IGSL Ltd

Dun Laoghaire Harbour Company

Geotechnical Site Investigation Report (factual) for Proposed Cruise Facility

Project No. 17585

July 2014

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FOREWORD

The following conditions and notes on the geotechnical site investigation procedures should be read in conjunction with this report.

Standards

The ground investigation works for this project (Dun Laoghaire Harbour, Proposed cruise Facility) have been carried out by IGSL in accordance with Eurocode 7 - Part 2: Ground Investigation & Testing (EN 1997-2:2007). This has been used together with complementary documents such as BS 5930:1999 +A2:2010 and BS 1377 (Parts 1 to 9) and the following European Norms:

- EN 1997-2 Eurocode 7: 2007 – Geotechnical Design – Part 2: Ground Investigation & Testing
- EN ISO 22475-1:2006 Geotechnical Investigation and Sampling – Sampling Methods & Groundwater Measurements
- EN ISO 14688-1:2002 Geotechnical Investigation and Testing – Identification and Classification of Soil, Part 1: Identification and Description
- EN ISO 14688-2:2004 Geotechnical Investigation and Testing – Identification and Classification of Soil, Part 2: Classification Principles
- EN ISO 14689-1:2004 Geotechnical Investigation and Testing - Identification & Classification of Rock, Part 1: Identification & Description

Reporting

This report has been prepared for Dun Laoghgaire Harbour Company and Waterman Moylan and the information should not be used without prior written permission of either party. IGSL Ltd accepts no responsibility or liability for this document being used other than for the purposes for which it was intended. No responsibility can be held by IGSL Ltd for ground conditions between exploratory hole locations.

The engineering logs provide ground profiles and configuration of strata relevant to the investigation depths achieved and caution should be taken when extrapolating between exploratory points. No liability is accepted for ground conditions extraneous to the investigation points. Unless specifically stated, no account has been taken of possible subsidence due to mineral extraction, mining works or karstification below or close to the site.

Boring Procedures

Unless otherwise stated, ‘shell and auger' or cable percussive boring technique has been employed as defined by Section 6.3 of IS EN ISO 22475-1:2006. The boring operations, sampling and in-situ testing complies with the recommendations of IS EN 1997-2:2007 and BS 1377:1990 and EN ISO 22476-3:2005. The shell and auger boring technique allows for continuous sampling in clay and silt above the water table and sand and gravel below the water table (Table 2 of IS EN ISO 22475-1:2006).

It is highlighted that some disturbance and variations is unavoidable in particular ground (e.g. blowing sands, gravel / cobble dominant glacial deposits etc). Attention is drawn to this condition, whenever it is suspected. Where cobbles and boulders are recorded, no conclusion should be drawn concerning the size, presence, lithological nature, or numbers per unit volume of ground.

Rotary Drilling Procedures
Rotary drilling methods are used to recover very heavily over-consolidated glacial till and bedrock samples in line with Section 3.5 of IS EN 1997-2:2007 and IS EN ISO 22475-1. Open hole drilling methods (odex or symmetrix) are utilized to advance the drillholes through granular dominant superficial deposits, with coring in hard ('cemented') fine grained or cohesive glacial deposits and bedrock. In this particular project, the key objective of the rotary coring operations was to advance and sample the high strength glacial till and underlying granite bedrock.

In-Situ Testing
Standard penetration tests are conducted by IGSL strictly in accordance with Section 4.6 of IS EN 1997-2:2007. The SPT equipment (hammer energy test) has been calibrated in accordance with EN ISO 22476-3:2005 and the Energy Ratio (E_r) is defined as the ratio of the actual energy E_{meas} (measured energy during calibration) delivered to the drive weight assembly into the drive rod below the anvil, to the theoretical energy (E_{theor}) as calculated from the drive weight assembly. The measured number of blows (N) reported on the engineering logs are uncorrected. In sands, the energy losses due to rod length and the effect of the overburden pressure should be taken into account (see IS EN ISO 22476-3:2005).

Groundwater
The depth of entry of any influx of groundwater is recorded during the course of boring or drilling operations. However, the normal rate of boring does not usually permit the recording of an equilibrium level for any one water strike. Where possible drilling is suspended for a period of twenty minutes to monitor the subsequent rise in water level. Groundwater conditions observed in the borings or pits are those appertaining to the period of investigation. It should be noted however, that groundwater levels are subject to diurnal, seasonal and climatic variations and can also be affected by drainage conditions, tidal variations etc.

Soil Sampling
Three categories of sampling methods are outlined in EN ISO 22475-1:2006. The categories are referenced A, B and C for any given ground conditions and are shown in Tables 1 and 2 of EN ISO 22475-1:2006. Reference should be made to EN 1997-2:2002 for guidelines on sample class and quality for strength and compressibility testing. Samples of quality classes 1 or 2 can only be obtained by using Category A sampling methods.

Where appropriate Class 1 thin wall undisturbed tube samples (UT100) are obtained in fine grained soils and strictly meet the requirements of EN 1997-2:2002 and EN ISO 22475-1:2006. Soil samples for laboratory tests are divided into five classes with respect to the soil properties that are assumed to remain unchanged during sampling, handling transport and storage. The minimum sample quality required for testing purposes to Eurocode 7 compatibility (EN 1997-2:2002) is shown in Table A.

Table A – Details of Sample Quality Requirements

EN 1997 Clause	Test	Minimum Sample Quality Class
5.5.3	Water Content	3
5.5.4	Bulk Density	2
5.5.5	Particle Density	N/S
5.5.6	Particle Size Analysis	N/S
5.5.7	Consistency Limits	4
5.5.8	Density Index	N/S
5.5.9	Soil Dispersivity	N/S
5.5.10	Frost Susceptibility	N/S
5.6.2	Organic Content	4
5.6.3	Carbonate Content	3
5.6.4	Sulphate Content	3
5.6.5	pH	3
5.6.6	Chloride Content	3
5.7	Strength Index	1
5.8	Strength Tests	1
5.9	Compressibility Tests	1
5.10	Compaction Tests	N/S
5.11	Permeability	2

N/S – not stated. Presume a representative sample of appropriate size.

Samples recovered from trial pits or trenches meet the requirements of IS EN ISO 22475-1. It is highlighted that unforeseen circumstances such as variations in geological strata may lead to lower quality sample classes being obtained.

Engineering Logging

Soil and rock identification is based on the examination of the samples recovered and conforms with IS EN ISO 14688-1:2002 and IS EN ISO 14689-1:2004. Rock weathering classification conforms to IS EN ISO 14689-1:2003 while discontinuities (bedding planes, joints, cleavages, faults etc) are classified in accordance with 4.3.3 of IS EN ISO 14689-1:2003. Rock mechanical indices (TCR, SCR, RQD) are defined in accordance with IS EN ISO 22475-1:2006.

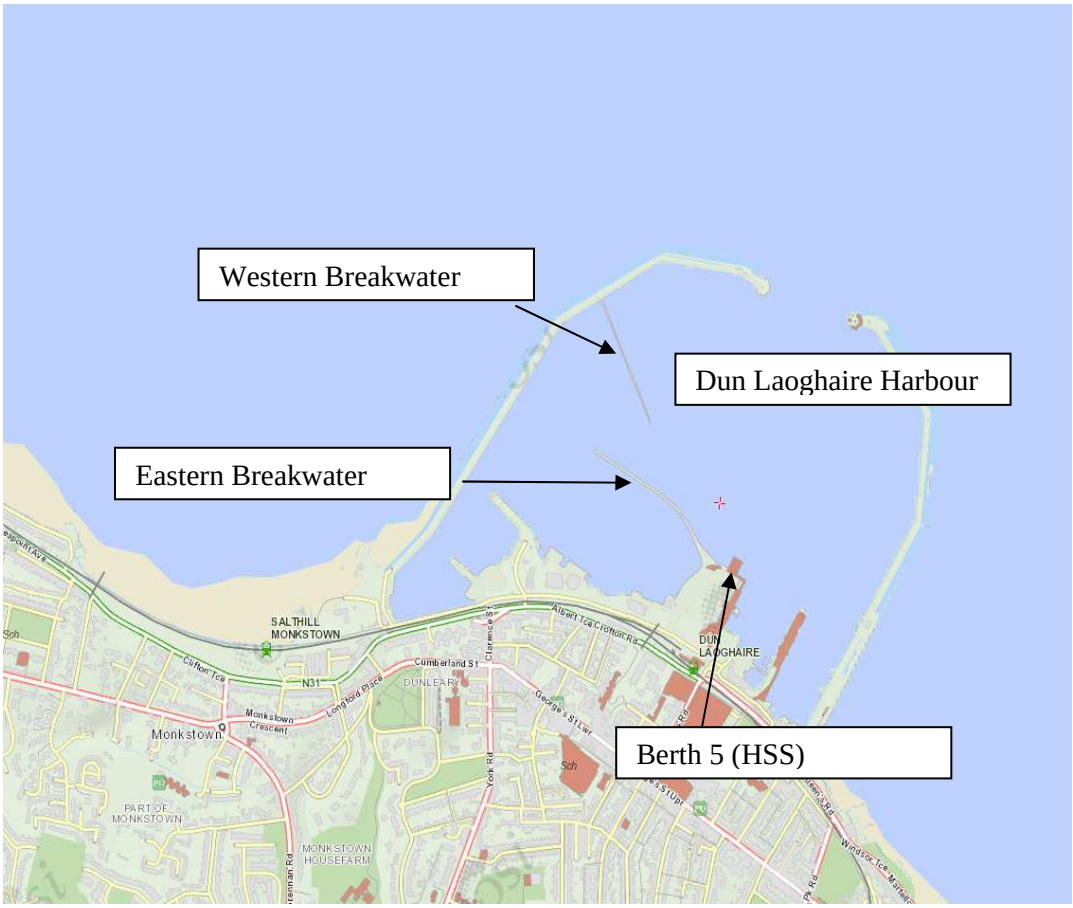
Retention of Samples

After satisfactory completion of all the scheduled laboratory tests on any sample, the remaining material will be discarded. Unless a period of retention of samples is agreed, it is company policy to discard soil samples one month after submission of our final report.

1. INTRODUCTION

At the instruction of Waterman Moylan Consulting Engineers, IGSL has undertaken a programme of marine geotechnical site investigation works for a proposed cruise facility at Dun Laoghaire Harbour. It is understood that the scheme will involve construction of a new berthing facility, terminal building and dredging works (i.e. to -10.5m chart datum) to accommodate docking of large cruise ships. The proposed development is to be located between the Stena HSS facility, western breakwater and eastern marina breakwater (refer to Figure 1).

Figure 1 – Site Location Plan



The geotechnical investigations were supervised by an IGSL geotechnical engineer. The fieldworks included a combination of shallow and deep boreholes (cable percussive and rotary drilling methods) which were undertaken from a spud-leg pontoon. The spud leg was positioned by a tug boat using GPS systems. The boreholes at the berthing facility area extended to depths of 22.40m (-26.47m CD) to 26.50m (-34.05m CD) while the boreholes for the turning area and dredging works extended to -14.56m CD.

The field investigations were executed in accordance with BS 5930, Code of Practice for Site Investigations (1999+A2:2010) and EN 1997-2 Eurocode 7 Part 2 Ground Investigation & Testing. Laboratory testing was carried out on a range of bulk disturbed samples, undisturbed samples (U100 & piston) and rotary core samples as

agreed with Waterman Moylan. Environmental laboratory testing was conducted by NLS on sediment samples.

This report presents the factual geotechnical data acquired from the 2014 investigations. Reference should be made to the IGSL 1993 report (Project No. 2210) which provides details of extensive exploratory works carried out at the main harbour and Coal Quay. A separate geotechnical interpretative report (GIR) has been prepared by IGSL and this provides an evaluation of the ground conditions and geotechnical characteristics of the superficial deposits and bedrock in relation to the proposed scheme.

Attention is drawn to engineering soil descriptions (as set out in the Foreword), which advises that soil descriptions presented on the engineering logs should be read in conjunction with the Atterberg Limits (Liquid & Plastic Limits) and particle size gradings. The fine-grained soils encountered during the investigation generally behave as a clay (plotting above the A-Line on the Casagrande Chart), however low plasticity silt dominant fines can also be present. It is advised that reference should be made to papers published by Farrell et al [4], Long & Menkiti [8] and Skipper et al [9] for details on the engineering properties and characteristics of Dublin Boulder Clay.

2. CONTRACT OUTLINE & OBJECTIVES

The contract for this project was separated into two 'work items' as outlined below:

Item 1: 3 No. deep cable percussion boreholes ('shell & auger') with rotary core follow-on in the vicinity of the proposed berthing area

Item 2: 9 No. shallow cable percussion boreholes extended 2m below dredge depth (i.e. dredge depth of 10.5m chart datum)

The primary objectives of the works were as follows:

- Determine the composition, consistency and strength / stiffness of the superficial soils
- Establish the rockhead elevation, weathering profile, discontinuity characteristics and strength of the bedrock
- Recover samples for geotechnical and environmental laboratory testing in accordance with the requirements of the Employer's Representative
- Assess the ground conditions and develop geotechnical parameters for design
- Evaluate the environmental characteristics of the upper soils with regard to dredging and disposal

The locations of the investigatory boreholes are enclosed in Appendix 6 and outlined in Figure 2. The cable percussion boreholes (BH's 1, 2 & 3) are shown in yellow and the rotary drillholes (RC 1, 2 & 3) are denoted in green.

