IRISH DRILLING LIMITED

LOUGHREA, CO. GALWAY, IRELAND

CONTRACT DRILLING
SITE INVESTIGATION

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PROPOSED DEVELOPMENT
AT
KEEL, ACHILL
CO. MAYO

SITE INVESTIGATION
REPORT

Mayo Co. Council,
Aras an Chontae,
The Mall,
Castlebar,
Co. Mayo.

December 2022
Job nr. 22MO113

Contents:

1.0 Introduction.

Irish Drilling Ltd. was instructed by Mayo Co. Council, to carry out a site investigation on the site of a proposed developments, at Keel Beach, Achill, Co. Mayo.

The fieldwork was carried out between 27th September and 6th October 2022.

2.0 The Sites & Geology.

The site is located at 'The Sandbanks' adjacent to Keel Beach, about 800m east of Keel village. The site was greenfield at the time of this investigation.

Geological Survey maps of the area indicate that the site is generally underlain by Quartite (Metamorphic) and is close to the contact with the Schist & Gneiss Formation.

A Site Plan is included in this report and show the positions of the boreholes.

3.0 Fieldwork.

The fieldwork consisted of the following:

A borehole was bored on each site, by shell and auger (light cable percussion) methods. Standard Penetration Tests were carried out at approximately one metre intervals and samples were taken and returned to the laboratory for examination. The boreholes were terminated on 'refusal' which was most likely on boulders.

The boreholes was continued using rotary core wire-line drilling equipment (HQ-65mm diameter) and cores were recovered and returned to the laboratory for examination, and logging by an engineering geologist.

The borehole records are included in Appendix 1.

Laboratory testing was carried out on representative samples, consisting of natural moisture content, Atterberg limits, Particle Size Distribution and Point Load tests on rock samples. Sulphate & pH tests were carried out by ALS Laboratories. The laboratory results are included in Appendix 2.

Photographs of the rock cores are included in Appendix 3.

The borehole location was surveyed, to ITM co-ordinates, using a Trimble CU Bluetooth Total Station.

The fieldwork was carried out in accordance with BS5930 (2015): Code of Practice for Site Investigations.

4.0 Ground Conditions

The borehole encountered the following ground conditions:

Depth	Strata
GL – 0.10m	Topsoil
0.10m – 3.00m	Medium dense silty sand, with cobbles
3.00m – 6.80m	Medium dense silty gravelly sand, with cobbles
6.80m – 7.00m	Soft peat
7.00m – 8.20m	Medium dense gravelly sand, with cobbles
8.20m – 12.90m	Dense grey silty sandy gravel, with cobbles
12.90m – 16.70m	Weak to medium strong schist

For detailed descriptions of the soils and rock, refer to Appendix 1.

4.1 Groundwater

Groundwater was encountered at the following depths:

Borehole	Date	Depth	Comments
Bh 1	27.9.'22	2.50m	Remained at 2.50m after 20 mins
	28.9.'22	2.50m	2.50m at 8am and at 11am

5.0 Foundations.

Consideration could be given to using pad or strip foundations for lightly loaded structures. At 0.60m depth, foundations may be designed using an allowable bearing pressure: of 100 kN/m^2.

Consideration could also be given to piled foundations and the length of pile will depend on design loads, the pile type and diameter, and the nature of the underlying soils and rock. The presence of boulders should be noted with regard to possible difficulties using driven piles, as the shell and auger borehole 'refused' before reaching bedrock.

The advice of specialist piling contractors should be sought as to the feasibility of their type of pile.

5.1 Retaining Walls

For the design of retaining walls the following parameters may be used [4] :

Strata	Unit Wt. saturated/dry kN/m^3	Cohesion (undrained) kPa	Angle of internal friction ϕ degrees
Fill	22/20	0	20
Loose Sand and Gravel	20/16	0	30
Dense Sand and Gravel	21/17	0	35
Very soft organic clay/silt	14/6	10	0
Soft slightly organic clay	16/10	20	0
Firm sandy clay	17/12	40	0
Firm to stiff gravelly sandy silt	20/17	75	0
Stiff gravelly sandy silt	20/17	100	0
Very stiff gravelly sandy silt	20/17	200	0
Sandstone or Schist rock	24/24	1,000-5,000	40

The results of Sulphate and pH tests indicate that the soils may be classed as DS-1 [6] and therefore no precautions are necessary with regard to protection of foundation concrete from chemical attack.

5.2 Ground Floor Slabs and Pavements

The overburden soils, after removal of topsoil and other organic material is considered suitable for the use of ground bearing slabs.

6.0 Excavations

Excavations in general are likely to be unstable and some form of side supports or battering of excavation sides may be necessary. The use of sumps and pumping may be necessary to maintain dry excavations. The close proximity of existing buildings, roads and services should be noted as excessive pumping is likely to cause settlement or movement of the structures.

