



Garrane Green Energy Project, Charleville, Co. Limerick

Supplementary Site Investigation Works for Construction of New Wind Turbines, Access Tracks and Associated Infrastructure

Report No: 2177-22C

7th September 2024

*This document has been prepared by Whiteford Geoservices Ltd
on behalf of*

**Garrane Green Energy Ltd
&
Jennings O'Donovan Ltd**



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1 INTRODUCTION

This report should be read in conjunction with the following two reports: -

1. Garrane Green Energy Project – “Desktop Study and Walkover Survey for Preliminary Determination of Ground Conditions”, Report 2177-22A.
2. Garrane Green Energy Project, Charleville, Co. Limerick, “Preliminary Site Investigation Works for Construction of New Wind Turbines, Access Tracks and Associated Infrastructure”, Report 2177-22B.

In July 2022 Whiteford Geoservices Ltd was commissioned by Jennings O'Donovan Ltd to undertake investigation works at Garrane Green Energy Project near Charleville, County Cork, Ireland.

A total of two phases of ground investigation were carried out, as follows: -

1. Stage 1 Site investigation works carried out for the turbines and associated infrastructure for the 12-turbine development, named “Garrane Green Energy Project”.
2. Stage 2 Supplementary site investigation works carried out for turbines, substation and associated infrastructure relating to the updated 9 turbine development, renamed as “Garrane Wind Farm”.

These investigations were required to obtain information for the civil design of access tracks and other infrastructure; primarily with respect to the assessment of soils and geology in relation to an application for planning permission in respect to: -

A total of 9nr new wind turbine generators, associated infrastructure and turbine hardstands as well as new and upgraded site access tracks and construction of a new Substation.

Prior to undertaking the site investigation works a desktop study and walkover survey had been undertaken for the site to provide a broad understanding of ground conditions present and an initial assessment of peat stability. As part of the desktop study and walkover report preliminary Peat Depth and Ground Slope plots were compiled and from this and other observations a Preliminary Plot of Peat Slide Risk Hazard had been compiled.

The results of this stage 1 site investigation were then employed to screen for the significance of peat soil thickness in respect to peat landslide susceptibility. The

same information was also analysed to gain a clearer understanding of the nature of soils and rock present along the proposed route of the access track network, at the proposed wind turbine generators, hardstandings and other infrastructure to be constructed as part of the wind farm development.

This analysis determined that peat is not present in sufficient depth, at the Site, to cause peat landslide. Peat soils were not identified within the wind farm boundary.

Stage 2 supplementary site investigation works for undertaken following a change to the proposed wind farm layout to the 9-turbine arrangement for Garrane Green Energy Project.

The scope of these 2 phases of site investigation works was as follows: -

Ref	SI Component	Remarks
STAGE 1 SITE INVESTIGATION		
A	Peat probing	In-situ assessment of peat thickness at wind turbine generators (12nr)
B	Trial pitting to determine the underlying soil type, its thickness overlying rock and the relative competence of each stratum.	A total of 6nr Trial pit exploratory holes to assess ground conditions.
C	Laboratory testing of soils	To determine preliminary geotechnical parameters for foundation design
STAGE 2 SITE INVESTIGATION		
A	Peat probing	In-situ assessment of peat thickness at wind turbine generators
B	Trial pitting to determine the underlying soil type, its thickness overlying rock and the relative competence of each stratum.	A total of 4nr Trial pit exploratory holes to assess ground conditions at the Substation.
C	Geophysical Profiles at the locations of T1, T2, T3, T4, T5, T6, T7, T8, T9 and the Met Mast	2nr approximately orthogonal 2D ERT profiles were undertaken to assess ground conditions at the main infrastructure.
D	Laboratory testing of soils	To determine preliminary geotechnical parameters for foundation design

Table 1 – Scope of SI Works

The investigation was performed in accordance with the relevant standards (see References) and data presented within the relevant appendix to this report.

This report presents the factual records of the investigations undertaken.

2 SITE AND GEOLOGY

2.1 The Site

Garrane Green Energy Project is situated approximately 1km north of Charleville, County Cork and straddles relatively flat lands that slope generally in a northerly direction.

Ground surface elevations vary between approximately 59m to 67m above Ordnance Datum (Malin Head).

The land usage does not appear to vary across the number of land holdings which make up the Garrane Green Energy Project, consisting of agricultural pastureland for grazing sheep and cattle.

The closest active quarrying operations to the site are set out in Appendix 9.1, Section 2.7, the closest is approximately 7km to the south.

2.2 Published Geology

A study was made of available geological information for the area (GSI Online Database). This study indicated that the following natural geology is present across the site of Garrane Green Energy Project;

- Lacustrine deposits
- Boulder Clay
- River Deposits
- Limestone rock

2.2.1 Solid Geology

According to the GSI online database, the Site is underlain by a succession of Limestone formations. Those being the Visean Limestones, Ballysteen Formation and the Waulsortian Limestones

Visean Limestones; undifferentiated limestones

Ballysteen Formation; dark muddy limestone interbedded with shale

Waulsortian Limestones; undifferentiated limestones

The rock formations are also bisected by a series of faults that trend both in a south west – north east direction and in a west to east direction. These indicate previous differential movement between adjacent rock formations the date of which is unknown.

Two of which faults cut directly across the wind farm site. It is unlikely that these faults will be re-activated during the lifetime of the wind farm; Ireland being one of the less seismically active parts of the world. However, it is probable that these fault zones will be associated with highly fractured and locally weaker rock masses. Such conditions can have significance for foundation design of structures such as wind turbines and warrant further investigation at construction phase.

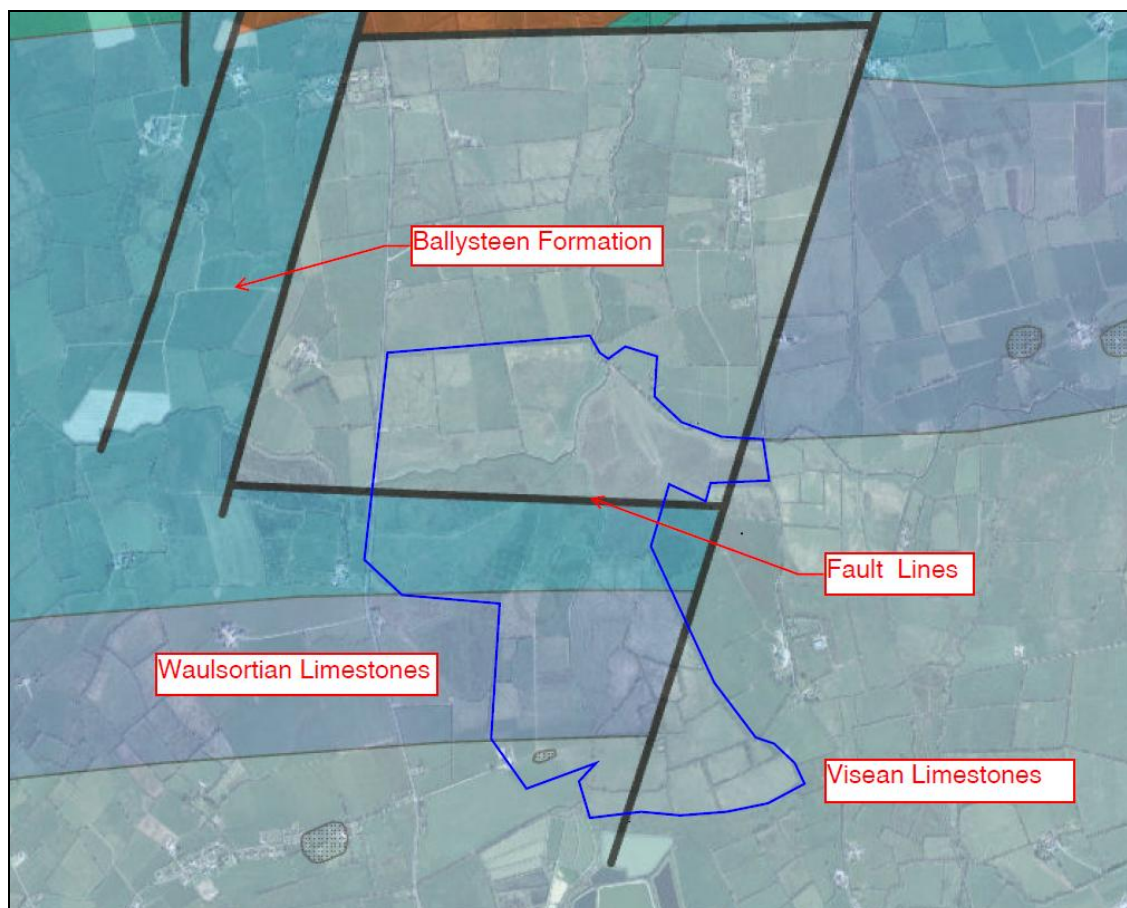


Figure 1 – Bedrock Solid Geology
Reproduced courtesy of GSI Datasets Public Viewer

2.2.2 Superficial Geology

Superficial soils present within the wind farm boundary largely consists of lake (lacustrine) deposits and river deposits (alluvium). The northern and southern

extents of the site are underlain by glacial till, with small pockets of gravels present elsewhere.

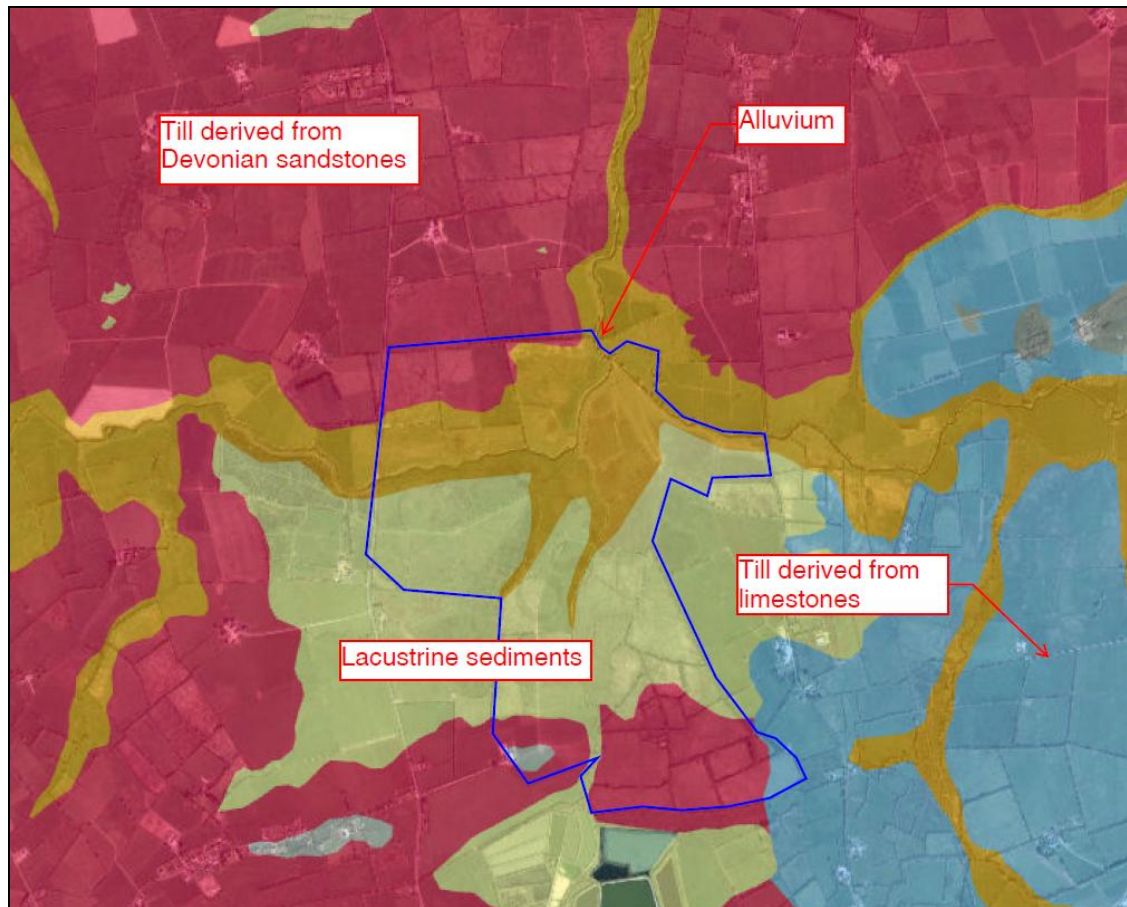


Figure 2 – Superficial Geology
Reproduced courtesy of GSI Datasets Public Viewer

For further information pertaining to site geology refer to the Desk Study and Walkover Survey Report (2177-22A).

3 FIELDWORK

3.1 General

All fieldwork was carried out in general accordance with BS 5930:2015+A1:2020 and other related standards.

Please refer to Appendix A for the location of all geotechnical investigations undertaken.

3.2 Exploratory Holes

The exploratory holes are detailed within the following table.

METHOD	QUANTITY	MAXIMUM DEPTH (m)	EQUIPMENT
Trial Pit	6 Nr.	3.60	Trial pits were carried out with the use of a 13T Tracked Excavator

Table 2A – Stage 1 Trial Hole Works

METHOD	QUANTITY	MAXIMUM DEPTH (m)	EQUIPMENT
Trial Pit	4 Nr.	3.80	Trial pits were carried out with the use of a 13T Tracked Excavator

Table 2B – Stage 2 Trial Hole Works

Refer to Appendix B for engineering logs of trial holes

3.3 In-situ Testing

The in-situ testing works carried out are detailed within the following table.

STAGE 1

TYPE	QUANTITY	MAX. DEPTH (M)	EQUIPMENT
Peat Probing	12 ¹	0.00	Rigid "depthing rods"

Table 3 – Stage 1 Peat Probing

¹ Additional peat probes were undertaken during this phase of the works at turbines and hardstands. Previously 106 peat probes had been undertaken during the Walkover phase of the assessment.

Refer to Appendix B for details

3.4 Geophysical Surveys

The geophysical survey involved the following non-destructive testing techniques.

METHOD	LOCATION	MAXIMUM DEPTH (m)	EQUIPMENT
2D Electrical Resistivity Tomography	2 Nr. Orthogonal profiles at "wind turbine generators T1, T2, T3, T4, T5, T6, T7, T8, T9 and the Met Mast	approx. 15m	Campus Tigre Electrical Resistivity Imaging System.

Table 4 – GPR and Geophysical Methods Deployed

2D Electrical Resistivity

A Campus Tigre Electrical Resistivity System employing a 32 electrode Wenner Array was used to conduct the geophysical 2D resistivity survey, with the intention of analysing the sub-surface to a depth of approximately 15m below existing ground level.

Field quality-controlled data processing was carried out using Imager Pro 2006.

Two electrodes input a controlled electrical current into the ground, where the lines of current flow adapt to the sub-surface resistivity pattern. In this way the potential difference between the equipotential surfaces can be measured, where they meet the ground surface, using a second pair of electrodes. Comparison of the input current to the measured potential difference enables the resistance to be calculated.

Imager Pro 2006, a Windows acquisition program allows real time colour pseudo-sections to be generated on the laptop computer used to collect and store data in the field. Such real time presentation offers instant confirmation of data quality.

Res2DinV software was applied to the field data to provide the modelled sections which were then interpreted, in terms of resistivity, by an experienced Geologist.

Refer to Appendix C for the annotated 2D Electrical Resistivity profiles collected.

3.5 Topographical Survey

A topographical survey of exploratory hole locations was undertaken post-completion of all associated investigation works and is detailed in the table below.

EQUIPMENT	COORDINATE SYSTEM
Leica RTK / GNSS DGPS System	Irish Transverse Mercator (ITM) / Malin Hean (Ordnance Datum)

Table 5 – Topographic Survey Details

4 LABORATORY TESTING

4.1 Geotechnical Testing

Following detailed analysis soils laboratory testing was undertaken on stage 1 samples collected from the site.

This testing was scheduled and carried out in accordance with BS 1377 (1990) and BS 1377 Part 3 (2018) other standards by Whiteford Geoservices Ltd.

A schedule of this testing is summarised in the table below and the results are presented within Appendix D.

TYPE	QUANTITY	REMARKS
Atterberg Limits	4	BS1377:1990 Part 2 (1990)
Bulk Density	10	BS1377:1990 Part 2 (1990)
Dry Density	6	BS1377:1990 Part 2 (1990)
Natural Moisture Content	4	BS1377:1990 Part 2 (1990)
Partial Size Distribution	10	BS1377:1990 Part 2 (1990)
Sulphate Content of Water Extract	10	BS 1377- Part 3 (2018)
Chloride Content of Water Extract	10	BS 1377- Part 3 (2018)
Sulphide Content of Water Extract	10	BS 1377- Part 3 (2018)
pH	10	BS 1377- Part 3 (2018)

Table 6 – Laboratory Soil Test Details

5 SURVEY RESULTS

5.1 Introduction

The investigation has provided geophysical information on the sub-surface conditions within the zones identified on the Geophysical Layout Plans in Appendix A.

Refer to Appendix C for annotated findings for the 2D Electrical Resistivity Surveys.

5.2 Soil Stratigraphy at Turbines

The following Table details the findings of preliminary exploratory holes undertaken at proposed Wind Turbine positions. Refer to Appendix B for individual engineering logs of exploratory holes and Appendix C for interpreted geophysical survey findings.