Figure 2 – Investigation Locations (2014)

3. FIELDWORKS

3.1 General

The marine geotechnical investigations were carried out during the period May and June 2014 and comprised the following:

- Cable percussion boreholes (3 No.)
- Rotary core drillholes (3 No.)
- Associated sampling & in-situ testing
- Setting out & surveying

A spud-leg pontoon was used and equipped with a Dando 3000 cable percussion boring rig and Casagrande top drive rotary rig (as illustrated in Figure 3). A moonpool was centerally located within the pontoon to facilitate lowering of the steel casing into the seabed.

Figure 3 - Spud-leg Pontoon Arrangement

Once the location of the borehole was set out and positioned, boring then commenced with conventional cable tool equipment and advanced until refusal occurred. The Casagrande rig was moved over the moonpool and rotary drilling commenced (odex) under the direction of IGSL's site based geotechnical engineer. The odex drilling was followed by coring in high strength 'cemented' glacial till and in the case of RC 1 advanced into granite bedrock. As noted previously, the boreholes at the berthing

facility area extended to depths of 22.40m (-26.87m CD) to 26.50m (-34.45m CD) while the boreholes for the dredging works terminated at elevations of -13.08 to -14.96m CD.

3.2 Cable Percussion Borehole

The cable percussion boreholes (200mm diameter) were sunk using a Dando 3000 rig and employed conventional cable tool boring methods as outlined in the Foreword. Representative bulk disturbed samples were taken at approximately 1.00m intervals or change of stratum and double sealed in polyethene bags. Tub samples were also recovered between each bulk sample. UT100 and piston samples were attempted in the upper estuarine soils and recovery was moderate to good.

Standard Penetration Tests (SPT's) were performed in the boreholes in accordance with Section 3.3, Part 9 of BS 1377 (1990). The SPT measures the number of blows required by a 63 kg hammer falling through a drop height of 760mm to drive a cone or a split spoon a distance of 300mm through the soil. Prior to the commencement of the test, the cone or split spoon is driven an initial distance of 150mm into the soil and the number of blows for this penetration depth are recorded as the “seating blows”. The subsequent blowcounts for each 75mm increment (300mm) of penetration are recorded and summated to give the ‘N-Value’ as reported on the borehole log. The seating and test blow counts are reported in brackets with the N-Value recorded accordingly (e.g. BH 1 at 2m where N=6 (1 0, 1, 1, 2, 2).

It is highlighted that persistent chiselling (i.e. hard strata boring) was necessary in the boreholes to advance through the very heavily over-consolidated glacial tillwhich incorporates lenses of dense to very dense granular soils. Details of the soils (strata) encountered, SPT N-Values, samples recovered and chiselling durations (hard strata boring) are presented on the boring records in Appendix 1.

3.3 Rotary Core Drillholes

Rotary drilling was carried out using up a tracked Casagrande Rotary Rig. The drilling unit employed conventional coring techniques and produced 80mm diameter (P size) core samples. Air mist flush was used to promote sample recovery in the glacial till. It is noted that Standard Penetration Tests were also performed in the drillholes.

The core samples were placed in 3m capacity timber boxes and transported to IGSL’s laboratory in Naas for logging by a senior engineering geologist. Photographs of the cores were undertaken with a digital camera prior to logging and subsequent sample selection for laboratory testing. These photographs are presented in Appendix 2.

The core log records include engineering geological descriptions of the cores, details of discontinuities and mechanical indices (TCR, SCR and RQD's) for each core run. It is noted that SCR and RQD values were not measured on the glacial till / boulder clay cores, as these are not relevant for superficial deposits. SPT N-Values and comments on casing details are also included on the rotary records. The rotary drillhole records are presented in Appendix 2 and reference should be made to the Foreword which provides details on the logging of the cores.

3.4 Environmental Sampling

Environmental samples were extracted from undisturbed open tube piston samples as recovered in the boreholes. Extracted soils were placed in the appropriate vessels (plastic tubs, amber glass jars and glass vials) which were then placed in cooled

storage containers. A Chain of Custody form was completed for each batch of samples, listing the sample numbers, depths, types of vessels and the precise date and time of sampling. This was then signed by the sampling engineer and placed in the storage containers for dispatch to the environmental laboratory.

The containers and relevant Chains of Custody were transported by courier within 24 hours of sampling to the environmental laboratory, where they were placed in an appropriate sample storage facility. Analyses were undertaken in accordance with laboratory test schedules provided by IGSL.

3.5 Setting Out & Surveying

For the purpose of this contract, the exploratory locations were surveyed to Irish National Grid with the ordnance datum reference as Chart Datum (CD). IGSL surveyed all exploratory locations to Irish Grid and Malin Head Datum. At the Employer's Representative request, IGSL correlated all ground level to Chart Datum using guidelines from Ordnance Survey Ireland (OSI). The conversion is set out below:

Chart Datum = (Ordnance Datum-Poolbeg) - (0.2)
and/ or
Chart Datum = (Ordnance Datum- Malin Head) +(2.51)

Setting out and surveying was undertaken by an IGSL engineer and the ground levels (m CD) and co-ordinates are shown on the engineering logs. The co-ordinates and elevations are presented on the field records and with as-built drawings presented in Appendix 5.

4. LABORATORY ANALYSIS

Laboratory analysis was performed on a selection of soil and core samples to validate consistency and establish strength and chemical characteristics. Environmental analysis was also conducted on sediment samples to classify and assess suitability for disposal. The laboratory test results are presented in Appendices 3, 4 and 5 respectively.

The geotechnical testing was carried out in accordance with BS1377; British Standard Methods of Test for Soils for Civil Engineering Purposes; British Standards Institute:1990 and ISRM unless otherwise stated. The following suites of tests were undertaken for this project:

Moisture Content

The moisture contents of representative disturbed samples (sealed bags, tubs) were carried out in accordance with BS1377 Part 2:1990.

Atterberg Limits

The liquid limits were determined using the cone method as described in BS 1377 Pt.2:1990. In the majority of cases, the specimens for liquid and plastic limit determination were obtained at their natural state by removal of particles greater than 425 µm. This is the definitive method, as stated in BS1377: Part 2: 1990, Clause 4. Where this was considered impractical, specimens were air-dried and sieved, as recommended in BS 1377.

While BS 1377 suggests that the results should include the percentage of material passing the 425 micron sieve, this information can be misleading in the case of coarse soils such as the glacial till encountered on this site. In the laboratory the percentage can only be related to the sample presented for testing while the actual soil stratum may contain coarse gravel and cobbles which would not necessarily be contained in the sample. Inclusion of coarse soil in a small sample would also distort the proportions.

Particle Size Distributions

Particle size distribution tests were carried out to BS1377: Part 2: 1990, method 9.2 (Wet sieving). Hydrometer tests to BS1377: Part 2: 1990, Method 9.5 were conducted on some samples to establish the percentage of silt and clay present.

To obtain particle size distributions, wet sieving methods were used, as specified. Large cobble and boulder size material was excluded from all tests while, in some instances the maximum particle size was further limited to take into account the mass of the sample. BS 1377 suggests that, for specimens with less than 10% retained on the 20mm sieve a sample mass of 2.5 kg should be used. This compares with a sample mass of 17 kg for specimens with less than 10% retained on the 37.5mm sieve. This is of particular importance for borehole samples in coarse soils.

Shear Box

Shear box tests were undertaken on samples to determine the angle of internal shearing resistance, which is of importance in assessing safe angle of repose in slopes. The shear box tests were carried out by UK laboratory, Geo Site and Testing Services Limited (GSTL) in accordance with BS1377: Part 7.4.5: 1990.

Triaxial Compression
Unconsolidated undrained triaxial tests were conducted on Piston and UT100 samples. The purpose of this was to determine undrained shear strength of the fine grained or cohesive soils. Single stage tests were carried out on 100 mm diameter specimens in accordance with BS1377: Part 7:1990 (Clause 8). Results are reported as undrained shear strength (Cu) and the strain at failure.

Sulphate, pH & Chloride
Determination of pH values, sulphate content and Chloride content of soil were conducted by a nominated accredited environmental laboratory (Jones Environmental Laboratory) and results are presented in Appendix 3.

Point Load Strength Index
The Point Load Index Test provides an assessment of strength cores or lump samples and unlike the Uniaxial Compression test (UCS) does not require careful preparation of intact lengths of core. The test specimen is compressed between two cones loaded from a hydraulic hand pump. The core fails due to the tensile forces over the diametral area between the points. The strength at failure is expressed as the point load index Is.

For purposes of comparison, the Is values are corrected to give the equivalent strength for a 50 mm diameter specimen. Recommended correction factors vary between 18 and 24 to estimate the Is_{50} value. For this project, a conversion factor of 20 was applied for the granite bedrock and a factor of 15 for the very weak mudstone/boulder clay.

Marine Sediment Testing
Specialist Marine Sediment Suites were conducted by an accredited environmental laboratory (National Laboratory Services, NLS)) and results are presented in Appendix 5.

References

1. BS 5930 (1999) Code of Practice for Site Investigation, British Standards Institution (BSI).

2. BS 1377 (1990) Methods of Testing of Soils for Civil Engineering Purposes, BSI.

3. Brown E.T., (1984) Rock Characterization Testing and Monitoring, ISRM Suggested Methods.

4. Farrell E.R., Coxon P., Doff D.H, Priedhomme L. The genesis of brown boulder clay of Dublin, QJEG, 1995, 28, 143-152

5. Geological Survey of Ireland, Sheet 16 (1:100,000), Geology of Dublin Wicklow

6. Houlsby A.C.; 1976: Routine Interpretation of the Lugeon water-test, QJEG, 1976, Vol. 9;pp303-313

7. Hughes, J.M.O., Wroth, C. P., & Windle, D. (1977), Pressuremeter Tests in Sands, *Geotechnique* 7, pp45-477.

8. Long M. & Menkiti C.O., Engineering Properties of Dublin Boulder Clay, Geotechnique 2007

9. Skipper J., Follett B., Menkiti C.O., Long M., Clark-Hughes J. The engineering geology and characterization of Dublin Boulder Clay, QJEG, 38 pp171-187, 2005

10. Site Investigation Practice: Assessing BS 5930 (1986), Geological Society Special Publication, No. 2.

Appendix 1

Cable Percussion Borehole Records

GEOTECHNICAL BORING RECORD

REPORT NUMBER 17585

CONTRACT	Dun Laoaghaire Harbour Cruise Facility - Site Investigation	**BOREHOLE NO.**	**BH01**
		SHEET	Sheet 1 of 1
CO-ORDINATES	324,513.78 E 229,059.76 N	**RIG TYPE**	Dando 3000
		BOREHOLE DIAMETER (mm)	
GROUND LEVEL (m CD))	-4.50	**BOREHOLE DEPTH (m)**	10.00
		DATE COMMENCED	10/06/2014
		DATE COMPLETED	10/06/2014
CLIENT	Dun Laoghaire Harbour Company	**SPT HAMMER REF. NO.**	SPT1
ENGINEER	Moylan Waterman	**ENERGY RATIO (%)**	68
		BORED BY	P.Thomas
		PROCESSED BY	D.Coss

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples: Ref. Number	Sample Type	Depth (m)	Recovery	Field Test Results	Standpipe Details
0	Soft grey/black sandy gravelly SILT with sea shells(Marine Sediment)				AA24140 AA24141/ 00281956	B ENV	0.00-1.00 0.00-1.00			
1									N = 5 (1, 1, 1, 1, 1, 2)	
2			-6.60	2.10	AA24142	B	2.00-2.00		N = 6 (1, 0, 1, 1, 2, 2)	
	Loose becoming firm grey very silty SAND with sea shells(Marine Sediment)				AA24143 AA24144	ENV U	2.00-2.00 2.50-2.50			
3					AA24145	B	3.00-3.00		N = 3 (1, 0, 1, 0, 1, 1)	
4					AA24146	B	4.00-4.00		N = 5 (1, 0, 1, 1, 1, 2)	
5					AA24147	B	5.00-5.00		N = 7 (1, 1, 1, 2, 2, 2)	
6	Dredge Depth Level -10.5m CD				AA24148	B	6.00-6.00		N = 2 (1, 0, 0, 1, 0, 1)	
7					AA24149	B	7.00-7.00		N = 11 (1, 0, 1, 2, 3, 5)	
			-12.30	7.80						
8	Soft/firm grey sandy slightly gravelly SILT(Marine Sediment)				AA24150	B	8.00-8.00		N = 10 (1, 1, 2, 2, 2, 4)	
			-13.00	8.50						
9	Loose grey slightly silty GRAVEL. Gravel is fine to coarse subrounded to subangular of various lithologies.(Marine Sediment)		-13.70	9.20	AA0831	B	9.00-9.00		N = 35 (2, 4, 7, 9, 9, 10)	
	Stiff dark brown very gravelly CLAY. Gravel is fine to coarse subrounded to subangular of various lithologies(Upper Boulder CLAY)		-14.50	10.00						
10	End of Borehole at 10.00 m				AA0832	B	10.00-10.00		N = 32 (3, 4, 5, 7, 8, 12)	

HARD STRATA BORING/CHISELLING

From (m)	To (m)	Time (h)	Comments
9.6	9.9	1	

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

GROUNDWATER PROGRESS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

REMARKS Marine Borehole - Deck to Bed depth 7.9m. All levels present are in reference to Chart Datum(CD).

