B.S.1377 TEST 7A (Wet Sieving)

Contract Name : BeWT
Location : Castleton WWTW
Job Number : 8156-129 Borehole Number : 2
Sample Number : S2 Depth : 2.0m

Operator : LW Date : 9 April 1997

Description
Brown slightly clayey fine to medium SAND with occasional fine gravel

Sample pretreated using sodium hexametaphosphate

Initial total dry weight : 485.70 gms

B.S. Sieve Size	Weight Retained gms	Total Weight Retained	Percent Retained	Cummulative Percentage Passing
100.0 mm	0	0	0.00	100.00
75.0 mm	0	0	0.00	100.00
63.0 mm	0	0	0.00	100.00
50.0 mm	0	0	0.00	100.00
37.5 mm	0	0	0.00	100.00
28.0 mm	0	0	0.00	100.00
20.0 mm	0	0	0.00	100.00
14.0 mm	0	0	0.00	100.00
10.0 mm	5	5	1.03	98.97
6.30 mm	2.0	2	0.41	98.56
5.00 mm	1.0	1	0.21	98.35
3.35 mm	2.0	2	0.41	97.94
2.00 mm	1.0	2	0.49	97.45
1.18 mm	1.0	2	0.49	96.96
600 micron	3.00	7	1.47	95.49
425 micron	6.00	14	2.94	92.55
300 micron	28.00	67	13.71	78.84
212 micron	83.00	197	40.65	38.20
150 micron	48.00	114	23.51	14.69
63 micron	17.00	40	8.32	6.37

Sample passing B.S. 3.35 mm
Sample riffled from 475.70 gms down to 200.00 gms
Difference between calculated and measured weight of dry material passing 3.35 mm sieve is 0.00 gms

Sample passing B.S. 63 micron
(Sample washed and / or collected in pan.)
Difference between calculated and measured weight of dry material passing 63 micron sieve is 13.00 gms

B.S.1377 TEST 7A (Wet Sieving)

Contract Name : BeWT
Location : Castleton WWTW
Job Number : 8156-129 Borehole Number : 2
Sample Number : B3 Depth : 3.0m

Operator : LW Date : 9 April 1997

Description
Brown slightly clayey very sandy SILT

Sample pretreated using sodium hexametaphosphate

Initial total dry weight : 632.00 gms

B.S. Sieve Size	Weight Retained gms	Total Weight Retained	Percent Retained	Cummulative Percentage Passing
100.0 mm	0	0	0.00	100.00
75.0 mm	0	0	0.00	100.00
63.0 mm	0	0	0.00	100.00
50.0 mm	0	0	0.00	100.00
37.5 mm	0	0	0.00	100.00
28.0 mm	0	0	0.00	100.00
20.0 mm	0	0	0.00	100.00
14.0 mm	0	0	0.00	100.00
10.0 mm	0	0	0.00	100.00
6.30 mm	0.0	0	0.00	100.00
5.00 mm	1.0	1	0.16	99.84
3.35 mm	1.0	1	0.16	99.68
2.00 mm	0.0	0	0.00	99.68
1.18 mm	1.0	1	0.16	99.53
600 micron	2.00	2	0.32	99.21
425 micron	3.00	3	0.47	98.73
300 micron	18.00	18	2.85	95.89
212 micron	37.00	37	5.85	90.03
150 micron	55.00	55	8.70	81.33
63 micron	68.00	68	10.76	70.57

Sample passing B.S. 63 micron
(Sample washed and / or collected in pan.)
Difference between calculated and measured weight of dry material passing 63 micron sieve is 446.00 gms

B.S.1377 TEST 7A (Wet Sieving)

Contract Name : BeWt
Location : Castleton WWTW
Job Number : 8156-129 Borehole Number : 2
Sample Number : S8 Depth : 8.0m

Operator : LW Date : 9 April 1997

Description
Brown slightly clayey very silty fine to medium SAND

Sample pretreated using sodium hexametaphosphate

Initial total dry weight : 37.60 gms

B.S. Sieve Size	Weight Retained gms	Total Weight Retained	Percent Retained	Cummulative Percentage Passing
100.0 mm	0	0	0.00	100.00
75.0 mm	0	0	0.00	100.00
63.0 mm	0	0	0.00	100.00
50.0 mm	0	0	0.00	100.00
37.5 mm	0	0	0.00	100.00
28.0 mm	0	0	0.00	100.00
20.0 mm	0	0	0.00	100.00
14.0 mm	0	0	0.00	100.00
10.0 mm	0	0	0.00	100.00
6.30 mm	0.0	0	0.00	100.00
5.00 mm	0.0	0	0.00	100.00
3.35 mm	0.0	0	0.00	100.00
2.00 mm	0.0	0	0.00	100.00
1.18 mm	0.0	0	0.00	100.00
600 micron	0.27	0	0.72	99.28
425 micron	0.00	0	0.00	99.28
300 micron	0.00	0	0.00	99.28
212 micron	9.30	9	24.73	74.55
150 micron	0.00	0	0.00	74.55
63 micron	12.10	12	32.18	42.37

Sample passing B.S. 63 micron
(Sample washed and / or collected in pan.)
Difference between calculated and measured weight of dry material passing 63 micron sieve is 15.93 gms

Sedimentation Method : Hydrometer

Particle Size mm	Percentage Passing	Corrected Percentage Passing
0.0600	41.50	41.91
0.0200	13.60	13.74
0.0060	6.80	6.87
0.0020	5.50	5.55

B.S.1377 TEST 7A (Wet Sieving)

Contract Name : BeWT
Location : Castleton WWTW
Job Number : 8156-129 Borehole Number : 2
Sample Number : S11 Depth : 11.0m

Operator : LW Date : 9 April 1997

Description
Brown slightly clayey fine to medium SAND

Sample pretreated using sodium hexametaphosphate

Initial total dry weight : 200.00 gms

B.S. Sieve Size	Weight Retained gms	Total Weight Retained	Percent Retained	Cummulative Percentage Passing
100.0 mm	0	0	0.00	100.00
75.0 mm	0	0	0.00	100.00
63.0 mm	0	0	0.00	100.00
50.0 mm	0	0	0.00	100.00
37.5 mm	0	0	0.00	100.00
28.0 mm	0	0	0.00	100.00
20.0 mm	0	0	0.00	100.00
14.0 mm	0	0	0.00	100.00
10.0 mm	0	0	0.00	100.00
6.30 mm	0.0	0	0.00	100.00
5.00 mm	0.0	0	0.00	100.00
3.35 mm	0.0	0	0.00	100.00
2.00 mm	0.0	0	0.00	100.00
1.18 mm	0.0	0	0.00	100.00
600 micron	2.00	2	1.00	99.00
425 micron	10.00	10	5.00	94.00
300 micron	57.00	57	28.50	65.50
212 micron	70.00	70	35.00	30.50
150 micron	32.00	32	16.00	14.50
63 micron	21.00	21	10.50	4.00

Sample passing B.S. 63 micron
(Sample washed and / or collected in pan.)
Difference between calculated and measured weight of dry material passing 63 micron sieve is 8.00 gms

B.S.1377 TEST 7A (Wet Sieving)

Contract Name : BeWt
Location : Castleton WWTW
Job Number : 8156-129 Borehole Number : 2
Sample Number : B12 Depth : 12.5m

Operator : LW Date : 9 April 1997

Description
Brown slightly clayey, sandy fine to coarse GRAVEL with occasional cobbles

Sample pretreated using sodium hexametaphosphate

Initial total dry weight : 5658.00 gms

B.S. Sieve Size	Weight Retained gms	Total Weight Retained	Percent Retained	Cummulative Percentage Passing
100.0 mm	0	0	0.00	100.00
75.0 mm	599	599	10.59	89.41
63.0 mm	940	940	16.61	72.80
50.0 mm	248	248	4.38	68.42
37.5 mm	495	495	8.75	59.67
28.0 mm	340	340	6.01	53.66
20.0 mm	414	414	7.32	46.34
14.0 mm	504	504	8.91	37.43
10.0 mm	361	361	6.38	31.05
6.30 mm	313.0	313	5.53	25.52
5.00 mm	92.0	92	1.63	23.90
3.35 mm	78.0	78	1.38	22.52
2.00 mm	7.0	45	0.79	21.73
1.18 mm	4.0	25	0.45	21.28
600 micron	5.00	32	0.56	20.72
425 micron	9.00	57	1.01	19.70
300 micron	29.00	185	3.26	16.44
212 micron	48.00	306	5.40	11.03
150 micron	47.00	299	5.29	5.74
63 micron	31.00	197	3.49	2.25

Sample passing B.S. 3.35 mm
Sample riffled from 1274.00 gms down to 200.00 gms
Difference between calculated and measured weight of dry material passing 3.35 mm sieve is 0.00 gms

Sample passing B.S. 63 micron
(Sample washed and / or collected in pan.)
Difference between calculated and measured weight of dry material passing 63 micron sieve is 20.00 gms

B.S.1377 TEST 7A (Wet Sieving)

Contract Name : BeWT
Location : Castleton WWTW
Job Number : 9069-17
Sample Number : B1

Borehole Number : 3
Depth : 1.20m

Operator : LW

Date : 24 July 1997

Description
Brown and grey fine to coarse SAND with occasional fine to medium gravel and some cobbles

Sample pretreated using sodium hexametaphosphate

Initial total dry weight : 3456.00 gms

B.S. Sieve Size	Weight Retained gms	Total Weight Retained	Percent Retained	Cummulative Percentage Passing
75.0 mm	0	0	0.00	100.00
63.0 mm	802	802	23.21	76.79
50.0 mm	0	0	0.00	76.79
37.5 mm	0	0	0.00	76.79
28.0 mm	0	0	0.00	76.79
20.0 mm	0	0	0.00	76.79
14.0 mm	8	8	0.23	76.56
10.0 mm	15	15	0.43	76.13
6.30 mm	15.0	15	0.43	75.69
5.00 mm	6.0	6	0.17	75.52
3.35 mm	19.0	19	0.55	74.97
2.00 mm	3.0	39	1.12	73.85
1.18 mm	3.0	39	1.12	72.72
600 micron	10.00	130	3.75	68.97
425 micron	23.00	298	8.62	60.35
300 micron	43.00	557	16.12	44.23
212 micron	42.00	544	15.74	28.49
150 micron	47.00	609	17.62	10.87
63 micron	26.00	337	9.75	1.12

Sample passing B.S. 3.35 mm
Sample riffled from 2591.00 gms down to 200.00 gms
Difference between calculated and measured weight of dry material passing 3.35 mm sieve is 0.00 gms

Sample passing B.S. 63 micron
(Sample washed and / or collected in pan.)
Difference between calculated and measured weight of dry material passing 63 micron sieve is 3.00 gms

B.S.1377 TEST 7A (Wet Sieving)

Contract Name : BeWT
Location : Castleton WWTW
Job Number : 9069-17 Borehole Number : 3
Sample Number : B2 Depth : 2.50m

Operator : LW Date : 24 July 1997

Description
Brown fine to medium SAND with much fine to coarse gravel and cobbles

Sample pretreated using sodium hexametaphosphate

Initial total dry weight : 1805.00 gms

B.S. Sieve Size	Weight Retained gms	Total Weight Retained	Percent Retained	Cummulative Percentage Passing
75.0 mm	0	0	0.00	100.00
63.0 mm	532	532	29.47	70.53
50.0 mm	0	0	0.00	70.53
37.5 mm	0	0	0.00	70.53
28.0 mm	204	204	11.30	59.22
20.0 mm	91	91	5.04	54.18
14.0 mm	30	30	1.66	52.52
10.0 mm	3	3	0.17	52.35
6.30 mm	19.0	19	1.05	51.30
5.00 mm	11.0	11	0.61	50.69
3.35 mm	15.0	15	0.83	49.86
2.00 mm	3.0	13	0.75	49.11
1.18 mm	3.0	13	0.75	48.37
600 micron	10.00	45	2.49	45.87
425 micron	24.00	108	5.98	39.89
300 micron	56.00	252	13.96	25.93
212 micron	51.00	229	12.71	13.21
150 micron	34.00	153	8.48	4.74
63 micron	18.00	81	4.49	0.25

Sample passing B.S. 3.35 mm
Sample riffled from 900.00 gms down to 200.00 gms
Difference between calculated and measured weight of dry material passing 3.35 mm sieve is 0.00 gms

Sample passing B.S. 63 micron
(Sample washed and / or collected in pan.)
Difference between calculated and measured weight of dry material passing 63 micron sieve is 1.00 gms

B.S.1377 TEST 7A (Wet Sieving)

Contract Name : BeWT
Location : Castleton WWTW
Job Number : 9069-17 Borehole Number : 3
Sample Number : B4 Depth : 4.50m

Operator : LW Date : 24 July 1997

Description
Brown slightly clayey SILT and fine to medium SAND with a little gravel

Sample pretreated using sodium hexametaphosphate

Initial total dry weight : 1387.00 gms

B.S. Sieve Size	Weight Retained gms	Total Weight Retained	Percent Retained	Cummulative Percentage Passing
75.0 mm	0	0	0.00	100.00
63.0 mm	0	0	0.00	100.00
50.0 mm	0	0	0.00	100.00
37.5 mm	0	0	0.00	100.00
28.0 mm	0	0	0.00	100.00
20.0 mm	0	0	0.00	100.00
14.0 mm	0	0	0.00	100.00
10.0 mm	5	5	0.36	99.64
6.30 mm	6.0	6	0.43	99.21
5.00 mm	4.0	4	0.29	98.92
3.35 mm	6.0	6	0.43	98.49
2.00 mm	2.0	14	0.98	97.50
1.18 mm	1.0	7	0.49	97.01
600 micron	2.00	14	0.98	96.02
425 micron	5.00	34	2.46	93.56
300 micron	11.00	75	5.42	88.14
212 micron	15.00	102	7.39	80.76
150 micron	14.00	96	6.89	73.86
63 micron	55.00	376	27.08	46.78

Sample passing B.S. 3.35 mm
Sample riffled from 1366.00 gms down to 200.00 gms
Difference between calculated and measured weight of dry material passing 3.35 mm sieve is 0.00 gms

Sample passing B.S. 63 micron
(Sample washed and / or collected in pan.)
Difference between calculated and measured weight of dry material passing 63 micron sieve is 95.00 gms

Sedimentation Method : Hydrometer

Particle Size mm	Percentage Passing	Corrected Percentage Passing
0.0600	98.70	46.17
0.0200	17.00	7.95
0.0060	8.50	3.98
0.0020	8.10	3.79

B.S.1377 TEST 7A (Wet Sieving)

Contract Name : BeWT
Location : Castleton WWTW
Job Number : 9069-17 Borehole Number : 3
Sample Number : B6 Depth : 6.50m

Operator : LW Date : 24 July 1997

Description
Brown slightly clayey very sandy SILT

Sample pretreated using sodium hexametaphosphate

Initial total dry weight : 200.00 gms

B.S. Sieve Size	Weight Retained gms	Total Weight Retained	Percent Retained	Cummulative Percentage Passing
75.0 mm	0	0	0.00	100.00
63.0 mm	0	0	0.00	100.00
50.0 mm	0	0	0.00	100.00
37.5 mm	0	0	0.00	100.00
28.0 mm	0	0	0.00	100.00
20.0 mm	0	0	0.00	100.00
14.0 mm	0	0	0.00	100.00
10.0 mm	0	0	0.00	100.00
6.30 mm	0.0	0	0.00	100.00
5.00 mm	0.0	0	0.00	100.00
3.35 mm	0.0	0	0.00	100.00
2.00 mm	0.0	0	0.00	100.00
1.18 mm	0.0	0	0.00	100.00
600 micron	0.00	0	0.00	100.00
425 micron	1.00	1	0.50	99.50
300 micron	2.00	2	1.00	98.50
212 micron	7.00	7	3.50	95.00
150 micron	15.00	15	7.50	87.50
63 micron	49.00	49	24.50	63.00

Sample passing B.S. 63 micron
(Sample washed and / or collected in pan.)
Difference between calculated and measured weight of dry material passing 63 micron sieve is 126.00 gms

Sedimentation Method : Hydrometer

Particle Size mm	Percentage Passing	Corrected Percentage Passing
0.0600	98.90	62.31
0.0200	14.80	9.32
0.0060	5.40	3.40
0.0020	4.40	2.77

B.S.1377 TEST 7A (Wet Sieving)

Contract Name : BeWT
Location : Castleton WWTW
Job Number : 9069-17 Borehole Number : 3
Sample Number : B8 Depth : 8.50m

Operator : LW Date : 24 July 1997

Description
Brown silty fine to medium SAND with some fine to coarse gravel and many cobbles

Sample pretreated using sodium hexametaphosphate

Initial total dry weight : 3717.00 gms

B.S. Sieve Size	Weight Retained gms	Total Weight Retained	Percent Retained	Cummulative Percentage Passing
75.0 mm	0	0	0.00	100.00
63.0 mm	1032	1032	27.76	72.24
50.0 mm	0	0	0.00	72.24
37.5 mm	54	54	1.45	70.78
28.0 mm	246	246	6.62	64.16
20.0 mm	59	59	1.59	62.58
14.0 mm	24	24	0.65	61.93
10.0 mm	4	4	0.11	61.82
6.30 mm	13.0	13	0.35	61.47
5.00 mm	6.0	6	0.16	61.31
3.35 mm	8.0	8	0.22	61.10
2.00 mm	1.0	11	0.31	60.79
1.18 mm	1.0	11	0.31	60.49
600 micron	3.00	34	0.92	59.57
425 micron	8.00	91	2.44	57.13
300 micron	27.00	307	8.25	48.88
212 micron	52.00	590	15.89	32.99
150 micron	39.00	443	11.91	21.08
63 micron	32.00	363	9.78	11.30

Sample passing B.S. 3.35 mm
Sample riffled from 2271.00 gms down to 200.00 gms
Difference between calculated and measured weight of dry material passing 3.35 mm sieve is 0.00 gms

Sample passing B.S. 63 micron
(Sample washed and / or collected in pan.)
Difference between calculated and measured weight of dry material passing 63 micron sieve is 37.00 gms

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B.S.1377 TEST 7A (Wet Sieving)

Contract Name : BeWT
Location : Castleton WWTW
Job Number : 9069-17 Borehole Number : 3
Sample Number : B11 Depth : 11.50m

Operator : LW Date : 24 July 1997

Description
Fine to coarse very sandy GRAVEL

Sample pretreated using sodium hexametaphosphate

Initial total dry weight : 5411.00 gms

B.S. Sieve Size	Weight Retained gms	Total Weight Retained	Percent Retained	Cummulative Percentage Passing
75.0 mm	0	0	0.00	100.00
63.0 mm	0	0	0.00	100.00
50.0 mm	385	385	7.12	92.88
37.5 mm	487	487	9.00	83.88
28.0 mm	532	532	9.83	74.05
20.0 mm	809	809	14.95	59.10
14.0 mm	409	409	7.56	51.54
10.0 mm	357	357	6.60	44.95
6.30 mm	412.0	412	7.61	37.33
5.00 mm	165.0	165	3.05	34.28
3.35 mm	154.0	154	2.85	31.44
2.00 mm	10.0	85	1.57	29.86
1.18 mm	5.0	43	0.79	29.08
600 micron	11.00	94	1.73	27.35
425 micron	23.00	196	3.62	23.73
300 micron	35.00	298	5.50	18.23
212 micron	41.00	349	6.44	11.79
150 micron	33.00	281	5.19	6.60
63 micron	32.00	272	5.03	1.57

Sample passing B.S. 3.35 mm
Sample riffled from 1701.00 gms down to 200.00 gms
Difference between calculated and measured weight of dry material passing 3.35 mm sieve is 0.00 gms

Sample passing B.S. 63 micron
(Sample washed and / or collected in pan.)
Difference between calculated and measured weight of dry material passing 63 micron sieve is 10.00 gms

B.S.1377 TEST 7A (Wet Sieving)

Contract Name : BeWT
Location : Castleton WWTW
Job Number : 9069-17 Borehole Number : 4
Sample Number : B1 Depth : 1.20m

Operator : LW Date : 24 July 1997

Description
Brown fine to medium SAND with occasional fine to medium gravel

Sample pretreated using sodium hexametaphosphate

Initial total dry weight : 2267.00 gms

B.S. Sieve Size	Weight Retained gms	Total Weight Retained	Percent Retained	Cummulative Percentage Passing
75.0 mm	0	0	0.00	100.00
63.0 mm	0	0	0.00	100.00
50.0 mm	0	0	0.00	100.00
37.5 mm	0	0	0.00	100.00
28.0 mm	0	0	0.00	100.00
20.0 mm	0	0	0.00	100.00
14.0 mm	39	39	1.72	98.28
10.0 mm	8	8	0.35	97.93
6.30 mm	12.0	12	0.53	97.40
5.00 mm	10.0	10	0.44	96.96
3.35 mm	10.0	10	0.44	96.52
2.00 mm	1.0	11	0.48	96.03
1.18 mm	1.0	11	0.48	95.55
600 micron	4.00	44	1.93	93.62
425 micron	12.00	131	5.79	87.83
300 micron	39.00	427	18.82	69.01
212 micron	72.00	788	34.75	34.26
150 micron	50.00	547	24.13	10.13
63 micron	18.00	197	8.69	1.45

Sample passing B.S. 3.35 mm
Sample riffled from 2188.00 gms down to 200.00 gms
Difference between calculated and measured weight of dry material passing 3.35 mm sieve is 0.00 gms

Sample passing B.S. 63 micron
(Sample washed and / or collected in pan.)
Difference between calculated and measured weight of dry material passing 63 micron sieve is 3.00 gms

B.S.1377 TEST 7A (Wet Sieving)

Contract Name : BeWT
Location : Castleton WWTW
Job Number : 9069-17 Borehole Number : 4
Sample Number : F3 Depth : 3.50m

Operator : LW Date : 24 July 1997

Description
Brown slightly clayey fine to medium SAND

Sample pretreated using sodium hexametaphosphate

Initial total dry weight : 200.00 gms

B.S. Sieve Size	Weight Retained gms	Total Weight Retained	Percent Retained	Cummulative Percentage Passing
75.0 mm	0	0	0.00	100.00
63.0 mm	0	0	0.00	100.00
50.0 mm	0	0	0.00	100.00
37.5 mm	0	0	0.00	100.00
28.0 mm	0	0	0.00	100.00
20.0 mm	0	0	0.00	100.00
14.0 mm	0	0	0.00	100.00
10.0 mm	0	0	0.00	100.00
6.30 mm	0.0	0	0.00	100.00
5.00 mm	0.0	0	0.00	100.00
3.35 mm	0.0	0	0.00	100.00
2.00 mm	1.0	1	0.50	99.50
1.18 mm	1.0	1	0.50	99.00
600 micron	3.00	3	1.50	97.50
425 micron	7.00	7	3.50	94.00
300 micron	28.00	28	14.00	80.00
212 micron	53.00	53	26.50	53.50
150 micron	58.00	58	29.00	24.50
63 micron	42.00	42	21.00	3.50

Sample passing B.S. 63 micron
(Sample washed and / or collected in pan.)
Difference between calculated and measured weight of dry material passing 63 micron sieve is 7.00 gms

B.S.1377 TEST 7A (Wet Sieving)

Contract Name : BeWT
Location : Castleton WWTW
Job Number : 9069-17
Sample Number : B5

Borehole Number : 4
Depth : 5.50m

Operator : LW

Date : 24 July 1997

Description
Brown clayey fine to coarse SAND

Sample pretreated using sodium hexametaphosphate

Initial total dry weight : 200.00 gms

B.S. Sieve Size	Weight Retained gms	Total Weight Retained	Percent Retained	Cummulative Percentage Passing
75.0 mm	0	0	0.00	100.00
63.0 mm	0	0	0.00	100.00
50.0 mm	0	0	0.00	100.00
37.5 mm	0	0	0.00	100.00
28.0 mm	0	0	0.00	100.00
20.0 mm	0	0	0.00	100.00
14.0 mm	0	0	0.00	100.00
10.0 mm	0	0	0.00	100.00
6.30 mm	0.0	0	0.00	100.00
5.00 mm	0.0	0	0.00	100.00
3.35 mm	0.0	0	0.00	100.00
2.00 mm	0.0	0	0.00	100.00
1.18 mm	2.0	2	1.00	99.00
600 micron	5.00	5	2.50	96.50
425 micron	4.00	4	2.00	94.50
300 micron	4.00	4	2.00	92.50
212 micron	10.00	10	5.00	87.50
150 micron	36.00	36	18.00	69.50
63 micron	114.00	114	57.00	12.50

Sample passing B.S. 63 micron
(Sample washed and / or collected in pan.)
Difference between calculated and measured weight of dry material passing 63 micron sieve is 25.00 gms

B.S.1377 TEST 7A (Wet Sieving)

Contract Name : BeWT
Location : Castleton WWTW
Job Number : 9069-17 Borehole Number : 4
Sample Number : B7 Depth : 7.50m

Operator : LW Date : 24 July 1997

Description
Brown slightly clayey SILT and fine to medium SAND

Sample pretreated using sodium hexametaphosphate

Initial total dry weight : 1233.00 gms

B.S. Sieve Size	Weight Retained gms	Total Weight Retained	Percent Retained	Cummulative Percentage Passing
75.0 mm	0	0	0.00	100.00
63.0 mm	0	0	0.00	100.00
50.0 mm	0	0	0.00	100.00
37.5 mm	0	0	0.00	100.00
28.0 mm	0	0	0.00	100.00
20.0 mm	0	0	0.00	100.00
14.0 mm	3	3	0.24	99.76
10.0 mm	0	0	0.00	99.76
6.30 mm	0.0	0	0.00	99.76
5.00 mm	0.0	0	0.00	99.76
3.35 mm	0.0	0	0.00	99.76
2.00 mm	0.0	0	0.00	99.76
1.18 mm	0.0	0	0.00	99.76
600 micron	0.00	0	0.00	99.76
425 micron	1.00	6	0.50	99.26
300 micron	3.00	18	1.50	97.76
212 micron	11.00	68	5.49	92.27
150 micron	22.00	135	10.97	81.30
63 micron	53.00	326	26.44	54.87

Sample passing B.S. 3.35 mm
Sample riffled from 1230.00 gms down to 200.00 gms
Difference between calculated and measured weight of dry material passing 3.35 mm sieve is 0.00 gms

Sample passing B.S. 63 micron
(Sample washed and / or collected in pan.)
Difference between calculated and measured weight of dry material passing 63 micron sieve is 110.00 gms

Sedimentation Method : Hydrometer

Particle Size mm	Percentage Passing	Corrected Percentage Passing
0.0600	99.00	54.32
0.0200	14.90	8.18
0.0060	5.90	3.24
0.0020	4.10	2.25

B.S.1377 TEST 7A (Wet Sieving)

Contract Name : BeWT
Location : Castleton WWTW
Job Number : 9069-17 Borehole Number : 4
Sample Number : B10 Depth : 10.50m

Operator : LW Date : 24 July 1997

Description
Slightly clayey, sandy fine to coarse GRAVEL

Sample pretreated using sodium hexametaphosphate

Initial total dry weight : 3560.00 gms

B.S. Sieve Size	Weight Retained gms	Total Weight Retained	Percent Retained	Cummulative Percentage Passing
75.0 mm	0	0	0.00	100.00
63.0 mm	0	0	0.00	100.00
50.0 mm	0	0	0.00	100.00
37.5 mm	115	115	3.23	96.77
28.0 mm	458	458	12.87	83.90
20.0 mm	775	775	21.77	62.13
14.0 mm	681	681	19.13	43.01
10.0 mm	428	428	12.02	30.98
6.30 mm	297.0	297	8.34	22.64
5.00 mm	124.0	124	3.48	19.16
3.35 mm	81.0	81	2.28	16.88
2.00 mm	14.0	42	1.18	15.70
1.18 mm	8.0	24	0.68	15.03
600 micron	8.00	24	0.68	14.35
425 micron	6.00	18	0.51	13.84
300 micron	10.00	30	0.84	13.00
212 micron	16.00	48	1.35	11.65
150 micron	19.00	57	1.60	10.04
63 micron	31.00	93	2.62	7.43

Sample passing B.S. 3.35 mm
Sample riffled from 601.00 gms down to 200.00 gms
Difference between calculated and measured weight of dry material passing 3.35 mm sieve is 0.00 gms

Sample passing B.S. 63 micron
(Sample washed and / or collected in pan.)
Difference between calculated and measured weight of dry material passing 63 micron sieve is 88.00 gms

B.S.1377 TEST 7A (Wet Sieving)

Contract Name : BeWT
Location : Castleton WWTW
Job Number : 9069-17 Borehole Number : 5
Sample Number : B1 Depth : 1.20m

Operator : LW Date : 25 July 1997

Description
Brown fine to medium SAND with much fine to coarse gravel

Sample pretreated using sodium hexametaphosphate

Initial total dry weight : 1710.00 gms

B.S. Sieve Size	Weight Retained gms	Total Weight Retained	Percent Retained	Cummulative Percentage Passing
75.0 mm	0	0	0.00	100.00
63.0 mm	0	0	0.00	100.00
50.0 mm	0	0	0.00	100.00
37.5 mm	110	110	6.43	93.57
28.0 mm	0	0	0.00	93.57
20.0 mm	143	143	8.36	85.20
14.0 mm	60	60	3.51	81.70
10.0 mm	18	18	1.05	80.64
6.30 mm	8.0	8	0.47	80.18
5.00 mm	4.0	4	0.23	79.94
3.35 mm	7.0	7	0.41	79.53
2.00 mm	1.0	7	0.40	79.13
1.18 mm	1.0	7	0.40	78.74
600 micron	6.00	41	2.39	76.35
425 micron	26.00	177	10.34	66.01
300 micron	49.00	333	19.49	46.53
212 micron	44.00	299	17.50	29.03
150 micron	33.00	224	13.12	15.91
63 micron	40.00	272	15.91	0.00

Sample passing B.S. 3.35 mm
Sample riffled from 1360.00 gms down to 200.00 gms
Difference between calculated and measured weight of dry material passing 3.35 mm sieve is 0.00 gms

Sample passing B.S. 63 micron
(Sample washed and / or collected in pan.)
Difference between calculated and measured weight of dry material passing 63 micron sieve is 0.00 gms

B.S.1377 TEST 7A (Wet Sieving)

Contract Name : BeWT
Location : Castleton WWTW
Job Number : 9069-17 Borehole Number : 5
Sample Number : B3 Depth : 3.50m

Operator : LW Date : 25 July 1997

Description
Brown slightly clayey fine to medium SAND

Sample pretreated using sodium hexametaphosphate

Initial total dry weight : 200.00 gms

B.S. Sieve Size	Weight Retained gms	Total Weight Retained	Percent Retained	Cummulative Percentage Passing
75.0 mm	0	0	0.00	100.00
63.0 mm	0	0	0.00	100.00
50.0 mm	0	0	0.00	100.00
37.5 mm	0	0	0.00	100.00
28.0 mm	0	0	0.00	100.00
20.0 mm	0	0	0.00	100.00
14.0 mm	0	0	0.00	100.00
10.0 mm	0	0	0.00	100.00
6.30 mm	0.0	0	0.00	100.00
5.00 mm	0.0	0	0.00	100.00
3.35 mm	0.0	0	0.00	100.00
2.00 mm	1.0	1	0.50	99.50
1.18 mm	1.0	1	0.50	99.00
600 micron	2.00	2	1.00	98.00
425 micron	2.00	2	1.00	97.00
300 micron	5.00	5	2.50	94.50
212 micron	34.00	34	17.00	77.50
150 micron	74.00	74	37.00	40.50
63 micron	65.00	65	32.50	8.00

Sample passing B.S. 63 micron
(Sample washed and / or collected in pan.)
Difference between calculated and measured weight of dry material passing 63 micron sieve is 16.00 gms

B.S.1377 TEST 7A (Wet Sieving)

Contract Name : BeWT
Location : Castleton WWTW
Job Number : 9069-17 Borehole Number : 5
Sample Number : B5 Depth : 6.0m

Operator : LW Date : 25 July 1997

Description
Brown slightly clayey, very sandy SILT

Sample pretreated using sodium hexametaphosphate

Initial total dry weight : 200.00 gms

B.S. Sieve Size	Weight Retained gms	Total Weight Retained	Percent Retained	Cummulative Percentage Passing
75.0 mm	0	0	0.00	100.00
63.0 mm	0	0	0.00	100.00
50.0 mm	0	0	0.00	100.00
37.5 mm	0	0	0.00	100.00
28.0 mm	0	0	0.00	100.00
20.0 mm	0	0	0.00	100.00
14.0 mm	0	0	0.00	100.00
10.0 mm	0	0	0.00	100.00
6.30 mm	0.0	0	0.00	100.00
5.00 mm	0.0	0	0.00	100.00
3.35 mm	0.0	0	0.00	100.00
2.00 mm	0.0	0	0.00	100.00
1.18 mm	0.0	0	0.00	100.00
600 micron	0.00	0	0.00	100.00
425 micron	0.00	0	0.00	100.00
300 micron	0.00	0	0.00	100.00
212 micron	2.00	2	1.00	99.00
150 micron	9.00	9	4.50	94.50
63 micron	46.00	46	23.00	71.50

Sample passing B.S. 63 micron
(Sample washed and / or collected in pan.)
Difference between calculated and measured weight of dry material passing 63 micron sieve is 143.00 gms

Sedimentation Method : Hydrometer

Particle Size mm	Percentage Passing	Corrected Percentage Passing
0.0600	99.00	70.78
0.0200	20.90	14.94
0.0060	8.50	6.08
0.0020	6.90	4.93

B.S.1377 TEST 7A (Wet Sieving)

Contract Name : BeWT
Location : Castleton WWTW
Job Number : 9069-17 Borehole Number : 5
Sample Number : B7 Depth : 8.00m

Operator : LW Date : 25 July 1997

Description
Brown slightly clayey fine to medium SAND

Sample pretreated using sodium hexametaphosphate

Initial total dry weight : 200.00 gms

B.S. Sieve Size	Weight Retained gms	Total Weight Retained	Percent Retained	Cummulative Percentage Passing
75.0 mm	0	0	0.00	100.00
63.0 mm	0	0	0.00	100.00
50.0 mm	0	0	0.00	100.00
37.5 mm	0	0	0.00	100.00
28.0 mm	0	0	0.00	100.00
20.0 mm	0	0	0.00	100.00
14.0 mm	0	0	0.00	100.00
10.0 mm	0	0	0.00	100.00
6.30 mm	0.0	0	0.00	100.00
5.00 mm	0.0	0	0.00	100.00
3.35 mm	0.0	0	0.00	100.00
2.00 mm	0.0	0	0.00	100.00
1.18 mm	1.0	1	0.50	99.50
600 micron	2.00	2	1.00	98.50
425 micron	9.00	9	4.50	94.00
300 micron	42.00	42	21.00	73.00
212 micron	72.00	72	36.00	37.00
150 micron	43.00	43	21.50	15.50
63 micron	23.00	23	11.50	4.00

Sample passing B.S. 63 micron
(Sample washed and / or collected in pan.)
Difference between calculated and measured weight of dry material passing 63 micron sieve is 8.00 gms

B.S.1377 TEST 7A (Wet Sieving)

Contract Name : BeWT
Location : Castleton WWTW
Job Number : 9069-17 Borehole Number : 5
Sample Number : S10 Depth : 11.0m

Operator : LW Date : 25 July 1997

Description
Brown slightly clayey fine to medium SAND and SILT

Sample pretreated using sodium hexametaphosphate

Initial total dry weight : 200.00 gms

B.S. Sieve Size	Weight Retained gms	Total Weight Retained	Percent Retained	Cummulative Percentage Passing
75.0 mm	0	0	0.00	100.00
63.0 mm	0	0	0.00	100.00
50.0 mm	0	0	0.00	100.00
37.5 mm	0	0	0.00	100.00
28.0 mm	0	0	0.00	100.00
20.0 mm	0	0	0.00	100.00
14.0 mm	0	0	0.00	100.00
10.0 mm	0	0	0.00	100.00
6.30 mm	0.0	0	0.00	100.00
5.00 mm	0.0	0	0.00	100.00
3.35 mm	0.0	0	0.00	100.00
2.00 mm	0.0	0	0.00	100.00
1.18 mm	0.0	0	0.00	100.00
600 micron	0.00	0	0.00	100.00
425 micron	2.00	2	1.00	99.00
300 micron	10.00	10	5.00	94.00
212 micron	22.00	22	11.00	83.00
150 micron	26.00	26	13.00	70.00
63 micron	33.00	33	16.50	53.50

Sample passing B.S. 63 micron
(Sample washed and / or collected in pan.)
Difference between calculated and measured weight of dry material passing 63 micron sieve is 107.00 gms