TURBINE NO.	TOPSOIL THICKNESS / DEPTH TO FIRM MINERAL SOILS (M)	SUITABLE FORMATION DEPTH FOR TRACKS AND HARDSTANDS DEPTH TO FIRM MINERAL SOIL (M)	SUMMARY OF FINDINGS – GEOPHYSICAL SURVEYS
T1	0.15 – 0.45	0.45 – 0.75	4m – 5m of low resistivity soils (probably clays or sands) overlying deeply weathered or fractured limestone rock. Limestone generally competent below 6m depth.
T2	0.15 – 0.45	0.45 – 0.75	4m – 6m of low resistivity soils (probably clays or sands) overlying deeply weathered or fractured limestone rock. No competent limestone identified. Potentially “karstic”
T3	0.15 – 0.45	0.45 – 0.75	4m – 5m of low resistivity soils (probably clays or sands) overlying very low resistivity, degraded, limestone rock. Potentially “karstic”
T4	0.15 – 0.45	0.45 – 0.75	3.5m – 4.5m of low resistivity soils (probably clays or sands) overlying deeply weathered or fractured limestone rock. Competence of limestone is variable across profiles. Potentially “karstic”

TURBINE NO.	TOPSOIL THICKNESS / DEPTH TO FIRM MINERAL SOILS (M)	SUITABLE FORMATION DEPTH FOR TRACKS AND HARDSTANDS DEPTH TO FIRM MINERAL SOIL (M)	SUMMARY OF FINDINGS – GEOPHYSICAL SURVEYS
T5	0.15 – 0.45	0.45 – 0.75	4m – 5m of low resistivity soils (probably clays or sands) overlying deeply weathered or fractured limestone rock. Limestone generally competent below 5m depth.
T6	0.15 – 0.45	0.45 – 0.75	c. 4m of low resistivity soils (probably clays or sands) overlying very low resistivity material. Either, degraded, “karstic” limestone rock or more competent mineral soils.
T7	0.15 – 0.45	0.45 – 0.75	c. 4m of low resistivity soils (probably clays or sands) overlying very low resistivity material. Either, degraded, “karstic” limestone rock or more competent mineral soils.
T8	0.15 – 0.45	0.45 – 0.75	3.5 – 4.5m of low resistivity soils (probably clays or sands) overlying very low resistivity material. Either, degraded, “karstic” limestone rock or more competent mineral soils.
T9	0.15 – 0.45	0.45 – 0.75	c. 4m of low resistivity soils (probably clays or sands) overlying very low resistivity material. Either, degraded, “karstic” limestone rock or more competent mineral soils.
Met Mast	0.15 – 0.45	0.45 – 0.75	2 – 3m of low resistivity soils (probably clays or sands) overlying generally competent limestone rock.
Substation	0.10 – 0.20	1.60	N/A
Substation Compound	0.20	1.20 – 1.40 (Soft to firm). Alternating sequence of soft to firm and stiff mineral soils.	N/A

Table 7 – Summary of Stratigraphy at Main Infrastructure

In light of the findings from the preliminary trial hole works the following schedule of foundations is recommended for the main infrastructure

TURBINE NO.	TURBINE / BUILDING	HARDSTAND / TRANSFORMER BASE / COMPOUND	ACCESS TRACKS
T1	Gravity Base Foundation possible within stiff or loose to medium dense mineral soils	Place at 0.45m to 0.75m depth within firm mineral soils	Remove all soft or very weak soils and commence road construction within firm CLAY/SILT or loose SAND mineral soils (0.45m – 0.75m depth). Tracks to be constructed within the predicted flood zone will require upgraded design and / or enhanced maintenance during the Development's lifetime.
T2	Gravity Base Foundation possible within stiff or loose to medium dense mineral soils	Place at 0.45m to 0.75m depth within firm mineral soils	
T3	Gravity Base Foundation possible within stiff or loose to medium dense mineral soils	Place at 0.45m to 0.75m depth within firm mineral soils	
T4	Within predicted flood zone. Deep Foundation recommended. Piled, rock anchored design or suitable alternative.	Place at 0.45m to 0.75m depth within firm mineral soils. Hardstand is within the predicted food zone. Upgraded design and / or enhanced maintenance will be required.	
T5	Within predicted flood zone. Deep Foundation recommended. Piled, rock anchored design or suitable alternative.	Place at 0.45m to 0.75m depth within firm mineral soils. Hardstand is within the predicted food zone. Upgraded design and / or enhanced maintenance will be required.	
T6	Within predicted flood zone. Deep Foundation recommended. Piled, rock anchored design or suitable alternative.	Place at 0.45m to 0.75m depth within firm mineral soils. Hardstand is within the predicted food zone. Upgraded design and / or enhanced maintenance will be required.	
T7	Within predicted flood zone. Deep Foundation recommended. Piled, rock anchored design or suitable alternative.	Place at 0.45m to 0.75m depth within firm mineral soils. Hardstand is within the predicted food zone. Upgraded design and / or enhanced maintenance will be required.	

TURBINE NO.	TURBINE / BUILDING	HARDSTAND / TRANSFORMER BASE / COMPOUND	ACCESS TRACKS
T8	Within predicted flood zone. Deep Foundation recommended. Piled, rock anchored design or suitable alternative.	Place at 0.45m to 0.75m depth within firm mineral soils. Hardstand is within the predicted food zone. Upgraded design and / or enhanced maintenance will be required.	
T9	Gravity Base Foundation possible within stiff or loose to medium dense mineral soils	Place at 0.45m to 0.75m depth within firm mineral soils	
MET MAST	Raft Foundation within firm mineral soils	Place at 0.45m to 0.75m depth within firm mineral soils	
SUB	1.2m Strip / Pad or Raft Footing for Building on firm mineral soils at 1.60m depth. Allowable bearing pressure of 150kPa for max. 50mm settlement.	0.70 m depth within firm mineral soils. Given the variation in soil competence with depth we recommend an engineered base consisting of crushed rock / gravel and geotextile be designed to accommodate the proposed loads.	

Table 8 – Recommendations for Infrastructure Foundations

6 REFERENCES

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

BS 5930:2015 + A1:2020 Code of practice for ground investigations. British Standards Institution.

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

BS EN ISO 14688-1: 2002: Geotechnical investigation and testing - Identification and classification of soil - Part 1 Identification and description. British Standards Institution.

BS EN ISO 14689-1: 2003: Geotechnical investigation and testing - Identification and classification of rock - Part 1 Identification and description. British Standards Institution.

BS EN ISO 22475-1: 2006: Geotechnical investigation and testing – Sampling methods and groundwater measurements - Part 1 Technical principles for execution. British Standards Institution.

BS EN ISO 22476-2: 2005: Geotechnical investigation and testing - Field testing - Part 2 Dynamic probing. British Standards Institution.

BS EN ISO 22476-3: 2005: Geotechnical investigation and testing - Field testing - Part 3 Standard penetration test. British Standards Institution.

ISRM: 2007: The Complete ISRM Suggested Methods for Rock Characterisation, Testing and Monitoring (1974-2006). Commission on Testing Methods, International Society for Rock Mechanics (Editors Ulusay R & Hudson JA).

ASTM D5731-08: Standard test method for determination of the point load strength index of rock and application to rock strength

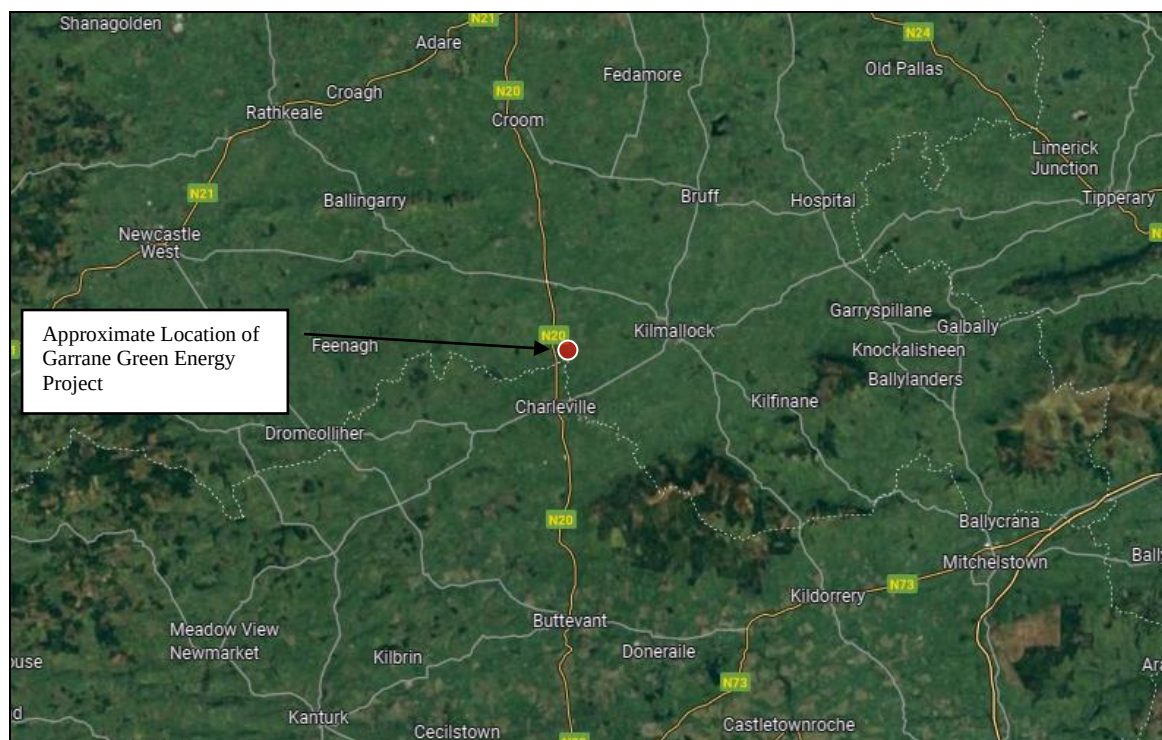
APPENDICES

Appendix A	Drawings
Appendix B	Exploratory Holes and In-situ Test Results
Appendix C	Interpreted Geophysical Survey Data
Appendix D	Laboratory Testing Results Employed for Analysis Purposes
Appendix E	Photographic Record

APPENDIX A

DRAWINGS

General Site Location Plan	1 x A4
Site Layout Plan showing position of Exploratory Holes and Insitu Tests	1 x A3



P1 - General Location Plan (Aerial view)
(© google maps 2021)



P2 - Local Location Plan (Aerial view)
(© google maps 2021)

2177-22 Garrane Green Energy Project

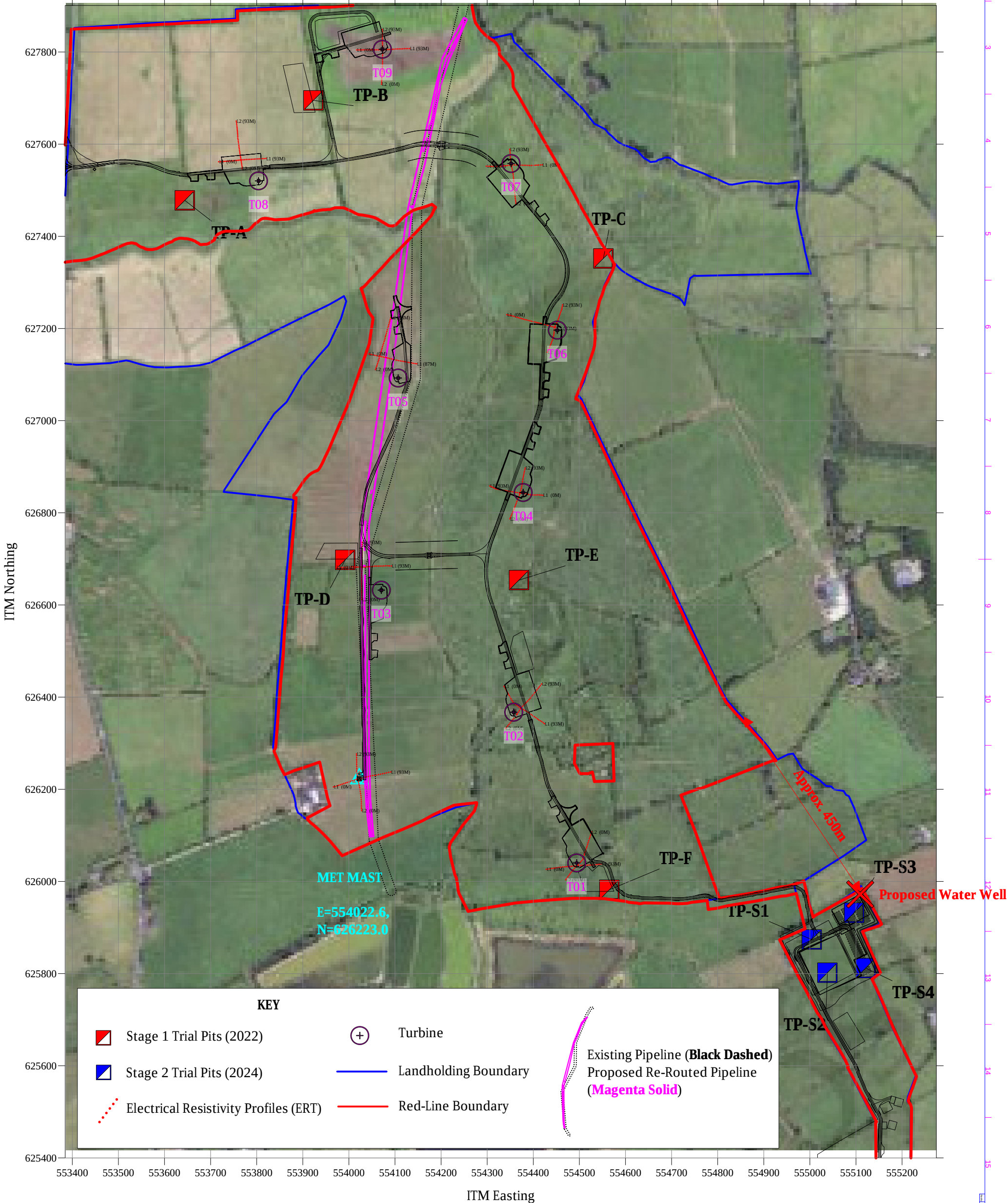


Site Layout Plan - Garrane Green Energy Project Updated with SI Exploratory Works

- Includes:
- Trial Holes within Wind Farm Landholding
- Trial Holes at Substation and Battery Storage Site
- ERT Resistivity Profiles (all Turbines and Met Mast)



17th June 2025



Notes:

1. All depths are relative to ground level existing at the time of the survey / investigation.
2. All positions relate to the ITM coordinate system.
3. Any elevations are provided relative to Ordnance Datum Malin Head
4. Do not scale from drawing; not to be used for measurement.
5. Relates to Stage 2 SI Works undertaken between 17 July and 17 August 2024.

Draft

Designed by J.W.	Checked by J.W.	Approved by - date J.M - 17/06/2025	Drawing No. 2177/22 - L1	Date 17/06/2025	Scale 1 : 7500
Whiteford Geoservices Ltd Shed House, 2 Main Street Strand, BALLYCLARE, Co. Antrim, Northern Ireland BT39 5NE UNITED KINGDOM			Garrane Green Energy Soils and Geology Assessment		
Site Layout Plan - Phases 1 & 2 (SI Works - Sept 22 / Aug 24)				Edition 2	Sheet A3

APPENDIX B

IN-SITU TEST RESULTS

Trial Pit Logs	10 x A4
Peat Probing Data	1 x A4

Trial Pit Log

Project Name: Garrane
Green Energy Project- S.I.

