Appendix A.9.1d

Ground Investigations Reports - Part 4

A.9.1d Ground Investigations Reports - Part 4

AGP23244_01

Report on the Geophysical Investigation at Galway Racecourse, Co. Galway, for Ground Investigation Ireland limited.

19th April 2024

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THE FINDINGS OF THIS REPORT ARE THE RESULT OF A GEOPHYSICAL SURVEY USING NON-INVASIVE SURVEY TECHNIQUES CARRIED OUT AT THE GROUND SURFACE. INTERPRETATIONS CONTAINED IN THIS REPORT ARE DERIVED FROM A KNOWLEDGE OF THE GROUND CONDITIONS, THE GEOPHYSICAL RESPONSES OF GROUND MATERIALS AND THE EXPERIENCE OF THE AUTHOR. APEX GEOPHYSICS LTD. HAS PREPARED THIS REPORT IN LINE WITH BEST CURRENT PRACTICE AND WITH ALL REASONABLE SKILL, CARE AND DILIGENCE IN CONSIDERATION OF THE LIMITS IMPOSED BY THE SURVEY TECHNIQUES USED AND THE RESOURCES DEVOTED TO IT BY AGREEMENT WITH THE CLIENT. THE INTERPRETATIVE BASIS OF THE CONCLUSIONS CONTAINED IN THIS REPORT SHOULD BE TAKEN INTO ACCOUNT IN ANY FUTURE USE OF THIS REPORT.

PROJECT NUMBER	AGP23244		
AUTHOR	**CHECKED**	**REPORT STATUS**	**DATE**
EURGEOL DR. YVONNE O'CONNELL P.GEO, PH.D., M.SC. (GEOPHYSICS)	TONY LOMBARD M.SC (GEOPHYSICS)	V.01	19TH APRIL 2024

CONTENTS

1. EXECUTIVE SUMMARY

APEX Geophysics Ltd. was requested by Ground Investigations Ireland Limited (GII) to carry out a geophysical survey for a proposed development in the infield of Galway Racecourse, Co. Galway, which will involve earthworks excavation and the drilling of two trial wells.

The purpose of the geophysical investigation was to provide information on the type, thickness and stiffness of the soils, the depth to and type of bedrock, the rock excavatability, the presence of potential karst features and any anomalous features.

The racecourse is located northeast of the city of Galway in Ballybrit, Co. Galway. The c. 3.4 ha site is located inside the racetrack and comprises predominantly greenfield with a hardcore area in the northeast. Site topography rises from 43.2 mOD in the southwest to 52.9 mOD in the north of the site.

The Geological Survey of Ireland (GSI) Quaternary Sediments map for the area indicates till across the site with subcropping/outcropping rock south/southeast of the site. Trial Pits and cable percussive boreholes encountered Made Ground comprising of sandy gravelly silty clay over soft to firm slightly sandy gravelly clay, becoming stiff to very stiff with depth, to refusal at depths from 2.0 to 4.3 m bgl. A well (TW02) was drilled in the northeast of the site and encountered 2 m Made Ground over 20 m of sand without encountering bedrock.

The GSI Geology map indicates Burren Formation limestone across the site. This formation is prone to karstification. Karst features are mapped c. 550 m north of the site and springs are mapped c. 1 km east and west of the site.

The geophysical survey, carried out between the 21st and 23rd February 2024, consisted of 6 ERT and 11 seismic refraction profiles.

The geophysical data have been interpreted as indicating:

1. A thin upper layer (average thickness 0.75 m) of soft to firm sandy gravelly silt/clay or Made Ground,
2. Underlain by firm to stiff sandy gravelly silt/clay soils to an average depth of 4.4 m bgl,
3. Underlain in the west and southwest by very stiff/consolidated sandy gravelly silt/clay with localised pockets of very dense clayey sand/gravel. The trial pits and cable percussive boreholes refused on this layer. This very stiff material varies in thickness from 0.7 to 23 m suggesting the presence of a deep infilled bedrock depression open to the west.
4. Underlain by a layer (with an average thickness of 2 m) of highly to moderately weathered/karstified limestone,
5. Over slightly weathered to fresh limestone.

The combined soil thickness (Layers 1, 2 & 3) varies from 2.5 to 26.3 m thick, with an average thickness of 14.9 m. Soil is thinnest in the northeast and to the southeast. The interpreted base of the soils varies from 18.1 to 48.5 mOD.

Six coreholes are recommended to confirm the findings of the geophysical investigation. All borehole locations should be screened for buried services and hand-dug to check for pipes, cables, etc. prior to boring.

The geophysical interpretation should be reviewed based on the findings of any further direct investigation.

2. INTRODUCTION

APEX Geophysics Ltd. was requested by Ground Investigations Ireland Limited (GII) to carry out a geophysical survey for a proposed development in the infield of Galway Racecourse, Co. Galway, which will involve earthworks excavation and the drilling of two trial wells. The purpose of the geophysical investigation was to provide information on the sub-soil conditions across the site.

2.1 Survey Objectives

The objectives of the investigation were to provide information on the:

- Type, thickness and stiffness of the soils,
- Depth to and type of bedrock,
- Excavatability,
- Presence of potential karst features,
- Presence of anomalous features.

2.2 Site Background

The racecourse is located northeast of the city of Galway in Ballybrit, Co. Galway (Fig. 2.1). The c. 3.4 ha site is located inside the racetrack and comprises predominantly greenfield with an area of hardcore in the northeast (Fig. 2.1). Site topography slopes up from 43.2 mOD in the southwest to 52.9 mOD in the north of the site.

Fig 2.1: Survey area location.

2.2.1 Geology

The Geological Survey of Ireland (GSI) 1:100k Bedrock Geology map for the area (GSI, 2018) indicates that the site is underlain by pale grey clean skeletal limestone of the Burren Formation (Fig. 2.2). Rock outcrops are indicated in the south of the site and outcropping rock was observed in this area during surveying.

Fig. 2.2: GSI 100k Bedrock geology.

The Burren Formation is known to be prone to karstification. Karst may be defined as the whole or partial dissolution of limestone bedrock by the action of water and the subsequent whole or partial infill with soil material. The degree of karstification depends on the quantity of limestone which has been dissolved and subsequently infilled. Karst features are mapped on the GSI karst database c. 550 m north of the site, springs are mapped c. 1 km east and swallow holes, springs and a cave are mapped 1.75 km to the west.

2.2.2 Soils

The GSI Quaternary Sediments map for the area (GSIc, 2019) indicates that the site is in an area of till derived from limestones with karstified bedrock subcropping/outcropping south/southeast of the site (Fig. 2.3).

Fig. 2.3: GSI Quaternary sediments.

2.2.3 Groundwater

The groundwater vulnerability rating for the site (GSIb, 2019) is predominantly classified as 'Extreme' with 'Extreme- Rock at or near the surface or karst' in the southeast of the site (Fig. 2.4). The Burren Formation is classified as a 'Regionally Important aquifer – karstified (conduit)' (GSIa, 2019).

Fig. 2.4: Groundwater vulnerability.

2.3 Historical Data

The historical 6 inch sheet for the area shows outcropping rock south/southeast of the site with stony drift northeast of the site (Fig. 2.5).

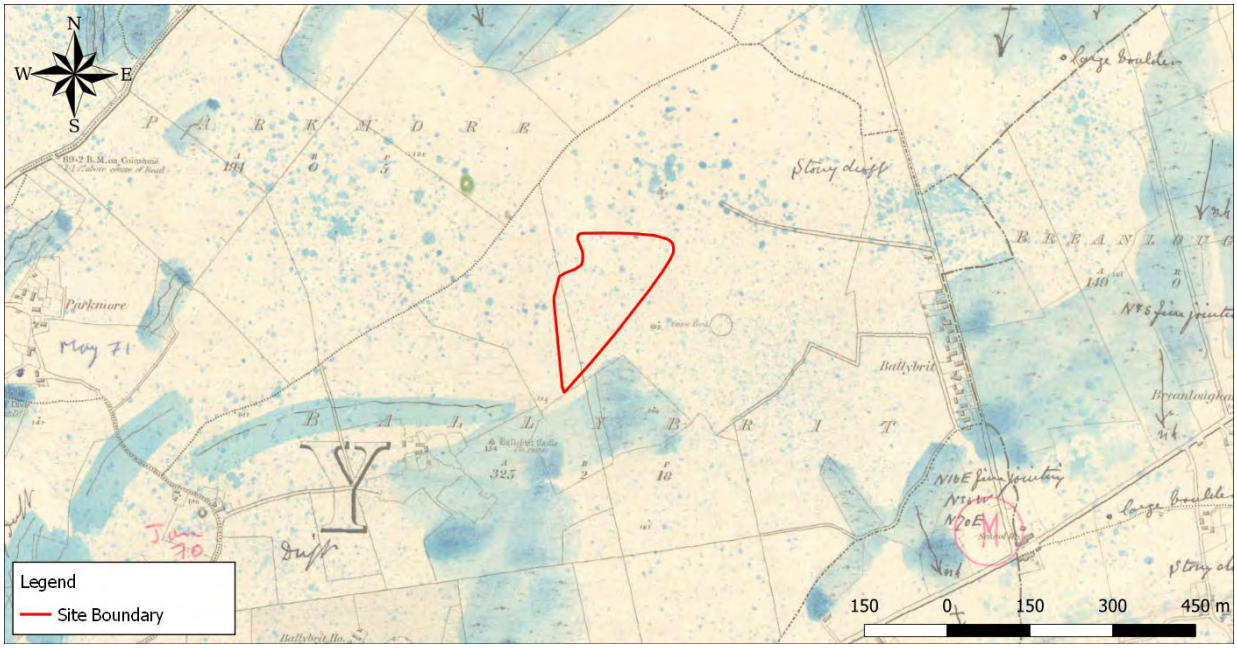

Fig. 2.5: The GSI historical 6-inch map.

2.3.1 Direct Investigation Data

Three wells (TW01 to TW03) were drilled at the racecourse at the time of surveying. Well TW02 was drilled within the geophysical site extents and encountered 2 m Made Ground over 20 m of sand without encountering bedrock. TW01, drilled 155 m to the east, encountered limestone bedrock from 5–100 m bgl. TW03, drilled 155m southeast of the site encountered limestone bedrock from 5–150 m bgl with minor fissures/water strikes.

Eleven trial Pits (TP01-TP11) were opened and 3 cable percussive boreholes (BH01-BH03) were drilled across the site. They encountered Made Ground comprising of sandy gravelly silty clay over soft to firm slightly sandy gravelly clay, becoming stiff to very stiff with depth, to refusal at depths from 2.0 to 4.3 m bgl.

2.4 Survey Rationale

The proposed geophysical investigation consisted of Electrical Resistivity Tomography (ERT) and Seismic Refraction profiling:

ERT images the resistivity of the materials in the subsurface along a profile to produce a cross-section showing the variation in resistivity with depth, depending on the length of the profile. Each profile is interpreted to determine the material type along the profile at increasing depth, based on the typical resistivities returned for Irish ground materials.

Seismic Refraction Profiling measures the P-wave velocity of refracted seismic waves through the soil and rock material and allows an assessment of the thickness and quality of the materials present to be made. Stiffer and stronger materials usually have higher seismic velocities while soft, loose or fractured materials have lower velocities. This method can profile depth to bedrock and provide information on the quality/strength of the rock.

As with all geophysical methods the results are based on indirect readings of the subsurface properties. The effectiveness of the proposed approach will be affected by variations in the ground properties. By combining a number of techniques, it is possible to provide a higher quality interpretation and reduce any ambiguities which may otherwise exist. Further information on the detailed methodology of each geophysical method employed in this investigation is given in **APPENDIX A: DETAILED METHODOLOGY**.

3. RESULTS

The survey was carried out between the 21st and 23rd February 2024. The geophysical survey locations are shown on Drawing AGP23244_01 (Appendix C).

3.1 ERT

Six resistivity profiles (R1 to R6) were recorded across the site. The results are presented on Drawings AGP23244_R1 to AGP23244_R6. The resistivity values at this site have been interpreted in conjunction with the seismic refraction and ground investigation data as follows:

Resistivity (Ohm-m)	Interpretation
50 - 250	Sandy gravelly SILT/CLAY
250 –325	Clayey SAND/GRAVEL
250-275	Possible Weathered/karstified LIMESTONE
>275	LIMESTONE

3.2 Seismic refraction profiling

Eleven seismic refraction profiles (S1 to S11) were recorded across the site. The results are presented on Drawings AGP23244_R1 to AGP23244_R6 Appendix C. The seismic data in conjunction with the ERT and ground investigation data has been interpreted as indicating the following velocity layers:

Layer	Velocity (m/s)	Velocity (m/s)	Thickness (m)	Interpretation	Estimated Stiffness/ Rock Quality	Estimated Excavatability
1	323-445	369	1.6 – 7.2 (ave. 4.4)	Soil	Soft-Firm/Loose - Medium Dense	Diggable
2	564-908	702		Soil	Firm-Stiff/Medium Dense-Dense	Diggable
3*	2302-2683	2475	0.7 – 23.0 (ave. 10.6)	Soil	Very Stiff/Very Dense	Diggable
			0.5 - 5.0 (ave. 2.0)	Weathered/Karstified Rock	Fair	Break/Blast
4	>2750			Slightly Weathered – Fresh Bedrock	Good	Break/Blast

**Layer 3 velocities are generally typical of slightly weathered rock however here appear to indicate very stiff/very dense soils.*

3.3 Integrated Interpretation

The ERT and seismic refraction data have been combined to produce the interpreted cross sections on Drawings AGP23244_R1 to AGP23244_R6. The combined data has been interpreted as follows:

Layer	Velocity (m/s)	Resistivity (Ohm-m)	Interpretation	Estimated Stiffness/ Rock Quality	Estimated Excavatability
1	323-445	50-250	Sandy gravelly SILT/CLAY or Made Ground	Soft-Firm	Diggable
2	564-908	50 - 250	Sandy gravelly SILT/CLAY	Firm-Stiff	
3	2302-2683	50-250	Sandy gravelly SILT/CLAY	Very Stiff	
		250 –325	Clayey SAND/GRAVEL	Very Dense	
4		250-275	Possible Highly - Moderately Weathered/ Karstified LIMESTONE	Fair	Break/Blast
5	2624-3025	>275	Slightly Weathered – Fresh LIMESTONE	Good	Break/Blast

The geophysical data have been interpreted as indicating:

1. A thin upper layer (average thickness 0.75 m) of soft to firm sandy gravelly silt/clay or Made Ground,
2. Underlain by firm to stiff sandy gravelly silt/clay soils to an average depth of 4.4 m bgl,
3. To the west and southwest of the survey area the geophysical data suggests the presence of a deep infilled bedrock depression open to the west. The soils comprise of very stiff sandy gravelly silt/clay, with very high seismic velocities (average 2475 m/s) that would be typical of slightly weathered rock, indicating that very consolidated material is present. The interpreted thickness of this material varies from 0.7 to 23 m. The trial pits and cable percussive boreholes refused on this layer. Some localised very dense clayey sand/gravel has been interpreted in places (R1, R5 & R6).

Given the high velocity of the very stiff sandy gravelly silt/clay, the contact with weathered/karstified limestone is difficult to define across the site. The bedrock layers have been interpreted as follows:

4. An upper layer (with an average thickness of 2 m) of possible weathered/karstified limestone which the low resistivities (250-275 Ohm-m) suggest would be highly to moderately weathered with some clay infill,
5. Over slightly weathered to fresh limestone. The resistivities are relatively low (275-400 Ohm-m) for the upper 4 m of this limestone layer, possibly suggesting some degree of karstification.

If any rock excavation is planned, the seismic velocities indicate that the limestone would require breaking or blasting.

The interpreted thickness of Layers 1 and 2 combined is plotted on Drawing AGP23244_02 and varies from 1.6 to 7.2 m thick, with an average thickness of 4.4 m.

The interpreted combined soil thickness (Layers 1, 2 & 3) is plotted on Drawing AGP23244_03 and varies from 2.5 to 26.3 m thick, with an average thickness of 14.9 m. Soil is thinnest in the northeast and to the southeast. The interpreted base of the soils is plotted on Drawing AGP23244_04 and varies from 18.1 to 48.5 mOD.

The interpreted combined thickness of the soils and highly to moderately weathered/karstified limestone is plotted on Drawing AGP23244_05 and ranges in thickness from 2.9 to 29.2 m, with an average thickness of 17 m. The interpreted base of the weathered/karstified rock layer is plotted on Drawing AGP23244_06 and varies from 16.1 to 48 mOD.

The 20 m of sand encountered in well TW02 has not been interpreted on the geophysical data but the absence of bedrock to a depth of 22 m bgl has been incorporated in to the contour maps above.

NOTE: *The contours on maps AGP23244_02 to AGP2244_06 include a degree of interpolation and extrapolation between the measured data points and reference to the type, number and location of these points should be made when assessing the significance of these data. In addition, significant anisotropy exists between profiles recorded E-W and N-S resulting in additional edits to the values contained in the drawings.*

4. RECOMMENDATIONS

Rotary cored boreholes are recommended to confirm the findings of the geophysical investigation as follows:

Comment	Easting	Northing
PBH1	533636.7	727908.5
PBH2	533713.5	727890.8
PBH3	533638.6	727865.5
PBH4	533677.5	727857.9
PBH5	533697.8	727838.2
PBH6	533645.6	727766.6

All borehole locations should be screened for buried services and hand-dug to check for pipes, cables, etc. prior to boring.

In karst environments, changes in surface water drainage or groundwater levels associated with proposed construction activities may re-activate dormant karst features and cause subsidence of the overburden materials. In order to minimize the risk of subsidence all drains should be sealed and surface water disposed of away from the construction area. Prior to construction a surface water management plan is advised.

Foundation design for any structures should take into account the presence of possible cavities in the rock and overburden and foundations capable of spanning voids that may migrate to the surface, should be incorporated into the design. Any cavities exposed during stripping of topsoil or excavation of rock should be backfilled in the appropriate manner for karstified limestone areas as advised by a competent geotechnical engineer.

If any bedrock excavation is proposed, a detailed assessment of excavatability should be carried out combining the results of the geophysical survey, rotary core drilling, strength testing, and trial excavation pits down to formation level using a high-powered excavator of similar rating to that to be used during construction. A more detailed discussion of velocity and excavatability is contained in Appendix B.

The geophysical interpretation should be reviewed based on the findings of any further direct investigation.

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APPENDIX A: DETAILED GEOPHYSICAL METHODOLOGY

A combination of geophysical techniques was used to provide a high-quality interpretation and reduce any ambiguities, which may otherwise exist.

Electrical Resistivity Tomography

Electrical Resistivity Tomography was carried out to provide information on lateral variations in the overburden material as well as on the underlying overburden and bedrock.

Principles
This surveying technique makes use of the Gradient resistivity array. The 2D-resistivity profiling method records a large number of resistivity readings in order to map lateral and vertical changes in material types. This method involves the use of electrodes connected to a resistivity meter, using computer software to control the process of data collection and storage.

Data Collection
Profiles were recorded using an ABEM LS4 resistivity meter, imaging software, four 21 takeout multicore cables and up to 80 stainless steel electrodes. Saline solution was used at the electrode/ground interface in order to gain a good electrical contact required for the technique to work effectively. The recorded data were processed and viewed immediately after surveying.

Data Processing
The field readings were stored in computer files and inverted using the RES2DINV package (Geotomo Software, 2006) with up to 5 iterations of the measured data carried out for each profile to obtain a 2D-depth model of the resistivities.

The inverted 2D resistivity models and corresponding interpreted geology are displayed on the accompanying drawings alongside the processed seismic sections. Profiles have been contoured using the same contour intervals and colour codes. Distance is indicated along the horizontal axis of the profiles.

Seismic Refraction Profiling

Principles
This method measures the velocity of refracted seismic waves through the overburden and rock material and allows an assessment of the thickness and quality of the materials present to be made. Stiffer and stronger materials usually have higher seismic velocities while soft, loose or fractured materials have lower velocities.

Seismic profiling measures the p-wave velocity (Vp) of refracted seismic waves through the overburden and rock material and allows an assessment of the thickness and quality of the materials present to be made. Stiffer and stronger materials usually have higher Vp velocities while soft, loose or fractured materials have lower Vp velocities. Readings are taken using geophones connected via multi-core cable to a seismograph.

Data Collection
A Geode high resolution 24 channel digital seismograph, 24 10HZ vertical geophones and a 10 kg hammer were used to provide first break information, with a 24 take-out cable. Equipment was carried and operated by a two-person crew.

Readings are taken using geophones connected via multi-core cable to a seismograph. The depth of resolution of soil/bedrock boundaries is determined by the length of the seismic spread, typically the depth of resolution is about one third the length of the profile.(eg. 69m profile ~23m depth, 33m profile ~ 11m depth).

Data Processing
First break picking in digital format was carried out using the SeisImager/2D PICKWIN software program from Geometrics to construct p-wave (Vp) traveltime plots for each spread. The processing and interpretation uses the ray-tracing and tomographic inversion methods, to acquire depths to boundaries and the P-wave velocities of these layers, using the SeisImager/2D PLOTREFA program. The processed seismic data are displayed in Appendix B.

SeisImager/2D interprets seismic refraction data as a laterally varying layered earth structure. The program includes three methods for data analysis, time-term inversion, the reciprocal method and tomography. The tomography method creates an initial velocity model, then traces rays through the model, comparing the calculated and measured traveltimes. The model is then modified and the process repeated to minimise the difference between the calculated and measured times. The data was processed using this method and was then converted to a layer model for display and interpretation.

Approximate errors for Vp velocities are estimated to be +/- 10%. Errors for the calculated layer thicknesses are of the order of +/-20%. Possible errors due to the "hidden layer" and "velocity inversion" effects may also occur (Soske, 1959).

Spatial Relocation

All the geophysical investigation locations were acquired using a Trimble Geo 7X high-accuracy GNSS handheld system using the settings listed below. This system allows collection of GPS data with c.20mm accuracy.

Projection:	Irish Transverse Mercator
Datum:	Ordnance
Coordinate units:	Metres
Altitude units:	Metres
Survey altitude reference:	MSL
Geoid model:	Republic of Ireland

APPENDIX B: EXCAVATABILITY

The seismic velocity of a rock formation is related to characteristics of the rock mass which include rock hardness and strength, degree of weathering and discontinuities. Usually the velocity is just one of several parameters used in the assessment of excavatability. The excavatability of a rock formation is favoured by the following factors:

- Open fractures, faults and other planes of weakness of any kind
- Weathering
- Brittleness and crystalline nature
- High degree of stratification or lamination
- Large grain size
- Low compressive strength

Weaver (1975) presented a comprehensive rippability rating chart (Fig.1) in which the p-wave velocity value and the relevant geological factors could be entered and assigned appropriate weightings. The total weighted index was found to correlate very well with actual rippability.

Fig.1 Rippability Rating Chart

Rock class	I	II	III	IV	V
Description	Very good rock	Good rock	Fair rock	Poor rock	Very poor rock
Seismic velocity (m/s)	>2150	2150-1850	1850-1500	1500-1200	1200-450
Rating	26	24	20	12	5
Rock hardness	Extremely hard rock	Very hard rock	Hard rock	Soft rock	Very soft rock
Rating	10	5	2	1	0
Rock weathering	Unweathered	Slightly weathered	Weathered	Highly weathered	Completely weathered
Rating	9	7	5	3	1
Joint spacing (mm)	>3000	3000-1000	1000-300	300-50	<50
Rating	30	25	20	10	5
Joint continuity	Non continuous	Slightly continuous	Continuous-no gouge	Continuous-some gouge	Continuous-with gouge
Rating	5	5	3	0	0
Joint gouge	No separation	Slight separation	Separation <1mm	Gouge <5mm	Gouge >5mm
Rating	5	5	4	3	1
Strike and dip orientation	Very unfavourable	Unfavourable	Slightly unfavourable	Favourable	Very favourable
Rating	15	13	10	5	3
Total rating	100-90	90-70*	70-50	50-25	<25
Rippability assessment	Blasting	Extremely hard ripping and blasting	Very hard ripping	Hard ripping	Easy ripping
Tractor horsepower		770/385	385/270	270/180	180
Tractor kilowatts		575/290	290/200	200/135	135

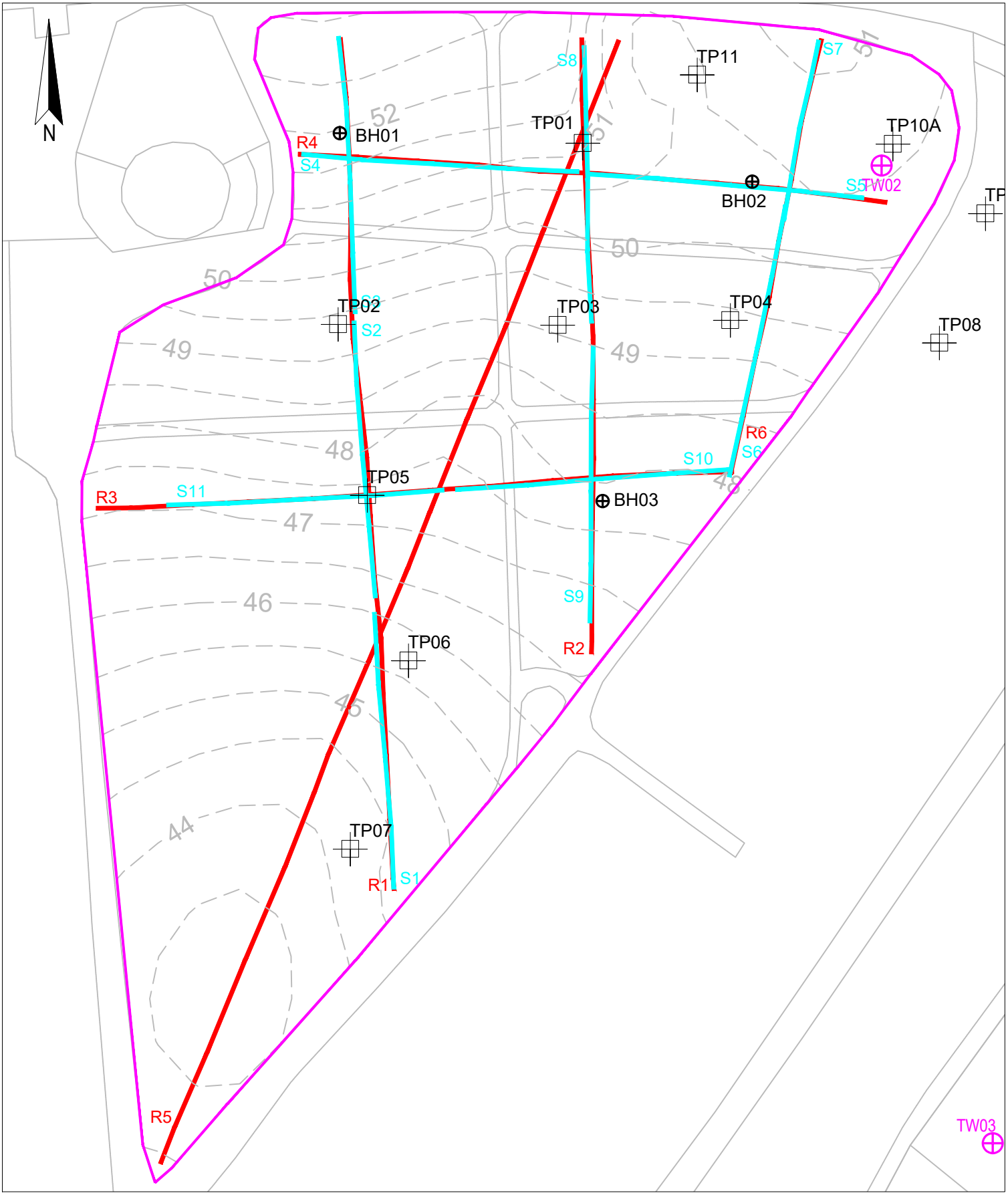
APPENDIX C: DRAWINGS

The information derived from the geophysical investigation is presented in the following drawings:

AGP23244_01	Geophysical Locations	1:1250	@ A3
AGP23244_02	Interpreted Thickness of Layers 1 & 2 (m)	1:1250	@ A3
AGP23244_03	Interpreted Soil Thickness - Layers 1, 2 & 3 (m)	1:1250	@ A3
AGP23244_04	Interpreted Base of Soils (mOD)	1:1250	@ A3
AGP23244_05	Interpreted Soil & Weathered Rock Thickness (m)	1:1250	@ A3
AGP23244_06	Interpreted Base of Weathered Rock (mOD)	1:1250	@ A3
AGP23244_R1	Results and Interpretation - ERT R1	1:1250	@ A4
AGP23244_R2	Results and Interpretation - ERT R2	1:1000	@ A4
AGP23244_R3	Results and Interpretation - ERT R3	1:1000	@ A4
AGP23244_R4	Results and Interpretation - ERT R4	1:1000	@ A4
AGP23244_R5	Results and Interpretation - ERT R5	1:1500	@ A4
AGP23244_R6	Results and Interpretation - ERT R6	1:1000	@ A4

GEOPHYSICAL LOCATIONS

SCALE 1:1250



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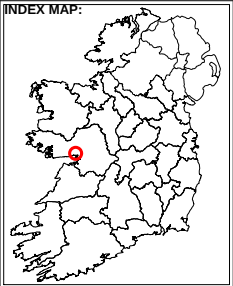
INDEX MAP:



LEGEND:

- R1 — Electrical Resistivity Tomography
- S1 — Seismic refraction profile
- BH01 — Cable percussive Boreholes
- TP01 — Trial Pit
- TW02 — Well

The information displayed here is to be used in conjunction with AGP23244_01 Report on the Geophysical Investigation at Galway Racecourse, for GII, APEX Geophysics Ltd. 19th April 2024

PROJECT:	GALWAY RACECOURSE GEOPHYSICAL SURVEY
CLIENT.:	GROUND INVESTIGATIONS IRELAND LTD
DRAWING NO:	AGP23244_01
SCALE:	AS INDICATED @ A4
DATE:	19-04-2024

Version:	Date:	Drawn By:	Checked:
01	19-04-2024	YOC	TL

INTERPRETED THICKNESS LAYERS 1 & 2 (m)

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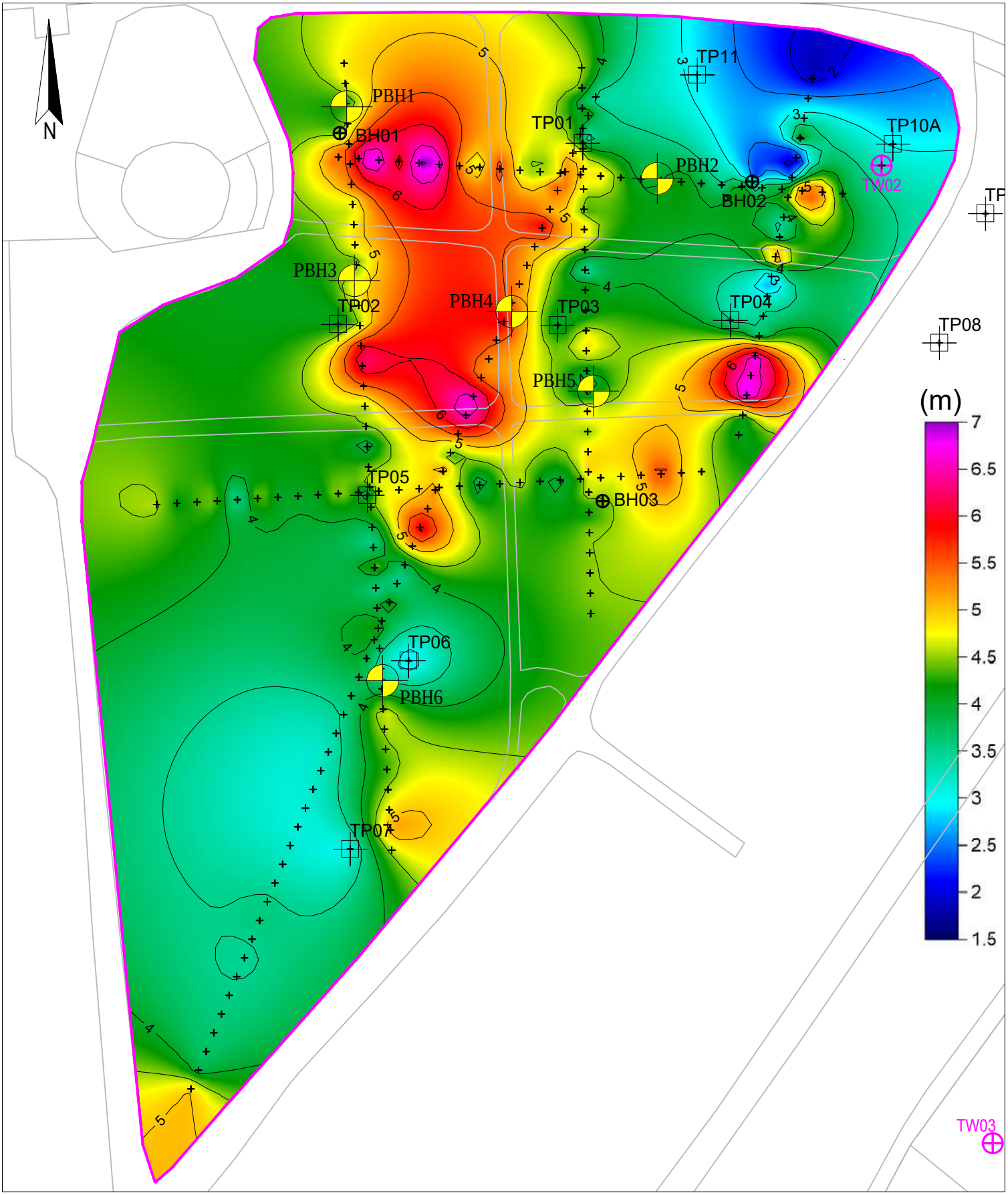

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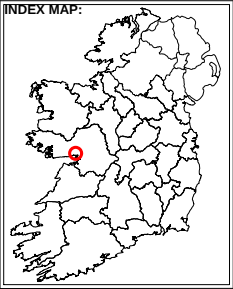
INDEX MAP:



LEGEND:

+	Data Point
BH01	Cable percussive Boreholes
TP01	Trial Pit
TW02	Well
PBH1	APEX Proposed borehole

The information displayed here is to be used in conjunction with AGP23244_01 Report on the Geophysical Investigation at Galway Racecourse, for GII, APEX Geophysics Ltd. 19th April 2024

PROJECT:	GALWAY RACECOURSE GEOPHYSICAL SURVEY
CLIENT.:	GROUND INVESTIGATIONS IRELAND LTD
DRAWING NO:	AGP23244_02
SCALE:	AS INDICATED @ A4
DATE:	19-04-2024

Version:	Date:	Drawn By:	Checked:
01	19-04-2024	YOC	TL

INTERPRETED SOIL THICKNESS - Layers 1, 2 & 3 (m)