Sample Legend
D - Small Disturbed (tub)
B - Bulk Disturbed
LB - Large Bulk Disturbed
Env - Environmental Sample (Jar + Vial + Tub)
U - Undisturbed 100mm Diameter Sample
P - Undisturbed Piston Sample
W - Water Sample

IGSL BH LOG 11M CHART DATUM 17585 FINAL 2014 RECORDS.GPJ IGSL.GDT 7/11/14

GEOTECHNICAL BORING RECORD

REPORT NUMBER 17585

CONTRACT	Dun Laoaghaire Harbour Cruise Facility - Site Investigation	**BOREHOLE NO.**	**BH02**
		SHEET	Sheet 1 of 1
CO-ORDINATES	324,540.57 E 229,213.72 N	**RIG TYPE**	Dando 3000
		BOREHOLE DIAMETER (mm)	
GROUND LEVEL (m CD))	-7.60	**BOREHOLE DEPTH (m)**	10.00
		DATE COMMENCED	12/06/2014
		DATE COMPLETED	12/06/2014
CLIENT	Dun Laoghaire Harbour Company	**SPT HAMMER REF. NO.**	SPT1
ENGINEER	Moylan Waterman	**ENERGY RATIO (%)**	68
		BORED BY	P.Thomas
		PROCESSED BY	D.Coss

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples: Ref. Number	Sample Type	Depth (m)	Recovery	Field Test Results	Standpipe Details
0	Soft grey very sandy SILT with sea shells(Marine Sediment)									
1					AA0833 AA0834	B ENV	1.00-1.00 1.00-1.00		N = 0 (1, 0, 0, 0, 0, 0)	
			-9.20	1.60						
	Loose grey slightly silty SAND with sea shells(Marine Sediment)									
2					AA0835 AA0836	B ENV	2.00-2.00 2.00-2.00		N = 2 (1, 0, 0, 1, 0, 1)	
3	Dredge Depth Level -10.5m CD				AA0837	B	3.00-3.00		N = 4 (1, 0, 0, 1, 1, 2)	
4					AA0838	B	4.00-4.00		N = 8 (1, 0, 1, 2, 2, 3)	
5					AA0839	B	5.00-5.00		N = 5 (1, 0, 0, 1, 1, 3)	
6					AA0840	B	6.00-6.00		N = 8 (1, 0, 1, 1, 2, 4)	
7			-14.70	7.10	AA0841	B	7.00-7.00		N = 33 (2, 4, 7, 7, 9, 10)	
	Medium dense grey slightly clayey GRAVEL with sea shells. Gravel is fine to coarse subrounded to subangular of various lithologies.(Marine Sediment)		-15.20	7.60	AA0842	B	7.50-7.50			
8	Very stiff brown sandy gravelly CLAY with a high cobble content. Gravel is fine to coarse subrounded to subangular of various lithologies(Upper Boulder CLAY)				AA0843	B	8.50-8.50		N = 42 (5, 5, 8, 9, 10, 15)	
9					AA0844	B	9.50-9.50		N = 43 (2, 4, 6, 10, 11, 16)	
			-17.60	10.00						
10	End of Borehole at 10.00 m								N = 50/290 mm (3, 6, 9, 12, 14, 15)	

HARD STRATA BORING/CHISELLING

From (m)	To (m)	Time (h)	Comments
9	10	2	

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

GROUNDWATER PROGRESS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

REMARKS Marine Borehole - Deck to Bed depth 9.9m. All levels present are in reference to Chart Datum(CD).

Sample Legend
D - Small Disturbed (tub)
B - Bulk Disturbed
LB - Large Bulk Disturbed
Env - Environmental Sample (Jar + Vial + Tub)
U - Undisturbed 100mm Diameter Sample
P - Undisturbed Piston Sample
W - Water Sample

IGSL BH LOG 11M CHART DATUM 17585 FINAL 2014 RECORDS.GPJ IGSL.GDT 7/11/14

GEOTECHNICAL BORING RECORD

REPORT NUMBER 17585

CONTRACT	Dun Laoaghaire Harbour Cruise Facility - Site Investigation	**BOREHOLE NO.**	**BH03**
		SHEET	Sheet 1 of 1
CO-ORDINATES	324,625.87 E 229,447.12 N	**RIG TYPE**	Dando 3000
		BOREHOLE DIAMETER (mm)	
GROUND LEVEL (m CD))	-6.60	**BOREHOLE DEPTH (m)**	9.00
		DATE COMMENCED	05/06/2014
		DATE COMPLETED	05/06/2014
CLIENT	Dun Laoghaire Harbour Company	**SPT HAMMER REF. NO.**	SPT1
ENGINEER	Moylan Waterman	**ENERGY RATIO (%)**	68
		BORED BY	P.Thomas
		PROCESSED BY	D.Coss

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples: Ref. Number	Sample Type	Depth (m)	Recovery	Field Test Results	Standpipe Details
0	Loose grey silty SAND with sea shells(Marine Sediment)				AA24127 AA24128/00281953	B ENV	0.00-1.00 0.00-1.00			
1									N = 9 (1, 1, 1, 2, 2, 4)	
2					AA24129 AA24130	B ENV	2.00-2.00 2.00-2.00		N = 5 (1, 0, 1, 1, 1, 2)	
3					AA24131	B	3.00-3.00		N = 7 (1, 0, 1, 1, 2, 3)	
4	Dredge Depth Level -10.5m CD				AA24132	B	4.00-4.00		N = 3 (1, 0, 1, 1, 1, 0)	
			-11.10	4.50						
	Very soft grey slightly sandy SILT(Marine Sediment)									
5					AA24133	B	5.00-5.00		N = 1 (1, 0, 0, 0, 1, 0)	
					AA24134	U	5.50-5.50			
6					AA24135	B	6.00-6.00		N = 3 (1, 0, 0, 1, 0, 2)	
			-13.10	6.50						
	Soft grey very sandy SILT.(Marine Sediment)				AA24136	U	6.50-6.50			
7					AA24137	B	7.00-7.00		N = 8 (1, 1, 2, 1, 2, 3)	
8					AA24138	B	8.00-8.00		N = 9 (1, 1, 1, 2, 2, 4)	
			-15.10	8.50						
	Hard black sandy gravelly CLAY with a high cobble content. Gravel is fine to coarse subrounded to subangular of various lithologies(Boulder CLAY)		-15.60	9.00						
9	End of Borehole at 9.00 m				AA24139	B	9.00-9.00		N = 50/75 mm (25, 50)	
10										

HARD STRATA BORING/CHISELLING

From (m)	To (m)	Time (h)	Comments
8.5	9	2	

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike

GROUNDWATER PROGRESS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

REMARKS Marine Borehole - Deck to Bed depth 8.65m. All levels present are in reference to Chart Datum(CD).

Sample Legend
D - Small Disturbed (tub)
B - Bulk Disturbed
LB - Large Bulk Disturbed
Env - Environmental Sample (Jar + Vial + Tub)
U - Undisturbed 100mm Diameter Sample
P - Undisturbed Piston Sample
W - Water Sample

IGSL BH LOG 11M CHART DATUM 17585 FINAL 2014 RECORDS.GPJ IGSL.GDT 7/11/14

GEOTECHNICAL BORING RECORD

REPORT NUMBER 17585

CONTRACT	Dun Laoaghaire Harbour Cruise Facility - Site Investigation	**BOREHOLE NO.**	**BH04D**
		SHEET	Sheet 1 of 1
CO-ORDINATES	324,651.95 E 229,536.21 N	**RIG TYPE**	Dando 3000
		BOREHOLE DIAMETER (mm)	
GROUND LEVEL (m CD))	-6.86	**BOREHOLE DEPTH (m)**	6.50
		DATE COMMENCED	30/05/2014
		DATE COMPLETED	30/05/2014
CLIENT	Dun Laoghaire Harbour Company	**SPT HAMMER REF. NO.**	SPT1
ENGINEER	Moylan Waterman	**ENERGY RATIO (%)**	68
		BORED BY	P.Thomas
		PROCESSED BY	C.Killaly

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples: Ref. Number	Sample Type	Depth (m)	Recovery	Field Test Results	Standpipe Details
0	Loose grey silty SAND with sea shells(Marine Sediment)				AA24102 AA24103	B ENV	0.00-1.00 0.00-1.00			
1					AA24104 AA24105	B ENV	1.00-2.00 1.00-2.00		N = 4 (1, 0, 1, 1, 1, 1)	
2									N = 4 (1, 0, 0, 1, 1, 2)	
3					AA24106 AA24106/00281953	B ENV	3.00-4.00 3.00-4.00		N = 3 (1, 0, 1, 0, 1, 1)	
	Dredge Depth Level -10.5m CD									
4					AA24107	B	4.00-5.00		N = 2 (1, 0, 1, 0, 1, 0)	
			-11.36	4.50						
	Very soft grey sandy SILT(Marine Sediment)									
5					AA24108 AA24108 AA24109	ENV P B	5.00-5.50 5.00-5.50 5.50-6.00	80%rec	N = 1 (1, 0, 0, 0, 1, 0)	
			-12.86	6.00						
6	Very soft grey very sandy SILT(Marine Sediment)				AA24110	U	6.00-6.50	85%rec	N = 3 (1, 0, 0, 1, 0, 2)	
			-13.36	6.50						
	Termination depth End of Borehole at 6.50 m									
7										
8										
9										
10										

HARD STRATA BORING/CHISELLING

From (m)	To (m)	Time (h)	Comments

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike

GROUNDWATER PROGRESS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

REMARKS Marine Borehole - Deck to Bed depth 9.3m. All levels present are in reference to Chart Datum(CD). Marine Environmental Suites recovered using Piston Sampling methods as per method statement.

Sample Legend
D - Small Disturbed (tub)
B - Bulk Disturbed
LB - Large Bulk Disturbed
Env - Environmental Sample (Jar + Vial + Tub)
U - Undisturbed 100mm Diameter Sample
P - Undisturbed Piston Sample
W - Water Sample

IGSL BH LOG 11M CHART DATUM 17585 FINAL 2014 RECORDS.GPJ IGSL.GDT 7/11/14

GEOTECHNICAL BORING RECORD

REPORT NUMBER 17585

CONTRACT	Dun Laoaghaire Harbour Cruise Facility - Site Investigation	**BOREHOLE NO.**	**BH05D**
		SHEET	Sheet 1 of 1
CO-ORDINATES	324,634.25 E 229,667.55 N	**RIG TYPE**	Dando 3000
		BOREHOLE DIAMETER (mm)	
GROUND LEVEL (m CD))	-6.52	**BOREHOLE DEPTH (m)**	6.60
		DATE COMMENCED	26/05/2014
		DATE COMPLETED	26/05/2014
CLIENT	Dun Laoghaire Harbour Company	**SPT HAMMER REF. NO.**	SPT1
ENGINEER	Moylan Waterman	**ENERGY RATIO (%)**	68
		BORED BY	P.Thomas
		PROCESSED BY	C.Killaly

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples: Ref. Number	Sample Type	Depth (m)	Recovery	Field Test Results	Standpipe Details
0	Grey sandy coarse GRAVEL with sea shells(Marine Sediment)				AA19101	B	0.00-0.50			
					AA19102	ENV	0.00-0.50			
			-7.12	0.60						
	Loose grey silty slightly gravelly SAND with sea shells(Marine Sediment)				AA19103	U	0.60-1.10	60%rec		
1					AA19104	B	1.10-2.00		N = 6	
					AA19105	ENV	1.10-2.00		(1, 0, 1, 1, 1, 3)	
					AA19106	B	1.50-2.00			
2					AA19107	B	2.00-3.00		N = 9	
									(1, 0, 1, 1, 3, 4)	
3					AA19108	B	3.00-4.00		N = 4	
					AA19108	ENV	3.00-4.00		(1, 0, 0, 1, 1, 2)	
4	Dredge Depth Level -10.5m CD				AA19109	B	4.00-4.50		N = 12	
			-11.12	4.60					(1, 1, 1, 3, 3, 5)	
					AA19110	B	4.50-5.00			
	Very soft grey very sandy SILT(Marine Sediment)									
5					AA19111	P	5.00-5.50	70%rec	N = 1	
					AA19111/00281953	ENV	5.00-5.50		(1, 0, 0, 0, 1, 0)	
					AA19112	B	5.50-6.00			
6					AA19113	U	6.00-6.60	80%rec	N = 3	
									(1, 0, 1, 0, 1, 1)	
			-13.12	6.60						
	Termination depth End of Borehole at 6.60 m									
7										
8										
9										
10										

HARD STRATA BORING/CHISELLING

From (m)	To (m)	Time (h)	Comments

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike

GROUNDWATER PROGRESS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

REMARKS Marine Borehole - Deck to Bed depth 10.9m. All levels present are in reference to Chart Datum(CD). Marine Environmental Suites recovered using Piston Sampling methods as per method statement.