Project No:
2177-22

Client: Garrane Green Energy Ltd

Date: 19/08/2024

Contractor: Whiteford Geoservices Ltd

Co-ords: E555128.39 N625814.67

Location:

Sub Contractor:

Equipment: Hitachi ZAXIS 130LCN

Location Number
TP-S04

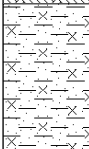
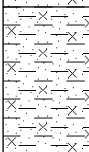
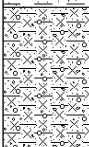
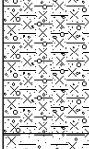
Location Type
TP

Level
63.75m AoD

Logged By
TOR

Scale
1:25

Page Number
Sheet 1 of 1

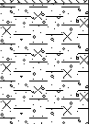
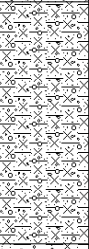
Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.20	63.55		TOPSOIL	1
								Stiff to very stiff, greyish brown, slightly sandy, slightly silty CLAY.	
		0.50	B		0.70	63.05		Stiff, brownish mottled grey, slightly sandy, slightly silty CLAY.	
		1.00	B		1.20	62.55		Soft to firm, brownish mottled grey, sandy, gravelly SOLT/CLAY, with some cobbles and boulders. Gravel is fine to coarse, sub angular to sub rounded.	
		1.70	B						2
					2.10	61.65		Soft to firm greyish brown, slightly sandy, slightly silty, gravelly CLAY, with some cobbles and boulders. Gravel is fine to coarse, sub angular to sub rounded.	
		2.70	B						3
3.70	B								
				3.80	59.95		End of Pit at 3.800m	4	

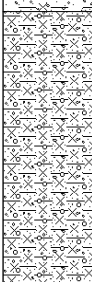
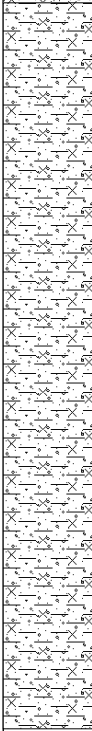
Dimensions		Trench Comments			Backfill Details		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Top	Base	Description
5.00	1.80	Sides stable through 1.40m to 3.80m			0.00	3.80	Arisings

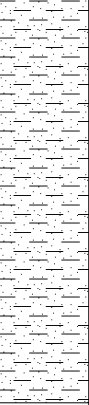
Remarks

Groundwater seeping in at 3.00m



 whiteford explore the possibilities					Address: 2 Main Street, Straid, Ballyclare BT39 9NE, UK Tel: (028) 9334 9351 Email: Info@whitefordgeoservices.com Website: www.whitefordgeoservices.com					Trial Pit Log				
Project Name: Garrane Green Energy Project- S.I.				Project No: 2177-22		Client: Garrane Green Energy Ltd				Date: 19/08/2024				
						Contractor: Whiteford Geoservices Ltd				Co-ords: E555096.95 N625934.38				
Location:						Sub Contractor:				Equipment: Hitachi ZAXIS 130LCN				
Location Number TP-S03			Location Type TP			Level 62.48m AoD		Logged By TOR		Scale 1:25		Page Number Sheet 1 of 1		
Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description						
		Depth (m)	Type	Results										
		0.50	B		0.20	62.28		TOPSOIL				1		
					Stiff, greenish grey, slightly silty, slightly sandy, slightly gravelly CLAY.									
		1.20	B		0.60	61.88		Firm brownish mottled grey sandy gravelly SILT/CLAY, with some cobbles and boulders. Gravel is fine to coarse, sub angular to sub rounded.				2		
					Soft to firm greyish brown slightly sandy, slightly silty, gravelly CLAY, with some cobbles and boulders. Gravel is fine to coarse, sub angular to sub rounded.									
		2.20	B		1.40	61.08						3		
3.20	B										4			
3.80	B				3.80	58.68		End of Pit at 3.800m						
Dimensions		Trench Comments		Backfill Details										
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks		Top	Base	Description						
5.00	1.80	Sides stable through 1.40m to 3.80m				0.00	3.80	Arisings						
Remarks														
No groundwater encountered. Wet soil from 1.40m														

 whiteford explore the possibilities				Address: 2 Main Street, Straid, Ballyclare BT39 9NE, UK Tel: (028) 9334 9351 Email: Info@whitefordgeoservices.com Website: www.whitefordgeoservices.com				Trial Pit Log					
Project Name: Garrane Green Energy Project- S.I.				Project No: 2177-22		Client: Garrane Green Energy Ltd				Date: 19/08/2024			
						Contractor: Whiteford Geoservices Ltd				Co-ords: E555038.80 N625796.30			
Location:						Sub Contractor:				Equipment: Hitachi ZAXIS 130LCN			
Location Number TP-S02			Location Type TP			Level 62.63m AoD		Logged By TOR		Scale 1:25		Page Number Sheet 1 of 1	
Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description					
		Depth (m)	Type	Results									
					0.20	62.43		TOPSOIL				1	
									Stiff greenish grey, silty, slightly sandy, slightly gravelly CLAY.				
		0.50	B		0.50	62.13			Firm to stiff brownish mottled grey sandy, gravelly SILT/CLAY. Gravel is fine to coarse, sub angular to sub rounded. Some cobbles and boulders.				
		1.20	B		1.40	61.23			Firm to stiff greyish brown, slightly silty, slightly sandy, gravelly CLAY, with some cobbles and boulders. Gravel is fine to coarse, sub angular to sub rounded.				
		2.00	B										
		3.00	B									3	
		3.80	B		3.80	58.83		End of Pit at 3.800m				4	
Dimensions		Trench Comments		Backfill Details									
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks		Top	Base	Description					
5.00	1.80	Sides stable through 1.40m to 3.80m				0.00	3.80	Arisings					
Remarks													
No groundwater encountered.													

 Address: 2 Main Street, Straid, Ballyclare BT39 9NE, UK Tel: (028) 9334 9351 Email: Info@whitefordgeoservices.com Website: www.whitefordgeoservices.com					Trial Pit Log							
Project Name: Garrane Green Energy Project- S.I.			Project No: 2177-22		Client: Garrane Green Energy Ltd			Date: 19/08/2024				
					Contractor: Whiteford Geoservices Ltd			Co-ords: E555002.58 N625873.51				
Location:					Sub Contractor:			Equipment: Hitachi ZAXIS 130LCN				
Location Number TP-S01		Location Type TP		Level 61.30m AoD		Logged By TOR		Scale 1:25		Page Number Sheet 1 of 1		
Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description				
		Depth (m)	Type	Results								
		0.10			0.10	61.20		TOPSOIL			1	
								Fine yellowish grey, slightly silty, slightly sandy, slightly gravelly CLAY.				
		1.00	B									
		1.40	B						Soft to firm, grey silty sandy gravelly CLAY, with some cobbles and boulders. Gravel is fine to coarse, sub angular to sub rounded.			
		1.50	B		1.40	59.90					2	
		1.80	B		1.80	59.50		Stiff to very stiff, greyish brown, slightly sandy CLAY, with some cobbles and boulders. Gravel is fine to coarse, sub angular to sub rounded.				
		2.00	B								3	
		3.00	B									
		3.80	B		3.80	57.50		End of Pit at 3.800m			4	
Dimensions		Trench Comments									Backfill Details	
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks				Top	Base	Description		
5.20	1.80	Sides Stable						0.00	3.80	Arisings		
Remarks												
No groundwater encountered.												

 whiteford <i>explore the possibilities</i>				Address: 2 Main Street, Straid, Ballyclare BT39 9NE, UK Tel: (028) 9334 9351 Email: Info@whitefordgeoservices.com Website: www.whitefordgeoservices.com				Trial Pit Log			
Project Name: Garrane Green Energy Project- S.I.				Project No: 2177-22		Client: Garrane Green Energy Ltd				Date: 27/09/2022	
						Contractor: Whiteford Geoservices Ltd				Co-ords: E554565.00 N625982.00	
Location: Ballynagoul, Co. Limerick				Sub Contractor: tli group				Equipment: Hyundai hx140lc			
Location Number TP-F		Location Type TP		Level		Logged By J.Stothers		Scale 1:25		Page Number Sheet 1 of 1	

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
		Depth (m)	Type	Results						
		0.25						Dark brown, slightly organic, sandy, silty TOPSOIL		
		1.00	B					Firm to stiff, orangish brown mottled grey, slightly sandy, slightly gravelly SILT with a medium cobble content. Sand is fine to coarse, Gravel is sub angular to sub rounded. Cobbles and boulders are sub rounded.	1	
		2.00								
		2.50	B					Stiff, brownish grey, sandy, gravelly SILT/CLAY with a medium cobble, low boulder and low large boulder content. Sand is fine to coarse, Gravel is sub angular to sub rounded. Cobbles and boulders are sub rounded.	2	
		3.50						End of Pit at 3.500m	3	
									4	

Dimensions		Trench Comments			Backfill Details		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Top	Base	Description
4.00	2.00	Sides unstable upon completion	None		0.00	3.50	Arisings

Remarks No groundwater encountered.							

 whiteford <i>explore the possibilities</i>				Address: 2 Main Street, Straid, Ballyclare BT39 9NE, UK Tel: (028) 9334 9351 Email: Info@whitefordgeoservices.com Website: www.whitefordgeoservices.com				Trial Pit Log			
Project Name: Garrane Green Energy Project- S.I.				Project No: 2177-22		Client: Garrane Green Energy Ltd				Date: 27/09/2022	
						Contractor: Whiteford Geoservices Ltd				Co-ords: E554369.00 N626654.00	
Location: Ballynagoul, Co. Limerick				Sub Contractor: tli group				Equipment: Hyundai hx140lc			
Location Number TP-E		Location Type TP		Level		Logged By J.Stothers		Scale 1:25		Page Number Sheet 1 of 1	

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.15			Dark brown, slightly organic, sandy, silty TOPSOIL	
		0.50	B					Soft to firm, grey mottled orange, slightly sandy, slightly gravelly SILT with a low cobble content.	
		1.50	B					Sand is fine to coarse, Gravel is sub angular to sub rounded. Cobbles are sub rounded.	
					1.40			Firm to stiff, grey, slightly sandy, slightly gravelly SILT with a low cobble content.	
2.50	B						Sand is fine to coarse, Gravel is sub angular to sub rounded. Cobbles are sub rounded.		
					2.50			Stiff, brownish grey, sandy, gravelly SILT/CLAY with a medium cobble, low boulder and low large boulder content.	
3.50	B						Sand is fine to coarse, Gravel is sub angular to sub rounded. Cobbles and boulders are sub rounded.		
					3.40			Loose to medium dense, silty, very gravelly, fine to coarse SAND with a low cobble content.	
					3.60			Gravel is sub angular to sub rounded. Cobbles are sub rounded.	
								End of Pit at 3.600m	

Dimensions		Trench Comments			Backfill Details		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Top	Base	Description
4.00	2.00	Sides unstable upon completion	None		0.00	3.60	Arisings

Remarks No groundwater encountered.							

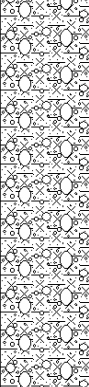
 whiteford <i>explore the possibilities</i>				Address: 2 Main Street, Straid, Ballyclare BT39 9NE, UK Tel: (028) 9334 9351 Email: Info@whitefordgeoservices.com Website: www.whitefordgeoservices.com				Trial Pit Log			
Project Name: Garrane Green Energy Project- S.I.				Project No: 2177-22		Client: Garrane Green Energy Ltd				Date: 27/09/2022	
						Contractor: Whiteford Geoservices Ltd				Co-ords: E553992.00 N626698.00	
Location: Ballynagoul, Co. Limerick				Sub Contractor: tli group				Equipment: Hyundai hx140lc			
Location Number TP-D		Location Type TP		Level		Logged By J.Stothers		Scale 1:25		Page Number Sheet 1 of 1	

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
		Depth (m)	Type	Results						
					0.20			Dark brown, slightly organic, sandy, silty TOPSOIL	1	
		0.50	B				Soft to firm, grey mottled orange, slightly sandy, slightly gravelly SILT with a low cobble content. Sand is fine to coarse, Gravel is sub angular to sub rounded. Cobbles are sub rounded.			
					1.20			Firm to stiff, grey, slightly sandy, slightly gravelly SILT with a low cobble content. Sand is fine to coarse, Gravel is sub angular to sub rounded. Cobbles are sub rounded.		
		2.00	B							2
					2.20					
		3.00	B				Stiff, brownish grey, sandy, gravelly SILT/CLAY with a medium cobble, low boulder content. Sand is fine to coarse, Gravel is sub angular to sub rounded. Cobbles and boulders are sub rounded.	3		
					3.50		End of Pit at 3.500m	4		

Dimensions		Trench Comments			Backfill Details		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Top	Base	Description
4.00	2.00	Sides unstable upon completion	None		0.00	3.50	Arisings

Remarks No groundwater encountered.							
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 whiteford <i>explore the possibilities</i>				Address: 2 Main Street, Straid, Ballyclare BT39 9NE, UK Tel: (028) 9334 9351 Email: Info@whitefordgeoservices.com Website: www.whitefordgeoservices.com				Trial Pit Log			
Project Name: Garrane Green Energy Project- S.I.				Project No: 2177-22		Client: Garrane Green Energy Ltd				Date: 27/09/2022	
						Contractor: Whiteford Geoservices Ltd				Co-ords: E554552.00 N627352.00	
Location: Ballynagoul, Co. Limerick				Sub Contractor: tli group				Equipment: Hyundai hx140lc			
Location Number TP-C		Location Type TP		Level		Logged By J.Stothers		Scale 1:25		Page Number Sheet 1 of 1	

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.30		 Dark brown, slightly organic, sandy, silty TOPSOIL	1	
		0.50	B			 Soft to firm, grey mottled orange, slightly sandy, slightly gravelly SILT with a low cobble content. Sand is fine to coarse, Gravel is sub angular to sub rounded. Cobbles are sub rounded.			
		1.50	B		1.50	 Firm to stiff, brownish grey, sandy, gravelly SILT/CLAY with a medium cobble and low boulder content. Sand is fine to coarse, Gravel is sub angular to sub rounded. Cobbles and boulders are sub rounded.	2		
		2.80							
		3.00	B		3.20	 Loose to medium dense, silty, very gravelly, fine to coarse SAND with a low cobble content. Gravel is sub angular to sub rounded. Cobbles are sub rounded.			3
							End of Pit at 3.200m	4	

Dimensions		Trench Comments			Backfill Details		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Top	Base	Description
4.00	2.00	Sides unstable upon completion	None		0.00	3.20	Arisings

Remarks Groundwater encountered 3.0m b.g.l. (weak flow)							
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 whiteford <i>explore the possibilities</i>				Address: 2 Main Street, Straid, Ballyclare BT39 9NE, UK Tel: (028) 9334 9351 Email: Info@whitefordgeoservices.com Website: www.whitefordgeoservices.com				Trial Pit Log			
Project Name: Garrane Green Energy Project- S.I.				Project No: 2177-22		Client: Garrane Green Energy Ltd				Date: 27/09/2022	
						Contractor: Whiteford Geoservices Ltd				Co-ords: E553923.00 N627695.00	
Location: Ballynagoul, Co. Limerick				Sub Contractor: tli group				Equipment: Hyundai hx140lc			
Location Number TP-B		Location Type TP		Level		Logged By J.Stothers		Scale 1:25		Page Number Sheet 1 of 1	

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.20			Dark brown, slightly organic, sandy, silty TOPSOIL	1
		0.50	B				Soft to firm, grey mottled orange, slightly sandy, slightly gravelly SILT with a low cobble content. Sand is fine to coarse, Gravel is sub angular to sub rounded. Cobbles are sub rounded.		
					0.90			Firm to stiff, grey, slightly sandy, slightly gravelly SILT with a low cobble content. Sand is fine to coarse, Gravel is sub angular to sub rounded. Cobbles are sub rounded.	
		1.50	B						
					2.30			Stiff, brownish grey, sandy, gravelly SILT/CLAY with a medium cobble, low boulder content. Sand is fine to coarse, Gravel is sub angular to sub rounded. Cobbles and boulders are sub rounded.	
		3.00	B					3	
					3.50		End of Pit at 3.500m	4	

Dimensions		Trench Comments			Backfill Details		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Top	Base	Description
4.00	2.00	Sides unstable upon completion	None		0.00	3.50	Arisings

Remarks No groundwater encountered.							

 whiteford <i>explore the possibilities</i>				Address: 2 Main Street, Straid, Ballyclare BT39 9NE, UK Tel: (028) 9334 9351 Email: Info@whitefordgeoservices.com Website: www.whitefordgeoservices.com				Trial Pit Log			
Project Name: Garrane Green Energy Project- S.I.				Project No: 2177-22		Client: Garrane Green Energy Ltd				Date: 27/09/2022	
						Contractor: Whiteford Geoservices Ltd				Co-ords: E553644.00 N627478.00	
Location: Ballynagoul, Co. Limerick				Sub Contractor: tli group				Equipment: Hyundai hx140lc			
Location Number TP-A		Location Type TP		Level		Logged By J.Stothers		Scale 1:25		Page Number Sheet 1 of 1	

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.50	B		0.45		 Dark brown, slightly organic, sandy, silty TOPSOIL	1	
							 Soft to firm, grey mottled orange, slightly sandy, slightly gravelly SILT with a low cobble content. Sand is fine to coarse, Gravel is sub angular to sub rounded. Cobbles are sub rounded.		
							 Firm to stiff, grey, slightly sandy, slightly gravelly SILT with a low cobble content. Sand is fine to coarse, Gravel is sub angular to sub rounded. Cobbles are sub rounded.		
							 Stiff, brownish grey, sandy, gravelly SILT/CLAY with a medium cobble, low boulder content. Sand is fine to coarse, Gravel is sub angular to sub rounded. Cobbles and boulders are sub rounded.		
		2.50	B		2.00			2	
					3.40			3	
					3.60		End of Pit at 3.600m		
								4	

Dimensions		Trench Comments			Backfill Details		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Top	Base	Description
4.00	2.00	Sides stable upon completion	None		0.00	3.60	Arisings

Remarks No groundwater encountered.							
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2177-22 - Garrane Green Energy Project
Preliminary Data of Peat Depth Variation Across the Site

Location	Easting	Northing	Depth
1	553641	627475	0
2	553921	627685	0
3	554267	627779	0
4	554338	627570	0
5	553979	627331	0
6	554111	627129	0
7	554454	627324	0
8	554406	627003	0
9	554032	626747	0
10	554352	626620	0
11	554442	626284	0
12	554587	625974	0

