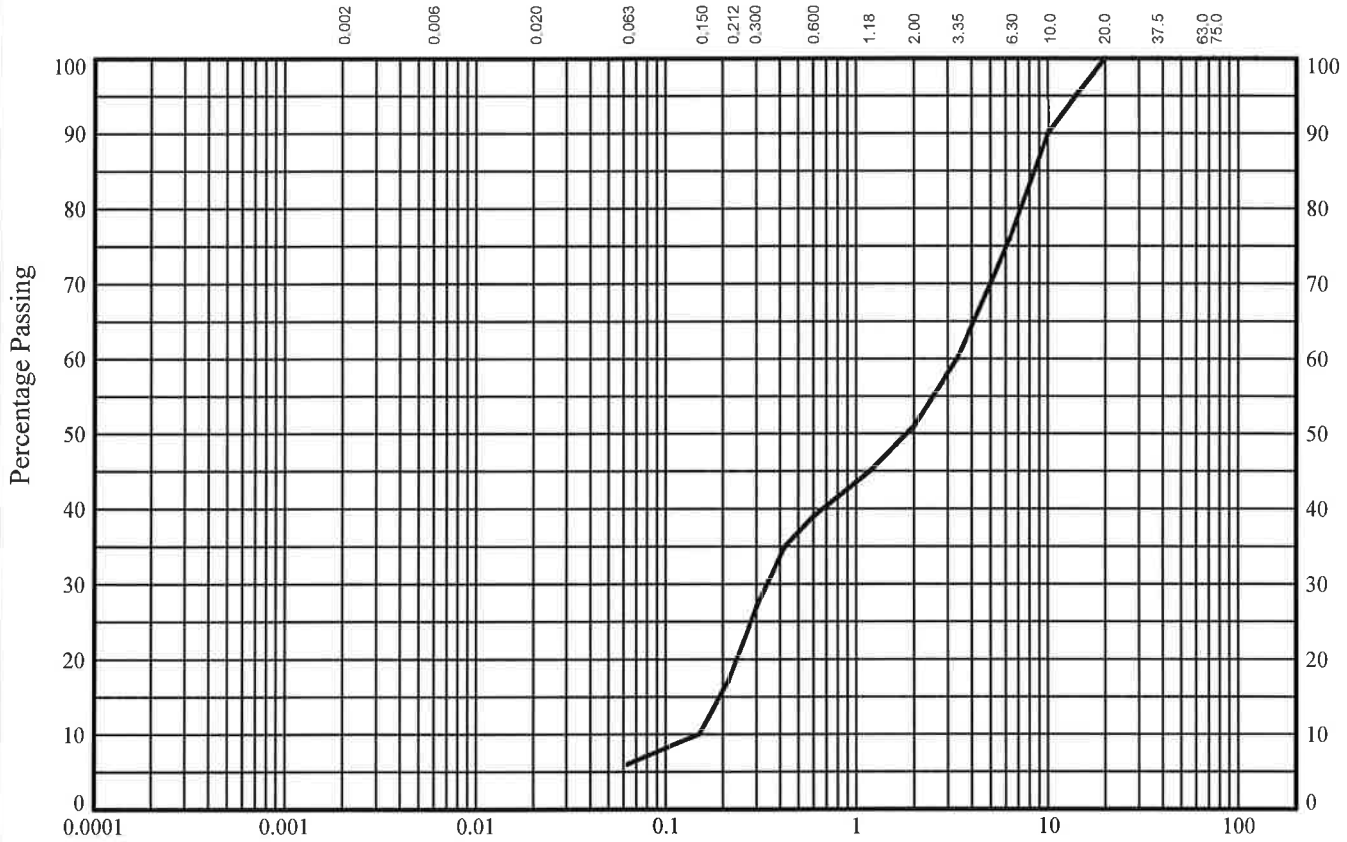
PARTICLE SIZE DISTRIBUTION TEST

In accordance with clauses 9.2,9.5 of BS1377:Part 2:1990

Window Sample : **WS23** Sample Ref: Sample Type: **D** Depth (m): **2.20**



CLAY	fine	medium	coarse	fine	medium	coarse	fine	medium	coarse	COBBLES
	SILT			SAND			GRAVEL			

BS Test Sieve (mm)	Percentage Passing
125	100
90	100
75	100
63	100
50	100
37.5	100
28	100
20	100
14	95
10	90
6.3	76
5	70
3.35	60
2	51
1.18	45
0.6	39
0.425	35
0.3	27
0.212	17
0.15	10
0.063	6

