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— GEOTECH

West Offaly Power Station and the Ash Disposal Facility – Site Investigation: Factual Report

Client: Bord na Móna

Client's Representative: Bord na Móna

Report No.: 16-1239

Date: May 2017

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Document Control Sheet

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Document Control Sheet

Report No.:	16-1239
Project title:	West Offaly Power Station and The Ash Disposal Facility
Client:	Bord na Mona
Client's Representative:	Bord na Mona

Revision	Status	Report prepared by	Report reviewed by	Report approved by	Issue date
A01	Final for Issue	 John Duggan BSc	 Matthew Gilbert MEarthSci FGS	 Darren O'Mahony BSc MSc MIEI	29 th May 2017

The works were conducted in accordance with:

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

IS 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 1377-2:1990, BS EN ISO 17892-1:2014, and BS EN ISO 17892-2:2014

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
D	Small disturbed sample
W	Water sample
ES / EW	Soil sample for environmental testing / Water sample for environmental testing
SPT	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 44.4.4 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.

West Offaly Power Station and The Ash Disposal Facility

1 AUTHORITY

On the instructions of Bord na Móna (“the Client”), a ground investigation was undertaken at the above location to provide geotechnical information for input to the design of an upgrade to the existing Power Station and the construction of bunding and storage facilities at the Ash Disposal Facility.

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 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, included boreholes by cable percussion boring and rotary drilling, trial pits, slit trenches, soil sampling, in-situ and laboratory testing, and the preparation of a 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 West Offaly Power Station and Ash Disposal Facility near Shannonbridge, Co. Offaly.

The Power Station is bordered to the north, east and south by farmland and to the southwest by the River Shannon. The works were conducted in the northern end of the site, both inside the perimeter fence and also in a rough area of ground to the north.

The Ash Disposal Facility is located 6.30km to the east of the power station. Access is by railway or via gravel road. The site is bordered on all sides by bog land.

4 SITE OPERATIONS

4.1 Summary of site works

Site operations, which were conducted between 23rd of January and 10th of March 2017, included:

- six light cable percussion boreholes with rotary follow on drilling in two of the boreholes in the power station
- six boreholes by rotary open hole drilling in the power station
- three light cable percussion boreholes in the ash disposal facility
- two boreholes by rotary open hole drilling in the ash disposal facility
- a standpipe installation in six boreholes in the power station
- a standpipe installation in two boreholes in the ash disposal facility
- eight machine dug trial pits in the power station
- ten machine dug trial puts in the ash disposal facility
- two machine dug slit trenches in the power station
- twenty-seven dynamic probes in the power station
- twenty dynamic probes in the ash disposal facility

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

A total of twelve boreholes were put down through soils and rock strata to their completion depths by a combination of methods, including light cable percussion boring by Dando 2000 rigs, and rotary drilling by a Beretta T44 tracked rotary drilling rig.

The borehole logs state the methodology and plant used for each location, as well as the appropriate depth ranges.

A summary of the boreholes, subdivided by category in accordance with the methods employed for their completion, is presented in the following sub-sections.

4.2.1 Boreholes by combined percussion boring and rotary follow-on drilling

Six boreholes were put down initially by light cable percussion boring. Two of the boreholes were subsequently continued to their completion by rotary follow on techniques with core recovery in bedrock.

Where the cable percussion borehole had not been advanced onto bedrock, rotary percussive methods were employed to advance the borehole to completion/bedrock. Symmetrix cased full-hole drilling was used, with SPTs carried out at standard intervals as required.

Hand dug inspection pits were carried out between ground level and 1.2m depth to ensure boreholes were put down at locations clear of services or subsurface obstructions.

Standard penetration tests were carried out in accordance with EC7 at standard depth intervals throughout the overburden using the split spoon sampler (SPT) or solid cone attachment (SPT(C)). The penetrations are stated for those tests for which the full 150mm seating drive or 300mm test drive was not possible. The N-values provided on the borehole logs are uncorrected and no allowance has been made for energy ratio corrections. The SPT hammer energy measurement report is provided in Appendix I.

Where coring was carried out within bedrock strata, conventional coring methods were used with a metric T2-101 core barrel. This produced core of nominal 84mm diameter, which was placed in triple channel wooden core boxes.

The core was subsequently photographed and examined by a qualified and experienced Engineering Geologist, thus enabling the production of an engineering log in accordance with *BS 5930: 2015: Code of practice for ground investigations*.

Appendix B presents the borehole logs, with core photographs presented in Appendix D.

4.2.2 Rotary drilled boreholes

Six boreholes were put to their completion by rotary drilling techniques only. The boreholes were completed using a Beretta T44 tracked rotary drilling rig.

Symmetrix-cased full hole rotary percussive drilling techniques were employed to advance the boreholes to bedrock or completion. Rotary coring was employed to recover core samples of the bedrock in five of the boreholes.

The core was extracted in up to 1.5m lengths using a metric T2-101 core barrel, which produced core of nominal 84mm diameter, and was placed in triple channel wooden core boxes.

The core was subsequently photographed and examined by a qualified and experienced Engineering Geologist, thus enabling the production of an engineering log in accordance with *BS 5930: 2015: Code of practice for ground investigations*.

Appendix B presents the borehole logs, with core photographs presented in Appendix D.

4.3 Standpipe installations

A groundwater monitoring standpipe was installed in six boreholes.

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

Following the completion of the intrusive investigation work groundwater monitoring was undertaken at the site on three occasions.

4.4 Trial pits

Eighteen trial pits were excavated using a 11t tracked excavator fitted with a 600mm wide bucket, to depths of up to 4.00m.

Environmental samples were taken in each trial pit. Disturbed (small jar and bulk bag) samples were taken at standard depth intervals and at change of strata for geotechnical purposes.

Any water strikes encountered during excavation were recorded with details shown in the trial pit logs. The stability of the trial pit walls was noted on completion.

Appendix E presents the trial pit logs with photographs of the pits and arising provided in Appendix F.

4.5 Slit trenches

Two slit trenches were excavated using a combination of hand digging and mechanical excavation using a compact 3t tracked excavator fitted with a 600mm wide toothless bucket, to locate and identify buried services at the site.

Drawing of the trenches and the locations of services encountered during excavation are shown on the slit trench logs in Appendix G, with photographs presented in Appendix H.

4.6 Dynamic probes

Forty-seven dynamic probes were conducted using the DPSH-B method as described in BSEN ISO 22476-2. The method entails a 63.5kg hammer falling 0.75m onto a 90° cone of 50.5mm diameter.

Appendix C provides the dynamic probe logs in the form of plots, against depth, of the number of blows per 100mm penetration.

4.7 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 Transverse Mercator) 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.

4.8 Ground water and ground gas monitoring

Following completion of site works, ground water monitoring was conducted in three rounds. Ground water monitoring was carried out using a water interface probe.

Groundwater monitoring records are presented in Section 6.3.

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.
- **shear strength** (total stress): unconsolidated undrained triaxial tests and lab vanes
- **compaction related:** Moisture Condition Value and MCV relationship, California bearing ratio tests

- **soil chemistry:** pH, water soluble sulphate content and organic matter content

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

The test results are presented in Appendix I.

5.2 Geotechnical laboratory testing of rock

Laboratory testing of rock sub-samples comprised:

- point load index
- unconfined compressive strength (UCS) tests

Test	Test carried out in accordance with
Point load index	ISRM Suggested Methods (1985) Suggested method for determining point-load strength. Int. J. Rock Mech. Min. Sci. Geomech. Abstr. 22, pp. 53–60
Uniaxial compression strength tests	ISRM Suggested Methods (1981) Suggested method for determining deformability of rock materials in uniaxial compression, Part 2 and ISRM (2007) Ulusay R, Hudson JA (eds) The complete ISRM suggested methods for rock characterization, testing and monitoring, 2007

The test results are presented in Appendix I.

5.3 Environmental laboratory testing of soils

In addition, environmental testing was conducted on selected environmental soil and water samples.

Results of environmental laboratory testing are presented in a separate environmental report.

6 GROUND CONDITIONS

6.1 General geology of the area

According to the published geological records for the power station site, superficial deposits in the area consist of glacial tills overlain by peat. There are also areas of alluvium associated with the River Shannon. The underlying bedrock is composed of argillaceous limestones of the Lucan Formation and Waulsortian Formation.

The site at the ash disposal facility is overlain again by glacial tills overlain by peat. The predominant bedrock is composed of massive unbedded lime-mudstone of the Waulsortian Formation.

6.2 Ground types encountered during investigation of the site: WOP Station

A summary of the ground types encountered in the exploratory holes at the power station are listed below, in approximate stratigraphic order:

- **Topsoil:** encountered in up to 0.50m thickness
- **Made Ground (sub-base):** approximately 1.00m to 2.00m of aggregate fill over ash deposits in numerous boreholes
- **Made Ground (fill):** ash rich deposits varying in colour and stiffness, described on the individual exploratory hole logs
- **Recent deposits:** spongy peat deposits overlaying both tills derived from bedrock and more recent fluvioglacial deposits
- **Fluvioglacial deposits:** typically medium dense sands and gravels with localised pockets of firm sandy gravelly clays interspersed throughout.
- **Glacial Till:** sandy gravelly clay, frequently with low cobble content, typically firm or stiff in upper horizons, becoming very stiff with increasing depth.
- **Bedrock (Limestone):** Rockhead was encountered at depths ranging from 3.70m in WOP-BH03/17 to 11.30m in borehole WOP-BH03/17

6.3 Ground types encountered during investigation of the site: WOP ADF

A summary of the ground types encountered in the exploratory holes at the ash disposal facility are listed below, in approximate stratigraphic order:

- **Recent deposits:** spongy peat deposits overlaying both tills derived from bedrock and more recent fluvioglacial deposits
- **Glacial Till:** sandy gravelly clay, frequently with low cobble content, typically firm or stiff in upper horizons, becoming very stiff with increasing depth.

6.4 Groundwater

At the West Offaly Power Station groundwater was encountered during boring through soil as water strikes in six boreholes. None of the water strikes were coincident with rockhead with the exception of WOP-BH05/17 where a water strike was recorded at 6.80m. Groundwater was encountered as seepage in two trial pits ranging from 1.50m in WOPTP02 to 3.50m in WOPTP01.

At the Ash Disposal Facility groundwater was encountered in two out of five boreholes and were not coincident with rockhead. Groundwater strikes were also recorded in six of the trial pits at a range of depths.

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 any groundwater strikes within bedrock may have been masked by the fluid used as the drilling flush medium.

Subsequent groundwater monitoring of the standpipe installations recorded water levels as shown in Table 2 for the Power Station and in Table 3 for the Ash Disposal Facility.

Table 1: Groundwater monitoring (WOP Station)

Date	Water level					
	WOP-BH02/17	WOP-BH04/17	WOP-BH05/17	WOP-BH06/17	WOP-BH09/17	WOP-BH11/17
07/03/2017	4.12	3.87		4.52	4.83	2.82
20/03/2017	4.45	4.00	3.95	4.70	5.25	3.00
28/03/2017	4.67	4.00	4.03	4.90	5.30	3.15

**Table 3: Groundwater monitoring (WOP ADF)**

Date	Water level		
	WOA-BH01/17	WOA-BH02A/17	WOA-BH03/17
07/03/2017	0.62	0.58	
20/03/2017	0.65	0.62	3.12
28/03/2017	0.71	0.74	3.07

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: 2002: Geotechnical investigation and testing - Identification and classification of soil - Part 1 Identification and description. British Standards Institution.

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

Construction Industry Research and Information Association (CIRIA). 1993. Research Project 369. The Standard Penetration Test (SPT): Methods and Use. CIRIA. London.

Building Research Establishment (2005) BRE Special Digest 1, Concrete in aggressive ground.

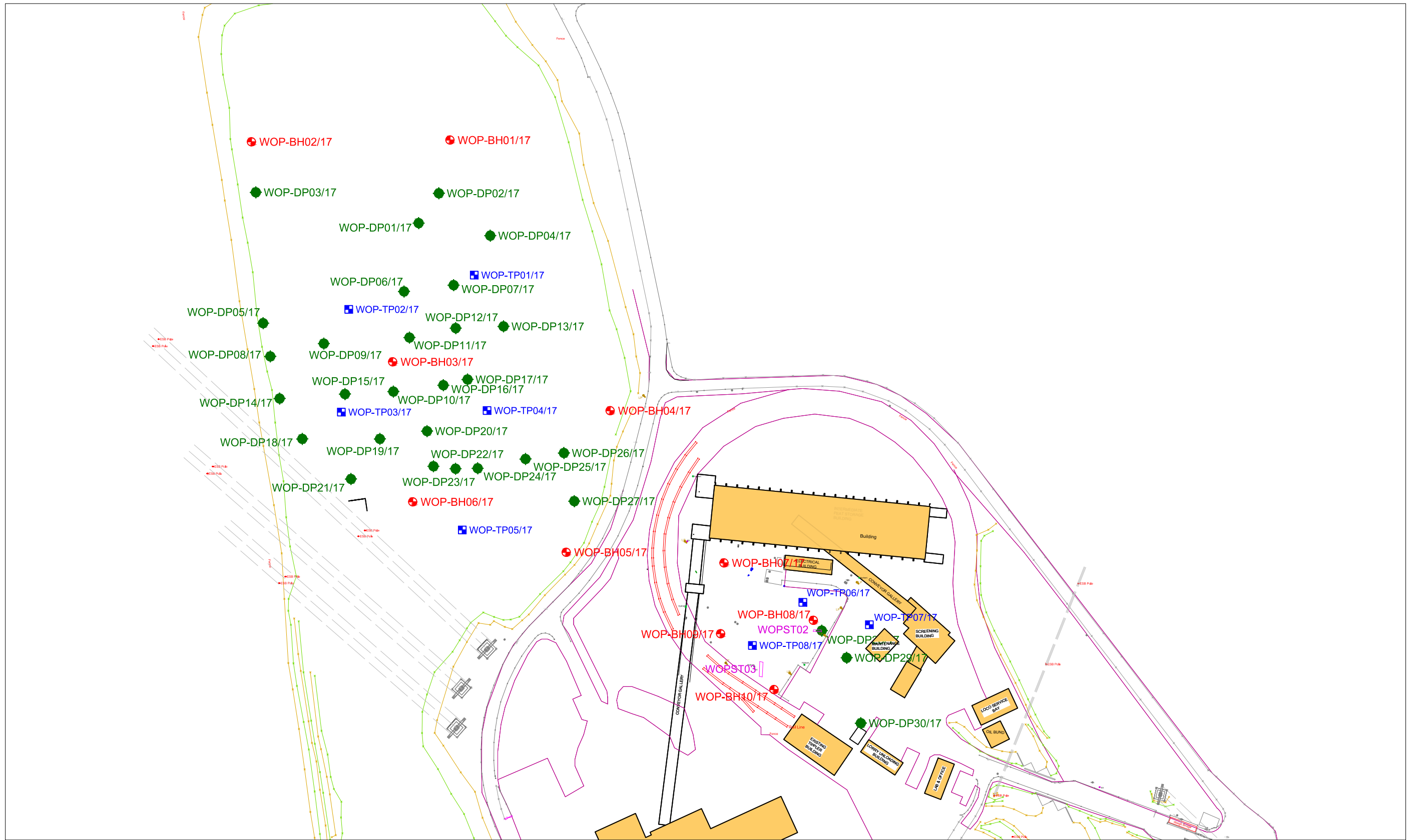


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APPENDIX A

Site and exploratory hole location plans





PROJECT: West Offaly Power Station and the Ash Disposal Facility

TITLE: Exploratory hole location plan

CLIENT: Bord Na Mona

- KEY:
- ⊕ Borehole
 - Dynamic Probe
 - Trial Pit



SCALE: NTS@A3

DATE: 20/04/2017

ENGINEER: Bord Na Mona

DRWN: BS
CHK: CH

SERIES: 1 of 3

DWG No: 16-1239-EHL-001



PROJECT: West Offaly Power Station and the Ash Disposal Facility

TITLE: Exploratory hole location plan

CLIENT: Bord Na Mona

KEY:
⊕ Borehole
⊕ Dynamic Probe
⊠ Trial Pit



SCALE: NTS@A3

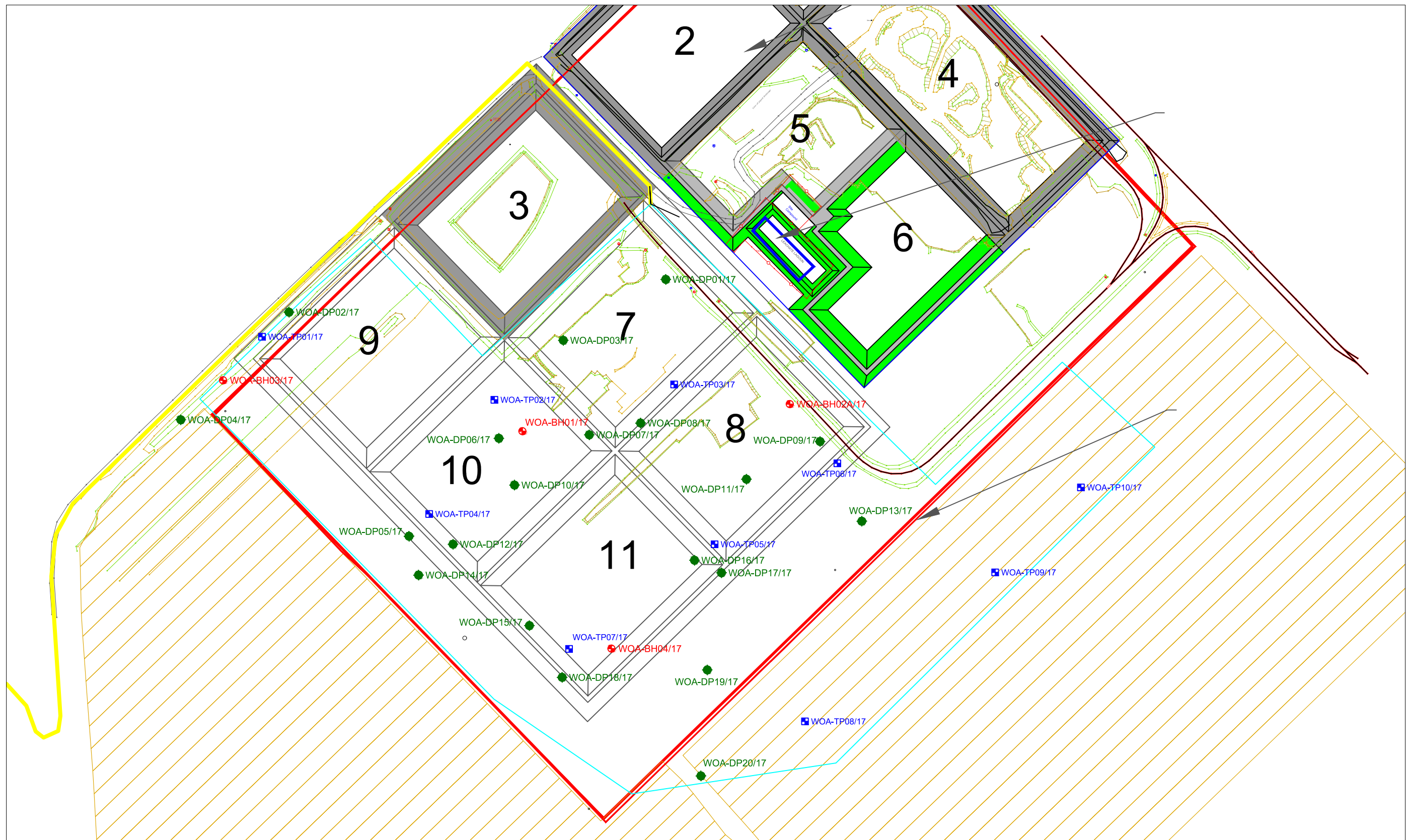
DATE: 20/04/2017

ENGINEER: Bord Na Mona

DRWN: BS
 CHCK: CH

SERIES: 2 of 3

DWG No: 16-1239-EHL-002



PROJECT: West Offaly Power Station and the Ash Disposal Facility

TITLE: Exploratory hole location plan

CLIENT: Bord Na Mona

KEY:
● Borehole
● Dynamic Probe
■ Trial Pit



SCALE: NTS@A3

DATE: 20/04/2017

ENGINEER: Bord Na Mona

DRWN: BS
 CHCK: CH

SERIES: 3 of 3

DWG No: 16-1239-EHL-003



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APPENDIX B

WOP borehole logs






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Project No.: 16-1239	Project Name: West Offaly Power station and the Ash Disposal Facility	Borehole No.: WOP-BH01/17
Coordinates: 597116.78 E	Client: Bord Na Mona	Sheet 1 of 1
	Client's Representative: Bord Na Mona	Scale: 1:50
Method: Cable Percussion	Ground Level: 40.13 mOD	Dates: 22/02/2017 - 22/02/2017
Plant: Dando 2000		Driller: IS
		Logger: CH

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
						(0.20)		TOPSOIL		
0.50 - 1.00	B1				39.93	0.20		MADE GROUND - Very stiff, locally firm thinly laminated dark grey and pinkish grey SILT (ash)		
1.20 - 1.70	U2			Ublow=18 100%		(1.50)				
1.70 - 1.90	B3				38.43	1.70		MADE GROUND - Dark grey slightly silty sandy subangular fine to coarse GRAVEL. Sand is fine to coarse.		
2.20 - 2.70	B4				37.93	2.20		MADE GROUND - Soft to firm thinly laminated dark grey and grey SILT (ash)		
2.20 - 2.65	SPT (C) N=10	2.20	Dry	N=10 (1,4/3,2,2,3)						
3.20 - 3.70	U5			Ublow=21 100%		(3.00)				
4.20 - 4.70	B6									
4.20 - 4.65	SPT (C) N=5	4.20	Dry	N=5 (1,2/1,1,2,1)						
5.20 - 5.70	B7				34.93	5.20		MADE GROUND - Stiff dark grey SILT (ash)		
5.20 - 5.65	SPT (C) N=23	4.20	Dry	N=23 (2,3/3,4,7,9)		(0.70)				
6.00 - 6.50	B8				34.23	5.90		Very dense dark grey clayey subangular to subrounded fine to coarse GRAVEL with high cobble content.		
6.00 - 6.45	SPT (C) N=52	6.00	Dry	N=52 (10,10/11,11,13,17)		(0.70)				
					33.53	6.60		End of Borehole at 6.60m		

Remarks Terminated at refusal on boulders/possible bedrock	Water Added		Water Strike - General			
	From (m)	To (m)	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)
Casing Details			Chiselling Details			
To (m)	Diam (mm)	From (m)	To (m)	Time (hh:mm)		
6.60	150	6.60	1.70	01:00		

	Project No.: 16-1239	Project Name: West Offaly Power station and the Ash Disposal Facility	Borehole No.: WOP-BH02/17
	Coordinates: 597008.21 E 725197.80 N	Client: Bord Na Mona	Sheet 1 of 1
Method: Cable Percussion		Client's Representative: Bord Na Mona	Scale: 1:50
Plant: Dando 2000	Ground Level: 39.63 mOD	Dates: 22/02/2017 - 22/02/2017	Driller: IS
			Logger: CH

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
						(0.20)		TOPSOIL		
0.50 - 1.00	B1				39.43	0.20		MADE GROUND - Soft dark grey slightly sandy slightly gravelly CLAY with many rootlets. Sand is fine to coarse. Gravel is subangular to subrounded fine to medium.		
1.00 - 1.45	SPT (C) N=13			N=13 (1,4/3,4,3,3)	38.63	1.00		MADE GROUND - Firm to stiff dark grey slightly sandy slightly gravelly CLAY with many rootlets. Sand is fine. Gravel is subangular to subrounded fine to medium.		
1.20 - 1.70	B11									
2.00 - 2.50	U2			Ublow=12 100%		(2.20)				
2.50 - 2.70	D3									
3.20 - 3.65	SPT (C) N=6			N=6 (2,3/2,1,2,1)	36.43	3.20		MADE GROUND- Very soft to soft ark grey slightly sandy slightly gravelly CLAY with many rootlets. Sand is fine. Gravel is subangular to subrounded fine to medium.		
4.00 - 4.50	U4			Ublow=14 100%		(1.30)				
5.00 - 5.50	B5				35.13	4.50		MADE GROUND - Very soft brown CLAY with closely spaced thick laminations of fine to coarse sand.		
5.00 - 5.45	SPT (C) N=3			N=3 (1,1/0,1,1,1)		(1.30)				
5.80 - 6.30	B6				33.83	5.80		Plastic dark brown amorphous PEAT		
7.00 - 7.50	B7				32.63	7.00		Brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subrounded fine to coarse.		
7.50 - 7.95	SPT (C) N=36			N=36 (8,7/6,10,9,11) Water strike at 7.50m	32.13	7.50		Dense dark grey sandy silty subangular to subrounded fine to coarse GRAVEL with high cobble content. Sand is fine to coarse.		
8.50 - 9.00	B8					(2.10)				
9.00 - 9.45	SPT (C) N=54			N=54 (10,10/12,12,13,17)						
9.30 - 9.50	B9				30.03	30.03		BOULDER/Possible BEDROCK		
9.60	B10				30.03	(9.60)		End of Borehole at 9.60m		

Remarks Terminated at refusal on boulders/possible bedrock	Water Added		Water Strike - General			
	From (m)	To (m)	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)
			7.50	7.50	20	6.90
Casing Details		Chiselling Details				
To (m)	Diam (mm)	From (m)	To (m)	Time (hh:mm)		
		9.60		01:00		



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Project No.: 16-1239	Project Name: West Offaly Power station and the Ash Disposal Facility	Borehole No.: WOP-BH03/17
Coordinates: 597084.93 E	Client: Bord Na Mona	Sheet 1 of 2
Method: Cable Percussion+Rotary Drilling+Rotary Coring	Client's Representative: Bord Na Mona	Scale: 1:50
Plant: Dando 2000+Beretta T44	Ground Level: 40.23 mOD	Dates: - 07/03/2017
		Driller: IS+JR
		Logger: CH+LP

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
0.50 - 1.00	B1				39.93	(0.30) 0.30		TOPSOIL		
1.20 - 1.70 1.20 - 1.65	B2 SPT (C) N=8	1.20		N=8 (1,0/1,1,2,4) Water strike at 1.80m	39.03	(0.90) 1.20		MADE GROUND - Soft dark grey slightly sandy slightly gravelly CLAY with rootlets. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse.		
2.20 - 2.70 2.20 - 2.65	B3 SPT (C) N=14	1.20		N=14 (2,1/2,2,6,4)		(3.00)		MADE GROUND - Firm thinly laminated dark grey and grey sandy SILT (ash) Sand is fine to coarse.		
3.20 - 3.70 3.20 - 3.65	B4 SPT (C) N=14	1.20		N=14 (1,6/4,3,4,3)						
4.20 - 4.70 4.20 - 4.65	B5 SPT (C) N=21	1.20		N=21 (4,3/6,3,6,6)	36.03	4.20		MADE GROUND - Firm to stiff thinly laminated dark grey slightly gravelly sandy SILT (ash).		
5.20 - 5.70 5.20 - 5.65	B6 SPT (C) N=11	5.20		N=11 (3,2/3,3,2,3)		(2.30)				
6.50 - 7.00	B7				33.73	6.50		Plastic dark brown amorphous PEAT		
7.10 7.10 - 7.55	B8 SPT (C) N=49	7.10		N=49 (11,10/12,10,11,16)	33.13	7.10 (0.50)		Dense grey clayey subangular to subrounded fine to coarse GRAVEL with medium cobble content.		
10.10 - 10.26	SPT (C)			Water strike at 7.10m 50 (25 for 85mm/50 for 80mm)	32.63	7.60 (3.70)		Spongy dark brown amorphous PEAT		

Remarks	Water Added		Water Strike - General			
	From (m)	To (m)	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)
			1.80	1.80	20	1.80
			7.10	7.10	20	6.60
			14.30	14.30	0	0.00
Casing Details		Chiselling Details				
To (m)	Diam (mm)	From (m)	To (m)	Time (hh:mm)		
7.60	150					



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Project No.: 16-1239	Project Name: West Offaly Power station and the Ash Disposal Facility	Borehole No.: WOP-BH03/17
Coordinates: 597084.93 E	Client: Bord Na Mona	Sheet 2 of 2
Method: Cable Percussion+Rotary Drilling+Rotary Coring	Client's Representative: Bord Na Mona	Scale: 1:50
Plant: Dando 2000+Beretta T44	Ground Level: 40.23 mOD	Dates: - 07/03/2017
		Driller: IS+JR
		Logger: CH+LP

Depth (m)	Sample / Tests		Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
12.30	100	100	100	10		28.93	(3.00)		Spongy dark brown amorphous PEAT		
									Strong dark grey to black argillaceous LIMESTONE. Largely unweathered. Discontinuities: 1. 0 to 10 degree bedding fractures closely to medium spaced (30/230/500) planar, smooth. 2. 70 to 90 degree fractures from 13.10m to 14.10m, medium spaced, undulating, rough, closed, occasionally with light brown and white staining.		
13.30	100	100	86	3							
14.30	100	87	87	6		25.93	14.30		End of Borehole at 14.30m		
					Water strike at 14.3m						

Remarks	Water Added		Water Strike - General			
	From (m)	To (m)	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)
			1.80	1.80	20	1.80
			7.10	7.10	20	6.60
			14.30	14.30	0	0.00
Casing Details		Chiselling Details				
To (m)	Diam (mm)	From (m)	To (m)	Time (hh:mm)		
7.60	150					



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Project No.: 16-1239	Project Name: West Offaly Power station and the Ash Disposal Facility	Borehole No.: WOP-BH04/17
Coordinates: 597204.36 E	Client: Bord Na Mona	Sheet 1 of 1
Method: Cable Percussion	Client's Representative: Bord Na Mona	Scale: 1:50
Plant: Dando 2000	Ground Level: 39.81 mOD	Dates: 22/02/2017 - 22/02/2017
		Driller: IS
		Logger: CH

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
0.50 - 1.20	B1				39.51	(0.30) 0.30	[Pattern]	TOPSOIL		
1.20 - 1.70	B3 D2				38.61	(0.90) 1.20	[Pattern]	MADE GROUND - Soft slightly sandy gravelly silty CLAY with many rootlets. Gravel is subangular fine to coarse		
1.20 - 1.65	SPT (C) N=19	1.20	Dry	N=19 (1,2/4,6,6,3)		(1.00)	[Pattern]	MADE GROUND - Firm thinly laminated dark grey slightly gravelly SILT with low cobble content. Gravel is subrounded fine to coarse.		
2.20 - 2.70	B5 D4				37.61	(1.00) 2.20	[Pattern]	MADE GROUND - Soft to firm thinly laminated grey and light grey CLAY.		
2.20 - 2.65	SPT (I) N=9	2.20	Dry	N=9 (4,4/3,2,2,2)						
3.20 - 3.70	B6									
3.20 - 3.65	SPT (I) N=9	3.20		N=9 (2,1/2,2,3,2)		(2.30)				
4.00 - 5.00	B8									
4.20 - 4.70	B7									
4.20 - 4.65	SPT (C) N=4			N=4 (3,1/2,1,1,0)	35.31	4.50	[Pattern]	MADE GROUND: Mixed pockets of dark brown pseudo- fibrous PEAT and very soft dark grey SILT (ash)		
5.00	ES11					(1.00)				
5.50	ES12				34.31	5.50	[Pattern]	Dense to very dense dark grey sandy clayey subangular to subrounded fine to coarse GRAVEL with low cobble content. Sand is fine to coarse.		
5.50 - 6.00	B9									
5.50 - 5.79	SPT (C)	5.50		50 (25 for 86mm/50 for 200mm) Water strike at 5.50m		(1.70)				
6.50 - 7.00	B10									
6.50 - 6.88	SPT (C)			48 (8,8/48 for 225mm)						
7.20 - 7.50	SPT (C)			60 (50 for 75mm/60 for 225mm)	32.61	7.20		End of Borehole at 7.20m		

Remarks Terminated at refusal on boulders/possible bedrock	Water Added		Water Strike - General			
	From (m)	To (m)	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)
			5.50	5.50	20	5.00
	Casing Details		Chiselling Details			
To (m)	Diam (mm)	From (m)	To (m)	Time (hh:mm)		
7.20	150					



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Project No.: 16-1239	Project Name: West Offaly Power station and the Ash Disposal Facility	Borehole No.: WOP-BH05/17
Coordinates: 597180.50 E	Client: Bord Na Mona	Sheet 1 of 1
Method: Cable Percussion+Roatry Drilling+Rotary Coring	Client's Representative: Bord Na Mona	Scale: 1:50
Plant: Dando 2000+Beretta T44	Ground Level: 39.69 mOD	Dates: 22/02/2017 - 22/02/2017
		Driller: IS+JR
		Logger: CH+LP

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
0.50 - 1.00	B1				39.39	(0.30) 0.30	TOPSOIL			
1.20 - 1.70 1.20 - 1.65	B2 SPT (C) N=40	1.20	Dry	N=40 (11,10/8,11,11,10)	38.69	(0.70) 1.00	MADE GROUND: Soft grey SILT (ash)			
2.00 - 2.50 2.00 - 2.45	B3 SPT (C) N=30			N=30 (6,6/7,7,8,8)		(2.00)		Stiff to very stiff bluish grey slightly sandy slightly gravelly CLAY with high cobble content. Gravel is subangular to subrounded fine to coarse of limestone.		
3.00 - 3.50 3.00 - 3.45	B4 SPT (C) N=9	3.00	Dry	N=9 (2,1/2,2,3,2)	36.69	3.00		Firm bluish grey slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine. Gravel is subangular fine to coarse.		
4.00 - 4.50 4.00 - 4.45	B5 SPT (C) N=10			N=10 (4,3/2,2,3,3)		(2.00)				
5.00 - 5.50 5.00 - 5.45	B6 SPT (C) N=33	5.00	Dry	N=33 (3,6/7,8,9,9)	34.69	5.00 (1.50)		Very stiff bluish grey slightly sandy slightly gravelly CLAY with medium cobble content. Sand is fine to coarse. Gravel is subangular fine to coarse.		
5.90 5.90 - 5.95	B7 SPT (C)			50 (25 for 50mm/50 for 0mm)	33.19	6.50 (0.30)				
				Water strike at 6.8m Water strike at 6.8m	32.89	6.80		Weathered LIMESTONE recovered as angular fine to coarse gravel.		
7.80	100 52	47	2 NI					Strong dark grey to black argillaceous LIMESTONE. Largely unweathered. Discontinuities: 1. 0 to 10 degree bedding fractures typically medium spaced occasionally closely spaced (100/300/700) planar, smooth, closed. 2. Subvertical fractures, [planar, rough, closed with light brown and white staining.		
8.80	100 95	95	8 2			(3.00)				
9.80	87 87	87	1		29.89	9.80				
								End of Borehole at 9.80m		

Remarks Terminated at scheduled depth	Water Added		Water Strike - General			
	From (m)	To (m)	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)
			6.80	6.80	0	0.00
Casing Details			Chiselling Details			
To (m)	Diam (mm)	From (m)	To (m)	Time (hh:mm)		
		5.90		01:00		



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Project No.: 16-1239	Project Name: West Offaly Power station and the Ash Disposal Facility	Borehole No.: WOP-BH06/17
Coordinates: 597096.41 E	Client: Bord Na Mona	Sheet 1 of 2
Method: Cable Percussion	Client's Representative: Bord Na Mona	Scale: 1:50
Plant: Dando 2000	Ground Level: 40.46 mOD	Dates: 22/02/2017 - 22/02/2017
		Driller: IS
		Logger: CH

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
0.50	B1				40.16	(0.30) 0.30		TOPSOIL		
1.00 - 1.50 1.00 - 1.45	B2 SPT (C) N=8	1.00		N=8 (1,2/2,2,2,2)		(1.70)		MADE GROUND: Soft to firm thinly laminated dark grey and light grey SILT (ash)		
2.00 - 2.50 2.00 - 2.45	B3 SPT (S) N=18	2.00		N=18 (3,4/4,4,4,6)	38.46	2.00		MADE GROUND: Firm to stiff thinly laminated dark grey and grey SILT (ash).		
3.20 - 3.70	U4			Ublow=33 100%		(1.70)				
3.70 - 3.90 4.00 - 4.45	D5 SPT (S) N=3			N=3 (2,1/0,1,1,1)	36.76	3.70		MADE GROUND: Very soft to soft thinly laminated dark grey and grey SILT (ash).		
5.00 - 5.45	SPT (S) N=7			N=7 (1,1/2,2,1,2)		(2.20)				
6.00 - 6.45	SPT (S) N=10			Water strike at 5.9m N=10 (3,2/3,2,2,3)	34.56	5.90		MADE GROUND: Loose to medium dense dark grey very sandy subangular to subrounded fine to coarse GRAVEL. Sand is fine to coarse.		
6.70 - 6.90 7.00 - 7.50	D6 U7			Ublow=6 100%	33.76	6.70		Spongy dark brown pseudo-fibrous PEAT.		
7.50 - 7.70 8.50 - 9.00 8.50 - 8.95	D8 B9 SPT (C)			Water strike at 7.70 45 (11,11/12,17,16,)	32.76	7.70		Dense dark grey sandy subrounded fine to coarse GRAVEL with low cobble content. Sand is fine to coarse.		
10.00 - 10.50	B10					(3.50)				

Remarks Terminated at refusal on boulders/possible bedrock	Water Added		Water Strike - General			
	From (m)	To (m)	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)
			5.90	5.90	20	5.60
			7.70	7.70	20	7.00
	Casing Details		Chiselling Details			
To (m)	Diam (mm)	From (m)	To (m)	Time (hh:mm)		
10.50	200					



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Project No.: 16-1239	Project Name: West Offaly Power station and the Ash Disposal Facility	Borehole No.: WOP-BH06/17
Coordinates: 597096.41 E	Client: Bord Na Mona	Sheet 2 of 2
Method: Cable Percussion	Client's Representative: Bord Na Mona	Scale: 1:50
Plant: Dando 2000	Ground Level: 40.46 mOD	Driller: IS
	Dates: 22/02/2017 - 22/02/2017	Logger: CH

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
10.00 - 10.30	SPT (C)			50 (6,13/50 for 150mm)				Dense dark grey sandy subrounded fine to coarse GRAVEL with low cobble content. Sand is fine to coarse.		
					29.26	11.20		End of Borehole at 11.20m		

Remarks Terminated at refusal on boulders/possible bedrock	Water Added		Water Strike - General			
	From (m)	To (m)	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)
			5.90	5.90	20	5.60
			7.70	7.70	20	7.00
Casing Details		Chiselling Details				
To (m)	Diam (mm)	From (m)	To (m)	Time (hh:mm)		
10.50	200					



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Project No.: 16-1239	Project Name: West Offaly Power station and the Ash Disposal Facility	Borehole No.: WOP-BH07/17
Coordinates: 597266.62 E	Client: Bord Na Mona	Sheet 1 of 1
Method: Rotary Drilling+Rotary Coring	Client's Representative: Bord Na Mona	Scale: 1:50
Plant: Beretta T44	Ground Level: 40.25 mOD	Dates: 01/03/2017 - 01/03/2017
		Driller: JR
		Logger: CH+LP

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
4.70						39.04	(1.20)		MADE GROUND (Drillers description)		
							1.20		PEAT (Drillers description)		
							(1.40)				
							2.60		Grey sandy gravelly CLAY (Drillers description)		
5.70	100	93	84			36.54	(1.10)		Medium strong dark grey and black argillaceous LIMESTONE. Partially weathered from 3.70m to 5.40m with light brown sand and white staining on fracture surfaces. Discontinuities: 1. 0 to 10 degree bedding fractures closely spaced becoming medium spaced below 5.40m, (60/120/360) planar, smooth, closed with light brown and white staining from 3.70m to 5.40m. 2. 70 to 90 degree fractures at 3.85m, 4.95m and 9.60m, undulating, rough, closed with light brown and white staining.		
							3.70				
							(3.00)				
6.70	100	100	100	3		33.54	6.70		End of Borehole at 6.70m		

Remarks Terminated at scheduled depth	Water Added		Water Strike - General			
	From (m)	To (m)	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)
Casing Details			Chiselling Details			
To (m)	Diam (mm)	From (m)	To (m)	Time (hh:mm)		



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Project No.: 16-1239	Project Name: West Offaly Power station and the Ash Disposal Facility	Borehole No.: WOP-BH08/17
Coordinates: 597315.47 E	Client: Bord Na Mona	Sheet 1 of 2
Method: Rotary Coring	Client's Representative: Bord Na Mona	Scale: 1:50
Plant: Beretta T44	Ground Level: 40.15 mOD	Dates: 28/02/2017 - 28/02/2017
		Driller: JR
		Logger: LP

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
38.95							(1.20)		MADE GROUD: Hardcore fill (Drillers description)		
							1.20		Gravelly CLAY (Drillers description)		
36.05							(2.90)		Gravelly PEAT (Drillers description)		
							4.10				
34.85	100	94	76	10					Strong medium bedded dark grey argillaceous LIMESTONE. Largely unweathered: unstained, film of grey clay on some fracture and joint surfaces. Discontinuities: 1. 0 to 30 degree fractures medium spaced (10/220/560) mostly planar but occasionally undulating, smooth, unstained film of grey clay on some fracture surfaces. 2. One 85 t 90 degree joint at 5.40 to 5.50m, planar, smooth, unstained.		
				20							
6.90				5							
				7							
8.40	100	99	94	3							
				10							
10.00				4							
				7							
10.00	100	97	95	10							
				2							
10.00				4							
				10							
10.00				7							
				3							

Remarks Terminated at scheduled depth	Water Added		Water Strike - General			
	From (m)	To (m)	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)
Casing Details			Chiselling Details			
To (m)	Diam (mm)	From (m)	To (m)	Time (hh:mm)		



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Project No.: 16-1239	Project Name: West Offaly Power station and the Ash Disposal Facility	Borehole No.: WOP-BH08/17
	Coordinates: 597315.47 E 724936.10 N	
Method: Rotary Coring	Client's Representative: Bord Na Mona	Scale: 1:50
Plant: Beretta T44	Ground Level: 40.15 mOD	Dates: 28/02/2017 - 28/02/2017
		Driller: JR
		Logger: LP

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
11.30	100	96	89	12		28.85	11.30		Strong medium bedded dark grey argillaceous LIMESTONE. Largely unweathered: unstained, film of grey clay on some fracture and joint surfaces. Discontinuities: 1. 0 to 30 degree fractures medium spaced (10/220/560) mostly planar but occasionally undulating, smooth, unstained film of grey clay on some fracture surfaces. 2. One 85 t 90 degree joint at 5.40 to 5.50m, planar, smooth, unstained.		
				2							
				3							
									End of Borehole at 11.30m		

Remarks Terminated at scheduled depth	Water Added		Water Strike - General			
	From (m)	To (m)	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)
	Casing Details		Chiselling Details			
To (m)	Diam (mm)	From (m)	To (m)	Time (hh:mm)		



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Project No.: 16-1239	Project Name: West Offaly Power station and the Ash Disposal Facility	Borehole No.: WOP-BH09/17
Coordinates: 597264.68 E	Client: Bord Na Mona	Sheet 1 of 2
	Client's Representative: Bord Na Mona	Scale: 1:50
Method: Rotary Drilling	Ground Level: 40.78 mOD	Dates: 01/03/2017 - 01/03/2017
Plant: Beretta T44		Driller: JR
		Logger: CH

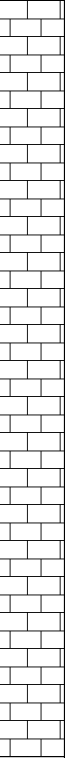
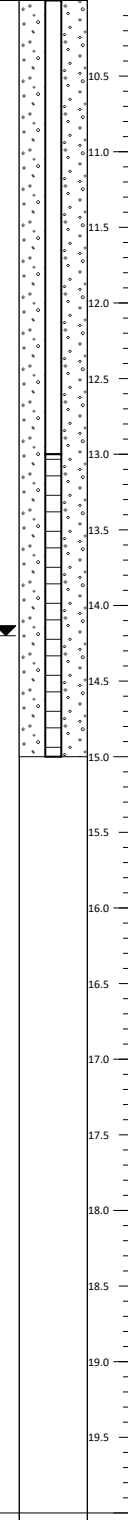
Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
						(1.20)	[Cross-hatch pattern]	MADE GROUND (Drillers description)		
					39.58	1.20	[Cross-hatch pattern]	MADE GROUND: Hardcore fill (Drillers description)		
						(1.40)				
					38.18	2.60	[Cross-hatch pattern]	MADE GROUND: Hardcore fill with red brick(Drillers description)		
						(1.10)				
					37.08	3.70	[Brick pattern]	LIMESTONE (Drillers description) Open hole drilling		
						(11.30)				

Remarks Terminated at scheduled depth	Water Added		Water Strike - General			
	From (m)	To (m)	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)
			14.20	3.70	0	0.00
Casing Details			Chiselling Details			
To (m)	Diam (mm)	From (m)	To (m)	Time (hh:mm)		



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Project No.: 16-1239	Project Name: West Offaly Power station and the Ash Disposal Facility	Borehole No.: WOP-BH09/17
Coordinates: 597264.68 E	Client: Bord Na Mona	Sheet 2 of 2
Method: Rotary Drilling	Client's Representative: Bord Na Mona	Scale: 1:50
Plant: Beretta T44	Ground Level: 40.78 mOD	Dates: 01/03/2017 - 01/03/2017
		Driller: JR
		Logger: CH

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
				Water strike at 14.2m	25.78	15.00		LIMESTONE (Drillers description) Open hole drilling		
								End of Borehole at 15.00m		

Remarks Terminated at scheduled depth	Water Added		Water Strike - General			
	From (m)	To (m)	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)
			14.20	3.70	0	0.00
	Casing Details		Chiselling Details			
To (m)	Diam (mm)	From (m)	To (m)	Time (hh:mm)		



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Project No.: 16-1239	Project Name: West Offaly Power station and the Ash Disposal Facility	Borehole No.: WOP-BH10/17
Coordinates: 597293.96 E	Client: Bord Na Mona	Sheet 1 of 1
Method: Roatry Drilling+Rotary Coring	Client's Representative: Bord Na Mona	Scale: 1:50
Plant: Beretta T44	Ground Level: 40.43 mOD	Dates: 02/03/2017 - 02/03/2017
		Driller: JR
		Logger: CH+LP

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
							(1.20)		MADE GROUND: Hardcore fill (Drillers description)		
						39.23	1.20		Wet silty CLAY with cobbles (Drillers description)		
							(1.40)				
						37.83	2.60		Sandy gravelly CLAY (Drillers description)		
							(1.20)				
						36.63	3.80		Medium strong dark grey argillaceous LIMESTONE. Partially weathered from 3.80m to 4.30m with slightly reduced strength and staining on fracture surfaces. Discontinuities: 1. 0 to 10 degree bedding fractures closely spaced becoming medium spaced below 5.20m (50/100/350) planar, smooth, closed with light brown staining on some surfaces. 2. One subvertical fracture from 4.90m to 5.20m, undulating, rough, closed with patchy light brown staining.		
4.80	100	54	26	NI							
							(2.50)				
	100	100	100	7							
5.80				2							
	54	54	54								
6.30						34.13	6.30		End of Borehole at 6.30m		

Remarks Terminated at scheduled depth	Water Added		Water Strike - General			
	From (m)	To (m)	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)
Casing Details		Chiselling Details				
To (m)	Diam (mm)	From (m)	To (m)	Time (hh:mm)		



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Project No.: 16-1239	Project Name: West Offaly Power station and the Ash Disposal Facility	Borehole No.: WOP-BH11/17
Coordinates: 597534.45 E	Client: Bord Na Mona	Sheet 1 of 1
Method: Rotary Drilling+Rotary Coring	Client's Representative: Bord Na Mona	Scale: 1:50
Plant: Beretta T44	Ground Level: 43.72 mOD	Dates: 06/03/2017 - 06/03/2017
		Driller: JR
		Logger: CH+LP

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
							(1.20)		MADE GROUND: Hardcore fill (Drillers description)		
						42.52	1.20		Sandy gravelly CLAY (Drillers description)		
						41.42	2.30		Sandy gravelly CLAY (Drillers description)		
						39.92	3.80		Medium strong black argillaceous LIMESTONE. Largely unweathered. Discontinuities: 1. 0 to 10 degree bedding fractures typically medium spaced, occasionally closely spaced (50/200/450) planar, smooth, closed occasionally with faint orangey brown staining. 2. 70 to 90 degree fractures at 4.15m, 4.40m and 4.60m, undulating, rough, closed with orange brown staining.		
4.80	100	100	92	2							
5.80	100	100	87	5			(3.10)				
6.90	100	100	100	1							
				5		36.82	6.90		End of Borehole at 6.90m		

Remarks Terminated at scheduled depth	Water Added		Water Strike - General			
	From (m)	To (m)	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)
Casing Details			Chiselling Details			
To (m)	Diam (mm)		From (m)	To (m)	Time (hh:mm)	



CAUSEWAY
— GEOTECH

Project No.: 16-1239	Project Name: West Offaly Power station and the Ash Disposal Facility	Borehole No.: WOP-BH12/17
Coordinates: 597574.62 E	Client: Bord Na Mona	Sheet 1 of 1
Method: Rotary Drilling+Rotary Coring	Client's Representative: Bord Na Mona	Scale: 1:50
Plant: Beretta T44	Ground Level: 44.22 mOD	Dates: 06/03/2017 - 06/03/2017
		Driller: JR
		Logger: CH+LP

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
							(1.20)		MADE GROUND: Hardcore fill (Drillers description)		
						43.02	1.20		Sandy gravelly CLAY (Drillers description)		
							(4.10)				
						38.92	5.30		Medium strong becoming strong from 6.20m to 7.50m black argillaceous LIMESTONE. Unweathered. Discontinuities: 1. 0 to 10 degree bedding fractures closely spaced becoming medium spaced below 6.20m (70/290/600) planar, smooth, closed.		
6.40	100	100	68	7							
				2							
	95	95	95	1			(3.00)				
7.50											
	100	59	59	2							
				NI							
8.30						35.92	8.30		End of Borehole at 8.30m		

Remarks Terminated at scheduled depth	Water Added		Water Strike - General			
	From (m)	To (m)	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)
Casing Details			Chiselling Details			
To (m)	Diam (mm)		From (m)	To (m)	Time (hh:mm)	



CAUSEWAY
— GEOTECH

APPENDIX C

WOA borehole logs





CAUSEWAY
— GEOTECH

Project No.: 16-1239	Project Name: West Offaly Power station and the Ash Disposal Facility	Borehole No.: WOA-BH01/17
Coordinates: 602693.58 E	Client: Bord Na Mona	Sheet 1 of 1
	Client's Representative: Bord Na Mona	Scale: 1:50
Method: Cable Percussion		Driller: AH
Plant: Dando 2000	Ground Level: 37.83 mOD	Dates: 23/02/2017 - 23/02/2017
		Logger: CH

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
0.50 - 1.50	D6							Spongy brown fibrous PEAT		
0.80 - 1.20	B1									
1.00 - 1.45	SPT (S) N=1			N=1 (1,0/1,0,0,0)						
1.80 - 2.20	B2					(3.80)				
2.00 - 2.45	SPT (S)			N=0 (1,0/0,0,0,0)						
2.50 - 3.40	D7									
2.80 - 3.20	B3									
3.00 - 3.45	SPT (S) N=1			N=1 (1,0/0,1,0,0)						
3.80 - 4.20	B4			Water strike at 3.80m	34.03	3.80		Very stiff grey slightly gravelly sandy SILT with high cobble content. Sand is fine to coarse. Gravel is subangular fine to coarse.		
4.00 - 4.45	SPT (C) N=35			N=35 (5,7/7,8,10,10)						
4.50 - 5.40	D8					(1.60)				
4.80 - 5.20	B5									
5.00 - 5.45	SPT (C) N=36			N=36 (8,8/7,8,9,12)						
5.40 - 5.41	SPT (C)			50 (25 for 10mm/50 for 0mm)	32.43	5.40		End of Borehole at 5.40m		

Remarks Terminated at refusal on boulders/possible bedrock	Water Added		Water Strike - General			
	From (m)	To (m)	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)
			3.80	3.80	20	3.50
Casing Details			Chiselling Details			
To (m)	Diam (mm)	From (m)	To (m)	Time (hh:mm)		
		5.40		01:00		



CAUSEWAY
GEOTECH

Project No.: 16-1239	Project Name: West Offaly Power station and the Ash Disposal Facility	Borehole No.: WOA-BH02/17
Coordinates: 602931.48 E	Client: Bord Na Mona	Sheet 1 of 1
Method: Cable Percussion	Client's Representative: Bord Na Mona	Scale: 1:50
Plant: Dando 2000	Ground Level: 38.92 mOD	Driller: AH
	Dates: 23/02/2017 - 23/02/2017	Logger: CH

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
0.50	D4					(0.70)		Spongy brown fibrous PEAT		
0.80 - 1.20	B1			N=21 (4,4/5,5,6,5)	38.22	0.70		Stiff grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine.		
1.00 - 1.45	SPT (S) N=21									
1.50	D5					(1.80)		Very stiff grey slightly sandy gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular fine to coarse.		
1.80	B7			N=24 (5,6/6,5,7,6)						
1.80 - 2.20	B2									
2.00 - 2.45	SPT (S) N=24									
2.50	D6				36.42	2.50		Very stiff grey slightly sandy gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular fine to coarse.		
2.80 - 3.20	B3			33 (8,8/33 for 150mm)		(0.80)				
3.00 - 3.30	SPT (C)									
3.30 - 3.35	SPT (C)			50 (25 for 50mm/50 for 0mm)	35.62	3.30		End of Borehole at 3.30m		

Remarks Terminated at refusal on boulders/possible bedrock	Water Added		Water Strike - General			
	From (m)	To (m)	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)
	Casing Details		Chiselling Details			
To (m)	Diam (mm)	From (m)	To (m)	Time (hh:mm)		
		3.30		01:00		



CAUSEWAY
GEOTECH

Project No.: 16-1239	Project Name: West Offaly Power station and the Ash Disposal Facility	Borehole No.: WOA-BH02A/17
Coordinates: 602929.24 E	Client: Bord Na Mona	Sheet 1 of 1
Method: Cable Percussion	Client's Representative: Bord Na Mona	Scale: 1:50
Plant: Dando 2000	Ground Level: 38.93 mOD	Dates: 23/02/2017 - 23/02/2017
		Driller: AH
		Logger: CH

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
0.50 - 1.50	D6				38.53	(0.40)	sl/ls, sl/ls	Spongy brown fibrous PEAT		
0.80 - 1.20	B1					0.40	sl/ls, sl/ls	Stiff grey slightly sandy gravelly CLAY with low cobble content and occasional thin lenses of clayey gravel. Sand is fine to coarse. Gravel is subangular fine to coarse.		
1.00 - 1.45	SPT (S) N=18			N=18 (4,5/4,4,5,5)			sl/ls, sl/ls			
1.80 - 2.20	B2					(3.60)		Very stiff grey slightly sandy gravelly CLAY with high cobble content and occasional thin lenses of sandy clayey gravel. Sand is fine to coarse. Gravel is subangular fine to coarse.		
2.00 - 2.45	SPT (S) N=21			N=21 (5,6/5,6,5,5)						
2.50 - 3.50	D7									
2.80 - 3.20	B3									
3.00 - 3.45	SPT (S) N=25			N=25 (5,6/6,7,6,6)						
4.00 - 4.45	SPT (S) N=33			N=33 (7,6/7,8,8,10)	34.93	4.00				
4.50 - 5.50	D8									
4.80 - 5.10	B4									
5.00 - 5.45	SPT (C) N=38			N=38 (10,11/9,10,9,10)		(2.20)				
5.80 - 6.20	B5									
6.00 - 6.22	SPT (C)			25 (8,8/25 for 75mm)				End of Borehole at 6.20m		
6.20 - 6.28	SPT (C)			50 (25 for 75mm/50 for 0mm)	32.73	6.20				

Remarks Terminated at refusal on boulders/possible bedrock	Water Added		Water Strike - General			
	From (m)	To (m)	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)
Casing Details		Chiselling Details				
To (m)	Diam (mm)	From (m)	To (m)	Time (hh:mm)		
		6.20		01:00		



CAUSEWAY
— GEOTECH

Project No.: 16-1239	Project Name: West Offaly Power station and the Ash Disposal Facility	Borehole No.: WOA-BH03/17
Coordinates: 602431.20 E	Client: Bord Na Mona	Sheet 1 of 2
727269.18 N	Client's Representative: Bord Na Mona	Scale: 1:50
Method: Rotary Drilling	Ground Level: 39.43 mOD	Dates: 08/03/2017 - 08/03/2017
Plant: Beretta T44		Driller: JR
		Logger: CH

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
						(4.10)		Spongy brown fibrous PEAT		
5.60 - 5.86	SPT (C)			50 (10,14/50 for 105mm)	35.33	4.10		Very stiff grey slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse.		
7.10 - 7.28	SPT (C)			50 (25 for 95mm/50 for 90mm)		(7.50)				
8.60 - 8.80	SPT (C)			50 (25 for 125mm/50 for 75mm)						

Remarks Terminated at refusal on boulders/possible bedrock	Water Added		Water Strike - General			
	From (m)	To (m)	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)
Casing Details			Chiselling Details			
To (m)	Diam (mm)		From (m)	To (m)	Time (hh:mm)	



CAUSEWAY
— GEOTECH

Project No.: 16-1239	Project Name: West Offaly Power station and the Ash Disposal Facility	Borehole No.: WOA-BH03/17
Coordinates: 602431.20 E	Client: Bord Na Mona	Sheet 2 of 2
727269.18 N	Client's Representative: Bord Na Mona	Scale: 1:50
Plant: Beretta T44	Ground Level: 39.43 mOD	Dates: 08/03/2017 - 08/03/2017
		Driller: JR
		Logger: CH

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
10.10 - 10.40	SPT (C)			50 (25 for 135mm/50 for 160mm)				Very stiff grey slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse.		
11.60 - 11.88	SPT (C)			50 (12,43/50 for 125mm)	27.82	11.60		End of Borehole at 11.60m		

Remarks Terminated at refusal on boulders/possible bedrock	Water Added		Water Strike - General			
	From (m)	To (m)	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)
Casing Details			Chiselling Details			
To (m)	Diam (mm)		From (m)	To (m)	Time (hh:mm)	



CAUSEWAY
— GEOTECH

Project No.: 16-1239	Project Name: West Offaly Power station and the Ash Disposal Facility	Borehole No.: WOA-BH04/17
Coordinates: 602772.09 E	Client: Bord Na Mona	Sheet 1 of 2
Method: Rotary Drilling	Client's Representative: Bord Na Mona	Scale: 1:50
Plant: Beretta T44	Ground Level: 39.34 mOD	Dates: 09/03/2017 - 09/03/2017
		Driller: JR
		Logger: CH

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
2.60 - 3.05	SPT (C) N=2			N=2 (0,0/0,1,0,1)	36.74	2.60	(SPT symbol)	Spongy brown fibrous PEAT		
4.10 - 4.38	SPT (C)			50 (10,14/50 for 135mm)			(SPT symbol)	Very stiff grey slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse.		
5.60 - 5.88	SPT (C)			50 (11,13/50 for 125mm)			(SPT symbol)			
7.10 - 7.35	SPT (C)			Water strike at 7.0m 50 (25 for 130mm/50 for 120mm)			(SPT symbol)		▼	
8.60 - 8.98	SPT (C)			50 (10,13/50 for 230mm)			(SPT symbol)			

Remarks
Terminated at refusal on boulders/possible bedrock

Water Added		Water Strike - General			
From (m)	To (m)	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)
		7.00	10.10	0	0.00
Casing Details		Chiselling Details			
To (m)	Diam (mm)	From (m)	To (m)	Time (hh:mm)	



CAUSEWAY
— GEOTECH

Project No.: 16-1239	Project Name: West Offaly Power station and the Ash Disposal Facility	Borehole No.: WOA-BH04/17
Coordinates: 602772.09 E	Client: Bord Na Mona	Sheet 2 of 2
Method: Rotary Drilling	Client's Representative: Bord Na Mona	Scale: 1:50
Plant: Beretta T44	Ground Level: 39.34 mOD	Driller: JR
	Dates: 09/03/2017 - 09/03/2017	Logger: CH

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
10.10 - 10.40	SPT (C)			50 (11,14/50 for 155mm)	29.24	10.10		Very stiff grey slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse. End of Borehole at 10.10m		

Remarks Terminated at refusal on boulders/possible bedrock	Water Added		Water Strike - General			
	From (m)	To (m)	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)
			7.00	10.10	0	0.00
	Casing Details		Chiselling Details			
To (m)	Diam (mm)	From (m)	To (m)	Time (hh:mm)		