APPENDIX C

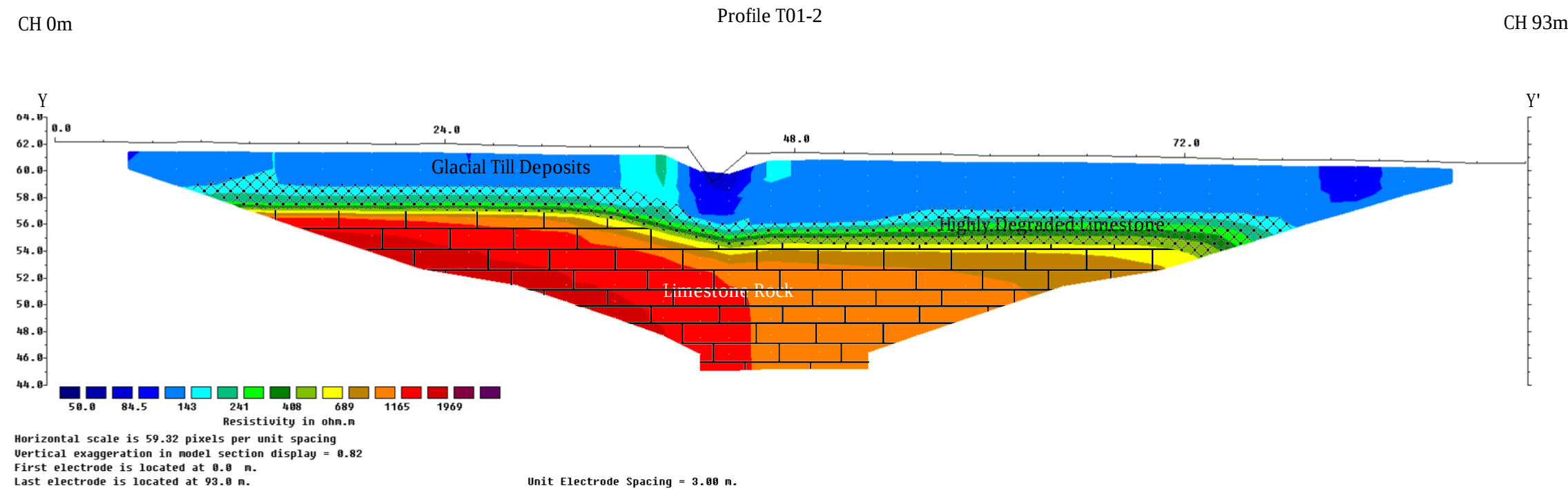
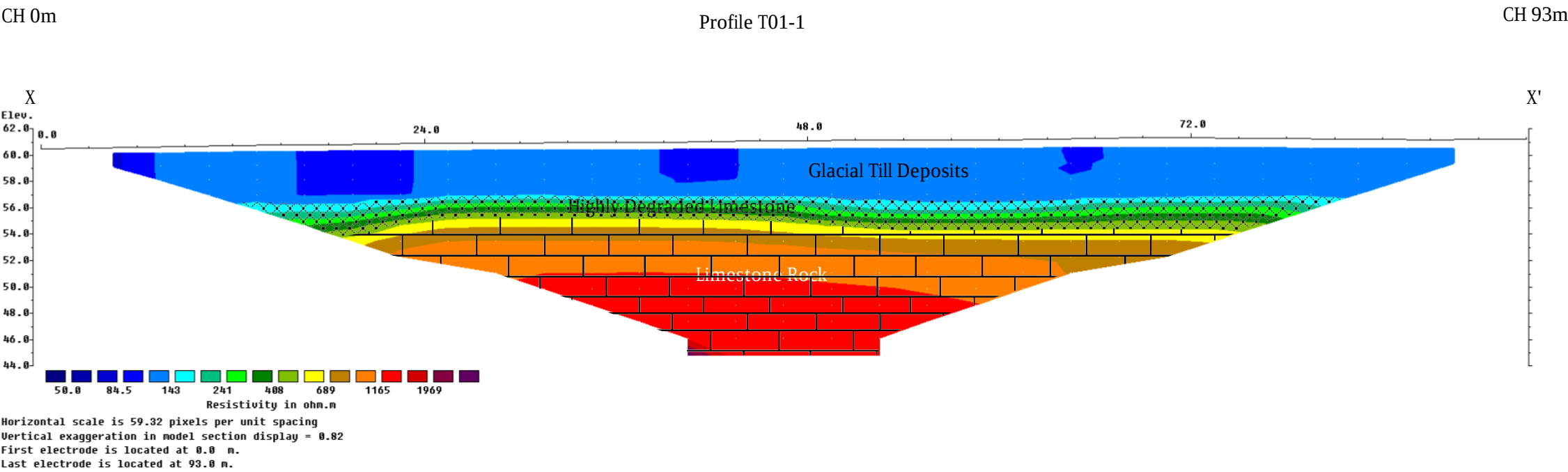
INTERPRETED GEOPHYSICAL SURVEY DATA

Annotated Electrical Resistivity Tomography (ERT) Profiles:

T1	1 x A3
T2	1 x A3
T3	1 x A3
T4	1 x A3
T5	1 x A3
T6	1 x A3
T7	1 x A3
T8	1 x A3
T9	1 x A3
MET MAST	1 x A3

Electrical Resistivity Tomography (ERT) Surveys

Interpretated Resistivity Imaging Profiles at Turbine T1
23rd August 2024



Key To Sections

Each Profile indicates variation in the elctrical restivity of the Subsurface with depth.

Natural Soils (generally 10 - 500Wm)
Rock (generally >500Wm)



Organic Soils
(PEAT and sandy, organic SILT / CLAYS)



Natural Soils
(Sandy, gravelly CLAYS with cobbles and boulders)



Highly Degraded Limestone
(Probably deeply weathered or highly fractured Limestone rock. May include wide, soil filled, fractures or appears as a raft of dense boulders.)



Limestone
(Massive or partially weathered)

Notes:

1. All depths are relative to ground level existing at the time of the survey / investigation.

2. Positions, where detailed, relate to the IG coordinate system.

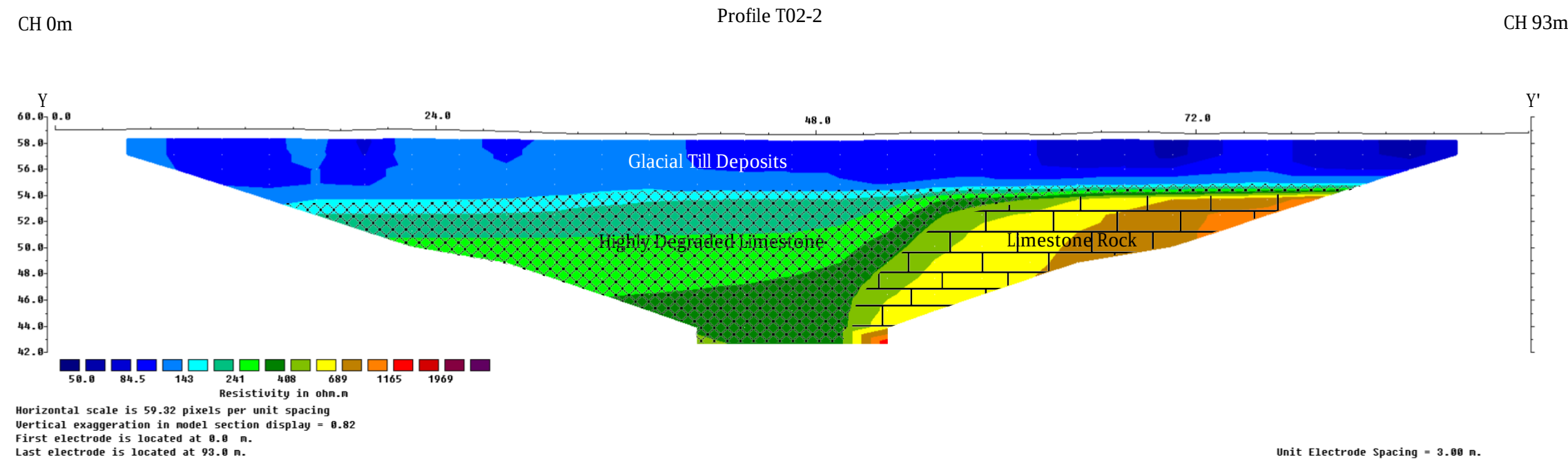
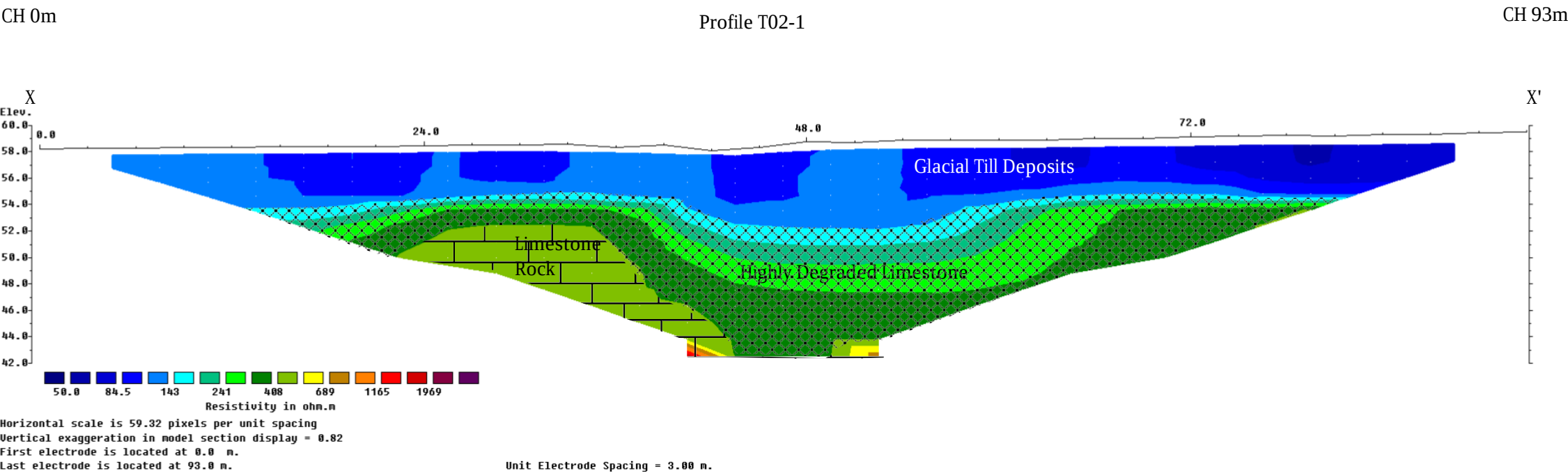
3. Please refer to Drawing 2217-23-A for position of each ERT Profile.

Draft

Designed by		Checked by		Approved by - date		Drawing No.		Date		Scale	
J.W.		J.W.		J.M. - 18/06/2025		2177/22 - ERT-T1		18/06/2025		As Shown	
Whiteford Geoservices Ltd				Interpreted Electrical Resistivity Data Profiles T01-1 and T01-2 at Turbin T1							
2 Main Street, Street, BALLYVAUGHAN, Co. DUBLIN, UK. E010 400											
Garrane Green Energy Project				Edition		Sheet					
				0		A3					

Electrical Resistivity Tomography (ERT) Surveys

Interpreted Resistivity Imaging Profiles at Turbine T2
23rd August 2024



Key To Sections

Each Profile indicates variation in the electrical resistivity of the Subsurface with depth.

Natural Soils (generally 10 - 500Wm)
Rock (generally >500Wm)



Organic Soils
(PEAT and sandy, organic SILT / CLAYS)



Natural Soils
(Sandy, gravelly CLAYS with cobbles and boulders)



Highly Degraded Limestone
(Probably deeply weathered or highly fractured Limestone rock. May include wide, soil filled, fractures or appears as a raft of dense boulders.)



Limestone
(Massive or partially weathered)

Notes:

1. All depths are relative to ground level existing at the time of the survey / investigation.
2. Positions, where detailed, relate to the IG coordinate system.
3. Please refer to Drawing 2217-23-A for position of each ERT Profile.

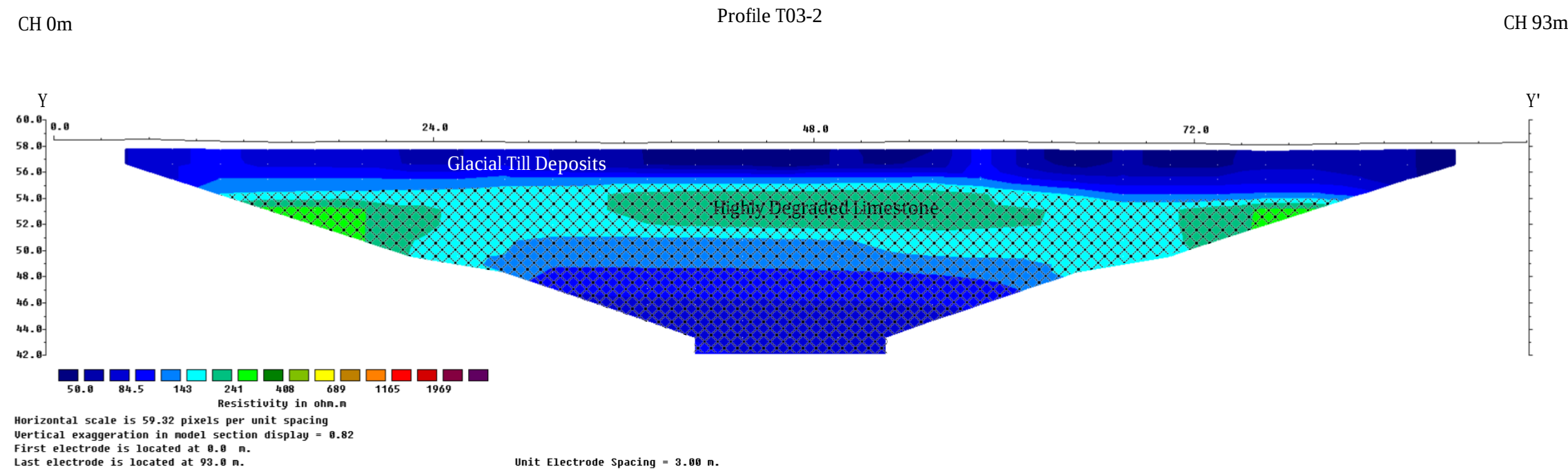
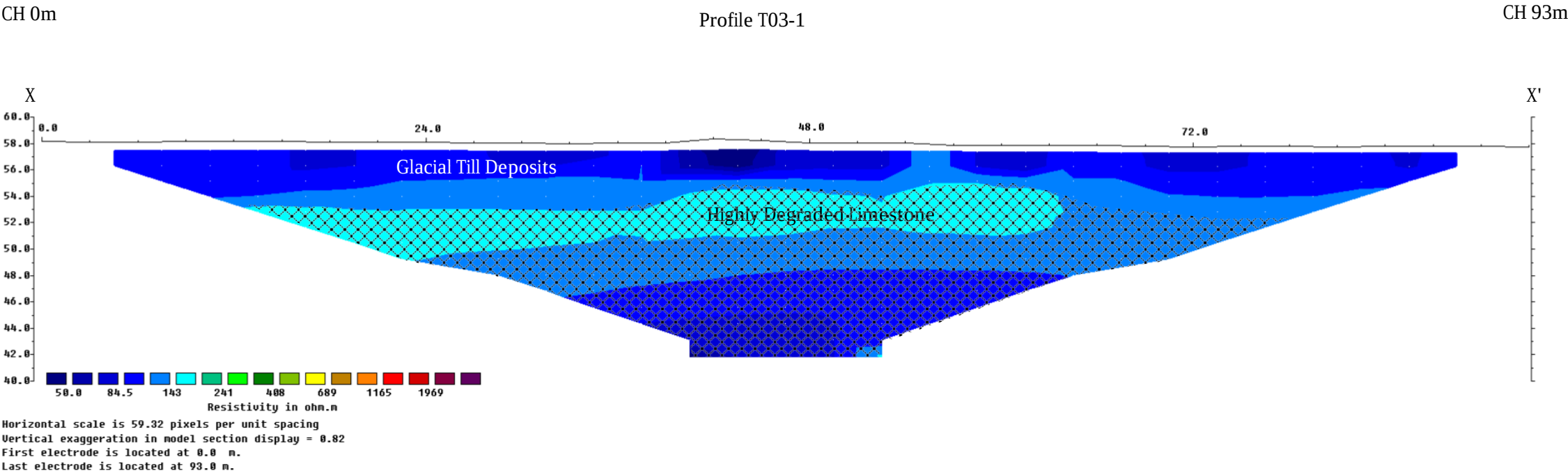
Draft

Designed by J.W.	Checked by J.W.	Approved by date J.M. - 18/06/2025	Drawing No. 2177/22 - ERT-T2	Date 18/06/2025	Scale As Shown
Whiteford Geoservices Ltd Great House 1 Main Street, Great Ballyclare, Co. Antrim, UK BT29 5NE			Interpreted Electrical Resistivity Data Profiles T02-1 and T02-2 at Turbine T2 Garrane Green Energy Project		
			Sheet 1	Drawn A3	

2177-22 Garrane Green Energy Project
Turbine T3

Electrical Resistivity Tomography (ERT) Surveys

Interpretated Resistivity Imaging Profiles at Turbines T3
23rd August 2024



Key To Sections

Each Profile indicates variation in the elctrical restivity of the Subsurface with depth.

Natural Soils (generally 10 - 500Wm)
Rock (generally >500Wm)

Organic Soils
(PEAT and sandy, organic SILT / CLAYS)

Natural Soils
(Sandy, gravelly CLAYS with cobbles and boulders)

Highly Degraded Limestone
(Probably deeply weathered or highly fractured Limestone rock. May include wide, soil filled, fractures or appears as a raft of dense boulders.)

Limestone
(Massive or partially weathered)

Notes:

1. All depths are relative to ground level existing at the time of the survey / investigation.
2. Positions, where detailed, relate to the IG coordinate system.
3. Please refer to Drawing 2217-23-A for position of each ERT Profile.