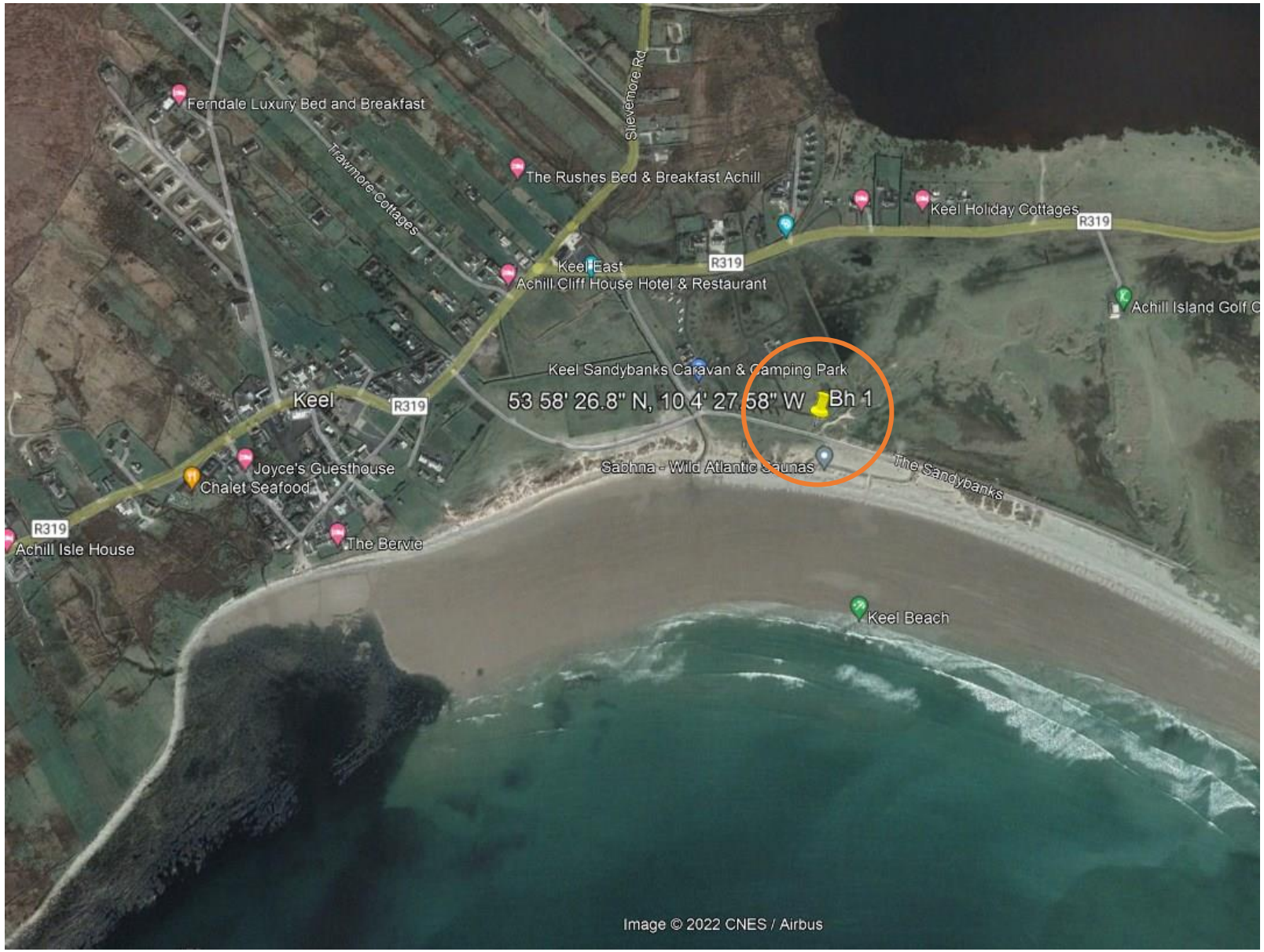
In the interest of safety, personnel should not be allowed enter unsupported excavations deeper than 1.0m.

Declan Joyce B.E., M.Eng.Sc., C.Eng., M.I.E.I
Chartered Geotechnical Engineer

REFERENCES:

(1) B.S.5930:(1981), Code of Practice for Site Investigation.
(2) B.S.1377:(1990), Methods of Test for Soils for Civil Engineering Purposes.
(3) B.S.8004:(1986), Foundations.
(4) Hoek E. & Bray J.W. (1991) Rock Slope Engineering. Revised 3rd ed. IMM
(5) Stroud M.A. & Butler F.G. (1975) The Standard Penetration Test and the Engineering Properties of Glacial Materials. Proceedings of the Symposium held at the University of Birmingham 21-23 April 1975.
(6) BRE Special Digest (1:2005) Concrete in aggressive ground.

Keel, Achill


Ferndale Luxury Bed and Breakfast
Trawmore Cottages
Slievemore Rd
The Rushes Bed & Breakfast Achill
Keel Holiday Cottages
R319
Keel East
Achill Cliff House Hotel & Restaurant
R319
Achill Island Golf C
Keel Sandybanks Caravan & Camping Park
53 58' 26.8" N, 10 4' 27.58" W
Bh 1
Keel
R319
Joyce's Guesthouse
Chalet Seafood
Sabhna - Wild Atlantic Saunas
The Sandybanks
R319
Achill Isle House
The Bervie
Keel Beach
Image © 2022 CNES / Airbus

00 Site Layout Plan
scale: 1:250

NOTES

GENERAL NOTES:

1. FIGURED DIMENSIONS ONLY TO BE TAKEN FROM THIS DRAWING.
2. ALL DRAWINGS TO BE CHECKED BY THE CONTRACTOR ON SITE
3. ENGINEER/EMPLOYERS REPRESENTATIVE, AS APPROPRIATE, TO BE INFORMED BY THE CONTRACTOR OF ANY DISCREPANCIES BEFORE ANY WORK COMMENCES
4. THE CONTRACTOR SHALL UNDERTAKE A THOROUGH CHECK FOR THE ACTUAL LOCATION OF ALL SERVICES/UTILITIES, ABOVE AND BELOW GROUND, BEFORE ANY WORK COMMENCES
5. ALL LEVELS SHOWN RELATE TO ORDNANCE SURVEY DATUM AT MALIN HEAD
6. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DRAWINGS AND SPECIFICATIONS. CONTRACTOR TO VERIFY THE ACCURACY OF THIS PROPOSAL TO THE ENGINEER AND ALLOW FOR MINOR CORRECTIONS AS DEEMED NECESSARY WITH A REASONABLE TIMEFRAME.

