



CAUSEWAY
— GEOTECH

APPENDIX D
TRIAL PIT PHOTOGRAPHS

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TP01



TP01



TP01



TP01



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TPC1



TP01



TP01



TP01



TP01



TP01



TP02



TP02



TP02



TP02



TP03



TP03

TP03



TP03



TP03



TP04



TP04



TP04



TP04



TP04

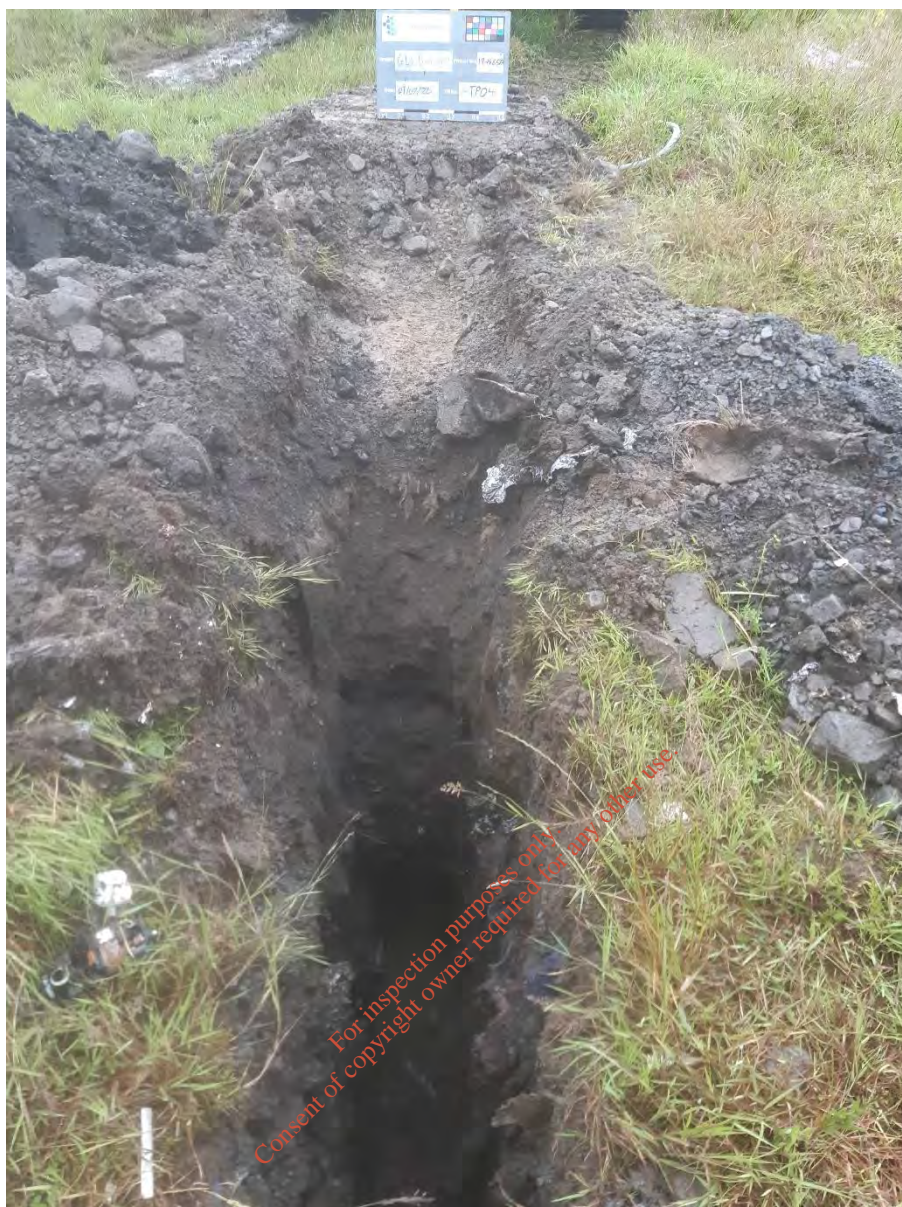
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TP04



TP04



TP04



TP04



TP04



TP04



TP04



TP05



TP05



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TPO5



TP05



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APPENDIX E
GEOTECHNICAL LABORATORY TEST RESULTS

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**SOIL AND ROCK SAMPLE ANALYSIS
LABORATORY TEST REPORT**

13 August 2020

Project Name:	Galway Historic Landfills - Tuam
Project No.:	19-1465A
Client:	Galway County Council
Engineer:	Feehily Timoney

We are pleased to attach the results of laboratory testing carried out for the above project. This memo and its attachments constitute a report of the results of tests as detailed in the Contents page(s).

