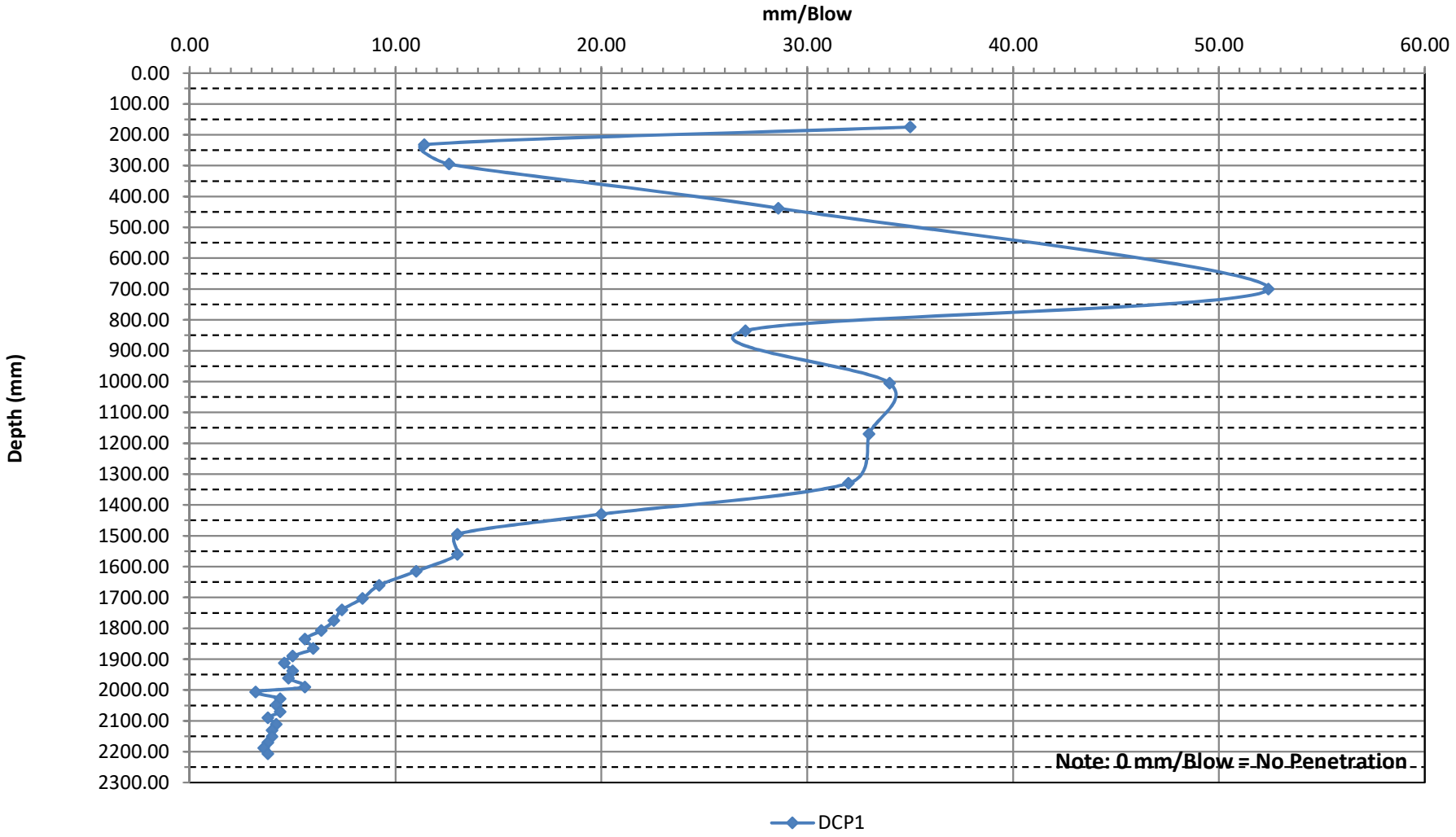
26	5.00	1990.00	2006.00	16	3.20	88.32
27	5.00	2006.00	2028.00	22	4.40	63.08
28	5.00	2028.00	2049.00	21	4.20	66.26
29	5.00	2049.00	2071.00	22	4.40	63.08
30	5.00	2071.00	2090.00	19	3.80	73.65
31	5.00	2090.00	2111.00	21	4.20	66.26
32	5.00	2111.00	2131.00	20	4.00	69.76
33	5.00	2131.00	2151.00	20	4.00	69.76
34	5.00	2151.00	2170.00	19	3.80	73.65
35	5.00	2170.00	2188.00	18	3.60	77.98
36	5.00	2188.00	2207.00	19	3.80	73.65

ALLIED EXPLORATION & GEOTECHNICS LIMITED
TRL Dynamic Cone Penetrometer Testing

TRL DCP mm/Blow v Depth (mm)



Contract: Eston Road Instrusive Works
Contract No.: 4287
Date: 22/09/2020
Sheet: 3 of 9

ALLIED EXPLORATION & GEOTECHNICS LIMITED

TRL Dynamic Cone Penetrometer Testing

Probe Reference:	**DCP2**	
Date Tested:	**15/06/2020**	
Investigation Type:	TBC	
Method:	TRL Dynamic Cone Penetrometer	
Coordinates:		
Eastings (m):	454307.983	
Northings (m):	521058.651	
Level (m):	9.270	
Chainage (m):	TBC	
Probing Equipment Specification		
Hammer Mass:	8.00	kg
Drop Distance:	575.00	mm
Cone Angle:	30.00	Degrees
Tip Diameter:	20.00	mm
Operator Details		
Operator :	L. Hayes	
Supervisor :	D. Portsmouth	
Other Information		
Remarks	(1) mm/blows taken over 1 blow intervals in order to derive equivalent CBR value (%).	
Test Start Depth:	0.00	mm
Reference Reading:	0.00	mm
Total Readings:	27.00	
Total Depth:	2019.00	mm

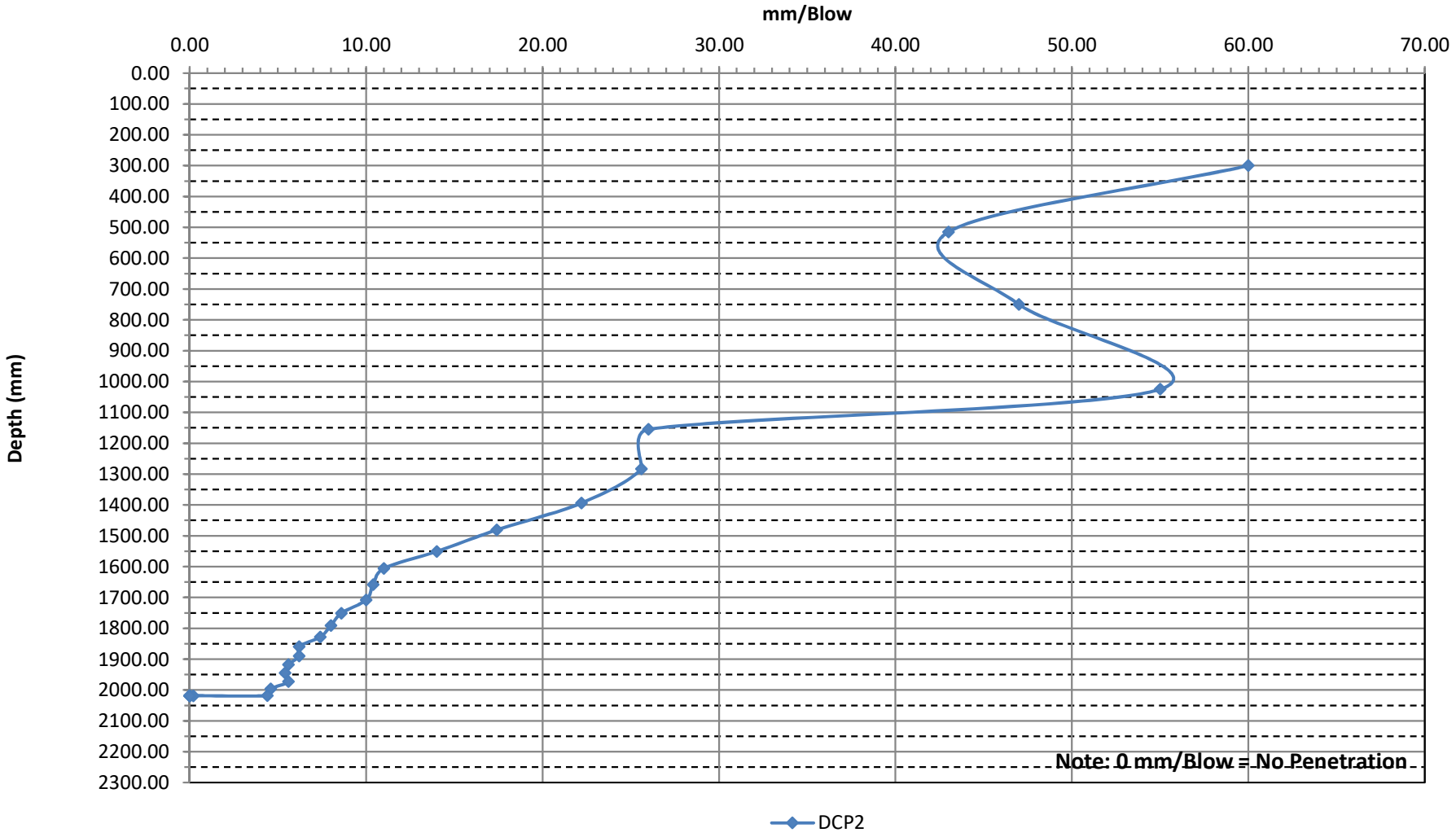
TRL Reading Index	No. of Blows	Start Depth (mm)	End Depth (mm)	Total Drive Penetration (mm)	TRL mm/Blow	Equivalent TRL CBR%
1	5.00	0.00	300.00	300	60.00	3.99
2	5.00	300.00	515.00	215	43.00	5.67
3	5.00	515.00	750.00	235	47.00	5.16
4	5.00	750.00	1025.00	275	55.00	4.37
5	5.00	1025.00	1155.00	130	26.00	9.65
6	5.00	1155.00	1283.00	128	25.60	9.81
7	5.00	1283.00	1394.00	111	22.20	11.40
8	5.00	1394.00	1481.00	87	17.40	14.75
9	5.00	1481.00	1551.00	70	14.00	18.56
10	5.00	1551.00	1606.00	55	11.00	23.95
11	5.00	1606.00	1658.00	52	10.40	25.41
12	5.00	1658.00	1708.00	50	10.00	26.49
13	5.00	1708.00	1751.00	43	8.60	31.06
14	5.00	1751.00	1791.00	40	8.00	33.53
15	5.00	1791.00	1828.00	37	7.40	36.41
16	5.00	1828.00	1859.00	31	6.20	43.90
17	5.00	1859.00	1890.00	31	6.20	43.90
18	5.00	1890.00	1918.00	28	5.60	48.88
19	5.00	1918.00	1945.00	27	5.40	50.80
20	5.00	1945.00	1973.00	28	5.60	48.88
21	5.00	1973.00	1996.00	23	4.60	60.18
22	5.00	1996.00	2018.00	22	4.40	63.08
23	5.00	2018.00	2018.00	0	0.00	-
24	5.00	2018.00	2019.00	1	0.20	1655.05
25	5.00	2019.00	2019.00	0	0.00	-

Contract: Eston Road Instrusive Works
Contract No.: 4287
Date: 22/09/2020

26	5.00	2019.00	2019.00	0	0.00	-
27	5.00	2019.00	2019.00	0	0.00	-

ALLIED EXPLORATION & GEOTECHNICS LIMITED
TRL Dynamic Cone Penetrometer Testing

TRL DCP mm/Blow v Depth (mm)



Contract: Eston Road Instrusive Works
Contract No.: 4287
Date: 22/09/2020
Sheet: 6 of 9

ALLIED EXPLORATION & GEOTECHNICS LIMITED

TRL Dynamic Cone Penetrometer Testing

Probe Reference:	**DCP3**	
Date Tested:	**15/06/2020**	
Investigation Type:	TBC	
Method:	TRL Dynamic Cone Penetrometer	
Coordinates:		
Eastings (m):	454322.976	
Northings (m):	521047.171	
Level (m):	9.382	
Chainage (m):	TBC	
Probing Equipment Specification		
Hammer Mass:	8.00	kg
Drop Distance:	575.00	mm
Cone Angle:	30.00	Degrees
Tip Diameter:	20.00	mm
Operator Details		
Operator :	L. Hayes	
Supervisor :	D. Portsmouth	
Other Information		
Remarks	(1) mm/blows taken over 1 blow intervals in order to derive equivalent CBR value (%).	
Test Start Depth:	0.00	mm
Reference Reading:	0.00	mm
Total Readings:	26.00	
Total Depth:	2306.00	mm

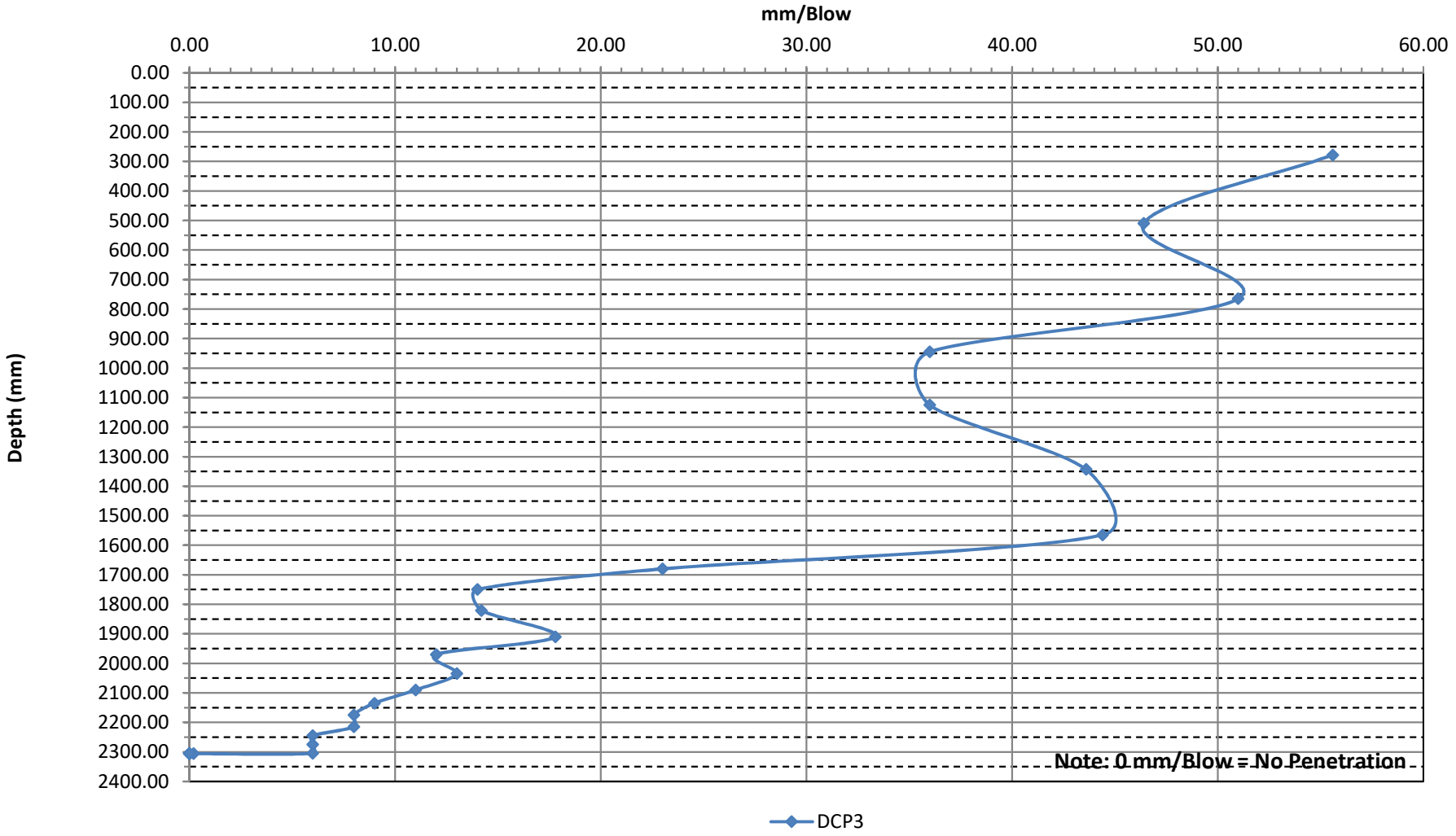
TRL Reading Index	No. of Blows	Start Depth (mm)	End Depth (mm)	Total Drive Penetration (mm)	TRL mm/Blow	Equivalent TRL CBR%
1	5.00	0.00	278.00	278	55.60	4.32
2	5.00	278.00	510.00	232	46.40	5.23
3	5.00	510.00	765.00	255	51.00	4.73
4	5.00	765.00	945.00	180	36.00	6.84
5	5.00	945.00	1125.00	180	36.00	6.84
6	5.00	1125.00	1343.00	218	43.60	5.59
7	5.00	1343.00	1565.00	222	44.40	5.48
8	5.00	1565.00	1680.00	115	23.00	10.98
9	5.00	1680.00	1750.00	70	14.00	18.56
10	5.00	1750.00	1821.00	71	14.20	18.28
11	5.00	1821.00	1910.00	89	17.80	14.40
12	5.00	1910.00	1970.00	60	12.00	21.84
13	5.00	1970.00	2035.00	65	13.00	20.07
14	5.00	2035.00	2090.00	55	11.00	23.95
15	5.00	2090.00	2135.00	45	9.00	29.61
16	5.00	2135.00	2175.00	40	8.00	33.53
17	5.00	2175.00	2215.00	40	8.00	33.53
18	5.00	2215.00	2245.00	30	6.00	45.45
19	5.00	2245.00	2275.00	30	6.00	45.45
20	5.00	2275.00	2305.00	30	6.00	45.45
21	5.00	2305.00	2306.00	1	0.20	1655.05
22	5.00	2306.00	2306.00	0	0.00	-
23	5.00	2306.00	2306.00	0	0.00	-
24	5.00	2306.00	2306.00	0	0.00	-
25	5.00	2306.00	2306.00	0	0.00	-

Contract: Eston Road Instrusive Works
Contract No.: 4287
Date: 22/09/2020

26	5.00	2306.00	2306.00	0	0.00	-

ALLIED EXPLORATION & GEOTECHNICS LIMITED
TRL Dynamic Cone Penetrometer Testing

TRL DCP mm/Blow v Depth (mm)



Contract: Eston Road Instrusive Works
Contract No.: 4287
Date: 22/09/2020
Sheet: 9 of 9

Laboratory Report Certificate

LABORATORY TESTING ENCLOSURES

ALLIED EXPLORATION & GEOTECHNICS LIMITED

Head Office: Unit 25 Sand Gill Industrial Estate, Rotten Flatt, Chester-le-Street, Co. Durham DH2 2RE - Tel: 0191 3874709 Fax: 0191 3874710
Regional Office: Unit 20 Business Development Centre, Eamon Wood, Blackburn, BB1 5BL - Tel: 01727 735 849 Fax: 01727 735 888

LABORATORY REPORT CERTIFICATE

UKAS TESTING
1367

Contract Title: Eston Road Intrusive Works **AEG Reference:** 4287

Client: South Tees Development Corporation

We certify that Laboratory testing was carried out on samples from the above contract in accordance with techniques outlined in BS 1377: 1990, BS EN ISO 17892:2014 or other appropriate standards as quoted. The samples were received from June 2020 and the following results, given on the attached enclosures, were obtained.

The tests carried out are indicated in the attached table showing the enclosure number and the total number of pages.

For and on behalf of Allied Exploration & Geotechnics Limited

- ☐ Nick Vater (Managing Director)
- ☐ Kevin Warriner (HSE & Quality Director)
- ☑ Michelle Selkirk (Laboratory Manager)

Signed MSelk Date: 06 November 2020

Tests marked not UKAS accredited in this certificate are not included in the UKAS accreditation schedule for our laboratory. Any opinions and interpretations expressed herein are outside the scope of the laboratory's UKAS accreditation.

Please note the material was derived from samples taken outside the control of the laboratory.

LABORATORY REPORT CERTIFICATE

ENCLOSURES

Enclosure Number	Description	UKAS Accredited	Reference	No. of Pages
0	Laboratory Report Certificate	N/A		3
1	Sample Description Sheets	N/A		3
2	Moisture Content	Yes	BS 1377 Part 2 1990 (BS EN ISO 17892-1:2014)	1
2	Plasticity Index and Moisture Content	Yes	BS 1377 Part 2 1990 (BS EN ISO 17892-1:2014)	3
3	Determination of Particle Density	Yes	BS 1377 Part 2 1990	1
4	Particle Size Distribution Sieving	Yes	BS 1377 Part 2 1990	19
4	Particle Size Distribution Sedimentation	No	BS 1377 Part 2 1990	11
5	Determination of Organic Matter Content, Sulphate and pH (Tested externally)	No	See DETS certificates	5
6	Determination of Dry Density/Moisture Content Relationship	Yes	BS 1377 Part 4 1990	7
7	Determination of California Bearing Ratio	Yes	BS 1377 Part 4 1990	15

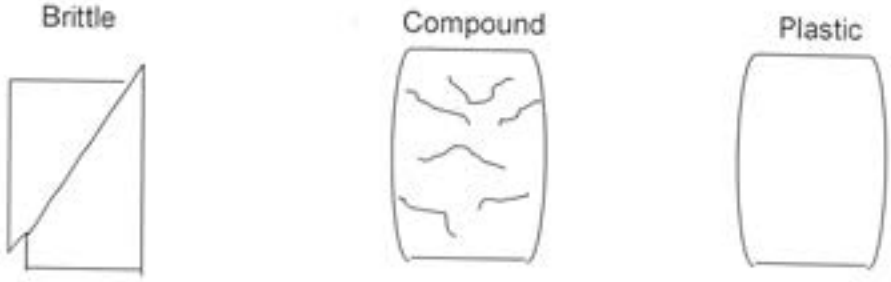
LABORATORY REPORT CERTIFICATE

ABBREVIATIONS

All the abbreviations used on the laboratory certificates are given below:

Br	Brittle	**PSD**	Particle Size Distribution by sieve analysis
C	Compound	**SB**	Shear Box
CBR	California Bearing Ratio	**SED**	Sedimentation Analysis
CDT	Consolidated Drained Triaxial	**SO4**	Sulphate (total, water extract, groundwater)
CL	Chloride content (water or soil)	**CP2**	Dry Density/Moisture Content 2.5kg rammer
US	Unsuitable sample for test	**CP4**	As above using 4.5kg rammer
UUT	Undrained Unconsolidated Triaxial	**CPV**	As above using vibrating hammer
HSV	Vane Test	**CUT**	Consolidated Undrained Triaxial
IS	Insufficient sample for test	**R**	Remoulded
LOI	Loss On Ignition	**U**	Undisturbed
M	Multi-stage testing	**MC**	Moisture Content
MCV	Moisture Content Value	**PL**	Point Load
NAT	Natural preparation method	**NMC**	Natural (or as received) moisture content
P	Plastic	**PFH**	Permeability Falling Head Method
OED	Oedometer	**PTXL**	Permeability in Triaxial Cell
OMC	Optimum Moisture Content	**ORG**	Organic content
B	Large disturbed (bulk) sample	**PD**	Particle Density (SG)
J	Small disturbed (jar) sample	**PI**	Liquid limit, plastic limit and plasticity index

Typical Mode of Failure for Triaxial Testing



Sample Description Sheets

LABORATORY TESTING ENCLOSURE 1

ALLIED EXPLORATION & GEOTECHNICS LIMITED

Head Office: [illegible]
Regional Office: [illegible]

LABORATORY SAMPLE DESCRIPTION SHEET

Exploratory Hole No	Sample Depth (m)	ID	Description	Laboratory Tests/Remarks
ATK_TP_001	1.40	B5	MADE GROUND (Brown slightly sandy slightly gravelly clay with a high cobble content. Gravel includes brick fragments).	PSD PD CP2 CBR
ATK_TP_001	2.60	B7	MADE GROUND (Dark brown/grey clayey sandy gravel with a low cobble content. Gravel includes glass, metal, clinker, ash, concrete, slag and brick fragments).	BRE
ATK_TP_002	0.40	B2	MADE GROUND (Black clayey very sandy gravel including brick fragments).	PSD CBR
ATK_TP_002	1.80	J6	Dark grey brown silty slightly sandy CLAY of high plasticity.	MC PI ORG
ATK_TP_002	2.00	B7	Brown slightly sandy CLAY.	CP2 Soaked CBR
ATK_TP_002	2.90	J8	Light brown silty slightly sandy CLAY of intermediate plasticity.	MC PI
ATK_TP_003	1.40	J4	Light brown slightly sandy CLAY of intermediate plasticity.	MC PI
ATK_TP_003	1.60	B5	Brown sandy CLAY.	Soaked CBR
ATK_TP_003	3.10	J9	Brown silty slightly sandy CLAY of intermediate plasticity.	MC PI
ATK_TP_003	3.30	B10	Fissured brown mottled silty CLAY.	Soaked CBR
ATK_TP_004	1.00	B2	MADE GROUND (Grey cobbles with some gravel. Gravel and cobbles includes slag).	PSD US for CP2
ATK_TP_004	1.30	J4	Friable dark brown slightly sandy CLAY of intermediate plasticity.	MC PI ORG
ATK_TP_004	2.10	B5	Brown slightly organic silty slightly sandy CLAY.	PSD SED
ATK_TP_005	0.60	B2	MADE GROUND (Blackish brown very clayey very sandy gravel with occasional clay pockets. Gravel includes concrete and slag).	PSD SED PD CP2 CBR
ATK_TP_005	1.60	J4	Light brown slightly sandy CLAY of intermediate plasticity.	MC PI ORG
ATK_TP_005	1.80	B5	Brown slightly sandy CLAY.	CBR
ATK_TP_006	0.30	B2	MADE GROUND (Grey sandy gravel with a medium cobble content. Gravel includes slag and clinker).	PSD US for CP2
ATK_TP_006	1.20	J6	Friable brown slightly sandy CLAY/SILT of high plasticity.	MC PI
ATK_TP_006	1.40	B7	Brown silty slightly sandy CLAY.	PSD SED CP2
ATK_TP_006	2.10	J8	Friable dark brown silty slightly sandy CLAY of intermediate plasticity.	MC PI
ATK_TP_006	2.30	B9	Brown with grey veining silty CLAY.	PSD Soaked CBR

Contract Title :-	Client :-
Eston Road Intrusive Works	South Tees Development Corporation

Signed :- MSono	Name :-	Page 1 of 3	UKAS TESTING 1367
Date of Issue :- 05/11/2020	Certificate No :- SD/4287/1	AEG Contract No :- 4287	

ALLIED EXPLORATION & GEOTECHNICS LIMITED

LABORATORY SAMPLE DESCRIPTION SHEET

Exploratory Hole No.	Sample Depth (m)	ID	Description	Laboratory Tests/Remarks
ATK_TP_006	2.50	J11	Laminated light brown silty slightly sandy CLAY of high plasticity.	MC PI BRE ORG
ATK_TP_006	3.00	B12	Fissured brown/grey silty CLAY	Soaked CBR
ATK_TP_007	0.50	B3	Blackish brown clayey very sandy GRAVEL.	MC PSD CBR
ATK_TP_007	0.70	B5	Blackish brown slightly clayey gravelly SAND.	BRE CP4
ATK_TP_007	1.30	J7	Light brown silty sandy CLAY of low plasticity.	MC PI
ATK_TP_007	1.50	B8	Brown with grey mottling silty slightly sandy CLAY	PSD SED
ATK_TP_007	2.30	J9	Greyish brown CLAY of high plasticity	MC PI
ATK_TP_007	2.50	B10	Brown slightly sandy CLAY	BRE PSD SED
ATK_TP_007	3.30	J12	Laminated dark brown CLAY of high plasticity.	MC PI
ATK_TP_007	3.50	B13	Fissured brown CLAY	PSD PD BRE
ATK_TP_008	0.80	B2	MADE GROUND (Black clayey very sandy gravel including slag, plastic and ceramic fragments).	PSD US for CBR
ATK_TP_009	1.10	J4	Dark brown with occasional grey mottling CLAY of high plasticity.	MC PI BRE ORG
ATK_TP_009	1.30	B5	Grey brown slightly sandy slightly gravelly CLAY	BRE PSD SED CBR
ATK_TP_009	2.30	B8	Fissured brown silty slightly sandy CLAY of intermediate plasticity	MC PI PSD SED
ATK_TP_009	3.30	B10	Fissured brown silty slightly sandy CLAY of intermediate plasticity	MC PI BRE
ATK_TP_010	0.40	B2	MADE GROUND (Dark grey/black sandy gravel including slag, concrete and ash)	BRE
ATK_TP_010	1.30	J6	Dark brown slightly sandy CLAY/SILT of high plasticity	MC PI
ATK_TP_010	1.50	B7	Greyish brown silty sandy slightly gravelly CLAY	PSD SED CP2 CBR
ATK_TP_010	3.00	J11	Brown silty CLAY of intermediate plasticity	MC PI
ATK_TP_010	3.20	B12	Brown silty slightly sandy CLAY	BRE PSD SED CBR
ATK_TP_011	0.80	B2	Brown clayey slightly sandy GRAVEL with a high cobble content	US for CBR

Contract Title :- Eston Road Intrusive Works

Client :- South Tees Development Corporation

Signed :- [signature]

Name :-

Date of issue :- 05/11/2020

Certificate No :- SD/4287/2

AEG Contract No :- 4287

UKAS TESTING 1367

ALLIED EXPLORATION & GEOTECHNICS LIMITED

LABORATORY SAMPLE DESCRIPTION SHEET

Exploratory Hole No.	Sample Depth (m)	ID	Description	Laboratory Tests/Remarks
ATK_TP_011	1.70	J4	Light brown CLAY of intermediate plasticity.	MC PI
ATK_TP_011	1.80	B5	Brown slightly sandy slightly gravelly CLAY.	BRE CBR
ATK_TP_011	2.70	J6	Brown with grey mottling slightly sandy CLAY.	MC
ATK_TP_011	2.80	B7	Brown with grey veining silty slightly sandy slightly gravelly CLAY.	PSD SED
ATK_TP_012	0.50	B2	MADE GROUND (Dark grey slightly clayey sandy gravel including slag, clinker, ash and brick fragments).	BRE
ATK_TP_012	0.90	J3	Brown with grey veining CLAY of high plasticity.	MC PI ORG
ATK_TP_012	1.20	B4	Brown silty slightly sandy CLAY.	PSD SED CP2
ATK_TP_012	2.00	J6	Brown silty CLAY of intermediate plasticity.	MC PI
ATK_TP_012	2.30	B7	Brown with grey mottling slightly sandy CLAY.	CBR
ATK_TP_012	2.90	J8	Brown with grey veining CLAY of intermediate plasticity.	MC PI
ATK_TP_012	3.20	B9	Brown with grey veining slightly sandy slightly gravelly CLAY.	BRE

Contract Title :-	Client :-
Eston Road Intrusive Works	South Tees Development Corporation

Signed :-	Name :-	Page 3 of 3	UKAS TESTING 1387
Date of issue :- 05/11/2020	Certificate No :- SD/4287/3	AEG Contract No :- 4287	

LABORATORY TESTING ENCLOSURE 2

Moisture Content/Plasticity Index and Moisture Content

ALLIED EXPLORATION & GEOTECHNICS LIMITED

MOISTURE CONTENT CERTIFICATE

BS 1377 : Part 2 : Clause 3.2

Exploratory Hole No.	Sample Depth (m)	Sample ID	Specific Depth (m)	Moisture Content (%)	Date Tested	Remarks
ATK_TP_011	2.70	J6	2.70	16.0	03/08/2020	

For description of sample please refer to the Laboratory Sample Description Sheet

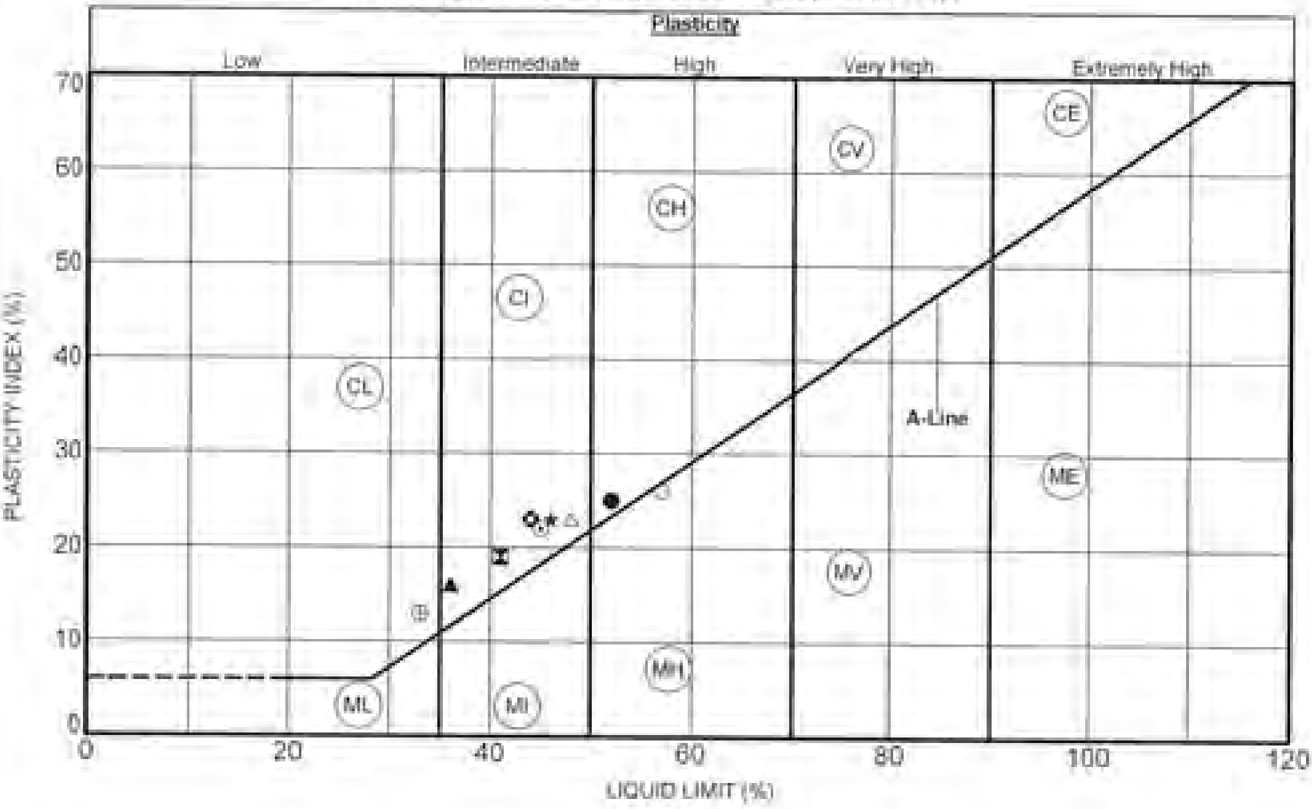
Contract Title :- Eston Road Intrusive Works	Client :- South Tees Development Corporation

Signed :-	Name :-		Page 1 of 1
Date of issue :- 09/11/2020	Certificate No :- MC/4287/1	AEG Contract No :- 4287	UKAS TESTING 1367

ALLIED EXPLORATION & GEOTECHNICS LIMITED

ATTERBERG LIMITS & NATURAL MOISTURE CONTENT

Test Method :- BS 1377 : Part 2 : Clause 3.2, 4.1 to 4.4 & 5 : 1990



Exploratory Hole No.	Depth (m)	Sample Type/Ref.	Specific Depth (m)	LL	PL	PI	I_L	Preparation Method	<0.425mm (%)	m/c (%)	Date Tested
● ATK_TP_002	1.80	J6	1.80	52	27	25	0.23	Natural		32.8	03/08/2020
⌶ ATK_TP_002	2.90	J8	2.90	41	22	19	0.35	Natural		28.6	03/08/2020
▲ ATK_TP_003	1.40	J4	1.40	36	20	16	0.16	Natural		22.6	03/08/2020
★ ATK_TP_003	3.10	J9	3.10	46	23	23	0.31	Natural		30.2	03/08/2020
ATK_TP_004	1.80	J4	1.80	45	23	22	0.10	Natural		25.1	03/08/2020
✪ ATK_TP_005	1.60	J4	1.60	44	21	23	0.22	Natural		26.1	03/08/2020
○ ATK_TP_006	1.20	J6	1.20	57	31	26	-0.02	Natural		30.5	03/08/2020
△ ATK_TP_006	2.10	J8	2.10	48	25	23	0.06	Natural		26.4	03/08/2020
ATK_TP_006	2.90	J11	2.90	52	27	25	0.12	Natural		29.9	03/08/2020
⊕ ATK_TP_007	1.30	J7	1.30	33	20	13	0.28	Natural		23.7	03/08/2020

For description of sample please refer to the Laboratory Sample Description Sheet. # = Insufficient for 4 point PI
If sample is prepared in the natural state we are unable to determine % retained on the 0.425mm test sieve.

Contract Title :- Eston Road Intrusive Works	Client :- South Tees Development Corporation

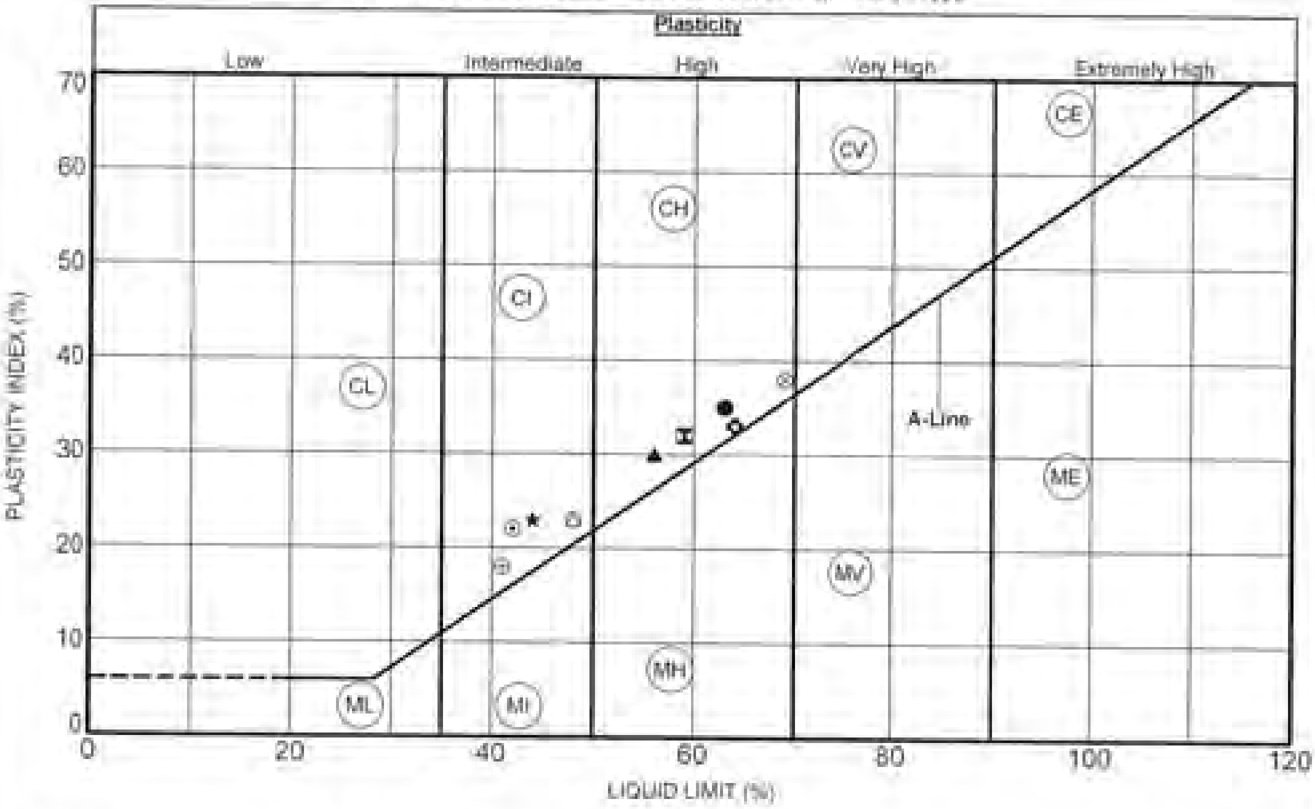
Signed :- [signature]	Name :-	Page 1 of 3
Date of issue :- 05/11/2020	Certificate No :- PM4287/1	AEG Contract No :- 4287

UKAS TESTING 1367

ALLIED EXPLORATION & GEOTECHNICS LIMITED

ATTERBERG LIMITS & NATURAL MOISTURE CONTENT

Test Method :- BS 1377 : Part 2 : Clause 3.2, 4.1 to 4.4 & 5 : 1990



Exploratory Hole No.	Depth (m)	Sample Type/Ref.	Specific Depth (m)	LL	PL	PI	I_L	Preparation Method	<0.425mm (%)	m/c (%)	Date Tested	
ATK_TP_007	2.30	J9	2.30	63	28	35	0.14	Natural		32.9	03/08/2020	
ATK_TP_007	3.30	J12	3.30	59	27	32	0.10	Natural		30.2	03/08/2020	
ATK_TP_009	1.10	J4	1.10	56	26	30	0.05	Natural		27.6	03/08/2020	
ATK_TP_009	2.30	B8	2.30	44	21	23	0.18	Natural	98.0	25.2	18/08/2020	
ATK_TP_009	3.30	B10	3.30	42	20	22	0.22	Natural		24.8	18/08/2020	
ATK_TP_010	1.30	J6	1.30	64	31	33	0.40	Natural		44.1	03/08/2020	
ATK_TP_010	3.00	J11	3.00	48	25	23	0.00	Natural		24.9	03/08/2020	
ATK_TP_011	1.70	J4	1.70	48	25	23	0.33	Natural		32.5	03/08/2020	
ATK_TP_012	0.90	J3	0.90	69	31	38	0.09	Natural		34.3	03/08/2020	#
ATK_TP_012	2.00	J6	2.00	41	23	18	0.09	Natural		24.6	18/08/2020	

For description of sample please refer to the Laboratory Sample Description Sheet. # = Insufficient for 4 point PI
If sample is prepared in the natural state we are unable to determine % retained on the 0.425mm test sieve

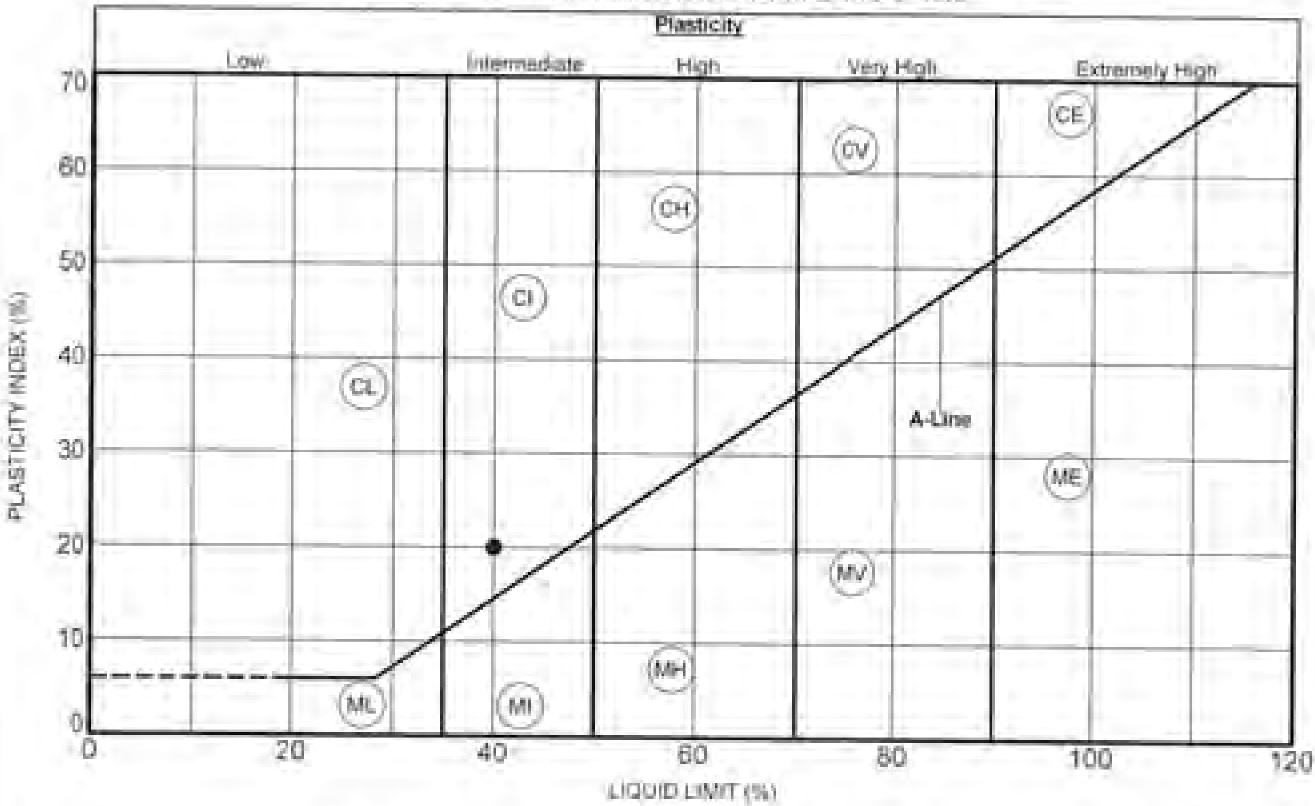
Contract Title :- Eston Road Intrusive Works	Client :- South Tees Development Corporation

Signed :- [signature]	Name :-		Page 2 of 3
Date of issue :- 05/11/2020	Certificate No :- PI/4287/2	AEG Contract No. :- 4287	UKAS TESTING 1367

ALLIED EXPLORATION & GEOTECHNICS LIMITED

ATTERBERG LIMITS & NATURAL MOISTURE CONTENT

Test Method :- BS 1377 : Part 2 : Clause 3.2, 4.1 to 4.4 & 5 : 1990



Exploratory Hole No.	Depth (m)	Sample Type/Ref.	Specific Depth (m)	LL	PL	PI	I_L	Preparation Method	<0.425mm (%)	m/c (%)	Date Tested	
● ATK_TP_012	2.90	J8	2.90	40	20	20	-0.03	Natural		19.5	03/08/2020	#

For description of sample please refer to the Laboratory Sample Description Sheet. # = insufficient for 4 point PI
If sample is prepared in the natural state we are unable to determine % retained on the 0.425mm test sieve.