LEGEND

SITE BOUNDARY shown thus

LAND HOLDING shown thus

Site Area:-
1244 m^2, 0.3074 Acres, 0.1244 Hectares
ITM Co-Ordinates of site:-
463903, 804757

OS Sheet No.
1641, 1642, 1710, 1711

Ordnance Survey Ireland National Mapping Agency

rev.	modifications	by	chkd	date
P.01	Planning Issue	AP	MF	09.05.22

Layout Ref.: C:\Users\natas\OneDrive - Accelerating Change Together\Shared Documents\15_Watersports Facility Development At Keel And Carramore\Working Files\CAD\Keel\6820-JOD-XX-XX-DR-C-200-002-003 P.01 Proposed Site Layout Plan.dwg

client: Comhairle Contae Mhaigh Eo / Mayo County Council

project:
PROPOSED DEVELOPMENT AT KEEL SANDYBANKS, ACHILL ISLAND, CO. MAYO

stage:
PLANNING

title:
SITE LAYOUT

scale:
1:250 @ A1

surveyed	drawn	checked	date
JOD	NT	JM	July 2022

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Drawing Title:
Borehole Location

Date: 6.10.2022 Drg. No.:

drawing no.: 6820-JOD-XX-ZZ-DR-C-700-002
revision: P.01

APPENDIX 1

BOREHOLE RECORDS

Irish Drilling Ltd
Old Galway Rd.
Loughrea, Co. Galway
Telephone: 091 841274

BOREHOLE LOG

Project	Location	BOREHOLE No
Keel, Achill	Keel, Achill, Co. Mayo	**BH 1**

Job No	Date	Ground Level (m OD)	Co-Ordinates ()
22MO113	27-09-22 06-10-22	5.96	E 463,923.5 N 804,751.7

Engineer

GROUNDWATER STRIKES — Water strikes: Rose to (@ 20 min.): Sealed at:
1st: 2.50m 2.50m
2nd:
3rd:

Sheet 1 of 3
Rev.

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION		
0.00-1.00	B			5.86		0.10	TOPSOIL		
							Medium dense, brown, slightly silty, (medium) SAND, with some cobbles.		
1.00	CPT	N = 15 (2, 3, 5, 3, 4, 3)							
1.00-1.50	B								
1.00	D					(2.90)			
2.00	CPT	N = 17 (2, 3, 4, 4, 5, 4)							
2.00-2.50	B								
2.00	D								
				2.96		3.00			
3.00	CPT	N = 13 (4, 2, 3, 3, 4, 3)					Medium dense, greyish brown, slightly silty, gravelly SAND, with some cobbles.		
3.00-3.50	B								
3.00	D								
4.00	CPT	N = 17 (3, 5, 4, 4, 4, 5)							
4.00-4.50	B								
4.00	D								
						(3.80)			
5.00	CPT	N = 19 (6, 4, 5, 5, 5, 4)							
5.00-5.50	B								
5.00	D								
6.00	CPT	N = 21 (3, 4, 5, 4, 7, 5)							
6.00-6.50	B								
6.00	D								
				-0.84		6.80			
				-1.04		7.00	Soft black PEAT.		
7.00	CPT	N = 20 (2, 2, 2, 5, 6, 7)					Medium dense to dense, dark grey and grey, slightly gravelly SAND, with some cobbles.		
7.00-7.50	B								
7.00	D								
						(1.20)			

Boring Progress and Water Observations

Date	Time	Depth	Casing Depth	Casing Dia. mm	Water (bgl) Depth, m
27-09-22	11.00	0.00	0.00	200	
27-09-22	17.00	7.00	7.00	200	4.0
28-09-22	08.00	7.00	7.00	200	2.58

Chiselling

From	To	Hours

Water Added

From	To

GENERAL REMARKS

Refusal of shell & auger at 9.2m

All dimensions in metres Scale 1:50	Client: Mayo Co. Council	Method/ Plant Used	Bit Design	Driller	Logged By

Irish Drilling Ltd
Old Galway Rd.
Loughrea, Co. Galway
Telephone: 091 841274

BOREHOLE LOG

Project	Location	BOREHOLE No
Keel, Achill	Keel, Achill, Co. Mayo	**BH 1**

Job No	Date	Ground Level (m OD)	Co-Ordinates ()
22MO113	27-09-22 06-10-22	5.96	E 463,923.5 N 804,751.7

Engineer	GROUNDWATER STRIKES	Sheet / Rev.
	Water strikes: 1st: 2.50m 2nd: 3rd: Rose to (@ 20 min.): 2.50m Sealed at: 2.50m	Sheet 2 of 3 Rev.