Particle Diameter	Percentage Passing

Soil Fraction	Sieve Percentage
GRAVEL	**49**
SAND	**45**
SILT/CLAY	**6**

Soil Description:
Orangey brown clayey SAND/GRAVEL

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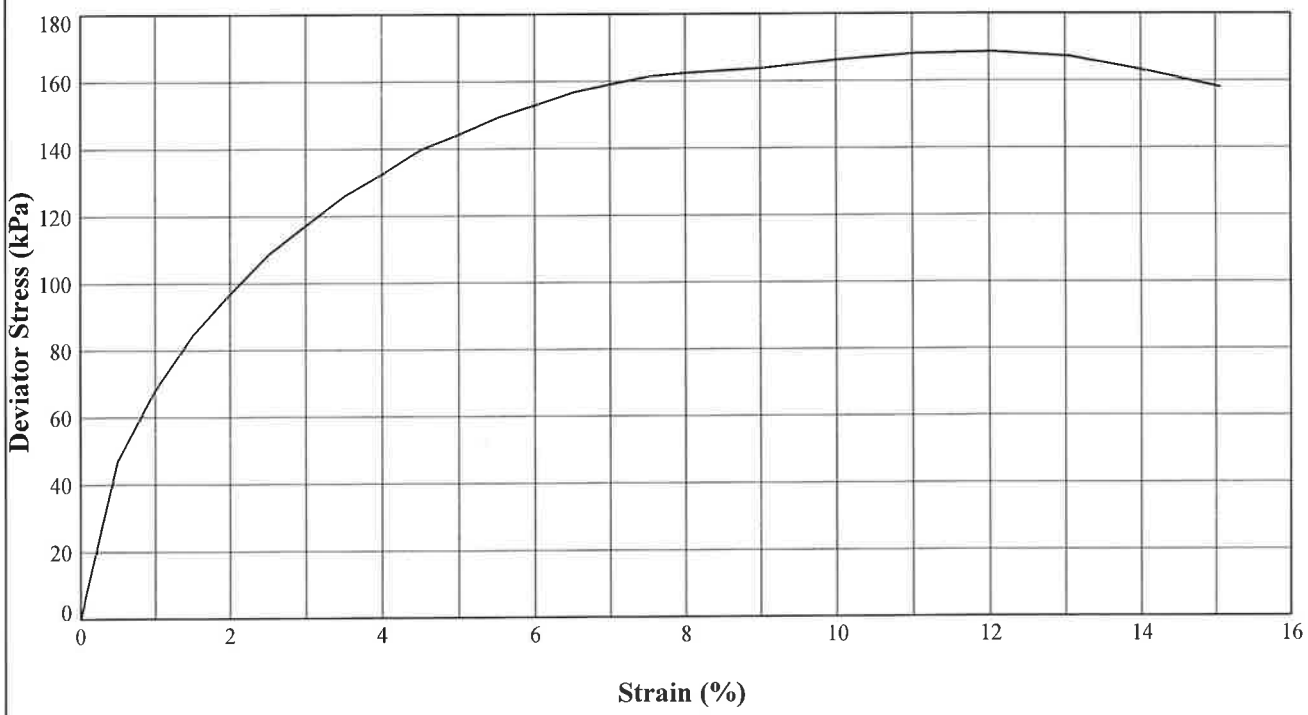
UNCONSOLIDATED QUICK UNDRAINED (SINGLE STAGE) TRIAXIAL COMPRESSION TEST

In accordance with BS1377:Part 7:1990, Clause 8

Borehole : **BH1** Sample Ref: Sample Type: **U** Depth (m): **2.50**

Description : **Grey mottled brown CLAY**

STAGE NUMBER			1	2	3
SAMPLE DETAILS	Sample Condition		Undisturbed		
	Orientation of sample		Vertical		
	Diameter	(mm)	103.03		
	Height	(mm)	208.97		
	Moisture Content	(%)	31		
	Bulk Density	(Mg/m^3)	1.94		
	Dry Density	(Mg/m^3)	1.48		
TEST DETAILS	Membrane Thickness	(mm)	0.26		
	Rate of Axial Displacement	(%/min)	2.01		
	Cell Pressure	(kPa)	50		
	Membrane Correction	(kPa)	0.66		
	Corrected Deviator Stress	(kPa)	169		
	Undrained Shear Strength	(kPa)	84		
	Strain at Failure	(%)	12.1		
	Mode of Failure		Brittle		



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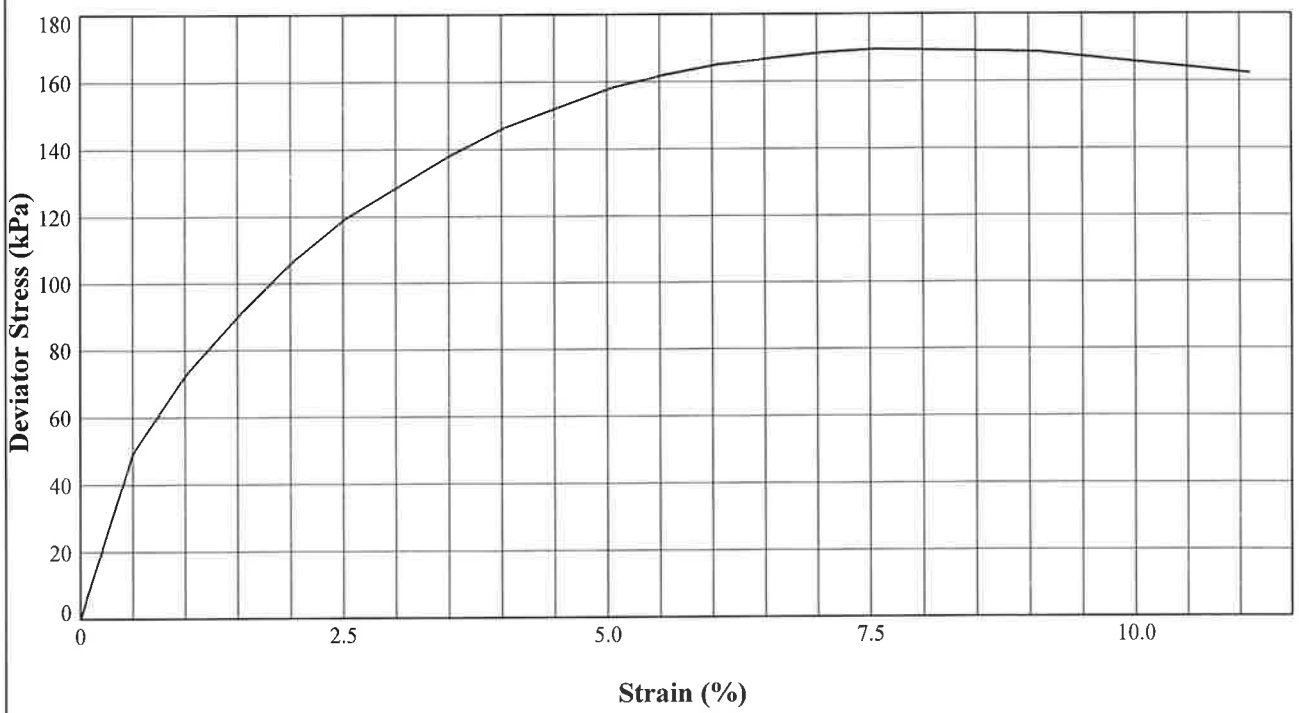
UNCONSOLIDATED QUICK UNDRAINED (SINGLE STAGE) TRIAXIAL COMPRESSION TEST