Contract Title :- Eston Road Intrusive Works	Client :- South Tees Development Corporation

Signed :-	Name :-	Page 3 of 3
Date of issue :- 05/11/2020	Certificate No :- PI/4287/3	AEG Contract No :- 4287

UKAS TESTING 1367

Determination of Particle Density

LABORATORY TESTING ENCLOSURE 3

ALLIED EXPLORATION & GEOTECHNICS LIMITED

DETERMINATION OF PARTICLE DENSITY

BS1377 : Part 2 : Clause 8.2 : 1990

Exploratory Hole No.	Depth (m)	Sample Type & No.	Specific Depth (m)	Particle Density (Mg/m^3)	Date Tested
ATK_TP_001	1.40	B5	1.40	2.64	26/08/2020
ATK_TP_005	0.80	B2	0.80	2.32	26/08/2020
ATK_TP_007	3.50	B13	3.50	2.57	24/08/2020

For description of sample please refer to the Laboratory Sample Description Sheet

Contract Title :- Eston Road Intrusive Works	Client :- South Tees Development Corporation

Signed :-	Name :-	Page 1 of 1
Date of issue :- 05/11/2020	Certificate No :- PD/4287/1	AEG Contract No :- 4287

UKAS TESTING 1367

Particle Size Distribution Sieving and Sedimentation

LABORATORY TESTING ENCLOSURE 4

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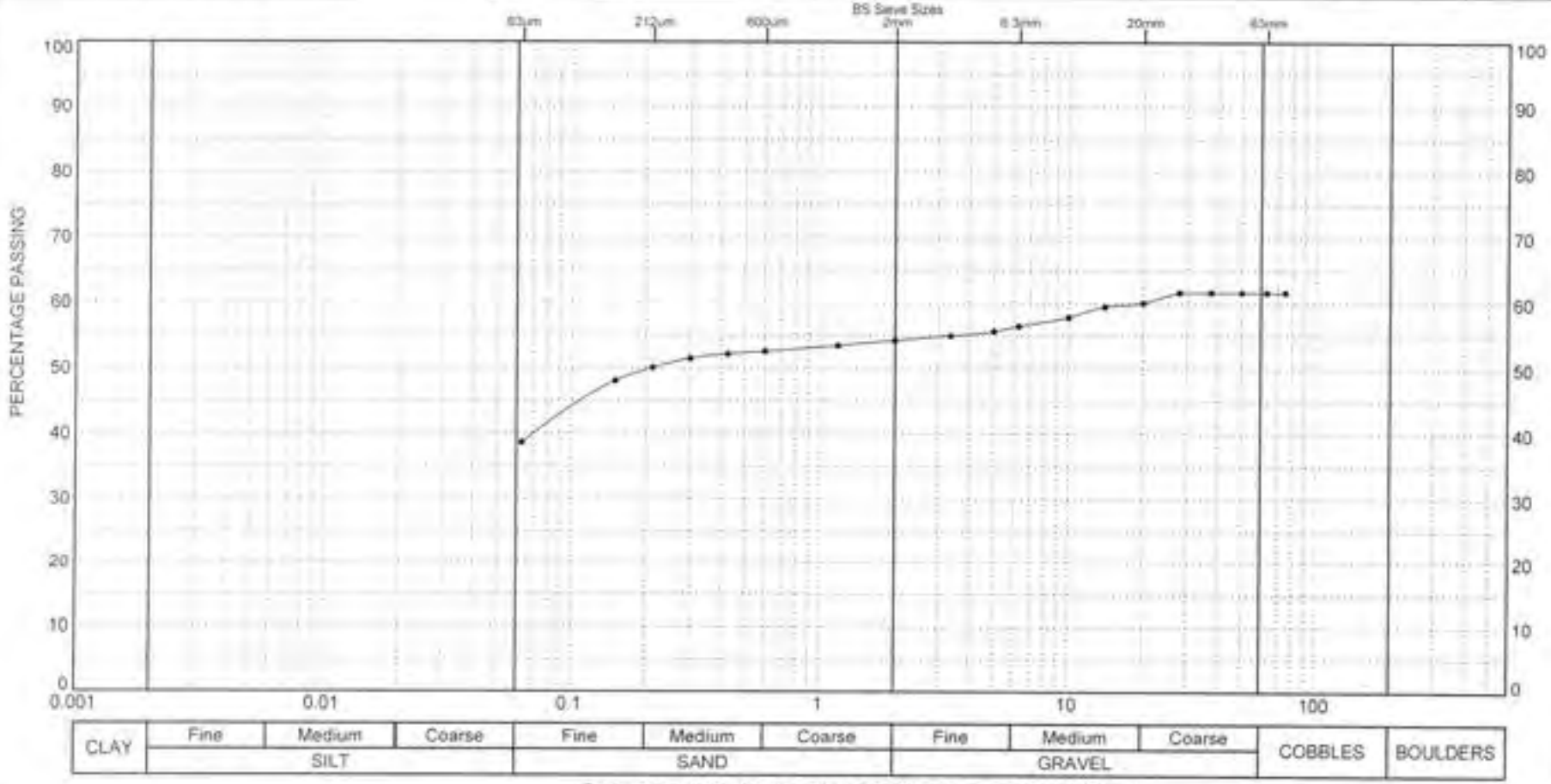
PARTICLE SIZE DISTRIBUTION

BS1377 : Part 2 : Clause 9.2 & 9.4 : 1990
(Test deviated from standard due to insufficient sample mass)

Exploratory Hole No :-	Depth (m) :-	Sample Type & No :-	Specific Depth (m) :-	Date Tested :-
ATK_TP_001	**1.40**	**B5**	**1.40**	**25/08/2020**



Sieve Size (mm)	Passing (%)
75	61.7
63	61.7
50	61.7
37.5	61.7
28	61.7
20	60.1
14	59.5
10	57.9
6.3	56.5
5	55.7
3.35	55.0
2	54.3
1.18	53.5
0.6	52.6
0.425	52.2
0.3	51.5
0.212	50.1
0.15	48.1
0.063	38.7

For description of sample please refer to the Laboratory Sample Description Sheet

Date of issue :-	Certificate No :-	Signed :-	Name :-	Page 1 of 1
05/11/2020	PSD/4287/ATK_TP_001/B5/1.40	MSenp	[illegible]	

Client :-	Contract Title :-	AEG Contract No :-
South Tees Development Corporation	Eston Road Intrusive Works	4287

UKAS TESTING 1367

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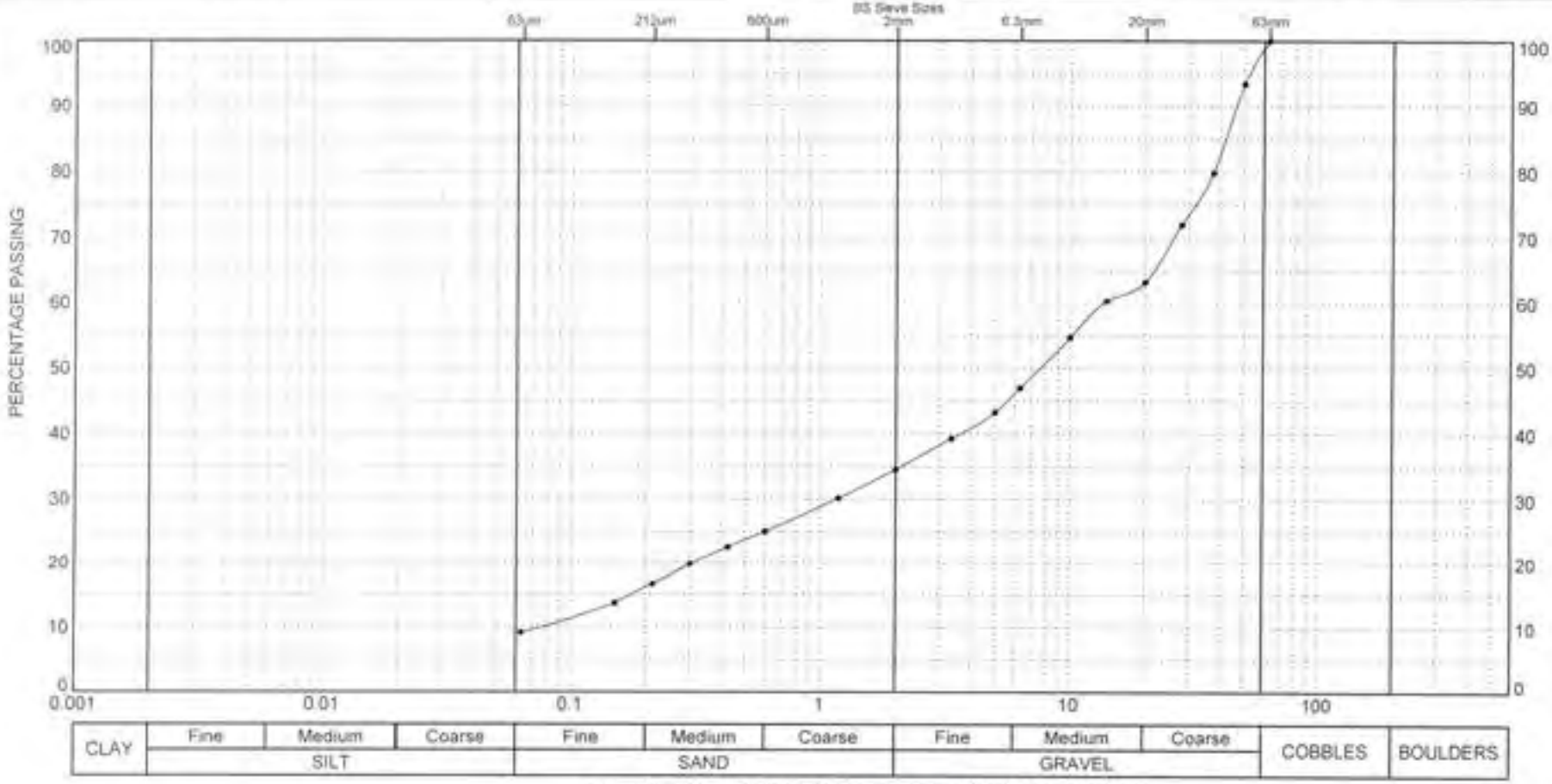
PARTICLE SIZE DISTRIBUTION

BS1377 : Part 2 : Clause 9.2 & 9.4 : 1990
(Test deviated from standard due to insufficient sample mass)

Exploratory Hole No :-	Depth (m) :-	Sample Type & No :-	Specific Depth (m) :-	Date Tested :-
ATK_TP_002	0.40	B2	0.40	24/08/2020



Sieve Size (mm)	Passing (%)
63	100.0
50	93.4
37.5	79.9
28	72.0
20	63.2
14	60.3
10	54.7
6.3	47.0
5	43.3
3.35	39.3
2	34.6
1.18	30.2
0.6	25.1
0.425	22.7
0.3	19.8
0.212	16.7
0.15	13.8
0.063	9.2

For description of sample please refer to the Laboratory Sample Description Sheet

Date of issue :-	Certificate No :-	Signed :-	Name :-	Page 1 of 1
05/11/2020	PSD/4287/ATK_TP_002/B2/0.40			

Client :-	Contract Title :-	AEG Contract No :-
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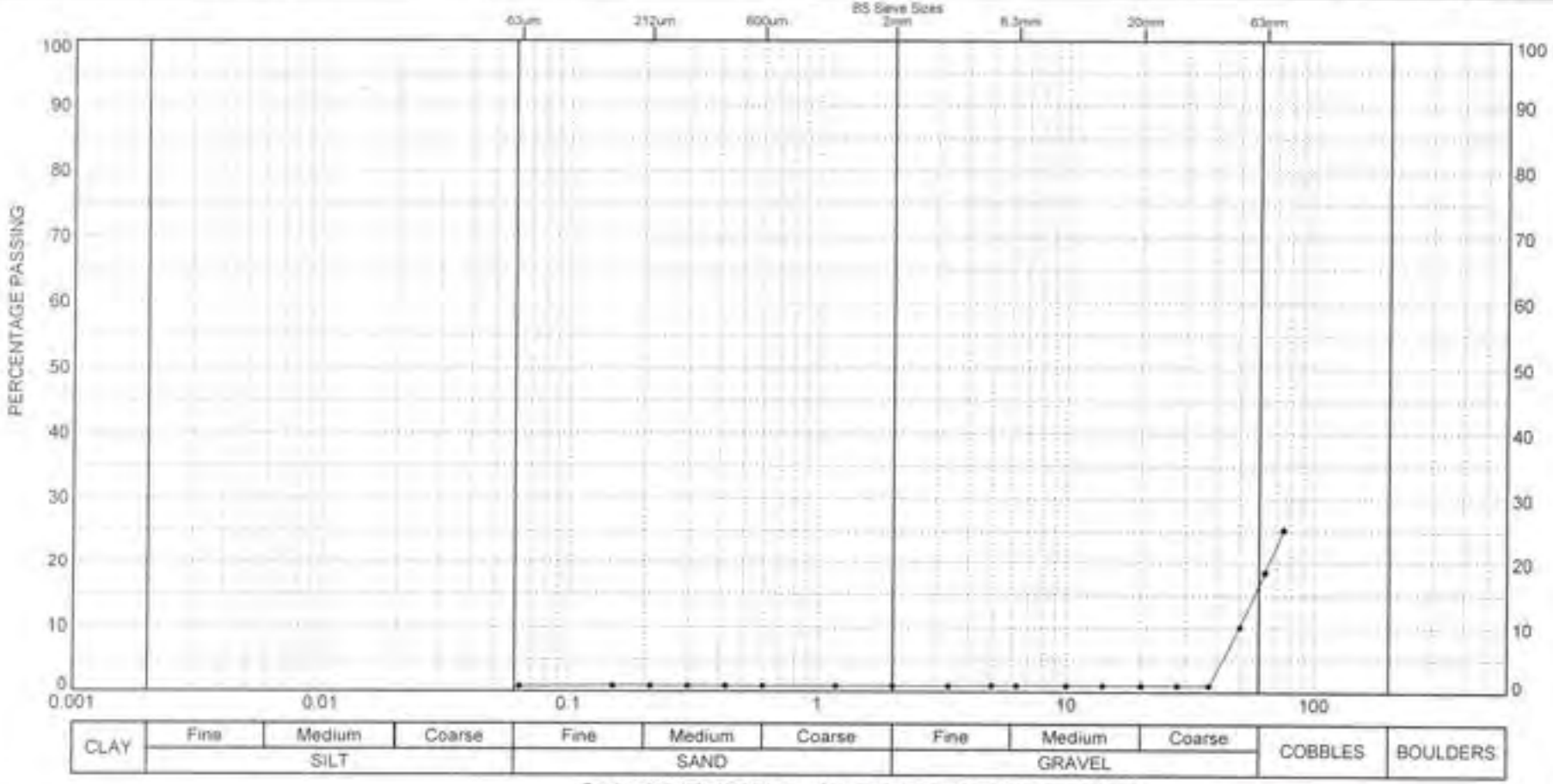
PARTICLE SIZE DISTRIBUTION

BS1377 : Part 2 : Clause 9.2 & 9.4 : 1990
(Test deviated from standard due to insufficient sample mass)

Exploratory Hole No :- **ATK_TP_004**	Depth (m) :- **1.00**	Sample Type & No :- **B2**	Specific Depth (m) :- **1.00**	Date Tested :- **29/07/2020**



Sieve Size (mm)	Passing (%)
75	25.4
63	18.6
50	10.2
37.5	1.0
28	1.0
20	1.0
14	1.0
10	1.0
6.3	1.0
5	1.0
3.35	0.9
2	0.9
1.18	0.9
0.6	0.9
0.425	0.9
0.3	0.9
0.212	0.9
0.15	0.9
0.063	0.8

For description of sample please refer to the Laboratory Sample Description Sheet

Date of issue :-	Certificate No :-	Signed :-	Name :-	Page 1 of 1
05/11/2020	PSD/4287/ATK_TP_004/B2/1.00			

Client :-	Contract Title :-	AEG Contract No :-
South Tees Development Corporation	Eston Road Intrusive Works	4287

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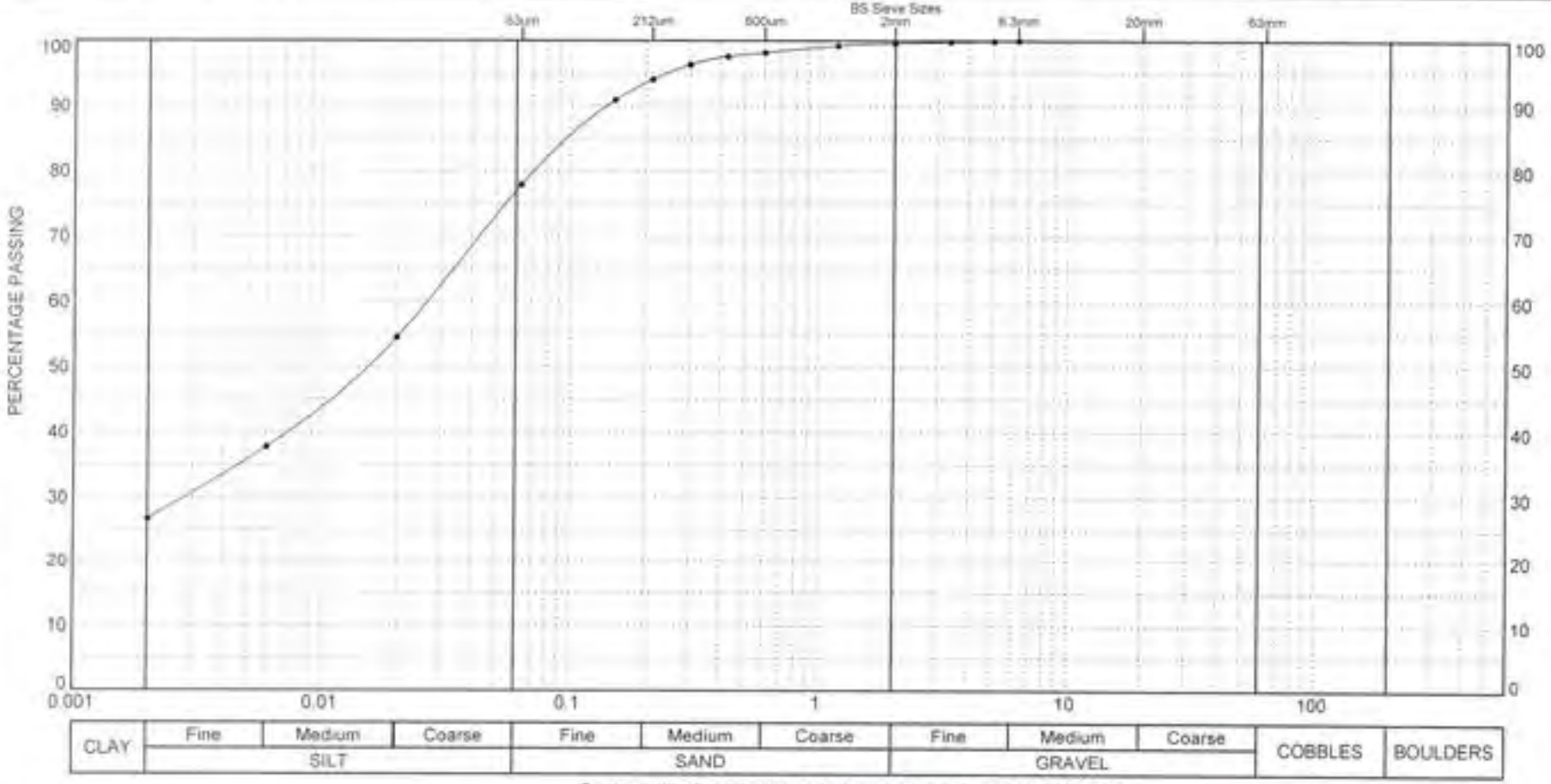
PARTICLE SIZE DISTRIBUTION

BS1377 : Part 2 : Clause 9.2 & 9.4 : 1990

Exploratory Hole No :- **ATK_TP_004**	Depth (m) :- **2.10**	Sample Type & No :- **B5**	Specific Depth (m) :- **2.10**	Date Tested :- **29/07/2020**



Sieve Size (mm)	Passing (%)
6.3	100.0
5	99.9
3.35	99.8
2	99.6
1.18	99.2
0.6	98.1
0.425	97.5
0.3	96.3
0.212	94.0
0.15	90.9
0.063	77.9
0.02	54.5
0.006	37.8
0.002	26.8

For description of sample please refer to the Laboratory Sample Description Sheet

Date of issue :-	Certificate No :-	Signed :-	Name :-	Page 1 of 1
05/11/2020	PSD/4287/ATK_TP_004/B5/2.10	MSmo		

Client :-	Contract Title :-	AEG Contract No :-
South Tees Development Corporation	Eston Road Intrusive Works	4287

UKAS TESTING 1367

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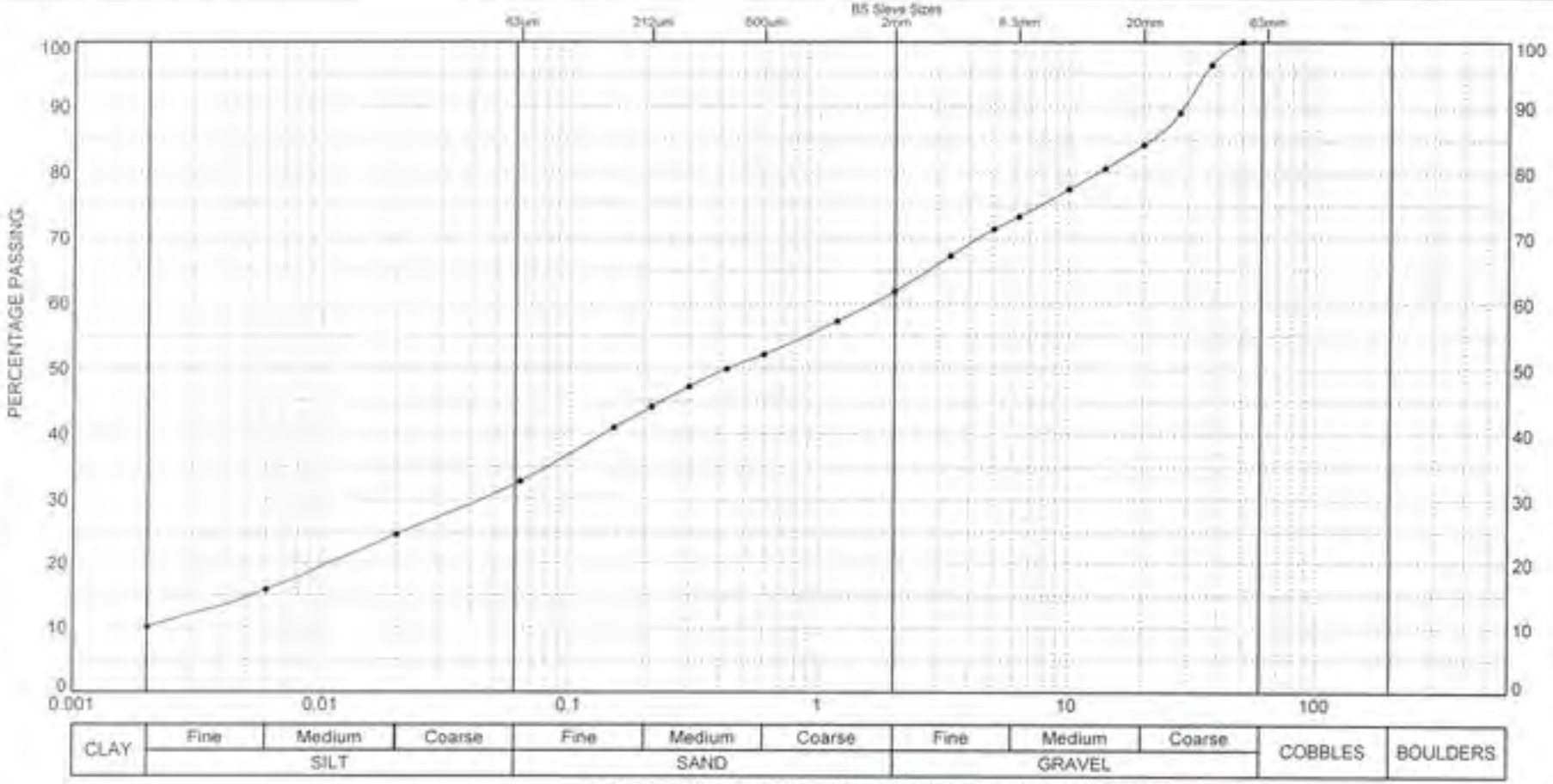
PARTICLE SIZE DISTRIBUTION

BS1377 : Part 2 : Clause 9.2 & 9.4 : 1990

Exploratory Hole No :- **ATK_TP_005**	Depth (m) :- **0.80**	Sample Type & No :- **B2**	Specific Depth (m) :- **0.80**	Date Tested :- **25/08/2020**



Sieve Size (mm)	Passing (%)
50	100.0
37.5	96.5
28	89.2
20	84.3
14	80.7
10	77.5
6.3	73.3
5	71.4
3.35	67.3
2	61.9
1.18	57.3
0.6	52.2
0.425	50.0
0.3	47.3
0.212	44.2
0.15	41.0
0.063	32.8
0.02	24.7
0.006	15.8
0.002	10.2

For description of sample please refer to the Laboratory Sample Description Sheet

Date of issue :-	Certificate No :-	Signed :-	Name :-	Page 1 of 1
05/11/2020	PSD/4287/ATK_TP_005/B2/0.80	msone		

Client :-	Contract Title :-	AEG Contract No :-
South Tees Development Corporation	Eston Road Intrusive Works	4287

UKAS TESTING 1367

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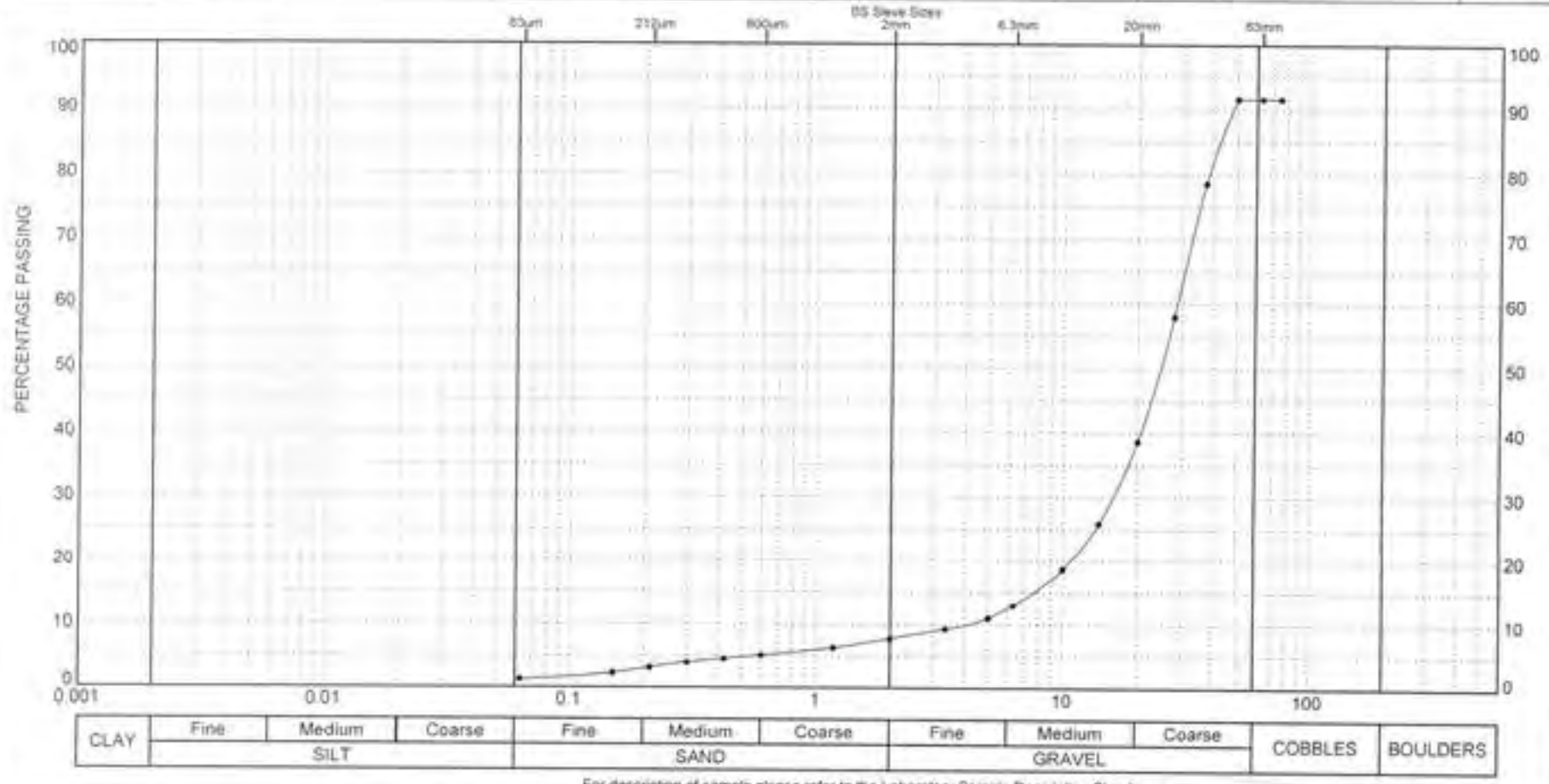
PARTICLE SIZE DISTRIBUTION

BS1377 : Part 2 : Clause 9.2 & 9.4 : 1990
(Test deviated from standard due to insufficient sample mass)

Exploratory Hole No :- **ATK_TP_006**	Depth (m) :- **0.30**	Sample Type & No :- **B2**	Specific Depth (m) :- **0.30**	Date Tested :- **25/08/2020**



Sieve Size (mm)	Passing (%)
75	91.6
63	91.6
50	91.6
37.5	78.6
28	58.0
20	38.7
14	26.0
10	18.7
6.3	13.0
5	11.0
3.35	9.3
2	7.7
1.18	6.3
0.6	5.1
0.425	4.5
0.3	3.9
0.212	3.1
0.15	2.3
0.063	1.3

For description of sample please refer to the Laboratory Sample Description Sheet

Date of issue :-	Certificate No :-	Signed :-	Name :-	Page 1 of 1
05/11/2020	PSD/4287/ATK_TP_006/B2/0.30	MSeal		

Client :-	Contract Title :-	AEG Contract No :-
South Tees Development Corporation	Eston Road Intrusive Works	4287

UKAS TESTING 1367

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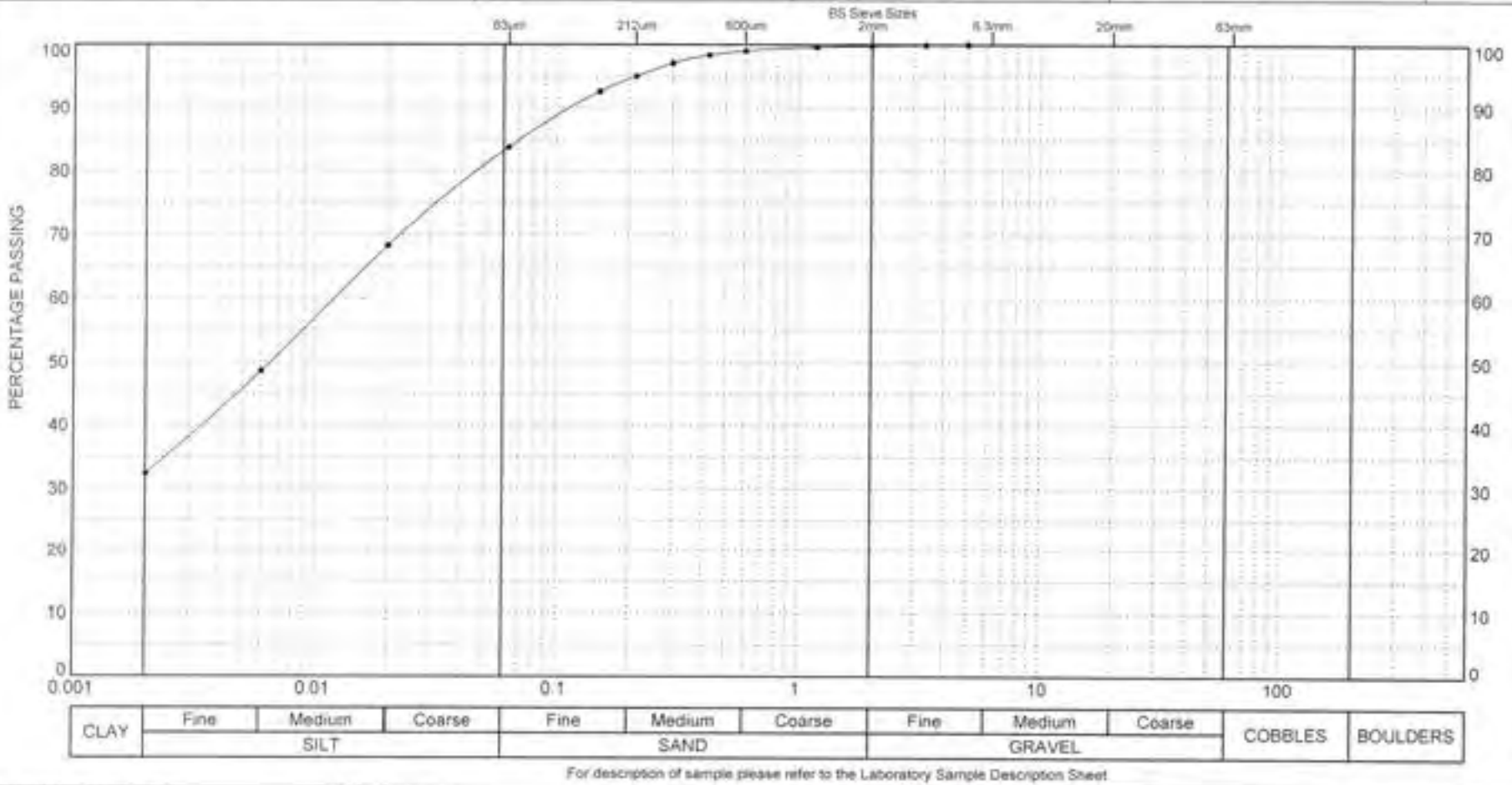
PARTICLE SIZE DISTRIBUTION

BS1377 : Part 2 : Clause 9.2 & 9.4 : 1990

Exploratory Hole No :- **ATK_TP_006**	Depth (m) :- **1.40**	Sample Type & No :- **B7**	Specific Depth (m) :- **1.40**	Date Tested :- **24/08/2020**



Sieve Size (mm)	Passing (%)
5	100.0
3.35	99.9
2	99.8
1.18	99.6
0.6	99.0
0.425	98.3
0.3	97.0
0.212	95.0
0.15	92.6
0.063	83.8
0.02	68.3
0.006	48.6
0.002	32.4

For description of sample please refer to the Laboratory Sample Description Sheet

Date of issue :-	Certificate No :-	Signed :-	Name :-	Page 1 of 1
05/11/2020	PSD/4287/ATK_TP_006/B7/1.40	MSeno		

Client :-	Contract Title :-	AEG Contract No :-
South Tees Development Corporation	Eston Road Intrusive Works	4287

UKAS TESTING 1367

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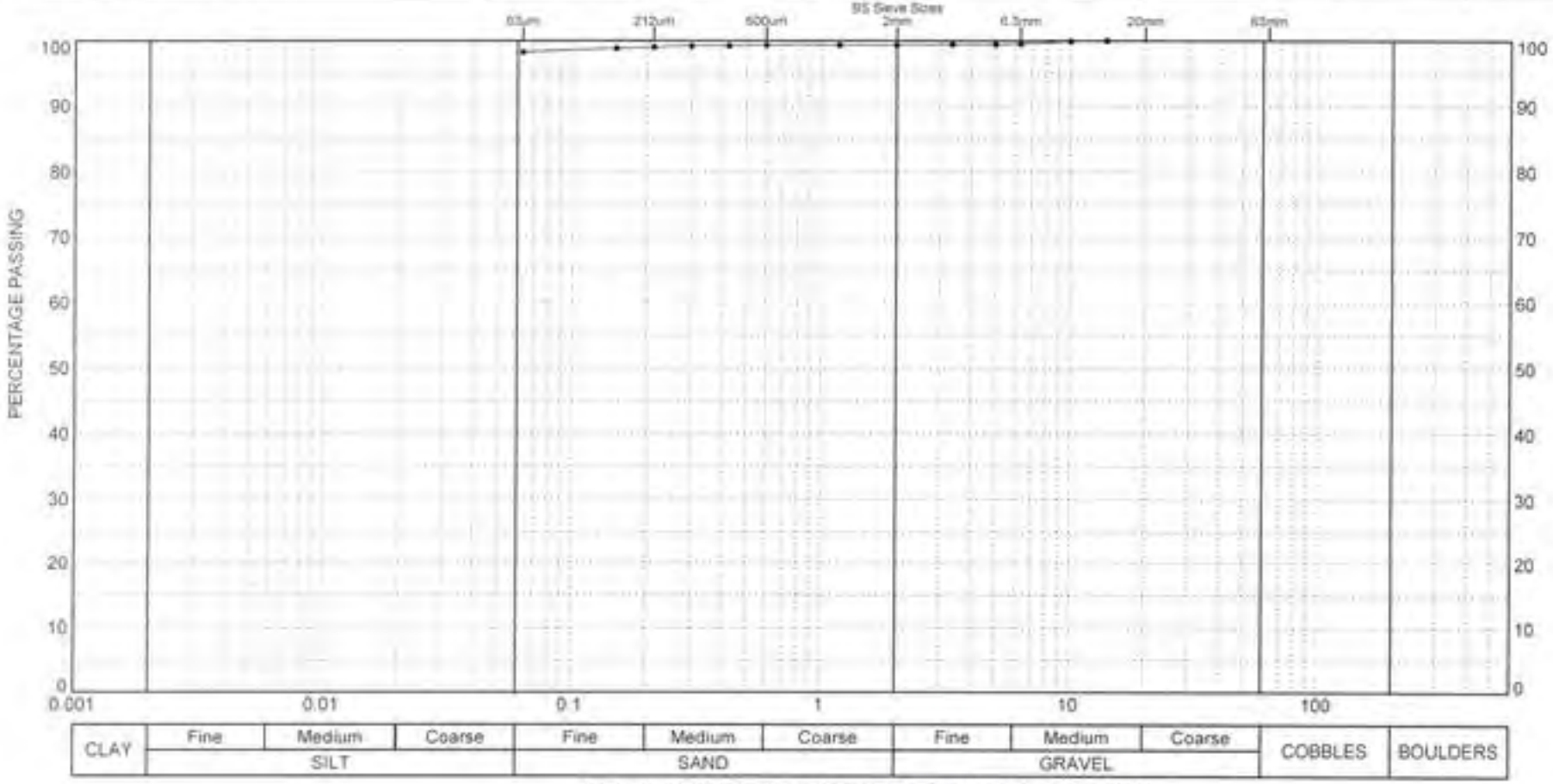
PARTICLE SIZE DISTRIBUTION

BS1377 : Part 2 : Clause 9.2 & 9.4 : 1990

Exploratory Hole No :- **ATK_TP_006**	Depth (m) :- **2.30**	Sample Type & No :- **B9**	Specific Depth (m) :- **2.30**	Date Tested :- **29/07/2020**



Sieve Size (mm)	Passing (%)
14	100.0
10	99.9
6.3	99.5
5	99.4
3.35	99.4
2	99.3
1.18	99.3
0.6	99.3
0.425	99.2
0.3	99.2
0.212	99.0
0.15	98.8
0.063	98.2

For description of sample please refer to the Laboratory Sample Description Sheet

Date of issue :-	Certificate No :-	Signed :-	Name :-	Page 1 of 1
05/11/2020	PSD/4287/ATK_TP_006/B9/2.30	MSond		

Client :-	Contract Title :-	AEG Contract No :-
South Tees Development Corporation	Eston Road Intrusive Works	4287

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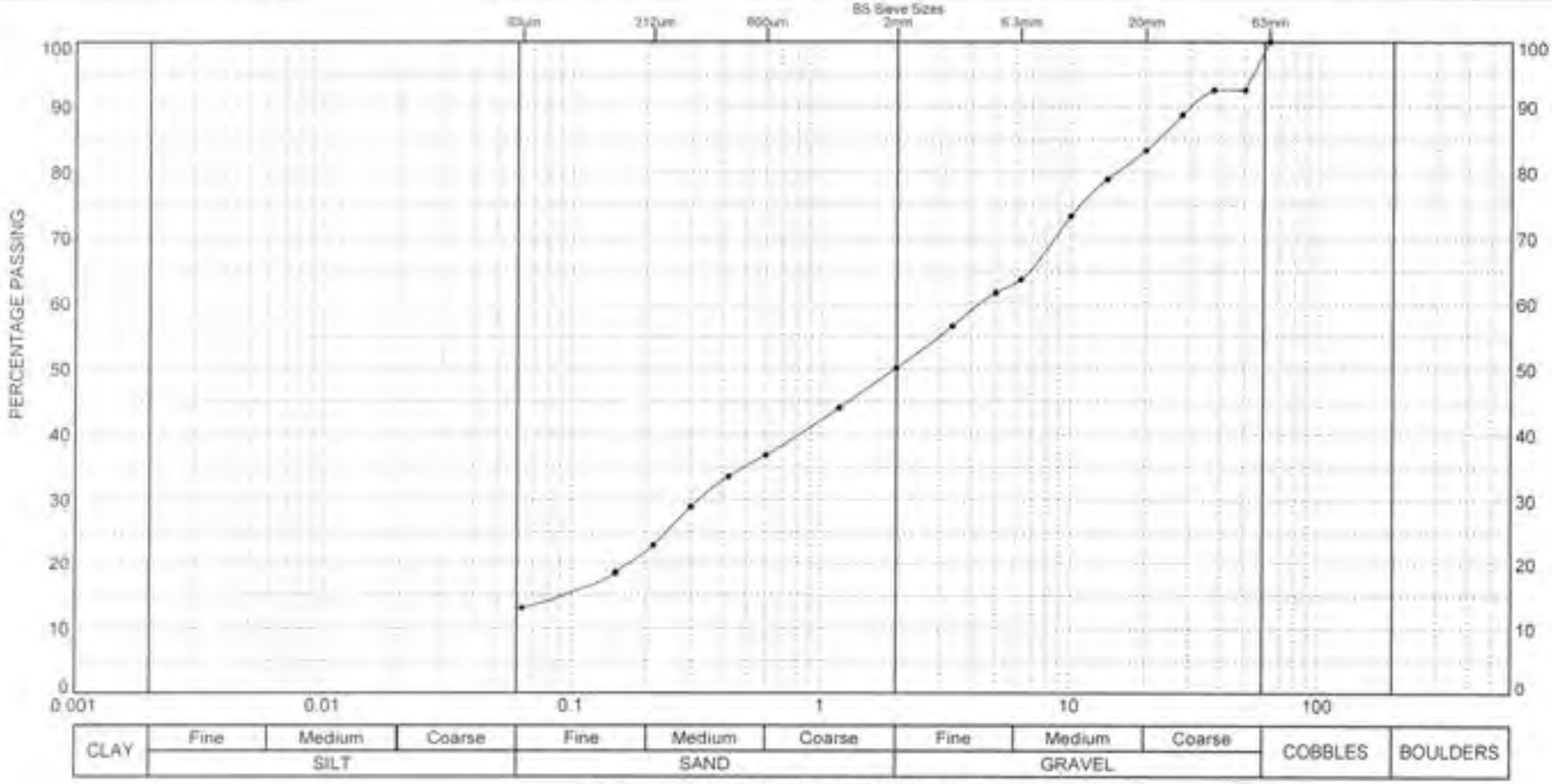
PARTICLE SIZE DISTRIBUTION