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION		
8.00	CPT	N = 33 (3, 6, 8, 8, 8, 9)		-2.24		8.20			
8.00-8.50 8.00	B D					(1.00)	Dense, grey, silty, sandy GRAVEL, with some cobbles.		
9.00	CPT	25 Seating Blows for 100 mm (15, 10)		-3.24		9.20			
9.00	D						Borehole continued as a Cored Drillhole		

Boring Progress and Water Observations

Date	Time	Depth	Casing Depth	Casing Dia. mm	Water (bgl) Depth, m
28-09-22	15.00	9.20	9.20	200	2.5
06-10-22	09.00	9.20	9.00	97	2.5

Chiselling

From	To	Hours
9.2		1

Water Added

From	To

GENERAL REMARKS

Refusal of shell & auger at 9.2m

All dimensions in metres Scale 1:50	Client: Mayo Co. Council	Method/ Plant Used	Bit Design	Driller	Logged By

IDL AGS3 UK BH KEEL ACHILL 2022.GPJ IDL TP TEMPLATE.GDT 2/12/22

Irish Drilling Ltd
Old Galway Rd.
Loughrea, Co. Galway
Telephone: 091 841274

DRILLHOLE LOG

Project	Location	DRILLHOLE No
Keel, Achill	Keel, Achill, Co. Mayo	**BH 1**

Job No	Date	Ground Level (m OD)	Co-Ordinates ()
22MO113	27-09-22 06-10-22	5.96	E 463,923.5 N 804,751.7

Engineer

Sheet 3 of 3

Rev.

RUN DETAILS					STRATA				
Depth Date	TCR (SCR) RQD	(SPT) Fracture Spacing	Red'cd Level	Legend	Depth (Thick- ness)	DESCRIPTION Discontinuities	Detail	Main	Geology	Instrument/ Backfill
06.10			-3.24		9.20			Subangular to rounded, fine to coarse, assorted sandstone and metamorphic GRAVEL, with a little coarse sand.		
	66 (-) -									
10.50										
	40 (-) -	-			(3.70)					
12.00										
	60 (36) 0		-6.94		12.90					
		15				12.90 - 16.70 Closely and locally very closely spaced, dipping 10 to 15 deg's, stepped, smooth, with 0.5mm to 1mm micaceous silt smear		Weak to medium strong, thinly foliated, grey and white felsic mica, fine to medium grained SCHIST.		
14.00										
	100 (91) 32	18			(3.80)			14.6m - 14.7m: medium strong, with a little brown silt		
15.50										
		20						15.7m - 16.3m: very strong QUARTZITE inclusion		
	100 (78) 25									
		16								
06.10 16.70			-10.74		16.70					

Drilling Progress and Water Observations

Date	Time	Depth	Casing Depth	Casing Dia	Core Dia mm	Water Strike	Water Standing
28-09-22	15.00	9.20	9.20	200			2.50
06-10-22	09.00	9.20	9.00	97	65		2.50
06-10-22	17.00	16.70	9.00	97	65		2.50

Rotary Flush

From (m)	To (m)	Type	Return (%)

GENERAL REMARKS

Refusal of shell & auger at 9.2m

All dimensions in metres Scale 1:50	Client: Mayo Co. Council	Method/ Plant Used	Bit Design	Driller	Logged By

IDL AGS UK DH (SPTS) KEEL ACHILL 2022.GPJ IDL TP TEMPLATE.GDT 2/12/22

APPENDIX 2

LABORATORY TEST RESULTS

CONTRACT: **Keel Achill** Sack: Schedule:

Client Mayo Co. Council Date: 16.11.22

Engineer Scheduled B DJ

			Classification					Earthworks		* Specify Rammer			Settlement	Strength				Chemical				
BH/TP No.	Sample Type	Sample Depth	MC (%)	Atterberg Limits	Bulk Density	PSD	Hydro	5-point MCV	CBR 1 point*	MCV 1 Point	5 Point Comp only*	5 Point Comp with CBR*	Consol (Oed)	Triaxial (Q-U)	Triaxial (Con-U)	**FALL CONE**	Shear Box	SO3	pH	Chloride	Organic Content	Remarks/Loading
BH 1	B	0.0 - 1.0																				
	D	1.00	**1**																			
	B	1.0 - 1.5																				
	D	2.00	**1**			**1**																
	B	2.0 - 2.5																**1**	**1**	**1**		**ALS 221123-176**
	D	3.00	**1**																			
	B	3.0 - 3.5																				
	D	4.00	**1**			**1**																
	B	4.0 - 4.5																				
	D	5.00	**1**																			
	B	5.0 - 5.5																				
	D	6.00	**1**																			
	B	6.0 - 6.5																				
	D	7.00	**1**	**1**																		
	B	7.0 - 7.5																				
	D	8.00	**1**																			
	B	8.0 - 8.5																				
	D	9.00	**1**																			
Tests scheduled:			9	1	0	2	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	
Test completed			9	1	0	2	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0

Summary of Classification Test Results

Project No.	Project Name
2022MO113	Mayo Beaches

Hole No.	Sample Ref	Top	Base	Type		Soil Description	Density bulk Mg/m3	Density dry Mg/m3	w %	Passing 425µm %	LL %	PL %	PI %	Particle density Mg/m3	Remarks
Keel BH01	2	1.00		D		Yellow-brown medium SAND.			26.0						
Keel BH01	4	2.00		D		Blackish-grey medium SAND.			18.0						
Keel BH01	5	2.00	2.50	B		Black-brown slightly silty medium SAND.			17.0	99					
Keel BH01	6	3.00		D		Brownish-grey slightly gravelly sandy SILT.			11.0						
Keel BH01	8	4.00		D		Grey slightly silty sandy medium GRAVEL.			26.0						
Keel BH01	9	4.00	4.50	B		Grey slightly silty gravelly medium SAND. Gravel is coarse.			20.0	73					
Keel BH01	10	5.00		D		Grey slightly silty gravelly SAND.			20.0						
Keel BH01	12	6.00		D		Grey slightly gravelly sandy SILT.			16.0						
Keel BH01	14	7.00		D		Grey slightly gravelly silty medium SAND.			23.0	98					NP
Keel BH01	16	8.00		D		Grey sandy very silty coarse GRAVEL.			4.1						
Keel BH01	18	9.00		D		Dark grey sandy very silty coarse GRAVEL.			4.3						

