

Appendix 2

Causeway Geotechnical Reports





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— GEOTECH

Monaghan Landfills Knockcronaghan – Ground Investigation

Client: Monaghan County Council

Client's Representative: Fehily Timoney

Report No.: 18-0838B

Date: October 2018

Status: Final for Issue



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Document Control Sheet


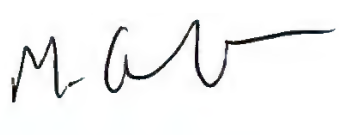
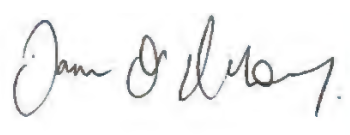
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Document Control Sheet

Report No.:		18-0838B			
Project Title:		Monaghan Landfills - Knockcronaghan			
Client:		Monaghan County Council			
Client's Representative:		Feehily Timoney			
Revision:	A00	Status:	Final for Issue	Issue Date:	16 October 2018
Prepared by:		Reviewed by:		Approved by:	
 Sean Ross BSc MSc		 Matthew Gilbert MEarthSci FGS		 Darren O'Mahony BSc MSc MIEI	

The works were conducted in accordance with:

British Standards Institute (2015) BS 5930:2015, Code of practice for site investigations.

BS EN 1997-2: 2007: Eurocode 7 - Geotechnical design - Part 2 Ground investigation and testing.

Geotechnical Society of Ireland (2016), Specification & Related Documents for Ground Investigation in Ireland

Laboratory testing was conducted in accordance with:

British Standards Institute BS 1377:1990 parts 2, 4, 5, 7 and 9

METHODS OF DESCRIBING SOILS AND ROCKS

Soil and rock descriptions are based on the guidance in BS5930:2015, The Code of Practice for Site Investigation.

Abbreviations used on exploratory hole logs	
U	Nominal 100mm diameter undisturbed open tube sample (thick walled sampler)
UT	Nominal 100mm diameter undisturbed open tube sample (thin walled sampler)
P	Nominal 100mm diameter undisturbed piston sample
B	Bulk disturbed sample
LB	Large bulk disturbed sample
D	Small disturbed sample
C	Core sub-sample (displayed in the Field Records column on the logs)
L	Liner sample from dynamic sampled borehole
W	Water sample
ES / EW	Soil sample for environmental testing / Water sample for environmental testing
SPT (s)	Standard penetration test using a split spoon sampler (small disturbed sample obtained)
SPT (c)	Standard penetration test using 60 degree solid cone
x,x/x,x,x,x	Blows per increment during the standard penetration test. The initial two values relate to the seating drive (150mm) and the remaining four to the 75mm increments of the test length. The length achieved is stated (mm) for any test increment less than 75mm
N=X	SPT blow count 'N' given by the summation of the blows 'X' required to drive the full test length (300mm)
N=X/Z	Incomplete standard penetration test where the full test length was not achieved. The blows 'X' represent the total blows for the given test length 'Z' (mm)
V VR	Shear vane test (borehole) Hand vane test (trial pit) Shear strength stated in kPa V: undisturbed vane shear strength VR: remoulded vane shear strength
<u>dd/mm/yy: 1.0</u> dd/mm/yy: dry	Date & water level at the borehole depth at the end of shift and the start of the following shift
Abbreviations relating to rock core – reference Clause 36.4.4 of BS 5930: 2015	
TCR (%)	Total Core Recovery: Ratio of rock/soil core recovered (both solid and non-intact) to the total length of core run.
SCR (%)	Solid Core Recovery: Ratio of solid core to the total length of core run. Solid core has a full diameter, uninterrupted by natural discontinuities, but not necessarily a full circumference and is measured along the core axis between natural fractures.
RQD (%)	Rock Quality Designation: Ratio of total length of solid core pieces greater than 100mm to the total length of core run.
FI	Fracture Index: Number of natural discontinuities per metre over an indicated length of core of similar intensity of fracturing.
NI	Non Intact: Used where the rock material was recovered fragmented, for example as fine to coarse gravel size particles.
AZCL	Assessed zone of core loss: The estimated depth range where core was not recovered.
DIF	Drilling induced fracture: A fracture of non-geological origin brought about by the rock coring.

Monaghan Landfills - Knockcronaghan

1 AUTHORITY

On the instructions of Feehily Timoney Consulting Engineers, (“the Client’s Representative”), acting on the behalf of Monaghan County Council (“the Client”), a ground investigation was undertaken at the above location to provide geotechnical and environmental information to aid in the remediation of an old landfill site.

This report details the work carried out both on site and in the geotechnical and chemical testing laboratories; it contains a description of the site and the works undertaken, the exploratory hole logs and the laboratory test results.

All information given in this report is based upon the ground conditions encountered during the site investigation works, and on the results of the laboratory and field tests performed. However, there may be conditions at the site that have not been taken into account, such as unpredictable soil strata, contaminant concentrations, and water conditions between or below exploratory holes. It should be noted that groundwater levels usually vary due to seasonal and/or other effects and may at times differ to those recorded during the investigation. No responsibility can be taken for conditions not encountered through the scope of work commissioned, for example between exploratory hole points, or beneath the termination depths achieved.

This report was prepared by Causeway Geotech Ltd for the use of the Client and the Client’s Representative in response to a particular set of instructions. Any other parties using the information contained in this report do so at their own risk and any duty of care to those parties is excluded.

2 SCOPE

The extent of the investigation, as instructed by the Client’s Representative, included boreholes, trial pits, soil sampling, in-situ and laboratory testing, and the preparation of a factual report on the findings.

3 DESCRIPTION OF SITE

As shown on the site location plan in Appendix A, the works were conducted on the site of an old landfill south west of the small town of Smithsborough, south of the Ulster Canal. The site is bounded by the Ulster Canal and a local tributary to the north, a local access road to the east and agricultural land to the south.