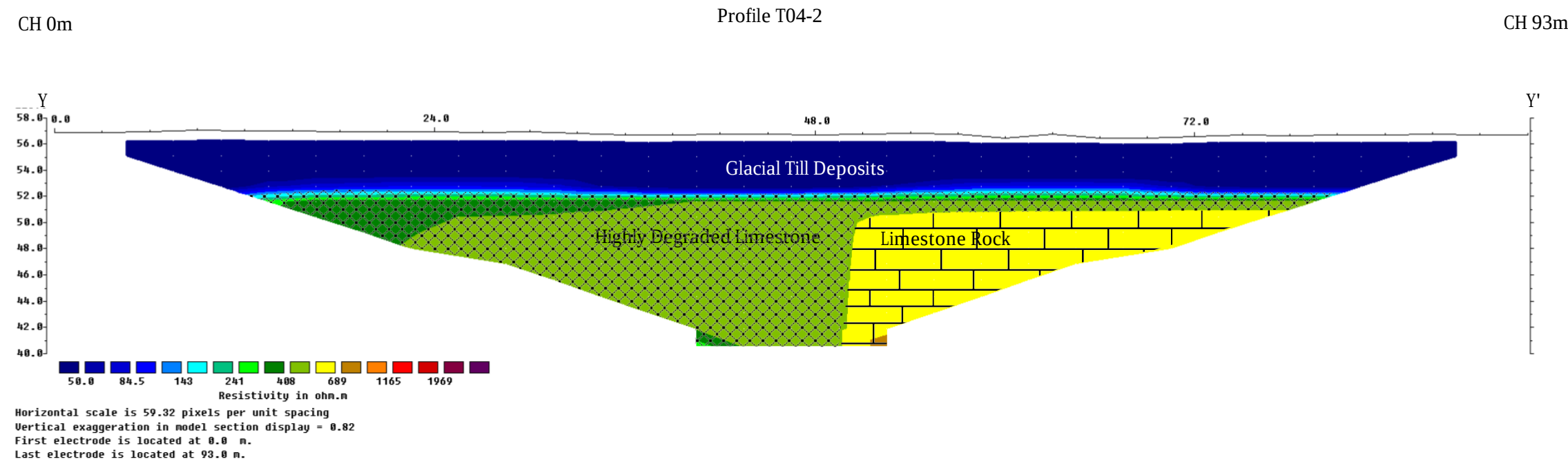
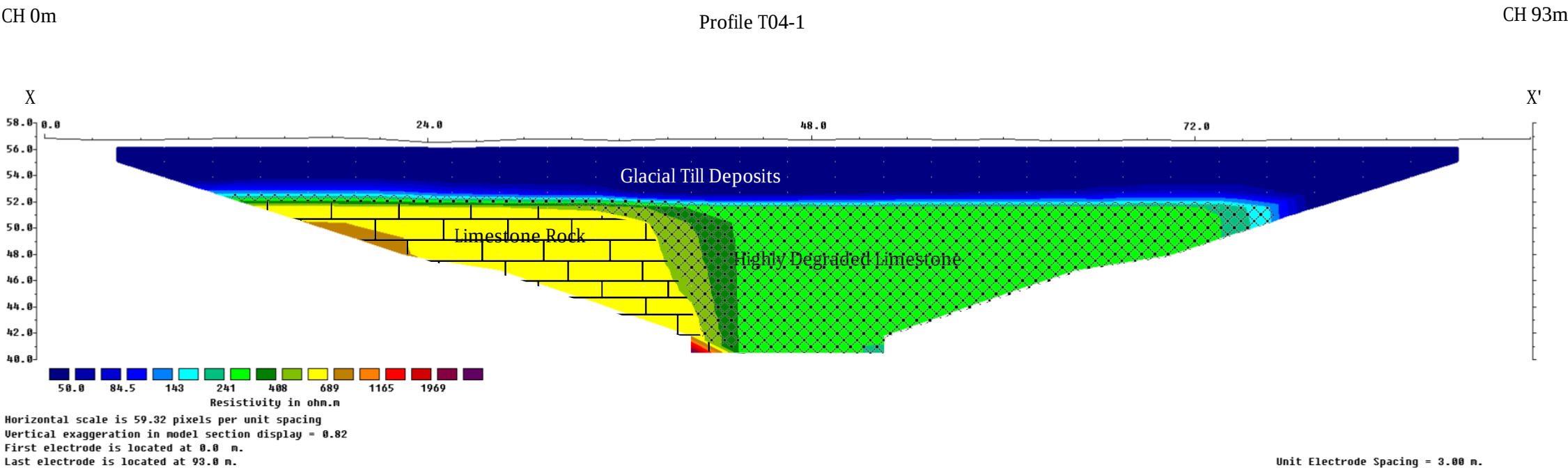
Draft

Designed by J.W.	Checked by J.W.	Approved by - date J.M. - 18/06/2025	Drawing No. 2177/22 - ERT-T3	Date 18/06/2025	Scale As Shown
Whiteford Geoservices Ltd Grand House 1 Main Street, Grand, Ballyclare, Co. Antrim, UK BT29 5NE			Interpreted Electrical Resistivity Data Profiles T03-1 and T03-2 at Turbine T3 Garrane Green Energy Project		
			Revision 0	Sheet A3	

2177-22 Garrane Green Energy Project
Turbine T4

Electrical Resistivity Tomography (ERT) Surveys

Interpretated Resistivity Imaging Profiles Turbine T4
23rd August 2024



Key To Sections

Each Profile indicates variation in the elctrical restivity of the Subsurface with depth.

Natural Soils (generally 10 - 500Wm)
Rock (generally >500Wm)

Organic Soils
(PEAT and sandy, organic SILT / CLAYS)

Natural Soils
(Sandy, gravelly CLAYS with cobbles and boulders)

Highly Degraded Limestone
(Probably deeply weathered or highly fractured Limestone rock. May include wide, soil filled, fractures or appears as a raft of dense boulders.)

Limestone
(Massive or partially weathered)

Notes:

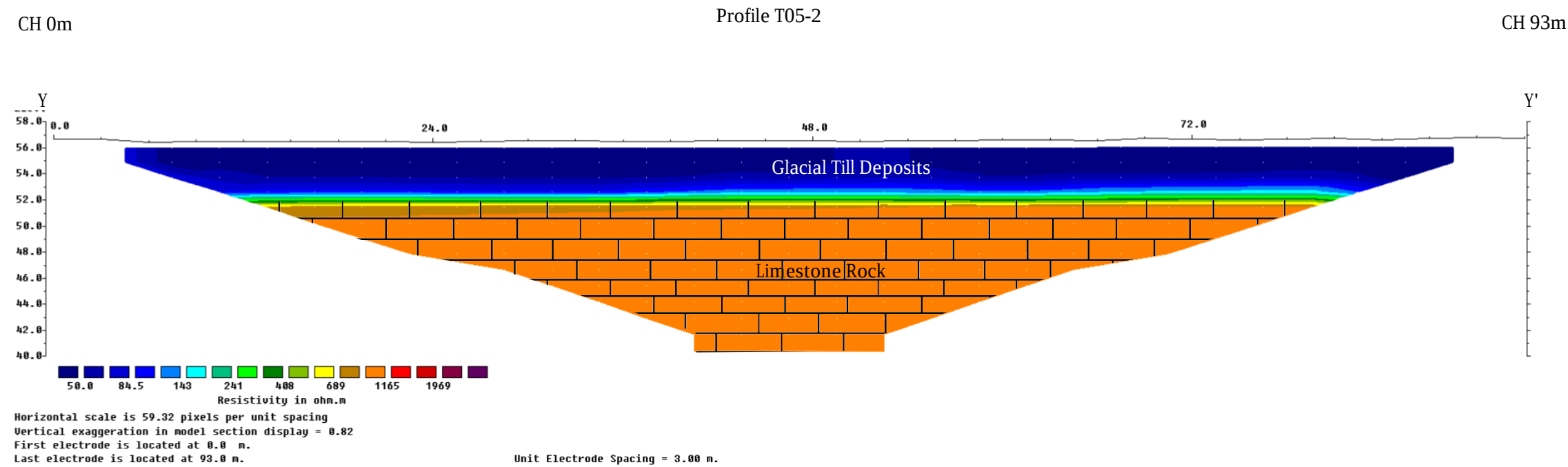
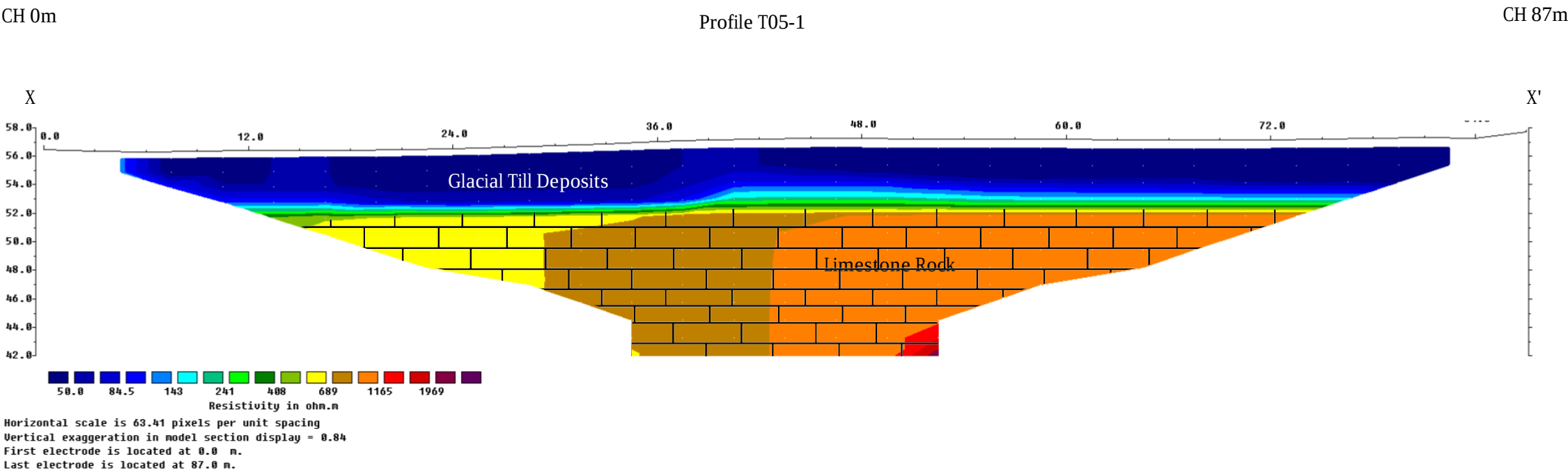
1. All depths are relative to ground level existing at the time of the survey / investigation.
2. Positions, where detailed, relate to the IG coordinate system.
3. Please refer to Drawing 2217-23-A for position of each ERT Profile.

Draft

Designed by J.W.	Checked by J.W.	Approved by - date J.M. - 18/06/2025	Drawing No. 2177/22 - ERT-T4	Date 18/06/2025	Scale As Shown
Whiteford Geoservices Ltd Great House 1 Main Street, Great Ballyclare, Co. Antrim, UK BT29 5NE			Interpreted Electrical Resistivity Data Profiles T04-1 and T04-2 at Turbine T4 Garrane Green Energy Project		
			Revision 0	Sheet A3	

Electrical Resistivity Tomography (ERT) Surveys

Interpretated Resistivity Imaging Profiles at Turbine T5
23rd August 2024



Key To Sections

Each Profile indicates variation in the elctrical restivity of the Subsurface with depth.

Natural Soils (generally 10 - 500Wm)
Rock (generally >500Wm)



Organic Soils
(PEAT and sandy, organic SILT / CLAYS)



Natural Soils
(Sandy, gravelly CLAYS with cobbles and boulders)



Highly Degraded Limestone
(Probably deeply weathered or highly fractured Limestone rock. May include wide, soil filled, fractures or appears as a raft of dense boulders.)



Limestone
(Massive or partially weathered)

Notes:

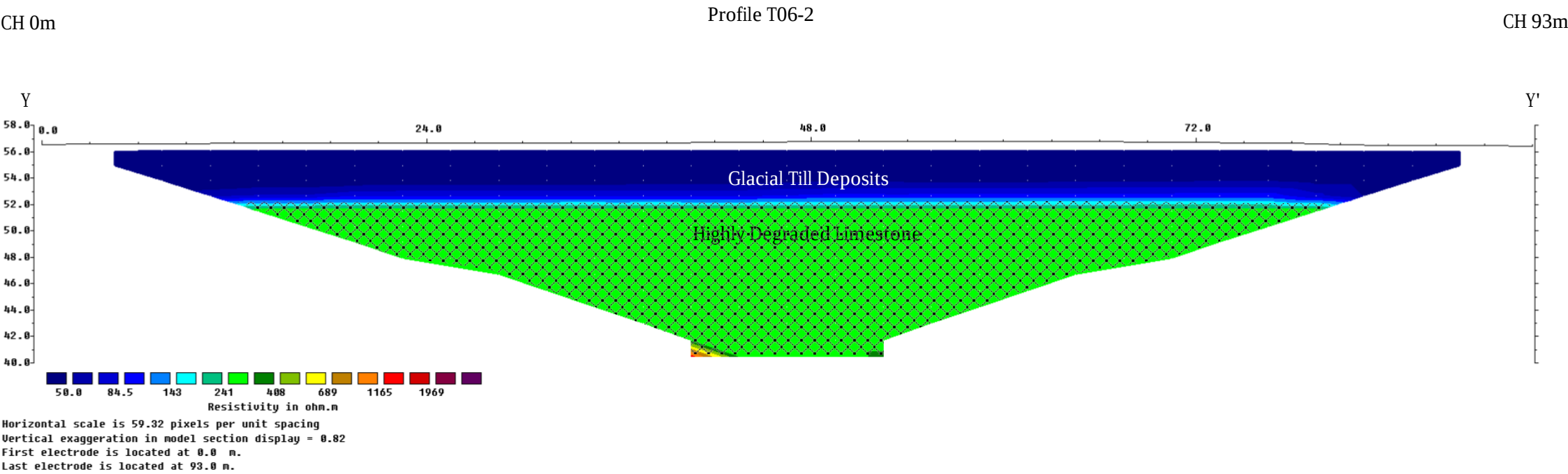
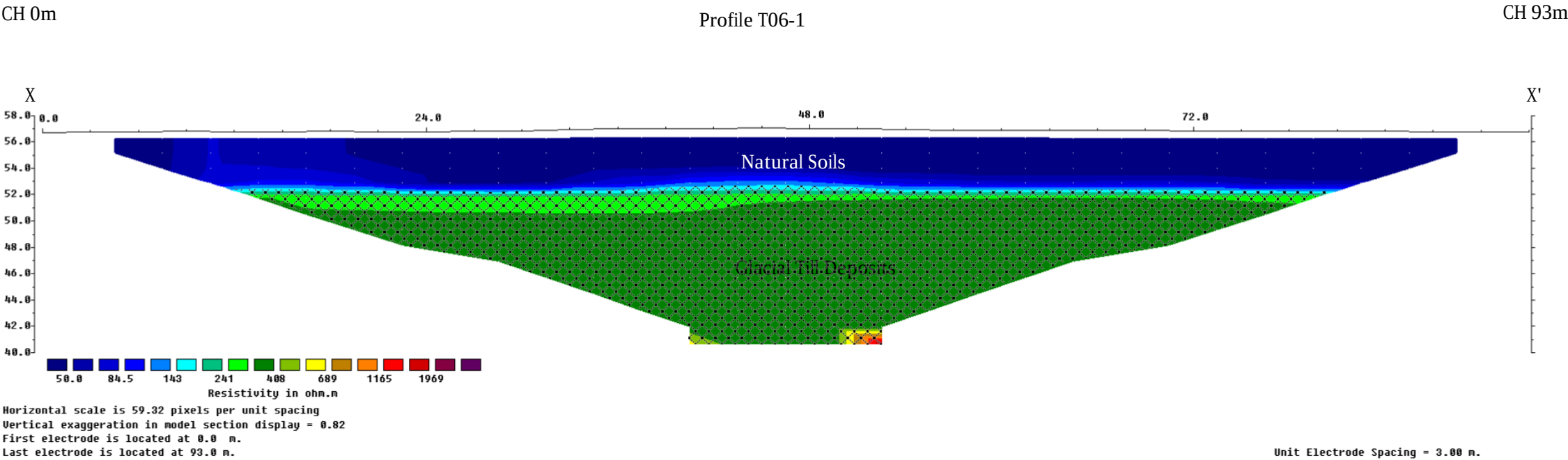
1. All depths are relative to ground level existing at the time of the survey / investigation.
2. Positions, where detailed, relate to the IG coordinate system.
3. Please refer to Drawing 2217-23-A for position of each ERT Profile.

Draft

Designed by	Checked by	Approved by - date	Drawing No.	Date	Scale
J.W.	J.W.	J.M. - 18/06/2025	2177/22 - ERT-T5	18/06/2025	As Shown
Whiteford Geoservices Ltd			Interpreted Electrical Resistivity Data		
2177/22 - ERT-T5			Profiles T05-1 and T05-2 at Turbine T5		
Garrane Green Energy Project			0	A3	

Electrical Resistivity Tomography (ERT) Surveys

Interpretated Resistivity Imaging Profiles at Turbine T6
23rd August 2024



Key To Sections

Each Profile indicates variation in the elctrical restivity of the Subsurface with depth.

Natural Soils (generally 10 - 500Wm)
Rock (generally >500Wm)



Organic Soils
(PEAT and sandy, organic
SILT / CLAYS)



Natural Soils
(Sandy, gravelly CLAYS with
cobbles and boulders)



Highly Degraded Limestone
(Probably deeply weathered
or highly fractured Limestone
rock. May include wide, soil
filled, fractures or appears as
a raft of dense boulders.)