The attached results complete the testing requested and we would therefore wish to confirm that samples will be retained without charge for a period of 28 days from the above date after which they will be appropriately disposed of unless we receive written instructions to the contrary prior to that date.

We trust our report meets with your approval but if you have any queries or require additional information, please do not hesitate to contact the undersigned.

Stephen Watson

Laboratory Manager

Signed for and on behalf of Causeway Geotech Ltd



Project Name: Galway Historic Landfills - Tuam

Report Reference: Schedule 1

The table below details the tests carried out, the specifications used, and the number of tests included in this report.

Tests marked with* in this report are not United Kingdom Accreditation Service (UKAS) accredited and are not included in Causeway Geotech Limited's scope of UKAS Accreditation Schedule of Tests. Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
SOIL	Moisture Content of Soil	BS 1377-2: 1990: Cl 3.2	2
SOIL	Liquid and Plastic Limits of soil-1 point cone penetrometer method	BS 1377-2: 1990: Cl 4.4, 5.3 & 5.4	2
SOIL	Particle size distribution - wet sieving	BS 1377-2: 1990: Cl 9.2	2
SOIL	Particle size distribution - sedimentation hydrometer method	BS 1377-2: 1990: Cl 9.5	2
SOIL	Moisture Condition Value / Moisture Content Relationship	BS 1377-4: 1990: Cl 5.5	2
SOIL	Undrained shear strength - triaxial compression without measurement of pore pressure (loads from 0.12 to 24 kN)	BS 1377-7: 1990: Cl 8	2


Summary of Classification Test Results

Project No. 19-1465A	Project Name Galway Historic Landfills - Tuam
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Hole No.	Sample				Soil Description	Density		w %	Passing 425µm %	LL %	PL %	PI %	Particle density Mg/m3	Casagrande Classification
	Ref	Top	Base	Type		bulk Mg/m3	dry							
TP01	1	0.10		B	Brown sandy gravelly clayey SILT.			28.0	78	47 -1pt	40	7		MI
TP02	1	0.00		B	Brown sandy gravelly clayey SILT.			26.0	71	47 -1pt	41	6		MI

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All tests performed in accordance with BS1377:1990 unless specified otherwise
LAB 01R Version 4

Key Density test Liquid Limit Particle density Linear measurement unless : 4pt cone unless : sp - small pyknometer wd - water displacement cas - Casagrande method gj - gas jar wi - immersion in water 1pt - single point test	Date Printed 13/08/2020	Approved By Stephen.Watson	
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PARTICLE SIZE DISTRIBUTION