BS1377 : Part 2 : Clause 9.2 & 9.4 : 1990

Exploratory Hole No :- **ATK_TP_007**	Depth (m) :- **0.50**	Sample Type & No :- **B3**	Specific Depth (m) :- **0.50**	Date Tested :- **24/08/2020**



Sieve Size (mm)	Passing (%)
63	100.0
50	92.6
37.5	92.6
28	88.8
20	83.4
14	79.0
10	73.4
6.3	63.7
5	61.7
3.35	56.6
2	50.2
1.18	44.1
0.6	36.9
0.425	33.6
0.3	29.0
0.212	23.1
0.15	18.6
0.063	13.2

For description of sample please refer to the Laboratory Sample Description Sheet

Date of issue :-	Certificate No :-	Signed :-	Name :-	Page 1 of 1
05/11/2020	PSD/4287/ATK_TP_007/B3/0.50			

Client :-	Contract Title :-	AEG Contract No :-
South Tees Development Corporation	Eston Road Intrusive Works	4287

UKAS TESTING 1367

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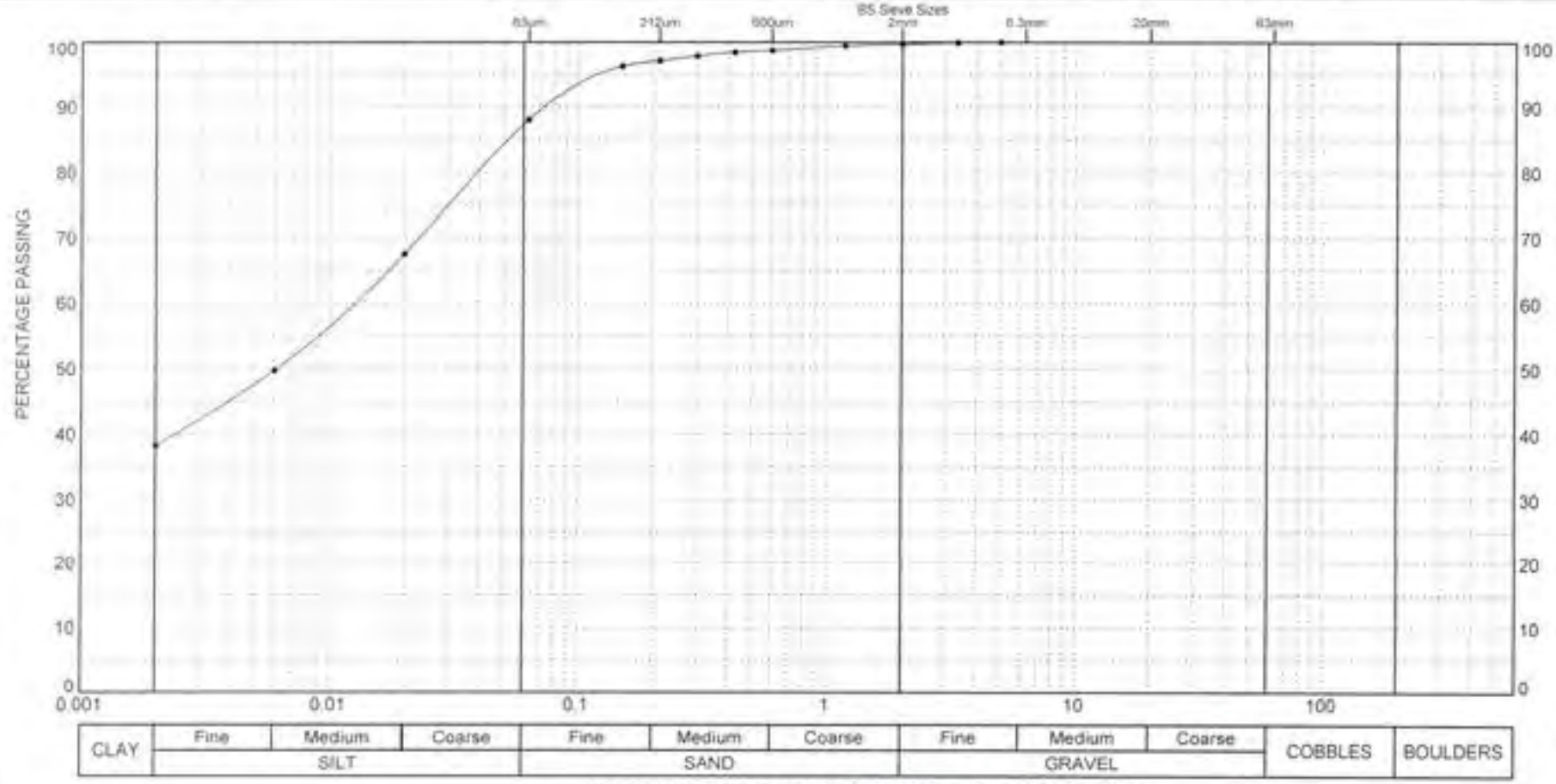
PARTICLE SIZE DISTRIBUTION

BS1377 : Part 2 : Clause 9.2 & 9.4 : 1990

Exploratory Hole No :- **ATK_TP_007**	Depth (m) :- **1.50**	Sample Type & No :- **B8**	Specific Depth (m) :- **1.50**	Date Tested :- **29/07/2020**



Sieve Size (mm)	Passing (%)
5	100.0
3.35	99.9
2	99.7
1.18	99.4
0.6	98.7
0.425	98.4
0.3	97.8
0.212	97.1
0.15	96.3
0.063	88.1
0.02	67.5
0.006	49.8
0.002	38.3

For description of sample please refer to the Laboratory Sample Description Sheet

Date of issue :-	Certificate No :-	Signed :-	Name :-	Page 1 of 1
05/11/2020	PSD/4287/ATK_TP_007/B8/1.50			

Client :-	Contract Title :-	AEG Contract No :-
South Tees Development Corporation	Eston Road Intrusive Works	4287

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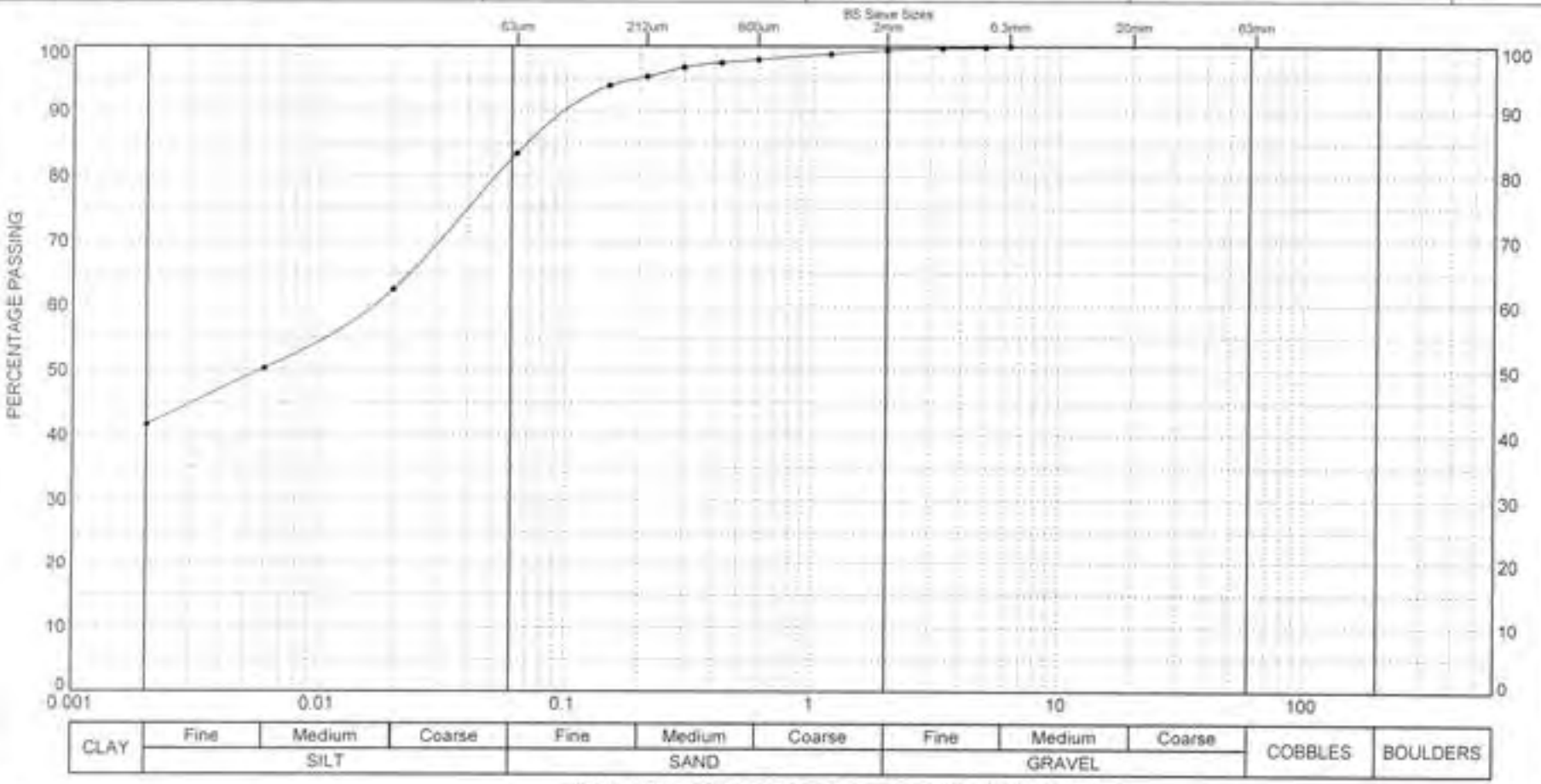
PARTICLE SIZE DISTRIBUTION

BS1377 : Part 2 : Clause 9.2 & 9.4 : 1990

Exploratory Hole No :- **ATK_TP_007**	Depth (m) :- **2.50**	Sample Type & No :- **B10**	Specific Depth (m) :- **2.50**	Date Tested :- **29/07/2020**



Sieve Size (mm)	Passing (%)
6.3	100.0
5	99.8
3.35	99.7
2	99.4
1.18	98.8
0.6	97.9
0.425	97.4
0.3	96.7
0.212	95.3
0.15	93.9
0.063	83.5
0.02	62.5
0.006	50.3
0.002	41.7

For description of sample please refer to the Laboratory Sample Description Sheet

Date of issue :-	Certificate No :-	Signed :-	Name :-	Page 1 of 1
05/11/2020	PSD/4287/ATK_TP_007/B10/2.50	MSeal		

Client :-	Contract Title :-	AEG Contract No :-
South Tees Development Corporation	Eston Road Intrusive Works	4287

UKAS TESTING 1367

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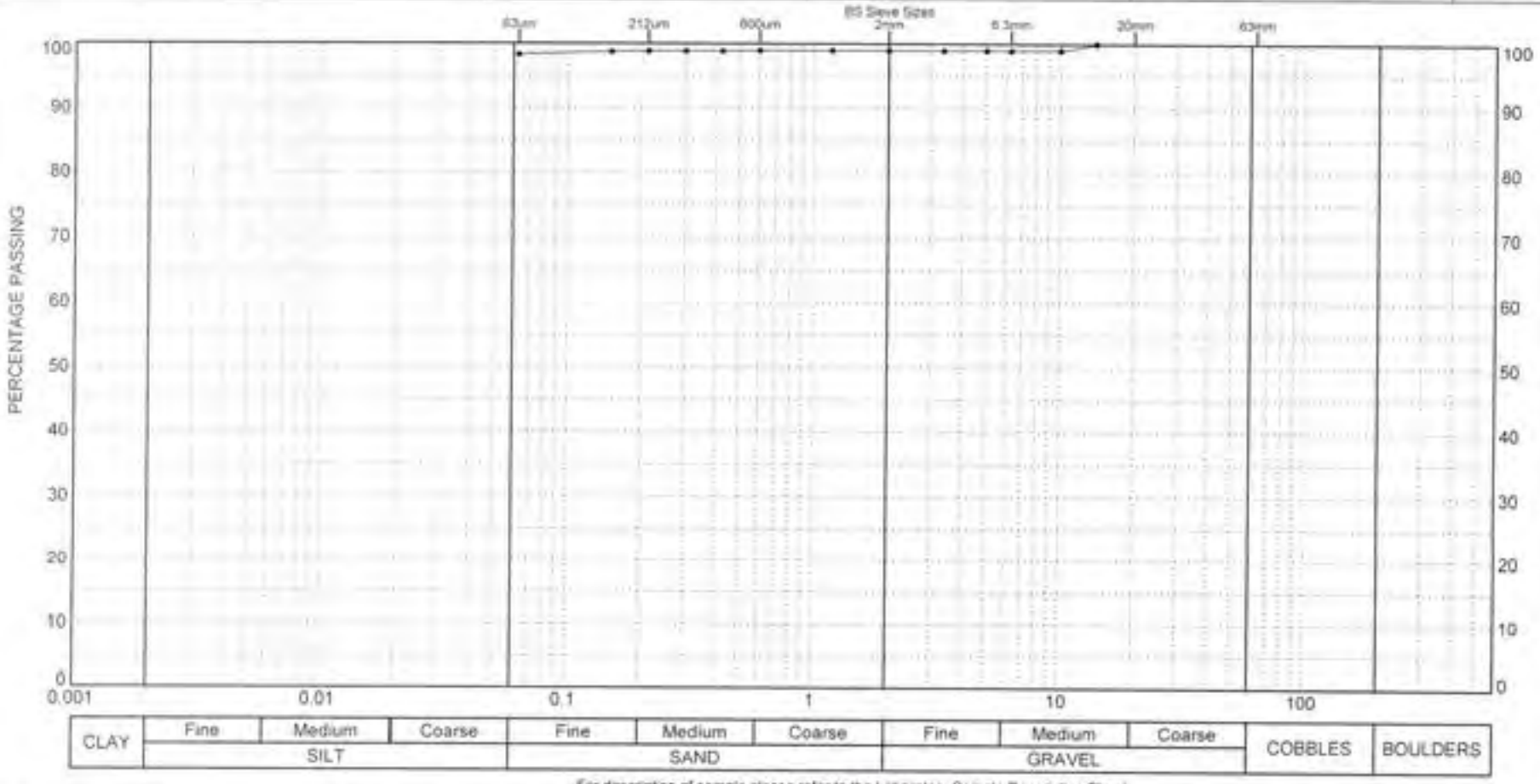
PARTICLE SIZE DISTRIBUTION

BS1377 : Part 2 : Clause 9.2 & 9.4 : 1990

Exploratory Hole No :- **ATK_TP_007**	Depth (m) :- **3.50**	Sample Type & No :- **B13**	Specific Depth (m) :- **3.50**	Date Tested :- **29/07/2020**



Sieve Size (mm)	Passing (%)
14	100.0
10	98.9
6.3	98.9
5	98.9
3.35	98.9
2	98.9
1.18	98.9
0.6	98.9
0.425	98.8
0.3	98.8
0.212	98.8
0.15	98.7
0.063	98.2

For description of sample please refer to the Laboratory Sample Description Sheet

Date of issue :-	Certificate No :-	Signed :-	Name :-	Page 1 of 1
05/11/2020	PSD/4287/ATK_TP_007/B13/3.50	MSD		

Client :-	Contract Title :-	AEG Contract No :-
South Tees Development Corporation	Eston Road Intrusive Works	4287

UKAS TESTING 1367

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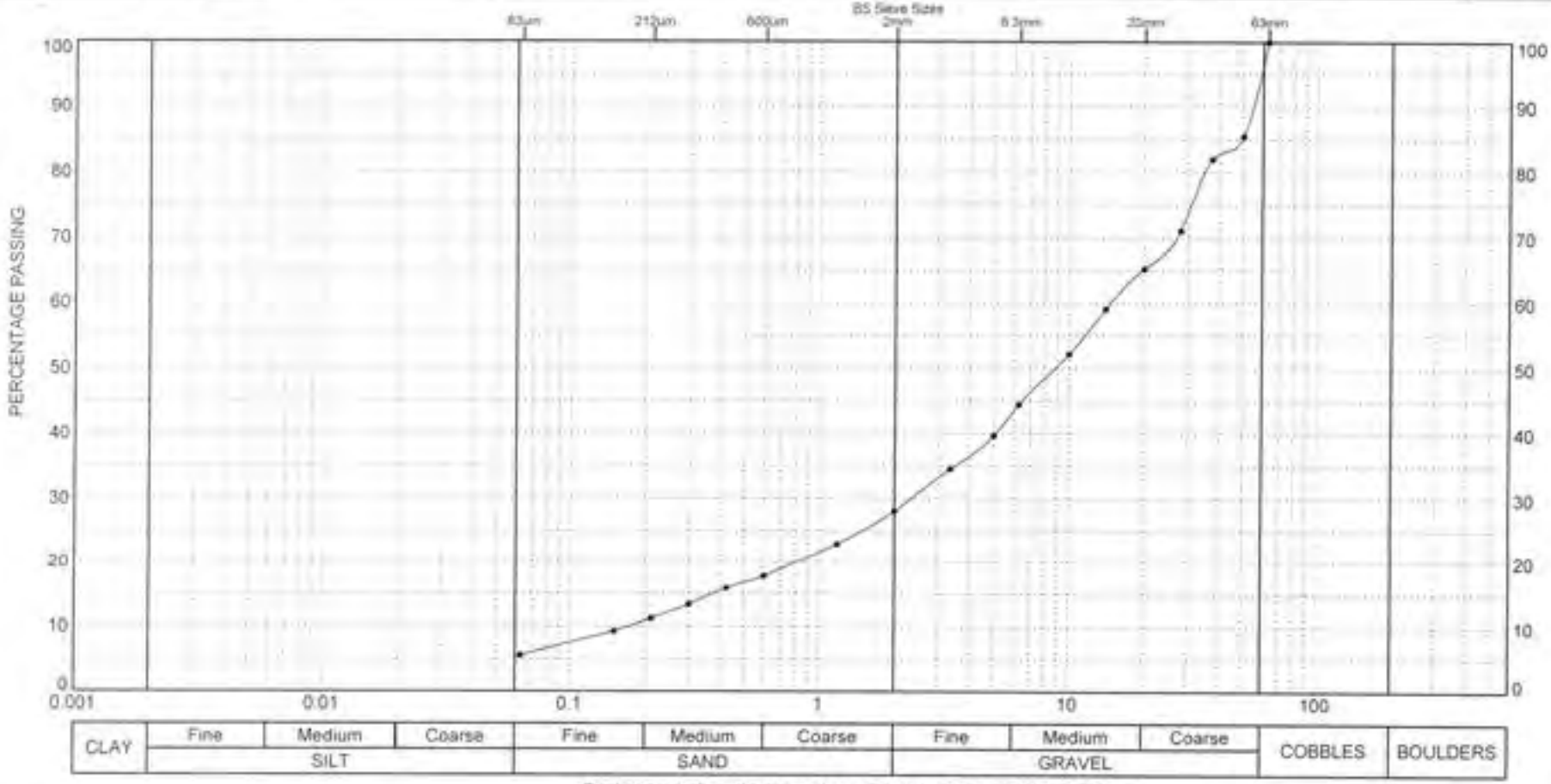
PARTICLE SIZE DISTRIBUTION

BS1377 : Part 2 : Clause 9.2 & 9.4 : 1990
(Test deviated from standard due to insufficient sample mass)

Exploratory Hole No :- **ATK_TP_008**	Depth (m) :- **0.80**	Sample Type & No :- **B2**	Specific Depth (m) :- **0.80**	Date Tested :- **29/07/2020**



Sieve Size (mm)	Passing (%)
63	100.0
50	85.5
37.5	82.0
28	71.1
20	65.3
14	59.1
10	52.2
6.3	44.5
5	39.7
3.35	34.6
2	28.1
1.18	23.0
0.6	17.9
0.425	15.9
0.3	13.5
0.212	11.2
0.15	9.3
0.063	5.6

For description of sample please refer to the Laboratory Sample Description Sheet

Date of issue :-	Certificate No :-	Signed :-	Name :-	Page 1 of 1
05/11/2020	PSD/4287/ATK_TP_008/B2/0.80	MSone		

Client :-	Contract Title :-	AEG Contract No :-
South Tees Development Corporation	Eston Road Intrusive Works	4287

UKAS TESTING 1367

ALLIED EXPLORATION & GEOTECHNICS LIMITED

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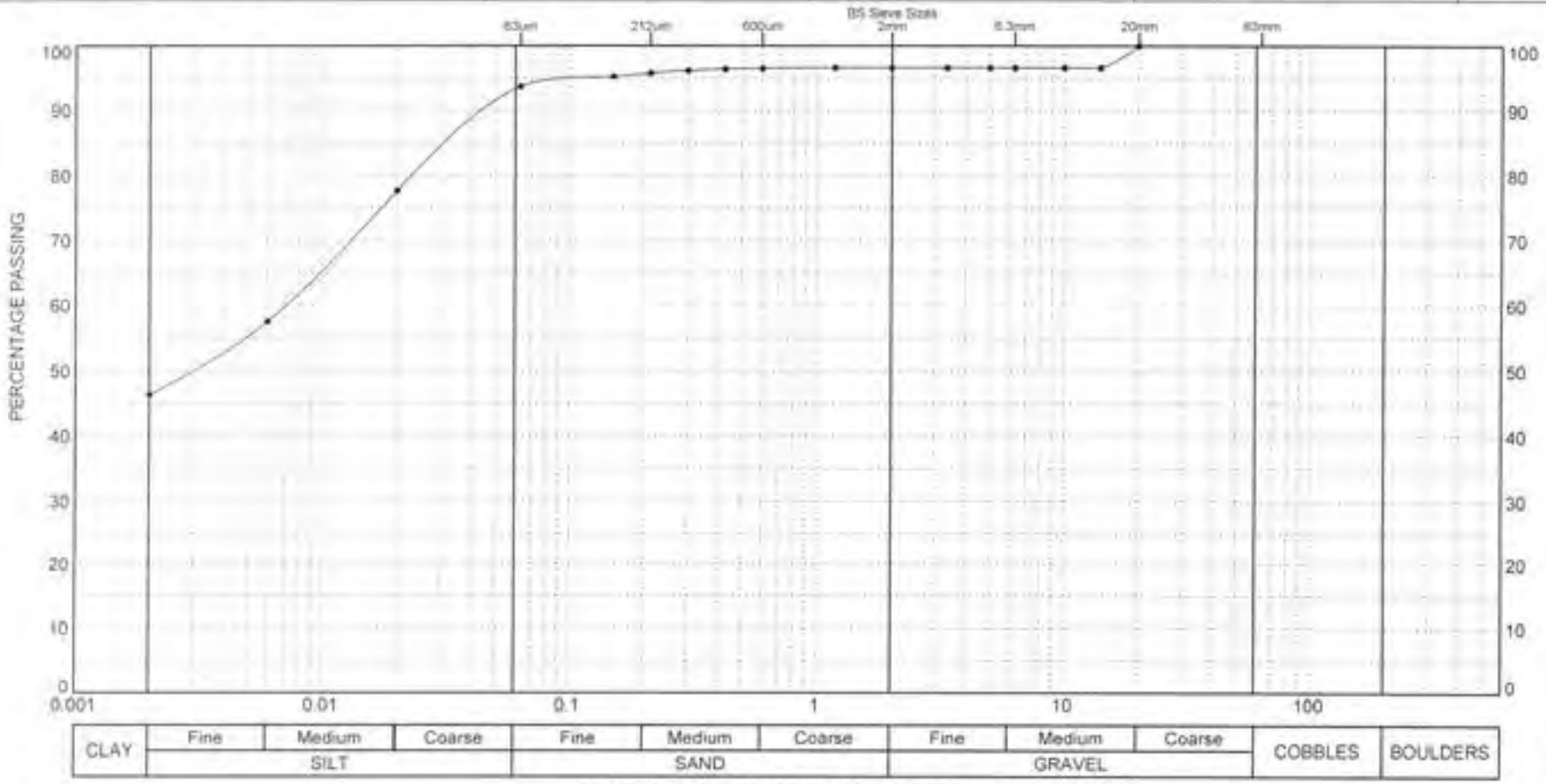
Regional Office: Unit 20, Business Development Centre, Earcars Wharf, Blackburn, BB1 3BL - Tel: 01772 336 300 Fax: 01772 336 999

PARTICLE SIZE DISTRIBUTION

BS1377 : Part 2 : Clause 9.2 & 9.4 : 1990

Exploratory Hole No :- **ATK_TP_009**	Depth (m) :- **1.30**	Sample Type & No :- **B5**	Specific Depth (m) :- **1.30**	Date Tested :- **29/07/2020**



Sieve Size (mm)	Passing (%)
20	100.0
14	96.6
10	96.6
6.3	96.6
5	96.6
3.35	96.6
2	96.6
1.18	96.6
0.6	96.5
0.425	96.4
0.3	96.2
0.212	95.8
0.15	95.3
0.063	93.7
0.02	77.7
0.006	57.6
0.002	46.4

For description of sample please refer to the Laboratory Sample Description Sheet

Date of issue :-	Certificate No :-	Signed :-	Name :-	Page 1 of 1
05/11/2020	PSD/4287/ATK_TP_009/B5/1.30			

Client :-	Contract Title :-	AEG Contract No :-
South Tees Development Corporation	Eston Road Intrusive Works	4287

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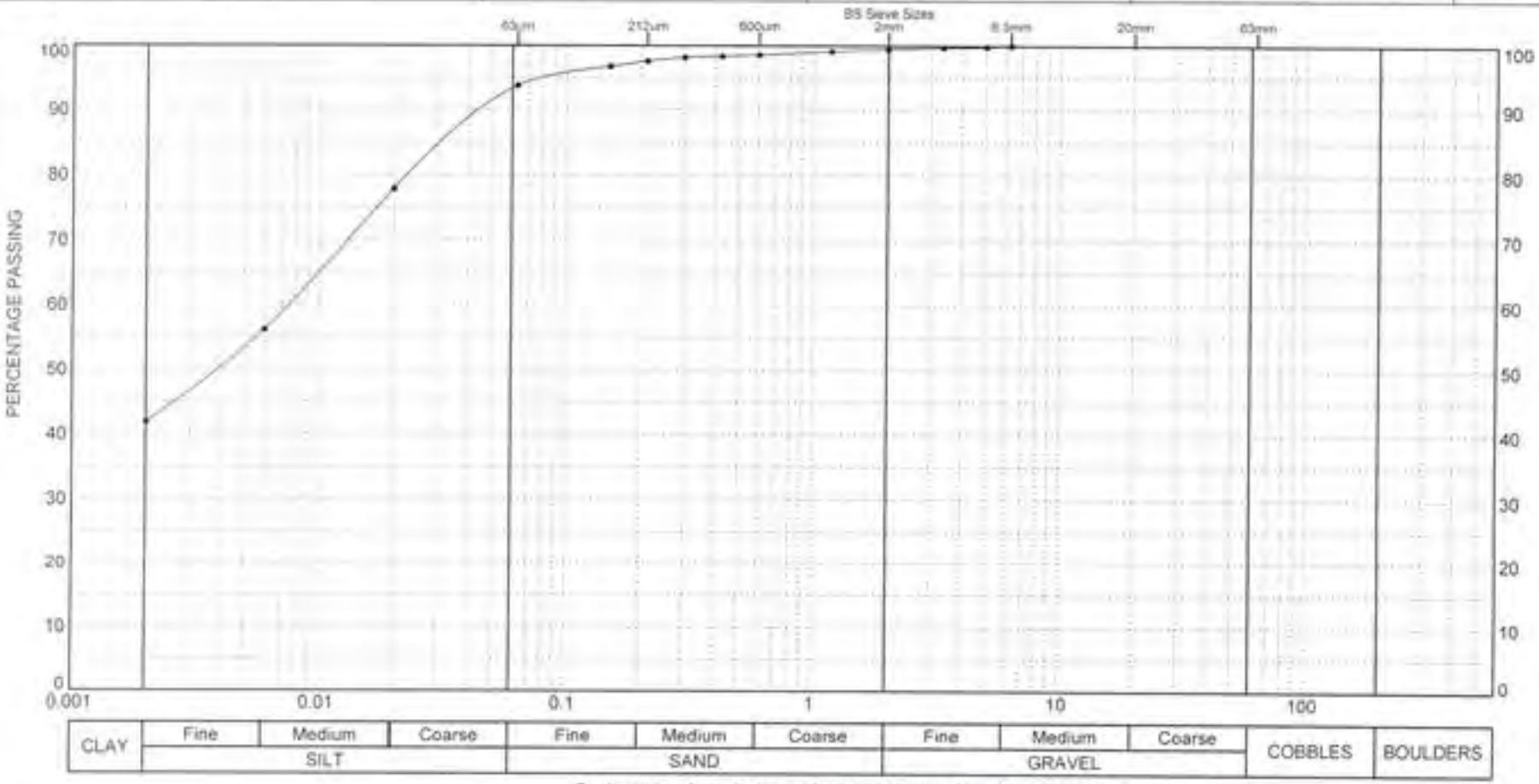
PARTICLE SIZE DISTRIBUTION

BS1377 : Part 2 : Clause 9.2 & 9.4 : 1990

Exploratory Hole No :- **ATK_TP_009**	Depth (m) :- **2.30**	Sample Type & No :- **B8**	Specific Depth (m) :- **2.30**	Date Tested :- **18/08/2020**



Sieve Size (mm)	Passing (%)
6.3	100.0
5	99.8
3.35	99.7
2	99.4
1.18	99.1
0.6	98.5
0.425	98.3
0.3	98.1
0.212	97.5
0.15	96.7
0.063	93.7
0.02	77.9
0.006	56.2
0.002	41.9

For description of sample please refer to the Laboratory Sample Description Sheet

Date of issue :-	Certificate No :-	Signed :-	Name :-	Page 1 of 1
05/11/2020	PSD/4287/ATK_TP_009/B8/2.30	MSone		

Client :-	Contract Title :-	AEG Contract No :-
South Tees Development Corporation	Eston Road Intrusive Works	4287

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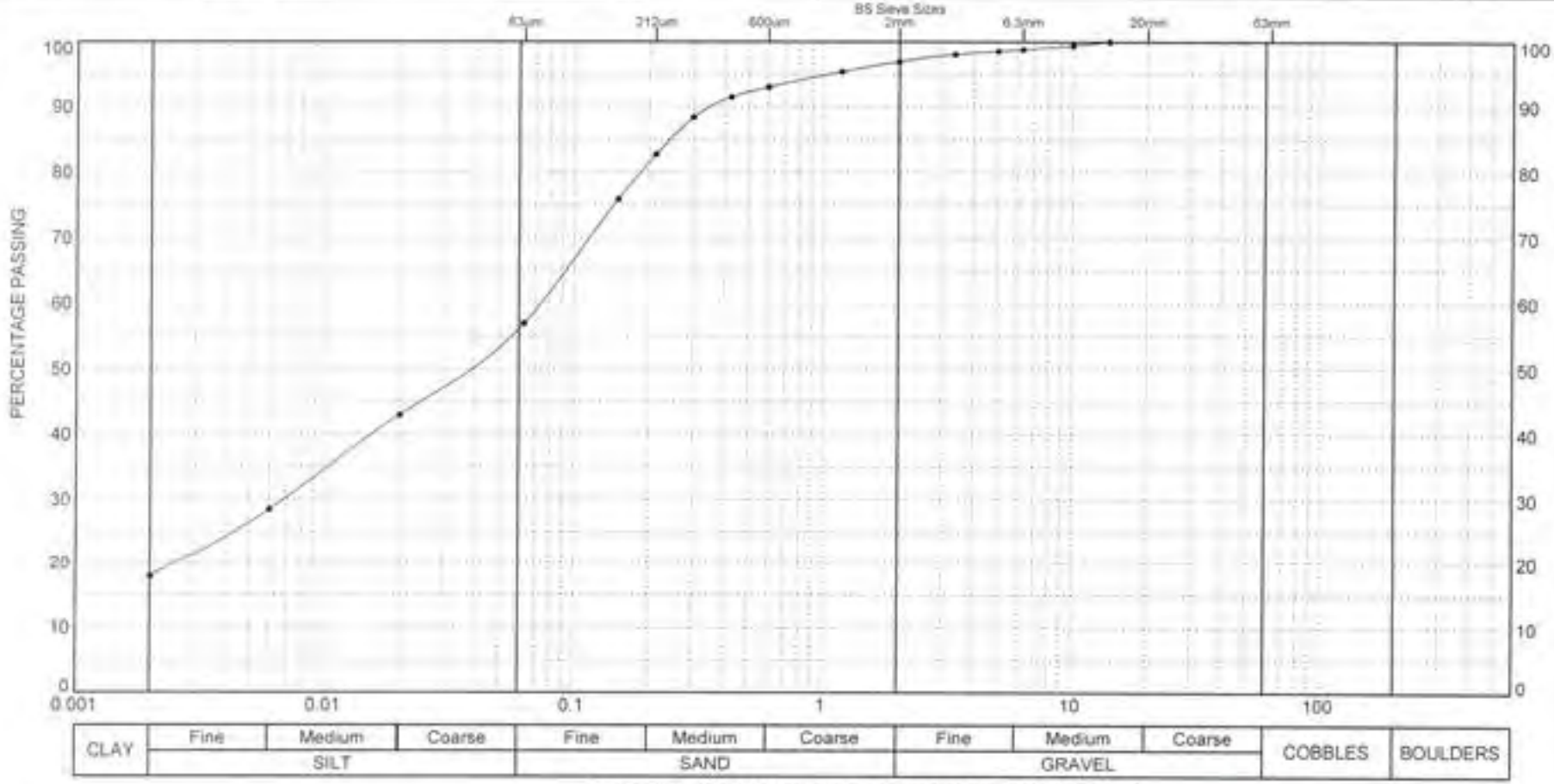
PARTICLE SIZE DISTRIBUTION

BS1377 : Part 2 : Clause 9.2 & 9.4 : 1990

Exploratory Hole No :- **ATK_TP_010**	Depth (m) :- **1.50**	Sample Type & No :- **B7**	Specific Depth (m) :- **1.50**	Date Tested :- **25/08/2020**



Sieve Size (mm)	Passing (%)
14	100.0
10	99.4
6.3	98.8
5	98.5
3.35	98.0
2	96.9
1.18	95.4
0.6	93.0
0.425	91.5
0.3	88.4
0.212	82.7
0.15	75.9
0.063	56.9
0.02	43.0
0.006	28.5
0.002	18.0

For description of sample please refer to the Laboratory Sample Description Sheet

Date of issue :-	Certificate No :-	Signed :-	Name :-	Page 1 of 1
05/11/2020	PSD/4287/ATK_TP_010/B7/1.50			

Client :-	Contract Title :-	AEG Contract No :-
South Tees Development Corporation	Eston Road Intrusive Works	4287

UKAS TESTING 1367

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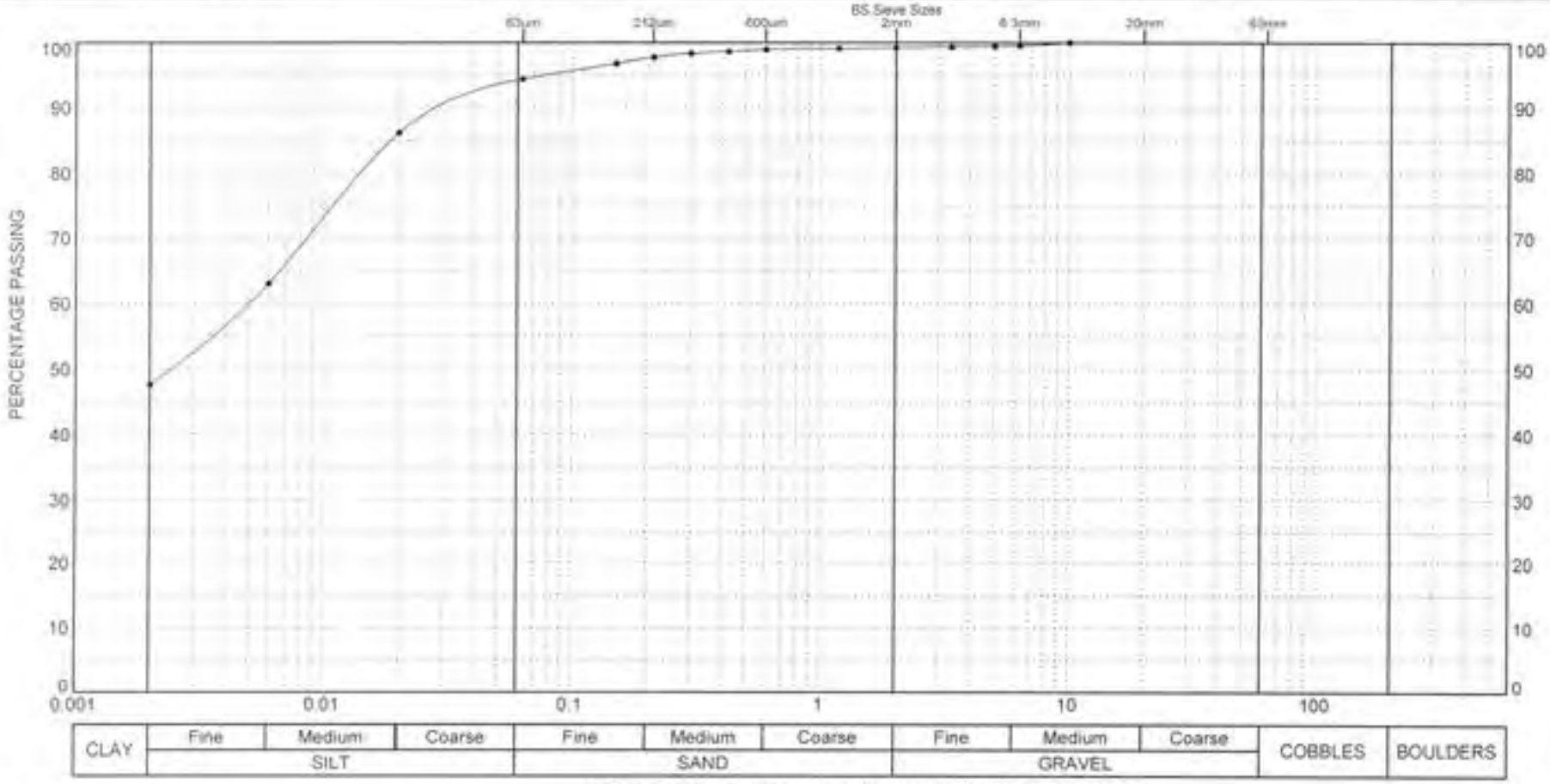
PARTICLE SIZE DISTRIBUTION

BS1377 : Part 2 : Clause 9.2 & 9.4 : 1990

Exploratory Hole No :- **ATK_TP_010**	Depth (m) :- **3.20**	Sample Type & No :- **B12**	Specific Depth (m) :- **3.20**	Date Tested :- **25/08/2020**



Sieve Size (mm)	Passing (%)
10	100.0
6.3	99.5
5	99.4
3.35	99.3
2	99.2
1.18	99.1
0.6	98.9
0.425	98.6
0.3	98.3
0.212	97.7
0.15	96.8
0.063	94.4
0.02	86.2
0.006	63.1
0.002	47.7

For description of sample please refer to the Laboratory Sample Description Sheet

Date of issue :-	Certificate No :-	Signed :-	Name :-	Page 1 of 1
05/11/2020	PSD/4287/ATK_TP_010/B12/3.20			

Client :-	Contract Title :-	AEG Contract No :-
South Tees Development Corporation	Eston Road Intrusive Works	4287

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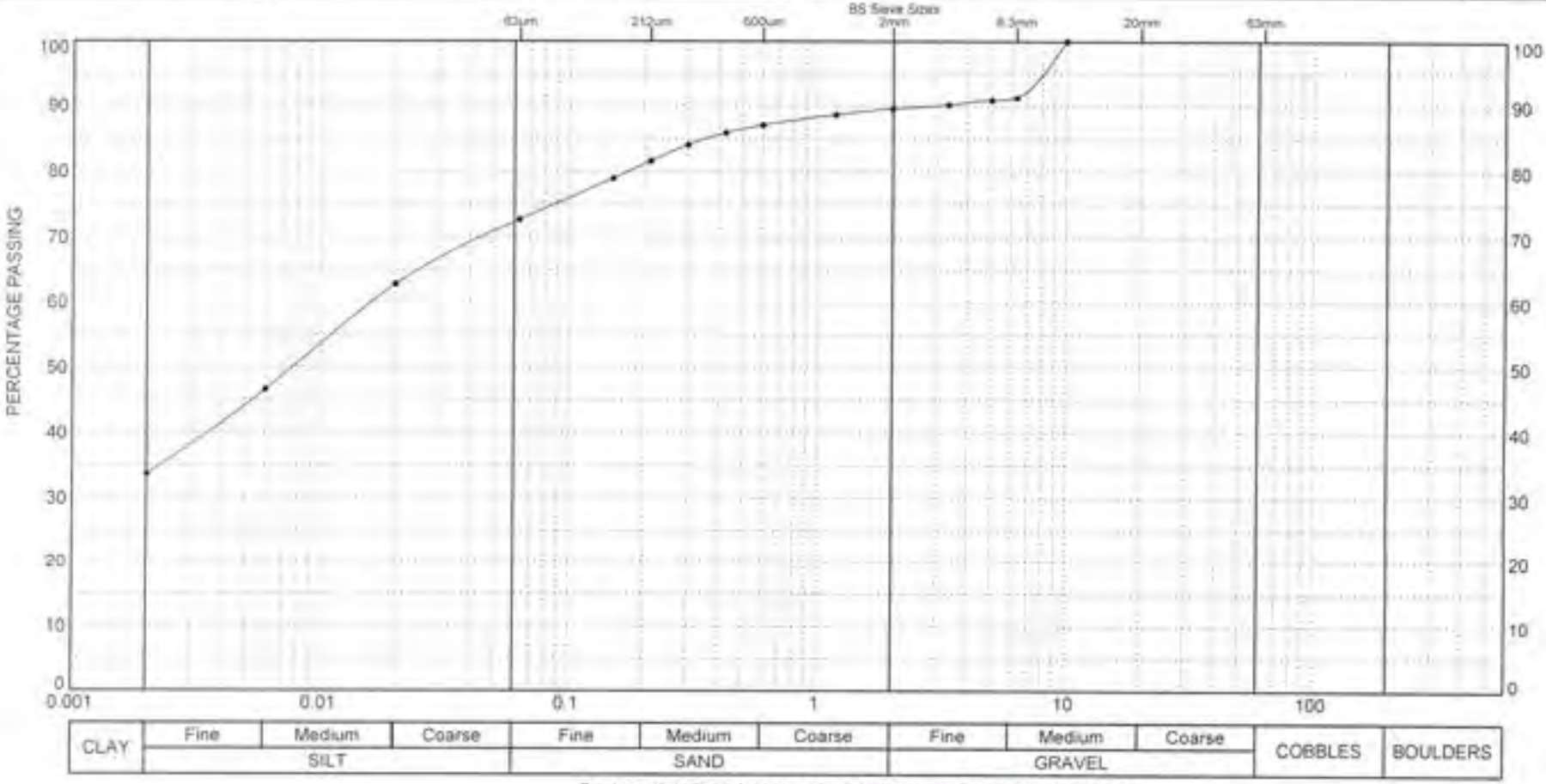
PARTICLE SIZE DISTRIBUTION

BS1377 : Part 2 : Clause 9.2 & 9.4 : 1990

Exploratory Hole No :- **ATK_TP_011**	Depth (m) :- **2.80**	Sample Type & No :- **B7**	Specific Depth (m) :- **2.80**	Date Tested :- **18/08/2020**



Sieve Size (mm)	Passing (%)
10	100.0
6.3	91.3
5	90.9
3.35	90.2
2	89.6
1.18	88.7
0.6	87.1
0.425	85.9
0.3	84.1
0.212	81.6
0.15	79.0
0.063	72.7
0.02	62.8
0.006	46.6
0.002	33.7

For description of sample please refer to the Laboratory Sample Description Sheet

Date of issue :-	Certificate No :-	Signed :-	Name :-	Page 1 of 1
05/11/2020	PSD/4287/ATK_TP_011/B7/2.80			

Client :-	Contract Title :-	AEG Contract No :-
South Tees Development Corporation	Eston Road Intrusive Works	4287

UKAS Testing 1367

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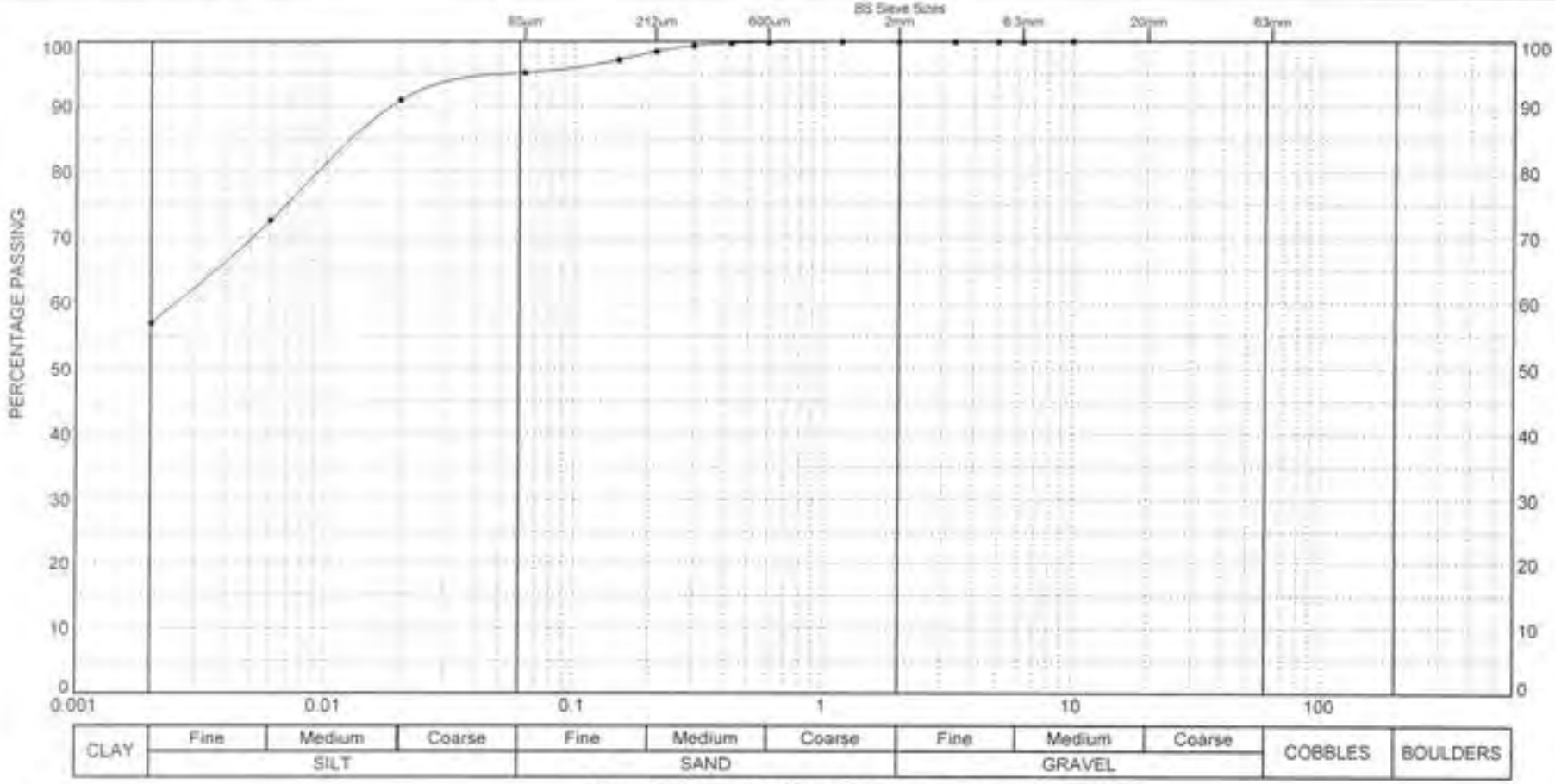
PARTICLE SIZE DISTRIBUTION

BS1377 : Part 2 : Clause 9.2 & 9.4 : 1990

Exploratory Hole No :- **ATK_TP_012**	Depth (m) :- **1.20**	Sample Type & No :- **B4**	Specific Depth (m) :- **1.20**	Date Tested :- **25/08/2020**



Sieve Size (mm)	Passing (%)
10	100.0
6.3	99.9
5	99.9
3.35	99.9
2	99.9
1.18	99.9
0.6	99.8
0.425	99.7
0.3	99.3
0.212	98.4
0.15	97.1
0.063	95.2
0.02	91.0
0.006	72.6
0.002	57.0

For description of sample please refer to the Laboratory Sample Description Sheet

Date of issue :-	Certificate No :-	Signed :-	Name :-	Page 1 of 1
05/11/2020	PSD/4287/ATK_TP_012/B4/1.20	MSene	M. SELNRA	

Client :-	Contract Title :-	AEG Contract No :-
South Tees Development Corporation	Eston Road Intrusive Works	4287

UKAS TESTING 1367

LABORATORY TESTING ENCLOSURE 5

Determination of Organic Matter Content, Sulphate and pH

(Tested Externally)

Certificate of Analysis

Certificate Number 20-16128-1

07-Sep-20

Client Allied Exploration & Geotechnics Limited
Unit 25
Stella Gill Industrial Estate
Pelton Fell
DH2 2RG

Our Reference 20-16128-1

Client Reference 4287

Order No LA2384

Contract Title Eston Road Intrusive Works

Description 17 Soil samples.