Sample Legend
D - Small Disturbed (tub)
B - Bulk Disturbed
LB - Large Bulk Disturbed
Env - Environmental Sample (Jar + Vial + Tub)
U - Undisturbed 100mm Diameter Sample
P - Undisturbed Piston Sample
W - Water Sample

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GEOTECHNICAL BORING RECORD

REPORT NUMBER 17585

CONTRACT	Dun Laoaghaire Harbour Cruise Facility - Site Investigation	**BOREHOLE NO.**	**BH06D**
		SHEET	Sheet 1 of 1
CO-ORDINATES	324,852.14 E 229,614.71 N	**RIG TYPE**	Dando 3000
		BOREHOLE DIAMETER (mm)	
GROUND LEVEL (m CD))	-7.46	**BOREHOLE DEPTH (m)**	7.50
		DATE COMMENCED	26/05/2014
		DATE COMPLETED	26/05/2014
CLIENT	Dun Laoghaire Harbour Company	**SPT HAMMER REF. NO.**	SPT1
ENGINEER	Moylan Waterman	**ENERGY RATIO (%)**	68
		BORED BY	P.Thomas
		PROCESSED BY	C.Killaly

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples: Ref. Number	Sample Type	Depth (m)	Recovery	Field Test Results	Standpipe Details
0	Loose grey silty slightly gravelly SAND with sea shells(Marine Sediment)				AA19111 AA19112	B ENV	0.00-1.00 0.00-1.00			
1					AA19113 AA19114	B ENV	1.00-2.00 1.00-2.00		N = 5 (1, 0, 1, 1, 1, 2)	
2									N = 6 (1, 1, 1, 1, 2, 2)	
3	Dredge Depth Level -10.5m CD				AA19115 AA19115	B ENV	3.00-4.00 3.00-4.00		N = 8 (1, 0, 1, 2, 2, 3)	
4					AA19116	B	4.00-5.00		N = 7 (1, 1, 1, 1, 2, 3)	
5			-12.76	5.30	AA19117	B	5.00-5.50		N = 3 (1, 0, 1, 1, 0, 1)	
	Very soft grey very sandy SILT(Marine Sediment)				AA19118 AA19118	ENV P	5.50-6.00 5.50-6.00	90%rec		
6					AA19119	B	6.00-7.00		N = 3 (1, 0, 1, 0, 1, 1)	
7			-14.96	7.50	AA19120	B	7.00-7.50		N = 3 (1, 0, 0, 1, 0, 2)	
	Termination depth End of Borehole at 7.50 m									
8										
9										
10										

HARD STRATA BORING/CHISELLING

From (m)	To (m)	Time (h)	Comments

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike

GROUNDWATER PROGRESS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

REMARKS Marine Borehole - Deck to Bed depth 10.0m. All levels present are in reference to Chart Datum(CD). Marine Environmental Suites recovered using Piston Sampling methods as per method statement.

Sample Legend
D - Small Disturbed (tub)
B - Bulk Disturbed
LB - Large Bulk Disturbed
Env - Environmental Sample (Jar + Vial + Tub)
U - Undisturbed 100mm Diameter Sample
P - Undisturbed Piston Sample
W - Water Sample

IGSL BH LOG 11M CHART DATUM 17585 FINAL 2014 RECORDS.GPJ IGSL.GDT 7/11/14

GEOTECHNICAL BORING RECORD

REPORT NUMBER 17585

CONTRACT	Dun Laoaghaire Harbour Cruise Facility - Site Investigation	**BOREHOLE NO.**	**BH07D**
		SHEET	Sheet 1 of 1
CO-ORDINATES	324,753.83 E 229,756.34 N	**RIG TYPE**	Dando 3000
		BOREHOLE DIAMETER (mm)	
GROUND LEVEL (m CD))	-6.96	**BOREHOLE DEPTH (m)**	6.50
		DATE COMMENCED	03/06/2014
		DATE COMPLETED	03/06/2014
CLIENT	Dun Laoghaire Harbour Company	**SPT HAMMER REF. NO.**	SPT1
ENGINEER	Moylan Waterman	**ENERGY RATIO (%)**	68
		BORED BY	P.Thomas
		PROCESSED BY	C.Killaly

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples: Ref. Number	Sample Type	Depth (m)	Recovery	Field Test Results	Standpipe Details
0	Loose grey silty SAND with sea shells(Marine Sediment)				AA24118	B	0.00-1.00			
					AA24119/00281952	ENV	0.00-1.00			
1					AA24120	B	1.00-2.00		N = 8 (1, 1, 1, 2, 2, 3)	
					AA24121	ENV	1.00-2.00			
2									N = 4 (1, 0, 1, 0, 1, 2)	
3					AA24122	B	3.00-4.00		N = 6 (1, 0, 1, 1, 2, 2)	
					AA24122/00281953	ENV	3.00-4.00			
	Dredge Depth Level -10.5m CD									
4					AA24123	B	4.00-5.00		N = 2 (1, 0, 1, 0, 1, 0)	
			-11.46	4.50						
	Very soft grey sandy SILT(Marine Sediment)									
5					AA24124	B	5.00-6.00		N = 1 (1, 0, 0, 0, 0, 1)	
					AA24124	ENV	5.00-6.00			
6					AA24125	B	6.00-6.50		N = 2 (1, 0, 0, 1, 0, 1)	
					AA24126	U	6.00-6.50	90%rec		
			-13.46	6.50						
	Termination depth End of Borehole at 6.50 m									
7										
8										
9										
10										

HARD STRATA BORING/CHISELLING

From (m)	To (m)	Time (h)	Comments

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike

GROUNDWATER PROGRESS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

REMARKS Marine Borehole - Deck to Bed depth 10.4m. All levels present are in reference to Chart Datum(CD). Marine Environmental Suites recovered using Piston Sampling methods as per method statement.

Sample Legend
D - Small Disturbed (tub)
B - Bulk Disturbed
LB - Large Bulk Disturbed
Env - Environmental Sample (Jar + Vial + Tub)
U - Undisturbed 100mm Diameter Sample
P - Undisturbed Piston Sample
W - Water Sample

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GEOTECHNICAL BORING RECORD

REPORT NUMBER 17585

CONTRACT	Dun Laoaghaire Harbour Cruise Facility - Site Investigation	**BOREHOLE NO.**	**BH08D**
		SHEET	Sheet 1 of 1
CO-ORDINATES	324,682.43 E 229,984.56 N	**RIG TYPE**	Dando 3000
		BOREHOLE DIAMETER (mm)	
GROUND LEVEL (m CD))	-7.01	**BOREHOLE DEPTH (m)**	6.70
		DATE COMMENCED	27/05/2014
		DATE COMPLETED	27/05/2014
CLIENT	Dun Laoghaire Harbour Company	**SPT HAMMER REF. NO.**	SPT1
ENGINEER	Moylan Waterman	**ENERGY RATIO (%)**	68
		BORED BY	P.Thomas
		PROCESSED BY	C.Killaly

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples: Ref. Number	Sample Type	Depth (m)	Recovery	Field Test Results	Standpipe Details
0	Loose grey silty SAND with sea shells(Marine Sediment)				AA19121	B	0.00-1.00			
					AA19122	ENV	0.00-1.00			
1									N = 4 (1, 0, 1, 1, 1, 1)	
					AA19123	B	1.50-2.00			
					AA19124	ENV	1.50-2.00			
2					AA19125	B	2.00-3.00		N = 4 (1, 0, 0, 1, 1, 2)	
3					AA19126	B	3.00-4.00		N = 7 (1, 0, 1, 1, 2, 3)	
					AA19126/00281953	ENV	3.00-4.00			
	Dredge Depth Level -10.5m CD									
4									N = 3 (1, 0, 0, 1, 1, 1)	
			-11.71	4.70						
	Very soft grey sandy SILT(Marine Sediment)									
5					AA19127	B	5.00-5.00		N = 1 (1, 0, 0, 0, 1, 0)	
					AA19128	ENV	5.50-6.00			
					AA19128	P	5.50-6.00			
6					AA19129	U	6.00-6.50			
			-13.71	6.70	AA19130	B	6.50-6.70			
7	Termination depth End of Borehole at 6.70 m									
8										
9										
10										

HARD STRATA BORING/CHISELLING

From (m)	To (m)	Time (h)	Comments

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike

GROUNDWATER PROGRESS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

REMARKS Marine Borehole - Deck to Bed depth 10.9m. All levels present are in reference to Chart Datum(CD). Marine Environmental Suites recovered using Piston Sampling methods as per method statement.

Sample Legend
D - Small Disturbed (tub)
B - Bulk Disturbed
LB - Large Bulk Disturbed
Env - Environmental Sample (Jar + Vial + Tub)
U - Undisturbed 100mm Diameter Sample
P - Undisturbed Piston Sample
W - Water Sample

IGSL BH LOG 11M CHART DATUM 17585 FINAL 2014 RECORDS.GPJ IGSL.GDT 7/11/14

GEOTECHNICAL BORING RECORD

REPORT NUMBER 17585

CONTRACT	Dun Laoaghaire Harbour Cruise Facility - Site Investigation	**BOREHOLE NO.**	**BH09D**
		SHEET	Sheet 1 of 1
CO-ORDINATES	324,842.94 E 229,975.97 N	**RIG TYPE**	Dando 3000
		BOREHOLE DIAMETER (mm)	
GROUND LEVEL (m CD))	-9.92	**BOREHOLE DEPTH (m)**	4.50
		DATE COMMENCED	03/06/2014
		DATE COMPLETED	03/06/2014
CLIENT	Dun Laoghaire Harbour Company	**SPT HAMMER REF. NO.**	SPT1
ENGINEER	Moylan Waterman	**ENERGY RATIO (%)**	68
		BORED BY	P.Thomas
		PROCESSED BY	C.Killaly

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples: Ref. Number	Sample Type	Depth (m)	Recovery	Field Test Results	Standpipe Details
0	Loose grey silty SAND with sea shells(Marine Sediment) Dredge Depth Level -10.5m CD				AA24111 AA24112	B ENV	0.00-1.00 0.00-1.00			
1					AA24113 AA24114	B ENV	1.00-2.00 1.00-2.00		N = 3 (0, 1, 1, 1, 1, 0)	
2			-12.42	2.50					N = 4 (0, 0, 1, 1, 1, 1)	
3	Very soft grey sandy SILT(Marine Sediment)				AA24115	B	3.00-3.50		N = 2 (0, 0, 0, 2, 0, 0)	
					AA24116 AA24116	ENV P	3.50-4.00 3.50-4.00	 90%rec		
4					AA24117	B	4.00-4.50		N = 2 (0, 0, 1, 0, 1, 0)	
			-14.42	4.50						
5	Termination depth End of Borehole at 4.50 m									
6										
7										
8										
9										
10										

HARD STRATA BORING/CHISELLING

From (m)	To (m)	Time (h)	Comments

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike

GROUNDWATER PROGRESS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

REMARKS Marine Borehole - Deck to Bed depth 11.6m. All levels present are in reference to Chart Datum(CD). Marine Environmental Suites recovered using Piston Sampling methods as per method statement.

Sample Legend
D - Small Disturbed (tub)
B - Bulk Disturbed
LB - Large Bulk Disturbed
Env - Environmental Sample (Jar + Vial + Tub)
U - Undisturbed 100mm Diameter Sample
P - Undisturbed Piston Sample
W - Water Sample

IGSL BH LOG 11M CHART DATUM 17585 FINAL 2014 RECORDS.GPJ IGSL.GDT 7/11/14

GEOTECHNICAL BORING RECORD

REPORT NUMBER 17585

CONTRACT	Dun Laoaghaire Harbour Cruise Facility - Site Investigation	**BOREHOLE NO.**	**BH10D**
		SHEET	Sheet 1 of 1
CO-ORDINATES	324,722.27 E 230,169.36 N	**RIG TYPE**	Dando 3000
		BOREHOLE DIAMETER (mm)	
GROUND LEVEL (m CD))	-8.63	**BOREHOLE DEPTH (m)**	6.00
		DATE COMMENCED	28/05/2014
		DATE COMPLETED	28/05/2014
CLIENT	Dun Laoghaire Harbour Company	**SPT HAMMER REF. NO.**	SPT1
ENGINEER	Moylan Waterman	**ENERGY RATIO (%)**	68
		BORED BY	P.Thomas
		PROCESSED BY	C.Killaly

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples: Ref. Number	Sample Type	Depth (m)	Recovery	Field Test Results	Standpipe Details
0	Loose grey silty SAND with sea shells (Marine Sediment)				AA19144 AA19145	B ENV	0.00-1.00 0.00-1.00			
1					AA19146 AA19147	B ENV	1.00-2.00 1.00-2.00		N = 5 (1, 1, 0, 1, 2, 2)	
2	Dredge Depth Level -10.5m CD				AA19148	B	2.00-3.00		N = 3 (1, 0, 0, 0, 0, 3)	
			-11.33	2.70						
3	Very soft grey sandy SILT (Marine Sediment)				AA19151 AA19151/00281952	B ENV	3.00-4.00 3.00-4.00		N = 1 (1, 0, 0, 0, 1, 0)	
4									N = 2 (1, 0, 0, 1, 0, 1)	
					AA19152	U	4.50-5.00	90%rec		
5									N = 1 (1, 0, 0, 0, 0, 1)	
					AA19153	U	5.50-6.00	90%rec		
			-14.63	6.00						
6	Termination depth End of Borehole at 6.00 m								N = 1 (0, 1, 0, 0, 1, 0)	
7										
8										
9										
10										

HARD STRATA BORING/CHISELLING

From (m)	To (m)	Time (h)	Comments

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike

GROUNDWATER PROGRESS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

REMARKS Marine Borehole - Deck to Bed depth 12.9m. All levels present are in reference to Chart Datum(CD). Marine Environmental Suites recovered using Piston Sampling methods as per method statement.