Job Ref **19-1465A**

Borehole/Pit No. **TP01**

Site Name **Galway Historic Landfills - Tuam**

Sample No. **1**

Soil Description **Brown sandy slightly gravelly clayey SILT.**

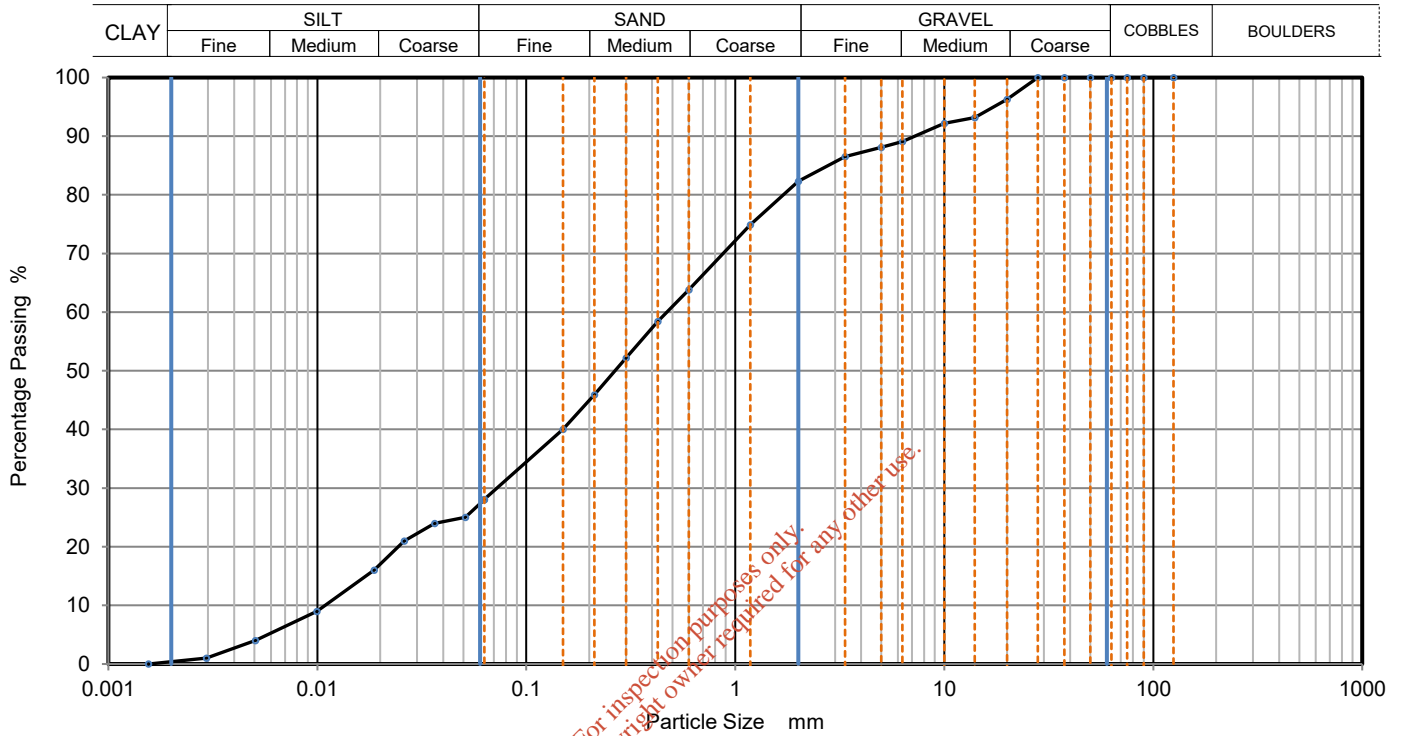
Depth, m **0.10**

Specimen Reference **8** Specimen Depth **0.1** m

Sample Type **B**

Test Method **BS1377:Part 2:1990, clauses 9.2 and 9.5**

KeyLAB ID **Caus2020071695**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	28
90	100	0.05114	25
75	100	0.03638	24
63	100	0.02603	21
50	100	0.01872	16
37.5	100	0.00994	9
28	100	0.00505	4
20	96	0.00294	1
14	93	0.00156	0
10	92		
6.3	89		
5	88		
3.35	87		
2	82		
1.18	75		
0.6	64	Particle density (assumed) 2.65 Mg/m3	
0.425	58		
0.3	52		
0.212	46		
0.15	40		
0.063	28		

Dry Mass of sample, g 2130

Sample Proportions	% dry mass
Cobbles	0
Gravel	18
Sand	54
Silt	28
Clay	1

Grading Analysis		
D100	mm	
D60	mm	0.47
D30	mm	0.0722
D10	mm	0.0109
Uniformity Coefficient		43
Curvature Coefficient		1