In accordance with BS1377:Part 7:1990, Clause 8

Borehole : **BH1** Sample Ref: Sample Type: **U** Depth (m): **4.60**

Description : **Grey mottled brown CLAY**

STAGE NUMBER			1	2	3
SAMPLE DETAILS	Sample Condition		Undisturbed		
	Orientation of sample		Vertical		
	Diameter	(mm)	102.15		
	Height	(mm)	208.03		
	Moisture Content	(%)	31		
	Bulk Density	(Mg/m^3)	1.96		
	Dry Density	(Mg/m^3)	1.50		
TEST DETAILS	Membrane Thickness	(mm)	0.18		
	Rate of Axial Displacement	(%/min)	2.02		
	Cell Pressure	(kPa)	90		
	Membrane Correction	(kPa)	0.32		
	Corrected Deviator Stress	(kPa)	170		
	Undrained Shear Strength	(kPa)	85		
	Strain at Failure	(%)	7.6		
	Mode of Failure		Brittle		



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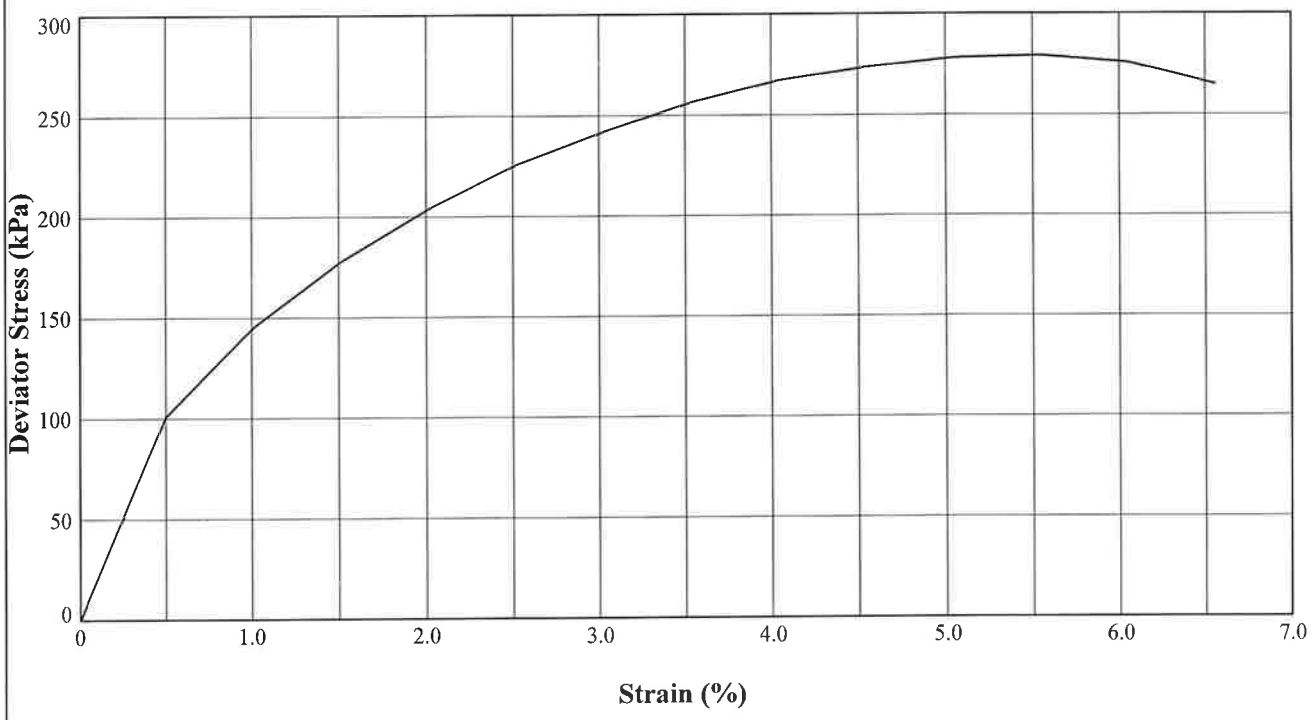
In accordance with BS1377:Part 7:1990, Clause 8

Borehole : **BH1** Sample Ref: Sample Type: **U** Depth (m): **7.50**

Description : **Grey CLAY**

STAGE NUMBER			1	2	3
SAMPLE DETAILS	Sample Condition		Undisturbed		
	Orientation of sample		Vertical		
	Diameter	(mm)	102.33		
	Height	(mm)	208.10		
	Moisture Content	(%)	30		
	Bulk Density	(Mg/m^3)	1.98		
	Dry Density	(Mg/m^3)	1.53		
TEST DETAILS	Membrane Thickness	(mm)	0.35		
	Rate of Axial Displacement	(%/min)	2.02		
	Cell Pressure	(kPa)	150		
	Membrane Correction	(kPa)	0.50		
	Corrected Deviator Stress	(kPa)	279		
	Undrained Shear Strength	(kPa)	140		
	Strain at Failure	(%)	5.6		
	Mode of Failure		Brittle		