Sample Legend
D - Small Disturbed (tub)
B - Bulk Disturbed
LB - Large Bulk Disturbed
Env - Environmental Sample (Jar + Vial + Tub)
U - Undisturbed 100mm Diameter Sample
P - Undisturbed Piston Sample
W - Water Sample

IGSL BH LOG 11M CHART DATUM 17585 FINAL 2014 RECORDS.GPJ IGSL.GDT 7/11/14

GEOTECHNICAL BORING RECORD

REPORT NUMBER 17585

CONTRACT	Dun Laoaghaire Harbour Cruise Facility - Site Investigation	**BOREHOLE NO.**	**BH11D**
		SHEET	Sheet 1 of 1
CO-ORDINATES	324,870.11 E 230,258.30 N	**RIG TYPE**	Dando 3000
		BOREHOLE DIAMETER (mm)	
GROUND LEVEL (m CD))	-9.08	**BOREHOLE DEPTH (m)**	4.00
		DATE COMMENCED	28/05/2014
		DATE COMPLETED	28/05/2014
CLIENT	Dun Laoghaire Harbour Company	**SPT HAMMER REF. NO.**	SPT1
ENGINEER	Moylan Waterman	**ENERGY RATIO (%)**	68
		BORED BY	P.Thomas
		PROCESSED BY	C.Killaly

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples: Ref. Number	Sample Type	Depth (m)	Recovery	Field Test Results	Standpipe Details
0	Loose grey very silty SAND with sea shells(Marine Sediment)				AA19138 AA19139	B ENV	0.00-1.00 0.00-1.00			
1					AA19140 AA19141/00281952	B ENV	1.00-2.00 1.00-2.00		N = 5 (1, 0, 1, 1, 1, 2)	
	Dredge Depth Level -10.5m CD									
2									N = 3 (1, 0, 1, 0, 1, 1)	
3			-12.28	3.20	AA19142	B	3.00-3.50		N = 2 (1, 0, 1, 0, 0, 1)	
	Very soft grey sandy SILT(Marine Sediment)				AA19143 AA19143	B ENV	3.50-4.00 3.50-4.00			
4			-13.08	4.00					N = 2 (0, 0, 1, 1, 0, 0)	
	Termination depth End of Borehole at 4.00 m									
5										
6										
7										
8										
9										
10										

HARD STRATA BORING/CHISELLING

From (m)	To (m)	Time (h)	Comments

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike

GROUNDWATER PROGRESS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

REMARKS Marine Borehole - Deck to Bed depth 12.5m. All levels present are in reference to Chart Datum(CD). Marine Environmental Suites recovered using Piston Sampling methods as per method statement.

Sample Legend
D - Small Disturbed (tub)
B - Bulk Disturbed
LB - Large Bulk Disturbed
Env - Environmental Sample (Jar + Vial + Tub)
U - Undisturbed 100mm Diameter Sample
P - Undisturbed Piston Sample
W - Water Sample

IGSL BH LOG 11M CHART DATUM 17585 FINAL 2014 RECORDS.GPJ IGSL.GDT 7/11/14

GEOTECHNICAL BORING RECORD

REPORT NUMBER 17585

CONTRACT	Dun Laoaghaire Harbour Cruise Facility - Site Investigation	**BOREHOLE NO.**	**BH12D**
		SHEET	Sheet 1 of 1
CO-ORDINATES	325,111.86 E 230,083.96 N	**RIG TYPE**	Dando 3000
		BOREHOLE DIAMETER (mm)	
GROUND LEVEL (m CD))	-10.06	**BOREHOLE DEPTH (m)**	4.30
		DATE COMMENCED	27/05/2014
		DATE COMPLETED	27/05/2014
CLIENT	Dun Laoghaire Harbour Company	**SPT HAMMER REF. NO.**	SPT1
ENGINEER	Moylan Waterman	**ENERGY RATIO (%)**	68
		BORED BY	P.Thomas
		PROCESSED BY	C.Killaly

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples: Ref. Number	Sample Type	Depth (m)	Recovery	Field Test Results	Standpipe Details
0	Loose grey silty SAND with sea shells(Marine Sediment) Dredge Depth Level -10.5m CD				AA19131 AA19132	B ENV	0.00-1.00 0.00-1.00			
1					AA19133 AA19134/00281953	B ENV	1.00-2.00 1.00-2.00		N = 2 (1, 0, 0, 1, 0, 1)	
2			-12.56	2.50					N = 3 (1, 0, 1, 0, 1, 1)	
3	Very soft grey sandy SILT(Marine Sediment)				AA19135	B	3.00-3.50		N = 0 (1, 0, 0, 0, 0, 0)	
4			-14.56	4.50	AA19136 AA19136 AA19137	ENV P B	3.50-4.00 3.50-4.00 4.00-4.50	85%rec	N = 2 (1, 0, 0, 0, 1, 1)	
5	Termination depth End of Borehole at 4.30 m									
6										
7										
8										
9										
10										

HARD STRATA BORING/CHISELLING

From (m)	To (m)	Time (h)	Comments

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike

GROUNDWATER PROGRESS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

REMARKS Marine Borehole - Deck to Bed depth 13.3m. All levels present are in reference to Chart Datum(CD). Marine Environmental Suites recovered using Piston Sampling methods as per method statement.

Sample Legend
D - Small Disturbed (tub)
B - Bulk Disturbed
LB - Large Bulk Disturbed
Env - Environmental Sample (Jar + Vial + Tub)
U - Undisturbed 100mm Diameter Sample
P - Undisturbed Piston Sample
W - Water Sample

IGSL BH LOG 11M CHART DATUM 17585 FINAL 2014 RECORDS.GPJ IGSL.GDT 7/11/14

Appendix 2

Rotary Core Drillhole Records

GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER 17585

CONTRACT	Dun Laoaghaire Harbour Cruise Facility - Site Investigation	**DRILLHOLE NO**	**RC01**
		SHEET	Sheet 1 of 3
CO-ORDINATES	324,505.91 E 229,059.43 N	**DATE DRILLED**	10/06/2014
GROUND LEVEL (mCD)	-4.47	**DATE LOGGED**	11/06/2014
RIG TYPE	Casagrande		
FLUSH	Air/Mist		
CLIENT	Dun Laoghaire Harbour Company	**DRILLED BY**	IGSL
ENGINEER	Moylan Waterman	**LOGGED BY**	D.O'Shea
CORE DIAMETER (mm)	80		

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm) 0 250 500	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0								SYMMETRIX DRILLING: No recovery, observed by driller as returns of silt (Marine Sediment)				
1												
2												
3												
4												
5												
6								Dredge Depth -10.5mCD				
7												
8									8.30	-12.77		
9								SYMMETRIX DRILLING: No recovery, observed by driller as returns of dark brown clay(Upper Boulder CLAY)				

REMARKS

Hole cased from 0.00-17.20m. All levels present are in reference to Chart Datum(CD).

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

IGSL RC FI LOG CHART DATUM 17585 FINAL 2014 RECORDS.GPJ IGSL.GDT 7/11/14

GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER 17585

CONTRACT	Dun Laoaghaire Harbour Cruise Facility - Site Investigation	**DRILLHOLE NO**	**RC01**
		SHEET	Sheet 2 of 3
CO-ORDINATES	324,505.91 E 229,059.43 N	**DATE DRILLED**	10/06/2014
GROUND LEVEL (mCD)	-4.47	**DATE LOGGED**	11/06/2014
RIG TYPE	Casagrande		
FLUSH	Air/Mist		
CLIENT	Dun Laoghaire Harbour Company	**DRILLED BY**	IGSL
ENGINEER	Moylan Waterman	**LOGGED BY**	D.O'Shea
INCLINATION (deg)	-90		
CORE DIAMETER (mm)	80		

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm) 0 250 500	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
10								SYMMETRIX DRILLING: No recovery, observed by driller as returns of dark brown clay(Upper Boulder CLAY) *(continued)*				
11												N = 37 (4, 5, 6, 8, 9, 14)
12									12.50	-16.97		
13								SYMMETRIX DRILLING: No recovery, observed by driller as returns of gravel(Glacial Till)	13.80	-18.27		N = 40 (3, 3, 6, 8, 11, 15)
14	14.20							SYMMETRIX DRILLING: No recovery, observed by driller as returns of grey black sandy gravelly clay with occasional cobbles, horizons of gravel and cobbles (assessed as extremely weak mudstone)(Boulder CLAY)	14.20	-18.67		N = 50/135 mm (9, 15, 21, 29)
15	15.70	100	0	0				Very Stiff / Hard, grey/black, slightly sandy gravelly clay with occasional cobbles, horizons of gravel and cobbles. Sand is fine to coarse. Gravel is angular to sub-rounded, fine to coarse of various lithologies. Cobbles are sub-rounded of limestone (assessed as extremely weak mudstone)(Boulder CLAY)				
16		47	0	0								N = 12/12 mm (25, 38, 12)
17	17.20							SYMMETRIX DRILLING: No recovery, observed by driller as returns of grey black sandy gravelly clay with occasional cobbles, horizons of gravel and cobbles (assessed as extremely mudstone)(Boulder CLAY)	17.20	-21.67		
18												
19	19.50	100	100	58					19.50	-23.97		

REMARKS

Hole cased from 0.00-17.20m. All levels present are in reference to Chart Datum(CD).

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

IGSL RC FI LOG CHART DATUM 17585 FINAL 2014 RECORDS.GPJ IGSL.GDT 7/11/14

GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER 17585

CONTRACT	Dun Laoaghaire Harbour Cruise Facility - Site Investigation	**DRILLHOLE NO**	**RC01**
		SHEET	Sheet 3 of 3
CO-ORDINATES	324,505.91 E 229,059.43 N	**DATE DRILLED**	10/06/2014
GROUND LEVEL (mCD)	-4.47	**DATE LOGGED**	11/06/2014
CLIENT	Dun Laoghaire Harbour Company	**DRILLED BY**	IGSL
ENGINEER	Moylan Waterman	**LOGGED BY**	D.O'Shea
RIG TYPE	Casagrande		
FLUSH	Air/Mist		
INCLINATION (deg)	-90		
CORE DIAMETER (mm)	80		

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm) 0 250 500	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
20	20.05	100	69	24				Strong, crystalline, grey/brown/white/black mottled, fine to medium grained, GRANITE, fresh to locally moderately weathered (at 20.05-20.34m & 21.95-22.40m) Discontinuities are medium to closely spaced, smooth to rough, planar. Apertures are tight to moderately open, locally clay smeared. Dips are 45-60° & locally subvertical. *(continued)*				
21	21.45	100	54	0								
22	22.40							End of Borehole at 22.40 m	22.40	-26.87		
23												
24												
25												
26												
27												
28												
29												

REMARKS

Hole cased from 0.00-17.20m. All levels present are in reference to Chart Datum(CD).

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER 17585

CONTRACT	Dun Laoaghaire Harbour Cruise Facility - Site Investigation	**DRILLHOLE NO**	**RC02**
		SHEET	Sheet 1 of 3
CO-ORDINATES	324,537.43 E 229,189.81 N	**DATE DRILLED**	12/06/2014
GROUND LEVEL (mCD)	-7.95	**DATE LOGGED**	13/06/2014
RIG TYPE	Casagrande		
FLUSH	Air/Mist		
CLIENT	Dun Laoghaire Harbour Company	**DRILLED BY**	IGSL
ENGINEER	Moylan Waterman	**LOGGED BY**	D.O'Shea
INCLINATION (deg)	-90		
CORE DIAMETER (mm)			

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm) 0 250 500	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0								SYMMETRIX DRILLING: No recovery, observed by driller as returns of silty sand(Marine Sediment)				
1									1.50	-9.45		
2								SYMMETRIX DRILLING: No recovery, observed by driller as returns of gravelly silt(Marine Sediment) Dredge Depth -10.5mCD				
3												
4												
5												
6												
7									7.50	-15.45		
8								SYMMETRIX DRILLING: No recovery, observed by driller as returns of brown clay(Upper Boulder CLAY)				
9												

REMARKS

Hole cased from 0.00-18.50m. All levels present are in reference to Chart Datum(CD).