Limestone
(Massive or partially weathered)

Notes:

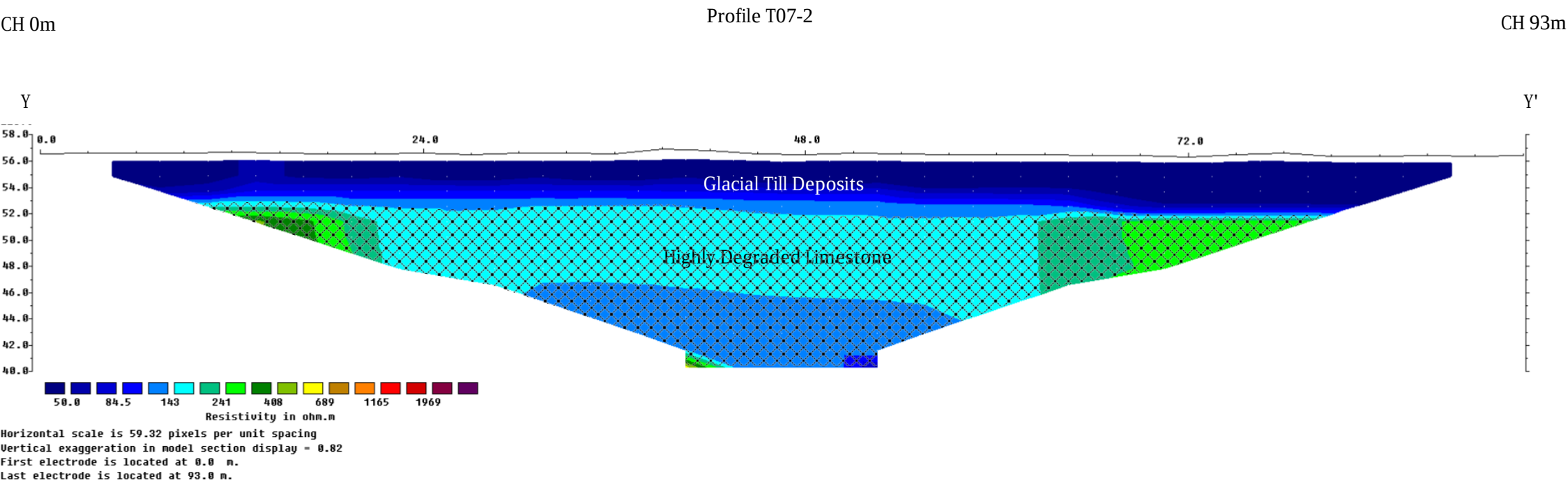
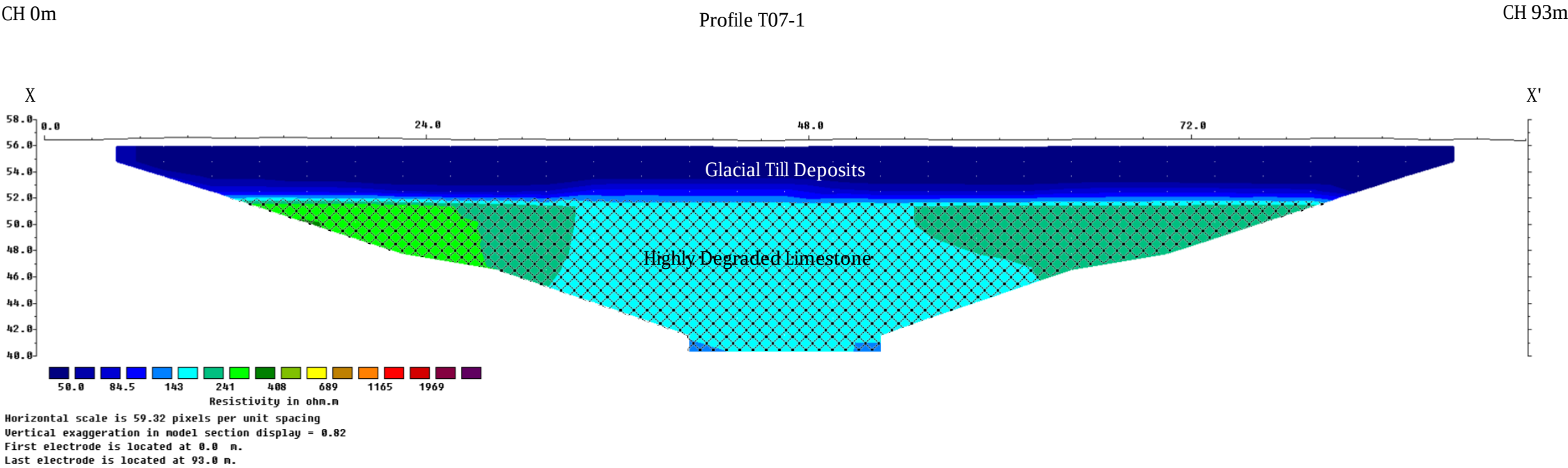
1. All depths are relative to ground level existing at the time of the survey / investigation.
2. Positions, where detailed, relate to the IG coordinate system.
3. Please refer to Drawing 2217-23-A for position of each ERT Profile.

Draft

Designed by	Checked by	Approved by - date	Drawing No.	Date	Scale
J.W.	J.W.	J.M. - 18/06/2025	2177/22 - ERT-T6	18/06/2025	As Shown
Whiteford Geoservices Ltd			Interpreted Electrical Resistivity Data Profiles T06-1 and T06-2 at Turbine T6		
Garrane Green Energy Project			0	A3	

Electrical Resistivity Tomography (ERT) Surveys

Interpretated Resistivity Imaging Profiles at Turbine T7
23rd August 2024



Key To Sections

Each Profile indicates variation in the electrical resistivity of the Subsurface with depth.

Natural Soils (generally 10 - 500Wm)
Rock (generally >500Wm)



Organic Soils
(PEAT and sandy, organic SILT / CLAYS)



Natural Soils
(Sandy, gravelly CLAYS with cobbles and boulders)



Highly Degraded Limestone
(Probably deeply weathered or highly fractured Limestone rock. May include wide, soil filled, fractures or appears as a raft of dense boulders.)



Limestone
(Massive or partially weathered)

Notes:

1. All depths are relative to ground level existing at the time of the survey / investigation.
2. Positions, where detailed, relate to the IG coordinate system.
3. Please refer to Drawing 2217-23-A for position of each ERT Profile.

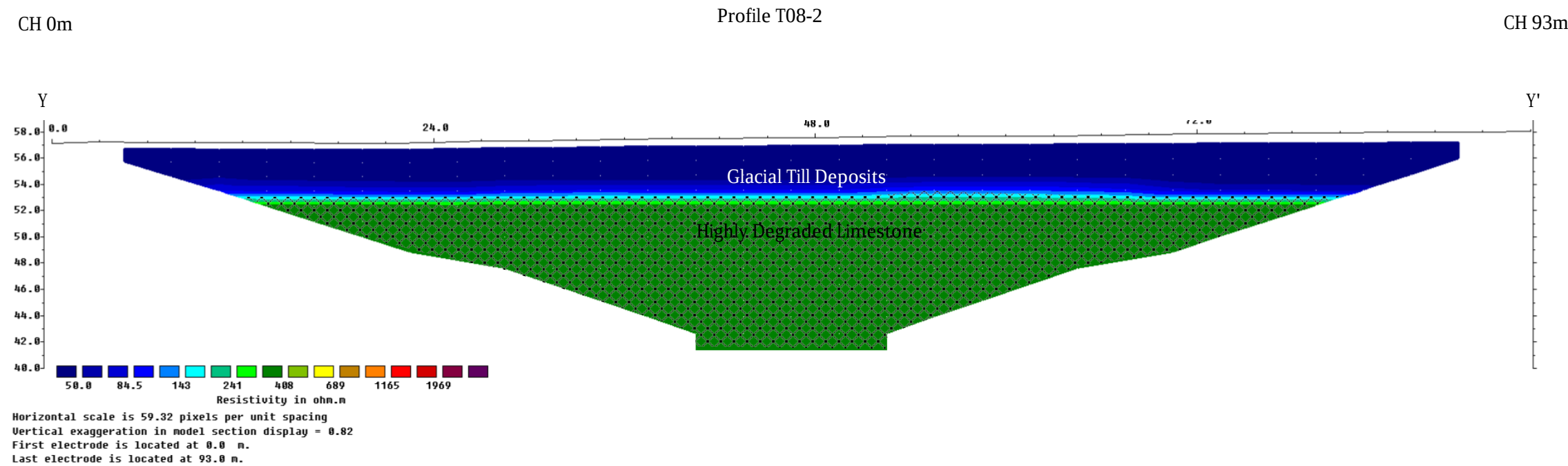
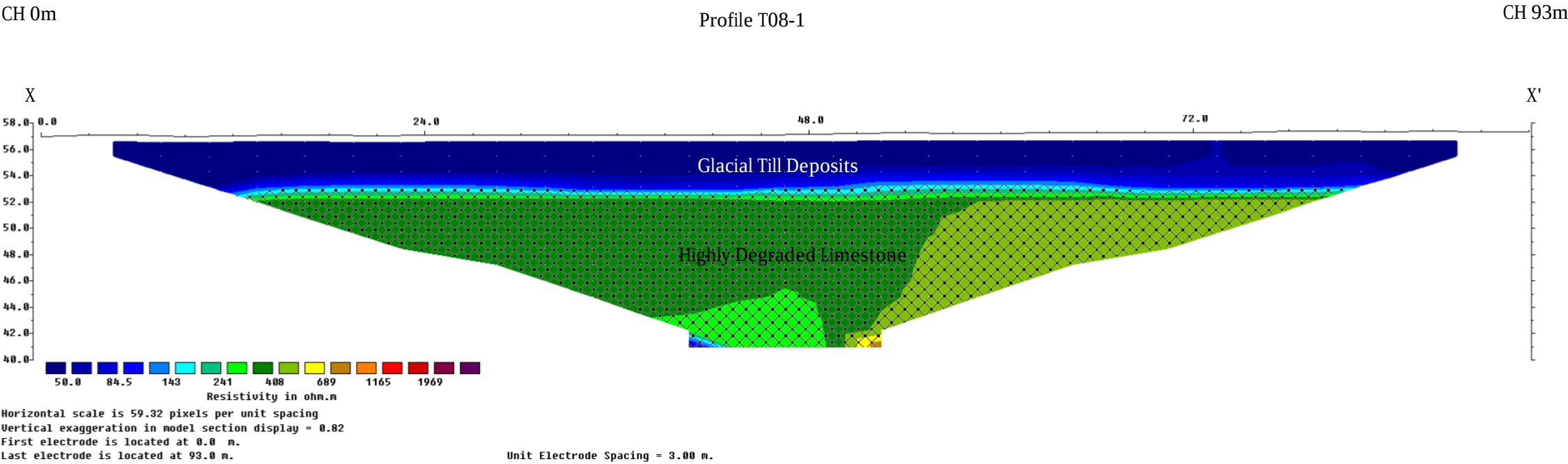
Draft

Designed by	Checked by	Approved by - date	Drawing No.	Date	Scale
J.W.	J.W.	J.M. - 18/06/2025	2177/22 - ERT-T7	18/06/2025	As Shown
Whiteford Geoservices Ltd 2177-22 Garrane Green Energy Project Ballyclare, Co. Antrim, UK BT29 5NE			Interpreted Electrical Resistivity Data Profiles T07-1 and T07-2 at Turbine T7		
Garrane Green Energy Project			0	A3	

2177-22 Garrane Green Energy Project
Turbine T8

Electrical Resistivity Tomography (ERT) Surveys

Interpretated Resistivity Imaging Profiles at Turbine T8
23rd August 2024



Key To Sections

Each Profile indicates variation in the elctrical restivity of the Subsurface with depth.

Natural Soils (generally 10 - 500Wm)
Rock (generally >500Wm)

Organic Soils
(PEAT and sandy, organic
SILT / CLAYS)

Natural Soils
(Sandy, gravelly CLAYS with
cobbles and boulders)

Highly Degraded Limestone
(Probably deeply weathered
or highly fractured Limestone
rock. May include wide, soil
filled, fractures or appears as
a raft of dense boulders.)

Limestone
(Massive or partially weathered)

Notes:

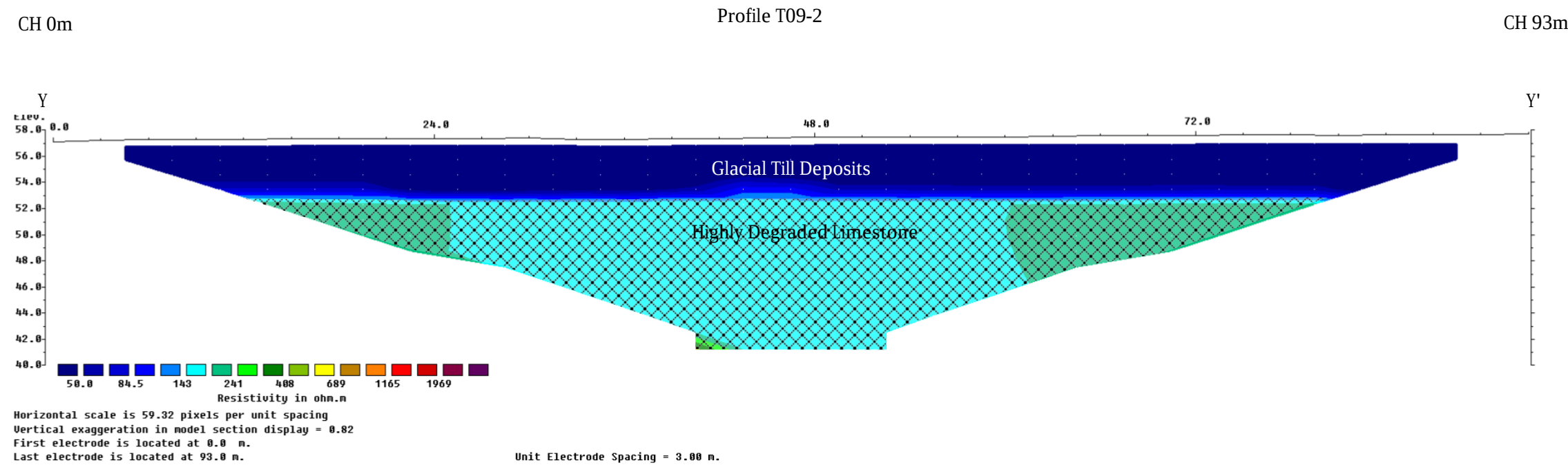
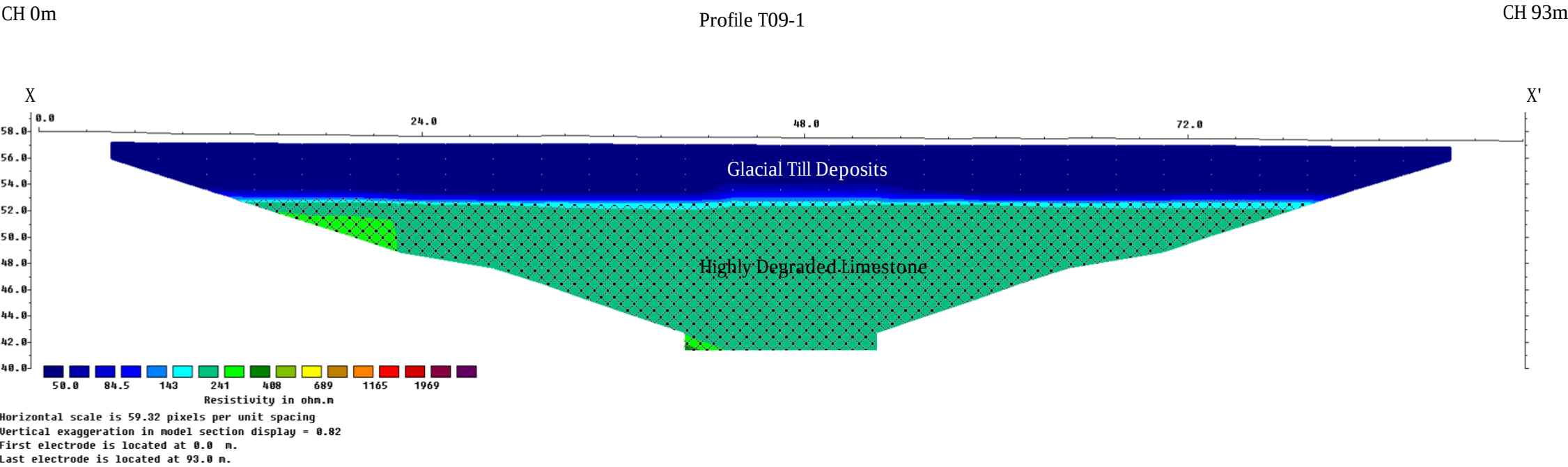
1. All depths are relative to ground level existing at the time of the survey / investigation.
2. Positions, where detailed, relate to the IG coordinate system.
3. Please refer to Drawing 2217-23-A for position of each ERT Profile.

Designed by	Checked by	Approved by - date	Drawing No.	Date	Scale
J.W.	J.W.	J.M. - 18/06/2025	2177/22 - ERT-T8	18/06/2025	As Shown
Whiteford Geoservices Ltd			Interpreted Electrical Resistivity Data		
2177/22 - ERT-T8			Profiles T08-1 and T08-2 at Turbine T8		
Garrane Green Energy Project			0	A3	

2177-22 Garrane Green Energy Project
Turbine T9

Electrical Resistivity Tomography (ERT) Surveys

Interpretated Resistivity Imaging Profiles at Turbine T9
23rd August 2024



Key To Sections

Each Profile indicates variation in the elctrical restivity of the Subsurface with depth.

Natural Soils (generally 10 - 500Wm)
Rock (generally >500Wm)

Organic Soils
(PEAT and sandy, organic SILT / CLAYS)

Natural Soils
(Sandy, gravelly CLAYS with cobbles and boulders)

Highly Degraded Limestone
(Probably deeply weathered or highly fractured Limestone rock. May include wide, soil filled, fractures or appears as a raft of dense boulders.)