Remarks

Preparation and testing in accordance with BS1377-2 :1990 unless noted below

Approved

Stephen.Watson

LAB 05R Version 4



10122



PARTICLE SIZE DISTRIBUTION

Job Ref **19-1465A**

Borehole/Pit No. **TP02**

Site Name **Galway Historic Landfills - Tuam**

Sample No. **1**

Soil Description **Brown sandy slightly gravelly clayey SILT.**

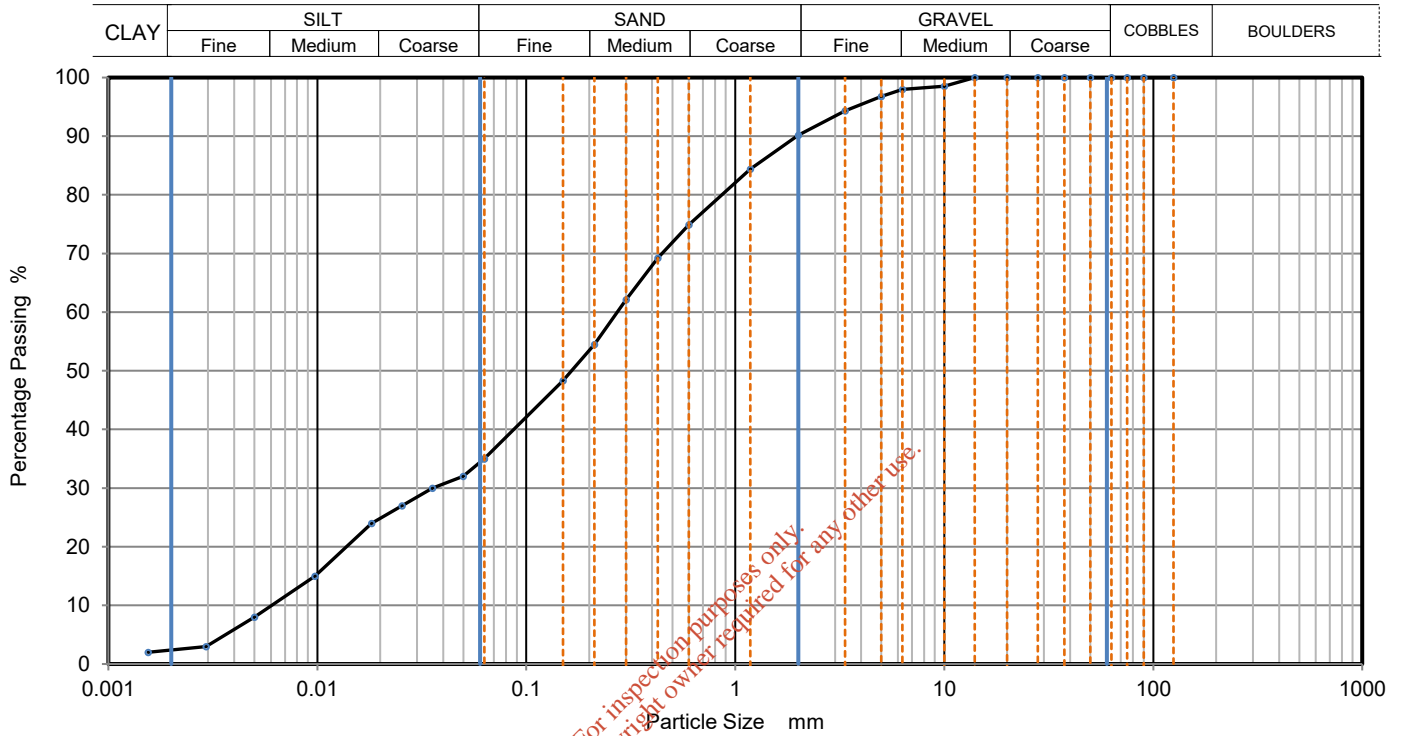
Depth, m **0.00**

Specimen Reference **8** Specimen Depth **0** m

Sample Type **B**

Test Method **BS1377:Part 2:1990, clauses 9.2 and 9.5**

KeyLAB ID **Caus2020071696**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.06300	35
90	100	0.04990	32
75	100	0.03551	30
63	100	0.02542	27
50	100	0.01819	24
37.5	100	0.00972	15
28	100	0.00499	8
20	100	0.00293	3
14	100	0.00155	2
10	99		
6.3	98		
5	97		
3.35	94		
2	90		
1.18	84		
0.6	75	Particle density (assumed)	
0.425	69	2.65 Mg/m3	
0.3	62		
0.212	55		
0.15	48		
0.063	35		

Dry Mass of sample, g 232

Sample Proportions	% dry mass
Cobbles	0
Gravel	10
Sand	55
Silt	33
Clay	2

Grading Analysis	
D100	mm
D60	mm 0.272
D30	mm 0.0339
D10	mm 0.00616
Uniformity Coefficient	44
Curvature Coefficient	0.68

Remarks
Preparation and testing in accordance with BS1377-2 :1990 unless noted below



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Approved

Stephen.Watson



Moisture Condition Value / Moisture Content Relationship

		Job Ref	19-1465A		
		Borehole/Pit No.	TP01		
Site Name	Galway Historic Landfills - Tuam		Sample No.	1	
Soil Description	Brown sandy slightly gravelly clayey SILT.		Depth	0.1	
Specimen Reference	9	Specimen Depth	0.1 m	Sample Type	B
Specimen Description	Brown sandy slightly gravelly clayey SILT.		KeyLAB ID	Caus2020071695	
Test Method	BS1377:Part4:1990:clause 5.5		Date started	23/07/2020	