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

IGSL RC FI LOG CHART DATUM 17585 FINAL 2014 RECORDS.GPJ IGSL.GDT 7/11/14

GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER 17585

CONTRACT	Dun Laoaghaire Harbour Cruise Facility - Site Investigation	**DRILLHOLE NO**	**RC02**
		SHEET	Sheet 2 of 3
CO-ORDINATES	324,537.43 E 229,189.81 N	**DATE DRILLED**	12/06/2014
GROUND LEVEL (mCD)	-7.95	**DATE LOGGED**	13/06/2014
RIG TYPE	Casagrande		
FLUSH	Air/Mist		
CLIENT	Dun Laoghaire Harbour Company	**DRILLED BY**	IGSL
ENGINEER	Moylan Waterman	**LOGGED BY**	D.O'Shea
INCLINATION (deg)	-90		
CORE DIAMETER (mm)			

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm) 0 250 500	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
10								SYMMETRIX DRILLING: No recovery, observed by driller as returns of brown clay(Upper Boulder CLAY) *(continued)*				
11												N = 32 (2, 4, 5, 7, 8, 12)
12												
13												N = 39 (3, 4, 6, 8, 11, 14)
14												
15												N = 35 (2, 4, 5, 9, 9, 12)
16								SYMMETRIX DRILLING: No recovery, observed by driller as returns of grey black sandy gravelly clay with occasional cobbles, horizons of gravel and cobbles (assessed as extremely weak mudstone)(Boulder CLAY)	16.00	-23.95		N = 41 (3, 3, 6, 9, 12, 14)
17												
18												N = 50/190 mm (6, 11, 14, 18, 18)
19												N = 50/35 mm (20, 50)

REMARKS

Hole cased from 0.00-18.50m. All levels present are in reference to Chart Datum(CD).

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

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GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER 17585

CONTRACT	Dun Laoaghaire Harbour Cruise Facility - Site Investigation	**DRILLHOLE NO**	**RC02**
		SHEET	Sheet 3 of 3
CO-ORDINATES	324,537.43 E 229,189.81 N	**DATE DRILLED**	12/06/2014
GROUND LEVEL (mCD)	-7.95	**DATE LOGGED**	13/06/2014
RIG TYPE	Casagrande		
FLUSH	Air/Mist		
CLIENT	Dun Laoghaire Harbour Company	**DRILLED BY**	IGSL
ENGINEER	Moylan Waterman	**LOGGED BY**	D.O'Shea
CORE DIAMETER (mm)			

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm) 0 250 500	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
20								SYMMETRIX DRILLING: No recovery, observed by driller as returns of grey black sandy gravelly clay with occasional cobbles, horizons of gravel and cobbles (assessed as extremely weak mudstone)(Boulder CLAY) *(continued)*				N = 50/95 mm (25, 50, 38, 12)
21												
22												N = 33/85 mm (9, 15, 21, 12)
23												
24												N = 50/35 mm (25, 50)
25												N = 50/40 mm (25, 50)
26									26.50	-34.45		
27								End of Borehole at 26.50 m				N = 50/50 mm (25, 50)
28												
29												

REMARKS

Hole cased from 0.00-18.50m. All levels present are in reference to Chart Datum(CD).

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

IGSL RC FI LOG CHART DATUM 17585 FINAL 2014 RECORDS.GPJ IGSL.GDT 7/11/14

GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER 17585

CONTRACT	Dun Laoaghaire Harbour Cruise Facility - Site Investigation	**DRILLHOLE NO**	**RC03**
		SHEET	Sheet 1 of 3
CO-ORDINATES	324,626.49 E 229,445.49 N	**DATE DRILLED**	05/06/2014
GROUND LEVEL (mCD)	-6.57	**DATE LOGGED**	05/06/2014
RIG TYPE	Casagrande		
FLUSH	Air/Mist		
CLIENT	Dun Laoghaire Harbour Company	**DRILLED BY**	IGSL
ENGINEER	Moylan Waterman	**LOGGED BY**	D.O'Shea
CORE DIAMETER (mm)	80		

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm) 0 250 500	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0								SYMMETRIX DRILLING: No recovery, observed by driller as returns of silty sand(Marine Sediment)				
1												
2												
3												
4								Dredge Depth -10.5mCD				
5												
6												
7												
8												
9	9.00								9.00	-15.57		
	9.40	100	0	0				Very Stiff/Hard, dark brown/black, slightly sandy gravelly clay with occasional cobbles, horizons of gravel and cobbles. Sand is fine to coarse. Gravel is angular to sub-rounded, fine to coarse of various lithologies. Cobbles are sub-rounded of limestone (assessed as extremely				
	10.00	100	0	0					10.00	-16.57		

REMARKS

Hole cased from 0.00-21.00m. All levels present are in reference to Chart Datum(CD).

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

IGSL RC FI LOG CHART DATUM 17585 FINAL 2014 RECORDS.GPJ IGSL.GDT 7/11/14

GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER 17585

CONTRACT Dun Laoaghaire Harbour Cruise Facility - Site Investigation

DRILLHOLE NO RC03
SHEET Sheet 2 of 3

CO-ORDINATES 324,626.49 E
229,445.49 N
GROUND LEVEL (mCD) -6.57

RIG TYPE Casagrande
FLUSH Air/Mist
INCLINATION (deg) -90
CORE DIAMETER (mm) 80

DATE DRILLED 05/06/2014
DATE LOGGED 05/06/2014

CLIENT Dun Laoghaire Harbour Company
ENGINEER Moylan Waterman

DRILLED BY IGSL
LOGGED BY D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm) 0 250 500	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
10								weak mudstone)(Boulder CLAY)				N = 50/275 mm (4, 7, 10, 11, 15, 14)
								SYMMETRIX DRILLING: No recovery, observed by driller as returns of grey/ balck sandy gravelly clay with occasional cobbles, horizons of gravel and cobbles (assessed as extremely weak mudstone)(Boulder CLAY)				
11												
12												
13												N = 50/160 mm (9, 9, 15, 18, 17)
14												
												N = 50/155 mm (8, 9, 12, 17, 21)
15												
16												N = 50/170 mm (8, 12, 17, 22, 11)
17												
	18.00								18.00	-24.57		
18		40	0	0				Very Stiff / Hard, grey/black, slightly sandy gravelly clay with occasional cobbles, horizons of gravel and cobbles. Sand is fine to coarse. Gravel is angular to sub-rounded, fine to coarse of various lithologies. Cobbles are sub-rounded of limestone (assessed as extremely weak mudstone)(Boulder CLAY)				N = 50/75 mm (10, 15, 38, 12)
19	19.50											N = 50/150 mm (10, 12, 22,

REMARKS

Hole cased from 0.00-21.00m. All levels present are in reference to Chart Datum(CD).

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

IGSL RC FI LOG CHART DATUM 17585 FINAL 2014 RECORDS.GPJ IGSL.GDT 7/11/14

GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER 17585

CONTRACT	Dun Laoaghaire Harbour Cruise Facility - Site Investigation	**DRILLHOLE NO**	**RC03**
		SHEET	Sheet 3 of 3
CO-ORDINATES	324,626.49 E 229,445.49 N	**DATE DRILLED**	05/06/2014
GROUND LEVEL (mCD)	-6.57	**DATE LOGGED**	05/06/2014
RIG TYPE	Casagrande		
FLUSH	Air/Mist		
CLIENT	Dun Laoghaire Harbour Company	**DRILLED BY**	IGSL
ENGINEER	Moylan Waterman	**LOGGED BY**	D.O'Shea
CORE DIAMETER (mm)	80		

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm) 0 250 500	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
20								Very Stiff / Hard, grey/black, slightly sandy gravelly clay with occasional cobbles, horizons of gravel and cobbles. Sand is fine to coarse. Gravel is angular to sub-rounded, fine to coarse of various lithologies. Cobbles are sub-rounded of limestone (assessed as extremely weak mudstone)(Boulder CLAY) *(continued)*				20, 8)
21												N = 50/150 mm (12, 12, 20, 18, 12)
22												
23												N = 72/225 mm (12, 15, 22, 25, 25)
24												N = 50/150 mm (9, 14, 32, 18)
25									25.20	-31.77		
								End of Borehole at 25.20 m				
26												
27												
28												
29												

REMARKS

Hole cased from 0.00-21.00m. All levels present are in reference to Chart Datum(CD).

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

GROUNDWATER DETAILS

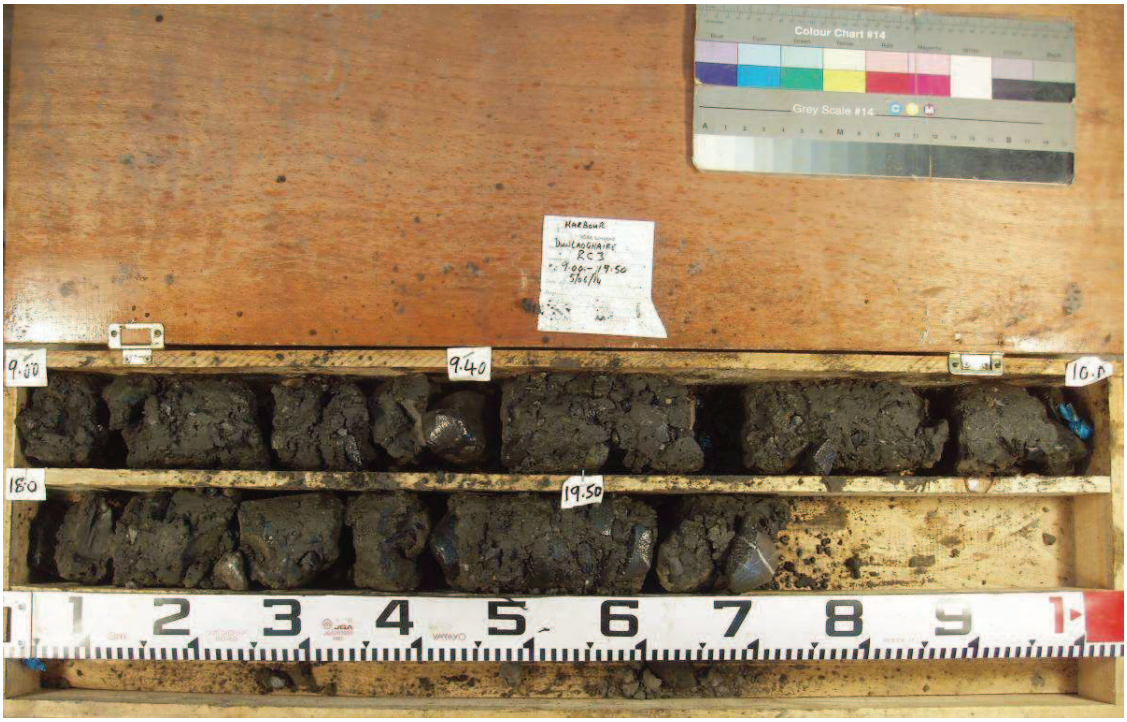
Date	Hole Depth	Casing Depth	Depth to Water	Comments

IGSL RC FI LOG CHART DATUM 17585 FINAL 2014 RECORDS.GPJ IGSL.GDT 7/11/14

RC01 Box 1 of 2 – 14.20-17.20m

RC01 Box 1 of 2 – 19.50-22.40m

RC03 Box 1 of 1 – 9.00-19.50m



Appendix 3

Laboratory Test Records (Soils)

IGSL Ltd
Materials Laboratory
Unit J5, M7 Business Park
Newhall, Naas
Co. Kildare
045 846176

Test Report

Determination of Moisture Content, Liquid & Plastic Limits

Tested in accordance with BS1377:Part 2:1990, clauses 3.2, 4.3, 4.4 & 5.3

ISO 17025 IVNAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 1331

Report No. **R58384** Contract No. 17585 Contract Name: Dun Laoghaire Harbour

Customer Department of the Marine

Samples Received: 25/06/14 Date Tested: 02/07/14

BH/TP	Sample No.	Depth (m)	Lab. Ref	Sample Type	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index	% <425µm	Preparation	Liquid Limit Clause	Classification (BS5930)	Description
Bh04D	AA24104	1.0-2.0	A14/1998	B	24	28	NP	NP	97	WS	4.4		Grey brown silty, slightly gravelly, SAND
Bh04D	AA24108	5.0-5.5	A14/1999	P	33	25	NP	NP	100	WS	4.4		Grey sandy SILT
Bh05D	AA19112	5.5-6	A14/2002	B	36	29	NP	NP	99	WS	4.4		Grey brown slightly sandy, SILT
Bh06D	AA19118	5.5-6	A14/2004	P	38	26	NP	NP	100	WS	4.4		Grey sandy, SILT
Bh07D	AA24126	6.0	A14/2006	U	44	25	NP	NP	100	WS	4.4		Grey sandy SILT
Bh08D	AA19128	5.50-6	A14/2008	P	31	27	NP	NP	99	WS	4.4		Grey sandy, SILT
Bh10D	AA19152	4.5-5	A14/2012	U	32	26	NP	NP	100	WS	4.4		Grey sandy SILT
Bh11D	AA19142	3.0-3.5	A14/2013	B	24	28	NP	NP	99	WS	4.4		Grey brown silty, SAND
Bh12D	AA19136	3.5-4	A14/2015	P	33	24	NP	NP	100	WS	4.4		Grey slightly sandy, SILT
Bh03	AA24134	5.5-5.5	A14/2016	U	29	28	NP	NP	100	WS	4.4		Grey sandy SILT
Bh03	AA24136	6.5	A14/2017	U	27	27	NP	NP	100	WS	4.4		Grey SAND/SILT
Bh02	AA0833	1.0	A14/2018	B	31	27	NP	NP	100	WS	4.4		Grey brown sandy, slightly gravelly, SILT
Bh02	AA0843	8.5	A14/2019	B	23	29	NP	NP	86	WS	4.4		Grey brown slightly sandy, slightly gravelly, SILT
Bh01	AA24145	3.0	A14/2020	B	28	30	NP	NP	99	WS	4.4		Grey brown slightly silty, slightly gravelly, SAND
Bh01	AA24150	8.0	A14/2021	B	10	26	NP	NP	60	WS	4.4		Grey sandy SILT with cobbles

Notes: Preparation: WS - Wet sieved; AR - As received; NP - Non plastic

Sample Type: B - bulk disturbed; U - Undisturbed

Liquid Limit Clause: 4.3 Cone Penetrometer definitive method; 4.4 Cone Penetrometer one point method

Remarks:

Opinions and interpretations are outside the scope of accreditation.