Sedimentation Method : Hydrometer

Particle Size mm	Percentage Passing	Corrected Percentage Passing
0.0600	99.10	53.02
0.0200	20.30	10.86
0.0060	7.20	3.85
0.0020	6.50	3.48

B.S.1377 TEST 7A (Wet Sieving)

Contract Name : BeWT
Location : Castleton WWTW
Job Number : 9069-17 Borehole Number : 5
Sample Number : B11 Depth : 12.0m

Operator : LW Date : 25 July 1997

Description
Brown slightly clayey fine to medium SAND with much fine to coarse gravel

Sample pretreated using sodium hexametaphosphate

Initial total dry weight : 1463.00 gms

B.S. Sieve Size	Weight Retained gms	Total Weight Retained	Percent Retained	Cummulative Percentage Passing
75.0 mm	0	0	0.00	100.00
63.0 mm	0	0	0.00	100.00
50.0 mm	0	0	0.00	100.00
37.5 mm	0	0	0.00	100.00
28.0 mm	320	320	21.87	78.13
20.0 mm	95	95	6.49	71.63
14.0 mm	18	18	1.23	70.40
10.0 mm	2	2	0.14	70.27
6.30 mm	2.0	2	0.14	70.13
5.00 mm	3.0	3	0.21	69.92
3.35 mm	7.0	7	0.48	69.45
2.00 mm	2.0	10	0.69	68.75
1.18 mm	2.0	10	0.69	68.06
600 micron	6.00	30	2.08	65.97
425 micron	15.00	76	5.21	60.77
300 micron	50.00	254	17.36	43.40
212 micron	57.00	290	19.79	23.61
150 micron	37.00	188	12.85	10.76
63 micron	26.00	132	9.03	1.74

Sample passing B.S. 3.35 mm
Sample riffled from 1016.00 gms down to 200.00 gms
Difference between calculated and measured weight of dry material passing 3.35 mm sieve is 0.00 gms

Sample passing B.S. 63 micron
(Sample washed and / or collected in pan.)
Difference between calculated and measured weight of dry material passing 63 micron sieve is 5.00 gms

B.S.1377 TEST 7A (Wet Sieving)

Contract Name : BeWT
Location : Castleton WWTW
Job Number : 9069-17
Sample Number : S1

Borehole Number : 6
Depth : 1.20m

Operator : LW

Date : 25 July 1997

Description
Brown fine to coarse SAND with occasional fine to medium gravel

Sample pretreated using sodium hexametaphosphate

Initial total dry weight : 370.00 gms

B.S. Sieve Size	Weight Retained gms	Total Weight Retained	Percent Retained	Cummulative Percentage Passing
75.0 mm	0	0	0.00	100.00
63.0 mm	0	0	0.00	100.00
50.0 mm	0	0	0.00	100.00
37.5 mm	0	0	0.00	100.00
28.0 mm	0	0	0.00	100.00
20.0 mm	0	0	0.00	100.00
14.0 mm	8	8	2.16	97.84
10.0 mm	0	0	0.00	97.84
6.30 mm	2.0	2	0.54	97.30
5.00 mm	0.0	0	0.00	97.30
3.35 mm	2.0	2	0.54	96.76
2.00 mm	3.0	5	1.45	95.31
1.18 mm	11.0	20	5.32	89.98
600 micron	17.00	30	8.22	81.76
425 micron	21.00	38	10.16	71.60
300 micron	38.00	68	18.38	53.22
212 micron	46.00	82	22.25	30.96
150 micron	40.00	72	19.35	11.61
63 micron	24.00	43	11.61	0.00

Sample passing B.S. 3.35 mm
Sample riffled from 358.00 gms down to 200.00 gms
Difference between calculated and measured weight of dry material passing 3.35 mm sieve is 0.00 gms

Sample passing B.S. 63 micron
(Sample washed and / or collected in pan.)
Difference between calculated and measured weight of dry material passing 63 micron sieve is 0.00 gms

B.S.1377 TEST 7A (Wet Sieving)

Contract Name : BeWT
Location : Castleton WWTW
Job Number : 9069-17 Borehole Number : 6
Sample Number : S3 Depth : 3.50m

Operator : LW Date : 25 July 1997

Description
Brown clayey fine to coarse SAND with occasional fine to medium gravel

Sample pretreated using sodium hexametaphosphate

Initial total dry weight : 543.00 gms

B.S. Sieve Size	Weight Retained gms	Total Weight Retained	Percent Retained	Cummulative Percentage Passing
75.0 mm	0	0	0.00	100.00
63.0 mm	0	0	0.00	100.00
50.0 mm	0	0	0.00	100.00
37.5 mm	0	0	0.00	100.00
28.0 mm	0	0	0.00	100.00
20.0 mm	0	0	0.00	100.00
14.0 mm	7	7	1.29	98.71
10.0 mm	0	0	0.00	98.71
6.30 mm	6.0	6	1.10	97.61
5.00 mm	2.0	2	0.37	97.24
3.35 mm	3.0	3	0.55	96.69
2.00 mm	1.0	3	0.48	96.20
1.18 mm	2.0	5	0.97	95.23
600 micron	4.00	10	1.93	93.30
425 micron	10.00	26	4.83	88.47
300 micron	27.00	71	13.05	75.41
212 micron	35.00	92	16.92	58.49
150 micron	31.00	81	14.99	43.51
63 micron	70.00	184	33.84	9.67

Sample passing B.S. 3.35 mm
Sample riffled from 525.00 gms down to 200.00 gms
Difference between calculated and measured weight of dry material passing 3.35 mm sieve is 0.00 gms

Sample passing B.S. 63 micron
(Sample washed and / or collected in pan.)
Difference between calculated and measured weight of dry material passing 63 micron sieve is 20.00 gms

B.S.1377 TEST 7A (Wet Sieving)

Contract Name : BeWT
Location : Castleton WWTW
Job Number : 9069-17
Sample Number : S5

Borehole Number : 6
Depth : 5.50m

Operator : LW

Date : 25 July 1997

Description
Brown slightly clayey very sandy SILT

Sample pretreated using sodium hexametaphosphate

Initial total dry weight : 200.00 gms

B.S. Sieve Size	Weight Retained gms	Total Weight Retained	Percent Retained	Cummulative Percentage Passing
75.0 mm	0	0	0.00	100.00
63.0 mm	0	0	0.00	100.00
50.0 mm	0	0	0.00	100.00
37.5 mm	0	0	0.00	100.00
28.0 mm	0	0	0.00	100.00
20.0 mm	0	0	0.00	100.00
14.0 mm	0	0	0.00	100.00
10.0 mm	0	0	0.00	100.00
6.30 mm	0.0	0	0.00	100.00
5.00 mm	0.0	0	0.00	100.00
3.35 mm	0.0	0	0.00	100.00
2.00 mm	0.0	0	0.00	100.00
1.18 mm	0.0	0	0.00	100.00
600 micron	0.00	0	0.00	100.00
425 micron	1.00	1	0.50	99.50
300 micron	6.00	6	3.00	96.50
212 micron	16.00	16	8.00	88.50
150 micron	15.00	15	7.50	81.00
63 micron	32.00	32	16.00	65.00

Sample passing B.S. 63 micron
(Sample washed and / or collected in pan.)
Difference between calculated and measured weight of dry material passing 63 micron sieve is 130.00 gms

Sedimentation Method : Hydrometer

Particle Size mm	Percentage Passing	Corrected Percentage Passing
0.0600	99.10	64.41
0.0200	12.00	7.80
0.0060	4.80	3.12
0.0020	2.50	1.62

B.S.1377 TEST 7A (Wet Sieving)

Contract Name : BeWT
Location : Castleton WWTW
Job Number : 9069-17 Borehole Number : 6
Sample Number : B7 Depth : 7.50m

Operator : LW Date : 25 July 1997

Description
Brown clayey fine to coarse SAND

Sample pretreated using sodium hexametaphosphate

Initial total dry weight : 200.00 gms

B.S. Sieve Size	Weight Retained gms	Total Weight Retained	Percent Retained	Cumulative Percentage Passing
75.0 mm	0	0	0.00	100.00
63.0 mm	0	0	0.00	100.00
50.0 mm	0	0	0.00	100.00
37.5 mm	0	0	0.00	100.00
28.0 mm	0	0	0.00	100.00
20.0 mm	0	0	0.00	100.00
14.0 mm	0	0	0.00	100.00
10.0 mm	0	0	0.00	100.00
6.30 mm	0.0	0	0.00	100.00
5.00 mm	0.0	0	0.00	100.00
3.35 mm	0.0	0	0.00	100.00
2.00 mm	0.0	0	0.00	100.00
1.18 mm	2.0	2	1.00	99.00
600 micron	5.00	5	2.50	96.50
425 micron	8.00	8	4.00	92.50
300 micron	24.00	24	12.00	80.50
212 micron	56.00	56	28.00	52.50
150 micron	50.00	50	25.00	27.50
63 micron	40.00	40	20.00	7.50

Sample passing B.S. 63 micron
(Sample washed and / or collected in pan.)
Difference between calculated and measured weight of dry material passing 63 micron sieve is 15.00 gms

B.S.1377 TEST 7A (Wet Sieving)

Contract Name : BeWT
Location : Castleton WWTW
Job Number : 9069-17 Borehole Number : 6
Sample Number : B9 Depth : 9.50m

Operator : LW Date : 25 July 1997

Description
Brown clayey fine to coarse SAND and GRAVEL

Sample pretreated using sodium hexametaphosphate

Initial total dry weight : 1482.00 gms

B.S. Sieve Size	Weight Retained gms	Total Weight Retained	Percent Retained	Cummulative Percentage Passing
75.0 mm	0	0	0.00	100.00
63.0 mm	0	0	0.00	100.00
50.0 mm	0	0	0.00	100.00
37.5 mm	0	0	0.00	100.00
28.0 mm	242	242	16.33	83.67
20.0 mm	113	113	7.62	76.05
14.0 mm	57	57	3.85	72.20
10.0 mm	52	52	3.51	68.69
6.30 mm	51.0	51	3.44	65.25
5.00 mm	23.0	23	1.55	63.70
3.35 mm	18.0	18	1.21	62.48
2.00 mm	2.0	9	0.62	61.86
1.18 mm	1.0	5	0.31	61.55
600 micron	2.00	9	0.62	60.92
425 micron	5.00	23	1.56	59.36
300 micron	19.00	88	5.94	53.42
212 micron	43.00	199	13.43	39.99
150 micron	46.00	213	14.37	25.62
63 micron	37.00	171	11.56	14.06

Sample passing B.S. 3.35 mm
Sample riffled from 926.00 gms down to 200.00 gms
Difference between calculated and measured weight of dry material passing 3.35 mm sieve is 0.00 gms

Sample passing B.S. 63 micron
(Sample washed and / or collected in pan.)
Difference between calculated and measured weight of dry material passing 63 micron sieve is 45.00 gms

B.S.1377 TEST 7A (Wet Sieving)

Contract Name : BeWT
Location : Castleton WWTW
Job Number : 9069-17 Borehole Number : 6
Sample Number : B12 Depth : 12.50m

Operator : LW Date : 25 July 1997

Description
Slightly clayey, sandy fine to coarse GRAVEL

Sample pretreated using sodium hexametaphosphate

Initial total dry weight : 4048.00 gms

B.S. Sieve Size	Weight Retained gms	Total Weight Retained	Percent Retained	Cummulative Percentage Passing
75.0 mm	0	0	0.00	100.00
63.0 mm	0	0	0.00	100.00
50.0 mm	726	726	17.93	82.07
37.5 mm	945	945	23.34	58.72
28.0 mm	360	360	8.89	49.83
20.0 mm	435	435	10.75	39.08
14.0 mm	292	292	7.21	31.87
10.0 mm	167	167	4.13	27.74
6.30 mm	124.0	124	3.06	24.68
5.00 mm	61.0	61	1.51	23.17
3.35 mm	42.0	42	1.04	22.13
2.00 mm	3.0	13	0.33	21.80
1.18 mm	2.0	9	0.22	21.58
600 micron	2.00	9	0.22	21.36
425 micron	4.00	18	0.44	20.92
300 micron	19.00	85	2.10	18.81
212 micron	41.00	184	4.54	14.28
150 micron	40.00	179	4.43	9.85
63 micron	42.00	188	4.65	5.20

Sample passing B.S. 3.35 mm
Sample riffled from 896.00 gms down to 200.00 gms
Difference between calculated and measured weight of dry material passing 3.35 mm sieve is 0.00 gms

Sample passing B.S. 63 micron
(Sample washed and / or collected in pan.)
Difference between calculated and measured weight of dry material passing 63 micron sieve is 47.00 gms

B.S.1377 TEST 7A (Wet Sieving)

Contract Name : BeWT
Location : Castleton WWTW
Job Number : 9069-17 Borehole Number : 7
Sample Number : B1 Depth : 1.20m

Operator : LW Date : 25 July 1997

Description
MADE GROUND (silty fine to coarse sand with some fine to medium gravel)

Sample pretreated using sodium hexametaphosphate

Initial total dry weight : 860.00 gms

B.S. Sieve Size	Weight Retained gms	Total Weight Retained	Percent Retained	Cummulative Percentage Passing
75.0 mm	0	0	0.00	100.00
63.0 mm	0	0	0.00	100.00
50.0 mm	0	0	0.00	100.00
37.5 mm	0	0	0.00	100.00
28.0 mm	0	0	0.00	100.00
20.0 mm	0	0	0.00	100.00
14.0 mm	10	10	1.16	98.84
10.0 mm	16	16	1.86	96.98
6.30 mm	7.0	7	0.81	96.16
5.00 mm	4.0	4	0.47	95.70
3.35 mm	4.0	4	0.47	95.23
2.00 mm	2.0	8	0.95	94.28
1.18 mm	2.0	8	0.95	93.33
600 micron	5.00	20	2.38	90.95
425 micron	22.00	90	10.48	80.47
300 micron	20.00	82	9.52	70.95
212 micron	46.00	188	21.90	49.04
150 micron	36.00	147	17.14	31.90
63 micron	38.00	156	18.09	13.81

Sample passing B.S. 3.35 mm
Sample riffled from 819.00 gms down to 200.00 gms
Difference between calculated and measured weight of dry material passing 3.35 mm sieve is 0.00 gms

Sample passing B.S. 63 micron
(Sample washed and / or collected in pan.)
Difference between calculated and measured weight of dry material passing 63 micron sieve is 29.00 gms

B.S.1377 TEST 7A (Wet Sieving)

Contract Name : BeWT
Location : Castleton WWTW
Job Number : 9069-17 Borehole Number : 7
Sample Number : B3 Depth : 3.30m

Operator : LW Date : 25 July 1997

Description
Slightly clayey very sandy fine to coarse GRAVEL

Sample pretreated using sodium hexametaphosphate

Initial total dry weight : 2663.00 gms

B.S. Sieve Size	Weight Retained gms	Total Weight Retained	Percent Retained	Cummulative Percentage Passing
75.0 mm	0	0	0.00	100.00
63.0 mm	0	0	0.00	100.00
50.0 mm	0	0	0.00	100.00
37.5 mm	0	0	0.00	100.00
28.0 mm	252	252	9.46	90.54
20.0 mm	480	480	18.02	72.51
14.0 mm	564	564	21.18	51.33
10.0 mm	233	233	8.75	42.58
6.30 mm	86.0	86	3.23	39.35
5.00 mm	42.0	42	1.58	37.78
3.35 mm	72.0	72	2.70	35.07
2.00 mm	11.0	51	1.93	33.14
1.18 mm	11.0	51	1.93	31.22
600 micron	18.00	84	3.16	28.06
425 micron	19.00	89	3.33	24.73
300 micron	30.00	140	5.26	19.47
212 micron	40.00	187	7.01	12.45
150 micron	29.00	135	5.09	7.37
63 micron	30.00	140	5.26	2.10

Sample passing B.S. 3.35 mm
Sample riffled from 934.00 gms down to 200.00 gms
Difference between calculated and measured weight of dry material passing 3.35 mm sieve is 0.00 gms

Sample passing B.S. 63 micron
(Sample washed and / or collected in pan.)
Difference between calculated and measured weight of dry material passing 63 micron sieve is 12.00 gms

B.S.1377 TEST 7A (Wet Sieving)

Contract Name : BeWT
Location : Castleton WWTW
Job Number : 9069-17 Borehole Number : 7
Sample Number : B5 Depth : 5.50m

Operator : LW Date : 25 July 1997

Description
Slightly clayey very sandy fine to coarse GRAVEL

Sample pretreated using sodium hexametaphosphate

Initial total dry weight : 2907.00 gms

B.S. Sieve Size	Weight Retained gms	Total Weight Retained	Percent Retained	Cummulative Percentage Passing
75.0 mm	0	0	0.00	100.00
63.0 mm	0	0	0.00	100.00
50.0 mm	347	347	11.94	88.06
37.5 mm	0	0	0.00	88.06
28.0 mm	186	186	6.40	81.66
20.0 mm	558	558	19.20	62.47
14.0 mm	444	444	15.27	47.20
10.0 mm	302	302	10.39	36.81
6.30 mm	121.0	121	4.16	32.65
5.00 mm	38.0	38	1.31	31.34
3.35 mm	65.0	65	2.24	29.10
2.00 mm	11.0	47	1.60	27.50
1.18 mm	9.0	38	1.31	26.19
600 micron	16.00	68	2.33	23.86
425 micron	18.00	76	2.62	21.24
300 micron	31.00	131	4.51	16.73
212 micron	37.00	157	5.38	11.35
150 micron	30.00	127	4.37	6.98
63 micron	31.00	131	4.51	2.47

Sample passing B.S. 3.35 mm
Sample riffled from 846.00 gms down to 200.00 gms
Difference between calculated and measured weight of dry material passing 3.35 mm sieve is 0.00 gms

Sample passing B.S. 63 micron
(Sample washed and / or collected in pan.)
Difference between calculated and measured weight of dry material passing 63 micron sieve is 17.00 gms

B.S.1377 TEST 7A (Wet Sieving)

Contract Name : BeWT
Location : Castleton WWTW
Job Number : 9069-17 Borehole Number : 8
Sample Number : B1 Depth : 1.20m

Operator : LW Date : 25 July 1997

Description
Brown clayey very sandy TOPSOIL with much fine to coarse gravel

Sample pretreated using sodium hexametaphosphate

Initial total dry weight : 1377.00 gms

B.S. Sieve Size	Weight Retained gms	Total Weight Retained	Percent Retained	Cummulative Percentage Passing
75.0 mm	0	0	0.00	100.00
63.0 mm	0	0	0.00	100.00
50.0 mm	0	0	0.00	100.00
37.5 mm	91	91	6.61	93.39
28.0 mm	0	0	0.00	93.39
20.0 mm	45	45	3.27	90.12
14.0 mm	41	41	2.98	87.15
10.0 mm	36	36	2.61	84.53
6.30 mm	57.0	57	4.14	80.39
5.00 mm	29.0	29	2.11	78.29
3.35 mm	33.0	33	2.40	75.89
2.00 mm	8.0	42	3.04	72.85
1.18 mm	9.0	47	3.42	69.44
600 micron	13.00	68	4.93	64.51
425 micron	13.00	68	4.93	59.57
300 micron	23.00	120	8.73	50.85
212 micron	34.00	178	12.90	37.94
150 micron	31.00	162	11.76	26.18
63 micron	34.00	178	12.90	13.28

Sample passing B.S. 3.35 mm
Sample riffled from 1045.00 gms down to 200.00 gms
Difference between calculated and measured weight of dry material passing
3.35 mm sieve is 0.00 gms

Sample passing B.S. 63 micron
(Sample washed and / or collected in pan.)
Difference between calculated and measured weight of dry material passing
63 micron sieve is 35.00 gms

B.S.1377 TEST 7A (Wet Sieving)

Contract Name : BeWT
Location : Castleton WWTW
Job Number : 9069-17 Borehole Number : 8
Sample Number : B2 Depth : 2.50m

Operator : LW Date : 25 July 1997

Description
Clayey very sandy TOPSOIL with occasional fine to medium gravel

Sample pretreated using sodium hexametaphosphate

Initial total dry weight : 416.00 gms

B.S. Sieve Size	Weight Retained gms	Total Weight Retained	Percent Retained	Cummulative Percentage Passing
75.0 mm	0	0	0.00	100.00
63.0 mm	0	0	0.00	100.00
50.0 mm	0	0	0.00	100.00
37.5 mm	0	0	0.00	100.00
28.0 mm	0	0	0.00	100.00
20.0 mm	0	0	0.00	100.00
14.0 mm	0	0	0.00	100.00
10.0 mm	0	0	0.00	100.00
6.30 mm	0.0	0	0.00	100.00
5.00 mm	0.0	0	0.00	100.00
3.35 mm	0.0	0	0.00	100.00
2.00 mm	4.0	8	2.00	98.00
1.18 mm	5.0	10	2.50	95.50
600 micron	10.00	21	5.00	90.50
425 micron	9.00	19	4.50	86.00
300 micron	14.00	29	7.00	79.00
212 micron	29.00	60	14.50	64.50
150 micron	26.00	54	13.00	51.50
63 micron	25.00	52	12.50	39.00

Sample passing B.S. 3.35 mm
Sample riffled from 416.00 gms down to 200.00 gms
Difference between calculated and measured weight of dry material passing 3.35 mm sieve is 0.00 gms

Sample passing B.S. 63 micron
(Sample washed and / or collected in pan.)
Difference between calculated and measured weight of dry material passing 63 micron sieve is 78.00 gms

Sedimentation Method : Hydrometer

Particle Size mm	Percentage Passing	Corrected Percentage Passing
0.0600	98.70	38.49
0.0200	18.90	7.37
0.0060	8.90	3.47
0.0020	5.00	1.95

B.S.1377 TEST 7A (Wet Sieving)

Contract Name : BeWT
Location : Castleton WWTW
Job Number : 9069-17 Borehole Number : 8
Sample Number : B3 Depth : 3.00m

Operator : LW Date : 25 July 1997

Description
Brown clayey fine to coarse SAND with much fine to coarse gravel

Sample pretreated using sodium hexametaphosphate

Initial total dry weight : 2225.00 gms

B.S. Sieve Size	Weight Retained gms	Total Weight Retained	Percent Retained	Cummulative Percentage Passing
75.0 mm	0	0	0.00	100.00
63.0 mm	0	0	0.00	100.00
50.0 mm	0	0	0.00	100.00
37.5 mm	106	106	4.76	95.24
28.0 mm	82	82	3.69	91.55
20.0 mm	62	62	2.79	88.76
14.0 mm	23	23	1.03	87.73
10.0 mm	39	39	1.75	85.98
6.30 mm	50.0	50	2.25	83.73
5.00 mm	29.0	29	1.30	82.43
3.35 mm	33.0	33	1.48	80.94
2.00 mm	5.0	45	2.02	78.92
1.18 mm	5.0	45	2.02	76.90
600 micron	12.00	108	4.86	72.04
425 micron	16.00	144	6.48	65.56
300 micron	33.00	297	13.36	52.21
212 micron	47.00	423	19.02	33.19
150 micron	33.00	297	13.36	19.83
63 micron	31.00	279	12.55	7.28

Sample passing B.S. 3.35 mm
Sample riffled from 1801.00 gms down to 200.00 gms
Difference between calculated and measured weight of dry material passing 3.35 mm sieve is 0.00 gms

Sample passing B.S. 63 micron
(Sample washed and / or collected in pan.)
Difference between calculated and measured weight of dry material passing 63 micron sieve is 18.00 gms

B.S.1377 TEST 7A (Wet Sieving)

Contract Name : BeWT
Location : Castleton WWTW
Job Number : 9069-17 Borehole Number : 8
Sample Number : B4 Depth : 4.50m

Operator : LW Date : 25 July 1997

Description
Slightly clayey very sandy fine to coarse GRAVEL

Sample pretreated using sodium hexametaphosphate

Initial total dry weight : 3259.00 gms

B.S. Sieve Size	Weight Retained gms	Total Weight Retained	Percent Retained	Cummulative Percentage Passing
75.0 mm	0	0	0.00	100.00
63.0 mm	0	0	0.00	100.00
50.0 mm	0	0	0.00	100.00
37.5 mm	0	0	0.00	100.00
28.0 mm	0	0	0.00	100.00
20.0 mm	233	233	7.15	92.85
14.0 mm	485	485	14.88	77.97
10.0 mm	486	486	14.91	63.06
6.30 mm	390.0	390	11.97	51.09
5.00 mm	109.0	109	3.34	47.74
3.35 mm	143.0	143	4.39	43.36
2.00 mm	18.0	127	3.90	39.45
1.18 mm	12.0	85	2.60	36.85
600 micron	19.00	134	4.12	32.73
425 micron	20.00	141	4.34	28.40
300 micron	31.00	219	6.72	21.68
212 micron	35.00	247	7.59	14.09
150 micron	29.00	205	6.29	7.80
63 micron	25.00	177	5.42	2.38

Sample passing B.S. 3.35 mm
Sample riffled from 1413.00 gms down to 200.00 gms
Difference between calculated and measured weight of dry material passing 3.35 mm sieve is 0.00 gms

Sample passing B.S. 63 micron
(Sample washed and / or collected in pan.)
Difference between calculated and measured weight of dry material passing 63 micron sieve is 11.00 gms

B.S.1377 TEST 7A (Wet Sieving)

Contract Name : BeWT
Location : Castleton WWTW
Job Number : 9069-17
Sample Number : B5

Borehole Number : 8
Depth : 5.50m

Operator : LW

Date : 25 July 1997

Description
Slightly clayey brown fine to coarse SAND and fine to coarse GRAVEL

Sample pretreated using sodium hexametaphosphate

Initial total dry weight : 2547.00 gms

B.S. Sieve Size	Weight Retained gms	Total Weight Retained	Percent Retained	Cummulative Percentage Passing
75.0 mm	0	0	0.00	100.00
63.0 mm	0	0	0.00	100.00
50.0 mm	0	0	0.00	100.00
37.5 mm	0	0	0.00	100.00
28.0 mm	154	154	6.05	93.95
20.0 mm	129	129	5.06	88.89
14.0 mm	168	168	6.60	82.29
10.0 mm	129	129	5.06	77.23
6.30 mm	161.0	161	6.32	70.91
5.00 mm	56.0	56	2.20	68.71
3.35 mm	64.0	64	2.51	66.20
2.00 mm	6.0	51	1.99	64.21
1.18 mm	5.0	42	1.65	62.55
600 micron	9.00	76	2.98	59.58
425 micron	14.00	118	4.63	54.94
300 micron	37.00	312	12.25	42.70
212 micron	44.00	371	14.56	28.13
150 micron	36.00	303	11.92	16.22
63 micron	30.00	253	9.93	6.29

Sample passing B.S. 3.35 mm
Sample riffled from 1686.00 gms down to 200.00 gms
Difference between calculated and measured weight of dry material passing 3.35 mm sieve is 0.00 gms

Sample passing B.S. 63 micron
(Sample washed and / or collected in pan.)
Difference between calculated and measured weight of dry material passing 63 micron sieve is 19.00 gms

B.S.1377 TEST 7A (Wet Sieving)

Contract Name : BeWt
Location : Castleton WWTW
Job Number : 8156-129
Sample Number : D3

Borehole Number : TP1
Depth : 2.6m

Operator : LW

Date : 9 April 1997

Description
Brown silty fine to medium SAND

Sample pretreated using sodium hexametaphosphate

Initial total dry weight : 200.00 gms

B.S. Sieve Size	Weight Retained gms	Total Weight Retained	Percent Retained	Cummulative Percentage Passing
100.0 mm	0	0	0.00	100.00
75.0 mm	0	0	0.00	100.00
63.0 mm	0	0	0.00	100.00
50.0 mm	0	0	0.00	100.00
37.5 mm	0	0	0.00	100.00
28.0 mm	0	0	0.00	100.00
20.0 mm	0	0	0.00	100.00
14.0 mm	0	0	0.00	100.00
10.0 mm	0	0	0.00	100.00
6.30 mm	0.0	0	0.00	100.00
5.00 mm	0.0	0	0.00	100.00
3.35 mm	0.0	0	0.00	100.00
2.00 mm	0.0	0	0.00	100.00
1.18 mm	0.0	0	0.00	100.00
600 micron	3.00	3	1.50	98.50
425 micron	6.00	6	3.00	95.50
300 micron	27.00	27	13.50	82.00
212 micron	50.00	50	25.00	57.00
150 micron	47.00	47	23.50	33.50
63 micron	46.00	46	23.00	10.50

Sample passing B.S. 63 micron
(Sample washed and / or collected in pan.)
Difference between calculated and measured weight of dry material passing 63 micron sieve is 21.00 gms

Sedimentation Method : Hydrometer

Particle Size mm	Percentage Passing	Corrected Percentage Passing
0.0600	99.10	10.41
0.0200	4.20	0.44
0.0060	2.10	0.22
0.0020	1.60	0.17

B.S.1377 TEST 7A (Wet Sieving)

Contract Name : BeWt
Location : Castleton WWTW
Job Number : 8156-129 Borehole Number : TP1
Sample Number : D4 Depth : 3.5m

Operator : LW Date : 9 April 1997

Description
Brown silty very sandy fine to coarse GRAVEL

Sample pretreated using sodium hexametaphosphate

Initial total dry weight : 527.00 gms

B.S. Sieve Size	Weight Retained gms	Total Weight Retained	Percent Retained	Cummulative Percentage Passing
100.0 mm	0	0	0.00	100.00
75.0 mm	0	0	0.00	100.00
63.0 mm	0	0	0.00	100.00
50.0 mm	0	0	0.00	100.00
37.5 mm	0	0	0.00	100.00
28.0 mm	0	0	0.00	100.00
20.0 mm	82	82	15.56	84.44
14.0 mm	79	79	14.99	69.45
10.0 mm	17	17	3.23	66.22
6.30 mm	42.0	42	7.97	58.25
5.00 mm	14.0	14	2.66	55.60
3.35 mm	17.0	17	3.23	52.37
2.00 mm	14.0	19	3.67	48.71
1.18 mm	9.0	12	2.36	46.35
600 micron	16.00	22	4.19	42.16
425 micron	20.00	28	5.24	36.92
300 micron	35.00	48	9.17	27.76
212 micron	37.00	51	9.69	18.07
150 micron	22.00	30	5.76	12.31
63 micron	18.00	25	4.71	7.59

Sample passing B.S. 3.35 mm
Sample riffled from 276.00 gms down to 200.00 gms
Difference between calculated and measured weight of dry material passing 3.35 mm sieve is 0.00 gms

Sample passing B.S. 63 micron
(Sample washed and / or collected in pan.)
Difference between calculated and measured weight of dry material passing 63 micron sieve is 29.00 gms

B.S.1377 TEST 7A (Wet Sieving)

Contract Name : BeWt
Location : Castleton WWTW
Job Number : 8156-129 Borehole Number : TP2A
Sample Number : B1 Depth : 0.7m

Operator : LW Date : 9 April 1997

Description
Brown silty fine to coarse SAND and GRAVEL

Sample pretreated using sodium hexametaphosphate

Initial total dry weight : 3468.00 gms

B.S. Sieve Size	Weight Retained gms	Total Weight Retained	Percent Retained	Cummulative Percentage Passing
100.0 mm	0	0	0.00	100.00
75.0 mm	0	0	0.00	100.00
63.0 mm	0	0	0.00	100.00
50.0 mm	352	352	10.15	89.85
37.5 mm	516	516	14.88	74.97
28.0 mm	111	111	3.20	71.77
20.0 mm	107	107	3.09	68.69
14.0 mm	54	54	1.56	67.13
10.0 mm	35	35	1.01	66.12
6.30 mm	56.0	56	1.61	64.50
5.00 mm	20.0	20	0.58	63.93
3.35 mm	26.0	26	0.75	63.18
2.00 mm	8.0	88	2.53	60.65
1.18 mm	9.0	99	2.84	57.81
600 micron	15.00	164	4.74	53.07
425 micron	15.00	164	4.74	48.33
300 micron	22.00	241	6.95	41.38
212 micron	21.00	230	6.63	34.75
150 micron	23.00	252	7.27	27.48
63 micron	37.00	405	11.69	15.79

Sample passing B.S. 3.35 mm
Sample riffled from 2191.00 gms down to 200.00 gms
Difference between calculated and measured weight of dry material passing 3.35 mm sieve is 0.00 gms

Sample passing B.S. 63 micron
(Sample washed and / or collected in pan.)
Difference between calculated and measured weight of dry material passing 63 micron sieve is 50.00 gms

Sedimentation Method : Hydrometer

Particle Size mm	Percentage Passing	Corrected Percentage Passing
0.0600	99.20	15.66
0.0200	6.50	1.03
0.0060	4.20	0.66
0.0020	3.30	0.52

Job No.: 9069/17
Site Name: CASTLETON WwTW

APPENDIX 4

GROUNDWATER

STRATA SURVEYS LIMITED

APPENDIX 4
GROUNDWATER RECORDS

B.H. No			During Boring			Piezo Installation			Standing Levels in Piezo/Date			
	Water met/	Date	T.S.L./after 20 mins	T.S.L.	Date	Depth to tip of Piezo	Prior to Install	After Install	m	m	m	m
BH1	1.40	11/03	1.40			7.50	4.00	4.00	1.30	1.30		
						11/03			12/03	12/03		
BH2	2.00	12/03	2.00									
	8.70	12/03	6.00	2.5	13-03am	14.00	4.00	0.00*				
BH3				wet	19-06 pm							
BH3				2.70	20-06 am							
BH3				6.00	20-06 pm	13.60	4.00					
BH4	3.00	18-06	2.50	3.00	18-06 pm							
BH4				2.30	19-06 am							
BH4				4.00	19-06 pm	12.50	4.00		2.10			
									(20-06)			
BH5	7.00	11-06	4.50	7.00	11-06 pm							
BH5				1.60	12-06 am							
BH5				4.00	12-06 pm							
BH5				1.80	14-06 am							
BH5				3.00	14-06 pm							
BH5				2.00	16-06 am	14.50	1.80		1.80	1.90	1.90	
							(18-06)		(18-06)	(19-06)	(20-06)	
BH6				6.00	17-06 pm							
BH6				1.80	18-06 am							
BH6				4.00	18-06 pm	14.60	4.00		2.00	2.00		
									(19-06)	(20-06)		
BH7	3.10	21-06	3.00	3.50	21-06 pm	5.60	3.50	4.50				
BH8	3.00	21-06	2.80	2.80	21-06 pm							
BH8				2.80	22-06 pm							
BH8				3.00	22-06 pm	5.00	3.00					