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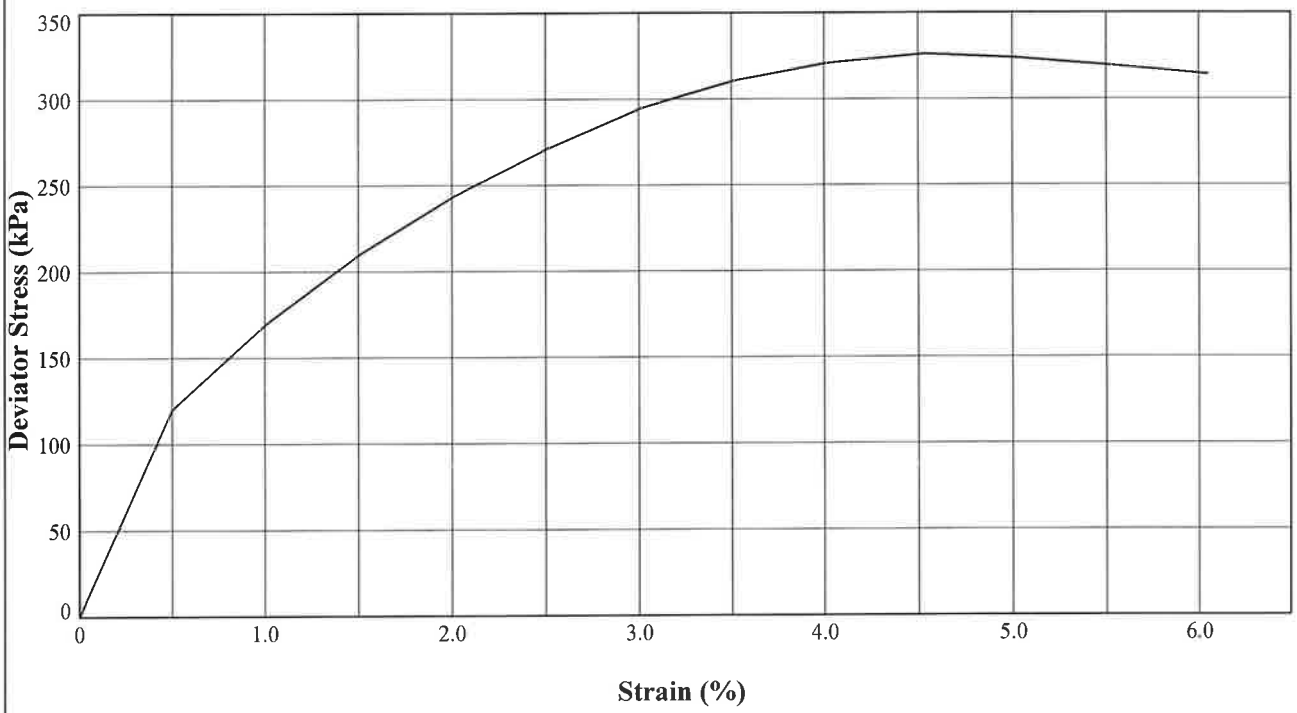
In accordance with BS1377:Part 7:1990, Clause 8

Borehole : **BH1** Sample Ref: Sample Type: **U** Depth (m): **10.50**

Description : **Grey CLAY**

STAGE NUMBER			1	2	3
SAMPLE DETAILS	Sample Condition		**Undisturbed**		
	Orientation of sample		**Vertical**		
	Diameter	(mm)	**101.87**		
	Height	(mm)	**208.30**		
	Moisture Content	(%)	**28**		
	Bulk Density	(Mg/m^3)	**2.00**		
	Dry Density	(Mg/m^3)	**1.56**		
TEST DETAILS	Membrane Thickness	(mm)	**0.28**		
	Rate of Axial Displacement	(%/min)	**2.02**		
	Cell Pressure	(kPa)	**210**		
	Membrane Correction	(kPa)	**0.34**		
	Corrected Deviator Stress	(kPa)	**326**		
	Undrained Shear Strength	(kPa)	**163**		
	Strain at Failure	(%)	**4.5**		
	Mode of Failure		**Brittle**		



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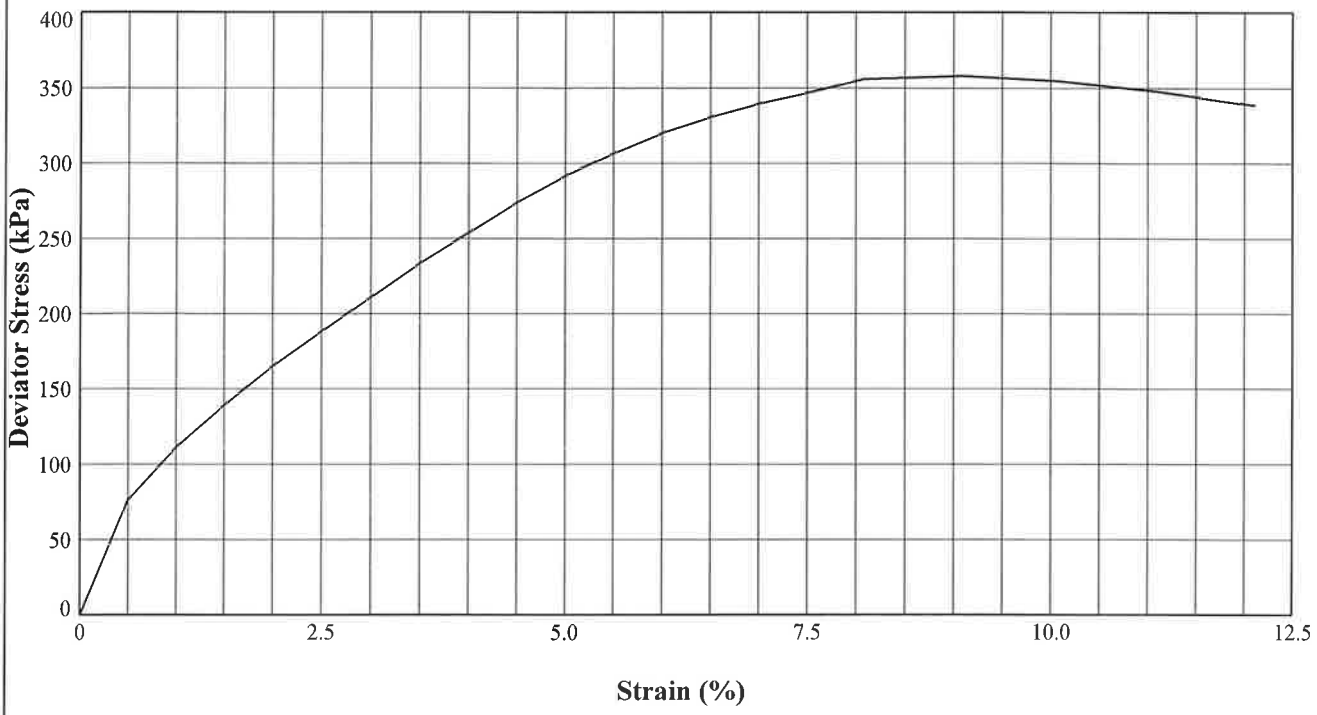
In accordance with BS1377:Part 7:1990, Clause 8