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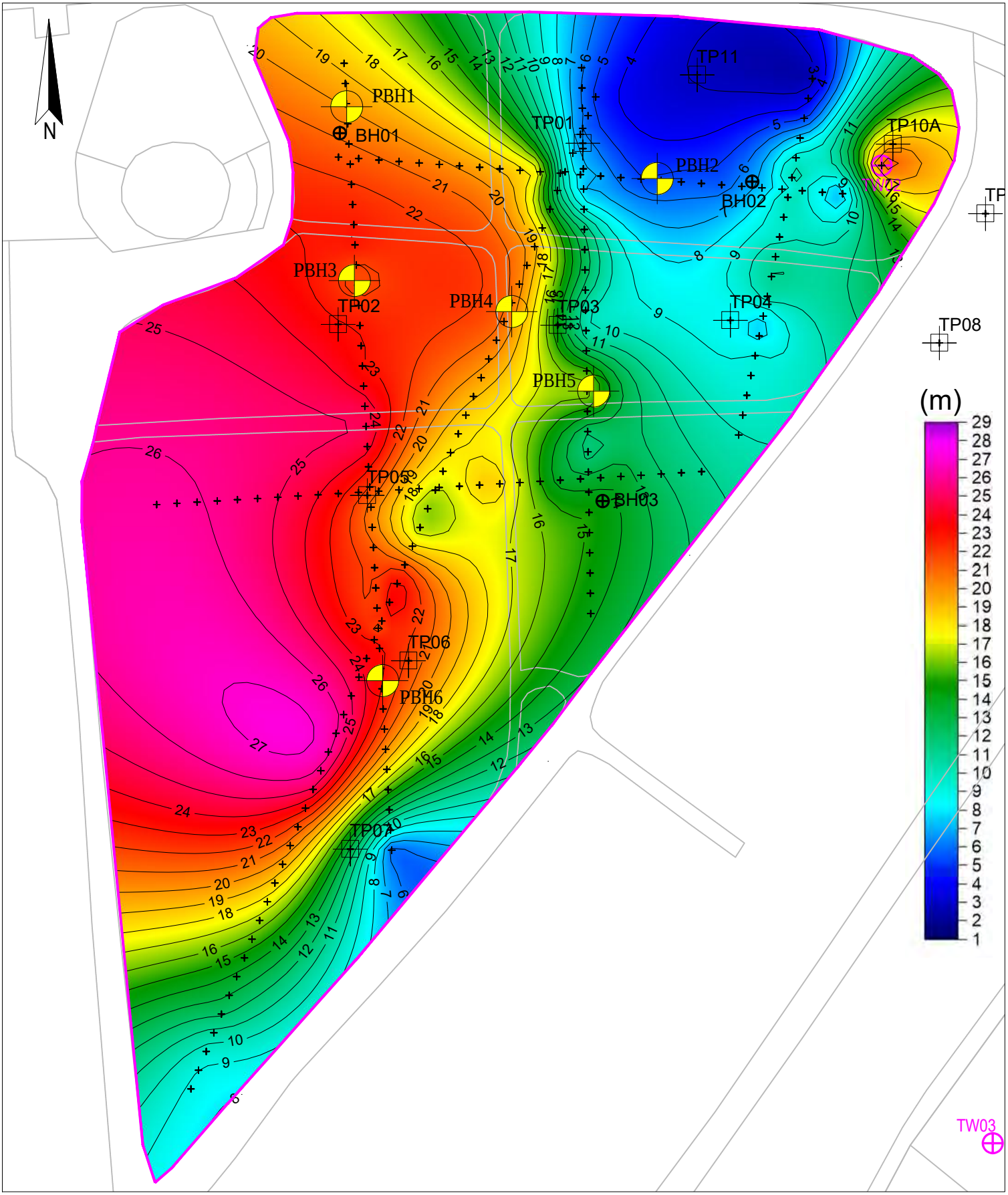

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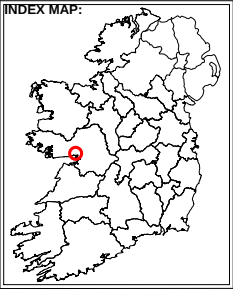
INDEX MAP:



LEGEND:

- Data Point
- BH01 Cable percussive Boreholes
- TP01 Trial Pit
- TW02 Well
- PBH1 APEX Proposed borehole

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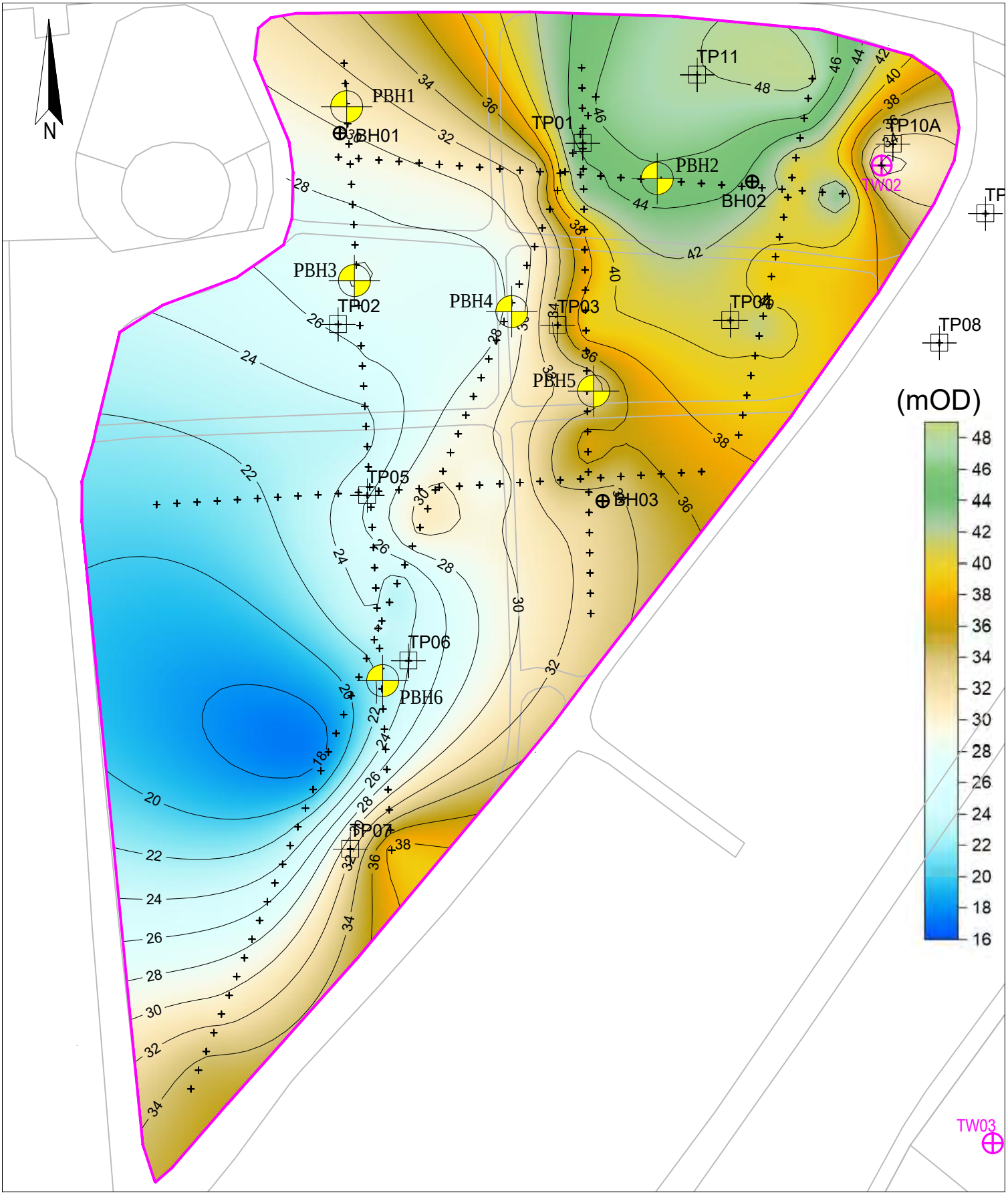

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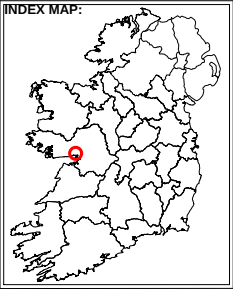

LEGEND:

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Version:	Date:	Drawn By:	Checked:
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INTERPRETED SOIL & WEATHERED ROCK THICKNESS (m)

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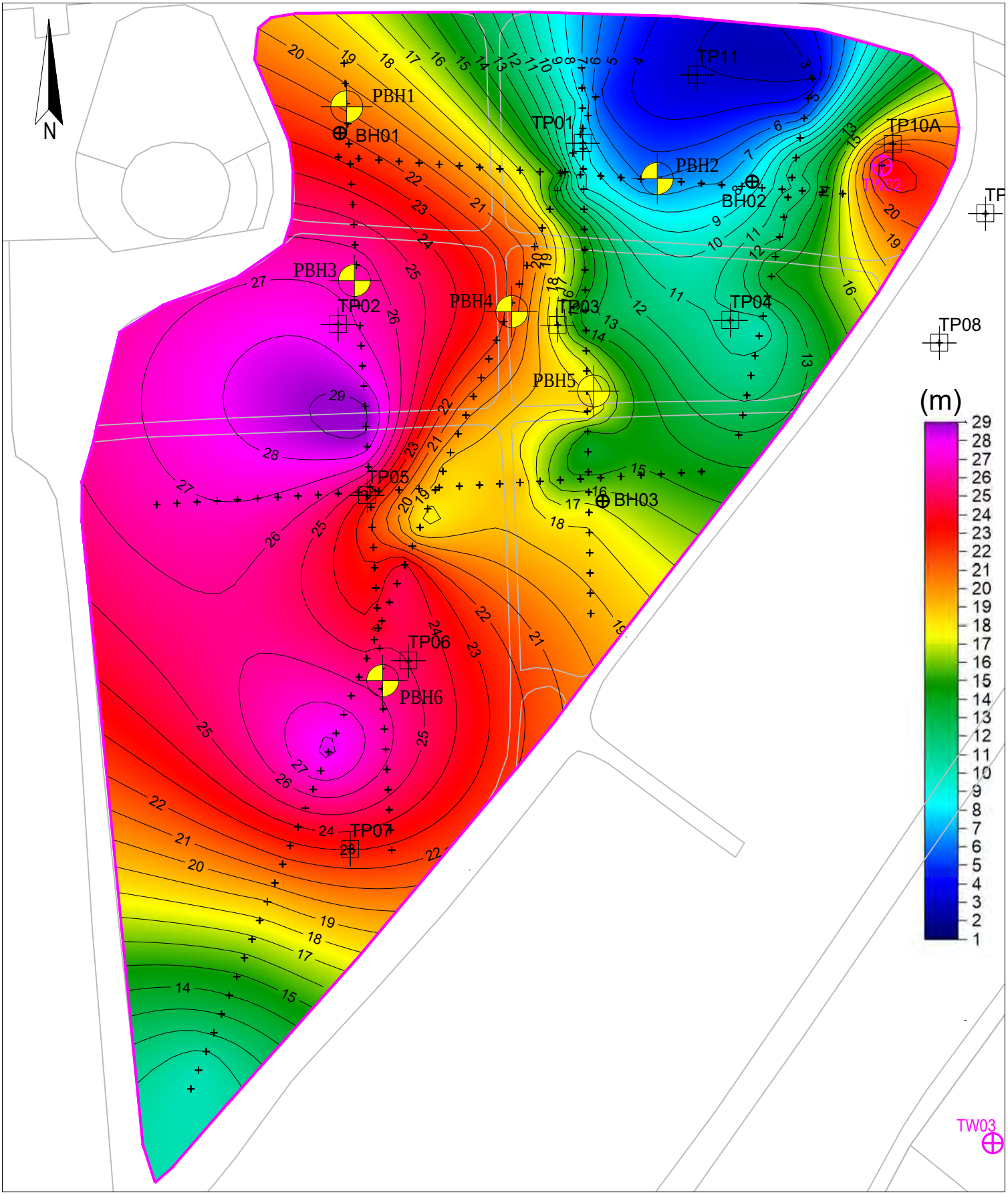

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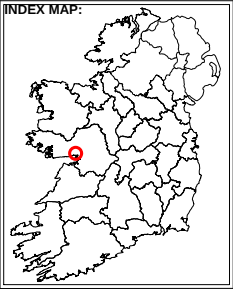

LEGEND:

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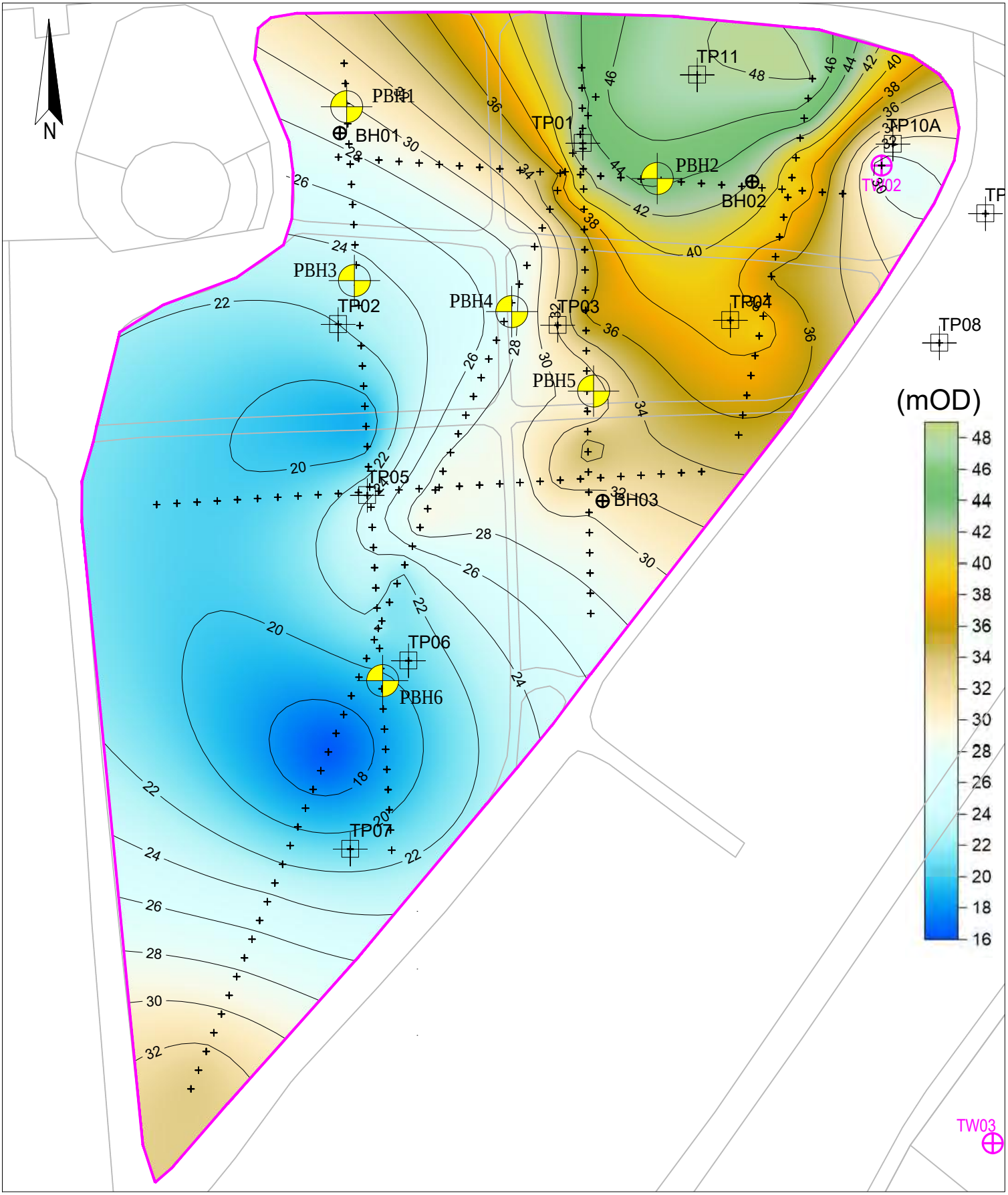

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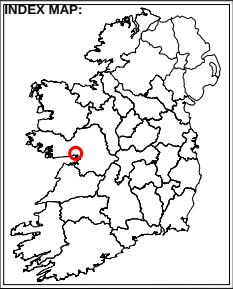

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RESULTS & INTERPRETATION - ERT R1

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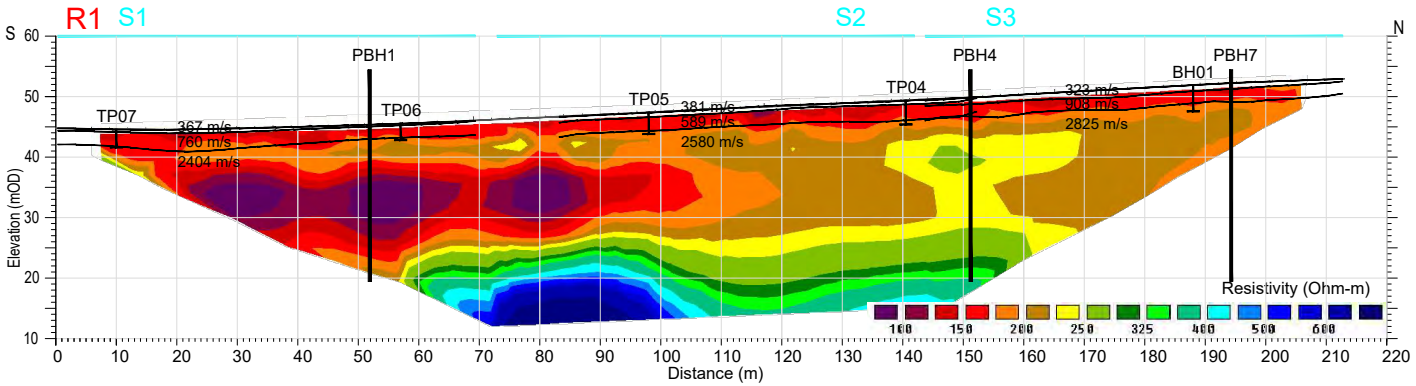

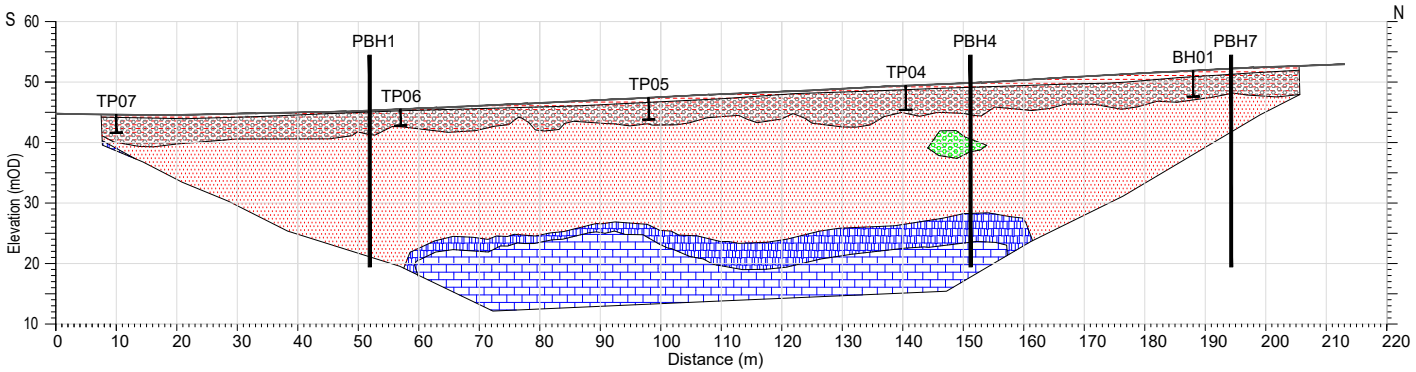

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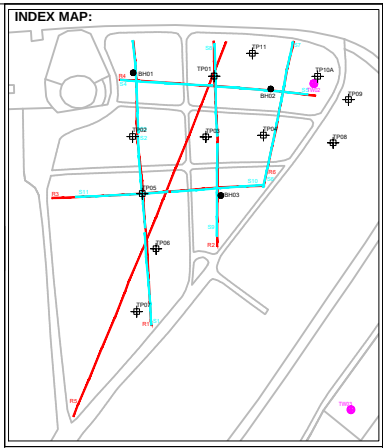

LEGEND:

- Soft-Firm sandy gravelly SILT/CLAY
- Firm-stiff sandy gravelly SILT/CLAY
- Very stiff sandy gravelly SILT/CLAY
- Very dense clayey SAND/GRAVEL
- Possible Highly- Moderately Weathered/Karstified LIMESTONE
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RESULTS & INTERPRETATION - ERT R2

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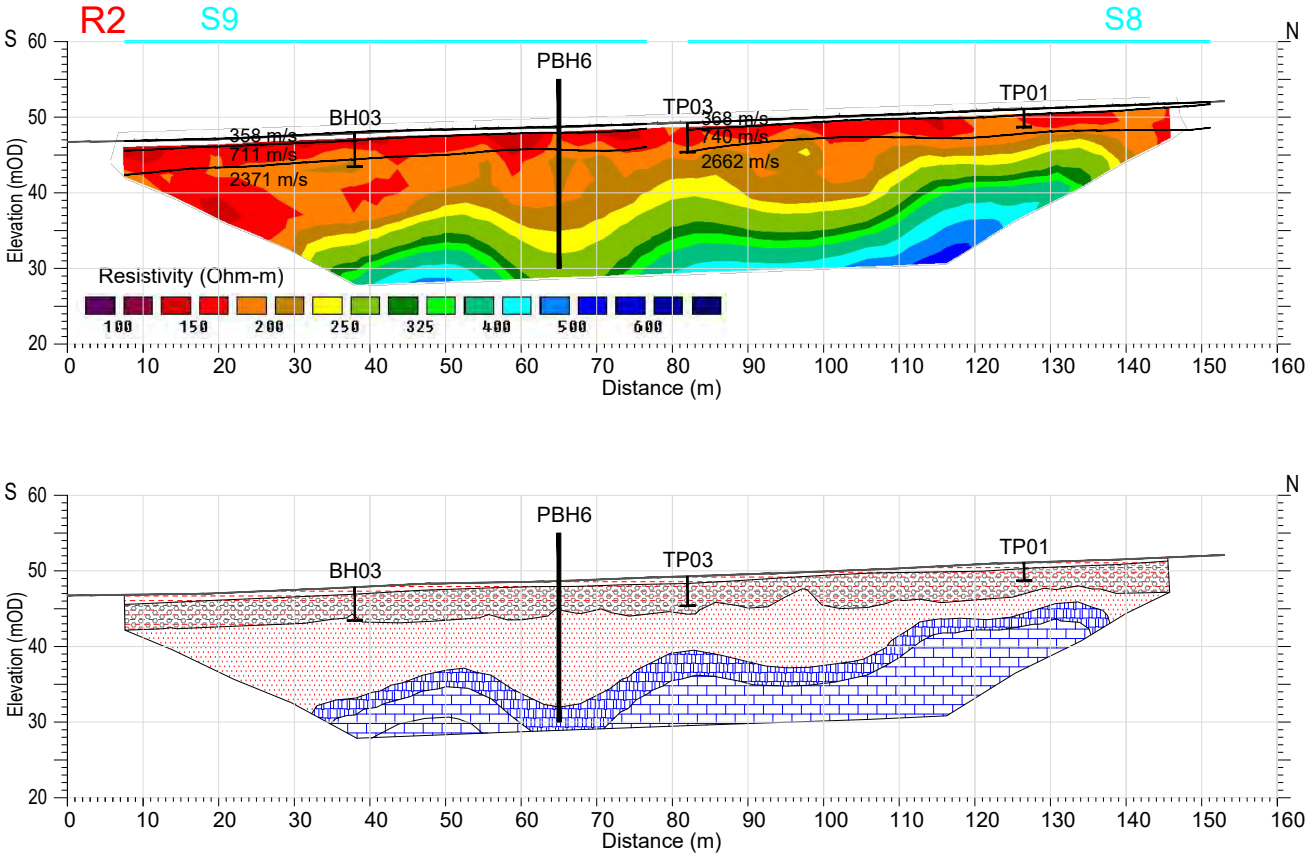

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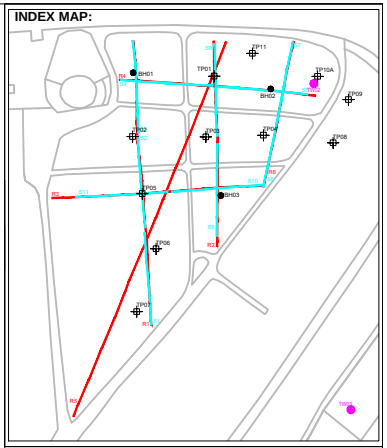

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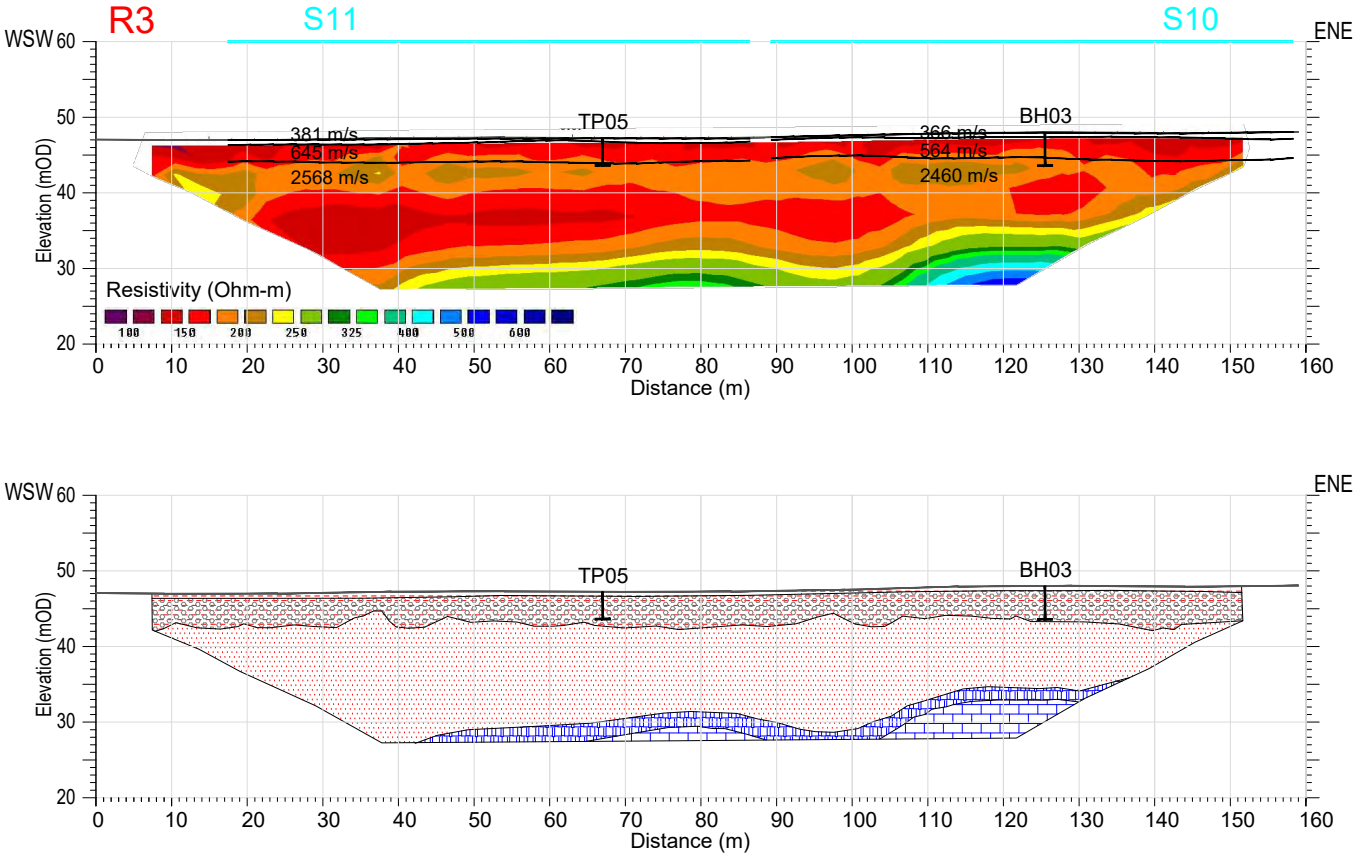

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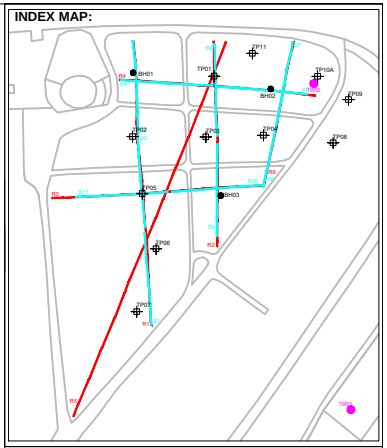

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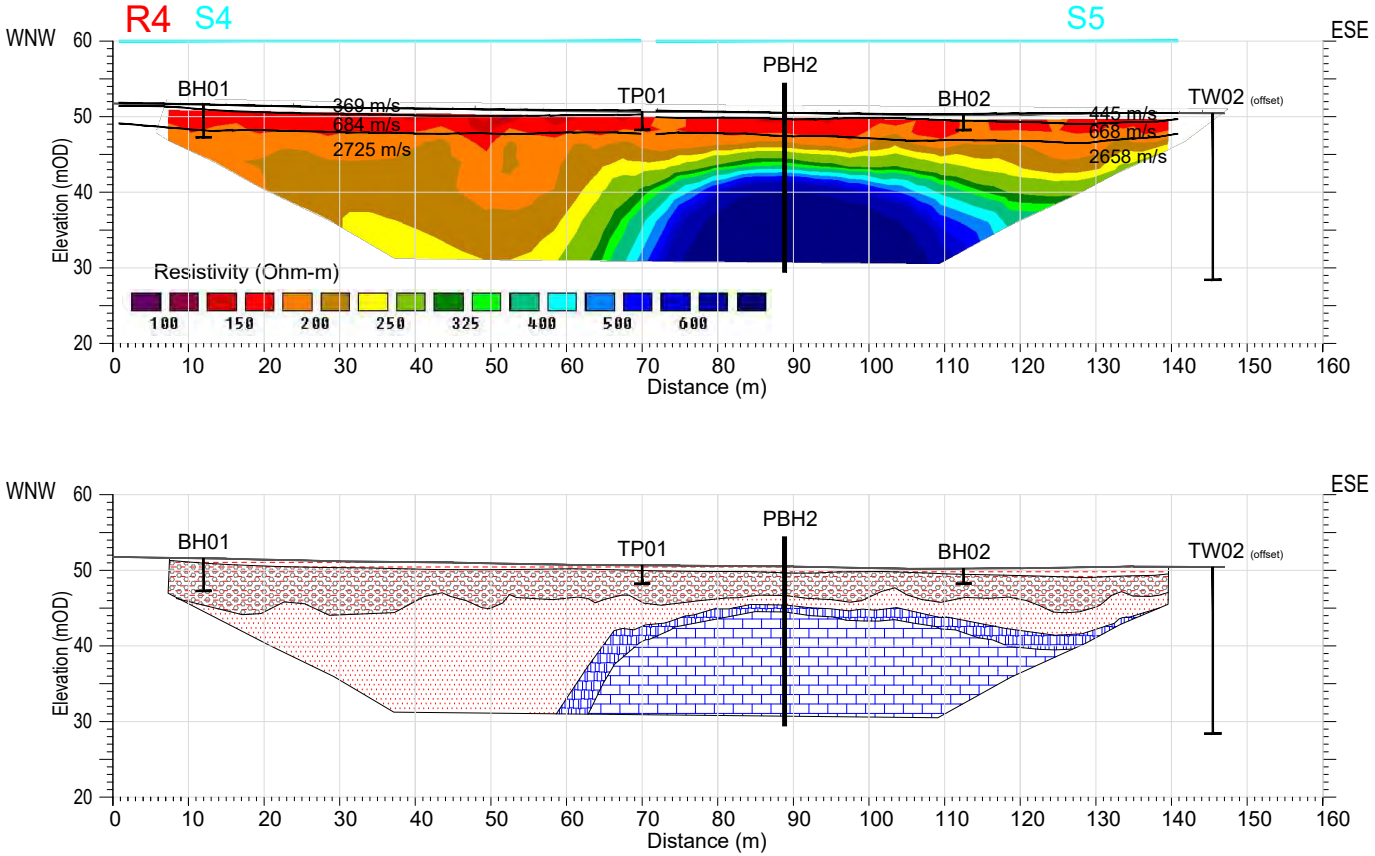

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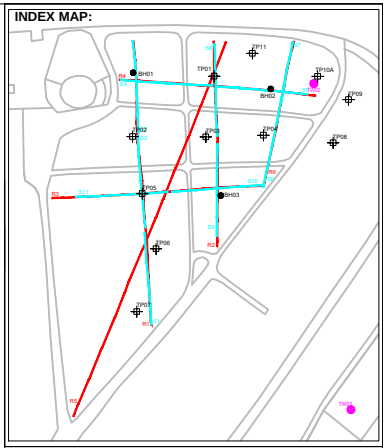

LEGEND:

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RESULTS & INTERPRETATION - ERT R5

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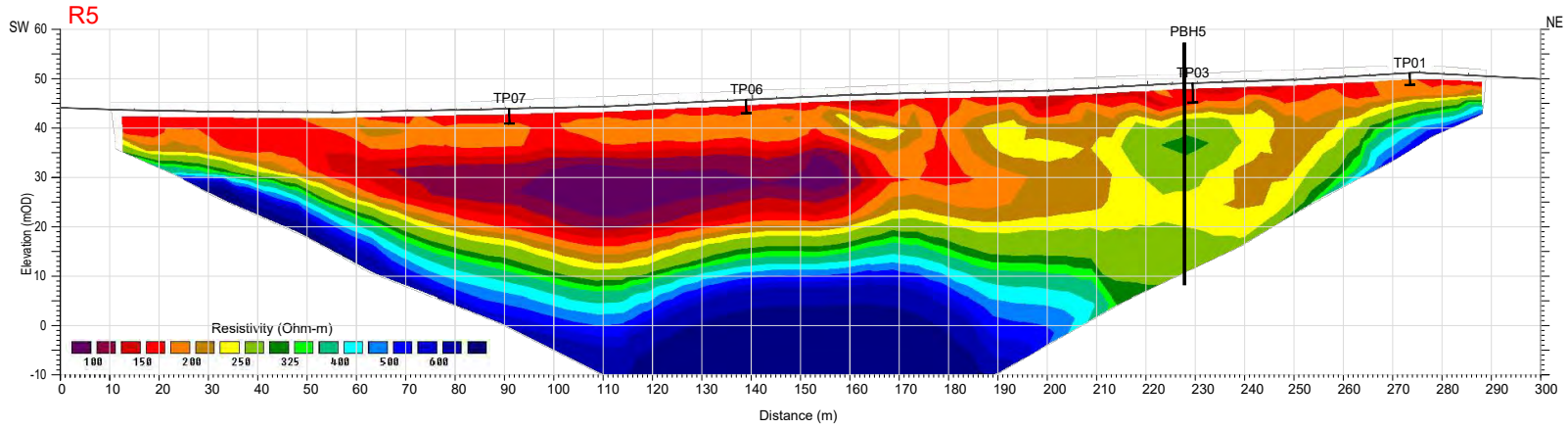

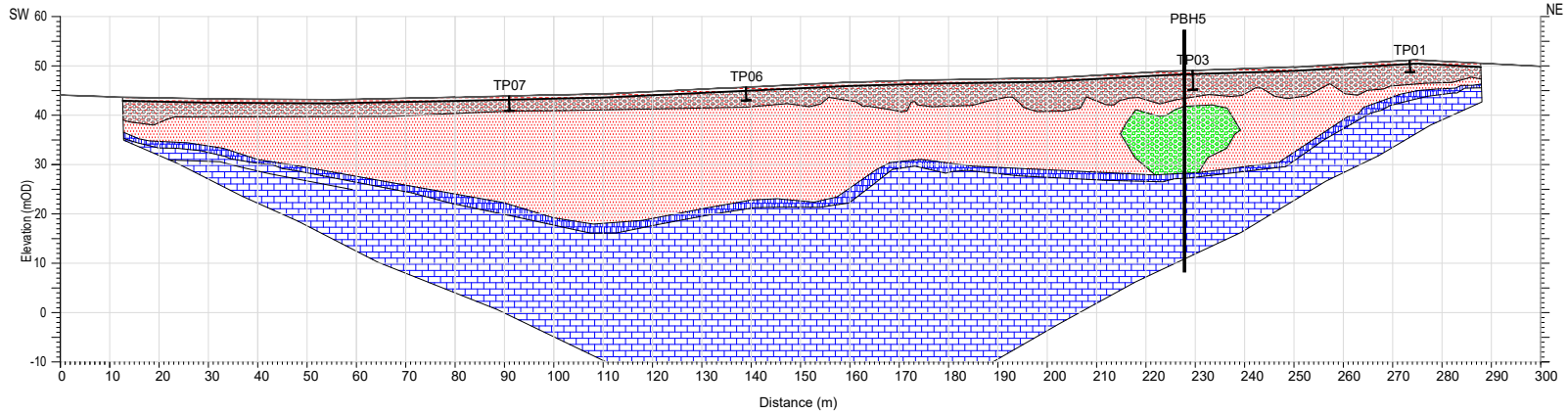

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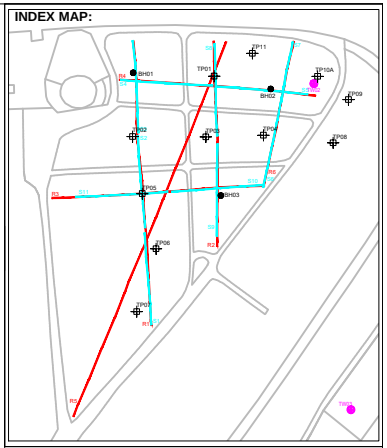

LEGEND:

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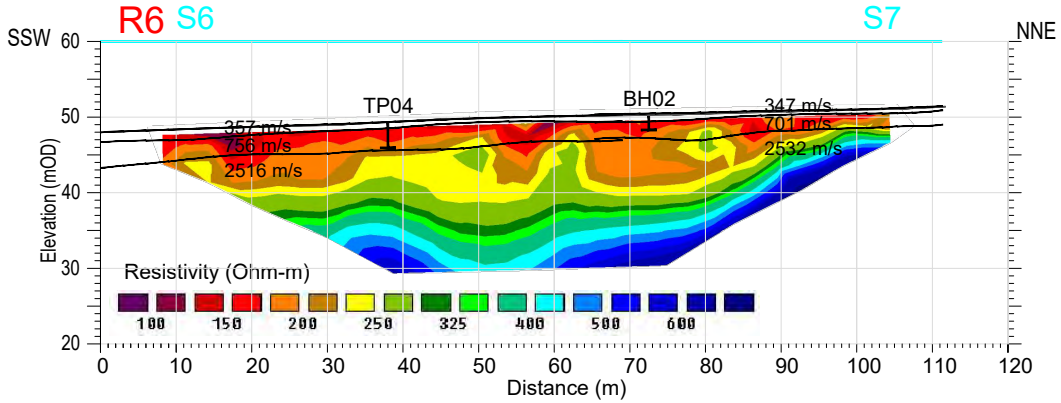

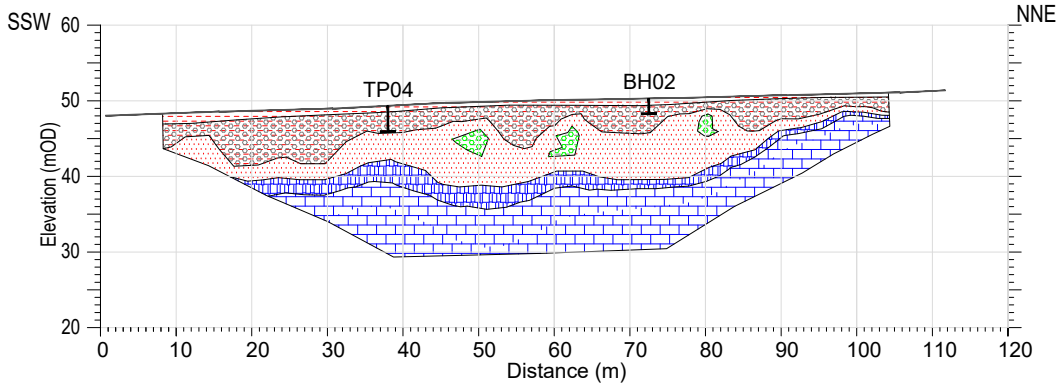

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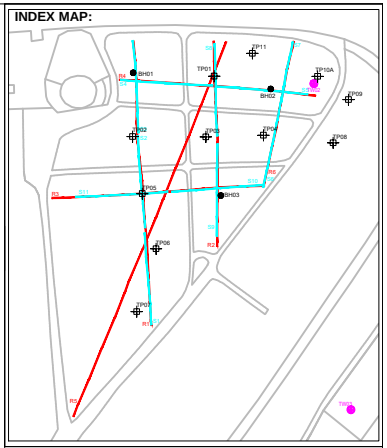

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Ground Investigations Ireland

Galway Racecourse Geotechnical Investigations, Ballybrit, Co. Galway

Galway County Council

Ground Investigation Report

April 2024

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Project Title	Galway Racecourse Geotechnical Investigations, Ballybrit, Co. Galway
Engineer	ARUP
Client	Galway County Council
Project No	13521-01-24
Document Title	Ground Investigation Report

Rev.	Status	Author(s)	Reviewed By	Approved By	Office of Origin	Issue Date
A	Interim	A Molloy	S Graydon	S Kealy	Dublin	25 April 2024

Ground Investigations Ireland Ltd. present the results of the fieldworks and laboratory testing in accordance with the specification and related documents provided by or on behalf of the client The possibility of variation in the ground and/or groundwater conditions between or below exploratory locations or due to the investigation techniques employed must be taken into account when this report and the appendices inform designs or decisions where such variation may be considered relevant. Ground and/or groundwater conditions may vary due to seasonal, man-made or other activities not apparent during the fieldworks and no responsibility can be taken for such variation. The data presented and the recommendations included in this report and associated appendices are intended for the use of the client and the client's geotechnical representative only and any duty of care to others is excluded unless approved in writing.