TP 4 Very slight groundwater entries at 2.80m

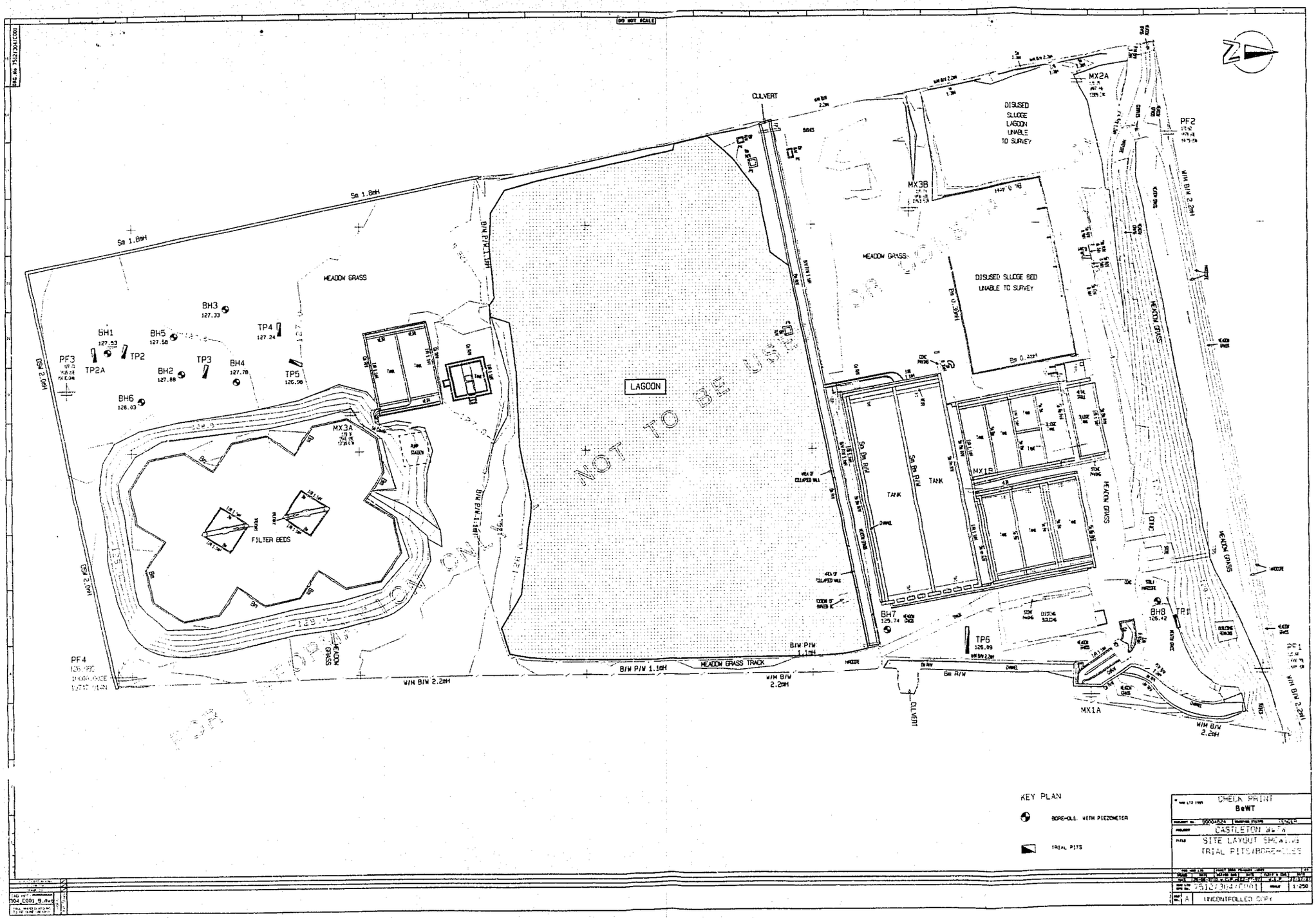
TP5 Pit moist below 2.00m

Job No.: 9069/17
Site Name: CASTLETON WwTW

APPENDIX 5

SITE PLAN

STRATA SURVEYS LIMITED


DO NOT SCALE
CULVERT
DISUSED SLUDGE LAGOON UNABLE TO SURVEY
MX2A
MX3B
MEADOW GRASS
DISUSED SLUDGE BED UNABLE TO SURVEY
PF2
Sa 1.8mH
BH3 127.33
BH1 127.53
BH5 127.58
TP4 127.24
TP2
TP2A
PF3
BH2 127.88
TP3
BH4 127.78
TP5 126.98
BH6 126.03
LAGOON
MX3A
FILTER BEDS
NOT TO BE USED
TANK
MX1B
BH7 125.74
BH8 126.42
TP1
TP6 126.09
PF1
PF4
MEADOW GRASS TRACK
B/W P/W 1.1mH
W/M B/W 2.2mH
Sa B/W
MX1A
KEY PLAN
BORE-OLE. WITH PIEZOMETER
TRIAL PITS
CHECK PRINT
BeWT
CASTLETON WWTW
SITE LAYOUT SHOWING TRIAL PITS/BORE-HOLES
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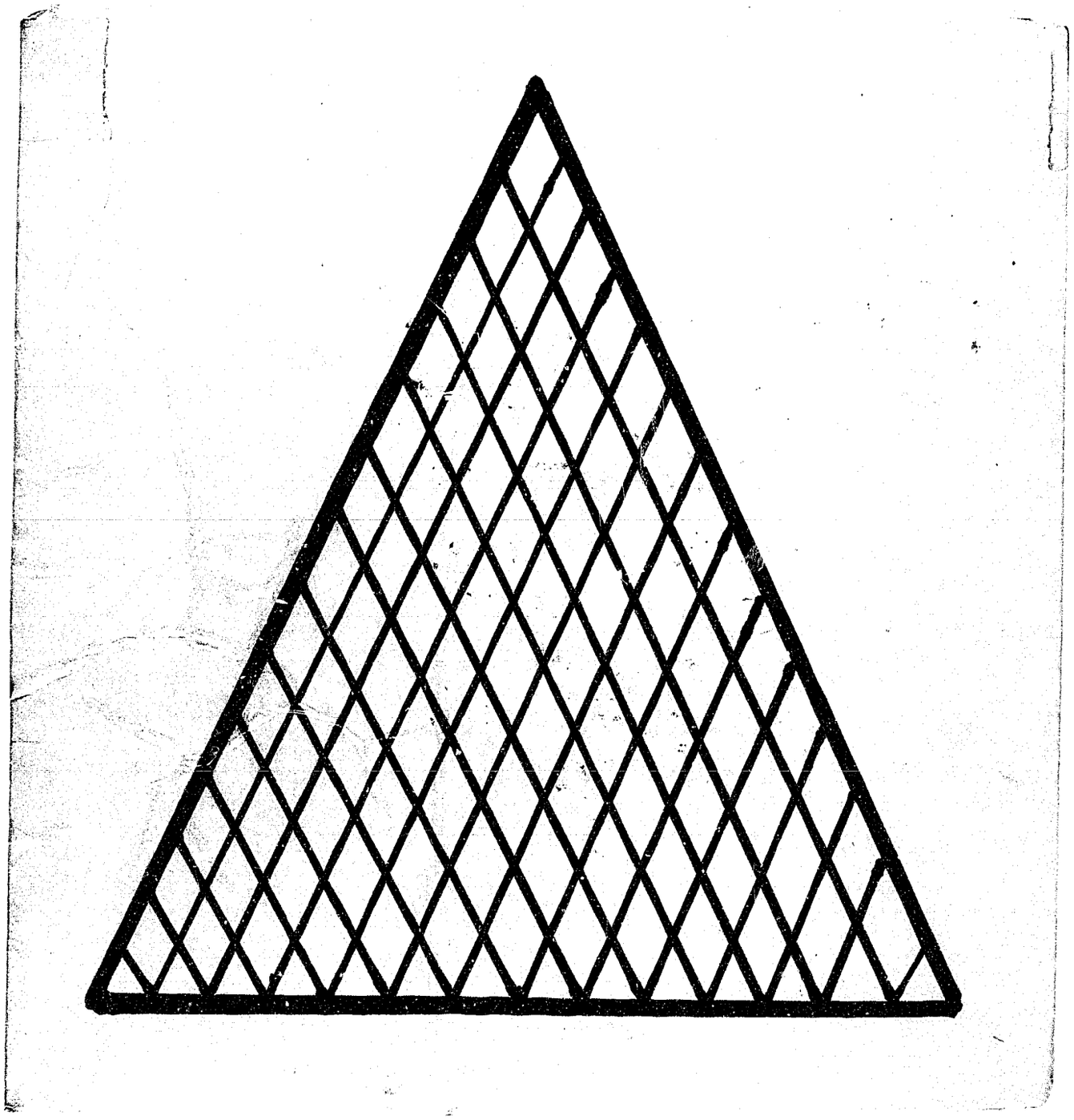

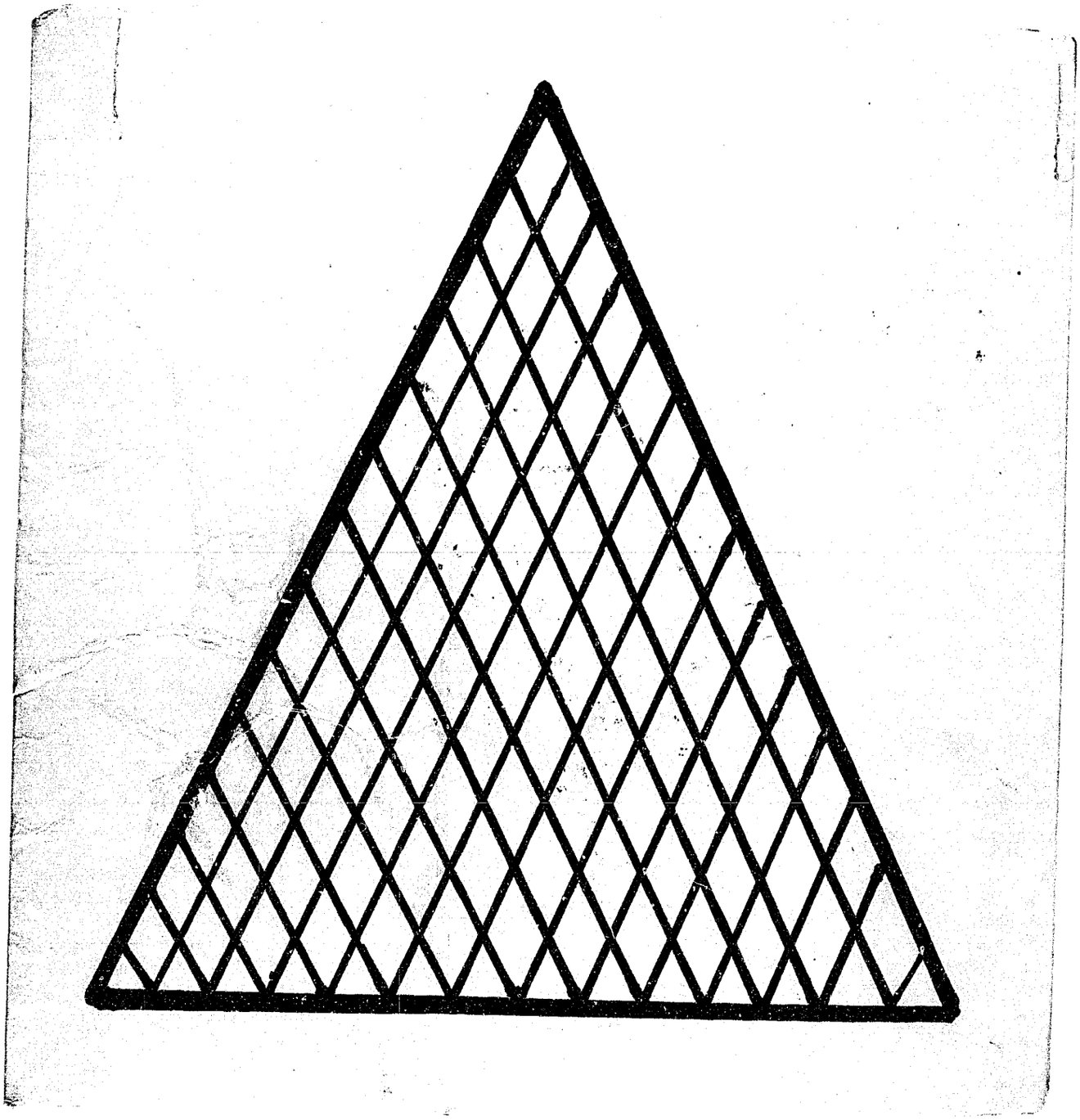

NORWEST HOLST SOIL ENGINEERING LTD

Norwest Holst

REPORT ON A GROUND INVESTIGATION

AT

CASTLETON WASTEWATER TREATMENT WARKS

Client: United Utilities

Engineer: Montgomery Watson

F No: F11984

Date: 16/07/2001

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REPORT ON A GROUND INVESTIGATION AT CASTLETON WASTEWATER TREATMENT WORKS

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Distribution: Montgomery Watson

The report is not to be used for contractual or engineering purposes unless this sheet is signed where indicated by both the originator of the report and the approver, and the report is designated "Final" on this report quality assurance sheet.

GROUND INVESTIGATION: CASTLETON WASTEWATER TREATMENT WORKS

REPORT CONTENTS

PAGE

1.0 **INTRODUCTION** 4

2.0 **PURPOSE, SCOPE AND REPORT FORMAT** 4
- 2.1 Purpose 4
- 2.2 Scope of Work 4
- 2.3 Report Format 4

3.0 **DESK STUDY INFORMATION** 5
- 3.1 Scope of Study 5
- 3.2 Site Location and Description 5
- 3.3 Geology 5
- 3.4 Previous Investigations 5

4.0 **FIELDWORK** 5
- 4.1 Scope of Fieldwork 5
- 4.2 Inspection Pits 5
- 4.3 Cable Percussive Boreholes 6

5.0 **LABORATORY TESTING** 6
- 5.1 Scope of Testing 6
- 5.2 Geotechnical Soils Testing 7

REFERENCES 8

LIST OF TABLES

Table 1: Results of Groundwater Monitoring in Borehole Installations..... Section B

LIST OF FIGURES

Figure 1: Site Location Plan ..... Section D
Figure 2: Exploratory Hole Location Plan..... Section D

GROUND INVESTIGATION: CASTLETON WASTEWATER TREATMENT WORKS

REPORT CONTENTS (cont)

SUPPORTING FACTUAL DATA

SECTION A: NOTES ON FIELDWORK, LOGGING AND LABORATORY TESTING

- Notes on Fieldwork Procedures
- Terminology used in Soil Descriptions
- Assessment of Aggressive Ground and Groundwater Conditions

SECTION B: EXPLORATORY HOLE RECORDS AND FIELD DATA

- Exploratory Hole Log Legend and Notation Sheet
- Borehole Records
- Piezometer Readings

SECTION C: LABORATORY TEST RESULTS

- Laboratory Test Data Key Sheet
- Laboratory Test Summary Sheets (Soils)
- Laboratory Test Data Sheets (Soils)

SECTION D: SITE PLANS

- Site Location Plan
- Exploratory Hole Location Plan

1.0 INTRODUCTION

In May 2001 Norwest Holst Soil Engineering Limited (NHSEL) were instructed by Montgomery Watson Project Management (The Engineer) acting for and on behalf of United Utilities (The Employer) to carry out a ground investigation at Castleton Wastewater Treatment Works, where it is proposed to increase the existing capacity. The investigation comprised the formation of cable percussive boreholes.

The fieldwork was carried out between 29th May 2001 and 1st June 2001. This report presents the results of the fieldwork and laboratory testing together with information on the ground and groundwater conditions.

2.0 PURPOSE, SCOPE AND REPORT FORMAT

2.1 Purpose

The purpose of this investigation was to determine the subsurface ground and groundwater conditions at the site of the proposed new tanks and washwater pumping main and pump station at Castleton Wastewater Treatment Works. Geotechnical parameters were also required in order that the Engineer could provide appropriate foundation design for the proposed structures.

2.2 Scope of Work

Our brief for this factual report comprised the following items:

1. A review of readily available geological maps and geological memoirs to ascertain the subsurface geology and ground conditions.
2. To form exploratory holes on site.
3. To undertake laboratory tests on samples recovered from exploratory holes.
4. Provide geotechnical parameters on the ground conditions.

The sources of information used in the compilation of this report are detailed in the list of references on page 8.

2.3 Report Format

Our report is presented in the following format:

- Factual information comprising:-
  - Description of fieldwork
  - Exploratory hole logs
  - Laboratory test results
  - Maps and plans

3.0 DESK STUDY INFORMATION

3.1 Scope of Study

No formal comprehensive desk study was requested by the Engineer for this investigation. The following sections however provide general details of site location and description as well as site geology as ascertained from published maps.

3.2 Site Location and Description

The existing Castleton Wastewater Treatment Works (approximate National Grid Reference SD 880 096) is located approximately three kilometres northeast of Middleton, Oldham.

The location of the site is indicated on Figure One in Section D of the report.

3.3 Geology

From the available information on the One Inch to One Statue Mile scale Geological Survey map of the area (Sheet 85, Drift and Solid editions for Manchester (1970 and 1949 respectively)). The site is shown to be underlain by Glacial Sand and Gravel Deposits and Boulder Clay. These in turn overlie Lower Coal Measures of Carboniferous age.

3.4 Previous Investigations

NHSEL were not made aware of any previous investigations at this site.

4.0 FIELDWORK

4.1 Scope of Fieldwork

The scope of the fieldwork was specified by the Engineer and was undertaken in general accordance with BS 5930. The Engineer had the responsibility for setting out and surveying all exploratory holes and also for determining the in situ testing and sampling regime. Cable percussive boreholes were formed and the locations of the boreholes are indicated on the exploratory hole location plan presented as Figure Two in Section D of this report.

4.2 Inspection Pits

In order to positively prove the absence of buried services a hand dug inspection pit was excavated to a depth of 1.20m at each of the exploratory hole locations. The base of each pit was scanned with a cable avoidance tool (CAT).

4.3 Cable Percussive Boreholes

A total of three boreholes designated BH101, BH102 and BH103 were formed to a depth of 18.00m using conventional light cable percussive techniques together with 150mm diameter temporary steel casings. The boreholes were all formed in order to obtain samples for laboratory testing and to provide geotechnical information, as well as facilitate the installation of piezometers.

102mm nominal diameter open tube samples (U100) were obtained at regular intervals throughout the boring operations where suitable cohesive materials were encountered. These were sealed with wax to prevent moisture loss and were transported to the Leeds laboratory of NHSEL.

In granular materials or where the presence of coarse material prevented the taking of open tube samples, Standard Penetration Tests were carried out using a split spoon sampler of a solid 60 solid cone. The results of these tests are given as a Standard Penetration "N" value or as a blow count for a given penetration at the appropriate position on the borehole logs, where the use of either the sampler or cone is also recorded.

Representative disturbed samples of all materials encountered were obtained and these were placed in sealed containers for transport to the laboratory.

The samples recovered from the boreholes were described by an Engineering Geologist, in accordance with the terminology included in Section A of this report. A detailed description of all strata encountered, groundwater conditions and the position and type of samples taken are included on the borehole logs contained in Section B of this report.

5.0 LABORATORY TESTING

5.1 Scope of Testing

All geotechnical (soils) testing was scheduled by NHSEL in accordance with the provisions of the Term Contract Framework Agreement and was subsequently approved by the Engineer. The scope of the testing was required to enable comments regarding foundation design to be made.

5.2 Geotechnical Soils Testing

The programme of laboratory testing was carried out in accordance with BS1377 (1990). All testing was carried out at the Leeds Laboratory of Norwest Holst Soil Engineering Ltd which is registered as UKAS Testing laboratory No 1265.

The tests listed on page 7 were carried out and the results are given on the summary sheets with individual test plots presented in Section C of this report.

B.S. TEST NO.	DESCRIPTION
Part 2:3	Moisture Content
Part 2:4,5	Atterberg Limits
Part 2:9	Particle Size Distribution
Part 3:5 & 9	Sulphate Content and pH Value
Part 7:9	Undrained Triaxial Compression with Multistage Loading

N. Bews
Project Geotechnical Engineer

M.J. Baldwin
Technical Manager

REPORT REFERENCES

- Code of Practice for Site Investigation, BS 5930 (1999) British Standards Institution.
- Norbury. D.R, Child, G.H and Spink, T.W 'A Critical Review of Section 8 (BS 5930 1981) - Soil and Rock Description'. Geological Society, Engineering Geology Special Publication No 2, 1986.
- British Standards Institution: 1990: Methods of Test for Soils For Civil Engineering Purposes. BS 1377: Parts 1 to 9.
- British Geological Survey One Inch to One statute mile scale map of the area, Sheet 85, Solid and Drift Editions for Manchester 1949 and 1970.

SUPPORTING FACTUAL DATA

SECTION A

NOTES ON FIELDWORK, LOGGING AND LABORATORY TESTING

FIELDWORK PROCEDURES

SECTION A: NOTES ON FIELDWORK PROCEDURES

1.0 CABLE PERCUSSIVE BORING TECHNIQUES

Unless otherwise stated the light cable percussion technique of 'soft ground' boring has been employed in the formation of boreholes for this contract. In cohesive soils a clay cutter has been used to advance the boreholes whilst in granular deposits a shell has been employed. The combination of clay cutter and shell bring up disturbed material which is generally sufficiently representative to permit identification of the strata. Whilst these particular techniques allow the maximum data to be obtained on strata conditions, a degree of mixing of some layered soils (e.g thin layers of coarse and fine granular material) is inevitable.

2.0 ROUTINE SAMPLING

In the UK "undisturbed" samples of predominantly cohesive soils are generally obtained in a 102mm diameter open drive sampler as defined in the British Standard Code of Practice B.S. 5930 (1999) (ref 01). The British Standard notes however that conventional and lined open drive samplers do not produce Class 1 samples for laboratory testing and for this reason NHSEL has incorporated a taper into the cutting shoe of all its lined open drive samplers. This taper significantly reduces sample disturbance and for the majority of cohesive soils allows samples to be recovered which are suitable for laboratory machine testing. However it should be appreciated that no sample can be truly undisturbed when sampled in this manner and the effects of disturbance can best be seen in laminated clays in which the laminations may be turned downward on the margins of the sample due to the driving effects of the sampler. Where it is necessary to minimise the effects of sample disturbance e.g in 'sensitive' clays and silts, alternative sampling techniques may be specified and where used, are described in the report text.

In granular deposits and mixed cohesive-granular deposits where it is not possible to recover undisturbed samples, either large or small disturbed samples are normally obtained. The size of these samples are in accordance with the requirements of B.S. 5930 (1999) whilst the frequency of sampling is unique to this contract.

3.0 GROUNDWATER

The groundwater conditions entered on the exploratory hole records are those encountered at the time of the investigation. These however, may not represent the actual conditions or those which may apply in large excavations. The normal rate of boring does not always permit the recording of an equilibrium water level for any one water strike, particularly because the entry of water into a borehole may be reduced or even eliminated due to casing off a water bearing layer or due to a skin being formed on the borehole wall by the drilling tools. It should also be noted that groundwater conditions may vary seasonally and/or tidally and that the water levels as shown at the time of investigation should not necessarily be taken as being constant because they may be subject to such fluctuations.

4.0 IN SITU DYNAMIC PENETRATION TESTS

Standard or Cone Penetration Testing is generally employed where undisturbed samples cannot be obtained e.g in granular soils, fill and rock etc, in order to obtain an indication of the insitu density, compaction or hardness. Inherent difficulties are present in obtaining true S.P.T or C.P.T "N" values in water bearing fine grained granular deposits and careful consideration of the test technique and groundwater conditions are necessary before test results are used for design purposes.

The full procedure for carrying out the Standard Penetration Test (SPT) is given in BS 1377: 1990, Test 9:3.3 (ref 02). Essentially the test consists of driving a 50mm external diameter split barrel sampler into the soil using a 65kg hammer dropping 760mm. The penetration resistance is expressed as the number of blows required to obtain 300mm penetration below an initial seating drive of 150mm through any disturbed ground at the bottom of the borehole. The number of blows for the 300mm test drive penetration is recorded on the borehole logs as the "N" value. A full record of the number of blows required to drive the sampler at 75mm intervals throughout the total 450mm drive is also tabulated along with the groundwater level at the time of test. It is important to distinguish how the blow count relates to the penetration of the sampler and this may be achieved in the following manner:

i) Where the test drive is terminated at 50 blows the number of blows for the partial test drive (usually 50) and the penetration of the sampler within the test drive are recorded. An approximate "N" value may be obtained by linear extrapolation of the number of blows recorded for the partial test drive.

ii) If the total penetration is equal to or less than the 150mm seating drive then the number of blows (usually 25) and the depth of penetration within the initial seating penetration are recorded on the borehole logs.

The "N" value obtained from the Standard Penetration Test may be used to assess the relative density of sands and gravels in accordance with Clause 41.3.2 of BS 5930: 1981, as follows:

Term	SPT N-Value: Blows/300mm Penetration
Very Loose	0-4
Loose	4-10
Medium Dense	10-30
Dense	30-50
Very Dense	Over 50

Standard Penetration Testing may also be performed in very stiff/hard clays in which it would be difficult to obtain undisturbed samples. In such cases the S.P.T "N" values may be used for design purposes based on correlations between "N" value and various soil parameters such as those proposed by Stroud and Butler (ref 03).

References:

(01) BS5930:1999 Code of Practice for Site Investigation. British Standards Institution.

(02) BS 1377: Part 9: Test 9.3.3 1990 Methods of Tests for Soils for Civil Engineering Purposes. British Standards Institution.

(03) Stroud, M.A, Butler, F.G ' The Standard Penetration Test and the Engineering Properties of Glacial Materials' from the Engineering Behaviour of Glacial Materials Proc. of Symp. April 1975.

SUPPORTING FACTUAL DATA

SECTION A

NOTES ON FIELDWORK, LOGGING AND LABORATORY TESTING

SOIL DESCRIPTION TERMINOLOGY

SECTION A: TERMINOLOGY USED IN SOIL DESCRIPTIONS

1.0 GENERAL PROCEDURES

Soil descriptions contained in this report have been produced in accordance with the procedure and principles given in BS 5930 (1999) (ref 01). The British Standard has largely adopted the extended descriptive approach proposed by Norbury, Child and Spink (ref 02), whose work provides additional amplification.

For a soil description the main soil characteristics should be given in a standard word order although the word order can be adjusted to enhance and clarify if appropriate. The main soil characteristics can be divided as follows:-

1	**Mass Characteristics** comprising state and structure	2	**Material Characteristics** comprising nature and state
1a	Density and Field Strength	2a	Colour
1b	Discontinuities	2b	Composite Soil Types: particle grading and composition, shape and size
1c	Bedding	2c	Principal Soil Type, name in capitals eg CLAY

3 **Stratum Name (optional)**
3.1 Geological Formation

For descriptions used in this report the soil colour is placed after the field strength or density ie stiff grey CLAY. Other word order is as described previously.

The basic soil categories covered by the following notes may be broadly summarised as:

(i) Very coarse soils: greater than 60mm in diameter, ie cobbles and boulders.

(ii) Coarse soils: 0.06mm to 60mm in diameter, ie sands and gravels.

(iii) Fine soils: less than 0.06mm in diameter, ie clays and silts.

(iv) Organic soils.

(v) Man made "soils".

2.0 MASS CHARACTERISTICS OF SOILS

2.1 Cohesive Soils

For cohesive material the strength guide given in Table One on the following page shall be used. Unless specified for individual contracts no subdivision of material strength categories is used.

TABLE ONE: STRENGTH SCALE GUIDE FOR COHESIVE MATERIAL

Term	Field Identification	Undrained Shear Strength kN/m²
Very Soft	Can be squeezed through fingers	<20
Soft	Easily remoulded by hand	20-40
Firm	Hard to remould by hand	40-75
Stiff	Indented slightly by thumb	75-150
Very Stiff	Indented by thumb nail	150-300
Hard	Can be scratched	>300
N.B Clays with undrained strengths greater than 300 kN/m² can be described as hard clays or as very weak mudstones as suggested by Spink and Norbury.		

2.2 Granular Soils

For granular deposits relative density may only be determined by the standard penetration test (S.P.T). The following table provides a scale of terms related to S.P.T 'N' values (see BS 1377:1990) (ref 03).

TABLE TWO: ASSESSMENT OF RELATIVE DENSITY FOR GRANULAR SOILS

Term	Field Identification (generally in trial pits)	S.P.T 'N' Values (blows for 300mm penetration)
Very loose	Can be excavated with a spade	0-4
Loose	and 50mm wooden peg can be easily driven	4-10
Medium dense	-	10-30
Dense	Requires pick for excavation	30-50
Very dense	and 50mm wooden peg is hard to drive	over 50
N.B. The field identification terms for very loose/loose material and dense/very dense material are very general and should be treated with caution.		

2.3 Discontinuities

The type of discontinuity should be described eg fissures, faults and shear planes together with their spacing as given in the following table. Discontinuity openness, and surface texture eg rough, smooth, polished, striated should be recorded although this need not always be added to the borehole log if the required level of detail is low.

2.4 Bedding

Bedding spacing is assessed using the thickness terms given in Table Three.

TABLE THREE: DESCRIPTIONS FOR DISCONTINUITIES AND BEDDING

DISCONTINUITIES		BEDDING	
Scale of Spacing Term	**Mean Spacing mm**	**Scale of Bedding Term**	**Mean Thickness mm**
Very widely	>2000	Very thickly bedded	>2000
Widely	2000-600	Thickly bedded	2000-600
Medium	600-200	Medium bedded	600-200
Closely	200-60	Thinly bedded	200-60
Very closely	60-20	Very thinly bedded	60-20
Extremely closely	<20	Thickly laminated	20-6
		Thinly laminated	<6
Note: Spacing terms are also used for describing the distance between partings, isolated beds, laminae or roots etc.		Note: Interbedded/interlaminated: alternating layers of different material type. These terms must be given a thickness if material is present in equal proportions. Otherwise the thickness of and spacing between subordinate layers must be defined.	

3.0 MATERIAL CHARACTERISTICS OF SOIL

An examination of insitu soil deposits, disturbed or undisturbed samples allows the material characteristics to be recorded. These characteristics include colour, particle shape, particle grading and particle composition.

3.1 Colour

The recorded colour should be based on the logger's general impression of the overall colour. For material with more than three colours the term multicoloured should be used. The term mottled should be applied to soils which exhibit two colours, one of which is subordinate to the other.

White, cream, grey, black, yellow, orange, red, brown, green and blue etc may be used but supplemented as necessary with: light, dark, mottled and reddish brownish etc. All coloration associated with chemical changes should be noted ie grey gleying on fissures.

3.2 Soil Types (Including Composite Soils)

3.2.1 Very Coarse Soils (Boulders and Cobbles)

Where the soil sample is considered large enough to be representative, material is described as follows:-

TABLE FOUR: DESCRIPTORS FOR VERY COARSE SOILS

	Main Name	Estimated Boulder/Cobble Content of Very Coarse Fraction
Over 50% of material is very coarse (>60mm)	BOULDERS	Over 50% is of boulder size (>200mm)
	COBBLES	Over 50% is of cobble size (200mm to 60mm)

Mixtures of very coarse and finer materials are described by combining terms for the very coarse constituents with those for the finer constituents as follows:-

TABLE FIVE: DESCRIPTORS FOR MIXTURES OF VERY COARSE AND FINER SOILS

Term	Composition (Approx %)
BOULDERS (or COBBLES) with a little finer material (1)	Up to 5% finer material
BOULDERS (or COBBLES) with some finer material (1)	5% to 20% finer material
BOULDERS (or COBBLES) with much finer material (1)	20% to 50% finer material
FINER MATERIAL with many boulders (or cobbles)	50% to 20% boulders (or cobbles)
FINER MATERIAL with some boulders (or cobbles)	20% to 5% boulders (or cobbles)
FINER MATERIAL with occasional boulders (or cobbles)	Up to 5% boulders (or cobbles)
(1) The description of "finer material" is made in accordance with BS 5930 41.4.2 to 41.4.6 ignoring the very coarse fraction; the principal soil type name of the finer material may also be given in capital letters, e.g. sandy GRAVEL with occasional boulders; COBBLES with some sandy CLAY.	

3.2.2 Coarse Soils (Gravel and Sand)

A coarse soil (omitting any cobbles and boulders) contains 65% or more of SAND or GRAVEL. The following terms may be used to describe the coarse fraction:-

TABLE SIX: DESCRIPTORS FOR COARSE SOILS

Term	Principal Soil Type	Approximate Proportion of Secondary Constituent
Slightly sandy or gravelly	SAND	Up to 5%
Sandy or gravelly	or	5% to 20%
Very sandy or gravelly	GRAVEL	Over 20%
-	SAND and GRAVEL	About equal proportions

Fine Soils and Mixtures of Fine and Coarse Soils

Fine soil should be described as either a SILT or a CLAY. The use of silty CLAY or clayey SILT is not permitted.

For deposits that contain a mixture of soil types the descriptors given in Table Six are used. The dominant secondary fraction is placed immediately before the principal soil type. It should also be noted that the terms silty and clayey are mutually exclusive in a coarse soil. The use of the terms sandy and gravelly are however permitted.

TABLE SEVEN: DESCRIPTORS FOR FINE SOILS AND COMPOSITE SOIL TYPES

Term	Principal Soil Type	Approximate Proportion of Secondary Consitutent	
		Coarse Soil	Coarse and/or Fine Soil
Slightly clayey or silty and/or sandy or gravelly Clayey or silty and/or sandy or gravelly Very clayey or silty and/ or sandy or gravelly	SAND and/or GRAVEL		>5% 5% - 20% * >20% *
Very sandy or gravelly Sandy and/or gravelly Slightly sandy and/or gravelly	SILT or CLAY	>65% + 35% - 65% <35%	
* or described as fine soil depending on assessed engineering behaviour + or described as coarse soil depending on assessed engineering behaviour			

3.3 Particle Shape and Grading

For coarser granular deposits (gravel and cobbles) the particle shape should be described as follows:-

TABLE EIGHT: DESCRIPTORS FOR PARTICLE SHAPE

Angularity	Form	Surface Texture
Angular Subangular Subrounded Rounded	Flat Elongated	Rough Smooth
Notes: Form and surface textural descriptors are optional.		

The distribution of particle sizes within sands and gravels should be described stating the predominant size fraction present eg fine to medium SAND.

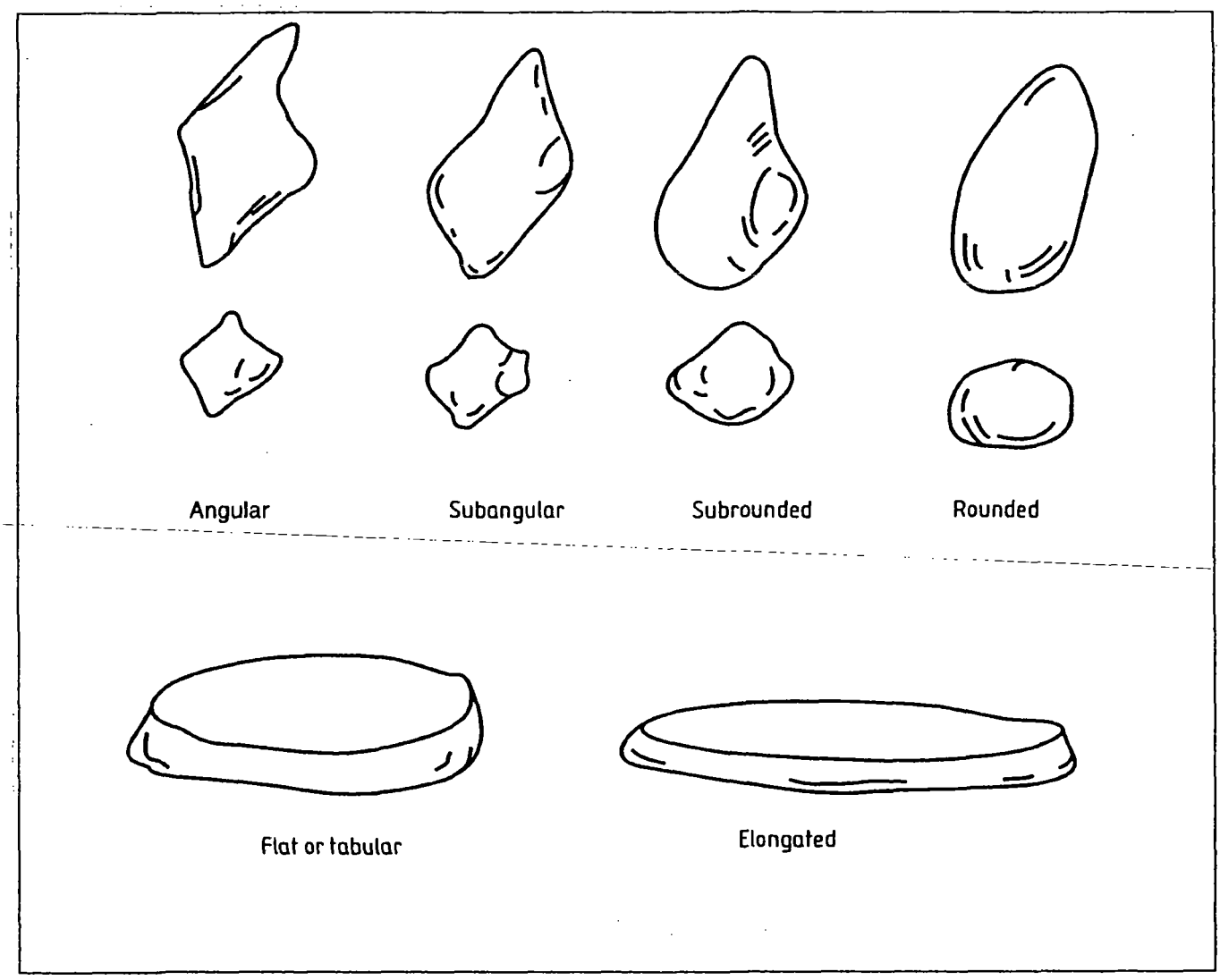


FIGURE ONE: PARTICLE ANGULARITY AND FORM TERMS

References:

(01) BS 5930: (1999) Code of Practice for Site Investigation. British Standards Institution.

(02) Norbury, D.R, Child, G.H and Spink, T.W 'A Critical Review of Section 8 (BS 5930: 1981) - Soil and Rock Description'. Geological Society, Engineering Geology Special Publication No 2, 1986.

(03) BS 1377: 1990 Methods of Test for Soils for Civil Engineering Purposes. Part 9 British Standards Institution.