Date Received 25-Aug-20

Date Started 25-Aug-20

Date Completed 07-Sep-20

Test Procedures Identified by prefix DETSn (details on request).

Notes **This report supersedes 20-16128, amendments.**

Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By

Adam Fenwick
Contracts Manager

Summary of Chemical Analysis

Soil Samples

Our Ref 20-16128-1
Client Ref 4287
Contract Title Eston Road Intrusive Works

			Lab No	1717076	1717077	1717078	1717079	1717080
			Sample ID	ATK_TP_002	ATK_TP_004	ATK_TP_005	ATK_TP_006	ATK_TP_007
			Depth	1.80	1.80	1.60	2.90	0.70
			Other ID	6	4	4	11	5
			Sample Type	J	J	J	J	J
			Sampling Date	18/06/2020	18/06/2020	18/06/2020	18/06/2020	18/06/2020
			Sampling Time	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**					
Inorganics								
pH	DETSC 2008#		pH				8.0	8.8
Organic matter	DETSC 2002#	0.1	%	2.6	2.9	1.5	2.3	
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l				240	430

Key: # - MCERTS (accreditation only applies if report carries the MCERTS logo). n/s - not supplied.

Summary of Chemical Analysis

Soil Samples

Our Ref 20-16128-1
Client Ref 4287
Contract Title Eston Road Intrusive Works

			Lab No	1717081	1717082	1717083	1717084	1717085	1717086	1717087
			Sample ID	ATK_TP_009	ATK_TP_010	ATK_TP_011	ATK_TP_012	ATK_TP_001	ATK_TP_007	ATK_TP_007
			Depth	1.10	3.20	1.80	0.90	2.60	2.50	3.50
			Other ID	4	12	5	3	7	10	13
			Sample Type	J	B	B	J	B	B	B
			Sampling Date	17/06/2020	17/06/2020	17/06/2020	17/06/2020	19/06/2020	16/06/2020	16/06/2020
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**							
Inorganics										
pH	DETSC 2008#		pH	8.2	8.3	4.9		9.0	7.5	8.3
Organic matter	DETSC 2002#	0.1	%	2.3			1.5			
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	42	48	1500		150	420	52

Key: # -MCERTS (accreditation only applies if report carries the MCERTS logo); n/s -not supplied

Summary of Chemical Analysis

Soil Samples

Our Ref 20-16128-1
Client Ref 4287
Contract Title Eston Road Intrusive Works

			Lab No	1717088	1717089	1717090	1717091	1717092
			Sample ID	ATK_TP_009	ATK_TP_009	ATK_TP_010	ATK_TP_012	ATK_TP_012
			Depth	1.30	3.30	0.40	0.50	3.20
			Other ID	5	10	1	2	5
			Sample Type	B	B	B	B	B
			Sampling Date	17/06/2020	17/06/2020	17/06/2020	17/06/2020	17/06/2020
			Sampling Time	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**					
Inorganics								
pH	DETSC 2008#		pH	8.2	8.4	10.9	8.2	10.0
Organic matter	DETSC 2002#	0.1	%					
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	41	86	320	200	160

Key: # -MCERTS (accreditation only applies if report carries the MCERTS logo), n/s - not supplied

Information in Support of the Analytical Results

Our Ref 20-16128-1
Client Ref 4287
Contract Eston Road Intrusive Works

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
1717076	ATK_TP_002 1.80 SOIL	18/06/20	PT 1L	Organic Matter (Manual) (28 days)	
1717077	ATK_TP_004 1.80 SOIL	18/06/20	PT 1L	Organic Matter (Manual) (28 days)	
1717078	ATK_TP_005 1.60 SOIL	18/06/20	PT 1L	Organic Matter (Manual) (28 days)	
1717079	ATK_TP_006 2.00 SOIL	18/06/20	PT 1L	Anions 2:1 (30 days), Organic Matter (Manual) (28 days), pH + Conductivity (7 days)	
1717080	ATK_TP_007 0.70 SOIL	16/06/20	PT 500ml	Anions 2:1 (30 days), pH + Conductivity (7 days)	
1717081	ATK_TP_009 1.10 SOIL	17/06/20	PT 1L	Anions 2:1 (30 days), Organic Matter (Manual) (28 days), pH + Conductivity (7 days)	
1717082	ATK_TP_010 3.20 SOIL	17/06/20	PT 500ml	Anions 2:1 (30 days), pH + Conductivity (7 days)	
1717083	ATK_TP_011 1.80 SOIL	17/06/20	PT 500ml	Anions 2:1 (30 days), pH + Conductivity (7 days)	
1717084	ATK_TP_012 0.90 SOIL	17/06/20	PT 1L	Organic Matter (Manual) (28 days)	
1717085	ATK_TP_001 2.60 SOIL	15/06/20	PT 500ml	Anions 2:1 (30 days), pH + Conductivity (7 days)	
1717086	ATK_TP_007 2.50 SOIL	16/06/20	PT 500ml	Anions 2:1 (30 days), pH + Conductivity (7 days)	
1717087	ATK_TP_007 3.50 SOIL	16/06/20	PT 500ml	Anions 2:1 (30 days), pH + Conductivity (7 days)	
1717088	ATK_TP_009 1.80 SOIL	17/06/20	PT 500ml	Anions 2:1 (30 days), pH + Conductivity (7 days)	
1717089	ATK_TP_009 3.30 SOIL	17/06/20	PT 500ml	Anions 2:1 (30 days), pH + Conductivity (7 days)	
1717090	ATK_TP_010 0.40 SOIL	17/06/20	PT 500ml	Anions 2:1 (30 days), pH + Conductivity (7 days)	
1717091	ATK_TP_012 0.50 SOIL	17/06/20	PT 500ml	Anions 2:1 (30 days), pH + Conductivity (7 days)	
1717092	ATK_TP_012 3.20 SOIL	17/06/20	PT 500ml	Anions 2:1 (30 days), pH + Conductivity (7 days)	

Key: P-Plastic T-Tub

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to 2mm & 425µm sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

The Loss on Drying, used to express organics analysis on an as dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal:

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

End of Report

LABORATORY TESTING ENCLOSURE 6

Determination of Dry Density/Moisture Content Relationship

ALLIED EXPLORATION & GEOTECHNICS LIMITED

MOISTURE CONTENT/DRY DENSITY RELATIONSHIP

BS 1377 : Part 4 : 1990

Specimen Identification

Exploratory Hole No :- **ATK_TP_001** Depth (m) :- **1.40** Sample Type & No :- **B5**

Test Method 2.5kg Compaction Single Sample

Test Results

Optimum Moisture Content (%) = **18.0**

Maximum Dry Density (Mg/m3) = **1.67**

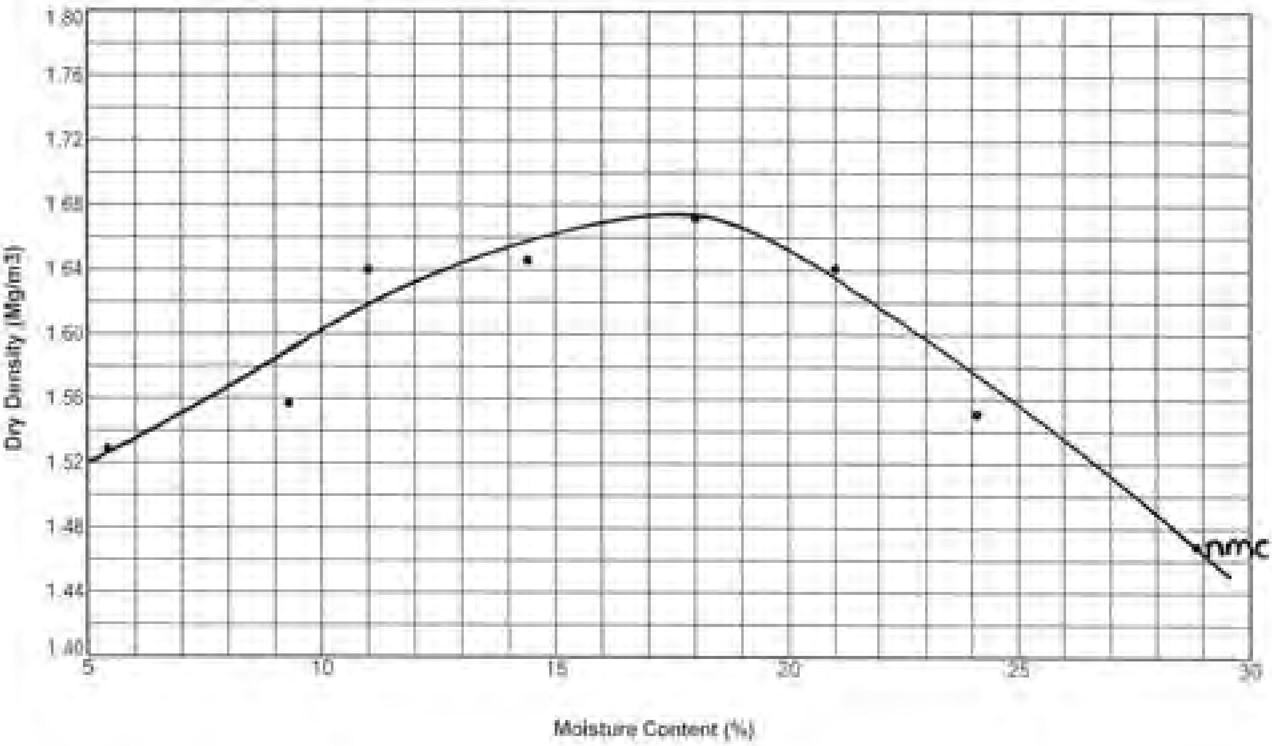
Date Tested = **25/08/2020**

Particle Density (Measured) = **2.64**

Retained on 20mm Sieve (%) = **40.0**

Retained on 37.5mm Sieve (%) = **38.0**

Remarks :



For description of sample please refer to the Laboratory Sample Description Sheet

Contract Title :- Eston Road Intrusive Works	Client :- South Tees Development Corporation

Signed :-	Name :-	Page 1 of 1
Date of Issue :- 05/11/2020	Certificate No :- COMP/4287/1	AEG Contract No. :- 4287

UKAS TESTING 1367

ALLIED EXPLORATION & GEOTECHNICS LIMITED

MOISTURE CONTENT/DRY DENSITY RELATIONSHIP

BS 1377 : Part 4 : 1990

Specimen Identification

Exploratory Hole No :- **ATK_TP_002** Depth (m) :- **2.00** Sample Type & No :- **B7**

Test Method 2.5kg Compaction Single Sample

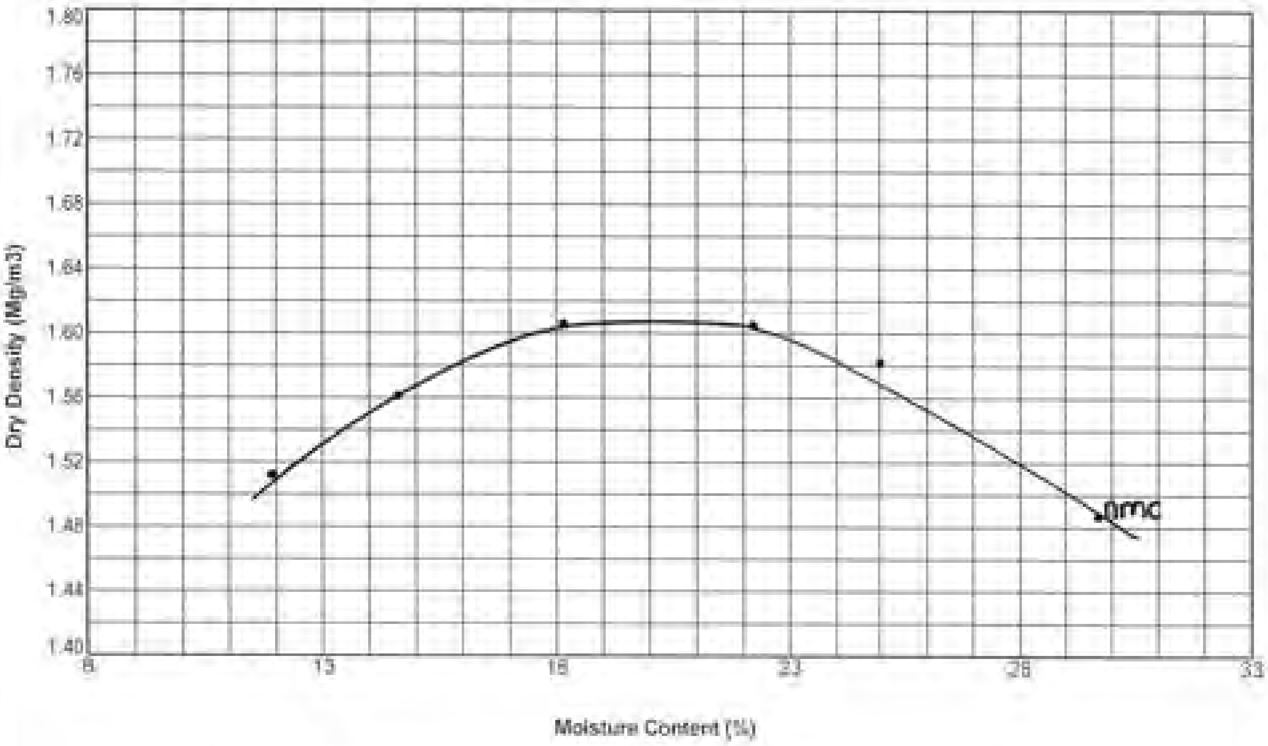
Test Results

Optimum Moisture Content (%) = **20.0** Particle Density (Assumed) = **2.70**

Maximum Dry Density (Mg/m3) = **1.61** Retained on 20mm Sieve (%) = **0.0**

Date Tested = **29/07/2020** Retained on 37.5mm Sieve (%) = **0.0**

Remarks :



For description of sample please refer to the Laboratory Sample Description Sheet

Contract Title :- Eston Road Intrusive Works	Client :- South Tees Development Corporation

Signed :-	Name :-	Page 1 of 1	
Date of issue :- 05/11/2020	Certificate No :- COMP/4287/1	AEG Contract No :- 4287	1367

ALLIED EXPLORATION & GEOTECHNICS LIMITED

MOISTURE CONTENT/DRY DENSITY RELATIONSHIP

BS 1377 Part 4 1990

Specimen Identification

Exploratory Hole No :- **ATK_TP_005** Depth (m) :- **0.80** Sample Type & No :- **B2**

Test Method 2.5kg Compaction Single Sample

Test Results

Optimum Moisture Content (%) = **15.0**

Particle Density (Measured) = **2.32**

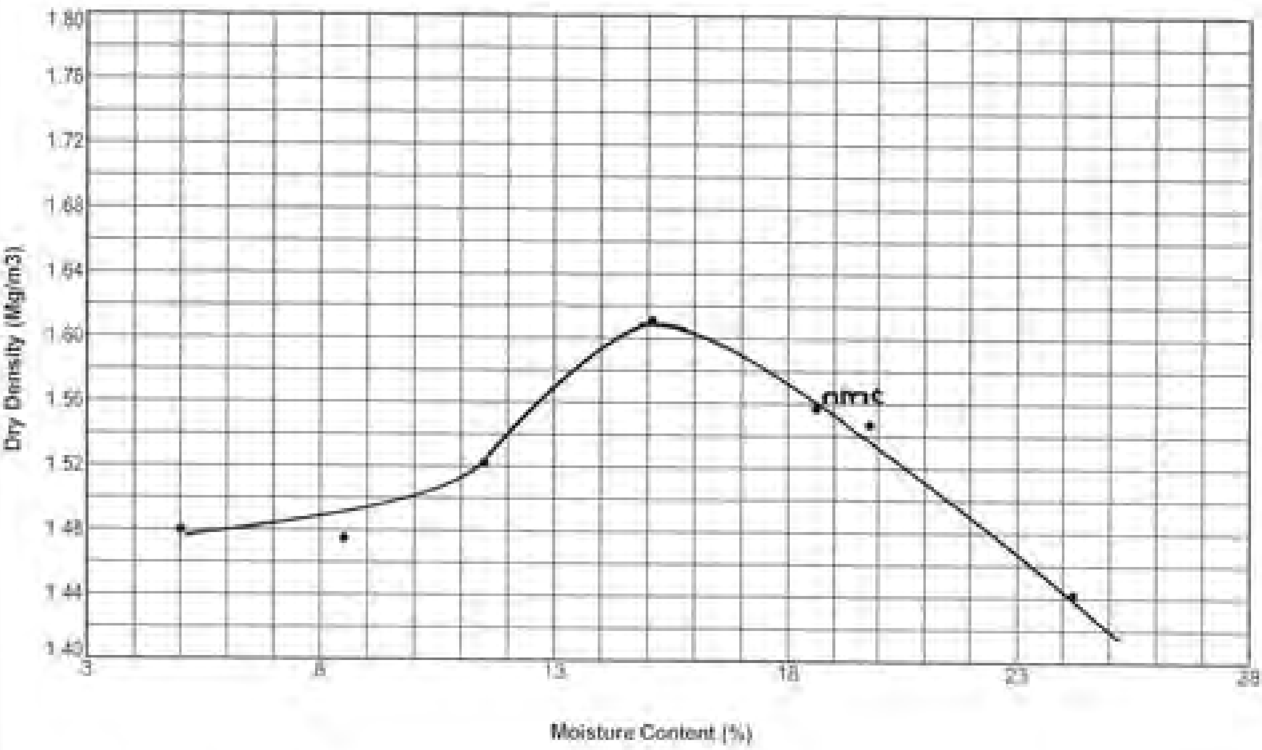
Maximum Dry Density (Mg/m3) = **1.61**

Retained on 20mm Sieve (%) = **16.0**

Date Tested = **25/08/2020**

Retained on 37.5mm Sieve (%) = **3.0**

Remarks :



For description of sample please refer to the Laboratory Sample Description Sheet

Contract Title :- Eston Road Intrusive Works	Client :- South Tees Development Corporation

Signed :-	Name :-	Page 1 of 1
Date of issue :- 05/11/2020	Certificate No :- COMP/4287/1	AEG Contract No :- 4287

UKAS TESTING 1367

ALLIED EXPLORATION & GEOTECHNICS LIMITED

MOISTURE CONTENT/DRY DENSITY RELATIONSHIP
BS 1377 : Part 4 : 1990

Specimen Identification

Exploratory Hole No :- **ATK_TP_006** Depth (m) :- **1.40** Sample Type & No :- **B7**

Test Method 2.5kg Compaction Single Sample

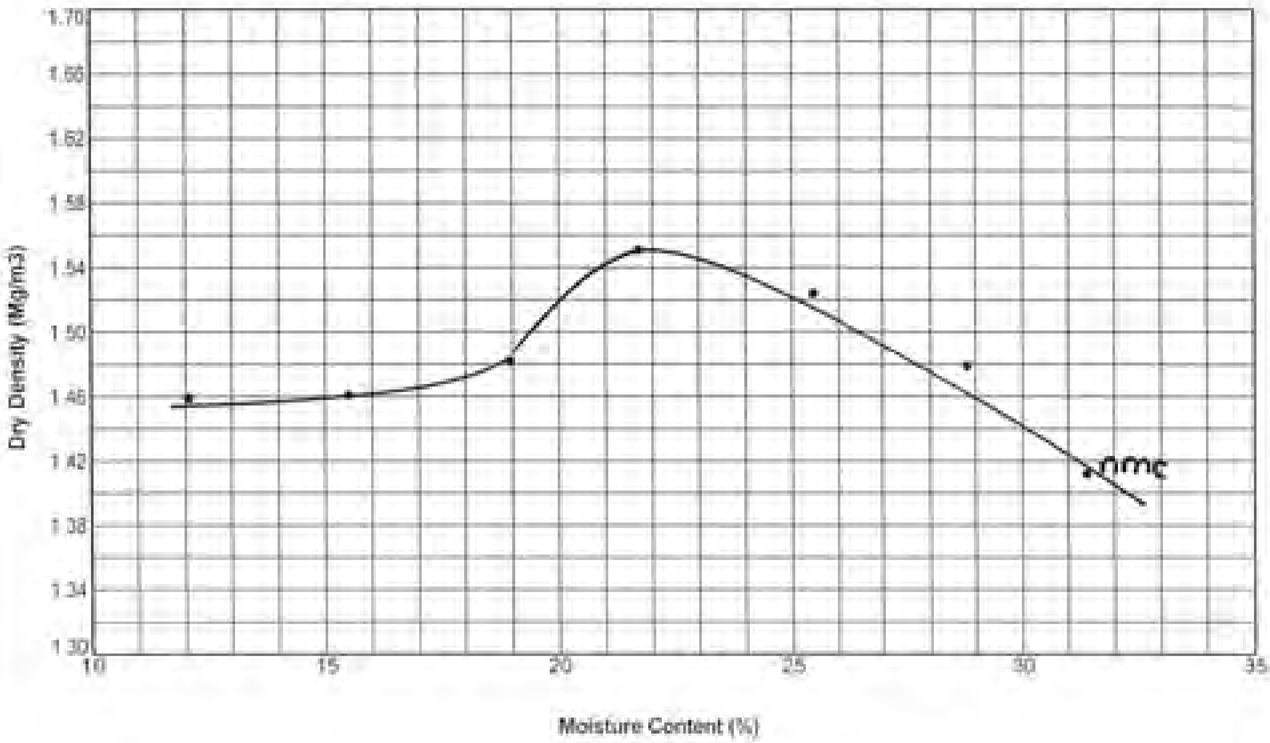
Test Results

Optimum Moisture Content (%) = **22.0** Particle Density (Assumed) = **2.65**

Maximum Dry Density (Mg/m3) = **1.55** Retained on 20mm Sieve (%) = **0.0**

Date Tested = **24/08/2020** Retained on 37.5mm Sieve (%) = **0.0**

Remarks :



For description of sample please refer to the Laboratory Sample Description Sheet

Contract Title :- Eston Road Intrusive Works	Client :- South Tees Development Corporation

Signed :-	Name :-		Page 1 of 1
Date of Issue :- 05/11/2020	Certificate No :- COMP/4287/1	AEG Contract No :- 4287	UKAS TESTING 1367

ALLIED EXPLORATION & GEOTECHNICS LIMITED

MOISTURE CONTENT/DRY DENSITY RELATIONSHIP

BS 1377 : Part 4 : 1990

Specimen Identification

Exploratory Hole No :- **ATK_TP_007** Depth (m) :- **0.70** Sample Type & No :- **B5**

Test Method 4.5kg Compaction Single Sample

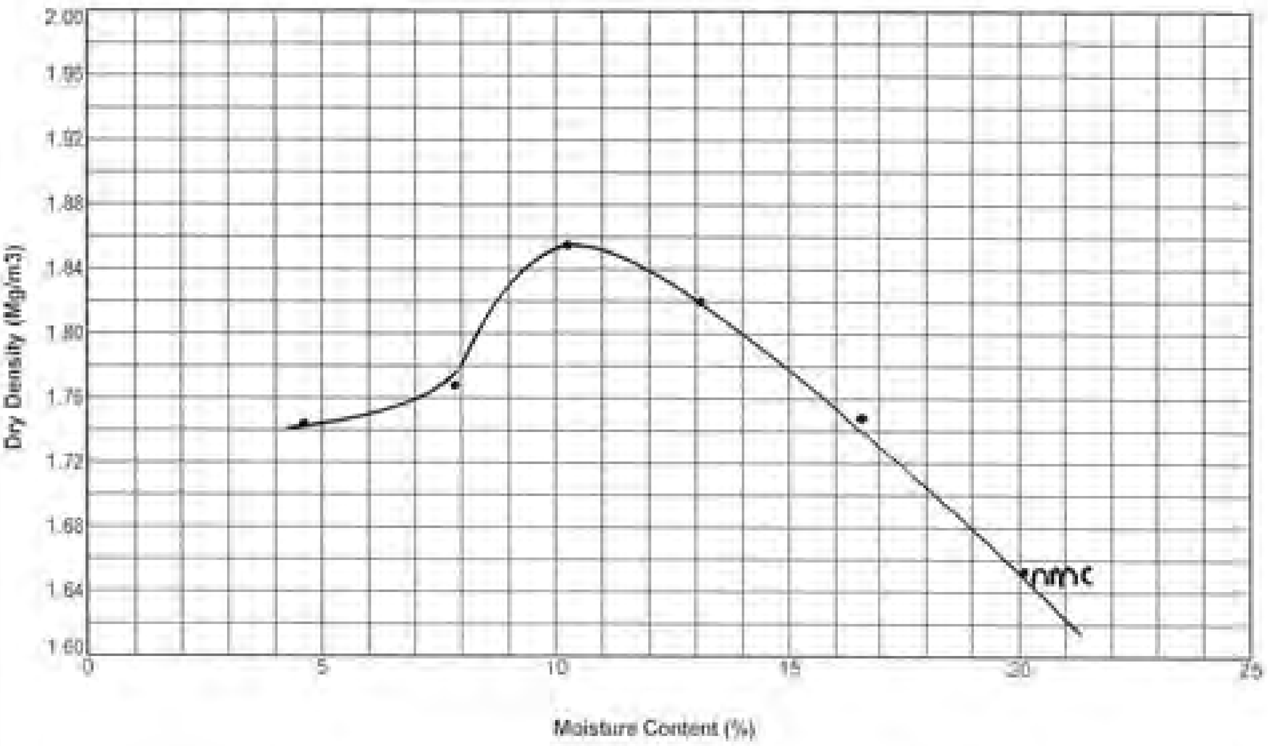
Test Results

Optimum Moisture Content (%) = **10.5** Particle Density (Assumed) = **2.55**

Maximum Dry Density (Mg/m3) = **1.86** Retained on 20mm Sieve (%) = **11.7**

Date Tested = **24/08/2020** Retained on 37.5mm Sieve (%) = **2.7**

Remarks :



For description of sample please refer to the Laboratory Sample Description Sheet

Contract Title :- Eston Road Intrusive Works	Client :- South Tees Development Corporation

Signed :-	Name :-	Page 1 of 1	UKAS TESTING 1367
Date of issue :- 05/11/2020	Certificate No :- COMP/4287/1	AEG Contract No. :- 4287	

ALLIED EXPLORATION & GEOTECHNICS LIMITED

MOISTURE CONTENT/DRY DENSITY RELATIONSHIP

BS 1377 : Part 4 : 1990

Specimen Identification

Exploratory Hole No :- **ATK_TP_010** Depth (m) :- **1.50** Sample Type & No :- **B7**

Test Method 2.5kg Compaction Separate Samples

Test Results

Optimum Moisture Content (%) = **22.0**

Particle Density (Assumed) = **2.50**

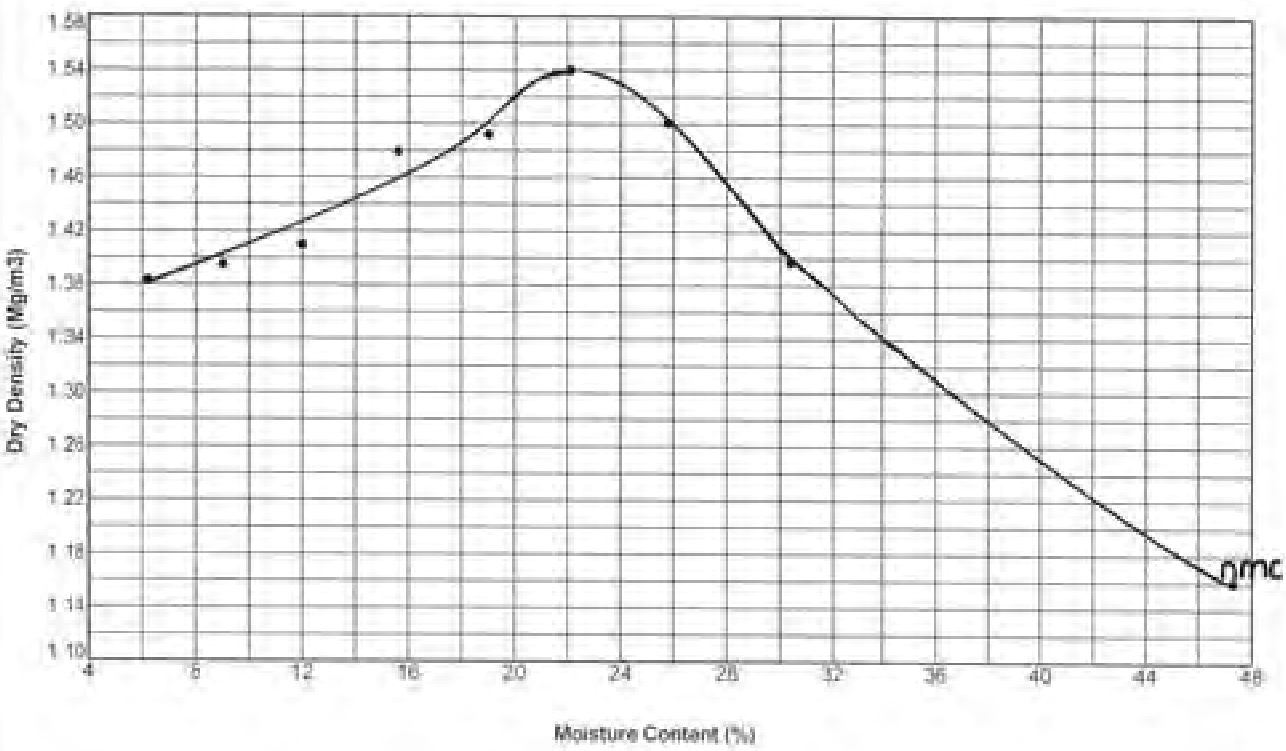
Maximum Dry Density (Mg/m3) = **1.54**

Retained on 20mm Sieve (%) = **0.0**

Date Tested = **25/08/2020**

Retained on 37.5mm Sieve (%) = **0.0**

Remarks :



For description of sample please refer to the Laboratory Sample Description Sheet

Contract Title :- Eston Road Intrusive Works	Client :- South Tees Development Corporation

Signed :- msone	Name :-	Page 1 of 1
Date of Issue :- 05/11/2020	Certificate No :- DSMP/4287/1	AEG Contract No :- 4287

UKAS TESTING 1367

ALLIED EXPLORATION & GEOTECHNICS LIMITED

MOISTURE CONTENT/DRY DENSITY RELATIONSHIP

BS 1377 : Part 4 : 1990

Specimen Identification

Exploratory Hole No :- **ATK_TP_012** Depth (m) :- **1.20** Sample Type & No :- **B4**

Test Method 2.5kg Compaction Single Sample

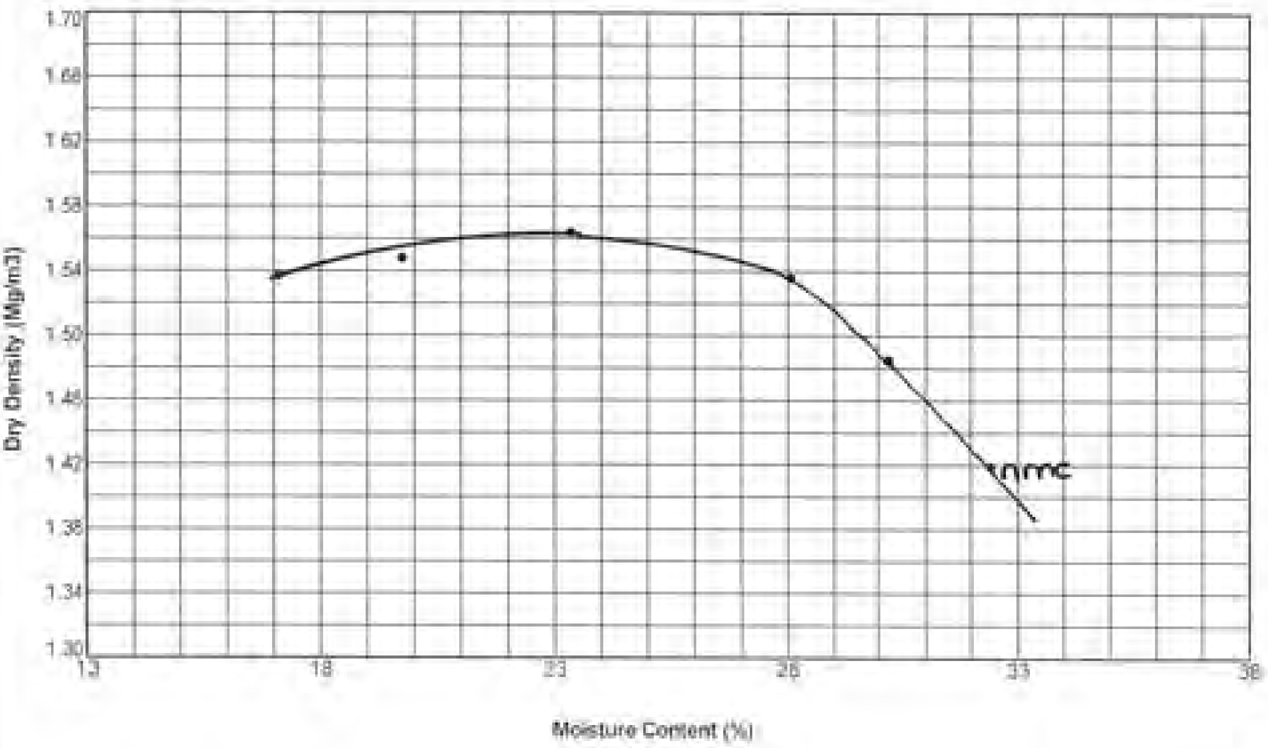
Test Results

Optimum Moisture Content (%) = **23.5** Particle Density (Assumed) = **2.75**

Maximum Dry Density (Mg/m3) = **1.56** Retained on 20mm Sieve (%) = **0.0**

Date Tested = **25/08/2020** Retained on 37.5mm Sieve (%) = **0.0**

Remarks :



For description of sample please refer to the Laboratory Sample Description Sheet

Contract Title :- Eston Road Intrusive Works	Client :- South Tees Development Corporation

Signed :-	Name :-		Page 1 of 1
Date of issue :- 05/11/2020	Certificate No :- COMP/4287/1	AEG Contract No. :- **4287**	UKAS TESTING 1367

LABORATORY TESTING ENCLOSURE 7

Determination of California Bearing Ratio

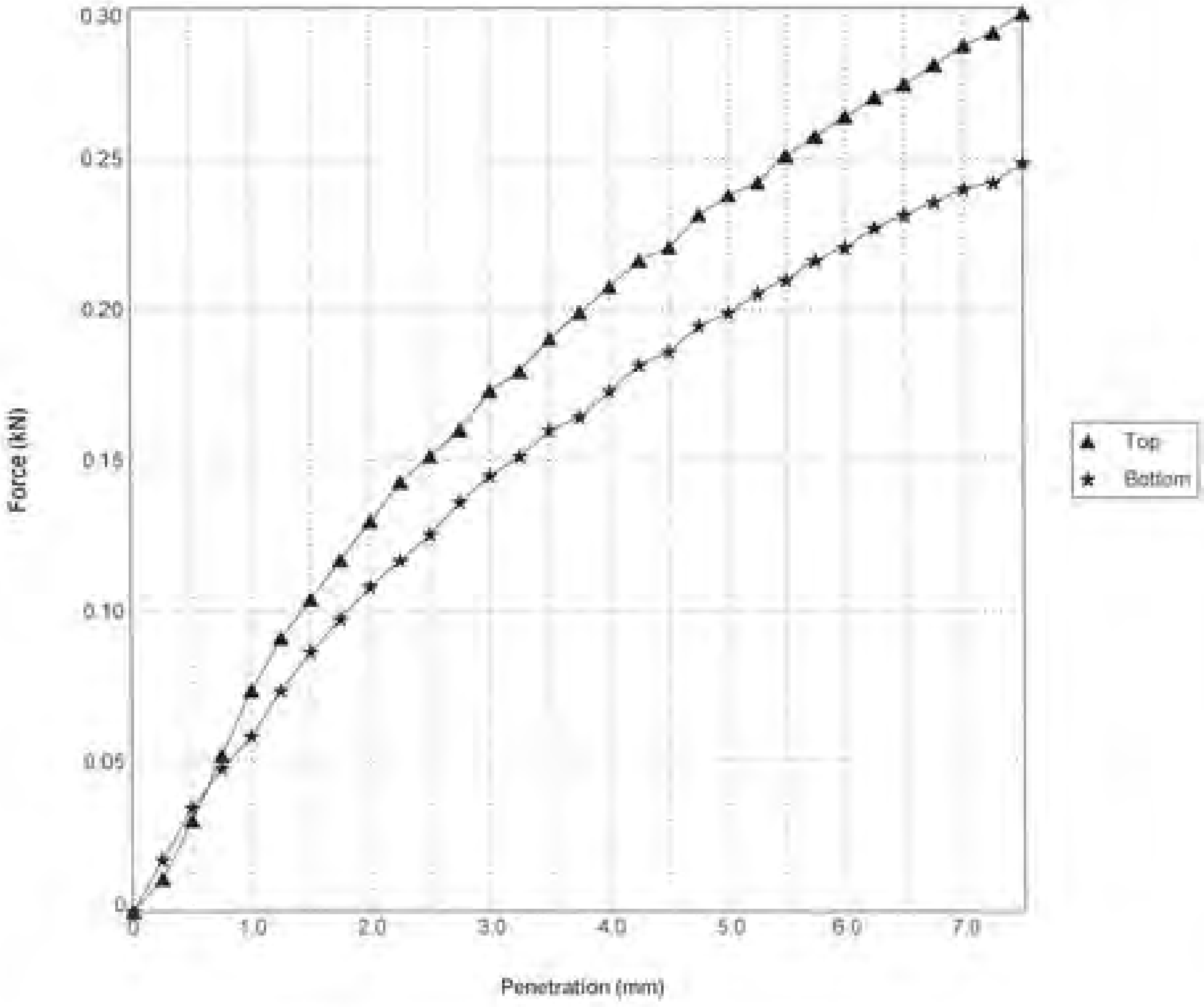
ALLIED EXPLORATION & GEOTECHNICS LIMITED