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CONTENTS

APPENDICES

1.0 Preamble

On the instructions of ARUP Consulting Engineers, a site investigation was carried out by Ground Investigations Ireland Ltd., between February and March at the site of the proposed redevelopment at Galway Racecourse in Ballybrit, Co. Galway.

2.0 Overview

2.1. Background

It is proposed to redevelop the existing horse stables and associated grounds. As part of the works the associated services, access roads and car parking will also be redeveloped. The proposed construction is envisaged to consist of conventional foundations and pavement make up with some local excavations for services and plant. The site is bounded by Galway Racecourse to the north and west side. The current N6 bounds the site to the south and Briarhill Business Park bounds the site to the east.

2.2. Purpose and Scope

The purpose of the site investigation was to investigate subsurface conditions utilising a variety of investigative methods in accordance with the project specification. The scope of the work undertaken for this project included the following:

- Visit project site to observe existing conditions
- Carry out 12 No. Trial Pits to a maximum depth of 4.0mBGL
- Carry out 8 No. Dynamic Probes to determine soil strength/density characteristics
- Carry out 3 No. Cable Percussion boreholes to a maximum depth of 4.40m BGL
- Carry out 3 No. Trial Wells to a maximum depth of 100m
- Carry out a 2D Resistivity and Seismic Geophysical Survey
- Installation of 3 No. Groundwater monitoring wells
- Geotechnical & Environmental Laboratory testing
- Factual Report

3.0 Subsurface Exploration

3.1. General

During the ground investigation a programme of intrusive investigation specified by the Consulting Engineer was undertaken to determine the sub surface conditions at the proposed site. Regular sampling and in-situ testing was undertaken in the exploratory holes to facilitate the geotechnical descriptions and to enable laboratory testing to be carried out on the soil samples recovered during excavation and drilling.

The procedures used in this site investigation are in accordance with Eurocode 7 Part 2: Ground Investigation and testing (ISEN 1997 – 2:2007) and B.S. 5930:2015.

3.2. Trial Pits

The trial pits were excavated using an 8T tracked excavator at the locations shown in the exploratory hole location plan in Appendix 1. The locations were checked using a CAT scan to minimise the potential for encountering services during the excavation. The trial pits were sampled, logged and photographed by an Engineering Geologist prior to backfilling with arisings. Notes were made of any services, inclusions, pit stability, groundwater encountered and the characteristics of the strata encountered and are presented on the trial pit logs which are provided in Appendix 2 of this Report.

3.1. Dynamic Probing (DPSH)

The dynamic probe tests (DPSH) were carried out at the locations shown in the location plan in Appendix 1 in accordance with B.S. 1377: Part 9 1990. The test consists of mechanically driving a cone with a 63.5kg weight dropping 760mm and recorded in 100mm intervals monitoring the number of blows required. An equivalent Standard Penetration Test (SPT) 'N' value may be calculated based on previous published information however the determination of the appropriate correlate strength should be completed with care and using experience with similar soil types. The dynamic probe logs are provided in Appendix 3 of this Report.

3.2. Cable Percussion Boreholes

The Cable Percussion Boreholes were drilled using a Dando 2000 drilling rig with regular in-situ testing and sampling undertaken to facilitate the production of geotechnical logs and laboratory testing.
The standard method of boring in soil for site investigation is known as the Cable Percussion method. It consists of using a Shell in non cohesive soils and a clay cutter in cohesive soils, both operated on a wire cable. Very hard soils, boulders and other hard obstructions are broken up by chiselling and the fragments removed with the Shell. Where ground conditions made it necessary, the borehole was lined with 200mm diameter steel casing. While the use of the Cable Percussion method of boring gives the maximum data on soil conditions, some mixing of laminated soil is inevitable. For this reason, thin lenses of granular material may not be noticed. Disturbed samples were taken from the boring tools at suitable depths, so that there is a representative sample at the top of each change in stratum and thereafter at regular intervals down the borehole until the next stratum was encountered. The disturbed samples were then sealed and sent to the laboratory where they were visually examined to confirm the description of the relevant strata.
Standard Penetration Tests were carried out in the boreholes. The results of these tests, together with the depths at which the tests were taken are shown on the accompanying borehole records. The test consists of a thick wall sampler tube, 50mm external diameter, being driven into the soil by a monkey weighing 63.5kg and with a free drop of 760mm. For gravels and glacial till the driving shoe was replaced by a solid 60º cone. The Standard Penetration Test number referred to as the 'N' value is the number of blows required to drive the tube 300mm, after an initial penetration of 150mm. The number gives a guide to the

consistency of the soil and can also be used to estimate the relative strength/density at the depth of the test and also to estimate the bearing capacity and compressibility of the soil. The cable percussion borehole logs are provided in Appendix 4 of this Report.

3.3. Water Trial Well Drilling

The trial well drilling was carried out by a Knebel truck mounted rig at the locations shown on the location plan in Appendix 1. The trial wells were completed from the ground surface,

The Knebel rig is truck mounted which allows for travel on pavement surfaces avoiding any damage to the surface. The Knebel drilling rig utilises a down the hole hammer system operated using a drilling hammer and a piston powered by compressed air. As the drill string rotates, the drilling hammer strikes down on the rock. The drill bit receives its striking power from a piston inside the hammer that is powered by compressed air.

This action along with the rotational movement of the drill string crushes the rock efficiently. Since the piston strikes directly on the bit, energy transfer takes place down the hole with minimum loss of energy, allowing drilling to greater depths.

The driving medium i.e. compressed air is also the flushing medium. The flushing medium (in some cases, water is also used) is pressed down through the drill pipes, down-the-hole hammer and the drill bit. It is then forced back out of the borehole along with the cuttings through the annular gap between the drill pipe and the borehole.

The Trial Well logs were provided to the consulting engineers on completion of the drilling.

3.4. Geophysical Survey

The geophysical survey consisted of Electrical Resistivity Tomography (ERT) and Seismic Refraction profiling. ERT surveying technique makes use of the Gradient resistivity array. The 2D-resistivity profiling method records a large number of resistivity readings in order to map lateral and vertical changes in material types. This method involves the use of electrodes connected to a resistivity meter, using computer software to control the process of data collection and storage.

Seismic profiling measures the p-wave velocity (Vp) of refracted seismic waves through the overburden and rock material and allows an assessment of the thickness and quality of the materials present to be made. Stiffer and stronger materials usually have higher Vp velocities while soft, loose or fractured materials have lower Vp velocities. Readings are taken using geophones connected via multi-core cable to a seismograph. The Report for the Geophysical survey is included under the cover of a separate report by Apex Geophysics.

3.5. Surveying

The exploratory hole locations have been recorded using a KQ GEO Technologies KQ-M8 System which records the coordinates and elevation of the locations to ITM or Irish National Grid as required by the project specification. The coordinates and elevations are provided on the exploratory hole logs in the appendices of this Report.

3.6. Laboratory Testing (Part-Pending)

Samples were selected from the exploratory holes for a range of geotechnical and environmental testing to assist in the classification of soils and to provide information for the proposed design.
Environmental & Chemical testing as required by the specification, including the ARUP Suite D, E and F testing was carried out by Element Materials Technology Laboratory in the UK.
Geotechnical testing consisting of moisture content, Atterberg limits, Particle Size Distribution (PSD), hydrometer, Moisture Condition Value (MCV), 2.5kg Rammer Compaction and MCV 5-point compaction tests were carried out in NMTL's Geotechnical Laboratory in Carlow.
The results of the laboratory testing are included in Appendix 5 of this Report.

4.0 Ground Conditions

4.1. General

The ground conditions encountered during the investigation are summarised below with reference to insitu and laboratory test results. The full details of the strata encountered during the ground investigation are provided in the exploratory hole logs included in the appendices of this report.

The sequence of strata encountered were consistent across the site and generally comprised;

- Topsoil/Surfacing
- Made Ground
- Possible Made Ground
- Cohesive Deposits

TOPSOIL: Topsoil was encountered in all the exploratory holes and was present to a maximum depth of 0.3m BGL.

MADE GROUND: Made Ground deposits were encountered beneath the Topsoil or from ground level and were present to a maximum depth of 0.90m BGL. These deposits were described generally as *Brown slightly sandy gravelly Clay with fragments of timber, ceramic and glass fragments and low angular to subangular fine to coarse cobble content* or a *Grey angular to subangular fine to coarse Gravel Fill.*

COHESIVE DEPOSITS: Cohesive deposits were encountered beneath the Made Ground to a maximum depth of 4.40m BGL and were described typically as *brownish greyish slightly sandy gravelly CLAY with medium angular to subangular cobble content. Gravels are angular to subangular fine to coarse.* The secondary sand and gravel constituents varied across the site and with depth, with granular lenses occasionally present in the glacial till matrix. The strength of the cohesive deposits typically increased with depth and was firm or firm to stiff below 1.5m BGL in the majority of the exploratory holes. These deposits had some, occasional or frequent cobble and boulder content, where noted on the exploratory hole logs.

4.2. Groundwater

Groundwater strikes are noted on the exploratory hole logs where they occurred. We would point out that these exploratory holes did not remain open for sufficiently long periods of time to establish the hydrogeological regime and groundwater levels would be expected to vary with the time of year, rainfall, nearby construction and other factors. For this reason, standpipes were installed in BH01, BH02 and BH03 to allow the equilibrium groundwater level to be determined. Data loggers were also installed in the boreholes and set to take hourly readings. The groundwater monitoring to date is included in Appendix 6 of this Report.

APPENDIX 1 - Site Location Plan

Trial Pits and Dynamic Probes

Trial Wells

Cable Percsussion Boreholes

Indicative Site Boundary

Client:

ARUP

Project Code:

13521-01-24

Project Title:

Galway Racecourse Geotechnical Investigations, Ballybrit, Co. Galway

Drawing Title:

Figure 1 Site Location

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

Ground Investigations Ireland Ltd.
Catherinstown House,
Hazelhatch Road,
Newcastle, Co. Dublin
www.gii.ie 01-6015175/5176

0 20 40 60 80 m

Drawn By:	Date:
SK	25/04/2024

APPENDIX 2 – Trial Pit Records

Ground Investigations Ireland Ltd
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Site Galway Racecourse Geotechnical Investigations, Ballybrit, Co. Galway			**Trial Pit Number** TP01
Machine : 8T Excavator **Method :** Trial Pit	**Dimensions** (L x W x D) 3.40m x 1.00m x 2.40m	**Ground Level (mOD)** 51.04	**Client** Galway County Council	**Job Number** 13521-01-24
	Location (dGPS) 533695.1 E 727899.5 N	**Dates** 23/02/2024	**Project Contractor** Ground Investigations Ireland	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.28)	TOPSOIL: Brown Clay with rootlets.		
				50.76	0.28			
					(0.19)	MADE GROUND: Brown slightly gravelly Clay with fragments of red brick and ceramic. Gravels are angular to subangular fine to coarse.		
				50.57	0.47			
0.50	ES1					Soft to firm brownish grey slightly sandy gravelly CLAY with high subangular cobble and boulder content. Gravels are angular to subangular fine to coarse.		
					(1.43)			
1.30	B1							
1.30	D1							
1.30	ES2							
				49.14	1.90			
2.00	B2					Stiff brownish grey slightly sandy gravelly CLAY with high subangular cobble and boulder content. Gravels are angular to subangular fine to coarse.		
2.00	D2							
					(0.50)			
2.40	ES3			48.64	2.40			
						Complete at 2.40m		

Plan

Remarks

No groundwater encountered.
Trial pit stable.
Trial pit terminated due to obstruction at 2.40m BGL, possible bedrock or boulders.
PID test carried out at 0.50m BGL.

Scale (approx)	Logged By	Figure No.
1:25	AM	13521-01-24.TP09

Ground Investigations Ireland Ltd
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Site Galway Racecourse Geotechnical Investigations, Ballybrit, Co. Galway			**Trial Pit Number** TP02
Machine : 8T Excavator **Method :** Trial Pit	**Dimensions** (L x W x D) 3.80m x 0.70m x 4.00m	**Ground Level (mOD)** 49.42	**Client** Galway County Council	**Job Number** 13521-01-24
	Location (dGPS) 533634.6 E 727854.7 N	**Dates** 22/02/2024	**Project Contractor** Ground Investigations Ireland	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.28)	TOPSOIL: Brown Clay with rootlets and low subangular to subrounded cobble and boulder content.		
				49.14	0.28			
0.40	ES1				(0.22)	Possible MADE GROUND: Brown slightly sandy silty gravelly Clay with low subangular to subrounded cobble content. Gravels are angular to subangular fine to coarse. (Soft to firm).		
				48.92	0.50			
1.00 1.00	B1 D1				(1.80)	Soft brownish grey slightly sandy slightly silty gravelly CLAY with low subangular cobble and boulder content. Gravels are angular to subangular fine to coarse.		
1.50	ES2							
				47.12	2.30	Firm to stiff brownish grey slightly sandy gravelly CLAY with low to medium subangular cobble content. Gravel are angular to subangular fine to coarse.		
2.40 2.40 2.40	B2 D2 ES3				(0.50)			
				46.62	2.80	Very stiff brownish grey slightly sandy gravelly CLAY with low to medium subangular cobble content. Gravel are angular to subangular fine to coarse.		
					(1.20)			
3.50 3.50 3.50	B3 D3 ES4							
			Slow ingress(1) at 3.90m.					▽1
				45.42	4.00			

Plan

Remarks

Groundwater encountered at 3.40m BGL with slow ingress.
Trial pit sidewalls spalling.
Obstruction at 4.00m BGL, possible bedrock or boulders.

Scale (approx)	Logged By	Figure No.
1:25	AM	13521-01-24.TP02

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Site Galway Racecourse Geotechnical Investigations, Ballybrit, Co. Galway			**Trial Pit Number** TP03
Machine : 8T Excavator **Method :** Trial Pit	**Dimensions** (L x W x D) 3.90m x 0.80m x 3.90m	**Ground Level (mOD)** 49.20	**Client** Galway County Council	**Job Number** 13521-01-24
	Location (dGPS) 533688.9 E 727854.5 N	**Dates** 22/02/2024	**Project Contractor** Ground Investigations Ireland	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.28)	TOPSOIL: Brown Clay with rootlets and low subangular to subrounded cobble and boulder content.		
				48.92	0.28			
					(0.22)	Possible MADE GROUND: Brown slightly sandy silty gravelly Clay with low subangular to subrounded cobble content. Gravels are angular to subangular fine to coarse. (Soft to firm).		
				48.70	0.50			
0.55	ES1					Soft brownish grey slightly sandy slightly silty gravelly CLAY with low subangular cobble and boulder content. Gravels are angular to subangular fine to coarse.		
1.10	B1							
1.10	D1							
1.50	ES2				(2.10)			
				46.60	2.60	Stiff brownish grey slightly sandy slightly silty gravelly CLAY with low subangular cobble and boulder content. Gravels are angular to subangular fine to coarse.		
					(0.40)			
				46.20	3.00	Very stiff brownish grey gravelly CLAY with medium angular to subangular cobble and boulder content. Gravels are angular to subangular fine to coarse.		
3.10	B2							
3.10	D2							
					(0.90)			
3.50	ES3							
				45.30	3.90	Complete at 3.90m		

Plan

Remarks

No groundwater encountered.
Trial pit sidewalls spalling.
Obstruction at 3.90m BGL, possible bedrock or boulder.

Scale (approx)	Logged By	Figure No.
1:25	AM	13521-01-24.TP03

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Site Galway Racecourse Geotechnical Investigations, Ballybrit, Co. Galway			**Trial Pit Number** TP04
Machine : 8T Excavator **Method :** Trial Pit	**Dimensions** (L x W x D) 3.90m x 1.00m x 3.40m	**Ground Level (mOD)** 49.48	**Client** Galway County Council	**Job Number** 13521-01-24
	Location (dGPS) 533731.6 E 727855.7 N	**Dates** 22/02/2024	**Project Contractor** Ground Investigations Ireland	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.28)	TOPSOIL: Brown slightly gravelly Clay with rootlets.		
				49.20	0.28	Possible MADE GROUND: Brown slightly sandy silty Clay with low subangular to subrounded cobble content. (Soft to firm).		
0.50	ES1				(0.47)			
				48.73	0.75	Soft to firm brownish grey slightly silty sandy gravelly CLAY with medium subangular to subrounded cobble content.		
1.20 1.20	B1 D1				(1.25)			
				47.48	2.00	Very stiff brownish grey sandy very gravelly CLAY with medium subangular cobble content. Gravels are angular to subangular fine to coarse.		
2.20 2.20 2.20	B2 D2 ES2				(1.10)			
				46.38	3.10	Complete at 3.40m		
3.20 3.20 3.20	B3 D3 ES3							

Plan

Remarks

No groundwater encountered.
Trial pit stable.
Obstruction at 3.40m BGL, possible bedrock or boulder.

Scale (approx)	Logged By	Figure No.
1:25	AM	13521-01-24.TP04

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Site Galway Racecourse Geotechnical Investigations, Ballybrit, Co. Galway			**Trial Pit Number** TP05
Machine : 8T Excavator **Method :** Trial Pit	**Dimensions** (L x W x D) 3.80m x 0.90m x 3.60m	**Ground Level (mOD)** 47.27	**Client** Galway County Council	**Job Number** 13521-01-24
	Location (dGPS) 533641.8 E 727812.4 N	**Dates** 22/02/2024	**Project Contractor** Ground Investigations Ireland	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.25)	TOPSOIL: Brown slightly gravlly Clay with rootlets and fragments of old clay pipe.		
				47.02	0.25			
0.40	ES1				(0.30)	MADE GROUND: Brown slightly sandy slightly gravelly Clay with fragments of red brick.		
				46.72	0.55			
1.10 1.10	B1 D1				(1.45)	Very soft brownish grey slightly sandy gravelly CLAY with low to medium angular to subangular cobble content. Gravels are angular to subangular fine to coarse.		
1.60	ES2							
				45.27	2.00	Firm brownish grey slightly sandy gravelly CLAY with low to medium subangular cobble and boulder content. Gravels are angular to subangular fine to coarse.		
					(0.90)			
2.60 2.60 2.60	B2 D2 ES3							
				44.37	2.90	Stiff brownish grey slightly sandy gravelly CLAY with low to medium subangular cobble and boulder content. Gravels are angular to subangular fine to coarse.		
					(0.40)			
				43.97	3.30	Very stiff brownish grey slightly sandy gravelly CLAY with low to medium subangular cobble and boulder content. Gravels are angular to subangular fine to coarse.		
					(0.30)			
				43.67	3.60			▽1
3.60 3.60 3.60	B3 D3 ES4		Slow ingress(1) at 3.60m.			Complete at 3.60m		

Plan

Remarks

Groundwater encountered at 2.60m BGL with slow ingress.
Trial pit sidewalls spalling and collapse at 3.60m BGL.
Trial pit terminated due to obstruction at 3.60m BGL, possible bedrock or boulders and sidewall collapse.

Scale (approx)	Logged By	Figure No.
1:25	AM	13521-01-24.TP05

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Site Galway Racecourse Geotechnical Investigations, Ballybrit, Co. Galway			**Trial Pit Number** TP06
Machine : 8T Excavator **Method :** Trial Pit	**Dimensions** (L x W x D) 3.30m x 0.90m x 2.70m	**Ground Level (mOD)** 45.53	**Client** Galway County Council	**Job Number** 13521-01-24
	Location (dGPS) 533652 E 727771.5 N	**Dates** 23/02/2024	**Project Contractor** Ground Investigations Ireland	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.30)	TOPSOIL: Brown slightly sandy slightly gravelly Clay with rootlets. Gravels are angular to subangular fine to coarse.		
				45.23	0.30			
					(0.15)	MADE GROUND: Brown slightly sandy slightly gravelly Clay with fragments of ceramic. Gravels are angular to subangular fine to coarse.		
				45.08	0.45			
0.50	ES1					Very soft brownish grey slightly sandy gravelly CLAY with low subangular cobble and boulder content. Gravels are angular to subangular fine to coarse.		
1.00	B1							
1.00	D1							
					(1.55)			
1.50	ES2							
				43.53	2.00	Stiff brownish grey slightly sandy gravelly CLAY with medium subangular cobble content. Gravels are angular to subangular fine to coarse.		
					(0.70)			
2.40	B2							
2.40	D2							
2.40	ES3							
				42.83	2.70	Complete at 2.70m		

Plan

Remarks

No groundwater encountered.
Trial pit stable.
Trial pit terminated due to obstruction at 2.70m BGL, possible bedrock or boulders.

Scale (approx)	Logged By	Figure No.
1:25	AM	13521-01-24.TP06

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Site Galway Racecourse Geotechnical Investigations, Ballybrit, Co. Galway			**Trial Pit Number** TP07
Machine : 8T Excavator **Method :** Trial Pit	**Dimensions** (L x W x D) 3.60m x 0.80m x 3.00m	**Ground Level (mOD)** 44.11	**Client** Galway County Council	**Job Number** 13521-01-24
	Location (dGPS) 533637.6 E 727724.9 N	**Dates** 26/02/2024	**Project Contractor** Ground Investigations Ireland	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.30)	TOPSOIL: Brown slightly gravelly Clay with cermaic fragments and medium angular to subangular cobble content.		
				43.81	0.30			
0.50	ES1				(0.40)	Possible MADE GROUND: Brown slightly sandy gravelly Clay. Gravels are angular to subangular fine to coarse. (Soft to firm).		
				43.41	0.70			
1.00	B1					Soft brown slightly sandy gravelly CLAY with medium subangular cobble content. Gravels are angular to subangular fine to coarse.		
1.00	D1							
					(1.20)			
1.50	ES2							
				42.21	1.90			
2.00	B2				(0.30)	Firm brown slightly sandy gravelly CLAY with medium angular to subangular cobble content. Gravels are angular to subangular fine to coarse.		
2.00	D2			41.91	2.20			
						Stiff to very stiff brown slightly sandy gravelly CLAY with medium angular to subangular cobble content. Gravels are angular to subangular fine to coarse.		
2.50	ES3				(0.80)			
				41.11	3.00			
3.00	B3					Complete at 3.00m		
3.00	D3							

Plan

Remarks

No groundwater encountered.
Trial pit stable.
Obstruction at 3.00m BGL, possible rock or boulder.
Trial pit backfilled upon completion.

Scale (approx)	Logged By	Figure No.
1:25	AM	13521-01-24.TP07

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Site Galway Racecourse Geotechnical Investigations, Ballybrit, Co. Galway			**Trial Pit Number** TP08
Machine : 8T Excavator **Method :** Trial Pit	**Dimensions** (L x W x D) 3.70m x 1.10m x 2.40m	**Ground Level (mOD)** 49.42	**Client** Galway County Council	**Job Number** 13521-01-24
	Location (dGPS) 533783.3 E 727850.1 N	**Dates** 23/02/2024	**Project Contractor** Ground Investigations Ireland	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				49.34	(0.08) 0.08	MADE GROUND: Grey angular to subangular fine to coarse Gravel Fill.		
					(0.47)	MADE GROUND: Brown sandy gravelly Clay high subangular cobble content.		
0.45	ES1			48.87	0.55	Firm greyish brown slightly silty slightly sandy gravelly CLAY with medium subangular cobble content. Gravels are angular to subangular fine to coarse.		
1.10 1.10	B1 D1				(1.35)			
1.40	ES2							
				47.52	1.90	Soft light greyish brown slightly silty slightly sandy gravelly CLAY with medium subangular cobble content. Gravels are angular to subangular fine to coarse.		
2.10 2.10	B2 D2				(0.50)			
2.30 2.40 2.40	ES3 B3 D3			47.02	2.40	Complete at 2.40m		

Plan

Remarks

No groundwater encountered.
Trial pit sidewalls spalling and collapsing below 2.10m BGL.
Trial pit terminated due to obstruction at 2.40m BGL, possible bedrock or boulders.
PID test carried out at 0.45m BGL.

Scale (approx)	Logged By	Figure No.
1:25	AM	13521-01-24.TP08

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Site Galway Racecourse Geotechnical Investigations, Ballybrit, Co. Galway			**Trial Pit Number** TP09
Machine : 8T Excavator **Method :** Trial Pit	**Dimensions** (L x W x D) 3.40m x 1.20m x 3.40m	**Ground Level (mOD)** 49.93	**Client** Galway County Council	**Job Number** 13521-01-24
	Location (dGPS) 533794.7 E 727882.1 N	**Dates** 23/02/2024	**Project Contractor** Ground Investigations Ireland	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				49.83	(0.10) 0.10	MADE GROUND: Grey to brown slightly sandy angular to subangular fine to coarse Gravel Fill.		
0.25	ES1				(0.70)	MADE GROUND: Light brownish grey slightly sandy gravelly Clay with fragments of plastic and medium angular to subangular cobble and boulder content. Gravels are angular to subangular fine to coarse.		
				49.13	0.80	Possible MADE GROUND: Brown slightly sandy gravelly Clay with medium angular to subangular cobble content and pockets of soft orange to brown slightly sandy gravelly Clay. Gravels are angular to subangular fine to coarse. (Soft to firm).		
1.00 1.00	B1 D1				(0.40)			
				48.73	1.20	Soft to firm brownish greyish slightly sandy gravelly CLAY with medium angular to subangular cobble content. Gravels are angular to subangular fine to coarse.		
1.50	ES2							
2.25 2.25	B2 D2				(2.20)			
2.90 2.90 2.90	B3 D3 ES3							
				46.53	3.40	Complete at 3.40m		

Plan

Remarks

No groundwater encountered.
Trial pit sidewalls spalling and collapsing below 3.00m BGL.
Trial pit terminated due to obstruction at 3.40m BGL, possible bedrock or boulders.
PID test carried out at 0.25m BGL.

Scale (approx)	Logged By	Figure No.
1:25	AM	13521-01-24.TP09

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Site Galway Racecourse Geotechnical Investigations, Ballybrit, Co. Galway			**Trial Pit Number** TP10
Machine : 8T Excavator **Method :** Trial Pit	**Dimensions** (L x W x D) 3.70m x 0.80m x 0.90m	**Ground Level (mOD)** 51.05	**Client** Galway County Council	**Job Number** 13521-01-24
	Location (dGPS) 533769.8 E 727906.8 N	**Dates** 26/02/2024	**Project Contractor** Ground Investigations Ireland	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.20)	MADE GROUND: Grey angular to subangular fine to coarse Gravel Fill.		
				50.85	0.20			
0.30	ES1				(0.55)	MADE GROUND: Brown slightly sandy gravelly Clay with fragments of timber, cermaic and glass fragments and low angular to subangular fine to coarse cobble content. Gravels are angular to subangular fine to coarse.		
				50.30	0.75			
					(0.15)	MADE GROUND: Grey angular to subangular fine to coarse Gravel Fill.		
				50.15	0.90	Underground service located at 0.90m BGL; see remarks.		
						Complete at 0.90m		

Plan

Remarks

No groundwater encountered.
Trial pit stable.
Trial pit backfilled with gravel and arisings upon completion.
PID test carried out at 0.30m BGL.
Trial pit terminated due to location of underground service at 0.90m BGL; approximately 0.40m diameter black plastic pipe running approximately 10-20 degrees east-west, possible storm drain.

Scale (approx)	Logged By	Figure No.
1:25	AM	13521-01-24.TP10

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Site Galway Racecourse Geotechnical Investigations, Ballybrit, Co. Galway			**Trial Pit Number** TP10A
Machine : 8T Excavator **Method :** Trial Pit	**Dimensions** (L x W x D) 3.50m x 0.85m x 2.95m	**Ground Level (mOD)** 50.79	**Client** Galway County Council	**Job Number** 13521-01-24
	Location (dGPS) 533771.8 E 727899.3 N	**Dates** 26/02/2024	**Project Contractor** Ground Investigations Ireland	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.20)	MADE GROUND: Grey angular to subangular fine to coarse Gravel Fill.		
				50.59	0.20			
0.45	ES1				(0.60)	MADE GROUND: Brown slightly silty slightly gravelly Clay. Gravels are angular to subangular fine to coarse.		
				49.99	0.80			
1.00	B1					Soft to firm brown slightly sandy gravelly CLAY with low subangular cobble and boulder content. Gravels are angular to subangular fine to coarse.		
1.00	D1				(0.70)			
				49.29	1.50			
1.50	ES2					Firm to stiff brown slightly sandy gravelly CLAY with medium angular to subangular cobble and boulder content. Gravels are angular to subangular fine to coarse.		
2.10	B2							
2.10	D2				(1.45)			
2.50	ES3							
				47.84	2.95			
2.95	B3					Complete at 2.95m		
2.95	D3							

Plan

Remarks

No groundwater encountered.
Trial pit sidewalls spalling.
Obstruction at 2.95m BGL, possible rock or boulder.
Trial pit backfilled upon completion.
PID test carried out at 0.45m BGL.

Scale (approx)	Logged By	Figure No.
1:25	AM	13521-01-24.TP10A

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Site Galway Racecourse Geotechnical Investigations, Ballybrit, Co. Galway			**Trial Pit Number** TP11
Machine : 8T Excavator **Method :** Trial Pit	**Dimensions** (L x W x D) 3.40m x 1.00m x 2.90m	**Ground Level (mOD)** 51.39	**Client** Galway County Council	**Job Number** 13521-01-24
	Location (dGPS) 533723.4 E 727916.4 N	**Dates** 26/02/2024	**Project Contractor** Ground Investigations Ireland	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.40)	MADE GROUND: Grey angular to subangular fine to coarse Gravel Fill.		
0.40	ES1			50.99	0.40			
					(0.25)	MADE GROUND: Brown silty gravelly Clay with fragments of plastic and low subangular cobble content. Gravels are angular to subangular fine to coarse.		
				50.74	0.65			
1.00 1.00	B1 D1				(1.05)	Soft to firm brown slightly sandy gravelly CLAY with low to medium subangular cobble and boulder content. Gravels are angular to subangular fine to coarse.		
1.50	ES2			49.69	1.70			
2.00 2.00	B2 D2				(1.10)	Firm to stiff brown slightly sandy gravelly CLAY with medium angular to subangular cobble and low subangular boulder content. Gravels are angular to subangular fine to coarse.		
2.50	ES3			48.59	2.80			
2.90 2.90	B3 D3			48.49	(0.10) 2.90	Very stiff brown slightly sandy gravelly CLAY with medium angular to subangular cobble content. Gravels are angular to subangular fine to coarse.		
						Complete at 2.90m		

Plan

Remarks

No groundwater encountered.
Trial pit stable.
Trial pit terminated due to obstruction at 2.90m BGL, possible bedrock or boulders.
PID test carried out at 0.40m BGL.