SUPPORTING FACTUAL DATA

SECTION A

NOTES ON FIELDWORK, LOGGING AND LABORATORY TESTING

AGGRESSIVE GROUND AND GROUNDWATER CONDITIONS

SECTION A: ASSESSMENT OF AGGRESSIVE GROUND AND GROUNDWATER CONDITIONS

Certain ground and groundwater conditions may be described as aggressive depending on their chemical composition which is related to previous industrial use. Where foundations are proposed to be constructed on industrial sites or on landfill sites in which the ground or groundwater may be contaminated with chemical waste, detailed consideration needs to be given to both the method of investigation and the severity of ground and groundwater conditions with respect to construction materials. For such sites it will usually be necessary to undertake a full chemical analysis in order to identify the potentially aggressive compounds.

On sites where new concrete foundations are to be constructed in natural ground it is usually only necessary to examine the sulphate content and pH level of the ground. The sulphate content of soils varies widely and can range from being virtually absent to extremely high concentrations in crystals eg gypsum. In between these two extremes sulphate may be disseminated throughout a soil or may be present in discrete bands or lenses. Because of this wide variation in the sulphate content of soils, the most reliable indication of possible aggressive conditions can be obtained by testing representative samples of groundwater. In order to take account of natural variations in the distribution of sulphates in the ground samples should be taken at a number of locations that are well spaced across the site and at different depths.

The methods for the determination of total sulphate of soil and the sulphate content of groundwater and 2:1 aqueous soil extracts are given in BS 1377: 1990: Part 3: Section 5 (ref 01). The results of tests performed in accordance with BS 1377 yield results which are expressed as percentage of dry weight retained or grammes/litre SO_3.

The classification of natural sulphate conditions is based on BRE Digest 363 (1996) (ref 02). This digest presents all sulphate values as percent of dry weight retained or grammes/litre SO_4. In order to convert the results expressed as SO_3 (BS 1377) to SO_4 (BRE Digest 363) it is necessary to apply a multiplication factor of 1.2. In the following discussion of sulphate conditions values given in the tables are expressed in terms of SO_4.

In general when the results of sulphate determinations are assessed emphasis must be given to the samples which fall in the higher classes. Therefore if 8 out of 10 samples are found to be non aggressive and fall within Class 1 and the remainder fall within Class 2 it will be necessary to adopt the precautions appropriate to Class 2 conditions for the whole site.

TABLE ONE: CLASSIFICATION OF SULPHATES IN SOILS IN RELATION TO THE REQUIREMENTS FOR WELL COMPACTED CAST IN-SITU CONCRETE

Class	In Soil or Fill		In Groundwater g/l
	By Acid Extraction % SO_4	By 2:1 Water/Soil Extract g/l SO_4	
1	0.24	<1.2	<0.4
2	If >0.24 classify on the basis of 2:1 extract	1.2-2.3	0.4-1.4
3		2.3-3.7	1.4-3.0
4		3.7-6.7	3.0-6.0
5		>6.7	>6.0
Notes: (1) To convert SO_3 to SO_4, multiply by 1.2			

The pH value of groundwater provides a crude measure of the potential aggressiveness due to the presence of organic acids. The standard procedure for measuring the acidity of soils and groundwater is the electrometric method using a pH meter and is described in BS 1377 (1990): Part 3: Section 5. The pH value of pure water is 7.0 and the presence of acid substances will yield results with values less than 7. It should be noted however that the pH of most natural waters depends mainly on the dissolved carbon dioxide content and therefore lies between pH values of 6.5 and 8.5. It is generally accepted that soils or groundwater with pH values in the range 6 to 9 may be classified as near neutral. It should be noted that the pH value of soil and groundwater can change with time and it is therefore necessary to carry out testing on fresh samples of soil or water. A classification of the acidity of soils and groundwaters is given below.

The pH value of the soil or groundwater also needs to be taken into consideration when the recorded sulphate content is borderline between two classes or approaches the upper limit of a given class. In these circumstances if the pH value is below 6 the sample should be placed in the more severe class of the sulphate classification. This general approach may be justified on the grounds that the acids present will tend to break down the concrete surface and therefore make it more susceptible to sulphate attack. This will be especially so if the sample contains large amounts of sulphides since these can be converted to sulphuric acid.

TABLE TWO: REQUIREMENTS FOR CONCRETE EXPOSED TO ATTACK FROM ACIDS OF pH >2.5

Use	Concrete in contact with:	pH	Mobility of Water M = Mobile S = Static	Aggressive CO_2	Change in classification with respect to minimum cement content and maximum water/cement ratio for the type of cement recommended on the basis of sulphate in Tables 1, 1a and 1b in BRE Digest 363
Foundations including poured cast-in-situ piles. For piles made by special techniques using low water/cement ratio, slightly less stringent requirements may be applicable	Natural ground	>5.5	S or M	-	No change
		3.5 to 5.5	S	-	No change
			M	-	Advance by one class
			S	-	Advance by one class
		<3.5	M	-	Advance by one class
	Ground containing wastes or made-up ground		S	-	No change
		>5.5	M	-	Advance by one class
		4.5 to 5.5	S	-	Advance by one class
			M	-	Advance by two classes
			S	-	Advance by one class
		<4.5	M	-	Advance by three classes

Organic acids are often found in peaty or marshy soils in which the pH value is below 6.0. In such soils it will be necessary to take specific precautions to protect any concrete which would be exposed to organic acids. The recommended precautionary measures outlined in Tomlinson (1994) (ref 03) could be followed. In all cases where mineral acids are present the groundwater is likely to be aggressive with regard to foundation concrete and in these circumstances special consideration will need to be given to designing appropriate protection for all foundation concrete.

Alkaline groundwater is not generally considered aggressive to concrete unless present in high concentrations. Unless the aggregate used in foundation concrete is of a reactive type pH values of groundwater up to pH = 14 need not be considered as problematic.

References:

(01) BS 1377: 1990 Methods of Test for Soils for Civil Engineering Purposes.Part 3: Chemical and Electrochemical Tests, British Standards Institution.

(02) Building Research Establishment: 1996: Sulphate and Acid Resistance of Concrete in the Ground. BRE Digest 363. Building Research Station, Garston.

(03) Tomlinson M.J: 1994: Foundation Design and Construction. 6th Edition, Pitman Advanced Publishing Programme.

SUPPORTING FACTUAL DATA

SECTION B

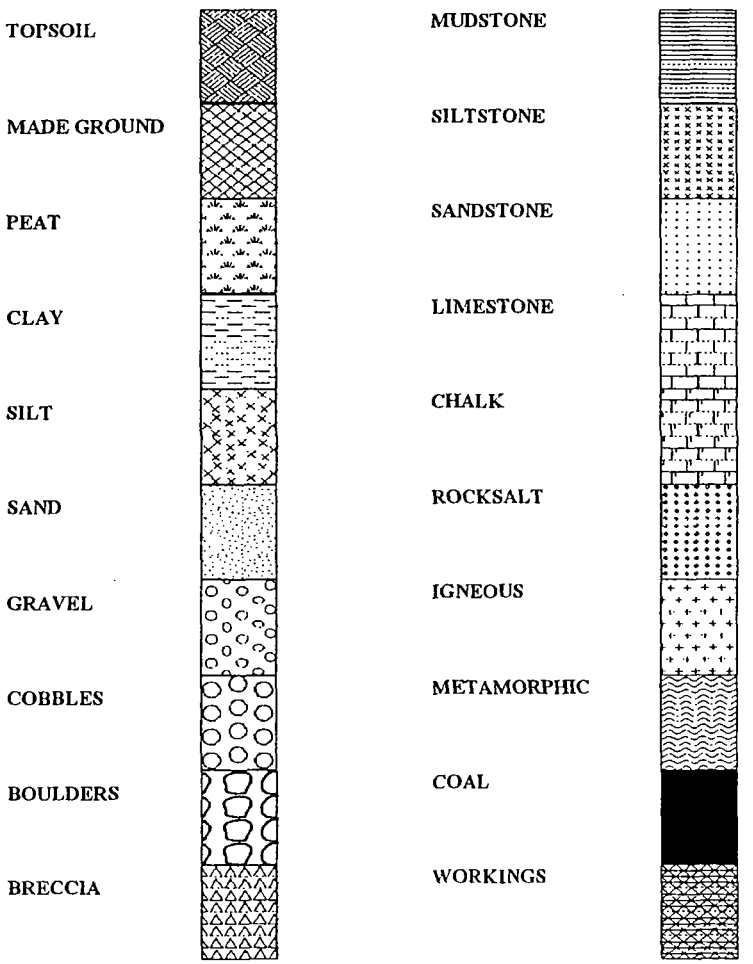
EXPLORATORY HOLE RECORDS AND FIELD DATA

LEGEND AND NOTATION SHEET

Norwest Holst Soil Engineering Ltd.

EXPLORATION HOLE LOG LEGEND AND NOTATION SHEET

SOIL AND ROCK LEGEND CODES



Where a strata consists of material of more than one soil or rock type the legends are appropriately combined.

LOG NOTATION

U -- Undisturbed U100 Sample
P - Piston Sample
BL - Block Sample
M - Mazier Sample
D -- Disturbed Sample
B -- Bulk Disturbed Sample
W -- Water Sample
V - Vane Test
K - Permeability Test
Pr - Pressuremeter Test
S -- Standard Penetration Test
C -- Cone Penetration Test

NR -- No Recovery
NP -- No Penetration
TCR -- Total Core Recovery
SCR -- Solid Core Recovery
RQD -- Rock Quality Designation
F.I. - Fracture Index
N.A. - Not Applicable
N.I. - Not Intact

SUPPORTING FACTUAL DATA

SECTION B

EXPLORATORY HOLE RECORDS AND FIELD DATA

BOREHOLE RECORDS

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Hole ID.
BH101
Header

Contract No.	F11984	Method	Cable Percussion	Coordinates	0.0 E
Project	Castleton WWTW				0.0 N
		Drilling Rig	Dando	Ground Level	0.00m AOD
Client	North West Water	Driller	DP	Orientation	Vertical
		Logged by	NM	Date Started	30/05/2001
Consultant	Montgomery Watson			Date Completed	31/05/2001

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
30/05/2001	1500	9.50	9.50	1.30	
31/05/2001	0800	9.50	9.50	0.60	
31/05/2001	1500	18.00	17.90	Dry	

DRILLING DETAILS

Hardbore from depth	Hardbore to depth	Chiselling hours	Remarks
16.80	17.00	1.00	
17.00	17.20	1.00	

CASING

Hole diam.	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	18.00	150	18.00

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
30/05/2001	1030	1.30	0.60	10.0	Fast	1.20	NR

GENERAL NOTES

1. Hand excavated inspection pit to 1.20m.
2. Borehole complete at 18.00m.
3. Piezometer installed at 6.00m.

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
1.20	S	N=23 (2,4,5,6,6,6)
2.00	S	N=26 (1,4,7,7,5,7)
3.00	S	N=21 (2,3,4,4,6,7)
4.00	S	N=28 (1,3,6,6,7,9)
5.00	S	N=12 (3,3,3,4,2,3)
6.00	S	N=15 (2,2,3,3,4,5)
7.00	S	N=11 (1,1,2,3,2,4)
8.00	S	N=14 (2,2,3,3,4,4)
9.00	S	N=13 (1,2,2,3,3,5)
10.00	S	N=21 (2,3,4,5,5,7)
11.50	S	N=21 (3,3,4,5,6,6)
12.50	S	N=25 (1,3,5,7,6,7)
13.50	S	N=29 (3,6,6,7,8,8)
15.50	S	N=32 (4,5,7,7,9,9)
16.50	C	78/125mm (6,9,28,50)
17.50	C	N=35 (6,8,7,9,9,10)

* Seating blows only.

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, chiselling time in hours.

Form	ARIAL CP HEADER
Version	1.00
Revised	01/10/1998

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Hole ID. **BH101** **Sheet 1 of 2**

Contract No.	F11984	Method	Cable Percussion	Coordinates	0.0 E
Project	Castleton WWTW				0.0 N
		Drilling Rig	Dando	Ground Level	0.00m AOD
Client	North West Water	Driller	DP	Orientation	Vertical
		Logged by	NM	Date Started	30/05/2001
Consultant	Montgomery Watson			Date Completed	31/05/2001

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
MADE GROUND: Topsoil. (Driller's description)		0.30		D 0.30			
MADE GROUND: Concrete slab, soil, brick and sand fill. (Drillers description).		0.40					
MADE GROUND: Black gravelly fine and medium sand. Gravel is angular and subangular of mixed lithologies.		0.70		D 0.80			
MADEGROUND: Black sandy slightly gravelly organic clay. Gravel is angular and subangular fine of mixed lithologies.		1.00		D 1.20 - 1.65 B 1.20 - 1.70	S23	S 1.20 1.65	
Medium dense light brown gravelly fine and medium SAND. Gravel is rounded fine and medium of mixed lithologies.		2.80		D 2.00 - 2.45 B 2.00 - 2.50	S26	S 2.00 2.45	
Medium dense orangish brown gravelly fine and medium SAND. Gravel is rounded and subrounded fine and medium of mixed lithologies.		5.70		D 3.00 - 3.45 B 3.00 - 3.50	S21	S 3.00 3.45	
				D 4.00 - 4.45 B 4.00 - 4.50	S28	S 4.00 4.45	
				D 5.00 - 5.45 B 5.00 - 5.50	S12	S 5.00 5.45	
Medium dense reddish brown fine and medium SAND.				D 6.00 - 6.45 B 6.00 - 6.50	S15	S 6.00 6.45	
				D 7.00 - 7.45 B 7.00 - 7.50	S11	S 7.00 7.45	
				D 8.00 - 8.45 B 8.00 - 8.50	S14	S 8.00 8.45	
				D 9.00 - 9.45 B 9.00 - 9.50	S13	S 9.00 9.45	
				B 10.00 - 10.50	S21	S 10.00	

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	ARIAL CP LOG
Version	1.00
Revised	01/10/1998

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Hole ID. **BH101** **Sheet 2 of 2**

Contract No.	F11984	Method	Cable Percussion	Coordinates	0.0 E
Project	Castleton WWTW				0.0 N
		Drilling Rig	Dando	Ground Level	0.00m AOD
Client	North West Water	Driller	DP	Orientation	Vertical
		Logged by	NM	Date Started	30/05/2001
Consultant	Montgomery Watson			Date Completed	31/05/2001

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
Medium dense reddish brown fine and medium SAND.				B 10.00 - 10.50	S21	S 10.00 10.45	
		10.70					
Firm thinly laminated brown slightly sandy CLAY.				UF 11.00 - 11.45 B 11.00 - 11.50			
		11.20					
Medium dense brown silty fine and medium SAND.				D 11.50 - 11.95 B 11.50 - 12.00	S21	S 11.50 11.95	
				D 12.50 - 12.95 B 12.50 - 13.00	S25	S 12.50 12.95	
		13.20					
Stiff thinly laminated brown very sandy CLAY.				D 13.50 - 13.95 B 13.50 - 14.00	S29	S 13.50 13.95	
				U 14.50 - 14.95	(67)		
---from 15.50m becoming very stiff				D 15.50 - 15.95 B 15.50 - 16.00	S32	S 15.50 15.95	
		16.40					
Dense brown sandy GRAVEL with occasional cobbles. Sand is medium to coarse. Gravel is subangular to rounded fine to coarse of mixed lithologies.				B 16.50 - 16.75	C78/125mm	C 16.50 16.78	
				B 17.50 - 17.95	C35	C 17.50 17.95	
		18.00					
Cable Percussion boring complete at 18.00 m.							

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	ARIAL CP LOG
Version	1.00
Revised	01/10/1998

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Hole ID.
BH102
Header

Contract No.	F11984	Method	Cable Percussion	Coordinates	0.0 E
Project	Castleton WWTW				0.0 N
		Drilling Rig	Dando	Ground Level	0.00m AOD
Client	North West Water	Driller	DP	Orientation	Vertical
		Logged by	NM	Date Started	29/05/2001
Consultant	Montgomery Watson			Date Completed	30/05/2001

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
29/05/2001	1500	14.00	14.00	1.00	
30/05/2001	0800	14.00	14.00	0.40	
30/05/2001	1500	18.00	18.00	0.40	

DRILLING DETAILS

Hardbore from depth	Hardbore to depth	Chiselling hours	Remarks
13.70	13.90	1.00	
13.90	14.00	1.00	
15.10	15.30	1.00	

CASING

Hole diam.	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	18.00	150	18.00

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
29/05/2001	1000	1.00	0.40	10.0	Fast	0.90	NR

GENERAL NOTES

1. Hand excavated inspection pit to 1.20m.
2. Borehole complete at 18.00m.
3. Piezometer installed at 12.00m.

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
1.20	S	N=24 (3,4,5,6,6,7)
2.00	S	N=17 (3,3,3,4,5,5)
3.00	S	N=21 (2,3,3,4,6,8)
4.00	S	N=23 (1,3,4,6,6,7)
5.00	S	N=8 (1,2,1,2,2,3)
6.00	S	N=9 (1,2,2,2,2,3)
7.00	S	N=13 (2,3,3,3,3,4)
9.00	S	N=18 (1,2,3,3,6,6)
10.00	S	N=23 (1,1,3,6,6,8)
11.00	S	N=16 (2,3,3,5,3,5)
13.50	C	81/135mm (10,17,31,50/60)
14.50	C	N=74 (10,12,19,20,21,14)
15.50	C	N=24 (8,3,4,7,5,8)
16.50	C	N=25 (4,7,6,6,6,7)
17.50	C	N=17 (1,2,3,4,5,5)

* Seating blows only.

NB All depths in metres, all diameters in millimetres,
water strike rise time in minutes, chiselling time in hours.

Form	ARIAL CP HEADER
Version	1.00
Revised	01/10/1998

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Hole ID. **BH102** **Sheet 1 of 2**

Contract No.	F11984	Method	Cable Percussion	Coordinates	0.0 E
Project	Castleton WWTW				0.0 N
		Drilling Rig	Dando	Ground Level	0.00m AOD
Client	North West Water	Driller	DP	Orientation	Vertical
		Logged by	NM	Date Started	29/05/2001
Consultant	Montgomery Watson			Date Completed	30/05/2001

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
MADE GROUND: Topsoil		0.40		D 0.30			
MADE GROUND: Black gravelly fine and medium sand. Gravel is subrounded fine to coarse of mixed lithologies.		1.00		D 0.80			
Medium dense brown slightly gravelly medium SAND. Gravel is rounded and subrounded fine of mixed lithologies.				D 1.20 - 1.65 B 1.20 - 1.70	S24	S 1.20 1.65	
				D 2.00 - 2.45 B 2.00 - 2.50	S17	S 2.00 2.45	
				D 3.00 - 3.45 B 3.00 - 3.50	S21	S 3.00 3.45	
				D 4.00 - 4.45 B 4.00 - 4.50	S23	S 4.00 4.45	
		4.80					
Loose brown fine and medium SAND.				D 5.00 - 5.45 B 5.00 - 5.50	S8	S 5.00 5.45	
				D 6.00 - 6.45 B 6.00 - 6.50	S9	S 6.00 6.45	
---from 7.00m becomes medium dense				D 7.00 - 7.45 B 7.00 - 7.50	S13	S 7.00 7.45	
		7.50		B 7.50 - 8.00			
Soft thinly laminated brown sandy CLAY.				U 8.00 - 8.45	(48)		
		8.60		D 8.50			
Medium dense brown slightly gravelly fine and medium SAND. Gravel is rounded fine of quartz.				D 9.00 - 9.45 B 9.00 - 9.50	S18	S 9.00 9.45	
				D 10.00 - 10.45	S23	S 10.00	

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	ARIAL CP LOG
Version	1.00
Revised	01/10/1998

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Hole ID. **BH102** **Sheet 2 of 2**

Contract No.	F11984	Method	Cable Percussion	Coordinates	0.0 E
Project	Castleton WWTW				0.0 N
		Drilling Rig	Dando	Ground Level	0.00m AOD
Client	North West Water	Driller	DP	Orientation	Vertical
		Logged by	NM	Date Started	29/05/2001
Consultant	Montgomery Watson			Date Completed	30/05/2001

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
Medium dense brown slightly gravelly fine and medium SAND. Gravel is rounded fine of quartz.				D 10.00 - 10.45 B 10.00 - 10.50	S23	S 10.00 10.45	
				D 11.00 - 11.45 B 11.00 - 11.50	S16	S 11.00 11.45	
		11.20					
Firm locally thinly laminated brown sandy slightly gravelly CLAY. Gravel is rounded fine and medium of quartz.				U 12.00 - 12.45	(39)		
				D 12.50			
				UF 13.00 - 13.40 B 13.00 - 13.50	(59)		
		13.10					
Dense brown silty gravelly fine and medium SAND. Gravel is subrounded fine and medium of mixed lithologies.				B 13.50 - 13.75	C81/135mm	C 13.50 13.79	
		14.00					
Dense and medium dense brown silty fine to coarse SAND and GRAVEL with occasional cobbles. Gravel is subangular to rounded fine to coarse of mixed lithologies.				B 14.50 - 14.95	C74	C 14.50 14.95	
				B 15.50 - 15.95	C24	C 15.50 15.95	
		16.40					
Medium dense brown sandy subangular to rounded fine to coarse GRAVEL of mixed lithologies.				B 16.50 - 16.95	C25	C 16.50 16.95	
				D 17.50 - 17.95 B 17.50 - 18.00	C17	C 17.50 17.95	
		18.00					
Cable Percussion boring complete at 18.00 m.							

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	ARIAL CP LOG
Version	1.00
Revised	01/10/1998

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Hole ID.
BH103
Header

Contract No.	F11984	Method	Cable Percussion	Coordinates	0.0 E
Project	Castleton WWTW				0.0 N
		Drilling Rig	Dando	Ground Level	0.00m AOD
Client	North West Water	Driller	DP	Orientation	Vertical
		Logged by	NM	Date Started	31/05/2001
Consultant	Montgomery Watson			Date Completed	01/06/2001

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
31/05/2001	1500	6.50	6.50	0.60	
01/06/2001	0700	6.50	6.50	0.60	
01/06/2001	1500	18.00	18.00	0.60	

DRILLING DETAILS

Hardbore from depth	Hardbore to depth	Chiselling hours	Remarks
13.50	14.00	1.00	
14.00	14.50	1.00	
14.50	15.00	1.00	
15.00	15.50	1.00	

CASING

Hole diam.	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	18.00	150	18.00

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
31/05/2001	1100	1.00	0.60	10.0	Moderate	0.90	NR

GENERAL NOTES

1. Hand excavated inspection pit to 1.20m.
2. Borehole complete at 18.00m.
3. Borehole backfilled with arisings.

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
1.20	S	N=20 (1,3,4,5,5,6)
2.00	S	N=23 (2,2,4,6,6,7)
3.00	S	N=15 (1,3,3,3,4,5)
4.00	S	N=20 (2,2,4,5,6,5)
5.00	S	N=24 (1,5,5,5,6,8)
6.00	S	N=15 (1,2,3,3,4,5)
7.00	S	N=23 (2,3,6,6,5,6)
8.00	S	N=19 (1,3,4,5,5,5)
9.00	S	N=31 (4,5,6,7,9,9)
11.00	C	N=41 (4,6,7,10,10,14)
12.00	S	N=72 (10,11,12,19,20,21)
13.00	C	N=93 (13,14,19,20,23,31)
14.00	C	76/115mm (10,19,26,50/40)
15.00	C	50/60mm (21,29,50/60)
16.00	C	N=38 (6,7,9,10,9,10)
17.00	C	N=26 (4,5,6,6,8,6)

* Seating blows only.

NB All depths in metres, all diameters in millimetres,
water strike rise time in minutes, chiselling time in hours.

Form	ARIAL CP HEADER
Version	1.00
Revised	01/10/1998

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Hole ID.
BH103
Sheet 1 of 2

Contract No.	F11984	Method	Cable Percussion	Coordinates	0.0 E
Project	Castleton WWTW				0.0 N
		Drilling Rig	Dando	Ground Level	0.00m AOD
Client	North West Water	Driller	DP	Orientation	Vertical
		Logged by	NM	Date Started	31/05/2001
Consultant	Montgomery Watson			Date Completed	01/06/2001

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
MADE GROUND: Topsoil.		0.30		D 0.30			
MADE GROUND: Black clayey gravelly fine and medium sand. Gravel is subangular to rounded fine to coarse of mixed lithologies.		0.90		D 1.00			
Medium dense dark brown slightly gravelly SAND. Gravel is subrounded and rounded fine of quartz.		1.80		D 1.20 - 1.65 B 1.20 - 1.70	S20	S 1.20 1.65	
Medium dense reddish brown slightly gravelly fine to coarse SAND. Gravel is subrounded and rounded of sandstone and quartz.				D 2.00 - 2.45 B 2.00 - 2.50	S23	S 2.00 2.45	
				D 3.00 - 3.45 B 3.00 - 3.50	S15	S 3.00 3.45	
				D 4.00 - 4.45 B 4.00 - 4.50	S20	S 4.00 4.45	
				D 5.00 - 5.45 B 5.00 - 5.50	S24	S 5.00 5.45	
		6.00		D 6.00 - 6.45 B 6.00 - 6.50	S15	S 6.00 6.45	
Medium dense brown silty fine and medium SAND.				D 7.00 - 7.45 B 7.00 - 7.50	S23	S 7.00 7.45	
				D 8.00 - 8.45 B 8.00 - 8.50	S19	S 8.00 8.45	
				D 9.00 - 9.45 B 9.00 - 9.50	S31	S 9.00 9.45	
		9.90		D 9.90	(51)		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	ARIAL CP LOG
Version	1.00
Revised	01/10/1998

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Hole ID.
BH103
Sheet 2 of 2

Contract No.	F11984	Method	Cable Percussion	Coordinates	0.0 E
Project	Castleton WWTW				0.0 N
		Drilling Rig	Dando	Ground Level	0.00m AOD
Client	North West Water	Driller	DP	Orientation	Vertical
		Logged by	NM	Date Started	31/05/2001
Consultant	Montgomery Watson			Date Completed	01/06/2001

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling		SPT N & (U blows)	SPT type & depth		Install-ation
Firm greyish brown very sandy slightly gravelly CLAY.				UF	10.00 - 10.45	(51)			
				B	10.00 - 10.50				
				UF	10.50 - 10.95	(66)			
		10.70		B	10.50 - 11.00				
Dense brown slightly silty slightly sandy subangular to rounded fine to coarse GRAVEL of mixed lithologies.				B	11.00 - 11.45	C41	C	11.00	
								11.45	
		12.00		B	12.00 - 12.50	S72	S	12.00	
Very stiff brown sandy CLAY								12.45	
				B	13.00 - 13.50	C93	C	13.00	
								13.45	
				B	14.00 - 14.50	C76/115mm	C	14.00	
								14.27	
						C50/60mm	C	15.00	
								15.21	
		15.50							
Dense brown slightly silty slightly sandy subangular to rounded fine to coarse GRAVEL of mixed lithologies.				B	16.00 - 16.45	C38	C	16.00	
								16.45	
				B	17.00 - 17.45	C26	C	17.00	
								17.45	
		18.00		D	18.00				
Cable Percussion boring complete at 18.00 m.									

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	ARIAL CP LOG
Version	1.00
Revised	01/10/1998

SUPPORTING FACTUAL DATA

SECTION B

EXPLORATORY HOLE RECORDS AND FIELD DATA

PIEZOMETER READINGS

TABLE 1: RESULTS OF GROUNDWATER MONITORING IN BOREHOLE INSTALLATIONS

BH ID	14/06/01 (m.b.g.l)	25/06/01 (m.b.g.l)	09/07/01 (m.b.g.l)	Engineer
101	0.61	0.72	0.70	PM / NB
102	0.11	0.07	0.02	PM / NB
Notes:				

SUPPORTING FACTUAL DATA

SECTION C

LABORATORY TESTING

KEY TO LABORATORY TEST RESULTS

LABORATORY TEST DATA KEY SHEET

Hole ID ■	Indicates results on rock and soil summary sheets

Type	U	Undisturbed sample	B	Bulk disturbed sample
	P	Piston sample	BL	Block sample
	D	Small disturbed sample	C	Rock core

Triaxial /Shear Box	UU	Unconsolidated quick undrained	*(Single)
	UUM	Unconsolidated quick undrained	(Multi)
	UU3	Unconsolidated quick undrained	(Set of 3)
	UUR	Unconsolidated quick undrained	*(Remoulded single)
	UUMR	Unconsolidated quick undrained	(Remoulded multi)
	CD	Consolidated drained	*(Single)
	CDM	Consolidated drained	(Multi)
	CDR	Consolidated drained	*(Remoulded single)
	CDRM	Consolidated drained	(Remoulded multi)
	CU	Consolidated undrained	*(Single)
	CUM	Consolidated undrained	(Multi)
	CUR	Consolidated undrained	*(Remoulded single)
	CURM	Consolidated undrained	(Remoulded multi)
	OTHR	Other	* *NB Single stage tests reported assuming*
	Sh p	Shearbox Peak	∅=zero for total stress and c'= zero for effective stress tests.
	Sh r	Shearbox Residual	
	RS r	Ring Shear	

The effective stress parameters are dashed (') on the summary sheets as opposed to the shear strength symbols (c'/=∅') which are common column headings to total stress results as well.

Consol/Oedometer	Oedometer consolidation Mv quoted for 'p0 to p0 + 100 kPa'

PSD	Frc	Combined Clay/Silt fraction

SO3	t	Total soil sulphate content (%)
	a	Sulphate aqueous extract 2:1 soil/water (g/l)
	w	Water sulphate content (g/l)
	d	Total soil sulphur content (%)
Cl	a	Acid soluble chloride ions (%)
	w	Water soluble chloride ions (%)
	d	Dissolved chloride ions (%)
Other	c	Carbonate content (as CO2) (%)
	l	Loss on ignition (%)
	+	Organic content (%)

Compaction	2.5kg	2.5kg Rammer effort	CBR	t	Top result
	4.5kg	4.5kg Rammer effort		b	Bottom result
	Vibro	Vibrating hammer		m	Multi point CBR test-highest value

U/S		Unsuitable sample
====		Test scheduled but not complete
=TX=	<TX>	Triaxial test scheduled/Unsuitable
=ES=	<ES>	Effective stress test scheduled/Unsuitable
=SB=	<SB>	Shearbox scheduled/Unsuitable

SUPPORTING FACTUAL DATA

SECTION C

LABORATORY TESTING

LABORATORY TEST SUMMARY SHEETS (SOILS)

SUMMARY OF LABORATORY SOIL TESTS: INDEX/CLASSIFICATION TESTS

Norwest Holst

Project CASTLETON WwTW. Contract no. F11984

Hole ID	Sample depth m	Sample type	Moisture Content	Bulk Density	Particle Density	Plastic Index	Particle size					Sulfate	pH	Chloride	Organic	Loss On Ignition
							Clay	Silt	Sand	Gravel	Cobbles					
			%	Mg/m³			%	%	%	%	%			%	%	%
BH101	0.40	D										0.07a	7.8			
BH101	0.80	D	41			14						0.02a	7.3			
BH101	1.20	B						4'	72	24	0					
BH101	3.00	B					1	1	97	2	0					
BH101	5.00	D						2'	84	14	0					
BH101	6.00	B						5'	94	1	0					
BH101	9.00	B						5'	94	1	0					
BH101	11.00	B	25			7						0.02a	8.8			
BH101	11.50	B					5	17	78	0	0					
BH101	13.50	B					17	41	42	0	0					
BH101	16.50	B						5'	31	63	0					
BH102	0.30	D	37									0.01a	6.3			
BH102	0.80	D	42									0.01a	5.6			
BH102	1.20	B						4'	94	2	0					
BH102	3.00	B						2'	98	1	0					
BH102	5.00	B						7'	93	0	0					
BH102	7.00	B						7'	93	1	0					
BH102	8.00	U					7	25	69	0	0	0.02a	8.8			
BH102	9.00	B						9'	89	1	0					
BH102	9.00	D	19													
BH102	11.00	B					28	40	31	1	0					
								End								

Norwest Holst Soil Engineering Limited

Parkside Lane, Dewsbury Road, Leeds LS11 5SX

Tel. 0113 2711111 Fax.0113 2760472 E-mail soils@norwest.co.uk

Approved:

Print date 17/07/2001

SUMMARY OF LABORATORY SOIL TESTS: INDEX/CLASSIFICATION TESTS

Norwest Holst

Project CASTLETON WwTW. Contract no. F11984

Hole ID	Sample depth m	Sample type	Moisture Content	Bulk Density	Particle Density	Plastic Index	Particle size					Sulfate	pH	Chloride	Organic	Loss On Ignition
							Clay	Silt	Sand	Gravel	Cobbles					
			%	Mg/m³			%	%	%	%	%			%	%	%
BH102	12.00	U										0.05a	8.2			
BH102	12.50	D	26			11										
BH102	14.50	B						8'	36	56	0					
BH102	16.50	B						3'	35	61	0					
BH103	0.30	D										0.04a	6.7			
BH103	1.20	B						4'	95	1	0					
BH103	2.00	B						3'	78	19	0					
BH103	4.00	B						10'	90	1	0					
BH103	6.00	B						6'	94	0	0					
BH103	8.00	B					4	25	70	0	0					
BH103	10.00	B	24			5						0.03a	8.9			
BH103	10.50	B					11	24	60	4	0					
BH103	11.00	B						6'	23	72	0					
BH103	12.00	B	25			8						0.02a	8.6			
BH103	14.00	B	23			13						0.04a	8.6			
BH103	16.00	B						5'	28	67	0					
								End								

Norwest Holst Soil Engineering Limited

Parkside Lane, Dewsbury Road, Leeds LS11 5SX

Tel. 0113 2711111 Fax.0113 2760472 E-mail soils@norwest.co.uk

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SUMMARY OF LABORATORY SOIL TESTS: STRENGTH AND RE-USE TESTS

Norwest Holst

Project CASTLETON WwTW. Contract no. F11984

Hole ID	Sample depth m	Sample type	Moisture Content %	Bulk Density Mg/m³	Triaxial / shearbox Type	Triaxial / shearbox c kPa	Triaxial / shearbox Ø °	Consol Type	Consol m_v %	Permeability Type	Permeability K %	Compaction OMC %	Compaction Max DD Mg/m³	MCV	CBR Top %	CBR Base %
BH102	8.00	U	22.22	2.05	UUM	17	0.3									
BH102	12.00	U	24.35	2.02	UUM	15	1.3									
								End								

Norwest Holst Soil Engineering Limited

Parkside Lane, Dewsbury Road, Leeds LS11 5SX

Tel. 0113 2711111 Fax.0113 2760472 E-mail soils@norwest.co.uk

Approved:

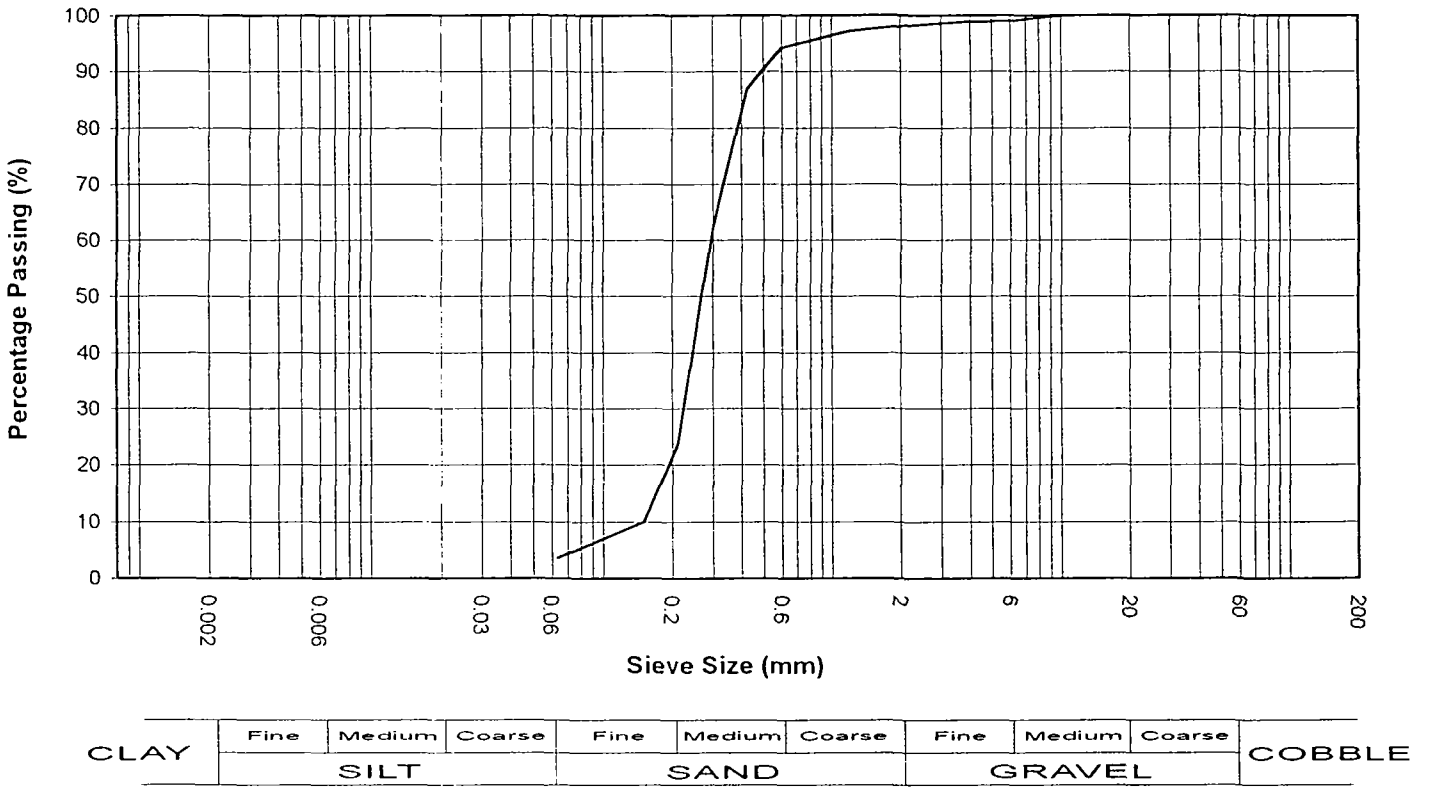
Print date 1/01/2001

PARTICLE SIZE DISTRIBUTION

Test method: BS1377: Part 2: 1990: Clause 9.2

Norwest Holst

Contract no.	F11984	Hole ID	BH102
Project	CASTLETON WwTW.	Sample no.	1
Soil description	Brown SAND.	Depth	1.20 m
		Sample type	B
		Page	1 of 1