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

Key w = water content, LL = Liquid Limit, PL = Plastic Limit, PI = Plasticity Index

Density test: wd - water displacement; wi - immersion in water

Linear measurement unless : 4pt cone unless : Liquid Limit; 1pt - single point test; NP - Non Plastic

Particle density: sp - small pyknometer; gj - gas jar

Date Printed: 30/11/2022

QC From No: R1

Approved By: DCD

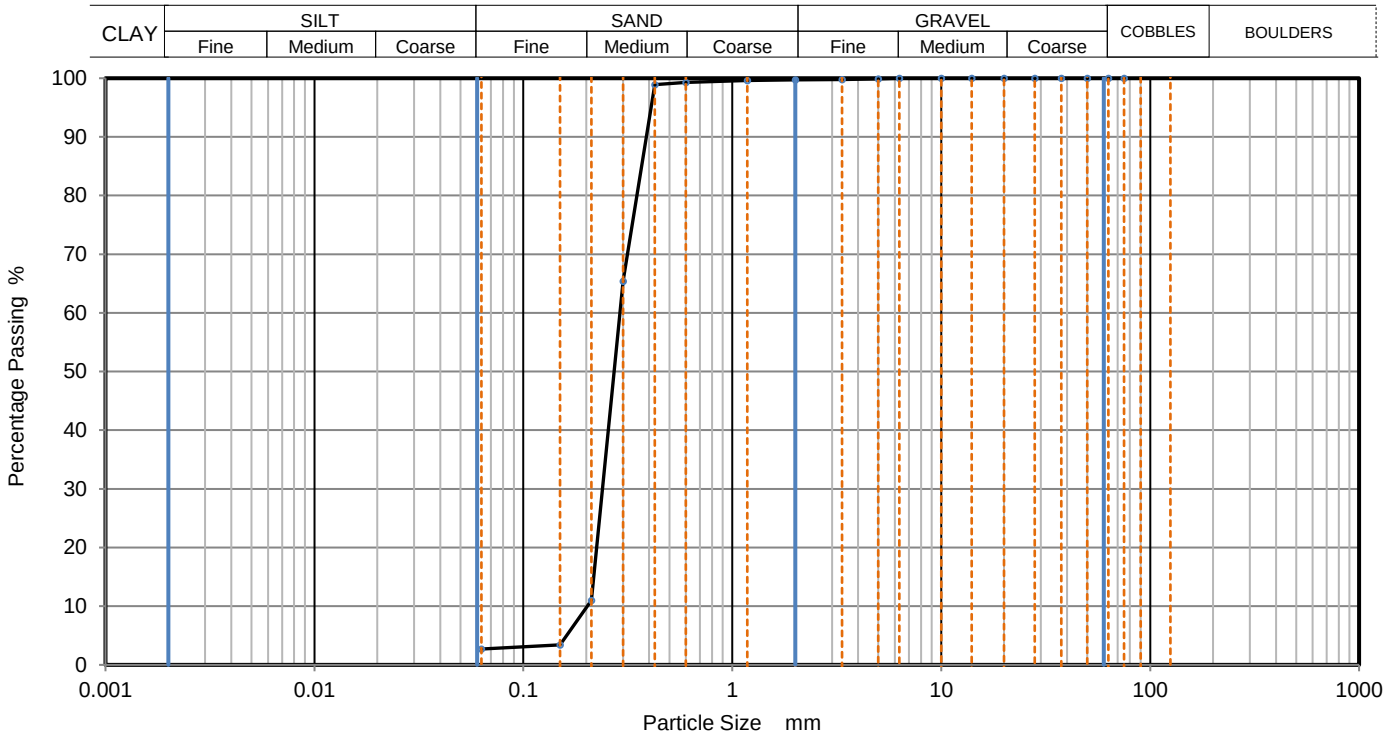
Table 1

sheet 1

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2022MO113**
				Borehole/Pit No.	Keel BH01
Site Name	Mayo Beaches			Sample No.	5
Soil Description	Black-brown slightly silty medium SAND.			Depth, m	2.00
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL12022111619



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.6	99		
0.425	99		
0.3	65		
0.212	11		
0.15	3		
0.063	3		

Dry Mass of sample, g	642

Sample Proportions	% dry mass
Very coarse	0
Gravel	0
Sand	97
Fines <0.063mm	3

Grading Analysis		
D100	mm	
D60	mm	0.29
D30	mm	0.239
D10	mm	0.202
Uniformity Coefficient		1.4
Curvature Coefficient		0.98