Scale (approx)	Logged By	Figure No.
1:25	AM	13521-01-24.TP11

Trial Pit Photographs - Galway Racecourse, Ballybrit

TP01

TP01

Trial Pit Photographs - Galway Racecourse, Ballybrit

TP01

TP02

Trial Pit Photographs - Galway Racecourse, Ballybrit

TP02

TP02

Trial Pit Photographs - Galway Racecourse, Ballybrit

TP03

TP03

Trial Pit Photographs - Galway Racecourse, Ballybrit

TP03

TP04

Trial Pit Photographs - Galway Racecourse, Ballybrit

TP04

TP04

Trial Pit Photographs - Galway Racecourse, Ballybrit

TP05

TP05

Trial Pit Photographs - Galway Racecourse, Ballybrit

TP05

TP06

Trial Pit Photographs - Galway Racecourse, Ballybrit

TP06

TP06

Trial Pit Photographs - Galway Racecourse, Ballybrit

TP07

TP07

Trial Pit Photographs - Galway Racecourse, Ballybrit

TP07

TP08

Trial Pit Photographs - Galway Racecourse, Ballybrit

TP08

TP08

Trial Pit Photographs - Galway Racecourse, Ballybrit

TP09

TP09

Trial Pit Photographs - Galway Racecourse, Ballybrit

TP09

TP10

Trial Pit Photographs - Galway Racecourse, Ballybrit

TP10

TP10

Trial Pit Photographs - Galway Racecourse, Ballybrit

TP10A

TP10A

Trial Pit Photographs - Galway Racecourse, Ballybrit

TP10A

TP11

Trial Pit Photographs - Galway Racecourse, Ballybrit

TP11

TP11

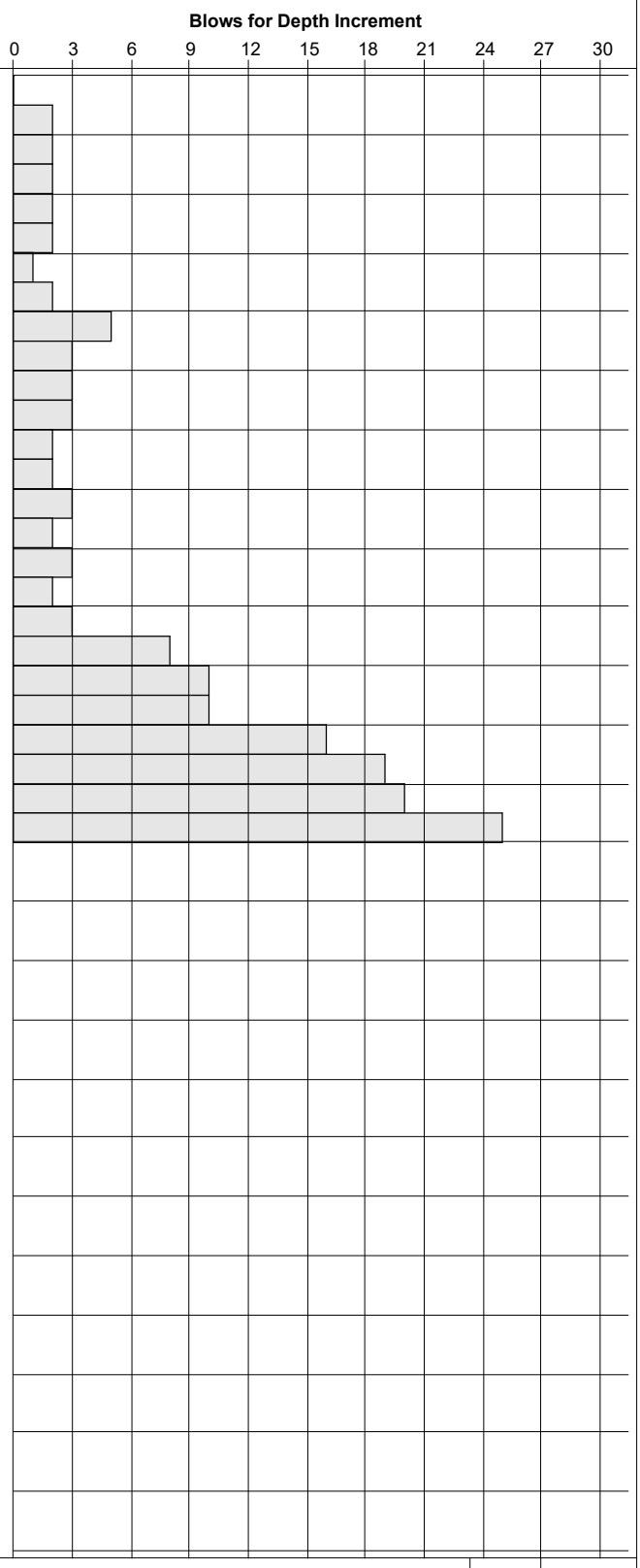
APPENDIX 3 – Dynamic Probe Records

Ground Investigations Ireland Ltd
www.gii.ie

Site	Probe Number
Galway Racecourse Geotechnical Investigations, Ballybrit, Co. Galway	DPH01

Method	Cone Dimensions	Ground Level (mOD)	Client	Job Number
Dynamic probe DPSH Fall height: 750mm Hammer Weight: 63.5kg	Diameter 50mm, Angle 90°	50.82	Galway County Council	13521-01-24
	Location	**Dates**	**Engineer**	**Sheet**
	533694 E 727898 N	27/02/2024	Arup	1/1

Depth (m)	Blows for Depth Increment	Field Records	Level (mOD)	Depth (m)
0.00-0.10	0		50.82	0.00
0.10-0.20	2			
0.20-0.30	2			
0.30-0.40	2			
0.40-0.50	2			
0.50-0.60	2		50.32	0.50
0.60-0.70	1			
0.70-0.80	2			
0.80-0.90	5			
0.90-1.00	3			
1.00-1.10	3		49.82	1.00
1.10-1.20	3			
1.20-1.30	2			
1.30-1.40	2			
1.40-1.50	3			
1.50-1.60	2		49.32	1.50
1.60-1.70	3			
1.70-1.80	2			
1.80-1.90	3			
1.90-2.00	8			
2.00-2.10	10		48.82	2.00
2.10-2.20	10			
2.20-2.30	16			
2.30-2.40	19			
2.40-2.50	20			
2.50-2.60	25		48.32	2.50
			47.82	3.00
			47.32	3.50
			46.82	4.00
			46.32	4.50
			45.82	5.00



Remarks
Hand pit dug to 1.20m BGL
Refusal at 2.60m BGL - 25 blows for 100mm

Scale (approx)	Logged By
1:25	JI

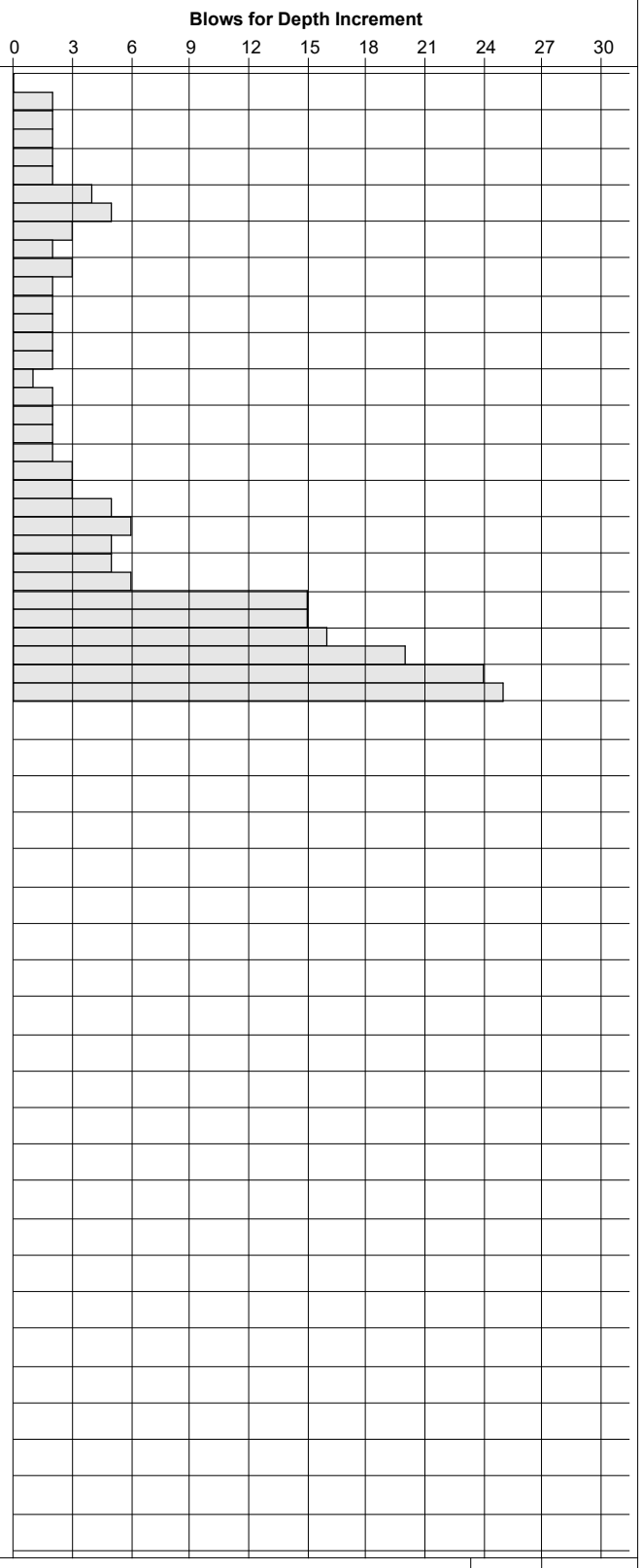
Figure No.
13521-01-24.DPH01

Ground Investigations Ireland Ltd
www.gii.ie

Site	Probe Number
Galway Racecourse Geotechnical Investigations, Ballybrit, Co. Galway	DPH02

Method	Cone Dimensions	Ground Level (mOD)	Client	Job Number
Dynamic probe DPSH Fall height: 750mm Hammer Weight: 63.5kg	Diameter 50mm, Angle 90°	49.27	Galway County Council	13521-01-24
	Location	**Dates**	**Engineer**	**Sheet**
	533635 E 727855 N	27/02/2024	Arup	1/1

Depth (m)	Blows for Depth Increment	Field Records	Level (mOD)	Depth (m)
0.00-0.10	0		49.27	0.00
0.10-0.20	2			
0.20-0.30	2			
0.30-0.40	2			
0.40-0.50	2			
0.50-0.60	2		48.77	0.50
0.60-0.70	4			
0.70-0.80	5			
0.80-0.90	3			
0.90-1.00	2			
1.00-1.10	3		48.27	1.00
1.10-1.20	2			
1.20-1.30	2			
1.30-1.40	2			
1.40-1.50	2			
1.50-1.60	2		47.77	1.50
1.60-1.70	1			
1.70-1.80	2			
1.80-1.90	2			
1.90-2.00	2			
2.00-2.10	2		47.27	2.00
2.10-2.20	3			
2.20-2.30	3			
2.30-2.40	5			
2.40-2.50	6			
2.50-2.60	5		46.77	2.50
2.60-2.70	5			
2.70-2.80	6			
2.80-2.90	15			
2.90-3.00	15			
3.00-3.10	16		46.27	3.00
3.10-3.20	20			
3.20-3.30	24			
3.30-3.40	25			
			45.77	3.50
			45.27	4.00
			44.77	4.50
			44.27	5.00
			43.77	5.50
			43.27	6.00
			42.77	6.50
			42.27	7.00
			41.77	7.50
			41.27	8.00



Remarks
Hand pit dug to 1.20m BGL
Refusal at 3.40m BGL - 25 blows for 100mm

Scale (approx)	Logged By
1:40	JC

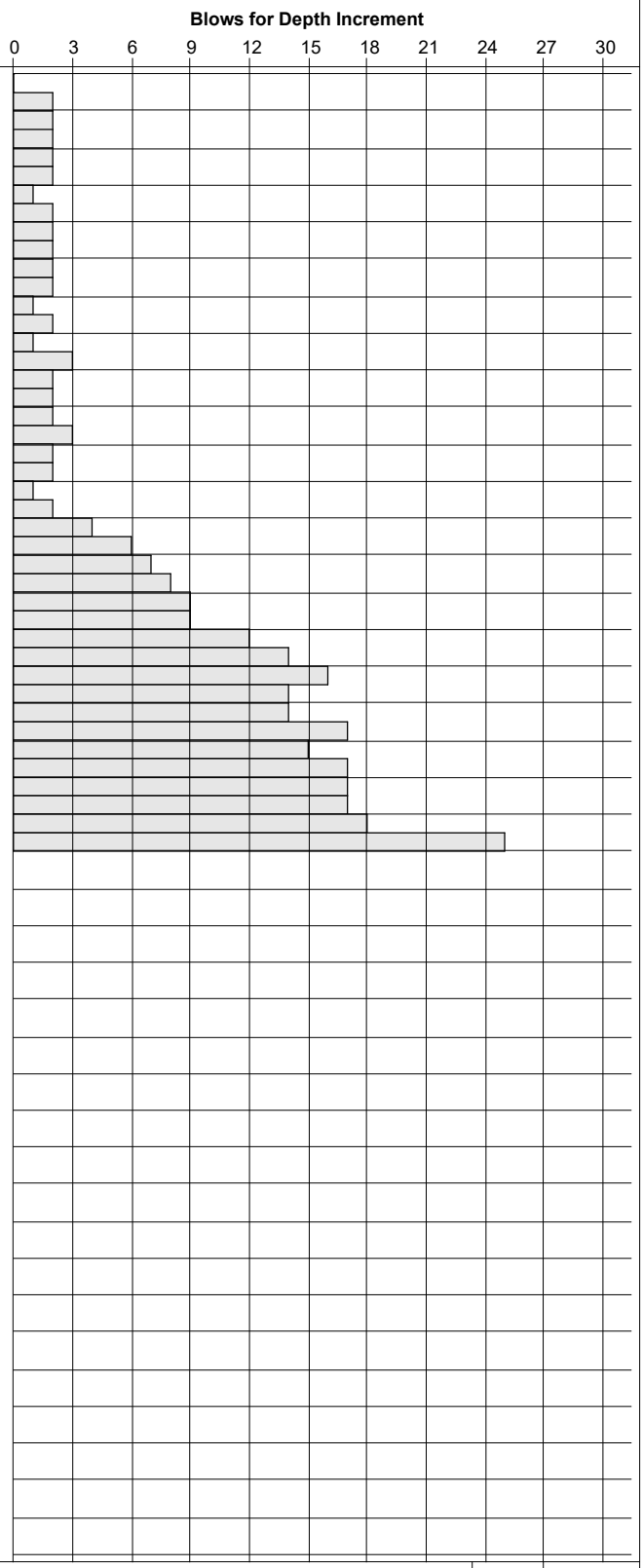
Figure No.
13521-01-24.DPH02

Ground Investigations Ireland Ltd
www.gii.ie

Site	Probe Number
Galway Racecourse Geotechnical Investigations, Ballybrit, Co. Galway	DPH03

Method	Cone Dimensions	Ground Level (mOD)	Client	Job Number
Dynamic probe DPSH Fall height: 750mm Hammer Weight: 63.5kg	Diameter 50mm, Angle 90°	49.13	Galway County Council	13521-01-24
	Location	**Dates**	**Engineer**	**Sheet**
	533690 E 727855 N	27/02/2024	Arup	1/1

Depth (m)	Blows for Depth Increment	Field Records	Level (mOD)	Depth (m)
0.00-0.10	0		49.13	0.00
0.10-0.20	2			
0.20-0.30	2			
0.30-0.40	2			
0.40-0.50	2			
0.50-0.60	2		48.63	0.50
0.60-0.70	1			
0.70-0.80	2			
0.80-0.90	2			
0.90-1.00	2			
1.00-1.10	2		48.13	1.00
1.10-1.20	2			
1.20-1.30	1			
1.30-1.40	2			
1.40-1.50	1			
1.50-1.60	3		47.63	1.50
1.60-1.70	2			
1.70-1.80	2			
1.80-1.90	2			
1.90-2.00	3			
2.00-2.10	2		47.13	2.00
2.10-2.20	2			
2.20-2.30	1			
2.30-2.40	2			
2.40-2.50	4			
2.50-2.60	6		46.63	2.50
2.60-2.70	7			
2.70-2.80	8			
2.80-2.90	9			
2.90-3.00	9			
3.00-3.10	12		46.13	3.00
3.10-3.20	14			
3.20-3.30	16			
3.30-3.40	14			
3.40-3.50	14			
3.50-3.60	17		45.63	3.50
3.60-3.70	15			
3.70-3.80	17			
3.80-3.90	17			
3.90-4.00	17			
4.00-4.10	18		45.13	4.00
4.10-4.20	25			
			44.63	4.50
			44.13	5.00
			43.63	5.50
			43.13	6.00
			42.63	6.50
			42.13	7.00
			41.63	7.50
			41.13	8.00



Remarks
Hand pit dug to 1.20m BGL
Refusal at 4.20m BGL - 25 blows for 100mm

Scale (approx)	Logged By
1:40	JC

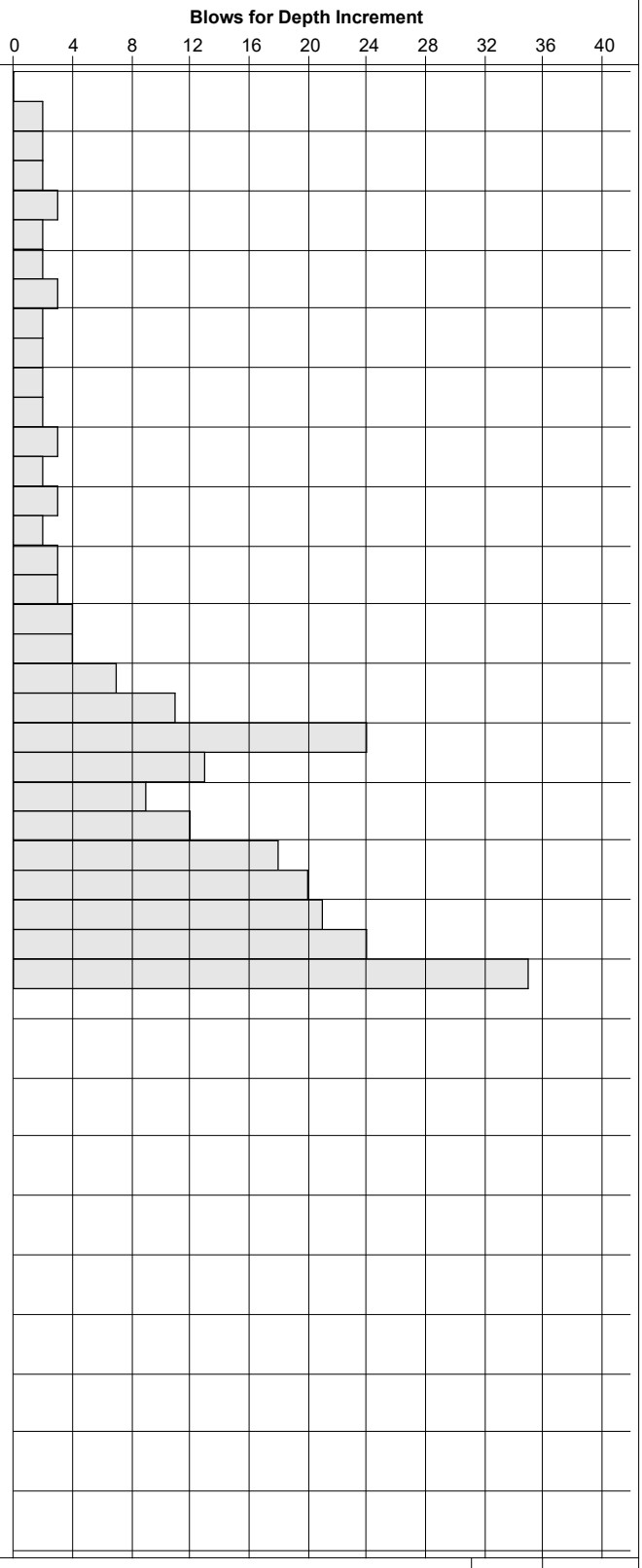
Figure No.
13521-01-24.DPH03

Ground Investigations Ireland Ltd
www.gii.ie

Site	Probe Number
Galway Racecourse Geotechnical Investigations, Ballybrit, Co. Galway	DPH04

Method	Cone Dimensions	Ground Level (mOD)	Client	Job Number
Dynamic probe DPSH Fall height: 750mm Hammer Weight: 63.5kg	Diameter 50mm, Angle 90°	49.37	Galway County Council	13521-01-24
	Location	**Dates**	**Engineer**	**Sheet**
	533731 E 727856 N	27/02/2024	Arup	1/1

Depth (m)	Blows for Depth Increment	Field Records	Level (mOD)	Depth (m)
0.00-0.10	0		49.37	0.00
0.10-0.20	2			
0.20-0.30	2			
0.30-0.40	2			
0.40-0.50	3			
0.50-0.60	2		48.87	0.50
0.60-0.70	2			
0.70-0.80	3			
0.80-0.90	2			
0.90-1.00	2			
1.00-1.10	2		48.37	1.00
1.10-1.20	2			
1.20-1.30	3			
1.30-1.40	2			
1.40-1.50	3			
1.50-1.60	2		47.87	1.50
1.60-1.70	3			
1.70-1.80	3			
1.80-1.90	4			
1.90-2.00	4			
2.00-2.10	7		47.37	2.00
2.10-2.20	11			
2.20-2.30	24			
2.30-2.40	13			
2.40-2.50	9			
2.50-2.60	12		46.87	2.50
2.60-2.70	18			
2.70-2.80	20			
2.80-2.90	21			
2.90-3.00	24			
3.00-3.10	35		46.37	3.00
			45.87	3.50
			45.37	4.00
			44.87	4.50
			44.37	5.00



Remarks
Hand pit dug to 1.20m BGL
Refusal at 3.10m BGL - 25 blows for 100mm

Scale (approx)	Logged By
1:25	JI

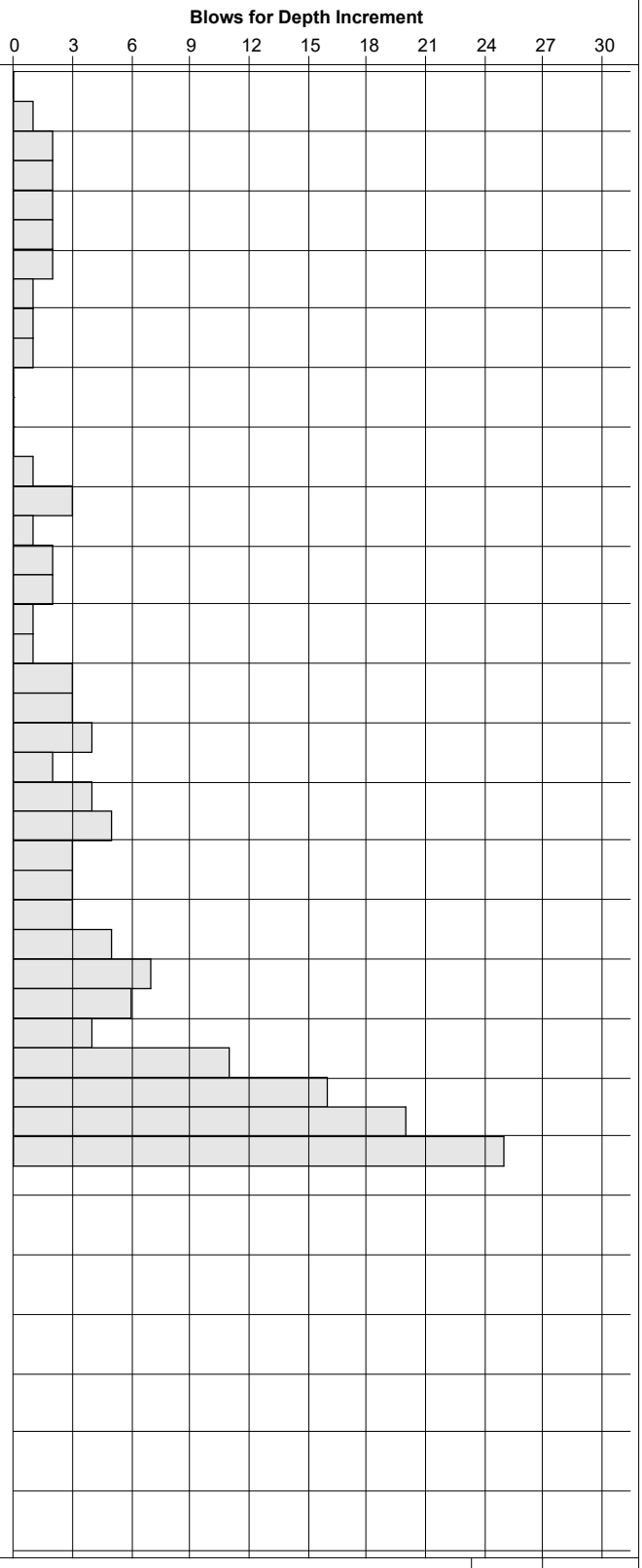
Figure No.
13521-01-24.DPH04

Ground Investigations Ireland Ltd
www.gii.ie

Site	Probe Number
Galway Racecourse Geotechnical Investigations, Ballybrit, Co. Galway	DPH05

Method	Cone Dimensions	Ground Level (mOD)	Client	Job Number
Dynamic probe DPSH Fall height: 750mm Hammer Weight: 63.5kg	Diameter 50mm, Angle 90°	47.21	Galway County Council	13521-01-24
	Location	**Dates**	**Engineer**	**Sheet**
	533643 E 727813 N	27/02/2024	Arup	1/1

Depth (m)	Blows for Depth Increment	Field Records	Level (mOD)	Depth (m)
0.00-0.10	0		47.21	0.00
0.10-0.20	1			
0.20-0.30	2			
0.30-0.40	2			
0.40-0.50	2			
0.50-0.60	2		46.71	0.50
0.60-0.70	2			
0.70-0.80	1			
0.80-0.90	1			
0.90-1.00	1			
1.00-1.10	0		46.21	1.00
1.10-1.20	0			
1.20-1.30	0			
1.30-1.40	1			
1.40-1.50	3			
1.50-1.60	1		45.71	1.50
1.60-1.70	2			
1.70-1.80	2			
1.80-1.90	1			
1.90-2.00	1			
2.00-2.10	3		45.21	2.00
2.10-2.20	3			
2.20-2.30	4			
2.30-2.40	2			
2.40-2.50	4			
2.50-2.60	5		44.71	2.50
2.60-2.70	3			
2.70-2.80	3			
2.80-2.90	3			
2.90-3.00	5			
3.00-3.10	7		44.21	3.00
3.10-3.20	6			
3.20-3.30	4			
3.30-3.40	11			
3.40-3.50	16			
3.50-3.60	20		43.71	3.50
3.60-3.70	25			
			43.21	4.00
			42.71	4.50
			42.21	5.00



Remarks
Hand pit dug to 1.20m BGL
Refusal at 3.70m BGL - 25 blows for 100mm

Scale (approx)	Logged By
1:25	JC

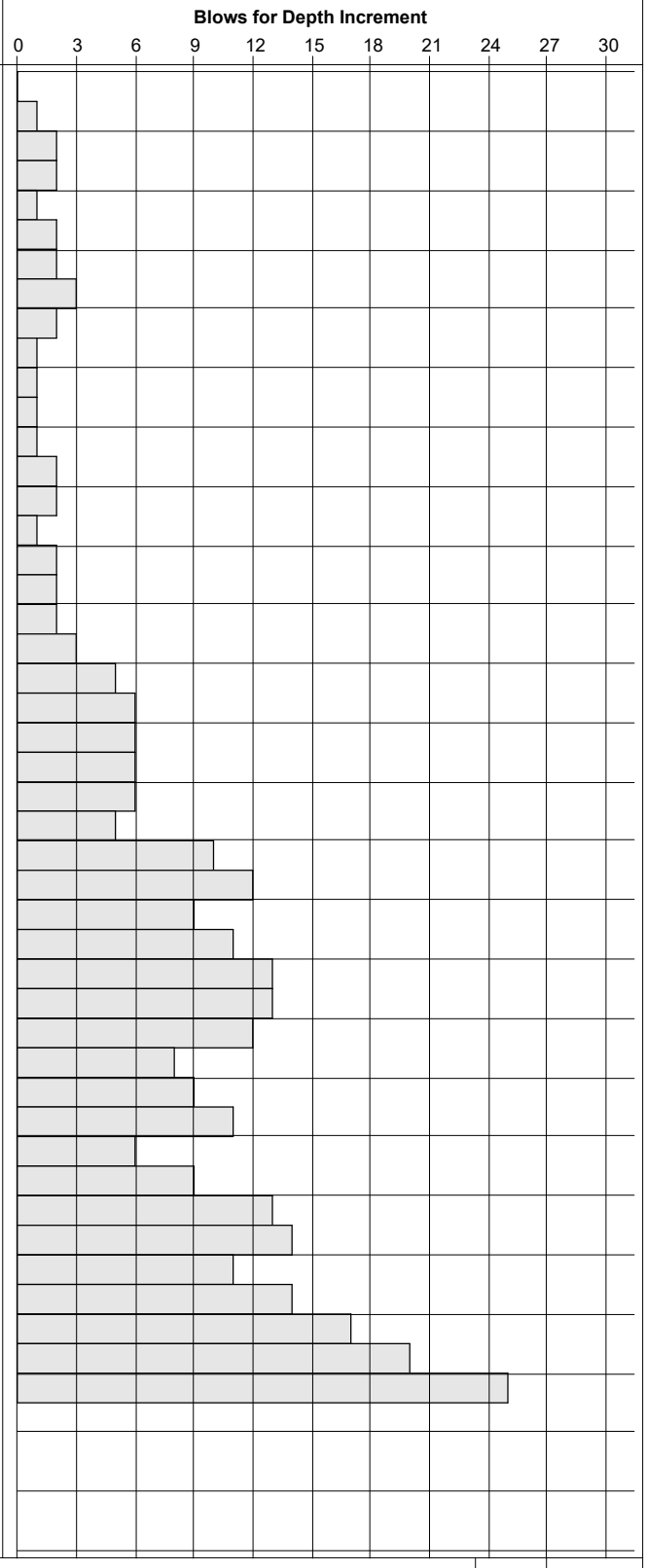
Figure No.
13521-01-24.DPH05

Ground Investigations Ireland Ltd
www.gii.ie

Site	Probe Number
Galway Racecourse Geotechnical Investigations, Ballybrit, Co. Galway	DPH06

Method	Cone Dimensions	Ground Level (mOD)	Client	Job Number
Dynamic probe DPSH Fall height: 750mm Hammer Weight: 63.5kg	Diameter 50mm, Angle 90°	45.53	Galway County Council	13521-01-24
	Location	**Dates**	**Engineer**	**Sheet**
	533651 E 727771 N	27/02/2024	Arup	1/1

Depth (m)	Blows for Depth Increment	Field Records	Level (mOD)	Depth (m)
0.00-0.10	0		45.53	0.00
0.10-0.20	1			
0.20-0.30	2			
0.30-0.40	2			
0.40-0.50	1			
0.50-0.60	2		45.03	0.50
0.60-0.70	2			
0.70-0.80	3			
0.80-0.90	2			
0.90-1.00	1			
1.00-1.10	1		44.53	1.00
1.10-1.20	1			
1.20-1.30	1			
1.30-1.40	2			
1.40-1.50	2			
1.50-1.60	1		44.03	1.50
1.60-1.70	2			
1.70-1.80	2			
1.80-1.90	2			
1.90-2.00	3			
2.00-2.10	5		43.53	2.00
2.10-2.20	6			
2.20-2.30	6			
2.30-2.40	6			
2.40-2.50	6			
2.50-2.60	5		43.03	2.50
2.60-2.70	10			
2.70-2.80	12			
2.80-2.90	9			
2.90-3.00	11			
3.00-3.10	13		42.53	3.00
3.10-3.20	13			
3.20-3.30	12			
3.30-3.40	8			
3.40-3.50	9			
3.50-3.60	11		42.03	3.50
3.60-3.70	6			
3.70-3.80	9			
3.80-3.90	13			
3.90-4.00	14			
4.00-4.10	11		41.53	4.00
4.10-4.20	14			
4.20-4.30	17			
4.30-4.40	20			
4.40-4.50	25		41.03	4.50
			40.53	5.00



Remarks
Hand pit dug to 1.20m BGL
Refusal at 4.50m BGL - 25 blows for 100mm

Scale (approx)	Logged By
1:25	JC

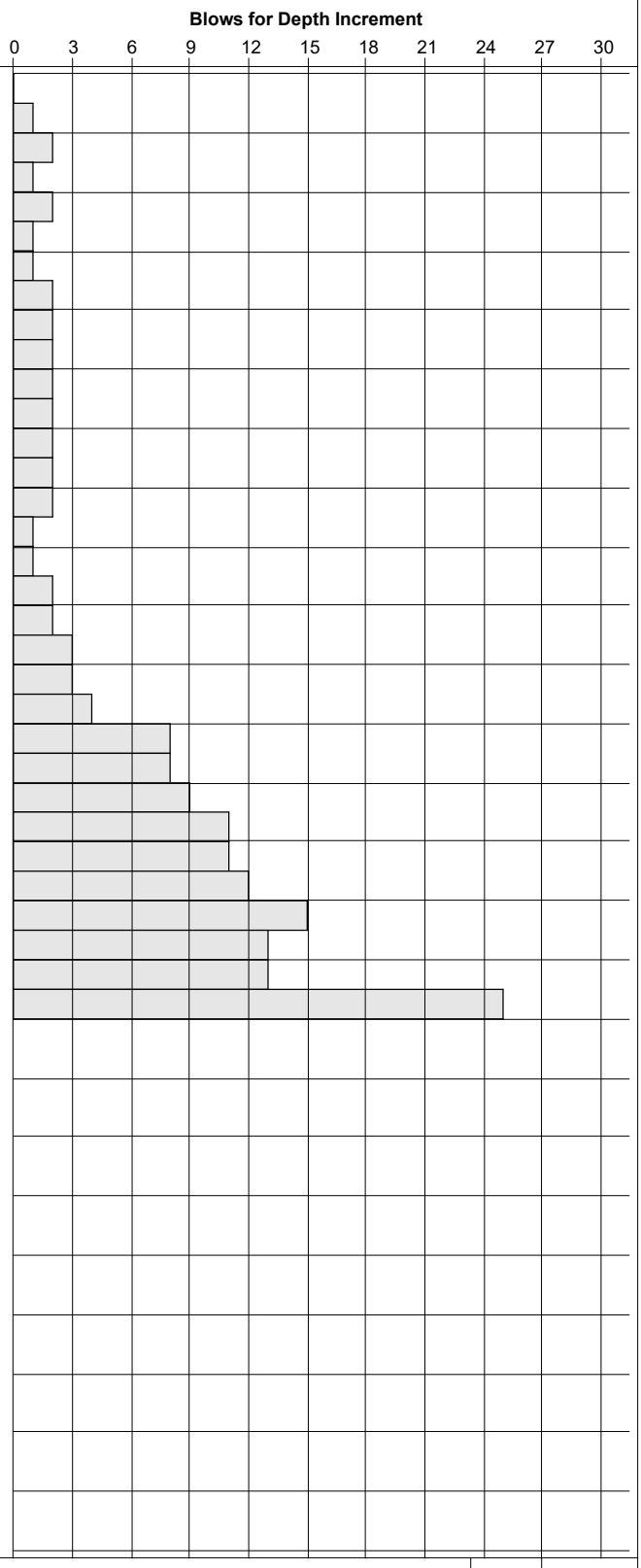
Figure No.
13521-01-24.DPH06

Ground Investigations Ireland Ltd
www.gii.ie

Site	Probe Number
Galway Racecourse Geotechnical Investigations, Ballybrit, Co. Galway	DPH07

Method	Cone Dimensions	Ground Level (mOD)	Client	Job Number
Dynamic probe DPSH Fall height: 750mm Hammer Weight: 63.5kg	Diameter 50mm, Angle 90°	44.05	Galway County Council	13521-01-24
	Location	**Dates**	**Engineer**	**Sheet**
	533638 E 727725 N	27/02/2024	Arup	1/1

Depth (m)	Blows for Depth Increment	Field Records	Level (mOD)	Depth (m)
0.00-0.10	0		44.05	0.00
0.10-0.20	1			
0.20-0.30	2			
0.30-0.40	1			
0.40-0.50	2			
0.50-0.60	1		43.55	0.50
0.60-0.70	1			
0.70-0.80	2			
0.80-0.90	2			
0.90-1.00	2			
1.00-1.10	2		43.05	1.00
1.10-1.20	2			
1.20-1.30	2			
1.30-1.40	2			
1.40-1.50	2			
1.50-1.60	1		42.55	1.50
1.60-1.70	1			
1.70-1.80	2			
1.80-1.90	2			
1.90-2.00	3			
2.00-2.10	3		42.05	2.00
2.10-2.20	4			
2.20-2.30	8			
2.30-2.40	8			
2.40-2.50	9			
2.50-2.60	11		41.55	2.50
2.60-2.70	11			
2.70-2.80	12			
2.80-2.90	15			
2.90-3.00	13			
3.00-3.10	13		41.05	3.00
3.10-3.20	25			
			40.55	3.50
			40.05	4.00
			39.55	4.50
			39.05	5.00