The site contains a local high in the centre of the site with ground level sloping away in all directions.

4 SITE OPERATIONS

4.1 Summary of site works

Site operations, which were conducted between 24th and 27th September 2018, comprised:

- three boreholes by rotary drilling methods;
- standpipe installation in all three boreholes;
- sixteen machine dug trial pits; and
- variable head permeability tests in all boreholes.

The exploratory holes and in-situ tests were located as instructed by the Client's Representative, as shown on the exploratory hole location plan in Appendix A.

4.2 Boreholes

Three boreholes (GW01 – GW03) were put to their completion by rotary drilling techniques only. The boreholes were completed using a Hanjin-8D tracked rotary rig.

Symmetrix-cased full hole rotary percussive drilling techniques were employed to advance the boreholes through overburden and bedrock to scheduled depths of 14.5 – 17.0m.

Any water strikes encountered during boring were recorded along with any changes in their levels as the borehole proceeded.

Where water was added to assist with boring, a note has been added to the log to account for same.

Appendix B presents the borehole logs.

4.3 Standpipe installations

A groundwater monitoring standpipe was installed in boreholes GW01 – GW03.

Details of the installations, including the depth range of the response zone, are provided in Appendix B on the individual borehole logs.

4.4 Trial Pits

Thirteen trial pits (TP01-TP16) were excavated using a 13t tracked excavator fitted with a 600mm wide bucket, to depths of 2.3 – 4.9m.

Environmental samples were taken at depths of 2.0m in TP04, 0.5m in TP07 and 0.3m in TP08.

Disturbed (bulk bag) samples were taken at depths as specified by the Client's Representative.

Any water strikes encountered during excavation were recorded along with any changes in their levels as the excavation proceeded. The stability of the trial pit walls was noted on completion.

Appendix C presents the trial pit logs with photographs of the pits and arising provided in Appendix D.

4.5 Variable head permeability testing

In-situ permeability tests were carried out in all boreholes by variable head permeability methods, following development of the wells. Testing was carried out in accordance with the guidance as set out in BS EN ISO 22282-2: 2012

The permeabilities were calculated using Hvorslev's formula $k=A/FT$ as defined in BS 5930:1999 (pg 52).

The results are presented in Appendix E.

4.6 Surveying

The as-built exploratory hole positions were surveyed following completion of site operations by a Site Engineer from Causeway Geotech. Surveying was carried out using a Trimble R6 GPS system employing VRS and real time kinetic (RTK) techniques.

The plan coordinates (Irish National Grid) and ground elevation (mOD Malin) at each location are recorded on the individual exploratory hole logs. The exploratory hole plan presented in Appendix A shows these as-built positions.

4.7 Ground water and ground gas monitoring

Following completion of site works, ground water was conducted on one round. Ground water monitoring was carried out using a water interface probe.

The monitoring records are presented in Table 1 below.

Table 1 Results of groundwater monitoring undertaken on site

Date - 11/10/2018	Water Level (mbgl)
GW01	2.47
GW02	0.73
GW03	1.19

5 LABORATORY WORK

Upon their receipt in the laboratory, all disturbed samples were carefully examined and accurately described, and their descriptions incorporated into the borehole logs.

5.1 Geotechnical laboratory testing of soils

Laboratory testing of soils comprised:

- **soil classification:** moisture content measurement, Atterberg Limit tests and particle size distribution analysis.

Laboratory testing of soils samples was carried out in accordance with British Standards Institute: *BS 1377, Methods of test for soils for civil engineering purposes; Part 1 (2016), and Parts 2-9 (1990)*.

The test results are presented in Appendix F.

5.2 Environmental laboratory testing of soils

Environmental testing, in the form of WAC testing was conducted on two environmental soil samples by Chemtest at its laboratory in Newmarket, Suffolk.

Results of environmental laboratory testing are presented in Appendix G.

6 GROUND CONDITIONS

6.1 General geology of the area

Published geological mapping indicate the superficial deposits underlying the site comprise fluvioglacial sands and gravels, alluvium and glacial till. These deposits are underlain by mudstones of the Coolaragh Formation and sandstones and conglomerates of the Fearnaght formation.

6.2 Ground types encountered during investigation of the site

A summary of the ground types encountered in the exploratory holes is listed below, in approximate stratigraphic order:

- **Topsoil:** encountered at all locations with thicknesses ranging between 100 – 300mm.
- **Made Ground (fill):** reworked clay/silt fill with localised pockets of glass, plastic, wood, red brick and steel encountered down to a depth of 2.3m in TP16.
- **Made Ground (general waste):** black general waste encountered to a depth of 4.8m in TP13.
- **Recent deposits (peat):** BH02 and BH03 encountered 6.8 and 5.0m of peat respectively. However, it must be noted that boreholes were undertaken using a symmetrix system with core recovery and therefore descriptions are based purely on visual drill returns
- **Fluvioglacial deposits:** typically silty/clayey sands and gravels with localised pockets of firm sandy gravelly clays interspersed throughout encountered to a depth of 14.5m in boreholes and 4.8m in TP07. Note that boreholes were undertaken using a symmetrix system with core recovery and therefore descriptions are based purely on visual drill returns. It is likely that the flush used has washed out any fines present.
- **Bedrock (Limestone):** Rockhead was encountered at a depth of 4.0m in GW01.

6.3 Groundwater

Groundwater was encountered during percussion boring through soil and trial pit excavations as water strikes as shown in Table 2 below.

Table 2 Groundwater strikes encountered during the ground investigation

GI Ref	Water Level (mbgl)	Comments
GW01	12.0	Light
GW01	14.0	Very Strong
GW02	8.0	Light
GW02	11.0	Very Strong
GW03	7.0	Light
GW03	10.5	Very Strong
TP01	2.0	
TP02	2.1	
TP03	2.7	
TP06	1.6	

TP07	3.7	
TP08	2.1	
TP12	4.2	

Details of the individual groundwater strikes, along with any relative changes in levels as works proceeded, are presented on the exploratory hole logs for each location.