Limestone
(Massive or partially weathered)

Notes:

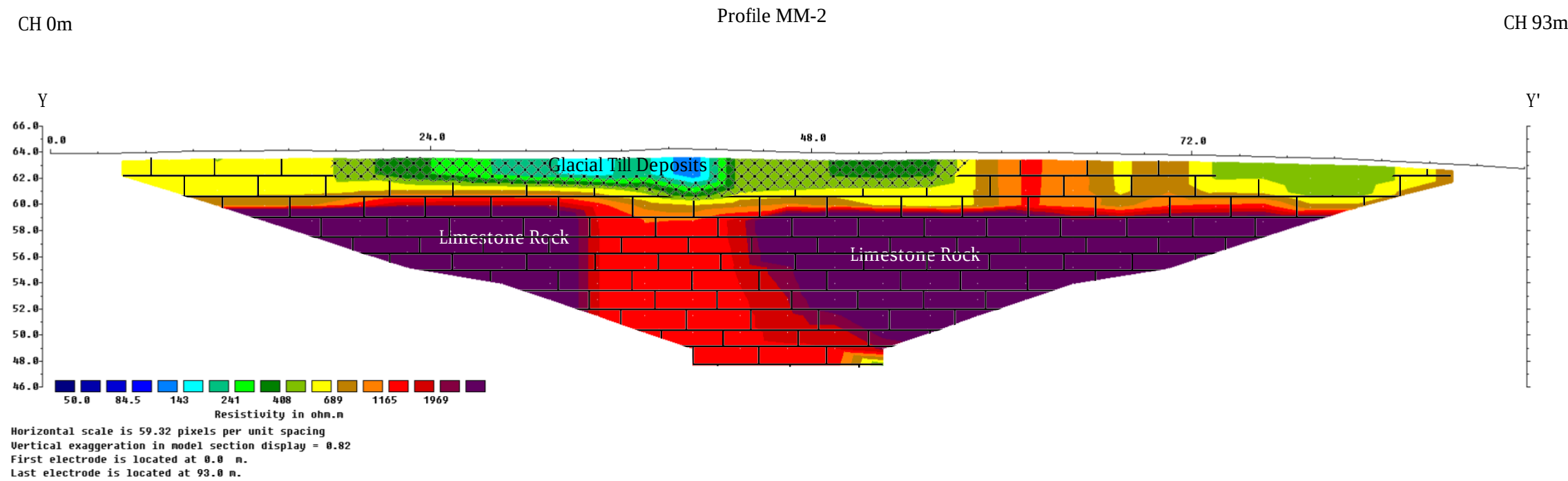
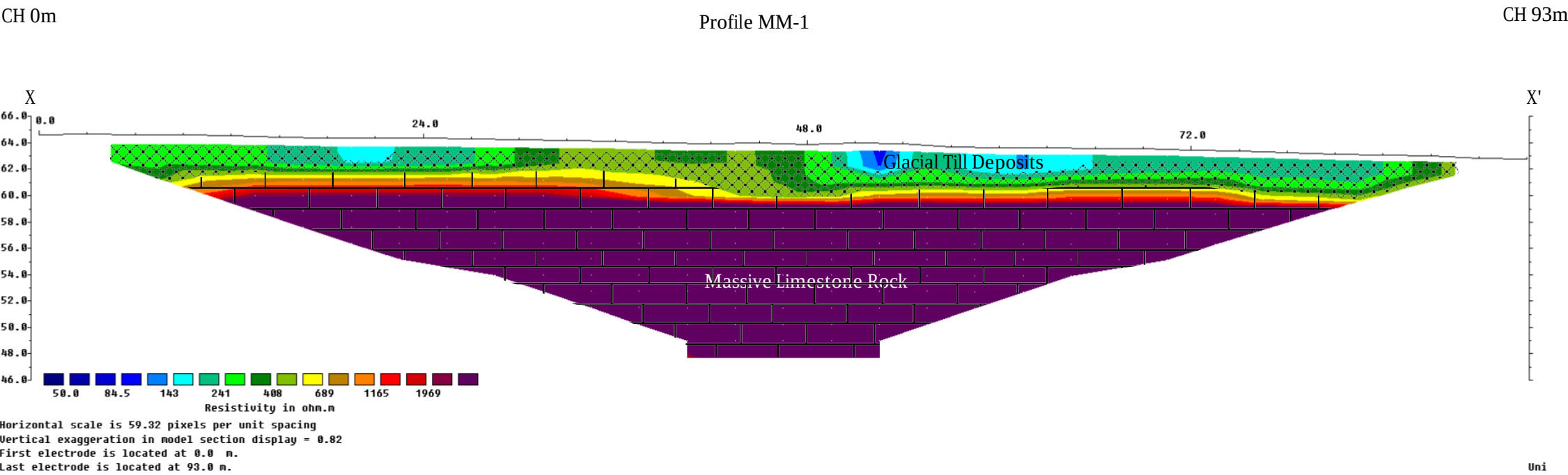
1. All depths are relative to ground level existing at the time of the survey / investigation.
2. Positions, where detailed, relate to the IG coordinate system.
3. Please refer to Drawing 2217-23-A for position of each ERT Profile.

Draft

Designed by J.W.	Checked by J.W.	Approved by date J.M. - 18/06/2025	Drawing No. 2177/22 - ERT-T9	Date 18/06/2025	Scale As Shown
Whiteford Geoservices Ltd Great House 4 Main Street, Great Ballyclare, Co. Antrim, UK BT29 5NE			Interpreted Electrical Resistivity Data Profiles T09-1 and T09-2 at Turbine T9 Garrane Green Energy Project		
			Sheet 0	Sheet A3	

Electrical Resistivity Tomography (ERT) Surveys

Interpretated Resistivity Imaging Profiles at Met Mast MM
23rd August 2024



Key To Sections

Each Profile indicates variation in the elctrical restivity of the Subsurface with depth.

Natural Soils (generally 10 - 500Wm)
Rock (generally >500Wm)



Organic Soils
(PEAT and sandy, organic SILT / CLAYS)



Natural Soils
(Sandy, gravelly CLAYS with cobbles and boulders)



Highly Fractured Limestone
(Probably deeply weathered or highly fractured Limestone rock. May include wide, soil filled, fractures or appears as a raft of dense boulders.)



Limestone
(Massive or partially weathered)

Notes:

1. All depths are relative to ground level existing at the time of the survey / investigation.
2. Positions, where detailed, relate to the IG coordinate system.
3. Please refer to Drawing 2217-23-A for position of each ERT Profile.

Draft

Designed by	Checked by	Approved by - date	Drawing No.	Date	Scale
J.W.	J.W.	J.M. - 18/06/2025	2177/22 - ERT-MM	18/06/2025	As Shown
Whiteford Geoservices Ltd			Interpreted Electrical Resistivity Data		
2177/22 - Garrane Green Energy Project			Profiles MM-1 and MM-2 at Met Mast MM		
Garrane Green Energy Project			0	A3	

APPENDIX D

LABORATORY TESTING RESULTS

Atterberg Limits	1 x A4
Bulk Density and Dry Density	1 x A4
Bulk Density	1 x A4
Natural Moisture Content	1 x A4
Partial Size Distribution	10 x A4
Sulphate Content of Water Extract, Chloride Content of Water Extract, Sulphide Content of Water Extract & pH	9 x A4

Atterberg Limits

Location: Garrane Green Energy Project

Client: Garrane Green Energy Ltd

Job No: 2177-22



Hole ID	Depth (m)	Passing 425%	LL (%)	PL (%)	PI (%)	Sample References	Results
TP SO1	1.50	59	24	14	10	Refer to Log	CLAY of LOW PLASTICITY
TP SO2	2.00	64	23	14	9	Refer to Log	CLAY of LOW PLASTICITY
TP SO3	1.20	57	24	14	10	Refer to Log	CLAY of LOW PLASTICITY
TP SO4	2.7	55	24	14	10	Refer to Log	CLAY of LOW PLASTICITY
Operator						Checked	Approved
SV						JM	JW

TESTS CARRIED OUT BY DR SIVAKUMAR VINAYAGAMOTHY OF QUEENS UNIVERSITY BELFAST

Bulk Density



Location: Garrane Green Energy Project

Client: Garrane Green Energy Ltd

Job No: 2177-22

<i>Hole ID</i>	<i>Depth</i>	<i>Bulk Density (kg/m³)</i>
TP SO1	1.50	2211
TP SO2	2.00	2302
TP SO3	1.20	2248
TP SO4	2.70	2313

<i>Operator</i>	<i>Checked</i>	<i>Approved</i>
DR. SIVAKUMAR	JMcN	JW

Test Method: BS 1377 : 1990: Part 2

Queens University Belfast

Laboratory Results



Location: Garrane Green Energy Project

Job No: 2177-22

Client: Garrane Green Energy Ltd

Sample no:	Depth (m)	Water Content (%)	Bulk Density kg/m3	Dry Density kg/m3
TP-A	2.50	27.7	2082	1500
TP-B	1.50	26.4	2098	1506
TP-C	3.00	11.0	2251	2041
TP-D	3.0	10.5	2492	2045
TP-E	3.5	14.4	2439	2062
TP-F	2.5	12.9	2392	1967

Operator	Checked	Approved
LJ	JMCN	JW

Moisture Content



Location: Garrane Green Energy Project

Client: Garrane Green Energy Ltd

Job No: 2177-22

<i>Hole ID</i>	<i>Depth</i>	<i>Moisture Content %</i>
TP SO1	1.50	11.0
TP SO2	2.00	7.9
TP SO3	1.20	8.9
TP SO4	2.70	8.2

<i>Operator</i>	<i>Checked</i>	<i>Approved</i>
DR. SIVAKUMAR	JMcN	JW

Test Method: BS 1377 : 1990: Part 2

Queens University Belfast

Whiteford Geoservices
Straid House
Straid
Ballyclare
United Kingdom
BT39 9EU



4225



Attention : Joy McNeill
Date : 9th September, 2024
Your reference : 2177-22
Our reference : Test Report 24/15197 Batch 1
Location : Garrane Green Energy Project
Date samples received : 5th September, 2024
Status : Final Report
Issue : 202409091334

Four samples were received for analysis on 5th September, 2024 of which four 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 - 4.923 kg of CO2

Scope 1&2&3 emissions - 11.635 kg of CO2

Authorised By:

Bruce Leslie
Project Manager

Please include all sections of this report if it is reproduced

Client Name: Whiteford Geoservices
Reference: 2177-22
Location: Garrane WF
Contact: Joy McNeill
EMT Job No: 24/15197

Report : Solid

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

[illegible]

Client Name: Whiteford Geoservices

Reference: 2177-22

Location: Garrane WF

Contact: Joy McNeill

[illegible]

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.: 24/15197

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 35°C ±5°C.

Where Mineral Oil 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 overestimate 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 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.

Tentatively Identified Compounds (TICs)

Where Tentatively Identified Compounds (TICs) are reported, up to 10 Tentatively Identified Compounds will be listed where there is found to be a greater than 80% match with the NIST library. The reported concentration is determined semi-quantitatively, with a matrix specific limit of detection. Note, other compounds may be present but are not reported.

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.
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: 24/15197

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/S ANAS)	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	
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		AD	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
TM107	Determination of Sulphide/Thiocyanate by Skalar Continuous Flow Analyser	PM45	As received solid samples are extracted with 1M NaOH by orbital shaker for Cyanide, Sulphide and Thiocyanate analysis.			AR	Yes

VINI Geotechnical Testing

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	90.0
20.000	90.0
14.000	86.6
10.000	83.9
6.300	81.4
5.000	74.3
3.350	71.3
2.000	68.0
1.180	65.1
0.600	61.2
0.425	58.7
0.300	55.0
0.212	48.4
0.150	42.3
0.063	37.5

Determination of Particle Size Distribution
BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5



Percentage Particle Size											
Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
	Silt			Sand			Gravel				
	0.0			37.5			30.6				
0.0											

Sample Description Gravelly sandy SILT

Project No. 2177-22

BH/TP No. TP-S01

Project Garrane Green Energy Project

Sample No.

Operator

SS

Checked

VS

Approved

VS

Date sample tested

07/09/2024

Depth

1.5m

VINI Geotechnical Testing

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	100.0
20.000	98.2
14.000	95.0
10.000	92.1
6.300	90.0
5.000	83.5
3.350	80.1
2.000	75.8
1.180	72.2
0.600	66.7
0.425	63.7
0.300	59.3
0.212	52.5
0.150	47.1
0.063	43.0

Determination of Particle Size Distribution
BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5



Percentage Particle Size											
Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
	Silt			Sand			Gravel				
	0.0			43.0			32.8				

Sample Description Gravelly sandy SILT

Project No. 2177-22

BH/TP No. TP-S02

Project Garrane Green Energy Project

Sample No.

Operator

SS

Checked

VS

Approved

VS

Date sample tested

07/09/2024

Depth

2.0m

VINI Geotechnical Testing

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	86.7
20.000	86.7
14.000	84.4
10.000	82.2
6.300	79.5
5.000	73.9
3.350	71.1
2.000	67.8
1.180	64.6
0.600	60.1
0.425	57.4
0.300	52.9
0.212	46.7
0.150	41.5
0.063	36.5

Determination of Particle Size Distribution
BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5



Percentage Particle Size											
Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
	Silt			Sand			Gravel				
	0.0	36.5		31.3			32.2				

Sample Description Gravelly sandy SILT

Project No. 2177-22

BH/TP No. TP-S03

Project Garrane Green Energy Project

Sample No.

Operator

SS

Checked

VS

Approved

VS

Date sample tested

07/09/2024

Depth

1.2m

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	91.3
20.000	87.7
14.000	83.6
10.000	79.9
6.300	78.3
5.000	72.1
3.350	69.2
2.000	65.9
1.180	62.6
0.600	58.0
0.425	54.5
0.300	49.2
0.212	43.8
0.150	41.0
0.063	37.8

Determination of Particle Size Distribution
BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5



Percentage Particle Size																	
Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder						
	Silt			Sand			Gravel										
	0.0			37.8			28.1					34.1			0.0		

Sample Description Gravelly sandy SILT

Project No. 2177-22

BH/TP No. TP-S04

Project Garrane Green Energy Project

Sample No.

Operator

SS

Checked

VS

Approved

VS

Date sample tested

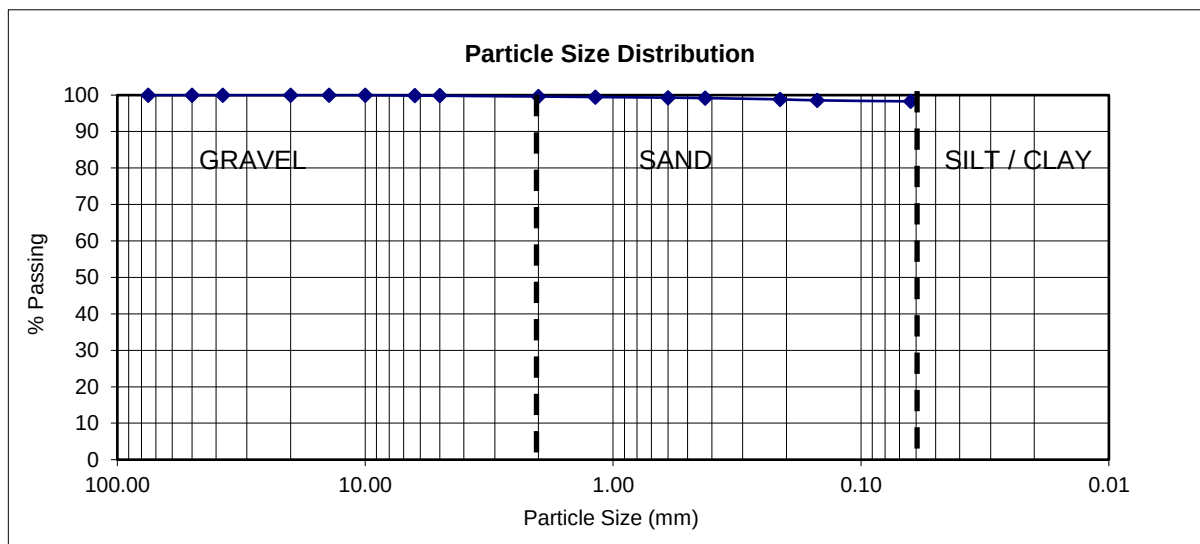
07/09/2024

Depth

2.7m

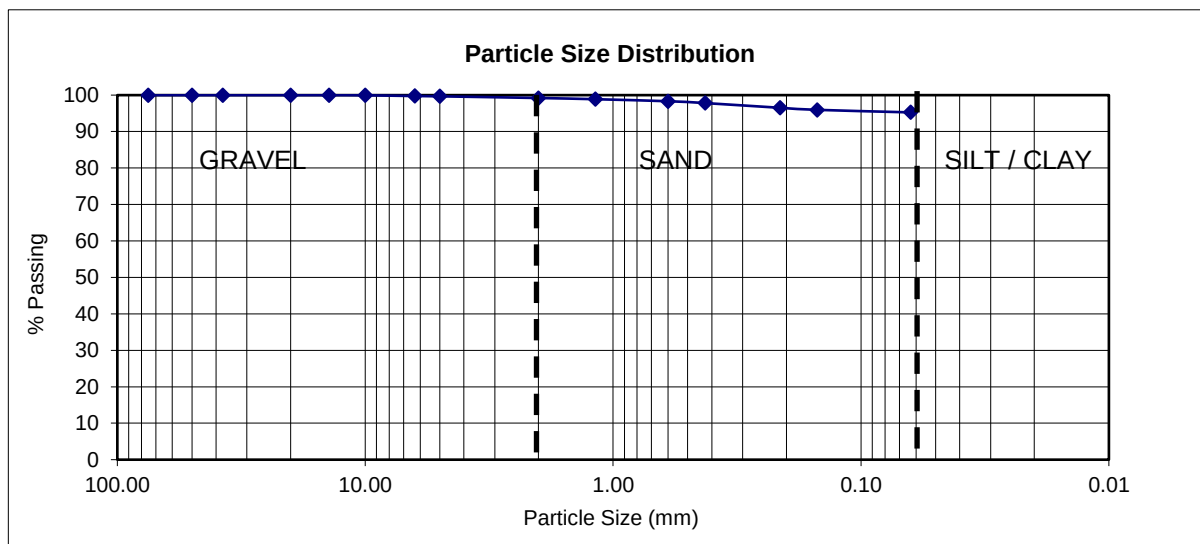
Particle Size Distribution

Location: Garrane Green Energy Project			Job ref:	2177-22
			Borehole/ Pit no.	TP-A
Soil description: SLIT / CLAY			Sample no.	
			Depth	2.50
Test method BS 1377-2:1990:9.2/9.3/9.4/9.5*			Date	28.10.22
Initial dry mass (m1)		2082.00		
Mass of receiver (g)				
BS test sieve (mm)	Mass of dry soil + receiver (g)	Mass of dry soil retained (m2) (g)	Percentage retained (m2/m1)100	Cumulative percentage passing
75		0.00	0.00	100.00
50		0.00	0.00	100.00
37.5		0.00	0.00	100.00
20		0.00	0.00	100.00
14		0.00	0.00	100.00
10		0.00	0.00	100.00
6.3		2.40	0.12	99.88
5		1.20	0.06	99.83
2		4.50	0.22	99.61
1.18		2.90	0.14	99.47
0.6		3.60	0.17	99.30
0.425		2.50	0.12	99.18
0.212		7.10	0.34	98.84
0.15		5.80	0.28	98.56
0.063		5.70	0.27	98.29
Bottom tray		2046.30	98.29	0.00