DETERMINATION OF THE CALIFORNIA BEARING RATIO

BS 1377 : Part 4 : 1990 and Part 2 : Clause 3.2 : 1990

Exploratory Hole No.- **ATK_TP_001** Sample No.- **B5** Depth (m)- **1.40**

"As Received" Moisture Content (%) :		Surcharge (Kg) :	6
Retained on 20mm (%) :	40.0	Seating Load (N) :	Top 10 / Bottom 10
Correction Needed :	No	Test Moisture Content (%) :	Top 29 / Bottom 29
Soaking Time (Days) :	N/A	Bulk Density (Mg/m^3) :	1.89
Swelling (mm) :	N/A	Dry Density (Mg/m^3) :	1.47
Date Tested :	25/08/2020	CBR Value (%) :	Top 1.2 / Bottom 1.0
Preparation Method :	2.5kg Compaction		
Remarks :			



For description of sample please refer to the Laboratory Sample Description Sheet

Contract Title :- Eston Road Intrusive Works	Client :- South Tees Development Corporation

Signed :- [signature]	Name :- M SELKIRK	Page 1 of 1
Date of issue :- 05/11/2020	Certificate No :- CBR/4287/ATK_TP_001/B5/1.40/1	AEG Contract No. :- 4287

UKAS TESTING 1367

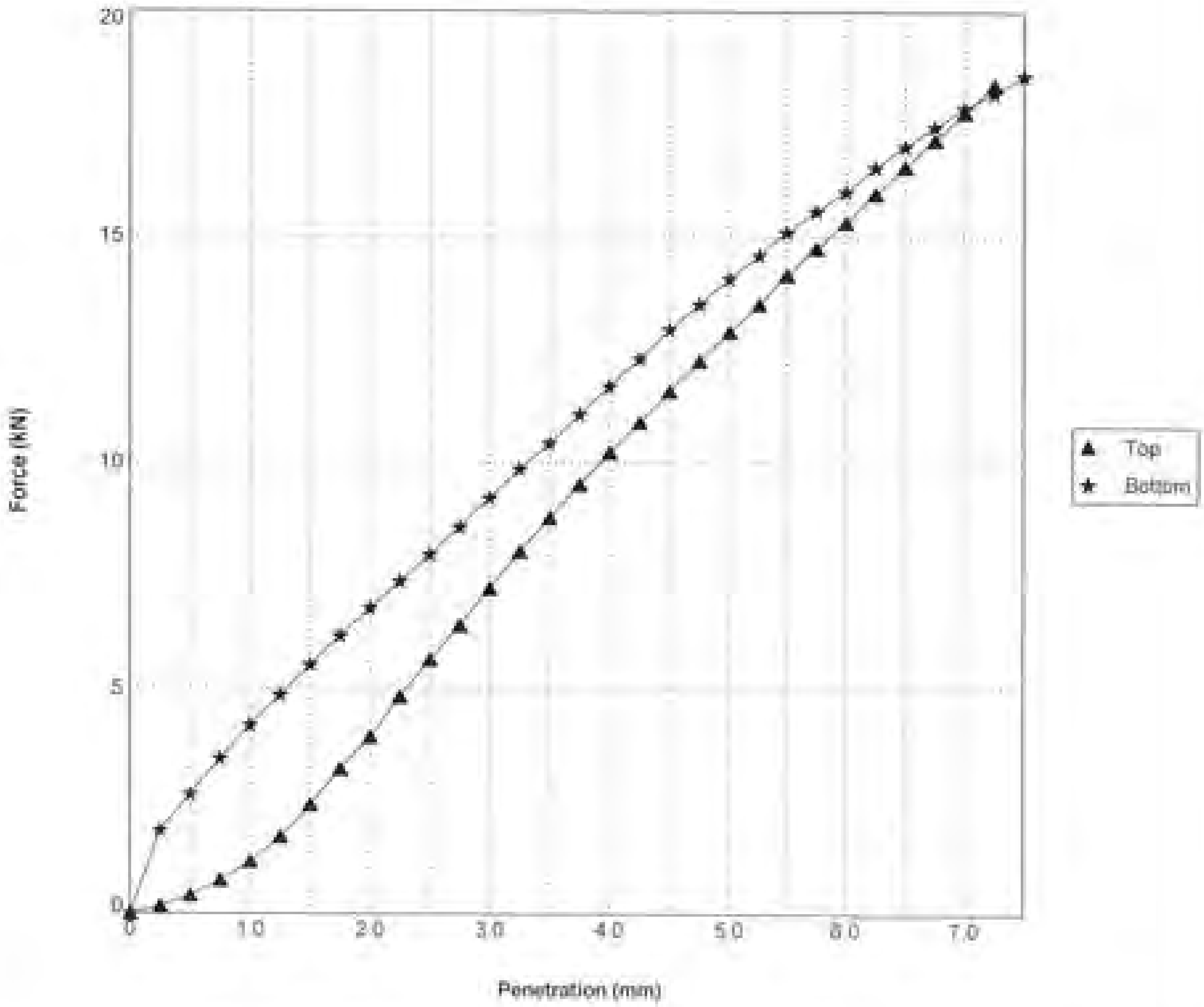
ALLIED EXPLORATION & GEOTECHNICS LIMITED

DETERMINATION OF THE CALIFORNIA BEARING RATIO

BS 1377 : Part 4 : 1990 and Part 2 : Clause 3.2 : 1990

Exploratory Hole No.- **ATK_TP_002** Sample No.- **B2** Depth (m)- **0.40**

"As Received" Moisture Content (%) :		Surcharge (Kg) :	6
Retained on 20mm (%) :	37.0	Seating Load (N) :	Top 250 / Bottom 250
Correction Needed :	No	Test Moisture Content (%) :	Top 16 / Bottom 15
Soaking Time (Days) :	N/A	Bulk Density (Mg/m^3) :	2.16
Swelling (mm) :	N/A	Dry Density (Mg/m^3) :	1.87
Date Tested :	24/08/2020	CBR Value (%) :	Top 65 / Bottom 70
Preparation Method :	2.5kg Compaction		
Remarks :	Test was stopped due to maximum load ring capacity being reached		



For description of sample please refer to the Laboratory Sample Description Sheet

Contract Title :- Eston Road Intrusive Works	Client :- South Tees Development Corporation

Signed :- msone	Name :-		Page 1 of 1
Date of issue :- 05/11/2020	Certificate No :- CBR/4287/ATK_TP_002/B2/0.40/1	AEG Contract No. :- **4287**	UKAS TESTING 1367

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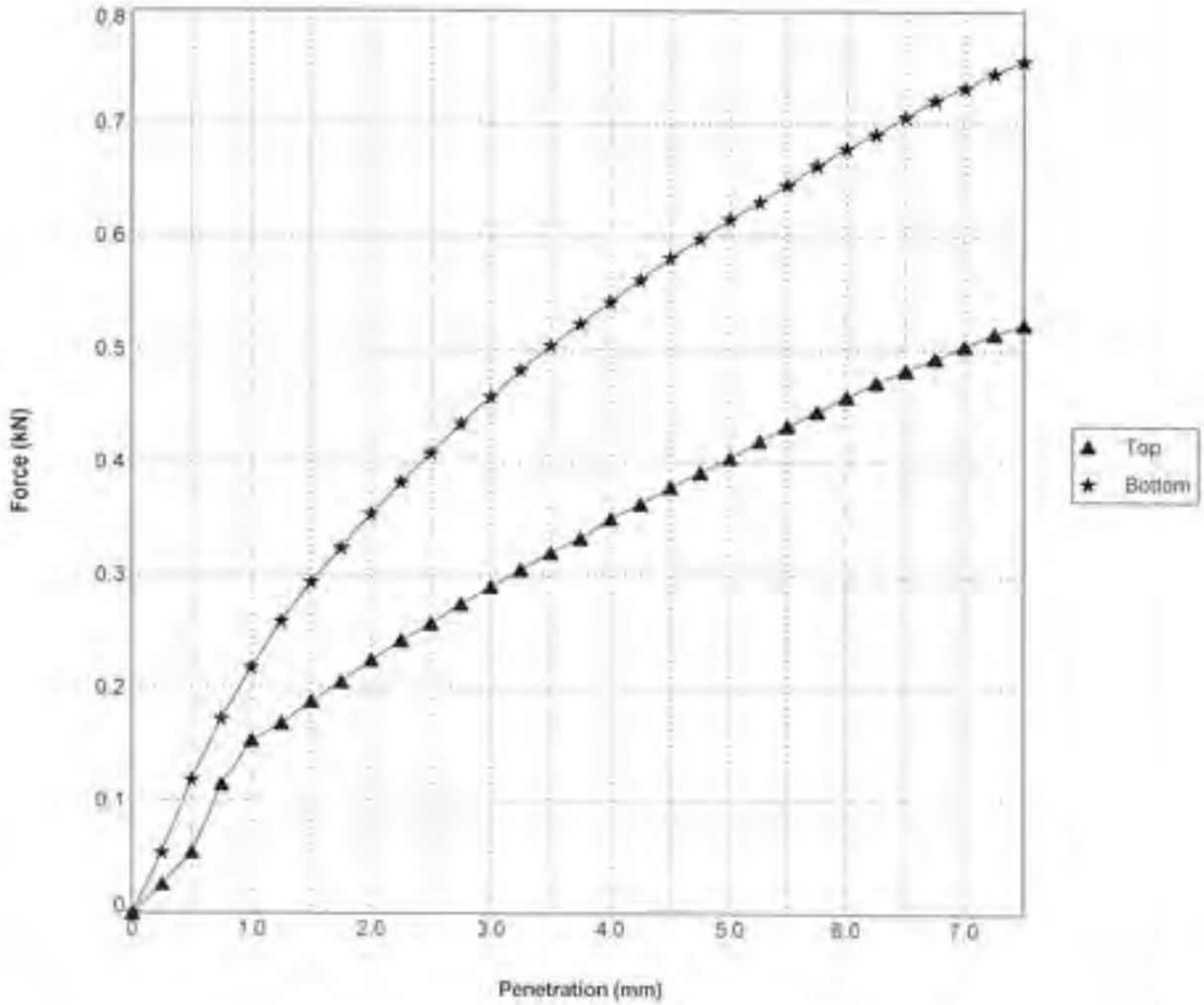
Head Office: Unit 29 Stella Gill Industrial Estate, Pelton Fell, Chester-le-Street, Co. Durham, DH2 2RG - Tel: (0191) 387 4700 Fax: (0191) 387 4710
Regional Office: Unit 2C, Stainforth Development Centre, Askham Wharf, Bawtry, DN10 3BJ - Tel: (01302) 710 700 Fax: (01302) 710 999

DETERMINATION OF THE CALIFORNIA BEARING RATIO

BS 1377 : Part 4 : 1990 and Part 2 : Clause 3.2 : 1990

Exploratory Hole No.- **ATK_TP_002** Sample No.- **B7** Depth (m)- **2.00**

"As Received" Moisture Content (%) :		Surcharge (Kg) :	6
Retained on 20mm (%) :	0.0	Seating Load (N) :	Top 10 / Bottom 10
Correction Needed :	No	Test Moisture Content (%) :	Top 31 / Bottom 29
Soaking Time (Days) :	15.5	Bulk Density (Mg/m^3) :	1.93
Swelling (mm) :	0.32	Dry Density (Mg/m^3) :	1.49
Date Tested :	29/07/2020	CBR Value (%) :	Top 2.0 / Bottom 3.1
Preparation Method :	2.5kg Compaction		
Remarks :			



For description of sample please refer to the Laboratory Sample Description Sheet

Contract Title :- Eston Road Intrusive Works	Client :- South Tees Development Corporation

Signed :- msore	Name :-	Page 1 of 1	UKAS TESTING 1367
Date of issue :- 05/11/2020	Certificate No :- CBR/4287/ATK_TP_002/B7/2.00/1	AEG Contract No :- 4287	

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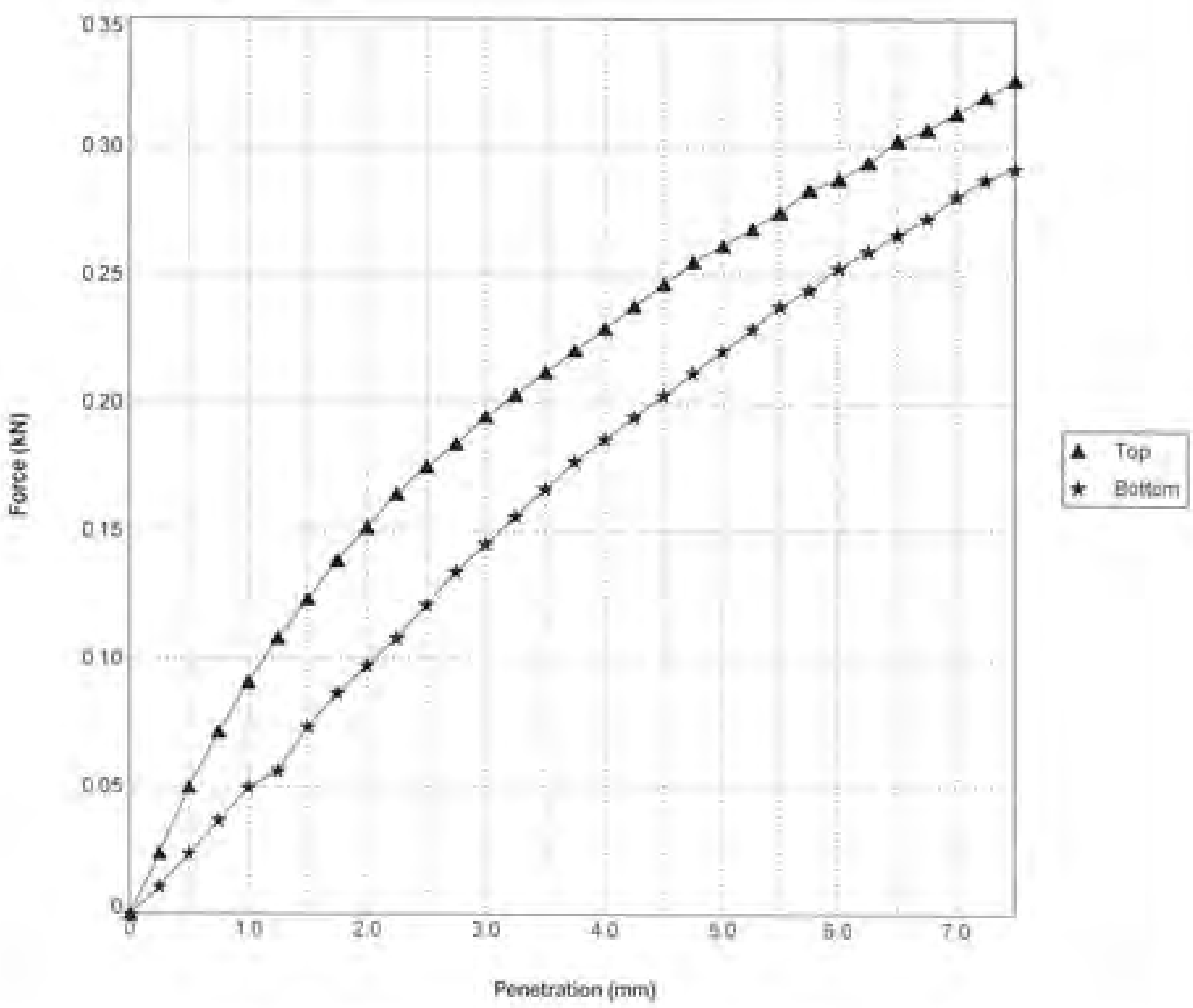
DETERMINATION OF THE CALIFORNIA BEARING RATIO

BS 1377 : Part 4 : 1990 and Part 2 : Clause 3.2 : 1990

Exploratory Hole No.- **ATK_TP_003** Sample No.- **B5** Depth (m)- **1.60**

"As Received" Moisture Content (%) :		Surcharge (Kg) :	6
Retained on 20mm (%) :	0.0	Seating Load (N) :	Top 10 / Bottom 10
Correction Needed :	No	Test Moisture Content (%) :	Top 26 / Bottom 26
Soaking Time (Days) :	15.5	Bulk Density (Mg/m^3) :	1.97
Swelling (mm) :	0.16	Dry Density (Mg/m^3) :	1.57
Date Tested :	28/07/2020	CBR Value (%) :	Top 1.3 / Bottom 1.1
Preparation Method :	2.5kg Compaction		
Remarks :			



For description of sample please refer to the Laboratory Sample Description Sheet

Contract Title :- Eston Road Intrusive Works	Client :- South Tees Development Corporation

Signed :- msow	Name :-	Page 1 of 1
Date of issue :- 05/11/2020	Certificate No :- CBR/4287/ATK_TP_003/B5/1.60/1	AEG Contract No :- 4287

UKAS TESTING 1367

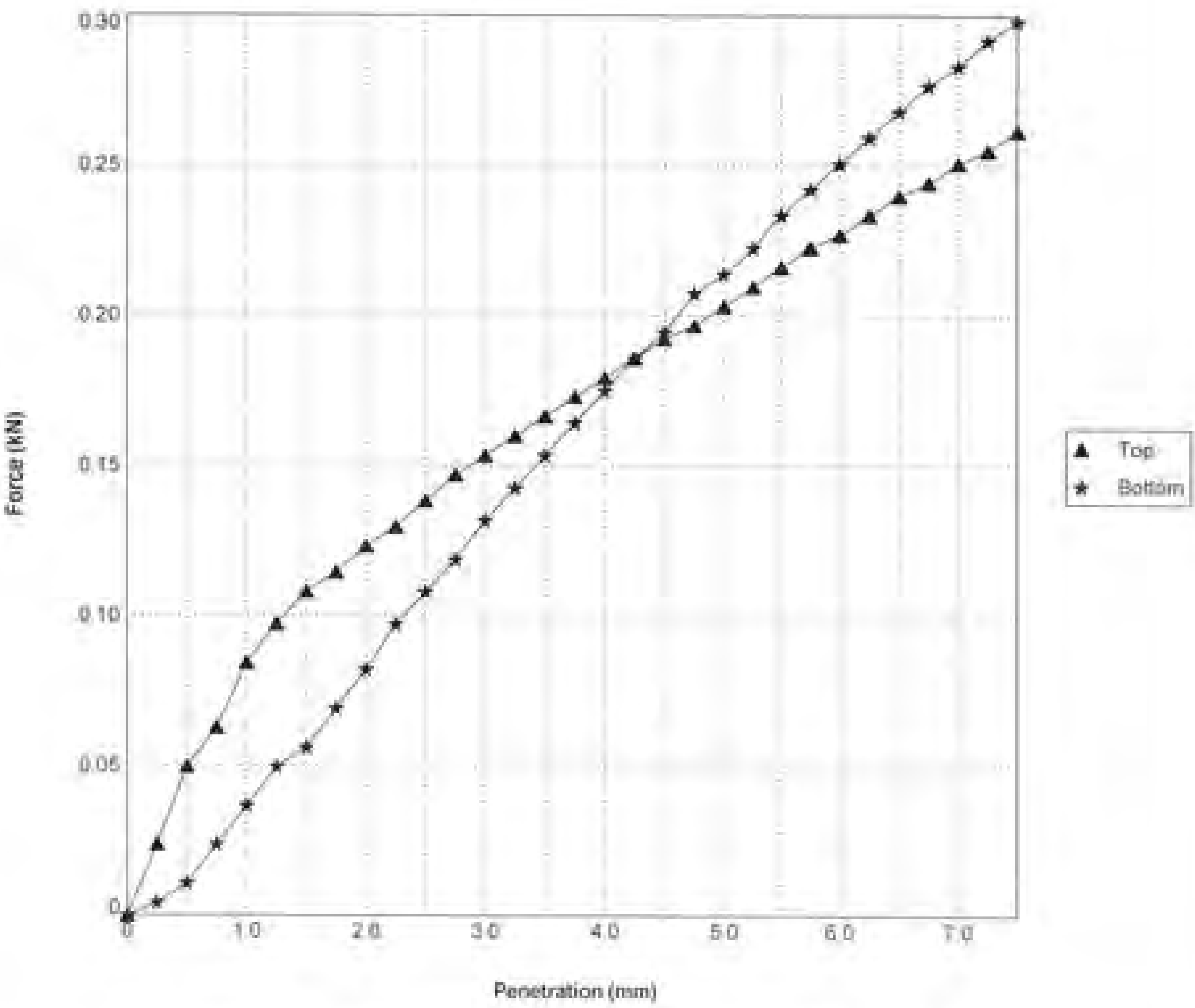
ALLIED EXPLORATION & GEOTECHNICS LIMITED

DETERMINATION OF THE CALIFORNIA BEARING RATIO

BS 1377 : Part 4 : 1990 and Part 2 : Clause 3.2 : 1990

Exploratory Hole No.- **ATK_TP_003** Sample No.- **B10** Depth (m)- **3.30**

"As Received" Moisture Content (%) :		Surcharge (Kg) :	6
Retained on 20mm (%) :	0.0	Seating Load (N) :	Top 10 / Bottom 10
Correction Needed :	No	Test Moisture Content (%) :	Top 32 / Bottom 29
Soaking Time (Days) :	8.5	Bulk Density (Mg/m^3) :	1.92
Swelling (mm) :	0.04	Dry Density (Mg/m^3) :	1.47
Date Tested :	29/07/2020	CBR Value (%) :	Top 1.1 / Bottom 1.1
Preparation Method :	2.5kg Compaction		
Remarks :			



For description of sample please refer to the Laboratory Sample Description Sheet

Contract Title :- Eston Road Intrusive Works	Client :- South Tees Development Corporation

Signed :- msene	Name :-		Page 1 of 1
Date of issue :- 05/11/2020	Certificate No. :- CBR/4287/ATK_TP_003/B10/3.30/1	AEG Contract No. :- 4287	UKAS TESTING 1367

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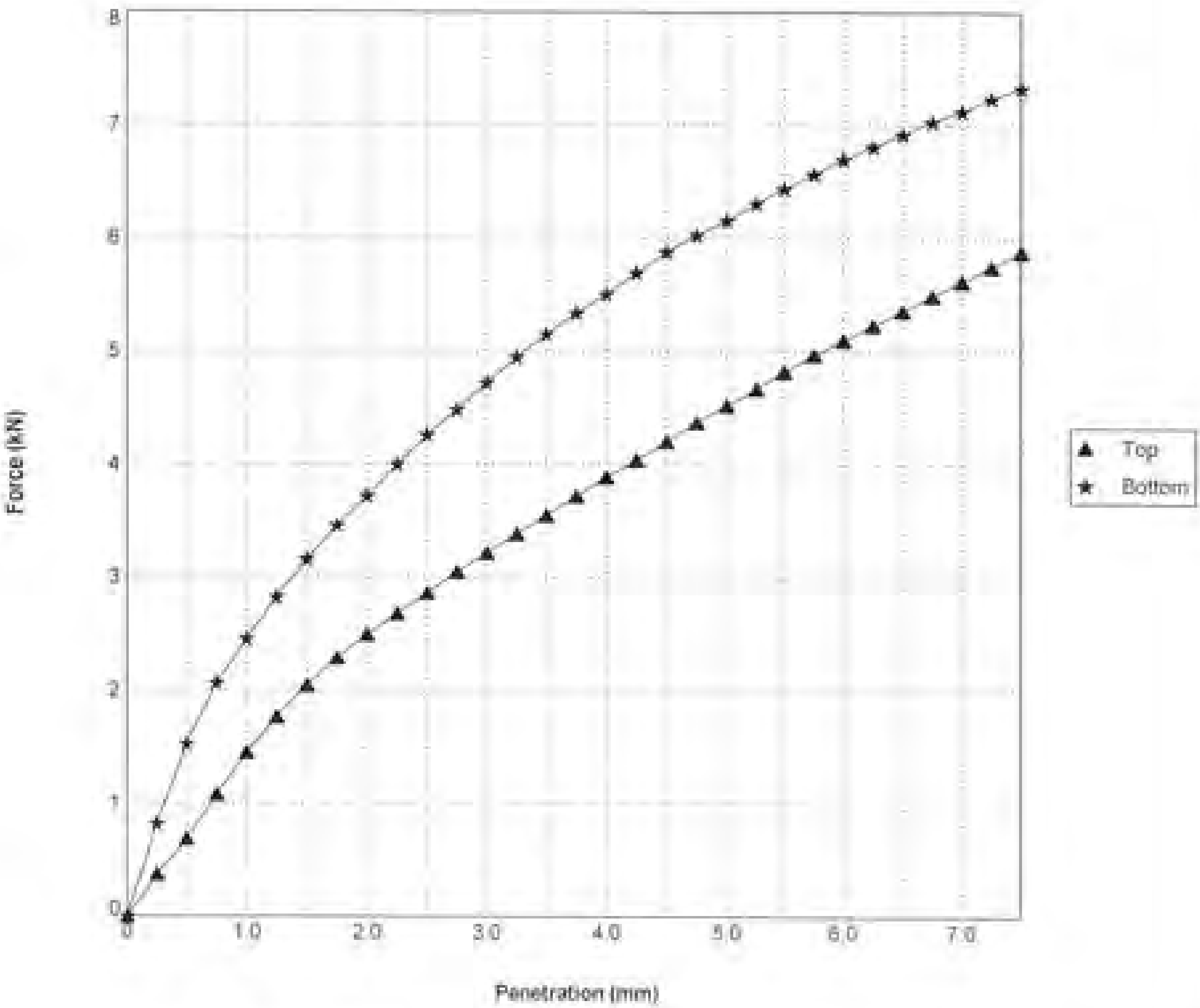
DETERMINATION OF THE CALIFORNIA BEARING RATIO

BS 1377 : Part 4 : 1990 and Part 2 : Clause 3.2 : 1990

Exploratory Hole No.- **ATK_TP_005** Sample No.- **B2** Depth (m)- **0.80**

"As Received" Moisture Content (%) :		Surcharge (Kg) :	6
Retained on 20mm (%) :	16.0	Seating Load (N) :	Top 250 / Bottom 250
Correction Needed :	No	Test Moisture Content (%) :	Top 19 / Bottom 18
Soaking Time (Days) :	N/A	Bulk Density (Mg/m^3) :	1.85
Swelling (mm) :	N/A	Dry Density (Mg/m^3) :	1.56
Date Tested :	25/08/2020	CBR Value (%) :	Top 21 / Bottom 18
Preparation Method :	2.5kg Compaction		
Remarks :			



For description of sample please refer to the Laboratory Sample Description Sheet

Contract Title :- Eston Road Intrusive Works	Client :- South Tees Development Corporation

Signed :- msene	Name :-		Page 1 of 1
Date of Issue :- 05/11/2020	Certificate No :- CBR/4287/ATK_TP_005/B2/0.80/1	AEG Contract No. :- 4287	UKAS TESTING 1367

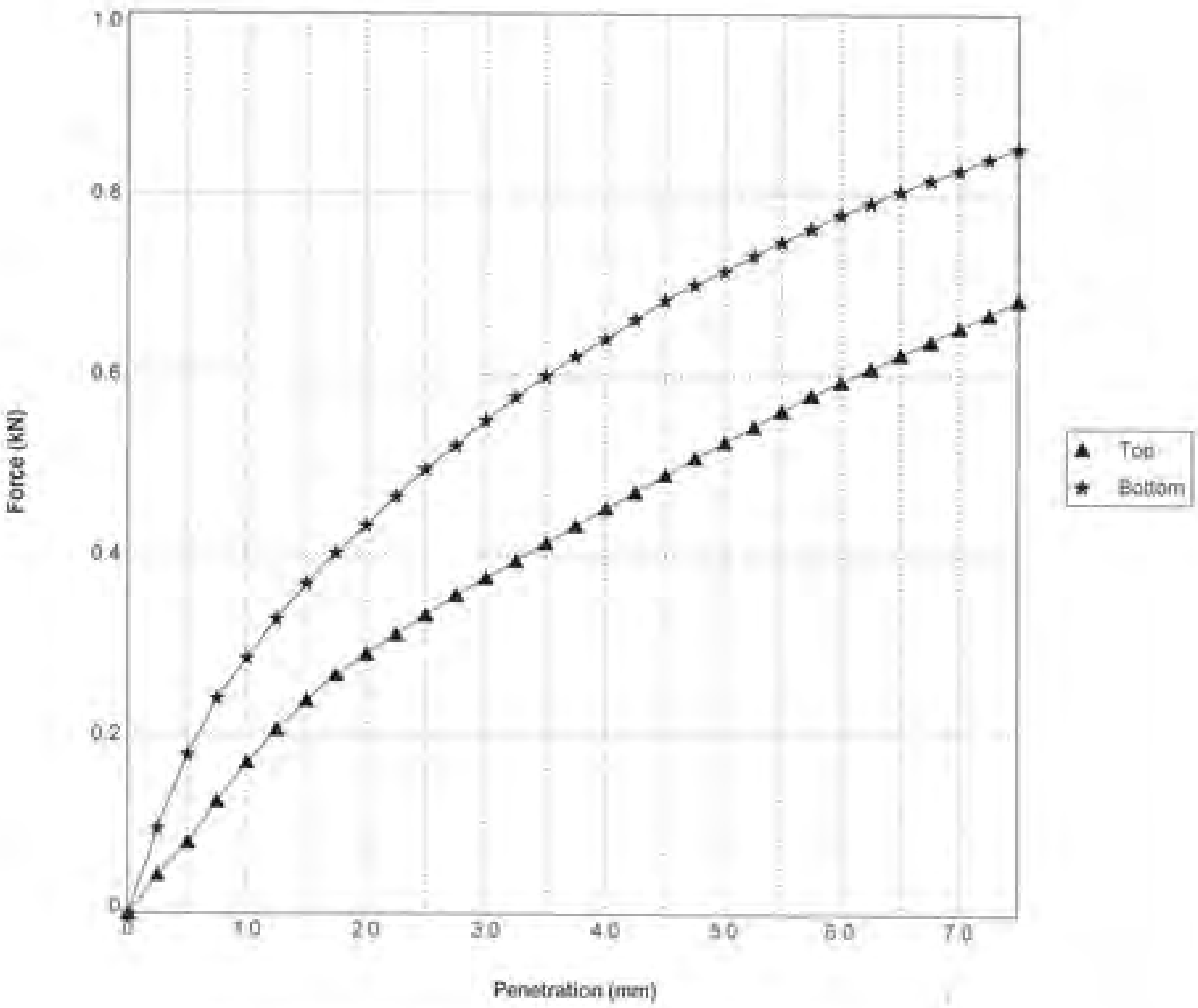
ALLIED EXPLORATION & GEOTECHNICS LIMITED

DETERMINATION OF THE CALIFORNIA BEARING RATIO

BS 1377 : Part 4 : 1990 and Part 2 : Clause 3.2 : 1990

Exploratory Hole No.- **ATK_TP_005** Sample No.- **B5** Depth (m)- **1.80**

"As Received" Moisture Content (%) :		Surcharge (Kg) :	6
Retained on 20mm (%) :	0.0	Seating Load (N) :	Top 50 / Bottom 50
Correction Needed :	No	Test Moisture Content (%) :	Top 29 / Bottom 29
Soaking Time (Days) :	N/A	Bulk Density (Mg/m^3) :	1.91
Swelling (mm) :	N/A	Dry Density (Mg/m^3) :	1.49
Date Tested :	24/08/2020	CBR Value (%) :	Top 2.6 / Bottom 3.8
Preparation Method :	2.5kg Compaction		
Remarks :			



For description of sample please refer to the Laboratory Sample Description Sheet

Contract Title :- Eston Road Intrusive Works	Client :- South Tees Development Corporation

Signed :- msone	Name :-	Page 1 of 1
Date of issue :- 05/11/2020	Certificate No :- CBR/4287/ATK_TP_005/B5/1.80/1	AEG Contract No. :- 4287

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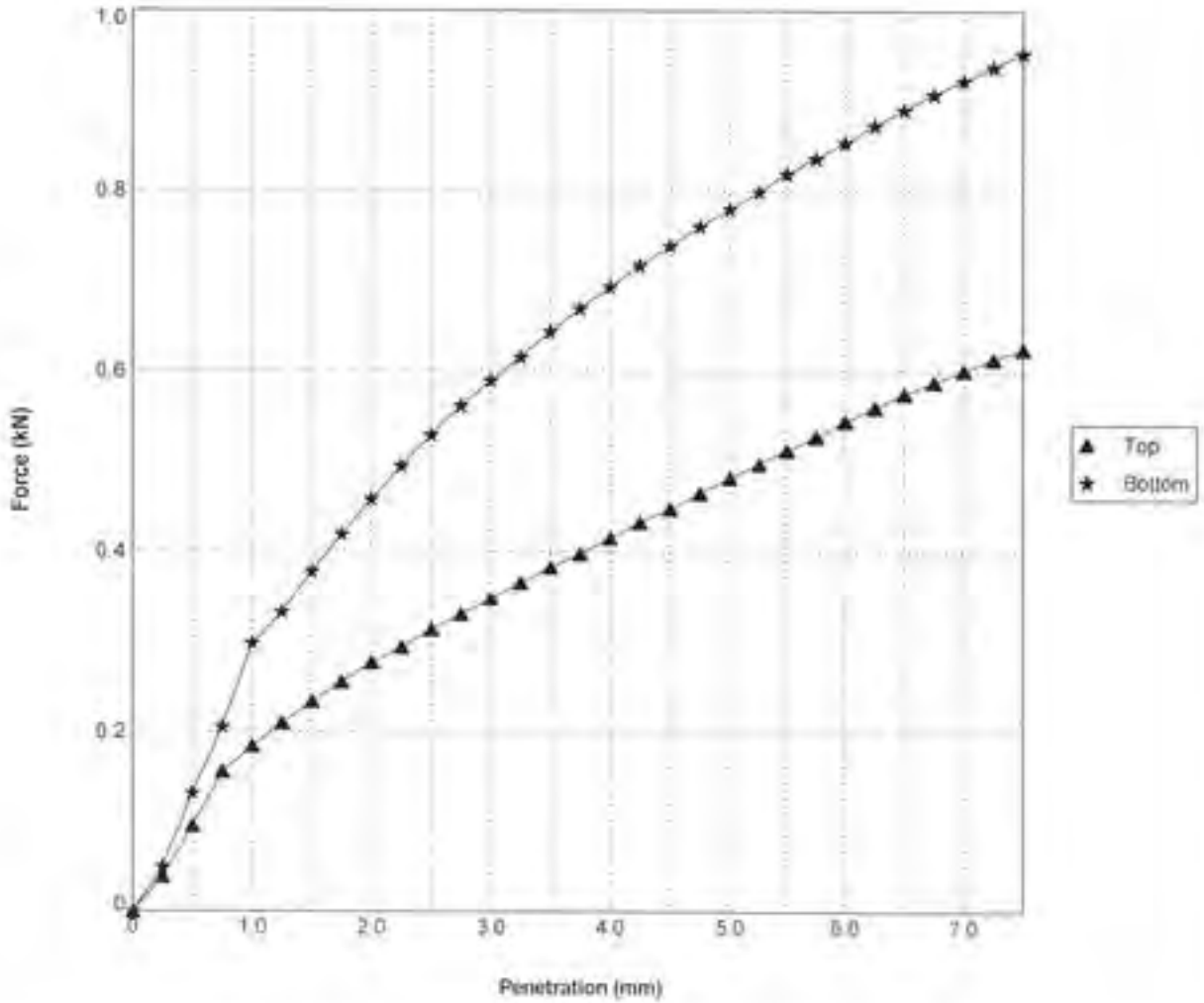
Regional Office: Unit 22, Business Development Centre, Eastern Wharf, Blackburn, BB1 5BL - Tel: 01772 725 300 Fax: 01772 735 009

DETERMINATION OF THE CALIFORNIA BEARING RATIO

BS 1377 : Part 4 : 1990 and Part 2 : Clause 3.2 : 1990

Exploratory Hole No.- **ATK_TP_006** Sample No.- **B9** Depth (m)- **2.30**

"As Received" Moisture Content (%) :		Surcharge (Kg) :	6
Retained on 20mm (%) :	0.0	Seating Load (N) :	Top 10 / Bottom 10
Correction Needed :	No	Test Moisture Content (%) :	Top 29 / Bottom 28
Soaking Time (Days) :	15.5	Bulk Density (Mg/m^3) :	1.95
Swelling (mm) :	1.07	Dry Density (Mg/m^3) :	1.52
Date Tested :	29/07/2020	CBR Value (%) :	Top 2.4 / Bottom 4.0
Preparation Method :	2.5kg Compaction		
Remarks :			



For description of sample please refer to the Laboratory Sample Description Sheet

Contract Title :- Eston Road Intrusive Works	Client :- South Tees Development Corporation

Signed :- mson	Name :-	Page 1 of 1	
Date of issue :- 05/11/2020	Certificate No :- CBR/4287/ATK_TP_006/B9/2.30/1	AEG Contract No :- 4287	UKAS TESTING 1367

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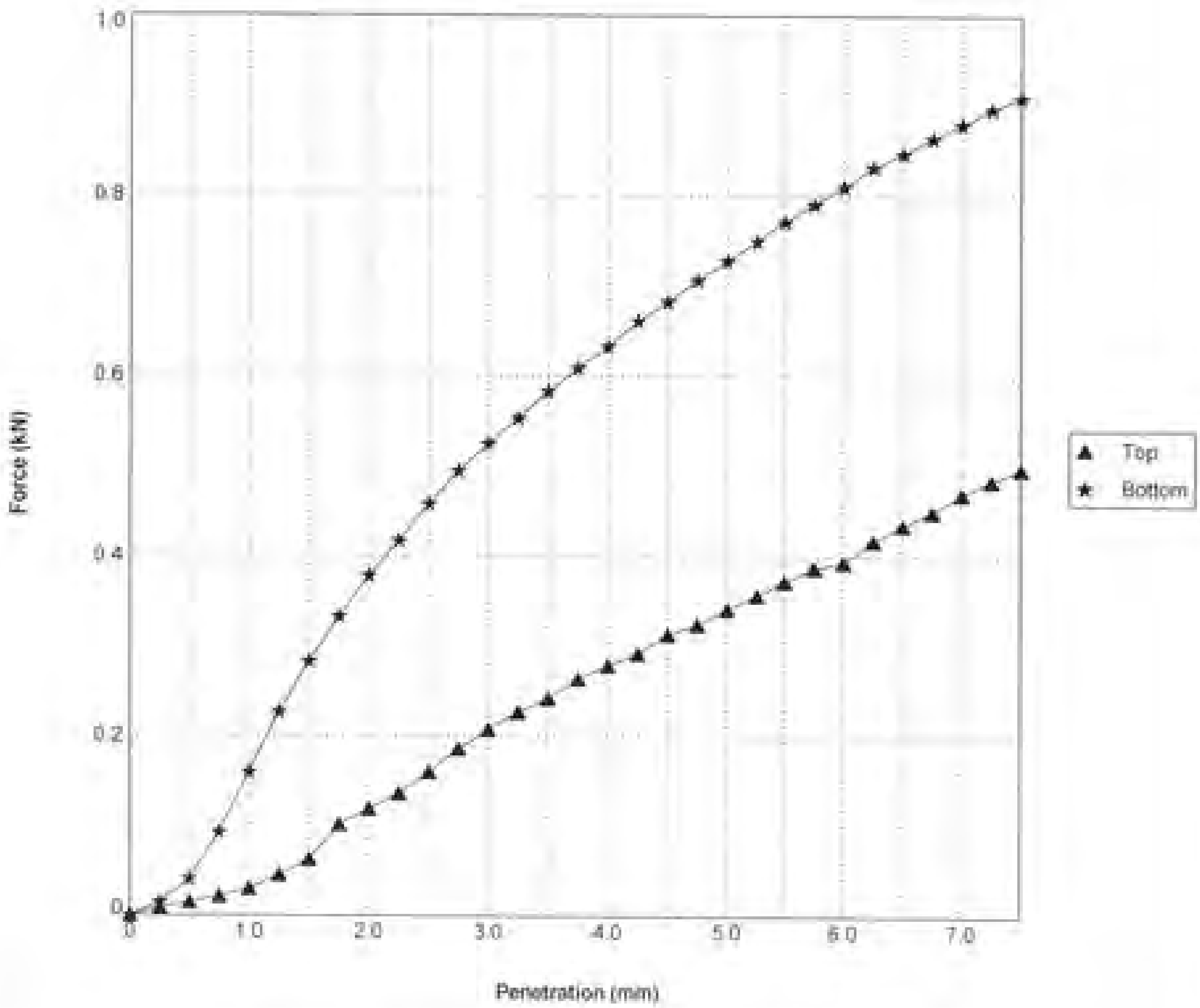
DETERMINATION OF THE CALIFORNIA BEARING RATIO

BS 1377 : Part 4 : 1990 and Part 2 : Clause 3.2 : 1990

Exploratory Hole No.- **ATK_TP_006** Sample No.- **B12** Depth (m)- **3.00**

"As Received" Moisture Content (%) :		Surcharge (Kg) :	6
Retained on 20mm (%) :	0.0	Seating Load (N) :	Top 10 / Bottom 10
Correction Needed :	No	Test Moisture Content (%) :	Top 29 / Bottom 28
Soaking Time (Days) :	14.5	Bulk Density (Mg/m^3) :	1.95
Swelling (mm) :	0.82	Dry Density (Mg/m^3) :	1.51
Date Tested :	29/07/2020	CBR Value (%) :	Top 1.7 / Bottom 3.6
Preparation Method :	2.5kg Compaction		
Remarks :			



For description of sample please refer to the Laboratory Sample Description Sheet

Contract Title :- Eston Road Intrusive Works	Client :- South Tees Development Corporation

Signed :- msono	Name :-	Page 1 of 1
Date of issue :- 05/11/2020	Certificate No :- CBR/4287/ATK_TP_006/B12/3.00/1	AEG Contract No. :- 4287

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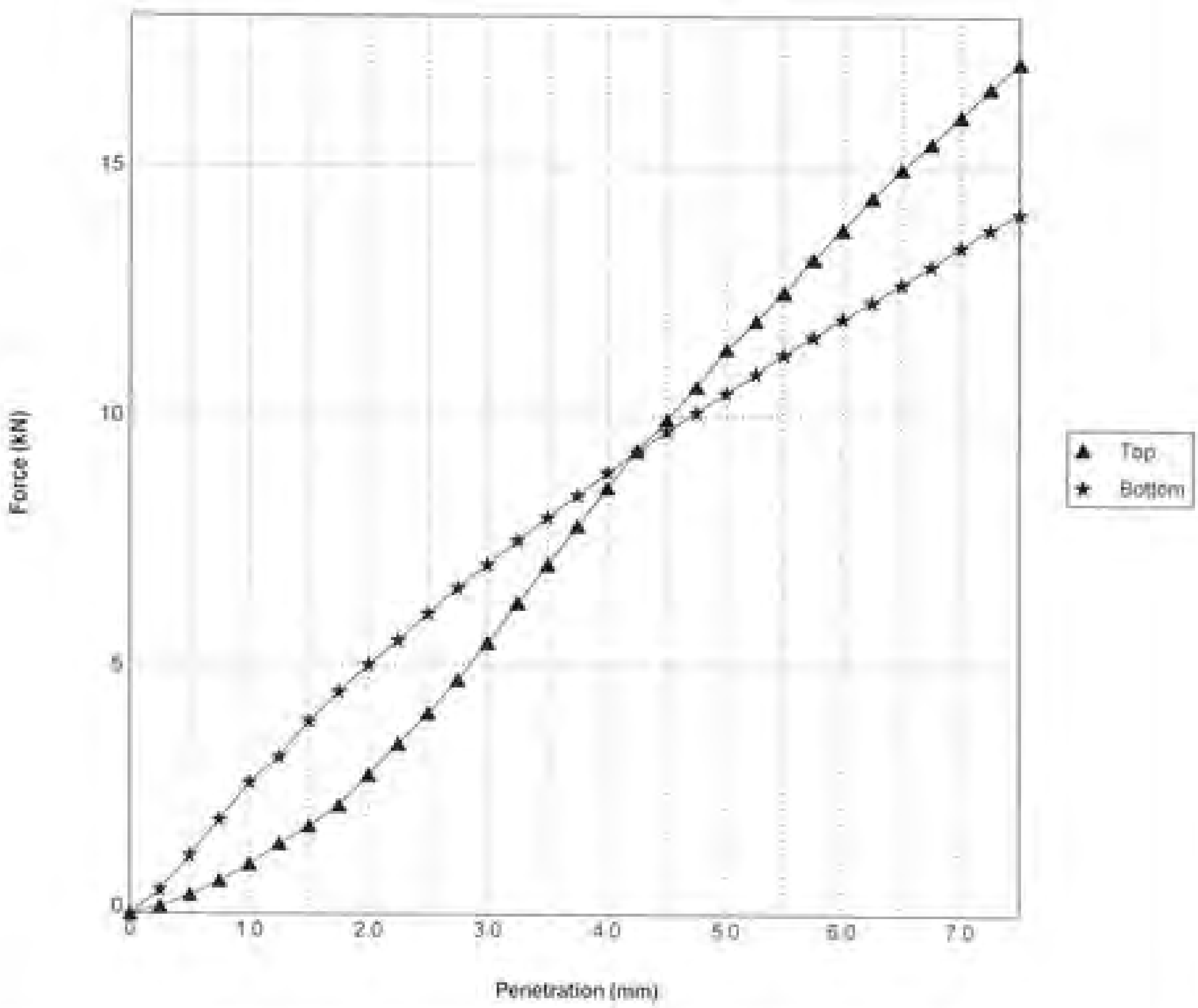
DETERMINATION OF THE CALIFORNIA BEARING RATIO

BS 1377 : Part 4 : 1990 and Part 2 : Clause 3.2 : 1990

Exploratory Hole No.- **ATK_TP_007** Sample No.- **B3** Depth (m)- **0.50**

"As Received" Moisture Content (%) :	15.0	Surcharge (Kg) :	6
Retained on 20mm (%) :	17.0	Seating Load (N) :	Top 250 / Bottom 250
Correction Needed :	No	Test Moisture Content (%) :	Top 18 / Bottom 17
Soaking Time (Days) :	N/A	Bulk Density (Mg/m^3) :	1.78
Swelling (mm) :	N/A	Dry Density (Mg/m^3) :	1.52
Date Tested :	24/08/2020	CBR Value (%) :	Top 57 / Bottom 52
Preparation Method :	2.5kg Compaction		
Remarks :			



For description of sample please refer to the Laboratory Sample Description Sheet.