PARTICLE SIZE	%
Silt and clay:	4
Sand:	94
Gravel:	2
Cobbles:	0

Specimen location within original sample: N/A

Remarks:

SIEVE DATA				SEDIMENTATION DATA	
Sieve size mm	Cumulative % passing	Sieve size mm	Cumulative % passing	Equivalent particle diameter mm	Cumulative % passing
75.0	100	5.0	99		
63.0	100	3.35	99		
50.0	100	2.00	98		
37.5	100	1.18	97		
28.0	100	0.600	94		
20.0	100	0.425	87		
14.0	100	0.300	62		
10.0	100	0.212	24		
6.3	99	0.150	10		
		0.063	4		

Norwest Holst Soil Engineering Limited

Parkside Lane, Dewsbury Road, Leeds LS11 5SX

Tel. 0113 2711111 Fax. 0113 2760472 E-mail soils@norwest.co.uk

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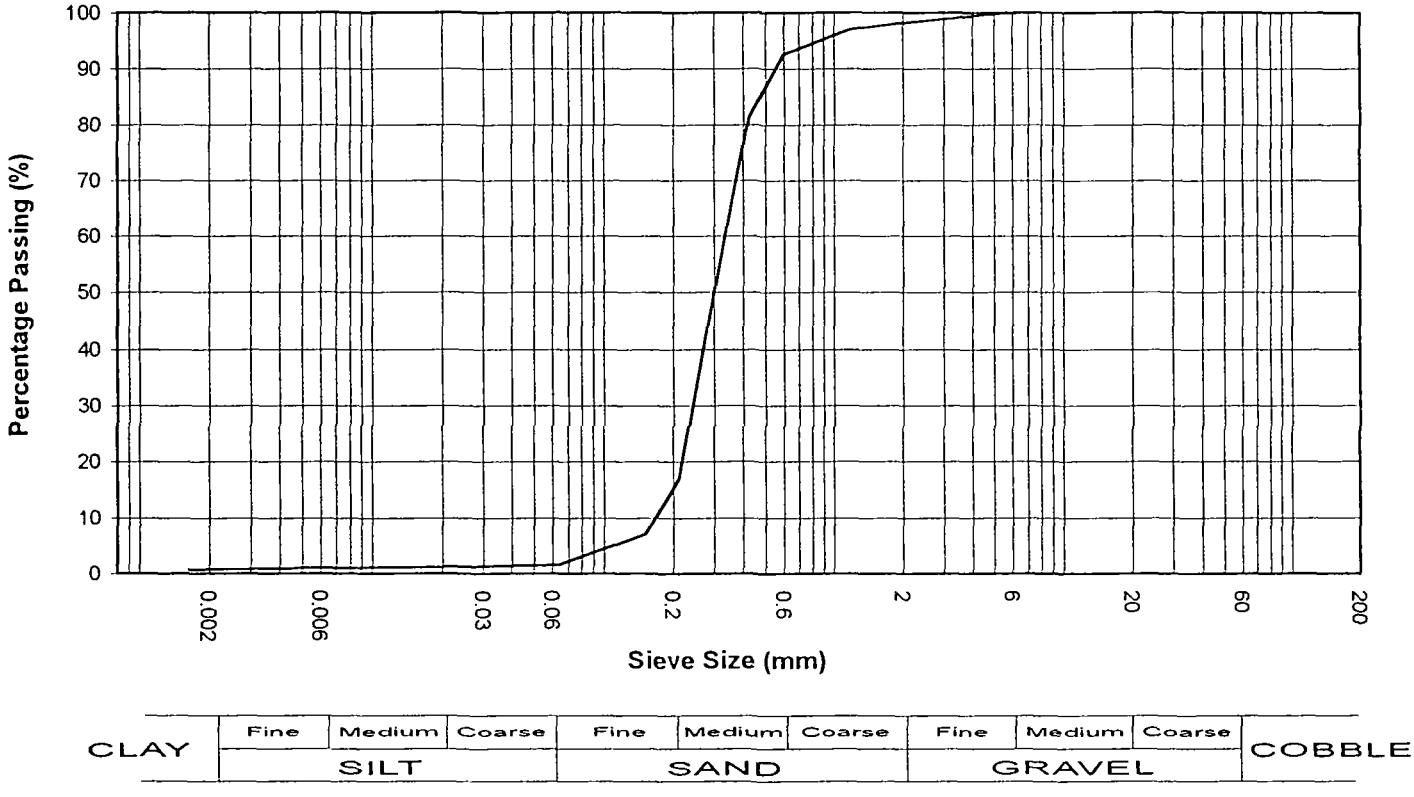
PARTICLE SIZE DISTRIBUTION

Test method: BS1377: Part 2: 1990: Clause 9.2, 9.5

Norwest Holst

Contract no.	F11984	Hole ID	BH101
Project	CASTLETON WwTW.	Sample no.	1
Soil description	Brown SAND.	Depth	3.00 m
		Sample type	B
		Page	1 of 1



PARTICLE SIZE	%
Clay:	1
Silt:	1
Sand:	97
Gravel:	2
Cobbles:	0

Specimen location within original sample: N/A

Remarks:

Particle density: 2.65 Mg/m³ Assumed

SIEVE DATA

Sieve size mm	*Cumulative* % passing	*Sieve size* mm	*Cumulative* % passing
75.0	100	5.0	100
63.0	100	3.35	99
50.0	100	2.00	98
37.5	100	1.18	97
28.0	100	0.600	93
20.0	100	0.425	81
14.0	100	0.300	50
10.0	100	0.212	17
6.3	100	0.150	7
		0.063	2

SEDIMENTATION DATA

Equivalent particle diameter mm	Cumulative % passing
0.0571	2
0.0404	1
0.0286	1
0.0202	1
0.0091	1
0.0047	1
0.0031	1
0.0016	1

Norwest Holst Soil Engineering Limited

Parkside Lane, Dewsbury Road, Leeds LS11 5SX

Tel. 0113 2711111 Fax. 0113 2760472 E-mail soils@norwest.co.uk

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SUPPORTING FACTUAL DATA

SECTION C

LABORATORY TESTING

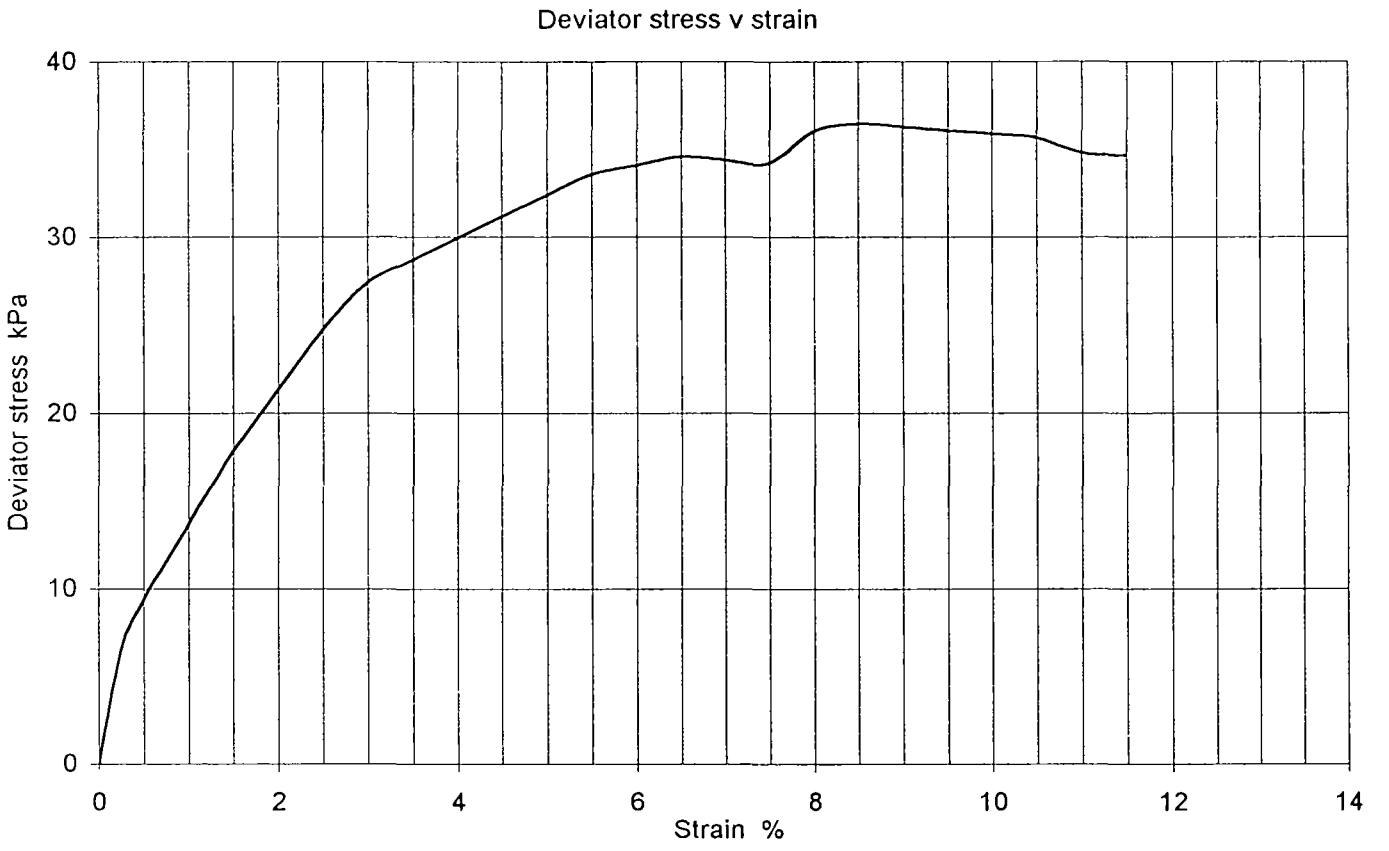
LABORATORY DATA SHEETS (SOILS)

UNDRAINED TRIAXIAL COMPRESSION WITHOUT MEASUREMENT OF PORE PRESSURE (MULTISTAGE METHOD)

Test Method: BS1377: Part 7: 1990: Clause 9

Norwest Holst

Contract no.	F11984	Hole ID	BH102
Project	CASTLETON WwTW.	Sample no.	1
Soil description	Soft brown very sandy CLAY.	Depth	8.00 m
		Sample type	U
		Page	1 of 1



Shear stength parameters	c'	17 kPa
	ϕ'	0.3 °
	Apparent c'	17 kPa

Test type		Multi stage			Mode of failure
Specimen number		1	2	3	Specimen 1
Cell pressure	kPa	75	150	300	
Deviator stress	kPa	34.58	36.49	35.89	Compound
Corrected deviator stress	kPa	34	36	35	
Membrane correction	kPa	0.54	0.67	0.76	
Membrane thickness	mm	0.346			
Moisture content	%	22.22			
Bulk density	Mg/m^3	2.05			
Dry Density	Mg/m^3	1.68			
Diameter	mm	103.3			
Length	mm	200.1			
Failure strain	%	6.5	8.5	10.0	
Cu	kPa	17	18	18	

Rate of strain 0.95 %/minute Specimen depth 8 m

High density rubber latex membrane used

Remarks

Norwest Holst Soil Engineering Limited

Parkside Lane, Dewsbury Road, Leeds LS11 5SX

Tel. 0113 2711111 Fax. 0113 2760472 E-mail soils@norwest.co.uk

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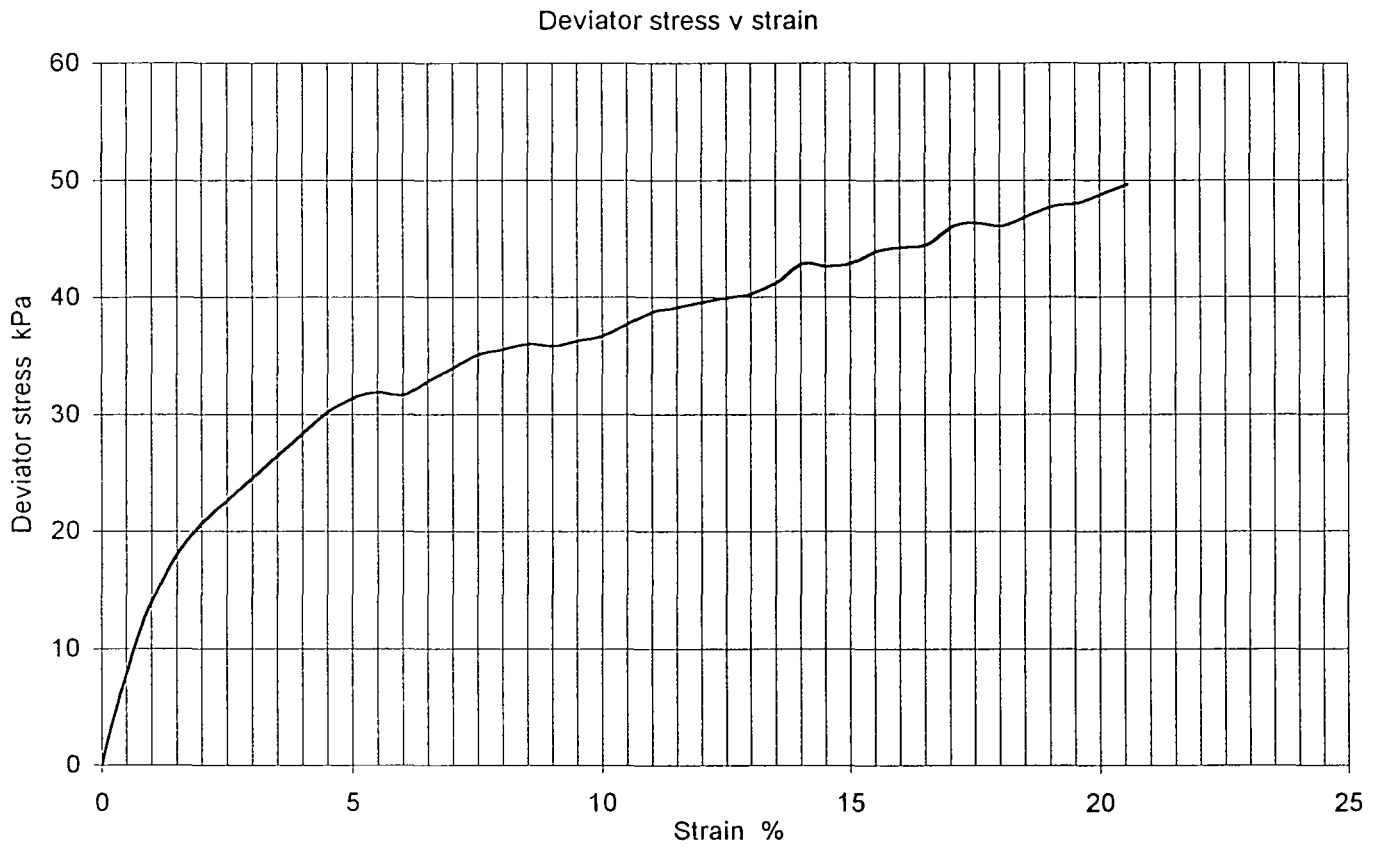
UNDRAINED TRIAXIAL COMPRESSION WITHOUT MEASUREMENT OF PORE PRESSURE (MULTISTAGE METHOD)

Test Method: BS1377: Part 7: 1990: Clause 9

Norwest Holst

Contract no.	F11984	Hole ID	BH102
Project	CASTLETON WwTW.	Sample no.	1
Soil description	Firm brown sandy CLAY.	Depth	12.00 m
		Sample type	U
		Page	1 of 1



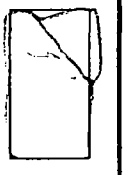
Shear stength parameters	c'	15 kPa
	ϕ'	1.3 °
	Apparent c'	21 kPa

Test type		Multi stage		
Specimen number		1	2	3
Cell pressure	kPa	110	220	440
Deviator stress	kPa	31.86	46.33	49.66
Corrected deviator stress	kPa	31	45	48
Membrane correction	kPa	0.46	1.14	1.28
Membrane thickness	mm	0.346		
Moisture content	%	24.35		
Bulk density	Mg/m^3	2.02		
Dry Density	Mg/m^3	1.62		
Diameter	mm	104.9		
Length	mm	199.3		
Failure strain	%	5.5	17.6	20.6
Cu	kPa	16	23	24

Mode of failure

Specimen 1

Compound



Rate of strain 0.95 %/minute Specimen depth 12 m

High density rubber latex membrane used

Remarks

Norwest Holst Soil Engineering Limited

Parkside Lane, Dewsbury Road, Leeds LS11 5SX

Tel. 0113 2711111 Fax. 0113 2760472 E-mail soils@norwest.co.uk

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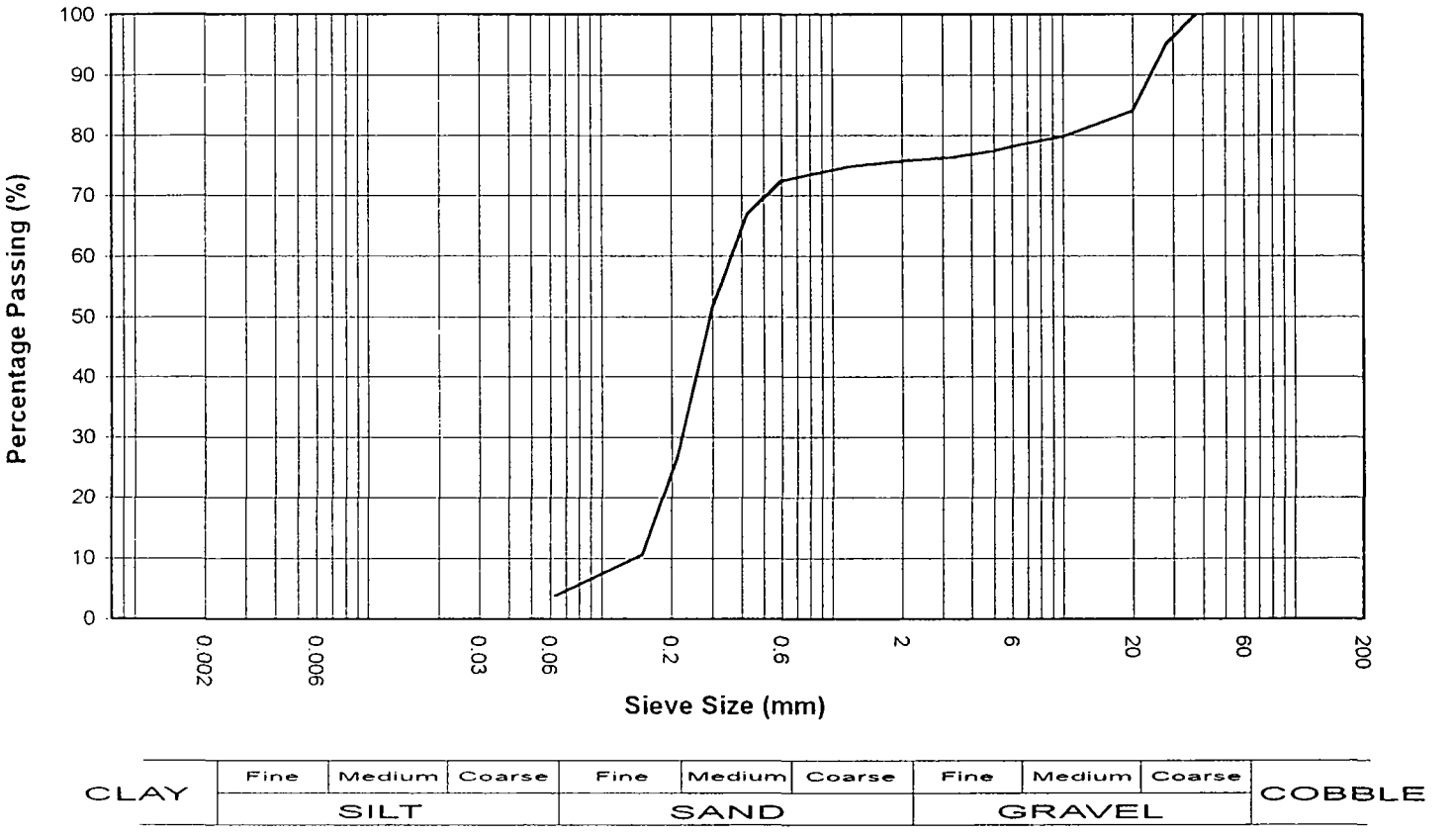
PARTICLE SIZE DISTRIBUTION

Test method: BS1377: Part 2: 1990: Clause 9.2

Norwest Holst

Contract no.	F11984	Hole ID	BH101
Project	CASTLETON WwTW.	Sample no.	1
Soil description	Brown very gravelly SAND.	Depth	1.20 m
		Sample type	B
		Page	1 of 1



PARTICLE SIZE	%
Silt and clay:	4
Sand:	72
Gravel:	24
Cobbles:	0

Specimen location within original sample: N/A

Remarks:

SIEVE DATA			
Sieve size mm	Cumulative % passing	Sieve size mm	Cumulative % passing
75.0	100	5.0	77
63.0	100	3.35	76
50.0	100	2.00	76
37.5	100	1.18	75
28.0	95	0.600	72
20.0	84	0.425	67
14.0	82	0.300	51
10.0	80	0.212	27
6.3	78	0.150	11
		0.063	4

SEDIMENTATION DATA	
Equivalent particle diameter mm	Cumulative % passing

Norwest Holst Soil Engineering Limited

Parkside Lane, Dewsbury Road, Leeds LS11 5SX

Tel. 0113 2711111 Fax. 0113 2760472 E-mail soils@norwest.co.uk

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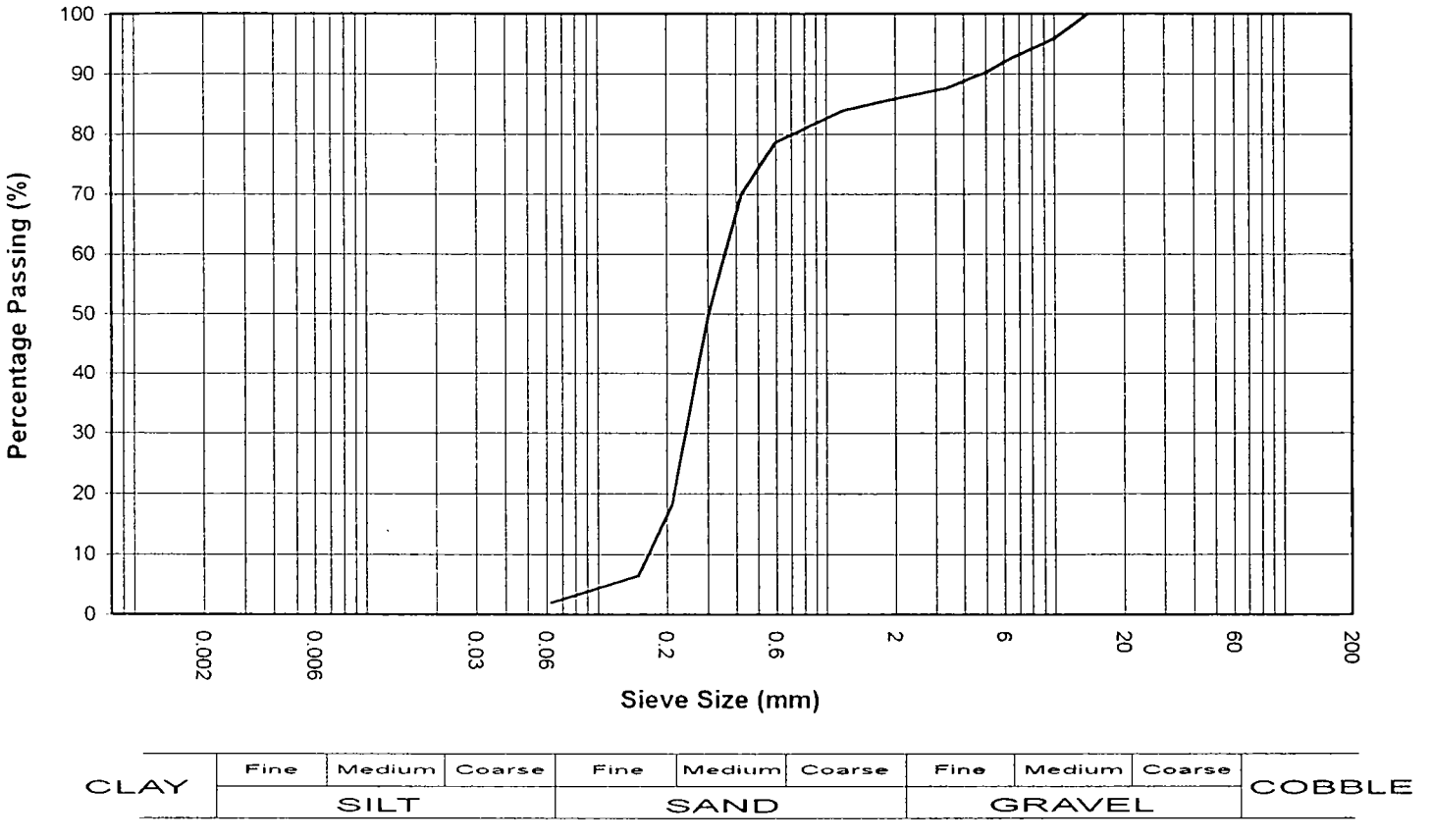
PARTICLE SIZE DISTRIBUTION

Test method: BS1377: Part 2: 1990: Clause 9.2

Norwest Holst

Contract no.	F11984	Hole ID	BH101
Project	CASTLETON WwTW.	Sample no.	1
Soil description	Brown gravelly SAND.	Depth	5.00 m
		Sample type	D
		Page	1 of 1



PARTICLE SIZE	%
Silt and clay:	2
Sand:	84
Gravel:	14
Cobbles:	0

Specimen location within original sample: N/A

Remarks:

SIEVE DATA

Sieve size mm	Cumulative % passing	Sieve size mm	Cumulative % passing
75.0	100	5.0	90
63.0	100	3.35	88
50.0	100	2.00	86
37.5	100	1.18	84
28.0	100	0.600	79
20.0	100	0.425	70
14.0	100	0.300	49
10.0	96	0.212	18
6.3	92	0.150	6
		0.063	2

SEDIMENTATION DATA

Equivalent particle diameter mm	Cumulative % passing

Norwest Holst Soil Engineering Limited

Parkside Lane, Dewsbury Road, Leeds LS11 5SX

Tel. 0113 2711111 Fax. 0113 2760472 E-mail soils@norwest.co.uk

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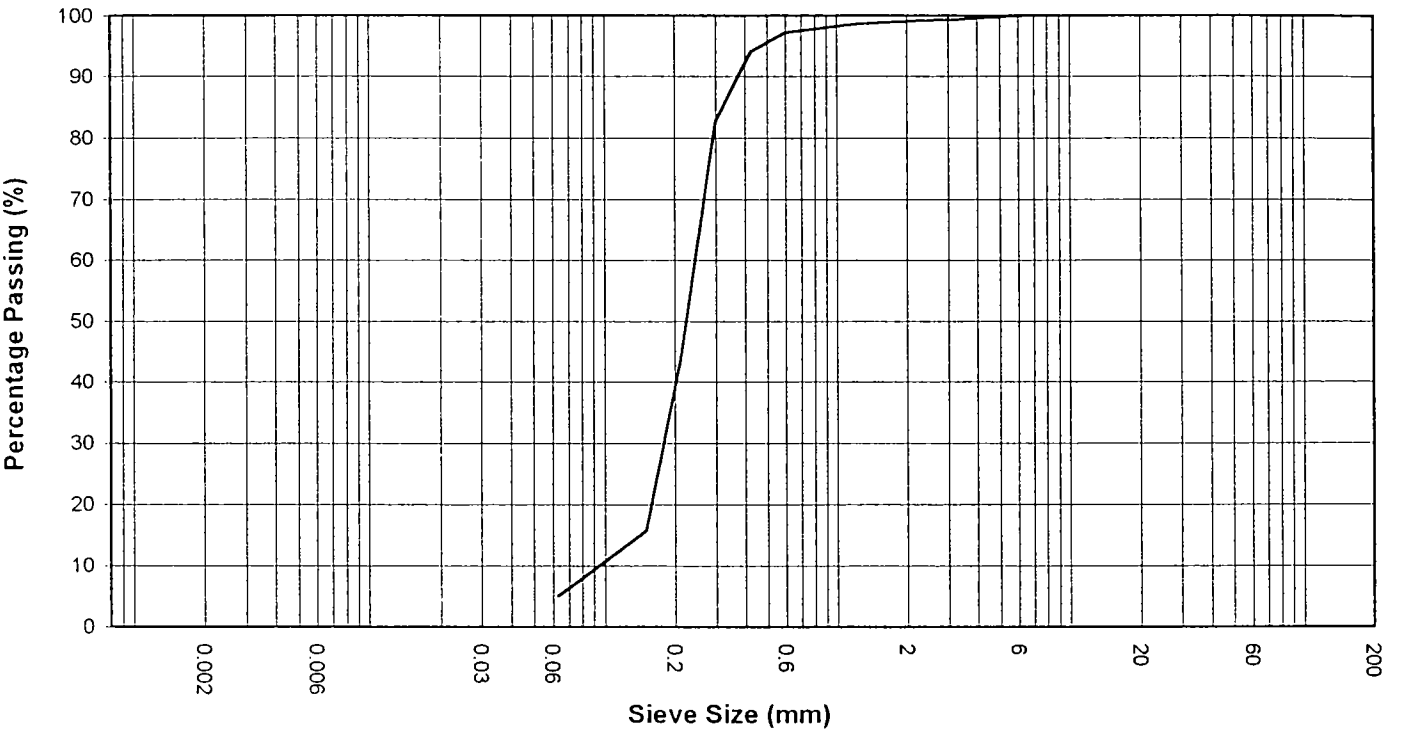
PARTICLE SIZE DISTRIBUTION

Test method: BS1377: Part 2: 1990: Clause 9.2

Norwest Holst

Contract no.	F11984	Hole ID	BH101
Project	CASTLETON WwTW.	Sample no.	1
Soil description	Brown SAND.	Depth	6.00 m
		Sample type	B
		Page	1 of 1



PARTICLE SIZE	%
Silt and clay:	5
Sand:	94
Gravel:	1
Cobbles:	0

Specimen location within original sample: N/A

Remarks:

SIEVE DATA

Sieve size mm	Cumulative % passing	Sieve size mm	Cumulative % passing
75.0	100	5.0	100
63.0	100	3.35	99
50.0	100	2.00	99
37.5	100	1.18	99
28.0	100	0.600	97
20.0	100	0.425	94
14.0	100	0.300	83
10.0	100	0.212	44
6.3	100	0.150	16
		0.063	5

SEDIMENTATION DATA

Equivalent particle diameter mm	Cumulative % passing

Norwest Holst Soil Engineering Limited

Parkside Lane, Dewsbury Road, Leeds LS11 5SX

Tel. 0113 2711111 Fax. 0113 2760472 E-mail soils@norwest.co.uk

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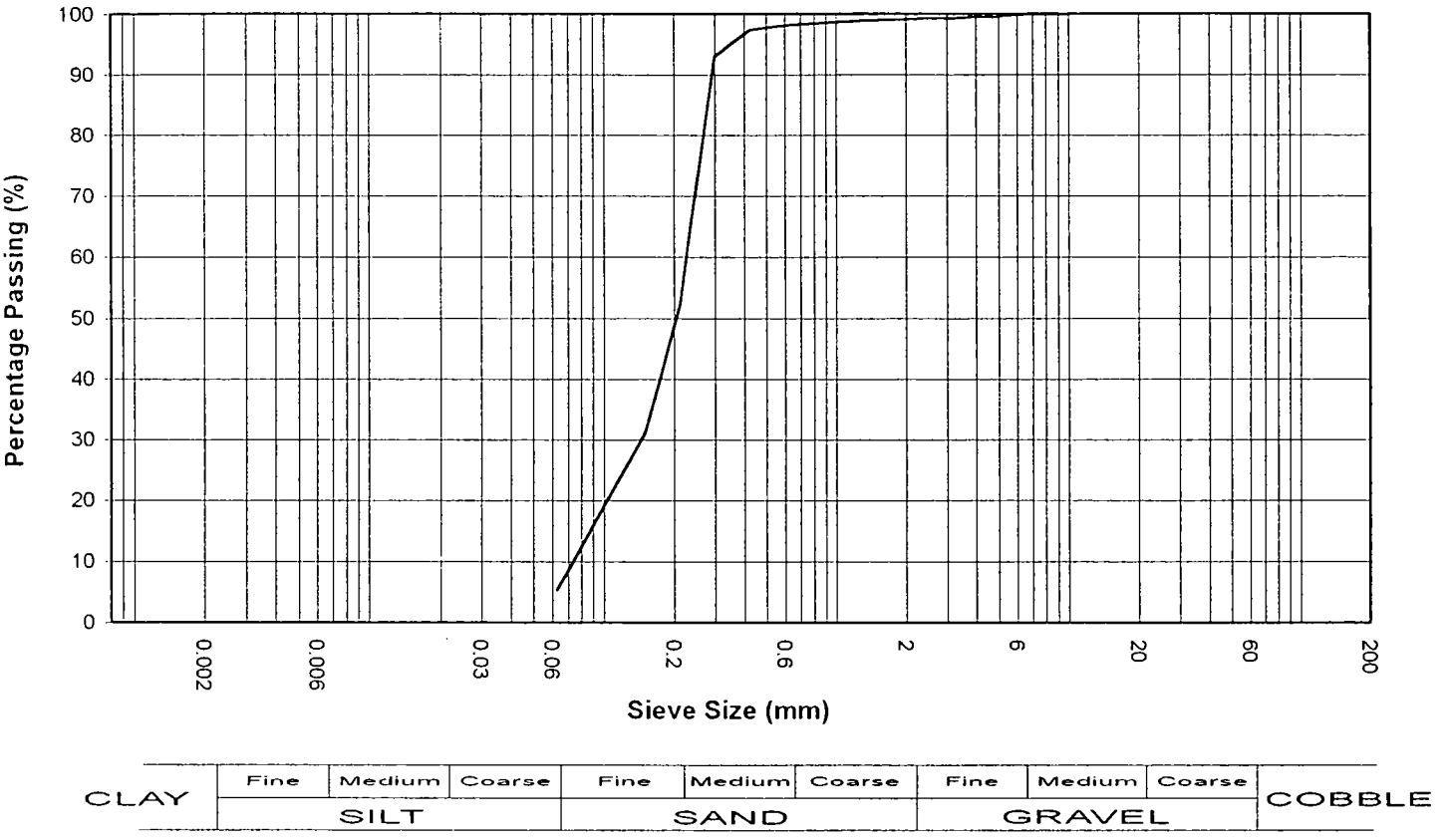
PARTICLE SIZE DISTRIBUTION

Test method: BS1377: Part 2: 1990: Clause 9.2

Norwest Holst

Contract no.	F11984	Hole ID	BH101
Project	CASTLETON WwTW.	Sample no.	1
Soil description	Orange brown slightly silty SAND.	Depth	9.00 m
		Sample type	B
		Page	1 of 1