It should be noted that the casing used in supporting the borehole walls during drilling may have sealed out any additional groundwater strikes encountered. In addition, groundwater strikes within bedrock may have been masked by the fluid used as the drilling flush medium

Seasonal variation in groundwater levels should also be factored into design considerations. Continued monitoring of the three installed standpipes will give an indication of the seasonal variation in groundwater level.

7 REFERENCES

Geotechnical Society of Ireland (2016), Specification & Related Documents for Ground Investigation in Ireland

IS EN 1997-2: 2007: Eurocode 7 - Geotechnical design - Part 2 Ground investigation and testing.

BS 1377: 1990: Methods of test for soils for civil engineering purposes. British Standards Institution.

BS 5930: 2015: Code of practice for ground investigations. British Standards Institution.

BS EN 1997-2: 2007: Eurocode 7 - Geotechnical design - Part 2 Ground investigation and testing. British Standards Institution.

BS EN ISO 14688-1:2018: Geotechnical investigation and testing. Identification and classification of soil. Part 1 Identification and description. British Standards Institution.

BS EN ISO 14688-2:2004+A1:2013: Geotechnical investigation and testing. Identification and classification of soil. Part 2 Principles for a classification.

BS EN ISO 22476-3:2005+A1:2011: Geotechnical investigation and testing. Field testing. Standard penetration test.

BS EN ISO 22282-2: 2012: Geotechnical investigation and testing. Geohydraulic testing – Part 2: Water permeability tests in a borehole using open systems.