The results relate to the specimens tested. Any remaining material will be retained for one month.

IGSL Ltd Materials Laboratory

Persons authorized to approve reports
J Barrett (Dep. Quality Manager)
H Byrne (Quality Manager)

Approved by	Date	Page
H Byrne	08/07/14	1 of 1

IGSL Ltd
Materials Laboratory
Unit J5, M7 Business Park
Newhall, Naas
Co. Kildare
045 846176

Test Report

Determination of Moisture Content, Liquid & Plastic Limits

Tested in accordance with BS1377:Part 2:1990, clauses 3.2, 4.3, 4.4 & 5.3

ISO 17025 IVNAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 1331

Report No. **R58385** Contract No. 17585 Contract Name: Dun Laoghaire Harbour

Customer Department of the Marine

Samples Received: 25/06/14 Date Tested: 02/07/14

BH/TP	Sample No.	Depth (m)	Lab. Ref	Sample Type	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index	% <425µm	Preparation	Liquid Limit Clause	Classification (BS5930)	Description
Bh01	AA0832	10	A14/2022	B	32	40	17	23	97	WS	4.4	C I	Grey slightly sandy, slightly gravelly, CLAY
RC01	N/A	14.2-17.2	A14/2023	Core	5.7	23	13	10	56	WS	4.4	C L	Grey gravelly sandy CLAY
RC03	N/A	9.00-10.00	A14/2024	Core	6.4	25	13	12	42	WS	4.4	C L	Grey gravelly sandy CLAY
RC03	N/A	18.00-19.50	A14/2025	Core	5.9	29	NP	NP	41	WS	4.4		Grey slightly sandy, gravelly, SILT with some cobbles
RC01	N/A	14.3	A14/2067	Core	7.4								Grey sandy gravelly SILTCLAY
RC01	N/A	14.7	A14/2068	Core	5.4								Grey sandy gravelly SILTCLAY
RC01	N/A	15.7	A14/2069	Core	5.9								Grey sandy gravelly SILTCLAY
RC01	N/A	17.1	A14/2070	Core	5.0								Grey sandy gravelly SILTCLAY
RC01	N/A	15.3	A14/2071	Core	5.6								Grey sandy gravelly SILTCLAY
RC03	N/A	9.6	A14/2072	Core	8.6								Grey sandy gravelly SILTCLAY
RC03	N/A	19.4	A14/2073	Core	6.6								Grey sandy gravelly SILTCLAY

Notes: Preparation: WS - Wet sieved; AR - As received; NP - Non plastic

Liquid Limit Clause: 4.3 Cone Penetrometer definitive method; 4.4 Cone Penetrometer one point method

Sample Type: B - bulk disturbed; U - Undisturbed

Remarks:

Opinions and interpretations are outside the scope of accreditation.

The results relate to the specimens tested. Any remaining material will be retained for one month.

IGSL Ltd Materials Laboratory

Persons authorized to approve reports
J Barrett (Dep. Quality Manager)
H Byrne (Quality Manager)

Approved by	Date	Page
H Byrne	08/07/14	1 of 1

IGSL Ltd
Materials Laboratory
Unit J5, M7 Business Park
Newhall, Naas
Co. Kildare
045 846176

Test Report

Lab Vane

Report No. **R58796** Contract No. 17585 Contract Name: Dun Laoghaire Harbour

Customer Department of the Marine

Samples Received: 25/06/14 Date Tested: 02/07/14

BH/TP	Sample No.	Depth (m)	Lab. Ref	Sample Type	Lab Vane (Kpa)								Description
Bh03	AA24134	5.5-5.5	A14/2016	U	51								Grey silty SAND
Bh03	AA24136	6.5-6.5	A14/2017	U	34								Grey SAND/SILT
Bh04D	AA24108	5.0-5.5	A14/1999	P	43								Grey sandy SILT
Bh04D	AA24110	6.0-6.5	N/A	U	31								Grey sandy, SILT
Bh05D	AA19103	0.6-1.1	N/A	U	23								Grey sandy SILT
Bh05D	AA19113	6.0-6.6	N/A	U	75								Grey sandy, SILT
Bh07D	AA24126	6.0-6.5	A14/2006	U	49								Grey sandy SILT
Bh08D	AA19129	6.0-6.5	N/A	U	20								Grey sandy SILT
Bh09D	AA24116	3.5-4.0	N/A	P	16								Grey sandy SILT
Bh10D	AA19152	4.5-5	A14/2012	U	87								Grey silty SAND
Bh10D	AA19153	5.5-6	N/A	U	28								Grey sandy SILT

Sample Type: B - bulk disturbed
U - Undisturbed
P - Piston

Remarks:

Opinions and interpretations are outside the scope of accreditation.
The results relate to the specimens tested. Any remaining material will be retained for one month.

IGSL Ltd Materials Laboratory	Persons authorized to approve reports	Approved by	Date	Page
	J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)	H Byrne	08/07/14	1 of 1

TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

ISO 17025 INAB ACCREDITED TESTING DETAILED SCHEDULE REG NO. 1321

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	96	
28	94	
20	90	
14	84	
10	81	
6.3	76	
5	74	
3.35	70	
2	66	
1.18	62	SAND
0.6	57	
0.425	55	
0.3	52	
0.15	48	
0.063	42	SILT/CLAY
0.038	36	
0.027	33	
0.017	29	
0.010	25	
0.007	22	
0.005	19	
0.002	12	

Contract No: 17585 Report No. R58278

Contract: Dun Laoghaire Harbour

BH/TP. RC01

Sample No. N/A Lab. Sample No. A14/2023

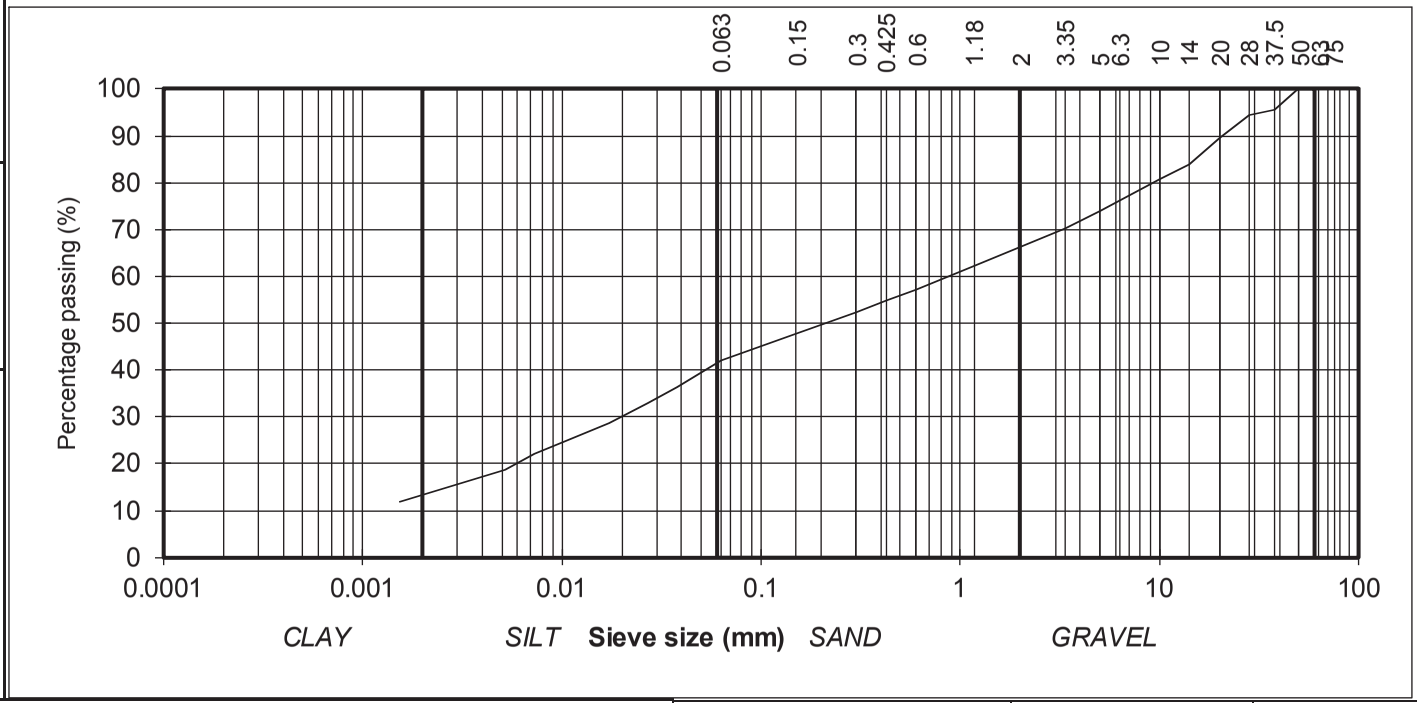
Sample Type: B

Depth (m) 14.20-14.70 Customer: Department of the Marine

Date Received 25/06/2014 Date Testing started 02/07/2014

Description: Grey slightly sandy, slightly gravelly, SILT/CLAY

Remarks



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
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TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

ISO 17025 INAB ACCREDITED TESTING DETAILED SCHEDULE REG NO. 1321

particle size	% passing	
75	100	COBBLES
63	89	
50	89	GRAVEL
37.5	81	
28	70	
20	65	
14	60	
10	58	
6.3	54	
5	52	
3.35	46	
2	41	
1.18	38	SAND
0.6	35	
0.425	34	
0.3	33	
0.15	31	
0.063	28	SILT/CLAY
0.038	25	
0.027	23	
0.017	21	
0.010	18	
0.007	15	
0.005	13	
0.002	8	

Contract No: 17585 Report No. R58279

Contract: Dun Laoghaire Harbour

BH/TP. RC03

Sample No. N/A Lab. Sample No. A14/2024

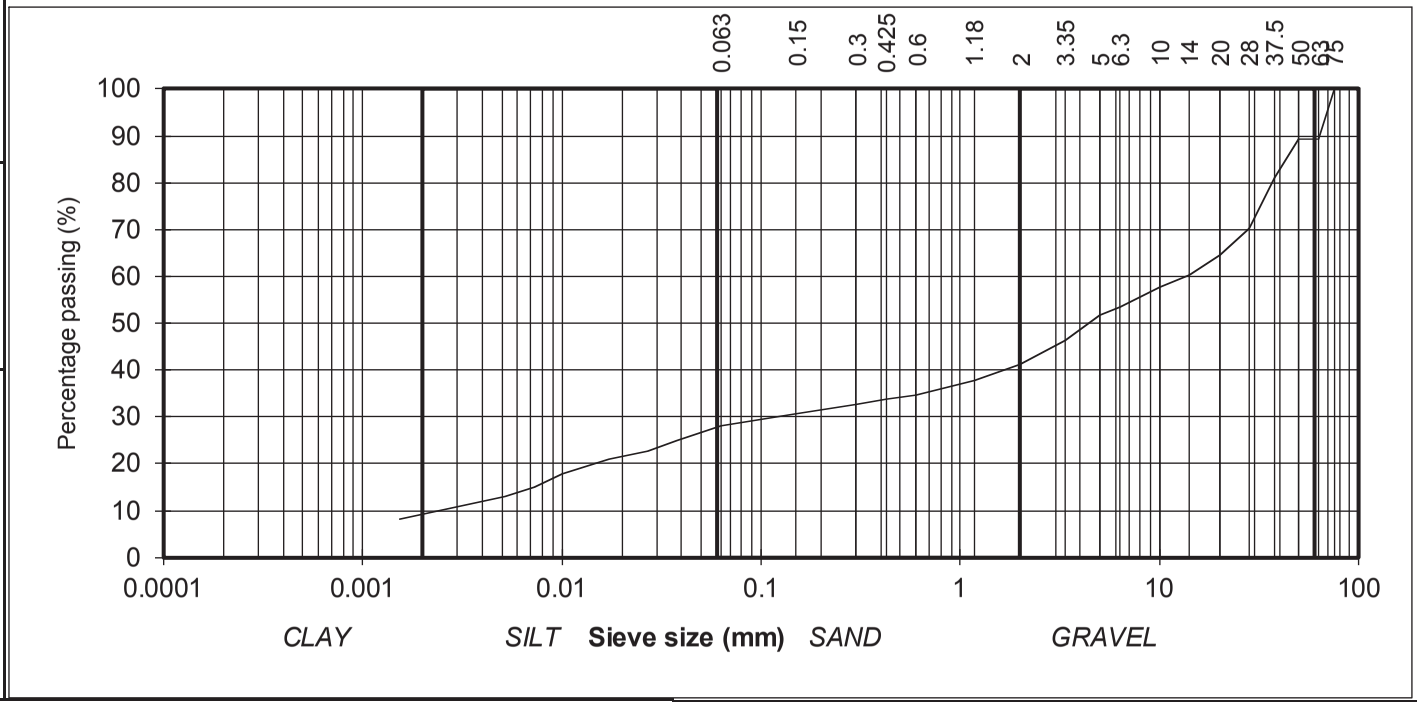
Sample Type: B

Depth (m) 9.00-10.00 Customer: Department of the Marine

Date Received 25/06/2014 Date Testing started 02/07/2014

Description: Grey slightly sandy, gravelly, SILT with some cobbles

Remarks Sample size did not meet the requiremnts of BS1377



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
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TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