Remarks

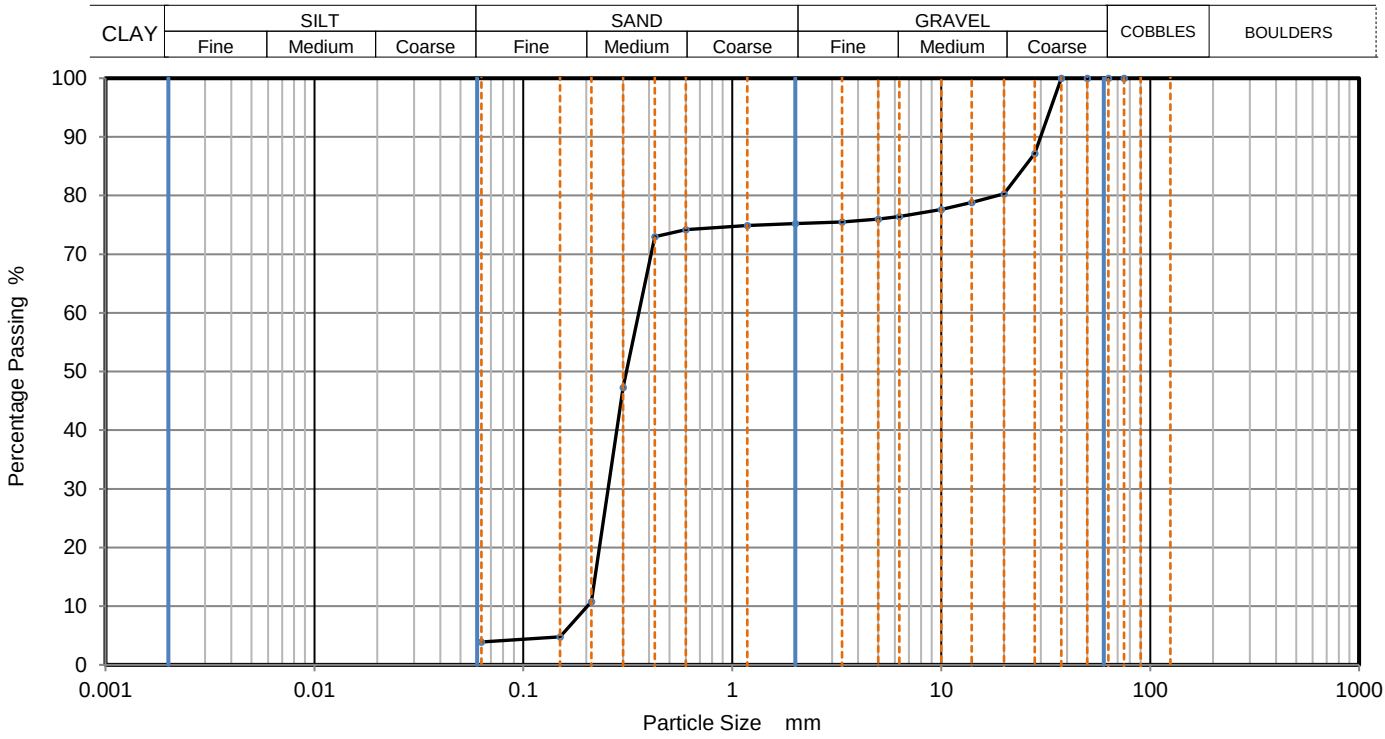
Preparation and testing in accordance with BS1377 unless noted below

Operator	Checked	Approved	Sheet printed	
		Dympna Darcy B.Sc.	30/11/2022 09:34	**1** QC From No:R2

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

IRISH DRILLING LIMITED	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**2022MO113**
				Borehole/Pit No.	Keel BH01
Site Name	Mayo Beaches			Sample No.	9
Soil Description	Grey slightly silty gravelly medium SAND. Gravel is coarse.			Depth, m	4.00
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	IDL12022111621



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
75	100		
63	100		
50	100		
37.5	100		
28	87		
20	80		
14	79		
10	78		
6.3	76		
5	76		
3.35	76		
2	75		
1.18	75		
0.6	74		
0.425	73		
0.3	47		
0.212	11		
0.15	5		
0.063	4		

Dry Mass of sample, g	757

Sample Proportions	% dry mass
Very coarse	0
Gravel	25
Sand	71
Fines <0.063mm	4

Grading Analysis		
D100	mm	
D60	mm	0.356
D30	mm	0.254
D10	mm	0.203
Uniformity Coefficient		1.8
Curvature Coefficient		0.9

Remarks

Preparation and testing in accordance with BS1377 unless noted below

Operator	Checked	Approved	Sheet printed	
		Dympna Darcy B.Sc.	30/11/2022 09:34	**1** QC From No:R2

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

IDL

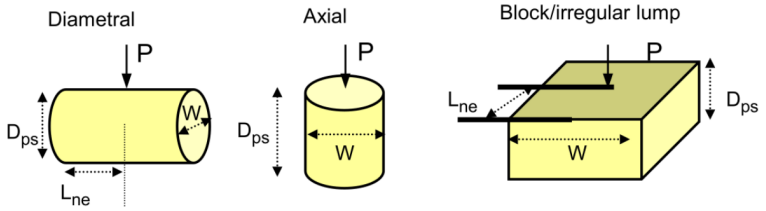
Point Load Strength Index Tests
Summary of Results