CAUSEWAY
— GEOTECH

APPENDIX D
WOP probe logs





Probe Log

Probe No:
WOP-DP-01/17
Sheet 1 of 1

Project Name: West Offaly Power station and the Ash Disposal Facility

Project No.: 16-1239

Co-ords: 597099.68 - 725153.32

Hole Type: DP

Client: Bord Na Mona

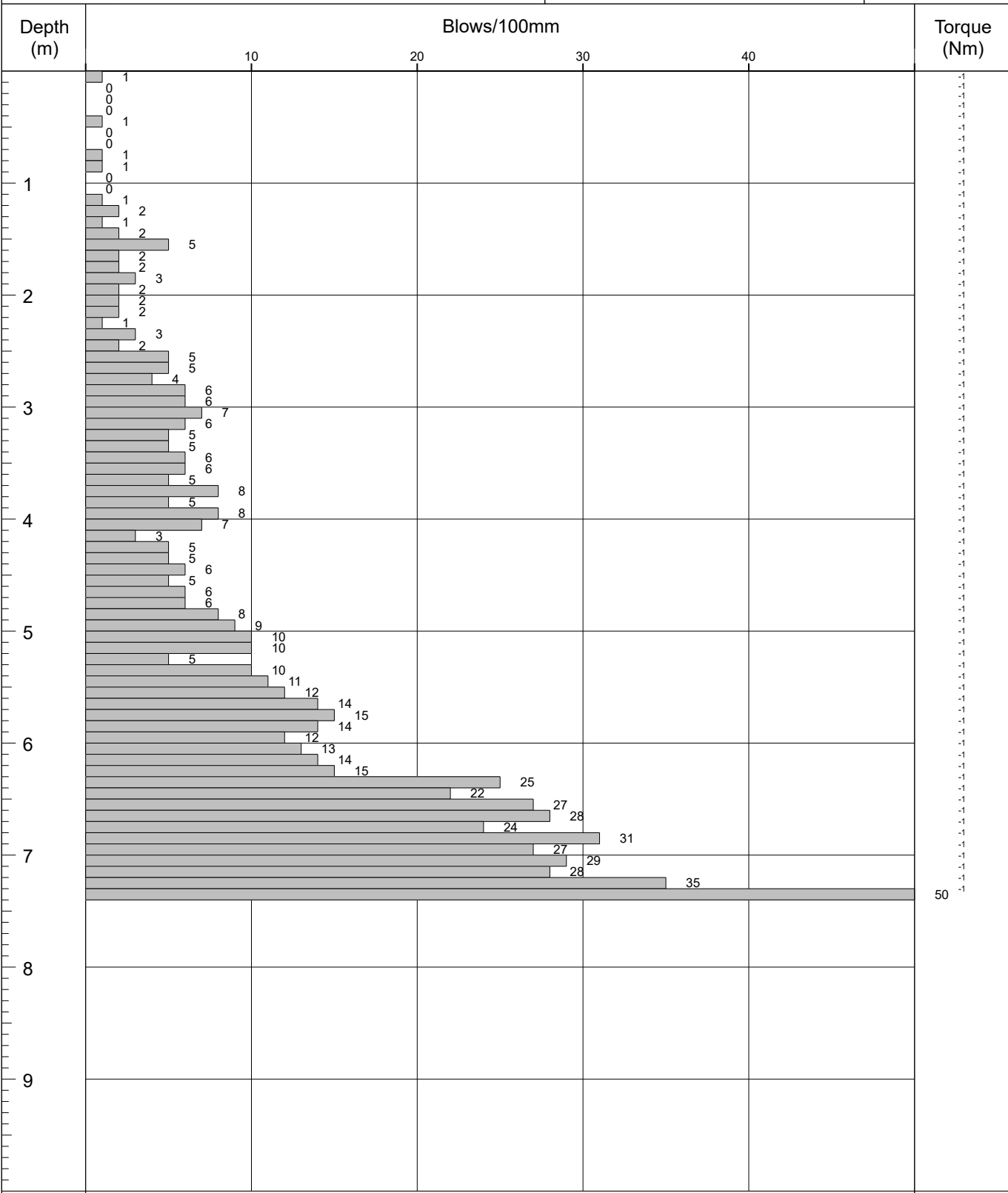
Level: 40.20

Scale: 1:50

Client's Rep: Bord Na Mona

Date: 22/02/2017

Operator: JC



Remarks:
General; 7.40m

Fall Height: 750
Hammer Wt: 64
Probe Type: DPSH-A

Cone Base Diameter: 45
Final Depth: 7.40





Probe Log

Probe No:
WOP-DP-02/17
Sheet 1 of 1

Project Name: West Offaly Power station and the Ash Disposal Facility

Project No.
16-1239

Co-ords: 597110.72 - 725169.62

Hole Type:
DP

Client: Bord Na Mona

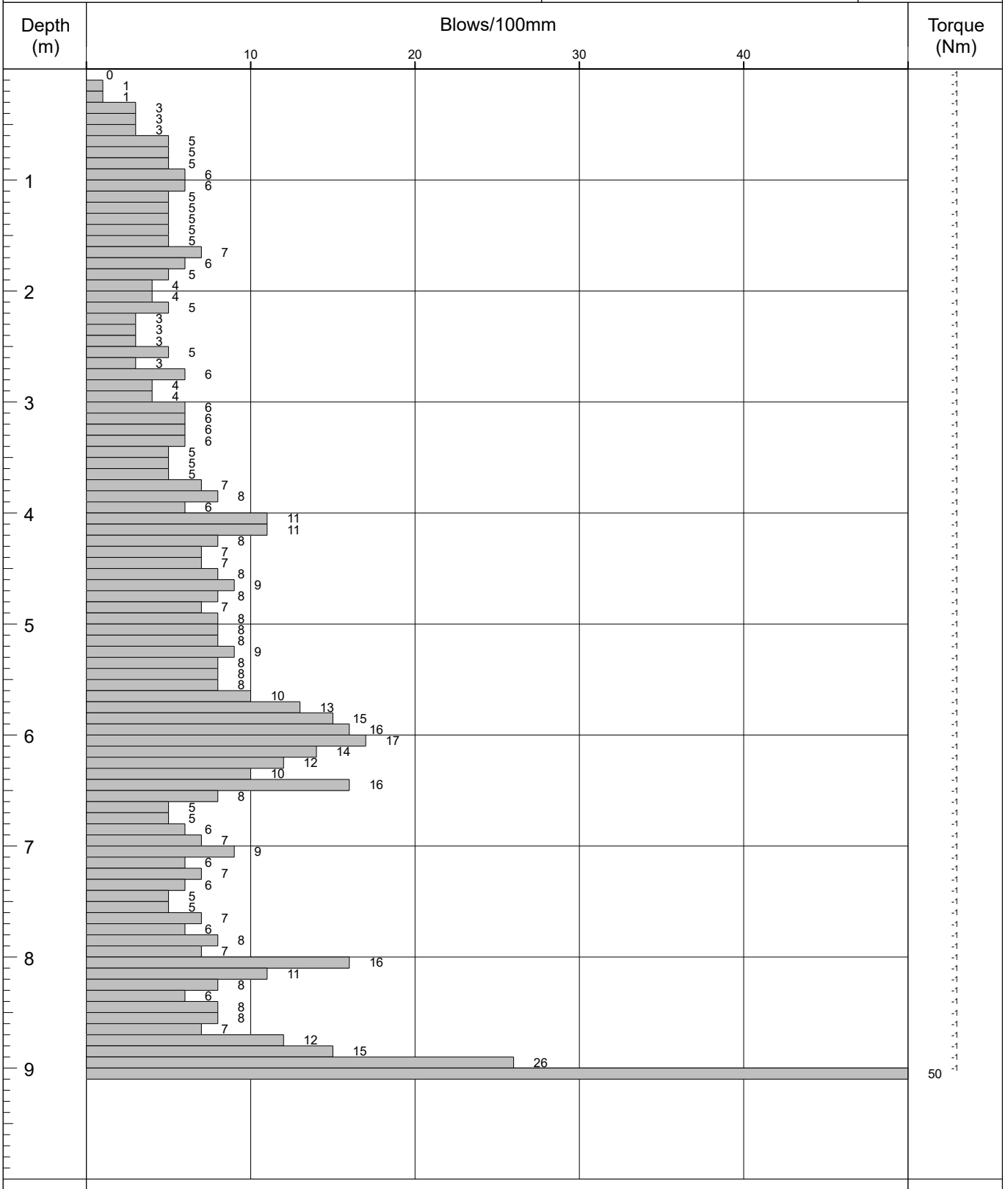
Level: 40.18

Scale:
1:50

Client's Rep: Bord Na Mona

Date: 22/02/2017

Operator:
JC



Remarks:
General; 9.10m

Fall Height 750

Cone Base Diameter 45

Hammer Wt 64

Final Depth 9.10

Probe Type DPSH-A





CAUSEWAY
GEOTECH

Probe Log

Probe No:
WOP-DP-03/17
Sheet 1 of 2

Project Name: West Offaly Power station and the Ash Disposal Facility

Project No.
16-1239

Co-ords: 597010.64 - 725170.16

Hole Type:
DP

Client: Bord Na Mona

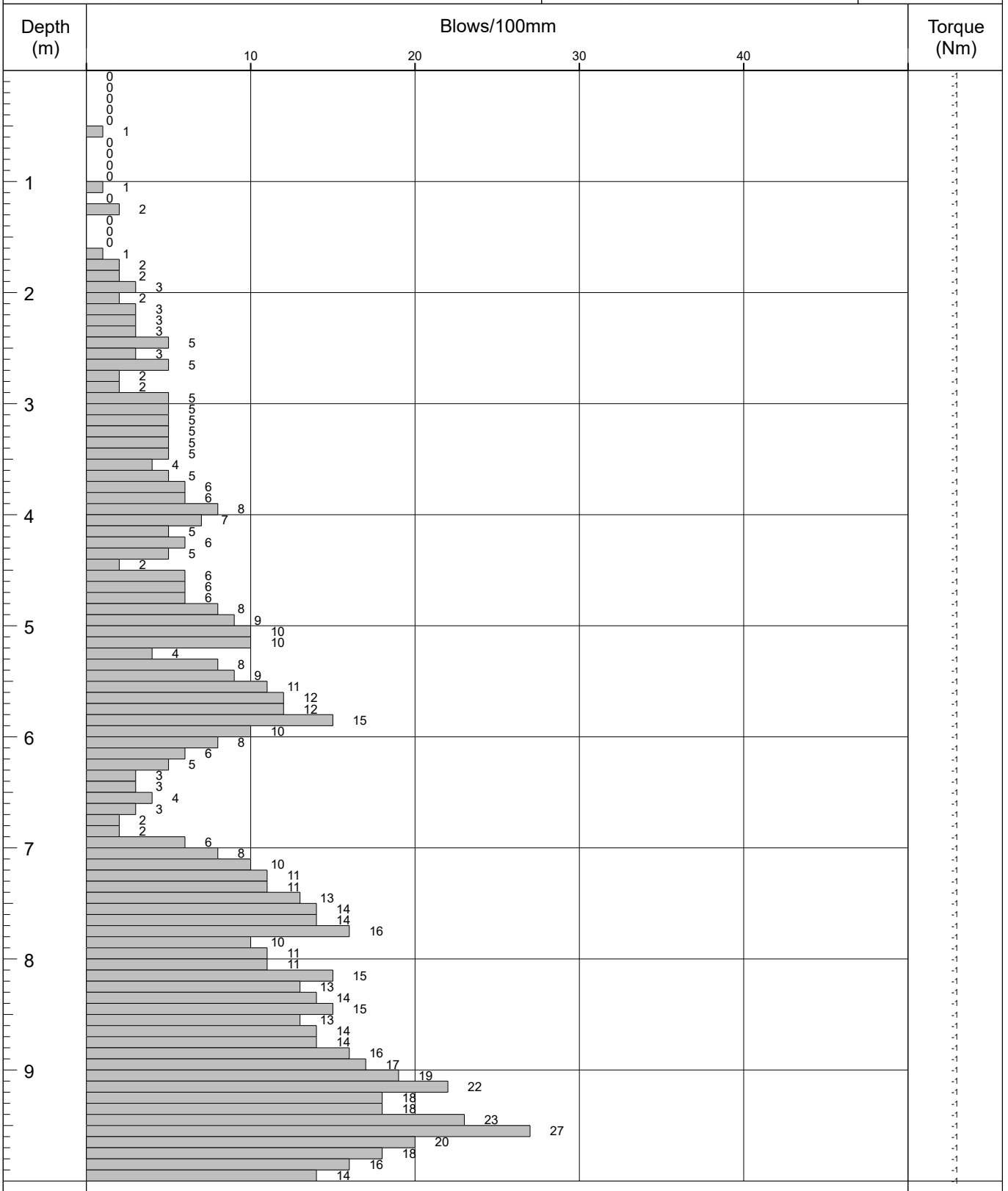
Level: 39.58

Scale:
1:50

Client's Rep: Bord Na Mona

Date: 22/02/2017

Operator:
JC



Remarks:
General; 10.10m

Fall Height 750

Cone Base Diameter 45

Hammer Wt 64

Final Depth 10.10

Probe Type DPSH-A





Probe Log

Probe No:
WOP-DP-03/17
Sheet 2 of 2

Project Name: West Offaly Power station and the Ash Disposal Facility

Project No.
16-1239

Co-ords: 597010.64 - 725170.16

Hole Type:
DP

Client: Bord Na Mona

Level: 39.58

Scale:
1:50

Client's Rep: Bord Na Mona

Date: 22/02/2017

Operator:
JC

Depth (m)	Blows/100mm				Torque (Nm)
	10	20	30	40	
11					50
12					
13					
14					
15					
16					
17					
18					
19					

Remarks:
General; 10.10m

Fall Height 750

Cone Base Diameter 45

Hammer Wt 64

Final Depth 10.10

Probe Type DPSH-A





Probe Log

Probe No:
WOP-DP-04/17
Sheet 1 of 1

Project Name: West Offaly Power station and the Ash Disposal Facility

Project No.
16-1239

Co-ords: 597138.83 - 725146.46

Hole Type:
DP

Client: Bord Na Mona

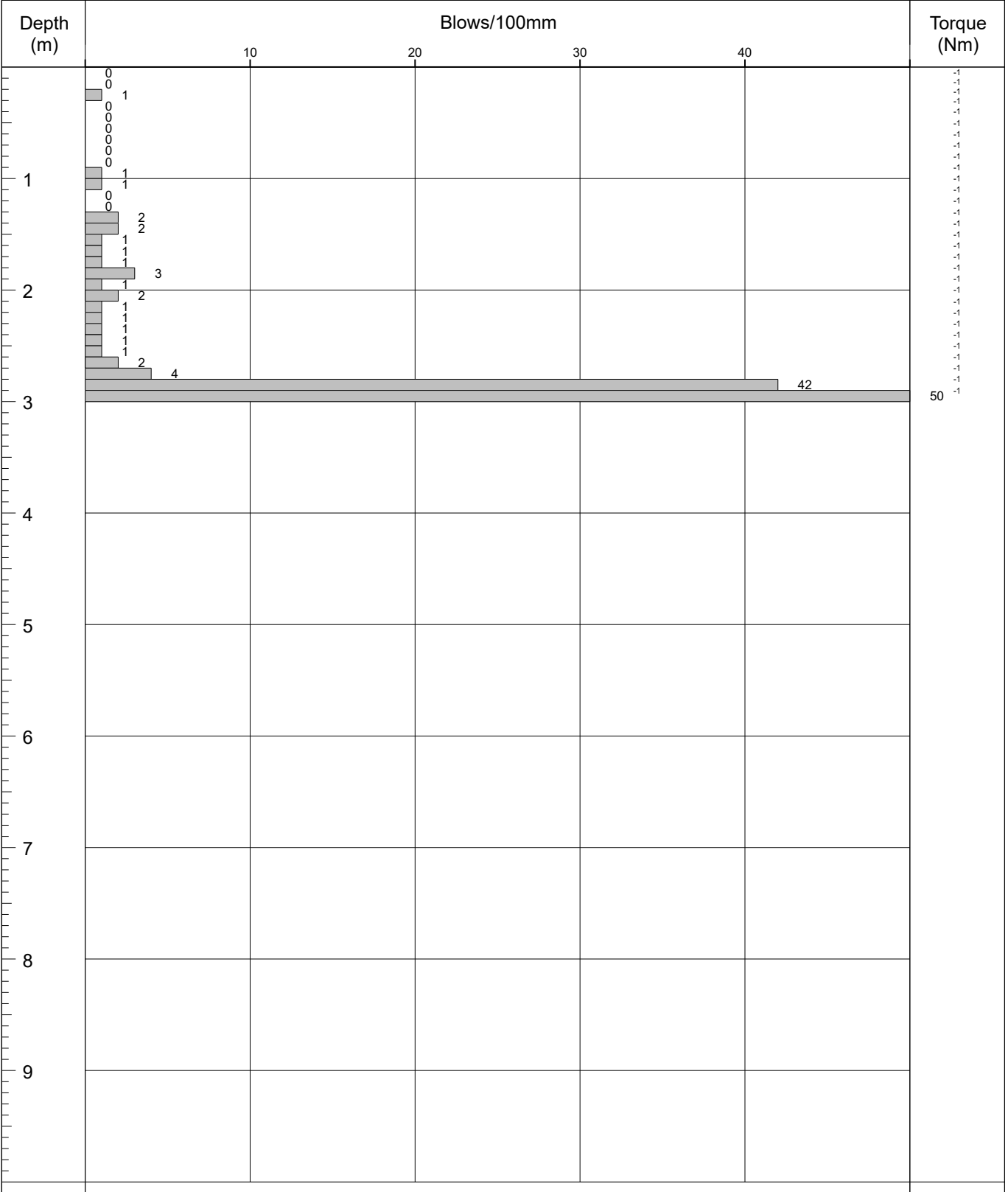
Level: 40.35

Scale:
1:50

Client's Rep: Bord Na Mona

Date: 22/02/2017

Operator:
JC



Remarks:
General; 3.00m

Fall Height 750

Cone Base Diameter 45

Hammer Wt 64

Final Depth 3.00

Probe Type DPSH-A





CAUSEWAY
GEOTECH

Probe Log

Probe No:
WOP-DP-05/17
Sheet 1 of 1

Project Name: West Offaly Power station and the Ash Disposal Facility

Project No.
16-1239

Co-ords: 597014.63 - 725098.60

Hole Type:
DP

Client: Bord Na Mona

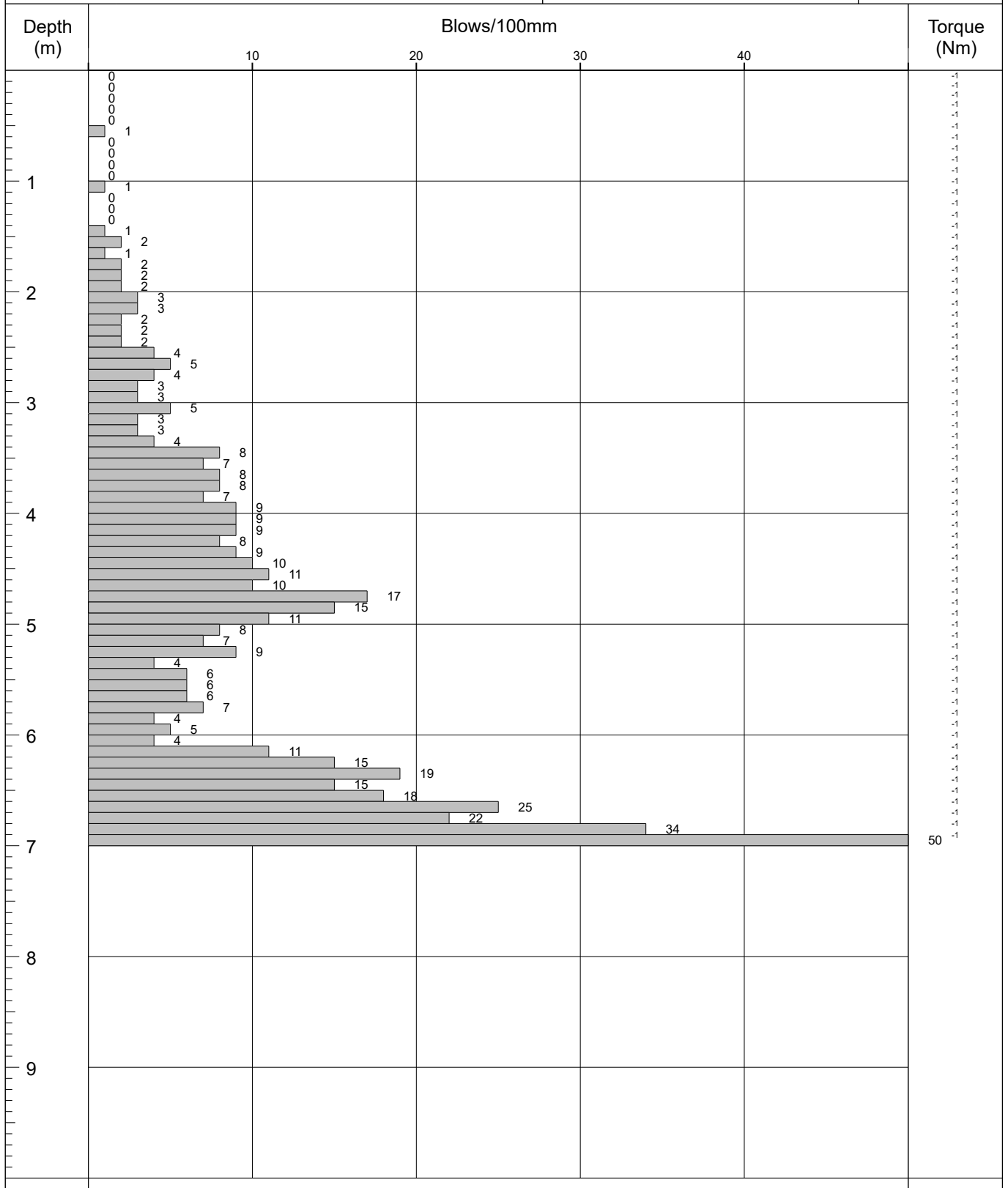
Level: 39.00

Scale:
1:50

Client's Rep: Bord Na Mona

Date: 22/02/2017

Operator:
JC



Remarks:
General; 7.00m

Fall Height 750

Cone Base Diameter 45

Hammer Wt 64

Final Depth 7.00

Probe Type DPSH-A





Probe Log

Probe No:
WOP-DP-06/17
Sheet 1 of 1

Project Name: West Offaly Power station and the Ash Disposal Facility

Project No.
16-1239

Co-ords: 597091.68 - 725115.94

Hole Type:
DP

Client: Bord Na Mona

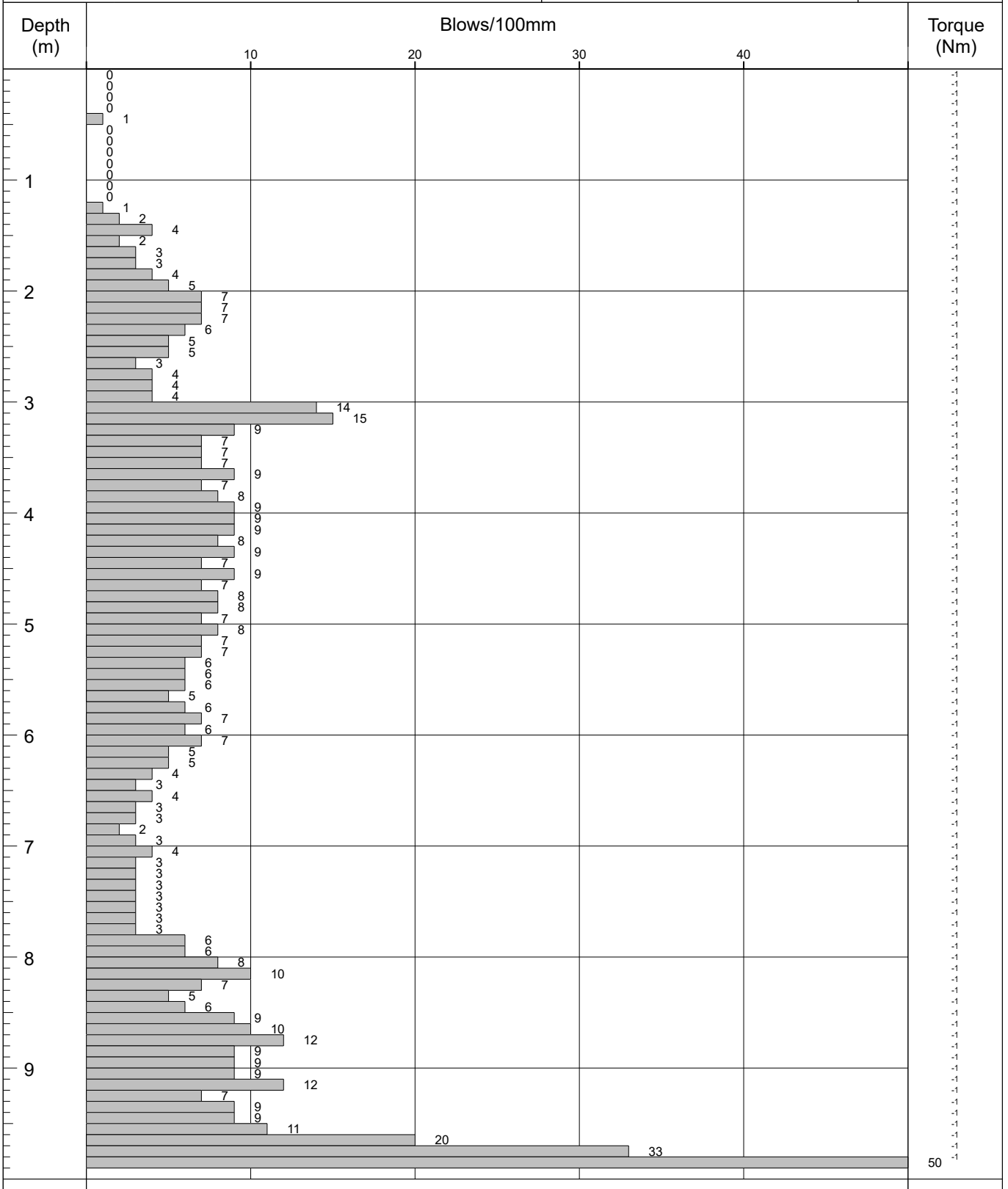
Level: 40.15

Scale:
1:50

Client's Rep: Bord Na Mona

Date: 22/02/2017

Operator:
JC



Remarks:
General; 9.90m

Fall Height 750

Cone Base Diameter 45

Hammer Wt 64

Final Depth 9.90

Probe Type DPSH-A





CAUSEWAY
GEOTECH

Probe Log

Probe No:
WOP-DP-07/17
Sheet 1 of 1

Project Name: West Offaly Power station and the Ash Disposal Facility

Project No.
16-1239

Co-ords: 597118.81 - 725119.39

Hole Type:
DP

Client: Bord Na Mona

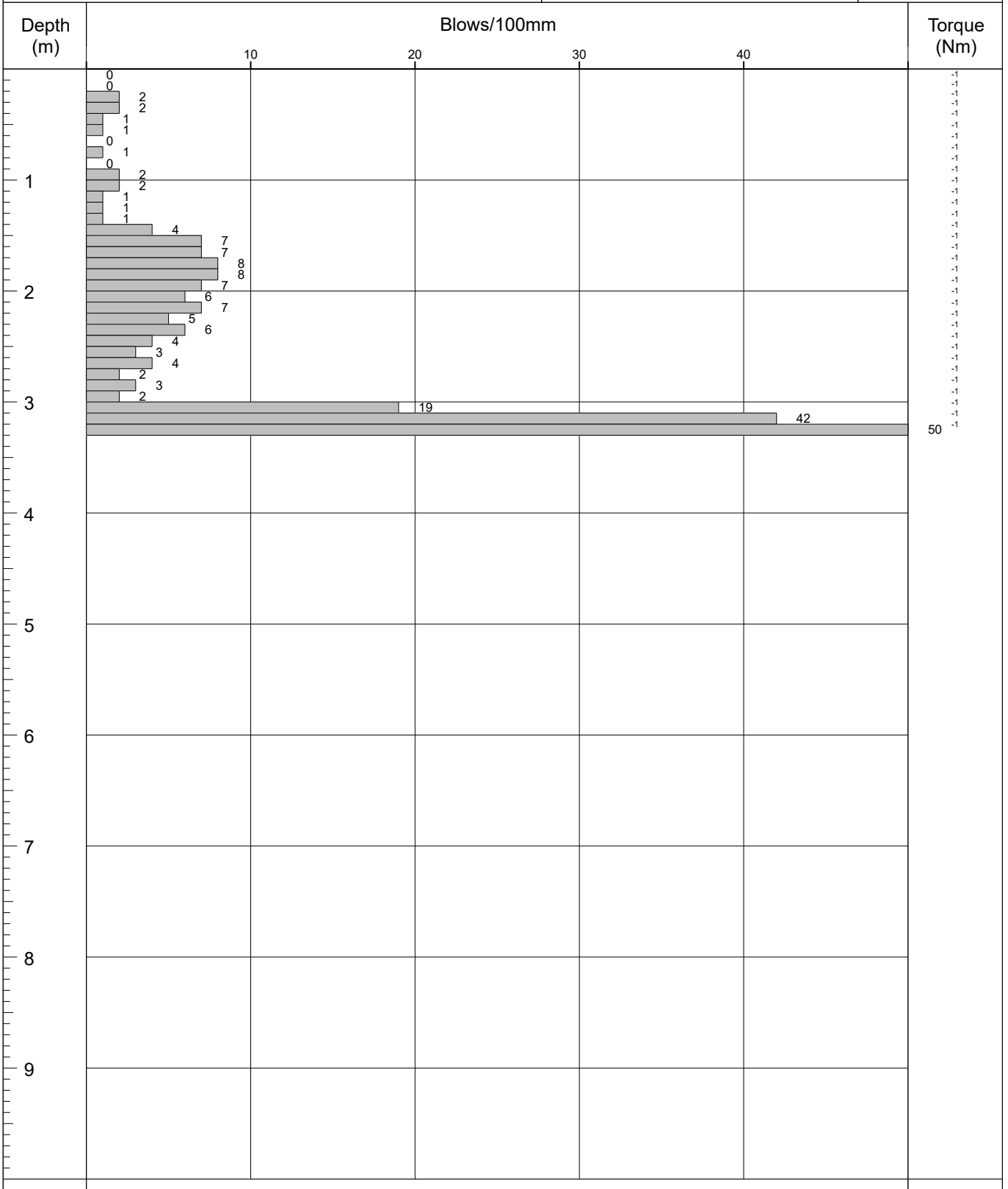
Level: 40.51

Scale:
1:50

Client's Rep: Bord Na Mona

Date: 22/02/2017

Operator:
JC



Remarks:
General; 3.30m

Fall Height 750

Cone Base Diameter 45

Hammer Wt 64

Final Depth 3.30

Probe Type DPSH-A





CAUSEWAY
GEOTECH

Probe Log

Probe No:
WOP-DP-08/17
Sheet 1 of 1

Project Name: West Offaly Power station and the Ash Disposal Facility

Project No.
16-1239

Co-ords: 597018.56 - 725080.42

Hole Type:
DP

Client: Bord Na Mona

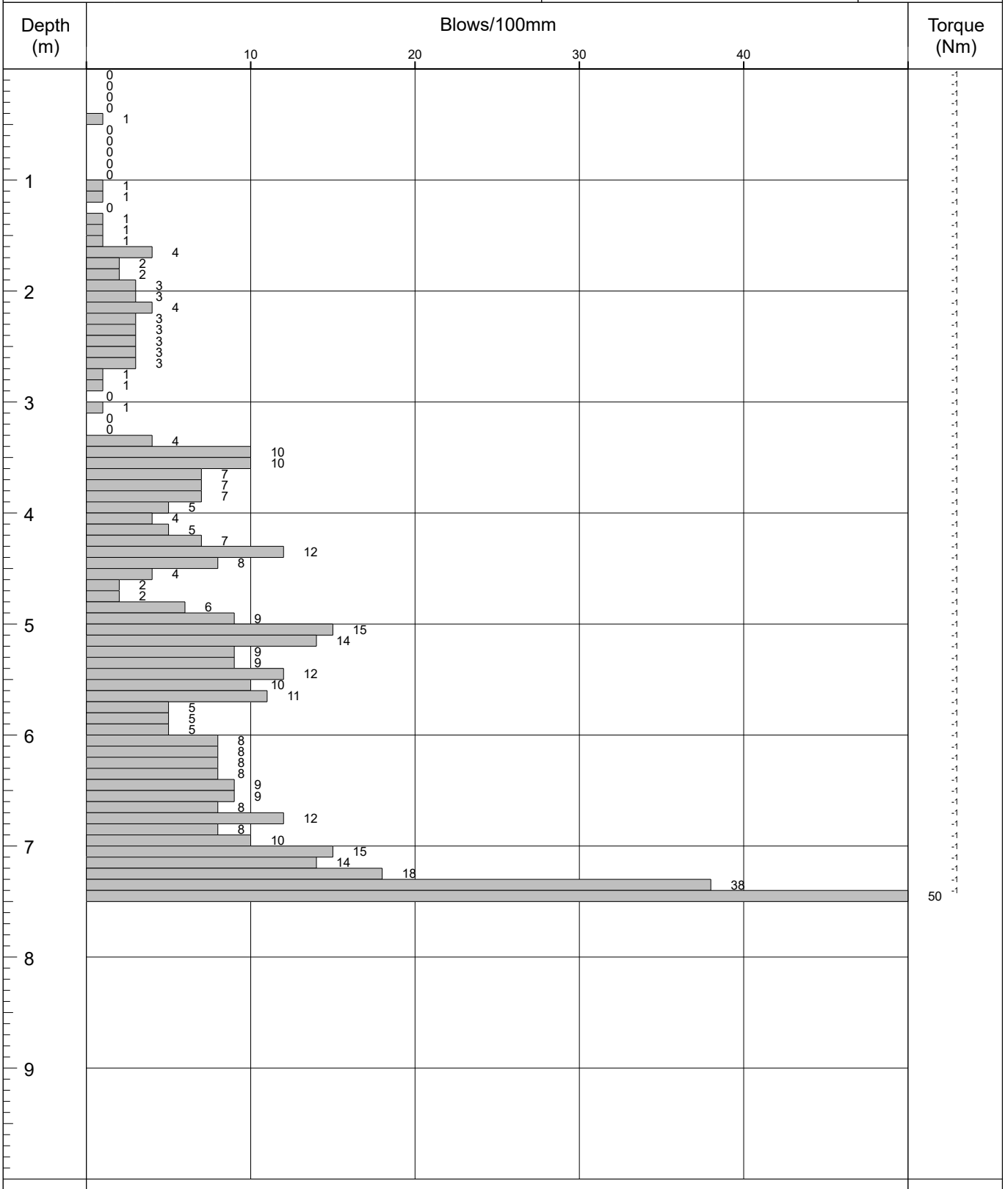
Level: 38.76

Scale:
1:50

Client's Rep: Bord Na Mona

Date: 22/02/2017

Operator:
JC



Remarks:
General; 7.50m

Fall Height 750
Hammer Wt 64
Probe Type DPSH-A

Cone Base Diameter 45
Final Depth 7.50





Probe Log

Probe No:
WOP-DP-09/17
Sheet 1 of 1

Project Name: West Offaly Power station and the Ash Disposal Facility

Project No.
16-1239

Co-ords: 597047.82 - 725087.43

Hole Type:
DP

Client: Bord Na Mona

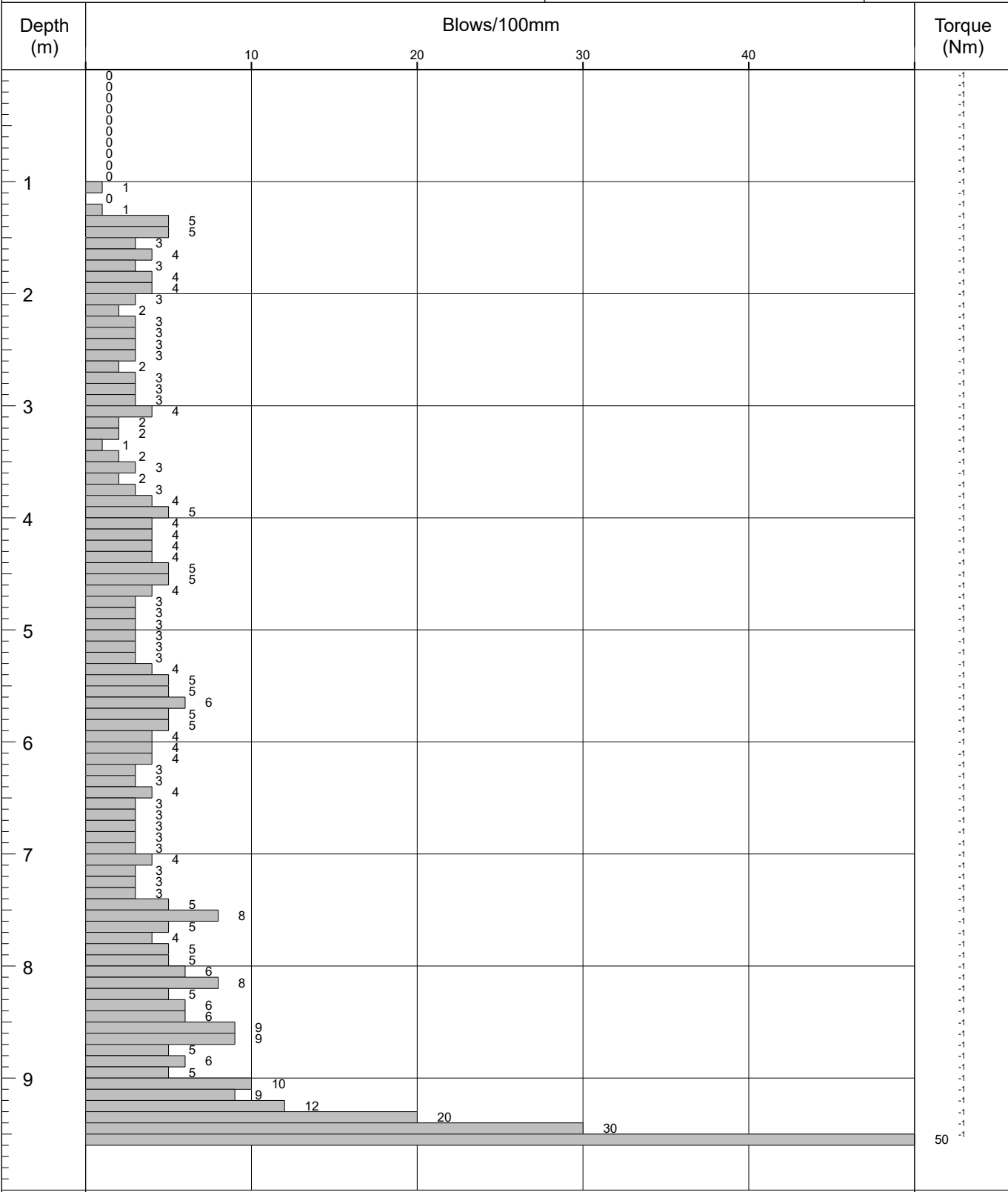
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Scale:
1:50

Client's Rep: Bord Na Mona

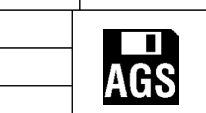
Date: 22/02/2017

Operator:
JC



Remarks:
General; 9.60m

Fall Height	750	Cone Base Diameter	45
Hammer Wt	64	Final Depth	9.60
Probe Type	DPSH-A		





Probe Log

Probe No:
WOP-DP-10/17
Sheet 1 of 1

Project Name: West Offaly Power station and the Ash Disposal Facility

Project No.
16-1239

Co-ords: 597085.86 - 725061.20

Hole Type:
DP

Client: Bord Na Mona

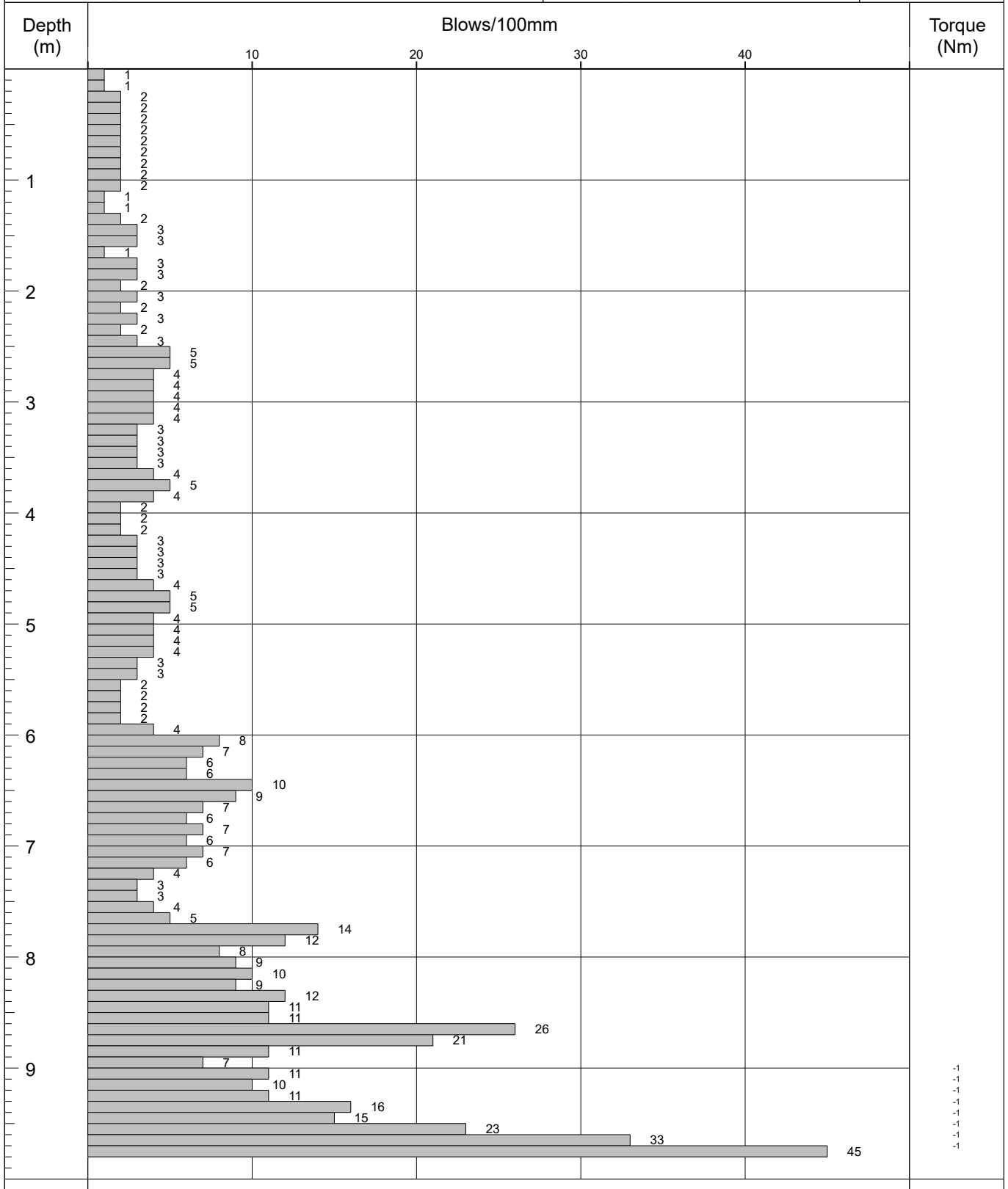
Level: 40.48

Scale:
1:50

Client's Rep: Bord Na Mona

Date: 22/02/2017

Operator:
JC



-1
-1
-1
-1
-1
-1
-1

Remarks:
General; 9.80m

Fall Height 750

Cone Base Diameter 45

Hammer Wt 64

Final Depth 9.60

Probe Type DPSH-A





Probe Log

Probe No:
WOP-DP-11/17
Sheet 1 of 1

Project Name: West Offaly Power station and the Ash Disposal Facility

Project No.
16-1239

Co-ords: 597094.64 - 725090.73

Hole Type:
DP

Client: Bord Na Mona

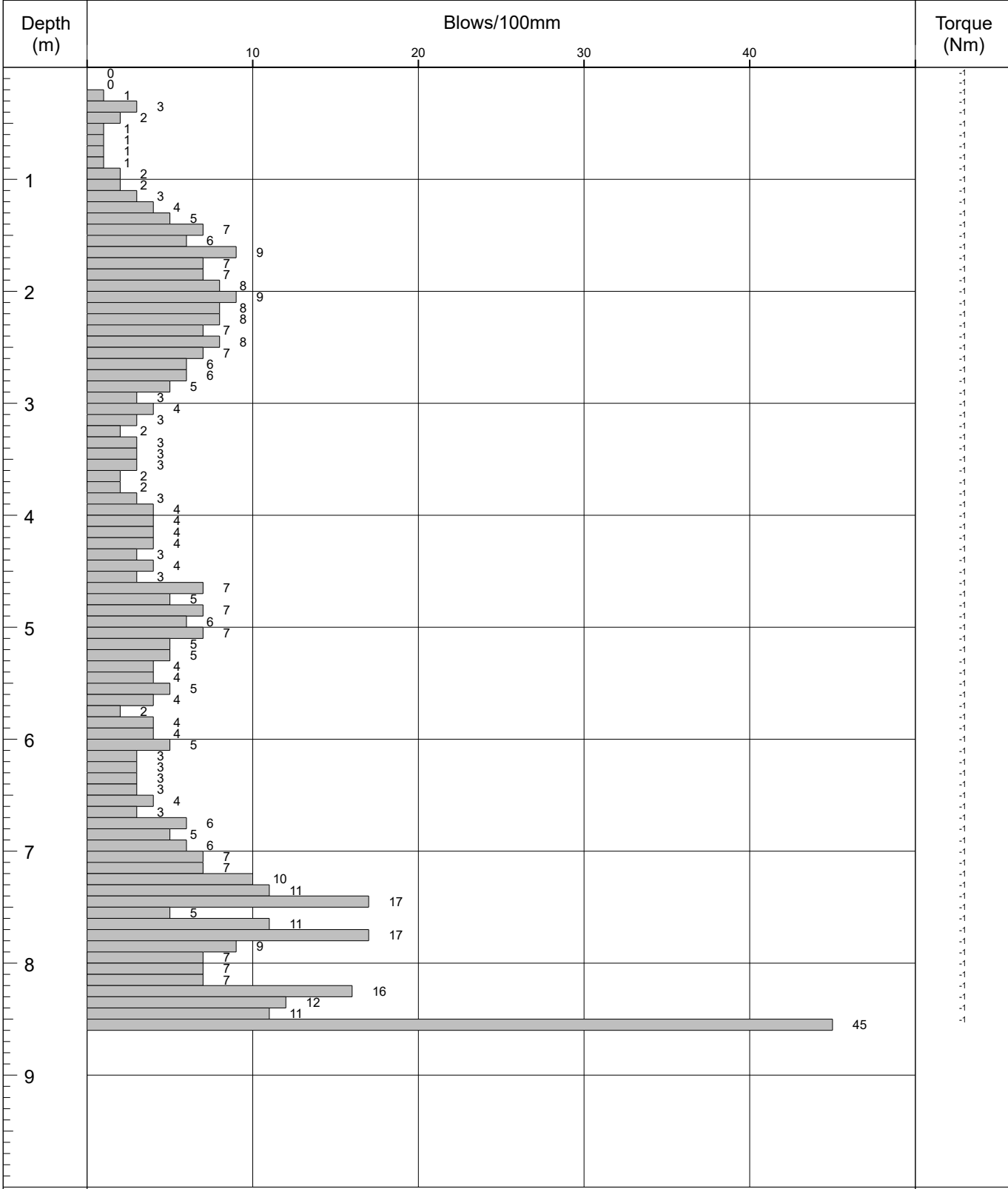
Level: 40.21

Scale:
1:50

Client's Rep: Bord Na Mona

Date: 22/02/2017

Operator:
JC



Remarks:
General; 8.60m

Fall Height 750
Hammer Wt 64
Probe Type DPSH-A

Cone Base Diameter 45
Final Depth 8.60





CAUSEWAY
GEOTECH

Probe Log

Probe No:
WOP-DP-12/17
Sheet 1 of 2

Project Name: West Offaly Power station and the Ash Disposal Facility

Project No.
16-1239

Co-ords: 597119.94 - 725095.89

Hole Type:
DP

Client: Bord Na Mona

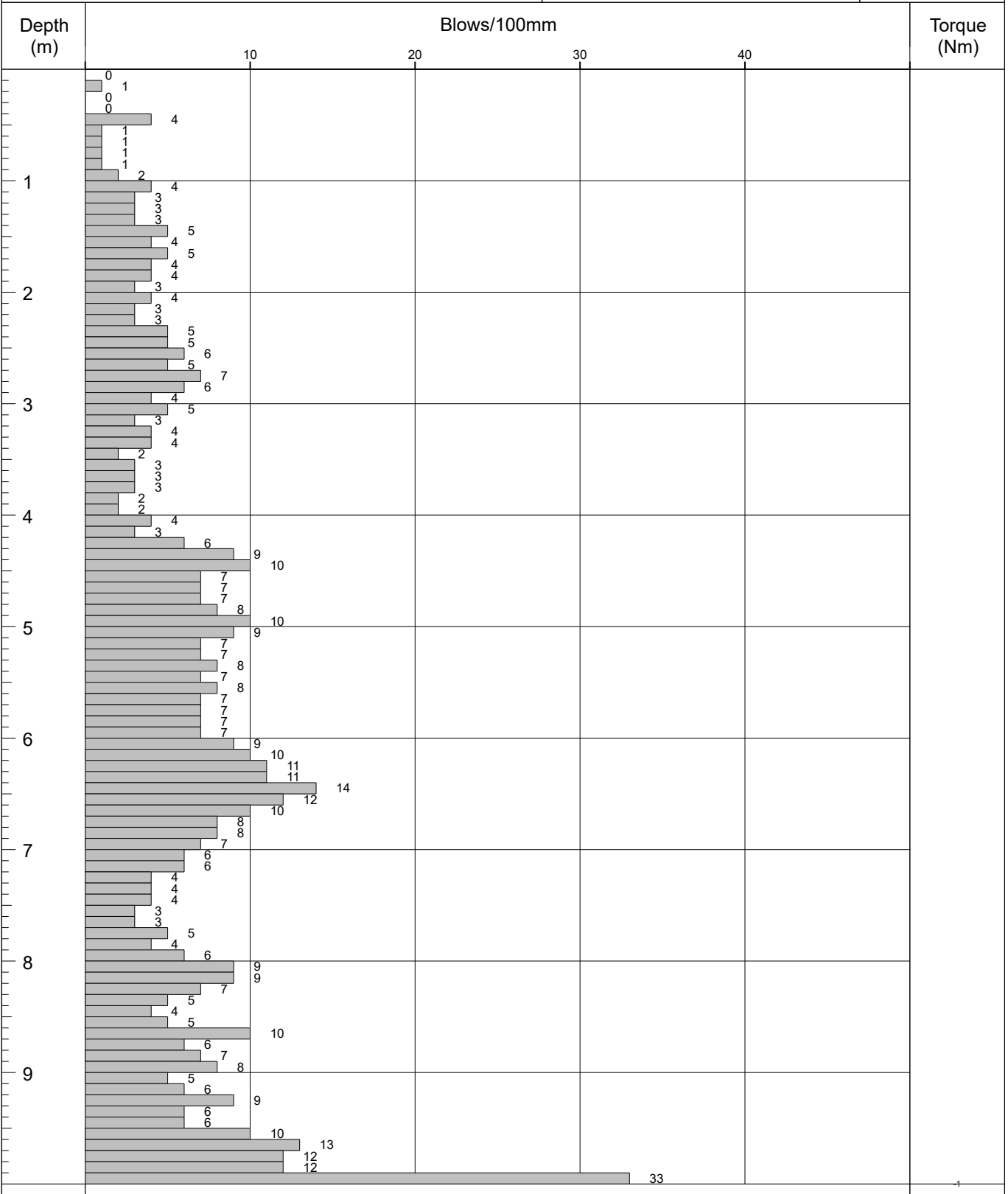
Level: 40.66

Scale:
1:50

Client's Rep: Bord Na Mona

Date: 22/02/2017

Operator:
JC



Remarks:
General; 10.20m

Fall Height 750

Cone Base Diameter 45

Hammer Wt 64

Final Depth 10.20

Probe Type DPSH-A





Probe Log

Probe No:
WOP-DP-12/17
Sheet 2 of 2

Project Name: West Offaly Power station and the Ash Disposal Facility

Project No.
16-1239

Co-ords: 597119.94 - 725095.89

Hole Type:
DP

Client: Bord Na Mona

Level: 40.66

Scale:
1:50

Client's Rep: Bord Na Mona

Date: 22/02/2017

Operator:
JC

Depth (m)	Blows/100mm				Torque (Nm)
	10	20	30	40	
	39				50 ⁻¹
11					
12					
13					
14					
15					
16					
17					
18					
19					

Remarks:
General; 10.20m

Fall Height 750

Cone Base Diameter 45

Hammer Wt 64

Final Depth 10.20

Probe Type DPSH-A





Probe Log

Probe No:
WOP-DP-13/17
Sheet 1 of 1

Project Name: West Offaly Power station and the Ash Disposal Facility

Project No.
16-1239

Co-ords: 597146.09 - 725096.84

Hole Type:
DP

Client: Bord Na Mona

Level: 40.81

Scale:
1:50

Client's Rep: Bord Na Mona

Date: 22/02/2017

Operator:
JC

Depth (m)	Blows/100mm				Torque (Nm)
	0-10	10-20	20-30	30-40	
0.0 - 0.1	3	6	11	28	-1
0.1 - 0.2				37	-1
0.2 - 0.3				45	-1
0.3 - 0.4					-1
0.4 - 0.5					-1
0.5 - 0.6					-1
0.6 - 0.7					-1
0.7 - 0.8					-1
0.8 - 0.9					-1
0.9 - 1.0					-1
1.0 - 1.1					-1
1.1 - 1.2					-1
1.2 - 1.3					-1
1.3 - 1.4					-1
1.4 - 1.5					-1
1.5 - 1.6					-1
1.6 - 1.7					-1
1.7 - 1.8					-1
1.8 - 1.9					-1
1.9 - 2.0					-1

Remarks:
General; 0.7m 3 attempts made @ 1.0m from original location all with same result

Fall Height	750	Cone Base Diameter	45
Hammer Wt	64	Final Depth	0.70
Probe Type	DPSH-A		





Probe Log

Probe No:
WOP-DP-14/17
Sheet 1 of 1

Project Name: West Offaly Power station and the Ash Disposal Facility

Project No.
16-1239

Co-ords: 597023.64 - 725057.40

Hole Type:
DP

Client: Bord Na Mona

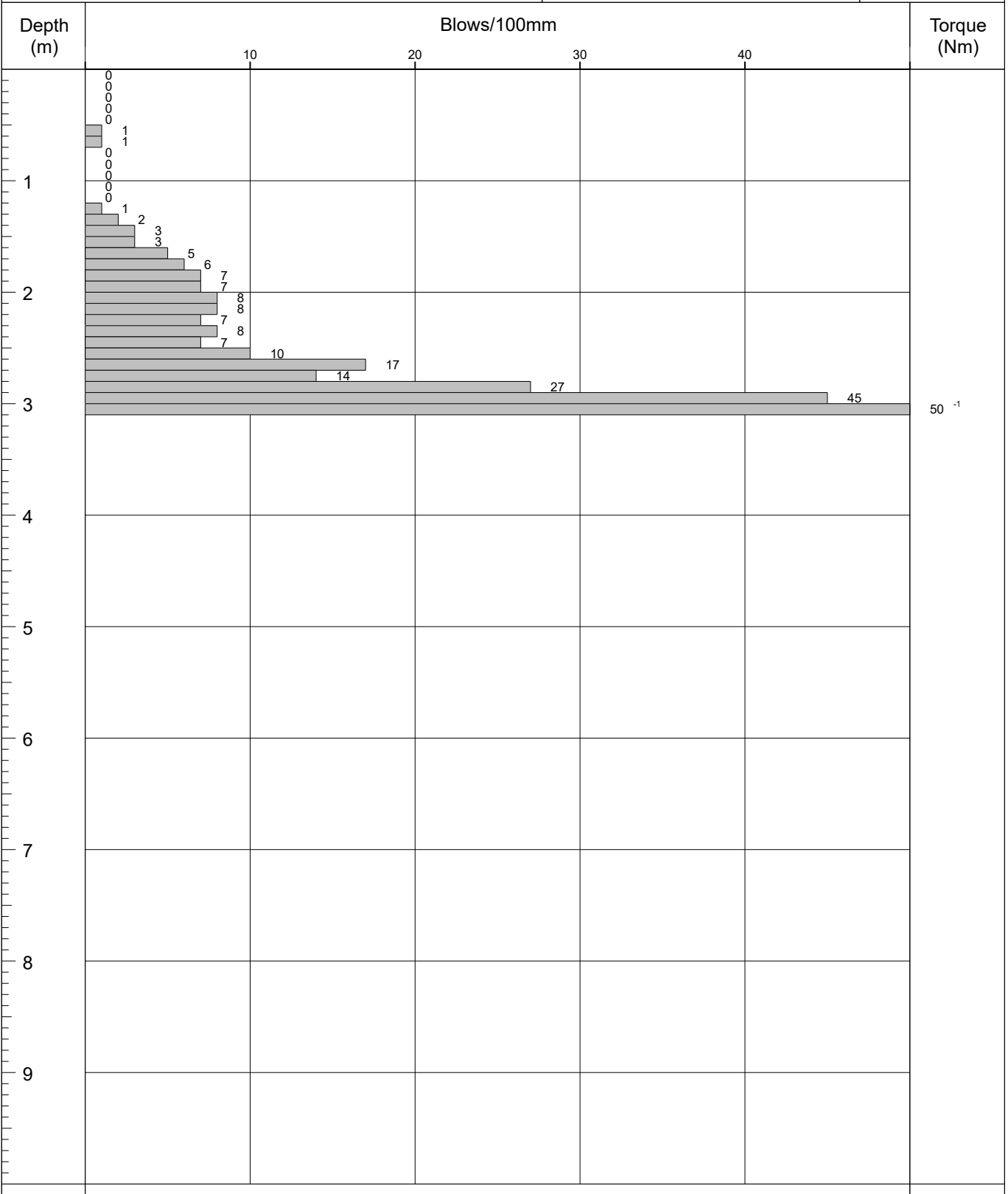
Level: 38.08

Scale:
1:50

Client's Rep: Bord Na Mona

Date: 22/02/2017

Operator:
JC



Remarks:
General; 3.10m

Fall Height 750

Cone Base Diameter 45

Hammer Wt 64

Final Depth 3.10

Probe Type DPSH-A





Probe Log

Probe No:
WOP-DP-15/17
Sheet 1 of 1

Project Name: West Offaly Power station and the Ash Disposal Facility

Project No.
16-1239

Co-ords: 597059.38 - 725059.84

Hole Type:
DP

Client: Bord Na Mona

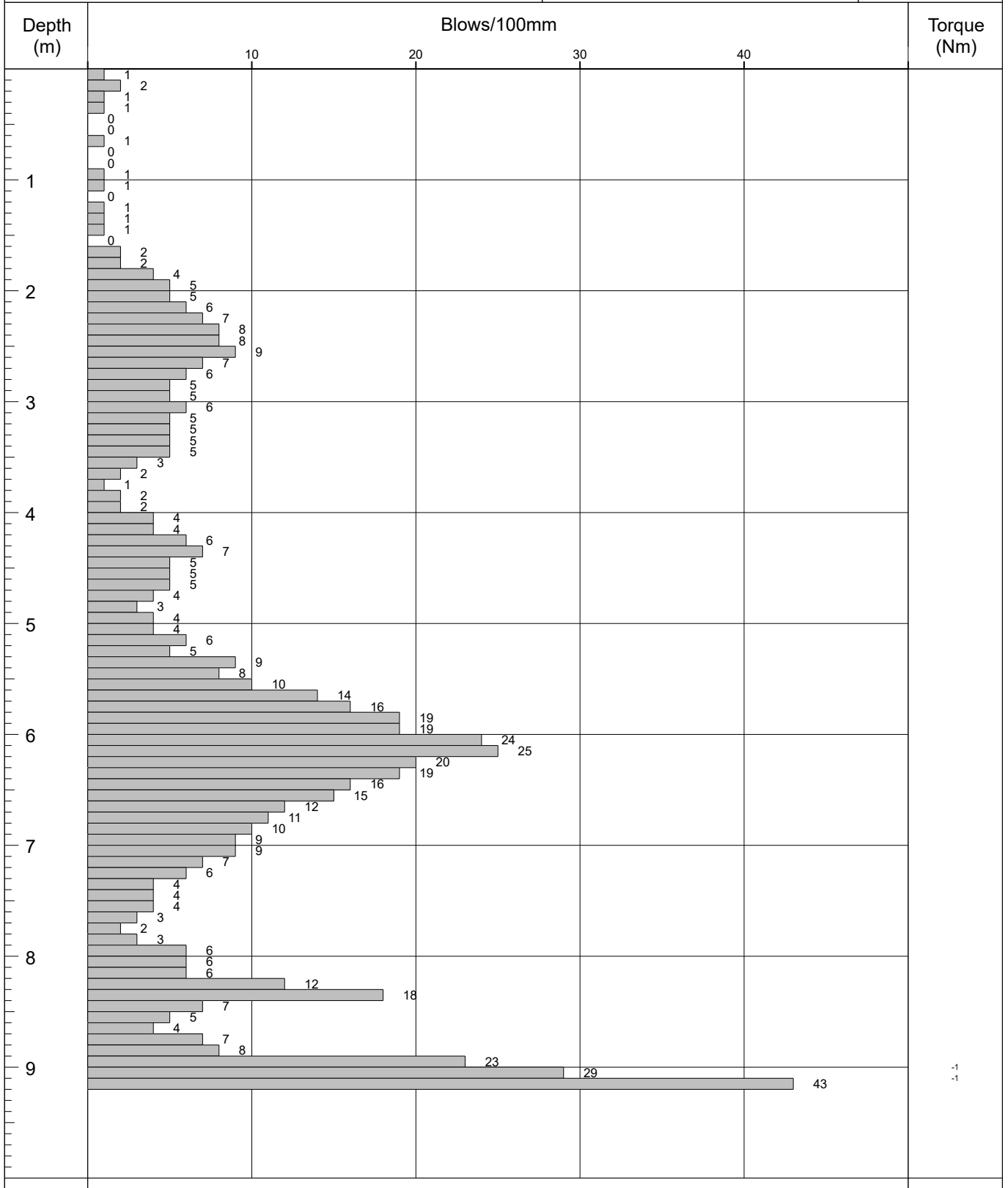
Level: 40.03

Scale:
1:50

Client's Rep: Bord Na Mona

Date: 22/02/2017

Operator:
JC



-1
-1

Remarks:
General; 9.20m

Fall Height 750
Hammer Wt 64
Probe Type DPSH-A

Cone Base Diameter 45
Final Depth 9.20





CAUSEWAY
GEOTECH

Probe Log

Probe No:
WOP-DP-16/17
Sheet 1 of 1

Project Name: West Offaly Power station and the Ash Disposal Facility

Project No.
16-1239

Co-ords: 597113.18 - 725064.66

Hole Type:
DP

Client: Bord Na Mona

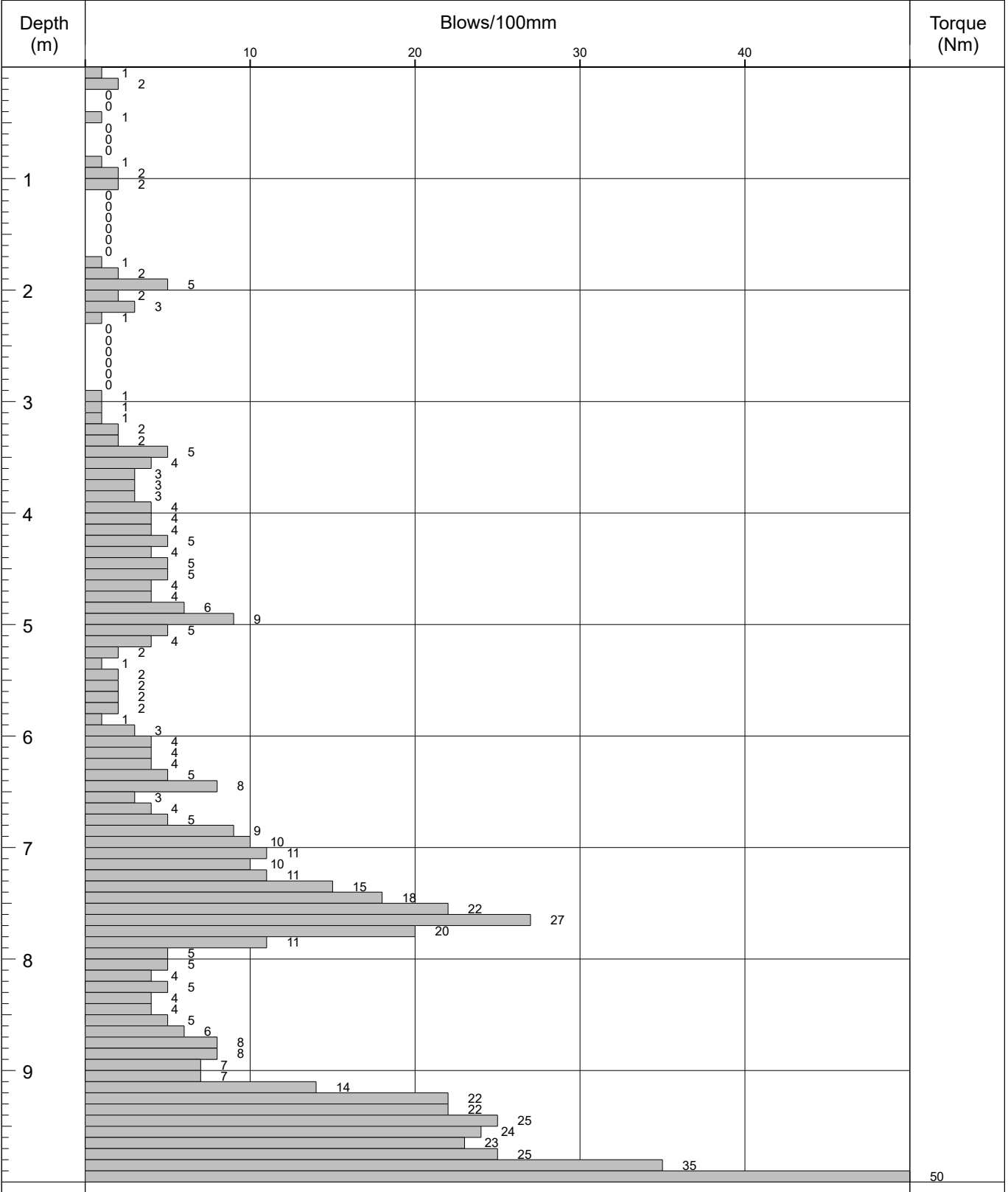
Level: 40.58

Scale:
1:50

Client's Rep: Bord Na Mona

Date: 22/02/2017

Operator:
JC



Remarks:
General; 10.00m

Fall Height 750

Cone Base Diameter 45

Hammer Wt 64

Final Depth 10.00

Probe Type DPSH-A





Probe Log

Probe No:
WOP-DP-17/17
Sheet 1 of 2

Project Name: West Offaly Power station and the Ash Disposal Facility

Project No.
16-1239

Co-ords: 597126.42 - 725067.81

Hole Type:
DP

Client: Bord Na Mona

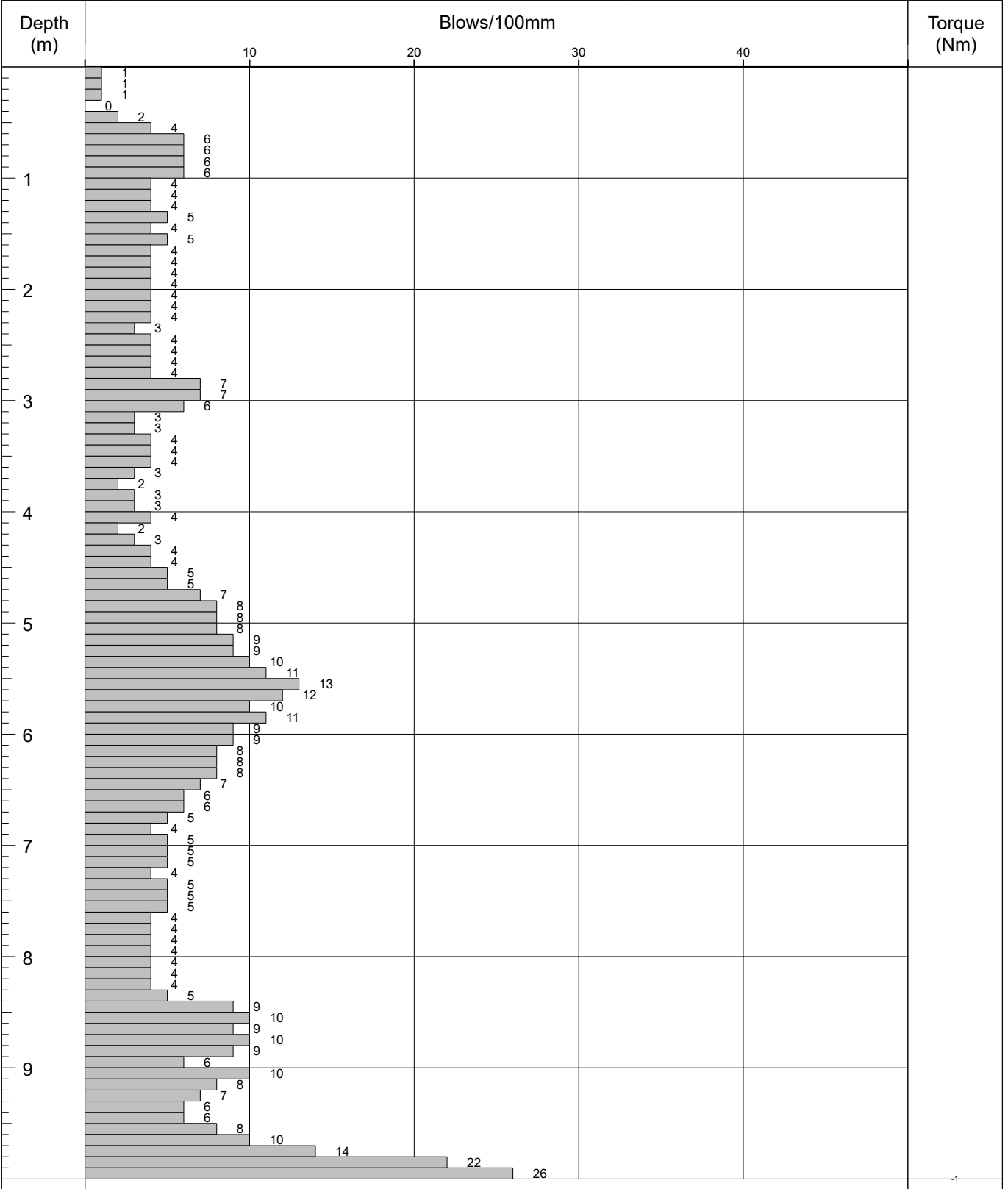
Level: 40.76

Scale:
1:50

Client's Rep: Bord Na Mona

Date: 22/02/2017

Operator:
JC



Remarks:
General; 10.20m

Fall Height 750

Cone Base Diameter 45

Hammer Wt 64

Final Depth 10.20

Probe Type DPSH-A





Probe Log

Probe No:
WOP-DP-17/17
Sheet 2 of 2

Project Name: West Offaly Power station and the Ash Disposal Facility

Project No.
16-1239

Co-ords: 597126.42 - 725067.81

Hole Type:
DP

Client: Bord Na Mona

Level: 40.76

Scale:
1:50

Client's Rep: Bord Na Mona

Date: 22/02/2017

Operator:
JC

Depth (m)	Blows/100mm				Torque (Nm)
	10	20	30	40	
	33				50 ⁻¹
11					
12					
13					
14					
15					
16					
17					
18					
19					