PARTICLE SIZE	%
Silt and clay:	5
Sand:	94
Gravel:	1
Cobbles:	0

Specimen location within original sample: N/A

Remarks:

SIEVE DATA			
Sieve size mm	Cumulative % passing	Sieve size mm	Cumulative % passing
75.0	100	5.0	100
63.0	100	3.35	99
50.0	100	2.00	99
37.5	100	1.18	99
28.0	100	0.600	98
20.0	100	0.425	97
14.0	100	0.300	93
10.0	100	0.212	52
6.3	100	0.150	31
		0.063	5

SEDIMENTATION DATA	
Equivalent particle diameter mm	Cumulative % passing

Norwest Holst Soil Engineering Limited

Parkside Lane, Dewsbury Road, Leeds LS11 5SX

Tel. 0113 2711111 Fax. 0113 2760472 E-mail soils@norwest.co.uk

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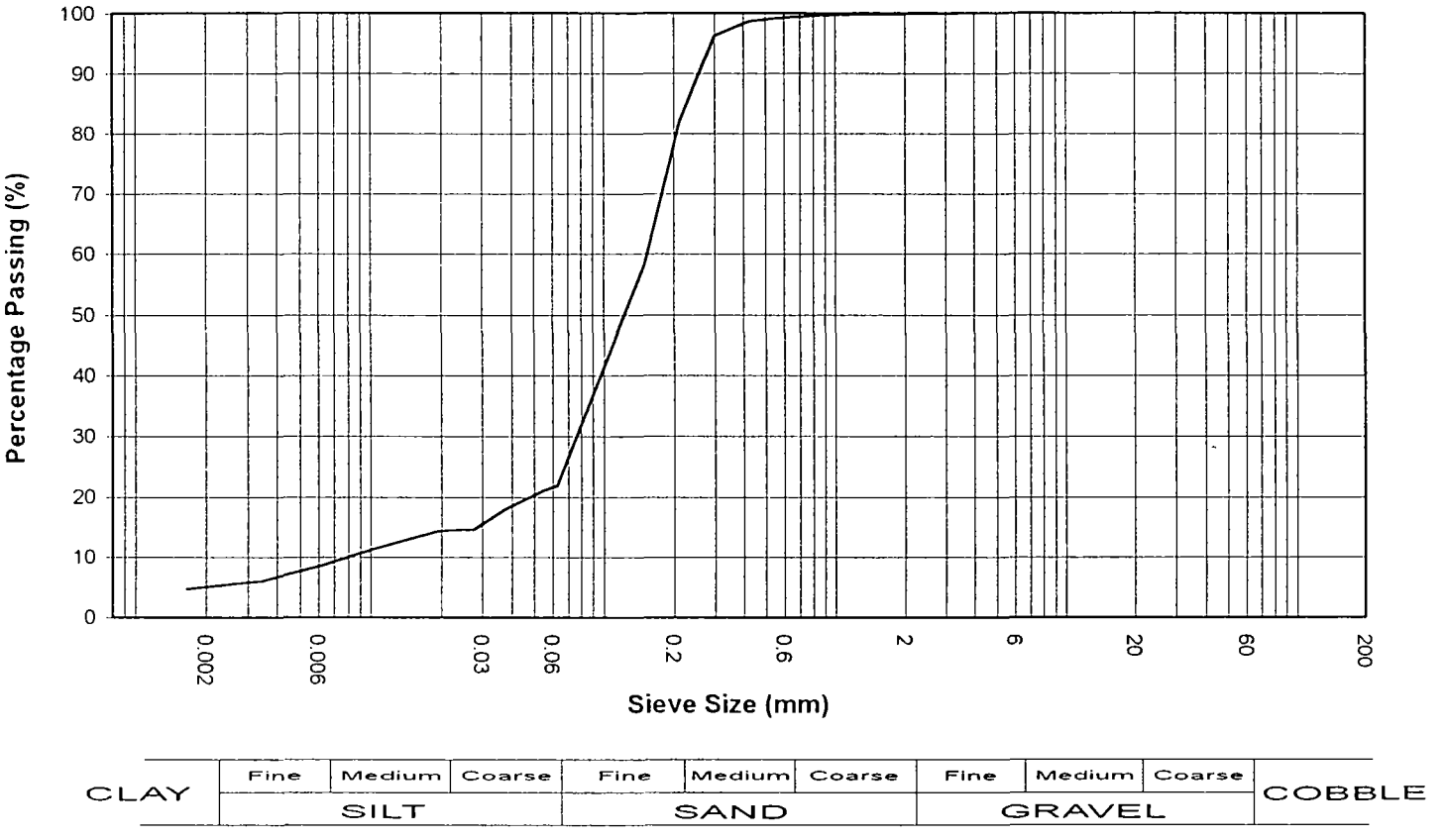
PARTICLE SIZE DISTRIBUTION

Test method: BS1377: Part 2: 1990: Clause 9.2, 9.5

Norwest Holst

Contract no.	F11984	Hole ID	BH101
Project	CASTLETON WwTW.	Sample no.	1
Soil description	Brown silty SAND.	Depth	11.50 m
		Sample type	B
		Page	1 of 1



PARTICLE SIZE	%
Clay:	5
Silt:	17
Sand:	78
Gravel:	0
Cobbles:	0

Specimen location within original sample: N/A

Remarks:

Particle density: 2.65 Mg/m³ Assumed

SIEVE DATA			
Sieve size mm	Cumulative % passing	Sieve size mm	Cumulative % passing
75.0	100	5.0	100
63.0	100	3.35	100
50.0	100	2.00	100
37.5	100	1.18	100
28.0	100	0.600	99
20.0	100	0.425	99
14.0	100	0.300	96
10.0	100	0.212	82
6.3	100	0.150	58
		0.063	22

SEDIMENTATION DATA	
Equivalent particle diameter mm	Cumulative % passing
0.0543	21
0.0387	18
0.0277	15
0.0196	14
0.0102	11
0.0062	9
0.0035	6
0.0017	5

Norwest Holst Soil Engineering Limited

Parkside Lane, Dewsbury Road, Leeds LS11 5SX

Tel. 0113 2711111 Fax. 0113 2760472 E-mail soils@norwest.co.uk

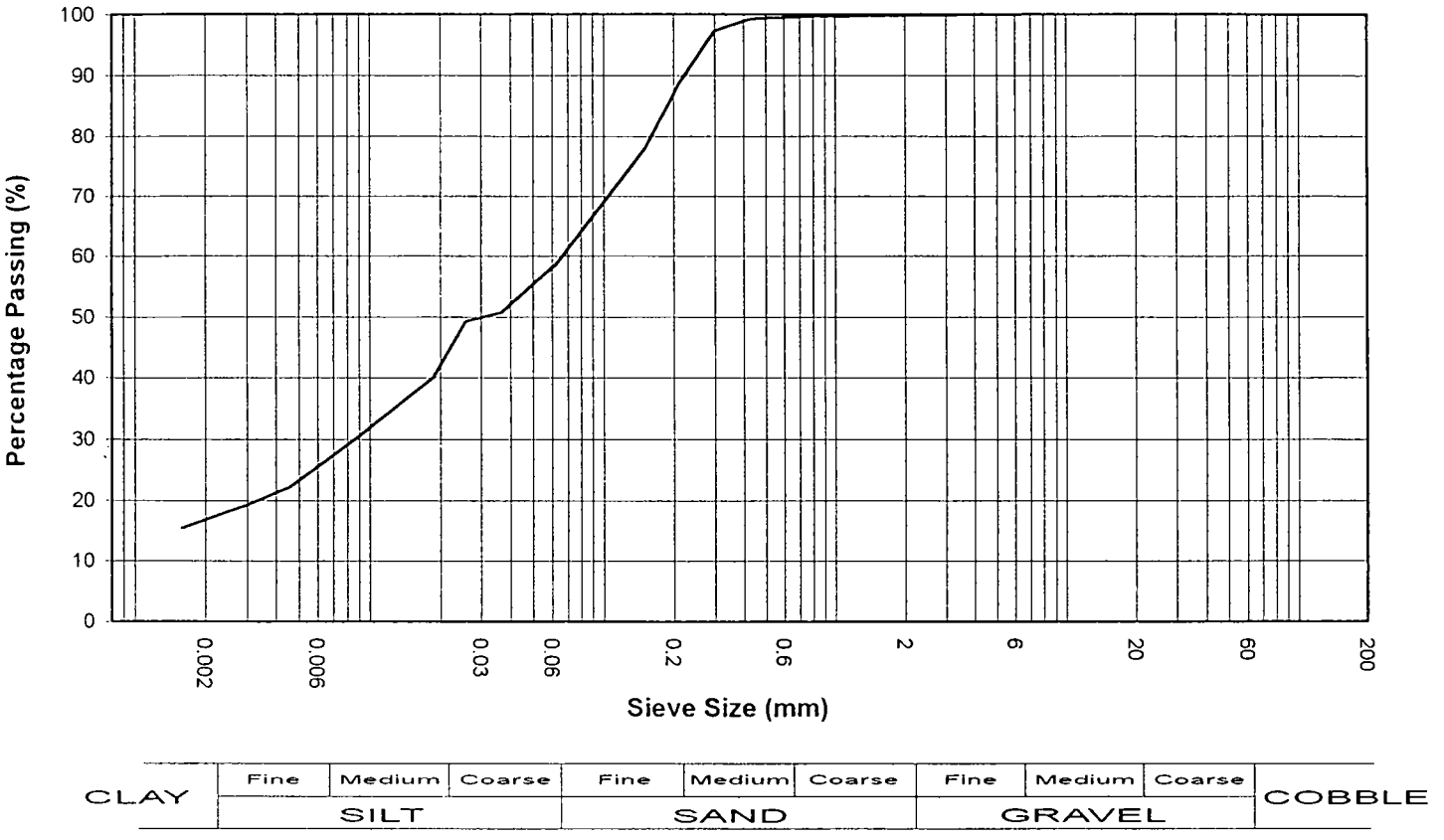
Approved:

PARTICLE SIZE DISTRIBUTION

Norwest Holst

Test method: BS1377: Part 2: 1990: Clause 9.2, 9.5

Contract no.	F11984	Hole ID	BH101
Project	CASTLETON WwTW.	Sample no.	1
Soil description	Brown sandy CLAY.	Depth	13.50 m
		Sample type	B
		Page	1 of 1



PARTICLE SIZE	%
Clay:	17
Silt:	41
Sand:	42
Gravel:	0
Cobbles:	0

Specimen location within original sample: N/A

Remarks:

Particle density: 2.65 Mg/m³ Assumed

SIEVE DATA			
Sieve size mm	Cumulative % passing	Sieve size mm	Cumulative % passing
75.0	100	5.0	100
63.0	100	3.35	100
50.0	100	2.00	100
37.5	100	1.18	100
28.0	100	0.600	100
20.0	100	0.425	99
14.0	100	0.300	97
10.0	100	0.212	89
6.3	100	0.150	78
		0.063	59

SEDIMENTATION DATA	
Equivalent particle diameter mm	Cumulative % passing
0.0509	56
0.0365	51
0.0259	49
0.0187	40
0.0086	30
0.0046	22
0.0030	19
0.0016	15

Norwest Holst Soil Engineering Limited

Parkside Lane, Dewsbury Road, Leeds LS11 5SX

Tel. 0113 2711111 Fax. 0113 2760472 E-mail soils@norwest.co.uk

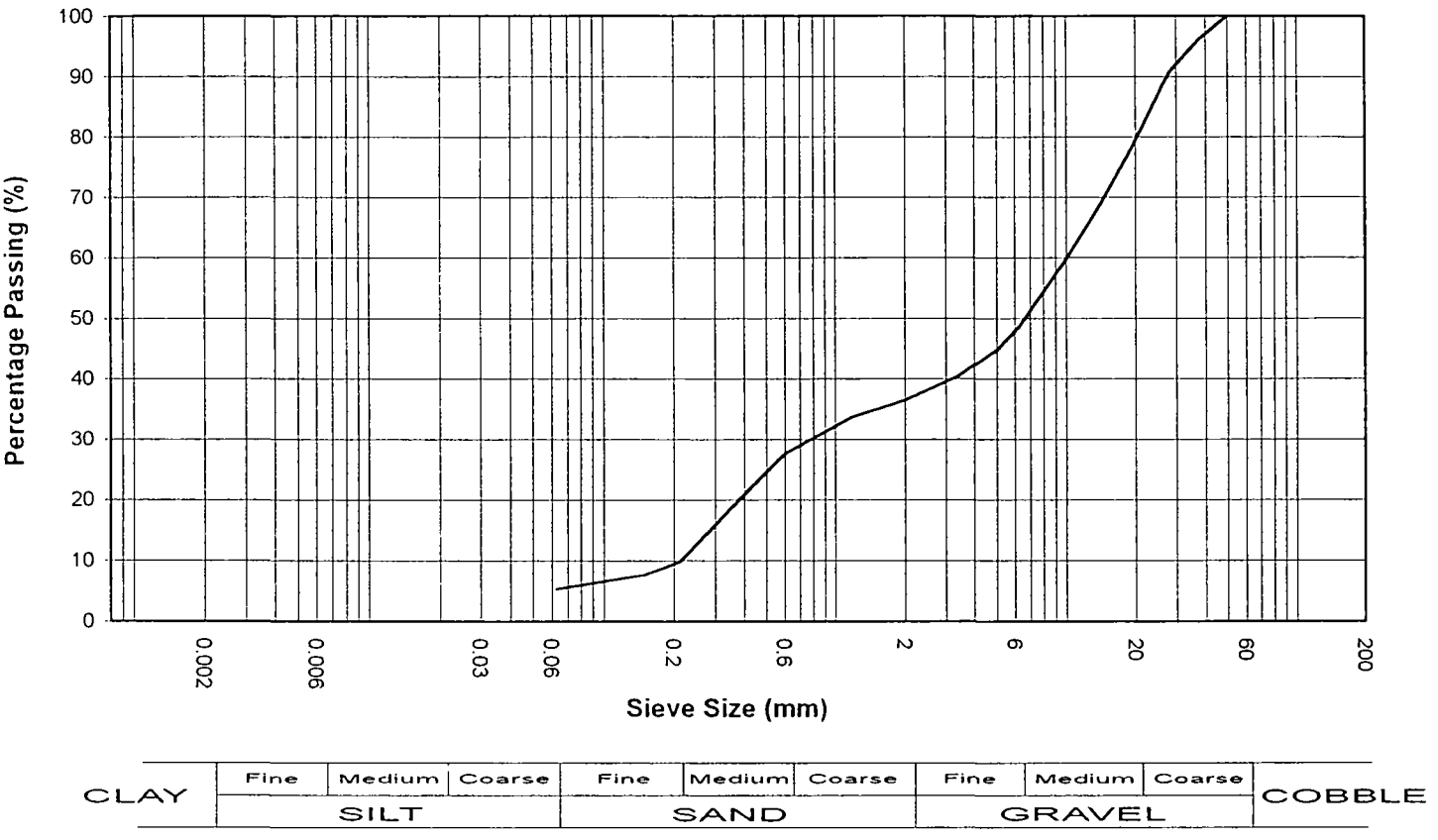
Approved:

PARTICLE SIZE DISTRIBUTION

Test method: BS1377: Part 2: 1990: Clause 9.2

Norwest Holst

Contract no.	F11984	Hole ID	BH101
Project	CASTLETON WwTW.	Sample no.	1
Soil description	Brown sandy GRAVEL.	Depth	16.50 m
		Sample type	B
		Page	1 of 1



PARTICLE SIZE	%
Silt and clay:	5
Sand:	31
Gravel:	63
Cobbles:	0

Specimen location within original sample: N/A

Remarks:

SIEVE DATA			
Sieve size mm	Cumulative % passing	Sieve size mm	Cumulative % passing
75.0	100	5.0	45
63.0	100	3.35	40
50.0	100	2.00	37
37.5	96	1.18	34
28.0	91	0.600	28
20.0	79	0.425	22
14.0	69	0.300	16
10.0	60	0.212	10
6.3	49	0.150	8
		0.063	5

SEDIMENTATION DATA	
Equivalent particle diameter mm	Cumulative % passing

Norwest Holst Soil Engineering Limited

Parkside Lane, Dewsbury Road, Leeds LS11 5SX

Tel. 0113 2711111 Fax. 0113 2760472 E-mail soils@norwest.co.uk

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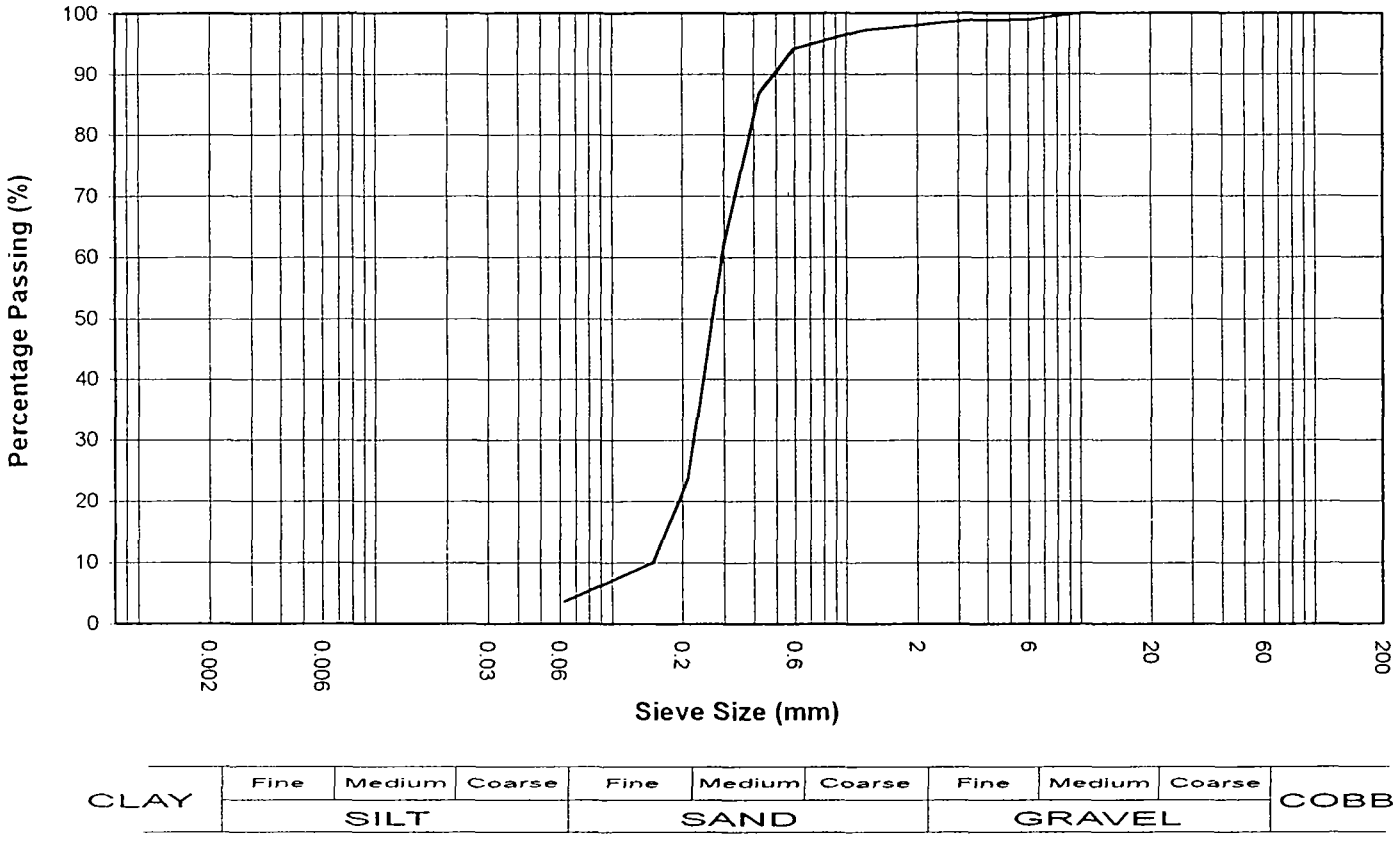
Test method: BS1377: Part 2: 1990: Clause 9.2

Norwest Holst

Contract no.	F11984	Hole ID	BH102
Project	CASTLETON WwTW.	Sample no.	1
Soil description	Brown gravelly SAND.	Depth	1.20 m
		Sample type	B
		Page	1 of 1



PARTICLE SIZE	%
Silt and clay:	4
Sand:	94
Gravel:	2
Cobbles:	0

Specimen location within original sample: N/A

Remarks:

SIEVE DATA

Sieve size mm	Cumulative % passing	Sieve size mm	Cumulative % passing
75.0	100	5.0	99
63.0	100	3.35	99
50.0	100	2.00	98
37.5	100	1.18	97
28.0	100	0.600	94
20.0	100	0.425	87
14.0	100	0.300	62
10.0	100	0.212	24
6.3	99	0.150	10
		0.063	4

SEDIMENTATION DATA

Equivalent particle diameter mm	Cumulative % passing

Norwest Holst Soil Engineering Limited

Parkside Lane, Dewsbury Road, Leeds LS11 5SX

Tel. 0113 2711111 Fax. 0113 2760472 E-mail soils@norwest.co.uk

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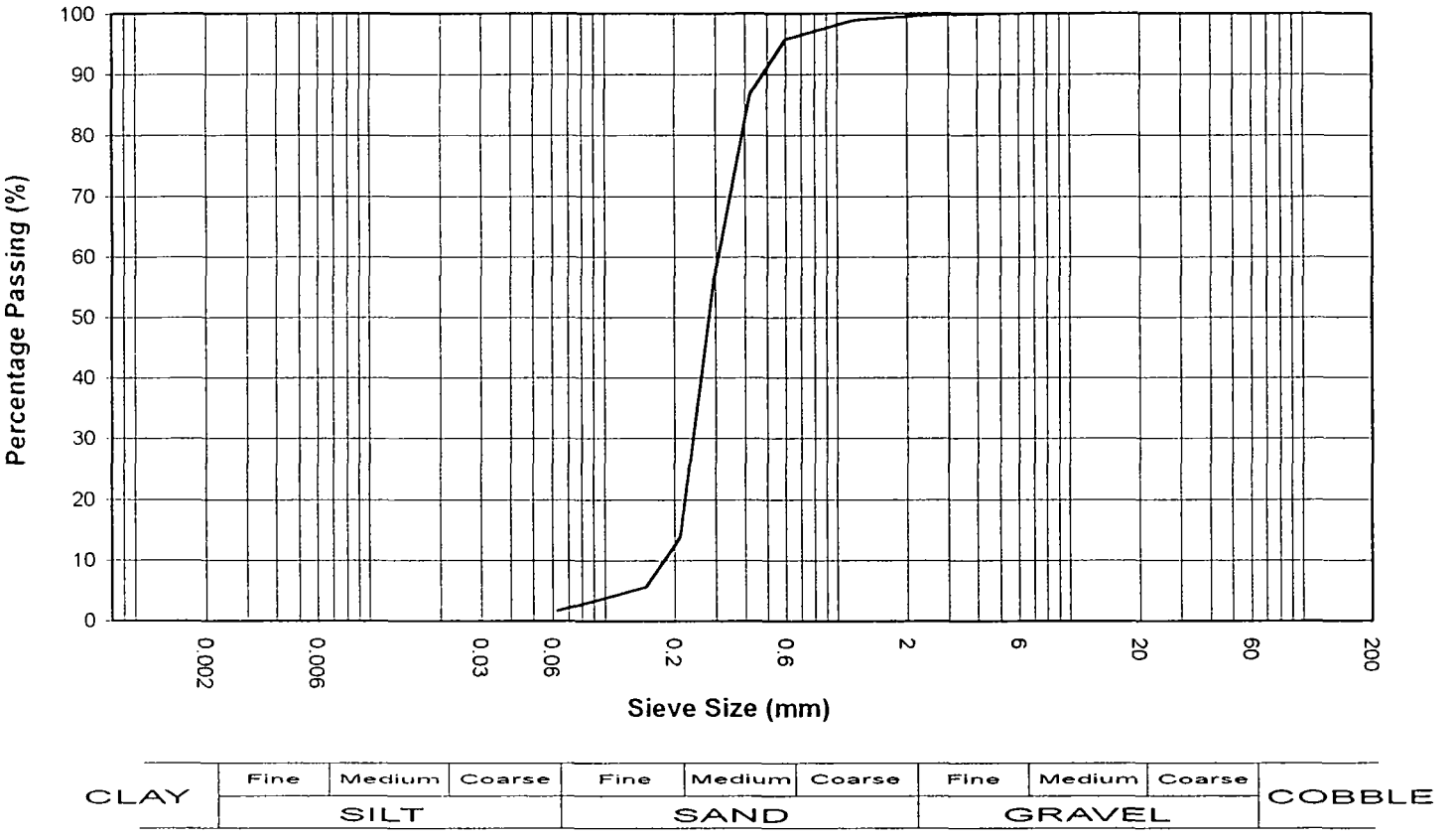
PARTICLE SIZE DISTRIBUTION

Test method: BS1377: Part 2: 1990: Clause 9.2

Norwest Holst

Contract no.	F11984	Hole ID	BH102
Project	CASTLETON WwTW.	Sample no.	1
Soil description	Brown SAND.	Depth	3.00 m
		Sample type	B
		Page	1 of 1



PARTICLE SIZE	%
Silt and clay:	2
Sand:	98
Gravel:	1
Cobbles:	0

Specimen location within original sample: N/A

Remarks:

SIEVE DATA

Sieve size mm	Cumulative % passing	Sieve size mm	Cumulative % passing
75.0	100	5.0	100
63.0	100	3.35	100
50.0	100	2.00	99
37.5	100	1.18	99
28.0	100	0.600	96
20.0	100	0.425	87
14.0	100	0.300	58
10.0	100	0.212	14
6.3	100	0.150	6
		0.063	2

SEDIMENTATION DATA

Equivalent particle diameter mm	Cumulative % passing

Norwest Holst Soil Engineering Limited

Parkside Lane, Dewsbury Road, Leeds LS11 5SX

Tel. 0113 2711111 Fax. 0113 2760472 E-mail soils@norwest.co.uk

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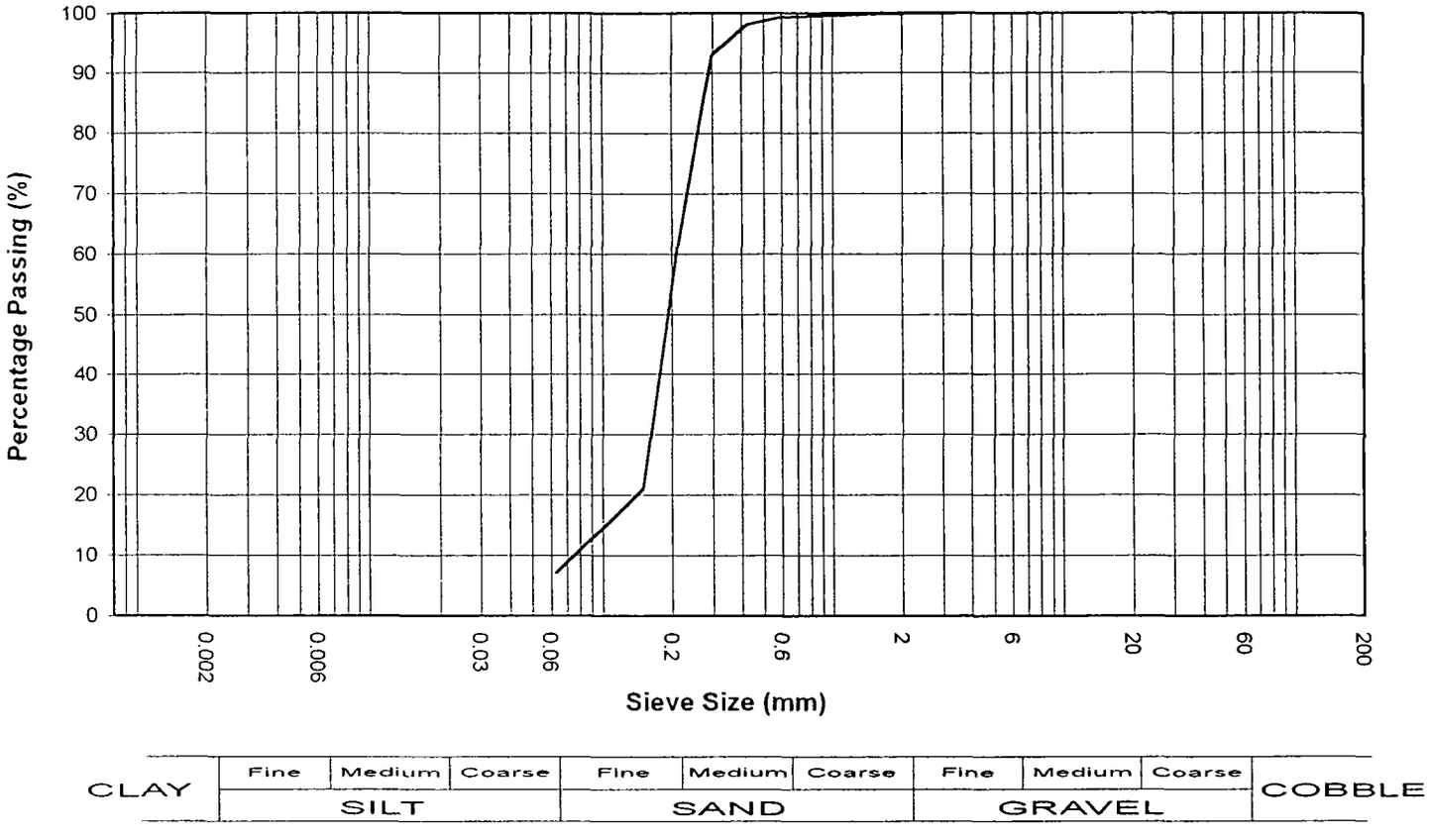
PARTICLE SIZE DISTRIBUTION

Test method: BS1377: Part 2: 1990: Clause 9.2

Norwest Holst

Contract no.	F11984	Hole ID	BH102
Project	CASTLETON WwTW.	Sample no.	1
Soil description	Brown silty SAND.	Depth	5.00 m
		Sample type	B
		Page	1 of 1



PARTICLE SIZE	%
Silt and clay:	7
Sand:	93
Gravel:	0
Cobbles:	0

Specimen location within original sample: N/A

Remarks:

SIEVE DATA			
Sieve size mm	Cumulative % passing	Sieve size mm	Cumulative % passing
75.0	100	5.0	100
63.0	100	3.35	100
50.0	100	2.00	100
37.5	100	1.18	100
28.0	100	0.600	99
20.0	100	0.425	98
14.0	100	0.300	93
10.0	100	0.212	61
6.3	100	0.150	21
		0.063	7

SEDIMENTATION DATA	
Equivalent particle diameter mm	Cumulative % passing

Norwest Holst Soil Engineering Limited

Parkside Lane, Dewsbury Road, Leeds LS11 5SX

Tel. 0113 2711111 Fax. 0113 2760472 E-mail soils@norwest.co.uk

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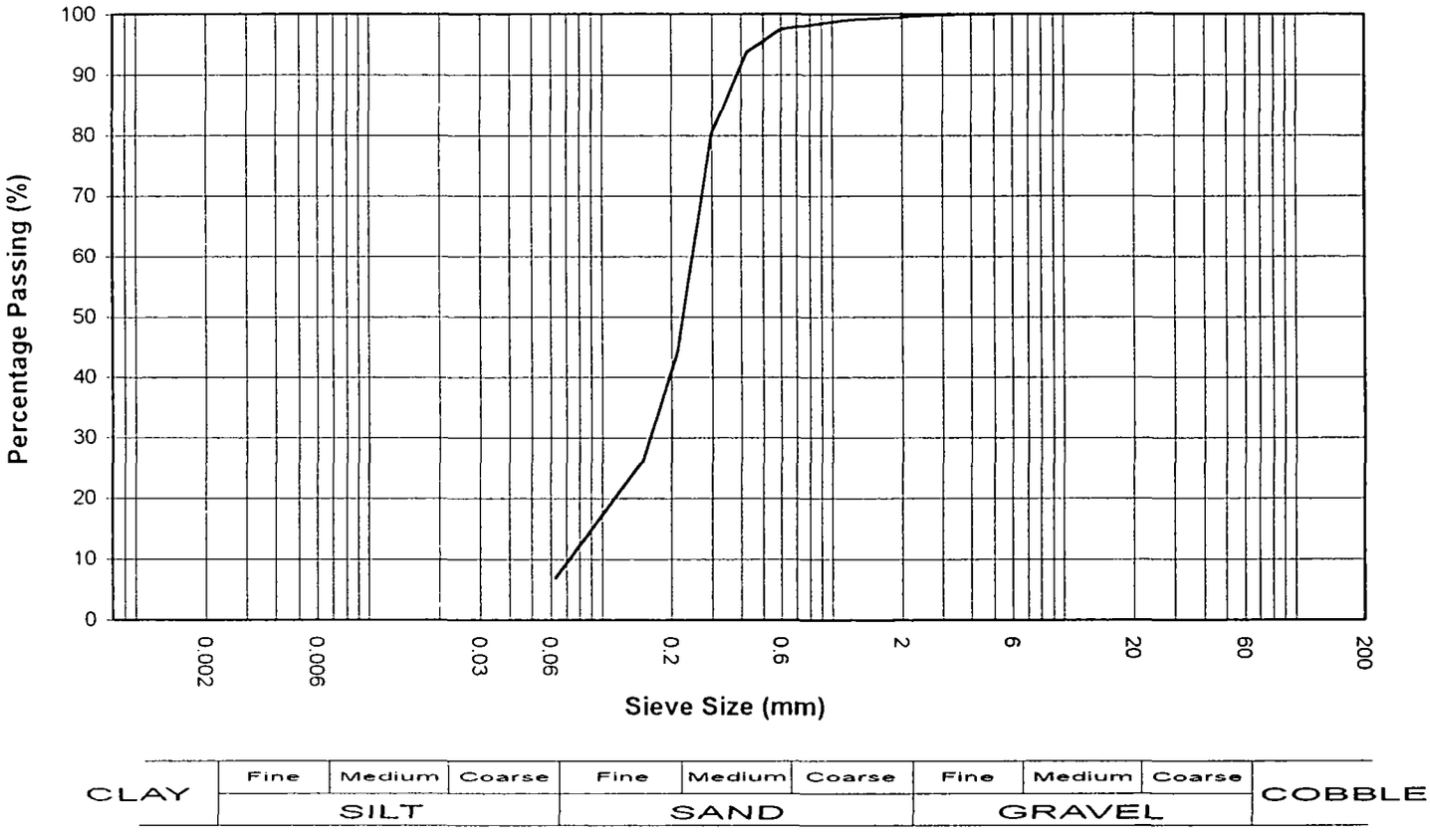
Test method: BS1377: Part 2: 1990: Clause 9.2

Norwest Holst

Contract no.	F11984	Hole ID	BH102
Project	CASTLETON WwTW.	Sample no.	1
Soil description	Brown silty SAND.	Depth	7.00 m
		Sample type	B
		Page	1 of 1



PARTICLE SIZE	%
Silt and clay:	7
Sand:	93
Gravel:	1
Cobbles:	0

Specimen location within original sample: N/A

Remarks:

SIEVE DATA

Sieve size mm	Cumulative % passing	Sieve size mm	Cumulative % passing
75.0	100	5.0	100
63.0	100	3.35	100
50.0	100	2.00	99
37.5	100	1.18	99
28.0	100	0.600	98
20.0	100	0.425	94
14.0	100	0.300	80
10.0	100	0.212	44
6.3	100	0.150	26
		0.063	7