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APPENDIX A
SITE AND EXPLORATORY HOLE LOCATION PLANS





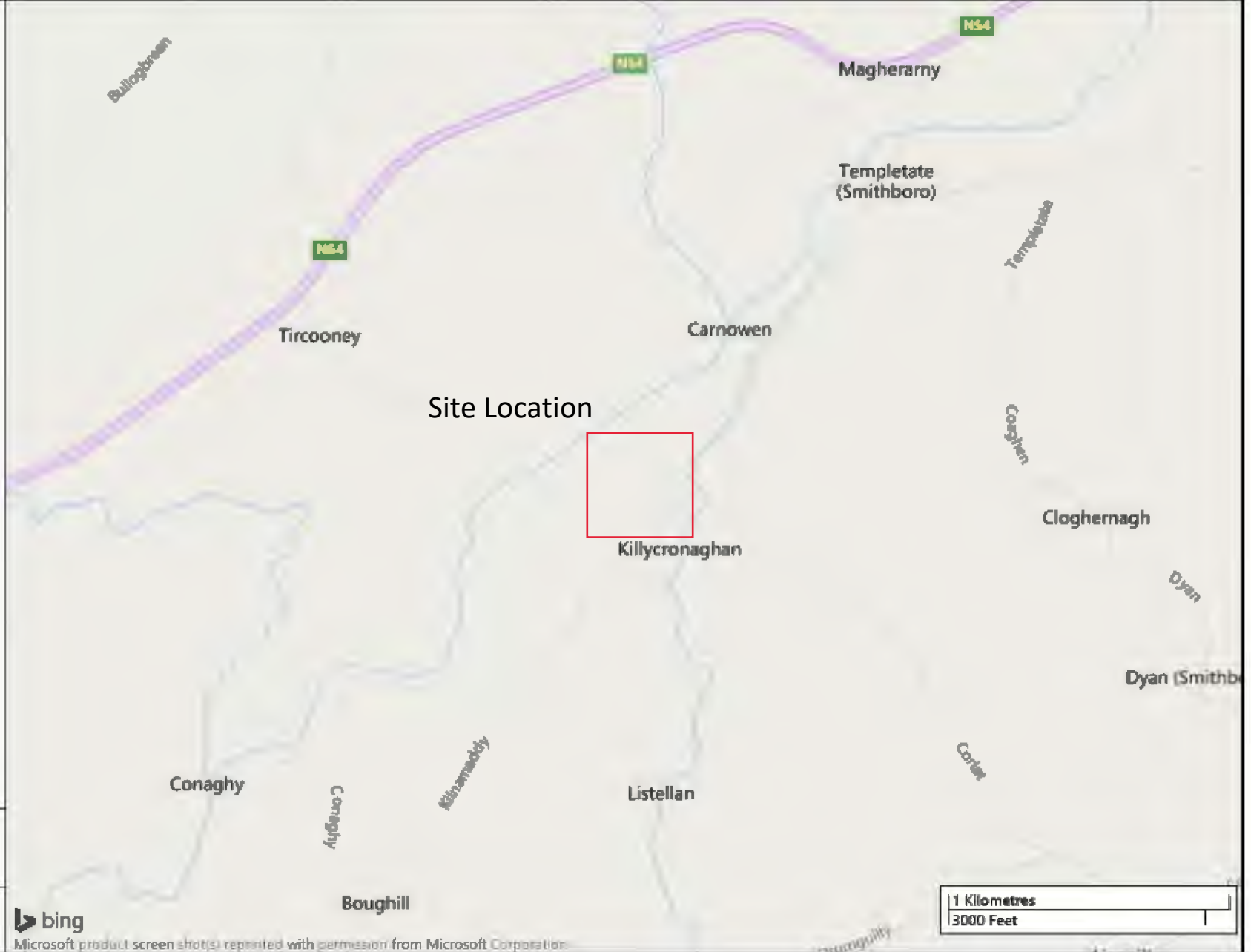
Project No.: 18-0838B

Client: Monaghan County Council

Project Name: Monaghan Landfills - Knockcronaghan

Client's Representative: Fehily Timoney

Legend Key



Title:
Site Location Plan

Last Revised:
15/10/2018

Scale:
1:20000



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Project No.: 18-0838B

Client: Monaghan County Council

Project Name: Monaghan Landfills - Knockcronaghan

Client's Representative: Fehily Timoney

Legend Key

- Locations By Type - RO
- Locations By Type - TP



Title:
Exploratory Hole Location Plan

Last Revised:
15/10/2018

Scale:
1:2500



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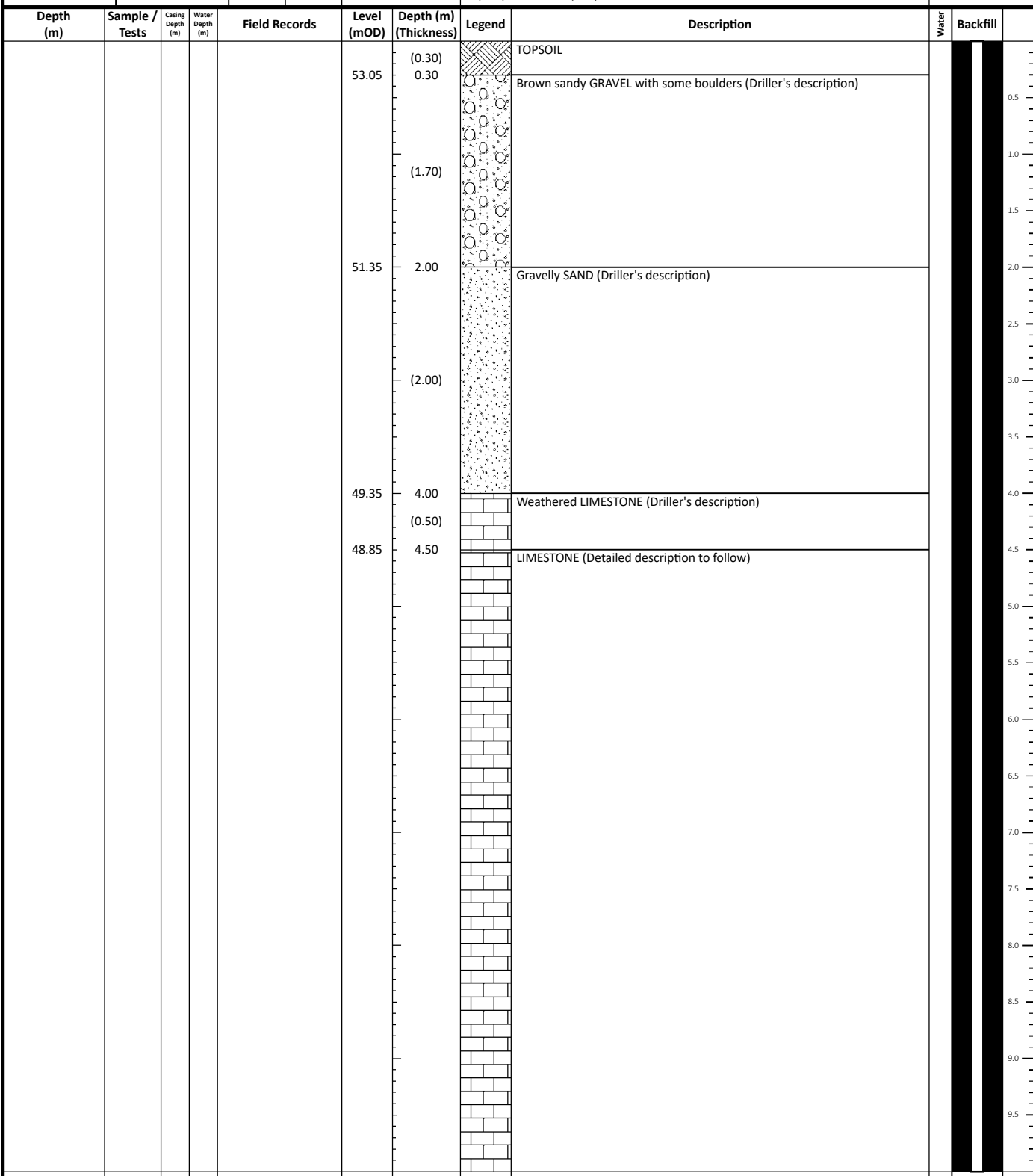
APPENDIX B
BOREHOLE LOGS





CAUSEWAY GEOTECH

Project No.: 18-0838B	Project Name: Monaghan Landfills - Knockcronaghan	Borehole No.: GW01
Coordinates: 256937.31 E 328495.59 N	Client: Monaghan County Council	Sheet 1 of 2
Method Symmetrix Drilling	Plant Used Hanjin-8D	Top 0.00
Base 17.00	Client's Representative: Fehily Timoney	Scale: 1:50
Ground Level: 53.35 mOD	Dates: 27/09/2018 - 27/09/2018	Driller: JG
		Logger: GH



Remarks Terminated at scheduled depth.	Water Strikes				Chiselling Details		
	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)
	12.00						
	14.00						
	Water Added		Casing Details				
	From (m)	To (m)	To (m)	Diam (mm)			
			4.50	200			



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Project No.: 18-0838B	Project Name: Monaghan Landfills - Knockcronaghan	Borehole No.: GW01	
Coordinates: 256937.31 E	Client: Monaghan County Council	Sheet 2 of 2	
Method Symmetrix Drilling	Plant Used Hanjin-8D	Top 0.00	Base 17.00
Ground Level: 53.35 mOD		Dates: 27/09/2018 - 27/09/2018	
328495.59 N		Client's Representative: Fehily Timoney	
		Scale: 1:50	
		Driller: JG	
		Logger: GH	

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
								LIMESTONE (Detailed description to follow)		
				Water Strike at 12.00m		(12.50)				
				Strong Inflow at 14.00m - 17.00m						
		4.50	10.00	27-09-2018	36.35	17.00		End of Borehole at 17.00m		