Remarks:
General; 10.20m

Fall Height 750

Cone Base Diameter 45

Hammer Wt 64

Final Depth 10.20

Probe Type DPSH-A





Probe Log

Probe No:
WOP-DP-18/17
Sheet 1 of 1

Project Name: West Offaly Power station and the Ash Disposal Facility

Project No.
16-1239

Co-ords: 597036.05 - 725035.31

Hole Type:
DP

Client: Bord Na Mona

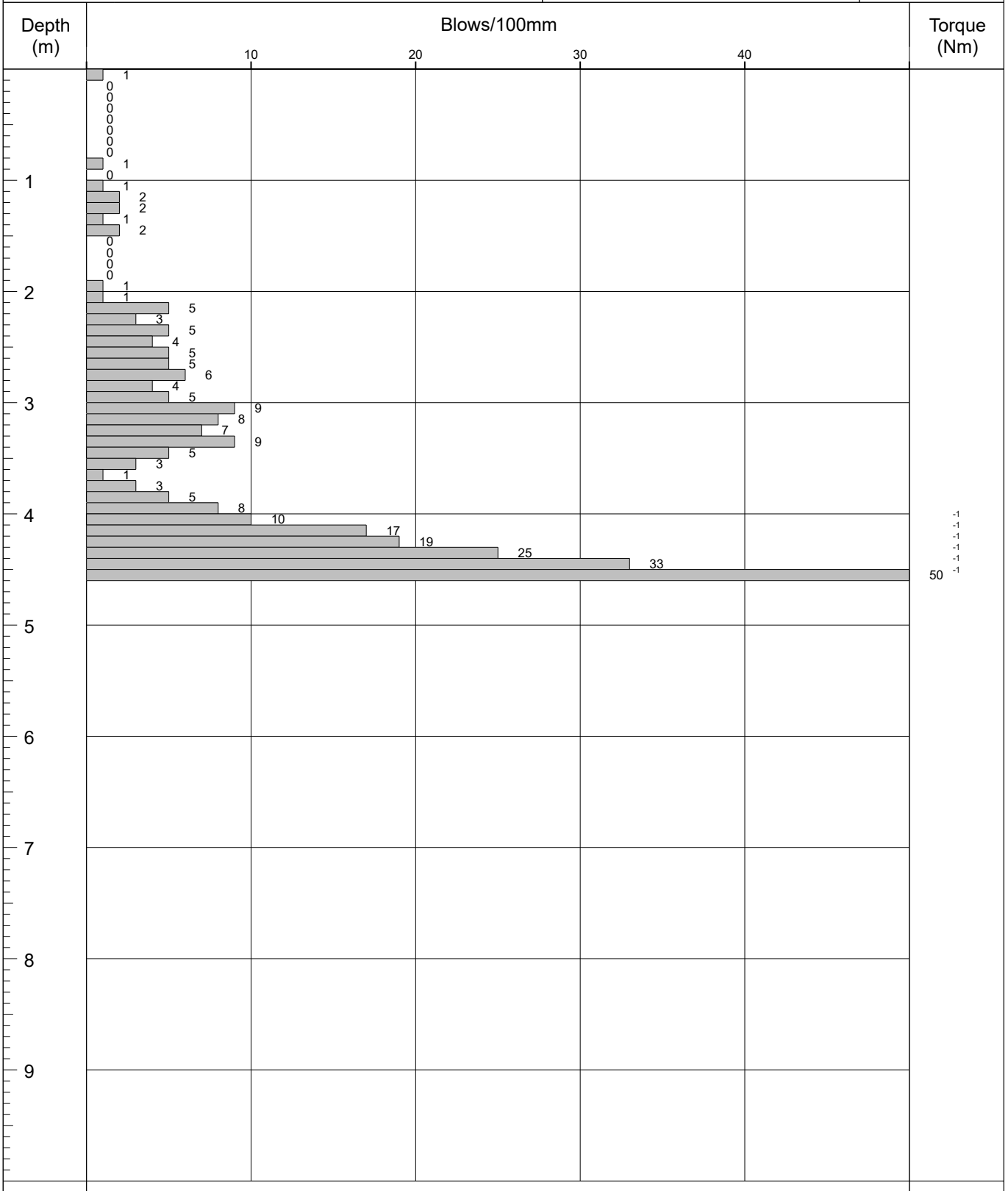
Level: 38.13

Scale:
1:50

Client's Rep: Bord Na Mona

Date: 22/02/2017

Operator:
JC



Remarks:
General; 4.60m

Fall Height 750

Cone Base Diameter 45

Hammer Wt 64

Final Depth 4.60

Probe Type DPSH-A





Probe Log

Probe No:
WOP-DP-19/17
Sheet 1 of 2

Project Name: West Offaly Power station and the Ash Disposal Facility

Project No.
16-1239

Co-ords: 597078.48 - 725035.30

Hole Type:
DP

Client: Bord Na Mona

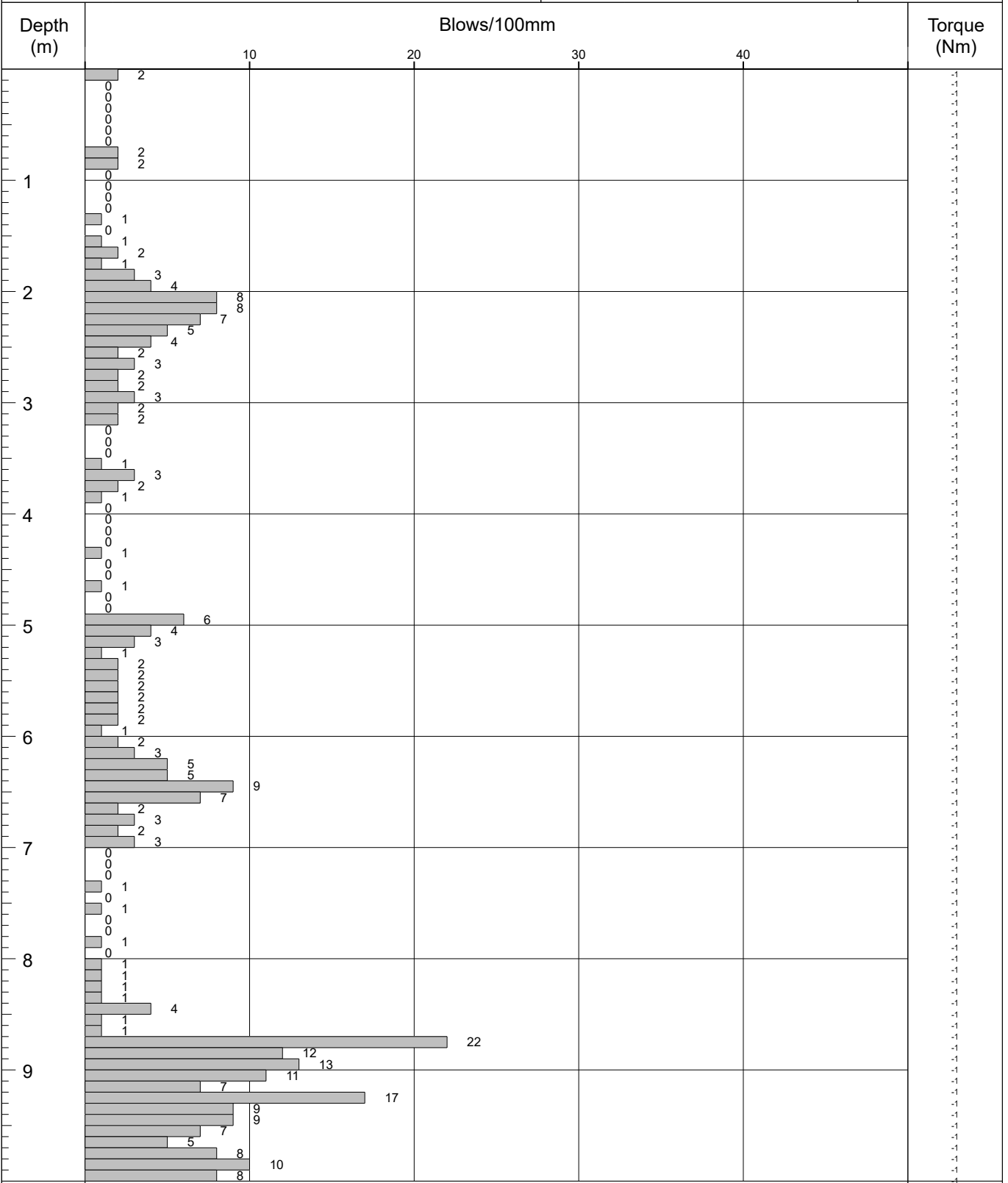
Level: 40.32

Scale:
1:50

Client's Rep: Bord Na Mona

Date: 21/02/2017

Operator:
JC



Remarks:
General; 10.40M

Fall Height 750

Cone Base Diameter 45

Hammer Wt 64

Final Depth 10.40

Probe Type DPSH-A





CAUSEWAY
GEOTECH

Probe Log

Probe No:
WOP-DP-19/17
Sheet 2 of 2

Project Name: West Offaly Power station and the Ash Disposal Facility

Project No.
16-1239

Co-ords: 597078.48 - 725035.30

Hole Type:
DP

Client: Bord Na Mona

Level: 40.32

Scale:
1:50

Client's Rep: Bord Na Mona

Date: 21/02/2017

Operator:
JC

Depth (m)	Blows/100mm				Torque (Nm)
	10	20	30	40	
10.40	15	19	27	45	-1 -1 -1
11					
12					
13					
14					
15					
16					
17					
18					
19					

Remarks:
General; 10.40M

Fall Height 750

Cone Base Diameter 45

Hammer Wt 64

Final Depth 10.40

Probe Type DPSH-A





CAUSEWAY
GEOTECH

Probe Log

Probe No:
WOP-DP-20/17
Sheet 1 of 1

Project Name: West Offaly Power station and the Ash Disposal Facility

Project No.
16-1239

Co-ords: 597104.27 - 725039.57

Hole Type:
DP

Client: Bord Na Mona

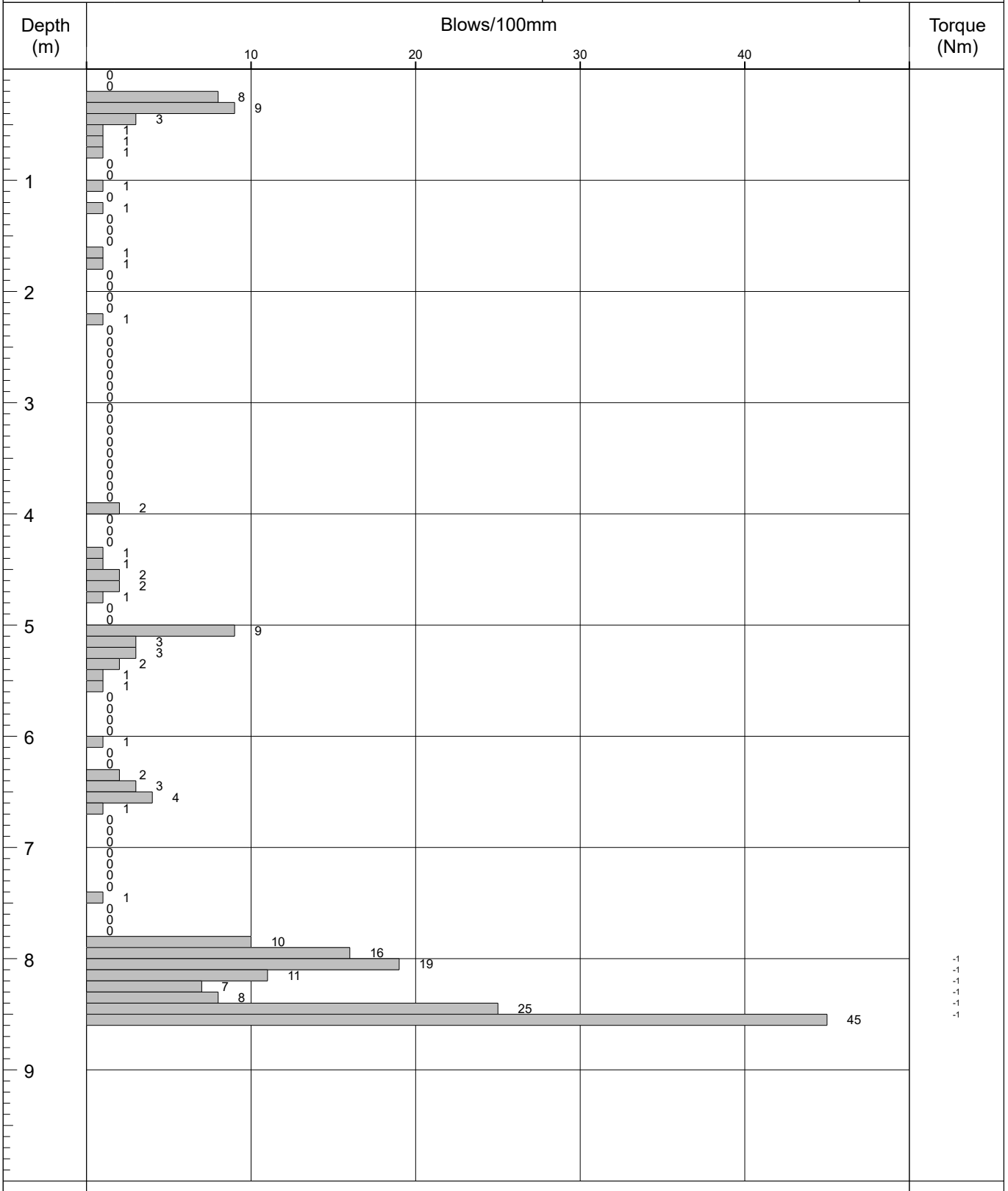
Level: 40.53

Scale:
1:50

Client's Rep: Bord Na Mona

Date: 21/02/2017

Operator:
JC



-1
-1
-1
-1
-1

Remarks:
General; 8.60M

Fall Height 750

Cone Base Diameter 45

Hammer Wt 64

Final Depth 8.60

Probe Type DPSH-A





CAUSEWAY
—
GEOTECH

Probe Log

Probe No:
WOP-DP-21/17
Sheet 1 of 1

Project Name: West Offaly Power station and the Ash Disposal Facility

Project No.
16-1239

Co-ords: 597062.66 - 725013.38

Hole Type:
DP

Client: Bord Na Mona

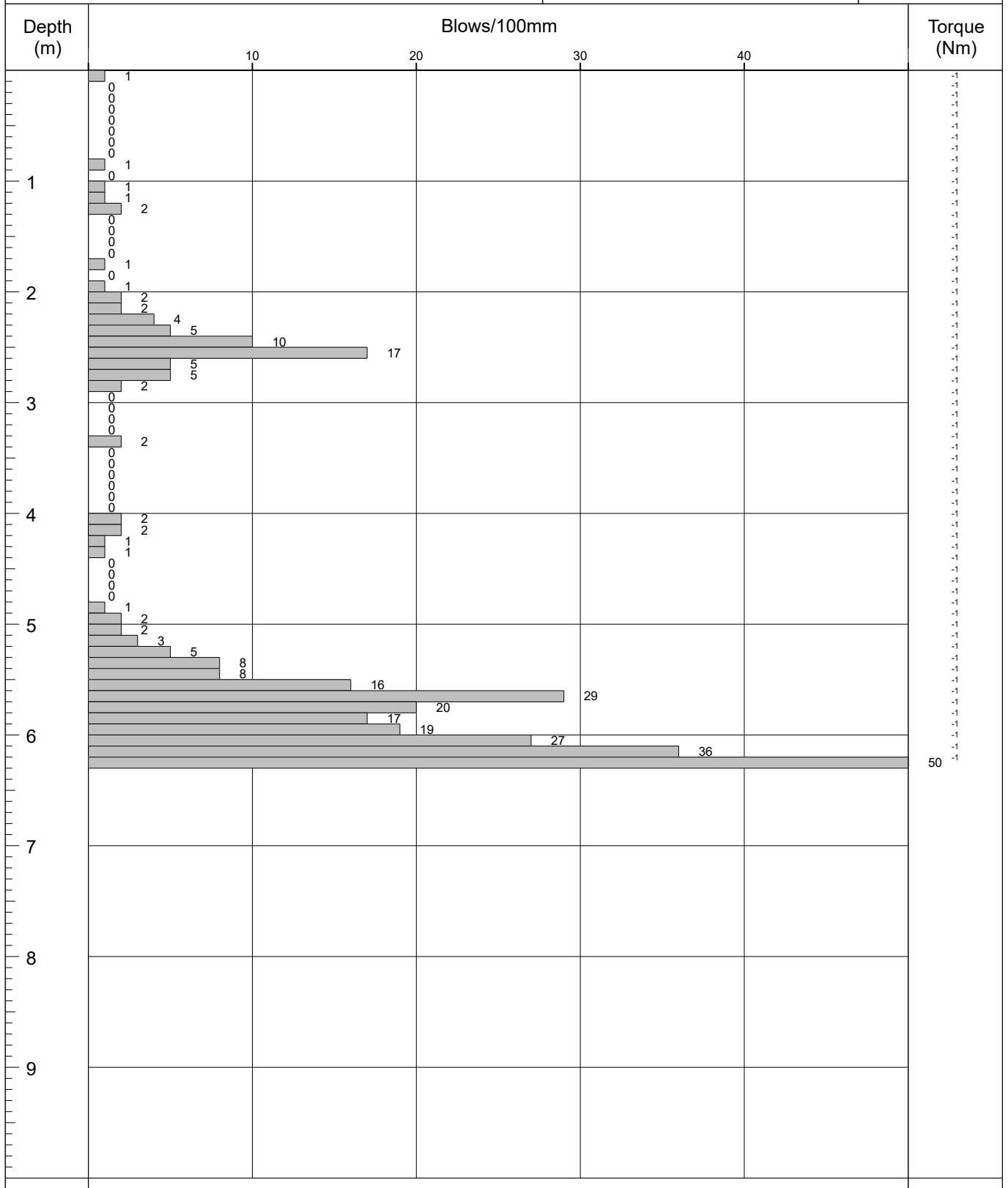
Level: 40.20

Scale:
1:50

Client's Rep: Bord Na Mona

Date: 21/02/2017

Operator:



Remarks:
General; 6.30M

Fall Height 750

Cone Base Diameter 45

Hammer Wt 64

Final Depth 6.30

Probe Type DPSH-A





Probe Log

Probe No:
WOP-DP-22/17
Sheet 1 of 2

Project Name: West Offaly Power station and the Ash Disposal Facility

Project No.
16-1239

Co-ords: 597107.77 - 725020.34

Hole Type:
DP

Client: Bord Na Mona

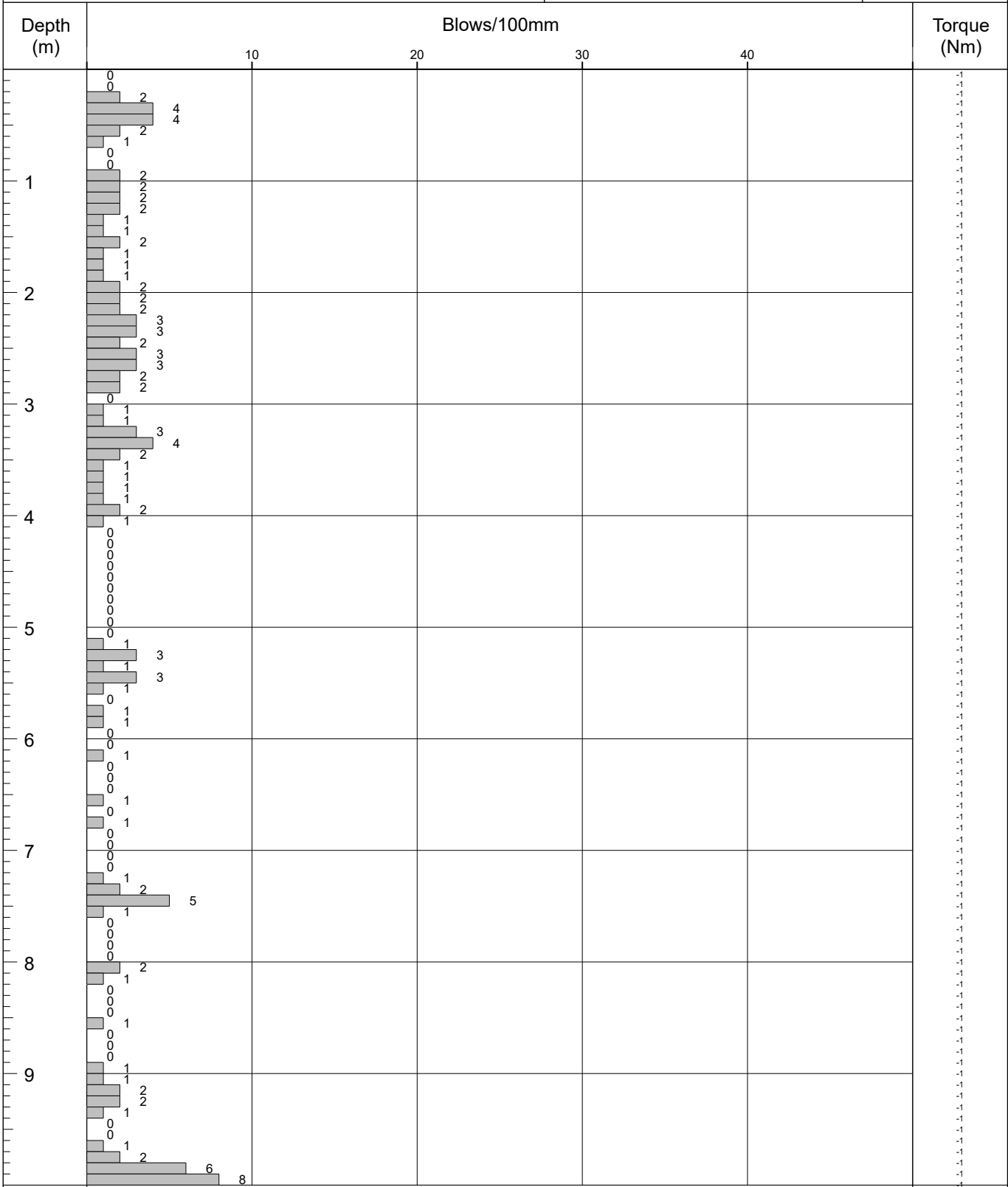
Level: 40.51

Scale:
1:50

Client's Rep: Bord Na Mona

Date: 21/02/2017

Operator:
JC



Remarks:
General; 10.30M

Fall Height 750
Hammer Wt 64
Probe Type DPSH-A

Cone Base Diameter 45
Final Depth 10.30





Probe Log

Probe No:
WOP-DP-22/17
Sheet 2 of 2

Project Name: West Offaly Power station and the Ash Disposal Facility

Project No.
16-1239

Co-ords: 597107.77 - 725020.34

Hole Type:
DP

Client: Bord Na Mona

Level: 40.51

Scale:
1:50

Client's Rep: Bord Na Mona

Date: 21/02/2017

Operator:
JC

Depth (m)	Blows/100mm				Torque (Nm)
	10	20	30	40	
	15	27	45		-1 -1
11					
12					
13					
14					
15					
16					
17					
18					
19					

Remarks:
General; 10.30M

Fall Height 750

Cone Base Diameter 45

Hammer Wt 64

Final Depth 10.30

Probe Type DPSH-A





Probe Log

Probe No:
WOP-DP-23/17
Sheet 1 of 2

Project Name: West Offaly Power station and the Ash Disposal Facility

Project No.
16-1239

Co-ords: 597119.86 - 725019.00

Hole Type:
DP

Client: Bord Na Mona

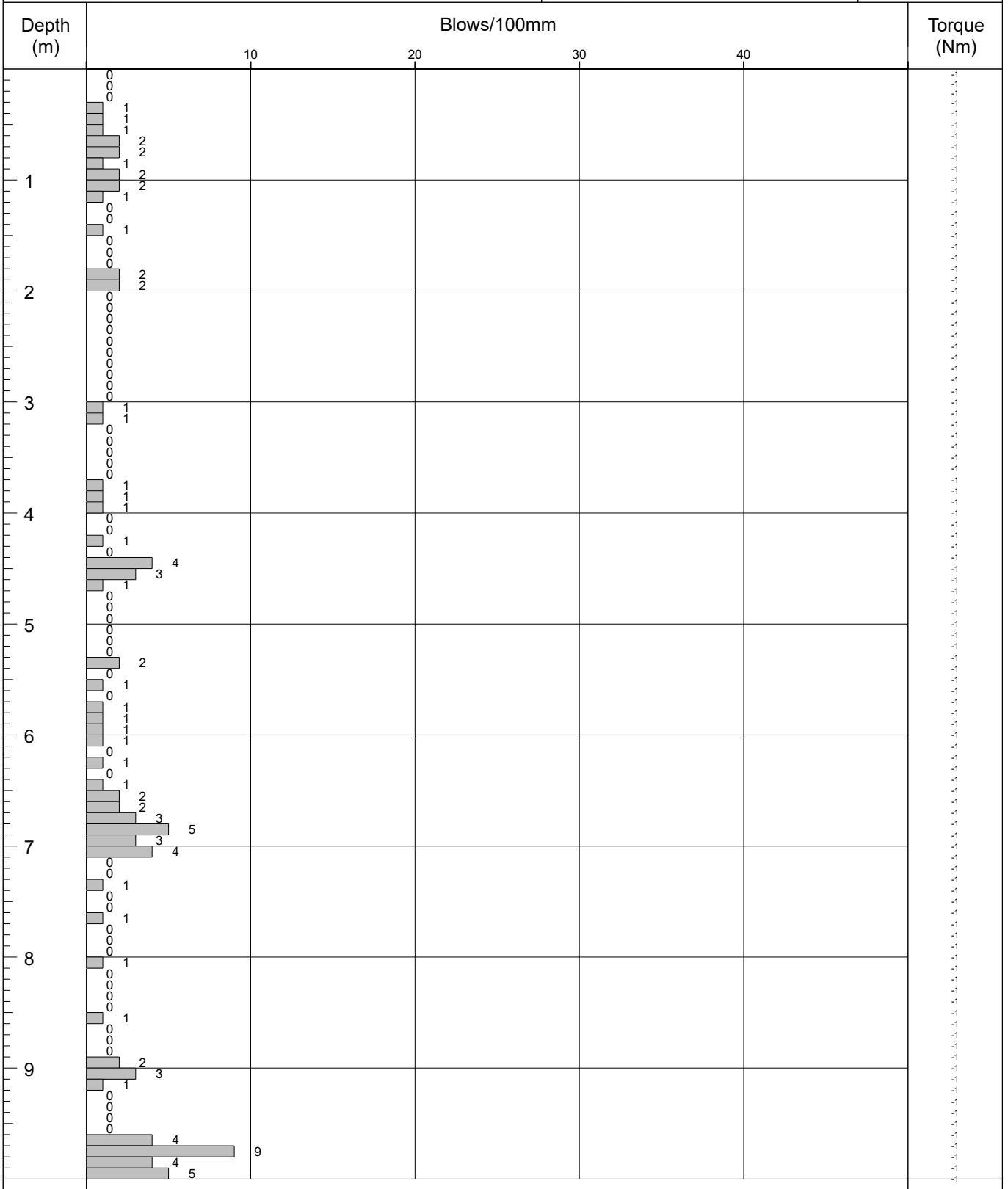
Level: 40.65

Scale:
1:50

Client's Rep: Bord Na Mona

Date: 21/02/2017

Operator:
JC



Remarks:
General; 11.00m

Fall Height 750

Cone Base Diameter 45

Hammer Wt 64

Final Depth 11.00

Probe Type DPSH-A





CAUSEWAY
GEOTECH

Probe Log

Probe No:
WOP-DP-23/17
Sheet 2 of 2

Project Name: West Offaly Power station and the Ash Disposal Facility

Project No.
16-1239

Co-ords: 597119.86 - 725019.00

Hole Type:
DP

Client: Bord Na Mona

Level: 40.65

Scale:
1:50

Client's Rep: Bord Na Mona

Date: 21/02/2017

Operator:
JC

Depth (m)	Blows/100mm				Torque (Nm)
	0-10	10-20	20-30	30-40	
10.0	4				-1
10.1	3				-1
10.2	4				-1
10.3	3				-1
10.4	4				-1
10.5	7				-1
10.6	3				-1
10.7	10				-1
10.8	25				-1
11.0	50				-1
12.0					
13.0					
14.0					
15.0					
16.0					
17.0					
18.0					
19.0					

Remarks:
General; 11.00m

Fall Height 750

Cone Base Diameter 45

Hammer Wt 64

Final Depth 11.00

Probe Type DPSH-A





Probe Log

Probe No:
WOP-DP-24/17
Sheet 1 of 2

Project Name: West Offaly Power station and the Ash Disposal Facility

Project No.
16-1239

Co-ords: 597131.96 - 725019.23

Hole Type:
DP

Client: Bord Na Mona

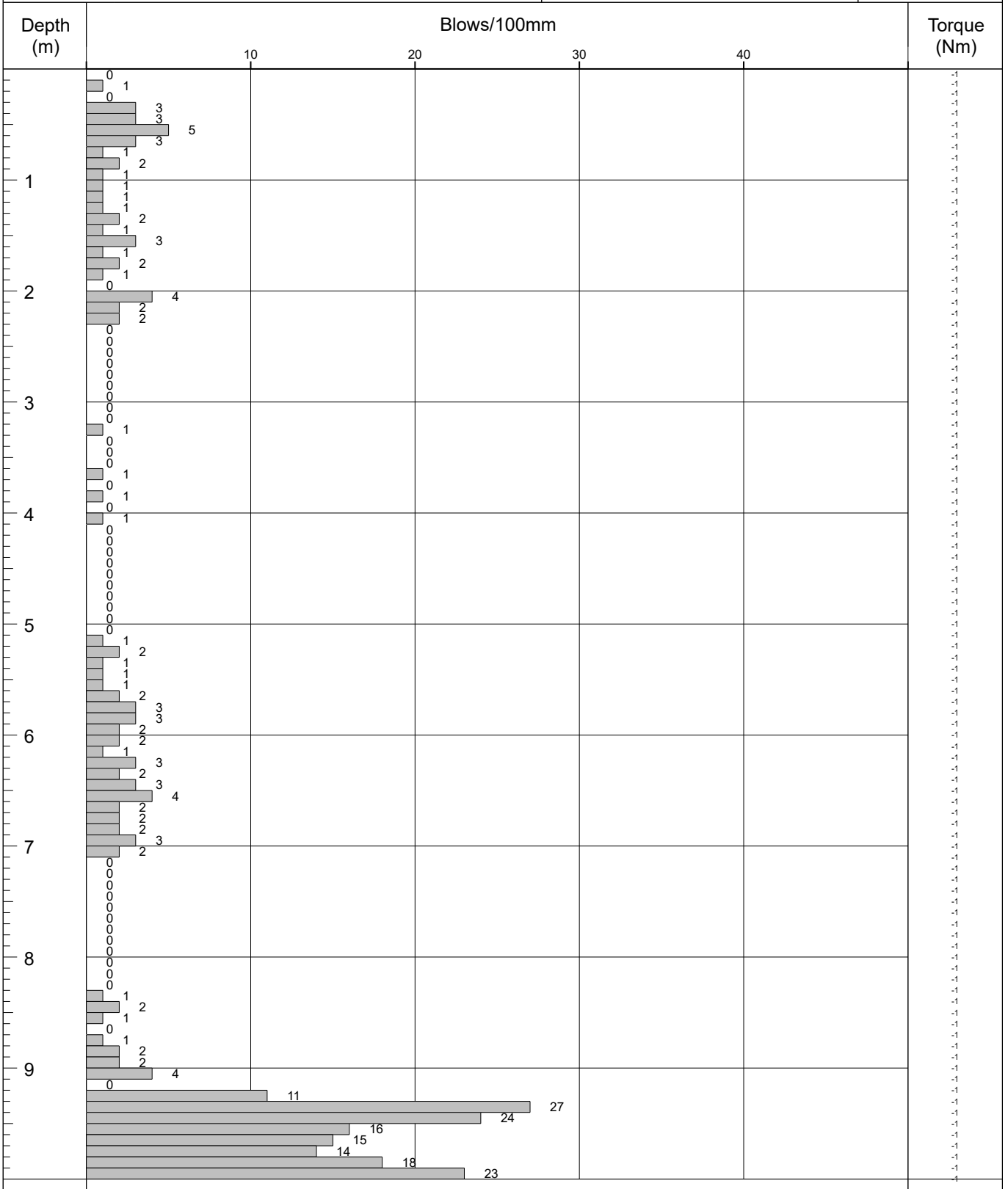
Level: 40.78

Scale:
1:50

Client's Rep: Bord Na Mona

Date: 21/02/2017

Operator:
JC



Remarks:
General; 10.10m

Fall Height 750

Cone Base Diameter 45

Hammer Wt 64

Final Depth 10.10

Probe Type DPSH-A





Probe Log

Probe No:
WOP-DP-24/17
Sheet 2 of 2

Project Name: West Offaly Power station and the Ash Disposal Facility

Project No.
16-1239

Co-ords: 597131.96 - 725019.23

Hole Type:
DP

Client: Bord Na Mona

Level: 40.78

Scale:
1:50

Client's Rep: Bord Na Mona

Date: 21/02/2017

Operator:
JC

Depth (m)	Blows/100mm				Torque (Nm)
	10	20	30	40	
11					50
12					
13					
14					
15					
16					
17					
18					
19					

Remarks:
General; 10.10m

Fall Height 750

Cone Base Diameter 45

Hammer Wt 64

Final Depth 10.10

Probe Type DPSH-A





Probe Log

Probe No:
WOP-DP-25/17
Sheet 1 of 1

Project Name: West Offaly Power station and the Ash Disposal Facility

Project No.
16-1239

Co-ords: 597158.12 - 725024.33

Hole Type:
DP

Client: Bord Na Mona

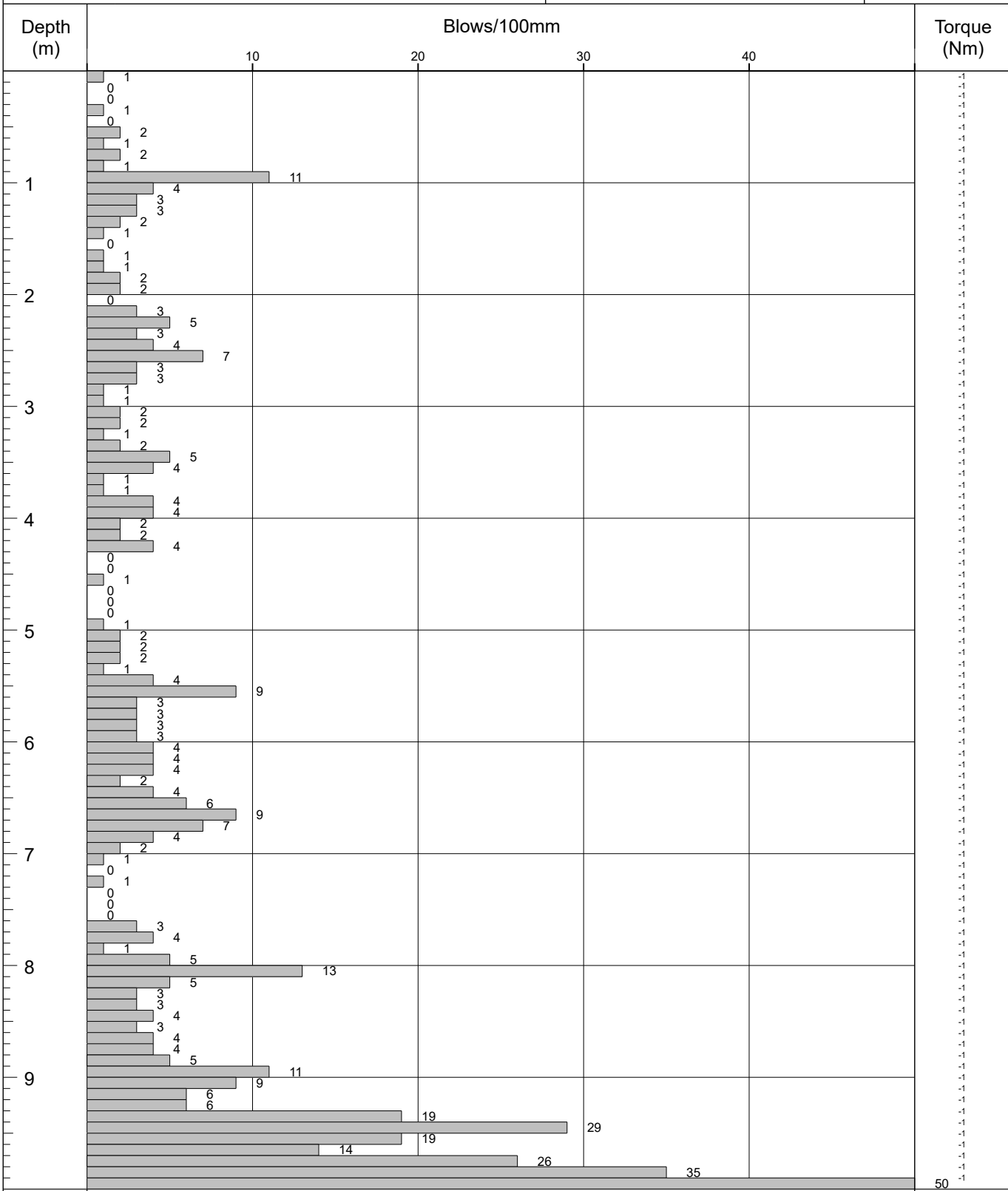
Level: 41.08

Scale:
1:50

Client's Rep: Bord Na Mona

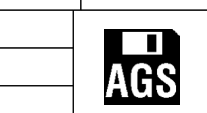
Date: 21/02/2017

Operator:
JC



Remarks:
General; 10.00M

Fall Height	750	Cone Base Diameter	45
Hammer Wt	64	Final Depth	10.00
Probe Type	DPSH-A		





CAUSEWAY
GEOTECH

Probe Log

Probe No:
WOP-DP-26/17
Sheet 1 of 1

Project Name: West Offaly Power station and the Ash Disposal Facility

Project No.
16-1239

Co-ords: 597179.11 - 725027.59

Hole Type:
DP

Client: Bord Na Mona

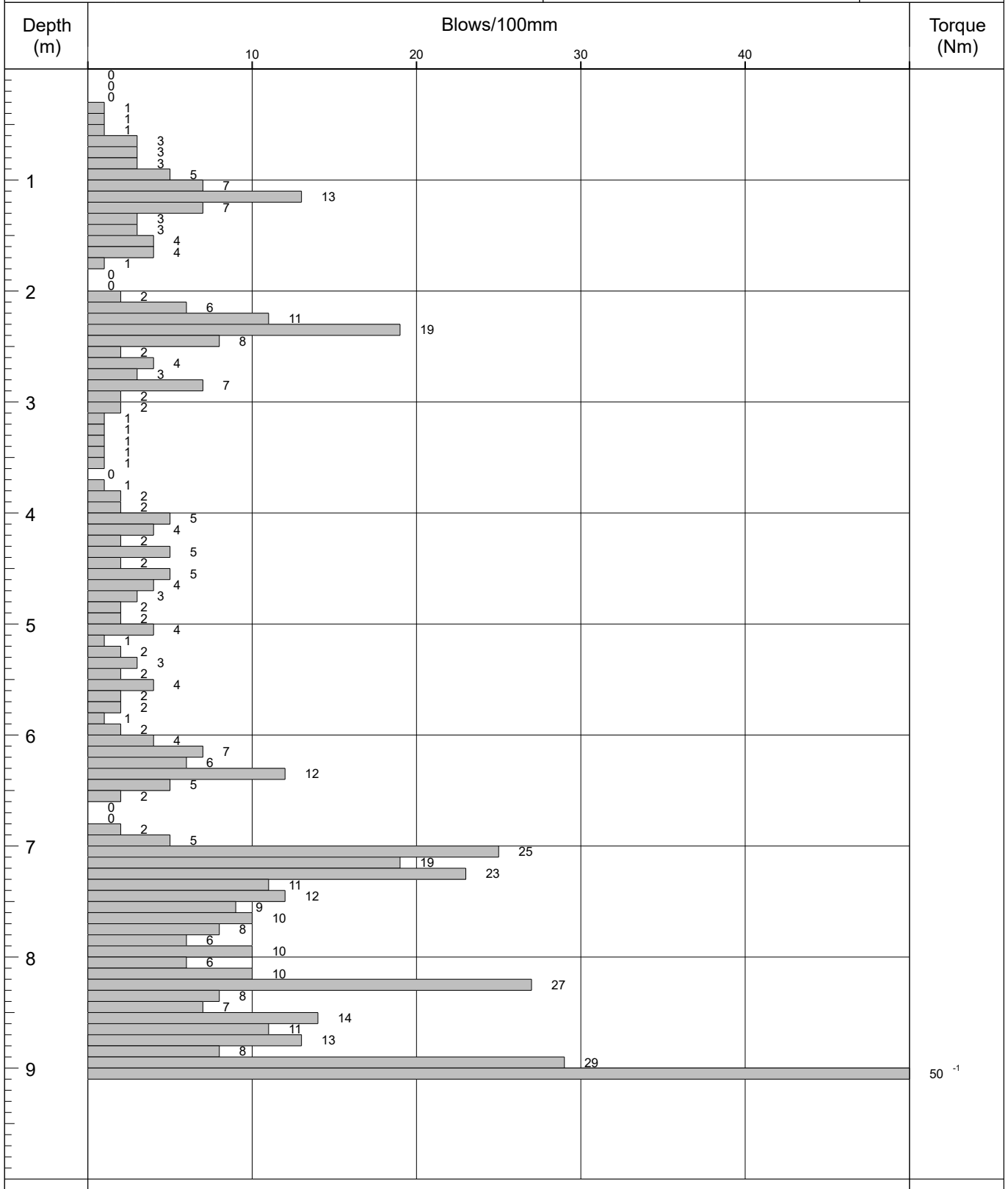
Level: 40.79

Scale:
1:50

Client's Rep: Bord Na Mona

Date: 20/02/2017

Operator:
JC



Remarks:
General; 9.10M

Fall Height 750

Cone Base Diameter 45

Hammer Wt 64

Final Depth 9.10

Probe Type DPSH-A





Probe Log

Probe No:
WOP-DP-27/17
Sheet 1 of 1

Project Name: West Offaly Power station and the Ash Disposal Facility

Project No.
16-1239

Co-ords: 597184.78 - 725001.26

Hole Type:
DP

Client: Bord Na Mona

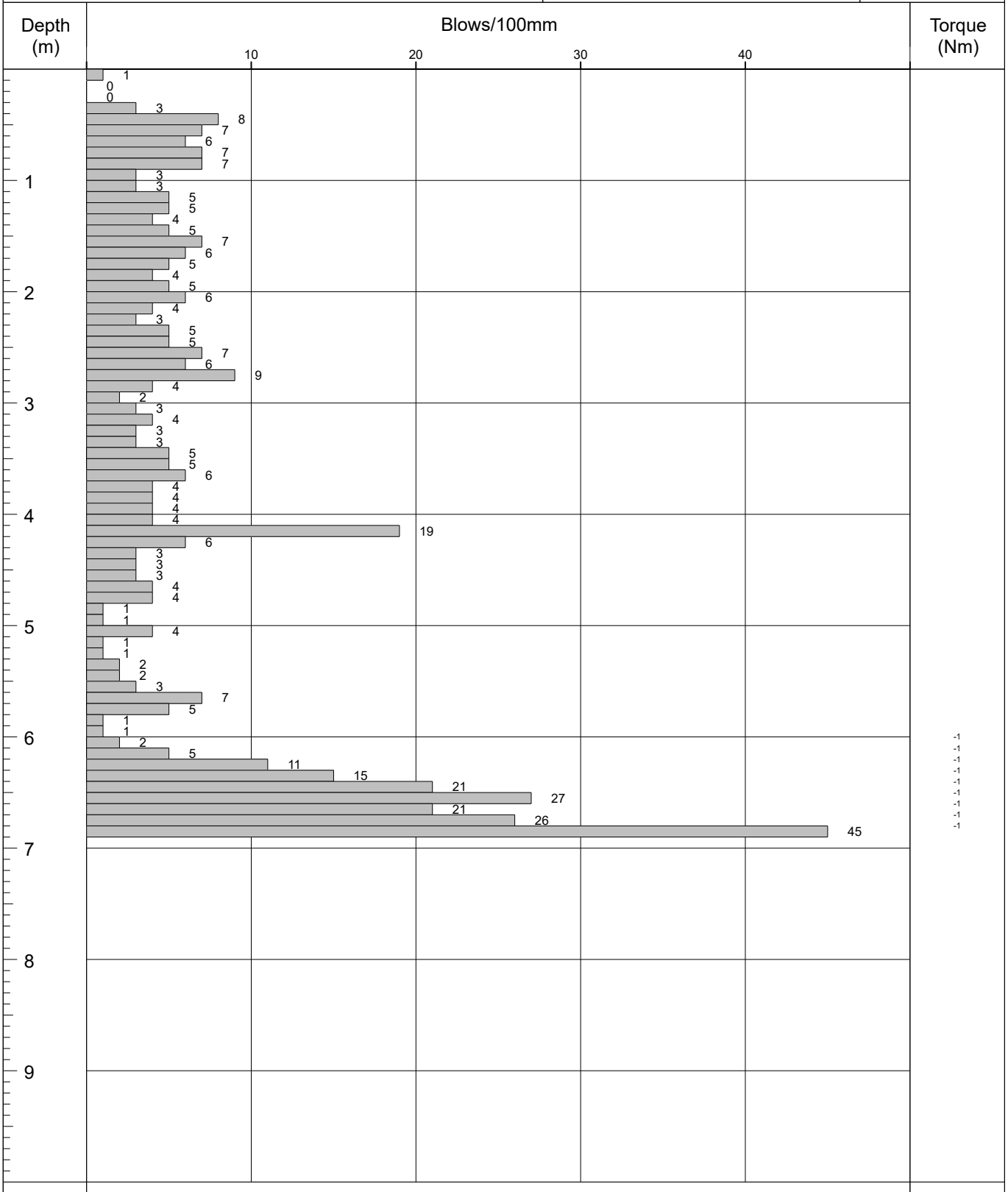
Level: 40.33

Scale:
1:50

Client's Rep: Bord Na Mona

Date: 20/02/2017

Operator:
JC



-1
-1
-1
-1
-1
-1
-1
-1

Remarks:
General; 6.9

Fall Height 750

Cone Base Diameter 45

Hammer Wt 64

Final Depth 6.90

Probe Type DPSH-A





CAUSEWAY
— GEOTECH

APPENDIX E
WOA probe logs





CAUSEWAY
GEOTECH

Probe Log

Probe No:
WOA-DP-01/17
Sheet 1 of 1

Project Name: West Offaly Power station and the Ash Disposal Facility

Project No.
16-1239

Co-ords: 602819.99 - 727355.38

Hole Type:
DP

Client: Bord Na Mona

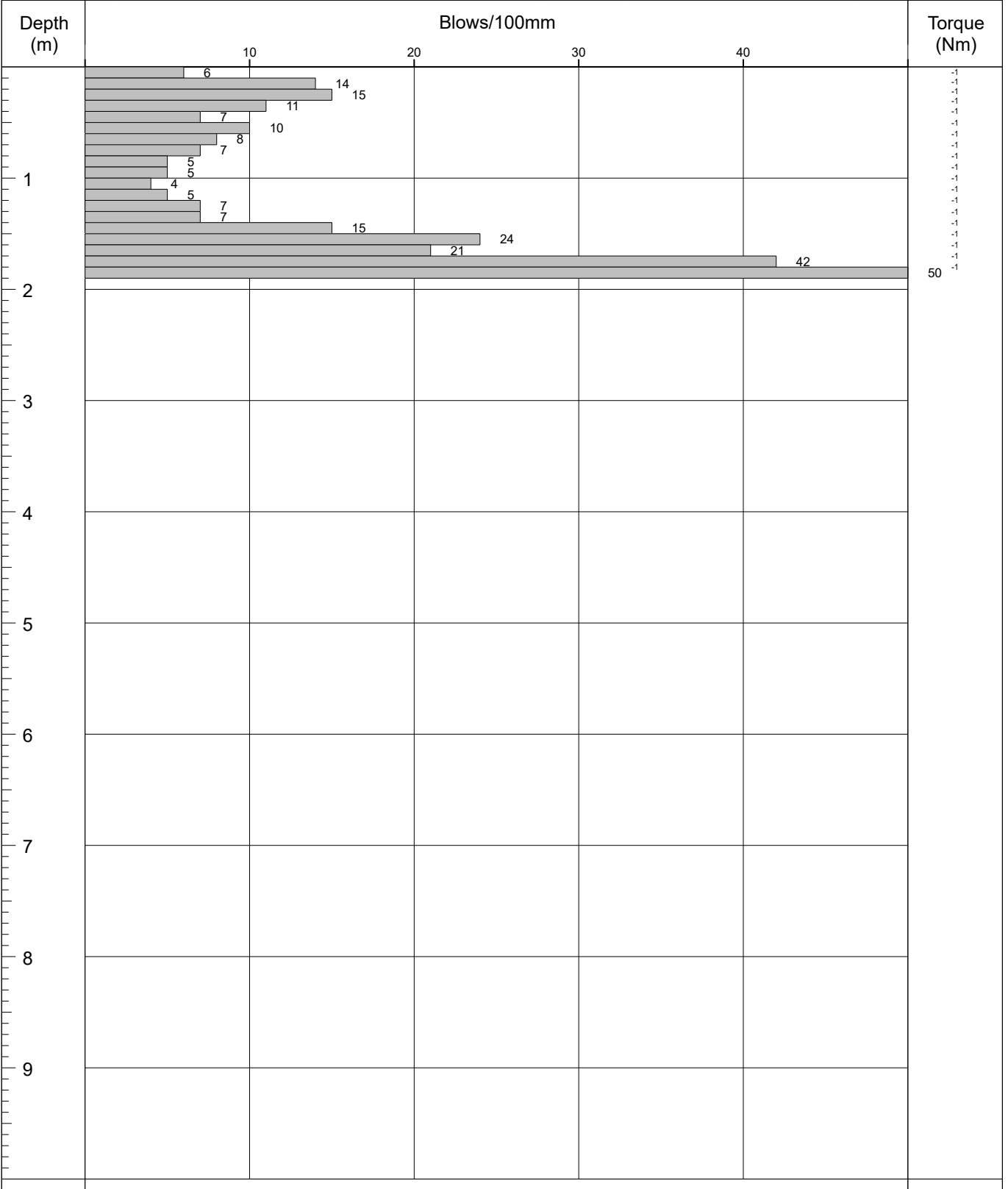
Level: 37.71

Scale:
1:50

Client's Rep: Bord Na Mona

Date: 14/02/2017

Operator:
JC



Remarks:

Fall Height 750

Cone Base Diameter 45

Hammer Wt 64

Final Depth 0.00

Probe Type DPSH-A





Probe Log

Probe No:
WOA-DP-02/17
Sheet 1 of 1

Project Name: West Offaly Power station and the Ash Disposal Facility

Project No.
16-1239

Co-ords: 602487.93 - 727326.48

Hole Type:
DP

Client: Bord Na Mona

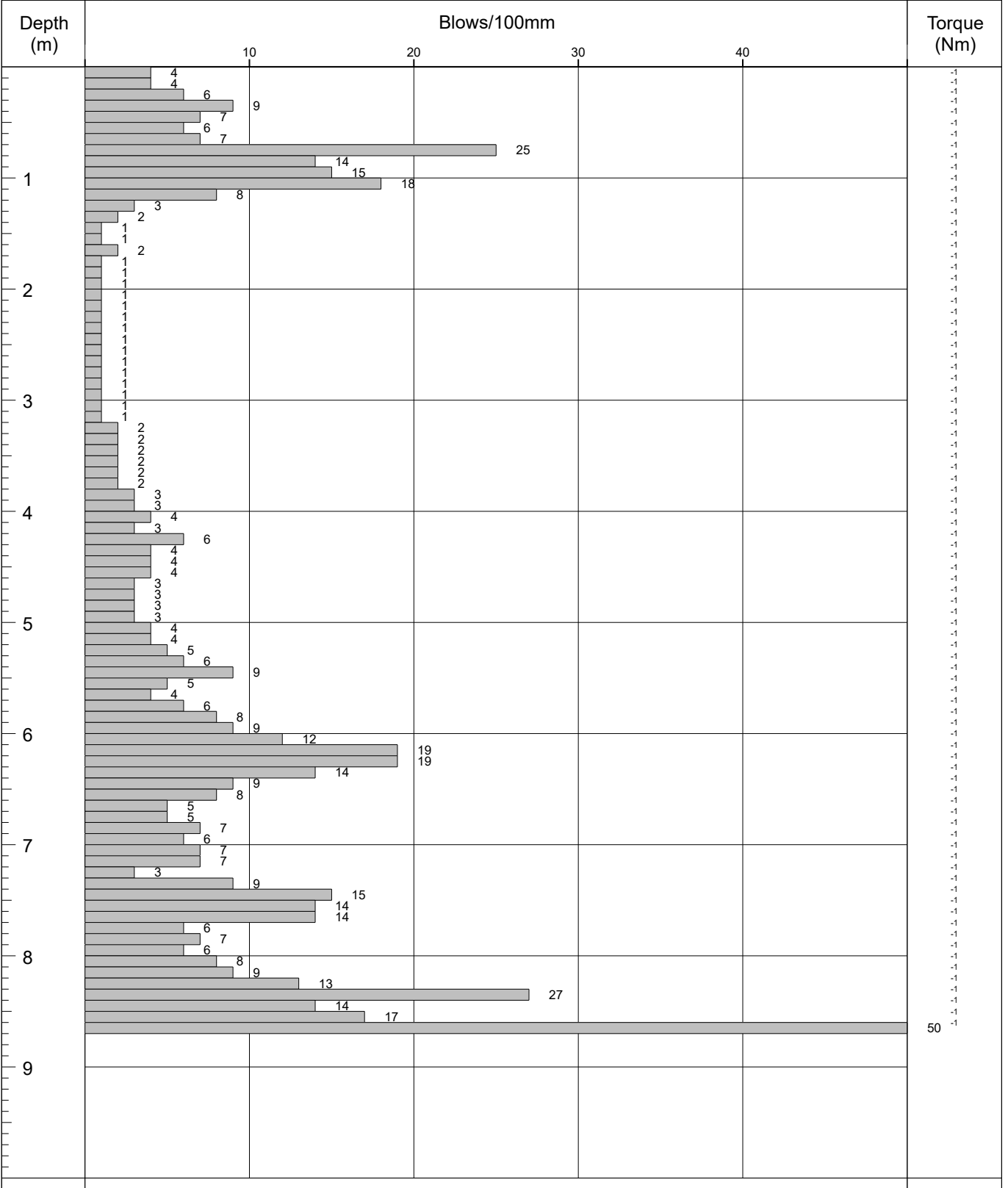
Level: 39.19

Scale:
1:50

Client's Rep: Bord Na Mona

Date: 14/02/2017

Operator:
JC



Remarks:

Fall Height 750
Hammer Wt 64
Probe Type DPSH-A

Cone Base Diameter 45
Final Depth 0.00





Probe Log

Probe No:
WOA-DP-03/17
Sheet 1 of 1

Project Name: West Offaly Power station and the Ash Disposal Facility

Project No.
16-1239

Co-ords: 602729.67 - 727301.69

Hole Type:
DP

Client: Bord Na Mona

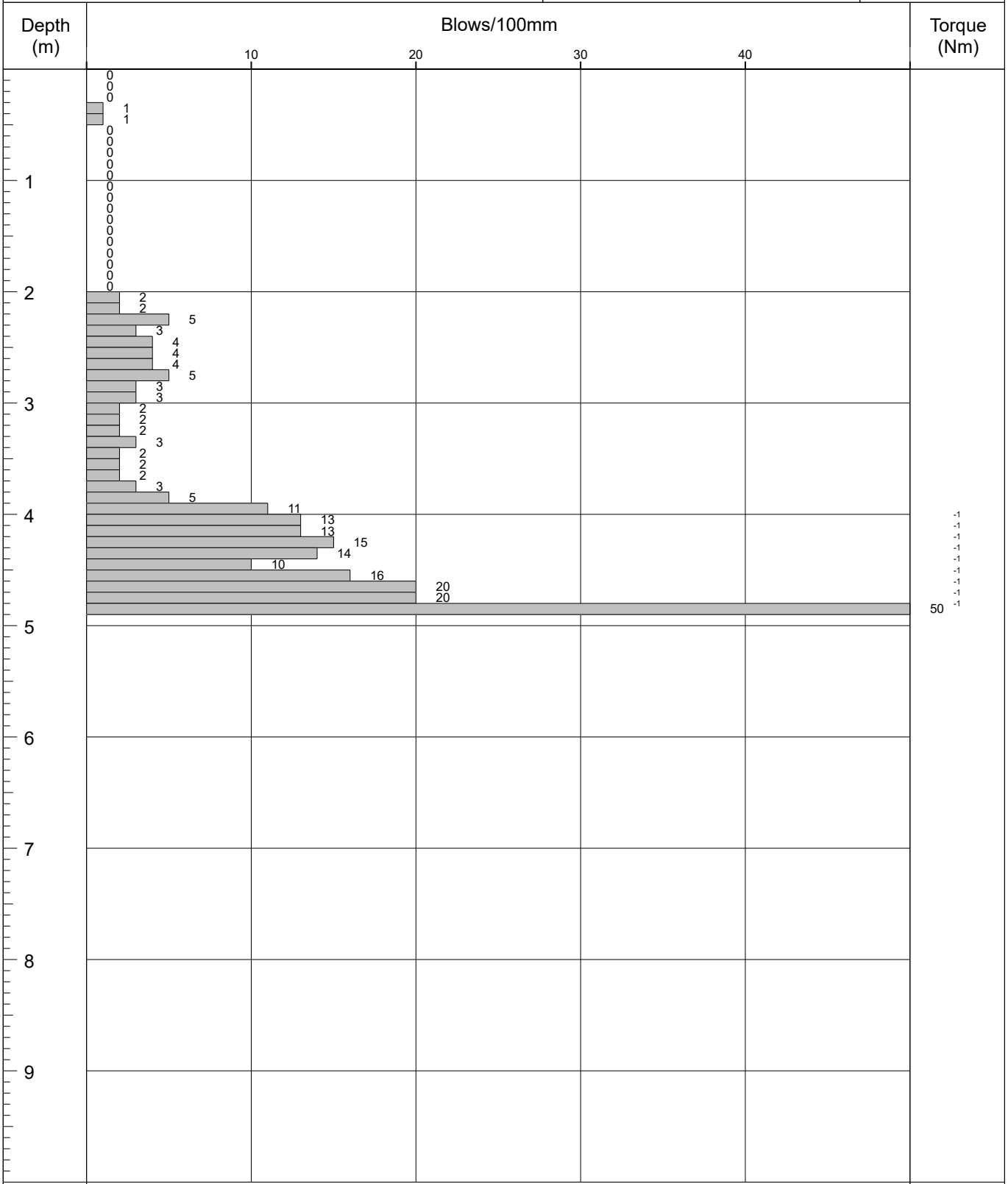
Level: 37.06

Scale:
1:50

Client's Rep: Bord Na Mona

Date: 15/02/2017

Operator:
JC



Remarks:

Fall Height	750	Cone Base Diameter	45
Hammer Wt	64	Final Depth	4.90
Probe Type	DPSH-A		





CAUSEWAY
GEOTECH

Probe Log

Probe No:
WOA-DP-04/17
Sheet 1 of 1

Project Name: West Offaly Power station and the Ash Disposal Facility

Project No.
16-1239

Co-ords: 602392.49 - 727231.68

Hole Type:
DP

Client: Bord Na Mona

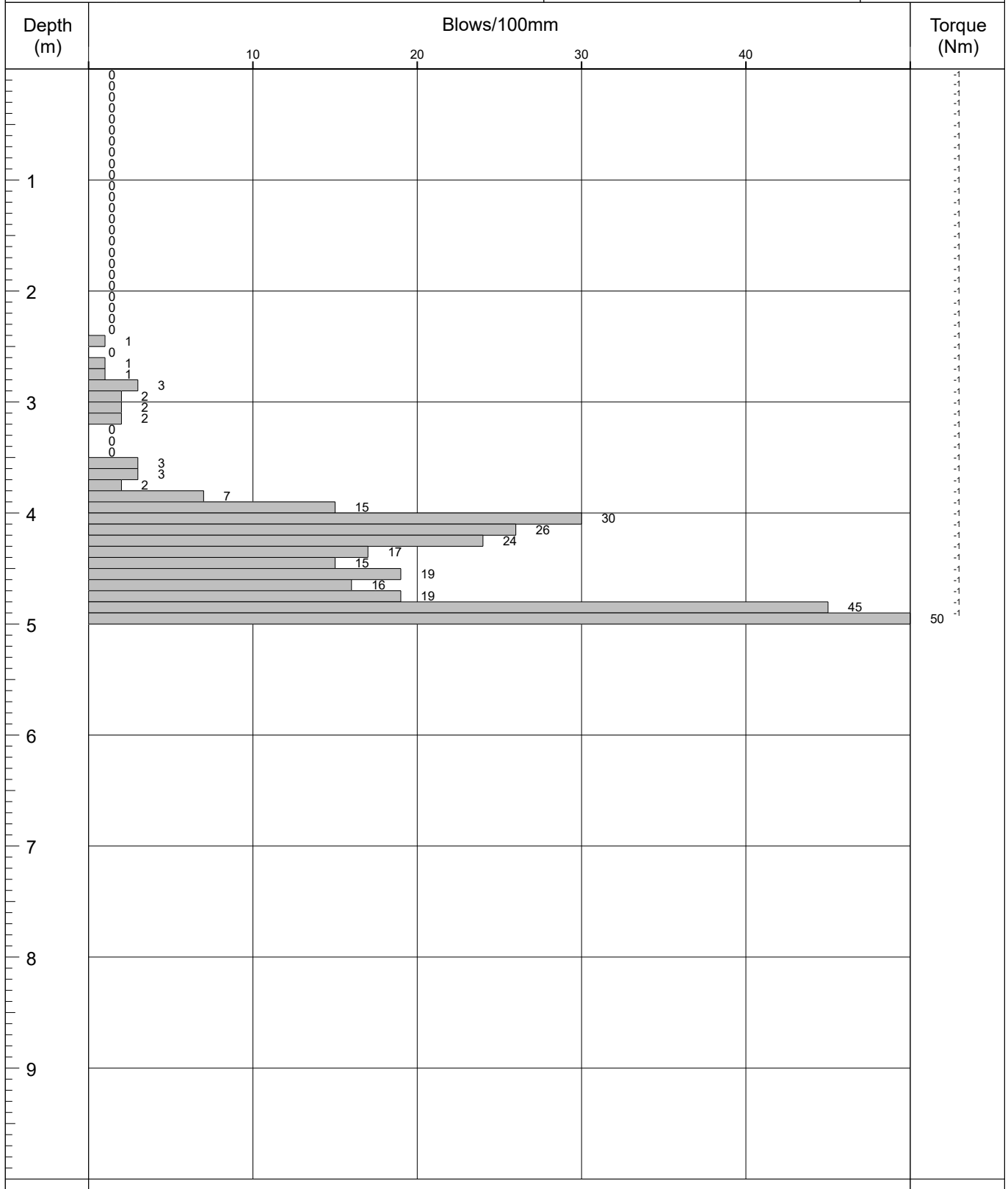
Level: 37.93

Scale:
1:50

Client's Rep: Bord Na Mona

Date: 14/02/2017

Operator:
JC



Remarks:

Fall Height 750

Cone Base Diameter 45

Hammer Wt 64

Final Depth 0.00

Probe Type DPSH-A





Probe Log

Probe No:
WOA-DP-05/17
Sheet 1 of 1

Project Name: West Offaly Power station and the Ash Disposal Facility

Project No.
16-1239

Co-ords: 602593.67 - 727129.02

Hole Type:
DP

Client: Bord Na Mona

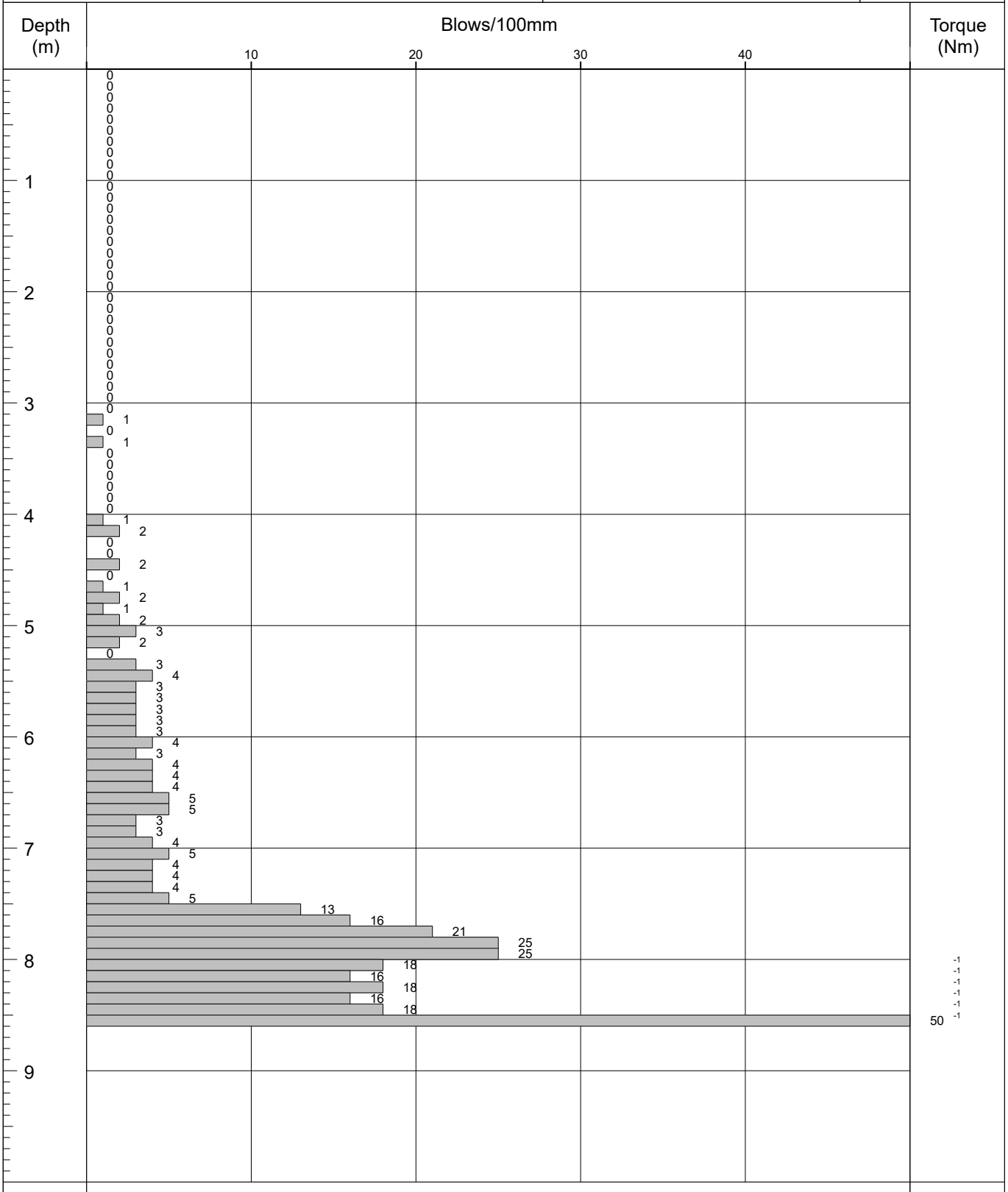
Level: 37.44

Scale:
1:50

Client's Rep: Bord Na Mona

Date: 15/02/2017

Operator:
JC



Remarks:

Fall Height 750

Cone Base Diameter 45

Hammer Wt 64

Final Depth 8.60

Probe Type DPSH-A





CAUSEWAY
GEOTECH

Probe Log

Probe No:
WOA-DP-06/17
Sheet 1 of 1

Project Name: West Offaly Power station and the Ash Disposal Facility

Project No.
16-1239

Co-ords: 602672.88 - 727215.32

Hole Type:
DP

Client: Bord Na Mona

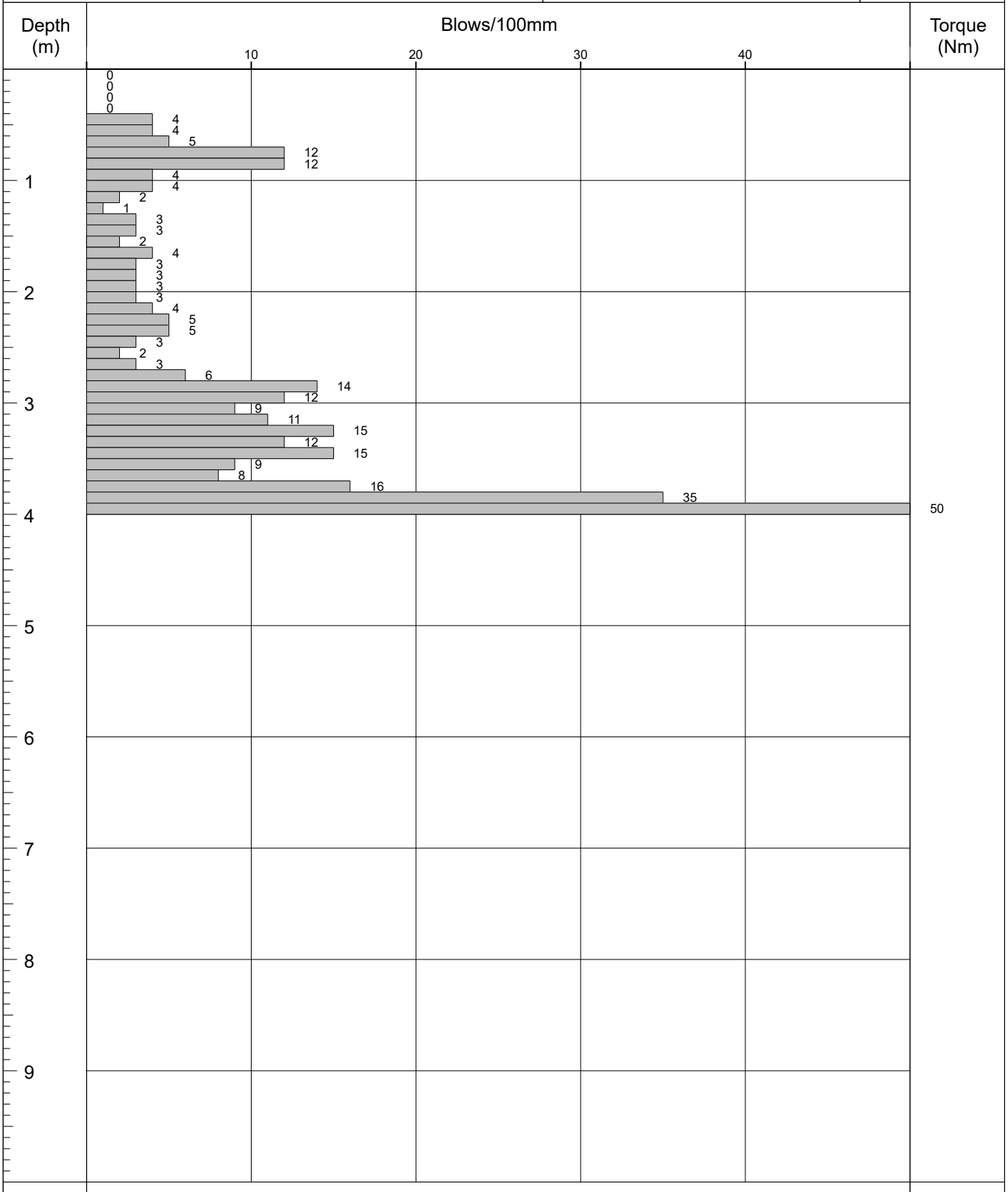
Level: 37.39

Scale:
1:50

Client's Rep: Bord Na Mona

Date: 15/02/2017

Operator:
JC



Remarks:

Fall Height 750

Cone Base Diameter 45

Hammer Wt 64

Final Depth 4.00

Probe Type DPSH-A





CAUSEWAY
GEOTECH

Probe Log

Probe No:
WOA-DP-07/17
Sheet 1 of 1

Project Name: West Offaly Power station and the Ash Disposal Facility

Project No.
16-1239

Co-ords: 602752.56 - 727218.39

Hole Type:
DP

Client: Bord Na Mona

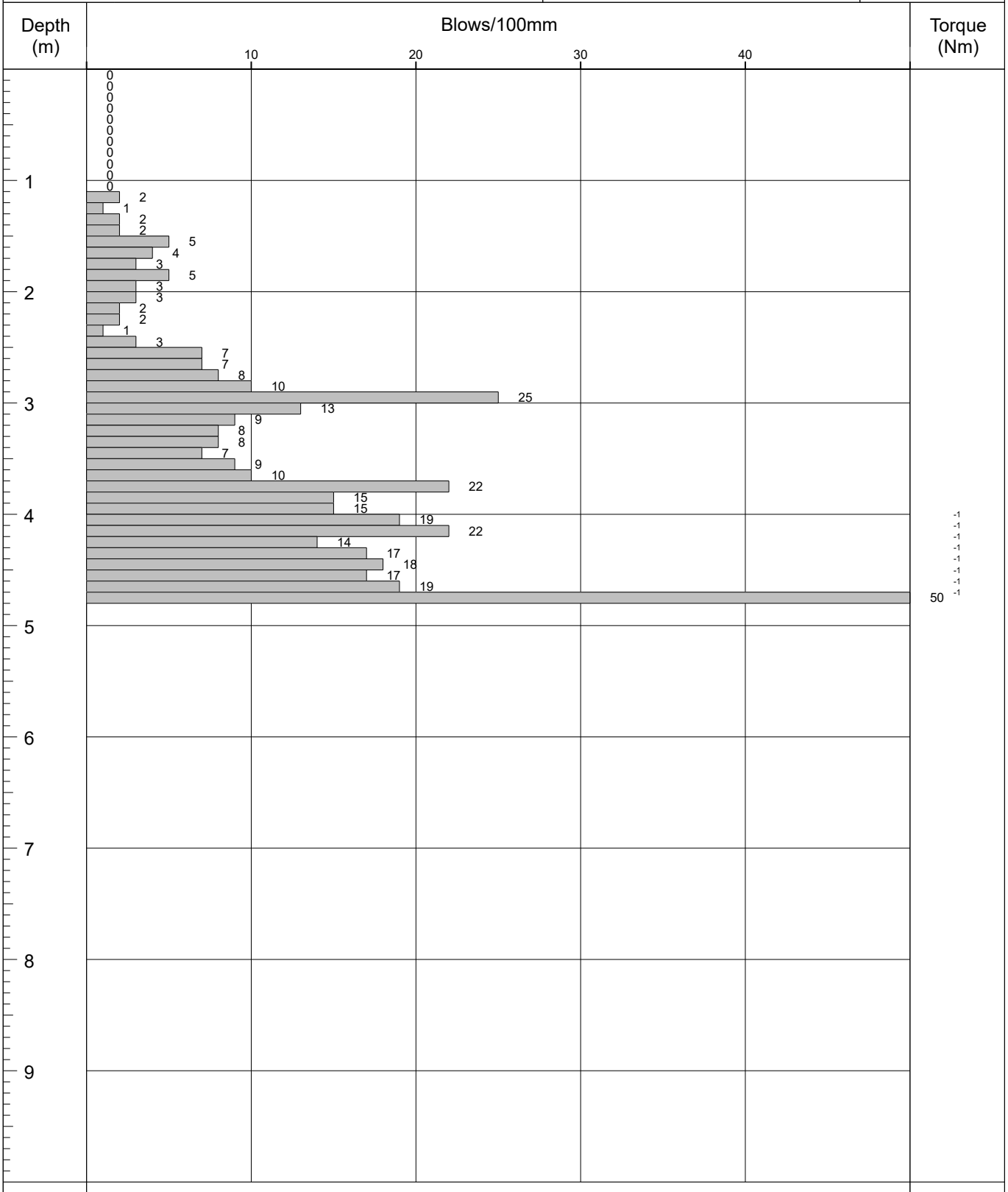
Level: 38.28

Scale:
1:50

Client's Rep: Bord Na Mona

Date: 15/02/2017

Operator:
JC



Remarks:

Fall Height 750
Hammer Wt 64
Probe Type DPSH-A

Cone Base Diameter 45
Final Depth 4.80





Probe Log

Probe No:
WOA-DP-08/17
Sheet 1 of 1

Project Name: West Offaly Power station and the Ash Disposal Facility

Project No.
16-1239

Co-ords: 602797.80 - 727228.77

Hole Type:
DP

Client: Bord Na Mona

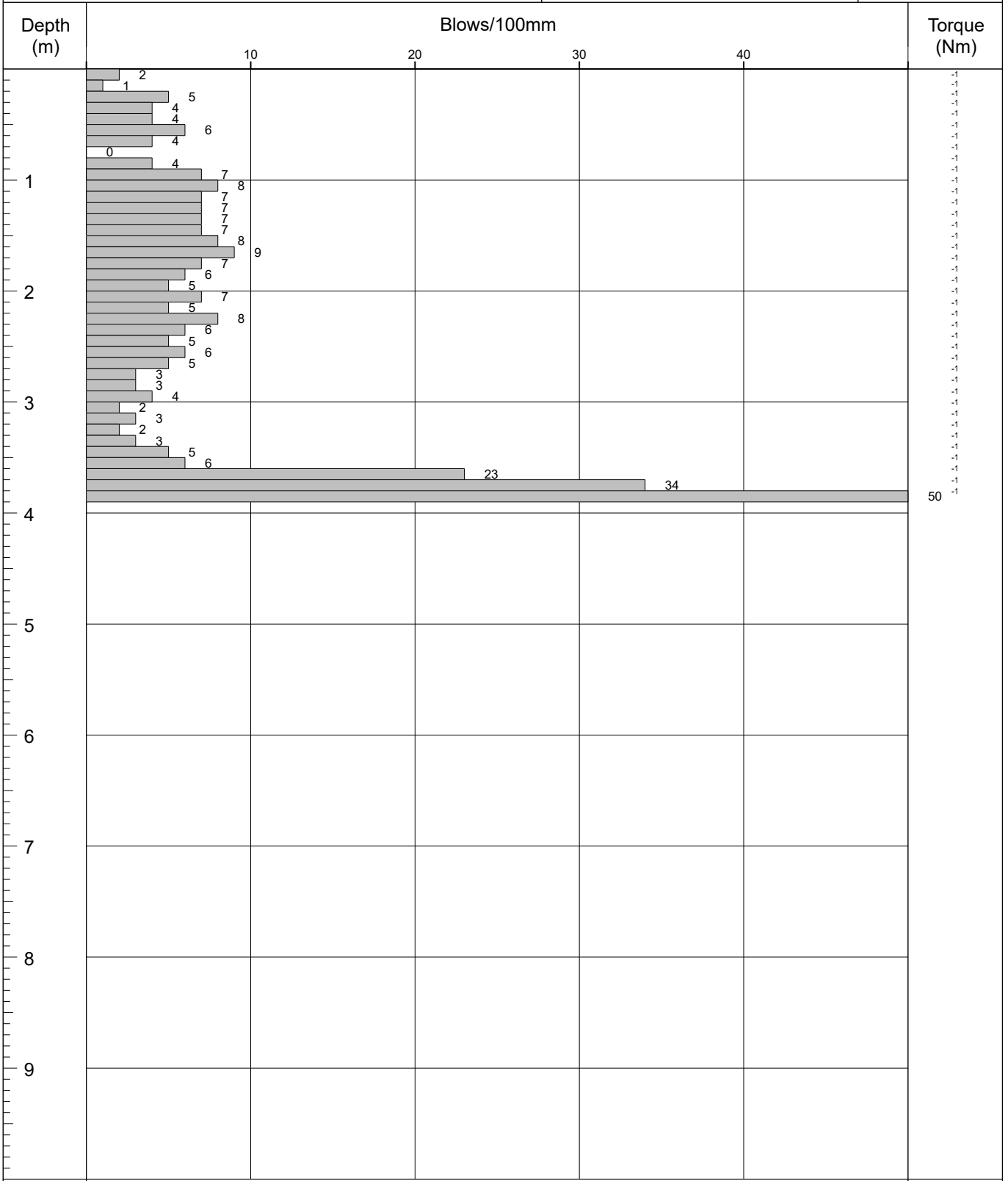
Level: 38.40

Scale:
1:50

Client's Rep: Bord Na Mona

Date: 16/02/2017

Operator:
JC



Remarks:
General; 3.90m

Fall Height 750

Cone Base Diameter 45

Hammer Wt 64

Final Depth 3.90

Probe Type DPSH-A





CAUSEWAY
GEOTECH

Probe Log

Probe No:
WOA-DP-09/17
Sheet 1 of 1

Project Name: West Offaly Power station and the Ash Disposal Facility

Project No.
16-1239

Co-ords: 602955.99 - 727212.52

Hole Type:
DP

Client: Bord Na Mona

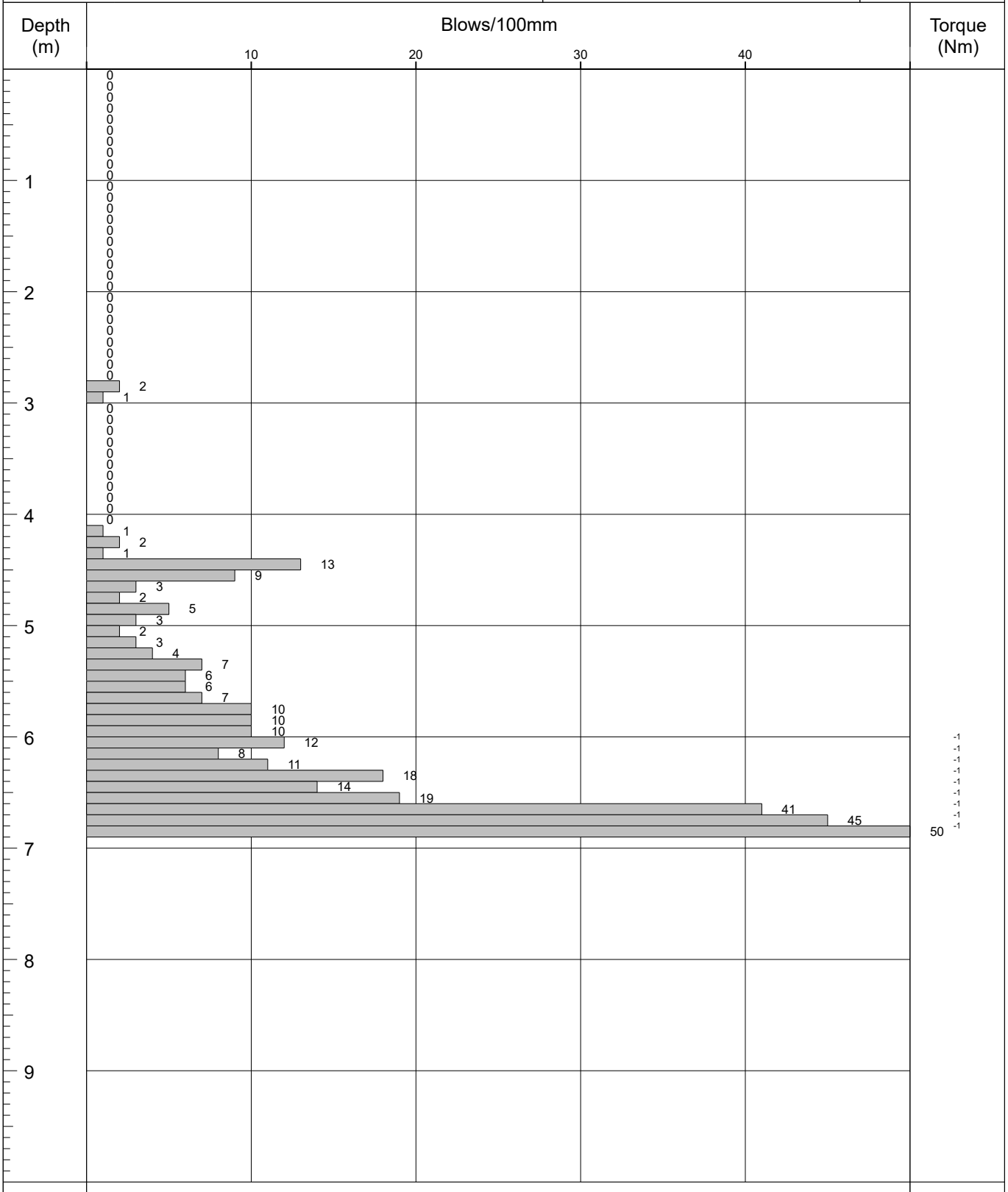
Level: 39.45

Scale:
1:50

Client's Rep: Bord Na Mona

Date: 15/02/2017

Operator:
JC



Remarks:

Fall Height 750
Hammer Wt 64
Probe Type DPSH-A

Cone Base Diameter 45
Final Depth 6.90





Probe Log

Probe No:
WOA-DP-10/17
Sheet 1 of 1

Project Name: West Offaly Power station and the Ash Disposal Facility

Project No.
16-1239

Co-ords: 602686.66 - 727174.11

Hole Type:
DP

Client: Bord Na Mona

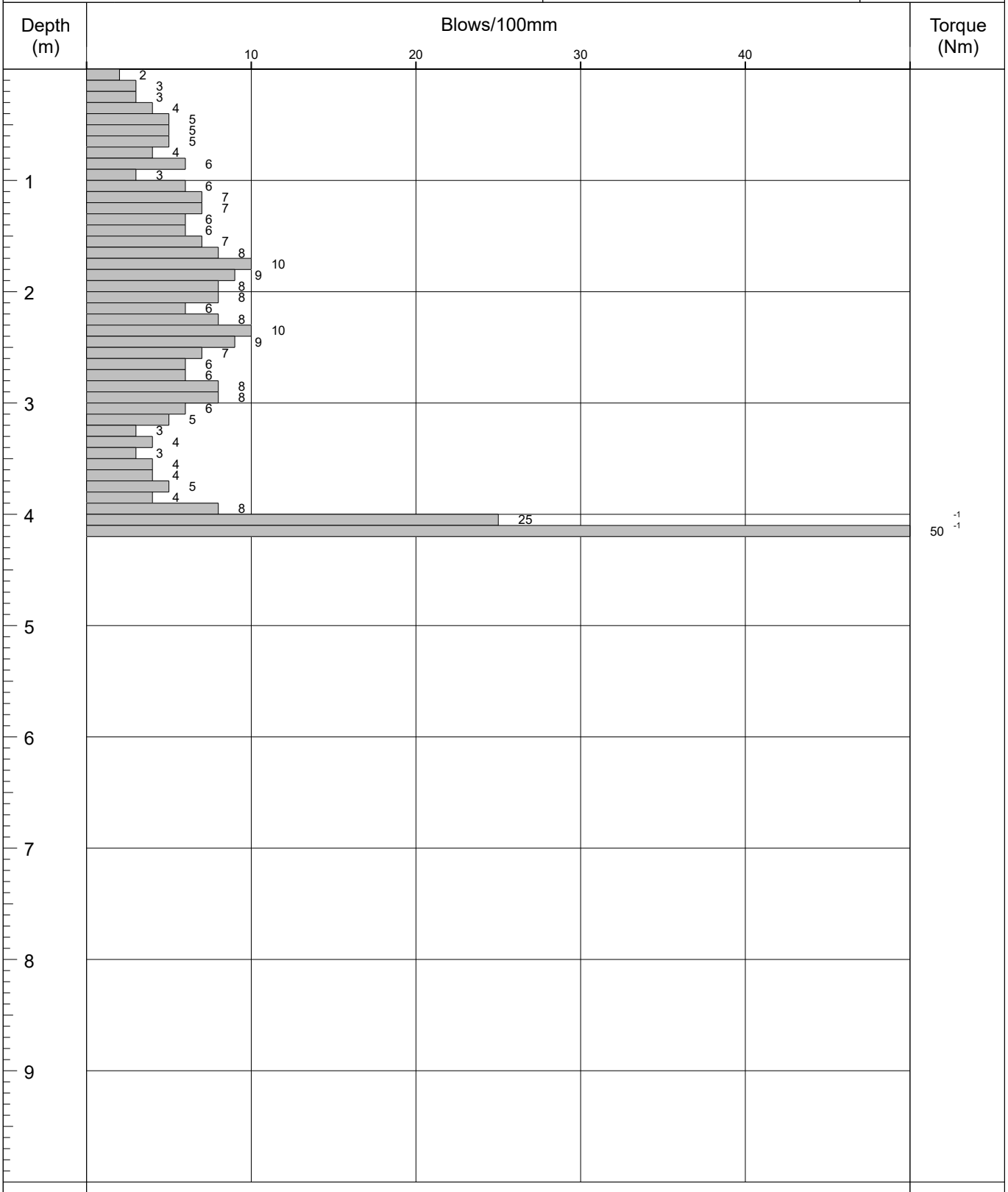
Level: 38.67

Scale:
1:50

Client's Rep: Bord Na Mona

Date: 16/02/2017

Operator:
JC



Remarks:
General; 4.20m

Fall Height 750

Cone Base Diameter 45

Hammer Wt 64

Final Depth 4.20

Probe Type DPSH-A





Probe Log

Probe No:
WOA-DP-11/17
Sheet 1 of 1

Project Name: West Offaly Power station and the Ash Disposal Facility

Project No.
16-1239

Co-ords: 602891.09 - 727179.29

Hole Type:
DP

Client: Bord Na Mona

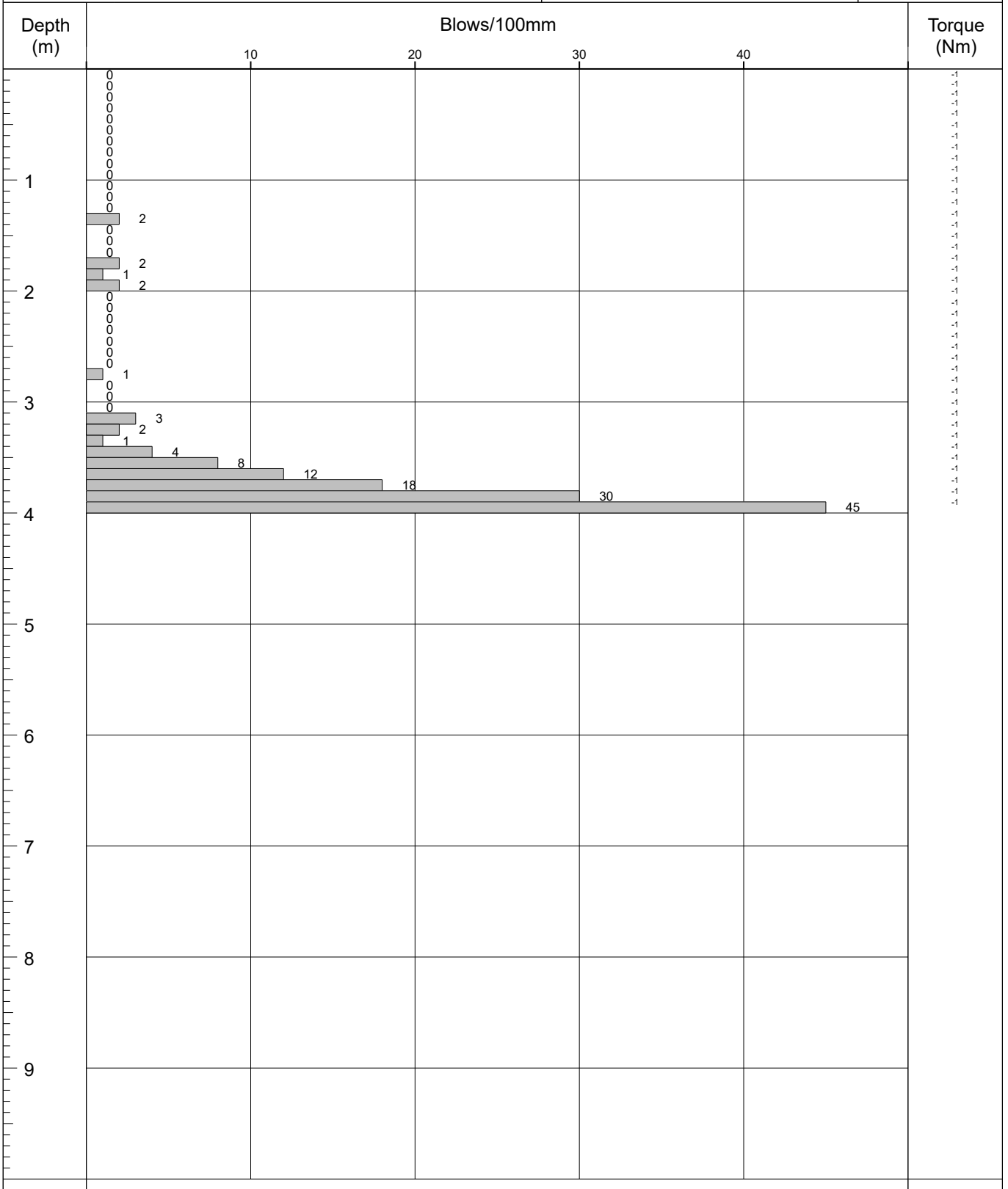
Level: 38.74

Scale:
1:50

Client's Rep: Bord Na Mona

Date: 16/02/2017

Operator:
JC



Remarks:
General; 4.00M

Fall Height 750

Cone Base Diameter 45

Hammer Wt 64

Final Depth 4.00

Probe Type DPSH-A





CAUSEWAY
GEOTECH

Probe Log

Probe No:
WOA-DP-12/17
Sheet 1 of 1

Project Name: West Offaly Power station and the Ash Disposal Facility

Project No.
16-1239

Co-ords: 602632.46 - 727121.97

Hole Type:
DP

Client: Bord Na Mona

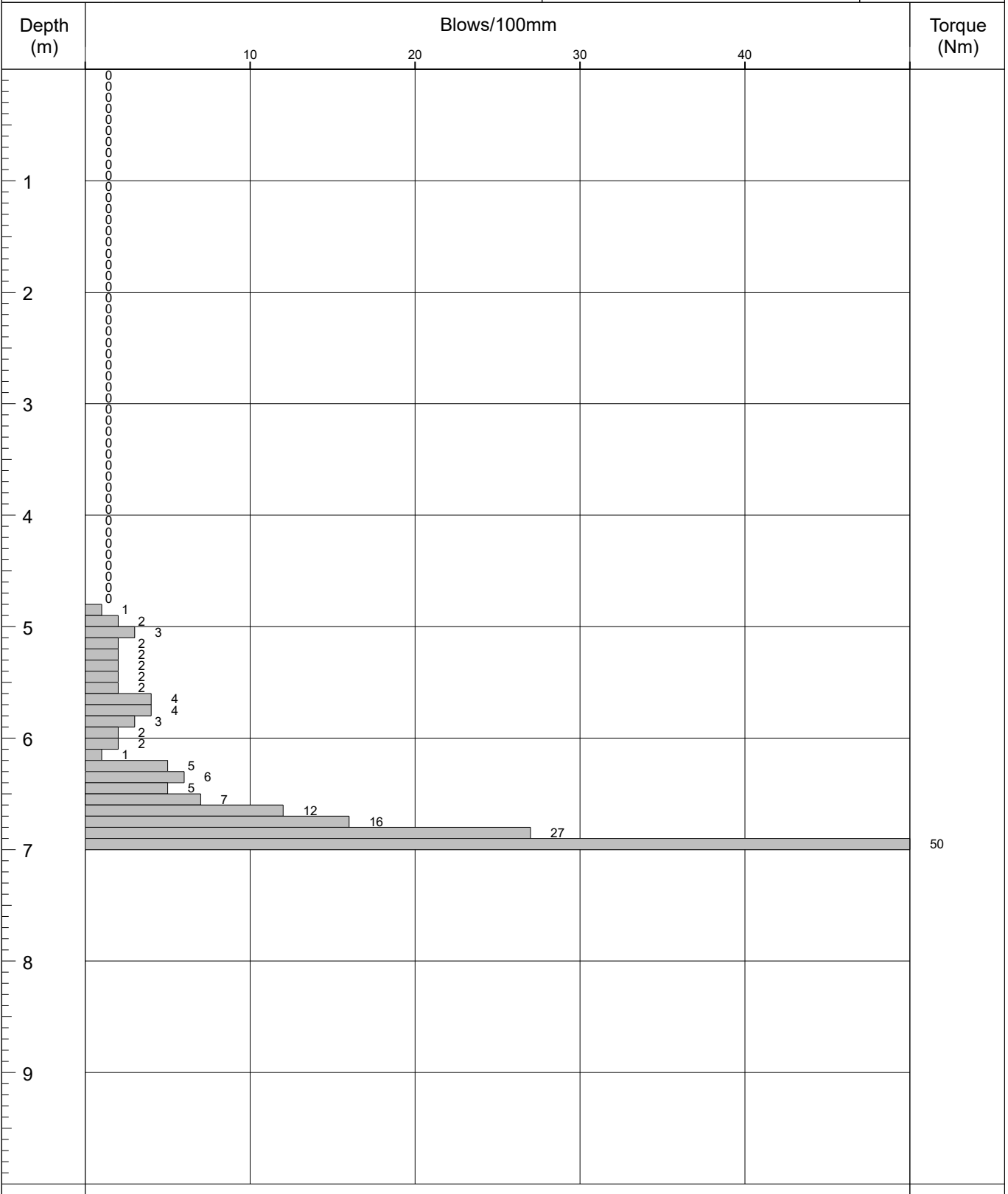
Level: 38.46

Scale:
1:50

Client's Rep: Bord Na Mona

Date: 15/02/2017

Operator:
JC



Remarks:

Fall Height 750

Cone Base Diameter 45

Hammer Wt 64

Final Depth 7.00

Probe Type DPSH-A





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GEOTECH

Probe Log

Probe No:
WOA-DP-13/17
Sheet 1 of 1

Project Name: West Offaly Power station and the Ash Disposal Facility

Project No.
16-1239

Co-ords: 602992.80 - 727142.24

Hole Type:
DP

Client: Bord Na Mona

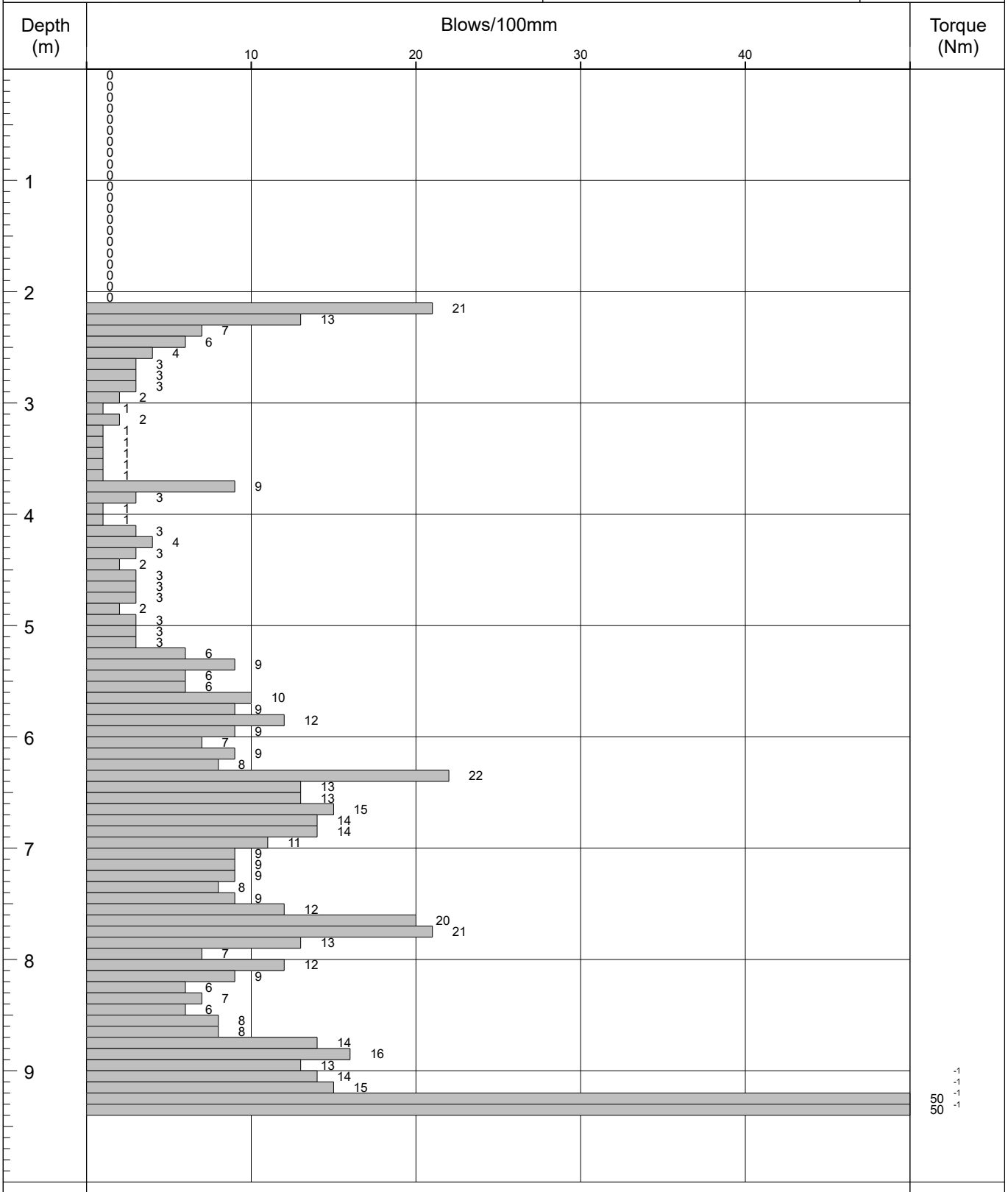
Level: 39.67

Scale:
1:50

Client's Rep: Bord Na Mona

Date: 15/02/2017

Operator:
JC



Remarks:

Fall Height	750	Cone Base Diameter	45
Hammer Wt	64	Final Depth	9.40
Probe Type	DPSH-A		





Probe Log

Probe No:
WOA-DP-14/17
Sheet 1 of 1

Project Name: West Offaly Power station and the Ash Disposal Facility

Project No.
16-1239

Co-ords: 602602.07 - 727094.76

Hole Type:
DP

Client: Bord Na Mona

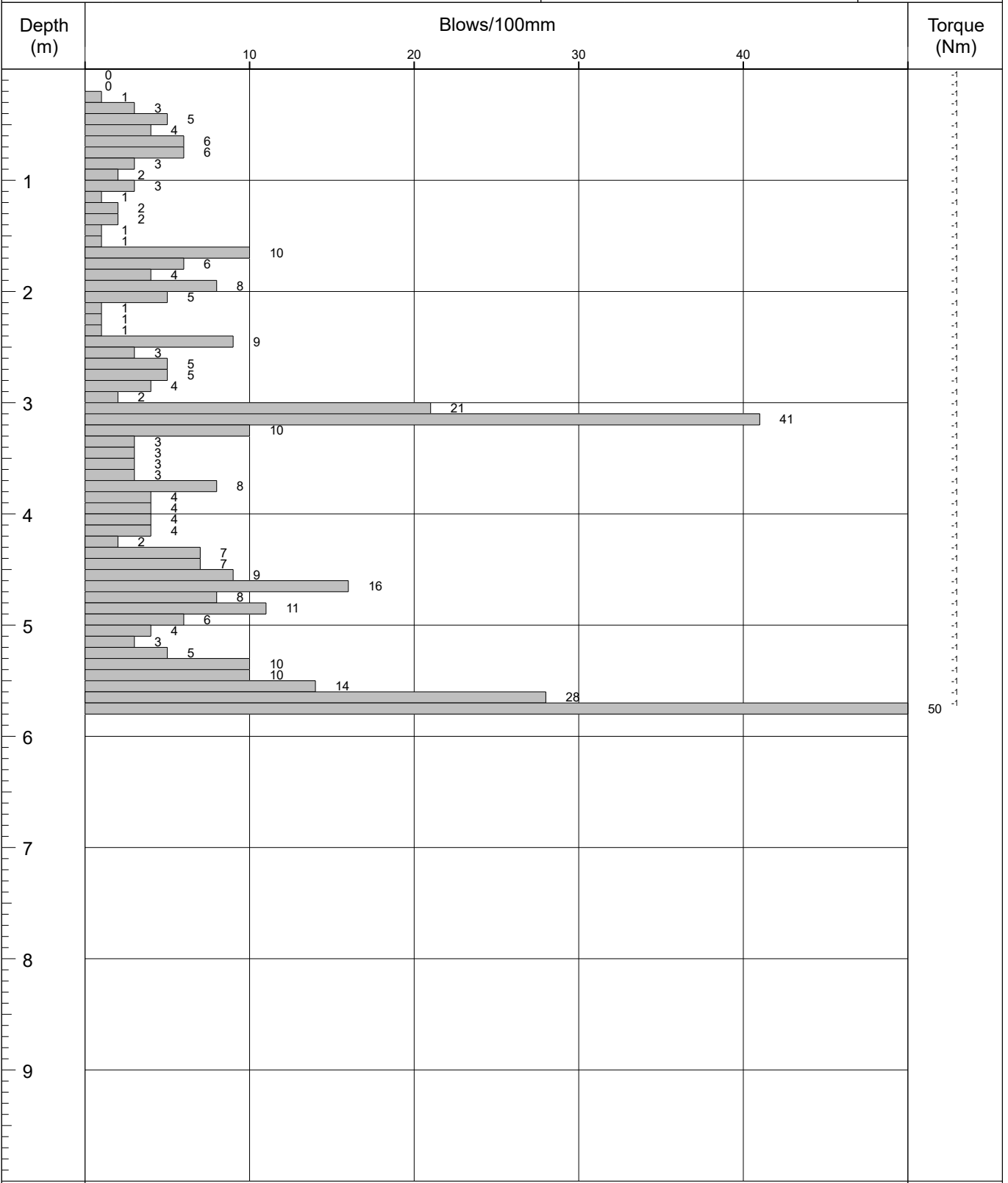
Level: 38.38

Scale:
1:50

Client's Rep: Bord Na Mona

Date: 16/02/2017

Operator:
JC



Remarks:
General; 5.80m

Fall Height 750

Cone Base Diameter 45

Hammer Wt 64

Final Depth 5.80

Probe Type DPSH-A





Probe Log

Probe No:
WOA-DP-15/17
Sheet 1 of 1

Project Name: West Offaly Power station and the Ash Disposal Facility

Project No.
16-1239

Co-ords: 602699.78 - 727050.24

Hole Type:
DP

Client: Bord Na Mona

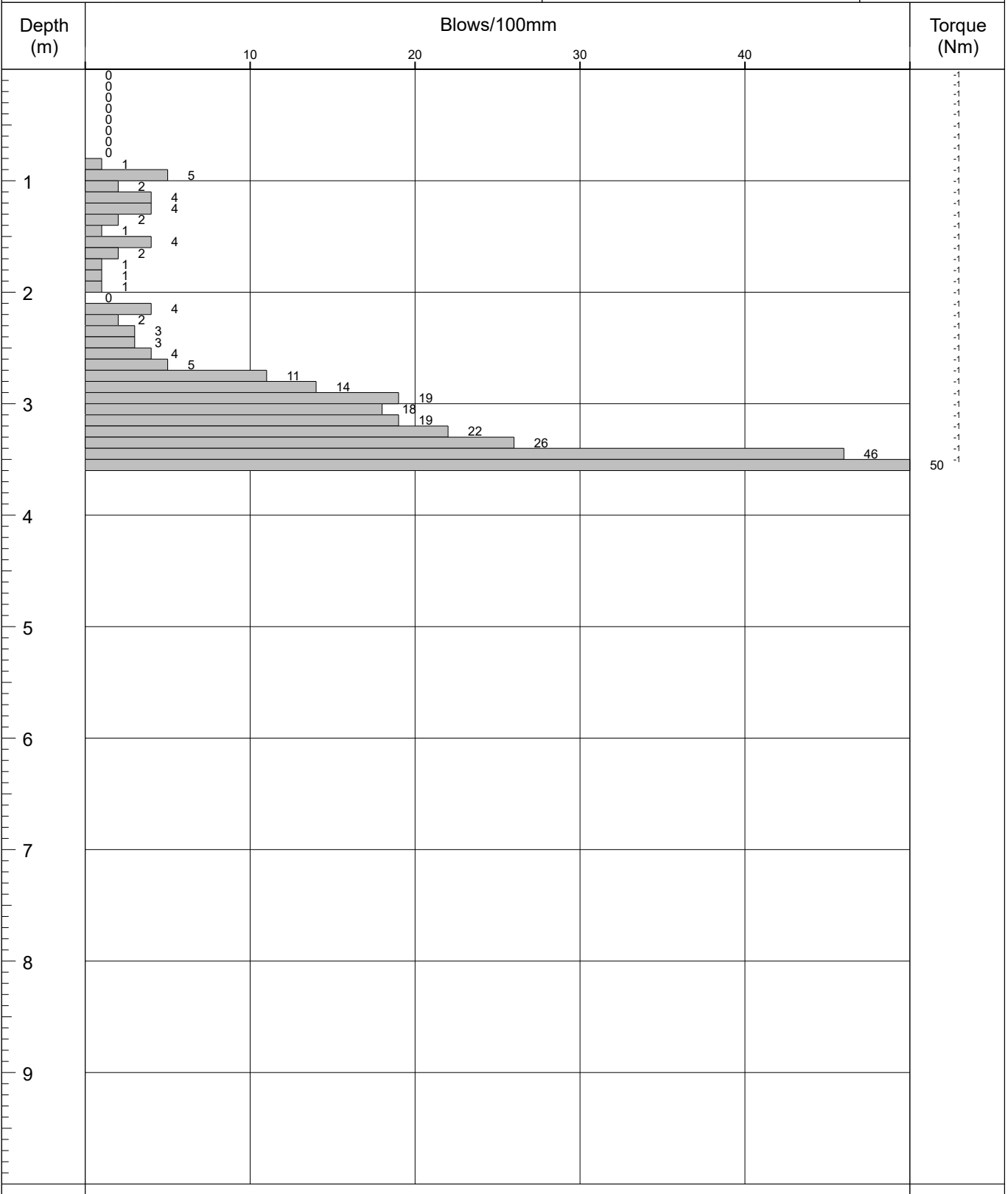
Level: 39.20

Scale:
1:50

Client's Rep: Bord Na Mona

Date: 16/02/2017

Operator:
JC



Remarks:
General; 3.60m

Fall Height 750

Cone Base Diameter 45

Hammer Wt 64

Final Depth 3.60

Probe Type DPSH-A





Probe Log

Probe No:
WOA-DP-16/17
Sheet 1 of 1

Project Name: West Offaly Power station and the Ash Disposal Facility

Project No.
16-1239

Co-ords: 602845.31 - 727107.88

Hole Type:
DP

Client: Bord Na Mona

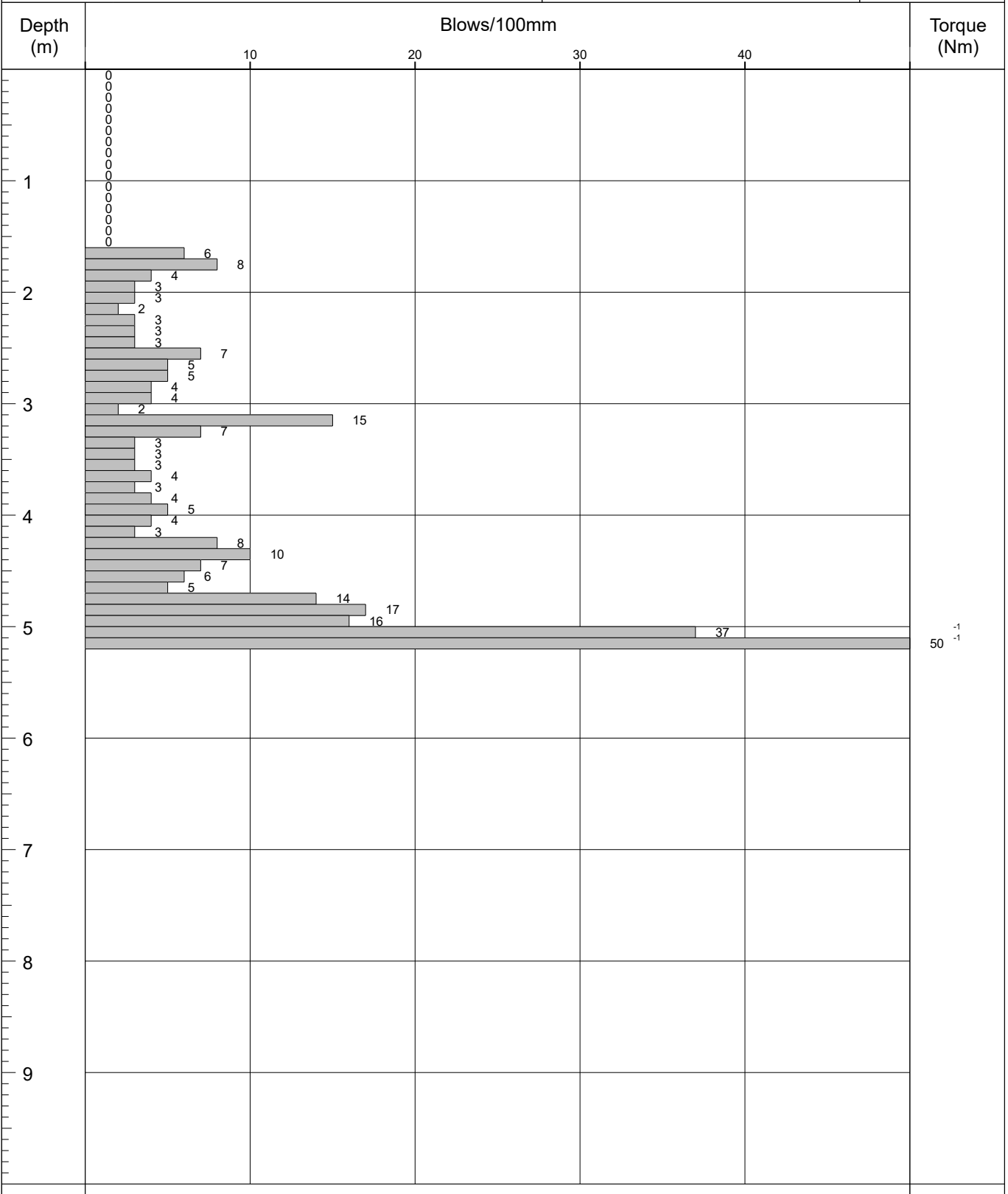
Level: 39.38

Scale:
1:50

Client's Rep: Bord Na Mona

Date: 15/02/2017

Operator:
JC



Remarks:

Fall Height 750

Cone Base Diameter 45

Hammer Wt 64

Final Depth 5.20

Probe Type DPSH-A





Probe Log

Probe No:
WOA-DP-17/17
Sheet 1 of 1

Project Name: West Offaly Power station and the Ash Disposal Facility

Project No.
16-1239

Co-ords: 602869.07 - 727096.81

Hole Type:
DP

Client: Bord Na Mona

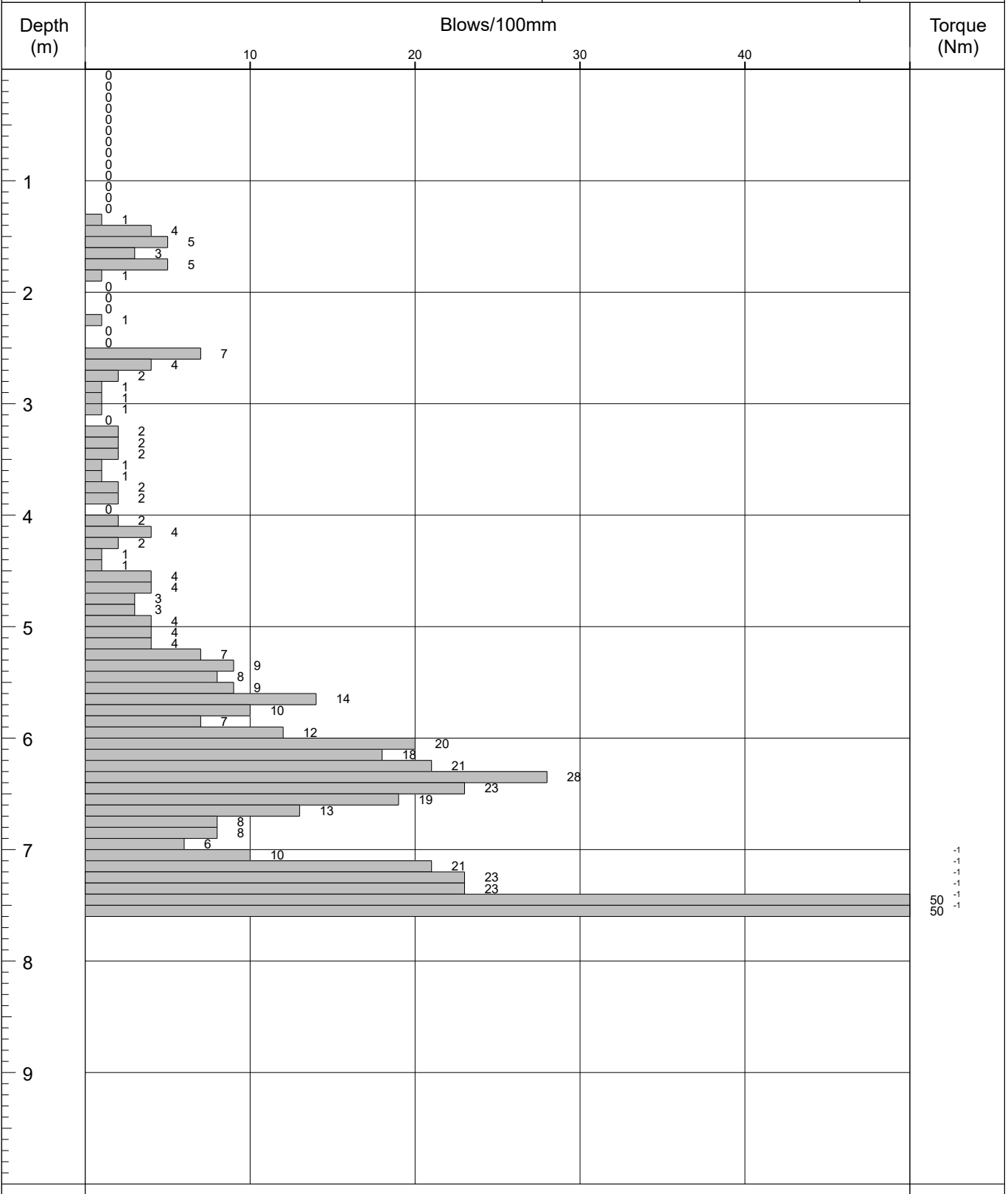
Level: 39.09

Scale:
1:50

Client's Rep: Bord Na Mona

Date: 15/02/2017

Operator:
JC



Remarks:

Fall Height 750

Cone Base Diameter 45

Hammer Wt 64

Final Depth 7.60

Probe Type DPSH-A





Probe Log

Probe No:
WOA-DP-18/17
Sheet 1 of 1

Project Name: West Offaly Power station and the Ash Disposal Facility

Project No.
16-1239

Co-ords: 602728.66 - 727004.66

Hole Type:
DP

Client: Bord Na Mona

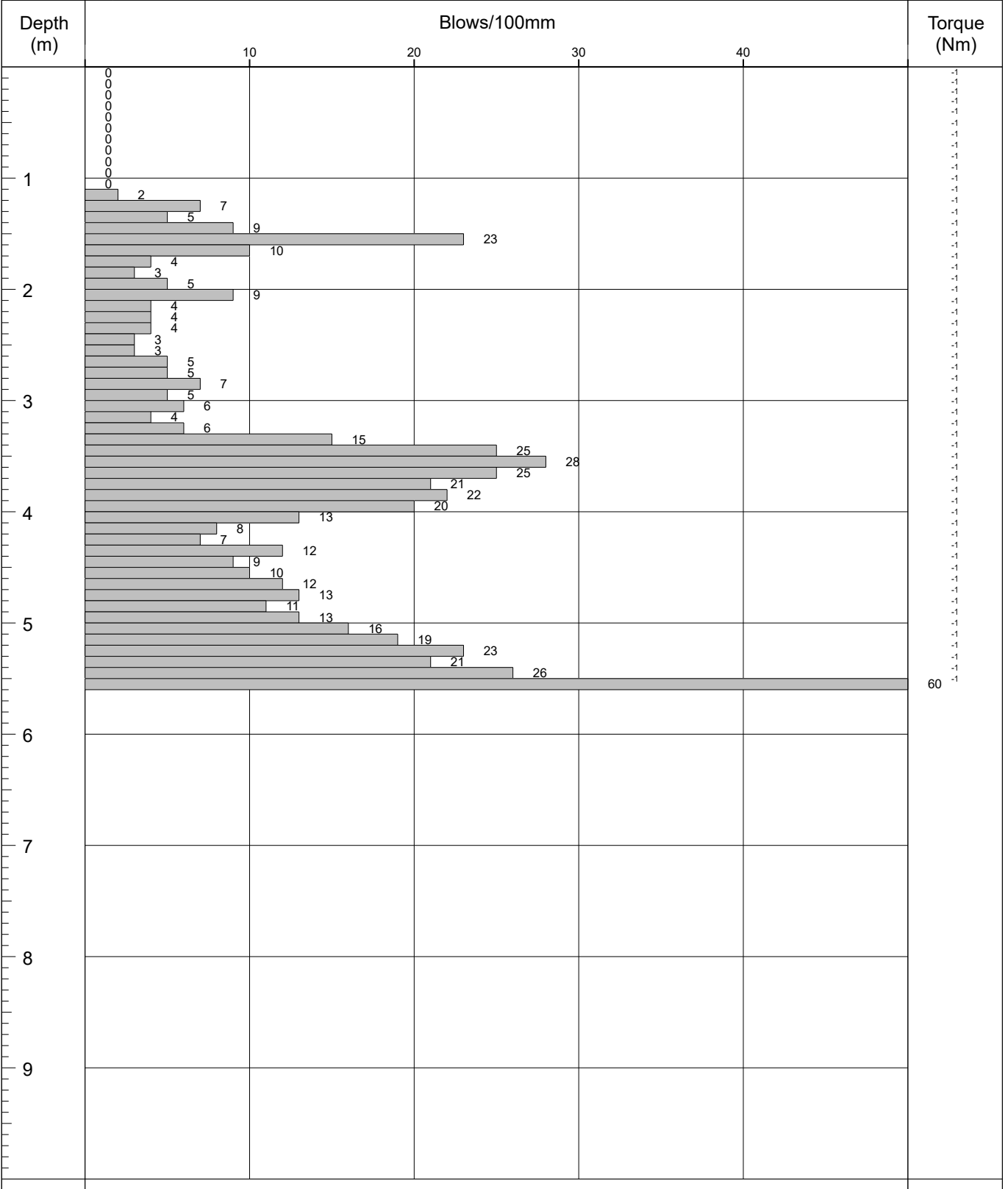
Level: 39.23

Scale:
1:50

Client's Rep: Bord Na Mona

Date: 16/02/2017

Operator:
JC



Remarks:
General; 5.60M

Fall Height	750	Cone Base Diameter	45
Hammer Wt	64	Final Depth	5.60
Probe Type	DPSH-A		





Probe Log

Probe No:
WOA-DP-19/17
Sheet 1 of 1

Project Name: West Offaly Power station and the Ash Disposal Facility

Project No.
16-1239

Co-ords: 602856.57 - 727011.20

Hole Type:
DP

Client: Bord Na Mona

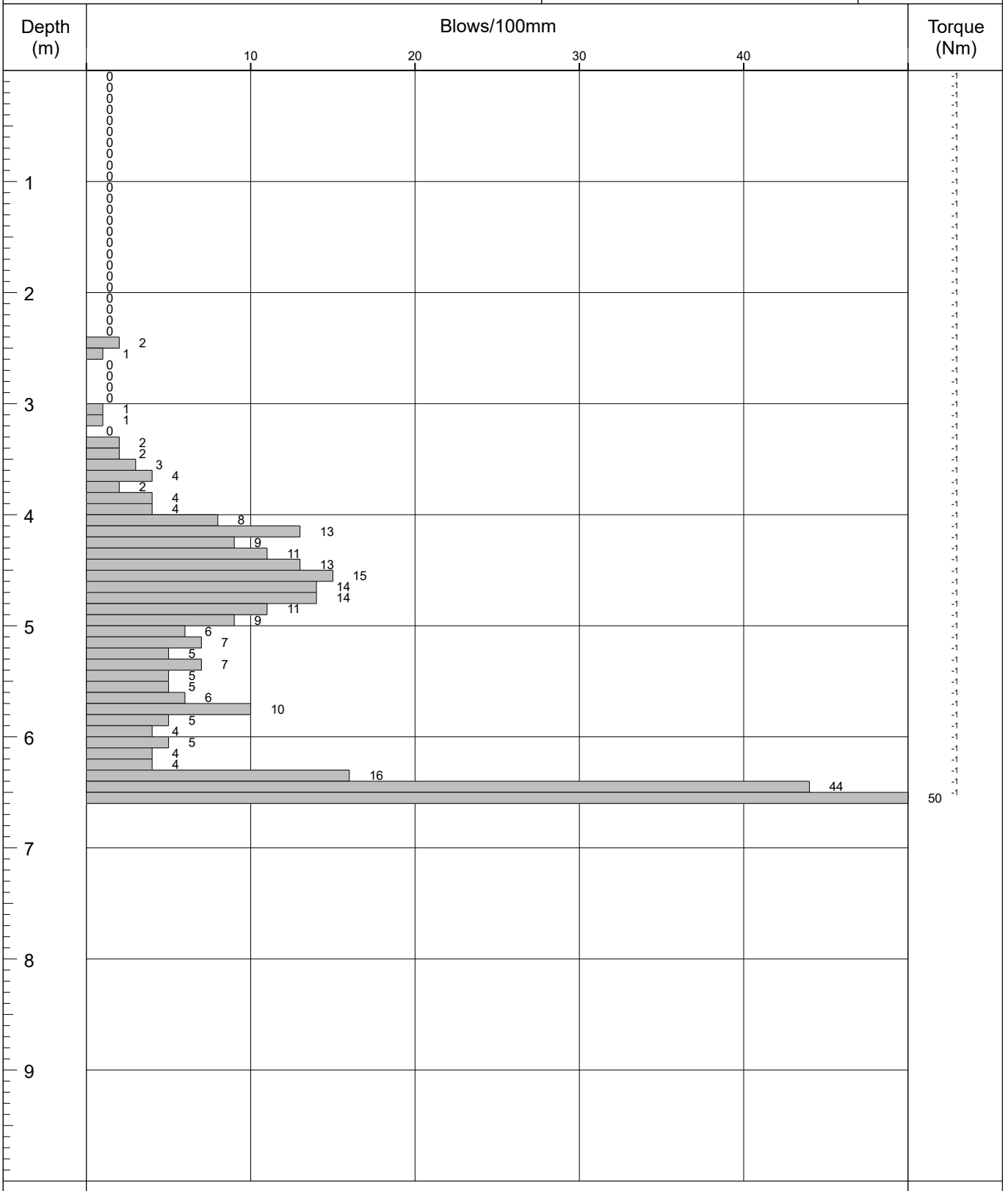
Level: 39.52

Scale:
1:50

Client's Rep: Bord Na Mona

Date: 16/02/2017

Operator:
JC



Remarks:
General; 6.60m

Fall Height 750

Cone Base Diameter 45

Hammer Wt 64

Final Depth 6.60

Probe Type DPSH-A





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Probe Log

Probe No:
WOA-DP-20/17
Sheet 1 of 1

Project Name: West Offaly Power station and the Ash Disposal Facility

Project No.
16-1239

Co-ords: 602850.97 - 726917.79

Hole Type:
DP

Client: Bord Na Mona

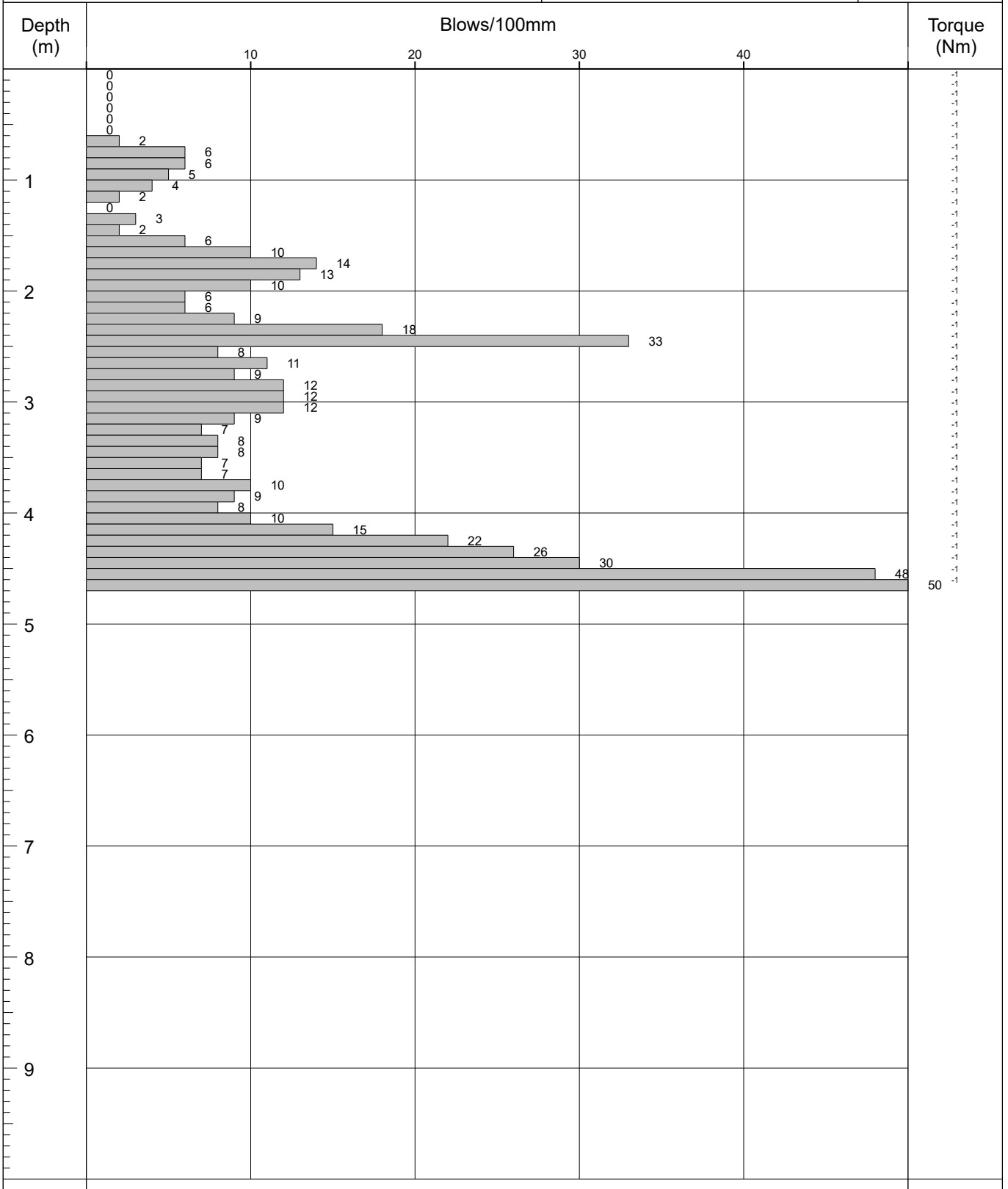
Level: 38.74

Scale:
1:50

Client's Rep: Bord Na Mona

Date: 16/02/2017

Operator:
JC



Remarks:
General; 4.70m

Fall Height 750

Cone Base Diameter 45

Hammer Wt 64

Final Depth 4.70

Probe Type DPSH-A





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— GEOTECH

APPENDIX F

WOP core photographs



WOP-BH03/17



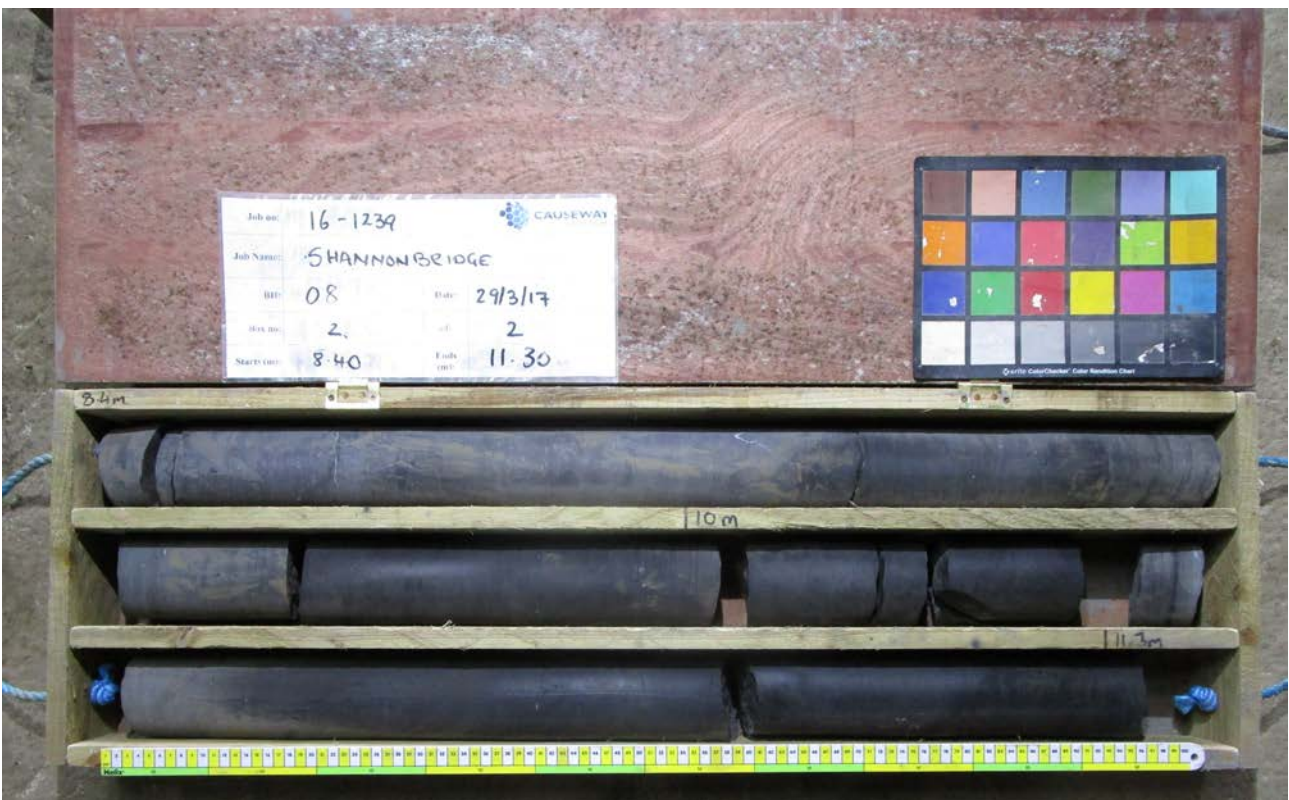
WOP-BH05/17



WOP-BH07/17



WOP-BH08/17



WOP-BH10/17



WOP-BH11/17



WOP-BH12/17





CAUSEWAY
— GEOTECH

APPENDIX G
WOP trial pit logs





CAUSEWAY
— GEOTECH

Project No.: 16-1239	Project Name: West Offaly Power station and the Ash Disposal Facility	Trial Pit No.: WOPTP-01
Co-ordinates: 597130.08 E	Client: Bord Na Mona	Sheet 1 of 1
Method: Trial Pitting	Client's Representative: Bord Na Mona	Scale: 1:25
Plant: 11T Tracked Excavator	Ground Level: 40.58 mOD	Date: 24/01/2017
		Logger: RS

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
0.50 0.50 - 1.50	ES7 W9	PID = 0.10ppm	40.28	(0.30) 0.30		Black peaty TOPSOIL	
1.00 1.00	B1 D2	PID = 0.20ppm PID = 0.20ppm	39.88	(0.40) 0.70		MADE GROUND: Very stiff thinly laminated grey slightly sandy CLAY (ash). Sand is fine to coarse.	0.5
2.00 2.00	B3 D4	PID = 0.30ppm PID = 0.30ppm		(2.80)		MADE GROUND: Soft locally stiff thinly laminated grey slightly gravelly sandy CLAY (ash) Sand is fine to coarse. Gravel is fine.	1.0 1.5 2.0
3.00 3.00 3.00	B5 D6 ES8	PID = 0.40ppm Water strike at 3.5m PID = 0.40ppm	37.08	3.50		End of trial pit at 3.50m	2.5 3.0 3.5 4.0 4.5

Remarks	Water Strikes:		Stability: Stable
	Struck at (m):	Remarks:	
	3.50	Water strike at 3.5m	Width: 0.80 Length: 3.50



CAUSEWAY
— GEOTECH

Project No.: 16-1239	Project Name: West Offaly Power station and the Ash Disposal Facility	Trial Pit No.: WOPTP-02
Co-ordinates: 597061.46 E	Client: Bord Na Mona	Sheet 1 of 1
Method: Trial Pitting	Client's Representative: Bord Na Mona	Scale: 1:25
Plant: 11T Tracked Excavator	Ground Level: 39.62 mOD	Date: 24/01/2017
		Logger: RS

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
				(0.50)		Black peaty TOPSOIL	
		PID = 0.10ppm	39.12	0.50		MADE GROUND: Soft locally stiff thinly laminated grey slightly sandy SILT (ash). Sand is fine to coarse.	
1.00 1.00 1.00	B1 D2 ES9	PID = 0.10ppm					
		Water strike at 1.5m PID = 0.20ppm					▼
2.00 2.00 2.00	B3 D4 ES10	PID = 0.40ppm PID = 0.20ppm		(3.50)			
3.00 3.00	B5 D6	PID = 0.20ppm PID = 0.30ppm					
4.00 4.00	B7 D8	PID = 0.20ppm	35.62	4.00		End of trial pit at 4.00m	

Remarks	Water Strikes:		Stability: Stable
	Struck at (m):	Remarks:	
	1.50	Water strike at 1.5m	Width: 0.80 Length: 3.50



CAUSEWAY
— GEOTECH

Project No.: 16-1239	Project Name: West Offaly Power station and the Ash Disposal Facility	Trial Pit No.: WOPTP-03
Co-ordinates: 597955.33 E	Client: Bord Na Mona	Sheet 1 of 1
Method: Trial Pitting	Client's Representative: Bord Na Mona	Scale: 1:25
Plant: 11T Tracked Excavator	Ground Level: 40.07 mOD	Date: 24/01/2017
		Logger: RS

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
0.50	ES9	PID = 0.10ppm	39.82	(0.25)		Very soft to soft blueish brown slightly sandy gravelly CLAY. Sand is fine to coarse. gravel is fine to medium subrounded of mixed lithologies.	
1.00 1.00	B1 D2	PID = 0.20ppm		0.25		MADE GROUND: Stiff thinly laminated blueish grey slightly gravelly sandy SILT (ash) Sand is fine to coarse. Gravel is fine.	
		PID = 0.10ppm		(2.65)			
2.00 2.00	B3 D4	PID = 0.10ppm					
2.50	ES10	PID = 0.20ppm					
3.00 3.00	B5 D6	PID = 0.20ppm	37.17	2.90		MADE GROUND: Soft locally stiff thinly laminated blueish grey slightly sandy SILT (ash). Sand is fine to coarse.	
		PID = 0.20ppm		(0.60)			
4.00 4.00	B7 D8	PID = 0.10ppm	36.57	3.50		MADE GROUND: Soft locally stiff thinly laminated pinkish grey slightly sandy CLAY (ash). Sand is fine to coarse.	
				(1.10)			
			35.47	4.60		End of trial pit at 4.60m	

Remarks No groundwater encountered Terminated at scheduled depth	Water Strikes:		Stability:
	Struck at (m):	Remarks:	Stable
			Width: 0.70 Length: 3.50



CAUSEWAY
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Project No.: 16-1239	Project Name: West Offaly Power station and the Ash Disposal Facility	Trial Pit No.: WOPTP-04
Co-ordinates: 597137.08 E	Client: Bord Na Mona	Sheet 1 of 1
Method: Trial Pitting	Client's Representative: Bord Na Mona	Scale: 1:25
Plant: 11T Tracked Excavator	Ground Level: 40.83 mOD	Date: 24/01/2017
		Logger: RS

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
0.50 0.50 0.50 - 2.00	B1 D2 EW13	PID = 1.00ppm	40.38	(0.45) 0.45		MADE GROUND: Very soft to soft bluish brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is fine to medium subrounded of mixed lithologies.	0.5
1.00 1.00	B3 D4	PID = 0.20ppm PID = 0.20ppm		(1.15)		MADE GROUND: Soft to locally stiff thinly laminated grey slightly gravelly sandy SILT (ash). Gravel is fine.	1.0
2.00	ES11		39.23	(0.60)		MADE GROUND: Very soft thinly laminated interlayered grey and pink CLAY (ash).	1.5
2.20 2.20	B5 D6	PID = 0.40ppm PID = 0.10ppm	38.63	(0.30)		MADE GROUND: Black slightly silty fine to coarse SAND (ash).	2.0
3.50 3.50 3.50	B7 D8 ES12	PID = 0.10ppm	38.33	(1.50)		MADE GROUND: Very soft locally very stiff thinly laminated grey CLAY (ash).	2.5
4.00 4.00	B9 D10	PID = 0.10ppm	36.83	4.00		End of trial pit at 4.00m	3.0
							4.0
							4.5

Remarks Terminated at scheduled depth	Water Strikes:		Stability: Stable
	Struck at (m):	Remarks:	
			Width: 0.60 Length: 3.00



CAUSEWAY
— GEOTECH

Project No.: 16-1239	Project Name: West Offaly Power station and the Ash Disposal Facility	Trial Pit No.: WOPTP-05
Co-ordinates: 597123.53 E	Client: Bord Na Mona	Sheet 1 of 1
Method: Trial Pitting	Client's Representative: Bord Na Mona	Scale: 1:25
Plant: 11T Tracked Excavator	Ground Level: 40.61 mOD	Date: 23/01/2017
		Logger: RS

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
0.50 0.50	B1 D2	PID = 0.00ppm	40.37	(0.24) 0.24		MADE GROUND: Soft blackish brown slightly sandy slightly gravelly CLAY (ash). Sand is fine to coarse. Gravel is fine to medium subrounded of mixed lithologies.	
1.00 1.00 1.00	B3 D4 ES5	PID = 0.00ppm PID = 0.00ppm				MADE GROUND: Very stiff thinly laminated grey SILT (ash).	
2.00 2.00	B6 D7	PID = 0.00ppm		(3.76)			
3.00 3.00	B8 D9	PID = 0.00ppm					
4.00 4.00 4.00	B10 D11 ES12	PID = 0.00ppm	36.61	4.00		End of trial pit at 4.00m	

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



CAUSEWAY
— GEOTECH

Project No.: 16-1239	Project Name: West Offaly Power station and the Ash Disposal Facility	Trial Pit No.: WOPTP-06
Co-ordinates: 597309.76 E	Client: Bord Na Mona	Sheet 1 of 1
Method: Trial Pitting	Client's Representative: Bord Na Mona	Scale: 1:25
Plant: 11T Tracked Excavator	Ground Level: 40.13 mOD	Date: 27/01/2017
		Logger: RS

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
0.50 - 1.50	EW5	PID = 0.00ppm	39.65	0.48 (0.12)		MADE GROUND: Grey slightly clayey sandy fine to coarse subrounded to subangular GRAVEL with red brick and wood fragments. Sand is fine to coarse.	
0.75	ES3		39.52	0.60 (0.25)		MADE GROUND: Lean mix concrete	
1.00 1.00	B1 D2	PID = 0.00ppm	39.28	0.85 (0.65)		Dark blueish grey sandy fine to coarse subangular GRAVEL. Sand is fine to coarse.	
1.50	ES4	PID = 0.10ppm	38.62	1.50		Brownish grey very sandy silty fine to coarse subangular to subrounded GRAVEL of mixed lithologies with high cobble content. Sand is fine to coarse.	
						End of trial pit at 1.50m	

Remarks No groundwater encountered Terminated on boulders at 1.50m	Water Strikes:		Stability:
	Struck at (m):	Remarks:	Stable
			Width: 1.00 Length: 4.00



CAUSEWAY
— GEOTECH

Project No.: 16-1239	Project Name: West Offaly Power station and the Ash Disposal Facility	Trial Pit No.: WOPTP-07
Co-ordinates: 597346.14 E	Client: Bord Na Mona	Sheet 1 of 1
Method: Trial Pitting	Client's Representative: Bord Na Mona	Scale: 1:25
Plant: 11T tarcked Excavator	Ground Level: 40.11 mOD	Date: 27/01/2017
		Logger: RS

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
0.50	ES3	PID = 0.00ppm	39.91	(0.20)		MADE GROUND: Grey slightly silty sandy fine to coarse subangular GRAVEL of limestone. Sand is fine to coarse.	
				0.20 (0.15)		Dark grey slightly silty sandy fine to coarse subangular GRAVEL of shale with low cobble and boulder content. Sand is fine to coarse.	
1.00 1.00	B1 D2	PID = 0.10ppm	39.76	0.35		Brown sandy fine to coarse subangular GRAVEL of limestone with medium boulder and cobble content. Sand is fine to coarse.	
				(0.60)		Dark brown sandy clayey fine to coarse subangular GRAVEL of limestone with high boulder and cobble content. Sand is fine to coarse.	
			39.16	0.95 (0.20)		Dark brown sandy clayey fine to coarse subangular GRAVEL of limestone with high boulder and cobble content. Sand is fine to coarse.	
			38.96	1.15		End of trial pit at 1.15m	

Remarks No groundwater encountered Terminated on boulders at 1.15m	Water Strikes:		Stability:
	Struck at (m):	Remarks:	Stable
			Width: 0.90 Length: 4.00



CAUSEWAY
GEOTECH

Project No.: 16-1239	Project Name: West Offaly Power station and the Ash Disposal Facility	Trial Pit No.: WOPTP-08
Co-ordinates: 597282.17 E	Client: Bord Na Mona	Sheet 1 of 1
Method: Trial Pitting	Client's Representative: Bord Na Mona	Scale: 1:25
Plant: 11T Tracked Excavator	Ground Level: 40.24 mOD	Date: 27/01/2017
		Logger: RS

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
1.00	B1	PID = 0.10ppm	40.14	(0.10) 0.10		MADE GROUND: Grey slightly sandy fine to coarse subangular GRAVEL of limestone. Sand is fine to coarse.	
1.00	D2			(0.50)		MADE GROUND: Brownish grey slightly sandy clayey fine to coarse subangular GRAVEL of mixed lithologies. Sand is fine to coarse.	
1.00	ES3	PID = 0.10ppm	39.64	0.60 (0.10)		MADE GROUND: Lean mix	
			39.54	0.70 (0.15)		Dark grey slightly silty sandy fine to coarse subangular GRAVEL of shale. Sand is fine to coarse.	
			39.39	0.85 (0.17)		Brown slightly sandy clayey fine to coarse subangular GRAVEL of limestone. Sand is fine to coarse.	
			39.22	1.02		End of trial pit at 1.02m	





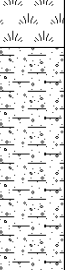

Remarks No groundwater encountered Terminated on boulders 1.02m	Water Strikes:		Stability:
	Struck at (m):	Remarks:	Stable
			Width: 0.80 Length: 4.00


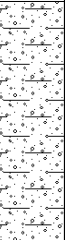


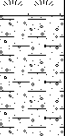
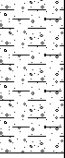


CAUSEWAY
— GEOTECH

APPENDIX H
WOA trial pit logs



		Project No.: 16-1239		Project Name: West Offaly Power station and the Ash Disposal Facility		Trial Pit No.: WPATP-01/17	
		Co-ordinates: 602464.13 E		Client: Bord Na Mona		Sheet 1 of 1	
Method: Trial Pitting		727304.85 N		Client's Representative: Bord Na Mona		Scale: 1:25	
Plant: 11T Tracked Excavator		Ground Level: 39.40 mOD		Date: 31/01/2017		Logger: RS	
Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
1.00 1.00	B1 D2	PID = 0.40ppm	38.50	(0.90)		Spongy dark brown pseudo-fibrous PEAT.	0.5
1.50	ES7	PID = 0.60ppm		0.90		Spongy brown fibrous PEAT	1.0
2.00 2.00	B3 D4	PID = 0.40ppm	36.60	(1.90)			1.5
3.00 3.00 3.00	B5 D6 ES8	PID = 0.10ppm PID = 0.00ppm		2.80		Firm grey slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse angular of limestone.	2.0 2.5
		PID = 0.00ppm PID = 0.00ppm	35.60	(1.00)			3.0 3.5
				3.80		End of trial pit at 3.80m	4.0 4.5
Remarks No groundwater encountered						Water Strikes:	
Terminated at scheduled depth						Struck at (m):	
						Remarks:	
						Stability: Stable	
						Width: 0.90	
						Length: 4.00	

		Project No.:	Project Name:		Trial Pit No.:				
Method:		16-1239	West Offaly Power station and the Ash Disposal Facility		WPATP-02/17				
Trial Pitting		Co-ordinates:	Client:		Sheet 1 of 1				
Plant:		602668.92 E	Bord Na Mona		Scale: 1:25				
11T Tracked Excavator		727249.28 N	Client's Representative:		Logger: RS				
		Ground Level:	Date:						
		37.27 mOD	30/01/2017						
Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water		
1.00	B1	PID = 0.50ppm	36.47	(0.80)		Yellowish grey slightly sandy clayey fine to coarse subangular GRAVEL of mixed lithologies. Sand is fine to coarse .			
1.00	D2	PID = 0.70ppm		0.80		Spongy dark brown fibrous PEAT			
1.50	ES7	PID = 0.90ppm		(1.30)					
2.00	B3	PID = 0.50ppm	35.16	2.10		Soft grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to medium subrounded of mixed lithologies.			
2.00	D4	PID = 0.10ppm		(0.90)					
2.50	ES8	PID = 0.10ppm		3.00		End of trial pit at 3.00m			
3.00	B5	PID = 0.10ppm	34.26						
3.00	D6	PID = 0.10ppm							
Remarks Terminated at scheduled depth						Water Strikes:		Stability:	
						Struck at (m):		Remarks:	Stable
									Width: 0.90
			Length: 3.00						



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Project No.: 16-1239	Project Name: West Offaly Power station and the Ash Disposal Facility	Trial Pit No.: WPATP-03/17
Co-ordinates: 602827.35 E	Client: Bord Na Mona	Sheet 1 of 1
Method: Trial Pitting	Client's Representative: Bord Na Mona	Scale: 1:25
Plant: 11T Tracked Excavator	Ground Level: 38.70 mOD	Date: 30/01/2017
		Logger: RS

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
0.50	ES1	PID = 1.00ppm	38.45	(0.25) 0.25		Spongy dark brown pseudo-fibrous PEAT	
1.00	B3 D4	HVP=20, HVR=20 HVP=28, HVR=28 HVP=39, HVR=39	37.80	(0.65) 0.90		Very soft grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse subrounded of mixed lithologies.	
1.50	ES2	PID = 0.10ppm Slow	36.70	(1.10) 2.00		Blueish grey gravelly very silty fine to coarse SAND with high cobble and boulder content. Gravel is fine to coarse subrounded of mixed lithologies .	▼
		Fast				End of trial pit at 2.00m	▼

Remarks Terminated due to collapsing pit walls	Water Strikes:		Stability: Unstable
	Struck at (m):	Remarks:	
	1.54 2.00	Slow Fast	Width: 0.65 Length: 3.00



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— GEOTECH

Project No.: 16-1239	Project Name: West Offaly Power station and the Ash Disposal Facility	Trial Pit No.: WPATP-04/17
Co-ordinates: 602611.41 E	Client: Bord Na Mona	Sheet 1 of 1
Method: Trial Pitting	Client's Representative: Bord Na Mona	Scale: 1:25
Plant: 11T Tracked Excavator	Ground Level: 37.46 mOD	Date: 30/01/2017
		Logger: RS

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
1.00 1.00 1.00	B1 D2 ES7	PID = 0.10ppm Slow		(1.30)		Spongy dark brown fibrous PEAT	
1.50	ES8	PID = 0.10ppm	36.16	1.30		Soft grey slightly sandy CLAY. Sand is fine to coarse.	
2.00 2.00 2.00	B3 D4	HVP=12, HVR=1 PID = 0.10ppm PID = 0.10ppm	35.36	2.10		Very soft blueish grey CLAY.	
3.00 3.00	B5 D6	PID = 0.10ppm	34.46	3.00		End of trial pit at 3.00m	

Remarks Terminated at scheduled depth	Water Strikes:		Stability:
	Struck at (m):	Remarks:	Stable
	0.90	Slow	Width: 0.90 Length: 4.00



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— GEOTECH

Project No.: 16-1239	Project Name: West Offaly Power station and the Ash Disposal Facility	Trial Pit No.: WPATP-05/17
Co-ordinates: 602863.04 E	Client: Bord Na Mona	Sheet 1 of 1
Method: Trial Pitting	Client's Representative: Bord Na Mona	Scale: 1:25
Plant: 11T Tracked Excavtor	Ground Level: 39.36 mOD	Date: 30/01/2017
		Logger: RS

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
1.00	B1	PID = 0.40ppm	39.11	(0.25)		Spongy dark brown amorphous PEAT	
1.00	D2	PID = 0.40ppm		0.25		Spongy brown fibrous PEAT	
1.50	ES7	PID = 0.40ppm					
2.00	B3	PID = 0.10ppm	37.51	1.85		Very soft grey slightly sandy gravelly CLAY with medium cobble and boulder content. Gravel is fine to coarse subangular of mixed lithologies. Sand is fine to coarse.	
2.00	D4	PID = 0.00ppm		(1.15)			
2.00	ES8	PID = 0.00ppm					
3.00	B5	PID = 0.00ppm	36.36	3.00		End of trial pit at 3.00m	
3.00	D6	PID = 0.00ppm					

Remarks No groundwater encountered Terminated due to pit walls collapsing	Water Strikes:		Stability: Unstable
	Struck at (m):	Remarks:	
			Width: 0.90 Length: 4.00



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Project No.: 16-1239	Project Name: West Offaly Power station and the Ash Disposal Facility	Trial Pit No.: WPATP-06/17
Co-ordinates: 602971.22 E	Client: Bord Na Mona	Sheet 1 of 1
Method: Trial Pitting	Client's Representative: Bord Na Mona	Scale: 1:25
Plant: 11T Tracked Excavtor	Ground Level: 38.99 mOD	Date: 30/01/2017
		Logger: RS

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
1.00	B1	PID = 0.30ppm	38.78	(0.20)		Spongy dark brown amorphous PEAT	
1.00	D2			0.20		Spongy brown fibrous PEAT	
1.00	ES3	PID = 0.30ppm Fast	37.58	(1.20)		Very soft grey slightly sandy CLAY	
			37.53	(1.40)		End of trial pit at 1.45m	

Remarks Terminated on confining layer	Water Strikes:		Stability: Unstable
	Struck at (m):	Remarks:	
	1.30	Fast	Width: 1.00 Length: 5.00



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Project No.: 16-1239	Project Name: West Offaly Power station and the Ash Disposal Facility	Trial Pit No.: WPATP-07/17
Co-ordinates: 602734.75 E	Client: Bord Na Mona	Sheet 1 of 1
Method: Trial Pitting	Client's Representative: Bord Na Mona	Scale: 1:25
Plant: 11T Tracked Excavator	Ground Level: 38.98 mOD	Date: 30/01/2017
		Logger: RS

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
0.50	ES5	PID = 0.00ppm	38.43	(0.55)		Spongy dark brown fibrous PEAT	
1.00 1.00	B1 D2	PID = 0.10ppm		(1.25)		Very soft grey slightly sandy gravelly CLAY with high cobble and boulder content. Gravel is fine to coarse subangular of mixed lithologies.	
1.50	ES6	PID = 0.00ppm					
2.00 2.00	B3 D4	Slow	37.18	1.80		End of trial pit at 1.80m	▼

Remarks Terminated due to pit walls collapsing	Water Strikes:		Stability: Unstable
	Struck at (m):	Remarks:	
	1.80	Slow	Width: 0.90 Length: 4.00



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Project No.: 16-1239	Project Name: West Offaly Power station and the Ash Disposal Facility	Trial Pit No.: WPATP-08/17
Co-ordinates: 602942.70 E	Client: Bord Na Mona	Sheet 1 of 1
Method: Trial Pitting	Client's Representative: Bord Na Mona	Scale: 1:25
Plant: 11T Tracked Excavator	Ground Level: 39.70 mOD	Date: 31/01/2017
		Logger: RS

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
1.00	B1	PID = 2.40ppm	39.60	(0.10)		Spongy dark brown pseudo fibrous PEAT	
1.00	D2	PID = 0.50ppm		0.10		Spongy brown fibrous PEAT	
1.50	ES7	PID = 0.10ppm		(1.70)			
2.00	B3	PID = 0.00ppm	37.90	1.80		Grey sandy clayey subangular fine to coarse GRAVEL of mixed lithologies with high cobble content. Sand is fine to coarse.	
2.00	D4	PID = 0.00ppm		(1.20)			
2.50	ES8	PID = 0.00ppm Fast		3.00			▼
3.00	B5	PID = 0.00ppm	36.70	3.00		End of trial pit at 3.00m	
3.00	D6	PID = 0.00ppm					

Remarks Terminated due to pit walls collapsing	Water Strikes:		Stability: Unstbale
	Struck at (m):	Remarks:	
	2.58	Fast	Width: 0.90 Length: 5.00



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Project No.: 16-1239	Project Name: West Offaly Power station and the Ash Disposal Facility	Trial Pit No.: WPATP-09/17
Co-ordinates: 603110.35 E	Client: Bord Na Mona	Sheet 1 of 1
Method: Trial Pitting	Client's Representative: Bord Na Mona	Scale: 1:25
Plant: 11T Tracked Excavator	Ground Level: 41.90 mOD	Date: 31/01/2017
		Logger: RS

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
1.00 1.00 1.00	B1 D2 ES5	PID = 0.00ppm PID = 0.00ppm PID = 0.00ppm		(2.00)		Grey very sandy very clayey fine to coarse subangular GRAVEL of mixed lithologies. Sand is fine to coarse.	
2.00 2.00	B3 D4	PID = 0.00ppm Fast	39.90 39.50	2.00 (0.40) 2.40		Grey very sandy clayey subangular fine to coarse GRAVEL of mixed lithologies with high cobble content. Sand is fine to coarse. Cobbles are subrounded.	
						End of trial pit at 2.40m	▼

Remarks Terminated due to pit walls collapsing	Water Strikes:		Stability: Unstable
	Struck at (m):	Remarks:	
	2.40	Fast	Width: 1.80 Length: 4.00



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Project No.: 16-1239	Project Name: West Offaly Power station and the Ash Disposal Facility	Trial Pit No.: WPATP-10/17
Co-ordinates: 603185.90 E	Client: Bord Na Mona	Sheet 1 of 1
Method: Trial Pitting	Client's Representative: Bord Na Mona	Scale: 1:25
Plant: 11T Tracked Excavator	Ground Level: 40.90 mOD	Date: 31/01/2017
		Logger: RS

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
0.50	ES5	PID = 0.00ppm	40.30	(0.60)		Spongy dark brown amorphous PEAT	
1.00 1.00 1.00	B1 D2 ES6	PID = 0.00ppm PID = 0.00ppm		(1.55)		Very soft grey slightly sandy gravelly CLAY with high cobble and boulder content. Gravel is fine to coarse subangular of mixed lithologies.	
2.00 2.00	B3 D4	PID = 0.00ppm	38.75	2.15		End of trial pit at 2.15m	

Remarks Terminated due to pit walls collapsing	Water Strikes:		Stability: Unstable
	Struck at (m):	Remarks:	
			Width: 0.90 Length: 3.00



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APPENDIX I

WOP trial pit photographs



WOPTP01



WOPTP01



WOPTP02



WOPTP02



WOPTP03



WOPTP03



WOPTP04



WOPTP04



WOPTP05



WOPTP05



WOPTP06



WOPTP06



WOPTP07



WOPTP07



WOPTP08



WOPTP08





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APPENDIX J

WOA trial pit photographs



WPATP-01/17



WPATP-01/17



WPATP-02/17



WPATP-02/17



WPATP-03/17



WPATP-03/17



WPATP-04/17



WPATP-04/17



WPATP-05/17



WPATP-05/17



WPATP-06/17



WPATP-06/17



WPATP-07/17



WPATP-07/17



WPATP-08/17



WPATP-08/17



WPATP-09/17



WPATP-09/17



WPATP-10/17



WPATP-10/17





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APPENDIX K

WOP slit trench logs and drawings





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— GEOTECH

Project No.: 16-1239	Project Name: West Offaly Power station and the Ash Disposal Facility	Trial Pit No.: WOPST-02
Co-ordinates: 597315.59 E	Client: Bord Na Mona	Sheet 1 of 1
Method: Slit Trenching	Client's Representative: Bord Na Mona	Scale: 1:25
Plant: 11T Tracked Excavator	Ground Level: 40.26 mOD	Date: 26/01/2017
		Logger: RS

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
				(0.30)		TOPSOIL	
			39.96	0.30		MADE GROUND: Concrete	
				(0.30)			
			39.66	0.60		MADE GROUND: Grey slightly clayey sandy fine to coarse angular to subangular GRAVEL. Sand is fine to coarse (CL804)	
				(0.20)			
			39.46	0.80		MADE GROUND: Brown slightly gravelly slightly clayey fine to coarse SAND. Gravel is subangular to subrounded fine to coarse.	
				(0.55)			
			38.90	1.35		End of trial pit at 1.35m	

Remarks Terminated at scheduled depth	Water Strikes:		Stability:
	Struck at (m):	Remarks:	
			Width: 0.60 Length: 4.50

JOB NUMBER: 16-1239

JOB NAME: West Offaly Power Station and Ash Disposal Facility

LOCATION: ST-02/17

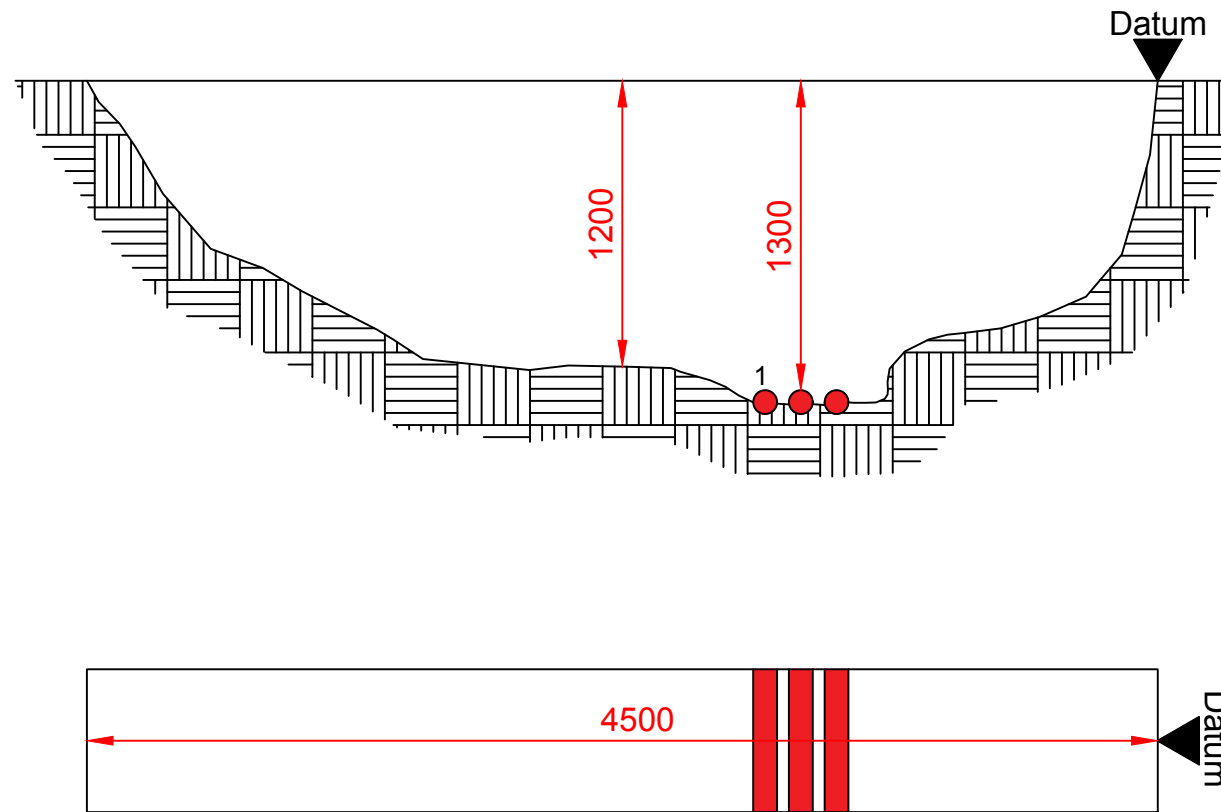
CLIENT: Bord Na Mona

CLIENTS REPRESENTATIVE: Bord Na Mona

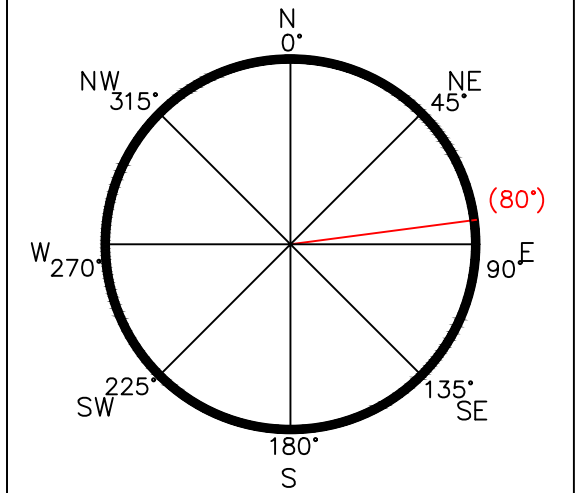
CREW: RS

PLANT & EQUIPMENT: 3 Tonne Excavator & Hand Tools

TRENCH: (SECTION & PLAN)



TRENCH - ORIENTATION



TRENCH ORIENTATED: 80° FROM NORTH

COORDINATES

EASTING: -
NORTHING: -
ELEVATION: -

No:	Type of Service:	Diameter (in mm)	Depth to Top of Service (m)	Distance to Centre of Service (m)	Details/Comments
01	Electric	100	1.30	1.35 - 1.50 - 1.65	3x 100mm Red plastic pipe possible electric
02					
03					
04					
05					
06					
07					
08					
09					
10					
11					
12					
13					
14					
15					

TRENCH LENGHT (M): 4.50
TRENCH DEPTH (M): 1.35
TRENCH WIDTH (M): 0.60

STABILITY: GOOD
GROUNDWATER: NONE

SCALE: NTS@A3
DRAWN: BS
CHECKED: CH
DATE EXCAVATED: 26/01/2017





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Project No.: 16-1239	Project Name: West Offaly Power station and the Ash Disposal Facility	Trial Pit No.: WOPST-03
Co-ordinates: 597287.58 E	Client: Bord Na Mona	Sheet 1 of 1
Method: Slit Trenching	Client's Representative: Bord Na Mona	Scale: 1:25
Plant: 11T Tracked Excavator	Ground Level: 40.30 mOD	Date: 26/01/2017
		Logger: RS

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
			40.00	(0.30)		MADE GROUND: Concrete	
			38.90	0.30		MADE GROUND: Brown very sandy fine to coarse subangular to subrounded GRAVEL. Sand is fine to coarse.	
				(1.10)			
				1.40		End of trial pit at 1.40m	

Remarks Terminated at scheduled depth	Water Strikes:		Stability:
	Struck at (m):	Remarks:	
			Width: 1.80 Length: 8.30

JOB NUMBER: 16-1239

JOB NAME: West Offaly Power Station and Ash Disposal Facility

LOCATION: ST-03/17

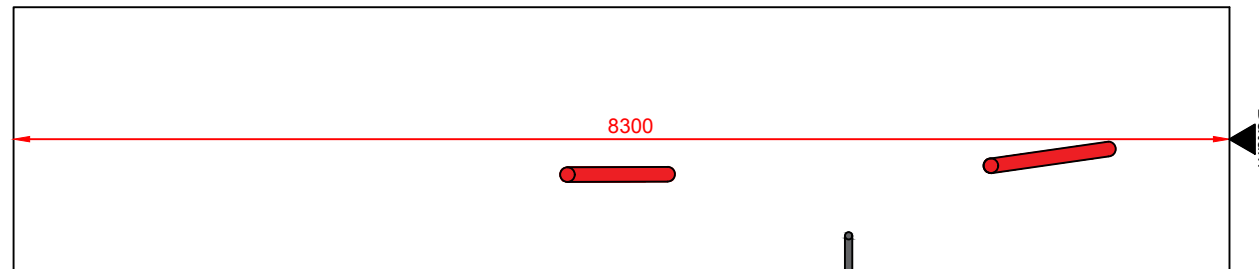
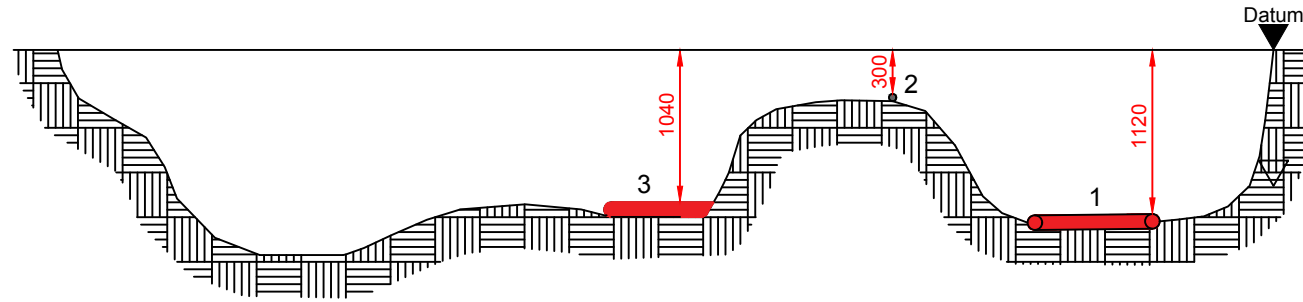
CLIENT: Bord Na Mona

CLIENTS REPRESENTATIVE: Bord Na Mona

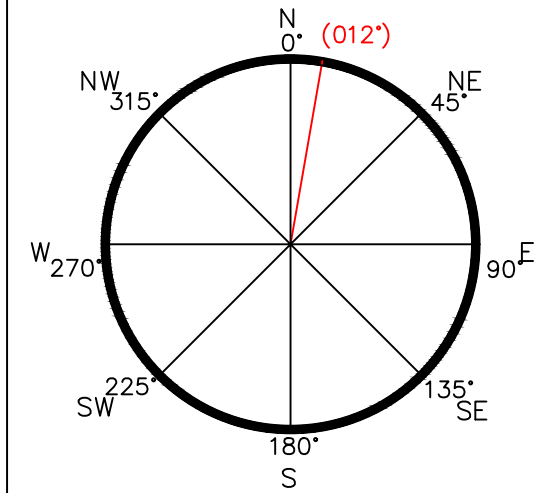
CREW: RS

PLANT & EQUIPMENT: 3 Tonne Excavator & Hand Tools

TRENCH: (SECTION & PLAN)



TRENCH - ORIENTATION



TRENCH ORIENTATED: 012° FROM NORTH

COORDINATES

EASTING: -
NORTHING: -
ELEVATION: -

No:	Type of Service:	Diameter (in mm)	Depth to Top of Service (m)	Distance to Centre of Service (m)	Details/Comments
01	Electric	100	1.12	1.30	100mm Red plastic possible electric (possible joined to service 3)
02	Unknown	50	0.30	2.60	50mm Unknown service possible electric
03	Electric	100	1.04	4.05	100mm Red plastic pipe possible electric (possible joined to service 1)
04					
05					
06					
07					
08					
09					
10					
11					
12					
13					
14					
15					

TRENCH LENGHT (M): 8.30
TRENCH DEPTH (M): 1.40
TRENCH WIDTH (M): 1.80

STABILITY: GOOD
GROUNDWATER: NONE

SCALE: NTS@A3
DRAWN: BS
CHECKED: CH
DATE EXCAVATED: 26/01/2017





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APPENDIX L

WOP slit trench photographs



WOPST-02/17



WOPST-02/17



WOPST-03/17



WOPST-03/17





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APPENDIX M

Geotechnical laboratory test results





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

Client:	Bord Na Mona
From:	Stephen Watson Laboratory Manager Causeway Geotech Ltd
Tel:	+44(0)2827666640
E-mail:	stephen.watson@causewaygeotech.com
Date:	29/03/17
Ref:	16-1239 - Schedule 1

West Offaly Power Station and the Ash Disposal Facility

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 60 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.

Approved Signatory

Stephen Watson
Laboratory Manager



Project Name **West Offaly Power Station and the Ash Disposal Facility**

Report Reference. **16-1239 – Schedule 1**

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

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	Number of test results included in the report
SOIL	Moisture content - oven drying method	BS 1377-2:1990	36
SOIL	Liquid limit - cone penetrometer	BS 1377-2:1990	27
SOIL	Liquid limit - cone penetrometer - one point	BS 1377-2:1990	27
SOIL	Plastic limit	BS 1377-2:1990	27
SOIL	Plasticity index and liquidity index	BS 1377-2:1990	27
SOIL	Particle size distribution - wet sieving	BS 1377-2:1990	10
SOIL	Particle size distribution - dry sieving	BS 1377-2:1990	10
SOIL	Particle size distribution -sedimentation hydrometer method	BS 1377-2:1990	6
SOIL	MCV	BS 1377-4:1990	5
SOIL	MCV relationship	BS 1377-4:1990	2
SOIL	California Bearing Ratio (CBR)	BS 1377-4:1990	7
SOIL	Laboratory vane	BS 1377- 7:1990	5
SOIL	Undrained shear strength – triaxial compression without measurement of pore pressure (loads from 0.12 to 24 kN)	BS 1377- 7:1990	3
SOIL	pH Value of Soil		13
SOIL	Sulphate Content water extract		13
SOIL	Organic Matter		2

Summary of Classification Test Results

Project No. 16-1239	Project Name West Offaly Power station and the Ash Disposal Facility
------------------------	---

Hole No.	Sample				Soil Description	Density		w	Passing 425µm	LL	PL	PI	Particle density	Casagrande Classification
	Ref	Top	Base	Type		bulk	dry							
						Mg/m3		%	%	%	%	Mg/m3		
WOPTP-01	1	1.00		B	MADE GROUND: Grey sandy slightly gravelly organic CLAY.			194.0	74	21 -1pt	14	7		CL
WOPTP-01	3	2.00		B	MADE GROUND: Grey sandy slightly gravelly organic CLAY.			156.0	100	21 -1pt	13	8		CL
WOPTP-01	5	3.00		B	MADE GROUND: Grey sandy slightly gravelly organic CLAY.			156.0	56	20 -1pt	9	11		CL
WOPTP-02	2	1.00		D	MADE GROUND: Grey sandy organic SILT.			149.0	100	101 -1pt	89	12		ME
WOPTP-02	3	2.00		B	MADE GROUND: Grey sandy organic SILT.			42.0	100	103 -1pt	81	22		ME
WOPTP-02	5	3.00		B	MADE GROUND: Grey sandy slightly organic SILT.			198.0	100	102 -1pt	47	55		ME
WOPTP-03	1	1.00		B	MADE GROUND: Grey sandy organic SILT.			132.0	100	107 -1pt	63	44		ME
WOPTP-03	3	2.00		B	MADE GROUND: Grey sandy organic SILT.			153.0	100	137 -1pt	105	32		ME
WOPTP-03	6	3.00		D	MADE GROUND: Grey sandy organic SILT.			84.0	100	139 -1pt	110	29		ME
WOPTP-04	1	0.50		B	MADE GROUND: Grey sandy slightly gravelly organic SILT.			151.0	59	131 -1pt	100	31		ME
WOPTP-04	2	0.50		D	MADE GROUND: Grey sandy slightly gravelly organic SILT.			129.0	100	143 -1pt	89	54		ME
WOPTP-04	3	1.00		B	MADE GROUND: Grey sandy organic SILT.			181.0	100	143 -1pt	89	54		ME
WOPTP-04	5	2.20		B	MADE GROUND: Grey sandy organic SILT..			187.0	100	151 -1pt	NP			

All tests performed in accordance with BS1377:1990 unless specified otherwise

Key Density test Linear measurement unless : wd - water displacement wi - immersion in water Liquid Limit 4pt cone unless : cas - Casagrande method 1pt - single point test Particle density sp - small pyknometer gj - gas jar	Date Printed 29/03/2017	Approved By Stephen.Watson	Table 1 sheet 1
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Summary of Classification Test Results

Project No. 16-1239		Project Name West Offaly Power station and the Ash Disposal Facility												
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							
WOPTP-04	7	3.50		B	MADE GROUND: Grey sandy organic SILT.			141.0	100	137 -1pt	92	45		ME
WOPTP-05	4	1.00		D	MADE GROUND: Grey sandy organic SILT.			102.0	100	123 -1pt	103	20		ME
WOPTP-05	6	2.00		B	MADE GROUND: Grey sandy organic SILT.			130.0	100	125 -1pt	105	20		ME
WOPTP-05	8	3.00		B	MADE GROUND: Grey sandy organic SILT.			153.0	100	124 -1pt	103	21		ME
WOPTP-05	10	4.00		B	MADE GROUND: Grey sandy slightly gravelly organic SILT.			128.0	100	124 -1pt	103	21		ME
WOPTP-06	1	1.00		B	Brownish grey silty sandy fine to coarse sandy GRAVEL with low cobble content.			4.5						
WOPTP-07	1	1.00		B	Dark brown sandy fine to coarse subangular GRAVEL with medium cobble content.			5.3						
WPATP-01/17	4	2.00		D	Brown fibrous PEAT.			437.0						
WPATP-01/17	5	3.00		B	Grey slightly sandy slightly gravelly CLAY.			19.0	93	30 -1pt	18	12		CL
WPATP-02/17	5	3.00		B	Grey slightly sandy very gravelly CLAY.			31.0	94	38 -1pt	23	15		CI
WPATP-02/17	6	3.00		D	Grey slightly sandy very gravelly CLAY.			32.0	100	39 -1pt	23	16		CI
WPATP-03/17	3	1.00		B	Blueish grey sandy slightly gravelly CLAY.			21.0						
WPATP-04/17	2	1.00		D	Dark brown fibrous PEAT.			707.0						

All tests performed in accordance with BS1377:1990 unless specified otherwise

Key Density test Linear measurement unless : wd - water displacement wi - immersion in water Liquid Limit 4pt cone unless : cas - Casagrande method 1pt - single point test Particle density sp - small pyknometer gj - gas jar	Date Printed 29/03/2017	Approved By Stephen.Watson	Table 1 sheet 2
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Summary of Classification Test Results

Project No. 16-1239	Project Name West Offaly Power station and the Ash Disposal Facility
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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							
WPATP-04/17	3	2.00		B	Grey slightly sandy CLAY.			47.0	100	40 -1pt	23	17		CI
WPATP-04/17	5	3.00		B	Blueish grey slightly sandy CLAY.			31.0	100	40 -1pt	22	18		CI
WPATP-05/17	2	1.00		D	Brown fibrous PEAT.			686.0						
WPATP-05/17	3	2.00		B	Grey sandy gravelly CLAY.			17.0	83	25 -1pt	15	10		CL
WPATP-05/17	5	3.00		B	Grey sandy gravelly CLAY.			8.8	73	21 -1pt	11	10		CL
WPATP-07/17	4	2.00		D	Grey slightly sandy gravelly CLAY.			11.0	52	22 -1pt	12	10		CL
WPATP-08/17	5	3.00		B	Grey slightly sandy fine to coarse GRAVEL with medium to high cobble content.			3.1						
WPATP-09/17	1	1.00		B	Grey sandy gravelly CLAY.			11.0						
WPATP-09/17	3	2.00		B	Grey sandy fine to coarse subangular GRAVEL.			8.0						
WPATP-10/17	3	2.00		B	Grey sandy very gravelly CLAY.			9.3	42	22 -1pt	14	8		CL

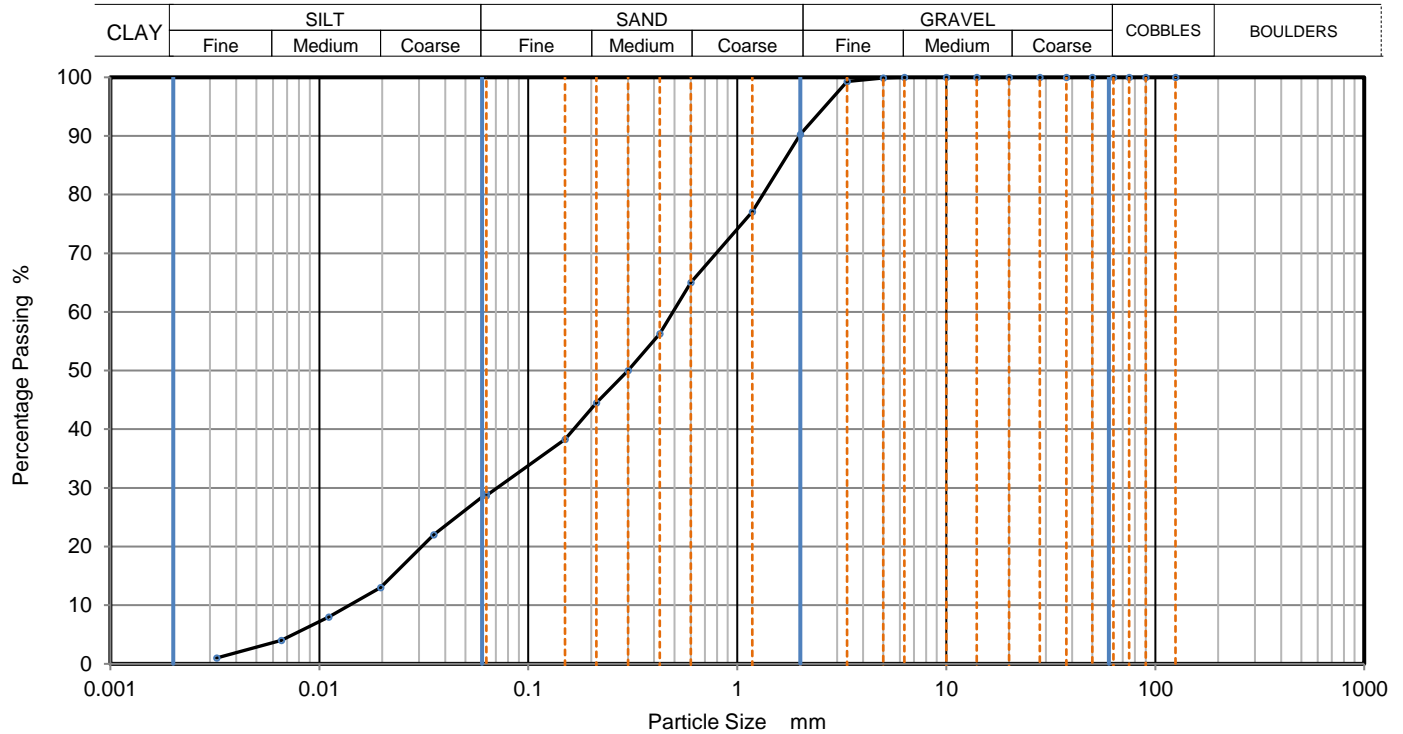
All tests performed in accordance with BS1377:1990 unless specified otherwise

Key Density test Linear measurement unless : wd - water displacement wi - immersion in water Liquid Limit 4pt cone unless : cas - Casagrande method 1pt - single point test Particle density sp - small pyknometer gj - gas jar	Date Printed 29/03/2017	Approved By Stephen.Watson	Table 1 sheet 3
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PARTICLE SIZE DISTRIBUTION

Job Ref	16-1239
Borehole/Pit No.	WOPTP-01
Site Name	West Offaly Power station and the Ash Disposal Facility
Sample No.	1
Soil Description	MADE GROUND: Grey sandy slightly gravelly organic CLAY.
Depth, m	1.00
Specimen Reference	7
Specimen Depth	m
Sample Type	B
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5
KeyLAB ID	Caus201702240



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0630	29
90	100	0.0353	22
75	100	0.0196	13
63	100	0.0111	8
50	100	0.0066	4
37.5	100	0.0032	1
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	99		
2	90		
1.18	77		
0.6	65	Particle density (assumed) 1.40 Mg/m ³	
0.425	56		
0.3	50		
0.212	45		
0.15	38		
0.063	29		

Dry Mass of sample, g 602

Sample Proportions	% dry mass
Cobbles	0
Gravel	10
Sand	62
Fines <0.063mm	29

Grading Analysis	
D100	mm
D60	mm 0.492
D30	mm 0.0706
D10	mm 0.0141
Uniformity Coefficient	35
Curvature Coefficient	0.72

Remarks
Preparation and testing in accordance with BS1377 unless noted below



PARTICLE SIZE DISTRIBUTION

Job Ref

16-1239

Borehole/Pit No.