Sample preparation

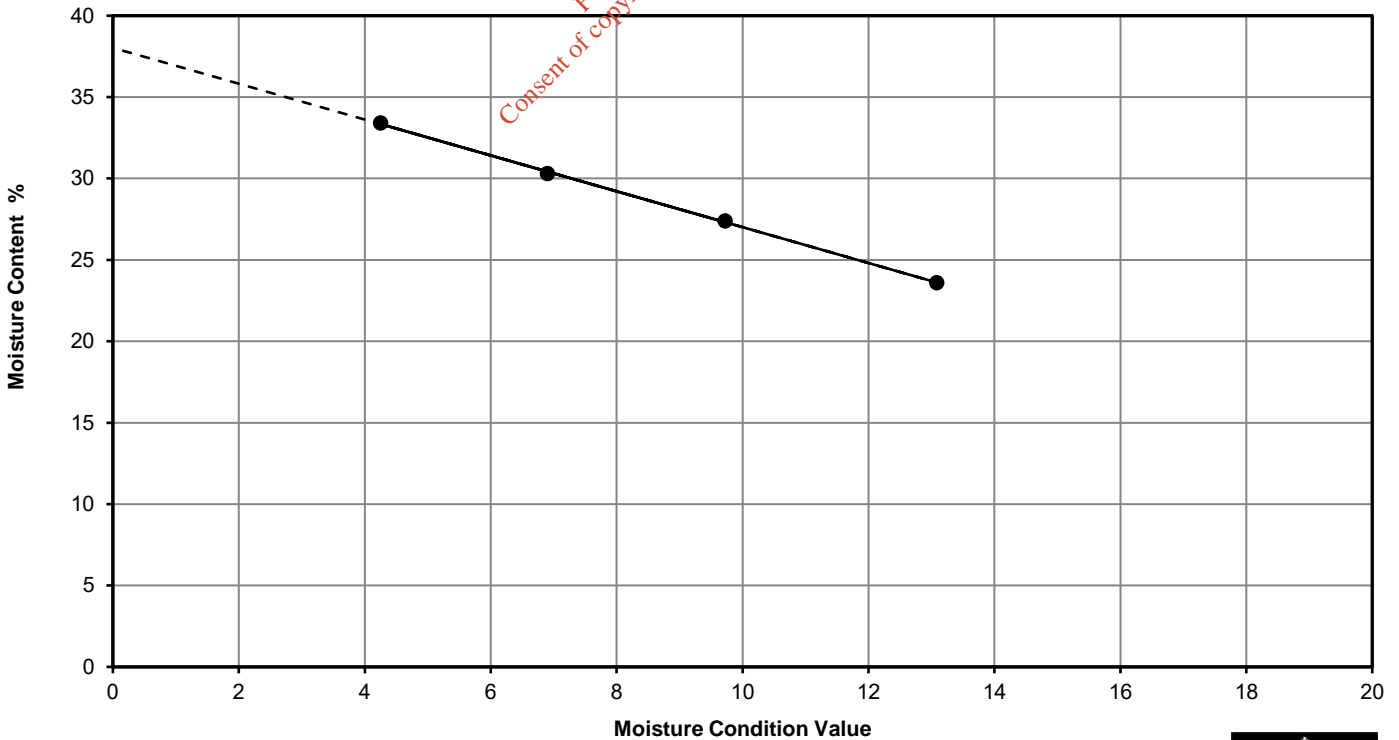
Amount of material larger than 20mm sieve removed	3	%
Natural Moisture Content of sample	26.5	%
Initial Moisture Content of test sample below 20mm	27.4	%
Separate specimens tested		

General remarks

Table of results

MCV Test Number	1	2	3	4	
Moisture Content, %	27.4	30.3	33.4	23.6	
Moisture Condition Value	9.7	6.9	4.2	13.1	
MCV report	9.7	6.9	4.2	13.1	
Effective / Valid data point	YES	YES	YES	YES	
Specimen remarks					

● valid points × invalid points - - - extended regression — linear regression



Approved
 Stephen.Watson
 LAB 11R Version 4





Moisture Condition Value / Moisture Content Relationship

Job Ref	19-1465A
Borehole/Pit No.	TP02
Sample No.	1
Depth	0
Sample Type	B
KeyLAB ID	Caus2020071696
Date started	01/08/2020

Site Name	Galway Historic Landfills - Tuam	
Soil Description	Brown sandy slightly gravelly clayey SILT.	
Specimen Reference	9	Specimen Depth
Specimen Description	Brown sandy slightly gravelly clayey SILT.	
Test Method	BS1377:Part4:1990:clause 5.5	