Remarks Terminated at scheduled depth.	Water Strikes				Chiselling Details		
	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hr:mm)
	Water Added		Casing Details				
	From (m)	To (m)	To (m)	Diam (mm)			
			4.50	200			



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Project No.: 18-0838B	Project Name: Monaghan Landfills - Knockcronaghan	Borehole No.: GW02
Coordinates: 256938.39 E	Client: Monaghan County Council	Sheet 1 of 2
Method Symmetrix Drilling	Plant Used Hanjin-8D	Top 0.00
Base 14.50	Client's Representative: Fehily Timoney	Scale: 1:50
Ground Level: 51.23 mOD	Dates: 26/09/2018 - 26/09/2018	Driller: JG
		Logger: GH

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
					51.03	(0.20) 0.20	TOPSOIL	Spongy dark brown PEAT (Driller's description)		
						(6.80)				
				Water Strike at 8.00m	44.23	7.00	Soft grey SILT (Driller's description)			
						(4.00)				

Remarks Terminated at scheduled depth.	Water Strikes				Chiselling Details		
	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)
	8.00						
	11.00						
	Water Added		Casing Details				
	From (m)	To (m)	To (m)	Diam (mm)			
			14.50	200			



CAUSEWAY GEOTECH

Project No.: 18-0838B	Project Name: Monaghan Landfills - Knockcronaghan	Borehole No.: GW02
Coordinates: 256938.39 E	Client: Monaghan County Council	Sheet 2 of 2
328767.53 N	Client's Representative: Fehily Timoney	Scale: 1:50
Ground Level: 51.23 mOD	Dates: 26/09/2018 - 26/09/2018	Driller: JG
		Logger: GH

Method	Plant Used	Top	Base
Symmetrix Drilling	Hanjin-8D	0.00	14.50

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
				Strong Inflow at 11.00m - 14.50m	40.23	11.00	XXXXXX	Soft grey SILT (Driller's description)		
						(3.50)	XXXXXX	Grey sandy silty GRAVEL (Driller's description)		
		14.50	1.00	26-09-2018	36.73	14.50		End of Borehole at 14.50m		

Remarks Terminated at scheduled depth.	Water Strikes				Chiselling Details		
	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)
	Water Added		Casing Details				
From (m)	To (m)	To (m)	Diam (mm)				
		14.50	200				



CAUSEWAY GEOTECH

Project No.: 18-0838B	Project Name: Monaghan Landfills - Knockcronaghan	Borehole No.: GW03
Coordinates: 256710.59 E	Client: Monaghan County Council	Sheet 1 of 2
Method Symmetrix Drilling	Plant Used Hanjin-8D	Top 0.00
Base 14.50	Client's Representative: Fehily Timoney	Scale: 1:50
Ground Level: 50.69 mOD	Dates: 25/09/2018 - 25/09/2018	Driller: JG
		Logger: GH

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
						(0.20)		TOPSOIL		
					50.49	0.20		Brown gravelly CLAY (Driller's description)		
						(0.80)				
					49.69	1.00		Spongy dark brown PEAT (Driller's description)		
						(5.00)				
					44.69	6.00		Soft grey SILT (Driller's description)		
				Water Strike at 7.00m		(4.50)				

Remarks Terminated at scheduled depth.	Water Strikes				Chiselling Details		
	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)
	7.00						
	10.50						
	Water Added		Casing Details				
	From (m)	To (m)	To (m)	Diam (mm)			
			14.50	200			



CAUSEWAY GEOTECH

Project No.: 18-0838B	Project Name: Monaghan Landfills - Knockcronaghan	Borehole No.: GW03
Coordinates: 256710.59 E 328731.56 N	Client: Monaghan County Council	Sheet 2 of 2
Ground Level: 50.69 mOD	Client's Representative: Fehily Timoney	Scale: 1:50
	Dates: 25/09/2018 - 25/09/2018	Driller: JG
		Logger: GH

Method	Plant Used	Top	Base
Symmetrix Drilling	Hanjin-8D	0.00	14.50

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
				Strong Inflow at 10.50m - 14.50m	40.19	10.50	XXXXX	Soft grey SILT (Driller's description)		
						(4.00)	XXXXX	Silty sandy GRAVEL (Driller's description)		
		14.50	1.00	25-09-2018	36.19	14.50		End of Borehole at 14.50m		

Remarks Terminated at scheduled depth.	Water Strikes				Chiselling Details		
	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)
	Water Added		Casing Details				
From (m)	To (m)	To (m)	Diam (mm)				
		14.50	200				



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APPENDIX C
TRIAL PIT LOGS





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Project No.: 18-0838B	Project Name: Monaghan Landfills - Knockcronaghan	Trial Pit No.: TP01
Co-ordinates: 256774.28 E	Client: Monaghan County Council	Sheet 1 of 1
Method: Trial Pitting	Client's Representative: Fehily Timoney	Scale: 1:25
Plant: 13T Tracked Excavator	Ground Level: 52.16 mOD	Date: 24/09/2018
		Logger: GH

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
			52.06	(0.10) 0.10		TOPSOIL	
				(0.60)		Firm reddish brown slightly sandy slightly gravelly SILT. Sand is fine to coarse. Gravel is subangular fine to coarse.	
			51.46	0.70 (0.20)		Firm grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse.	
			51.26	0.90		Bluish grey fine to coarse SAND.	
		Water strike at 2.00m		(1.60)			
			49.66	2.50		End of trial pit at 2.50m	

Remarks Terminated due to pit walls collapsing	Water Strikes:		Stability: Unstable
	Struck at (m):	Remarks:	
	2.00	Water strike at 2.00m	Width: 1.20 Length: 3.80



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Project No.: 18-0838B	Project Name: Monaghan Landfills - Knockcronaghan	Trial Pit No.: TP02
Co-ordinates: 256815.86 E	Client: Monaghan County Council	Sheet 1 of 1
Method: Trial Pitting	Client's Representative: Fehily Timoney	Scale: 1:25
Plant: 13T Tracked Excavator	Ground Level: 52.24 mOD	Date: 24/09/2018
		Logger: GH