WOPTP-01

Site Name

West Offaly Power station and the Ash Disposal Facility

Sample No.

5

Soil Description

MADE GROUND: Grey sandy slightly gravelly organic CLAY.

Depth, m

3.00

Specimen Reference

6

Specimen
Depth

m

Sample Type

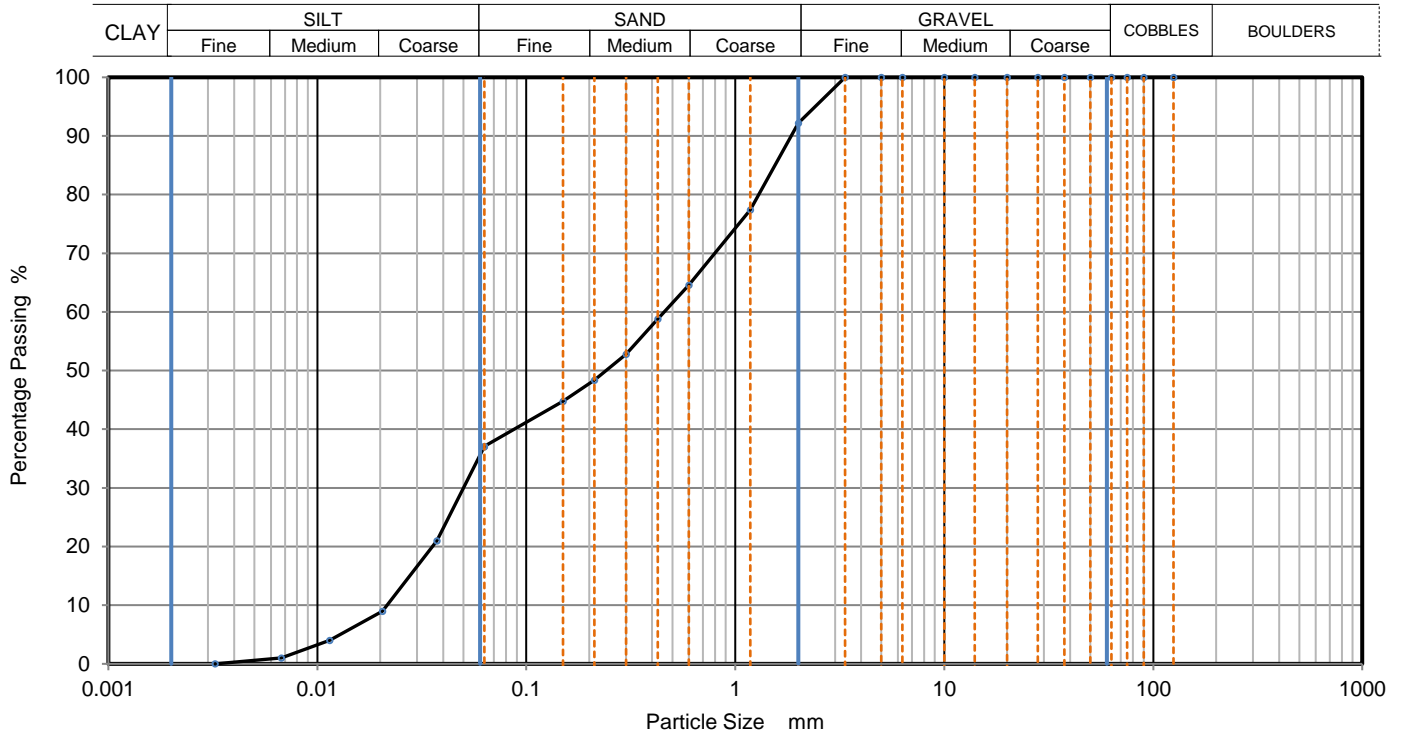
B

Test Method

BS1377:Part 2:1990, clauses 9.2 and 9.5

KeyLAB ID

Caus201702242



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0630	37
90	100	0.0373	21
75	100	0.0205	9
63	100	0.0115	4
50	100	0.0067	1
37.5	100	0.0032	0
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	92		
1.18	77		
0.6	65	Particle density (assumed)	
0.425	59	1.40 Mg/m ³	
0.3	53		
0.212	48		
0.15	45		
0.063	37		

Dry Mass of sample, g

1139

Sample Proportions	% dry mass
Cobbles	0
Gravel	8
Sand	55
Fines <0.063mm	37

Grading Analysis		
D100	mm	
D60	mm	0.456
D30	mm	0.0497
D10	mm	0.0215
Uniformity Coefficient		21
Curvature Coefficient		0.25

Remarks

Preparation and testing in accordance with BS1377 unless noted below

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Fig 1

Sheet



PARTICLE SIZE DISTRIBUTION

Job Ref

16-1239

Borehole/Pit No.

WOPTP-03

Site Name

West Offaly Power station and the Ash Disposal Facility

Sample No.

3

Soil Description

MADE GROUND: Grey sandy slightly gravelly organic SILT.

Depth, m

2.00

Specimen Reference

6

Specimen
Depth

m

Sample Type

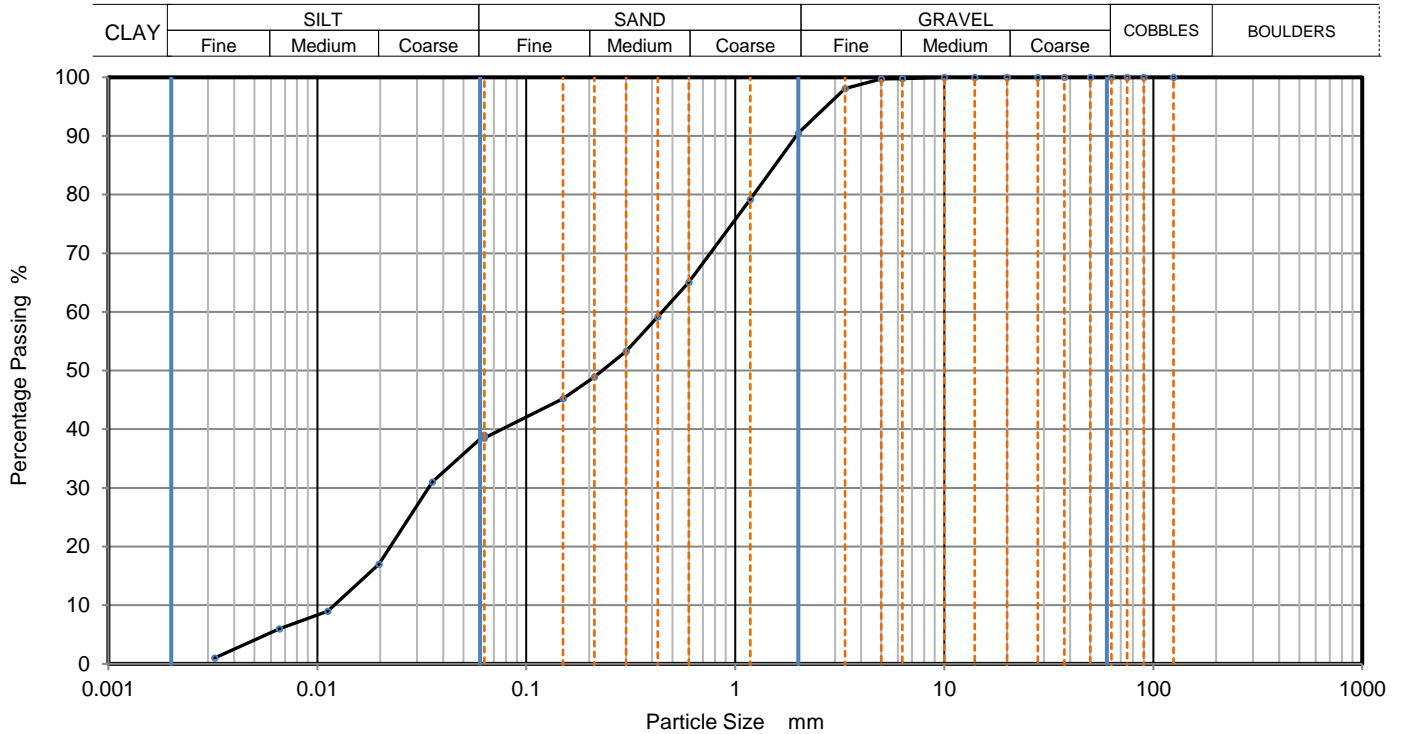
B

Test Method

BS1377:Part 2:1990, clauses 9.2 and 9.5

KeyLAB ID

Caus201702248



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0630	39
90	100	0.0355	31
75	100	0.0197	17
63	100	0.0112	9
50	100	0.0066	6
37.5	100	0.0032	1
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	98		
2	91		
1.18	79		
0.6	65	Particle density (assumed)	
0.425	59	1.40 Mg/m3	
0.3	53		
0.212	49		
0.15	45		
0.063	39		

Dry Mass of sample, g

901

Sample Proportions	% dry mass
Cobbles	0
Gravel	10
Sand	52
Fines <0.063mm	38

Grading Analysis		
D100	mm	
D60	mm	0.445
D30	mm	0.0346
D10	mm	0.012
Uniformity Coefficient		37
Curvature Coefficient		0.22

Remarks

Preparation and testing in accordance with BS1377 unless noted below

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Fig 1

Sheet



PARTICLE SIZE DISTRIBUTION

Job Ref **16-1239**

Borehole/Pit No. **WOPTP-04**

Site Name **West Offaly Power station and the Ash Disposal Facility**

Sample No. **1**

Soil Description **MADE GROUND: Grey sandy slightly gravelly organic SILT.**

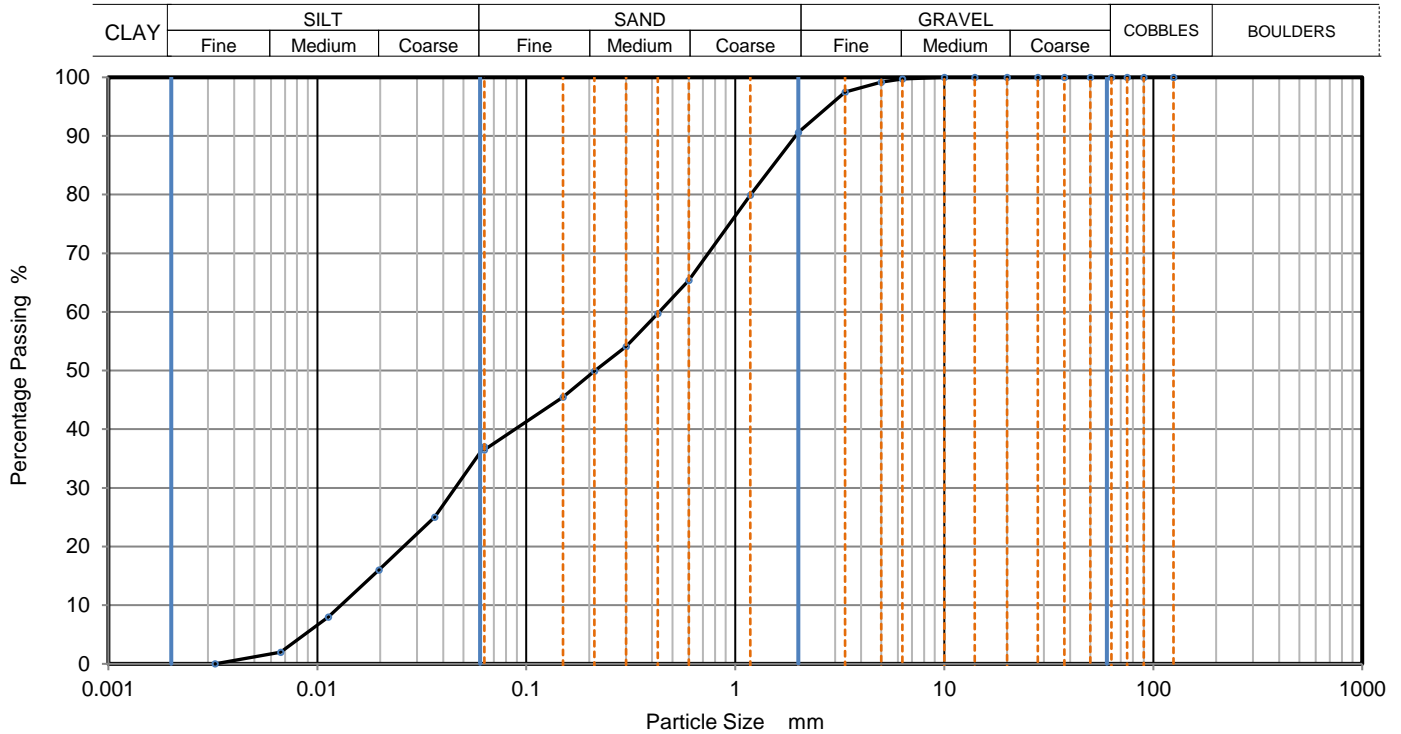
Depth, m **0.50**

Specimen Reference **6** Specimen Depth **m**

Sample Type **B**

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

KeyLAB ID **Caus2017022410**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0630	37
90	100	0.0364	25
75	100	0.0197	16
63	100	0.0113	8
50	100	0.0067	2
37.5	100	0.0032	0
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	99		
3.35	98		
2	91		
1.18	80		
0.6	65		
0.425	60	Particle density (assumed)	
0.3	54	1.40	Mg/m3
0.212	50		
0.15	46		
0.063	37		

Dry Mass of sample, g **1229**

Sample Proportions	% dry mass
Cobbles	0
Gravel	9
Sand	54
Fines <0.063mm	36

Grading Analysis		
D100	mm	
D60	mm	0.432
D30	mm	0.0466
D10	mm	0.0133
Uniformity Coefficient		33
Curvature Coefficient		0.38

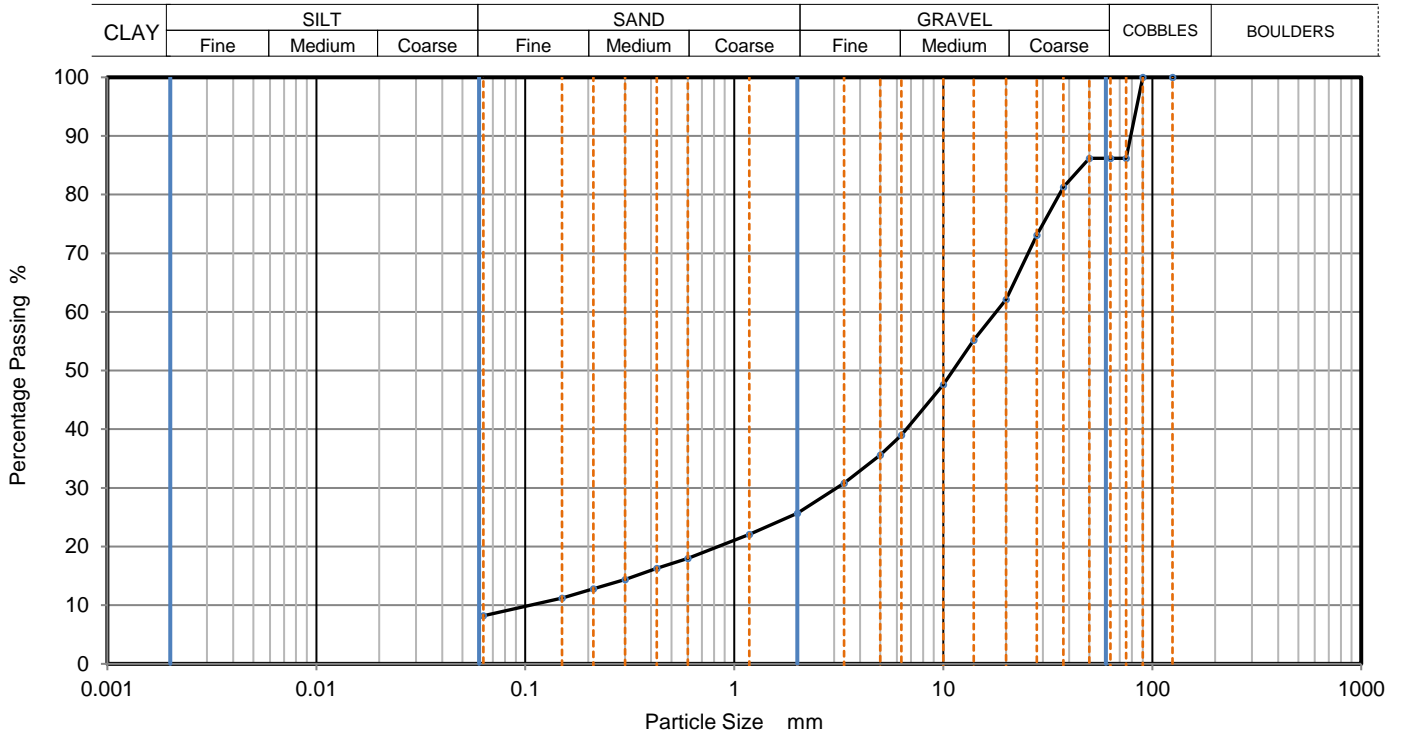
Remarks
Preparation and testing in accordance with BS1377 unless noted below



PARTICLE SIZE DISTRIBUTION

Job Ref	16-1239
Borehole/Pit No.	WOPTP-06
Sample No.	1
Depth, m	1.00
Sample Type	B
KeyLAB ID	Caus2017022420

Site Name	West Offaly Power station and the Ash Disposal Facility	
Soil Description	Brownish grey silty sandy fine to coarse sandy GRAVEL with low cobble content.	
Specimen Reference	4	Specimen Depth
Test Method	BS1377:Part 2:1990, clause 9.2	



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	86		
63	86		
50	86		
37.5	81		
28	73		
20	62		
14	55		
10	48		
6.3	39		
5	36		
3.35	31		
2	26		
1.18	22		
0.6	18		
0.425	16		
0.3	14		
0.212	13		
0.15	11		
0.063	8		

Dry Mass of sample, g 6195

Sample Proportions	% dry mass
Cobbles	14
Gravel	61
Sand	18
Fines <0.063mm	8

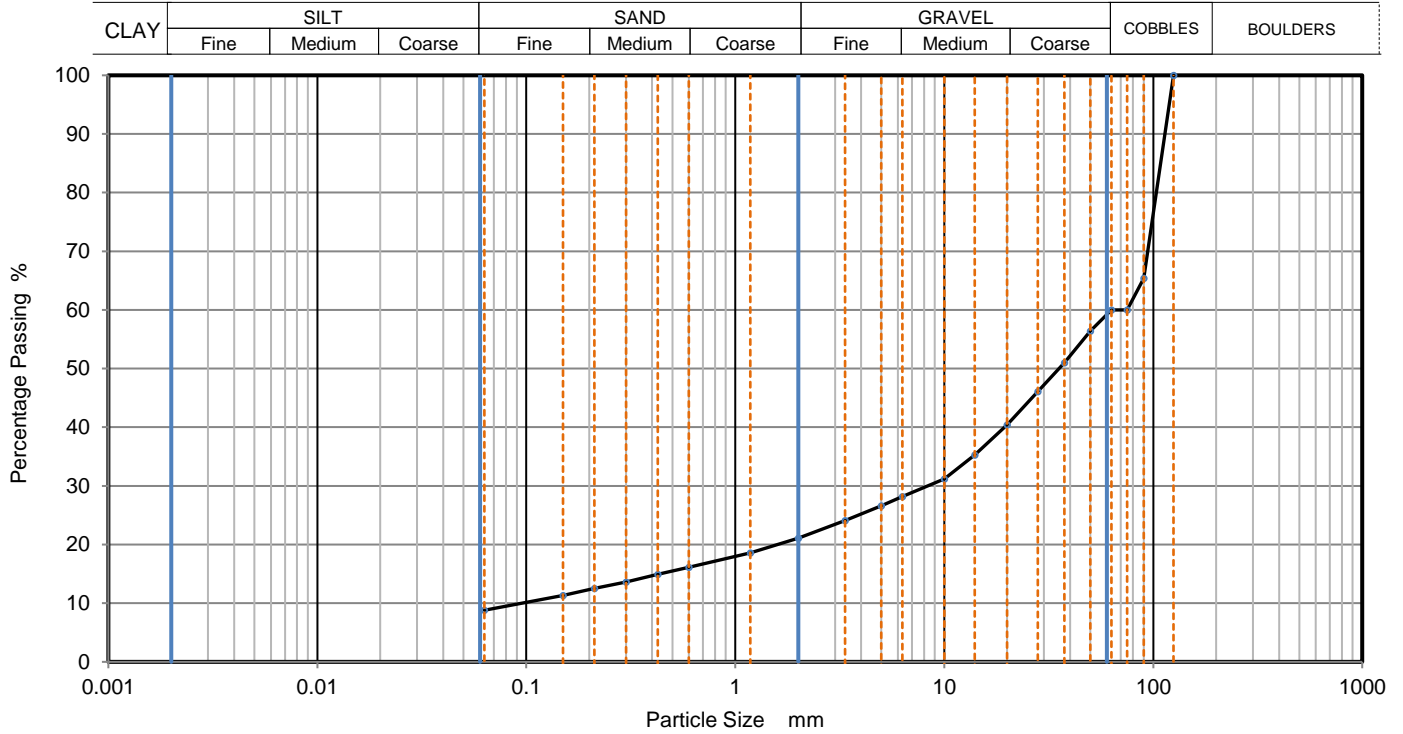
Grading Analysis	
D100	mm
D60	mm 17.9
D30	mm 3.1
D10	mm 0.106
Uniformity Coefficient	170
Curvature Coefficient	5.1

Remarks
Preparation and testing in accordance with BS1377 unless noted below



PARTICLE SIZE DISTRIBUTION

Job Ref	16-1239
Borehole/Pit No.	WOPTP-07
Site Name	West Offaly Power station and the Ash Disposal Facility
Sample No.	1
Soil Description	Dark brown sandy fine to coarse subangular GRAVEL with medium cobble content.
Depth, m	1.00
Specimen Reference	4
Specimen Depth	m
Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2
KeyLAB ID	Caus2017022421



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	65		
75	60		
63	60		
50	56		
37.5	51		
28	46		
20	40		
14	35		
10	31		
6.3	28		
5	27		
3.35	24		
2	21		
1.18	19		
0.6	16		
0.425	15		
0.3	14		
0.212	13		
0.15	11		
0.063	9		

Dry Mass of sample, g 11014

Sample Proportions	% dry mass
Cobbles	40
Gravel	39
Sand	12
Fines <0.063mm	9

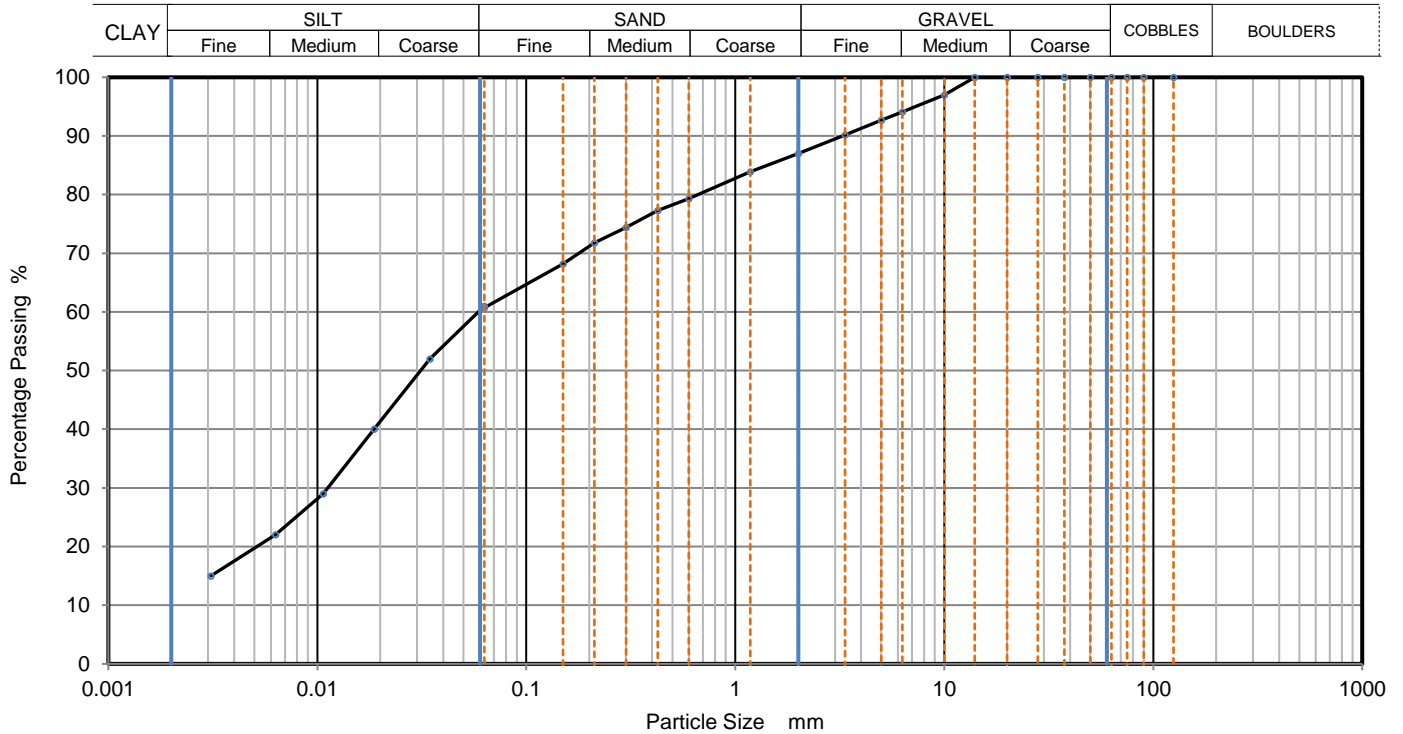
Grading Analysis		
D100	mm	125
D60	mm	62.8
D30	mm	8.31
D10	mm	0.0951
Uniformity Coefficient		660
Curvature Coefficient		12

Remarks
Preparation and testing in accordance with BS1377 unless noted below



PARTICLE SIZE DISTRIBUTION

Job Ref	16-1239
Borehole/Pit No.	WPATP-03/17
Site Name	West Offaly Power station and the Ash Disposal Facility
Sample No.	3
Soil Description	Blueish grey sandy slightly gravelly CLAY.
Depth, m	1.00
Specimen Reference	4
Specimen Depth	m
Sample Type	B
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5
KeyLAB ID	Caus2017022426



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0630	61
90	100	0.0346	52
75	100	0.0187	40
63	100	0.0107	29
50	100	0.0063	22
37.5	100	0.0031	15
28	100		
20	100		
14	100		
10	97		
6.3	94		
5	93		
3.35	90		
2	87		
1.18	84		
0.6	79		
0.425	77	Particle density (assumed) 1.40 Mg/m ³	
0.3	74		
0.212	72		
0.15	68		
0.063	61		

Dry Mass of sample, g 3991

Sample Proportions	% dry mass
Cobbles	0
Gravel	13
Sand	26
Fines <0.063mm	61

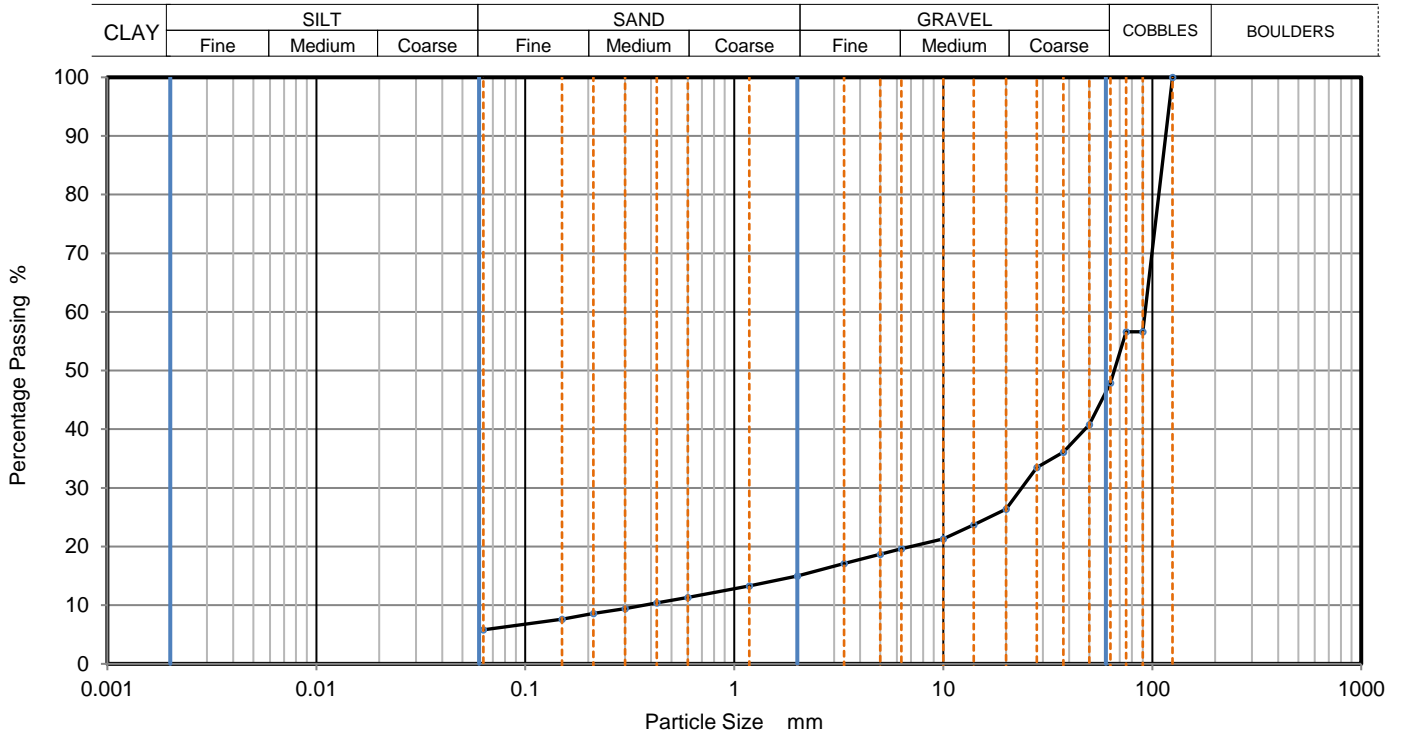
Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	
Curvature Coefficient	

Remarks
Preparation and testing in accordance with BS1377 unless noted below



PARTICLE SIZE DISTRIBUTION

Job Ref	16-1239
Borehole/Pit No.	WPATP-08/17
Sample No.	5
Depth, m	3.00
Sample Type	B
KeyLAB ID	Caus2017022435



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	57		
75	57		
63	48		
50	41		
37.5	36		
28	34		
20	26		
14	24		
10	21		
6.3	20		
5	19		
3.35	17		
2	15		
1.18	13		
0.6	11		
0.425	10		
0.3	9		
0.212	9		
0.15	8		
0.063	6		

Dry Mass of sample, g 6499

Sample Proportions	% dry mass
Cobbles	52
Gravel	33
Sand	9
Fines <0.063mm	6

Grading Analysis		
D100	mm	125
D60	mm	92.3
D30	mm	23.8
D10	mm	0.366
Uniformity Coefficient		250
Curvature Coefficient		17

Remarks
Preparation and testing in accordance with BS1377 unless noted below



PARTICLE SIZE DISTRIBUTION

Job Ref **16-1239**

Borehole/Pit No. **WPATP-09/17**

Site Name **West Offaly Power station and the Ash Disposal Facility**

Sample No. **1**

Soil Description **Grey sandy gravelly CLAY.**

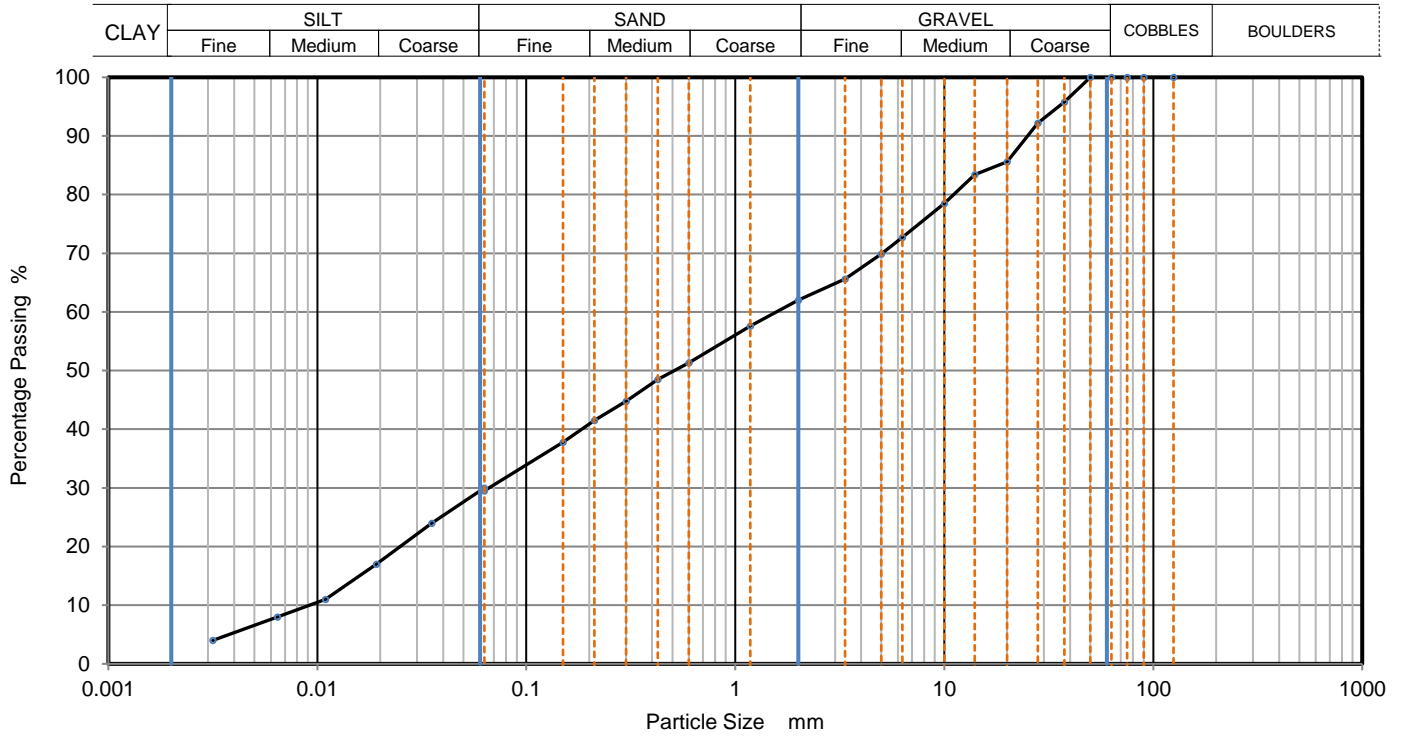
Depth, m **1.00**

Specimen Reference **4** Specimen Depth **m**

Sample Type **B**

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

KeyLAB ID **Caus2017022436**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0630	30
90	100	0.0353	24
75	100	0.0192	17
63	100	0.0109	11
50	100	0.0064	8
37.5	96	0.0032	4
28	92		
20	86		
14	83		
10	79		
6.3	73		
5	70		
3.35	66		
2	62		
1.18	58		
0.6	51		
0.425	49	Particle density (assumed)	
0.3	45	1.40 Mg/m ³	
0.212	42		
0.15	38		
0.063	30		

Dry Mass of sample, g

4787

Sample Proportions	% dry mass
Cobbles	0
Gravel	38
Sand	32
Fines <0.063mm	30

Grading Analysis	
D100	mm
D60	mm 1.58
D30	mm 0.0661
D10	mm 0.0094
Uniformity Coefficient	170
Curvature Coefficient	0.29

Remarks

Preparation and testing in accordance with BS1377 unless noted below

Approved

Stephen.Watson

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Fig **1**

Sheet



PARTICLE SIZE DISTRIBUTION

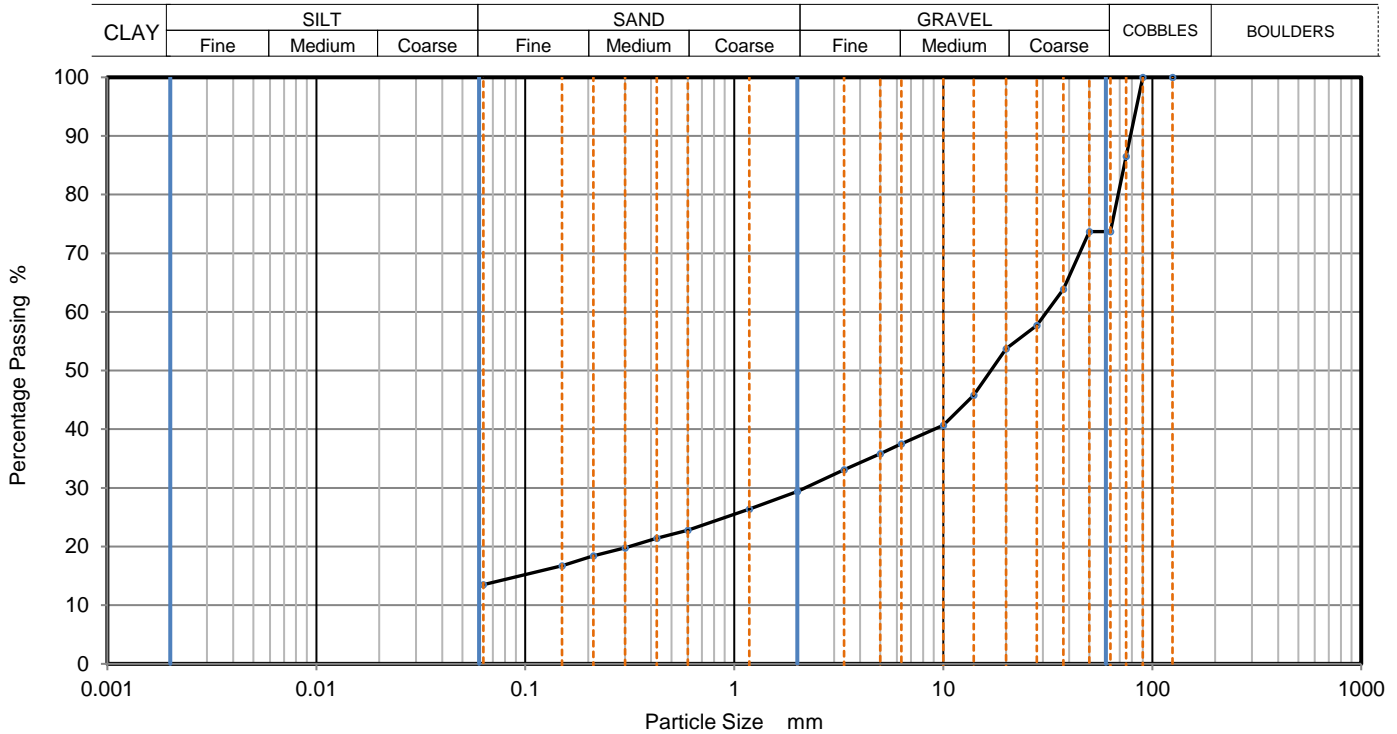
Job Ref	16-1239
Borehole/Pit No.	WPATP-09/17
Sample No.	3
Depth, m	2.00
Sample Type	B
KeyLAB ID	Caus2017022437

Site Name: West Offaly Power station and the Ash Disposal Facility

Soil Description: Grey sandy fine to coarse subangular GRAVEL.

Specimen Reference: 4 Specimen Depth: m

Test Method: BS1377:Part 2:1990, clause 9.2



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	87		
63	74		
50	74		
37.5	64		
28	58		
20	54		
14	46		
10	41		
6.3	38		
5	36		
3.35	33		
2	29		
1.18	26		
0.6	23		
0.425	21		
0.3	20		
0.212	18		
0.15	17		
0.063	14		

Dry Mass of sample, g: 7675

Sample Proportions	% dry mass
Cobbles	26
Gravel	44
Sand	16
Fines <0.063mm	13

Grading Analysis	
D100	mm
D60	mm 31.2
D30	mm 2.17
D10	mm
Uniformity Coefficient	
Curvature Coefficient	

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



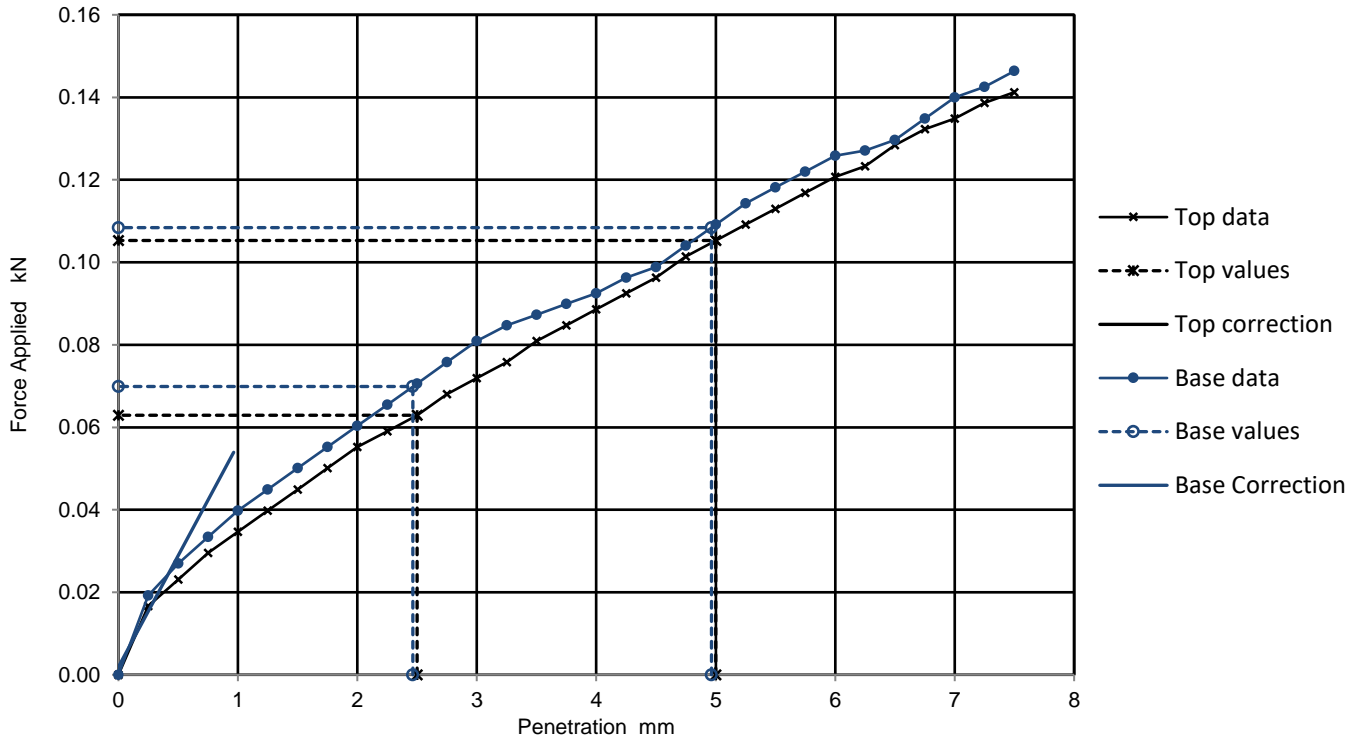
California Bearing Ratio (CBR)

Job Ref	16-1239
Borehole/Pit No.	WOPTP-01
Site Name	West Offaly Power station and the Ash Disposal Facility
Sample No.	1
Soil Description	MADE GROUND: Grey sandy slightly gravelly organic CLAY.
Depth m	1.00
Specimen Reference	8
Specimen Depth	m
Sample Type	B
Specimen Description	MADE GROUND: Grey sandy slightly gravelly organic CLAY.
KeyLAB ID	Caus201702240
Test Method	BS1377 : Part 4 : 1990, clause 7
CBR Test Number	1

Specimen Preparation

Condition	REMOULDED	Soaking details	Not soaked
Details	Recompacted with specified standard effort using 2.5kg rammer	Period of soaking	days
		Time to surface	days
		Amount of swell recorded	mm
Material retained on 20mm sieve removed	0 %	Dry density after soaking	Mg/m3
Initial Specimen details	Bulk density	1.27 Mg/m3	Surcharge applied
	Dry density	0.45 Mg/m3	13.5 kg
	Moisture content	182.8 %	8 kPa

Force v Penetration Plots



Results

	Curve correction applied	CBR Values, %				Moisture Content %
		2.5mm	5mm	Highest	Average	
TOP	No	0.5	0.5	0.5	0.5	182.8
BASE	Yes	0.5	0.5	0.5		183.5

General remarks	Test specific remarks	Approved
Tested at natural moisture content		Stephen.Watson

Fig No.	1
Sheet No	1



California Bearing Ratio (CBR)

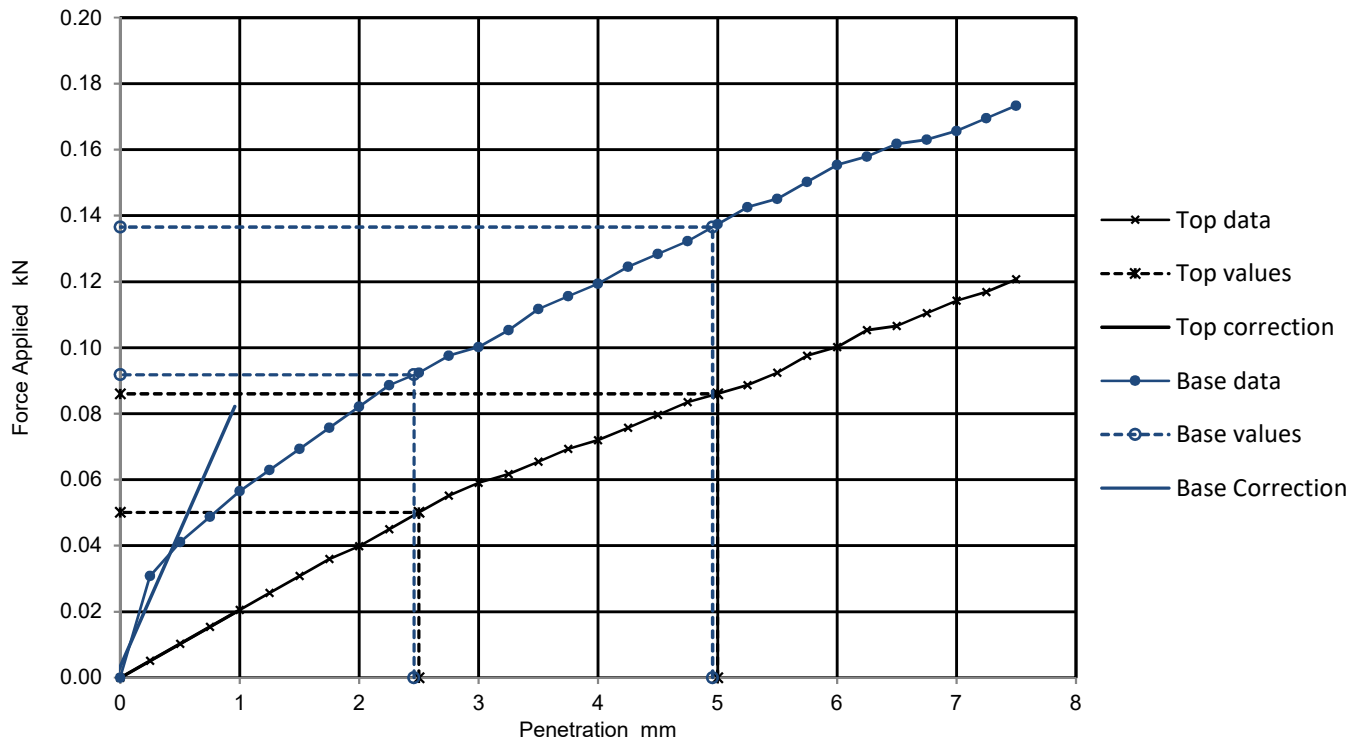
Job Ref	16-1239
Borehole/Pit No.	WOPTP-01
Sample No.	3
Depth m	2.00
Sample Type	B
KeyLAB ID	Caus201702241
CBR Test Number	1

Site Name	West Offaly Power station and the Ash Disposal Facility	
Soil Description	MADE GROUND: Grey sandy slightly gravelly organic CLAY.	
Specimen Reference	6	Specimen Depth m
Specimen Description	MADE GROUND: Grey sandy slightly gravelly organic CLAY.	
Test Method	BS1377 : Part 4 : 1990, clause 7	

Specimen Preparation

Condition	REMOULDED	Soaking details	Not soaked
Details	Recompacted with specified standard effort using 2.5kg rammer	Period of soaking	days
		Time to surface	days
		Amount of swell recorded	mm
Material retained on 20mm sieve removed	0 %	Dry density after soaking	Mg/m3
Initial Specimen details	Bulk density	1.36 Mg/m3	Surcharge applied
	Dry density	0.58 Mg/m3	13.5 kg
	Moisture content	135.5 %	8 kPa

Force v Penetration Plots



Results

	Curve correction applied	CBR Values, %				Moisture Content %
		2.5mm	5mm	Highest	Average	
TOP	Yes	0.4	0.4	0.4	0.55	135.5
BASE	Yes	0.7	0.7	0.7		138.3

General remarks	Test specific remarks	Approved
Tested at natural moisture content		Stephen.Watson

Fig No.	1
Sheet No	2



California Bearing Ratio (CBR)

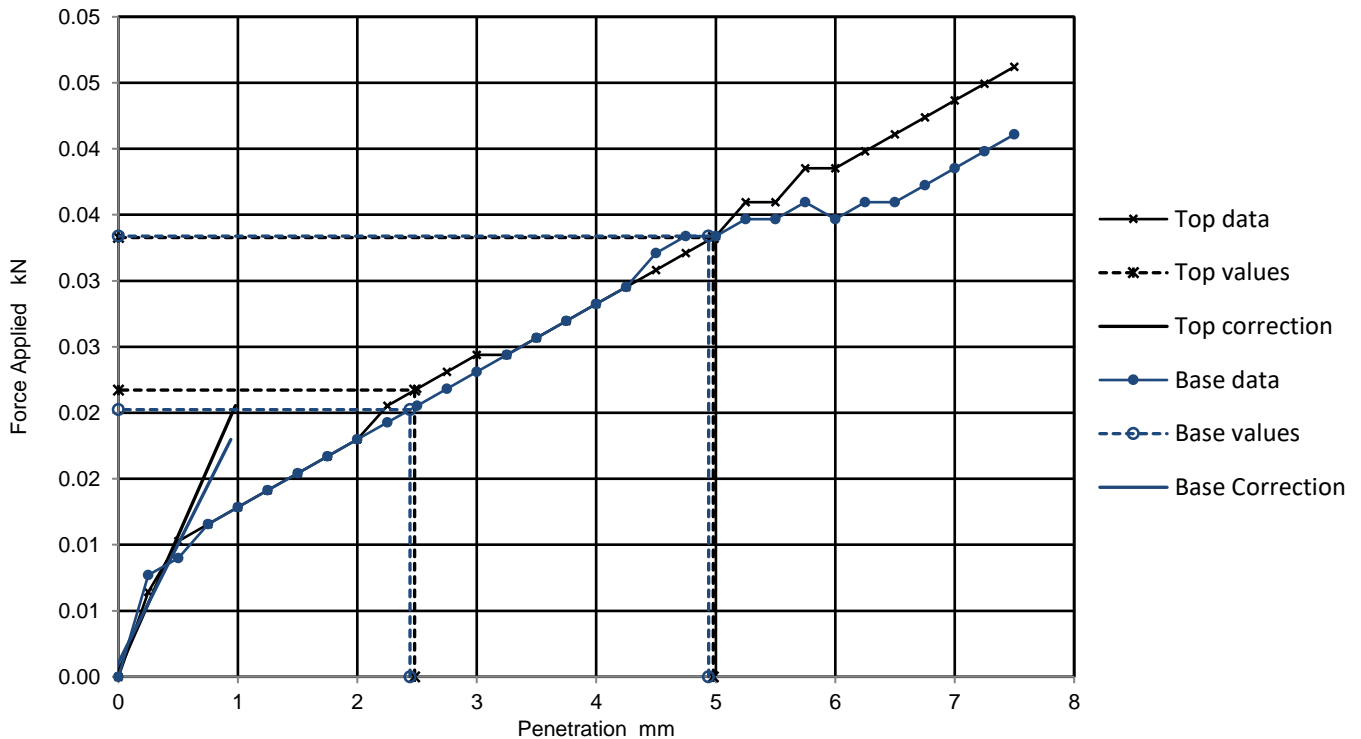
Job Ref	16-1239
Borehole/Pit No.	WOPTP-02
Sample No.	3
Depth m	2.00
Sample Type	B
KeyLAB ID	Caus201702244
CBR Test Number	1

Site Name	West Offaly Power station and the Ash Disposal Facility	
Soil Description	MADE GROUND: Grey sandy organic SILT.	
Specimen Reference	6	Specimen Depth m
Specimen Description	MADE GROUND: Grey sandy organic SILT.	
Test Method	BS1377 : Part 4 : 1990, clause 7	

Specimen Preparation

Condition	REMOULDED	Soaking details	Not soaked
Details	Recompacted with specified standard effort using 2.5kg rammer	Period of soaking	days
		Time to surface	days
		Amount of swell recorded	mm
Material retained on 20mm sieve removed	0 %	Dry density after soaking	Mg/m3
Initial Specimen details	Bulk density	1.12 Mg/m3	Surcharge applied
	Dry density	0.38 Mg/m3	13.5 kg
	Moisture content	192.5 %	8 kPa

Force v Penetration Plots



Results

	Curve correction applied	CBR Values, %				Moisture Content %
		2.5mm	5mm	Highest	Average	
TOP	Yes	0.2	0.2	0.2	0.2	192.5
BASE	Yes	0.2	0.2	0.2		193.8

General remarks	Test specific remarks	Approved
Tested at natural moisture content		Stephen.Watson

Fig No.	1
Sheet No	3

Lab Sheet Reference :



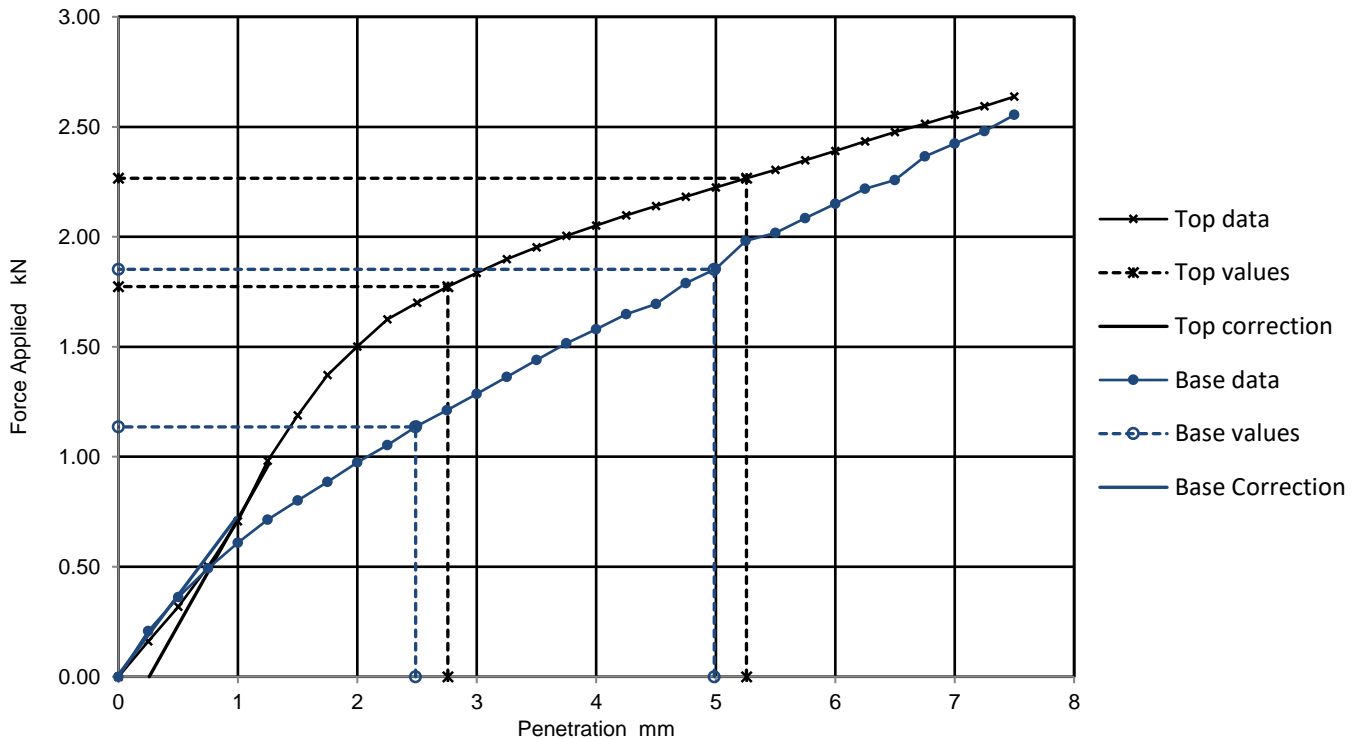
California Bearing Ratio (CBR)

Job Ref	16-1239
Borehole/Pit No.	WOPTP-03
Site Name	West Offaly Power station and the Ash Disposal Facility
Sample No.	1
Soil Description	MADE GROUND: Grey sandy organic SILT.
Depth m	1.00
Specimen Reference	6
Specimen Depth	m
Sample Type	B
Specimen Description	MADE GROUND: Grey sandy organic SILT.
KeyLAB ID	Caus201702247
Test Method	BS1377 : Part 4 : 1990, clause 7
CBR Test Number	1

Specimen Preparation

Condition	REMOULDED	Soaking details	Not soaked
Details	Recompacted with specified standard effort using 2.5kg rammer	Period of soaking	days
		Time to surface	days
		Amount of swell recorded	mm
Material retained on 20mm sieve removed	0 %	Dry density after soaking	Mg/m3
Initial Specimen details	Bulk density	1.27 Mg/m3	Surcharge applied
	Dry density	0.56 Mg/m3	13.5 kg
	Moisture content	127.7 %	8 kPa

Force v Penetration Plots



Results

	Curve correction applied	CBR Values, %				Moisture Content %
		2.5mm	5mm	Highest	Average	
TOP	Yes	13.0	11.0	13.0	11.2	127.7
BASE	Yes	8.6	9.3	9.3		126.9

General remarks	Test specific remarks	Approved
Tested at natural moisture content		Stephen.Watson