Remarks
Hand pit dug to 1.20m BGL
Refusal at 2.40m BGL - 25 blows for 100mm

Scale (approx)	Logged By
1:25	JC

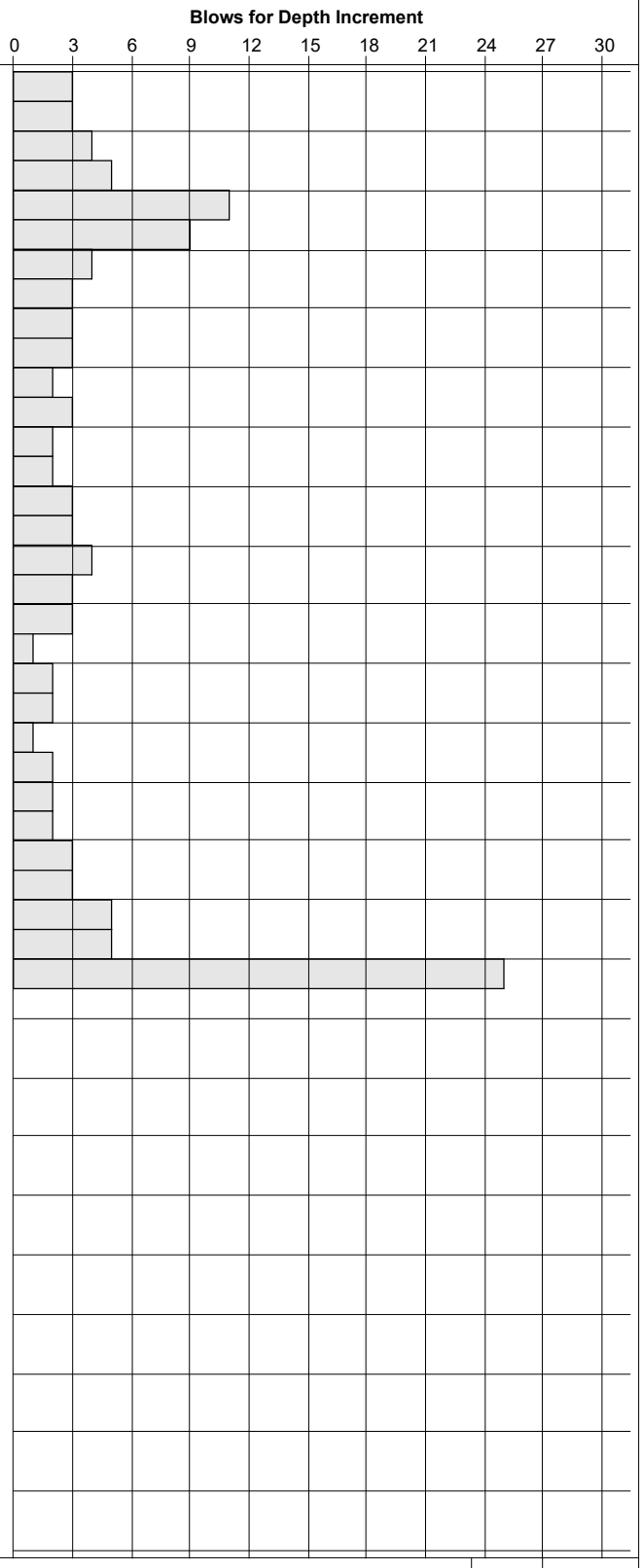
Figure No.
13521-01-24.DPH07

Ground Investigations Ireland Ltd
www.gii.ie

Site	Probe Number
Galway Racecourse Geotechnical Investigations, Ballybrit, Co. Galway	DPH08

Method	Cone Dimensions	Ground Level (mOD)	Client	Job Number
Dynamic probe DPSH Fall height: 750mm Hammer Weight: 63.5kg	Diameter 50mm, Angle 90°	49.16	Galway County Council	13521-01-24
	Location	**Dates**	**Engineer**	**Sheet**
	533781 E 727851 N	27/02/2024	Arup	1/1

Depth (m)	Blows for Depth Increment	Field Records	Level (mOD)	Depth (m)
0.00-0.10	3		49.16	0.00
0.10-0.20	3			
0.20-0.30	4			
0.30-0.40	5			
0.40-0.50	11			
0.50-0.60	9		48.66	0.50
0.60-0.70	4			
0.70-0.80	3			
0.80-0.90	3			
0.90-1.00	3			
1.00-1.10	2		48.16	1.00
1.10-1.20	3			
1.20-1.30	2			
1.30-1.40	2			
1.40-1.50	3			
1.50-1.60	3		47.66	1.50
1.60-1.70	4			
1.70-1.80	3			
1.80-1.90	3			
1.90-2.00	1			
2.00-2.10	2		47.16	2.00
2.10-2.20	2			
2.20-2.30	1			
2.30-2.40	2			
2.40-2.50	2			
2.50-2.60	2		46.66	2.50
2.60-2.70	3			
2.70-2.80	3			
2.80-2.90	5			
2.90-3.00	5			
3.00-3.10	25		46.16	3.00
			45.66	3.50
			45.16	4.00
			44.66	4.50
			44.16	5.00



Remarks
Hand pit dug to 1.20m BGL
Dynamic probe carried out adjacent to hand pit on the instruction of the engineer
Refusal at 3.10m BGL - 25 blows for 100mm

Scale (approx)	Logged By
1:25	JC

Figure No.
13521-01-24.DPH08

APPENDIX 4 - Borehole Records

Ground Investigations Ireland Ltd
www.gii.ie

Site Galway Racecourse Geotechnical Investigations, Ballybrit, Co. Galway			**Borehole Number** BH01
Machine : Dando 2000 **Method :** Cable Percussion	**Casing Diameter** 200mm cased to 4.30m	**Ground Level (mOD)** 51.78	**Client** Galway County Council	**Job Number** 13521-01-24
	Location 533635 E 727902 N	**Dates** 27/02/2024	**Project Contractor** Ground Investigations Ireland	**Sheet** 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
						(0.30)	TOPSOIL: Brown slightly sandy gravelly Clay with rootlets.			
					51.48	0.30				
						(0.40)	Brown slightly sandy slightly gravelly CLAY. Gravel is fine to coarse subangular to subrounded.			
					51.08	0.70				
						(0.30)	Grey/light brown slightly sandy slightly gravelly CLAY with medium subangular to subrounded cobble content.			
					50.78	1.00				
1.20-1.65 1.20 1.20	SPT(C) N=5 B1 D1			1,1/1,1,2,1		(1.00)	Soft grey/light brown slightly sandy slightly gravelly CLAY with medium subangular to subrounded cobble content.			
2.00-2.45 2.00 2.00	SPT(C) N=12 B2 D2			1,2/2,3,2,5	49.78	2.00				
						(0.40)	Firm to stiff grey/light brown slightly sandy slightly gravelly CLAY with medium subangular to subrounded cobble content.			
					49.38	2.40				
						(0.60)	Firm to stiff grey slightly sandy slightly gravelly CLAY with medium subangular to subrounded cobble content.			
3.00-3.42	SPT(C) 50/265			5,8/13,14,14,9	48.78	3.00				
						(0.40)	Very stiff grey slightly sandy slightly gravelly CLAY with medium subangular to subrounded cobble content.			
3.40 3.40	B3 D3				48.38	3.40				
						(0.80)	Very stiff grey/light brown sandy slightly gravelly CLAY with medium angular to subangular cobble content.			
4.00-4.30	SPT(C) 50/150			6,18/20,30						
4.10 4.10	B4 D4				47.58	4.20				
					47.48	(0.10) 4.30	Obstruction Possible Boulder or Bedrock			
							Complete at 4.30m			

Remarks
Hand pit dug to 1.20m BGL
No Groundwater encountered
Borehole terminated at 4.30m BGL due to obstruction possible bedrock or boulder
Standpipe installed in borehole upon completion - Bentonite seal from 4.30m BGL to 4.0m BGL, slotted from 4.0m BGL to 1.50m BGL with geosock and gravel surround, plain form 1.50m BGL to ground level with bentonite surround and raised cover
Chiselling from 4.30m to 4.30m for 1 hour.

Scale (approx)	Logged By
1:25	SK

Figure No. 13521-01-24.BH01

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Site Galway Racecourse Geotechnical Investigations, Ballybrit, Co. Galway			**Borehole Number** BH02
Machine : Dando 2000 **Method :** Cable Percussion	**Casing Diameter** 200mm cased to 2.00m	**Ground Level (mOD)** 50.06	**Client** Galway County Council	**Job Number** 13521-01-24
	Location 533737 E 727890 N	**Dates** 22/03/2024	**Project Contractor** Ground Investigations Ireland	**Sheet** 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
						(0.40)	TOPSOIL: Brown slightly sandy gravelly Clay with rootlets.			
					49.66	0.40	Brown slightly sandy slightly gravelly CLAY. Gravel is fine to coarse subangular to subrounded.			
						(0.80)				
					48.86	1.20	Soft brown/grey slightly sandy slightly gravelly CLAY with medium subangular to subrounded cobble content.			
1.20-1.65	SPT(C) N=5			2,1/1,1,2,1						
1.20	B1					(0.60)				
1.20	D1									
1.80	B2				48.26	1.80	Very stiff brown/grey slightly sandy slightly gravelly CLAY with medium subangular to subrounded cobble content.			
1.80	D2				48.16	1.90	Obstruction Possible Boulder or Bedrock			
2.00-2.15	SPT(C) 50/0			25,25/50	48.06	2.00	Complete at 2.00m			

Remarks

Hand pit dug to 1.20m BGL
No Gorundwater encountered
Borehole terminated at 2.0m BGL due to obstruction possible bedrock or boulder
Standpipe installed in borehole upon completion - Slotted from 2.0m BGL to 1.0m BGL with geosock and gravel surround, plain form 1.0m BGL to ground level with bentonite surround and raised cover
Chiselling from 2.00m to 2.00m for 0.5 hours.

Scale (approx)	Logged By
1:50	SK

Figure No. 13521-01-24.BH02

Ground Investigations Ireland Ltd

www.gii.ie

Site Galway Racecourse Geotechnical Investigations, Ballybrit, Co. Galway			**Borehole Number** BH03
Machine : Dando 2000 **Method :** Cable Percussion	**Casing Diameter** 200mm cased to 4.40m	**Ground Level (mOD)** 47.71	**Client** Galway County Council	**Job Number** 13521-01-24
	Location 533700 E 727811 N	**Dates** 21/03/2024	**Project Contractor** Ground Investigations Ireland	**Sheet** 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
						(0.30)	TOPSOIL: Brown slightly sandy gravelly Clay with rootlets.			
					47.41	0.30	Brown slightly sandy slightly gravelly CLAY. Gravel is fine to coarse subangular to subrounded.			
						(0.60)				
					46.81	0.90	Grey/light brown slightly sandy slightly gravelly CLAY with medium subangular to subrounded cobble content.			
						(0.30)				
1.20-1.65 1.20 1.20	SPT(C) N=8 B1 D1			1,1/2,2,2,2	46.51	1.20	Firm grey/light brown slightly sandy slightly gravelly CLAY with medium subangular to subrounded cobble content.			
						(1.50)				
2.00-2.45 2.00 2.00	SPT(C) N=9 B2 D2			1,2/3,2,2,2						
					45.01	2.70	Firm grey slightly sandy slightly gravelly CLAY with medium subangular to subrounded cobble content.			
						(0.30)				
3.00-3.38 3.00 3.00	SPT(C) 50/225 B3 D3			6,8/14,16,14,6	44.71	3.00	Very stiff grey slightly sandy slightly gravelly CLAY with medium subangular to subrounded cobble content.			
						(1.30)				
4.00-4.30 4.00 4.00	SPT(C) 50/150 B4 D4			7,13/14,36						
					43.41	4.30	Obstruction Possible Boulder or Bedrock			
					43.31	(0.10) 4.40	Complete at 4.40m			

Remarks

Hand pit dug to 1.20m BGL
No Groundwater encountered
Borehole terminated at 4.40m BGL due to obstruction possible bedrock or boulder
Standpipe installed in borehole upon completion - Bentonite seal from 4.40m BGL to 4.0m BGL, slotted from 4.0m BGL to 1.50m BGL with geosock and gravel surround, plain form 1.50m BGL to ground level with bentonite surround and raised cover
Chiselling from 4.30m to 4.40m for 1 hour.

Scale (approx)	Logged By
1:25	SK

Figure No. 13521-01-24.BH03

APPENDIX 5 – Laboratory Testing

National Materials Testing Laboratory Ltd.

SUMMARY OF TEST RESULTS

				Particle			Index Properties		Bulk	Cell	Undrained Triaxial Tests		Lab	
BH/TP	Depth	sample	Moisture	Density	<425um	LL	PL	PI	Density	Presssure	Compressive	Strain at	Vane	Remarks
No	m	No.	%	Mg/m3	%	%	%	%	Mg/m3	kPa	Stress kPa	Failure %	kPa	
TP01	1.30	D	16.4		53.0	23	14	9						
TP02	1.00	D	13.6		55.4	23	13	10						
TP02	2.40	D	10.2		66.8	20	12	8						
TP02	3.50	D	11.1		52.7	21	12	9						
TP03	1.10	D	15.4		67.0	45	23	22						
TP03	3.10	D	12.8		65.5	21	12	9						
TP04	1.20	D	12.1		46.3	21	13	8						
TP04	3.20	D	12.2		71.7	22	12	10						
TP05	1.10	D	14.4		54.4	26	16	10						
TP05	2.60	D	13.5		53.3	22	13	9						
TP05	3.60	D	10.8		71.5	22	14	8						
TP06	1.00	D	12.8		66.0	21	13	8						
TP06	2.40	D	10.6		47.8	21	13	8						
TP07	1.00	D	14.1		53.9	23	13	10						
TP08	1.10	D	12.2		52.6	21	12	9						
TP08	2.10	D	9.9		62.4	20	11	9						
TP09	1.00	D	16.9		59.2	26	15	11						
TP09	2.25	D	11.7		52.2	19	12	7						
TP10A	1.00	D	11.5		60.3	20	12	8						
TP10A	2.10	D	10.2		66.3	20	11	9						
TP11	1.00	D	13.5		66.7	22	13	9						
NMTL		Notes :									Job ref No.	NMTL 3723	GII Project ID:	13352-01-24
		1. All BS tests carried out using preferred (definitive) method unless otherwise stated.									Location	Galway Racecources Ballybrit		

Revision-02

NMTL LTD
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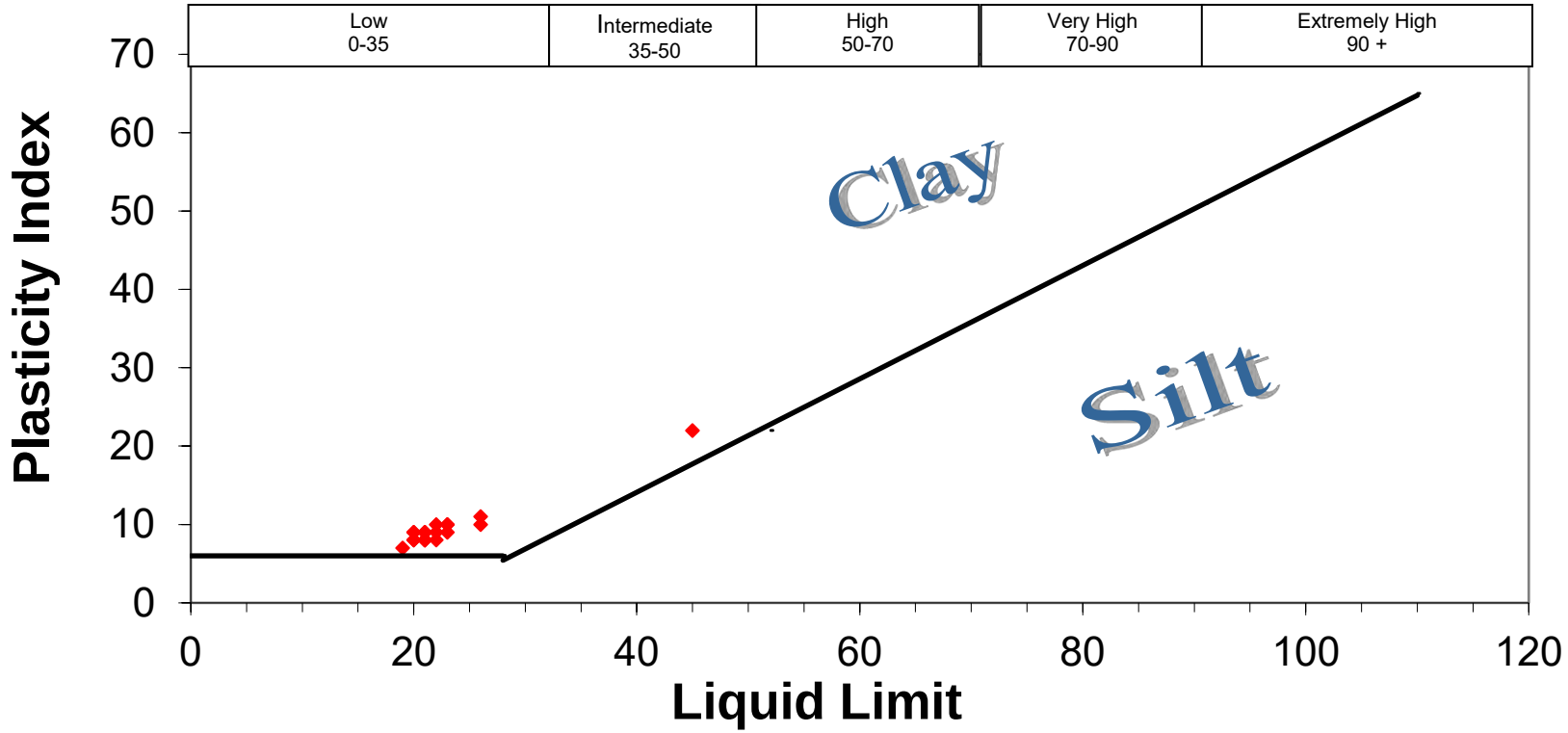
Contract:	**Galway Racecources Ballybrit**		
Client:	**Ground Investigations Ireland ltd**		
Engineer:	**Stephen Kealy**		
GII Project ID	**13352-01-24**		
Date:	**27/03/2024**		
Tested By:	**Js**	**Checked:**	**Bc**
Job ref No.	**NMTL 3723**		



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Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	86.3
28.000	81.8
20.000	77.6
14.000	76.0
10.000	73.5
6.300	70.4
5.000	68.5
3.350	66.2
2.000	62.8
1.180	59.5
0.600	55.3
0.425	53.0
0.300	50.5
0.212	47.8
0.150	44.7
0.063	37.5
0.054	35.6
0.039	32.0
0.020	25.8
0.011	20.0
0.008	16.1
0.005	13.5
0.004	9.9
0.002	6.5

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
6.5		31.0			25.3			37.2		0.0	0.0

Sample Description	Light brown slightly sandy gravelly silty CLAY.					Project No.	NMTL 3723
						BH/TP No.	TP01
Project	Galway Racecource, Ballybrit			GII Project ID:13352-01-24		Sample No.	B
Operator	Js	Checked	Nc	Approved	Bc	Depth	1.00m
				Date sample tested	20/03/2024		

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Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	90.0
28.000	84.9
20.000	81.8
14.000	79.7
10.000	77.7
6.300	74.1
5.000	72.6
3.350	71.2
2.000	67.8
1.180	64.0
0.600	58.4
0.425	55.4
0.300	52.1
0.212	48.7
0.150	45.1
0.063	37.5
0.054	35.3
0.038	32.7
0.020	27.7
0.010	22.1
0.007	19.7
0.005	16.6
0.004	14.9
0.002	12.3

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
12.3		25.1			30.3			32.2		0.0	0.0

Sample Description	Light brown/grey slightly sandy slightly gravelly silty CLAY.					Project No.	NMTL 3723
						BH/TP No.	TP01
Project	Galway Racecource, Ballybrit			GII Project ID:13352-01-24		Sample No.	B
Operator	Js	Checked	Nc	Approved	Bc	Date sample tested	20/03/2024	Depth	2.00m

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Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	91.0
50.000	91.0
37.500	84.9
28.000	80.9
20.000	80.2
14.000	77.2
10.000	75.0
6.300	71.5
5.000	69.6
3.350	67.6
2.000	64.3
1.180	60.5
0.600	56.1
0.425	53.8
0.300	51.3
0.212	48.5
0.150	45.4
0.063	38.0
0.053	35.5
0.038	32.4
0.020	25.6
0.010	19.9
0.007	16.5
0.005	12.9
0.004	11.1
0.002	7.2

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
7.2		30.8			26.3			26.7		9.0	0.0

Sample Description	Light grey/brown slightly sandy slightly gravelly silty CLAY.			Project No.	NMTL 3723
				BH/TP No.	TP02
Project	Galway Racecource, Ballybrit		GII Project ID:13352-01-24	Sample No.	B
Operator Js	Checked Nc	Approved Bc	Date sample tested 20/03/2024	Depth	1.00m

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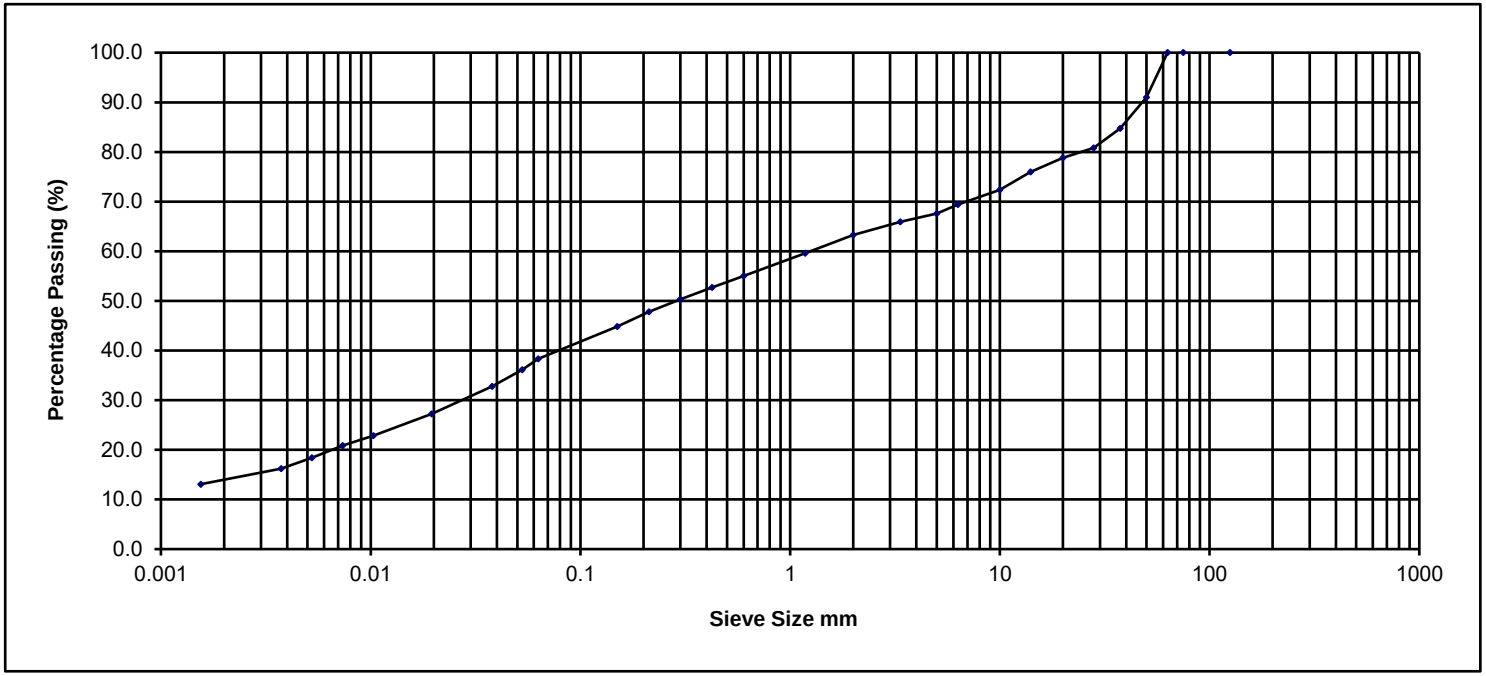
Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	91.0
37.500	84.7
28.000	80.8
20.000	78.8
14.000	76.0
10.000	72.3
6.300	69.4
5.000	67.6
3.350	65.9
2.000	63.2
1.180	59.6
0.600	55.0
0.425	52.7
0.300	50.3
0.212	47.8
0.150	44.8
0.063	38.3
0.053	36.1
0.038	32.8
0.020	27.3
0.010	22.8
0.007	20.8
0.005	18.4
0.004	16.2
0.002	13.1



Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
13.1		25.3			24.9			36.8		0.0	0.0

Sample Description	Light brown slightly sandy gravelly silty CLAY.			Project No.	NMTL 3723
				BH/TP No.	TP02
Project	Galway Racecource, Ballybrit		GII Project ID:13352-01-24	Sample No.	B
Operator Js	Checked Nc	Approved Bc	Date sample tested 20/03/2024	Depth	3.50m

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Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	92.5
28.000	92.1
20.000	89.9
14.000	89.7
10.000	86.8
6.300	83.4
5.000	81.5
3.350	79.4
2.000	76.1
1.180	72.6
0.600	68.1
0.425	65.5
0.300	62.6
0.212	59.4
0.150	55.9
0.063	48.3
0.053	46.1
0.038	42.5
0.019	35.2
0.010	26.0
0.007	21.8
0.005	18.2
0.004	14.8
0.002	9.8

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
9.8		38.6			27.7			23.9		0.0	0.0

Sample Description	Light grey brown slightly gravelly slightly sandy silty CLAY.					Project No.	NMTL 3723
						BH/TP No.	TP03
Project	Galway Racecource, Ballybrit			GII Project ID:13352-01-24		Sample No.	B
Operator	Js	Checked	Nc	Approved	Bc	Date sample tested	20/03/2024	Depth	3.10m

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Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	87.3
50.000	79.7
37.500	74.5
28.000	71.7
20.000	69.0
14.000	64.7
10.000	62.9
6.300	59.8
5.000	58.1
3.350	56.7
2.000	54.1
1.180	51.6
0.600	48.2
0.425	46.4
0.300	44.3
0.212	41.9
0.150	39.3
0.063	32.8
0.054	31.5
0.039	28.8
0.020	22.7
0.010	18.3
0.007	16.1
0.005	13.7
0.004	11.7
0.002	8.4

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
8.4		24.4			21.3			33.2		12.7	0.0

Sample Description	Light grey/ brown slightly sandy slightly gravelly silty CLAY.					Project No.	NMTL 3723
						BH/TP No.	TP04
Project	Galway Racecource, Ballybrit			GII Project ID:13352-01-24		Sample No.	B
Operator	Js	Checked	Nc	Approved	Bc	Date sample tested	20/03/2024	Depth	1.20m

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Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	91.3
37.500	86.9
28.000	83.6
20.000	81.4
14.000	75.7
10.000	73.9
6.300	70.7
5.000	68.2
3.350	66.3
2.000	63.6
1.180	60.7
0.600	56.7
0.425	54.4
0.300	51.8
0.212	49.0
0.150	45.9
0.063	38.7
0.054	37.2
0.039	33.6
0.020	27.3
0.010	22.3
0.007	19.2
0.005	17.2
0.004	14.7
0.002	9.9

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
9.9		28.8			24.9			36.4		0.0	0.0

Sample Description	Light grey/brown slightly sandy slightly gravelly silty CLAY.					Project No.	NMTL 3723
						BH/TP No.	TP05
Project	Galway Racecource, Ballybrit			GII Project ID:13352-01-24		Sample No.	B
Operator	Js	Checked	Nc	Approved	Bc	Date sample tested	20/03/2024	Depth	1.10m

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Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	90.0
37.500	84.2
28.000	81.6
20.000	79.3
14.000	75.9
10.000	74.0
6.300	70.8
5.000	68.3
3.350	66.3
2.000	63.1
1.180	59.8
0.600	55.5
0.425	53.3
0.300	51.0
0.212	48.6
0.150	45.9
0.063	39.8
0.054	37.9
0.039	34.0
0.020	28.1
0.010	21.8
0.007	19.0
0.005	16.1
0.004	13.5
0.002	8.6

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
8.6		31.2			23.4			36.9		0.0	0.0

Sample Description	Light grey brown slightly sandy gravelly silty CLAY.					Project No.	NMTL 3723
						BH/TP No.	TP05
Project	Galway Racecource, Ballybrit			GII Project ID:13352-01-24		Sample No.	B
Operator	Js	Checked	Nc	Approved	Bc	Date sample tested	20/03/2024	Depth	2.60m

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Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	91.1
50.000	84.5
37.500	80.7
28.000	76.7
20.000	75.3
14.000	69.5
10.000	66.8
6.300	64.4
5.000	63.1
3.350	61.5
2.000	58.7
1.180	55.0
0.600	50.1
0.425	47.8
0.300	45.4
0.212	42.9
0.150	40.1
0.063	33.9
0.054	32.1
0.038	30.0
0.020	25.6
0.010	21.3
0.007	18.7
0.005	16.9
0.004	14.1
0.002	10.6

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
10.6		23.2			24.8			32.4		8.9	0.0

Sample Description	Light grey/brown slightly sandy slightly gravelly silty CLAY.					Project No.	NMTL 3723
						BH/TP No.	TP06
Project	Galway Racecource, Ballybrit			GII Project ID:13352-01-24		Sample No.	B
Operator	Js	Checked	Nc	Approved	Bc	Date sample tested	20/03/2024	Depth	2.40m

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Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	90.8
37.500	82.8
28.000	80.2
20.000	78.3
14.000	75.1
10.000	73.1
6.300	69.4
5.000	67.7
3.350	66.0
2.000	63.0
1.180	60.1
0.600	56.1
0.425	53.9
0.300	51.4
0.212	48.5
0.150	45.1
0.063	36.8
0.053	35.5
0.038	31.3
0.020	23.2
0.011	17.1
0.008	14.7
0.005	11.6
0.004	9.0
0.002	6.6

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
6.6		30.2			26.2			37.0		0.0	0.0

Sample Description	Brown slightly sandy gravelly silty CLAY.					Project No.	NMTL 3723
						BH/TP No.	TP07
Project	Galway Racecource, Ballybrit			GII Project ID:13352-01-24		Sample No.	B
Operator	Js	Checked	Nc	Approved	Bc	Date sample tested	20/03/2024	Depth	1.00m

NM TL Ltd

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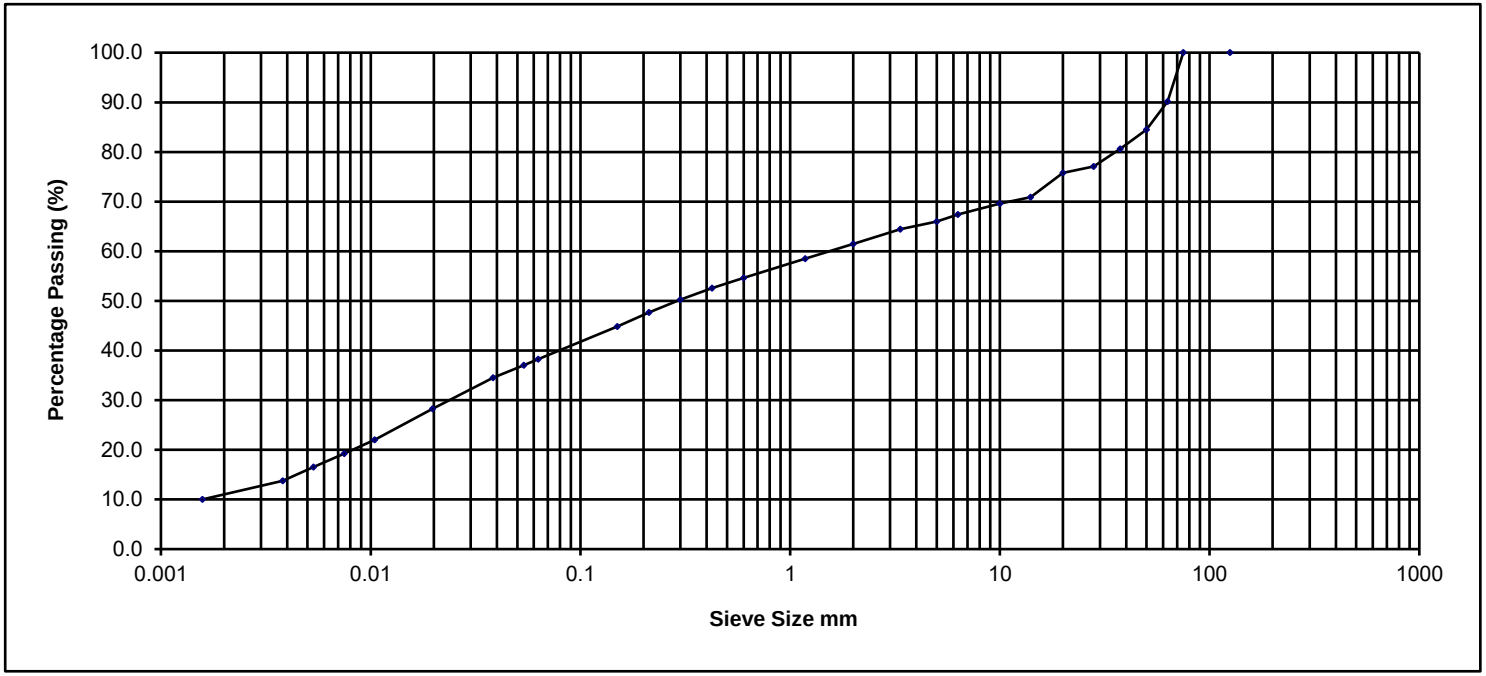
Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	90.2
50.000	84.5
37.500	80.6
28.000	77.1
20.000	75.8
14.000	70.9
10.000	69.6
6.300	67.4
5.000	66.0
3.350	64.5
2.000	61.5
1.180	58.5
0.600	54.6
0.425	52.6
0.300	50.3
0.212	47.7
0.150	44.9
0.063	38.3
0.054	37.0
0.038	34.5
0.020	28.3
0.010	22.0
0.007	19.3
0.005	16.5
0.004	13.8
0.002	10.0



Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
10.0		28.3			23.2			28.7		9.8	0.0

Sample Description	Light grey/brown slightly sandy slightly gravelly silty CLAY.			Project No.	NMTL 3723
				BH/TP No.	TP08
Project	Galway Racecource, Ballybrit		GII Project ID:13352-01-24	Sample No.	B
Operator Js	Checked Nc	Approved Bc	Date sample tested 20/03/2024	Depth	1.10m

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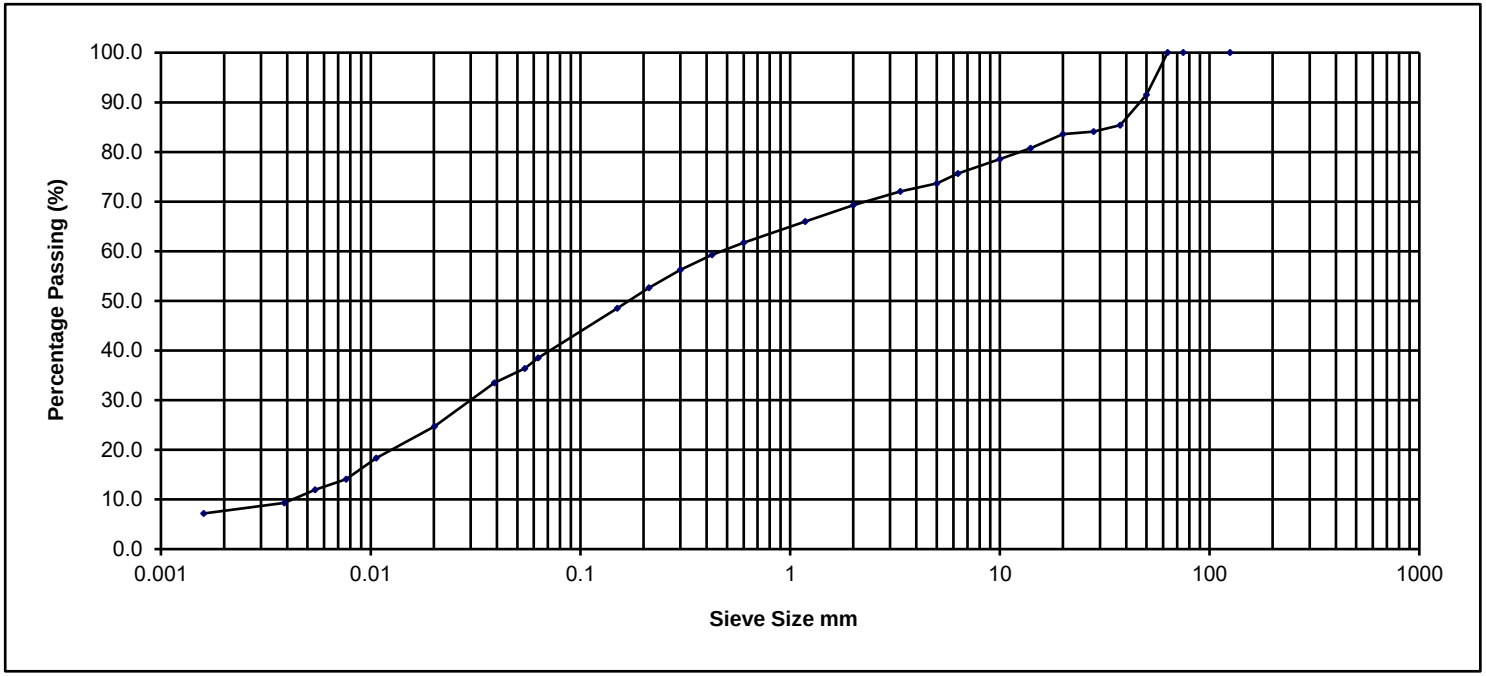
Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	91.5
37.500	85.4
28.000	84.1
20.000	83.6
14.000	80.7
10.000	78.6
6.300	75.6
5.000	73.6
3.350	72.0
2.000	69.3
1.180	66.0
0.600	61.7
0.425	59.2
0.300	56.3
0.212	52.6
0.150	48.5
0.063	38.5
0.054	36.4
0.039	33.5
0.020	24.7
0.011	18.3
0.008	14.1
0.005	12.0
0.004	9.3
0.002	7.2



Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
7.2		31.4			30.7			30.7		0.0	0.0

Sample Description	Brown/grey slightly sandy slightly gravelly silty CLAY.			Project No.	NMTL 3723
				BH/TP No.	TP09
Project	Galway Racecource, Ballybrit		GII Project ID:13352-01-24	Sample No.	B
Operator Js	Checked Nc	Approved Bc	Date sample tested 20/03/2024	Depth	1.00m

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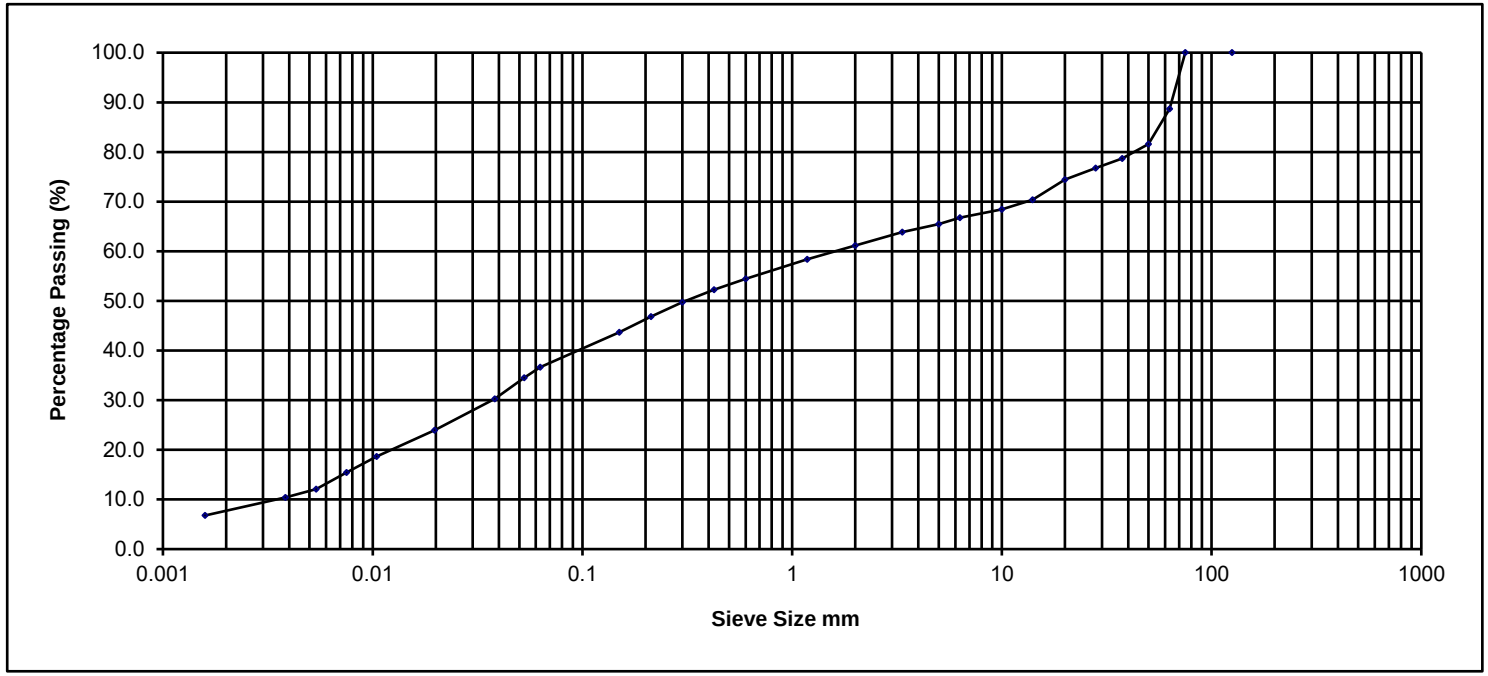
Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	88.7
50.000	81.6
37.500	78.7
28.000	76.8
20.000	74.4
14.000	70.4
10.000	68.5
6.300	66.8
5.000	65.5
3.350	63.8
2.000	61.2
1.180	58.4
0.600	54.5
0.425	52.2
0.300	49.7
0.212	46.9
0.150	43.7
0.063	36.6
0.053	34.5
0.038	30.3
0.020	23.9
0.010	18.6
0.007	15.5
0.005	12.1
0.004	10.4
0.002	6.8



Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
6.8		29.9			24.5			27.5		11.3	0.0

Sample Description	Light brown slightly sandy slightly gravelly silty CLAY.			Project No.	NMTL 3723
				BH/TP No.	TP09
Project	Galway Racecource, Ballybrit		GII Project ID:13352-01-24	Sample No.	B
Operator Js	Checked Nc	Approved Bc	Date sample tested 20/03/2024	Depth	2.25m

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NMTL Ltd

Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	94.6
28.000	90.5
20.000	89.8
14.000	86.4
10.000	84.0
6.300	80.1
5.000	77.9
3.350	75.8
2.000	72.0
1.180	67.8
0.600	62.8
0.425	60.3
0.300	57.4
0.212	54.3
0.150	50.8
0.063	42.6
0.053	40.1
0.038	36.3
0.020	28.7
0.010	22.3
0.007	18.5
0.005	14.5
0.004	12.2
0.002	7.9

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
7.9		34.7			29.4			28.0		0.0	0.0

Sample Description	Brown slightly gravelly slightly sandy silty CLAY.					Project No.	NMTL 3723
						BH/TP No.	TP10A
Project	Galway Racecource, Ballybrit			GII Project ID:13352-01-24		Sample No.	B
Operator	Js	Checked	Nc	Approved	Bc	Date sample tested	20/03/2024	Depth	1.00m

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Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	93.0
28.000	92.3
20.000	91.9
14.000	88.0
10.000	85.6
6.300	82.5
5.000	80.5
3.350	78.8
2.000	76.1
1.180	73.2
0.600	68.8
0.425	66.3
0.300	63.5
0.212	60.4
0.150	57.0
0.063	49.4
0.053	46.7
0.038	42.9
0.020	34.7
0.010	27.3
0.007	21.4
0.005	17.0
0.004	14.4
0.002	9.4

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
9.4		40.0			26.7			23.9		0.0	0.0

Sample Description	Light brown slightly gravelly slightly sandy silty CLAY.					Project No.	NMTL 3723
						BH/TP No.	TP10A
Project	Galway Racecource, Ballybrit			GII Project ID:13352-01-24		Sample No.	B
Operator	Js	Checked	Nc	Approved	Bc	Date sample tested	20/03/2024	Depth	2.00m

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Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	99.3
20.000	97.8
14.000	94.4
10.000	93.5
6.300	90.2
5.000	87.4
3.350	84.6
2.000	80.4
1.180	75.5
0.600	69.7
0.425	66.7
0.300	63.3
0.212	59.6
0.150	55.4
0.063	45.6
0.053	42.6
0.038	39.0
0.020	31.3
0.010	23.8
0.007	20.0
0.005	16.9
0.004	13.6
0.002	9.0

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
9.0		36.7			34.7			19.6		0.0	0.0

Sample Description	Brown slightly gravelly slightly sandy silty CLAY.			Project No.	NMTL 3723
				BH/TP No.	TP11
Project	Galway Racecource, Ballybrit		GII Project ID:13352-01-24	Sample No.	B
Operator Js	Checked Nc	Approved Bc	Date sample tested 20/03/2024	Depth	1.00m

NM TL ***Ltd***

SINGLE POINT MOISTURE CONDITION VALUE TEST

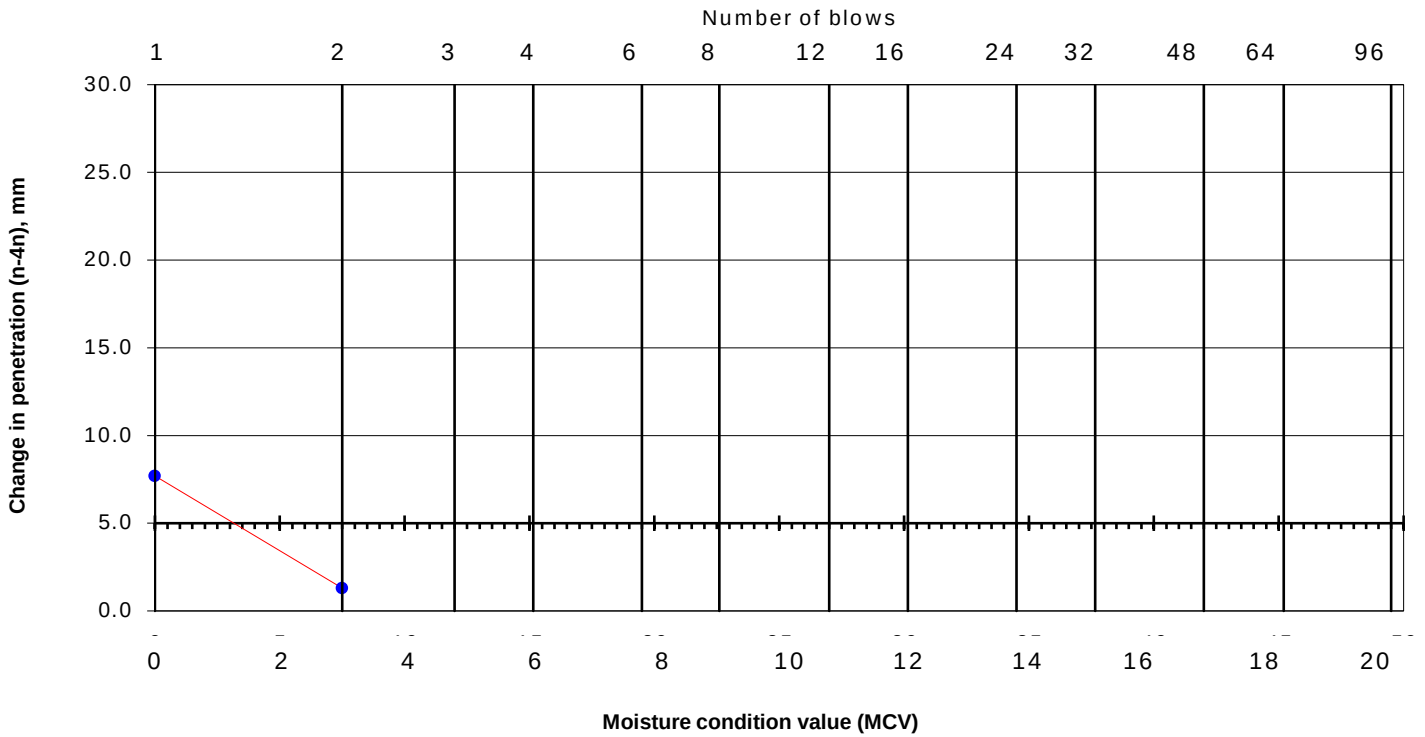
Single sample mass		
Initial sample mass	1683	g
Moisture content	13.1	%
Dry mass	1487.9	g
Mass retained on 20mm sieve	19.8	g %

* Delete as appropriate

Project Name:	Job ref.	NMTL_7326
Galway Racecourse, Ballybrit	GII Project ID	13521-01-24
	BH/TP	TP02
Soil description:	Sample no.	B
Light grey/brown slightly sandy slightly gravelly silty CLAY.	Depth	1.00m
Test method BS 1377 : Part 4 : 1990 : 5	Date Tested	21/03/2024
	Date Sampled	N/A
	Date Received	16/03/2024

MCV **1.3** **Natural**

Total number of blows n	Penetration or protrusion mm	Change in penetration n to 4n mm
1	56.6	7.7
2	49.5	1.3
3	49.1	
4	48.9	
6	48.6	
8	48.2	
12		
16		
24		
32		
48		
64		
96		
128		
192		
256		



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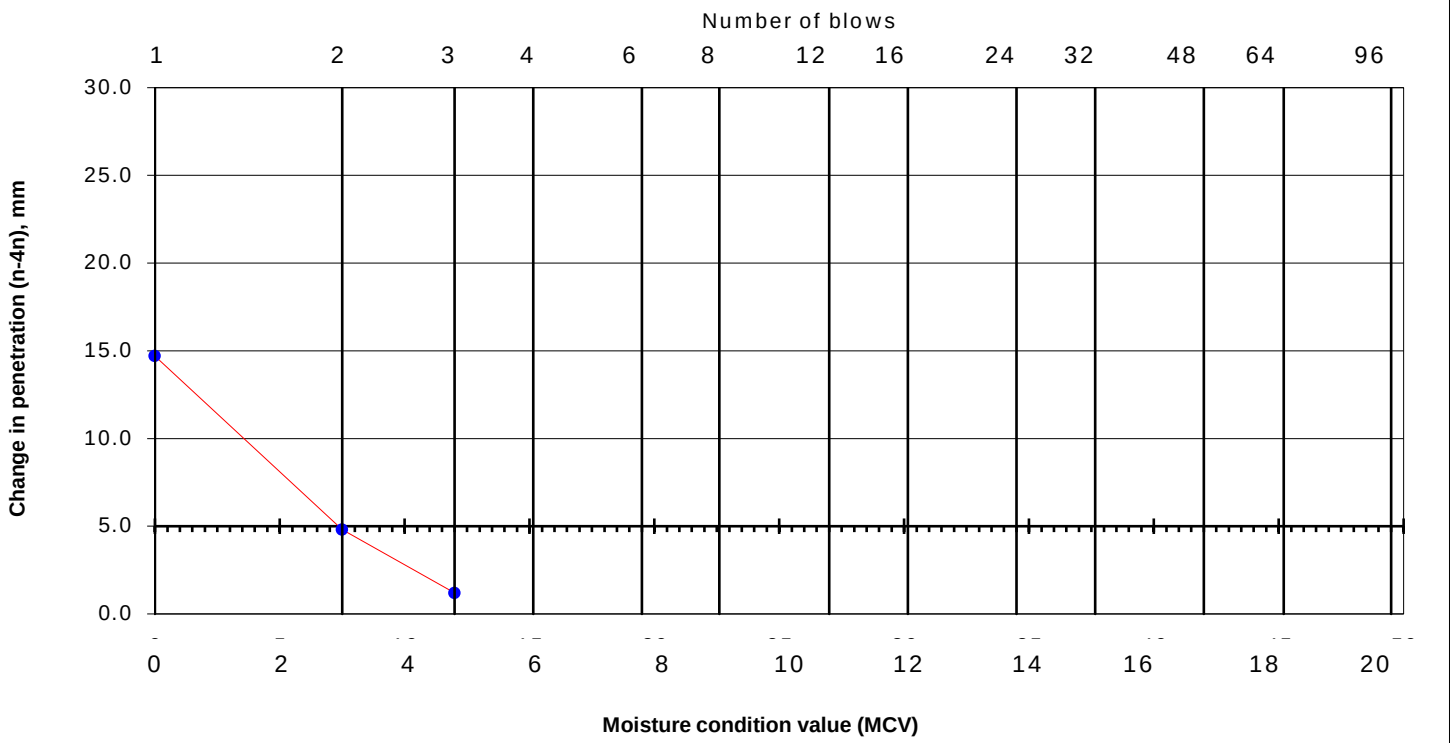
Operator	Checked	Approved
Dk	Nc	Bc

SINGLE POINT MOISTURE CONDITION VALUE TEST

Single sample mass			
Initial sample mass	1580 g		
Moisture content	12.0 %		
Dry mass	1410.8 g		
Mass retained on 20mm sieve	g 31.0 %		
* Delete as appropriate			

Project Name: Galway Racecourse, Ballybrit		Job ref.	NMTL_7326
		GII Project ID	13521-01-24
		BH/TP	TP04
Soil description:		Sample no.	B
Light grey/brown slightly sandy slightly gravelly silty CLAY.		Depth	1.20m
Test method	BS 1377 : Part 4 : 1990 : 5	Date Tested	21/03/2024
		Date Sampled	N/A
MCV	**3.0** **Natural**	Date Received	16/03/2024

Total number of blows n	Penetration or protrusion mm	Change in penetration n to 4n mm
1	55.6	14.7
2	45.2	4.8
3	41.5	1.2
4	40.9	
6	40.5	
8	40.4	
12	40.3	
16		
24		
32		
48		
64		
96		
128		
192		
256		



Operator	Checked	Approved
Dk	Nc	Bc

NMTL Ltd

SINGLE POINT MOISTURE CONDITION VALUE TEST

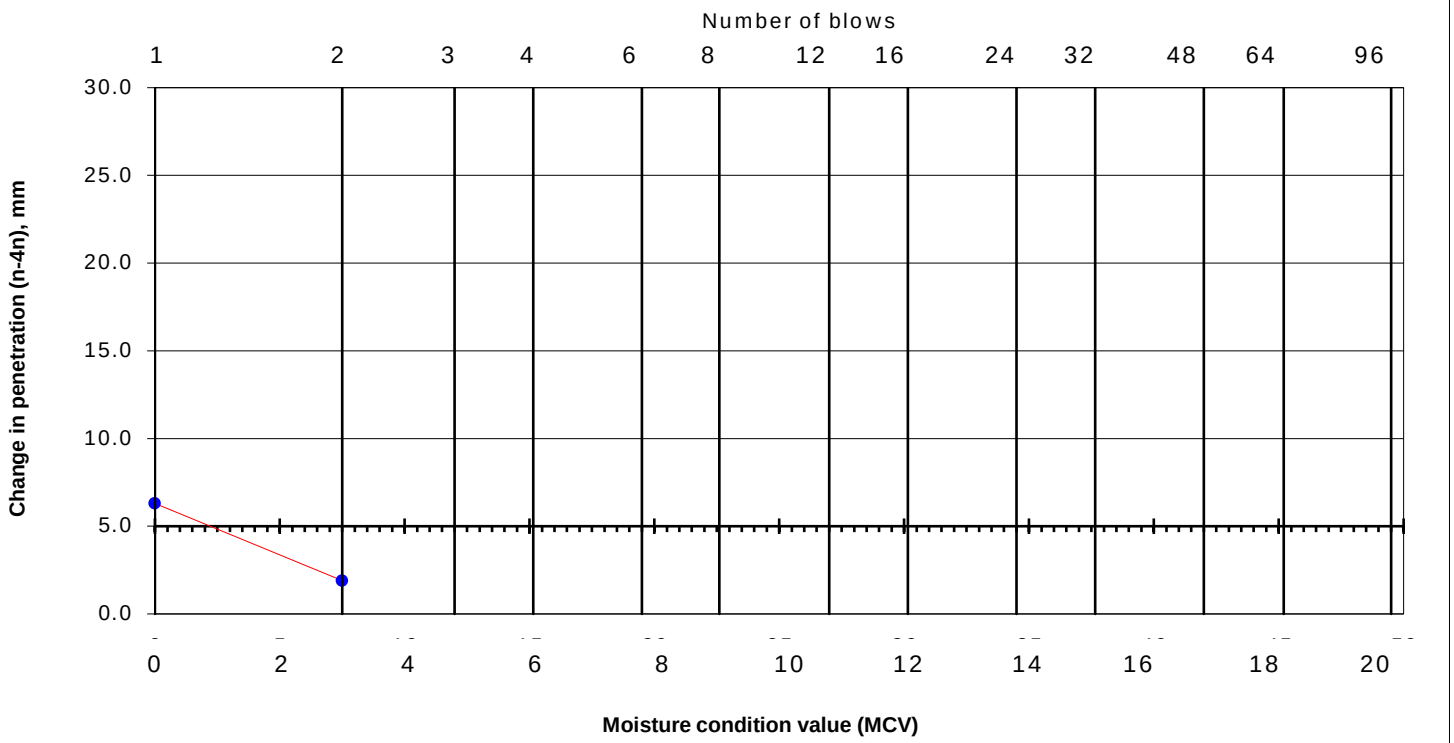
Single sample mass		
Initial sample mass	1542	g
Moisture content	12.4	%
Dry mass	1372.2	g
Mass retained on 20mm sieve	18.4	%

* Delete as appropriate

Project Name:	Job ref.	NMTL_7326
Galway Racecourse, Ballybrit	GII Project ID	13521-01-24
	BH/TP	TP05
Soil description:	Sample no.	B
Light grey brown slightly sandy gravelly silty CLAY.	Depth	2.60m
Test method BS 1377 : Part 4 : 1990 : 5	Date Tested	21/03/2024
	Date Sampled	N/A
	Date Received	16/03/2024

MCV **0.9** **Natural**

Total number of blows n	Penetration or protrusion mm	Change in penetration n to 4n mm
1	46.2	6.3
2	41.7	1.9
3	40.0	
4	39.9	
6	39.8	
8	39.8	
12		
16		
24		
32		
48		
64		
96		
128		
192		
256		



Operator	Checked	Approved
Dk	Nc	Bc

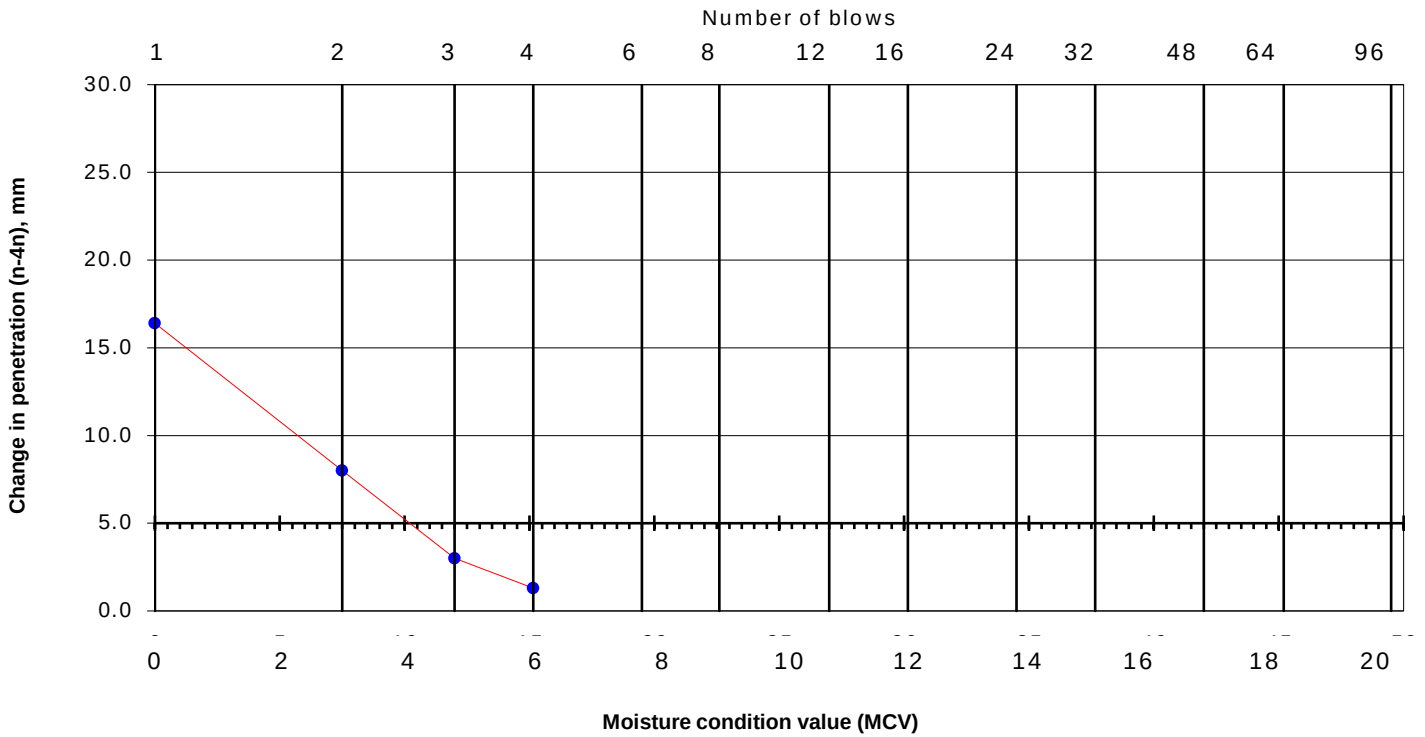
NMTL Ltd

SINGLE POINT MOISTURE CONDITION VALUE TEST

Single sample mass			
Initial sample mass	1552 g		
Moisture content	11.0 %		
Dry mass	1398.0 g		
Mass retained on 20mm sieve	g 24.7 %		
* Delete as appropriate			

Project Name: Galway Racecourse, Ballybrit		Job ref.	NMTL_7326
		GII Project ID	13521-01-24
		BH/TP	TP06
Soil description:		Sample no.	B
Light grey/brown slightly sandy slightly gravelly silty CLAY.		Depth	2.40m
Test method	BS 1377 : Part 4 : 1990 : 5	Date Tested	21/03/2024
		Date Sampled	N/A
MCV	**4.1** **Natural**	Date Received	16/03/2024

Total number of blows n	Penetration or protrusion mm	Change in penetration n to 4n mm
1	55.6	16.4
2	46.7	8.0
3	41.1	3.0
4	39.2	1.3
6	38.7	
8	38.7	
12	38.1	
16	37.9	
24		
32		
48		
64		
96		
128		
192		
256		



Operator	Checked	Approved
Dk	Nc	Bc

NMTL Ltd

SINGLE POINT MOISTURE CONDITION VALUE TEST

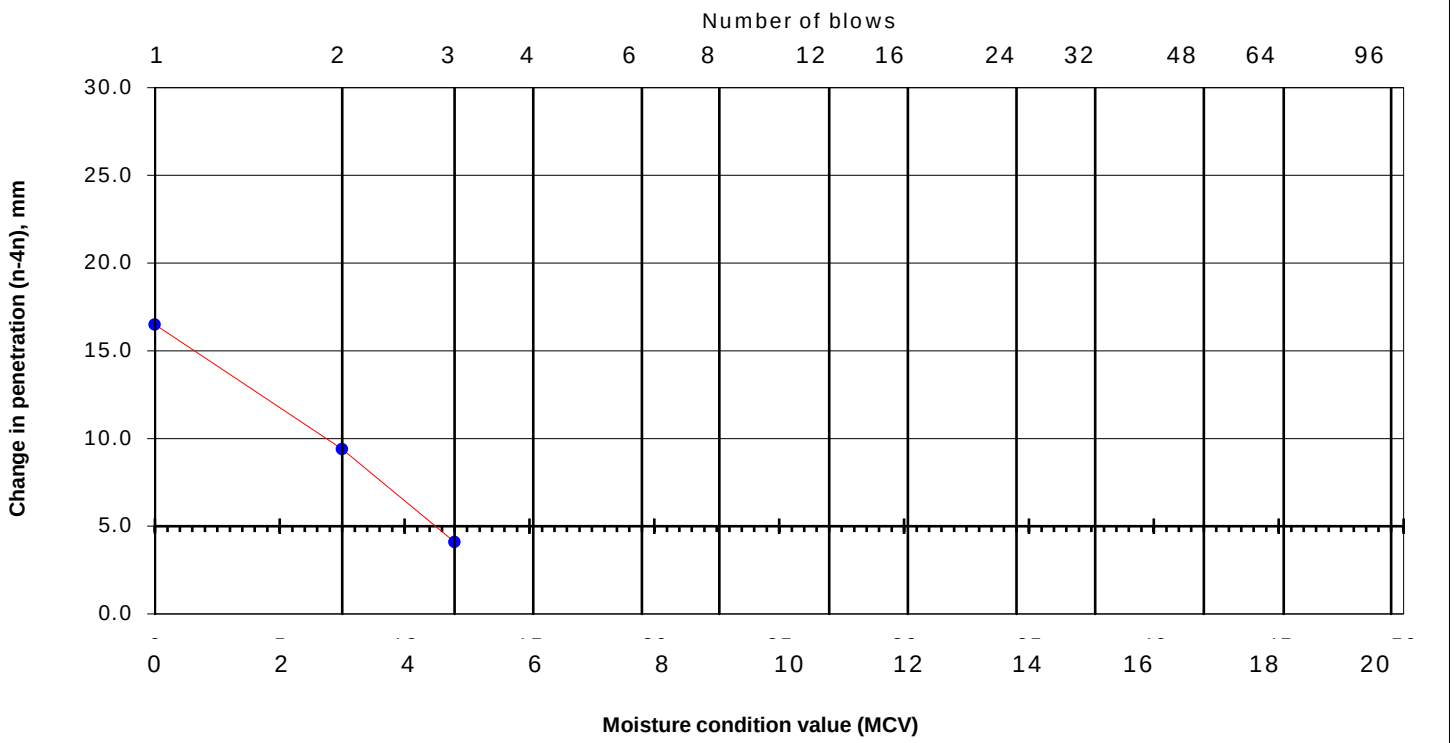
Single sample mass		
Initial sample mass	1676	g
Moisture content	10.8	%
Dry mass	1512.6	g
Mass retained on 20mm sieve	16.4	%

* Delete as appropriate

Project Name:	Job ref.	NMTL_7326
Galway Racecourse, Ballybrit	GII Project ID	13521-01-24
	BH/TP	TP05
Soil description:	Sample no.	B
light grey/brown slightly sandy slightly gravelly silty CLAY	Depth	3.60m
Test method BS 1377 : Part 4 : 1990 : 5	Date Tested	21/03/2024
	Date Sampled	N/A
	Date Received	16/03/2024

MCV **4.5** **Natural**

Total number of blows n	Penetration or protrusion mm	Change in penetration n to 4n mm
1	75.4	16.5
2	67.2	9.4
3	61.9	4.1
4	58.9	
6	57.9	
8	57.8	
12	57.8	
16		
24		
32		
48		
64		
96		
128		
192		
256		



Operator	Checked	Approved
Dk	Nc	Bc

NMTL Ltd

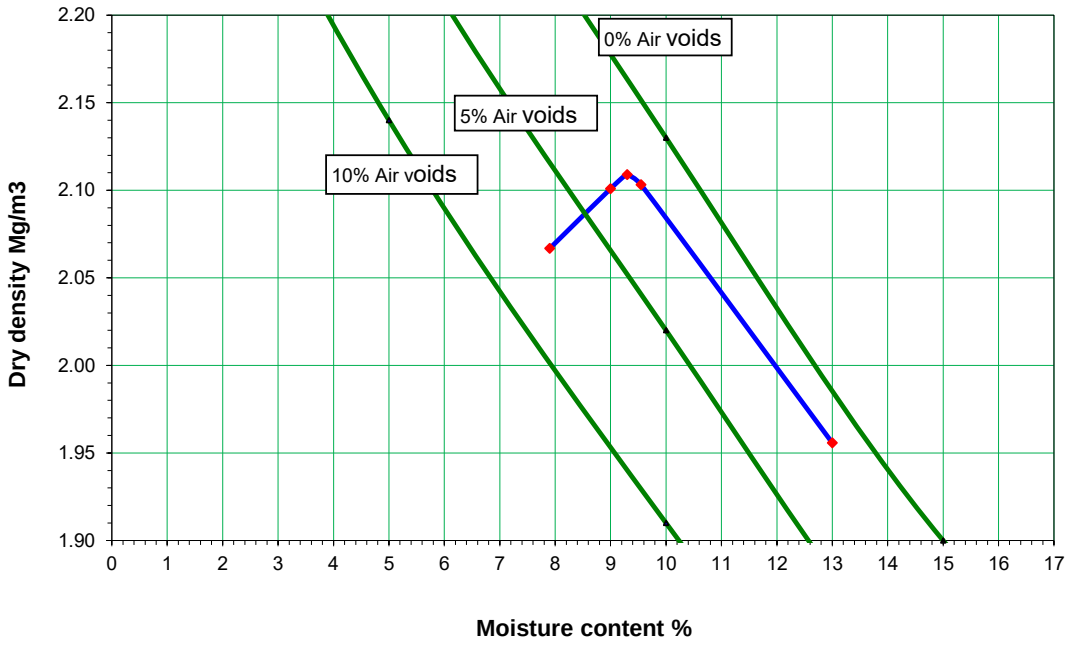
Determination of dry density / moisture content relationship

BS 1377: Part 4: 1990 : Clause 3.4

Location: Galway Racecourse, Ballybrit

Soil description: **Light brown slightly sandy slightly gravelly SILT/CLAY**

Test No.		1	2	3	4	5
Bulk Density	Mg/m3	2.23	2.29	2.31	2.30	2.21
Moisture Content	%	7.9	9.0	9.3	9.6	13.0
Dry Density	Mg/m3	2.07	2.10	2.11	2.10	1.96



Maximum Dry Density	2.11	Mg/m3	% passing 37.5 mm sieve	95.9
Optimum Moisture content	9.3	%	% passing 20 mm sieve	90.9
Particle Density	2.70	Assumed		
Natural Moisture content	13.00	%		

NM TL Ltd		Project: **Galway Racecourse, Ballybrit**				Job No.	NMTL 3723
					GII Project ID: 13521-01-24	Trial pit No.	TP03
						Sample No.	B
Operator-Dk	21/03/2024	Checked	Nc	Approved	Bc 27/03/2024	Depth m	1.10m

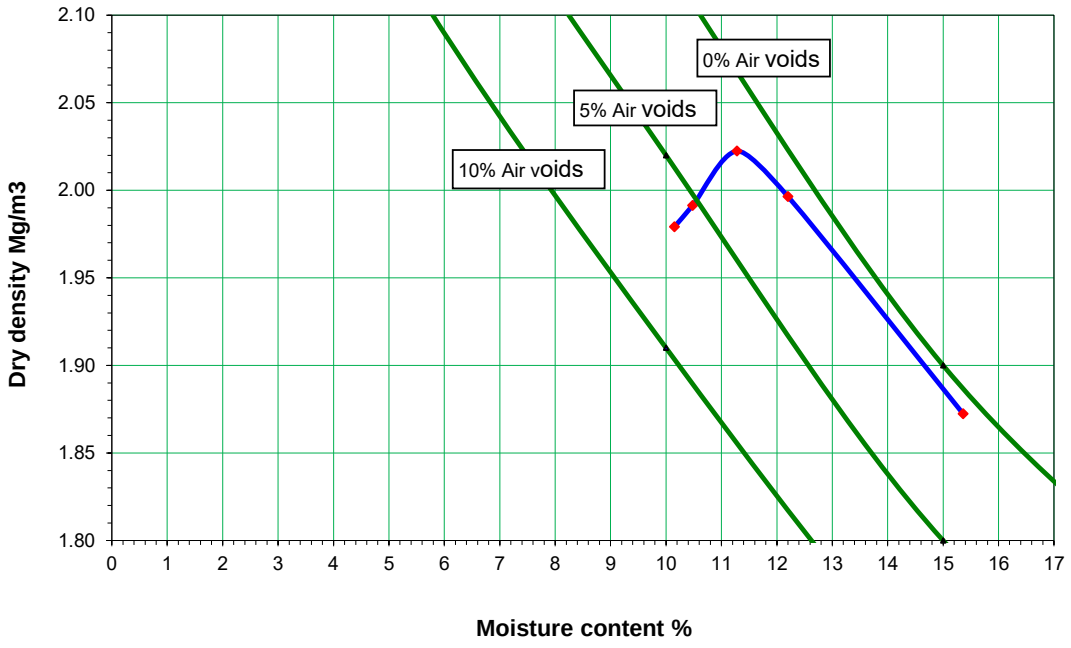
Determination of dry density / moisture content relationship

BS 1377: Part 4: 1990 : Clause 3.4

Location: Galway Racecourse, Ballybrit

Soil description: **Light Grey brown slightly sandy slightly gravelly SILT/CLAY.**

Test No.		1	2	3	4	5
Bulk Density	Mg/m3	2.18	2.20	2.25	2.24	2.16
Moisture Content	%	10.2	10.5	11.3	12.2	15.4
Dry Density	Mg/m3	1.98	1.99	2.02	2.00	1.87



Maximum Dry Density	2.02	Mg/m3	% passing 37.5 mm sieve	89.3
Optimum Moisture content	11.3	%	% passing 20 mm sieve	80.4
Particle Density	2.70	Assumed		
Natural Moisture content	15.36	%		

NM TL Ltd		Project	Galway Racecourse, Ballybrit			Job No.	NMTL 3723
						Trial pit No.	TP04
			GII Project ID: 13521-01-24			Sample No.	B
Operator-Dk	21/03/2024	Checked	Nc	Approved	Bc 27/03/2024	Depth m	3.20m