Contract Title :- Eston Road Intrusive Works	Client :- South Tees Development Corporation

Signed :-	Name :-		Page 1 of 1
Date of issue :- 05/11/2020	Certificate No :- CBR/4287/ATK_TP_007/B3/0.50/1	AEG Contract No. :- 4287	1367

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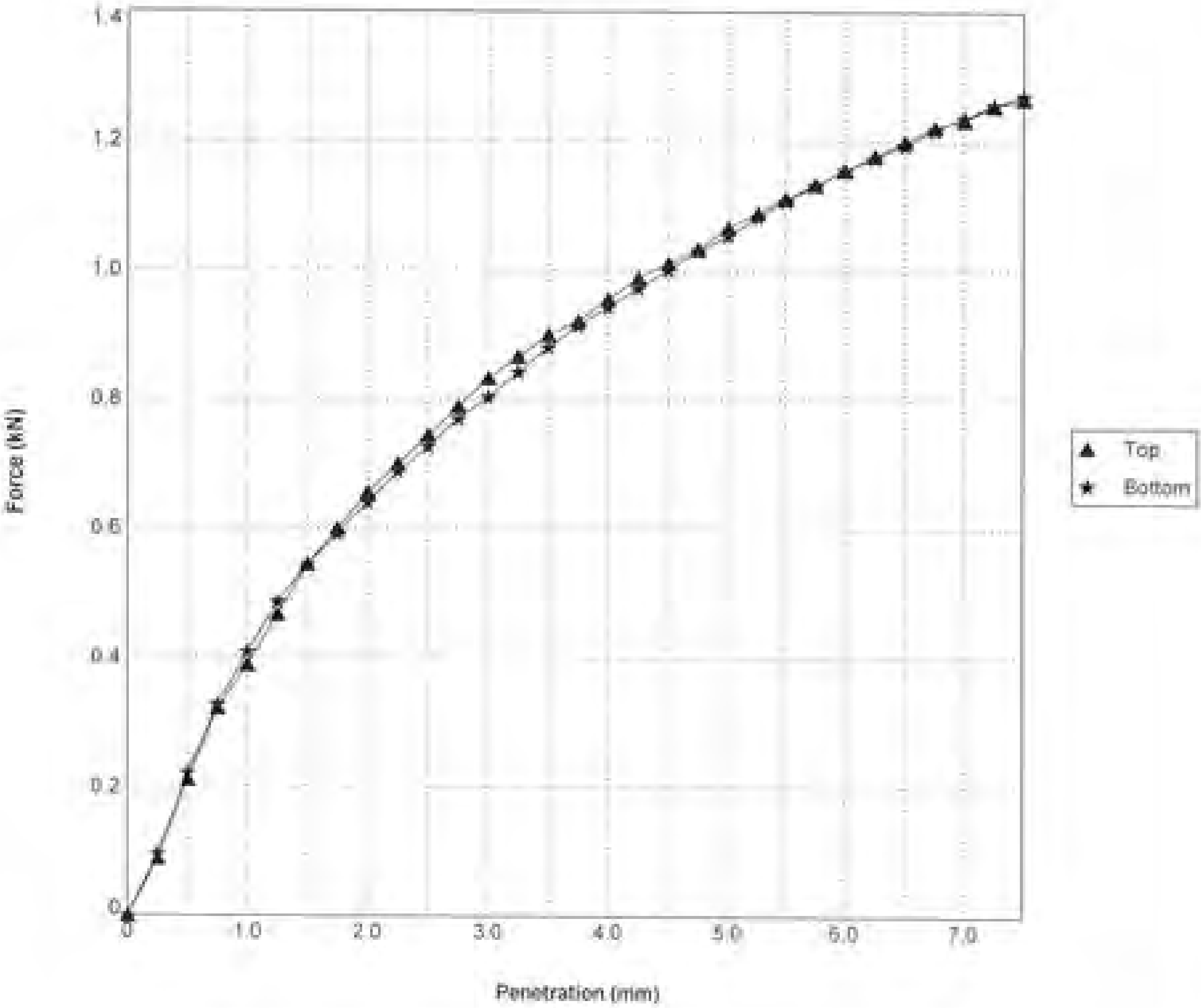
DETERMINATION OF THE CALIFORNIA BEARING RATIO
BS 1377 : Part 4 : 1990 and Part 2 : Clause 3.2 : 1990

Exploratory Hole No.- **ATK_TP_009** Sample No.- **B5** Depth (m)- **1.30**

"As Received" Moisture Content (%) :		Surcharge (Kg) :	6
Retained on 20mm (%) :	0.0	Seating Load (N) :	Top 50 / Bottom 50
Correction Needed :	No	Test Moisture Content (%) :	Top 25 / Bottom 25
Soaking Time (Days) :	N/A	Bulk Density (Mg/m^3) :	1.99
Swelling (mm) :	N/A	Dry Density (Mg/m^3) :	1.59
Date Tested :	29/07/2020	CBR Value (%) :	Top 5.6 / Bottom 5.5
Preparation Method :	2.5kg Compaction		
Remarks			



For description of sample please refer to the Laboratory Sample Description Sheet

Contract Title :-	Client :-
Eston Road Intrusive Works	South Tees Development Corporation

Signed :- [signature]	Name :-	Page 1 of 1
Date of issue :- 05/11/2020	Certificate No :- CBR/4287/ATK_TP_009/B5/1.30/1	AEG Contract No :- **4287**

UKAS TESTING 1367

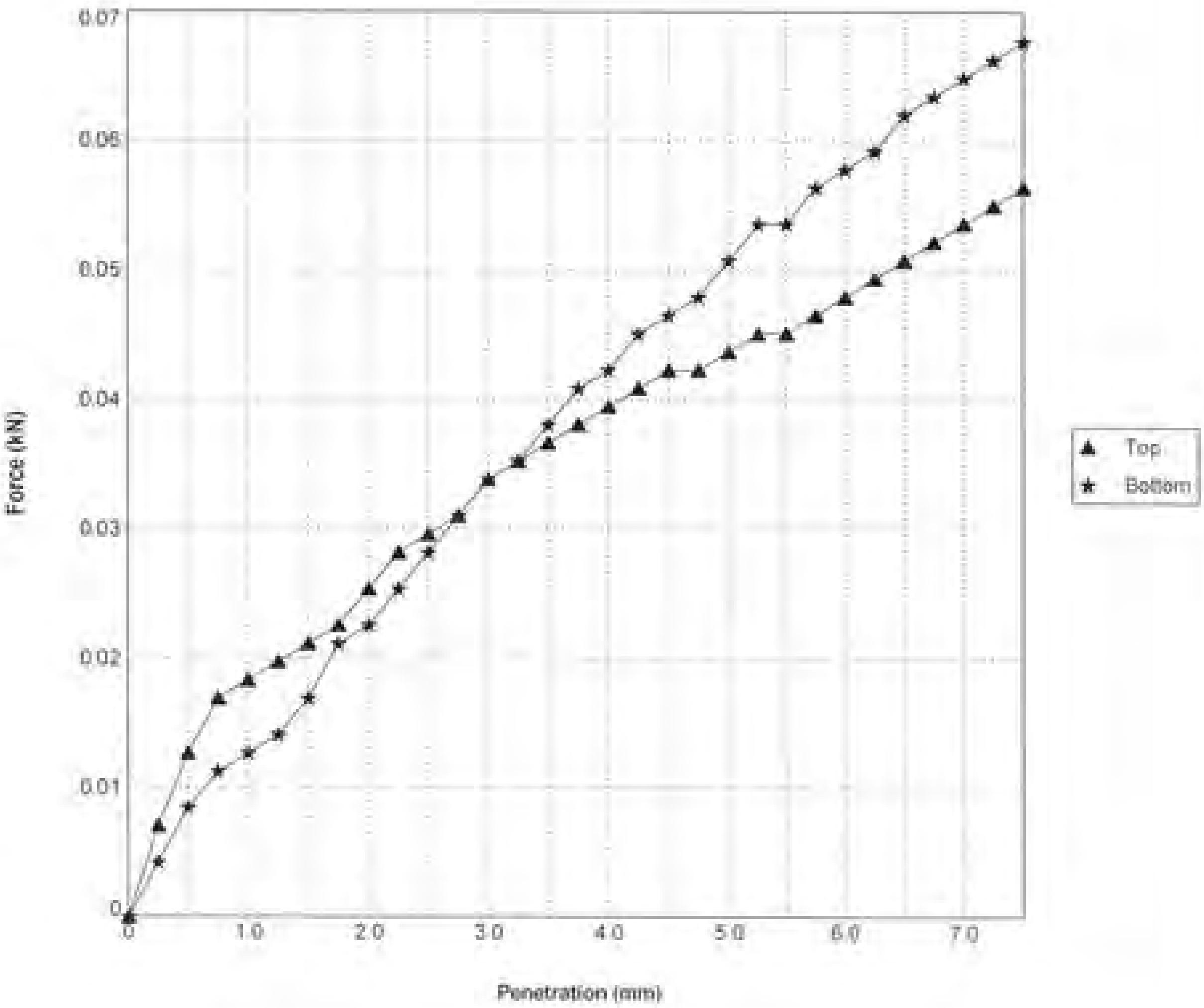
ALLIED EXPLORATION & GEOTECHNICS LIMITED

DETERMINATION OF THE CALIFORNIA BEARING RATIO

BS 1377 : Part 4 : 1990 and Part 2 : Clause 3.2 : 1990

Exploratory Hole No.- **ATK_TP_010** Sample No.- **B7** Depth (m)- **1.50**

"As Received" Moisture Content (%) :		Surcharge (Kg) :	6
Retained on 20mm (%) :	0.0	Seating Load (N) :	Top 10 / Bottom 10
Correction Needed :	No	Test Moisture Content (%) :	Top 47 / Bottom 48
Soaking Time (Days) :	N/A	Bulk Density (Mg/m³) :	1.71
Swelling (mm) :	N/A	Dry Density (Mg/m³) :	1.16
Date Tested :	25/08/2020	CBR Value (%) :	Top 0.20 / Bottom 0.30
Preparation Method :	2.5kg Compaction		
Remarks :			



For description of sample please refer to the Laboratory Sample Description Sheet

Contract Title :- Eston Road Intrusive Works	Client :- South Tees Development Corporation

Signed :-	Name :-	Page 1 of 1
Date of issue :- 05/11/2020	Certificate No :- CBR/4287/ATK_TP_010/B7/1.50/1	AEG Contract No. :- 4287

1367

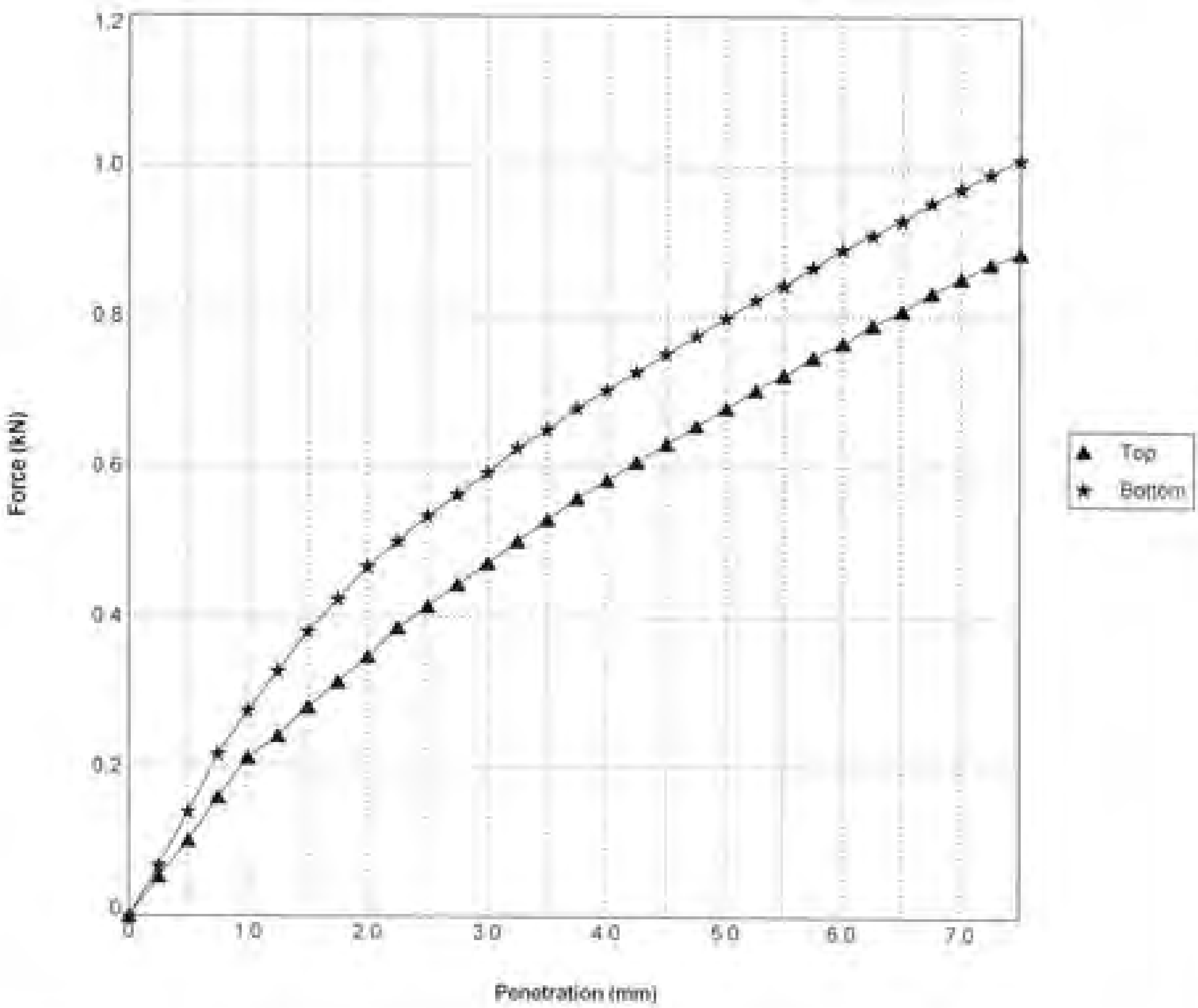
ALLIED EXPLORATION & GEOTECHNICS LIMITED

DETERMINATION OF THE CALIFORNIA BEARING RATIO

BS 1377 : Part 4 : 1990 and Part 2 : Clause 3.2 : 1990

Exploratory Hole No.- **ATK_TP_010** Sample No.- **B12** Depth (m)- **3.20**

"As Received" Moisture Content (%) :		Surcharge (Kg) :	6
Retained on 20mm (%) :	0.0	Seating Load (N) :	Top 50 / Bottom 50
Correction Needed :	No	Test Moisture Content (%) :	Top 27 / Bottom 26
Soaking Time (Days) :	N/A	Bulk Density (Mg/m^3) :	1.96
Swelling (mm) :	N/A	Dry Density (Mg/m^3) :	1.55
Date Tested :	25/08/2020	CBR Value (%) :	Top 3.4 / Bottom 4.1
Preparation Method :	2.5kg Compaction		
Remarks :			



For description of sample please refer to the Laboratory Sample Description Sheet

Contract Title :- Eston Road Intrusive Works	Client :- South Tees Development Corporation

Signed :-	Name :-		Page 1 of 1
Date of issue :- 05/11/2020	Certificate No :- CBR/4287/ATK_TP_010/B12/3.20/1	AEG Contract No :- 4287	UKAS TESTING 1367

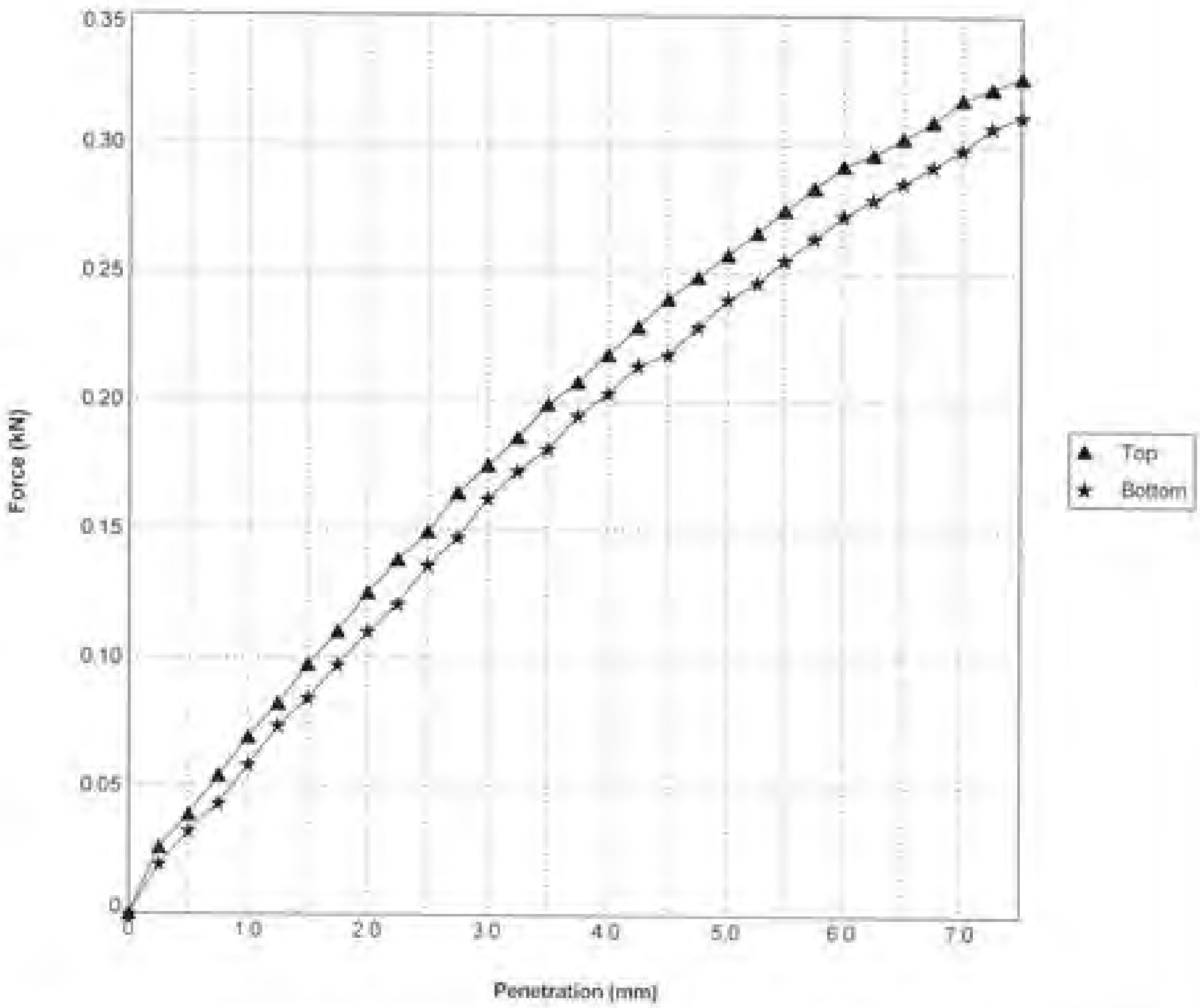
ALLIED EXPLORATION & GEOTECHNICS LIMITED

DETERMINATION OF THE CALIFORNIA BEARING RATIO

BS 1377 : Part 4 : 1990 and Part 2 : Clause 3.2 : 1990

Exploratory Hole No - **ATK_TP_011** Sample No - **B5** Depth (m)- **1.80**

"As Received" Moisture Content (%) :		Surcharge (Kg) :	6
Retained on 20mm (%) :	4.0	Seating Load (N) :	Top 50 / Bottom 10
Correction Needed :	No	Test Moisture Content (%) :	Top 33 / Bottom 34
Soaking Time (Days) :	N/A	Bulk Density (Mg/m^3) :	1.83
Swelling (mm) :	N/A	Dry Density (Mg/m^3) :	1.37
Date Tested :	25/08/2020	CBR Value (%) :	Top 1.3 / Bottom 1.2
Preparation Method :	2.5kg Compaction		
Remarks :			



For description of sample please refer to the Laboratory Sample Description Sheet

Contract Title :- Eston Road Intrusive Works	Client :- South Tees Development Corporation

Signed :- [signature]	Name :-		Page 1 of 1
Date of issue :- 05/11/2020	Certificate No :- CBR/4287/ATK_TP_011/B5/1.80/1	AEG Contract No :- **4287**	UKAS TESTING 1367

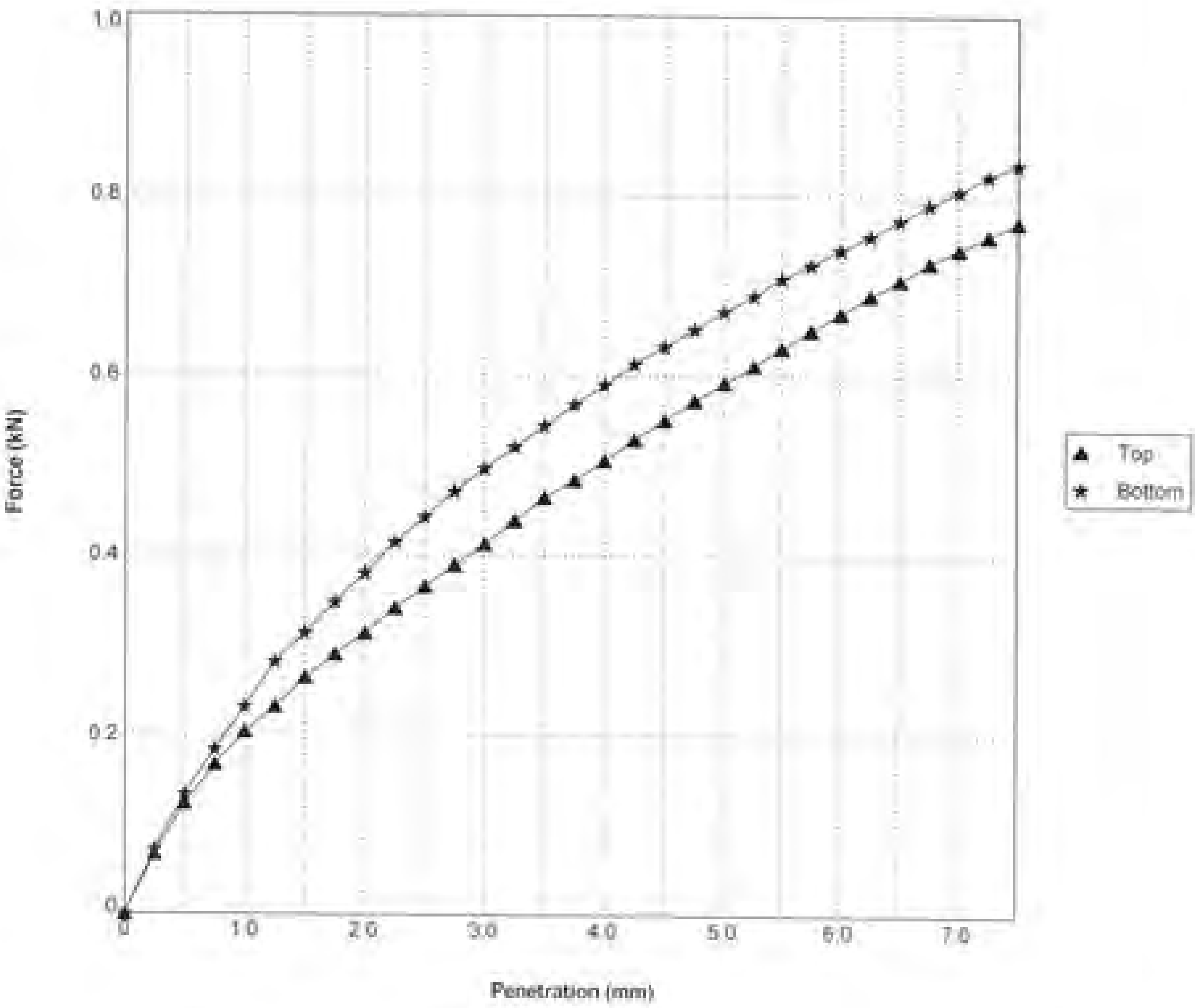
ALLIED EXPLORATION & GEOTECHNICS LIMITED

DETERMINATION OF THE CALIFORNIA BEARING RATIO

BS 1377 : Part 4 : 1990 and Part 2 : Clause 3.2 : 1990

Exploratory Hole No.- **ATK_TP_012** Sample No.- **B7** Depth (m)- **2.30**

"As Received" Moisture Content (%) :		Surcharge (Kg) :	6
Retained on 20mm (%) :	0.0	Seating Load (N) :	Top 50 / Bottom 50
Correction Needed :	No	Test Moisture Content (%) :	Top 25 / Bottom 25
Soaking Time (Days) :	N/A	Bulk Density (Mg/m^3) :	1.97
Swelling (mm) :	N/A	Dry Density (Mg/m^3) :	1.58
Date Tested :	18/08/2020	CBR Value (%) :	Top 3.0 / Bottom 3.4
Preparation Method :	2.5kg Compaction		
Remarks :			



For description of sample please refer to the Laboratory Sample Description Sheet

Contract Title :- **Eston Road Intrusive Works**	Client :- **South Tees Development Corporation**

Signed :- msene	Name :-		Page 1 of 1
Date of issue :- 05/11/2020	Certificate No :- CBR/4287/ATK_TP_012/B7/2.30/1	AEG Contract No. :- 4287	UKAS TESTING 1367

APPENDIX I

Specialist Chemical Testing

(Tested Externally)

Certificate of Analysis

Certificate Number 20-11138

09-Nov-20

Client Allied Exploration & Geotechnics Limited
Unit 25
Stella Gill Industrial Estate
Pelton Fell
DH2 2RG

Our Reference 20-11138

Client Reference 4287

Order No (not supplied)

Contract Title Eston Road Intrusive Works

Description 5 Soil samples, 7 Leachate samples.

Date Received 24-Jun-20

Date Started 24-Jun-20

Date Completed 09-Nov-20

Test Procedures Identified by prefix DETSn (details on request).

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Approved By

Adam Fenwick
Contracts Manager

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Summary of Chemical Analysis
Matrix Descriptions

Our Ref 20-11138
Client Ref 4287
Contract Title Eston Road Intrusive Works

Sample ID	Other ID	Depth	Lab No	Completed	Matrix Description
ATK_TP_001	3	0.6	1688424	05/08/2020	Dark brown gravelly SAND
ATK_TP_003	3	1	1688425	05/08/2020	Dark brown gravelly SAND
ATK_TP_007	6	0.9	1688426	05/08/2020	Dark brown gravelly SAND
ATK_TP_009	3	0.5	1688427	05/08/2020	Dark brown gravelly SAND
ATK_TP_011	3	0.9	1688428	05/08/2020	Brown gravelly, sandy CLAY

Summary of Chemical Analysis
Soil Samples

Our Ref 20-11138
Client Ref 4287
Contract Title Eston Road Intrusive Works

			Lab No	1688424	1688425	1688426
			Sample ID	ATK_TP_001	ATK_TP_003	ATK_TP_007
			Depth	0.60	1.00	0.90
			Other ID	3	3	6
			Sample Type	ES	ES	ES
			Sampling Date	19/06/2020	18/06/2020	16/06/2020
			Sampling Time	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**			
Metals						
Arsenic	DETSC 2301#	0.2	mg/kg	13	21	14
Boron, Water Soluble	DETSC 2311#	0.2	mg/kg	2.7	2.3	2.6
Cadmium	DETSC 2301#	0.1	mg/kg	0.6	0.4	0.7
Chromium	DETSC 2301#	0.15	mg/kg	90	27	32
Copper	DETSC 2301#	0.2	mg/kg	29	140	63
Lead	DETSC 2301#	0.3	mg/kg	80	59	250
Mercury	DETSC 2325#	0.05	mg/kg	2.4	0.12	0.22
Nickel	DETSC 2301#	1	mg/kg	16	31	17
Zinc	DETSC 2301#	1	mg/kg	230	150	230
Inorganics						
pH	DETSC 2008#		pH	9.7	8.8	10.3
Cyanide, Total	DETSC 2130#	0.1	mg/kg	9.9	0.9	0.8
Cyanide, Free	DETSC 2130#	0.1	mg/kg	0.3	< 0.1	< 0.1
Thiocyanate	DETSC 2130#	0.6	mg/kg	2.3	< 0.6	< 0.6
Organic matter	DETSC 2002#	0.1	%	3.2	3.5	5.7
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	190	110	410
Sulphur (free)	DETSC 3049#	0.75	mg/kg	< 0.75	< 0.75	< 0.75
Petroleum Hydrocarbons						
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2	< 1.2	< 1.2
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	< 3.4	< 3.4	< 3.4
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10	< 10
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	< 0.9	< 0.9	< 0.9
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	0.8	< 0.5	0.8
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	5.4	< 0.6	13
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	13	< 1.4	34
Aromatic C5-C35	DETSC 3072*	10	mg/kg	20	< 10	48
TPH Ali/Aro Total C5-C35	DETSC 3072*	10	mg/kg	20	< 10	48

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Summary of Chemical Analysis

Soil Samples

Our Ref 20-11138
Client Ref 4287
Contract Title Eston Road Intrusive Works

			Lab No	1688424	1688425	1688426
			Sample ID	ATK_TP_001	ATK_TP_003	ATK_TP_007
			Depth	0.60	1.00	0.90
			Other ID	3	3	6
			Sample Type	ES	ES	ES
			Sampling Date	19/06/2020	18/06/2020	16/06/2020
			Sampling Time	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**			
PAHs						
Naphthalene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	0.08
Acenaphthylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	0.06
Acenaphthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	0.12
Fluorene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03	0.11
Phenanthrene	DETSC 3303#	0.03	mg/kg	0.25	0.04	1.5
Anthracene	DETSC 3303	0.03	mg/kg	0.07	< 0.03	0.72
Fluoranthene	DETSC 3303#	0.03	mg/kg	1.1	0.05	9.7
Pyrene	DETSC 3303#	0.03	mg/kg	1.1	0.05	8.9
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	0.58	< 0.03	5.2
Chrysene	DETSC 3303	0.03	mg/kg	0.52	< 0.03	4.2
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	0.75	< 0.03	6.8
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	0.27	< 0.03	2.5
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	0.47	< 0.03	4.8
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	0.33	< 0.03	2.8
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	0.06	< 0.03	0.72
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	0.33	< 0.03	2.8
PAH - USEPA 16, Total	DETSC 3303	0.1	mg/kg	5.8	0.14	51
Phenols						
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	< 0.3	< 0.3

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Summary of Chemical Analysis
Soil Samples

Our Ref 20-11138
Client Ref 4287
Contract Title Eston Road Intrusive Works

			Lab No	1688427	1688428
			Sample ID	ATK_TP_009	ATK_TP_011
			Depth	0.50	0.90
			Other ID	3	3
			Sample Type	ES	ES
			Sampling Date	17/06/2020	17/06/2020
			Sampling Time	n/s	n/s
Test	**Method**	**LOD**	**Units**		
Metals					
Arsenic	DETSC 2301#	0.2	mg/kg	30	970
Boron, Water Soluble	DETSC 2311#	0.2	mg/kg	2.6	2.6
Cadmium	DETSC 2301#	0.1	mg/kg	1.4	0.8
Chromium	DETSC 2301#	0.15	mg/kg	92	91
Copper	DETSC 2301#	0.2	mg/kg	79	51
Lead	DETSC 2301#	0.3	mg/kg	170	470
Mercury	DETSC 2325#	0.05	mg/kg	6.0	0.41
Nickel	DETSC 2301#	1	mg/kg	25	56
Zinc	DETSC 2301#	1	mg/kg	570	300
Inorganics					
pH	DETSC 2008#		pH	8.8	6.6
Cyanide, Total	DETSC 2130#	0.1	mg/kg	220	0.8
Cyanide, Free	DETSC 2130#	0.1	mg/kg	2.1	< 0.1
Thiocyanate	DETSC 2130#	0.6	mg/kg	8.3	< 0.6
Organic matter	DETSC 2002#	0.1	%	2.2	3.5
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	770	1900
Sulphur (free)	DETSC 3049#	0.75	mg/kg	22	9.5
Petroleum Hydrocarbons					
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	1.4	< 1.2
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	4.7	< 1.5
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	17	< 3.4
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	24	< 10
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	< 0.9	< 0.9
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	< 0.5	< 0.5
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	5.8	< 0.6
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	26	< 1.4
Aromatic C5-C35	DETSC 3072*	10	mg/kg	32	< 10
TPH Ali/Aro Total C5-C35	DETSC 3072*	10	mg/kg	56	< 10

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Summary of Chemical Analysis
Soil Samples

Our Ref 20-11138
Client Ref 4287
Contract Title Eston Road Intrusive Works

Lab No	1688427	1688428
Sample ID	ATK_TP_009	ATK_TP_011
Depth	0.50	0.90
Other ID	3	3
Sample Type	ES	ES
Sampling Date	17/06/2020	17/06/2020
Sampling Time	n/s	n/s

Test	Method	LOD	Units		
PAHs					
Naphthalene	DETSC 3303#	0.03	mg/kg	0.05	< 0.03
Acenaphthylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03
Acenaphthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03
Fluorene	DETSC 3303	0.03	mg/kg	0.04	< 0.03
Phenanthrene	DETSC 3303#	0.03	mg/kg	0.41	< 0.03
Anthracene	DETSC 3303	0.03	mg/kg	0.11	< 0.03
Fluoranthene	DETSC 3303#	0.03	mg/kg	1.5	< 0.03
Pyrene	DETSC 3303#	0.03	mg/kg	1.5	< 0.03
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	0.80	< 0.03
Chrysene	DETSC 3303	0.03	mg/kg	0.66	< 0.03
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	1.3	< 0.03
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	0.48	< 0.03
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	0.78	< 0.03
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	0.58	< 0.03
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	0.14	< 0.03
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	0.58	< 0.03
PAH - USEPA 16, Total	DETSC 3303	0.1	mg/kg	9.0	< 0.10
Phenols					
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	< 0.3

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Summary of Chemical Analysis
Soil VOC Samples

Our Ref 20-11138
Client Ref 4287
Contract Title Eston Road Intrusive Works

Lab No	1688427
Sample ID	ATK_TP_009
Depth	0.50
Other ID	3
Sample Type	ES
Sampling Date	17/06/2020
Sampling Time	n/s

Test	Method	LOD	Units	
VOCs				
Vinyl Chloride	DETSC 3431	0.01	mg/kg	< 0.01
1,1 Dichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01
Trans-1,2-dichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01
1,1-dichloroethane	DETSC 3431	0.01	mg/kg	< 0.01
Cis-1,2-dichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01
2,2-dichloropropane	DETSC 3431	0.01	mg/kg	< 0.01
Bromochloromethane	DETSC 3431	0.01	mg/kg	< 0.01
Chloroform	DETSC 3431	0.01	mg/kg	< 0.01
1,1,1-trichloroethane	DETSC 3431	0.01	mg/kg	< 0.01
1,1-dichloropropene	DETSC 3431	0.01	mg/kg	< 0.01
Carbon tetrachloride	DETSC 3431	0.01	mg/kg	< 0.01
Benzene	DETSC 3431	0.01	mg/kg	< 0.01
1,2-dichloroethane	DETSC 3431	0.01	mg/kg	< 0.01
Trichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01
1,2-dichloropropane	DETSC 3431	0.01	mg/kg	< 0.01
Dibromomethane	DETSC 3431	0.01	mg/kg	< 0.01
Bromodichloromethane	DETSC 3431	0.01	mg/kg	< 0.01
cis-1,3-dichloropropene	DETSC 3431	0.01	mg/kg	< 0.01
Toluene	DETSC 3431	0.01	mg/kg	< 0.01
trans-1,3-dichloropropene	DETSC 3431	0.01	mg/kg	< 0.01
1,1,2-trichloroethane	DETSC 3431	0.01	mg/kg	< 0.01
Tetrachloroethylene	DETSC 3431	0.01	mg/kg	< 0.01
1,3-dichloropropane	DETSC 3431	0.01	mg/kg	< 0.01
Dibromochloromethane	DETSC 3431	0.01	mg/kg	< 0.01
1,2-dibromoethane	DETSC 3431	0.01	mg/kg	< 0.01
Chlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01

Summary of Chemical Analysis
Soil VOC Samples

Our Ref 20-11138
Client Ref 4287
Contract Title Eston Road Intrusive Works

Lab No	1688427
Sample ID	ATK_TP_009
Depth	0.50
Other ID	3
Sample Type	ES
Sampling Date	17/06/2020
Sampling Time	n/s

Test	Method	LOD	Units	
1,1,1,2-tetrachloroethane	DETSC 3431	0.01	mg/kg	< 0.01
Ethylbenzene	DETSC 3431	0.01	mg/kg	< 0.01
m+p-Xylene	DETSC 3431	0.01	mg/kg	< 0.01
o-Xylene	DETSC 3431	0.01	mg/kg	< 0.01
Styrene	DETSC 3431*	0.01	mg/kg	< 0.01
Bromoform	DETSC 3431	0.01	mg/kg	< 0.01
Isopropylbenzene	DETSC 3431	0.01	mg/kg	< 0.01
Bromobenzene	DETSC 3431	0.01	mg/kg	< 0.01
1,2,3-trichloropropane	DETSC 3431	0.01	mg/kg	< 0.01
n-propylbenzene	DETSC 3431	0.01	mg/kg	< 0.01
2-chlorotoluene	DETSC 3431	0.01	mg/kg	< 0.01
1,3,5-trimethylbenzene	DETSC 3431	0.01	mg/kg	< 0.01
4-chlorotoluene	DETSC 3431	0.01	mg/kg	< 0.01
Tert-butylbenzene	DETSC 3431	0.01	mg/kg	< 0.01
1,2,4-trimethylbenzene	DETSC 3431	0.01	mg/kg	< 0.01
sec-butylbenzene	DETSC 3431	0.01	mg/kg	< 0.01
p-isopropyltoluene	DETSC 3431	0.01	mg/kg	< 0.01
1,3-dichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01
1,4-dichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01
n-butylbenzene	DETSC 3431	0.01	mg/kg	< 0.01
1,2-dichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01
1,2-dibromo-3-chloropropane	DETSC 3431	0.01	mg/kg	< 0.01
1,2,4-trichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01
Hexachlorobutadiene	DETSC 3431	0.01	mg/kg	< 0.01
1,2,3-trichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01
MTBE	DETSC 3431*	0.01	mg/kg	< 0.01

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Leachate Samples

Our Ref 20-11138
Client Ref 4287
Contract Title Eston Road Intrusive Works

			Lab No	1702407	1702408	1702409	1702410
			Sample ID	ATK_TP_001	ATK_TP_004	ATK_TP_004	ATK_TP_007
			Depth	0.60	1.40	2.80	0.90
			Other ID	3	3	10	6
			Sample Type	ES	ES	ES	ES
			Sampling Date	19/06/2020	18/06/2020	18/06/2020	16/06/2020
			Sampling Time	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**				
Preparation							
Leachate 2:1 250g Non-WAC	DETSC 1009*			Y	Y	Y	Y
Metals							
Antimony, Dissolved	DETSC 2306	0.17	ug/l	< 0.17	< 0.17	< 0.17	0.29
Arsenic, Dissolved	DETSC 2306	0.16	ug/l	0.64	0.67	0.38	2.5
Barium, Dissolved	DETSC 2306	0.26	ug/l	12	8.2	5.7	23
Beryllium, Dissolved	DETSC 2306*	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Boron, Dissolved	DETSC 2306*	12	ug/l	24	31	19	59
Cadmium, Dissolved	DETSC 2306	0.03	ug/l	< 0.03	< 0.03	< 0.03	< 0.03
Chromium, Dissolved	DETSC 2306	0.25	ug/l	0.30	< 0.25	< 0.25	0.41
Chromium, Hexavalent	DETSC 2203	7	ug/l	< 7.0	< 7.0	< 7.0	< 7.0
Copper, Dissolved	DETSC 2306	0.4	ug/l	3.4	4.1	1.5	5.5
Iron, Dissolved	DETSC 2306	5.5	ug/l	62	13	18	19
Lead, Dissolved	DETSC 2306	0.09	ug/l	0.56	0.11	< 0.09	0.34
Magnesium, Dissolved	DETSC 2306	0.02	mg/l	1.8	0.92	1.4	3.9
Manganese, Dissolved	DETSC 2306	0.22	ug/l	7.9	14	15	18
Mercury, Dissolved	DETSC 2306	0.01	ug/l	0.06	< 0.01	< 0.01	< 0.01
Molybdenum, Dissolved	DETSC 2306	1.1	ug/l	< 1.1	< 1.1	< 1.1	< 1.1
Nickel, Dissolved	DETSC 2306	0.5	ug/l	< 0.5	0.5	< 0.5	< 0.5
Vanadium, Dissolved	DETSC 2306	0.6	ug/l	< 0.6	2.9	1.1	7.2
Zinc, Dissolved	DETSC 2306	1.3	ug/l	7.6	4.0	7.3	5.4
Inorganics							
pH	DETSC 2008		pH	8.1	6.8	6.8	7.2
Cyanide, Total	DETSC 2130	40	ug/l	< 40	< 40	< 40	< 40
Ammoniacal Nitrogen as N	DETSC 2207	0.015	mg/l	< 0.015	< 0.015	< 0.015	< 0.015
Chloride	DETSC 2055	0.1	mg/l	2.4	1.9	3.2	2.2
Sulphate as SO4	DETSC 2055	0.1	mg/l	21	22	18	46

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Summary of Chemical Analysis

Leachate Samples

Our Ref 20-11138
Client Ref 4287
Contract Title Eston Road Intrusive Works

			Lab No	1702407	1702408	1702409	1702410
			Sample ID	ATK_TP_001	ATK_TP_004	ATK_TP_004	ATK_TP_007
			Depth	0.60	1.40	2.80	0.90
			Other ID	3	3	10	6
			Sample Type	ES	ES	ES	ES
			Sampling Date	19/06/2020	18/06/2020	18/06/2020	16/06/2020
			Sampling Time	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**				
Petroleum Hydrocarbons							
Aliphatic C5-C6	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C6-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C5-C35	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10
Aromatic C5-C7	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C7-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0	1.7	< 1.0
Aromatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	< 1.0	1.4	< 1.0
Aromatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C5-C35	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10
TPH Ali/Aro Total C5-C35	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10
PAHs							
Naphthalene	DETSC 3304	0.05	ug/l	0.15	< 0.05	< 0.05	0.05
Acenaphthylene	DETSC 3304	0.01	ug/l	0.13	0.02	< 0.01	0.06
Acenaphthene	DETSC 3304	0.01	ug/l	0.09	0.02	0.01	0.16
Fluorene	DETSC 3304	0.01	ug/l	0.07	0.02	< 0.01	0.05
Phenanthrene	DETSC 3304	0.01	ug/l	1.6	0.12	0.05	0.39
Anthracene	DETSC 3304	0.01	ug/l	0.40	0.05	< 0.01	0.15
Fluoranthene	DETSC 3304	0.01	ug/l	7.0	0.18	0.07	2.6
Pyrene	DETSC 3304	0.01	ug/l	7.6	0.16	0.06	2.7
Benzo(a)anthracene	DETSC 3304	0.01	ug/l	6.8	0.10	0.04	0.83
Chrysene	DETSC 3304	0.01	ug/l	3.3	0.21	0.04	0.87
Benzo(b)fluoranthene	DETSC 3304	0.01	ug/l	5.4	0.17	0.06	1.8
Benzo(k)fluoranthene	DETSC 3304	0.01	ug/l	1.7	0.07	0.02	0.64
Benzo(a)pyrene	DETSC 3304	0.01	ug/l	4.6	0.10	0.03	3.6
Indeno(1,2,3-c,d)pyrene	DETSC 3304	0.01	ug/l	4.2	0.10	0.03	1.3
Dibenzo(a,h)anthracene	DETSC 3304	0.01	ug/l	1.1	0.02	< 0.01	0.21
Benzo(g,h,i)perylene	DETSC 3304	0.01	ug/l	4.7	0.11	0.03	1.0
PAH Total	DETSC 3304	0.2	ug/l	49	1.5	0.51	16
Phenols							
Phenol - Monohydric	DETSC 2130	100	ug/l	< 100	< 100	< 100	< 100