Fig No.	1
Sheet No	4



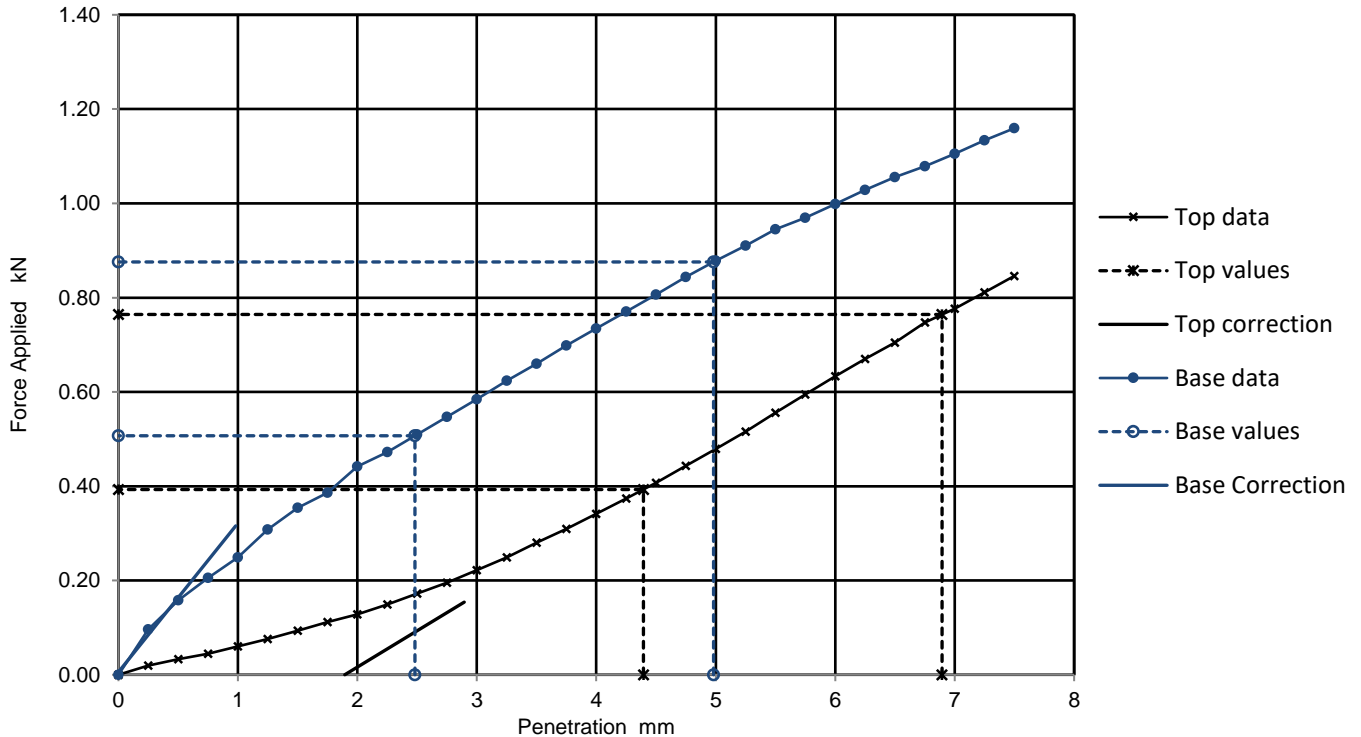
California Bearing Ratio (CBR)

Job Ref	16-1239
Borehole/Pit No.	WOPTP-04
Sample No.	3
Depth m	1.00
Sample Type	B
KeyLAB ID	Caus2017022412
CBR Test Number	1

Specimen Preparation

Condition	REMOULDED	Soaking details	Not soaked
Details	Recompacted with specified standard effort using 2.5kg rammer	Period of soaking	days
		Time to surface	days
		Amount of swell recorded	mm
Material retained on 20mm sieve removed	0 %	Dry density after soaking	Mg/m3
Initial Specimen details	Bulk density 1.26 Mg/m3	Surcharge applied	13.5 kg
	Dry density 0.47 Mg/m3		8 kPa
	Moisture content 165.4 %		

Force v Penetration Plots



Results

	Curve correction applied	CBR Values, %				Moisture Content %
		2.5mm	5mm	Highest	Average	
TOP	Yes	3.0	3.8	3.8	4.1	165.4
BASE	Yes	3.8	4.4	4.4		166.6

General remarks	Test specific remarks	Approved
Tested at natural moisture content		Stephen.Watson

Fig No.	1
Sheet No	5



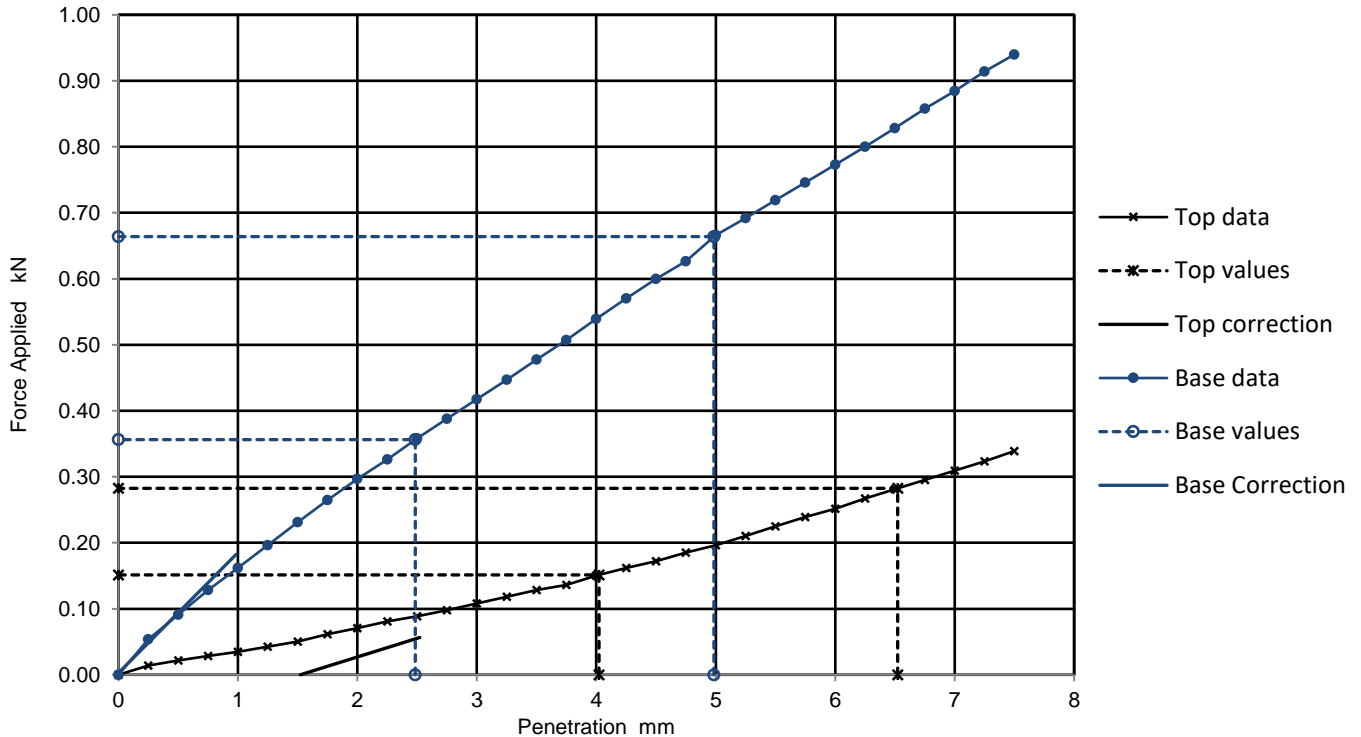
California Bearing Ratio (CBR)

Job Ref	16-1239
Borehole/Pit No.	WOPTP-05
Sample No.	8
Depth m	3.00
Sample Type	B
KeyLAB ID	Caus2017022418
CBR Test Number	1

Specimen Preparation

Condition	REMOULDED	Soaking details	Not soaked
Details	Recompacted with specified standard effort using 2.5kg rammer	Period of soaking	days
		Time to surface	days
		Amount of swell recorded	mm
Material retained on 20mm sieve removed	0 %	Dry density after soaking	Mg/m3
Initial Specimen details	Bulk density	1.38 Mg/m3	Surcharge applied
	Dry density	0.57 Mg/m3	13.5 kg
	Moisture content	143.8 %	8 kPa

Force v Penetration Plots



Results

	Curve correction applied	CBR Values, %				Moisture Content %
		2.5mm	5mm	Highest	Average	
TOP	Yes	1.1	1.4	1.4	2.4	143.8
BASE	Yes	2.7	3.3	3.3		134.5

General remarks	Test specific remarks	Approved
Tested at natural moisture content		Stephen.Watson

Fig No.	1
Sheet No	6



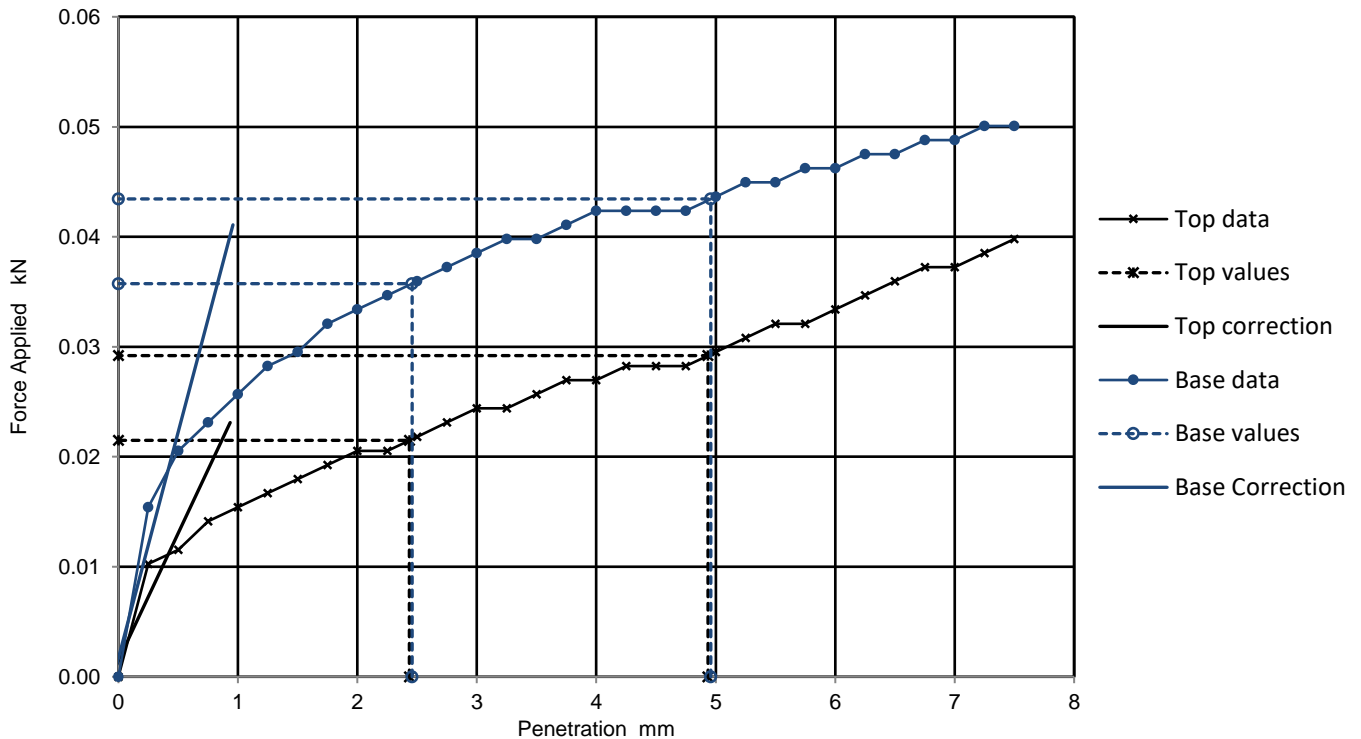
California Bearing Ratio (CBR)

Job Ref	16-1239
Borehole/Pit No.	WPATP-04/17
Sample No.	5
Depth m	3.00
Sample Type	B
KeyLAB ID	Caus2017022429
CBR Test Number	1

Specimen Preparation

Condition	REMOULDED	Soaking details	Not soaked
Details	Recompacted with specified standard effort using 2.5kg rammer	Period of soaking	days
		Time to surface	days
		Amount of swell recorded	mm
Material retained on 20mm sieve removed	0 %	Dry density after soaking	Mg/m3
Initial Specimen details	Bulk density	1.93 Mg/m3	Surcharge applied
	Dry density	1.46 Mg/m3	13.5 kg
	Moisture content	31.9 %	8 kPa

Force v Penetration Plots



Results

	Curve correction applied	CBR Values, %				Moisture Content %
		2.5mm	5mm	Highest	Average	
TOP	Yes	0.2	0.2	0.2	0.3	31.9
BASE	Yes	0.3	0.2	0.3		27.8

General remarks	Test specific remarks	Approved
Tested at natural moisture content		Stephen.Watson

Fig No.	1
Sheet No	7



Moisture Condition Value / Moisture Content Relationship

Job Ref	16-1239
Borehole/Pit No.	WOPTP-04
Site Name	West Offaly Power station and the Ash Disposal Facility
Sample No.	9
Soil Description	MADE GROUND: Grey sandy organic SILT.
Depth	4
Specimen Reference	4
Specimen Depth	m
Sample Type	B
Specimen Description	MADE GROUND: Grey sandy organic SILT.
KeyLAB ID	Caus2017022415
Test Method	BS1377:Part4:1990:clause 5.5
Date started	

Sample preparation

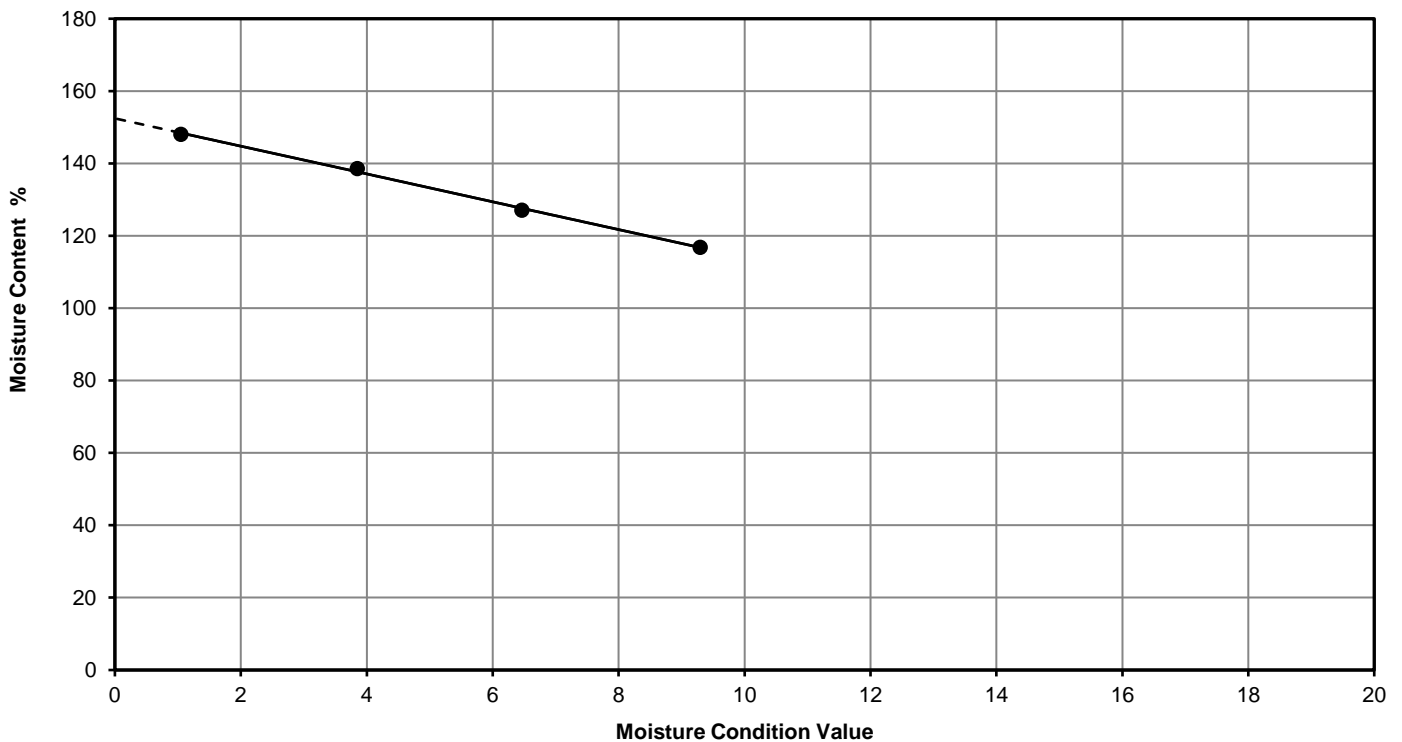
Amount of material larger than 20mm sieve removed	0	%
Natural Moisture Content of sample	148	%
Initial Moisture Content of test sample below 20mm	148	%
Separate specimens tested		

General remarks

Table of results

MCV Test Number	1	2	3	4	
Moisture Content, %	148.0	138.6	127.1	116.8	
Moisture Condition Value	1.0	3.9	6.5	9.3	
MCV report	1	3.9	6.5	9.3	
Effective / Valid data point	YES	YES	YES	YES	
Vane Shear strength (kPa)	7	13	40	68	

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



Approved
Stephen.Watson



Moisture Condition Value / Moisture Content Relationship

Job Ref	16-1239
Borehole/Pit No.	WPATP-10/17
Sample No.	3
Depth	2
Sample Type	B
KeyLAB ID	Caus2017022438
Date started	

Site Name	West Offaly Power station and the Ash Disposal Facility	
Soil Description	Grey sandy very gravelly CLAY.	
Specimen Reference	8	Specimen Depth
Specimen Description		m
Test Method	BS1377:Part4:1990:clause 5.5	

Sample preparation

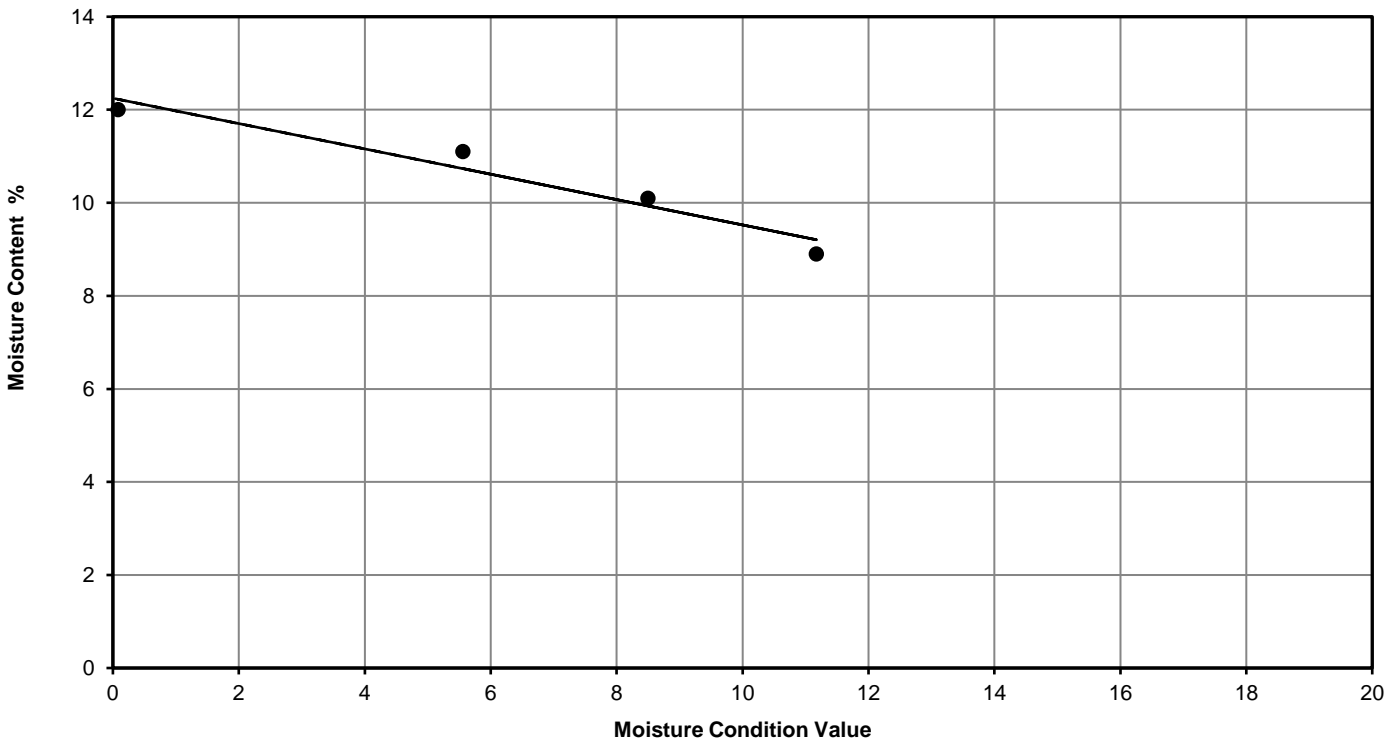
Amount of material larger than 20mm sieve removed	37	%
Natural Moisture Content of sample	7.3	%
Initial Moisture Content of test sample below 20mm	12	%
Separate specimens tested		

General remarks

Table of results

MCV Test Number	1	2	3	4	
Moisture Content, %	12.0	8.9	10.1	11.1	
Moisture Condition Value	0.1	11.2	8.5	5.6	
MCV report	0.1	11.2	8.5	5.6	
Effective / Valid data point	YES	YES	YES	YES	
Vane Shear strength (kPa)	4	83	55	27	

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



Approved
Stephen.Watson



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

Job Ref	16-1239
Borehole/Pit No.	WPATP-01/17
Sample No.	5
Depth	3.00
Sample Type	B
KeyLAB ID	Caus2017022423
Date of test	

Site Name	West Offaly Power station and the Ash Disposal Facility		
Soil Description	Grey slightly sandy slightly gravelly CLAY.		
Specimen Reference	6	Specimen Depth	m
Specimen Description	Very soft grey slightly sandy slightly gravelly CLAY.		
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen		

Test Number
Length
Diameter
Bulk Density
Moisture Content
Dry Density

1
210.0
105.2
2.13
19.5
1.78

mm
mm
Mg/m³
%
Mg/m³

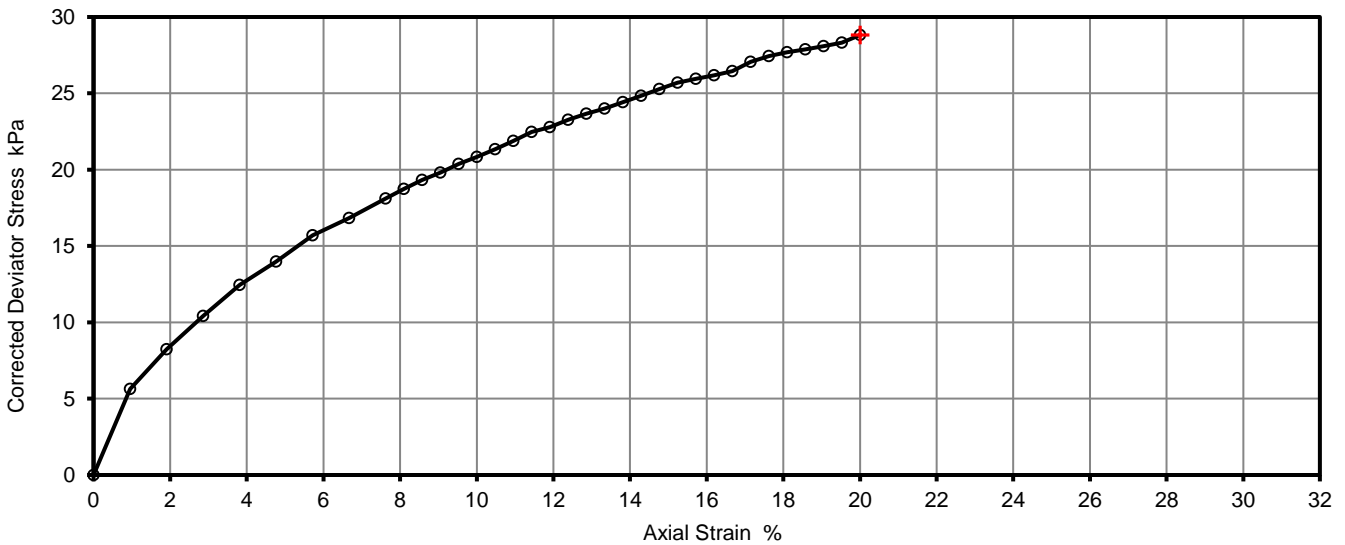
Rate of Strain
Cell Pressure
At failure

2.0
70
20.0
29
14

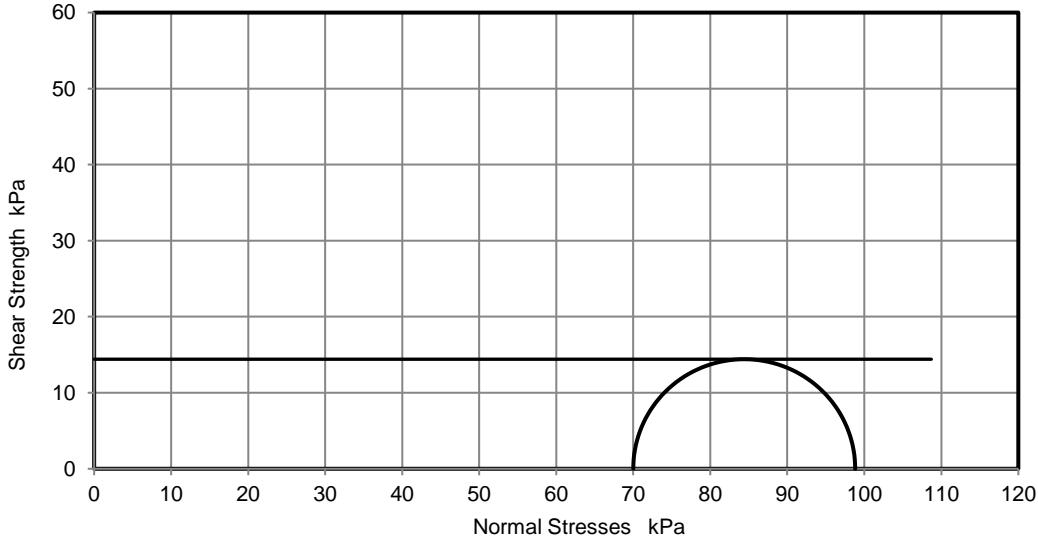
%/min
kPa
%
kPa
kPa $\frac{1}{2}(\sigma_1 - \sigma_3)_f$

Axial Strain
Deviator Stress, $(\sigma_1 - \sigma_3)_f$
Undrained Shear Strength, c_u
Mode of Failure

Deviator Stress v Axial Strain



Mohr Circles



Deviator stress corrected for area change and membrane effects

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

Remarks

REMOULDED SPECIMEN -Testing terminated at 20% strain

Approved

Stephen.Watson

Printed

29/03/2017 16:29

Lab Sheet Reference :

Fig. No. 1
Sheet 1



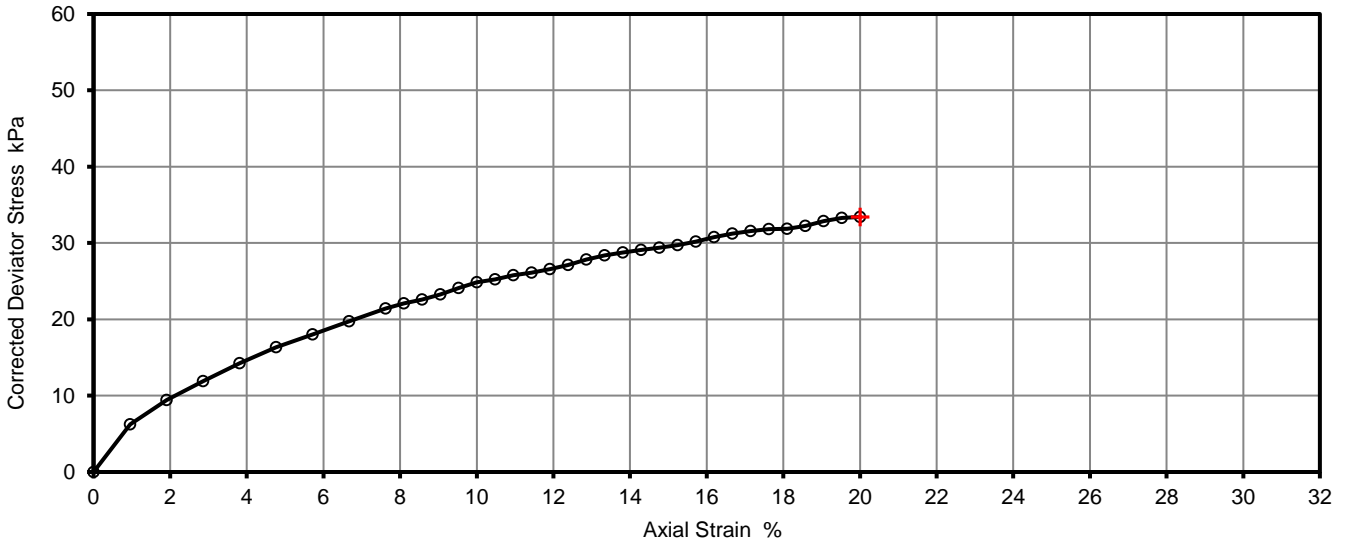
**Unconsolidated Undrained Triaxial
Compression Test without measurement
of pore pressure - single specimen**

Job Ref	16-1239
Borehole/Pit No.	WPATP-02/17
Sample No.	5
Depth	3.00
Sample Type	B
KeyLAB ID	Caus2017022424
Date of test	

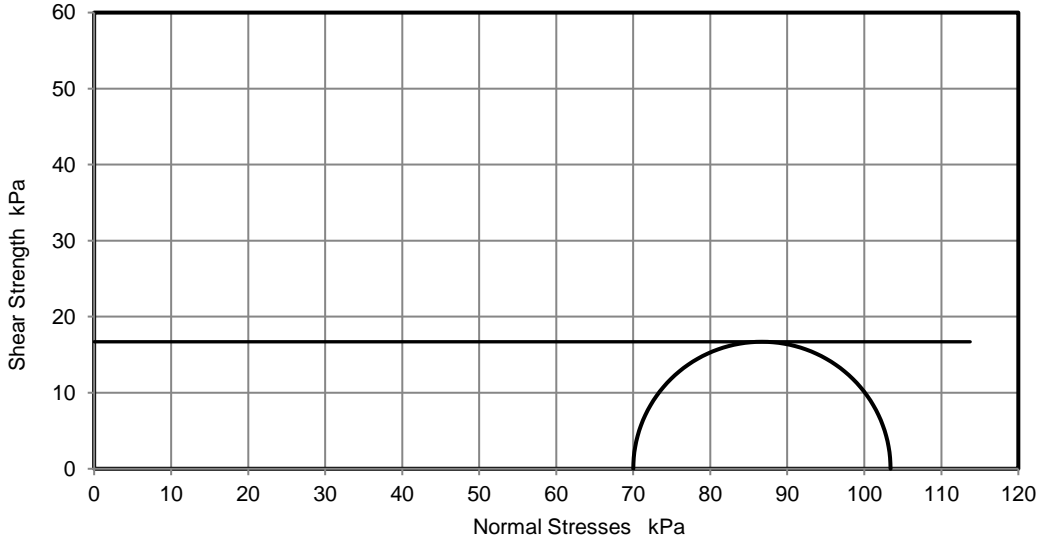
Site Name	West Offaly Power station and the Ash Disposal Facility	
Soil Description	Grey slightly sandy very gravelly CLAY.	
Specimen Reference	7	Specimen Depth m
Specimen Description	Very soft grey slightly sandy very gravelly CLAY.	
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen	

Test Number	1	
Length	210.0	mm
Diameter	105.2	mm
Bulk Density	2.13	Mg/m ³
Moisture Content	19.5	%
Dry Density	1.78	Mg/m ³
Rate of Strain	2.0	%/min
Cell Pressure	70	kPa
At failure	20.0	%
Axial Strain	33	kPa
Deviator Stress, (σ ₁ - σ ₃) _f	17	kPa ½(σ ₁ - σ ₃) _f
Undrained Shear Strength, c _u		
Mode of Failure		

Deviator Stress v Axial Strain



Mohr Circles



Deviator stress corrected for area change and membrane effects

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

Remarks

REMOULDED SPECIMEN -Testing terminated at 20% strain

Approved

Stephen.Watson

Printed

29/03/2017 16:29

Lab Sheet Reference :

Fig. No. 1
Sheet 2



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

Job Ref	16-1239
Borehole/Pit No.	WPATP-07/17
Sample No.	3
Depth	2.00
Sample Type	B
KeyLAB ID	Caus2017022433
Date of test	

Site Name	West Offaly Power station and the Ash Disposal Facility		
Soil Description	Grey slightly sandy gravelly CLAY.		
Specimen Reference	4	Specimen Depth	m
Specimen Description	Very soft grey slightly sandy gravelly CLAY.		
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen		

Test Number
Length
Diameter
Bulk Density
Moisture Content
Dry Density

1
210.0
105.2
2.40
9.6
2.19

mm
mm
Mg/m3
%
Mg/m3

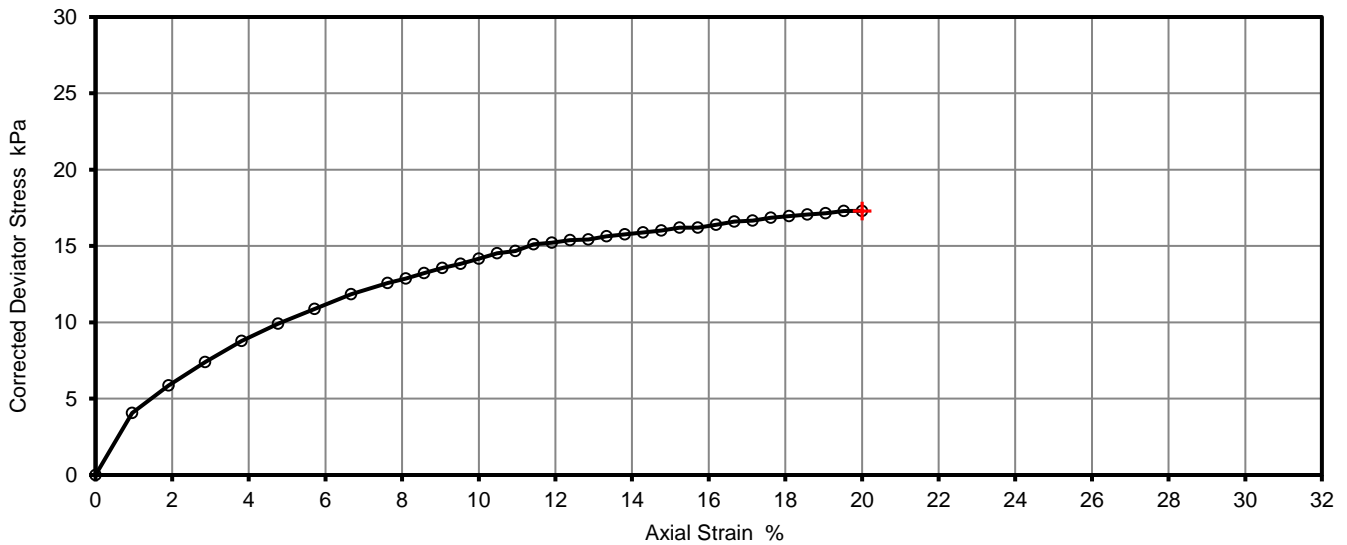
Rate of Strain
Cell Pressure
At failure

2.0
55
20.0
17
9

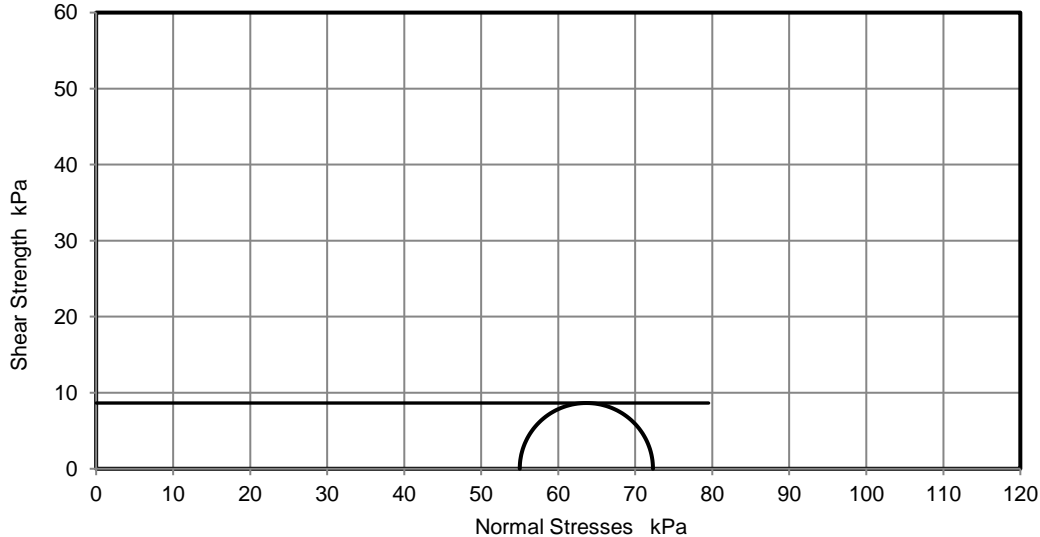
%/min
kPa
%
kPa
kPa $\frac{1}{2}(\sigma_1 - \sigma_3)_f$

Axial Strain
Deviator Stress, $(\sigma_1 - \sigma_3)_f$
Undrained Shear Strength, c_u
Mode of Failure

Deviator Stress v Axial Strain



Mohr Circles



Deviator stress corrected for area change and membrane effects

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

Remarks

REMOULDED SPECIMEN -Testing terminated at 20% strain

Approved

Stephen.Watson

Printed

29/03/2017 16:29

Lab Sheet Reference :

Fig. No. 1
Sheet 3

LABORATORY RESTRICTION REPORT

Project Reference	16-1239	To	Darren O'Mahony
Project Name	West Offaly Power Station and the Ash Disposal Facility	Position	Project Manager
TR reference	16-1239 / 1	From	Stephen Watson
		Position	Laboratory Manager

The following sample(s) and test(s) are restricted as detailed below. Could you please complete the "Required Action" column and return the completed form to the laboratory.

Hole Number	Sample			Test Type	Reason for Restriction	Required Action
	Number	Depth (m)	Type			
WPATP-01/17	4	2.0	D	Atterberg Limits	Fibrous PEAT - Testing not suitable	Cancelled
WPATP-04/17	1	1.0	D	Atterberg Limits	Fibrous PEAT - Testing not suitable	Cancelled
WPATP-05/17	2	1.0	D	Atterberg Limits	Fibrous PEAT - Testing not suitable	Cancelled
WPATP-04/17	5	3.0	B	QUICK triaxial (remoulded)	No suitable test specimen. Sample slumped while setting up test.	Lab vane test carried out
WPATP-05/17	3	2.0	B	QUICK triaxial (remoulded)	No suitable test specimen. Sample slumped while setting up test.	Lab vane test carried out
WPATP-10/17	3	2.0	B	QUICK triaxial (remoulded)	No suitable test specimen. Sample slumped while setting up test.	Lab vane test carried out
WOPTP-02	7	4.0	B	QUICK triaxial (remoulded)	No suitable test specimen. Sample slumped while setting up test.	Lab vane test carried out
WOPTP-04	9	4.0	B	QUICK triaxial (remoulded)	No suitable test specimen. Sample slumped while setting up test.	Lab vane test carried out
WOPTP-04	7	3.50	B	CBR	No suitable test specimen. Sample damaged/split in transit to laboratory.	Testing cancelled
WPATP-07/17	3	2.00	B	CBR	Greater than 25% gravel retained on the 20mm test sieve. GRADING ZONE (X) - Testing not applicable as BS1377 part 4 table 2	Testing cancelled
WPATP-10/17	4	2.00	D	CBR	Greater than 25% gravel retained on the 20mm test sieve. GRADING ZONE (X) - Testing not applicable as BS1377 part 4 table 3	Testing cancelled

For electronic reporting a form of electronic signature or printed name is acceptable

Laboratory Signature Stephen Watson	Project Manager Signature Darren O'Mahony
Date 29 March 2017	Date 29 March 2017



TEST RESTRICTION FORM

Issue No.	1
Page	1 of 1
Date	29/03/2017



Final Report

Report No.: 17-05120-1
Initial Date of Issue: 06-Mar-2017
Client Causeway Geotech Ltd

Client Address: 8 Drumahiskey Road
Balnamore
Ballymoney
County Antrim
BT53 7QL

Contact(s): Brian Mooney
Colm Hurley
Darren O'Mahony
Lucy Peaker
Mark Nyhan
Matthew Gilbert
Neil Haggan
Paul Dunlop
Paul McNamara
Stephen Franey
Stephen Watson
Andy Garne

Project 16-1239 West Offaly Power Station &
Ash Disposal Facility

Quotation No.: **Date Received:** 02-Mar-2017

Order No.: **Date Instructed:** 02-Mar-2017

No. of Samples: 13

Turnaround (Wkdays): 3 **Results Due:** 06-Mar-2017

Date Approved: 06-Mar-2017

Approved By:

Details: Keith Jones, Technical Manager

Project: 16-1239 West Offaly Power Station & Ash Disposal Facility

Client: Causeway Geotech Ltd	Chemtest Job No.:				17-05120	17-05120	17-05120	17-05120	17-05120	17-05120	17-05120	17-05120	17-05120
Quotation No.:	Chemtest Sample ID.:				419241	419242	419243	419244	419245	419246	419247	419248	419249
Order No.:	Client Location ID.:				WOPTP-01	WOPTP-02	WOPTP-03	WOPTP-03	WOPTP-05	WOPTP-06	WPATP-01/17	WPATP-02/17	WPATP-03/17
	Sample Type:				SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
	Top Depth (m):				3	3	1	2	2	1	2	3	1
	Date Sampled:				01-Mar-2017	01-Mar-2017	01-Mar-2017	01-Mar-2017	01-Mar-2017	01-Mar-2017	01-Mar-2017	01-Mar-2017	01-Mar-2017
Determinand	Accred.	SOP	Units	LOD									
Moisture	N	2030	%	0.020	58	54	51	36	53	5.8	84	21	8.0
pH	U	2010		N/A	12.2	12.3	10.8	11.7	11.1	11.3	9.1	9.7	9.7
Sulphate (2:1 Water Soluble) as SO ₄	U	2120	g/l	0.010	1.0	0.63	1.8	1.0	1.7	1.4	< 0.010	0.34	0.026
Organic Matter	U	2625	%	0.40							83		

Project: 16-1239 West Offaly Power Station & Ash Disposal Facility

Client: Causeway Geotech Ltd	Chemtest Job No.:				17-05120	17-05120	17-05120	17-05120
Quotation No.:	Chemtest Sample ID.:				419250	419251	419252	419253
Order No.:	Client Location ID.:				WPATP-05/17	WPATP-07/17	WPATP-08/17	WPATP-09/17
	Sample Type:				SOIL	SOIL	SOIL	SOIL
	Top Depth (m):				1	2	3	2
	Date Sampled:				01-Mar-2017	01-Mar-2017	01-Mar-2017	01-Mar-2017
Determinand	Accred.	SOP	Units	LOD				
Moisture	N	2030	%	0.020	87	8.8	6.4	9.6
pH	U	2010		N/A	8.8	9.6	9.2	9.1
Sulphate (2:1 Water Soluble) as SO ₄	U	2120	g/l	0.010	< 0.010	0.11	0.015	< 0.010
Organic Matter	U	2625	%	0.40	86			

Report Information

Key

- U UKAS accredited
- M MCERTS and UKAS accredited
- N Unaccredited
- S This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
- SN This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
- T This analysis has been subcontracted to an unaccredited laboratory
- I/S Insufficient Sample
- U/S Unsuitable Sample
- N/E not evaluated
- < "less than"
- > "greater than"

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at the indicated laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

- A - Date of sampling not supplied
- B - Sample age exceeds stability time (sampling to extraction)
- C - Sample not received in appropriate containers
- D - Broken Container

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:

customerservices@chemtest.co.uk



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

Client:	Bord Na Mona
From:	Stephen Watson Laboratory Manager Causeway Geotech Ltd
Tel:	+44(0)2827666640
E-mail:	stephen.watson@causewaygeotech.com
Date:	04/04/17
Ref:	16-1239 - Schedule 2

West Offaly Power Station and the Ash Disposal Facility

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 60 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.

Approved Signatory

Stephen Watson
Laboratory Manager



Project Name **West Offaly Power Station and the Ash Disposal Facility**

Report Reference. **16-1239 – Schedule 2**

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

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	Number of test results included in the report
SOIL	Moisture content - oven drying method	BS 1377-2:1990	13
SOIL	Liquid limit - cone penetrometer	BS 1377-2:1990	10
SOIL	Liquid limit - cone penetrometer - one point	BS 1377-2:1990	10
SOIL	Plastic limit	BS 1377-2:1990	10
SOIL	Plasticity index and liquidity index	BS 1377-2:1990	10
SOIL	Particle size distribution - wet sieving	BS 1377-2:1990	6
SOIL	Particle size distribution - dry sieving	BS 1377-2:1990	6
SOIL	Particle size distribution -sedimentation hydrometer method	BS 1377-2:1990	4
SOIL	Undrained shear strength – triaxial compression without measurement of pore pressure (loads from 0.12 to 24 kN)	BS 1377- 7:1990	4
SOIL	pH Value of Soil		6
SOIL	Sulphate Content water extract		6
SOIL	Organic Matter		1



Summary of Classification Test Results

Project No. 16-1239	Project Name West Offaly Power station and the Ash Disposal Facility
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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							
WOP-BH01/17	2	1.20		U	MADE GROUND - Dark grey sandy slightly gravelly laminated organic SILT.			92.0	100	110 -1pt	NP			
WOP-BH01/17	5	3.20		U	MADE GROUND - Dark grey sandy slightly gravelly laminated organic SILT.			140.0	100	151 -1pt	NP			
WOP-BH02/17	11	1.20		B	MADE GROUND - Dark grey sandy slightly gravelly laminated organic SILT.			143.0	100	147 -1pt	99	48		ME
WOP-BH02/17	2	2.00		U	MADE GROUND - Dark grey sandy slightly gravelly laminated organic SILT.			142.0	100	148 -1pt	101	47		ME
WOP-BH02/17	4	4.00		U	MADE GROUND - Dark grey sandy slightly gravelly laminated organic SILT.			181.0	100	165 -1pt	125	40		ME
WOP-BH02/17	6	5.80		B	Dark brown amorphous PEAT.			223.0						
WOP-BH03/17	2	1.20		B	MADE GROUND - Dark grey sandy slightly gravelly laminated organic SILT.			166.0	66	169 -1pt	122	47		ME
WOP-BH03/17	5	4.20		B	MADE GROUND - Dark grey sandy slightly gravelly laminated organic SILT.			269.0	58	175 -1pt	130	45		ME
WOP-BH03/17	7	6.50		B	Dark grey sandy slightly gravelly organic SILT.			223.0	70	156 -1pt	98	58		ME
WOP-BH04/17	3	1.20		B	MADE GROUND - Dark grey sandy slightly gravelly laminated organic SILT.			44.0	44	63 -1pt	39	24		MH
WOP-BH04/17	9	5.50		B	Grey slightly sandy subangular to subrounded fine to coarse GRAVEL.			6.0						
WOP-BH05/17	3	2.00		B	Dark grey slightly sandy slightly gravelly SILT.			45.0	64	108 -1pt	85	23		ME
WOP-BH06/17	9	8.50		B	Dark grey slightly sandy subangular to subrounded fine to coarse GRAVEL.			15.0						

All tests performed in accordance with BS1377:1990 unless specified otherwise

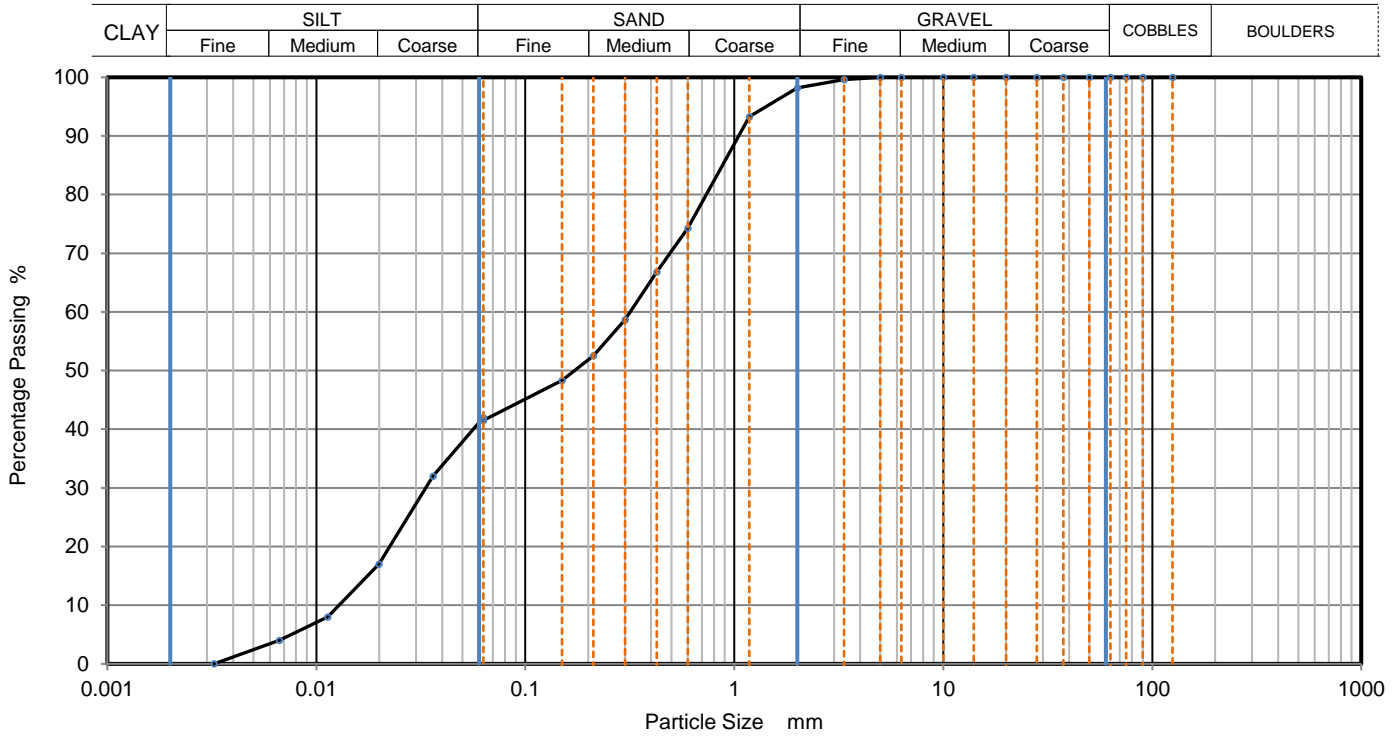
Key Density test Linear measurement unless : wd - water displacement wi - immersion in water Liquid Limit 4pt cone unless : cas - Casagrande method 1pt - single point test Particle density sp - small pyknometer gj - gas jar	Date Printed 04/04/2017 00:00	Approved By Stephen.Watson	Table sheet 1 sheet 1
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PARTICLE SIZE DISTRIBUTION

Job Ref	16-1239
Borehole/Pit No.	WOP-BH03/17

Site Name	West Offaly Power station and the Ash Disposal Facility	Sample No.	2
Soil Description	MADE GROUND - Dark grey sandy slightly gravelly laminated organic SILT.	Depth, m	1.20
Specimen Reference	8	Specimen Depth	m
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5	KeyLAB ID	Caus2017031022
		Sample Type	B



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0630	42
90	100	0.0362	32
75	100	0.0199	17
63	100	0.0113	8
50	100	0.0066	4
37.5	100	0.0032	0
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	98		
1.18	93		
0.6	74	Particle density (assumed) 1.40 Mg/m ³	
0.425	67		
0.3	59		
0.212	53		
0.15	48		
0.063	42		

Dry Mass of sample, g 1013

Sample Proportions	% dry mass
Cobbles	0
Gravel	2
Sand	57
Fines <0.063mm	41

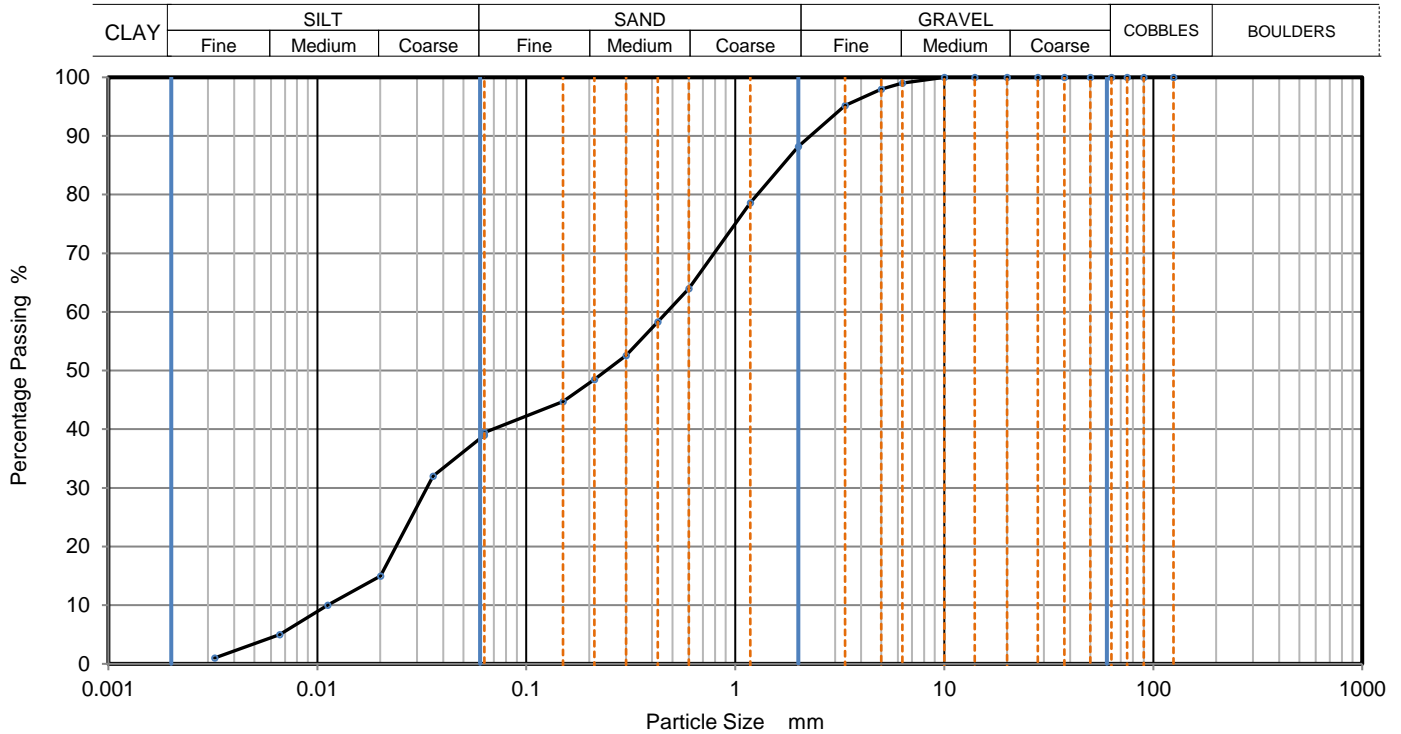
Grading Analysis	
D100	mm
D60	mm 0.317
D30	mm 0.0332
D10	mm 0.0128
Uniformity Coefficient	25
Curvature Coefficient	0.27

Remarks
Preparation and testing in accordance with BS1377 unless noted below



PARTICLE SIZE DISTRIBUTION

Job Ref	16-1239
Borehole/Pit No.	WOP-BH03/17
Site Name	West Offaly Power station and the Ash Disposal Facility
Sample No.	5
Soil Description	MADE GROUND - Dark grey sandy slightly gravelly laminated organic SILT.
Depth, m	4.20
Specimen Reference	8
Specimen Depth	m
Sample Type	B
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5
KeyLAB ID	Caus2017031023



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0630	39
90	100	0.0357	32
75	100	0.0200	15
63	100	0.0112	10
50	100	0.0066	5
37.5	100	0.0032	1
28	100		
20	100		
14	100		
10	100		
6.3	99		
5	98		
3.35	95		
2	88		
1.18	79		
0.6	64		
0.425	58	Particle density (assumed) 1.40 Mg/m ³	
0.3	53		
0.212	49		
0.15	45		
0.063	39		

Dry Mass of sample, g 752

Sample Proportions	% dry mass
Cobbles	0
Gravel	12
Sand	49
Fines <0.063mm	39

Grading Analysis	
D100	mm
D60	mm 0.471
D30	mm 0.0334
D10	mm 0.0114
Uniformity Coefficient	41
Curvature Coefficient	0.21

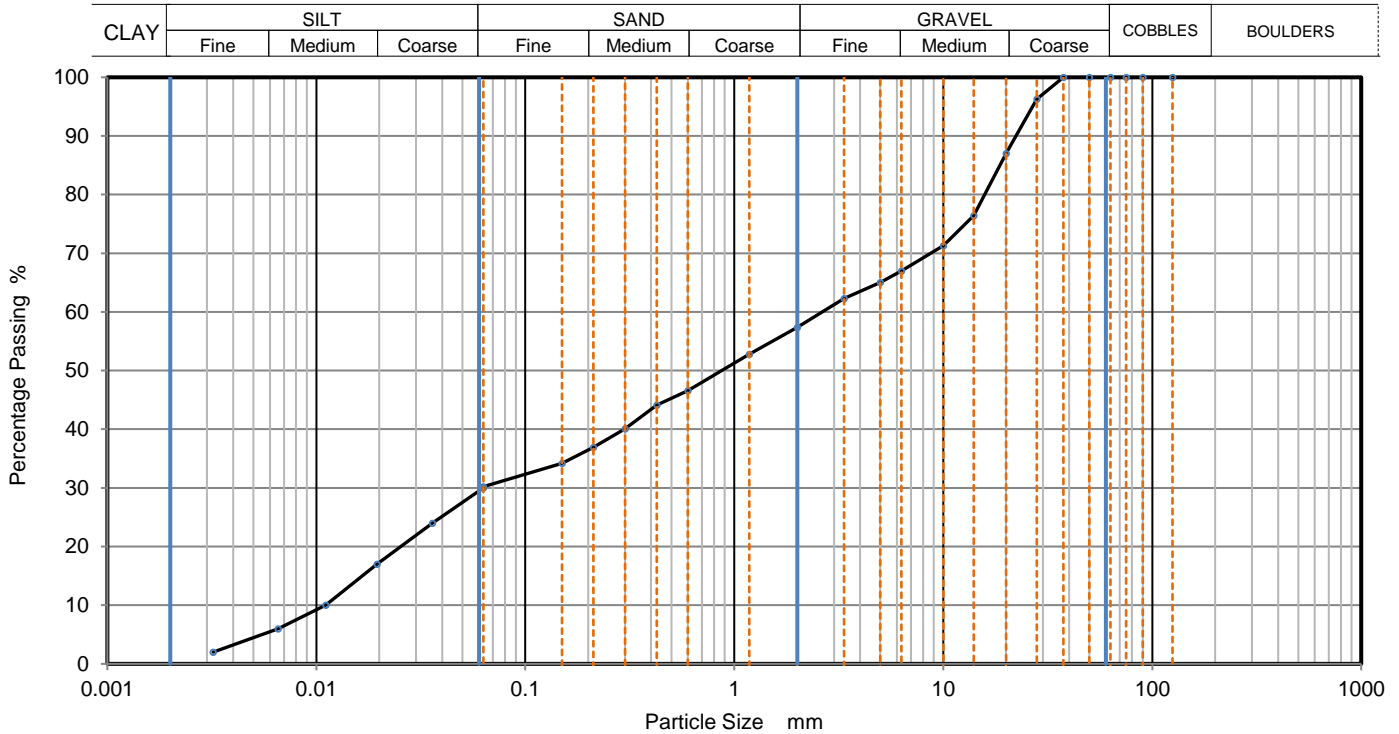
Remarks
Preparation and testing in accordance with BS1377 unless noted below



PARTICLE SIZE DISTRIBUTION

Job Ref	16-1239
Borehole/Pit No.	WOP-BH04/17
Sample No.	3
Depth, m	1.20
Sample Type	B
KeyLAB ID	Caus2017031026

Site Name	West Offaly Power station and the Ash Disposal Facility	
Soil Description	MADE GROUND - Dark grey sandy slightly gravelly laminated organic SILT.	
Specimen Reference	8	m
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5	



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0630	30
90	100	0.0360	24
75	100	0.0195	17
63	100	0.0111	10
50	100	0.0065	6
37.5	100	0.0032	2
28	96		
20	87		
14	76		
10	71		
6.3	67		
5	65		
3.35	62		
2	57		
1.18	53		
0.6	47		
0.425	44	Particle density (assumed) 1.40 Mg/m ³	
0.3	40		
0.212	37		
0.15	34		
0.063	30		

Dry Mass of sample, g 2535

Sample Proportions	% dry mass
Cobbles	0
Gravel	43
Sand	27
Fines <0.063mm	30

Grading Analysis	
D100	mm
D60	mm 2.63
D30	mm 0.0619
D10	mm 0.0113
Uniformity Coefficient	230
Curvature Coefficient	0.13

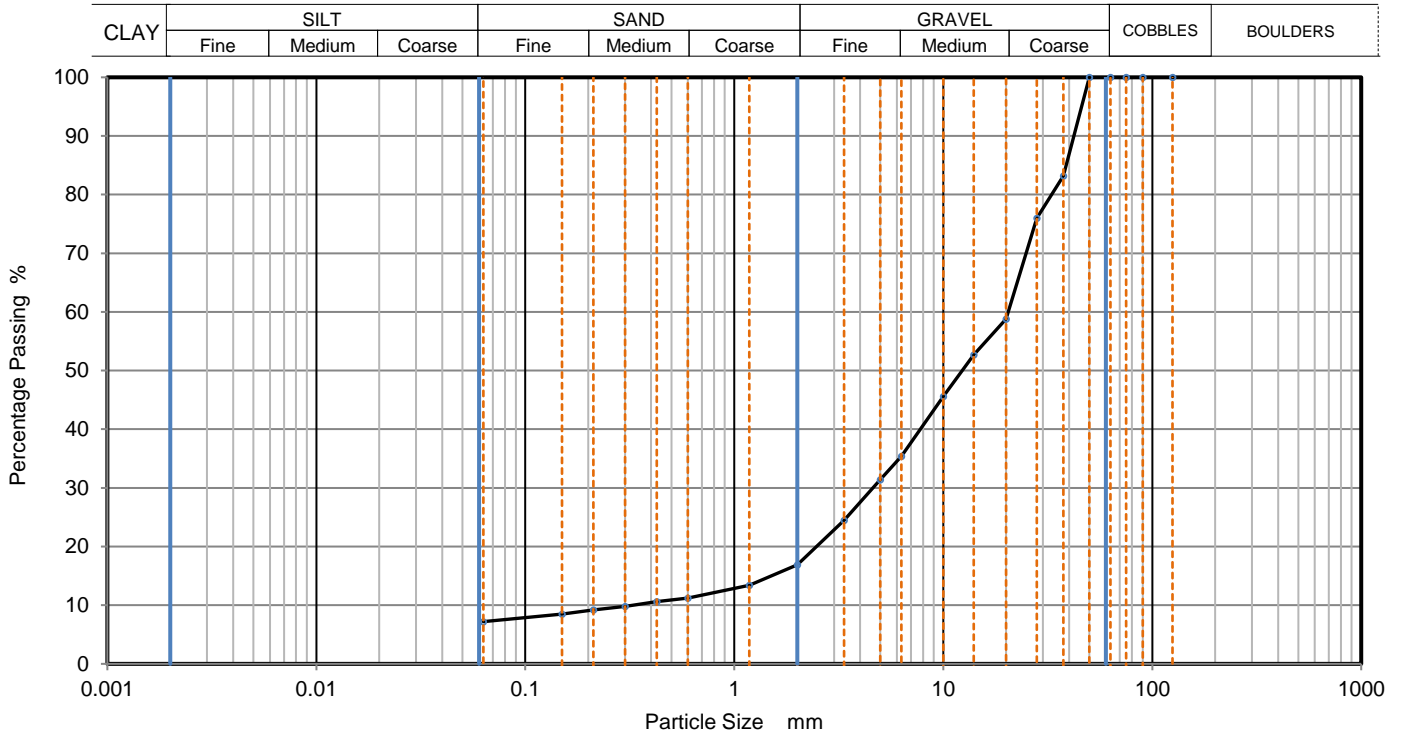
Remarks
Preparation and testing in accordance with BS1377 unless noted below