Borehole : **BH1** Sample Ref: Sample Type: **U** Depth (m): **13.50**

Description : **Grey CLAY**

STAGE NUMBER			1	2	3
SAMPLE DETAILS	Sample Condition		Undisturbed		
	Orientation of sample		Vertical		
	Diameter	(mm)	100.51		
	Height	(mm)	208.03		
	Moisture Content	(%)	29		
	Bulk Density	(Mg/m^3)	1.98		
	Dry Density	(Mg/m^3)	1.53		
TEST DETAILS	Membrane Thickness	(mm)	0.28		
	Rate of Axial Displacement	(%/min)	2.02		
	Cell Pressure	(kPa)	270		
	Membrane Correction	(kPa)	0.59		
	Corrected Deviator Stress	(kPa)	358		
	Undrained Shear Strength	(kPa)	179		
	Strain at Failure	(%)	9.1		
	Mode of Failure		Brittle		



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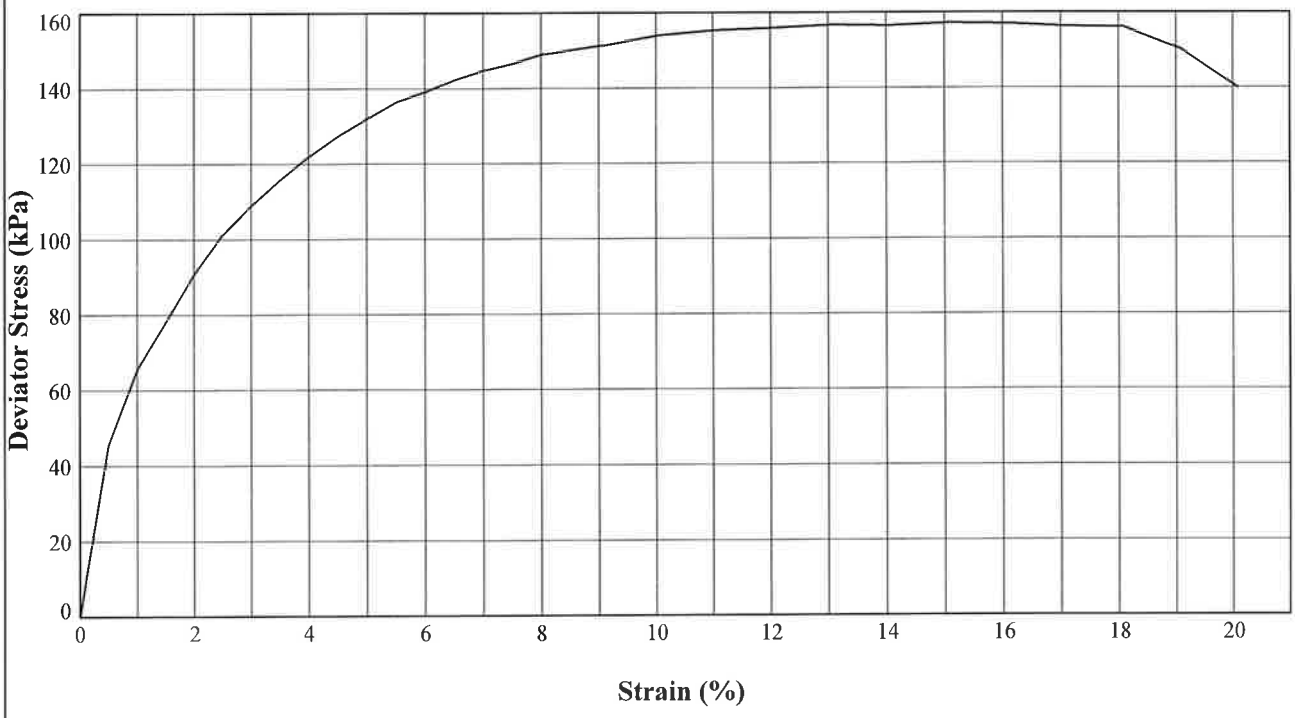
UNCONSOLIDATED QUICK UNDRAINED (SINGLE STAGE) TRIAXIAL COMPRESSION TEST