Project No.: 2022MO113

Project Name: Mayo Beaches

Borehole No.	Sample			Specimen		Rock Type and Test condition	Test Type see ISRM		Failure Valid (Y/N)	Dimensions				Force P	Equivalent diameter, De	Point Load Strength Index		Remarks (including water content if measured)
	Top Depth	Base Depth	Type	Top	Base		Type (D, A, I, B)	Direction (L, P or U)		Lne	W	Dps	Dps'			Is	Is(50)	
	m	m		m	m					mm	mm	mm	mm	kN	mm	MPa	MPa	
Keel	12.00	14	C	13	13.10		D	U	YES		63.4		63.4	1.1	63.4	0.3	0.3	Weak
Keel	14.00	15.5	C	14.1	14.20		D	U	YES		63.4		63.4	0.7	63.4	0.2	0.2	Weak
Keel	14.00	15.5	C	15.1	15.20		D	U	YES		63.4		63.4	1.3	63.4	0.3	0.3	Weak
Keel	15.50	16.7	C	16.1	16.20		D	U	YES		63.4		63.4	3.5	63.4	0.9	1.0	Medium Strong

Test Type
D - Diametral, A - Axial, I - Irregular Lump, B - Block
Direction
L - parallel to planes of weakness
P - perpendicular to planes of weakness
U - unknown or random
Dimensions
Dps - Distance between platens (platen separation)
Dps' - at failure (see ISRM note 6)
Lne - Length from platens to nearest free end
W - Width of shortest dimension perpendicular to load, P



Test performed in accordance with ISRM Suggested Methods : 2007, unless noted otherwise
Detailed legend for test and dimensions, based on ISRM, is shown above.
Size factor, F = (De/50)0.45 for all tests.

Date Printed: 30/11/2022

Approved By: DCD

Table 1 sheet 1

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39
Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

Unit 7-8 Hawarden Business Park
Manor Road (off Manor Lane)
Hawarden
Deeside
CH5 3US
Tel: (01244) 528777
email: hawardencustomerservices@alsglobal.com
Website: www.alsenvironmental.co.uk

Irish Drilling Limited
Old Galway Road
Loughrea
Co. Galway

Attention: Dympna Darcy

CERTIFICATE OF ANALYSIS

Date of report Generation:	29 November 2022
Customer:	Irish Drilling Limited
Sample Delivery Group (SDG):	221123-176
Your Reference:	22MO113
Location:	Mayo Beaches
Report No:	670153
Order Number:	11880

We received 2 samples on Wednesday November 23, 2022 and 2 of these samples were scheduled for analysis which was completed on Tuesday November 29, 2022. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

Chemical testing (unless subcontracted) performed at ALS Laboratories (UK) Limited Hawarden.

All sample data is provided by the customer. The reported results relate to the sample supplied, and on the basis that this data is correct.
Incorrect sampling dates and/or sample information will affect the validity of results.

Approved By:

Sonia McWhan

Operations Manager

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
27205921	KeelBH01	B5	2.00 - 2.50	27/09/2022

Only received samples which have had analysis scheduled will be shown on the following pages.

CERTIFICATE OF ANALYSIS

SDG: 221123-176 **Report Number:** 670153 **Superseded Report:**
Client Ref.: 22MO113 **Location:** Mayo Beaches

Results Legend

X **Test**

N **No Determination Possible**

Sample Types -
S - Soil/Solid
UNS - Unspecified Solid
GW - Ground Water
SW - Surface Water
LE - Land Leachate
PL - Prepared Leachate
PR - Process Water
SA - Saline Water
TE - Trade Effluent
TS - Treated Sewage
US - Untreated Sewage
RE - Recreational Water
DW - Drinking Water Non-regulatory
UNL - Unspecified Liquid
SL - Sludge
G - Gas
OTH - Other

	Lab Sample No(s)		27205921
	Customer Sample Reference		KeelBH01
	AGS Reference		B5
	Depth (m)		2.00 - 2.50
	Container		250g Amber Jar (ALE210)
	Sample Type		S
Anions by Kone (soil)	All	NDPs: 0 Tests: 2	X
pH	All	NDPs: 0 Tests: 2	X
Sample description	All	NDPs: 0 Tests: 2	X

Sample Descriptions

Grain Sizes

very fine	<0.063mm	fine	0.063mm - 0.1mm	medium	0.1mm - 2mm	coarse	2mm - 10mm	very coarse	>10mm

Lab Sample No(s)	Customer Sample Ref.	Depth (m)	Colour	Description	Inclusions	Inclusions 2
27205921	KeelBH01	2.00 - 2.50	Light Brown	Sand	None	None

These descriptions are only intended to act as a cross check if sample identities are questioned, and to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions.

We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally ocurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample.

Other coarse granular materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

Validated

CERTIFICATE OF ANALYSIS

SDG: 221123-176 **Report Number:** 670153 **Superseded Report:**
Client Ref.: 22MO113 **Location:** Mayo Beaches

Results Legend

#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted - refer to subcontractor report for accreditation status.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample Ref.	Depth (m)	Sample Type	Date Sampled	Sample Time	Date Received	SDG Ref	Lab Sample No.(s)	AGS Reference
			KeelBH01	2.00 - 2.50	Soil/Solid (S)	27/09/2022	.	23/11/2022	221123-176	27205921	B5
Moisture Content Ratio (% of as received sample)	%	PM024	23								
pH	1 pH Units	TM133	9.11 @ M								
Water Soluble Sulphate as SO4 2:1 Extract	<0.004 g/l	TM243	0.0212 @ M								
Chloride (soluble)	<5 mg/kg	TM243	16.4 @ M								

Table of Results - Appendix

Method No	Reference	Description
PM024	Modified BS 1377	Soil preparation including homogenisation, moisture screens of soils for Asbestos Containing Material
TM133	BS 1377: Part 3 1990;BS 6068-2.5	Determination of pH in Soil and Water using the GLpH pH Meter
TM243		Mixed Anions In Soils By Kone

NA = not applicable.