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Leachate Samples

Our Ref 20-11138
Client Ref 4287
Contract Title Eston Road Intrusive Works

			Lab No	1702411	1702412	1702413
			Sample ID	ATK_TP_007	ATK_TP_009	ATK_TP_009
			Depth	2.80	0.50	1.50
			Other ID	11	3	6
			Sample Type	ES	ES	ES
			Sampling Date	16/06/2020	17/06/2020	n/s
			Sampling Time	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**			
Preparation						
Leachate 2:1 250g Non-WAC	DETSC 1009*			Y	Y	Y
Metals						
Antimony, Dissolved	DETSC 2306	0.17	ug/l	< 0.17	0.60	< 0.17
Arsenic, Dissolved	DETSC 2306	0.16	ug/l	0.37	1.8	0.29
Barium, Dissolved	DETSC 2306	0.26	ug/l	12	44	25
Beryllium, Dissolved	DETSC 2306*	0.1	ug/l	< 0.1	< 0.1	< 0.1
Boron, Dissolved	DETSC 2306*	12	ug/l	20	37	20
Cadmium, Dissolved	DETSC 2306	0.03	ug/l	< 0.03	< 0.03	< 0.03
Chromium, Dissolved	DETSC 2306	0.25	ug/l	< 0.25	< 0.25	< 0.25
Chromium, Hexavalent	DETSC 2203	7	ug/l	< 7.0	< 7.0	< 7.0
Copper, Dissolved	DETSC 2306	0.4	ug/l	2.5	5.9	3.3
Iron, Dissolved	DETSC 2306	5.5	ug/l	79	140	39
Lead, Dissolved	DETSC 2306	0.09	ug/l	0.13	0.26	0.15
Magnesium, Dissolved	DETSC 2306	0.02	mg/l	2.0	2.9	1.7
Manganese, Dissolved	DETSC 2306	0.22	ug/l	44	50	17
Mercury, Dissolved	DETSC 2306	0.01	ug/l	< 0.01	0.02	< 0.01
Molybdenum, Dissolved	DETSC 2306	1.1	ug/l	< 1.1	< 1.1	< 1.1
Nickel, Dissolved	DETSC 2306	0.5	ug/l	< 0.5	< 0.5	< 0.5
Vanadium, Dissolved	DETSC 2306	0.6	ug/l	< 0.6	3.7	< 0.6
Zinc, Dissolved	DETSC 2306	1.3	ug/l	2.5	16	7.1
Inorganics						
pH	DETSC 2008		pH	7.2	6.8	7.1
Cyanide, Total	DETSC 2130	40	ug/l	< 40	300	< 40
Ammoniacal Nitrogen as N	DETSC 2207	0.015	mg/l	0.18	0.030	< 0.015
Chloride	DETSC 2055	0.1	mg/l	9.9	2.2	3.9
Sulphate as SO4	DETSC 2055	0.1	mg/l	12	130	5.2

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Leachate Samples

Our Ref 20-11138
Client Ref 4287
Contract Title Eston Road Intrusive Works

			Lab No	1702411	1702412	1702413
			Sample ID	ATK_TP_007	ATK_TP_009	ATK_TP_009
			Depth	2.80	0.50	1.50
			Other ID	11	3	6
			Sample Type	ES	ES	ES
			Sampling Date	16/06/2020	17/06/2020	n/s
			Sampling Time	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**			
Petroleum Hydrocarbons						
Aliphatic C5-C6	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1
Aliphatic C6-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1
Aliphatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1
Aliphatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0
Aliphatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0
Aliphatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0
Aliphatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0
Aliphatic C5-C35	DETSC 3072*	10	ug/l	< 10	< 10	< 10
Aromatic C5-C7	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1
Aromatic C7-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1
Aromatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1
Aromatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0
Aromatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0
Aromatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0
Aromatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0
Aromatic C5-C35	DETSC 3072*	10	ug/l	< 10	< 10	< 10
TPH Ali/Aro Total C5-C35	DETSC 3072*	10	ug/l	< 10	< 10	< 10
PAHs						
Naphthalene	DETSC 3304	0.05	ug/l	0.16	0.07	0.14
Acenaphthylene	DETSC 3304	0.01	ug/l	0.02	0.04	< 0.01
Acenaphthene	DETSC 3304	0.01	ug/l	0.64	0.05	0.03
Fluorene	DETSC 3304	0.01	ug/l	0.38	0.04	0.01
Phenanthrene	DETSC 3304	0.01	ug/l	0.29	0.21	0.13
Anthracene	DETSC 3304	0.01	ug/l	0.16	0.15	0.02
Fluoranthene	DETSC 3304	0.01	ug/l	1.0	0.98	0.18
Pyrene	DETSC 3304	0.01	ug/l	0.74	0.91	0.17
Benzo(a)anthracene	DETSC 3304	0.01	ug/l	0.38	0.68	0.11
Chrysene	DETSC 3304	0.01	ug/l	0.46	0.61	0.12
Benzo(b)fluoranthene	DETSC 3304	0.01	ug/l	0.66	1.1	0.19
Benzo(k)fluoranthene	DETSC 3304	0.01	ug/l	0.24	0.38	0.07
Benzo(a)pyrene	DETSC 3304	0.01	ug/l	0.53	0.79	0.13
Indeno(1,2,3-c,d)pyrene	DETSC 3304	0.01	ug/l	0.26	0.95	0.11
Dibenzo(a,h)anthracene	DETSC 3304	0.01	ug/l	0.06	0.19	0.02
Benzo(g,h,i)perylene	DETSC 3304	0.01	ug/l	0.33	0.98	0.13
PAH Total	DETSC 3304	0.2	ug/l	6.3	8.1	1.6
Phenols						
Phenol - Monohydric	DETSC 2130	100	ug/l	< 100	< 100	< 100

Key: * -not accredited. n/s -not supplied.

Summary of Asbestos Analysis

Soil Samples

Our Ref 20-11138
Client Ref 4287
Contract Title Eston Road Intrusive Works

Lab No	Sample ID	Sample Location	Material Type	Result	Comment*	Analyst
1688424	ATK_TP_001 3 0.60	ATK_TP_001_0060	SOIL	Amosite	Small bundles of Amosite present	Jordan Eadington
1688425	ATK_TP_003 3 1.00	ATK_TP_003_0100	SOIL	NAD	none	Jordan Eadington
1688426	ATK_TP_007 6 0.90	ATK_TP_007_0090	SOIL	NAD	none	Jordan Eadington
1688427	ATK_TP_009 3 0.50	ATK_TP_009_0050	SOIL	NAD	none	Jordan Eadington
1688428	ATK_TP_011 3 0.90	ATK_TP_011_0090	SOIL	NAD	none	Jordan Eadington

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: * -not included in laboratory scope of accreditation.

Information in Support of the Analytical Results

Our Ref 20-11138
Client Ref 4287
Contract Eston Road Intrusive Works

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
1688424	ATK_TP_001 0.60 SOIL	19/06/20	GJ 250ml x2, GJ 60ml x2, PT 1L x2		
1688425	ATK_TP_003 1.00 SOIL	18/06/20	GJ 250ml x2, GJ 60ml x2, PT 1L x2		
1688426	ATK_TP_007 0.90 SOIL	16/06/20	GJ 250ml x2, GJ 60ml x2, PT 1L x2		
1688427	ATK_TP_009 0.50 SOIL	17/06/20	GJ 250ml x2, GJ 60ml x2, PT 1L x2		
1688428	ATK_TP_011 0.90 SOIL	17/06/20	GJ 250ml x2, GJ 60ml x2, PT 1L x2		
1702407	ATK_TP_001 0.60 LEACHATE	19/06/20	GJ 250ml x2, GJ 60ml x2, PT 1L x2		
1702408	ATK_TP_004 1.40 LEACHATE	18/06/20	GJ 250ml x2, GJ 60ml x2, PT 1L x2		
1702409	ATK_TP_004 2.80 LEACHATE	18/06/20	GJ 250ml x2, GJ 60ml x2, PT 1L x2		
1702410	ATK_TP_007 0.90 LEACHATE	16/06/20	GJ 250ml x2, GJ 60ml x2, PT 1L x2		
1702411	ATK_TP_007 2.80 LEACHATE	16/06/20	GJ 250ml x2, GJ 60ml x2, PT 1L x2		
1702412	ATK_TP_009 0.50 LEACHATE	17/06/20	GJ 250ml x2, GJ 60ml x2, PT 1L x2		
1702413	ATK_TP_009 1.50 LEACHATE		GJ 250ml x2, GJ 60ml x2, PT 1L x2		

Key: G-Glass P-Plastic J-Jar T-Tub

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

Appendix A - Details of Analysis

Method	Parameter	Units	Limit of Detection	Sample Preparation	Sub-Contracted	UKAS	MCERTS
DETSC 2002	Organic matter	%	0.1	Air Dried	No	Yes	Yes
DETSC 2003	Loss on ignition	%	0.01	Air Dried	No	Yes	Yes
DETSC 2008	pH	pH Units	1	Air Dried	No	Yes	Yes
DETSC 2024	Sulphide	mg/kg	10	Air Dried	No	Yes	Yes
DETSC 2076	Sulphate Aqueous Extract as SO4	mg/l	10	Air Dried	No	Yes	Yes
DETSC 2084	Total Carbon	%	0.5	Air Dried	No	Yes	Yes
DETSC 2084	Total Organic Carbon	%	0.5	Air Dried	No	Yes	Yes
DETSC 2119	Ammoniacal Nitrogen as N	mg/kg	0.5	Air Dried	No	Yes	Yes
DETSC 2130	Cyanide free	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC 2130	Cyanide total	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC 2130	Phenol - Monohydric	mg/kg	0.3	Air Dried	No	Yes	Yes
DETSC 2130	Thiocyanate	mg/kg	0.6	Air Dried	No	Yes	Yes
DETSC 2321	Total Sulphate as SO4	%	0.01	Air Dried	No	Yes	Yes
DETSC 2325	Mercury	mg/kg	0.05	Air Dried	No	Yes	Yes
DETSC 3049	Sulphur (free)	mg/kg	0.75	Air Dried	No	Yes	Yes
DETSC2123	Boron (water soluble)	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Arsenic	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Barium	mg/kg	1.5	Air Dried	No	Yes	Yes
DETSC2301	Beryllium	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Cadmium Available	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC2301	Cadmium	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC2301	Cobalt	mg/kg	0.7	Air Dried	No	Yes	Yes
DETSC2301	Chromium	mg/kg	0.15	Air Dried	No	Yes	Yes
DETSC2301	Copper	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Manganese	mg/kg	20	Air Dried	No	Yes	Yes
DETSC2301	Molybdenum	mg/kg	0.4	Air Dried	No	Yes	Yes
DETSC2301	Nickel	mg/kg	1	Air Dried	No	Yes	Yes
DETSC2301	Lead	mg/kg	0.3	Air Dried	No	Yes	Yes
DETSC2301	Selenium	mg/kg	0.5	Air Dried	No	Yes	Yes
DETSC2301	Zinc	mg/kg	1	Air Dried	No	Yes	Yes
DETSC 3072	Ali/Aro C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C12	mg/kg	1.5	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C12	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C12-C16	mg/kg	1.2	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C12-C16	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C16-C21	mg/kg	1.5	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C16-C21	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C21-C35	mg/kg	3.4	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C21-C35	mg/kg	3.4	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C12	mg/kg	0.9	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C12	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C12-C16	mg/kg	0.5	As Received	No	Yes	Yes
DETSC 3072	Aromatic C12-C16	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C16-C21	mg/kg	0.6	As Received	No	Yes	Yes
DETSC 3072	Aromatic C16-C21	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C21-C35	mg/kg	1.4	As Received	No	Yes	Yes
DETSC 3072	Aromatic C21-C35	mg/kg	1.4	As Received	No	Yes	Yes
DETS 062	Benzene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Ethylbenzene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Toluene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	m+p Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	o Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3311	C10-C24 Diesel Range Organics (DRO)	mg/kg	10	As Received	No	Yes	Yes
DETSC 3311	C24-C40 Lube Oil Range Organics (LORO)	mg/kg	10	As Received	No	Yes	Yes
DETSC 3311	EPH (C10-C40)	mg/kg	10	As Received	No	Yes	Yes

Appendix A - Details of Analysis

Method	Parameter	Units	Limit of Detection	Sample Preparation	Sub-Contracted	UKAS	MCERTS
DETSC 3303	Acenaphthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Acenaphthylene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(a)pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(a)anthracene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(b)fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(k)fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(g,h,i)perylene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Dibenzo(a,h)anthracene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Indeno(1,2,3-c,d)pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Naphthalene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Phenanthrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3401	PCB 28 + PCB 31	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 52	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 101	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 118	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 153	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 138	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 180	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB Total	mg/kg	0.01	As Received	No	Yes	Yes

Method details are shown only for those determinands listed in Annex A of the MCERTS standard. Anything not included on this list falls outside the scope of MCERTS. No Recovery Factors are used in the determination of results. Results reported assume 100% recovery. Full method statements are available on request.

End of Report

Quality Control

Quality Systems.

Derwentside Environmental Testing Services employs numerous measures to ensure high levels of confidence in the results produced. Our laboratory has been accredited by the United Kingdom Accreditation Service (UKAS) since its inception and operates in full compliance with the internationally recognised standard ISO17025 and the Environment Agency's MCERTS (Monitoring & Certification Scheme) standard for soils and waters, which provides greater assurance to all parties of the reliability of data from chemical analysis.

To obtain a copy of our full UKAS schedule visit the UKAS website at www.ukas.org and search for our laboratory number 2139.

2139

Proficiency Testing Schemes.

DETS participates in seven external proficiency testing schemes in order to monitor and ensure the continuing quality of analysis. These schemes are:

Aquacheck LGC Contest WEPAL

RTC AIMS AIHS pt:a

Internal Quality Control.

DETS runs a strict internal quality control system. A minimum of 5% of all samples that undergo analysis in our laboratories are quality control samples. This way we can ensure a high level of confidence in all of the analytical data produced. In addition, MCERTS accredited tests must meet strict, ongoing limits for precision and bias in order to maintain their accreditation status.

SAMPLE HOLDING TIME INFORMATION

Soil

Analyte	Container type	Minimum sample required	Reference	Maximum holding time from sampling	
				pre drying/extraction[1]	post drying/extraction[2]
Ammonium	Glass or plastic	20g	BS ISO18512:2007	1 week	
Anions	Glass or plastic	20g	BS ISO18512:2007	1 month	3 years
BTEX	60ml glass jar	Full container	EPA 8260	2 weeks	N/A
Conductivity	Glass or plastic	20g	BS ISO18512:2007	1 week	3 years
Cyanide	Glass or plastic	20g	EPA 9010B/9012	2 weeks	
Heavy metals	Glass or plastic	10g	BS ISO18512:2007	6 months	30 years
Hexavalent chromium	Glass or plastic	20g	BS ISO18512:2007	1 month	
Loss on ignition	Glass or plastic	10g	BS ISO18512:2007	1 month	
OCP	Glass	20g	BS ISO18512:2007	1 month	
Oil & grease	Glass	20g	EPA 9070/1	1 month	
Organic matter/TOC	Glass or plastic	20g	BS ISO18512:2007	1 month	
PAH	Glass	20g	EPA 8100/8270	2 weeks	6 weeks
PCB	Glass	20g	BS ISO18512:2007	1 month	
pH	Glass or plastic	20g	BS ISO18512:2007	1 week	3 years
Phenols	Glass	20g	EPA 8270	2 weeks	6 weeks
PRO	60ml glass jar	Full container	EPA 8015	2 weeks	N/A
Sulphide	Glass or plastic	20g	BRE SD1	3 weeks	1 month
SVOC	Glass	20g	EPA 8270	2 weeks	6 weeks
TEM/CEM	Glass	20g	EPA 418.1	2 weeks	6 weeks
Thiocyanate	Glass or plastic	20g	EPA 9251	No special requirement	
Total sulphur	Glass or plastic	20g	BS ISO18512:2007	1 month	3 years
TPH (C10-C40)	Glass	20g	EPA 418.1	2 weeks	6 weeks
VOC	60ml glass jar	Full container	EPA 8260	2 weeks	N/A

Sample storage environment 5°C

1. From sampling to extraction
2. Once extracted

Waters

Analyte	Container type	Min sample required (ml)	Reference	Preservative required	Max holding time until extraction
Alkalinity	Glass or plastic	100	EPA 310.2	none	2 weeks
Ammonium	Glass or plastic	20	ISO 5667 3:2012	Sulphuric acid	3 weeks
BOD	Glass or plastic	500	EPA 405.1 5120B	none	2 days
BTEX	Glass vial	Full container	Lab validation	none	2 weeks
Chloride	Glass or plastic	20	ISO 5667 3:2012	none	1 month
COD	Glass or plastic	20	ISO 5667 3:2012	Sulphuric acid	1 month
Conductivity/TDS	Glass or plastic	100	EPA 160.1	none	1 week
Cyanide	Plastic	50	EPA 9012/335.3	Sodium hydroxide	2 weeks
Hexavalent chromium	Glass or plastic	20	ISO 5667 3:2012	none	4 days
Metals	Glass or plastic	20	ISO 5667 3:2012	Nitric acid	1 month
Nitrate	Glass or plastic	20	EPA 353.2	none	2 days
Nitrite	Glass or plastic	20	EPA 600/4 079-020	none	2 days
OCP	Glass	500	EPA 8081A/608	none	1 week
Oil & grease	Glass	500	ISO 5667 3:2012	Hydrochloric acid	1 month
PAH	Glass	500	ISO 5667 3:2012	none	1 week
pH	Glass or plastic	50	Lab validation	none	1 week
PCB	Glass	500	EPA 8082A	none	6 weeks
Phenols	Glass	500	ISO 5667 3:2012	Sulphuric acid	3 weeks
Phosphate	Glass or plastic	20	ISO 5667 3:2012	Sulphuric acid	1 month
PRO	Glass vial	Full container	EPA 8015	none	2 weeks
Sulphate	Glass or plastic	20	ISO 5667 3:2012	none	1 month
Sulphide	Plastic	50	ISO 5667 3:2012	NaOH/Zinc acetate	1 week
Suspended solids	Glass or plastic	100	EPA 160.2 2540D	none	1 week
SVOC	Glass	500	EPA 8270/625	none	1 week
TOC	Glass or plastic	20	ISO 5667 3:2012	Sulphuric/Phosphoric acid	1 week
TON	Glass or plastic	20	EPA 353.2	none	1 month
TPH/EPH	Glass	500	Lab validation	none	1 weeks
VOC	Glass vial	Full container	Lab validation	none	1 week

Sample storage environment 3°C ± 2°C

DETS INFO 001 – ANALYTICAL METHOD SUMMARY

Method Number	Title	Description	Reference	LOD	Accreditation Status
DETS 036	**Leachate Preparation** **(NRA Method and BS EN 12457 Parts 1-3)**	Leachates are prepared as per the NRA (1994) method and as per BS EN 12457 Parts 1 - 3 one and two stage leachate preparation.	Leaching Test Method for the Assessment of Contaminated Land, Interim Guidance, NRA(1994) BS EN 12457 Part 1,2 & 3	n/a	Not Accredited
DETS 073	**Acid Neutralisation Capacity of Soils and Other Solids**	ANC is a measure of the buffering capacity of soils and other waste materials. The analysis measures the amount of acid required to bring the sample to a fixed pH. The initial pH of the sample extract must be measured before analysis begins. Analysis is performed by the addition of acid in conjunction with pH measurement by pH meter until the specified pH has been reached as indicated by the meter. The result is expressed in mol/kg (dry wt).	Annex B (Preliminary determination of the acid/base consumption) – CEN/TC 292 – WI 292046 – Characterization of waste – Leaching behaviour tests – Acid and Base neutralization capacity test	1.0 mol/kg	Not Accredited
DETS 074	**Low Level PAH by HPLC Fluorescence**	PAH is extracted from one litre of filtered water sample by solid phase extraction. PAH is eluted from the SPE column with DCM evaporated to dryness under nitrogen and redissolved in acetonitrile. Analysis of samples is carried out by HPLC fluorescence.	EPA Method 550 The Analyst 2001, 126:1336-1331 Phenomonex Strata X Application Note for PAH by SPE	0.01ug/L each 5.0 ug/L Total	Not Accredited

DETS INFO 001 – ANALYTICAL METHOD SUMMARY

Method Number	Title	Description	Reference	LOD	Accreditation Status
DETSC 1001	**Sample Pre-Treatment and Preparation of Solids**	Solid samples are classified and identified. Samples requiring analysis for unstable or volatile determinands are analysed as received. Samples requiring analysis for stable and non-volatile determinands are dried at <30◦C or 50◦C, depending on requirements, for a minimum of 16hrs (overnight). Dried samples are crushed in a jaw crusher, if necessary, and then ground using a mechanical mixer mill and sieved through a 250µm sieve to ensure they are homogenous.	BS1377:1990 – Soils for Civil Engineering Purposes The preparation and pre-treatment of potentially contaminated soils prior to chemical analysis – MEWAM – 2006 – Environment Agency (Updated procedure under preparation)	n/a	Not Accredited
DETSC 1002	**Description of Soil Sample Type**	This method outlines the procedure used to describe soil samples with respect to basic type, predominant colour and inclusions. The procedure is carried out during the sample preparation stage.	BS 5930:Section 6:1999	n/a	Not Accredited
DETSC 1003	**Stone and Glass / Metal / Plastic Content of Soil**	This method outlines the procedure used to determine the Stone and Glass/Metal/Plastic content of soil samples. The procedure is carried out during the sample preparation stage.	BS 3882:2007 BS 1377:1990	0.1%	Not Accredited
DETSC 1004	**Moisture Content/Loss on Drying of Soil**	Loss on drying is determined by loss of mass on drying in an oven set at 28ºC or 50ºC. Moisture content is determined by loss of mass on drying in an oven set at 105ºC. The procedure is carried out during the sample preparation stage.	Practical Environmental Analysis. Radojevic & Bashkin. RSC 1999 BS 1377: Part 2:1990 DETS drying time study	0.1%	Not Accredited
DETSC 1101	**Asbestos - Bulk Analysis**	Samples are examined visually for the presence of asbestos containing materials or asbestos fibres. Suspect fibres are removed from the sample and examined using polarised light microscopy to determine whether they are asbestos fibres. If no asbestos fibres are identified by the method after an adequate length of examination time, and after at least two small pinch samples have been examined, then the sample may be reported as 'NAD' (no asbestos detected).	HSG 248 Asbestos: The Analysis Guide for Sampling, Analysis and Clearance Procedures. 2005 McCrone W.C., Asbestos Identification (Second Edition), The McCrone Research Institute, 1987 LAB 30, Application of ISO/IEC17025 for Asbestos Sampling and Testing, UKAS, Edition 2, April 2008	n/a	UKAS

DETS INFO 001 – ANALYTICAL METHOD SUMMARY

Method Number	Title	Description	Reference	LOD	Accreditation Status
DETSC 1102	**Quantification of asbestos in soils, loose aggregates and ballast**	The method of quantification is divided into three procedures: Gravimetric analysis, detailed gravimetric analysis and PCOM analysis. The analysis may be affected by the client's requirements as determined by contract review, and by the nature of the asbestos found in the sample, e.g. whether ACMs are present, and whether fibre bundles large enough to pick out using tweezers are have been found in the sample.	HSG 248 Asbestos: The Analysis Guide for Sampling, Analysis and Clearance Procedures. 2005 HSG264 Asbestos: The survey guide. HSE Books, 2010. Davies, L. S.T., Wetherill, G. Z., McIntosh, C., McGonagle, C., Addison, J. 1996. Development and validation of an analytical method to determine the amount of asbestos in soils and loose aggregates. HSE Contract Research Report N0. 83/1996. HSE Books	Gravimetric Analysis: 0.01% for 1kg sample Detailed Gravimetric Analysis: 0.001% for 50g sample PCOM Analysis: 0.001%	UKAS
DETSC 1103	**Asbestos Water Absorption Test**	This test involves a sample of the asbestos product being dried and weighed before being immersed in water for a period of time. The sample is then removed from the water and re-weighed. If the amount of water absorbed is <30% by weight, then the sample should be reported as 'Not Licensed'. If ≥30% water is absorbed then the sample should be reported as being 'Licensed', i.e. an asbestos material for which a licence is required to work on.	Work with Materials Containing Asbestos: Approved Code of Practice and Guidance. HSE Books, 2006.	n/a	UKAS
DETSC 2002	**Organic matter content of soil**	The procedure is based upon Walkley and Black's method. Organic matter in soil is oxidised with potassium dichromate in the presence of concentrated sulphuric acid. The excess dichromate is titrated with ferrous sulphate using diphenylamine as an external indicator. The organic matter content is calculated from the amount of dichromate used during the oxidation process based on an empirical relationship.	BS1377 : Part 3 : 1990 Method 3 BS1377 : Part 1 : 1990 BS 3882:2007	0.1%	UKAS MCERTS(Soils)

DETS INFO 001 – ANALYTICAL METHOD SUMMARY

DETSC 2003	**Loss On Ignition**	Soil is ignited at 440C and the amount of sample lost on ignition is determined gravimetrically. Other specified temperatures may be used but are not accredited.	BS1377 : Part 3 : 1990 Method 4 BS1377 : Part 1 : 1990	0.01%	UKAS MCERTS(Soils)
Method Number	**Title**	**Description**	**Reference**	**LOD**	**Accreditation Status**
DETSC 2004	**Sulphate Content of Soil and Water**	The sulphate in the soil is dissolved in dilute hydrochloric acid, or in an aqueous extract having a water:soil ratio of 2:1 and the insoluble residue is removed by filtration. Waters are also filtered prior to analysis. The sulphate in the filtrate is precipitated as barium sulphate which is then filtered, ignited and weighed.	BS1377 : Part 3 : 1990 Method 5 BS1377 : Part 1 : 1990 BRE SD1: 2005 Concrete in Aggressive Ground	**Acid Soluble:** 0.01% **Water Soluble** 100mg/l **Waters** 10mg/l	UKAS MCERTS(Soils)
DETSC 2005	**Carbonate content of soil by Rapid Titration**	The carbonate present in the soil reacts with a known excess of hydrochloric acid liberating carbon dioxide. The acid remaining after the reaction is determined by titration against sodium hydroxide. The result is calculated in terms of the equivalent proportion of carbon dioxide.	BS 1377: Part 1: 1990. BS 1377: Part 3: 1990: Method 5	1%	UKAS
DETSC 2006	**Water Soluble Chloride Content of Soil & Chloride Content of Water**	The chloride in the soil is dissolved in water and the insoluble material is removed by filtration. Waters are filtered before analysis. The chloride is analysed by Mohr's method. The chloride in a neutral solution is titrated against standard silver nitrate using potassium chromate as an indicator. The colour change is from yellow to brick red.	BS1377 : Part 3 : 1990 Method 7.2 BS1377: Part 1: 1990	**Soil:** 0.01% **Water:** 10mg/l	UKAS MCERTS(Soils)
DETSC 2007	**Acid Soluble Chloride Content of Soil and Concrete**	The chloride in the sample is dissolved in nitric acid and the insoluble material is removed by filtration. The dissolved chloride is analysed by Volhard's method. The chloride in solution is precipitated with a known excess of standard silver nitrate. The excess silver nitrate is titrated against standard ammonium thiocyanate using ferric alum as an indicator. The colour change is white to red.	BS1377 : Part 3 : 1990 Method 7.3 BS1377: Part 1: 1990 BS 1881-124:1988	0.01%	UKAS

DETS INFO 001 – ANALYTICAL METHOD SUMMARY

Method Number	Title	Description	Reference	LOD	Accreditation Status
DETSC 2008	**pH Value of Soil and Water**	The pH value of a soil suspension in water or a groundwater sample is determined electrometrically using a glass electrode.	BS1377: Part 3: 1990 – Soils for Civil Engineering Purposes – Chemical and Electrochemical Methods	n/a	UKAS (Soils + Waters) MCERTS (Soils + Waters-Trade Effluent only)
DETSC 2009	**Electrical Conductivity of Soil & Water**	The electrical conductance of a soil suspension in water or of a water sample is determined by voltammetry using a conductivity meter. In some cases, the soil may need to be extracted with an aqueous solution of an inorganic salt e.g. the conductivity of topsoil is determined by preparing a suspension of the soil in saturated calcium sulphate.	Standard Methods for the Examination of water and Wastewater Part 2510B 21st Edition 2005 APHA, AWWA, WEF BS3882:2007 Specification for Topsoil	1uS/cm	UKAS
DETSC 2019	**Loose Packed Dry Soil Density**	Dried, ground soil is transferred to a dry, tared measuring cylinder and the volume recorded. The cylinder and its contents are then weighed and the density of the soil calculated.	BS3882:2007 Specification for Topsoil	n/a	Not Accredited

DETS INFO 001 – ANALYTICAL METHOD SUMMARY

Method Number	Title	Description	Reference	LOD	Accreditation Status
DETSC 2024	**Sulphide in Soil and Water by Iodometry**	Hydrogen sulphide is liberated by acidification of the sample with hydrochloric acid in a steam distillation unit. The hydrogen sulphide produced is carried over with the steam and is absorbed in alkaline zinc acetate. The zinc sulphide produced reacts with iodine formed when iodate-iodide is acidified and the excess iodine titrated with standard thiosulphate.	In House Method based on: Environment Agency The determination of easily liberated sulphide in soils and similar matrices (2010) - Blue Book 228 Method D - The determination of easily liberated sulphide in as received or air-dried samples following acid steam distillation with iodometric titration. Environment Agency The determination of sulphide in waters and associated materials (2007) Draft Method D - The determination of easily liberated sulphide in as received or air-dried samples following phosphoric acid steam distillation with iodometric titration.	**Soils:** 10mg/kg . **Waters:** 250ug/l	**Soils:** UKAS MCERTS(Soils) **Waters:** Not Accredited
DETSC 2030	**Alkalinity in Water**	Alkalinity of a water sample is determined by indicator end point titration with a strong acid from sample pH to pH8.3 (where applicable) and then to pH4.5. From the titres obtained the total alkalinity and concentrations and types of alkalinity present can be calculated.	SCA Method ISBN 0 11 751601 5 The Determination of Alkalinity and Acidity in Water 1981 Instruction Manual for Skalar SP50 Robotic Analyser	20mg/l as CaCO3	UKAS MCERTS(Waters) Trade Effluent only
DETSC 2031	**5 Day Biochemical Oxygen Demand**	The sample, either diluted or undiluted, is placed in a BOD bottle and the initial dissolved oxygen content of the sample is measured using a dissolved oxygen meter. The bottle is placed in an incubator at 20ºC in the dark for 5 days. After this time the bottle is removed and the residual dissolved oxygen content of the sample is measured. The BOD of the sample is calculated from the reduction in the concentration of dissolved oxygen over 5 days.	SCA Method ISBN 0 117522120 5 Day Biochemical Oxygen Demand (BOD5) Second Edition 1988	1 mg/l	UKAS MCERTS(Waters)- Trade Effluent only

DETS INFO 001 – ANALYTICAL METHOD SUMMARY

Method Number	Title	Description	Reference	LOD	Accreditation Status
DETSC 2032	**Chemical Oxygen Demand**	Oxidisable substances react with sulphuric acid – potassium dichromate solution in the presence of silver sulphate as a catalyst. Chloride is masked by mercury sulphate. The reduction in the yellow colouration of Cr6+ is evaluated using a spectrophotometer for the low range tubes (LCK 314) whilst the green colouration of Cr3+ is evaluated for the medium and high range tubes (LCK 014 and LCK 114).	Environment Agency The determination of chemical oxygen demand in waters and effluents (2007) Methods for the Examination of Waters and Associated Materials	10 mg/l	UKAS MCERTS(Waters)-Trade Effluent only
DETSC 2033	**Total and Dissolved Organic Carbon in Water**	The term TOC (Total Organic Carbon) is used to describe the total content of organically bound carbon in dissolved and undissolved compounds. The TOC content is expressed in mg/l. If DOC (Dissolved Organic Carbon) is required, samples are filtered through a 0.45µm filter paper prior to analysis. Inorganic carbon is expelled by acidification of the sample. TOC is then determined by digestion of the sample with sulphuric acid and peroxodisulphate. Carbon containing compounds are transformed into carbon dioxide. The carbon dioxide evolves and reacts with an indicator solution. The colour change is measured using a spectrophotometer.	Hach-Lange Technical Instructions: LCK 385, LCK 386, LCK 387	2 mg/l	UKAS
DETSC 2034	**Suspended and Settleable Solids in Water**	Suspended matter is removed from a measured volume of sample by filtration under reduced pressure through a pre-treated, pre-weighed glass fibre filter paper. The paper is washed with deionised water to remove dissolved salts and the total suspended matter is determined gravimetrically after drying at 105 ±5°C Settleable solids are determined by subtracting the solids left in suspension after settlement for 1 hour (or other agreed time) from the total suspended matter in the sample.	SCA Method ISBN 011 751957 X Suspended, Settleable and Total Dissolved Solids in Waters and Effluents 1980	5 mg/l	**Suspended Solids:** UKAS MCERTS(Waters)-Trade Effluent only **Settleable Solids:** Not Accredited

DETS INFO 001 – ANALYTICAL METHOD SUMMARY

Method Number	Title	Description	Reference	LOD	Accreditation Status
DETSC 2035	**Total Dissolved Solids in Water**	Water samples are pre-filtered to remove any suspended solids and evaporated in an oven at 180°C. The amount of residual dissolved solids is determined gravimetrically. An estimate of the total dissolved solids can be obtained by measuring the conductivity of the sample. This method is not accredited.	SCA Method ISBN 011 751957 X Suspended, Settleable and Total Dissolved Solids in Waters and Effluents 1980 BS1377: Part 3 : 1990 Section 8	5 mg/l	UKAS
DETSC 2047	**Formaldehyde in Water**	Formaldehyde in soil is extracted in water, with a water to soil ratio of 10:1. The insoluble residue is removed by filtration prior to analysis. Waters are filtered prior to analysis to remove any particulates in suspension. Formaldehyde in the extract or water sample reacts with chromatropic acid-sulphuric acid solution to form a purple coloured complex. The absorbance of the coloured solution is read at 580nm using a suitable visible spectrophotometer.	Formaldehyde by visible absorption spectrophotometry – Method 3500, Issue 2 – NIOSH Manual of Analytical Methods, Fourth edition, August 1994	**Soil:** 0.2mg/kg **Water:** 20µg/l	Not Accredited
DETSC 2048	**Dissolved Oxygen Content of Water**	The dissolved oxygen content of the sample is measured using a dissolved oxygen meter either electrochemically or by fluorescence, or by the titrimetric method developed by Winkler.	SCA Method ISBN 0.11 751442X Dissolved Oxygen in Natural and Waste Waters 1979	0.1 mg/l	Not Accredited
DETSC 2055	**Anions in Water and Aqueous Soil Extracts by Ion Chromatography**	Liquid samples and aqueous soil extracts are filtered through a 0.22µm syringe filter prior to analysis. The filtered samples are injected into an Ion Chromatograph. The anions of interest are separated on the basis of their affinity for the active sites of the column packing material. The separated anions are converted into their highly conductive acid forms and measured by conductivity. The anions are identified on the basis of retention time as compared to standards and quantisation is by measurement of peak area.	Standard Methods for the Examination of Water and Wastewater Section 4110 21st Edition 2005 APHA, AWWA, WEF	**Soil:** 1.0 mg/kg **Water:** 0.1 mg/L	UKAS

DETS INFO 001 – ANALYTICAL METHOD SUMMARY

Method Number	Title	Description	Reference	LOD	Accreditation Status
DETSC 2076	**Sulphate and Magnesium Content of 2:1 Aqueous Extract of Soil by ICP-OES**	The sulphate and magnesium in the soil are extracted in an aqueous extract having water: soil ratio of 2:1 and the insoluble material is removed by filtration. The concentrations of sulphate and magnesium in the filtrate are determined by Inductively Coupled Plasma Optical Emission Spectroscopy (ICP-OES). The wavelengths used for identification and quantification are 181.972nm for sulphate and 285.213nm for magnesium.	BS1377 : Part 3: 1990 Method 5 BS1377 : Part 1: 1990 TRL 447 Sulphate Specification for Structural Backfills 2005 BRE SD1:2005 Concrete in Aggressive Ground 2005	10mg/L	**Sulphate:** UKAS MCERTS(Soils) **Magnesium:** Not Accredited
DETSC 2084	**Total Organic Carbon by PrimacATC Analyser**	Soil samples are treated with phosphoric acid to expel any inorganic carbonates. The samples are then heated at high temperature in a continuous flow of air so that any organic carbon is oxidised to carbon dioxide. The gas is then allowed to cool and analysed by an infra-red detector.	PrimacsATC Analyser – User Manual, Skalar	0.47%	MCERTS(Soils)
DETSC 2085	**Total and Dissolved Organic Carbon in Water**	**Direct TOC Analysis** The sample is acidified, stirred and purged to remove the IC before the sample is injected and handled as in the TC Analysis. The sample is filtered before acidification for DOC. **TC Analysis** The sample is injected by an automated septum less rotary port into a high temperature reactor. In the reactor, at a temperature of 750 - 950°C all organic and inorganic carbon is oxidized to the gaseous carbon dioxide (CO2). The catalyst that is present in the reactor catalysis the oxidation to completion. A flow of air transports these oxidation products to the detectors. The oxygen required for reaction is taken from the airflow. The products are led into the non-dispersive infrared detector where the carbon dioxide is determined. The carbon dioxide is measured at a wavelength of 4.2 µm by NDIR detection.	Standard Methods for the Examination of Water and Wastewater Section 5310 B 21st Edition 2005 APHA, AWWA, WEF HMSO Methods for the Examination of Waters and Associated Materials – The Instrumental Determination of Total Organic Carbon and Related Determinands 1995	lmg/l as C	UKAS

DETS INFO 001 – ANALYTICAL METHOD SUMMARY

Method Number	Title	Description	Reference	LOD	Accreditation Status
DETSC 2119	**Exchangeable Ammonia in Soil**	An intense blue-green complex, related to indophenol blue, is formed by the reaction of ammonia with hypochlorite and sodium salicylate, with sodium nitroprusside acting as a catalyst. The complex is measured at 655nm and is related to the ammonia concentration by means of a calibration curve. Sodium citrate is added to overcome interfering ions.	MAFF/ADAS Reference Book 427 – the Analysis of Agricultural Materials – Method 53, Ammonium, Nitrate and Nitrite-Nitrogen, Potassium Chloride Extractable	0.5mg/kg	UKAS MCERTS(Soils)
DETSC 2120	**Ammonia in Water by Spectrophotometry**	An intense blue-green complex, related to indophenol blue, is formed by the reaction of ammonia with hypochlorite and sodium salicylate, with sodium nitroprusside acting as a catalyst. The complex is measured at 655nm and is related to the ammonia concentration by means of a calibration curve. Sodium citrate is added to overcome interfering ions.	Environment Agency Ammonia in Waters 1981 ISBN 0117516139 Methods for the Examination of Waters and Associated Materials	20µg/l	UKAS
DETSC 2121	**Total Kjeldahl Nitrogen Content of Soils and Waters**	The sample is digested with sulphuric acid and a mixture of catalysts to convert organic nitrogen to ammonia. The sample is then distilled under alkaline conditions, and the distilled ammonia is absorbed in sulphuric acid. The ammonia content of the distillate is then determined colorimetrically either using the UV/vis spectrophotometer or the Konelab 60i. Ammonia reacts with hypochlorite ions generated by the alkaline hydrolysis of sodium dichloroisocyanurate to form monochloramine. Monochloramine reacts with salicylate ions in the presence of sodium nitroprusside at around pH 12.6 to form a blue compound. The absorbance of this compound is measured spectrophotometrically at wavelength 660nm	The Analysis of Agricultural Materials – MAFF/ADAS Reference Book 427 – HMSO BS 3882: 2007 Specification for topsoil Standard Methods for the Examination of Water and Wastewater Part 4500-N. 21st Edition 2005 APHA, WWA, WEF	**Soil:** 0.01% **Water:** 2mg/l	Not Accredited
DETSC 2123	**Water Soluble Boron in Soil & Boron in Water**	Boron in soil is extracted in boiling saline water. Waters are filtered prior to analysis to remove any particulates in suspension. The water soluble boron in the extract or filtrate reacts with azomethine–H to produce a yellow coloured complex. The resulting colour absorbance is measured at 420nm using a suitable visible spectrophotometer.	SecondSite Property (now National Grid Property Holdings) - Guidance for assessing and managing potential contamination on former gasworks and associated sites (Part I) (Version 3) Method 17.12 The analysis of Agricultural materials MAFF/ADAS – reference book 427	**Soil:** 0.2mg/kg **Water:** 100ug/L	UKAS MCERTS(Soils)

			HMSO		

Method Number	Title	Description	Reference	LOD	Accreditation Status
DETSC 2130	**Cyanides & Monohydric Phenols by Skalar**	Water samples are filtered through a 0.45µm syringe filter and solid samples are extracted with 1M caustic soda prior to analysis on the automated flow analyser. The method determines total cyanide, easily liberated cyanide, complex cyanide, thiocyanate and monohydric phenols	Skalar methods: I295-001 w/r+P7 I295-002 w/r+P7 293-902 w/r+P7 497-001	**Soils mg/kg:** Total & Free CN=0.1, Thio=0.6, Phenol=0.3 **Waters ug/L:** Total CN=40, Free CN=20, Thio=20, Phenol=100	UKAS MCERTS(Soils)
DETSC 2140	**Sugar in Mixing Water for Cement**	Waters are filtered prior to analysis to remove any particulates in suspension. The sugar in the filtrate reacts with phenol and sulphuric acid to produce a yellow-orange coloured complex. The resulting colour absorbance is measured at 490nm using a suitable visible spectrophotometer.	Colorimetric Method for Determination of Sugars and Related Substances MICHEL DUBOIS, K. A. GILLES, J. K. HAMILTON, P. A. REBERS, and FRED SMITH - Division of Biochemistry, University of Minnesota, St. Paul, Minnesota.	10mg/l	Not Accredited
DETSC 2201	**Nitrite in Waters and Leachates by Konelab 60i**	Nitrite is determined colorimetrically using the Konelab60i autoanalyser. The nitrite colour reaction occurs at pH 2.0 to 2.5 by coupling diazotized Sulphanilamide with N-1-naphthyl-ethylenediamine. The absorbance of this compound is measured spectrophotometrically at 520nm.	Standard Methods for the Examination of Water and Wastewater Part 4500-NO2 B – 21st Edition 2005 APHA, AWWA, WEF Aquakem Method Nitrite in Waters Iss No 2 Methods for the Examination of Water and Associated Materials Oxidised Nitrogen in Waters 1981.	0.04mg/l (as N)	UKAS

			EPA Method 354.1 Nitrite, spectrophotometric (Approved at 40 CFR Part 136, not approved at Part 141)		