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
			52.14	(0.10) 0.10		TOPSOIL	
				(0.90)		Firm brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse.	
			51.24	1.00		Firm bluish grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse.	
				(1.00)			
		Seepage at 2.10m	50.24	2.00		Bluish grey fine to coarse SAND.	▼
				(2.00)			
			48.24	4.00		End of trial pit at 4.00m	

Remarks Terminated due to pit walls collapsing	Water Strikes:		Stability: Unstable
	Struck at (m):	Remarks:	
	2.10	Seepage at 2.10m	Width: 1.20 Length: 3.90



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Project No.: 18-0838B	Project Name: Monaghan Landfills - Knockcronaghan	Trial Pit No.: TP03
Co-ordinates: 256787.48 E	Client: Monaghan County Council	Sheet 1 of 1
Method: Trial Pitting	Client's Representative: Fehily Timoney	Scale: 1:25
Plant: 13T Tracked Excavator	Ground Level: 55.01 mOD	Date: 24/09/2018
		Logger: GH

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
0.50	B1		54.61	0.40	(0.40)	TOPSOIL	
0.50	D2		54.41	0.20	(0.20)	MADE GROUND: Firm brown sandy gravelly SILT. Sand is fine to coarse. Gravel is subangular fine to medium.	0.5
			53.31	1.70	(1.10)	MADE GROUND: Black waste- 70% plastic, 5% glass bottles, 5% clothes, old pipes, string, measuring tape, bag of old meat.	1.0
			52.01	3.00	(1.30)	Bluish grey slightly gravelly fine to coarse SAND. Gravel is subangular fine to coarse.	1.5
						End of trial pit at 3.00m	2.0
							2.5
							3.0
							3.5
							4.0
							4.5

Remarks Terminated due to pit walls collapsing	Water Strikes:		Stability: Unstable
	Struck at (m):	Remarks:	
			Width: 1.30 Length: 4.20



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Project No.: 18-0838B	Project Name: Monaghan Landfills - Knockcronaghan	Trial Pit No.: TP04
Co-ordinates: 256831.53 E	Client: Monaghan County Council	Sheet 1 of 1
Method: Trial Pitting	Client's Representative: Fehily Timoney	Scale: 1:25
Plant: 13T Tracked Excavator	Ground Level: 54.85 mOD	Date: 24/09/2018
		Logger: GH

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
2.00	ES1		54.75	(0.10) 0.10		TOPSOIL	
				(0.90)		Firm brown slightly sandy slightly gravelly silty CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse.	
			53.85	1.00		Firm bluish grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse.	
				(0.90)			
			52.95	1.90		Bluish grey fine to coarse SAND.	
				(2.60)			
			50.35	4.50		End of trial pit at 4.50m	

Remarks No groundwater encountered Terminated at scheduled depth	Water Strikes:		Stability: Unstable
	Struck at (m):	Remarks:	
			Width: 1.20 Length: 4.30



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Project No.: 18-0838B	Project Name: Monaghan Landfills - Knockcronaghan	Trial Pit No.: TP05
Co-ordinates: 257012.83 E	Client: Monaghan County Council	Sheet 1 of 1
Method: Trial Pitting	Client's Representative: Fehily Timoney	Scale: 1:25
Plant: 13T Tracked Excavator	Ground Level: 54.04 mOD	Date: 25/09/2018
		Logger: GH

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
			53.94	(0.10) 0.10		TOPSOIL	
0.50 0.50	B1 D2			(1.50)		Light brown fine to coarse SAND	
			52.44	1.60 (0.20)		Soft brown sandy silty CLAY. Sand is fine to coarse.	
			52.24	1.80		Light brown fine to coarse SAND.	
				(1.60)			
			50.64	3.40		End of trial pit at 3.40m	

Remarks No groundwater encountered Terminated due to pit walls collapsing	Water Strikes:		Stability:
	Struck at (m):	Remarks:	Unstable
			Width: 0.70
			Length: 4.10



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Project No.: 18-0838B	Project Name: Monaghan Landfills - Knockcronaghan	Trial Pit No.: TP06
Co-ordinates: 256837.18 E	Client: Monaghan County Council	Sheet 1 of 1
Method: Trial Pitting	Client's Representative: Fehily Timoney	Scale: 1:25
Plant: 13T Tracked Excavator	Ground Level: 58.38 mOD	Date: 24/09/2018
		Logger: GH

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
			58.28	(0.10) 0.10		TOPSOIL	
			58.08	(0.20) 0.30		MADE GROUND: Firm bluish grey slightly sandy slightly gravelly CLAY with fragments of plastic, rubber, steel and pipes. Sand is fine to coarse. Gravel is subangular fine to coarse.	
				(2.30)		MADE GROUND: Black waste with boulders. 20% plastic, glass, foam, pipes, steel straps, planks of wood. Boulders (0.30cm x 3.0cm) and (0.50cm x 6.0cm)	
		Seepage at 1.60m	55.78	2.60		End of trial pit at 2.60m	▼

Remarks Terminated on possible bedrock	Water Strikes:		Stability: Stable
	Struck at (m):	Remarks:	
	1.60	Seepage at 1.60m	Width: 1.20 Length: 4.30



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Project No.: 18-0838B	Project Name: Monaghan Landfills - Knockcronaghan	Trial Pit No.: TP07
Co-ordinates: 256823.76 E	Client: Monaghan County Council	Sheet 1 of 1
Method: Trial Pitting	Client's Representative: Fehily Timoney	Scale: 1:25
Plant: 13T Tracked Excavator	Ground Level: 56.74 mOD	Date: 24/09/2018
		Logger: GH