In accordance with BS1377:Part 7:1990, Clause 8

Borehole : **BH2** Sample Ref: Sample Type: **U** Depth (m): **3.00**

Description : **Brownish grey CLAY**

STAGE NUMBER			1	2	3
SAMPLE DETAILS	Sample Condition		Undisturbed		
	Orientation of sample		Vertical		
	Diameter	(mm)	102.22		
	Height	(mm)	208.97		
	Moisture Content	(%)	32		
	Bulk Density	(Mg/m^3)	1.93		
	Dry Density	(Mg/m^3)	1.46		
TEST DETAILS	Membrane Thickness	(mm)	0.18		
	Rate of Axial Displacement	(%/min)	2.01		
	Cell Pressure	(kPa)	60		
	Membrane Correction	(kPa)	0.54		
	Corrected Deviator Stress	(kPa)	157		
	Undrained Shear Strength	(kPa)	79		
	Strain at Failure	(%)	15.1		
	Mode of Failure		Compound		



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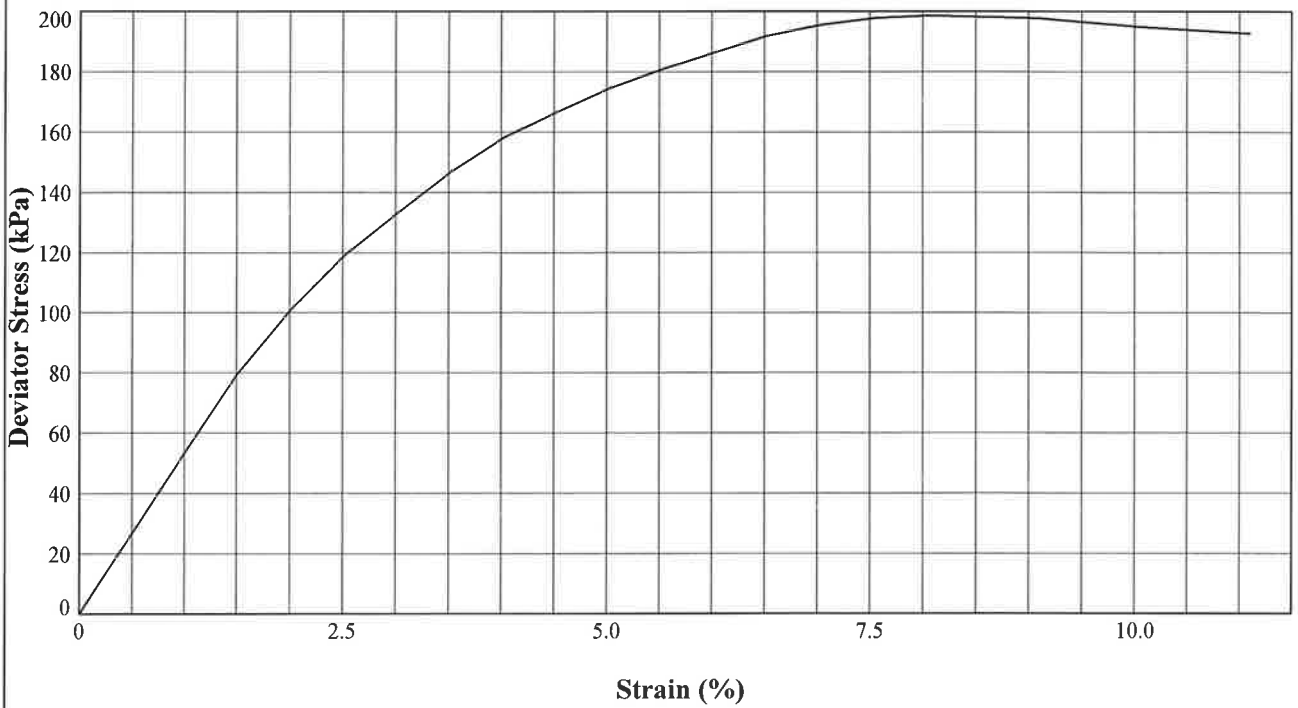
UNCONSOLIDATED QUICK UNDRAINED (SINGLE STAGE) TRIAXIAL COMPRESSION TEST

In accordance with BS1377:Part 7:1990, Clause 8

Borehole : **BH2** Sample Ref: Sample Type: **U** Depth (m): **5.00**

Description : **Brownish grey CLAY**

STAGE NUMBER			1	2	3
SAMPLE DETAILS	Sample Condition		**Undisturbed**		
	Orientation of sample		**Vertical**		
	Diameter	(mm)	**102.21**		
	Height	(mm)	**208.13**		
	Moisture Content	(%)	**31**		
	Bulk Density	(Mg/m^3)	**1.93**		
	Dry Density	(Mg/m^3)	**1.47**		
TEST DETAILS	Membrane Thickness	(mm)	**0.26**		
	Rate of Axial Displacement	(%/min)	**2.02**		
	Cell Pressure	(kPa)	**100**		
	Membrane Correction	(kPa)	**0.49**		
	Corrected Deviator Stress	(kPa)	**199**		
	Undrained Shear Strength	(kPa)	**99**		
	Strain at Failure	(%)	**8.1**		
	Mode of Failure		**Compound**		