DETS INFO 001 – ANALYTICAL METHOD SUMMARY

Method Number	Title	Description	Reference	LOD	Accreditation Status
DETSC 2202	**Total Oxidised Nitrogen in Waters and Leachates by Konelab 60i**	Nitrate is reduced to nitrite by hydrazine under alkaline conditions. The total nitrite ions are then reacted with sulphanilamide and N-1-naphthylethylenediamine dihydrochloride under acidic conditions to form a reddish purple azo-dye. The absorbance of this compound is measured spectrophotometrically at 540 nm using the Konelab 60i autoanalyser.	Standard Methods for the Examination of Water and Wastewater Part 4500-NO2 B and Part 4500-NO3 H – 21st Edition 2005 APHA, AWWA, WEF Aquakem Method Total Oxidised Nitrogen. Methods for the Examination of Water and Associated Materials Oxidised Nitrogen in Waters 1981. EPA Method 353.1 Nitrate, Nitrite Colorimetric Automated Hydrazine Reduction (Approved at 40 CFR Part 136, Not approved at Part 141)	0.7mg/l (as N)	UKAS
DETSC 2203	**Hexavalent Chromium in Waters and Leachates by Konelab 60i**	Hexavalent Chromium is determined colorimetrically using the Konelab 60i autoanalyser. Hexavalent chromium reacts with diphenylcarbizide in acid solution and produces a red-violet colour. The absorbance of this compound is measured spectrophotometrically at 540nm.	Standard Methods for the Examination of Water and Wastewater Part 3500-Cr – 21st Edition 2005 APHA, AWWA, WEF USEPA 7196-A Aquakem Method. Hexavalent Chromium	10µg/l	UKAS
DETSC 2204	**Hexavalent Chromium in Soil by Konelab 60i**	Hexavalent Chromium is determined colorimetrically using the Konelab 60i autoanalyser. Hexavalent chromium reacts with diphenylcarbizide in acid solution and produces a red-violet colour. The absorbance of this compound is measured spectrophotometrically at 540nm.	Aquakem Method. Hexavalent Chromium	1mg/kg	Not Accredited

DETS INFO 001 – ANALYTICAL METHOD SUMMARY

Method Number	Title	Description	Reference	LOD	Accreditation Status
DETSC 2205	**Reactive & Total Phosphorus in Waters and Leachates by Konelab 60i**	Phosphate is determined colorimetrically using the Konelab60i autoanalyser. The orthophosphate ion reacts with ammonium molybdate and antimony potassium tartrate under acidic conditions to form a 12-molybdophosphoric acid complex. The complex is then reduced with ascorbic acid to form a blue heteropoly compound. The absorbance of this compound is measured spectrophotometrically at wavelength 880nm.	Standard Methods for the Examination of Water and Wastewater Part 4500-P E– 21st Edition 2005 APHA, AWWA, WEF Aquakem Method. Phosphate in Waters Issue 2	0.01mg/l	**Reactive Phosphorus:** UKAS MCERTS (Waters-Trade Effluent only) **Total Phosphorus:** Not Accredited
DETSC 2206	**High Level Ammonia in Waters and Leachates by Konelab 60i**	Ammonia is determined colorimetrically using the Konelab60i autoanalyser. Ammonia reacts with hypochlorite ions generated by the alkaline hydrolysis of sodium dichloroisocyanurate to form monochloramine. Monochloramine reacts with salicylate ions in the presence of sodium nitroprusside at around pH 12.6 to form a blue compound. The absorbance of this compound is measured spectrophotometrically at wavelength 660nm.	Methods for the Examination of Waters and Associated Materials Ammonia in Waters 1981 ISBN 0117516139. Aquakem Method. Ammonia in Waters Issue 2	0.8mg/l	UKAS
DETSC 2207	**Low Level Ammonia in Waters and Leachates by Konelab 60i**	Ammonia is determined colorimetrically using the Konelab60i autoanalyser. Ammonia reacts with hypochlorite ions generated by the alkaline hydrolysis of sodium dichloroisocyanurate to form monochloramine. Monochloramine reacts with salicylate ions in the presence of sodium nitroprusside at around pH 12.6 to form a blue compound. The absorbance of this compound is measured spectrophotometrically at wavelength 660nm.	Methods for the Examination of Waters and Associated Materials Ammonia in Waters 1981 ISBN 0117516139. Aquakem Method. Ammonia in Waters Issue 2	0.015mg/l	UKAS

DETS INFO 001 – ANALYTICAL METHOD SUMMARY

Method Number	Title	Description	Reference	LOD	Accreditation Status
DETSC 2208	**Sulphide in Waters and Leachates by Konelab 60i**	Sulphide is determined colorimetrically using the Konelab60i autoanalyser. Potassium Dichromate converts N-N-Diethyl-p-phenylenediamine to the free radical which reacts rapidly with sulphide to produce the coloured 'DPD Blue' or 'Ethylene Blue'. The absorbance can then be measured at wavelength 660nm.	The determination of sulphide in waters and associated materials (2007) - SCA - Draft (March 2007) Aquakem Method. Sulphide SP001 Issue 2 Standard Methods for the Examination of Water and Wastewater, 21st Edition 2005, Part 4500. ISBN0-87553-223-3	10µg/l	UKAS
DETSC 2210	**Ferrous Iron in Waters and Leachates by Konelab 60i**	Three molecules of phenanthroline chelate with each atom of ferrous iron to form an orange/red complex. The intensity of the coloured solution is stable between pH3 to pH9. Rapid colour development occurs between pH2.9 and pH3.5 in the presence of excess phenanthroline. The resulting colour absorbance is measured at 510nm	Aquakem Method Ferrous Iron FIR001 Issue 2	0.1mg/l	Not Accredited
DETSC 2211	**Silicate in Waters and Leachates by Konelab 60i**	Reactive forms of silicon in acid solution, below pH2, react with ammonium molybdate ions to form a yellow silicomolybdate. Ascorbic acid reduces the yellow silicomolybdate to produce a blue silicomolybdate complex. Oxalic acid is added to destroy any molybdophosphoric acid formed.	ASTM D7126 - 10 Standard Test Method for On-Line Colorimetric Measurement of Silica Aquakem Method Silica SIL Issue 2	0.1mg/l	Not Accredited
DETSC 2301	**Metals in Soil by ICP-OES** As, Ba, Be, Cd, Cr, Co, Cu, Fe, Mn, Mo, Ni, Pb, Se, V, Zn	Metals in soil are extracted using aqua regia and their concentrations are determined by Inductively Coupled Plasma Optical Emission Spectroscopy (ICP-OES). Any metals not listed can be determined but are not accredited under UKAS or MCERTS for soils.	Standard Methods for the Examination of Water and Wastewater Part 3120 B – 21st Edition 2005, AWWA, WEF	**mg/kg:** As, Be Cu, Ni =0.2, Ba=1.5, Cd=0.1, Cr=0.15, Co=0.7, Mn=20, Mo=0.4, Pb=0.3, Fe=1200, Se=0.5, V=0.8, Zn=1.0	UKAS (all listed) MCERTS (All soils listed except Fe)

DETS INFO 001 – ANALYTICAL METHOD SUMMARY

Method Number	Title	Description	Reference	LOD	Accreditation Status
DETSC 2302	**Metals in Waters by ICP-OES** Al, As, Ca, Cd, Cr, Cu, Fe, K, Mg, Mn, Na, Ni, Pb, Se, Zn	Concentrations of metals in water are determined by Inductively Coupled Plasma Optical Emission Spectroscopy (ICP-OES). Any metals not listed can be determined but are not accredited under UKAS or MCERTS for waters	Standard Methods for the Examination of Water and Wastewater Part 3120 B – 21st Edition 2005 APHA, AWWA, WEF	**µg/l:** Al=6.5, As= 7.1, Ca=100, Cd=0.3, Cr=0.75, Cu=0.75, Fe=70, K=20, Mg=5, Na=12, Ni=2.7, Pb=4, Se=11.3, Zn=3.8	**Dissolved:** UKAS (all listed) MCERTS(Waters)-Trade Effluent only (Al, Cd, Cr, Cu, Ni, Pb, Zn) **Total:** Not Accredited
DETSC 2303	**Total Hardness (By Calculation)**	The concentrations of calcium and magnesium are determined using the appropriate methodologies. The hardness is a measure of the sum of the calcium and magnesium concentration expressed as calcium carbonate.	Standard Methods for the Examination of Water and Wastewater Part 3120 B – 21st Edition 2005 APHA, AWWA, WEF	n/a	UKAS
DETSC 2304	**Zinc Equivalent in Soil (By Calculation)**	The concentrations of copper, nickel and zinc concentrations are determined using the appropriate methodologies. The zinc equivalent is a measure of the combined toxicity of the three metals, relative to the toxicity of zinc.	n/a	n/a	Not Accredited
DETSC 2306	**Metals in Waters by ICP-MS** Ag, Al, As, Ba, Ca, Cd, Co, Cr, Cu, Fe, Hg, K, Mg, Mn, Mo, Na, Ni, P, Pb, Sb, Se, Sn, V, Zn	Concentrations of metals in water are determined by Inductively Coupled Plasma Mass Spectroscopy (ICP-MS). Any metals not listed can be determined but are not accredited under UKAS.	Standard Methods for the Examination of Water and Wastewater Part 3125 B – 21st Edition 2005 APHA, AWWA, WEF	**µg/l:** Ag=0.13, Al=10.0, As=0.16, Ba=0.26, Ca=90, Cd=0.03, Co=0.16, Cr=0.25, Cu=0.40, Fe=5.50, Hg=0.01, K=80, Mg=20, Mn=0.22, Mo=1.1, Na=70, Ni=0.50, P=18.0, Pb=0.09, Sb=0.17, Se=0.25, Sn=0.40, V=0.60, Zn=1.3	**Dissolved:** UKAS (all listed) **Total:** Not Accredited

DETS INFO 001 – ANALYTICAL METHOD SUMMARY

Method Number	Title	Description	Reference	LOD	Accreditation Status
DETSC 2320	**Total Sulphur in Soil by ICP**	Sulphur compounds in soil are extracted using aqua regia and the insoluble residue is removed by filtration. The concentration of sulphur in the filtrate is determined by Inductively Coupled Plasma Optical Emission Spectroscopy (ICP-OES). Loss of sulphur as H2S is prevented by oxidation of the sulphur compounds to sulphate by the aqua regia.	TRL 447 Sulphate Specification for Structural Backfills 2005 BRE SD1 Concrete in Aggressive Ground 2005	0.01%	UKAS
DETSC 2321	**Total Sulphate content of Soil by ICP-OES**	The sulphate in the soil is extracted in dilute hydrochloric acid and the insoluble residue is removed by filtration. The filtrate is made up to volume and the concentration of sulphate in the filtrate is determined by Inductively Coupled Plasma Optical Emission Spectroscopy (ICP-OES).	BS1377 : Part 3: 1990 Method 5 BS1377 : Part 1 : 1990	0.01%	UKAS MCERTS(Soils)
DETSC 2322	**Total Potential Sulfate and Total Oxidisable Sulphur (By Calculation)**	Sulphur compounds in soil are extracted using aqua regia and the insoluble residue is removed by filtration. The concentration of sulphur in the filtrate is determined by Inductively Coupled Plasma Optical Emission Spectroscopy (ICP-OES). Loss of sulphur as H2S is prevented by oxidation of the sulphur compounds to sulphate by the aqua regia. The wavelength used for identification and quantification of sulphate is 181.972nm. The sulphate in the soil is extracted in dilute hydrochloric acid and the insoluble residue is removed by filtration. The filtrate is made up to volume and the concentration of sulphate in the filtrate is determined by Inductively Coupled Plasma Optical Emission Spectroscopy (ICP-OES). The wavelength used for identification and quantification of sulphate is 181.972nm. The two results obtained from the above tests may then be combined to calculate the Total Potential Sulphate and Total Oxidisable Sulphur content	BS1377 : Part 3: 1990 Method 5 BS1377 : Part 1 : 1990	0.01%	Not Accredited

DETS INFO 001 – ANALYTICAL METHOD SUMMARY

Method Number	Title	Description	Reference	LOD	Accreditation Status
DETSC 2324	**Mercury in Waters by Atomic Fluorescence Spectroscopy**	Waters and aqueous samples are preserved by fixing with concentrated nitric acid. Treatment with tin (II) chloride reduces mercury (II) to mercury (0) vapour which is detected using atomic fluorescence spectrometry.	Standard Methods for the Examination of Water and Wastewater Part 3112 B – 21st Edition 2005 APHA, AWWA, WEF PSA Method – Millennium Merlin Method for Total Mercury in Drinking, Surface, Ground, Industrial and Domestic Wastewaters and Saline Waters	0.05µg/l	UKAS
DETSC 2325	**Mercury in Soil Atomic Fluorescence Spectroscopy**	The mercury is extracted from soil in aqua regia with gentle refluxing. The extract is filtered to remove particulates and diluted to volume. Treatment with tin (II) chloride reduces mercury (II) to mercury (0) vapour which is detected using atomic fluorescence spectrometry.	PSA Method – Millennium Merlin Method for Mercury in Sludge, Soils and Sediments	0.05 mg/kg	UKAS MCERTS(Soils)
DETSC 2332	**Inorganic and Methyl Mercury Speciation**	Soils are air-dried and crushed before being subjected to a two-stage microwave extraction procedure for Inorganic (Hg(II)) and Methyl (MeHg) mercury. Waters and aqueous samples are filtered to remove particulates. An aliquot is separated via HPLC before treatment with bromate-bromide and tin (II) chloride to generate mercury and the mercury is determined by atomic fluorescence spectroscopy.	USEPA Method 3200 – Mercury Species Fractionation and Quantification by Microwave Assisted Extraction. PSA Application Note 053 – Mercury Speciation Using The Millenium Merlin Speciation System	**Soil:** 100µg/kg **Water:** 1µg/l	Not Accredited
DETSC 2333	**Elemental Mercury Speciation**	Soils, waters and aqueous samples are tested on an as-received bases. A known quantity of sample is extracted using argon and the released elemental mercury is trapped. The trapped mercury is released upon heating in a scarifier module and determined by atomic fluorescence spectroscopy.		**Soil:** 0.6µg/kg **Water:** 1µg/l	Not Accredited

DETS INFO 001 – ANALYTICAL METHOD SUMMARY

Method Number	Title	Description	Reference	LOD	Accreditation Status
DETSC 2400	**Unified Barge Bioaccessible Metals in Soils**	The Unified BARGE Method (UBM) is a an in vitro method for simulating the human digestive system. Synthetic digestive fluids are used to simulate the fluids present in the body. Both inorganic solutions (Containing inorganic salts such as KCl, NaCletc), and organic solutions (Containing organic compounds such as Urea, Glucose etc) are mixed with enzymes to produce 4 Synthetic digestive fluids saliva (S), Gastric fluid (G), duodenal fluid (D) and bile (B). These solutions are then used to mimic the effect of a sample passing through a human gastro intestinal tract by shaking portions of the sample at 37^0C, human body temperature (17.4).	EPA 9200.2-86 April 2012- Standard Operating Procedure for an In Vitro Bioaccessibility Assay for Lead in Soil BGS Chemical& Biological Hazards Programme Open Report OR/07/027 - Inter-laboratory Trial of a Unified Bioaccessibility Procedure	V = 1.0mg/kg Cr = 5.0mg/kg Co = 1.0mg/kg Ni = 5.0mg/kg As = 0.5mg/kg Se = 0.5mg/kg Cd = 0.5mg/kg Pb = 1.0mg/kg	Not Accredited
DETSC 3001	**Solvent Extractable Matter in Soil**	Soil samples are extracted with a water-immiscible solvent and filtered to remove the water. The solvent is evaporated and the amount of extractable matter in the sample is determined gravimetrically.	In-house method based on:- Problems Arising from the Redevelopment of Gas Works and Similar Sites - AERE Harwell Laboratory 1981. Environmental Agency The Determination of Material Extractable by Carbon Tetrachloride and of Certain Hydrocarbon Oil and Grease Components in sewage Sludge – 1978	40mg/kg	**Toluene & Cyclohexane:** UKAS **Other Solvents:** Not Accredited
DETSC 3002	**Oil & Grease/Solvent Extractable Matter in Waters**	A known volume of sample is acidified to pH<2 and extracted three times with an organic solvent, such as n-Hexane, in a separating funnel. The solvent is removed by evaporation and the amount of extractable matter in the sample is determined gravimetrically.	APHA 21st Edition, 2005 – Method 5520 B. Oil & Grease - Partition Gravimetric Method USEPA Method 1664, Revision A: n-Hexane Extractable Material (HEM: Oil & Grease) and Silica Treated N-Hexane Extractable Material (SGT-HEM; Non Polar Material) by Extraction and Gravimetry.	1mg/l for 500ml sample	UKAS

DETS INFO 001 – ANALYTICAL METHOD SUMMARY

Method Number	Title	Description	Reference	LOD	Accreditation Status
DETSC 3049	**Elemental Sulphur in Soils and Waters by HPLC**	Soils are extracted in dichloromethane (DCM) by sonication. The elemental sulphur concentration is determined by high performance liquid chromatography (HPLC) with UV detection using a C_{18} (e.g. 250mm x 4.6mm) column and a mobile phase composed of 95% methanol and 5% water. Waters and aqueous extracts of soils are extracted using DCM in a separating funnel, filtered, and the concentration determined using HPLC.	National Grid Property Holdings Limited, Methods for the Collection and Analysis of Samples from National Grid Sites, Version 1, September 2006. Section 3.12 Soil Analysis: Elemental Sulphur.	**Soil:** 0.75mg/kg **Waters:** 90ug/l	**Soil:** UKAS MCERTS(Soils) **Water:** UKAS
DETSC 3072	**Aliphatic / Aromatic TPH by GC-FID**	Aliphatic and aromatic petroleum hydrocarbons (C_{10}-C_{35}) are extracted from soil and water using n-Hexane. The fractions are separated by solid phase extraction using silica columns, whereby the aliphatic fraction is eluted first with n-Hexane and the aromatic portion is eluted second with dichloromethane. The total, aliphatic, and aromatic concentrations are determined by gas chromatography flame ionisation detection (GC-FID) using a capillary column and hydrogen as the carrier gas. The chromatographic data is further characterized by subdivision into approximate boiling point/carbon number ranges with respect to n-alkane retention time markers.	National Grid Property Holdings Limited, Methods for the Collection and Analysis of Samples from National Grid Sites, Version 1, September 2006. Section 3.12 Soil Analysis: Draft TNRCC Method 1006	**Soil mg/kg:** AL10-12 =1.5 AL12-16 =1.2 AL16-21 =1.5 AL21-35 =3.4 AR10-12 =0.9 AR12-16 =0.5 AR16-21 =0.6 AR21-35 =1.4 **Water:** 1ug/l	**Soil:** UKAS MCERTS(Soils) (C10-C35 only) **Water:** Not Accredited
DETSC 3301	**PAH in Soil by GC-FID**	Soils and associated materials are extracted in dichloromethane (DCM) using sonication. The PAH concentration is recorded both as "Total PAH" and as "Speciated PAH", specified in terms of the 16 US EPA "Priority Pollutant" Polycyclic Aromatic Hydrocarbons. Concentrations are determined by gas chromatography using a BPX 50 (30m; 0.25µm ID; 0.25µm film) capillary column (or equivalent).	In-house method based on US EPA Method 8100, Polynuclear Aromatic Hydrocarbons	0.5 mg/kg each 1.6 mg/kg Total PAH	UKAS (16 PAH's only)
DETSC 3302	**Hexane / Acetone Extracted PAH in Soil by GC-FID**	Soils are extracted into hexane: acetone by shaking. The PAH concentration is recorded both as "Total PAH" and as "Speciated PAH", specified in terms of the 16 US EPA "Priority Pollutant" Polycyclic Aromatic Hydrocarbons. Concentrations are determined by gas chromatography using a BPX 50 (30m; 0.25µm ID; 0.25µm film) capillary column (or equivalent).	In-house method based on US EPA Method 8100, Polynuclear Aromatic Hydrocarbons	0.1 mg/kg each 1.6 mg/kg Total PAH	Not Accredited

DETS INFO 001 – ANALYTICAL METHOD SUMMARY

Method Number	Title	Description	Reference	LOD	Accreditation Status
DETSC 3303	**Polyaromatic Hydrocarbons in Soils by GC-MS**	The PAHs in the soil sample are extracted into hexane: acetone by shaking. The PAHs in the extract are separated by gas chromatography and identified by the mass selective detector. The concentration of each PAH is determined by referencing individual mass peak areas to the appropriate internal standard mass peak area. Quantification is carried out within the instrument software.	In-house method based on EPA Method 8270- US EPA Method 8270, Revision C, Semivolatile Organic Compounds by Gas Chromatography – Mass Spectrometry (GC/MS)	0.03 mg/kg each 0.10 mg/kg Total PAH	UKAS (All 16 PAH's) MCERTS (not Fluorene, Anthracene, Chrysene or Total)
DETSC 3304	**Polyaromatic Hydrocarbons in Waters by GC-MS**	The PAHs in the water sample are extracted into dichloromethane by shaking. The PAHs in the extract are separated by gas chromatography and identified by the mass selective detector. The concentration of each PAH is determined by referencing individual mass peak areas to the appropriate internal standard mass peak area. Quantification is carried out within the Instrument software.	In-house method based on EPA Method 8270- US EPA Method 8270, Revision 3, Semivolatile Organic Compounds by Gas Chromatography – Mass Spectrometry (GC/MS) In-house method based on EPA Method 3510C- EPA Method 3510C, Revision 3, Separatory Funnel Liquid-Liquid Extraction	10 ng/l each	UKAS (16 PAH's only)
DETSC 3311	**Extractable Petroleum Hydrocarbons (EPH) in Soil, Ballast and Water**	This method is designed to determine total concentrations of extractable petroleum hydrocarbons (EPH) in solid and aqueous matrices. This method uses a dichloromethane (DCM) extraction followed by quantification using gas chromatography/flame ionisation detection (GC-FID) analysis using a 1:1 mixture of diesel and mineral oil as calibration standards and n-alkane markers to establish the boiling point ranges. This method is used for the quantitative analysis of "Total EPH" (C10-C40) and as "Speciated EPH", specified in terms of the "diesel range" (C10-C24), and "mineral oil range" (C24-C40).	USEPA Method 3550C – Ultrasonic Extraction USEPA Method 8015B – Non-Halogenated Organics Using GC/FID	**Soil:** 10 mg/kg **Ballast:** 10mg/kg **Water:** 10µg/l	**Soil:** UKAS MCERTS(Soils) **Water:** UKAS

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Method Number	Title	Description	Reference	LOD	Accreditation Status
DETSC 3312	**Hexane Extractable Petroleum Hydrocarbons (HPH)**	This method is designed to determine total concentrations of extractable petroleum hydrocarbons (EPH) in solid matrices. This method uses a hexane: acetone (9.4) extraction followed by quantification using gas chromatography/flame ionisation detection (GC-FID) analysis using a 1:1 mixture of diesel and mineral oil as calibration standards and n-alkane markers to establish the boiling point ranges. This method is used for the quantitative analysis of "Total EPH" (C10-C40) and as "Speciated EPH", specified in terms of the "diesel range" (C10- C24) and "mineral oil range" (C24-C40).	USEPA Method 8015B – Non-Halogenated Organics Using GC/FID	**Soil:** 5 mg/kg	Not Accredited
DETSC 3321	**BTEX, MTBE & PRO in Soils by Headspace GC-FID**	BTEX, MTBE and PRO in soils are determined via Headspace GC-FID. Individual aromatic compounds are quantified by external calibration against known standards. PRO range is banded using alkane markers to define retention time windows.	EPA Methods 5021 and 8015D	0.01 mg/kg	UKAS MCERTS(Soils) Not accredited for PRO range (C5-10)
DETSC 3322	**BTEX, MTBE & PRO in Waters & Leachates by Headspace GC-FID**	BTEX, MTBE and PRO in soils are determined via Headspace GC-FID. Individual aromatic compounds are quantified by external calibration against known standards. PRO range is banded using alkane markers to define retention time windows.	EPA Methods 5021 and 8015D	1 µg/l	UKAS
DETSC 3401	**PCBs in Soils by GC-MS**	An as-received soil sample is extracted in Hexane:Acetone (1:2) using sonication methodology. The sample is separated by gas chromatography and identified by mass selective detector. Quantification is carried out within the instrument software.	EPA Method 8082 - Polychlorinated Biphenyls (PCBs) by Gas Chromatography.	**µg/kg** PCB 28=1.25 PCB 52=1.12 PCB 101=1.32 PCB 118=1.43 PCB 153=2.08 PCB 138=1.35 PCB 180=1.42	UKAS MCERTS(Soils)

DETS INFO 001 – ANALYTICAL METHOD SUMMARY

Method Number	Title	Description	Reference	LOD	Accreditation Status
DETSC 3402	**Polychlorinated Biphenols in Waters by GC/MS**	The water sample is extracted in DCM on a reciprocal shaker. The sample is separated by gas chromatography and identified by mass selective detector. Quantification is carried out within the GC-MS software using an internal standard.	EPA Method 8082 - Polychlorinated Biphenyls (PCBs) by Gas Chromatography.	**ng/l** PCB 28=208 PCB 52=161 PCB 101=211 PCB 118+123=513 PCB 153=163 PCB 138=107 PCB 180=132 PCB 105=133 PCB 114=253 PCB 126=399 PCB 156=253 PCB 157=119 PCB 167=248 PCB 169=181 PCB 189=271 PCB 77=202 PCB 81=186	UKAS
DETSC 3432	**Volatile Organic Compounds in Waters by Headspace GC-MS**	The method covers the range of volatile organic compounds with boiling points up to 220°C. Water samples are heated and agitated in a crimp cap vial. This drives the volatile components in to the headspace. An aliquot of the headspace is taken and injected in to a gas chromatograph with mass selective detection (GC-MS).The detector operates in full scan mode and is calibrated with standards containing known concentrations of the compounds of interest.	USEPA Method 8260B Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS), Revision 2, December 1996	1 ug/l except: DCM (27), 2,2-Dichloropropane (2), Bromochloromethane (4), Bromodichloromethane (4), m+p-Xylene (2), 1,3-Dichlorobenzene (2)	UKAS except: Trichlorofluoromethane, Methylene Chloride, 1,1,1-Trichloroethane,

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Method Number	Title	Description	Reference	LOD	Accreditation Status
DETSC 3433	**Semi-Volatile Organic Compounds in Soils by GCMS**	The SVOCs in the soil sample are extracted into DCM: Acetone by shaking. The SVOCs in the extract are separated by gas chromatography and identified by the mass selective detector. The concentration of each SVOC is determined by referencing individual mass peak areas to the appropriate internal standard mass peak area. Quantification is carried out within the instrument software.	In-house method based on EPA Method 8270- US EPA Method 8270, Revision 3, Semi volatile Organic Compounds by Gas Chromatography – Mass Spectrometry (GC/MS)	Individual SVOCs 0.1 mg/kg	UKAS
DETSC 5001	**Ash Content of Coal**	The ash content of the sample is determined gravimetrically. A known weight of the sample is placed in a prepared ash crucible and placed in a furnace. The furnace is heated to 750ºC ±10ºC where the temperature is maintained. Following combustion the crucible and sample are removed, cooled and reweighed.	ASTM D3174-11 BS 1016-104.4 1998 ISO 1171: 2010	0.1%	UKAS
DETSC 5002	**Ash & LOI Content of Solid Biomass & Solid Recovered Fuels**	The ash and LOI content of the sample is determined gravimetrically. A known weight of the sample is placed in a prepared ash crucible and placed in a furnace. The furnace is heated to 550ºC ±10ºC where the temperature is maintained. Following combustion the crucible and sample are removed, cooled and reweighed.	BS EN 14775:2009 BS EN 15403:2011	0.1%	UKAS
DETSC 5003	**Volatile Matter Content of Solid Biomass, Solid Recovered Fuels and Coal**	A known weight of the sample produced for volatile matter determination is placed in a suitable crucible fitted with a lid. The crucible and sample is weighed and heated in a furnace with a limited air through put at a temperature of 900ºC ±10ºC for 7 minutes. The sample and crucible are re-weighed and the volatile matter content determined by difference.	BSEN15148:2009 – Solid Biofuels Determination of the Content of Volatile Matter BS EN 15402:2011 - Solid Recovered Fuels - Determination of the Content of Volatile Matter	0.1%	UKAS

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Method Number	Title	Description	Reference	LOD	Accreditation Status
DETSC 5004	**Total Moisture / Dry Solids Content of Solid Biomass & Solid Recovered Fuels & Coal**	The sample produced for general analysis is placed into a suitable prepared and weighed tray and reweighed. The sample is dried at 105ºC to constant weight and the total moisture / dry solids content is calculated from the reduction in weight.	BSEN 14774 Parts 1 & 2 2009 DD CEN/TS 15414 Parts 1 & 2: 2010	0.1%	UKAS
DETSC 5005	**Analysis Moisture Content of Solid Biomass, Solid Recovered Fuels & Coal**	The sample produced for total moisture determination in accordance with DETSC 5009 or DETSC 5010 is placed in a suitable pre-weighed tray and reweighed. The sample is then dried at 105°C ±2°C to constant weight and then weighed again. The analysis moisture content is calculated from the reduction in weight.	BS EN 14774-3 2009 BS EN 15414-3 2011 BS 1016-104.1 -1999 ISO 11722 – 1999	n/a	UKAS
DETSC 5007	**Calorific Value of Solid Biomass, Solid Recovered Fuels & Coal**	Calorific value of a material is determined in an Isoperbol calorimeter by burning it in pure oxygen in a combustion bomb. A known amount of sample is placed in a combustion bomb which is then pressurised to 30bar with oxygen. A calorimeter bucket is filled with a known amount of deionised water which is placed in the calorimeter and the bomb placed in the bucket. The system is allowed to equilibrate and the bomb fired by electrical connection. The difference in temperature of the water in the calorimeter bucket caused by the ignition of the material in the bomb is measured and the calorific value calculated	BS EN 14918: Solid biofuels – Determination of calorific value BS EN 15400: Solid recovered fuels - Determination of calorific value	1MJ/kg	UKAS
DETSC 5008	**Calorific Value of Soil**	A known amount of sample material is burnt in a combustion bomb that is immersed in water in a calorimeter and the difference in the water temperature before and after ignition measured. The calorific value of the sample material is calculated making any necessary corrections for heat generation not associated with the combusting sample. A gelatine capsule will be required to assist combustion which is also corrected for in the final calculations.	BS 1016-105 1992 ISO 19208 ASTM 5865	1MJ/kg	UKAS

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Method Number	Title	Description	Reference	LOD	Accreditation Status
DETSC 5009	**Sample Preparation of Solid Biomass & Solid Recovered Fuels**	If analysis is required on the original material (i.e. Bulk Density) a sub-sample will be taken after initial mixing after which the sample is then reduced by cutting/chopping oversized pieces of material. The material is then mixed and subdivided by manual means during which process representative samples are taken for analysis i.e. total moisture. The remainder of the sample is dried and then reduced to <1mm and again mixed and subdivided to produce the sample for laboratory analysis.	BS EN 14780:2011 BS EN 15413:2011	n/a	Not Accredited
DETSC 5010	**Sample Preparation of Coal**	If required the sample received is first mixed and a sample taken for bulk density or bulk density is carried out on the whole initial sample. The remaining sample or the whole sample used for bulk density is then reduced to <10mm preferably by jaw crushing. The material is then mixed and subdivided by mechanical or manual means during which process representative samples are taken for any analysis required at this stage i.e. total moisture, The remainder of the sample is again mixed and subdivided to produce the sample for laboratory analysis which may require drying prior to crushing to <212 microns. If there is excessive water content a pre- drying stage of the whole sample may have to be carried out before sample blending and subdivision commences.	BS ISO 13909-4: 2001	n/a	Not Accredited
DETSC 5011	**Calculation of Fixed Carbon Content of Coal, SRF and Solid Biomass Fuels**	The total moisture, analysis moisture, ash and volatile matter content are determined by approved methods. The values obtained are deducted from 100 and this gives the fixed carbon value of the fuel.	DD CENT/S 15296:2006 BS 1016.100:1994 BS ISO 17246:2005	0.1%	Not Accredited

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Method Number	Title	Description	Reference	LOD	Accreditation Status
DETSC 5012	**Determination of Biomass Content of SRF**	Approximately 5g of the sample is dissolved in 150ml of 78% Sulphuric Acid for 16 hours ±2 hours after which 35ml of 30% Hydrogen Peroxide is added and the sample left for an additional 5 hours ±1 hour. At the end of this period 300ml of deionised water is added to the sample and the residue remaining filtered off using a glass fibre filter paper, washing the residue with an additional 300ml of deionised water. The filter paper and residue are placed in a pre-weighed crucible and dried at 1500C until completely dry. The filter paper is reweighed after drying and the non biomass residue determined. Corrections for carbonates content is made by determining the ash content of the original sample and the non biomass residue remaining. The result can also be expressed by percentage calorific value by performing a calorific valve on the solid captured on the filter paper.	BS EN 15440 Solid recovered fuels - Methods for the determination of biomass content	n/a	UKAS
DETSC 5013	**Determination Of Carbon, Hydrogen, Nitrogen & Oxygen In Solid Biomass, Solid Recovered Fuels & Coal**	A known mass of fuel is weighed into tin capsules which are dropped sequentially into the combustion reactor prior to the arrival of oxygen. The sample and tin capsule react with oxygen and combust at temperatures of 1700-1800 °C and the sample is broken down into its elemental components N2, CO2, and H2O. High performance copper wires absorb the excess oxygen not used for sample combustion. The gases flow through the gas chromatographic (GC) separation column which is kept at a constant temperature. As they pass through the GC column, the gases are separated and are detected sequentially by the thermal conductivity detector (TCD). The TCD generates a signal, which is proportional to the amount of element in the sample. The instrument software compares the elemental peak to a known standard material (after calibration) and generates a report for each element on a weight basis. The oxygen is calculated by deducting these quantities from 100 along with the moisture, ash, sulphur & chlorine contents determined by other methods.	BS EN 15104:2011 Solid biofuels - Determination of total content of carbon, hydrogen and nitrogen - Instrumental methods BS EN 15407:2011 Solid recovered fuels - Methods for the determination of carbon (C), hydrogen (H) and nitrogen(N) content BS EN 15296:2011 Solid biofuels - Conversion of analytical results from one basis to another	Carbon 0.10% Nitrogen 0.30% Hydrogen 0.30% Oxygen 3.55%	UKAS

DETS INFO 001 – ANALYTICAL METHOD SUMMARY

Method Number	Title	Description	Reference	LOD	Accreditation Status
DETSC 5014	**Metals in Coal, SRF and Biomass by ICP**	Metals in coal, solid recovered fuel (SRF) and biomass samples are extracted by microwave using Hydrogen Peroxide (to oxidise and break down organic matter) and Aqua Regia (to dissolve the matrix and hold the metals in solution). Their concentrations are determined by Inductively Coupled Plasma Optical Emission Spectroscopy (ICP-OES).	BS EN 15410 - Solid recovered fuels - Methods for the determination of the content of major elements (Al, Ca, Fe, K, Mg, Na, P, Si, Ti) BS EN 15411 - Solid recovered fuels - Methods for the determination of the content of trace elements (As, Ba, Be, Cd, Co, Cr, Cu, Hg, Mo, Mn, Ni, Pb, Sb, Se, Tl, V and Zn) BS EN 15290 - Solid biofuels - Determination of major elements - Al, Ca, Fe, Mg, P, K, Si, Na and Ti BS EN 15297 - Solid biofuels - Determination of minor elements - As, Cd, Co, Cr, Cu, Hg, Mn, Mo, Ni, Pb, Sb, V and Zn	**0.1 mg/kg:** As, Be, Cd, Co, Mn, Ni, P, Pb, Sb, Se, Sn, Ti, V, Zn **0.2mg/kg:** Cr, Cu, Tl **0.5mg/kg:** Mo **1mg/kg:** Al, Fe, K, Mg **5mg/kg:** Ca **10mg/kg:** Ag, Ba, Rh, Sr, Te	UKAS: Al, As (SRF only), Ca, Cd, Co, Cr, Cu, K, Mg, Mn, Na (SRF only), Ni, P, Pb, Se, Sn, Tl, V, Zn All other metals not accredited
DETSC 5015	**Mercury in Coal, SRF and Biomass by Atomic Fluorescence Spectroscopy**	The mercury is extracted from coal, SRF and biomass in aqua regia with gentle refluxing. The extract is filtered to remove particulates and diluted to volume. Treatment of the resulting solution with tin (II) chloride reduces mercury (II) to mercury (0) vapour which is then quantitatively detected using atomic fluorescence spectrometry.	PSA Method – Millennium Merlin Method for Mercury in Sludge, Soils and Sediments.	0.055mg/kg	UKAS

DETS INFO 001 – ANALYTICAL METHOD SUMMARY

Method Number	Title	Description	Reference	LOD	Accreditation Status
DETSC 5016	**Total Sulphur Content Of Coal, SRF And Biomass**	Sulphur compounds in SRF and biomass are extracted using aqua regia / hydrogen peroxide and the insoluble residue is removed by filtration. The concentration of sulphur in the filtrate is determined by Inductively Coupled Plasma Optical Emission Spectroscopy (ICP-OES). Loss of sulphur as H2S is prevented by oxidation of the sulphur compounds to sulphate by the aqua regia. The use of hydrogen peroxide enhances the oxidation properties of nitric acid especially in the digestion of organics. Sulphur compounds in coal are determined by ICP-OES from the aqueous washings of the combustion products after firing in a bomb calorimeter.	TRL Report TRL447 (Updated) - Sulphate specification for structural backfills 2005	0.001mg/kg	UKAS
DETSC 5017	**Sulphur, Chlorine, Fluorine & Bromine Content of Solid Biomass, Solid Recovered Fuels and Coal by IC**	A known weight of fuel is burnt in a pressurised bomb in pure oxygen. After firing of the bomb, it is stood for a minimum of five minutes to allow the combustion products to settle then the oxygen is slowly released over a period of at least three minutes. The bomb is then taken apart and the bomb electrodes rinsed with deionised water into the inside of the bomb. These washings are then decanted into a 50ml volumetric flask. The inside of the bomb is rinsed with deionised water and the washings added to those in the volumetric flask. The contents of the volumetric flask are made up to volume with deionised water and stored for the analysis of sulphur, chloride, fluoride and bromide by ion chromatography.	Operating Instruction Manual No. 442M 6200 Parr Oxygen Bomb Calorimeter Operating Instruction Manual No. 205M 1108 Oxygen Combustion Bomb Operating Instruction Manual No. 454M 6510 Water Handling System	0.01% Chlorine 0.01% Fluorine 0.01% Bromine 0.04% Sulphur (Coal only)	UKAS

DETS INFO 001 – ANALYTICAL METHOD SUMMARY

Method Number	Title	Description	Reference	LOD	Accreditation Status
DETSC 5018	**XRF Analysis of Coal, Biomass, SRF and Cement**	When X-rays are targeted at a material they will cause electrons to be ejected from the component atoms (Ionisation). The ejection of electrons will cause the electronic structure of the component atoms to become unstable resulting in electrons from the higher energy outer orbitals "falling" into the inner orbitals to compensate. This causes a release of energy in the form of a photon equal to the energy difference between the two orbitals involved. Thus the material emits radiation which has energy characteristics of the atoms present. In energy dispersive X-ray fluorescence the fluorescent X-rays emitted are directed to a detector from which the data is processed by a multichannel analyser, producing a digital spectrum which is processed to obtain analytical data. The instrument analytical parameters are set up for the matrix type. A sample cell is prepared by placing a piece of prolene film over the outer cell and then inserting the inner cell. This gives a complete cell with a clear prolene base. A portion of the sample is placed into the cell and then analysed.	Rigaku NEX CG EDXRF instruction manual	**Cement:** 0.01% BaO, Cr_2O_3, CuO, PbO, Rb_2O, SrO, ZnO 0.02% Cl, V_2O_5 0.05% TiO_2 0.1% Mn_2O_3, P_2O_5, SO_3 0.5% K_2O 1% Al_2O_3, CaO, CdO, Co_2O_3, Fe_2O_3, MgO, Na_2O, NiO, SiO_2, Y_2O_3 **Fuel:** 0.01% Co, Cr, Cu, I, Li, Mn, Ni, P, Pb, Sn, Ti, V, Zn 0.02% Al, Ba, S, Si 0.1% Mg 0.2% Ca 0.5% As, Cd, Hg, Mo, Na, Sb, Se, Th, Tl 1% Ag	UKAS Al, As, Ca, Cd, Co, Cr, Cu, Fe, Hg, K, Mg, Mn, Mo, Na, Ni, P, Sb, Si, Sn, Tl, Ti, V, Zn Al2O3, BaO, CaO, Cl, Cr2O3, CuO, Fe2O3, K2O, MgO, Mn2O3, Na2O, P2O5, PbO, Rb2O, SiO2, SO3, SrO, TiO2, V2O5, ZnO All other testing not accredited
DETSC 5019	**Determination of Biodegradable Municipal Waste Content (Compositional Analysis)**	The method is based on handpicking the BMW fraction from the municipal waste sample, and then weighing the amount of BMW sorted and expressing this as a percentage on a wet weight basis of the weight of the whole municipal waste sample.	ENVIRONMENT AGENCY: Guidance on monitoring of MBT and other treatment processes for the landfill allowances schemes (LATS and LAS) for England and Wales	n/a	Not Accredited
DETSC 5020	**Determination of Bulk Density in Solid Biomass and Solid Recovered Fuels**	The test portion is filled into a standard container of a given size and shape and weighed afterwards. Bulk density is calculated from the net weight per standard volume and reported for the moisture content.	BS EN 15103:2009 Solid Biofuels- Determination of bulk density BS EN 15401:2010 Solid Recovered Fuels- Determination of bulk density	0.5kg/m^3	Not Accredited

DETS INFO 001 – ANALYTICAL METHOD SUMMARY

Method Number	Title	Description	Reference	LOD	Accreditation Status
DETSC 5021	**Auto Ignition Temperature**	A quantity of the sample is placed into a metal tray or crucible and placed into an oven or furnace. The temperature of the oven / furnace is increased in predefined increments and the temperature in which the sample ignites is noted.	None	25°C	Not Accredited

APPENDIX D

Tidal Monitoring and Aquifer Permeability Testing

Appendix D

Permeability Tests

The aim of the slug test is to determine an estimate for the hydraulic conductivity within the screened interval of a monitoring well.

Methodology

Slug testing at the site was conducted by AEG and the methodology is reported in AEG 2020a.

The slug tests were undertaken on monitoring wells BH101D (screening Glacial till), BH103 (screening Glaciolacustrine Deposits), BH108D and BH110 (both screening Mercia Mudstone) on 3rd July 2020. An additional test had been undertaken on BH103 on June 24th however AEG noted that the permeability was high based on the cohesive geology screened and these tests were disregarded by AEG.

Data Interpretation – Bouwer-Rice

To determine the hydraulic conductivity of an unconfined aquifer from a permeability test, Bouwer and Rice (1976) presented a method that is based on Thiem's equation. Using this methodology the data collected from the field is plotted on a graph showing natural logarithm of head versus time. The best-fit line of this graph defines the head change at time zero (h0) and the head at an arbitrary time t (ht). From this data and the specific monitoring well parameters hydraulic conductivity is calculated.

Permeability Test Results

Slug tests were performed on monitoring wells BH101D, BH103, BH108D and BH110, to provide an estimate of the hydraulic conductivity of the aquifer unit beneath the Site. The technique used by AEG was to extract or insert a solid mass of known volume to each well and monitor water level recovery electronically using a pressure transducer.

From this data the depths to water were calculated and combined with data on the physical properties of the well, calculations for the derivation of the value for hydraulic conductivities were calculated using Bouwer and Rice's method for a partially penetrating well in an unconfined aquifer for BH101D, BH108D and BH110. The recharge in BH103 during the test was noted to be rapid and not considered to be representative of the cohesive geology the well screens. Given the discrepancy between the geology and test, the data for BH103 was not used in permeability calculations. It is possible that the test was reflective of the permeability of the filter pack and not the surrounding geology.

The hydraulic conductivity estimated from the tests conducted in BH101D screening the Glacial Till indicated a range in conductivity from 0.0007 to 0.025 m/day. These values are broadly in line with literature values for a clay such as the US EPA 1988 who suggest 0.014m/day, Morris and Johnson 1967, who suggest 0.0002m/day and ConSim 2000, where a range in hydraulic conductivity of 8.6×10^{-7} to 0.00041 m/day is presented for a clay. As such the permeabilities are considered to be representative of the screened geology.

The hydraulic conductivity estimated from the tests conducted in BH108D and BH110 which screen the Mercia Mudstone were higher, between 0.3 and 0.61 m/day. In comparison to literature values for a mudstone, these permeabilities are more rapid than expected. For example, ConSim 2000 suggests between 8.64×10^{-9} to 0.00017 m/day for a shale, with similar values reported by Tindal 1998. The literature values presented are at least 3 orders of magnitude below the calculated permeabilities. The higher than expected permeabilities may be the result of drilling induced fracturing of the mudstone in the close proximity of the well, where mudstone is described in some sections of the well screen as extremely weak and moderately weak.

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