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
			56.64	(0.10) 0.10	[Hatched Pattern]	TOPSOIL	
0.50	B2			(0.50)	[Cross-hatched Pattern]	MADE GROUND: Firm brown slightly gravelly sandy silty CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular fine to medium. Cobbles are subangular.	
0.50	D3		56.14	0.60	[Cross-hatched Pattern]	MADE GROUND: Black waste- 60% plastic, 5% glass bottles, old carpet, foam, clothes, old metal pipes, planks of wood, tin cans, straps of pallets and newspaper (The Irish Times Monday 19th July 1982).	
0.50	ES1			(4.10)	[Cross-hatched Pattern]		
		Seepage at 3.70m					
			52.04	4.70 (0.10)	[Dotted Pattern]	Bluish grey fine to coarse SAND.	
			51.94	4.80		End of trial pit at 4.80m	

Remarks Terminated at scheduled depth	Water Strikes:		Stability: Stable
	Struck at (m):	Remarks:	
	3.70	Seepage at 3.70m	Width: 1.20 Length: 4.10



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Project No.: 18-0838B	Project Name: Monaghan Landfills - Knockcronaghan	Trial Pit No.: TP08
Co-ordinates: 256863.00 E	Client: Monaghan County Council	Sheet 1 of 1
Method: Trial Pitting	Client's Representative: Fehily Timoney	Scale: 1:25
Plant: 13T Tracked Excavator	Ground Level: 56.36 mOD	Date: 24/09/2018
		Logger: GH

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
0.30	ES1		56.16	(0.20)		TOPSOIL	
			55.96	(0.20)		MADE GROUND: Firm bluish grey slightly sandy slightly gravelly silty CLAY with fragments of plastic and glass. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse.	
				(4.10)		MADE GROUND: Black waste- 60% plastic, 20% steel and metal pipes, glass bottles, old boxes of cardboard, planks of wood, clothes and newspaper from 1978.	
		Seepage at 2.10m	51.86	4.50		End of trial pit at 4.50m	

Remarks Terminated at scheduled depth	Water Strikes:		Stability: Stable
	Struck at (m):	Remarks:	
	2.10	Seepage at 2.10m	Width: 0.90 Length: 3.80



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Project No.: 18-0838B	Project Name: Monaghan Landfills - Knockcronaghan	Trial Pit No.: TP09
Co-ordinates: 257027.66 E	Client: Monaghan County Council	Sheet 1 of 1
Method: Trial Pitting	Client's Representative: Fehily Timoney	Scale: 1:25
Plant: 13T Tracked Excavator	Ground Level: 54.46 mOD	Date: 25/09/2018
		Logger: GH

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
			54.36	(0.10) 0.10		TOPSOIL	
				(0.40)		Soft brown slightly sandy slightly gravelly SILT with low cobble content. Sand is fine to coarse, Gravel is subangular fine to coarse. Cobbles are rounded.	
			53.96	0.50		Brown very gravelly slightly silty angular fine to coarse SAND. Gravel is subangular fine to medium.	
1.00 1.00	B1 D2			(4.00)			
			49.96	4.50		End of trial pit at 4.50m	

Remarks No groundwater encountered Terminated at scheduled depth	Water Strikes:		Stability: Stable
	Struck at (m):	Remarks:	
			Width: 0.60 Length: 3.80



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Project No.: 18-0838B	Project Name: Monaghan Landfills - Knockcronaghan	Trial Pit No.: TP10
Co-ordinates: 257043.96 E	Client: Monaghan County Council	Sheet 1 of 1
Method: Trial Pitting	Client's Representative: Fehily Timoney	Scale: 1:25
Plant: 13T Tracked Excavator	Ground Level: 54.50 mOD	Date: 25/09/2018
		Logger: GH

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
			54.40	(0.10) 0.10		TOPSOIL	
				(0.50)		Soft brown slightly sandy slightly gravelly SILT with low cobble content. Sand is fine to coarse. Gravel is subangular fine to coarse. Cobbles are rounded.	
			53.90	0.60		Reddish brown slightly gravelly fine to coarse SAND. Gravel is subangular fine to coarse.	
				(2.40)			
			51.50	3.00		End of trial pit at 3.00m	

Remarks No groundwater encountered Terminated due to pit walls collapsing	Water Strikes:		Stability:
	Struck at (m):	Remarks:	Unstable
			Width: 1.00
		Length: 3.80	



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Project No.: 18-0838B	Project Name: Monaghan Landfills - Knockcronaghan	Trial Pit No.: TP11
Co-ordinates: 256879.64 E	Client: Monaghan County Council	Sheet 1 of 1
Method: Trial Pitting	Client's Representative: Fehily Timoney	Scale: 1:25
Plant: 13T Tracked Excavator	Ground Level: 57.58 mOD	Date: 24/09/2018
		Logger: GH

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
1.00 1.00	B1 D2		57.48	(0.10) 0.10	[Hatched Pattern]	TOPSOIL: Firm brown slightly sandy slightly gravelly clayey SILT. Sand is fine to coarse. Gravel is subangular fine to coarse.	
				(1.10)	[Hatched Pattern]	MADE GROUND: Firm bluish grey slightly sandy slightly gravelly silty CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse.	
			56.38	1.20	[Cross-hatched Pattern]	MADE GROUND: Black waste- 60% plastic, 10% glass bottles, duct pipes, 10% clothes, fertiliser bags, foam, planks of wood, cartons from milk/ yoghurt factory.	
				(3.30)	[Cross-hatched Pattern]		
			53.08	4.50	[Cross-hatched Pattern]	End of trial pit at 4.50m	

Remarks No groundwater encountered Terminated at scheduled depth	Water Strikes:		Stability: Stable
	Struck at (m):	Remarks:	
			Width: 1.20 Length: 4.10