Chemical testing (unless subcontracted) performed at ALS Laboratories (UK) Limited Hawarden (Method codes TM).

CERTIFICATE OF ANALYSIS

SDG: 221123-176 **Report Number:** 670153 **Superseded Report:**
Client Ref.: 22MO113 **Location:** Mayo Beaches

Test Completion Dates

Lab Sample No(s)	27205923	27205921
Customer Sample Ref.	CarrowmoreBH01	KeelBH01
AGS Ref.	B7	B5
Depth	3.00 - 3.50	2.00 - 2.50
Type	Soil/Solid (S)	Soil/Solid (S)
Anions by Kone (soil)	29-Nov-2022	29-Nov-2022
pH	28-Nov-2022	28-Nov-2022
Sample description	24-Nov-2022	24-Nov-2022

Appendix

General

1. Results are expressed on a dry weight basis (dried at 35ºC) for all soil analyses except for the following: NRA and CEN Leach tests, flash point LOI, pH, ammonium as NH4 by the BRE method, VOC TICs and SVOC TICs.

2. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for all sample types unless the sample is destroyed on testing. The prepared soil sub sample that is analysed for asbestos will be retained for a period of 6 months after the analysis date. All bulk samples will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALS reserve the right to charge for samples received and stored but not analysed.

3. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.

4. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.

5. If no separate volatile sample is supplied by the client, or if a headspace or sediment is present in the volatile sample, the integrity of the data may be compromised. This will be flagged up as an invalid VOC on the test schedule and the result marked as deviating on the test certificate.

6. NDP - No determination possible due to insufficient/unsuitable sample.

7. Results relate only to the items tested.

8. LoDs (Limit of Detection) for wet tests reported on a dry weight basis are not corrected for moisture content.

9. **Surrogate recoveries** - Surrogates are added to your sample to monitor recovery of the test requested. A % recovery is reported, results are not corrected for the recovery measured. Typical recoveries for organics tests are 70-130%. Recoveries in soils are affected by organic rich or clay rich matrices. Waters can be affected by remediation fluids or high amounts of sediment. Test results are only ever reported if all of the associated quality checks pass; it is assumed that all recoveries outside of the values above are due to matrix affect.

10. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.

11. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.

12. For dried and crushed preparations of soils volatile loss may occur e.g volatile mercury.

13. For leachate preparations other than Zero Headspace Extraction (ZHE) volatile loss may occur.

14. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.

15. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C5-C12 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

16. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

17 Data retention. All records, communications and reports pertaining to the analysis are archived for seven years from the date of issue of the final report.

18. **Tentatively Identified Compounds (TICs)** are non-target peaks in VOC and SVOC analysis. All non-target peaks detected with a concentration above the LoD are subjected to a mass spectral library search. Non-target peaks with a library search confidence of >75% are reported based on the best mass spectral library match. When a non-target peak with a library search confidence of <75% is detected it is reported as “mixed hydrocarbons”. Non-target compounds identified from the scan data are semi-quantified relative to one of the deuterated internal standards, under the same chromatographic conditions as the target compounds. This result is reported as a semi-quantitative value and reported as Tentatively Identified Compounds (TICs). TICs are outside the scope of UKAS accreditation and are not moisture corrected.

19. **Sample Deviations**

If a sample is classed as deviated then the associated results may be compromised.

1	**Container with Headspace provided for volatiles analysis**
2	**Incorrect container received**
3	**Deviation from method**
4	**Matrix interference**
♦	**Sample holding time exceeded in laboratory**
@	**Sample holding time exceeded due to late arrival of instructions or samples**
§	**Sampled on date not provided**

20. **Asbestos**

When requested, the individual sub sample scheduled will be analysed in house for the presence of asbestos fibres and asbestos containing material by our documented in house method TM048 based on HSG 248 (2021), which is accredited to ISO17025. If a specific asbestos fibre type is not found this will be reported as “Not detected”. If no asbestos fibre types are found all will be reported as “Not detected” and the sub sample analysed deemed to be clear of asbestos. If an asbestos fibre type is found it will be reported as detected (for each fibre type found). Testing can be carried out on asbestos positive samples, but, due to Health and Safety considerations, may be replaced by alternative tests or reported as No Determination Possible (NDP). The quantity of asbestos present is not determined unless specifically requested.

Identification of Asbestos in Bulk Materials & Soils

The results for identification of asbestos in bulk materials and soils are obtained from supplied bulk materials andd soils which have been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2021).

The results for identification of asbestos in soils are obtained from a homogenised sub sample which has been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining.

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

Visual Estimation Of Fibre Content

Estimation of fibre content is not permitted as part of our UKAS accredited test other than: - Trace - Where only one or two asbestos fibres were identified.

Respirable Fibres

Respirable fibres are defined as fibres of <3 µm diameter, longer than 5 µm and with aspect ratios of at least 3:1 that can be inhaled into the lower regions of the lung and are generally acknowledged to be most important predictor of hazard and risk for cancers of the lung.

Further guidance on typical asbestos fibre content of manufactured products can be found in HSG 264.

The identification of asbestos containing materials and soils falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.

APPENDIX 3

PHOTOGRAPHS


KODAK Color Control Patches
KODAK Gray Scale
IRISH DRILLING LIMITED
IRISH DRILLING LTD.
Printed: 13/10/2022
Keel,
Achill,
Co. Mayo
2022 MO 113
RC
1
Box
1.
2.
9m
10.5m
12m
16.7m EOH
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150