SEDIMENTATION DATA

Equivalent particle diameter mm	Cumulative % passing

Norwest Holst Soil Engineering Limited

Parkside Lane, Dewsbury Road, Leeds LS11 5SX

Tel. 0113 2711111 Fax. 0113 2760472 E-mail soils@norwest.co.uk

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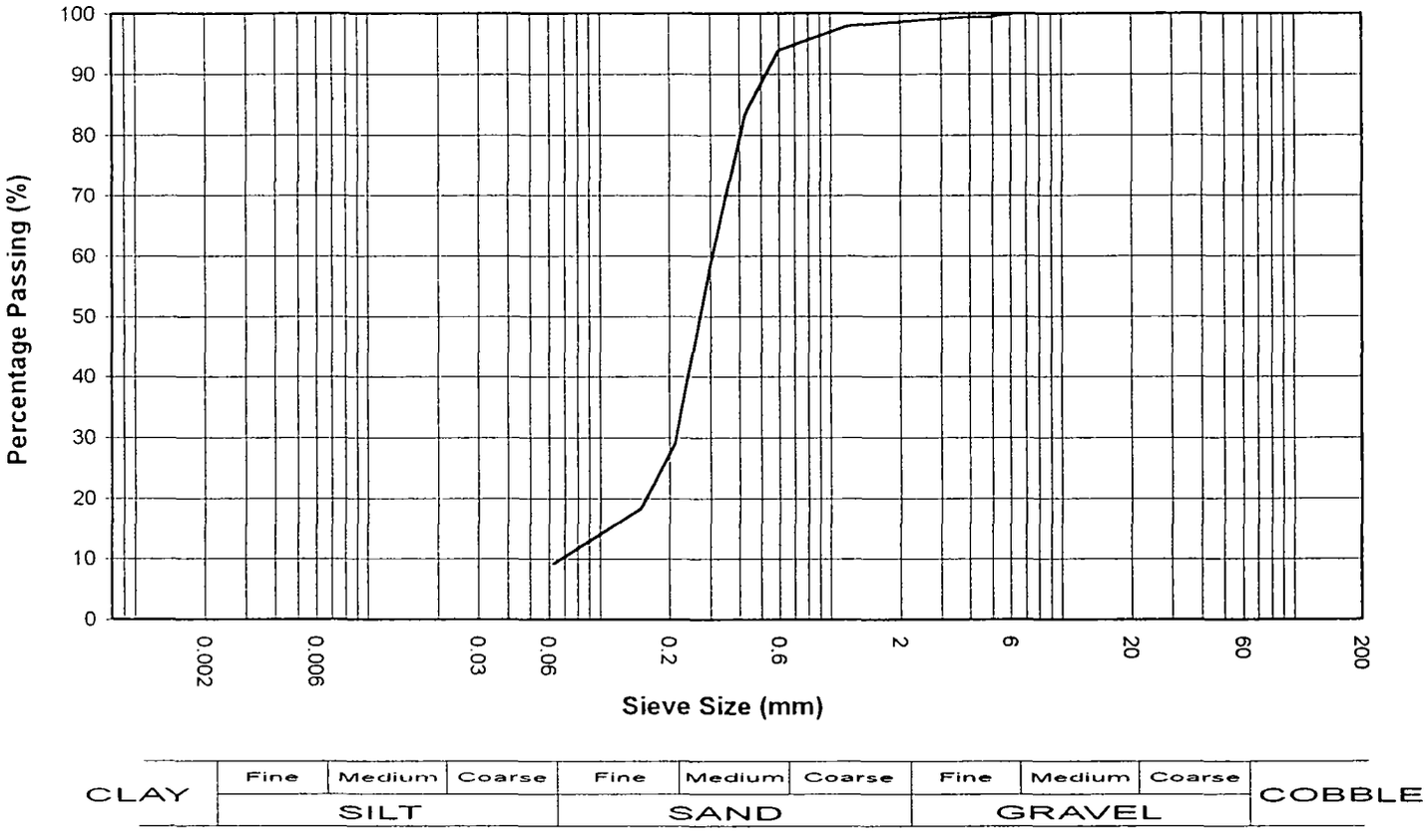
Norwest Holst

Contract no.	F11984	Hole ID	BH102
Project	CASTLETON WwTW.	Sample no.	1
Soil description	Brown SAND.	Depth	9.00 m
		Sample type	B
		Page	1 of 1



PARTICLE SIZE	%
Silt and clay:	9
Sand:	89
Gravel:	1
Cobbles:	0

Specimen location within original sample: N/A

Remarks:

SIEVE DATA

Sieve size mm	Cumulative % passing	Sieve size mm	Cumulative % passing
75.0	100	5.0	99
63.0	100	3.35	99
50.0	100	2.00	99
37.5	100	1.18	98
28.0	100	0.600	94
20.0	100	0.425	83
14.0	100	0.300	58
10.0	100	0.212	29
6.3	100	0.150	18
		0.063	9

SEDIMENTATION DATA

Equivalent particle diameter mm	Cumulative % passing

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Parkside Lane, Dewsbury Road, Leeds LS11 5SX

Tel. 0113 2711111 Fax. 0113 2760472 E-mail soils@norwest.co.uk

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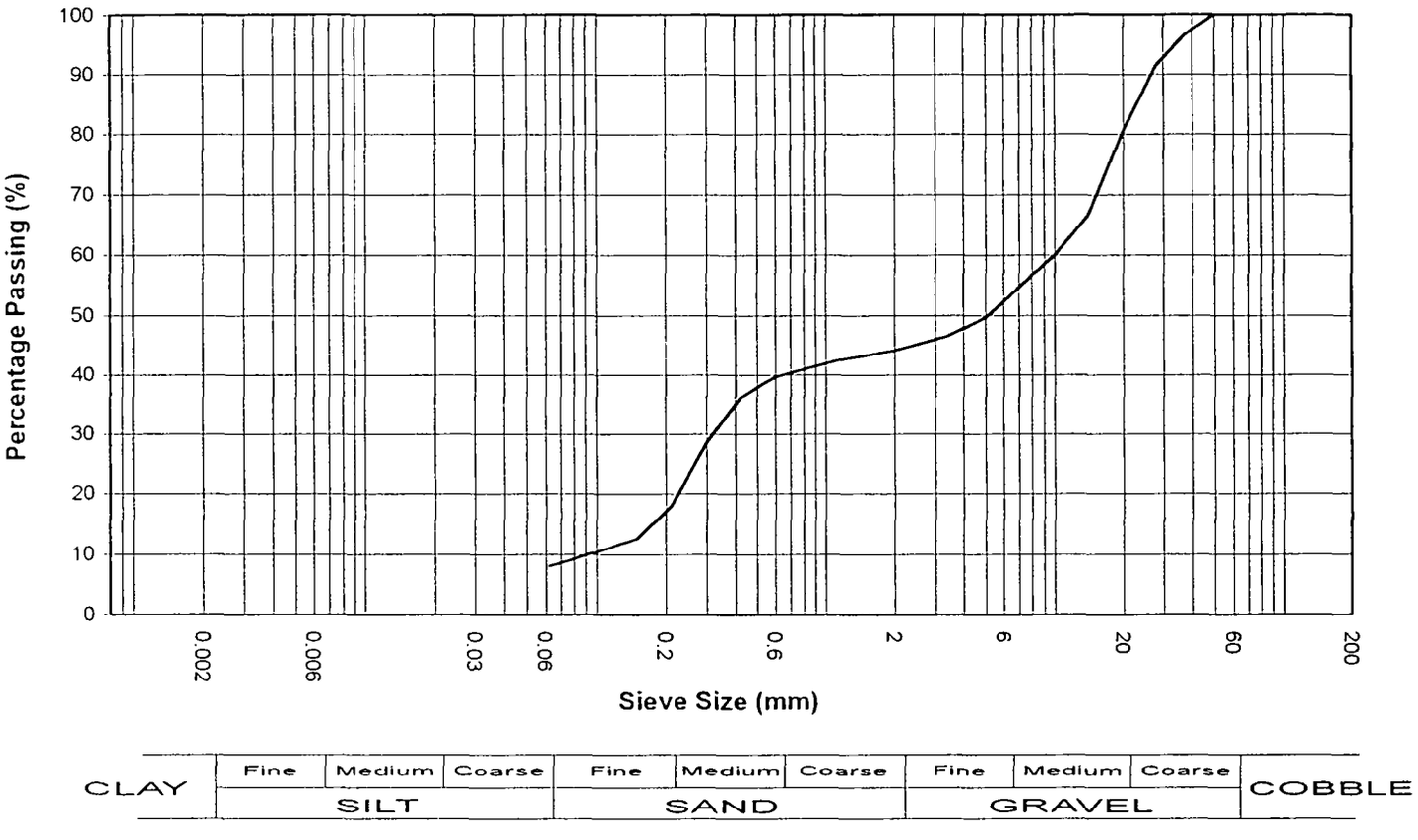
Test method: BS1377: Part 2: 1990: Clause 9.2

Norwest Holst

Contract no.	F11984	Hole ID	BH102
Project	CASTLETON WwTW.	Sample no.	1
Soil description	Brown very sandy GRAVEL.	Depth	14.50 m
		Sample type	B
		Page	1 of 1



PARTICLE SIZE	%
Silt and clay:	8
Sand:	36
Gravel:	56
Cobbles:	0

Specimen location within original sample: N/A

Remarks:

SIEVE DATA				SEDIMENTATION DATA	
Sieve size mm	Cumulative % passing	Sieve size mm	Cumulative % passing	Equivalent particle diameter mm	Cumulative % passing
75.0	100	5.0	50		
63.0	100	3.35	46		
50.0	100	2.00	44		
37.5	97	1.18	43		
28.0	91	0.600	40		
20.0	81	0.425	36		
14.0	67	0.300	29		
10.0	60	0.212	18		
6.3	53	0.150	13		
		0.063	8		

Norwest Holst Soil Engineering Limited

Parkside Lane, Dewsbury Road, Leeds LS11 5SX

Tel. 0113 2711111 Fax. 0113 2760472 E-mail soils@norwest.co.uk

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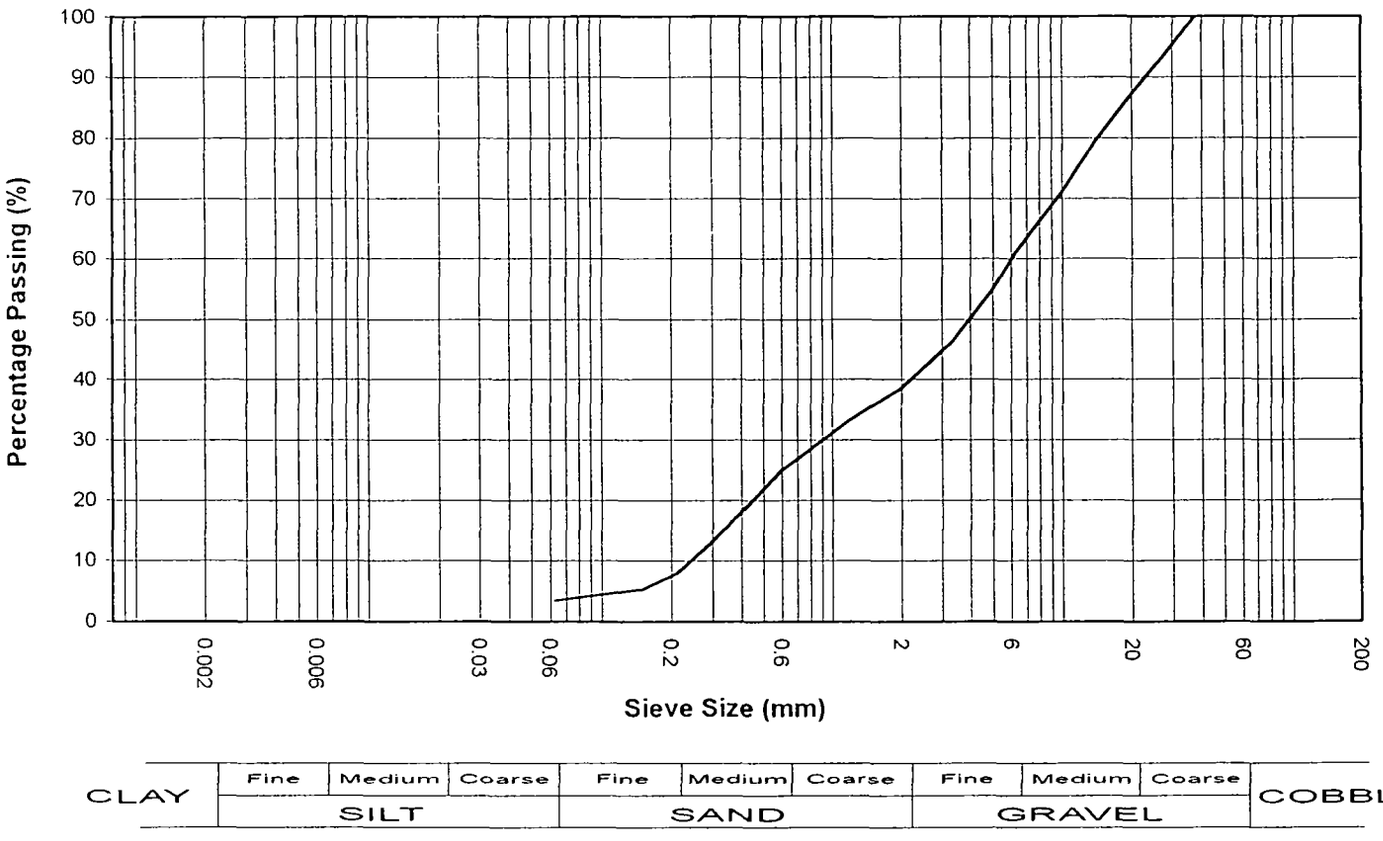
Norwest Holst

Contract no.	F11984	Hole ID	BH102
Project	CASTLETON WwTW.	Sample no.	1
Soil description	Brown very sandy GRAVEL.	Depth	16.50 m
		Sample type	B
		Page	1 of 1



PARTICLE SIZE	%
Silt and clay:	3
Sand:	35
Gravel:	61
Cobbles:	0

Specimen location within original sample: N/A

Remarks:

SIEVE DATA			
Sieve size mm	Cumulative % passing	Sieve size mm	Cumulative % passing
75.0	100	5.0	55
63.0	100	3.35	46
50.0	100	2.00	39
37.5	100	1.18	33
28.0	94	0.600	25
20.0	87	0.425	19
14.0	80	0.300	13
10.0	71	0.212	8
6.3	61	0.150	5
		0.063	3

SEDIMENTATION DATA	
Equivalent particle diameter mm	Cumulative % passing

Norwest Holst Soil Engineering Limited

Parkside Lane, Dewsbury Road, Leeds LS11 5SX

Tel. 0113 2711111 Fax. 0113 2760472 E-mail soils@norwest.co.uk

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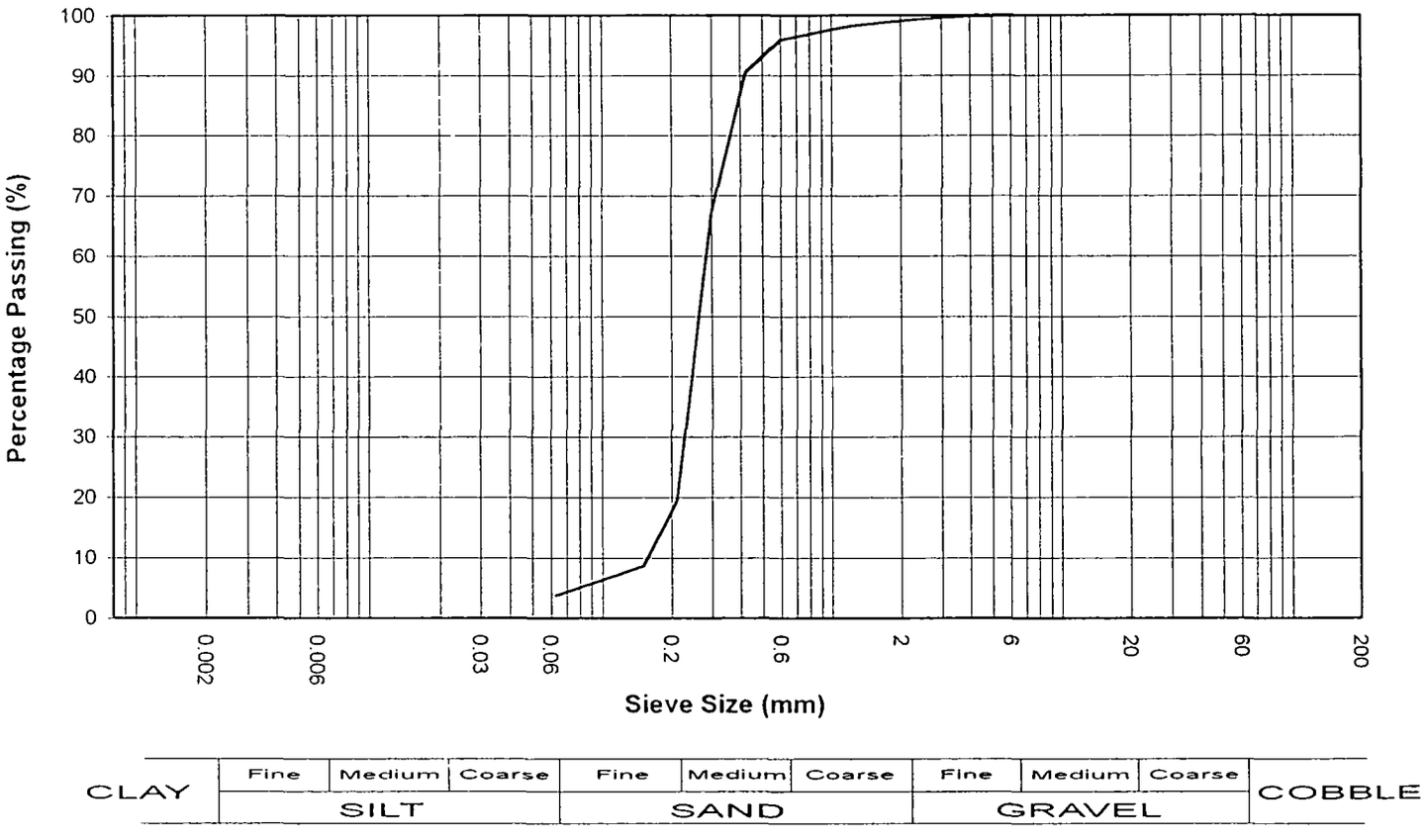
PARTICLE SIZE DISTRIBUTION

Test method: BS1377: Part 2: 1990: Clause 9.2

Norwest Holst

Contract no.	F11984	Hole ID	BH103
Project	CASTLETON WwTW.	Sample no.	1
Soil description	Brown slightly silty SAND.	Depth	1.20 m
		Sample type	B
		Page	1 of 1



PARTICLE SIZE	%
Silt and clay:	4
Sand:	95
Gravel:	1
Cobbles:	0

Specimen location within original sample: N/A

Remarks:

SIEVE DATA			
Sieve size mm	Cumulative % passing	Sieve size mm	Cumulative % passing
75.0	100	5.0	100
63.0	100	3.35	100
50.0	100	2.00	99
37.5	100	1.18	98
28.0	100	0.600	96
20.0	100	0.425	91
14.0	100	0.300	67
10.0	100	0.212	19
6.3	100	0.150	9
		0.063	4

SEDIMENTATION DATA	
Equivalent particle diameter mm	Cumulative % passing

Norwest Holst Soil Engineering Limited

Parkside Lane, Dewsbury Road, Leeds LS11 5SX

Tel. 0113 2711111 Fax. 0113 2760472 E-mail soils@norwest.co.uk

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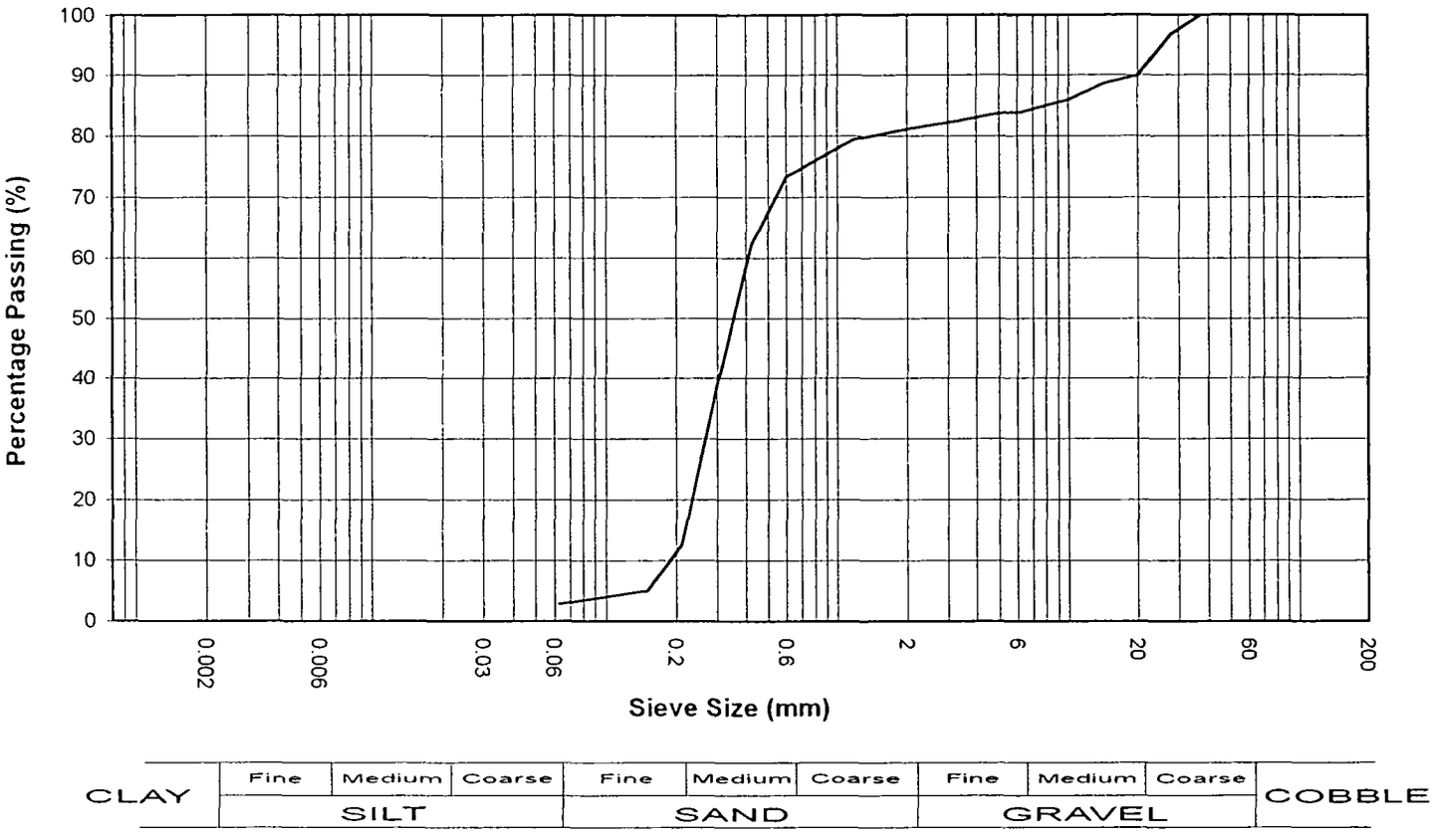
PARTICLE SIZE DISTRIBUTION

Test method: BS1377: Part 2: 1990: Clause 9.2

Norwest Holst

Contract no.	F11984	Hole ID	BH103
Project	CASTLETON WwTW.	Sample no.	1
Soil description	Brown gravelly SAND.	Depth	2.00 m
		Sample type	B
		Page	1 of 1



PARTICLE SIZE	%
Silt and clay:	3
Sand:	78
Gravel:	19
Cobbles:	0

Specimen location within original sample: N/A

Remarks:

SIEVE DATA			
Sieve size mm	Cumulative % passing	Sieve size mm	Cumulative % passing
75.0	100	5.0	84
63.0	100	3.35	82
50.0	100	2.00	81
37.5	100	1.18	79
28.0	97	0.600	73
20.0	90	0.425	62
14.0	88	0.300	39
10.0	86	0.212	13
6.3	84	0.150	5
		0.063	3

SEDIMENTATION DATA	
Equivalent particle diameter mm	Cumulative % passing

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Parkside Lane, Dewsbury Road, Leeds LS11 5SX

Tel. 0113 2711111 Fax. 0113 2760472 E-mail soils@norwest.co.uk

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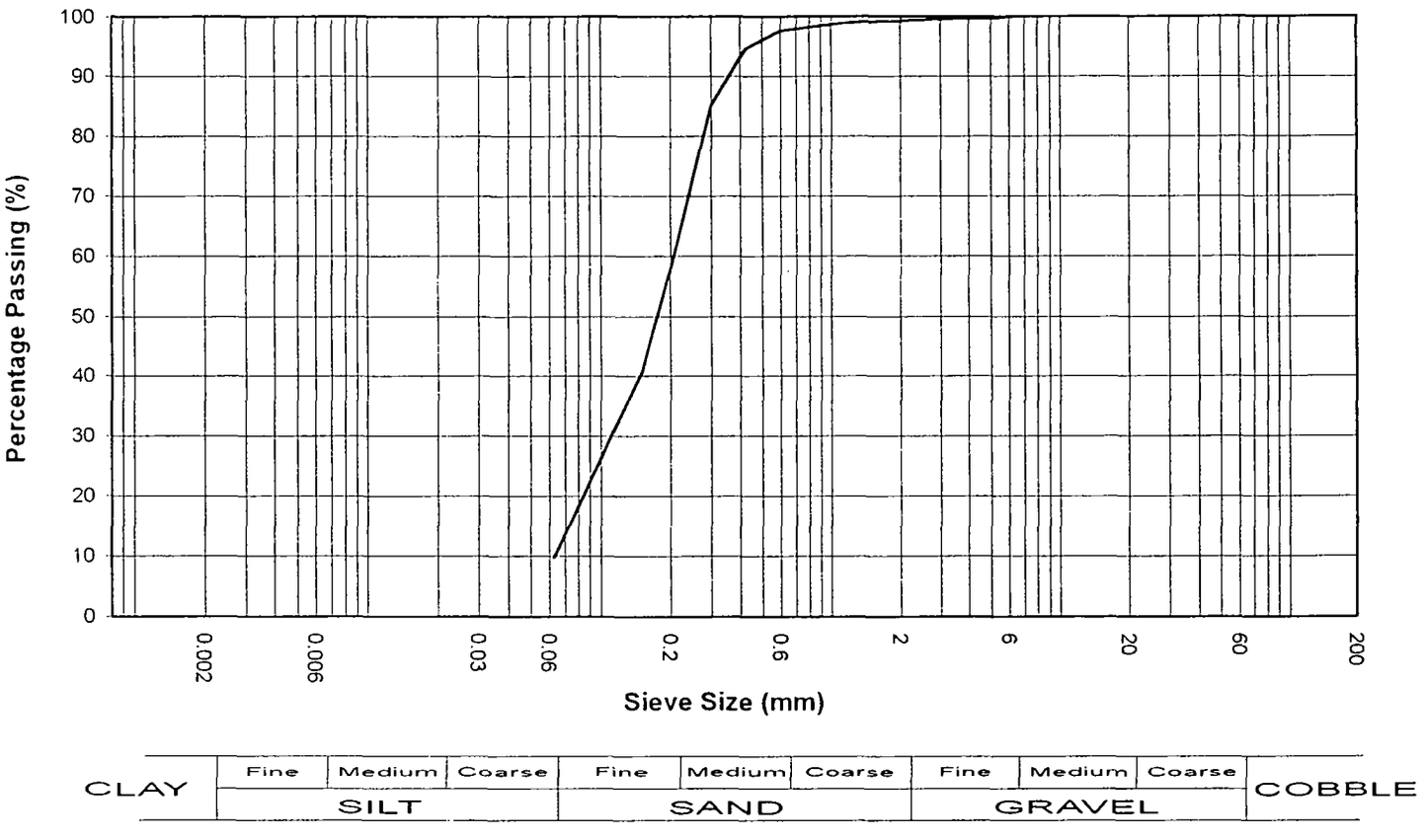
Norwest Holst

Test method: BS1377: Part 2: 1990: Clause 9.2

Contract no.	F11984	Hole ID	BH103
Project	CASTLETON WwTW.	Sample no.	1
Soil description	Brown silty SAND.	Depth	4.00 m
		Sample type	B
		Page	1 of 1



PARTICLE SIZE	%
Silt and clay:	10
Sand:	90
Gravel:	1
Cobbles:	0

Specimen location within original sample: N/A

Remarks:

SIEVE DATA

Sieve size mm	Cumulative % passing	Sieve size mm	Cumulative % passing
75.0	100	5.0	100
63.0	100	3.35	100
50.0	100	2.00	99
37.5	100	1.18	99
28.0	100	0.600	98
20.0	100	0.425	95
14.0	100	0.300	85
10.0	100	0.212	61
6.3	100	0.150	41
		0.063	10

SEDIMENTATION DATA

Equivalent particle diameter mm	Cumulative % passing

Norwest Holst Soil Engineering Limited

Parkside Lane, Dewsbury Road, Leeds LS11 5SX

Tel. 0113 2711111 Fax. 0113 2760472 E-mail soils@norwest.co.uk

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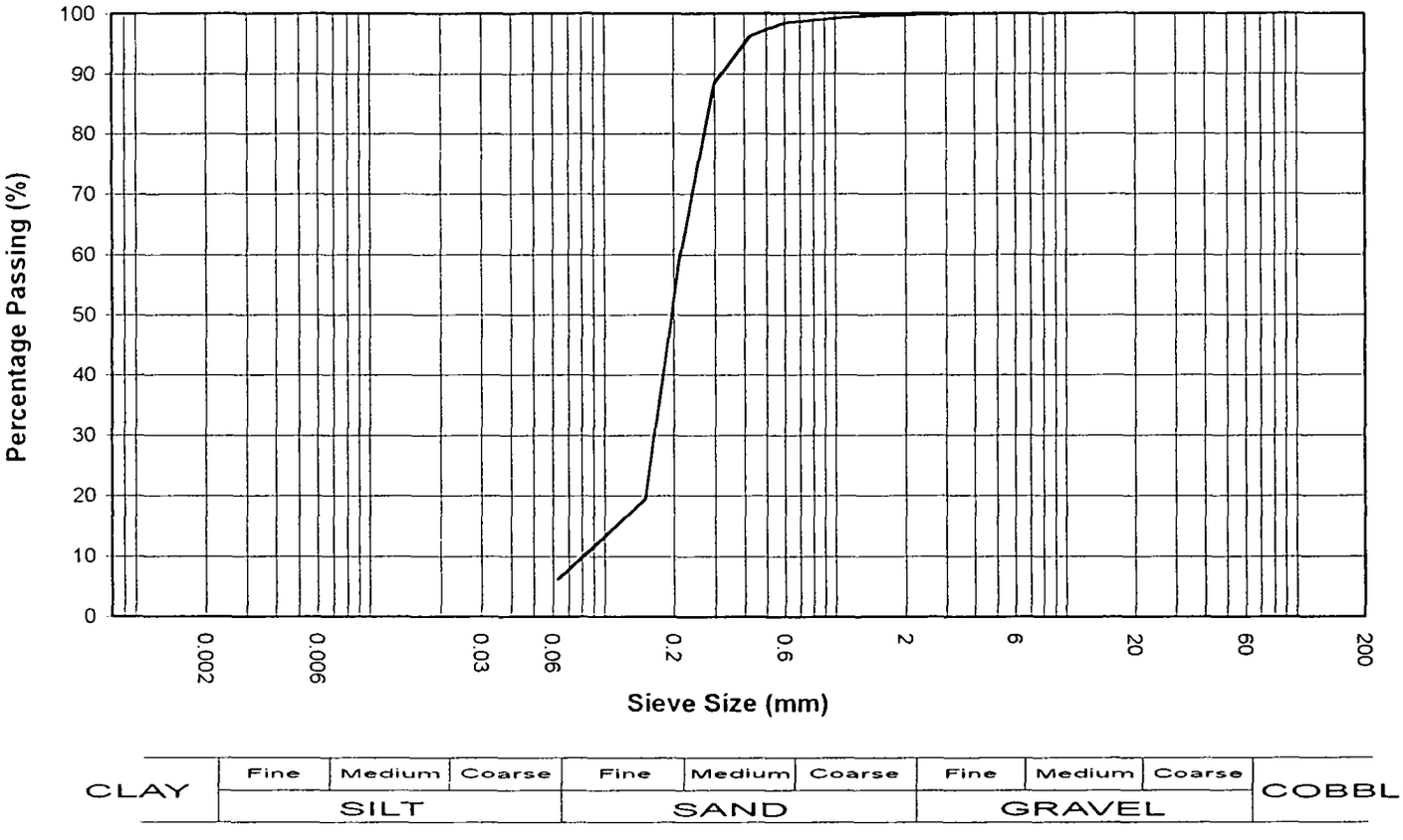
PARTICLE SIZE DISTRIBUTION

Test method: BS1377: Part 2: 1990: Clause 9.2

Norwest Holst

Contract no.	F11984	Hole ID	BH103
Project	CASTLETON WwTW.	Sample no.	1
Soil description	Brown SAND.	Depth	6.00 m
		Sample type	B
		Page	1 of 1



PARTICLE SIZE	%
Silt and clay:	6
Sand:	94
Gravel:	0
Cobbles:	0

Specimen location within original sample: N/A

Remarks:

SIEVE DATA			
Sieve size mm	Cumulative % passing	Sieve size mm	Cumulative % passing
75.0	100	5.0	100
63.0	100	3.35	100
50.0	100	2.00	100
37.5	100	1.18	99
28.0	100	0.600	98
20.0	100	0.425	96
14.0	100	0.300	88
10.0	100	0.212	59
6.3	100	0.150	19
		0.063	6

SEDIMENTATION DATA	
Equivalent particle diameter mm	Cumulative % passing

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Parkside Lane, Dewsbury Road, Leeds LS11 5SX

Tel. 0113 2711111 Fax. 0113 2760472 E-mail soils@norwest.co.uk

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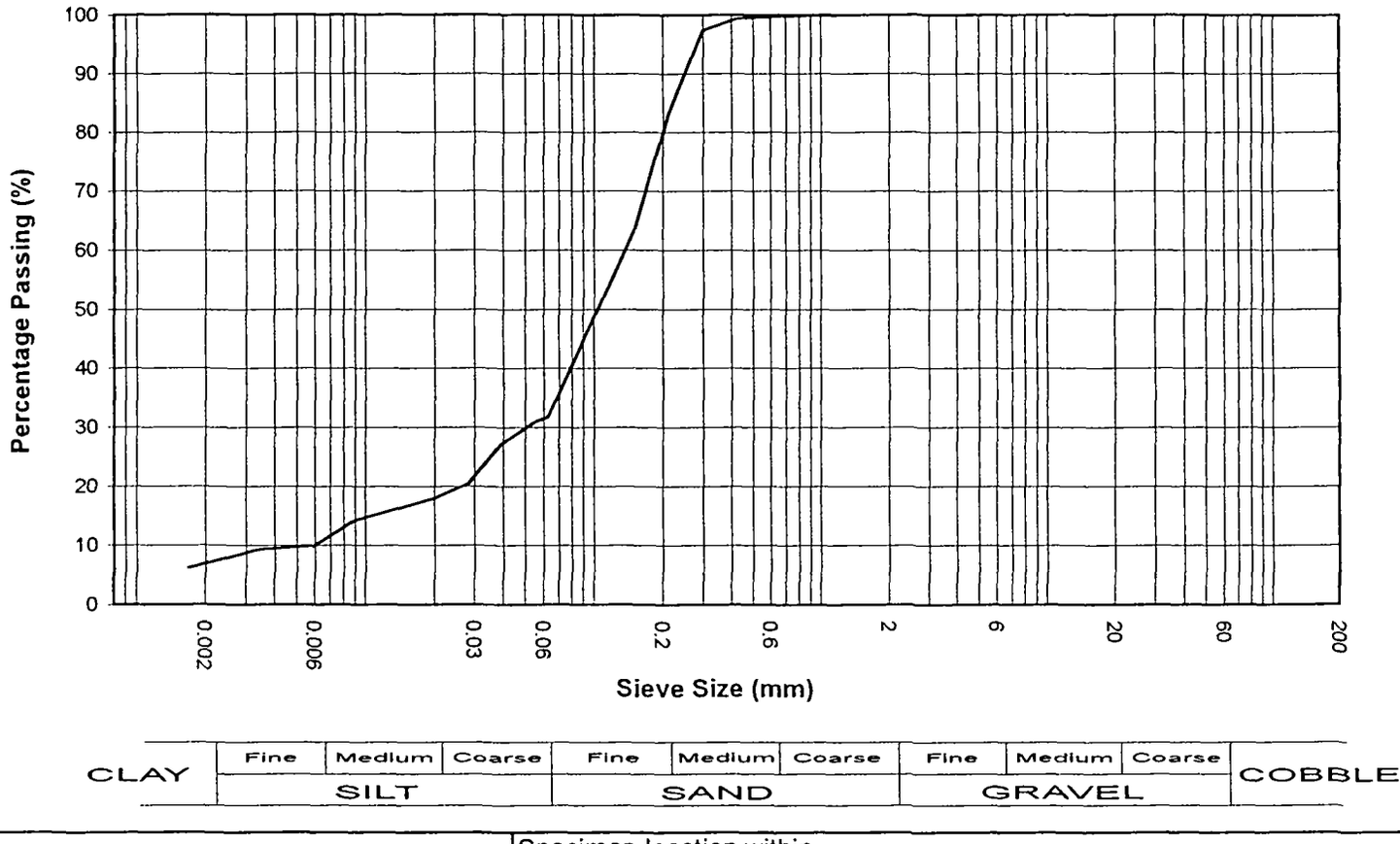
PARTICLE SIZE DISTRIBUTION