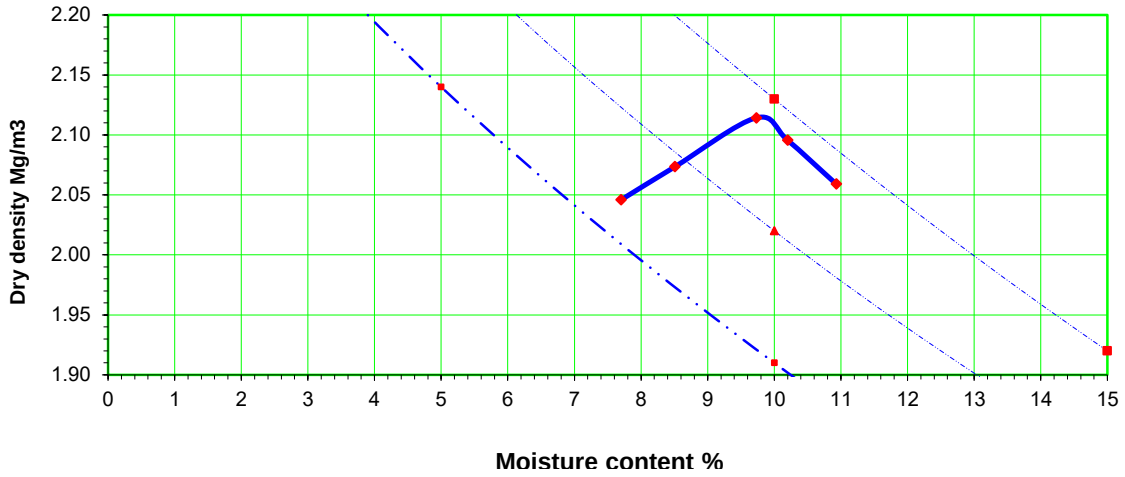
Determination of dry density / moisture content relationship

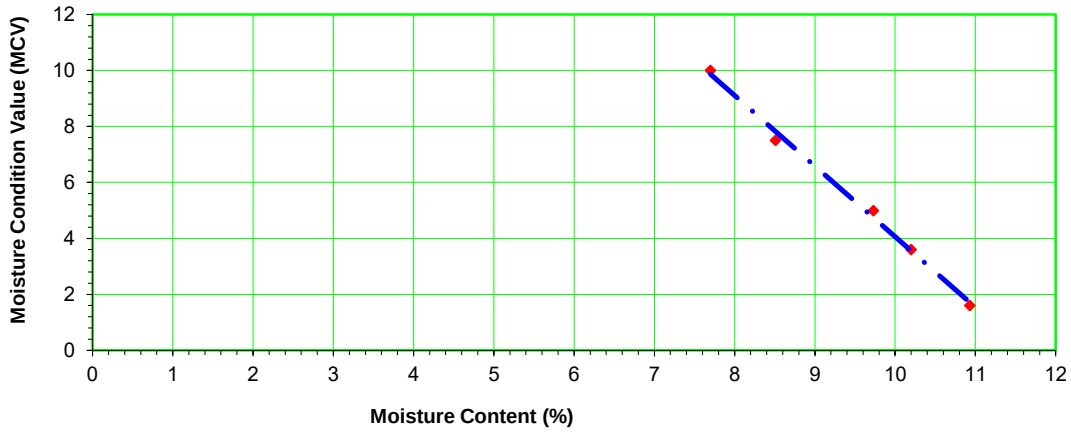
BS 1377: Part 4: 1990 : Clause 3.4

Tested in accordance with BS 1377: Part 4 : 1990.Clause 5.5-Moisture Condition Value

Soil description:	**Light grey brown slightly sandy gravelly silty CLAY**			
	Optimum Moisture Content	9.73 %	% Passing 37.5mm Sieve	84.8
	Maximum Dry density	2.11 Mg/m3	% Passing 37.5mm Sieve	72.1
	Particle Density -Assumed	2.70		

Moisture Content %	Bulk Density Mg/m3	Dry Density Mg/m3		MCV
7.70	2.22	2.05		10.00
8.51	2.25	2.07		7.50
9.73	2.32	2.11		5.00
10.20	2.32	2.10	At natural moisture.	3.60
10.93	2.28	2.06		1.60





NM TL Ltd		Project:	Galway Racecourse, Ballybrit			Job No	NMTL3723
						Trial Pit No.	TP02
			GII Project ID:13521-01-24			Sample No.	B
Operator	Dk	Checked	Nc	Approved	Bc 27/03/2024	Depth	2.40m

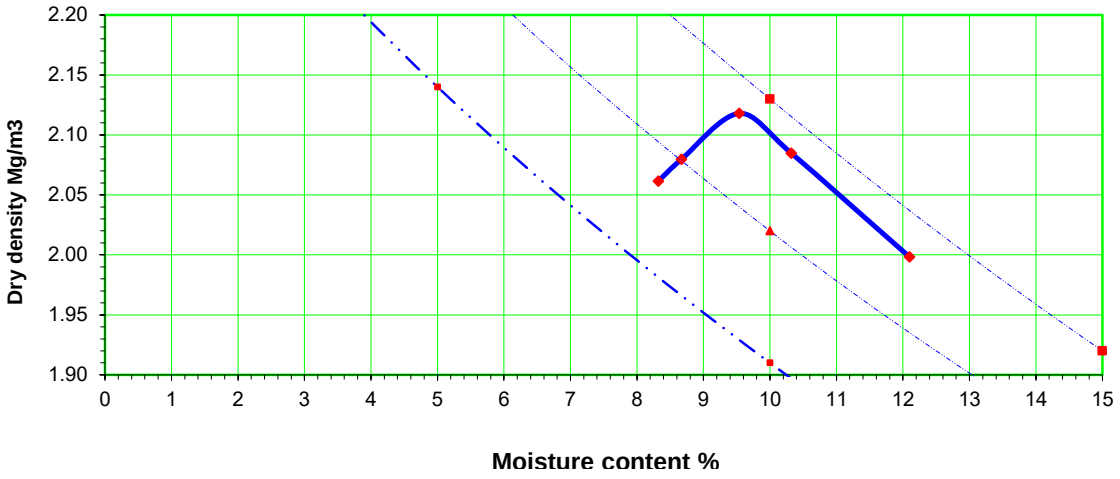
Determination of dry density / moisture content relationship
BS 1377: Part 4: 1990 : Clause 3.4

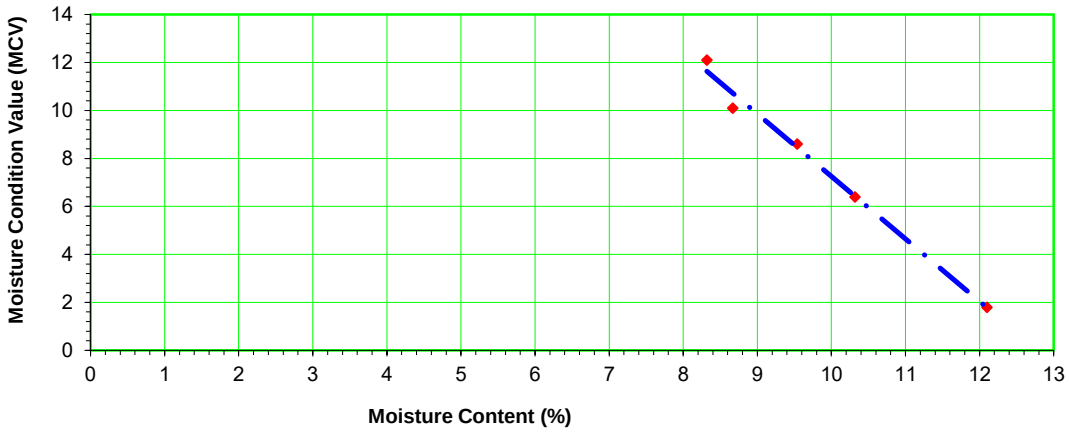
Tested in accordance with BS 1377: Part 4 : 1990.Clause 5.5-Moisture Condition Value

Soil description: **Light grey/brown slightly sandy slightly gravelly silty CLAY**

Optimum Moisture Content	9.54 %	% Passing 37.5mm Sieve	89.7
Maximum Dry density	2.12 Mg/m3	% Passing 37.5mm Sieve	77.8
Particle Density -Assumed	2.70		

Moisture Content %	Bulk Density Mg/m3	Dry Density Mg/m3		MCV
8.32	2.23	2.06		12.10
8.67	2.26	2.08		10.10
9.54	2.32	2.12		8.60
10.32	2.30	2.08		6.40
12.10	2.24	2.00	At natural moisture.	1.80





NM TL Ltd		Project:	Galway Racecourse, Ballybrit			Job No	NMTL3723
						Trial Pit No.	TP04
			GII Project ID:13521-01-24			Sample No.	B
Operator	Dk	Checked	Nc	Approved	Bc 27/03/2024	Depth	2.20m

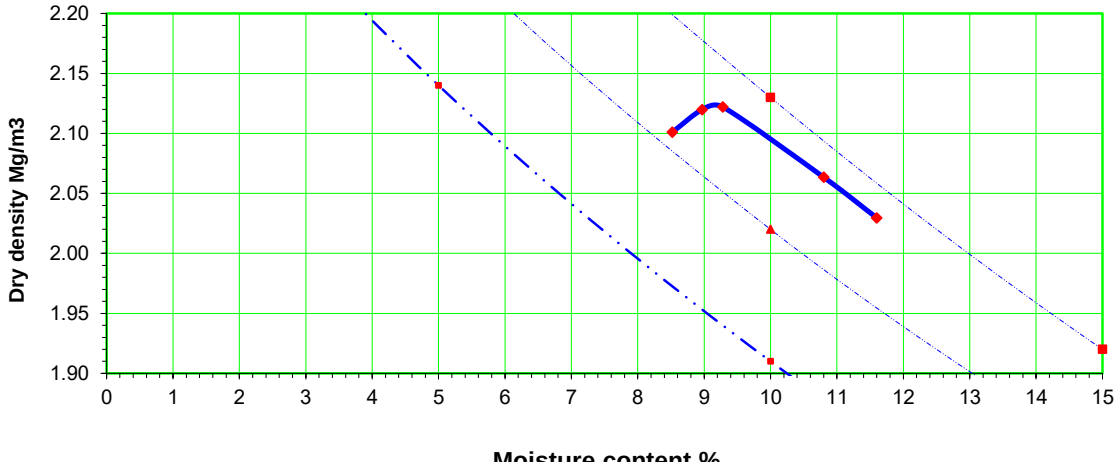
Determination of dry density / moisture content relationship
BS 1377: Part 4: 1990 : Clause 3.4

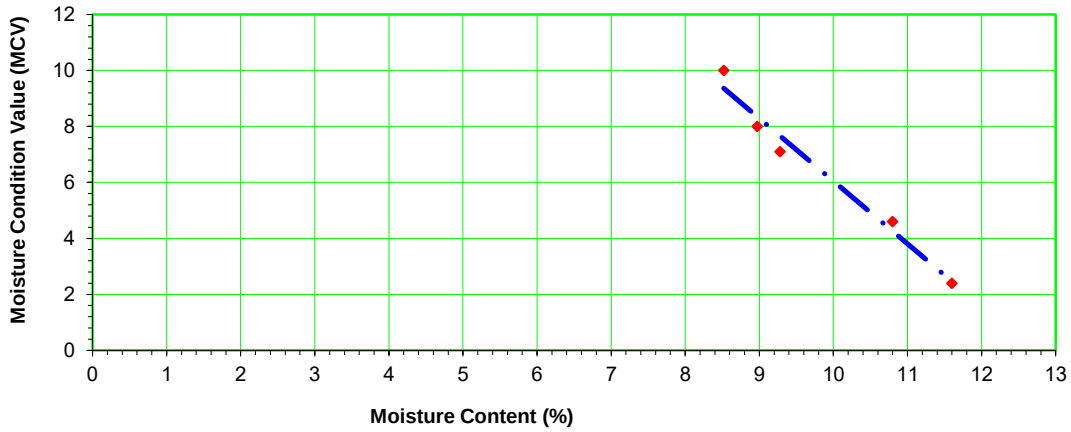
Tested in accordance with BS 1377: Part 4 : 1990.Clause 5.5-Moisture Condition Value

Soil description: **Light grey/brown slightly sandy slightly gravelly silty CLAY**

Optimum Moisture Content	9.28 %	% Passing 37.5mm Sieve	90.8
Maximum Dry density	2.12 Mg/m3	% Passing 37.5mm Sieve	83.6
Particle Density -Assumed	2.70		

Moisture Content %	Bulk Density Mg/m3	Dry Density Mg/m3		MCV
8.52	2.28	2.10		10.00
8.97	2.31	2.12		8.00
9.28	2.32	2.12		7.10
10.80	2.29	2.06	At natural moisture.	4.60
11.60	2.27	2.03		2.40





NM TL Ltd	Project: Galway Racecourse, Ballybrit			Job No	NMTL3723
				Trial Pit No.	TP05
	GII Project ID:13521-01-24			Sample No.	B
Operator Dk	Checked Nc	Approved Bc	27/03/2024	Depth	3.60m

Element Materials Technology
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Catherinestown House
Hazelhatch Road
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Ireland
D22 K5P8

Attention :	Stephen Kealy
Date :	12th March, 2024
Your reference :	13521-01-24
Our reference :	Test Report 24/3391 Batch 1
Location :	Galway Racecourse Ballybrit
Date samples received :	27th February, 2024
Status :	Final Report
Issue :	202403121508

Nine samples were received for analysis on 27th February, 2024 of which eight were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

The greenhouse gas emissions generated (in Carbon – Co2e) to obtain the results in this report are estimated as:

Scope 1&2 emissions - 23.313 kg of CO2

Scope 1&2&3 emissions - 55.094 kg of CO2

Authorised By:

Liza Klebe
Project Co-ordinator

Element Materials Technology

Client Name: Ground Investigations Ireland
Reference: 13521-01-24
Location: Galway Racecourse Ballybrit
Contact: Stephen Kealy
EMT Job No: 24/3391

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	1-4	5	6-9	10	11-14	15	16-19	20-23			LOD/LOR	Units	Method No.
Sample ID	TP03	TP03	TP03	TP03	TP04	TP04	TP04	TP04					
Depth	0.55	1.10	1.50	3.10	0.50	1.20	2.20	3.30					
COC No / misc													
Containers	V J T	T	V J T	T	V J T	T	V J T	V J T					
Sample Date	22/02/2024	22/02/2024	22/02/2024	22/02/2024	22/02/2024	22/02/2024	22/02/2024	22/02/2024					
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil					
Batch Number	1	1	1	1	1	1	1	1					
Date of Receipt	27/02/2024	27/02/2024	27/02/2024	27/02/2024	27/02/2024	27/02/2024	27/02/2024	27/02/2024					
Antimony	2	-	<1	-	1	-	<1	<1			<1	mg/kg	TM30/PM15
Arsenic #	5.9	-	2.3	-	5.7	-	3.5	2.8			<0.5	mg/kg	TM30/PM15
Barium #	46	-	26	-	41	-	31	25			<1	mg/kg	TM30/PM15
Cadmium #	1.5	-	0.6	-	0.8	-	0.8	0.6			<0.1	mg/kg	TM30/PM15
Chromium #	54.2	-	21.8	-	57.9	-	27.3	9.2			<0.5	mg/kg	TM30/PM15
Copper #	13	-	7	-	10	-	9	7			<1	mg/kg	TM30/PM15
Lead #	16	-	<5	-	16	-	8	<5			<5	mg/kg	TM30/PM15
Mercury #	<0.1	-	<0.1	-	0.2	-	<0.1	<0.1			<0.1	mg/kg	TM30/PM15
Molybdenum #	3.2	-	1.1	-	3.6	-	1.3	0.3			<0.1	mg/kg	TM30/PM15
Nickel #	26.0	-	9.9	-	25.1	-	16.5	9.7			<0.7	mg/kg	TM30/PM15
Selenium #	<1	-	<1	-	1	-	<1	<1			<1	mg/kg	TM30/PM15
Zinc #	48	-	19	-	45	-	34	20			<5	mg/kg	TM30/PM15
PAH MS													
Naphthalene #	<0.04	-	<0.04	-	<0.04	-	<0.04	<0.04			<0.04	mg/kg	TM4/PM8
Acenaphthylene	<0.03	-	<0.03	-	<0.03	-	<0.03	<0.03			<0.03	mg/kg	TM4/PM8
Acenaphthene #	<0.05	-	<0.05	-	<0.05	-	<0.05	<0.05			<0.05	mg/kg	TM4/PM8
Fluorene #	<0.04	-	<0.04	-	<0.04	-	<0.04	<0.04			<0.04	mg/kg	TM4/PM8
Phenanthrene #	<0.03	-	<0.03	-	<0.03	-	<0.03	<0.03			<0.03	mg/kg	TM4/PM8
Anthracene #	<0.04	-	<0.04	-	<0.04	-	<0.04	<0.04			<0.04	mg/kg	TM4/PM8
Fluoranthene #	<0.03	-	<0.03	-	<0.03	-	<0.03	<0.03			<0.03	mg/kg	TM4/PM8
Pyrene #	<0.03	-	<0.03	-	<0.03	-	<0.03	<0.03			<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene #	<0.06	-	<0.06	-	<0.06	-	<0.06	<0.06			<0.06	mg/kg	TM4/PM8
Chrysene #	<0.02	-	<0.02	-	<0.02	-	<0.02	<0.02			<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene #	<0.07	-	<0.07	-	<0.07	-	<0.07	<0.07			<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene #	<0.04	-	<0.04	-	<0.04	-	<0.04	<0.04			<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene #	<0.04	-	<0.04	-	<0.04	-	<0.04	<0.04			<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene #	<0.04	-	<0.04	-	<0.04	-	<0.04	<0.04			<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene #	<0.04	-	<0.04	-	<0.04	-	<0.04	<0.04			<0.04	mg/kg	TM4/PM8
Coronene	<0.04	-	<0.04	-	<0.04	-	<0.04	<0.04			<0.04	mg/kg	TM4/PM8
PAH 17 Total	<0.64	-	<0.64	-	<0.64	-	<0.64	<0.64			<0.64	mg/kg	TM4/PM8
Benzo(b)fluoranthene	<0.05	-	<0.05	-	<0.05	-	<0.05	<0.05			<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	<0.02	-	<0.02	-	<0.02	-	<0.02	<0.02			<0.02	mg/kg	TM4/PM8
PAH Surrogate % Recovery	97	-	80	-	100	-	94	95			<0	%	TM4/PM8
Mineral Oil (C10-C40) (EH_CU_1D_AL)	<30	-	<30	-	<30	-	<30	<30			<30	mg/kg	TM5/PM8/PM16

Please include all sections of this report if it is reproduced
All solid results are expressed on a dry weight basis unless stated otherwise.

Client Name: Ground Investigations Ireland
Reference: 13521-01-24
Location: Galway Racecourse Ballybrit
Contact: Stephen Kealy
EMT Job No: 24/3391

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	1-4	5	6-9	10	11-14	15	16-19	20-23			LOD/LOR	Units	Method No.
Sample ID	TP03	TP03	TP03	TP03	TP04	TP04	TP04	TP04					
Depth	0.55	1.10	1.50	3.10	0.50	1.20	2.20	3.30					
COC No / misc													
Containers	V J T	T	V J T	T	V J T	T	V J T	V J T					
Sample Date	22/02/2024	22/02/2024	22/02/2024	22/02/2024	22/02/2024	22/02/2024	22/02/2024	22/02/2024					
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil					
Batch Number	1	1	1	1	1	1	1	1					
Date of Receipt	27/02/2024	27/02/2024	27/02/2024	27/02/2024	27/02/2024	27/02/2024	27/02/2024	27/02/2024					
TPH CWG													
Aliphatics													
>C5-C6 (HS_1D_AL)#	<0.1	-	<0.1	-	<0.1	-	<0.1	<0.1			<0.1	mg/kg	TM36/PM12
>C6-C8 (HS_1D_AL)#	<0.1	-	<0.1	-	<0.1	-	<0.1	<0.1			<0.1	mg/kg	TM36/PM12
>C8-C10 (HS_1D_AL)	<0.1	-	<0.1	-	<0.1	-	<0.1	<0.1			<0.1	mg/kg	TM36/PM12
>C10-C12 (EH_CU_1D_AL)#	<0.2	-	<0.2	-	<0.2	-	<0.2	<0.2			<0.2	mg/kg	TM5/PM8/PM16
>C12-C16 (EH_CU_1D_AL)#	<4	-	<4	-	<4	-	<4	<4			<4	mg/kg	TM5/PM8/PM16
>C16-C21 (EH_CU_1D_AL)#	<7	-	<7	-	<7	-	<7	<7			<7	mg/kg	TM5/PM8/PM16
>C21-C35 (EH_CU_1D_AL)#	<7	-	<7	-	<7	-	<7	<7			<7	mg/kg	TM5/PM8/PM16
Total aliphatics C5-35 (EH_CU+HS_1D_AL)	<19	-	<19	-	<19	-	<19	<19			<19	mg/kg	TM5/TM36/PM8/PM12/PM16
Aromatics													
>C5-EC7 (HS_1D_AR)#	<0.1	-	<0.1	-	<0.1	-	<0.1	<0.1			<0.1	mg/kg	TM36/PM12
>EC7-EC8 (HS_1D_AR)#	<0.1	-	<0.1	-	<0.1	-	<0.1	<0.1			<0.1	mg/kg	TM36/PM12
>EC8-EC10 (HS_1D_AR)#	<0.1	-	<0.1	-	<0.1	-	<0.1	<0.1			<0.1	mg/kg	TM36/PM12
>EC10-EC12 (EH_CU_1D_AR)#	<0.2	-	<0.2	-	<0.2	-	<0.2	<0.2			<0.2	mg/kg	TM5/PM8/PM16
>EC12-EC16 (EH_CU_1D_AR)#	<4	-	<4	-	<4	-	<4	<4			<4	mg/kg	TM5/PM8/PM16
>EC16-EC21 (EH_CU_1D_AR)#	<7	-	<7	-	<7	-	<7	<7			<7	mg/kg	TM5/PM8/PM16
>EC21-EC35 (EH_CU_1D_AR)#	<7	-	<7	-	<7	-	<7	<7			<7	mg/kg	TM5/PM8/PM16
Total aromatics C5-35 (EH_CU+HS_1D_AR)#	<19	-	<19	-	<19	-	<19	<19			<19	mg/kg	TM5/TM36/PM8/PM12/PM16
Total aliphatics and aromatics(C5-35) (EH_CU+HS_1D_Total)	<38	-	<38	-	<38	-	<38	<38			<38	mg/kg	TM5/TM36/PM8/PM12/PM16
MTBE#	<5	-	<5	-	<5	-	<5	<5			<5	ug/kg	TM36/PM12
Benzene#	<5	-	<5	-	<5	-	<5	<5			<5	ug/kg	TM36/PM12
Toluene#	<5	-	<5	-	<5	-	<5	<5			<5	ug/kg	TM36/PM12
Ethylbenzene#	<5	-	<5	-	<5	-	<5	<5			<5	ug/kg	TM36/PM12
m/p-Xylene#	<5	-	<5	-	<5	-	<5	<5			<5	ug/kg	TM36/PM12
o-Xylene#	<5	-	<5	-	<5	-	<5	<5			<5	ug/kg	TM36/PM12
PCB 28#	<5	-	<5	-	<5	-	<5	<5			<5	ug/kg	TM17/PM8
PCB 52#	<5	-	<5	-	<5	-	<5	<5			<5	ug/kg	TM17/PM8
PCB 101#	<5	-	<5	-	<5	-	<5	<5			<5	ug/kg	TM17/PM8
PCB 118#	<5	-	<5	-	<5	-	<5	<5			<5	ug/kg	TM17/PM8
PCB 138#	<5	-	<5	-	<5	-	<5	<5			<5	ug/kg	TM17/PM8
PCB 153#	<5	-	<5	-	<5	-	<5	<5			<5	ug/kg	TM17/PM8
PCB 180#	<5	-	<5	-	<5	-	<5	<5			<5	ug/kg	TM17/PM8
Total 7 PCBs#	<35	-	<35	-	<35	-	<35	<35			<35	ug/kg	TM17/PM8
Natural Moisture Content	20.7	-	10.9	-	17.7	-	13.1	9.0			<0.1	%	PM4/PM0
Hexavalent Chromium#	<0.3	-	<0.3	-	<0.3	-	<0.3	<0.3			<0.3	mg/kg	TM38/PM20
Chromium III	54.2	-	21.8	-	57.9	-	27.3	9.2			<0.5	mg/kg	NONE/NONE
Total Organic Carbon#	0.73	-	0.03	-	0.89	-	0.27	0.05			<0.02	%	TM21/PM24

Element Materials Technology

Client Name: Ground Investigations Ireland
Reference: 13521-01-24
Location: Galway Racecourse Ballybrit
Contact: Stephen Kealy
EMT Job No: 24/3391

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	1-4	5	6-9	10	11-14	15	16-19	20-23			LOD/LOR	Units	Method No.
Sample ID	TP03	TP03	TP03	TP03	TP04	TP04	TP04	TP04					
Depth	0.55	1.10	1.50	3.10	0.50	1.20	2.20	3.30					
COC No / misc													
Containers	V J T	T	V J T	T	V J T	T	V J T	V J T					
Sample Date	22/02/2024	22/02/2024	22/02/2024	22/02/2024	22/02/2024	22/02/2024	22/02/2024	22/02/2024					
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil					
Batch Number	1	1	1	1	1	1	1	1					
Date of Receipt	27/02/2024	27/02/2024	27/02/2024	27/02/2024	27/02/2024	27/02/2024	27/02/2024	27/02/2024					
Loss on Ignition #	5.4	-	<1.0	-	7.9	-	1.8	4.8			<1.0	%	TM22/PM0
pH #	8.09	-	8.38	-	7.94	-	8.15	8.75			<0.01	pH units	TM73/PM11
Asbestos Type*	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD				None	Subcontracted

Please see attached notes for all abbreviations and acronyms

Please include all sections of this report if it is reproduced
All solid results are expressed on a dry weight basis unless stated otherwise.

Client Name: Ground Investigations Ireland
Reference: 13521-01-24
Location: Galway Racecourse Ballybrit
Contact: Stephen Kealy
EMT Job No: 24/3391

Report : CEN 10:1 1 Batch

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	1-4	6-9	11-14	16-19	20-23						LOD/LOR	Units	Method No.
Sample ID	TP03	TP03	TP04	TP04	TP04								
Depth	0.55	1.50	0.50	2.20	3.30								
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T								
Sample Date	22/02/2024	22/02/2024	22/02/2024	22/02/2024	22/02/2024								
Sample Type	Soil	Soil	Soil	Soil	Soil								
Batch Number	1	1	1	1	1								
Date of Receipt	27/02/2024	27/02/2024	27/02/2024	27/02/2024	27/02/2024								
Dissolved Antimony (A10)#	<0.02	<0.02	<0.02	<0.02	<0.02						<0.02	mg/kg	TM170/PM14
Dissolved Arsenic (A10)#	<0.025	<0.025	<0.025	<0.025	<0.025						<0.025	mg/kg	TM170/PM14
Dissolved Barium (A10)#	<0.03	<0.03	<0.03	<0.03	<0.03						<0.03	mg/kg	TM170/PM14
Dissolved Cadmium (A10)#	<0.005	<0.005	<0.005	<0.005	<0.005						<0.005	mg/kg	TM170/PM14
Dissolved Chromium (A10)#	<0.015	<0.015	<0.015	<0.015	<0.015						<0.015	mg/kg	TM170/PM14
Dissolved Copper (A10)#	<0.07	<0.07	<0.07	<0.07	<0.07						<0.07	mg/kg	TM170/PM14
Dissolved Lead (A10)#	<0.05	<0.05	<0.05	<0.05	<0.05						<0.05	mg/kg	TM170/PM14
Dissolved Mercury (A10)#	<0.01	<0.01	<0.01	<0.01	<0.01						<0.01	mg/kg	TM170/PM14
Dissolved Molybdenum (A10)#	<0.02	<0.02	<0.02	<0.02	<0.02						<0.02	mg/kg	TM170/PM14
Dissolved Nickel (A10)#	<0.02	<0.02	<0.02	<0.02	<0.02						<0.02	mg/kg	TM170/PM14
Dissolved Selenium (A10)#	<0.03	<0.03	<0.03	<0.03	<0.03						<0.03	mg/kg	TM170/PM14
Dissolved Zinc (A10)#	<0.03	<0.03	<0.03	<0.03	<0.03						<0.03	mg/kg	TM170/PM14
Total Phenols HPLC	<0.5	<0.5	<0.5	<0.5	<0.5						<0.5	mg/kg	TM26/PM0
Fluoride	<3	<3	<3	<3	<3						<3	mg/kg	TM173/PM0
Sulphate as SO4#	<5	<5	<5	<5	<5						<5	mg/kg	TM38/PM0
Mass of raw test portion	0.1063	0.1003	0.1111	0.176	0.098							kg	NONE/PM17
Chloride#	5	<3	4	5	<3						<3	mg/kg	TM38/PM0
Mass of dried test portion	0.09	0.09	0.09	0.09	0.09							kg	NONE/PM17
Dissolved Organic Carbon	<2	<2	2	<2	<2						<2	mg/l	TM60/PM0
Dissolved Organic Carbon	<20	<20	20	<20	<20						<20	mg/kg	TM60/PM0
Total Dissolved Solids#	730	<350	680	850	<350						<350	mg/kg	TM20/PM0

Please see attached notes for all abbreviations and acronyms

Client Name: Ground Investigations Ireland
Reference: 13521-01-24
Location: Galway Racecourse Ballybrit
Contact: Stephen Kealy
EMT Job No: 24/3391

Report : EN12457_2

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	1-4	6-9	11-14	16-19	20-23						LOD LOR	Units	Method No.
Sample ID	TP03	TP03	TP04	TP04	TP04								
Depth	0.55	1.50	0.50	2.20	3.30								
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T								
Sample Date	22/02/2024	22/02/2024	22/02/2024	22/02/2024	22/02/2024								
Sample Type	Soil	Soil	Soil	Soil	Soil								
Batch Number	1	1	1	1	1								
Date of Receipt	27/02/2024	27/02/2024	27/02/2024	27/02/2024	27/02/2024								
Solid Waste Analysis													
CEN 10:1 Leachate													
Mass of raw test portion	0.1063	0.1003	0.1111	0.176	0.098							kg	NONE/PM17
Dry Matter Content Ratio	84.5	89.8	80.8	51.1	91.7						<0.1	%	NONE/PM4
Leachant Volume	0.883	0.89	0.879	0.814	0.892							l	NONE/PM17
Moisture Content 105C (% Dry Weight)	18.4	11.3	23.8	95.7	9.0						<0.1	%	PM4/PM0

Please see attached notes for all abbreviations and acronyms

Client Name: Ground Investigations Ireland
Reference: 13521-01-24
Location: Galway Racecourse Ballybrit
Contact: Stephen Kealy

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
No deviating sample report results for job 24/3391						

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating. Only analyses which are accredited are recorded as deviating if set criteria are not met.
It is a requirement under ISO 17025 that we inform clients if samples are deviating i.e. outside what is expected. A deviating sample indicates that the sample 'may' be compromised but not necessarily will be compromised. The result is still accredited and our analytical reports will still show accreditation on the relevant analytes.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 24/3391

SOILS and ASH

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. Asbestos samples are retained for 6 months.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C. Ash samples are dried at 37°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overesitimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

STACK EMISSIONS

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation for Dioxins and Furans and Dioxin like PCBs has been performed on XAD-2 Resin, only samples which use this resin will be within our MCERTS scope.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a requirement of our Accreditation Body for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.
Laboratory records are kept for a period of no less than 6 years.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

Customer Provided Information

Sample ID and depth is information provided by the customer.

Age of Diesel

The age of release estimation is based on the nC17/pristane ratio only as prescribed by Christensen and Larsen (1993) and Kaplan, Galperin, Alimi et al., (1996).
Age estimation should be treated with caution as it can be influenced by site specific factors of which the laboratory are not aware.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above quantitative calibration range. The result should be considered the minimum value and is indicative only. The actual result could be significantly higher.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

HWOL ACRONYMS AND OPERATORS USED

HS	Headspace Analysis.
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent.
CU	Clean-up - e.g. by florisil, silica gel.
1D	GC - Single coil gas chromatography.
Total	Aliphatics & Aromatics.
AL	Aliphatics only.
AR	Aromatics only.
2D	GC-GC - Double coil gas chromatography.
#1	EH_Total but with humics mathematically subtracted
#2	EU_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +).
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry.