Sample preparation

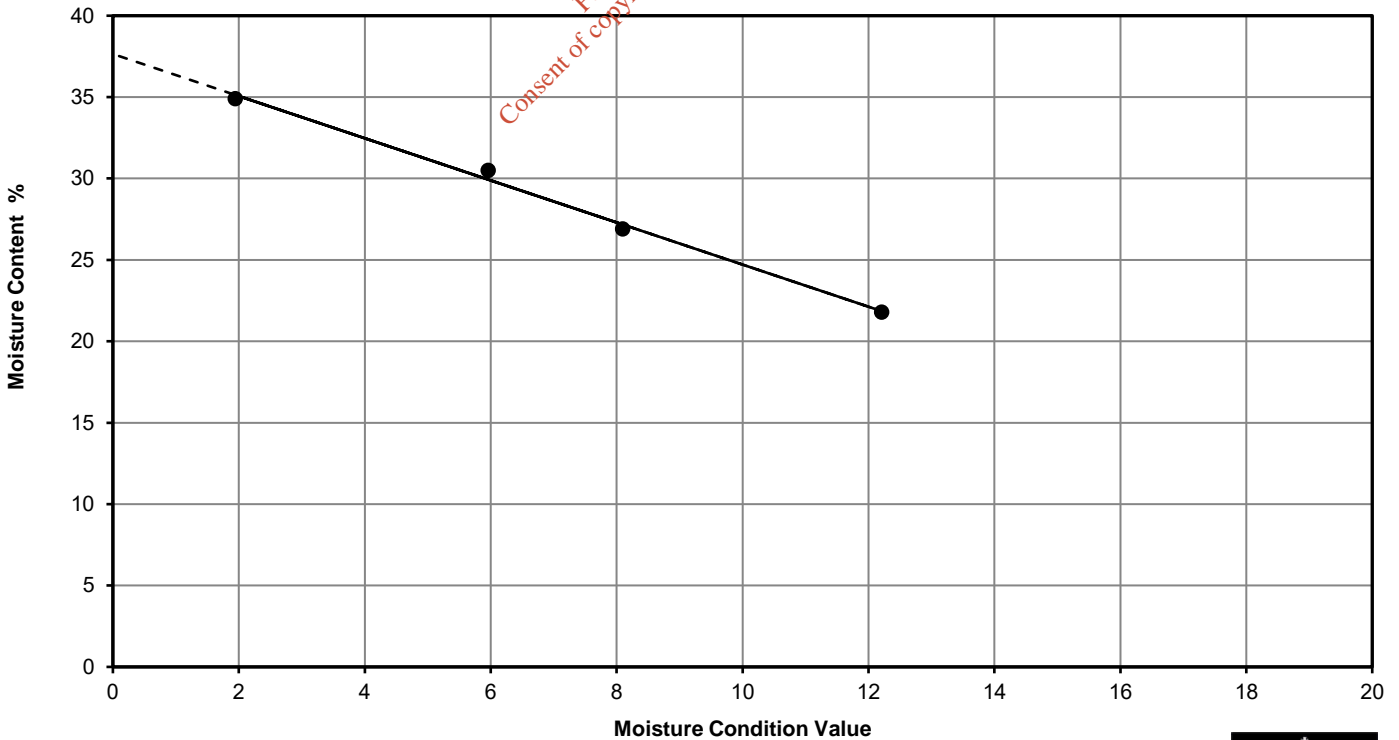
Amount of material larger than 20mm sieve removed	5	%
Natural Moisture Content of sample	25.3	%
Initial Moisture Content of test sample below 20mm	26.9	%
Separate specimens tested		

General remarks

Table of results

MCV Test Number	1	2	3	4	
Moisture Content, %	26.9	30.5	34.9	21.8	
Moisture Condition Value	8.1	6.0	1.9	12.2	
MCV report	8.1	6	1.9	12.2	
Effective / Valid data point	YES	YES	YES	YES	
Specimen remarks					

● valid points × invalid points - - - extended regression — linear regression



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**Unconsolidated Undrained Triaxial
Compression Test without measurement
of pore pressure - single specimen**

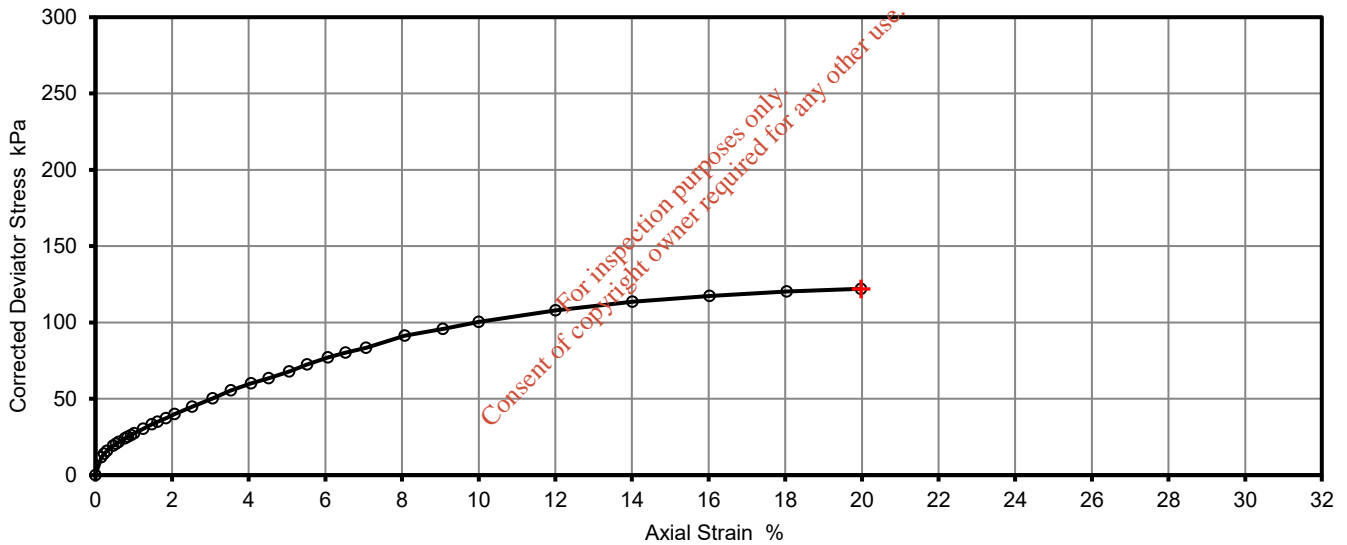
Job Ref	19-1465A
Borehole/Pit No.	TP01
Sample No.	1
Depth	0.10
Sample Type	B
KeyLAB ID	Caus2020071695
Date of test	11/04/2020