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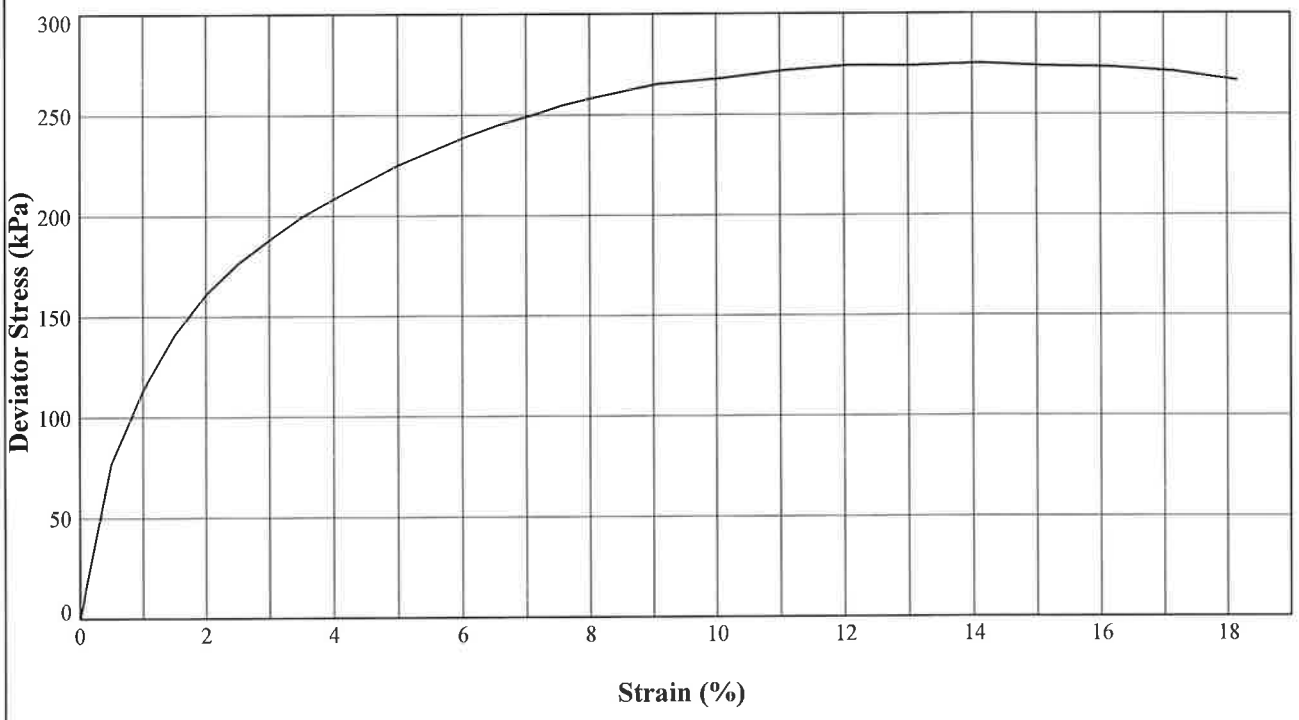
In accordance with BS1377:Part 7:1990, Clause 8

Borehole : **BH2** Sample Ref: Sample Type: **U** Depth (m): **8.00**

Description : **Grey CLAY**

STAGE NUMBER			1	2	3
SAMPLE DETAILS	Sample Condition		**Undisturbed**		
	Orientation of sample		**Vertical**		
	Diameter	(mm)	**101.87**		
	Height	(mm)	**208.13**		
	Moisture Content	(%)	**31**		
	Bulk Density	(Mg/m^3)	**1.96**		
	Dry Density	(Mg/m^3)	**1.50**		
TEST DETAILS	Membrane Thickness	(mm)	**0.31**		
	Rate of Axial Displacement	(%/min)	**2.02**		
	Cell Pressure	(kPa)	**160**		
	Membrane Correction	(kPa)	**0.89**		
	Corrected Deviator Stress	(kPa)	**275**		
	Undrained Shear Strength	(kPa)	**138**		
	Strain at Failure	(%)	**14.1**		
	Mode of Failure		**Compound**		



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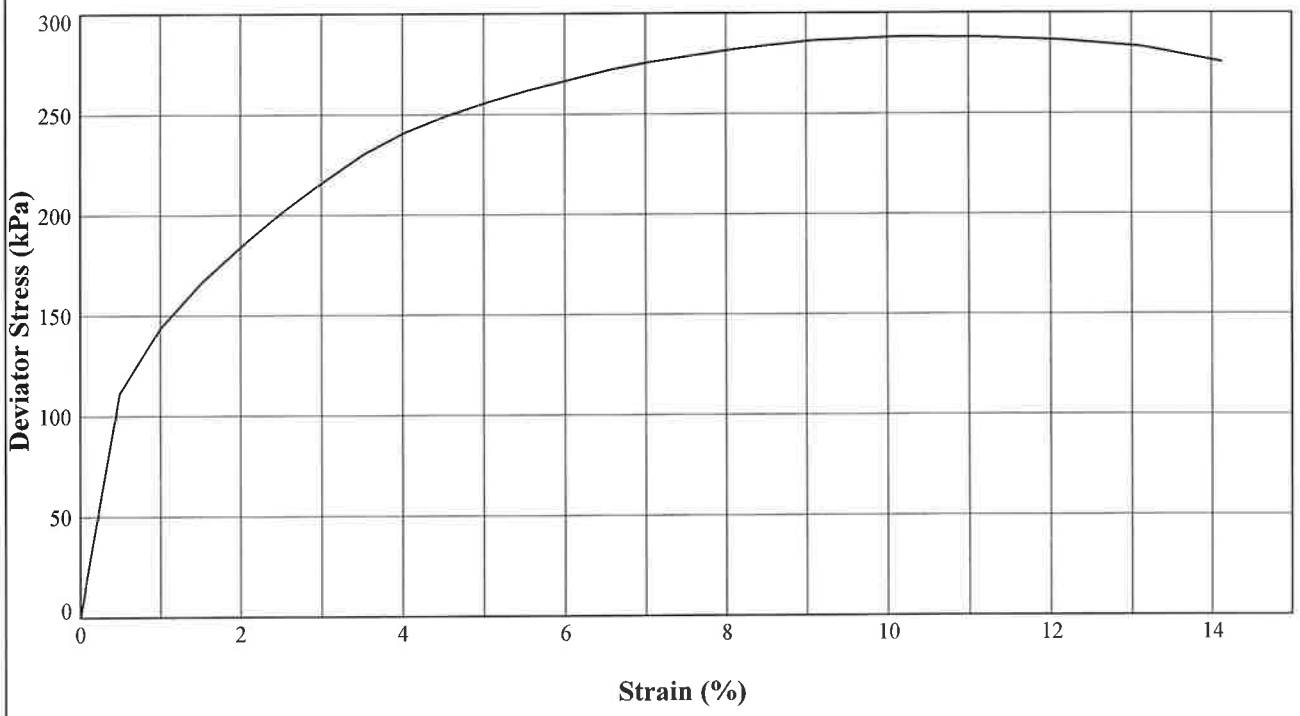
UNCONSOLIDATED QUICK UNDRAINED (SINGLE STAGE) TRIAXIAL COMPRESSION TEST