PARTICLE SIZE DISTRIBUTION

Job Ref	16-1239
Borehole/Pit No.	WOP-BH04/17
Sample No.	9
Depth, m	5.50
Sample Type	B
KeyLAB ID	Caus2017031027

Site Name	West Offaly Power station and the Ash Disposal Facility	
Soil Description	Grey slightly sandy subangular to subrounded fine to coarse GRAVEL.	
Specimen Reference	5	m
Test Method	BS1377:Part 2:1990, clause 9.2	



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	83		
28	76		
20	59		
14	53		
10	46		
6.3	35		
5	31		
3.35	25		
2	17		
1.18	13		
0.6	11		
0.425	11		
0.3	10		
0.212	9		
0.15	9		
0.063	7		

Dry Mass of sample, g 4129

Sample Proportions	% dry mass
Cobbles	0
Gravel	83
Sand	10
Fines <0.063mm	7

Grading Analysis	
D100	mm
D60	mm 20.5
D30	mm 4.61
D10	mm 0.33
Uniformity Coefficient	62
Curvature Coefficient	3.2

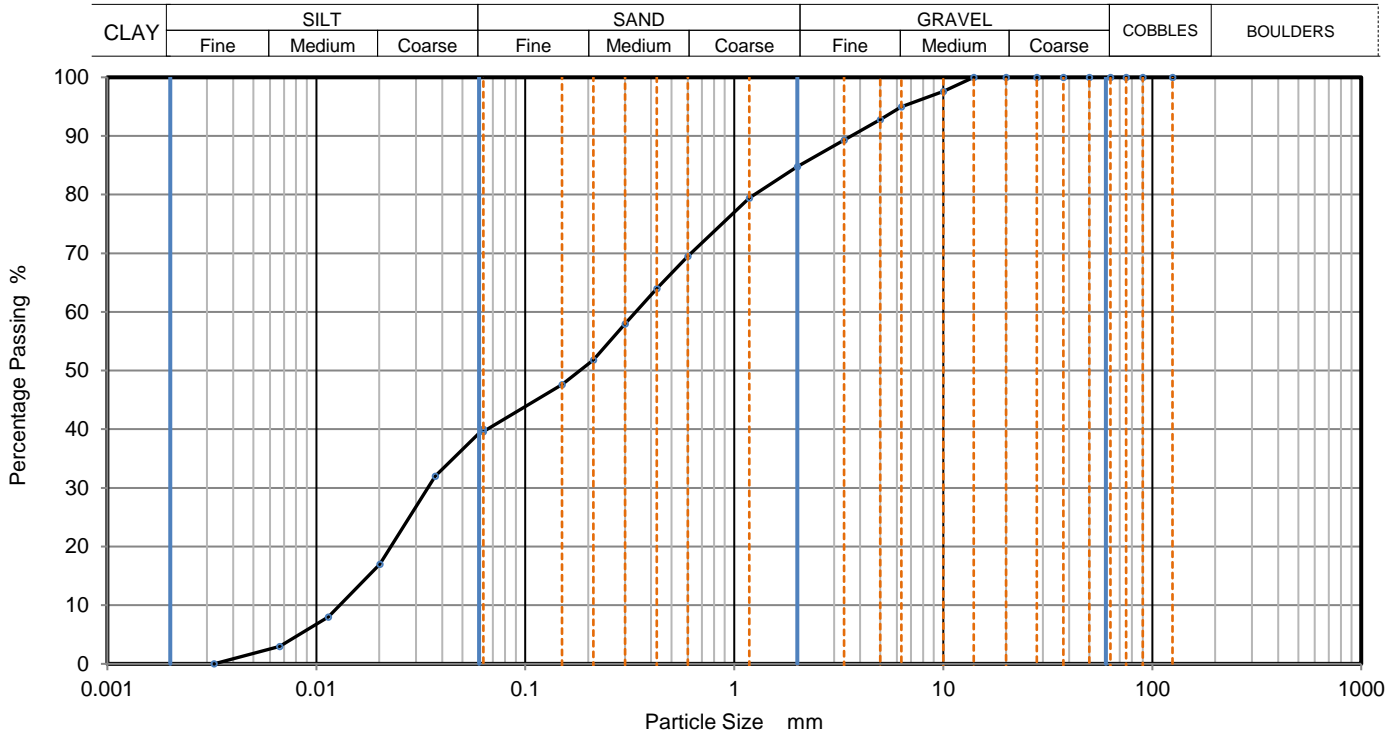
Remarks
Preparation and testing in accordance with BS1377 unless noted below



PARTICLE SIZE DISTRIBUTION

Job Ref	16-1239
Borehole/Pit No.	WOP-BH05/17

Site Name	West Offaly Power station and the Ash Disposal Facility	Sample No.	3
Soil Description	Dark grey slightly sandy slightly gravelly SILT.	Depth, m	2.00
Specimen Reference	8	Specimen Depth	m
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5	Sample Type	B
		KeyLAB ID	Caus2017031028



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0630	40
90	100	0.0371	32
75	100	0.0202	17
63	100	0.0114	8
50	100	0.0067	3
37.5	100	0.0032	0
28	100		
20	100		
14	100		
10	98		
6.3	95		
5	93		
3.35	89		
2	85		
1.18	79		
0.6	70		
0.425	64	Particle density (assumed) 1.40 Mg/m3	
0.3	58		
0.212	52		
0.15	48		
0.063	40		

Dry Mass of sample, g 1899

Sample Proportions	% dry mass
Cobbles	0
Gravel	15
Sand	45
Fines <0.063mm	40

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	26
Curvature Coefficient	0.27

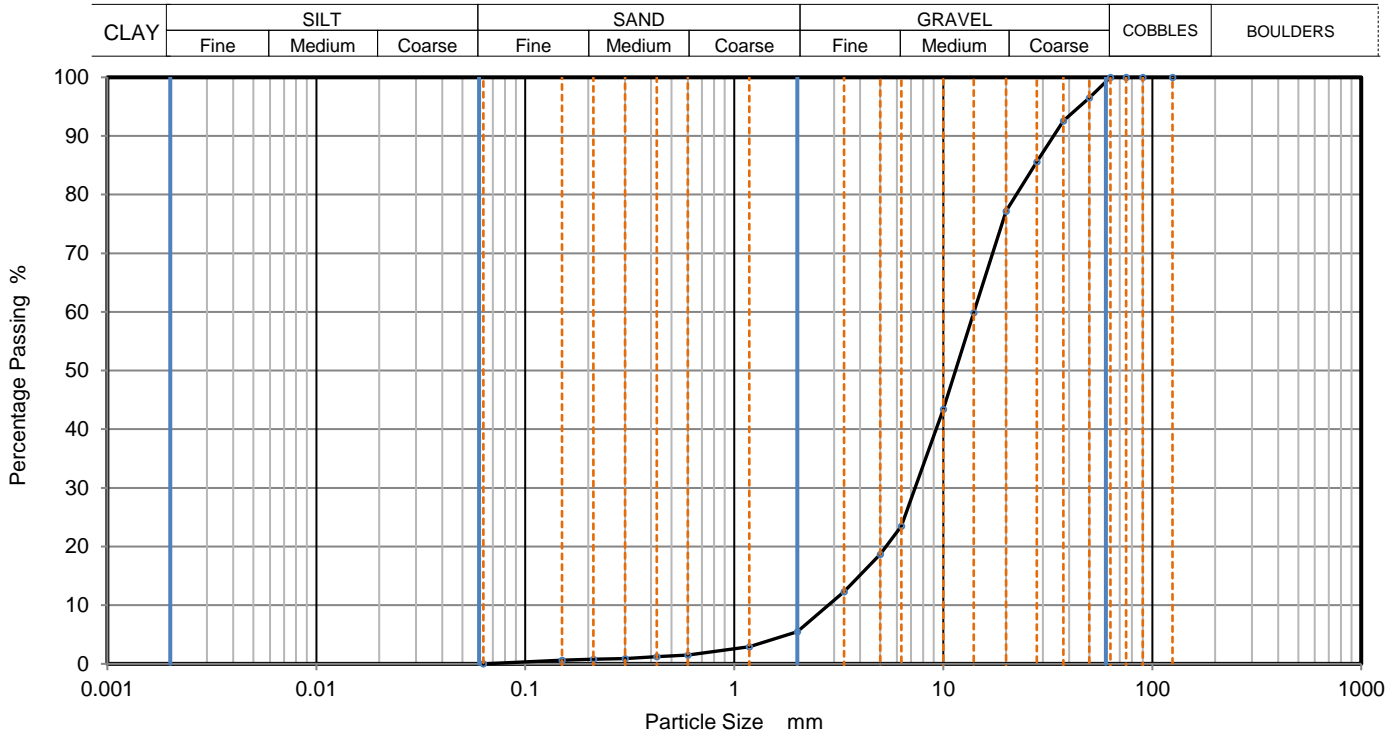
Remarks
Preparation and testing in accordance with BS1377 unless noted below



PARTICLE SIZE DISTRIBUTION

Job Ref	16-1239
Borehole/Pit No.	WOP-BH06/17
Sample No.	9
Depth, m	8.50
Sample Type	B
KeyLAB ID	Caus2017031033

Site Name	West Offaly Power station and the Ash Disposal Facility	
Soil Description	Dark grey slightly sandy subangular to subrounded fine to coarse GRAVEL.	
Specimen Reference	5	Specimen Depth m
Test Method	BS1377:Part 2:1990, clause 9.2	



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	97		
37.5	93		
28	86		
20	77		
14	60		
10	43		
6.3	24		
5	19		
3.35	12		
2	6		
1.18	3		
0.6	2		
0.425	1		
0.3	1		
0.212	1		
0.15	1		
0.063	0		

Dry Mass of sample, g 8091

Sample Proportions	% dry mass
Cobbles	0
Gravel	95
Sand	5
Fines <0.063mm	0

Grading Analysis	
D100	mm
D60	mm 14
D30	mm 7.33
D10	mm 2.82
Uniformity Coefficient	5
Curvature Coefficient	1.4

Remarks
Preparation and testing in accordance with BS1377 unless noted below



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

Job Ref	16-1239
Borehole/Pit No.	WOP-BH01/17
Sample No.	2
Depth	1.20
Sample Type	U
KeyLAB ID	Caus2017031013
Date of test	

Site Name	West Offaly Power station and the Ash Disposal Facility	
Soil Description	MADE GROUND - Dark grey sandy slightly gravelly laminated organic SILT.	
Specimen Reference	8	Specimen Depth m
Specimen Description	MADE GROUND - Very stiff dark grey sandy slightly gravelly laminated organic SILT.	
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen	

Test Number
Length
Diameter
Bulk Density
Moisture Content
Dry Density

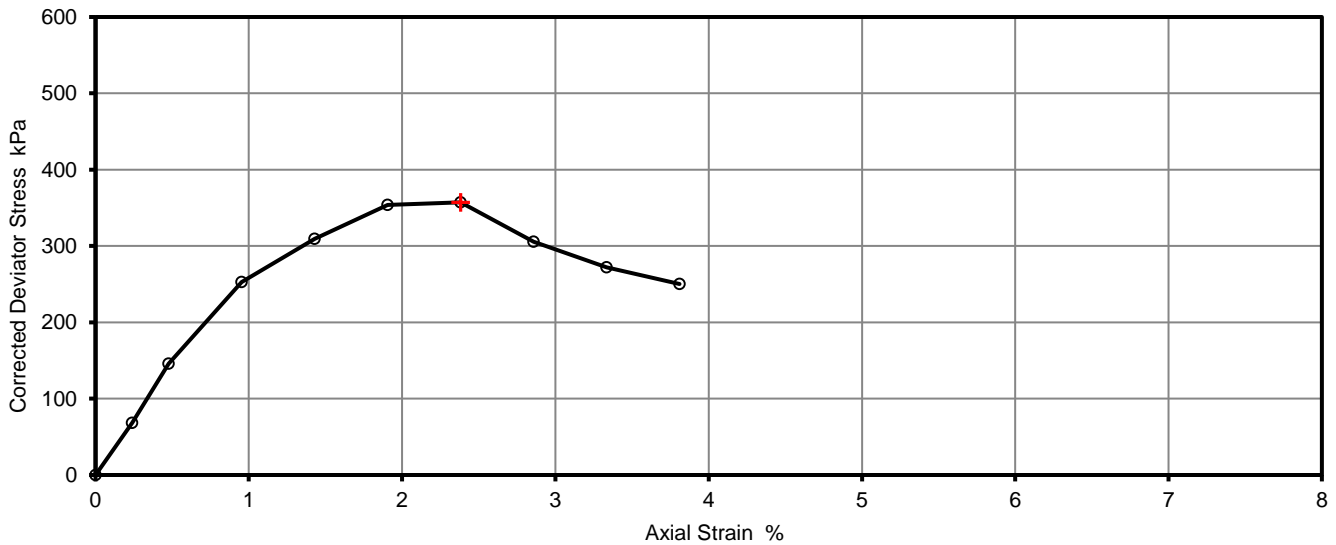
1	
210.0	mm
103.2	mm
1.28	Mg/m3
92.2	%
0.66	Mg/m3

Rate of Strain
Cell Pressure
At failure

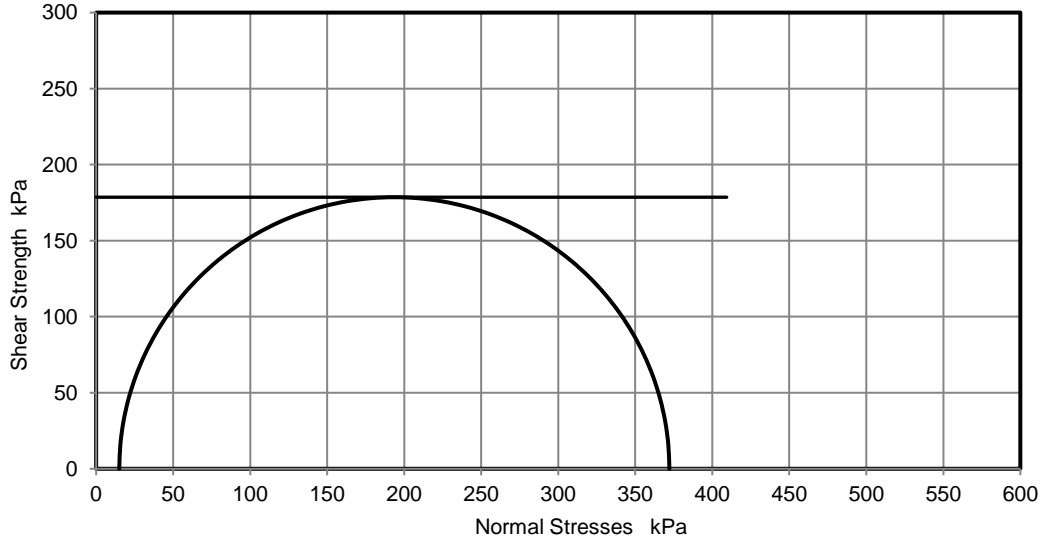
2.0	%/min
15	kPa
2.4	%
357	kPa
179	kPa $\frac{1}{2}(\sigma_1 - \sigma_3)_f$
Brittle	

Axial Strain
Deviator Stress, $(\sigma_1 - \sigma_3)_f$
Undrained Shear Strength, c_u
Mode of Failure

Deviator Stress v Axial Strain



Mohr Circles



Deviator stress corrected for area change and membrane effects

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

Remarks

Strengths corrected for area change, and membrane effects based on Fig 11 BS1377

Approved

Stephen.Watson

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04/04/2017 16:11

Fig. No.

1

Sheet

1

Lab Sheet Reference :



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

Job Ref	16-1239
Borehole/Pit No.	WOP-BH01/17
Sample No.	5
Depth	3.20
Sample Type	U
KeyLAB ID	Caus2017031015
Date of test	

Site Name	West Offaly Power station and the Ash Disposal Facility	
Soil Description	MADE GROUND - Dark grey sandy slightly gravelly laminated organic SILT.	
Specimen Reference	8	Specimen Depth m
Specimen Description	MADE GROUND - Firm dark grey sandy slightly gravelly laminated organic SILT.	
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen	

Test Number
Length
Diameter
Bulk Density
Moisture Content
Dry Density

1
210.0
103.2
1.32
140.0
0.55

mm
mm
Mg/m3
%
Mg/m3

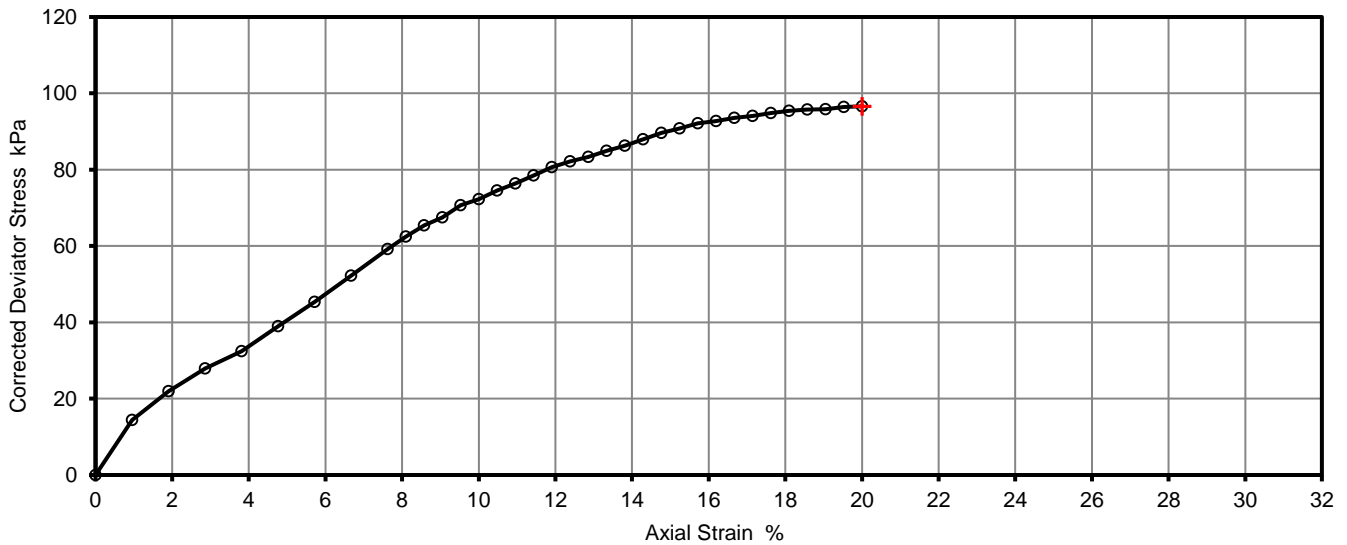
Rate of Strain
Cell Pressure
At failure

2.0
45
20.0
97
48

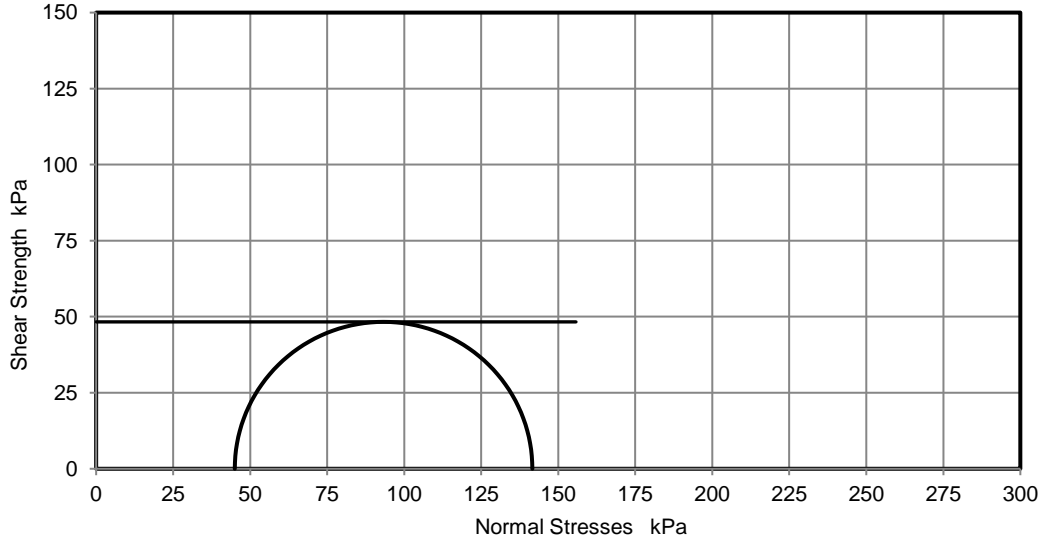
%/min
kPa
%
kPa
kPa $\frac{1}{2}(\sigma_1 - \sigma_3)_f$

Axial Strain
Deviator Stress, $(\sigma_1 - \sigma_3)_f$
Undrained Shear Strength, c_u
Mode of Failure

Deviator Stress v Axial Strain



Mohr Circles



Deviator stress corrected for area change and membrane effects

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

Remarks

Testing terminated at 20% strain

Approved

Stephen.Watson

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Lab Sheet Reference :

Fig. No. 1
Sheet 2



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

Job Ref	16-1239
Borehole/Pit No.	WOP-BH02/17
Sample No.	2
Depth	2.00
Sample Type	U
KeyLAB ID	Caus2017031018
Date of test	

Site Name	West Offaly Power station and the Ash Disposal Facility	
Soil Description	MADE GROUND - Dark grey sandy slightly gravelly laminated organic SILT.	
Specimen Reference	8	Specimen Depth m
Specimen Description	MADE GROUND - Stiff dark grey sandy slightly gravelly laminated organic SILT.	
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen	

Test Number
Length
Diameter
Bulk Density
Moisture Content
Dry Density

1
210.0
103.2
1.26
142.1
0.52

mm
mm
Mg/m3
%
Mg/m3

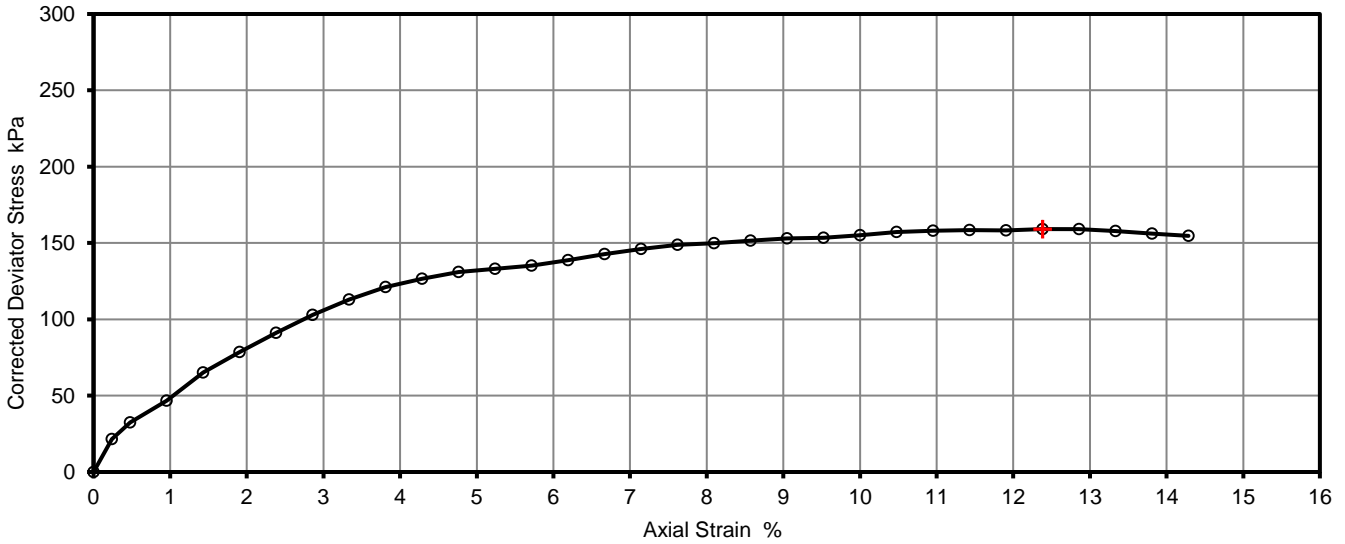
Rate of Strain
Cell Pressure
At failure

2.0
25
12.4
159
80
Brittle

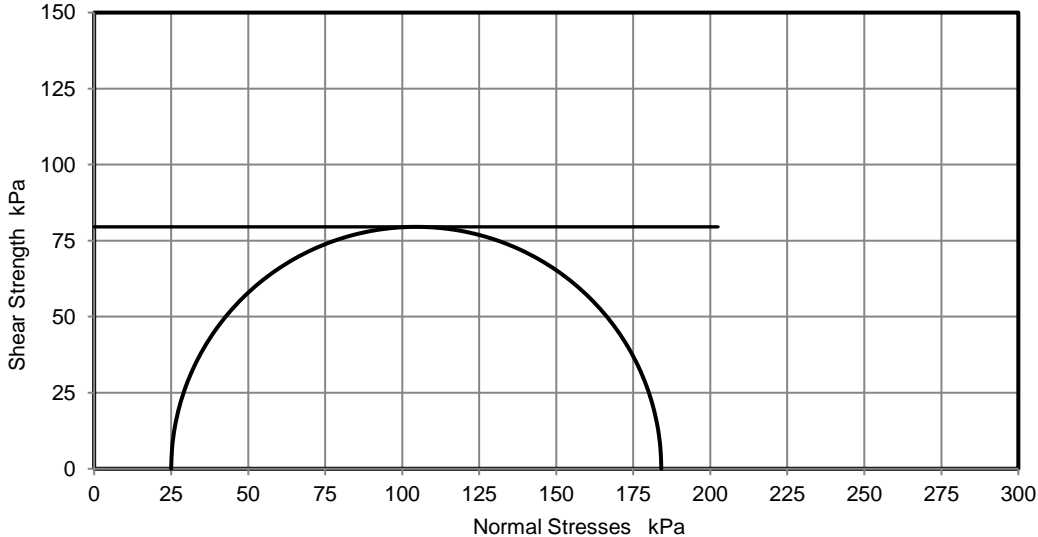
%/min
kPa
%
kPa
kPa $\frac{1}{2}(\sigma_1 - \sigma_3)_f$

Axial Strain
Deviator Stress, $(\sigma_1 - \sigma_3)_f$
Undrained Shear Strength, c_u
Mode of Failure

Deviator Stress v Axial Strain



Mohr Circles



Deviator stress corrected for area change and membrane effects

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

Remarks

Strengths corrected for area change, and membrane effects based on Fig 11 BS1377

Approved

Stephen.Watson

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Fig. No.

1

Sheet

3

Lab Sheet Reference :



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

Job Ref	16-1239
Borehole/Pit No.	WOP-BH02/17
Sample No.	4
Depth	4.00
Sample Type	U
KeyLAB ID	Caus2017031019
Date of test	

Site Name	West Offaly Power station and the Ash Disposal Facility	
Soil Description	MADE GROUND - Dark grey sandy slightly gravelly laminated organic SILT.	
Specimen Reference	8	Specimen Depth m
Specimen Description	MADE GROUND - Very soft dark grey sandy slightly gravelly laminated organic SILT.	
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen	

Test Number
Length
Diameter
Bulk Density
Moisture Content
Dry Density

1
210.0
103.2
1.23
181.1
0.44

mm
mm
Mg/m³
%
Mg/m³

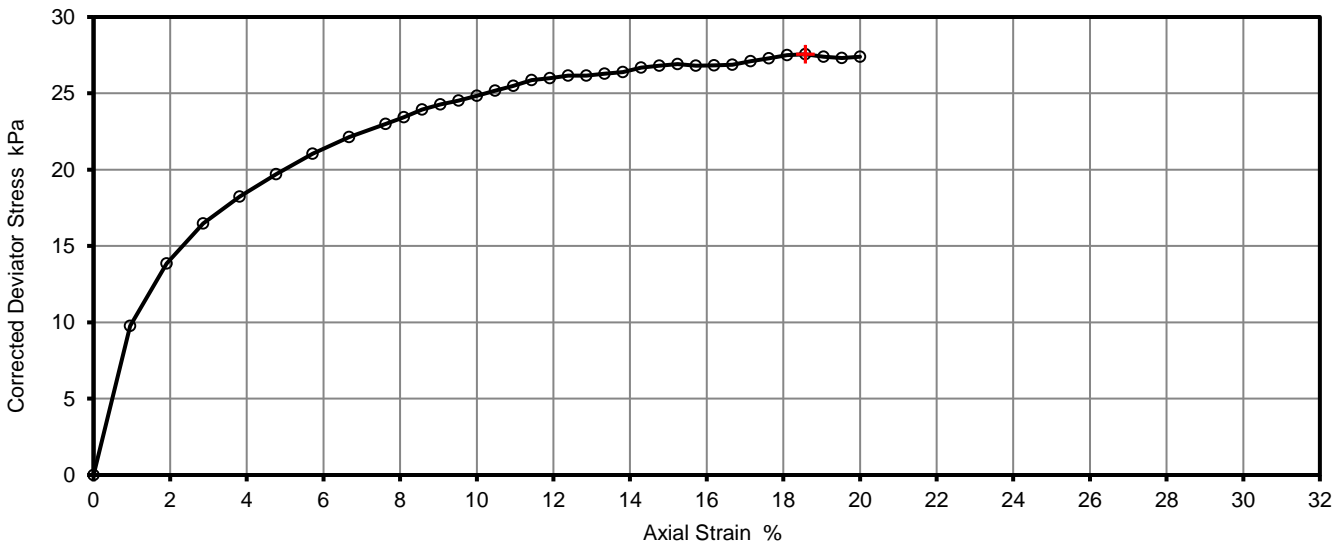
Rate of Strain
Cell Pressure
At failure

2.0
50
18.6
28
14
Brittle

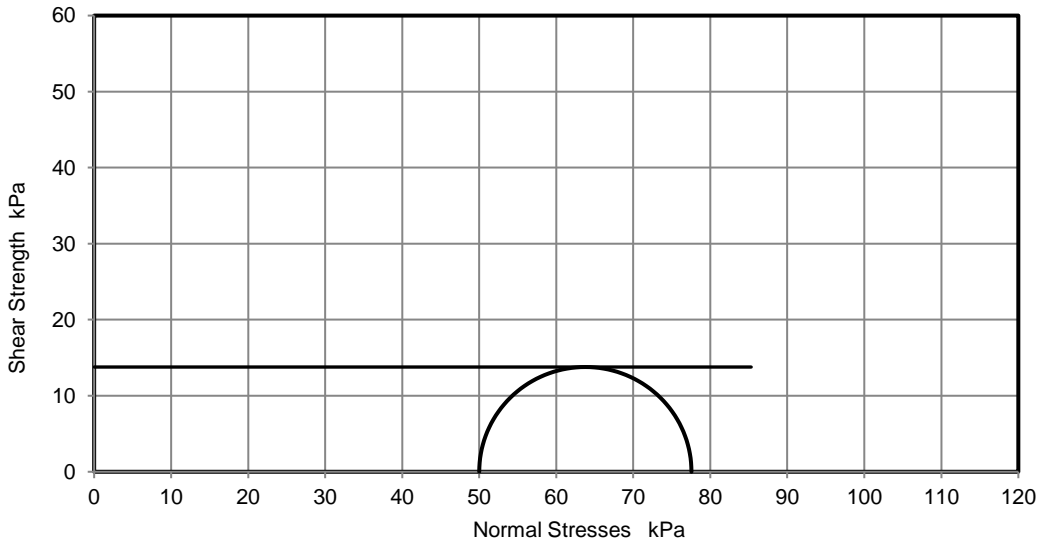
%/min
kPa
%
kPa
kPa $\frac{1}{2}(\sigma_1 - \sigma_3)_f$

Axial Strain
Deviator Stress, $(\sigma_1 - \sigma_3)_f$
Undrained Shear Strength, c_u
Mode of Failure

Deviator Stress v Axial Strain



Mohr Circles



Deviator stress corrected for area change and membrane effects

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

Remarks

Strengths corrected for area change, and membrane effects based on Fig 11 BS1377

Approved

Stephen.Watson

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Fig. No.

1

Sheet

4

Lab Sheet Reference :



Final Report

Report No.: 17-07344-1

Initial Date of Issue: 29-Mar-2017

Client: Causeway Geotech Ltd

Client Address: 8 Drumahiskey Road
Balnamore
Ballymoney
County Antrim
BT53 7QL

Contact(s): Aisling O'Kane
Brian Mooney
Colm Hurley
Darren O'Mahony
John Cameron
John Duggan
Matthew Gilbert
Neil Haggan
Paul Dunlop
Paul McNamara
Stephen Curtis
Stephen Franey
Stephen Watson
Lucy Peaker

Project: 16-1239 West Offaly Power Station and
the Ash Disposal Facil

Quotation No.: **Date Received:** 27-Mar-2017


Order No.: **Date Instructed:** 27-Mar-2017

No. of Samples: 6

Turnaround (Wkdays): 3 **Results Due:** 29-Mar-2017

Date Approved: 29-Mar-2017

Approved By:



Details: Keith Jones, Technical Manager

Project: 16-1239 West Offaly Power Station and the Ash Disposal Facil

Client: Causeway Geotech Ltd		Chemtest Job No.:		17-07344	17-07344	17-07344	17-07344	17-07344	17-07344	
Quotation No.:	Chemtest Sample ID.:		430405	430406	430407	430408	430409	430410		
Order No.:	Client Location ID.:		WOP-BH02/17	WOP-BH02/17	WOP-BH03/17	WOP-BH04/17	WOP-BH04/17	WOP-BH05/17		
	Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL		
	Top Depth (m):		1.2	5.8	4.2	1.2	5.5	2.0		
	Bottom Depth (m):		1.7	6.3	4.7	1.7	6.0	2.5		
	Date Sampled:		24-Mar-2017	24-Mar-2017	24-Mar-2017	24-Mar-2017	24-Mar-2017	24-Mar-2017		
Determinand	Accred.	SOP	Units	LOD						
Moisture	N	2030	%	0.020	55	62	61	27	6.0	44
pH	U	2010		N/A	9.7	9.7	11.3	8.9	9.3	11.5
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010	1.7	0.48	1.3	1.0	0.038	1.4
Organic Matter	U	2625	%	0.40	19	8.8				

Report Information

Key

- U UKAS accredited
- M MCERTS and UKAS accredited
- N Unaccredited
- S This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
- SN This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
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- U/S Unsuitable Sample
- N/E not evaluated
- < "less than"
- > "greater than"

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis

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Sample Deviation Codes

- A - Date of sampling not supplied
- B - Sample age exceeds stability time (sampling to extraction)
- C - Sample not received in appropriate containers
- D - Broken Container

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:

customerservices@chemtest.co.uk



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

Client:	Bord Na Mona
From:	Stephen Watson Laboratory Manager Causeway Geotech Ltd
Tel:	+44(0)2827666640
E-mail:	stephen.watson@causewaygeotech.com
Date:	13/04/17
Ref:	16-1239 - Schedule 3

West Offaly Power Station and the Ash Disposal Facility

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 60 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.

Approved Signatory

Stephen Watson
Laboratory Manager



Project Name **West Offaly Power Station and the Ash Disposal Facility**

Report Reference. **16-1239 – Schedule 3**

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

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	Number of test results included in the report
SOIL	Moisture content - oven drying method	BS 1377-2:1990	6
SOIL	Liquid limit - cone penetrometer	BS 1377-2:1990	5
SOIL	Liquid limit - cone penetrometer - one point	BS 1377-2:1990	5
SOIL	Plastic limit	BS 1377-2:1990	5
SOIL	Plasticity index and liquidity index	BS 1377-2:1990	5
SOIL	Particle size distribution - wet sieving	BS 1377-2:1990	4
SOIL	Particle size distribution - dry sieving	BS 1377-2:1990	4
SOIL	Particle size distribution -sedimentation hydrometer method	BS 1377-2:1990	4
SOIL	pH Value of Soil		4
SOIL	Sulphate Content water extract		4
SOIL	Organic Matter		1



Summary of Classification Test Results

Project No. 16-1239	Project Name West Offaly Power station and the Ash Disposal Facility
------------------------	---

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							
WOA-BH01/17	1	0.80		B	Dark brown fibrous PEAT.			132.0						
WOA-BH01/17	4	3.80		B	Grey brown sandy slightly gravelly organic SILT.			123.0	64	113 -1pt	95	18		ME
WOA-BH02/17	2	1.80		B	Grey slightly sandy slightly gravelly CLAY.			24.0	94	29 -1pt	19	10		CL
WOA-BH02A/17	1	0.80		B	Grey slightly sandy very gravelly CLAY.			7.1	30	21 -1pt	12	9		CL
WOA-BH02A/17	7	2.50		D	Grey sandy very gravelly CLAY.			9.6	34	22 -1pt	12	10		CL
WOA-BH02A/17	4	4.80		B	Grey sandy very gravelly CLAY.			5.5	20	21 -1pt	12	9		CL

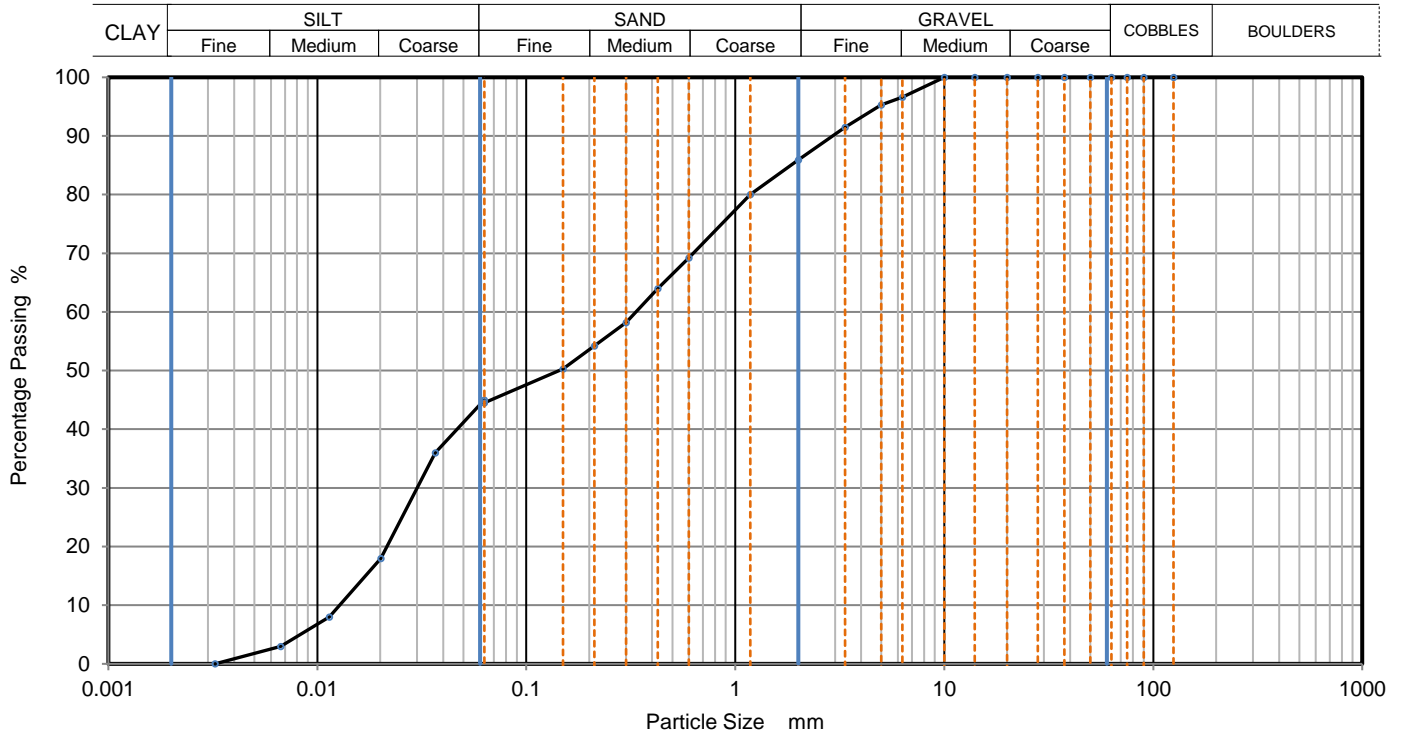
All tests performed in accordance with BS1377:1990 unless specified otherwise

Key Density test Linear measurement unless : wd - water displacement wi - immersion in water Liquid Limit 4pt cone unless : cas - Casagrande method 1pt - single point test Particle density sp - small pyknometer gj - gas jar	Date Printed 04/11/2017 00:00	Approved By Stephen.Watson	Table 1 sheet 1
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PARTICLE SIZE DISTRIBUTION

Job Ref	16-1239
Borehole/Pit No.	WOA-BH01/17
Site Name	West Offaly Power station and the Ash Disposal Facility
Sample No.	4
Soil Description	Grey brown sandy slightly gravelly organic SILT.
Depth, m	3.80
Specimen Reference	6
Specimen Depth	m
Sample Type	B
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5
KeyLAB ID	Caus201703108



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0630	45
90	100	0.0366	36
75	100	0.0202	18
63	100	0.0114	8
50	100	0.0067	3
37.5	100	0.0032	0
28	100		
20	100		
14	100		
10	100		
6.3	97		
5	95		
3.35	92		
2	86		
1.18	80		
0.6	69		
0.425	64	Particle density (assumed) 1.40 Mg/m3	
0.3	58		
0.212	54		
0.15	50		
0.063	45		

Dry Mass of sample, g 1515

Sample Proportions	% dry mass
Cobbles	0
Gravel	14
Sand	41
Fines <0.063mm	44

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	27
Curvature Coefficient	0.21

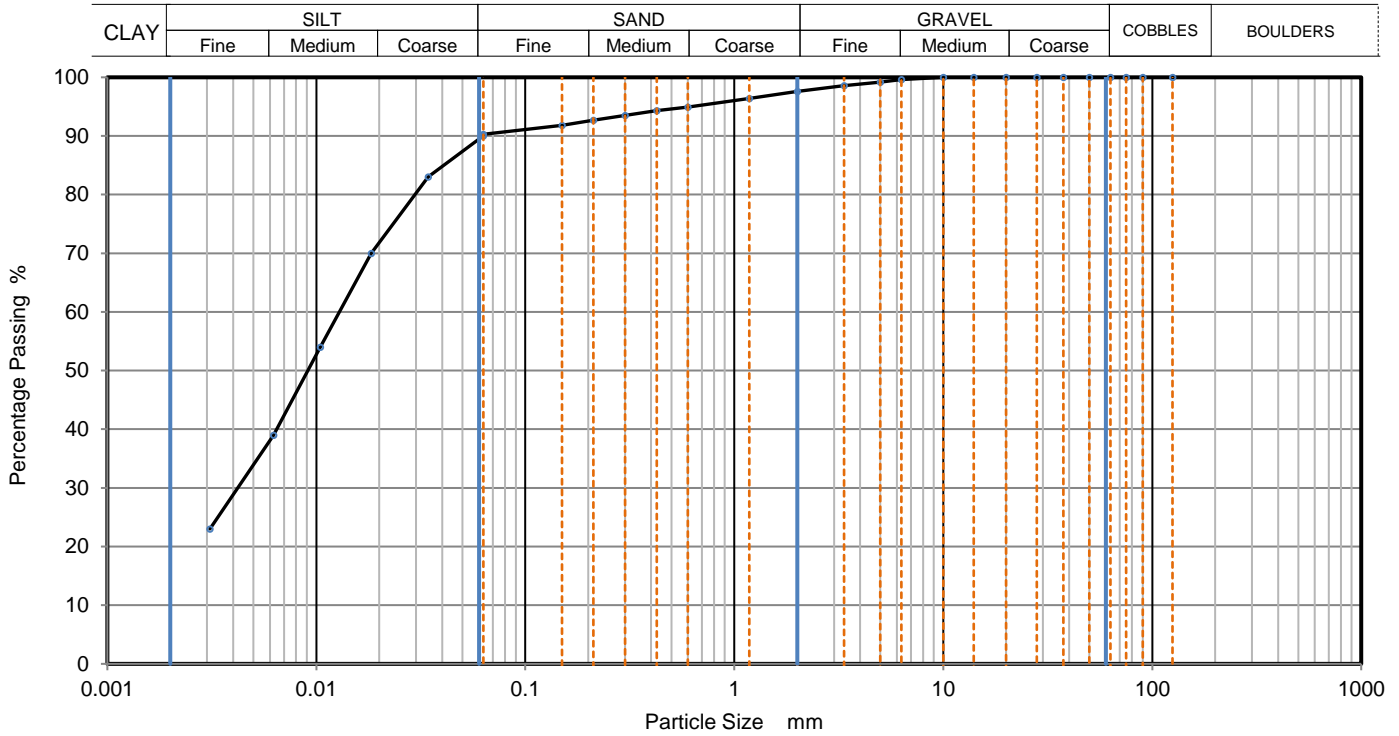
Remarks
Preparation and testing in accordance with BS1377 unless noted below



PARTICLE SIZE DISTRIBUTION

Job Ref	16-1239
Borehole/Pit No.	WOA-BH02/17

Site Name	West Offaly Power station and the Ash Disposal Facility	Sample No.	2
Soil Description	Grey slightly sandy slightly gravelly CLAY.	Depth, m	1.80
Specimen Reference	9	Specimen Depth	m
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5	KeyLAB ID	Caus201703109
Sample Type	B		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0630	90
90	100	0.0343	83
75	100	0.0183	70
63	100	0.0104	54
50	100	0.0062	39
37.5	100	0.0031	23
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	99		
3.35	99		
2	98		
1.18	96		
0.6	95	Particle density (assumed) 1.40 Mg/m3	
0.425	94		
0.3	94		
0.212	93		
0.15	92		
0.063	90		

Dry Mass of sample, g 2564

Sample Proportions	% dry mass
Cobbles	0
Gravel	2
Sand	7
Fines <0.063mm	90

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	
Curvature Coefficient	

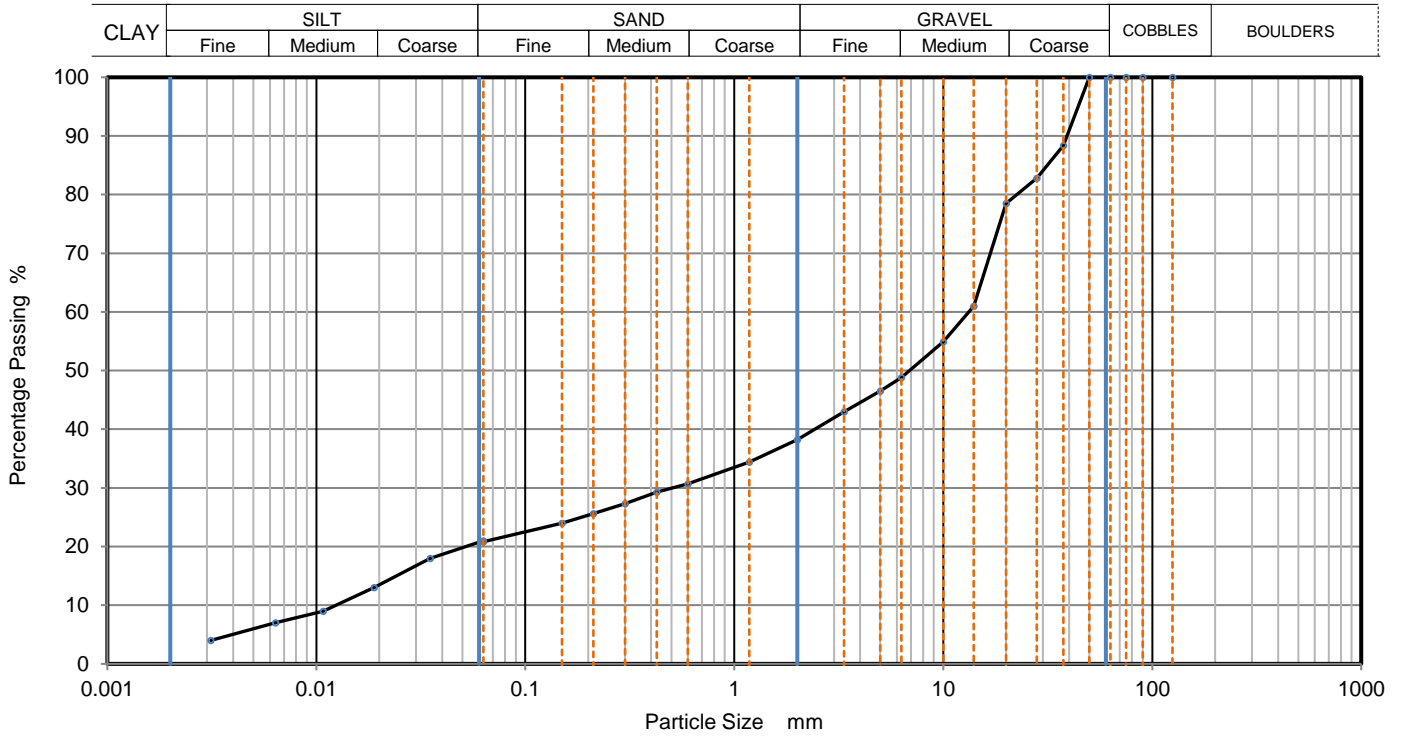
Remarks
Preparation and testing in accordance with BS1377 unless noted below



PARTICLE SIZE DISTRIBUTION

Job Ref	16-1239
Borehole/Pit No.	WOA-BH02A/17
Sample No.	1
Depth, m	0.80
Sample Type	B
KeyLAB ID	Caus2017031010

Site Name	West Offaly Power station and the Ash Disposal Facility	
Soil Description	Grey slightly sandy very gravelly CLAY.	
Specimen Reference	9	m
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5	



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0630	21
90	100	0.0350	18
75	100	0.0189	13
63	100	0.0108	9
50	100	0.0064	7
37.5	88	0.0031	4
28	83		
20	79		
14	61		
10	55		
6.3	49		
5	47		
3.35	43		
2	38		
1.18	34		
0.6	31		
0.425	29	Particle density (assumed) 1.40 Mg/m3	
0.3	27		
0.212	26		
0.15	24		
0.063	21		

Dry Mass of sample, g 4564

Sample Proportions	% dry mass
Cobbles	0
Gravel	62
Sand	17
Fines <0.063mm	21

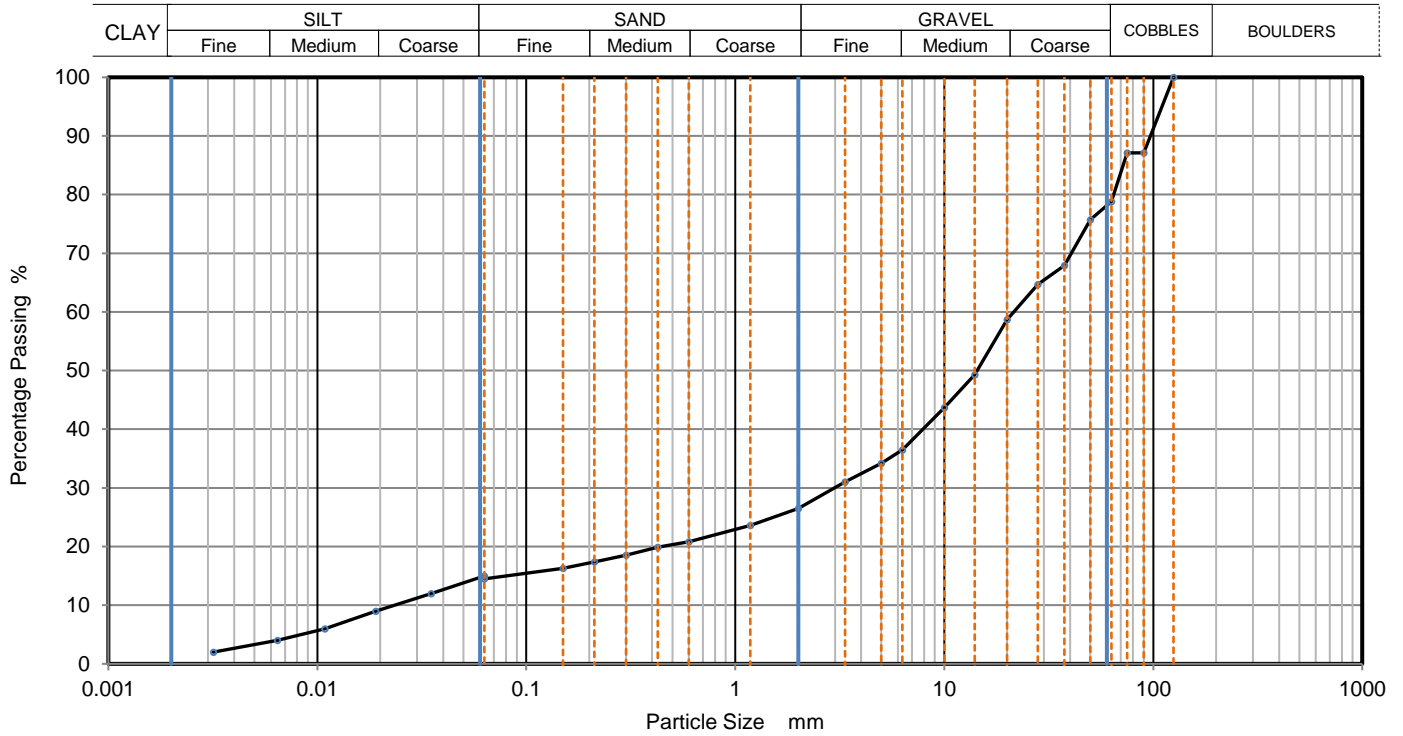
Grading Analysis	
D100	mm
D60	mm 13.2
D30	mm 0.509
D10	mm 0.012
Uniformity Coefficient	1100
Curvature Coefficient	1.6

Remarks
Preparation and testing in accordance with BS1377 unless noted below



PARTICLE SIZE DISTRIBUTION

Job Ref	16-1239
Borehole/Pit No.	WOA-BH02A/17
Site Name	West Offaly Power station and the Ash Disposal Facility
Sample No.	4
Soil Description	Grey sandy very gravelly CLAY.
Depth, m	4.80
Specimen Reference	9
Specimen Depth	m
Sample Type	B
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5
KeyLAB ID	Caus2017031012



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0630	15
90	87	0.0350	12
75	87	0.0190	9
63	79	0.0109	6
50	76	0.0064	4
37.5	68	0.0032	2
28	65		
20	59		
14	49		
10	44		
6.3	37		
5	34		
3.35	31		
2	27		
1.18	24		
0.6	21		
0.425	20	Particle density (assumed) 1.40 Mg/m3	
0.3	19		
0.212	17		
0.15	16		
0.063	15		

Dry Mass of sample, g 11389

Sample Proportions	% dry mass
Cobbles	21
Gravel	52
Sand	12
Fines <0.063mm	15

Grading Analysis		
D100	mm	125
D60	mm	21.5
D30	mm	2.99
D10	mm	0.0229
Uniformity Coefficient		940
Curvature Coefficient		18

Remarks
Preparation and testing in accordance with BS1377 unless noted below



Final Report

Report No.: 17-08518-1

Initial Date of Issue: 13-Apr-2017

Client: Causeway Geotech Ltd

Client Address: 8 Drumahiskey Road
Balnamore
Ballymoney
County Antrim
BT53 7QL

Contact(s): Aisling O'Kane
Brian Mooney
Colm Hurley
Darren O'Mahony
John Cameron
John Duggan
Lucy Peaker
Matthew Gilbert
Neil Haggan
Paul Dunlop
Paul McNamara
Stephen Curtis
Stephen Franey
Stephen Watson

Project: 16-1239 - West Offaly Power Station & Ash Disp. Facility

Quotation No.: **Date Received:** 07-Apr-2017

Order No.: **Date Instructed:** 07-Apr-2017

No. of Samples: 4

Turnaround (Wkdays): 5 **Results Due:** 13-Apr-2017

Date Approved: 13-Apr-2017

Approved By:


Details: Glynn Harvey, Laboratory Manager

Project: 16-1239 - West Offaly Power Station & Ash Disp. Facility

Client: Causeway Geotech Ltd	Chemtest Job No.:				17-08518	17-08518	17-08518	17-08518
Quotation No.:	Chemtest Sample ID.:				437051	437052	437053	437054
Order No.:	Client Location ID.:				WOA-BH01/17	WOA-BH01/17	WOA-BH02/17	WOA-BH02A/17
	Sample Type:				SOIL	SOIL	SOIL	SOIL
	Top Depth (m):				0.80	3.80	1.80	0.80
	Bottom Depth (m):				1.20	4.20	2.20	1.20
	Date Sampled:				06-Apr-2017	06-Apr-2017	06-Apr-2017	06-Apr-2017
Determinand	Accred.	SOP	Units	LOD				
Moisture	N	2030	%	0.020	52	41	19	6.8
pH	U	2010		N/A	9.4	11.0	9.0	9.4
Sulphate (2:1 Water Soluble) as SO ₄	U	2120	g/l	0.010	1.9	1.4	0.039	< 0.010
Organic Matter	U	2625	%	0.40	24			

Report Information

Key

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- M MCERTS and UKAS accredited
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CAUSEWAY
— GEOTECH

APPENDIX N

SPT hammer energy measurement report



SPT Calibration Report



Hammer Energy Measurement Report

Type of Hammer: SPT HAMMER
 Client: CAUSEWAY GEOTECH
 Test No: EQU1763
 Test Depth (m): 7.50
 Date of Test: **18 February 2017**
 Valid until: **18 February 2018**
 Hammer ID: **EQU1763**

Mass of the hammer: $m = 63.5\text{kg}$
 Falling height: $h = 0.76\text{m}$
 $E_{\text{theor}} = m \times g \times h = 473\text{J}$
Characteristics of the instrumented rod
 Diameter: $d_r = 0.052\text{ m}$
 Length of the instrumented rod: 0.558 m
 Area: $A = 11.61\text{ cm}^2$
 Modulus: $E_a = 206843\text{ MPa}$

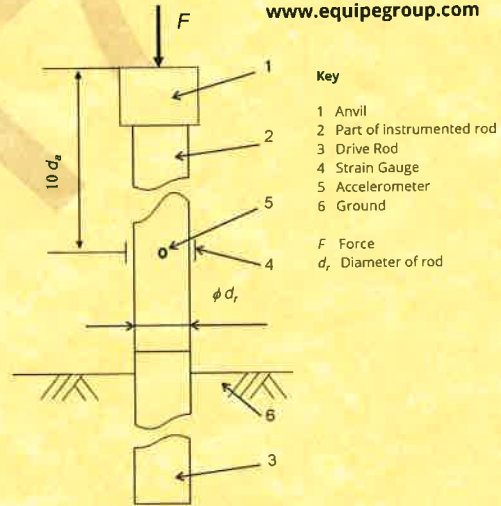
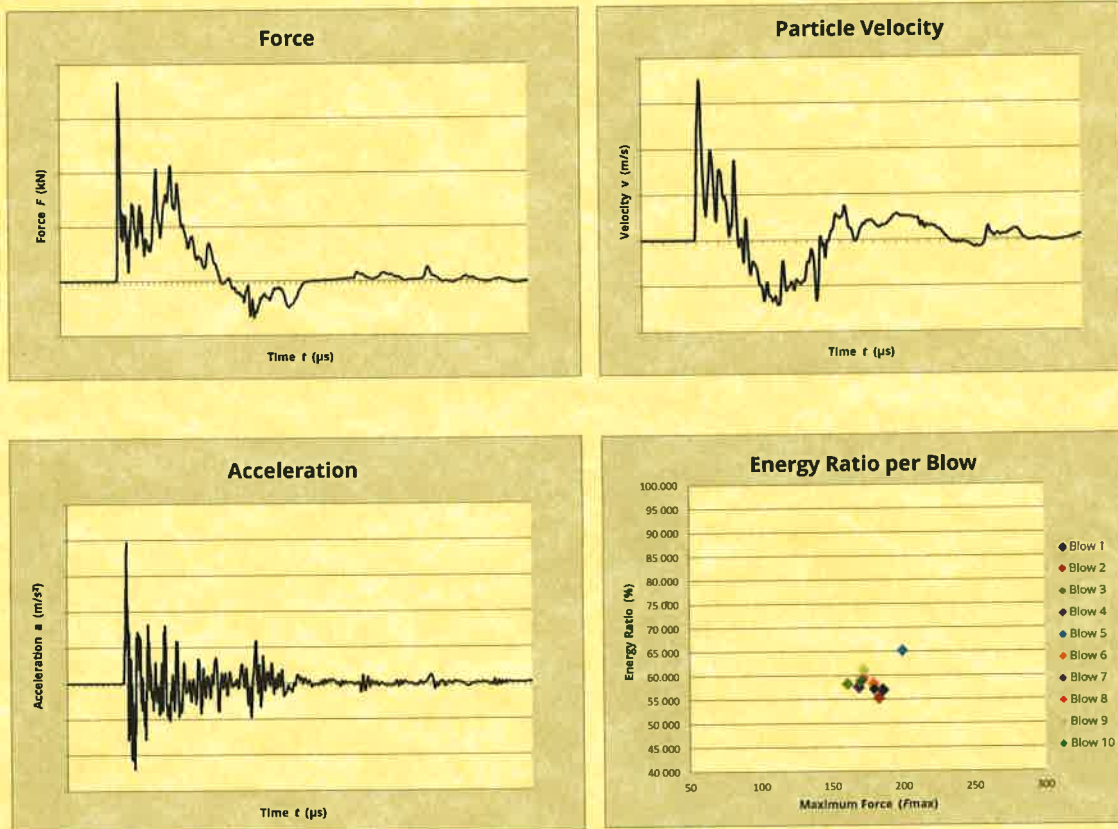


Fig. B.1 and B.2 BS EN ISO 22476-3 : 2005 + A1 : 2011



Observations:
1.

$E_{\text{meas}} = 0.277\text{ kN-m}$
 $E_{\text{theor}} = 0.473\text{ kN-m}$

$$\text{Energy Ratio } (E_r) = \frac{E_{\text{meas}}}{E_{\text{theor}}} = 58.61\%$$

Equipe SPT Analyzer Operators: AF
 Prepared by: *[Signature]* Checked by: *[Signature]* Date: 02/03/2017