Site Name	Galway Historic Landfills - Tuam		
Soil Description	Brown sandy slightly gravelly clayey SILT.		
Specimen Reference	10	Specimen Depth	0.10 m
Specimen Description	Firm brown sandy slightly gravelly clayey SILT.		
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen		

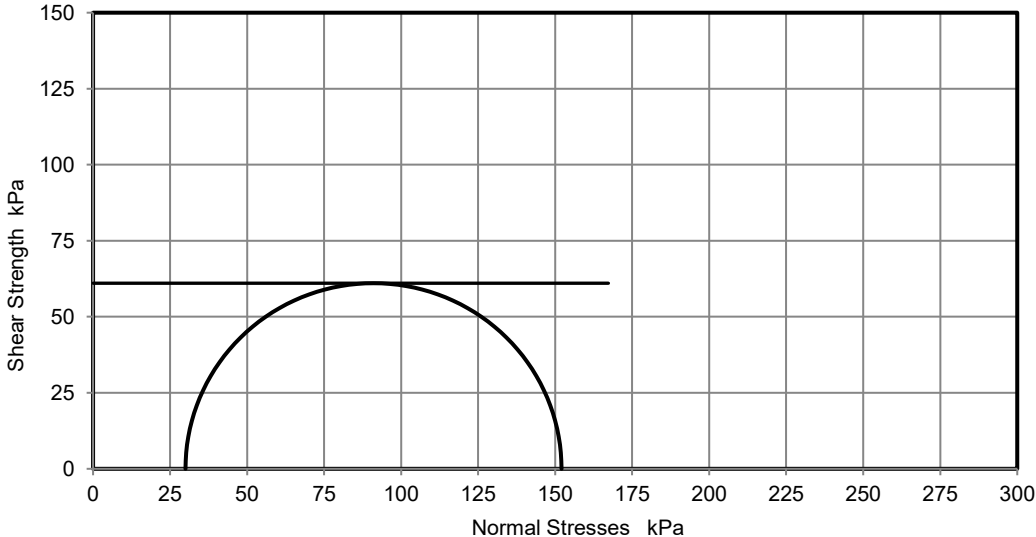
Test Number	1	
Length	210.9	mm
Diameter	105.4	mm
Bulk Density	1.82	Mg/m ³
Moisture Content	28.5	%
Dry Density	1.42	Mg/m ³

Rate of Strain	1.0	%/min
Cell Pressure	30	kPa
At failure	20.0	%
Axial Strain	122	kPa
Deviator Stress, ($\sigma_1 - \sigma_3$) _f	61	kPa $\frac{1}{2}(\sigma_1 - \sigma_3)$
Undrained Shear Strength, c_u		
Mode of Failure		

Deviator Stress v Axial Strain



Mohr Circles



Deviator stress corrected for area change and membrane effects based on Fig 11 BS1377-7:1990

Mohr circles and their interpretation is not covered by BS1377-7. This is provided for information only.

Remarks

Recompacted from bulk sample using 4.5kg rammer. Testing terminated at 20% axial strain.