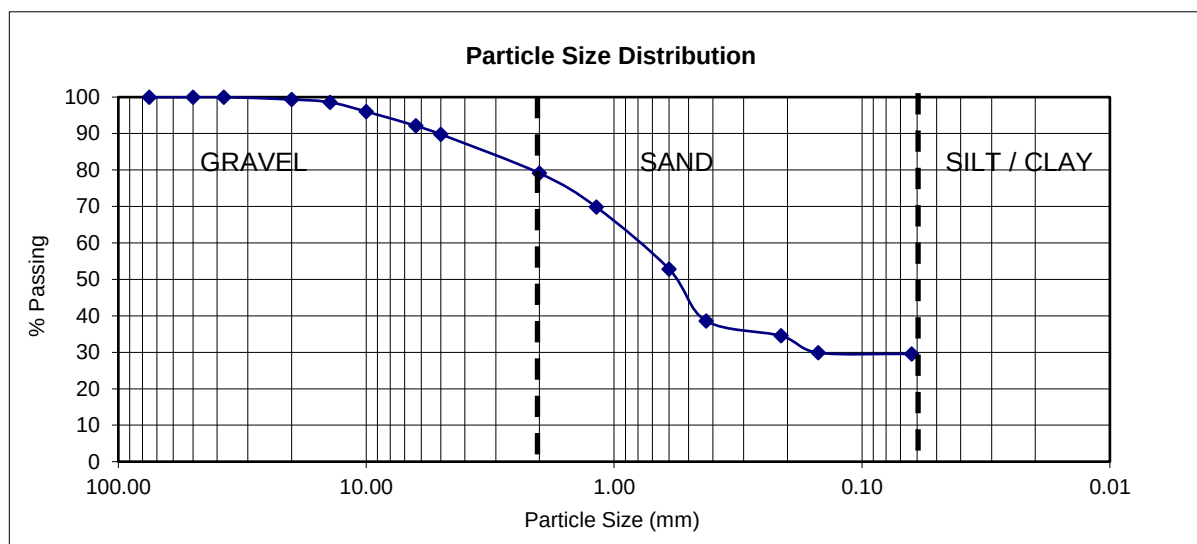
Particle Size Distribution

Location: Garrane Green Energy Project			Job ref:	2177-22
			Borehole/ Pit no.	TP-B
Soil description: Slightly Sandy SILT / CLAY			Sample no.	
			Depth	1.50
Test method BS 1377-2:1990:9.2/9.3/9.4/9.5*			Date	28.10.22
Initial dry mass (m1)		2043.30		
Mass of receiver (g)				
BS test sieve (mm)	Mass of dry soil + receiver (g)	Mass of dry soil retained (m2) (g)	Percentage retained (m2/m1)100	Cumulative percentage passing
75		0.00	0.00	100.00
50		0.00	0.00	100.00
37.5		0.00	0.00	100.00
20		0.00	0.00	100.00
14		0.00	0.00	100.00
10		1.00	0.05	99.95
6.3		4.20	0.21	99.75
5		1.60	0.08	99.67
2		9.50	0.46	99.20
1.18		6.70	0.33	98.87
0.6		11.40	0.56	98.32
0.425		10.20	0.50	97.82
0.212		26.60	1.30	96.52
0.15		11.50	0.56	95.95
0.063		14.10	0.69	95.26
Bottom tray		1946.50	95.26	0.00



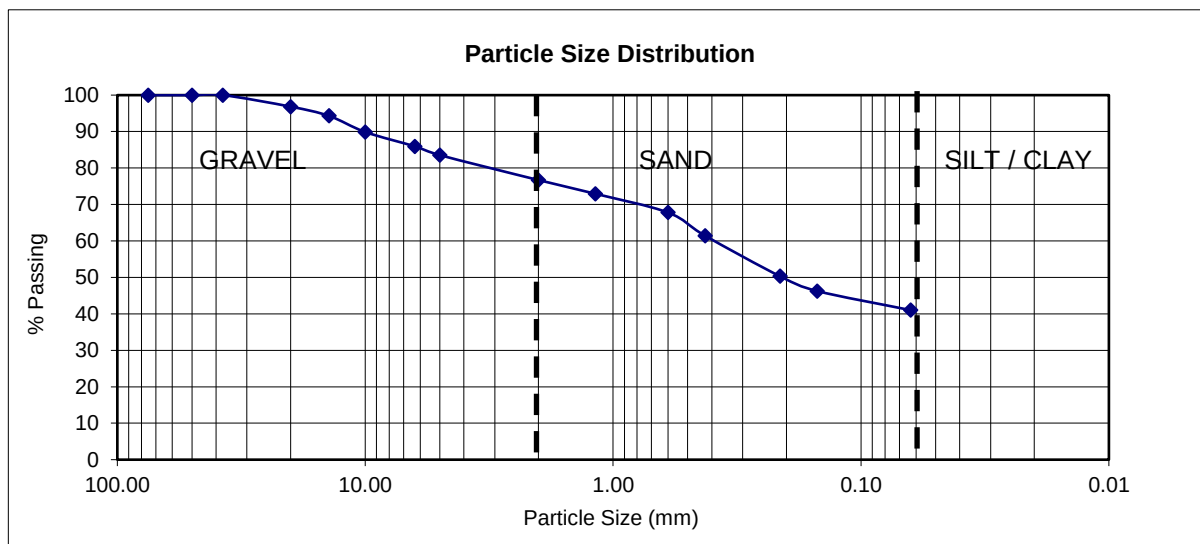
Particle Size Distribution

Location: Garrane Green Energy Project			Job ref:	2177-22
			Borehole/ Pit no.	TP-C
Soil description: Slightly Gravelly, Sandy, SILT / CLAY			Sample no.	
			Depth	3.00
Test method BS 1377-2:1990:9.2/9.3/9.4/9.5*			Date	28.10.22
Initial dry mass (m1)	1744.10			
Mass of receiver (g)				
BS test sieve (mm)	Mass of dry soil + receiver (g)	Mass of dry soil retained (m2) (g)	Percentage retained (m2/m1)100	Cumulative percentage passing
75		0.00	0.00	100.00
50		0.00	0.00	100.00
37.5		0.00	0.00	100.00
20		11.30	0.65	99.35
14		13.40	0.77	98.58
10		44.60	2.56	96.03
6.3		68.00	3.90	92.13
5		40.90	2.35	89.78
2		186.00	10.66	79.12
1.18		161.70	9.27	69.85
0.6		297.10	17.03	52.81
0.425		247.80	14.21	38.60
0.212		71.40	4.09	34.51
0.15		80.60	4.62	29.89
0.063		5.70	0.33	29.56
Bottom tray		515.60	29.56	0.00



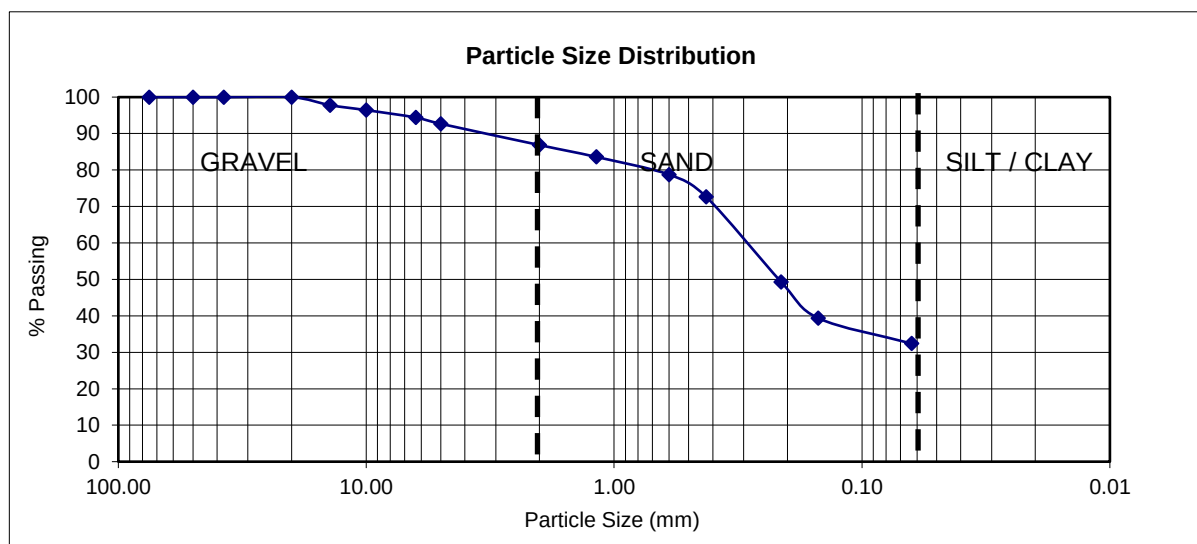
Particle Size Distribution

Location: Garrane Green Energy Project			Job ref:	2177-22
			Borehole/ Pit no.	TP-D
Soil description: Slightly Gravelly, Sandy, CLAY / SILT			Sample no.	
			Depth	3.00
Test method BS 1377-2:1990:9.2/9.3/9.4/9.5*			Date	28.10.22
Initial dry mass (m1)	2304.90			
Mass of receiver (g)				
BS test sieve (mm)	Mass of dry soil + receiver (g)	Mass of dry soil retained (m2) (g)	Percentage retained (m2/m1)100	Cumulative percentage passing
75		0.00	0.00	100.00
50		0.00	0.00	100.00
37.5		0.00	0.00	100.00
20		73.00	3.17	96.83
14		58.50	2.54	94.29
10		101.80	4.42	89.88
6.3		91.00	3.95	85.93
5		55.20	2.39	83.54
2		157.70	6.84	76.69
1.18		86.50	3.75	72.94
0.6		119.00	5.16	67.78
0.425		147.00	6.38	61.40
0.212		255.80	11.10	50.30
0.15		93.30	4.05	46.25
0.063		121.00	5.25	41.00
Bottom tray		945.10	41.00	0.00



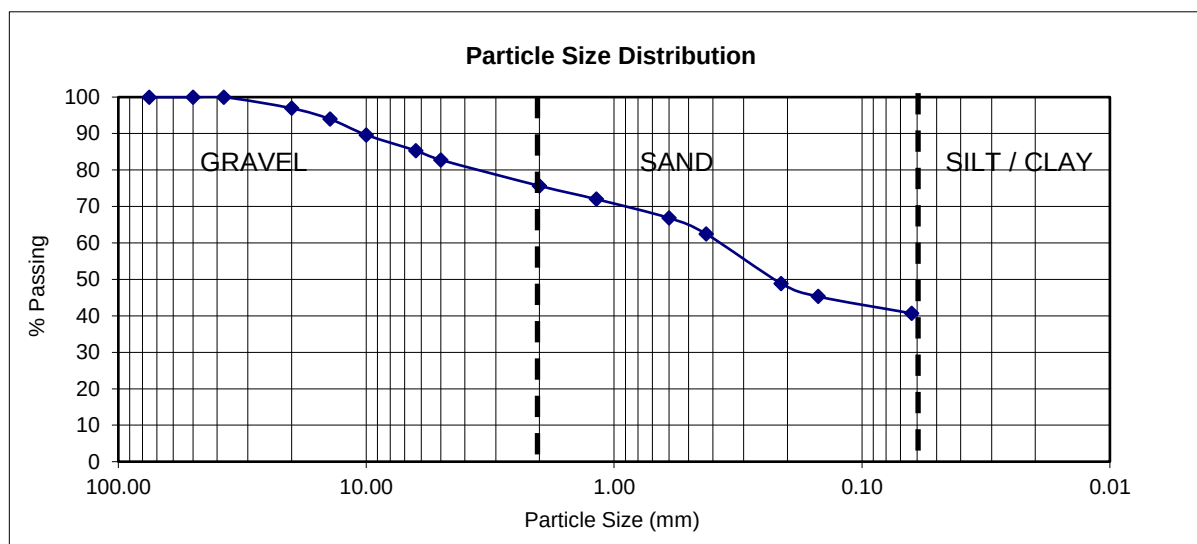
Particle Size Distribution

Location: Garrane Green Energy Project			Job ref:	2177-22
			Borehole/ Pit no.	TP-E
Soil description:Slightly Gravelly, Very Sandy CLAY / SILT			Sample no.	
			Depth	3.50
Test method BS 1377-2:1990:9.2/9.3/9.4/9.5*			Date	28.10.22
Initial dry mass (m1)	2270.20			
Mass of receiver (g)				
BS test sieve (mm)	Mass of dry soil + receiver (g)	Mass of dry soil retained (m2) (g)	Percentage retained (m2/m1)100	Cumulative percentage passing
75		0.00	0.00	100.00
50		0.00	0.00	100.00
37.5		0.00	0.00	100.00
20		0.00	0.00	100.00
14		50.10	2.21	97.79
10		30.90	1.36	96.43
6.3		46.20	2.04	94.40
5		39.10	1.72	92.67
2		132.30	5.83	86.85
1.18		73.90	3.26	83.59
0.6		110.20	4.85	78.74
0.425		138.90	6.12	72.62
0.212		529.10	23.31	49.31
0.15		225.90	9.95	39.36
0.063		158.30	6.97	32.39
Bottom tray		735.30	32.39	0.00



Particle Size Distribution

Location: Garrane Green Energy Project			Job ref:	2177-22
			Borehole/ Pit no.	TP-F
Soil description: Slightly gravelly, Sandy, SILT / CLAY			Sample no.	
			Depth	2.50
Test method BS 1377-2:1990:9.2/9.3/9.4/9.5*			Date	28.10.22
Initial dry mass (m1)	2636.40			
Mass of receiver (g)				
BS test sieve (mm)	Mass of dry soil + receiver (g)	Mass of dry soil retained (m2) (g)	Percentage retained (m2/m1)100	Cumulative percentage passing
75		0.00	0.00	100.00
50		0.00	0.00	100.00
37.5		0.00	0.00	100.00
20		80.70	3.06	96.94
14		78.40	2.97	93.97
10		114.10	4.33	89.64
6.3		114.20	4.33	85.31
5		66.90	2.54	82.77
2		187.70	7.12	75.65
1.18		96.20	3.65	72.00
0.6		136.30	5.17	66.83
0.425		115.70	4.39	62.44
0.212		357.20	13.55	48.89
0.15		94.80	3.60	45.30
0.063		121.80	4.62	40.68
Bottom tray		1072.40	40.68	0.00



Chemical Content Results



Location: Garrane Green Energy Project

Job No: 2177-22

Client: Garrane Green Energy Ltd

Sample ID:	Depth (m)	Sulphate (mg/l)	Chloride (mg/l)	Sulphide (mg/l)	pH
TP-A	2.50	38	23	0.16	8.86
TP-B	1.50	0	180	0.60	8.89
TP-C	3.00	56	51	0.10	7.75
TP-D	3.00	42	60	0.13	7.68
TP-E	3.50	53	93	0.06	8.42
TP-F	2.50	39	38	0.19	8.36

Operator	Checked	Approved
LJ	JWJM	WGS

BS1377-Part2 (1990) Section 2

APPENDIX E

PHOTOGRAPHIC RECORD

Photographic Plates- Stage 1	6 x A4
Photographic Plates- Stage 2	8 x A4



Plate 1—TP-A



Plate 2—TP-A



Plate 3—TP-B



Plate 4—TP-B



Plate 5—TP-C



Plate 6—TP-C



Plate 7—TP-D



Plate 8—TP-D



Plate 9—TP-E



Plate 10—TP-E



Plate 11—TP-F



Plate 12—TP-F



Trial Pit TP-S01



Trial Pit TP-S01



Trial Pit TP-S01



Trial Pit TP-S01



Trial Pit TP-S02



Trial Pit TP-S02



Trial Pit TP-S02



Trial Pit TP-S03



Trial Pit TP-S03



Trial Pit TP-S03



Trial Pit TP-S03



Trial Pit TP-S04



Trial Pit TP-S04



Trial Pit TP-S04



Trial Pit TP-S04