EMT Job No: 24/3391

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465:1993(E) and BS1377-2:1990.	PM0	No preparation is required.			AR	
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM8/PM16	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required/Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.			AR	Yes
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM8/PM16	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required/Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.	Yes		AR	Yes
TM5/TM36	please refer to TM5 and TM36 for method details	PM8/PM12/PM16	please refer to PM8/PM16 and PM12 for method details			AR	Yes
TM5/TM36	please refer to TM5 and TM36 for method details	PM8/PM12/PM16	please refer to PM8/PM16 and PM12 for method details	Yes		AR	Yes
TM17	Modified US EPA method 8270D v5:2014. Determination of specific Polychlorinated Biphenyl congeners by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM20	Modified BS 1377-3:1990/USEPA 160.1/3 (TDS/TS: 1971) Gravimetric determination of Total Dissolved Solids/Total Solids	PM0	No preparation is required.	Yes		AR	Yes
TM21	Modified BS 7755-3:1995, ISO10694:1995 Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection. Organic Matter (SOM) calculated as per EA MCERTS Chemical Testing of Soil, March 2012 v4.	PM24	Preparation of Soil and Marine Sediment Samples for Total Organic Carbon.	Yes		AD	Yes

EMT Job No: 24/3391

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM22	Modified BS1377-3:1990 Gravimetric determination of Loss on Ignition by temperature controlled Muffle Furnace (35C-440C). On request modified ASTM D2974-00 LOI (105C-440C)	PM0	No preparation is required.	Yes		AD	Yes
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM0	No preparation is required.			AR	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.			AD	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.	Yes		AD	Yes
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results will be re-run using GC-MS to double check, when requested.	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results will be re-run using GC-MS to double check, when requested.	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013I	PM0	No preparation is required.	Yes		AR	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013I	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AR	Yes
TM60	TC/TOC analysis of Waters by High Temperature Combustion followed by NDIR detection. Based on the following modified standard methods: USEPA 9060A (2002), APHA SMEWW 5310B:1999 22nd Edition, ASTM D 7573, and USEPA 415.1.	PM0	No preparation is required.			AR	Yes
TM73	Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No

EMT Job No: 24/3391

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM170	Determination of Trace Metals by ICP-MS (Inductively Coupled Plasma – Mass Spectrometry): Modified USEPA Method 200.8, Rev. 5.4, 1994; Modified EPA Method 6020A, Rev.1, Feb 2007; Modified BS EN ISO 17294-2:2016	PM14	Preparation of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for Dissolved metals, and remain unfiltered for Total metals then acidified	Yes		AR	Yes
TM173	Analysis of fluoride by ISE (Ion Selective Electrode) using modified ISE method 9214 - 340.2 (EPA 1998)	PM0	No preparation is required.			AR	Yes
NONE	No Method Code	NONE	No Method Code			AD	Yes
NONE	No Method Code	PM17	Modified method BS EN12457-2:2002 As received solid samples are leached with water in a 10:1 water to soil ratio for 24 hours, the moisture content of the sample is included in the ratio.				
NONE	No Method Code	PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465:1993(E) and BS1377-2:1990.			AR	
Subcontracted	See attached subcontractor report for accreditation status and provider.					AR	

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Attention :	Stephen Kealy
Date :	12th March, 2024
Your reference :	13521-01-24
Our reference :	Test Report 24/3391 Batch 2
Location :	Galway Racecourse Ballybrit
Date samples received :	28th February, 2024
Status :	Final Report
Issue :	202403121510

Thirty samples were received for analysis on 28th February, 2024 of which sixteen were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

The greenhouse gas emissions generated (in Carbon – Co2e) to obtain the results in this report are estimated as:

Scope 1&2 emissions - 72.979 kg of CO2

Scope 1&2&3 emissions - 172.469 kg of CO2

Authorised By:

Liza Klebe
Project Co-ordinator

Client Name: Ground Investigations Ireland
Reference: 13521-01-24
Location: Galway Racecourse Ballybrit
Contact: Stephen Kealy
EMT Job No: 24/3391

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	84-87	88-91	92-95	96-99	100-103	104-107	108-111	112-115	116-119	120-123	LOD/LOR	Units	Method No.
Sample ID	TP07	TP07	TP07	TP08	TP08	TP08	TP09	TP09	TP09	TP10			
Depth	0.50	1.50	2.50	0.45	1.40	2.30	0.25	1.50	2.90	0.30			
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T			
Sample Date	26/02/2024	26/02/2024	26/02/2024	23/02/2024	23/02/2024	23/02/2024	23/02/2024	23/02/2024	23/02/2024	26/02/2024			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Batch Number	2	2	2	2	2	2	2	2	2	2			
Date of Receipt	28/02/2024	28/02/2024	28/02/2024	28/02/2024	28/02/2024	28/02/2024	28/02/2024	28/02/2024	28/02/2024	28/02/2024			
Antimony	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	mg/kg	TM30/PM15
Arsenic #	5.7	2.6	2.0	3.1	2.2	1.5	3.5	3.3	1.6	4.9	<0.5	mg/kg	TM30/PM15
Barium #	40	25	21	15	21	14	23	22	18	36	<1	mg/kg	TM30/PM15
Cadmium #	0.8	0.6	0.5	0.4	0.5	0.5	0.9	0.7	0.6	0.8	<0.1	mg/kg	TM30/PM15
Chromium #	27.0	10.8	9.2	14.5	7.5	7.6	12.4	9.4	8.3	18.9	<0.5	mg/kg	TM30/PM15
Copper #	13	7	6	7	6	4	8	7	5	11	<1	mg/kg	TM30/PM15
Lead #	22	5	<5	6	<5	<5	6	<5	<5	16	<5	mg/kg	TM30/PM15
Mercury #	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	mg/kg	TM30/PM15
Molybdenum #	0.8	0.3	0.2	0.8	0.3	0.3	0.5	0.4	0.2	0.7	<0.1	mg/kg	TM30/PM15
Nickel #	22.2	10.8	8.1	9.0	7.3	5.5	10.9	9.6	6.7	18.7	<0.7	mg/kg	TM30/PM15
Selenium #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	mg/kg	TM30/PM15
Zinc #	44	20	18	31	14	10	21	17	13	41	<5	mg/kg	TM30/PM15
PAH MS													
Naphthalene #	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	TM4/PM8
Acenaphthylene	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	mg/kg	TM4/PM8
Acenaphthene #	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	mg/kg	TM4/PM8
Fluorene #	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	TM4/PM8
Phenanthrene #	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	mg/kg	TM4/PM8
Anthracene #	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	TM4/PM8
Fluoranthene #	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	mg/kg	TM4/PM8
Pyrene #	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene #	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	mg/kg	TM4/PM8
Chrysene #	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene #	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene #	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene #	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene #	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene #	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	TM4/PM8
Coronene	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	TM4/PM8
PAH 17 Total	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64	mg/kg	TM4/PM8
Benzo(b)fluoranthene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	mg/kg	TM4/PM8
PAH Surrogate % Recovery	101	83	86	99	92	93	95	99	94	101	<0	%	TM4/PM8
Mineral Oil (C10-C40) (EH_CU_1D_AL)	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	mg/kg	TM5/PM8/PM16

Please see attached notes for all abbreviations and acronyms

Client Name: Ground Investigations Ireland
Reference: 13521-01-24
Location: Galway Racecourse Ballybrit
Contact: Stephen Kealy
EMT Job No: 24/3391

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	84-87	88-91	92-95	96-99	100-103	104-107	108-111	112-115	116-119	120-123	LOD/LOR	Units	Method No.
Sample ID	TP07	TP07	TP07	TP08	TP08	TP08	TP09	TP09	TP09	TP10			
Depth	0.50	1.50	2.50	0.45	1.40	2.30	0.25	1.50	2.90	0.30			
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T			
Sample Date	26/02/2024	26/02/2024	26/02/2024	23/02/2024	23/02/2024	23/02/2024	23/02/2024	23/02/2024	23/02/2024	26/02/2024			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Batch Number	2	2	2	2	2	2	2	2	2	2			
Date of Receipt	28/02/2024	28/02/2024	28/02/2024	28/02/2024	28/02/2024	28/02/2024	28/02/2024	28/02/2024	28/02/2024	28/02/2024			
TPH CWG													
Aliphatics													
>C5-C6 (HS_1D_AL)#	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	TM36/PM12
>C6-C8 (HS_1D_AL)#	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	TM36/PM12
>C8-C10 (HS_1D_AL)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	TM36/PM12
>C10-C12 (EH_CU_1D_AL)#	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	mg/kg	TM5/PM8/PM16
>C12-C16 (EH_CU_1D_AL)#	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	mg/kg	TM5/PM8/PM16
>C16-C21 (EH_CU_1D_AL)#	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	mg/kg	TM5/PM8/PM16
>C21-C35 (EH_CU_1D_AL)#	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	mg/kg	TM5/PM8/PM16
Total aliphatics C5-35 (EH_CU+HS_1D_AL)	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19	mg/kg	TM5/TM36/PM8/PM12/PM16
Aromatics													
>C5-EC7 (HS_1D_AR)#	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	TM36/PM12
>EC7-EC8 (HS_1D_AR)#	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	TM36/PM12
>EC8-EC10 (HS_1D_AR)#	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	TM36/PM12
>EC10-EC12 (EH_CU_1D_AR)#	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	mg/kg	TM5/PM8/PM16
>EC12-EC16 (EH_CU_1D_AR)#	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	mg/kg	TM5/PM8/PM16
>EC16-EC21 (EH_CU_1D_AR)#	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	mg/kg	TM5/PM8/PM16
>EC21-EC35 (EH_CU_1D_AR)#	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	mg/kg	TM5/PM8/PM16
Total aromatics C5-35 (EH_CU+HS_1D_AR)#	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19	mg/kg	TM5/TM36/PM8/PM12/PM16
Total aliphatics and aromatics(C5-35) (EH_CU+HS_1D_Total)	<38	<38	<38	<38	<38	<38	<38	<38	<38	<38	<38	mg/kg	TM5/TM36/PM8/PM12/PM16
MTBE#	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/kg	TM36/PM12
Benzene#	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/kg	TM36/PM12
Toluene#	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/kg	TM36/PM12
Ethylbenzene#	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/kg	TM36/PM12
m/p-Xylene#	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/kg	TM36/PM12
o-Xylene#	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/kg	TM36/PM12
PCB 28#	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/kg	TM17/PM8
PCB 52#	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/kg	TM17/PM8
PCB 101#	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/kg	TM17/PM8
PCB 118#	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/kg	TM17/PM8
PCB 138#	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/kg	TM17/PM8
PCB 153#	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/kg	TM17/PM8
PCB 180#	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/kg	TM17/PM8
Total 7 PCBs#	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	ug/kg	TM17/PM8
Natural Moisture Content	24.9	10.3	9.0	12.9	9.3	6.4	9.7	11.5	9.1	19.1	<0.1	%	PM4/PM0
Hexavalent Chromium#	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	mg/kg	TM38/PM20
Chromium III	27.0	10.8	9.2	14.5	7.5	7.6	12.4	9.4	8.3	18.9	<0.5	mg/kg	NONE/NONE
Total Cyanide#	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	mg/kg	TM89/PM45

Please see attached notes for all abbreviations and acronyms

Element Materials Technology

Client Name: Ground Investigations Ireland
Reference: 13521-01-24
Location: Galway Racecourse Ballybrit
Contact: Stephen Kealy
EMT Job No: 24/3391

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	84-87	88-91	92-95	96-99	100-103	104-107	108-111	112-115	116-119	120-123	LOD/LOR	Units	Method No.
Sample ID	TP07	TP07	TP07	TP08	TP08	TP08	TP09	TP09	TP09	TP10			
Depth	0.50	1.50	2.50	0.45	1.40	2.30	0.25	1.50	2.90	0.30			
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T			
Sample Date	26/02/2024	26/02/2024	26/02/2024	23/02/2024	23/02/2024	23/02/2024	23/02/2024	23/02/2024	23/02/2024	26/02/2024			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Batch Number	2	2	2	2	2	2	2	2	2	2			
Date of Receipt	28/02/2024	28/02/2024	28/02/2024	28/02/2024	28/02/2024	28/02/2024	28/02/2024	28/02/2024	28/02/2024	28/02/2024			
Total Organic Carbon #	1.15	0.03	0.07	0.38	<0.02	<0.02	0.24	0.15	0.04	0.97	<0.02	%	TM21/PM24
Loss on Ignition #	6.1	<1.0	<1.0	1.8	<1.0	<1.0	1.2	<1.0	<1.0	4.5	<1.0	%	TM22/PM0
pH #	7.69	8.28	8.40	8.51	8.42	9.01	8.48	8.90	8.81	7.87	<0.01	pH units	TM73/PM11
Asbestos Type*	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD		None	Subcontracted

Please see attached notes for all abbreviations and acronyms

Client Name: Ground Investigations Ireland
Reference: 13521-01-24
Location: Galway Racecourse Ballybrit
Contact: Stephen Kealy
EMT Job No: 24/3391

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	124-127	128-131	132-135	136-139	140-143	144-147					LOD/LOR	Units	Method No.
Sample ID	TP10A	TP10A	TP10A	TP11	TP11	TP11							
Depth	0.45	1.50	2.50	0.40	1.50	2.50							
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T	V J T							
Sample Date	26/02/2024	26/02/2024	26/02/2024	26/02/2024	26/02/2024	26/02/2024							
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil							
Batch Number	2	2	2	2	2	2							
Date of Receipt	28/02/2024	28/02/2024	28/02/2024	28/02/2024	28/02/2024	28/02/2024							
Antimony	<1	<1	<1	<1	<1	<1					<1	mg/kg	TM30/PM15
Arsenic #	6.9	3.0	2.2	4.2	2.7	2.7					<0.5	mg/kg	TM30/PM15
Barium #	46	27	21	26	28	25					<1	mg/kg	TM30/PM15
Cadmium #	1.0	0.7	0.5	0.6	0.7	0.6					<0.1	mg/kg	TM30/PM15
Chromium #	26.0	10.6	8.3	15.8	9.7	9.9					<0.5	mg/kg	TM30/PM15
Copper #	18	8	6	10	8	7					<1	mg/kg	TM30/PM15
Lead #	21	5	<5	11	<5	6					<5	mg/kg	TM30/PM15
Mercury #	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1					<0.1	mg/kg	TM30/PM15
Molybdenum #	0.8	0.4	0.2	1.0	0.3	0.3					<0.1	mg/kg	TM30/PM15
Nickel #	25.6	11.1	8.4	15.0	10.3	9.9					<0.7	mg/kg	TM30/PM15
Selenium #	<1	<1	<1	<1	<1	<1					<1	mg/kg	TM30/PM15
Zinc #	49	21	17	26	20	21					<5	mg/kg	TM30/PM15
PAH MS													
Naphthalene #	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04					<0.04	mg/kg	TM4/PM8
Acenaphthylene	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03					<0.03	mg/kg	TM4/PM8
Acenaphthene #	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05					<0.05	mg/kg	TM4/PM8
Fluorene #	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04					<0.04	mg/kg	TM4/PM8
Phenanthrene #	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03					<0.03	mg/kg	TM4/PM8
Anthracene #	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04					<0.04	mg/kg	TM4/PM8
Fluoranthene #	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03					<0.03	mg/kg	TM4/PM8
Pyrene #	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03					<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene #	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06					<0.06	mg/kg	TM4/PM8
Chrysene #	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02					<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene #	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07					<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene #	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04					<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene #	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04					<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene #	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04					<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene #	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04					<0.04	mg/kg	TM4/PM8
Coronene	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04					<0.04	mg/kg	TM4/PM8
PAH 17 Total	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64					<0.64	mg/kg	TM4/PM8
Benzo(b)fluoranthene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05					<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02					<0.02	mg/kg	TM4/PM8
PAH Surrogate % Recovery	98	93	102	103	96	93					<0	%	TM4/PM8
Mineral Oil (C10-C40) (EH_CU_1D_AL)	<30	<30	<30	<30	<30	<30					<30	mg/kg	TM5/PM8/PM16

Client Name: Ground Investigations Ireland
Reference: 13521-01-24
Location: Galway Racecourse Ballybrit
Contact: Stephen Kealy
EMT Job No: 24/3391

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	124-127	128-131	132-135	136-139	140-143	144-147					LOD/LOR	Units	Method No.
Sample ID	TP10A	TP10A	TP10A	TP11	TP11	TP11							
Depth	0.45	1.50	2.50	0.40	1.50	2.50							
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T	V J T							
Sample Date	26/02/2024	26/02/2024	26/02/2024	26/02/2024	26/02/2024	26/02/2024							
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil							
Batch Number	2	2	2	2	2	2							
Date of Receipt	28/02/2024	28/02/2024	28/02/2024	28/02/2024	28/02/2024	28/02/2024							
TPH CWG													
Aliphatics													
>C5-C6 (HS_1D_AL)#	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1					<0.1	mg/kg	TM36/PM12
>C6-C8 (HS_1D_AL)#	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1					<0.1	mg/kg	TM36/PM12
>C8-C10 (HS_1D_AL)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1					<0.1	mg/kg	TM36/PM12
>C10-C12 (EH_CU_1D_AL)#	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2					<0.2	mg/kg	TM5/PM8/PM16
>C12-C16 (EH_CU_1D_AL)#	<4	<4	<4	<4	<4	<4					<4	mg/kg	TM5/PM8/PM16
>C16-C21 (EH_CU_1D_AL)#	<7	<7	<7	<7	<7	<7					<7	mg/kg	TM5/PM8/PM16
>C21-C35 (EH_CU_1D_AL)#	<7	<7	<7	<7	<7	<7					<7	mg/kg	TM5/PM8/PM16
Total aliphatics C5-35 (EH_CU+HS_1D_AL)	<19	<19	<19	<19	<19	<19					<19	mg/kg	TM5/TM36/PM8/PM12/PM16
Aromatics													
>C5-EC7 (HS_1D_AR)#	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1					<0.1	mg/kg	TM36/PM12
>EC7-EC8 (HS_1D_AR)#	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1					<0.1	mg/kg	TM36/PM12
>EC8-EC10 (HS_1D_AR)#	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1					<0.1	mg/kg	TM36/PM12
>EC10-EC12 (EH_CU_1D_AR)#	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2					<0.2	mg/kg	TM5/PM8/PM16
>EC12-EC16 (EH_CU_1D_AR)#	<4	<4	<4	<4	<4	<4					<4	mg/kg	TM5/PM8/PM16
>EC16-EC21 (EH_CU_1D_AR)#	<7	<7	<7	<7	<7	<7					<7	mg/kg	TM5/PM8/PM16
>EC21-EC35 (EH_CU_1D_AR)#	<7	<7	<7	<7	<7	<7					<7	mg/kg	TM5/PM8/PM16
Total aromatics C5-35 (EH_CU+HS_1D_AR)#	<19	<19	<19	<19	<19	<19					<19	mg/kg	TM5/TM36/PM8/PM12/PM16
Total aliphatics and aromatics(C5-35) (EH_CU+HS_1D_Total)	<38	<38	<38	<38	<38	<38					<38	mg/kg	TM5/TM36/PM8/PM12/PM16
MTBE#	<5	<5	<5	<5	<5	<5					<5	ug/kg	TM36/PM12
Benzene#	<5	<5	<5	<5	<5	<5					<5	ug/kg	TM36/PM12
Toluene#	<5	<5	<5	9	<5	<5					<5	ug/kg	TM36/PM12
Ethylbenzene#	<5	<5	<5	<5	<5	<5					<5	ug/kg	TM36/PM12
m/p-Xylene#	<5	<5	<5	<5	<5	<5					<5	ug/kg	TM36/PM12
o-Xylene#	<5	<5	<5	<5	<5	<5					<5	ug/kg	TM36/PM12
PCB 28#	<5	<5	<5	<5	<5	<5					<5	ug/kg	TM17/PM8
PCB 52#	<5	<5	<5	<5	<5	<5					<5	ug/kg	TM17/PM8
PCB 101#	<5	<5	<5	<5	<5	<5					<5	ug/kg	TM17/PM8
PCB 118#	<5	<5	<5	<5	<5	<5					<5	ug/kg	TM17/PM8
PCB 138#	<5	<5	<5	<5	<5	<5					<5	ug/kg	TM17/PM8
PCB 153#	<5	<5	<5	<5	<5	<5					<5	ug/kg	TM17/PM8
PCB 180#	<5	<5	<5	<5	<5	<5					<5	ug/kg	TM17/PM8
Total 7 PCBs#	<35	<35	<35	<35	<35	<35					<35	ug/kg	TM17/PM8
Natural Moisture Content	17.7	10.7	8.3	10.8	11.0	7.9					<0.1	%	PM4/PM0
Hexavalent Chromium#	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3					<0.3	mg/kg	TM38/PM20
Chromium III	26.0	10.6	8.3	15.8	9.7	9.9					<0.5	mg/kg	NONE/NONE
Total Cyanide#	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5					<0.5	mg/kg	TM89/PM45

Please see attached notes for all abbreviations and acronyms

Element Materials Technology

Client Name: Ground Investigations Ireland
Reference: 13521-01-24
Location: Galway Racecourse Ballybrit
Contact: Stephen Kealy
EMT Job No: 24/3391

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	124-127	128-131	132-135	136-139	140-143	144-147					LOD/LOR	Units	Method No.
Sample ID	TP10A	TP10A	TP10A	TP11	TP11	TP11							
Depth	0.45	1.50	2.50	0.40	1.50	2.50							
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T	V J T							
Sample Date	26/02/2024	26/02/2024	26/02/2024	26/02/2024	26/02/2024	26/02/2024							
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil							
Batch Number	2	2	2	2	2	2							
Date of Receipt	28/02/2024	28/02/2024	28/02/2024	28/02/2024	28/02/2024	28/02/2024							
Total Organic Carbon #	1.18	0.05	<0.02	0.48	0.02	0.03					<0.02	%	TM21/PM24
Loss on Ignition #	<1.0	<1.0	<1.0	2.0	<1.0	<1.0					<1.0	%	TM22/PM0
pH #	8.03	8.32	8.38	7.84	8.44	8.42					<0.01	pH units	TM73/PM11
Asbestos Type*	NAD	NAD	NAD	NAD	NAD	NAD						None	Subcontracted

Please see attached notes for all abbreviations and acronyms

Client Name: Ground Investigations Ireland
Reference: 13521-01-24
Location: Galway Racecourse Ballybrit
Contact: Stephen Kealy
EMT Job No: 24/3391

Report : CEN 10:1 1 Batch

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	84-87	88-91	92-95	96-99	100-103	104-107	108-111	112-115	116-119	120-123	LOD/LOR	Units	Method No.
Sample ID	TP07	TP07	TP07	TP08	TP08	TP08	TP09	TP09	TP09	TP10			
Depth	0.50	1.50	2.50	0.45	1.40	2.30	0.25	1.50	2.90	0.30			
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T			
Sample Date	26/02/2024	26/02/2024	26/02/2024	23/02/2024	23/02/2024	23/02/2024	23/02/2024	23/02/2024	23/02/2024	26/02/2024			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Batch Number	2	2	2	2	2	2	2	2	2	2			
Date of Receipt	28/02/2024	28/02/2024	28/02/2024	28/02/2024	28/02/2024	28/02/2024	28/02/2024	28/02/2024	28/02/2024	28/02/2024			
Dissolved Antimony (A10)#	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	mg/kg	TM170/PM14
Dissolved Arsenic (A10)#	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	mg/kg	TM170/PM14
Dissolved Barium (A10)#	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	mg/kg	TM170/PM14
Dissolved Cadmium (A10)#	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	mg/kg	TM170/PM14
Dissolved Chromium (A10)#	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	mg/kg	TM170/PM14
Dissolved Copper (A10)#	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	mg/kg	TM170/PM14
Dissolved Lead (A10)#	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	mg/kg	TM170/PM14
Dissolved Mercury (A10)#	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	TM170/PM14
Dissolved Molybdenum (A10)#	<0.02	<0.02	<0.02	0.05	0.02	0.03	0.04	0.04	<0.02	<0.02	<0.02	mg/kg	TM170/PM14
Dissolved Nickel (A10)#	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	mg/kg	TM170/PM14
Dissolved Selenium (A10)#	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	mg/kg	TM170/PM14
Dissolved Zinc (A10)#	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	mg/kg	TM170/PM14
Total Phenols HPLC	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	mg/kg	TM26/PM0
Fluoride	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	mg/kg	TM173/PM0
Sulphate as SO4#	<5	<5	<5	18	16	<5	<5	15	17	84	<5	mg/kg	TM38/PM0
Mass of raw test portion	0.1115	0.1013	0.1149	0.107	0.1006	0.0989	0.1024	0.1	0.0984	0.1082		kg	NONE/PM17
Chloride#	3	<3	<3	4	3	<3	6	6	3	5	<3	mg/kg	TM38/PM0
Mass of dried test portion	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09		kg	NONE/PM17
Dissolved Organic Carbon	2	<2	<2	<2	<2	<2	3	<2	<2	3	<2	mg/l	TM60/PM0
Dissolved Organic Carbon	20	<20	<20	<20	<20	<20	30	<20	<20	30	<20	mg/kg	TM60/PM0
Total Dissolved Solids#	<350	<350	<350	450	<350	<350	610	<350	<350	890	<350	mg/kg	TM20/PM0

Please see attached notes for all abbreviations and acronyms

Client Name: Ground Investigations Ireland
Reference: 13521-01-24
Location: Galway Racecourse Ballybrit
Contact: Stephen Kealy
EMT Job No: 24/3391

Report : CEN 10:1 1 Batch

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	124-127	128-131	132-135	136-139	140-143	144-147					LOD/LOR	Units	Method No.
Sample ID	TP10A	TP10A	TP10A	TP11	TP11	TP11							
Depth	0.45	1.50	2.50	0.40	1.50	2.50							
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T	V J T							
Sample Date	26/02/2024	26/02/2024	26/02/2024	26/02/2024	26/02/2024	26/02/2024							
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil							
Batch Number	2	2	2	2	2	2							
Date of Receipt	28/02/2024	28/02/2024	28/02/2024	28/02/2024	28/02/2024	28/02/2024							
Dissolved Antimony (A10)#	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02					<0.02	mg/kg	TM170/PM14
Dissolved Arsenic (A10)#	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025					<0.025	mg/kg	TM170/PM14
Dissolved Barium (A10)#	<0.03	<0.03	<0.03	0.03	<0.03	<0.03					<0.03	mg/kg	TM170/PM14
Dissolved Cadmium (A10)#	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005					<0.005	mg/kg	TM170/PM14
Dissolved Chromium (A10)#	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015					<0.015	mg/kg	TM170/PM14
Dissolved Copper (A10)#	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07					<0.07	mg/kg	TM170/PM14
Dissolved Lead (A10)#	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05					<0.05	mg/kg	TM170/PM14
Dissolved Mercury (A10)#	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01					<0.01	mg/kg	TM170/PM14
Dissolved Molybdenum (A10)#	<0.02	<0.02	<0.02	0.04	<0.02	<0.02					<0.02	mg/kg	TM170/PM14
Dissolved Nickel (A10)#	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02					<0.02	mg/kg	TM170/PM14
Dissolved Selenium (A10)#	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03					<0.03	mg/kg	TM170/PM14
Dissolved Zinc (A10)#	0.05	<0.03	<0.03	<0.03	0.04	0.05					<0.03	mg/kg	TM170/PM14
Total Phenols HPLC	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5					<0.5	mg/kg	TM26/PM0
Fluoride	<3	<3	<3	<3	<3	<3					<3	mg/kg	TM173/PM0
Sulphate as SO4#	42	22	23	207	6	17					<5	mg/kg	TM38/PM0
Mass of raw test portion	0.1084	0.1001	0.0996	0.1074	0.101	0.0991						kg	NONE/PM17
Chloride#	4	4	3	5	<3	<3					<3	mg/kg	TM38/PM0
Mass of dried test portion	0.09	0.09	0.09	0.09	0.09	0.09						kg	NONE/PM17
Dissolved Organic Carbon	3	<2	<2	6	<2	<2					<2	mg/l	TM60/PM0
Dissolved Organic Carbon	30	<20	<20	60	<20	<20					<20	mg/kg	TM60/PM0
Total Dissolved Solids#	810	440	<350	1471	<350	<350					<350	mg/kg	TM20/PM0

Element Materials Technology

Client Name: Ground Investigations Ireland
Reference: 13521-01-24
Location: Galway Racecourse Ballybrit
Contact: Stephen Kealy
EMT Job No: 24/3391

Report : EN12457_2

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	84-87	88-91	92-95	96-99	100-103	104-107	108-111	112-115	116-119	120-123			
Sample ID	TP07	TP07	TP07	TP08	TP08	TP08	TP09	TP09	TP09	TP10			
Depth	0.50	1.50	2.50	0.45	1.40	2.30	0.25	1.50	2.90	0.30	Please see attached notes for all abbreviations and acronyms		
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T			
Sample Date	26/02/2024	26/02/2024	26/02/2024	23/02/2024	23/02/2024	23/02/2024	23/02/2024	23/02/2024	23/02/2024	26/02/2024			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Batch Number	2	2	2	2	2	2	2	2	2	2			
Date of Receipt	28/02/2024	28/02/2024	28/02/2024	28/02/2024	28/02/2024	28/02/2024	28/02/2024	28/02/2024	28/02/2024	28/02/2024	LOD LOR	Units	Method No.
Solid Waste Analysis													
CEN 10:1 Leachate													
Mass of raw test portion	0.1115	0.1013	0.1149	0.107	0.1006	0.0989	0.1024	0.1	0.0984	0.1082		kg	NONE/PM17
Dry Matter Content Ratio	80.9	88.8	78.7	84.0	89.8	91.2	87.6	90.1	91.7	82.9	<0.1	%	NONE/PM4
Leachant Volume	0.879	0.889	0.876	0.883	0.89	0.891	0.887	0.89	0.892	0.881		l	NONE/PM17
Moisture Content 105C (% Dry Weight)	23.5	12.6	27.1	19.1	11.4	9.7	14.2	11.0	9.1	20.7	<0.1	%	PM4/PM0

Please include all sections of this report if it is reproduced
All solid results are expressed on a dry weight basis unless stated otherwise.

Element Materials Technology

Client Name: Ground Investigations Ireland
Reference: 13521-01-24
Location: Galway Racecourse Ballybrit
Contact: Stephen Kealy
EMT Job No: 24/3391

Report : EN12457_2

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	124-127	128-131	132-135	136-139	140-143	144-147					LOD LOR	Units	Method No.
Sample ID	TP10A	TP10A	TP10A	TP11	TP11	TP11							
Depth	0.45	1.50	2.50	0.40	1.50	2.50							
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T	V J T							
Sample Date	26/02/2024	26/02/2024	26/02/2024	26/02/2024	26/02/2024	26/02/2024							
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil							
Batch Number	2	2	2	2	2	2							
Date of Receipt	28/02/2024	28/02/2024	28/02/2024	28/02/2024	28/02/2024	28/02/2024							
Solid Waste Analysis													
CEN 10:1 Leachate													
Mass of raw test portion	0.1084	0.1001	0.0996	0.1074	0.101	0.0991						kg	NONE/PM17
Dry Matter Content Ratio	82.9	89.8	90.5	83.7	89.1	91.2					<0.1	%	NONE/PM4
Leachant Volume	0.881	0.89	0.891	0.883	0.889	0.891						l	NONE/PM17
Moisture Content 105C (% Dry Weight)	20.7	11.4	10.5	19.4	12.2	9.6					<0.1	%	PM4/PM0

Please see attached notes for all abbreviations and acronyms

Please include all sections of this report if it is reproduced
All solid results are expressed on a dry weight basis unless stated otherwise.

Client Name: Ground Investigations Ireland
Reference: 13521-01-24
Location: Galway Racecourse Ballybrit
Contact: Stephen Kealy

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
No deviating sample report results for job 24/3391						

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating. Only analyses which are accredited are recorded as deviating if set criteria are not met.
It is a requirement under ISO 17025 that we inform clients if samples are deviating i.e. outside what is expected. A deviating sample indicates that the sample 'may' be compromised but not necessarily will be compromised. The result is still accredited and our analytical reports will still show accreditation on the relevant analytes.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 24/3391

SOILS and ASH

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. Asbestos samples are retained for 6 months.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C. Ash samples are dried at 37°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overesitimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

STACK EMISSIONS

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation for Dioxins and Furans and Dioxin like PCBs has been performed on XAD-2 Resin, only samples which use this resin will be within our MCERTS scope.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a requirement of our Accreditation Body for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.
Laboratory records are kept for a period of no less than 6 years.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

Customer Provided Information

Sample ID and depth is information provided by the customer.

Age of Diesel

The age of release estimation is based on the nC17/pristane ratio only as prescribed by Christensen and Larsen (1993) and Kaplan, Galperin, Alimi et al., (1996).
Age estimation should be treated with caution as it can be influenced by site specific factors of which the laboratory are not aware.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above quantitative calibration range. The result should be considered the minimum value and is indicative only. The actual result could be significantly higher.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

HWOL ACRONYMS AND OPERATORS USED

HS	Headspace Analysis.
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent.
CU	Clean-up - e.g. by florisil, silica gel.
1D	GC - Single coil gas chromatography.
Total	Aliphatics & Aromatics.
AL	Aliphatics only.
AR	Aromatics only.
2D	GC-GC - Double coil gas chromatography.
#1	EH_Total but with humics mathematically subtracted
#2	EU_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +).
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry.

EMT Job No: 24/3391

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465:1993(E) and BS1377-2:1990.	PM0	No preparation is required.			AR	
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM8/PM16	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required/Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.			AR	Yes
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM8/PM16	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required/Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.	Yes		AR	Yes
TM5/TM36	please refer to TM5 and TM36 for method details	PM8/PM12/PM16	please refer to PM8/PM16 and PM12 for method details			AR	Yes
TM5/TM36	please refer to TM5 and TM36 for method details	PM8/PM12/PM16	please refer to PM8/PM16 and PM12 for method details	Yes		AR	Yes
TM17	Modified US EPA method 8270D v5:2014. Determination of specific Polychlorinated Biphenyl congeners by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM20	Modified BS 1377-3:1990/USEPA 160.1/3 (TDS/TS: 1971) Gravimetric determination of Total Dissolved Solids/Total Solids	PM0	No preparation is required.	Yes		AR	Yes
TM21	Modified BS 7755-3:1995, ISO10694:1995 Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection. Organic Matter (SOM) calculated as per EA MCERTS Chemical Testing of Soil, March 2012 v4.	PM24	Preparation of Soil and Marine Sediment Samples for Total Organic Carbon.	Yes		AD	Yes

EMT Job No: 24/3391

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM22	Modified BS1377-3:1990 Gravimetric determination of Loss on Ignition by temperature controlled Muffle Furnace (35C-440C). On request modified ASTM D2974-00 LOI (105C-440C)	PM0	No preparation is required.	Yes		AD	Yes
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM0	No preparation is required.			AR	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.			AD	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.	Yes		AD	Yes
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results will be re-run using GC-MS to double check, when requested.	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results will be re-run using GC-MS to double check, when requested.	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013I	PM0	No preparation is required.	Yes		AR	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013I	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AR	Yes
TM60	TC/TOC analysis of Waters by High Temperature Combustion followed by NDIR detection. Based on the following modified standard methods: USEPA 9060A (2002), APHA SMEWW 5310B:1999 22nd Edition, ASTM D 7573, and USEPA 415.1.	PM0	No preparation is required.			AR	Yes
TM73	Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No

EMT Job No: 24/3391

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM89	Modified USEPA method OIA-1667 (1999). Determination of cyanide by Flow Injection Analyser. Where WAD cyanides are required a Ligand displacement step is carried out before analysis.	PM45	As received solid samples are extracted with 1M NaOH by orbital shaker for Cyanide, Sulphide and Thiocyanate analysis.	Yes		AR	Yes
TM170	Determination of Trace Metals by ICP-MS (Inductively Coupled Plasma – Mass Spectrometry): Modified USEPA Method 200.8, Rev. 5.4, 1994; Modified EPA Method 6020A, Rev.1, Feb 2007; Modified BS EN ISO 17294-2:2016	PM14	Preparation of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for Dissolved metals, and remain unfiltered for Total metals then acidified	Yes		AR	Yes
TM173	Analysis of fluoride by ISE (Ion Selective Electrode) using modified ISE method 9214 - 340.2 (EPA 1998)	PM0	No preparation is required.			AR	Yes
NONE	No Method Code	NONE	No Method Code			AD	Yes
NONE	No Method Code	PM17	Modified method BS EN12457-2:2002 As received solid samples are leached with water in a 10:1 water to soil ratio for 24 hours, the moisture content of the sample is included in the ratio.				
NONE	No Method Code	PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465:1993(E) and BS1377-2:1990.			AR	
Subcontracted	See attached subcontractor report for accreditation status and provider.					AR	

APPENDIX 6 – Groundwater Monitoring

Ground Investigations Ireland Ltd
www.gii.ie

Site	Borehole Number
Galway Racecourse Geotechnical Investigations, Ballybrit, Co. Galway	BH01

Installation Type	Dimensions	Client	Job Number
		Galway County Council	13521-01-24

Location	Ground Level (mOD)	Project Contractor	Sheet
533635 E 727902 N	51.78	Ground Investigations Ireland	1/1

Legend	Water	Instr (A)	Level (mOD)	Depth (m)	Description
					Cement/Bentonite Grout
			50.28	1.50	
					Slotted Standpipe
			47.78	4.00	
					Cement/Bentonite Grout
			47.48	4.30	

Groundwater Strikes During Drilling

Date	Time	Depth Struck (m)	Casing Depth (m)	Inflow Rate	Readings 5 min	Readings 10 min	Readings 15 min	Readings 20 min	Depth Sealed (m)

Groundwater Observations During Drilling

Date	Start of Shift Time	Start of Shift Depth Hole (m)	Start of Shift Casing Depth (m)	Start of Shift Water Depth (m)	Start of Shift Water Level (mOD)	End of Shift Time	End of Shift Depth Hole (m)	End of Shift Casing Depth (m)	End of Shift Water Depth (m)	End of Shift Water Level (mOD)

Instrument Groundwater Observations

Inst. [A] Type :

Date	Instrument [A] Time	Instrument [A] Depth (m)	Instrument [A] Level (mOD)	Remarks
18/04/24	09:00	2.84	48.94	

Remarks

Ground Investigations Ireland Ltd
www.gii.ie

Site	Borehole Number
Galway Racecourse Geotechnical Investigations, Ballybrit, Co. Galway	BH02

Installation Type	Dimensions	Client	Job Number
		Galway County Council	13521-01-24

Location	Ground Level (mOD)	Project Contractor	Sheet
533737 E 727890 N	50.06	Ground Investigations Ireland	1/1

Legend	Water	Instr (A)	Level (mOD)	Depth (m)	Description
					Cement/Bentonite Grout
			49.06	1.00	
					Slotted Standpipe
			48.06	2.00	

Groundwater Strikes During Drilling

Date	Time	Depth Struck (m)	Casing Depth (m)	Inflow Rate	Readings 5 min	Readings 10 min	Readings 15 min	Readings 20 min	Depth Sealed (m)

Groundwater Observations During Drilling

Date	Start of Shift Time	Start of Shift Depth Hole (m)	Start of Shift Casing Depth (m)	Start of Shift Water Depth (m)	Start of Shift Water Level (mOD)	End of Shift Time	End of Shift Depth Hole (m)	End of Shift Casing Depth (m)	End of Shift Water Depth (m)	End of Shift Water Level (mOD)

Instrument Groundwater Observations

Inst. [A] Type :

Date	Instrument [A] Time	Instrument [A] Depth (m)	Instrument [A] Level (mOD)	Remarks
18/04/24	09:52	1.13	48.93	

Remarks

Ground Investigations Ireland Ltd
www.gii.ie

Site	Borehole Number
Galway Racecourse Geotechnical Investigations, Ballybrit, Co. Galway	BH03

Installation Type	Dimensions	Client	Job Number
		Galway County Council	13521-01-24

Location	Ground Level (mOD)	Project Contractor	Sheet
533700 E 727811 N	47.71	Ground Investigations Ireland	1/1

Legend	Water	Instr (A)	Level (mOD)	Depth (m)	Description
			46.21	1.50	Cement/Bentonite Grout
			43.41	4.30	Slotted Standpipe
			43.31	4.40	Cement/Bentonite Grout

Groundwater Strikes During Drilling

Date	Time	Depth Struck (m)	Casing Depth (m)	Inflow Rate	Readings				Depth Sealed (m)
					5 min	10 min	15 min	20 min	

Groundwater Observations During Drilling

Date	Start of Shift					End of Shift				
	Time	Depth Hole (m)	Casing Depth (m)	Water Depth (m)	Water Level (mOD)	Time	Depth Hole (m)	Casing Depth (m)	Water Depth (m)	Water Level (mOD)

Instrument Groundwater Observations

Inst. [A] Type :

Date	Instrument [A]			Remarks
	Time	Depth (m)	Level (mOD)	
18/04/24	10:56	2.51	45.20	

Remarks