In accordance with BS1377:Part 7:1990, Clause 8

Borehole : **BH2** Sample Ref: Sample Type: **U** Depth (m): **11.00**

Description : **Grey CLAY**

STAGE NUMBER			1	2	3
SAMPLE DETAILS	Sample Condition		**Undisturbed**		
	Orientation of sample		**Vertical**		
	Diameter	(mm)	**102.25**		
	Height	(mm)	**208.13**		
	Moisture Content	(%)	**30**		
	Bulk Density	(Mg/m^3)	**1.97**		
	Dry Density	(Mg/m^3)	**1.52**		
TEST DETAILS	Membrane Thickness	(mm)	**0.31**		
	Rate of Axial Displacement	(%/min)	**2.02**		
	Cell Pressure	(kPa)	**220**		
	Membrane Correction	(kPa)	**0.71**		
	Corrected Deviator Stress	(kPa)	**288**		
	Undrained Shear Strength	(kPa)	**144**		
	Strain at Failure	(%)	**10.1**		
	Mode of Failure		**Brittle**		



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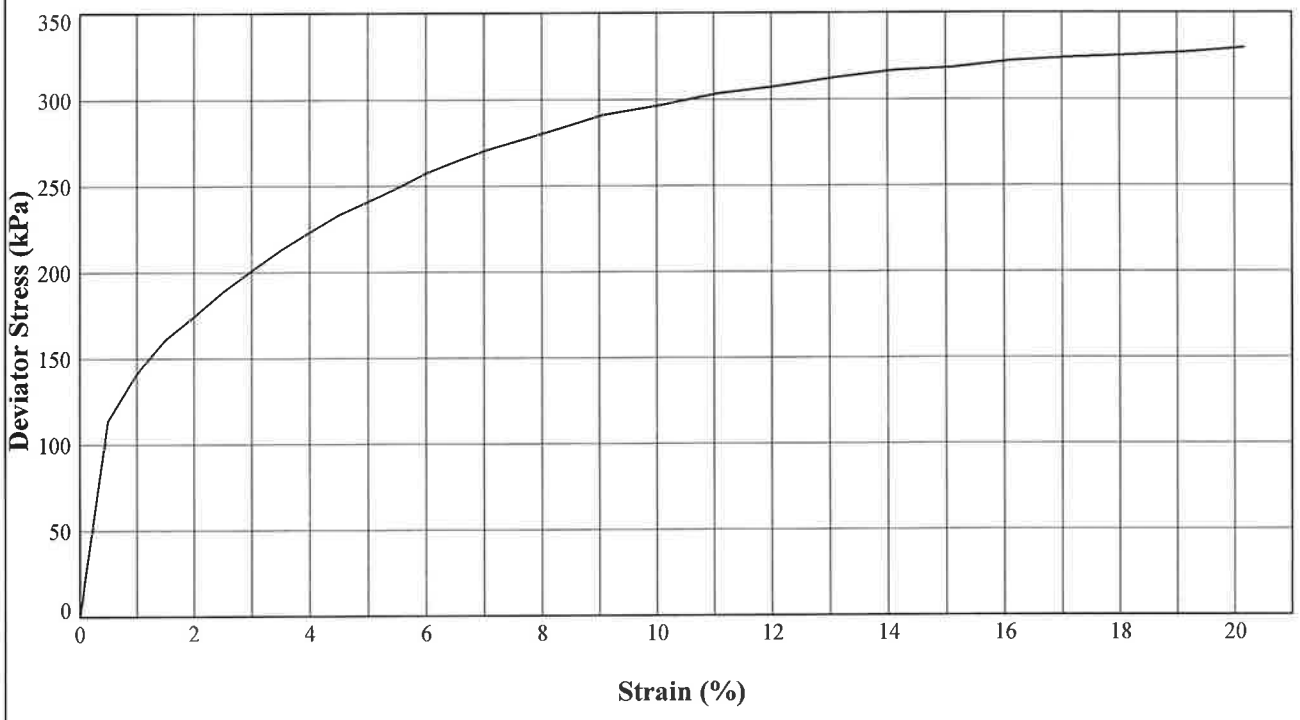
In accordance with BS1377:Part 7:1990, Clause 8

Borehole : **BH2** Sample Ref: Sample Type: **U** Depth (m): **13.50**

Description : **Grey CLAY**

STAGE NUMBER			1	2	3
SAMPLE DETAILS	Sample Condition		**Undisturbed**		
	Orientation of sample		**Vertical**		
	Diameter	(mm)	**102.10**		
	Height	(mm)	**208.26**		
	Moisture Content	(%)	**28**		
	Bulk Density	(Mg/m^3)	**1.97**		
	Dry Density	(Mg/m^3)	**1.54**		
TEST DETAILS	Membrane Thickness	(mm)	**0.18**		
	Rate of Axial Displacement	(%/min)	**2.02**		
	Cell Pressure	(kPa)	**270**		
	Membrane Correction	(kPa)	**0.68**		
	Corrected Deviator Stress	(kPa)	**330**		
	Undrained Shear Strength	(kPa)	**165**		
	Strain at Failure	(%)	**20.2**		
	Mode of Failure		**Compound**		



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