Approved

Stephen.Watson

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13/08/2020 08:48



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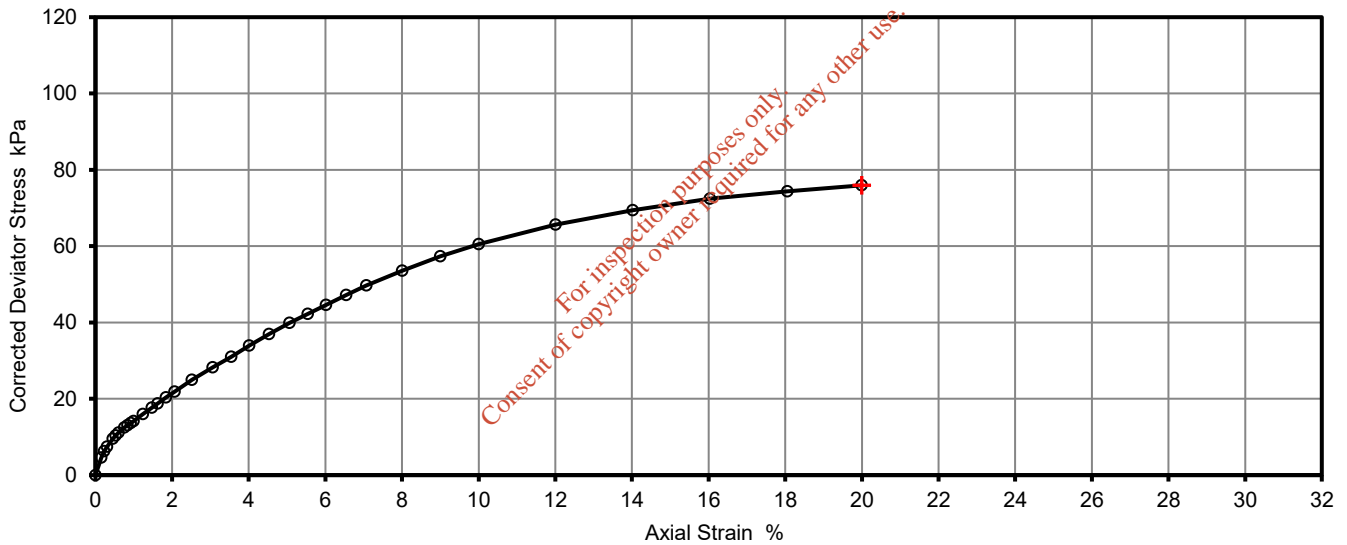
**Unconsolidated Undrained Triaxial
Compression Test without measurement
of pore pressure - single specimen**

Job Ref	19-1465A
Borehole/Pit No.	TP02
Sample No.	1
Depth	0.00
Sample Type	B
KeyLAB ID	Caus2020071696
Date of test	11/08/2020

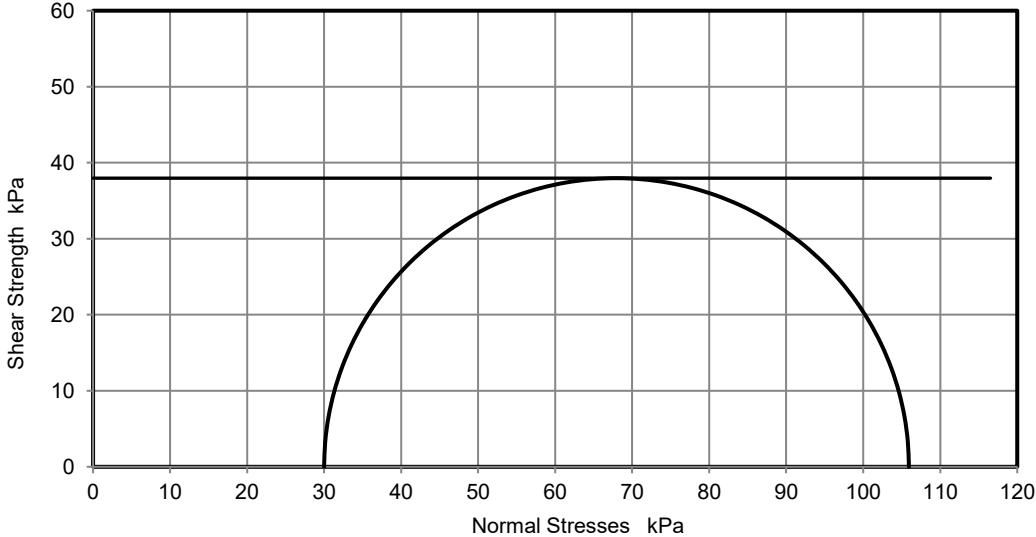
Site Name	Galway Historic Landfills - Tuam		
Soil Description	Brown sandy slightly gravelly clayey SILT.		
Specimen Reference	10	Specimen Depth	0.00 m
Specimen Description	Soft brown sandy slightly gravelly clayey SILT.		
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen		

Test Number	1	
Length	210.8	mm
Diameter	105.6	mm
Bulk Density	1.87	Mg/m ³
Moisture Content	25.0	%
Dry Density	1.50	Mg/m ³
Rate of Strain	1.0	%/min
Cell Pressure	30	kPa
At failure	20.0	%
Axial Strain	76	kPa
Deviator Stress, ($\sigma_1 - \sigma_3$) _f	38	kPa
Undrained Shear Strength, c_u		$\frac{1}{2}(\sigma_1 - \sigma_3)_f$
Mode of Failure		

Deviator Stress v Axial Strain



Mohr Circles



Deviator stress corrected for area change and membrane effects based on Fig 11 BS1377-7:1990

Mohr circles and their interpretation is not covered by BS1377-7. This is provided for information only.

Remarks

Recompacted from bulk sample using 4.5kg rammer. Testing terminated at 20% axial strain.

Approved

Stephen.Watson

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