Test method: BS1377: Part 2: 1990: Clause 9.2, 9.5

Norwest Holst

Contract no.	F11984	Hole ID	BH102
Project	CASTLETON WwTW.	Sample no.	1
Soil description	Brown slightly clayey silty SAND.	Depth	8.00 m
		Sample type	U
		Page	1 of 1



PARTICLE SIZE	%
Clay:	7
Silt:	25
Sand:	69
Gravel:	0
Cobbles:	0

Specimen location within original sample: N/A

Remarks:

Particle density: 2.65 Mg/m³ Assumed

SIEVE DATA

Sieve size mm	Cumulative % passing	Sieve size mm	Cumulative % passing
75.0	100	5.0	100
63.0	100	3.35	100
50.0	100	2.00	100
37.5	100	1.18	100
28.0	100	0.600	100
20.0	100	0.425	99
14.0	100	0.300	97
10.0	100	0.212	83
6.3	100	0.150	63
		0.063	32

SEDIMENTATION DATA

Equivalent particle diameter mm	Cumulative % passing
0.0550	31
0.0391	27
0.0280	20
0.0199	18
0.0089	14
0.0059	10
0.0034	9
0.0017	6

Norwest Holst Soil Engineering Limited

Parkside Lane, Dewsbury Road, Leeds LS11 5SX

Tel. 0113 2711111 Fax. 0113 2760472 E-mail soils@norwest.co.uk

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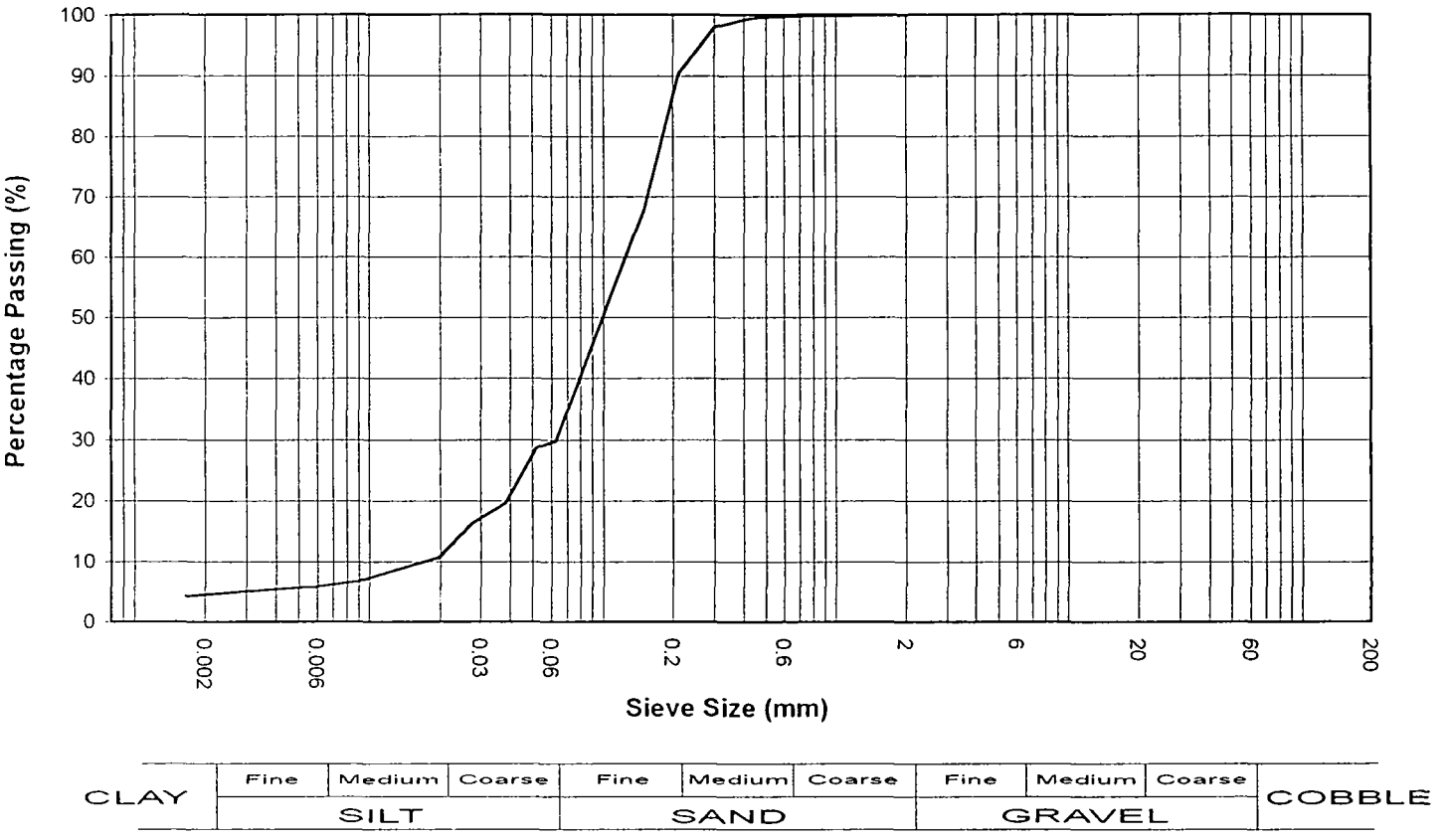
PARTICLE SIZE DISTRIBUTION

Norwest Holst

Test method: BS1377: Part 2: 1990: Clause 9.2, 9.5

Contract no.	F11984	Hole ID	BH103
Project	CASTLETON WwTW.	Sample no.	1
Soil description	Brown clayey SAND.	Depth	8.00 m
		Sample type	B
		Page	1 of 1



PARTICLE SIZE	%
Clay:	4
Silt:	25
Sand:	70
Gravel:	0
Cobbles:	0

Specimen location within original sample: N/A

Remarks:

Particle density: 2.65 Mg/m³ Assumed

SIEVE DATA

Sieve size mm	Cumulative % passing	Sieve size mm	Cumulative % passing
75.0	100	5.0	100
63.0	100	3.35	100
50.0	100	2.00	100
37.5	100	1.18	100
28.0	100	0.600	100
20.0	100	0.425	99
14.0	100	0.300	98
10.0	100	0.212	90
6.3	100	0.150	68
		0.063	30

SEDIMENTATION DATA

Equivalent particle diameter mm	Cumulative % passing
0.0523	29
0.0383	20
0.0274	16
0.0198	11
0.0090	7
0.0059	6
0.0034	5
0.0017	4

Norwest Holst Soil Engineering Limited

Parkside Lane, Dewsbury Road, Leeds LS11 5SX

Tel. 0113 2711111 Fax. 0113 2760472 E-mail soils@norwest.co.uk

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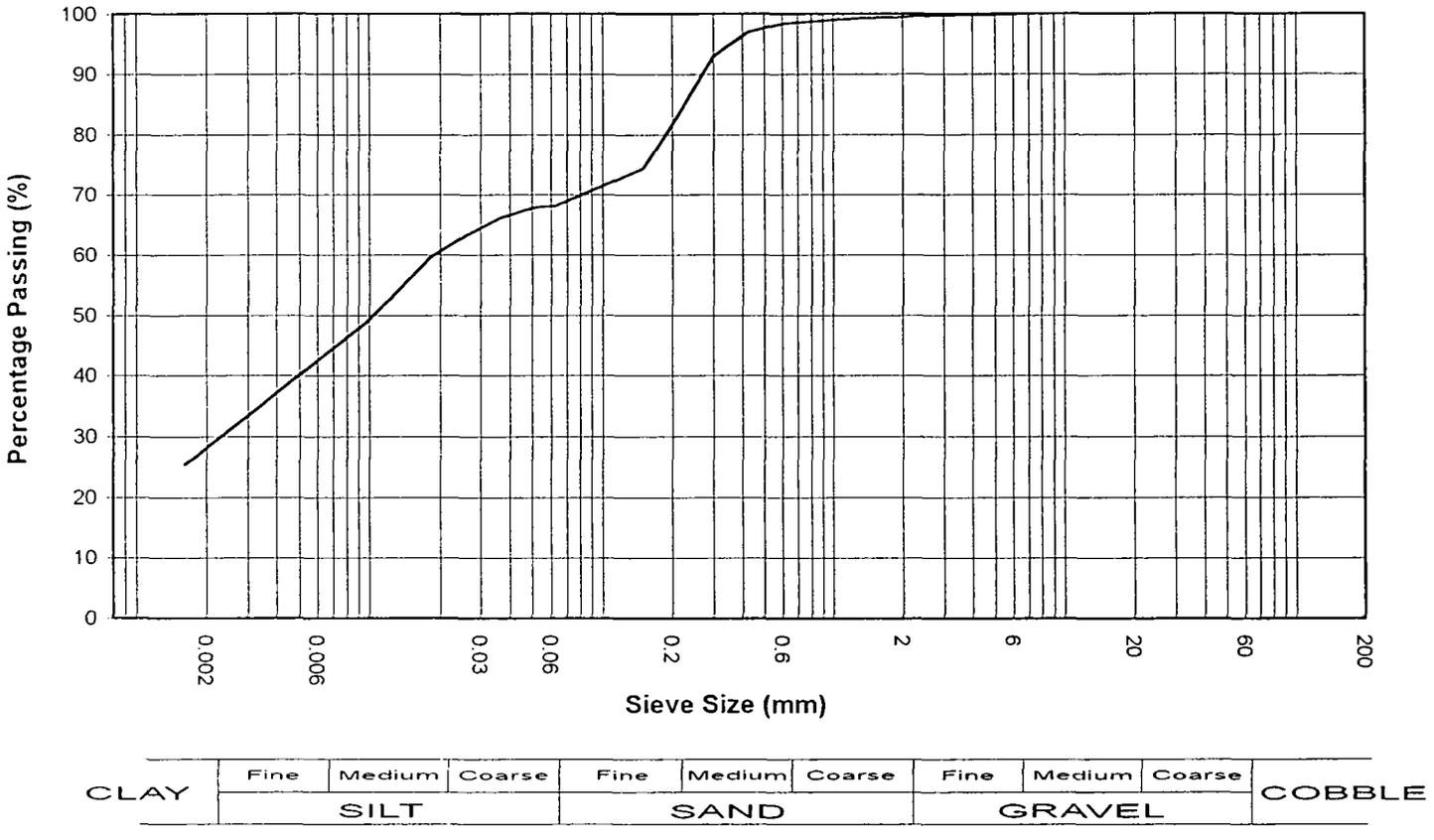
Test method: BS1377: Part 2: 1990: Clause 9.2, 9.5

Norwest Holst

Contract no.	F11984	Hole ID	BH102
Project	CASTLETON WwTW.	Sample no.	1
Soil description	Brown sandy CLAY.	Depth	11.00 m
		Sample type	B
		Page	1 of 1



PARTICLE SIZE	%
Clay:	28
Silt:	40
Sand:	31
Gravel:	1
Cobbles:	0

Specimen location within original sample: N/A

Remarks:

Particle density: 2.65 Mg/m³ Assumed

SIEVE DATA

Sieve size mm	Cumulative % passing	Sieve size mm	Cumulative % passing
75.0	100	5.0	100
63.0	100	3.35	100
50.0	100	2.00	99
37.5	100	1.18	99
28.0	100	0.600	98
20.0	100	0.425	97
14.0	100	0.300	93
10.0	100	0.212	83
6.3	100	0.150	74
		0.063	68

SEDIMENTATION DATA

Equivalent particle diameter mm	Cumulative % passing
0.0509	68
0.0361	66
0.0257	63
0.0183	60
0.0097	49
0.0059	42
0.0033	35
0.0016	25

Norwest Holst Soil Engineering Limited

Parkside Lane, Dewsbury Road, Leeds LS11 5SX

Tel. 0113 2711111 Fax. 0113 2760472 E-mail soils@norwest.co.uk

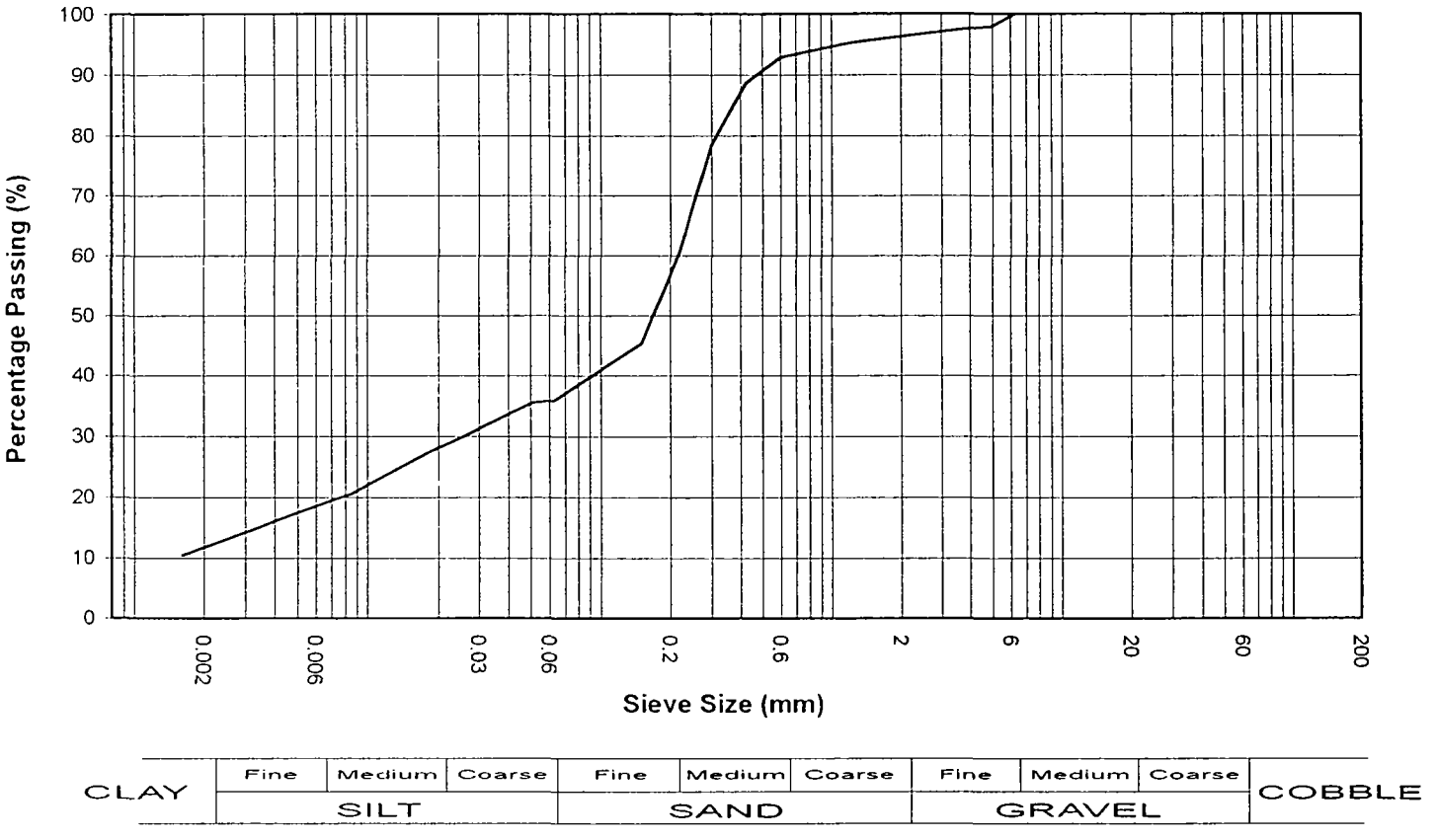
Approved:

PARTICLE SIZE DISTRIBUTION

Norwest Holst

Test method: BS1377: Part 2: 1990: Clause 9.2, 9.5

Contract no.	F11984	Hole ID	BH103
Project	CASTLETON WwTW.	Sample no.	1
Soil description	Brown clayey very silty SAND.	Depth	10.50 m
		Sample type	B
		Page	1 of 1



PARTICLE SIZE	%
Clay:	11
Silt:	24
Sand:	60
Gravel:	4
Cobbles:	0

Specimen location within original sample: N/A

Remarks:

Particle density: 2.65 Mg/m³ Assumed

SIEVE DATA

Sieve size mm	Cumulative % passing	Sieve size mm	Cumulative % passing
75.0	100	5.0	98
63.0	100	3.35	97
50.0	100	2.00	96
37.5	100	1.18	95
28.0	100	0.600	93
20.0	100	0.425	89
14.0	100	0.300	78
10.0	100	0.212	59
6.3	100	0.150	45
		0.063	36

SEDIMENTATION DATA

Equivalent particle diameter mm	Cumulative % passing
0.0512	36
0.0366	33
0.0261	30
0.0187	28
0.0086	21
0.0052	18
0.0032	15
0.0016	10

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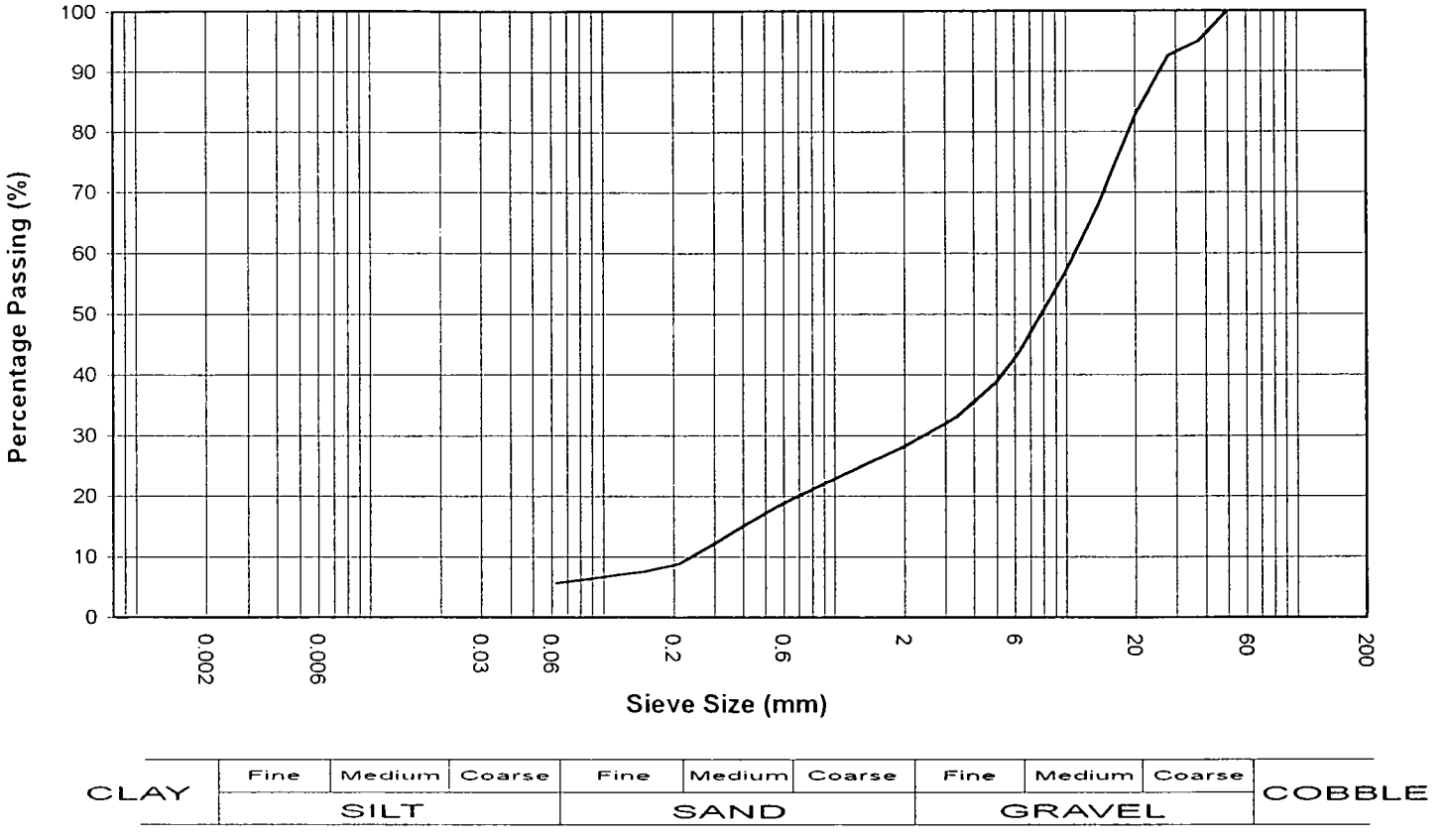
Approved:

PARTICLE SIZE DISTRIBUTION

Norwest Holst

Test method: BS1377: Part 2: 1990: Clause 9.2

Contract no.	F11984	Hole ID	BH103
Project	CASTLETON WwTW.	Sample no.	1
Soil description	Brown very sandy GRAVEL.	Depth	11.00 m
		Sample type	B
		Page	1 of 1



PARTICLE SIZE	%
Silt and clay:	6
Sand:	23
Gravel:	72
Cobbles:	0

Specimen location within original sample: N/A

Remarks:

SIEVE DATA

Sieve size mm	Cumulative % passing	Sieve size mm	Cumulative % passing
75.0	100	5.0	39
63.0	100	3.35	33
50.0	100	2.00	28
37.5	95	1.18	24
28.0	93	0.600	19
20.0	83	0.425	16
14.0	68	0.300	12
10.0	57	0.212	9
6.3	44	0.150	8
		0.063	6

SEDIMENTATION DATA

Equivalent particle diameter mm	Cumulative % passing

Norwest Holst Soil Engineering Limited

Parkside Lane, Dewsbury Road, Leeds LS11 5SX

Tel. 0113 2711111 Fax. 0113 2760472 E-mail soils@norwest.co.uk

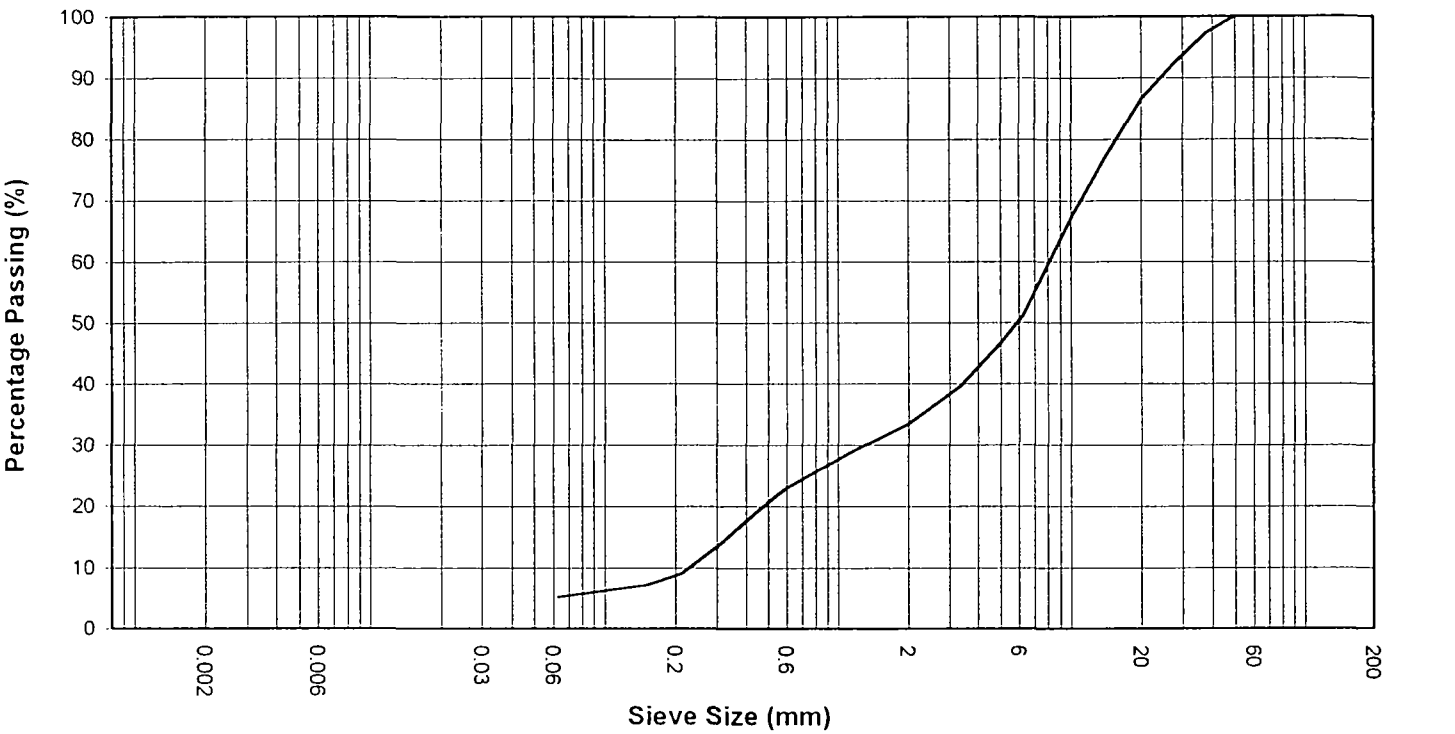
Approved:

PARTICLE SIZE DISTRIBUTION

Test method: BS1377: Part 2: 1990: Clause 9.2

Norwest Holst

Contract no.	F11984	Hole ID	BH103
Project	CASTLETON WwTW.	Sample no.	1
Soil description	Brown very sandy GRAVEL.	Depth	16.00 m
		Sample type	B
		Page	1 of 1



PARTICLE SIZE	%
Silt and clay:	5
Sand:	28
Gravel:	67
Cobbles:	0

Specimen location within original sample: N/A

Remarks:

SIEVE DATA

Sieve size mm	Cumulative % passing	Sieve size mm	Cumulative % passing
75.0	100	5.0	47
63.0	100	3.35	40
50.0	100	2.00	33
37.5	97	1.18	29
28.0	93	0.600	23
20.0	87	0.425	18
14.0	77	0.300	13
10.0	67	0.212	9
6.3	51	0.150	7
		0.063	5

SEDIMENTATION DATA

Equivalent particle diameter mm	Cumulative % passing

Norwest Holst Soil Engineering Limited

Parkside Lane, Dewsbury Road, Leeds LS11 5SX

Tel. 0113 2711111 Fax. 0113 2760472 E-mail soils@norwest.co.uk

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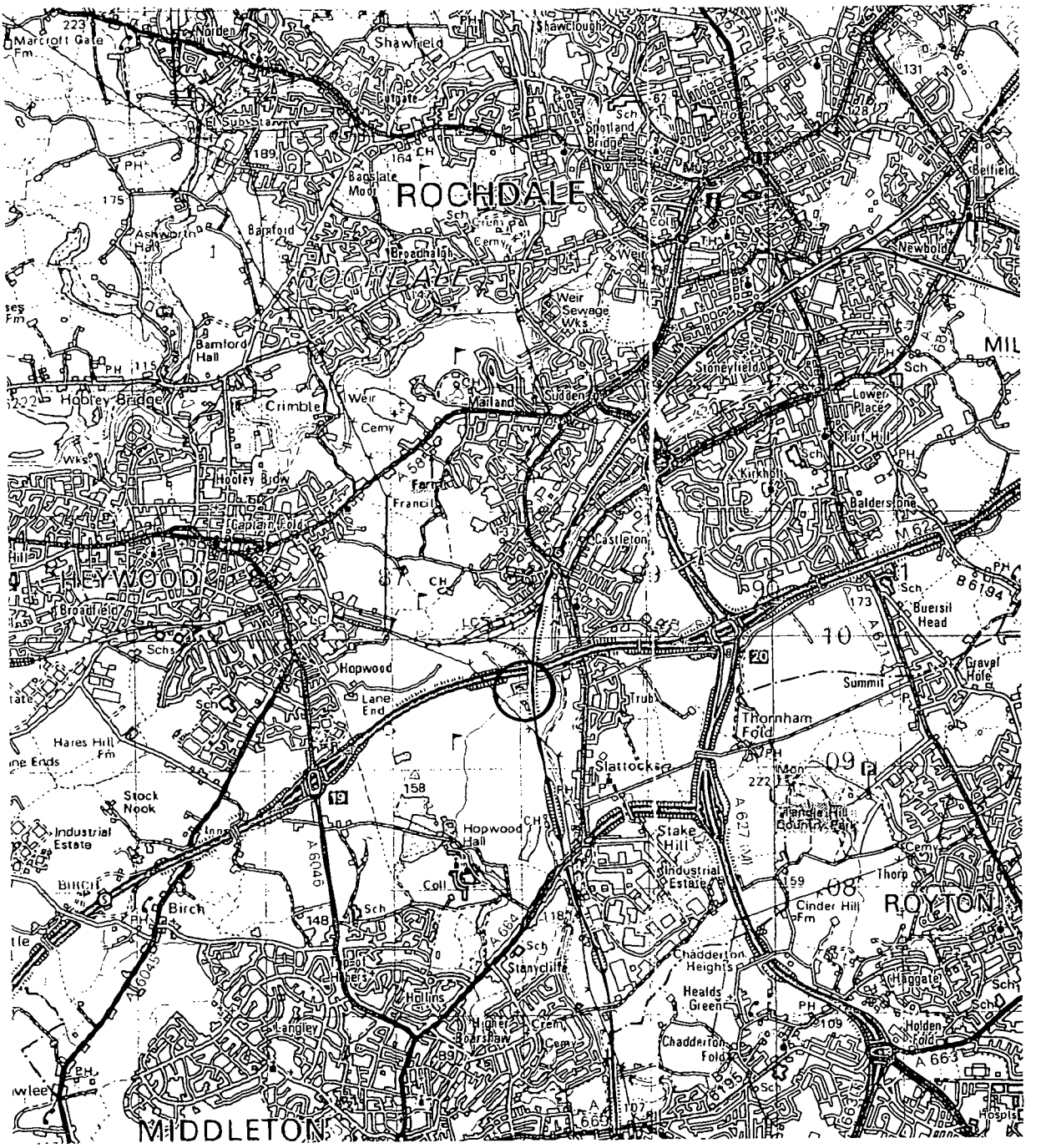
SUPPORTING FACTUAL DATA

SECTION D

SITE PLANS

SITE LOCATION PLAN

NORWEST HOLST SOIL ENGINEERING LTD



Denotes Site Location

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SITE: CASTLETON WwTW	CONTRACT No: F11984	SCALE: 1:50,000
TITLE: SITE LOCATION PLAN	DATE: 16/07/2001	FIGURE: 01

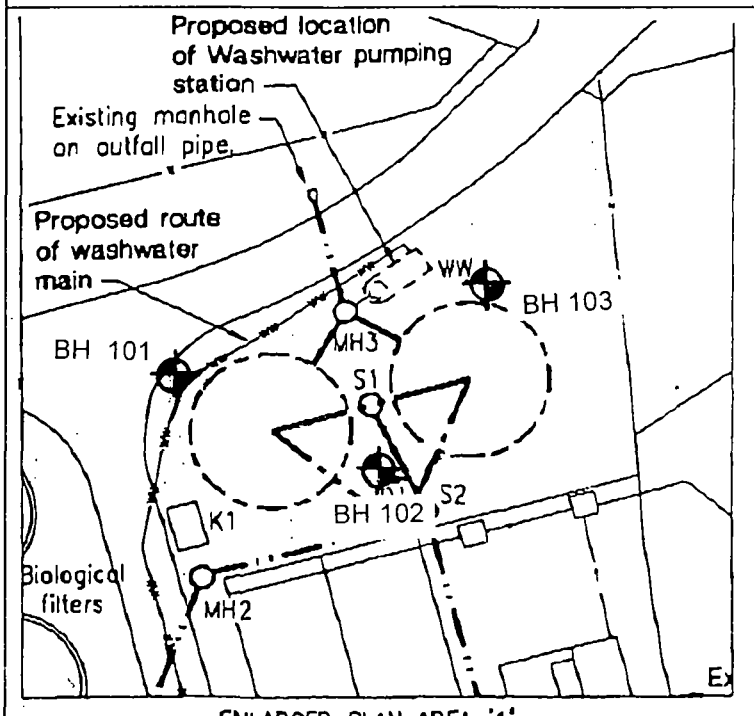
SUPPORTING FACTUAL DATA

SECTION D

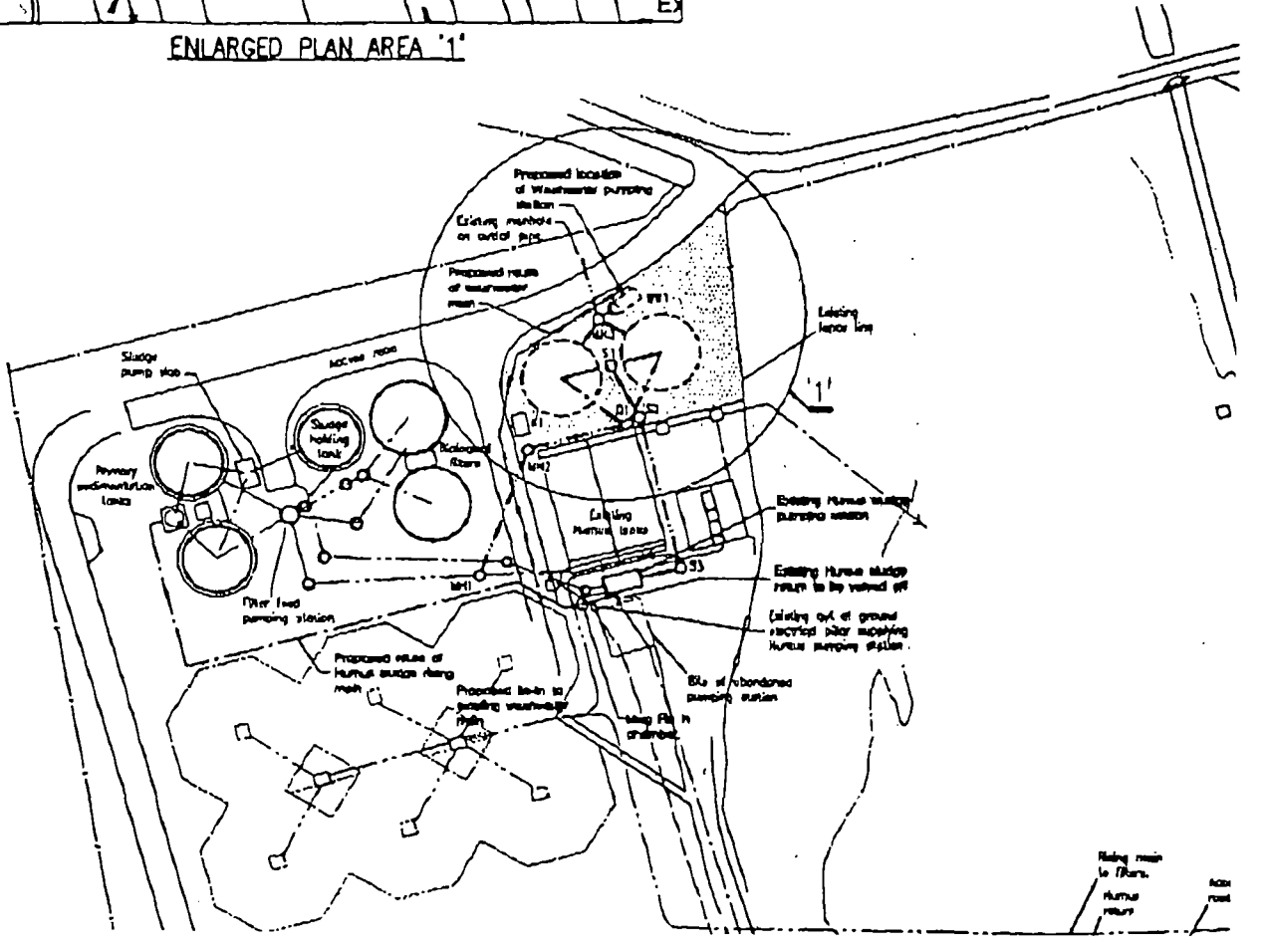
SITE PLANS

EXPLORATORY HOLE LOCATION PLAN

NORWEST HOLST SOIL ENGINEERING LTD



ENLARGED PLAN AREA '1'



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SITE: CASTLETON WwTW	CONTRACT No: F11984	SCALE: NTS
TITLE: EXPLORATORY HOLE LOCATION PLAN	DATE: 16/07/2001	FIGURE: 02