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Project No.: 18-0838B	Project Name: Monaghan Landfills - Knockcronaghan	Trial Pit No.: TP12
Co-ordinates: 256890.72 E	Client: Monaghan County Council	Sheet 1 of 1
Method: Trial Pitting	Client's Representative: Fehily Timoney	Scale: 1:25
Plant: 13T Tracked Excavator	Ground Level: 56.76 mOD	Date: 24/09/2018
		Logger: GH

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
				(0.30)		TOPSOIL	
			56.46	0.30		MADE GROUND: Firm bluish grey sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse.	
				(0.50)			0.5
			55.96	0.80		MADE GROUND: Black waste- 50% plastic, fertiliser bags, glass, 20% planks of wood, foam, shoes, clothes, coal bags.	
				(4.00)			1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5
		Seepage at 4.20m					▼
			51.96	4.80 (0.10)		Bluish grey slightly sandy angular fine to coarse GRAVEL. Sand is fine to coarse	
			51.86	4.90		End of trial pit at 4.90m	

Remarks Terminated at scheduled depth	Water Strikes:		Stability: Stable
	Struck at (m):	Remarks:	
	4.20	Seepage at 4.20m	Width: 1.20 Length: 4.20



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Project No.: 18-0838B	Project Name: Monaghan Landfills - Knockcronaghan	Trial Pit No.: TP13
Co-ordinates: 256919.83 E	Client: Monaghan County Council	Sheet 1 of 1
Method: Trial Pitting	Client's Representative: Fehily Timoney	Scale: 1:25
Plant: 13T Tracked Excavator	Ground Level: 57.38 mOD	Date: 24/09/2018
		Logger: GH

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
			57.28	(0.10) 0.10		TOPSOIL	
						MADE GROUND: Black waste with high cobble and boulder content. 60% plastic, clothes, glass bottles, coal bags, fertiliser bags, planks of wood, net, 20% metal wires and newspapers (The Evening Herald Tuesday 4th May 1982, Woman's Way December 1982, Sunday Mirror October 1982, Irish Framer Journal 1982). Boulders are (0.20cm x 0.20cm)	0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5
				(4.70)			
			52.58	4.80		End of trial pit at 4.80m	

Remarks No groundwater encountered Terminated at scheduled depth	Water Strikes:		Stability: Stable
	Struck at (m):	Remarks:	
			Width: 0.90 Length:



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Project No.: 18-0838B	Project Name: Monaghan Landfills - Knockcronaghan	Trial Pit No.: TP14
Co-ordinates: 257071.04 E	Client: Monaghan County Council	Sheet 1 of 1
Method: Trial Pitting	Client's Representative: Fehily Timoney	Scale: 1:25
Plant: 13T Tracked Excavator	Ground Level: 53.68 mOD	Date: 25/09/2018
		Logger: GH

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
			53.58	(0.10) 0.10		TOPSOIL	
				(0.40)		Soft bluish grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse.	
			53.18	0.50		Reddish brown slightly gravelly clayey fine to coarse SAND. Gravel is subangular fine to coarse.	
				(1.50)			
			51.68	2.00		Grey gravelly slightly clayey fine to coarse SAND with low cobble content. Gravel is subangular fine to coarse. Cobbles are rounded.	
				(0.50)			
			51.18	2.50		End of trial pit at 2.50m	

Remarks No groundwater encountered Terminated due to pit walls collapsing	Water Strikes:		Stability: Unstable
	Struck at (m):	Remarks:	
			Width: 1.20 Length: 4.00



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Project No.: 18-0838B	Project Name: Monaghan Landfills - Knockcronaghan	Trial Pit No.: TP15
Co-ordinates: 256996.13 E	Client: Monaghan County Council	Sheet 1 of 1
Method: Trial Pitting	Client's Representative: Fehily Timoney	Scale: 1:25
Plant: 13T Tracked Excavator	Ground Level: 53.71 mOD	Date: 24/09/2018
		Logger: GH

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
			53.61	(0.10) 0.10		TOPSOIL	
				(0.90)		MADE GROUND: Firm brown slightly sandy gravelly CLAY with cobble and boulder content. Sand is fine to coarse. Gravel is angular fine to coarse. Cobbles and boulders are angular.	0.5
			52.71	1.00		MADE GROUND: Firm grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse.	1.0
1.50	B1			(0.90)			1.5
1.50	D2						
			51.81	1.90		MADE GROUND: Firm bluish grey slightly sandy slightly gravelly CLAY with fragments of of plastic. Sand is fine to coarse. Gravel is subangular fine to coarse.	2.0
				(0.40)			
			51.41	2.30		Bluish grey slightly sandy clayey subangular fine to coarse GRAVEL. Sand is fine to coarse.	2.5
				(1.20)			3.0
			50.21	3.50		End of trial pit at 3.50m	3.5
							4.0
							4.5

Remarks No groundwater encountered Terminated due to pit walls collapsing	Water Strikes:		Stability: Unstable
	Struck at (m):	Remarks:	
			Width: 1.20 Length: 4.20



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Project No.: 18-0838B	Project Name: Monaghan Landfills - Knockcronaghan	Trial Pit No.: TP16
Co-ordinates: 257032.75 E	Client: Monaghan County Council	Sheet 1 of 1
Method: Trial Pitting	Client's Representative: Fehily Timoney	Scale: 1:25
Plant: 13T Tracked Excavator	Ground Level: 55.80 mOD	Date: 24/09/2018
		Logger: GH

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
			55.70	(0.10) 0.10		TOPSOIL	
				(2.20)		MADE GROUND: Firm pinkish brown slightly sandy slightly gravelly CLAY with high cobble and boulder content. Sand is fine to coarse. Gravel is sub-angular fine to coarse. Cobbles and boulders are angular. Maximum boulder size is 0.6 x 0.7m.	
			53.50	2.30		End of trial pit at 2.30m	

Remarks Hard digging - tooth broke off excavator bucket. Terminated on obstruction.	Water Strikes:		Stability:
	Struck at (m):	Remarks:	Stable
			Width: 0.80
			Length: 4.30