ISO 17025 INAB ACCREDITED TESTING DETAILED SCHEDULE REG NO. 1321

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	100	
28	96	
20	93	
14	89	
10	85	
6.3	80	
5	77	
3.35	73	
2	68	
1.18	64	SAND
0.6	59	
0.425	56	
0.3	54	
0.15	50	
0.063	44	SILT/CLAY
0.038	37	
0.027	33	
0.017	29	
0.010	26	
0.007	23	
0.005	21	
0.002	16	

Contract No: 17585 Report No. R58280

Contract: Dun Laoghaire Harbour

BH/TP. RC03

Sample No. N/A Lab. Sample No. A14/2025

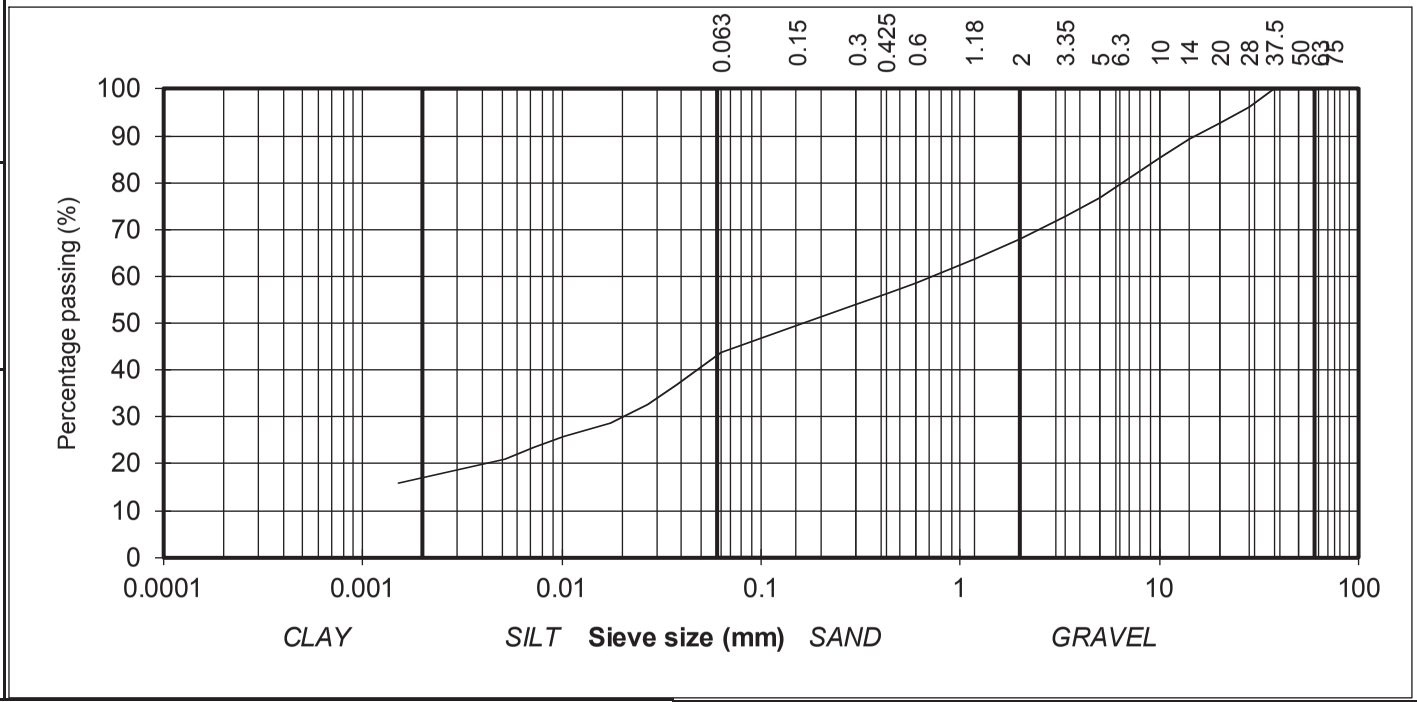
Sample Type: B

Depth (m) 18.00-19.00 Customer: Department of the Marine

Date Received 25/06/2014 Date Testing started 02/07/2014

Description: Grey slightly sandy, slightly gravelly, SILT/CLAY

Remarks



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
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TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

ISO 17025 INAB ACCREDITED TESTING DETAILED SCHEDULE REG NO. 1321

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	100	
28	100	
20	100	
14	100	
10	100	
6.3	100	
5	100	
3.35	99	
2	98	
1.18	98	SAND
0.6	97	
0.425	97	
0.3	97	
0.15	40	
0.063	5	SILT/CLAY

Contract No: 17585 Report No. R58281

Contract: Dun Laoghaire Harbour

BH/TP. Bh01

Sample No. AA24145 Lab. Sample No. A14/2020

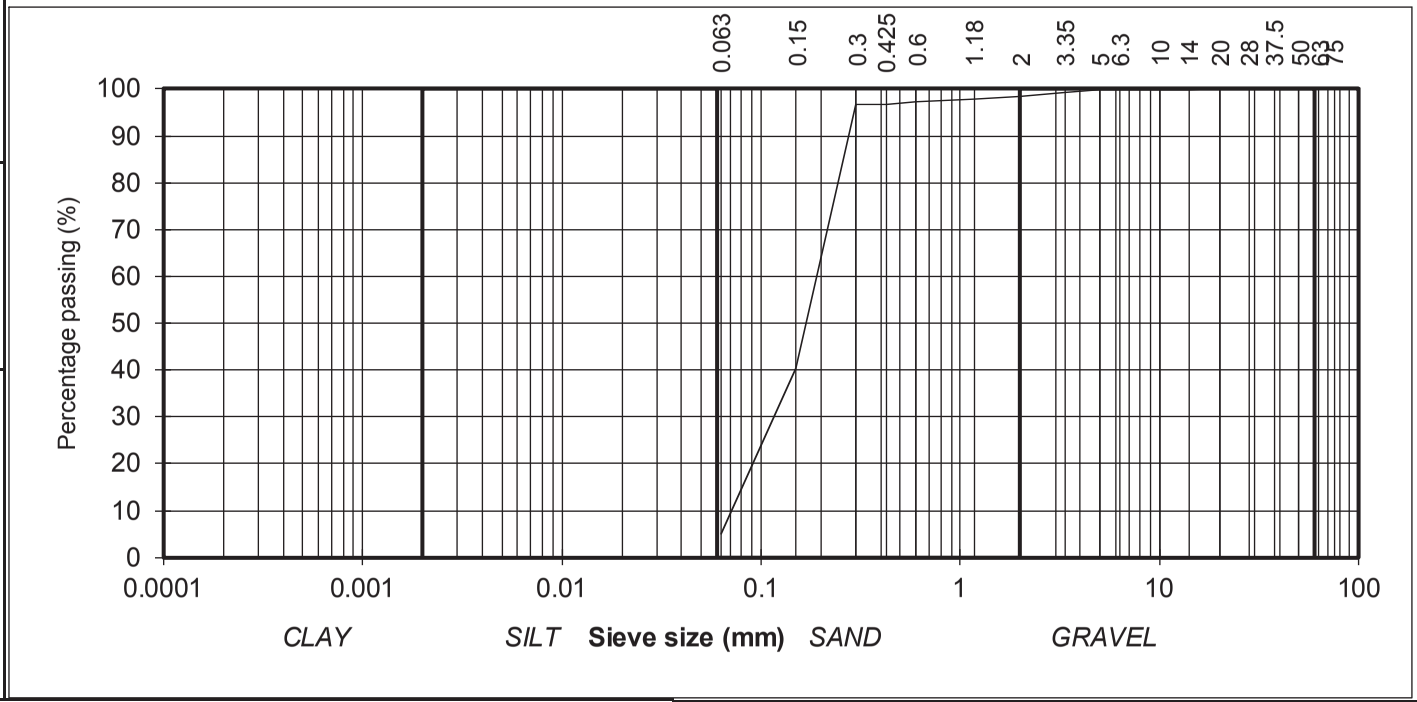
Sample Type: B

Depth (m) 3.00 Customer: Department of the Marine

Date Received 25/06/2014 Date Testing started 02/07/2014

Description: Grey brown slightly silty, slightly gravelly, SAND

Remarks



IGSL Ltd Materials Laboratory

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TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	100	
28	100	
20	98	
14	98	
10	97	
6.3	95	
5	94	
3.35	93	
2	91	
1.18	90	SAND
0.6	87	
0.425	85	
0.3	82	
0.15	73	
0.063	65	SILT/CLAY
0.038	57	
0.027	51	
0.017	45	
0.010	39	
0.007	35	
0.005	31	
0.002	21	

Contract No: 17585 Report No. R58282

Contract: Dun Laoghaire Harbour

BH/TP. Bh01

Sample No. AA0832 Lab. Sample No. A14/2022

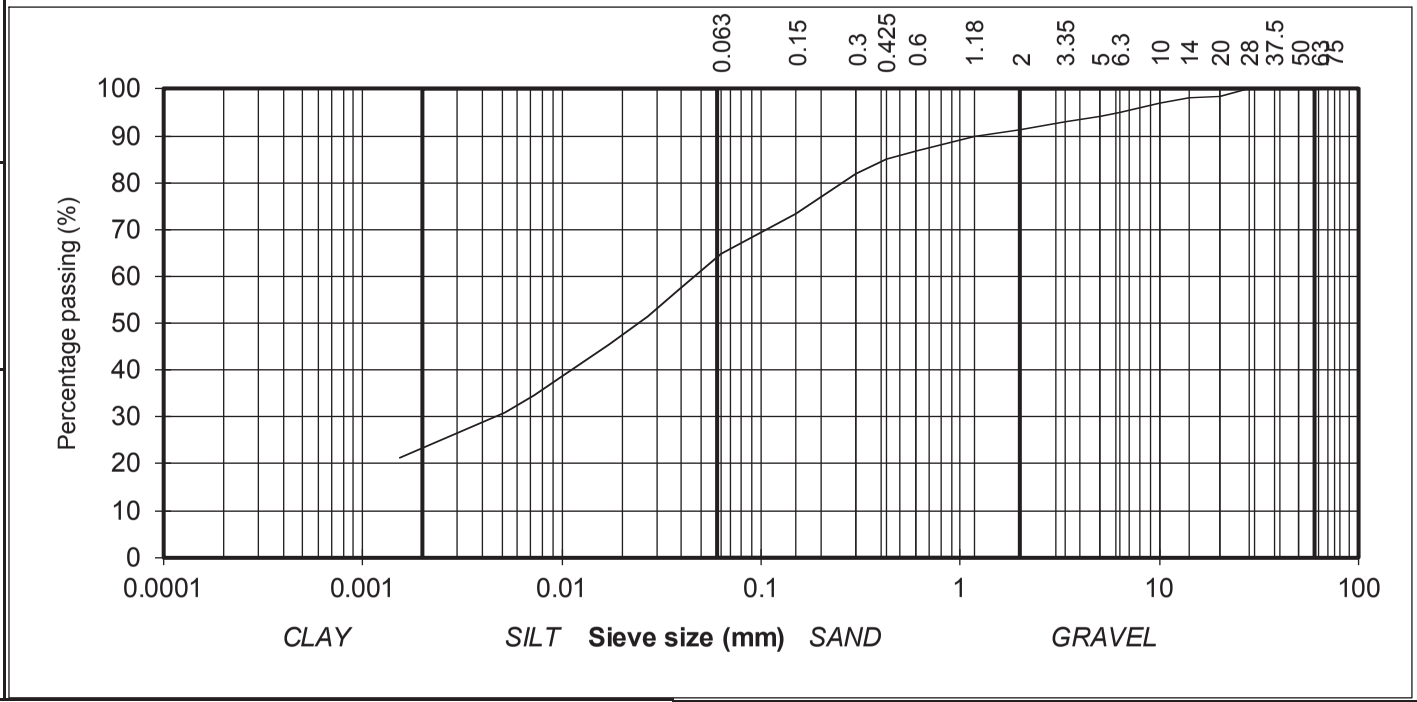
Sample Type: B

Depth (m) 10.00 Customer: Department of the Marine

Date Received 25/06/2014 Date Testing started 02/07/2014

Description: Grey slightly sandy, slightly gravelly, CLAY

Remarks



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
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TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

ISO 17025 INAB ACCREDITED TESTING DETAILED SCHEDULE REG NO. 1321

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	100	
28	100	
20	100	
14	100	
10	100	
6.3	100	
5	100	
3.35	100	
2	99	
1.18	99	SAND
0.6	98	
0.425	98	
0.3	97	
0.15	80	
0.063	44	SILT/CLAY
0.038	32	
0.027	28	
0.018	24	
0.010	20	
0.007	16	
0.005	12	
0.002	6	

Contract No: 17585 Report No. R58283

Contract: Dun Laoghaire Harbour

BH/TP. Bh02

Sample No. AA0833 Lab. Sample No. A14/2018

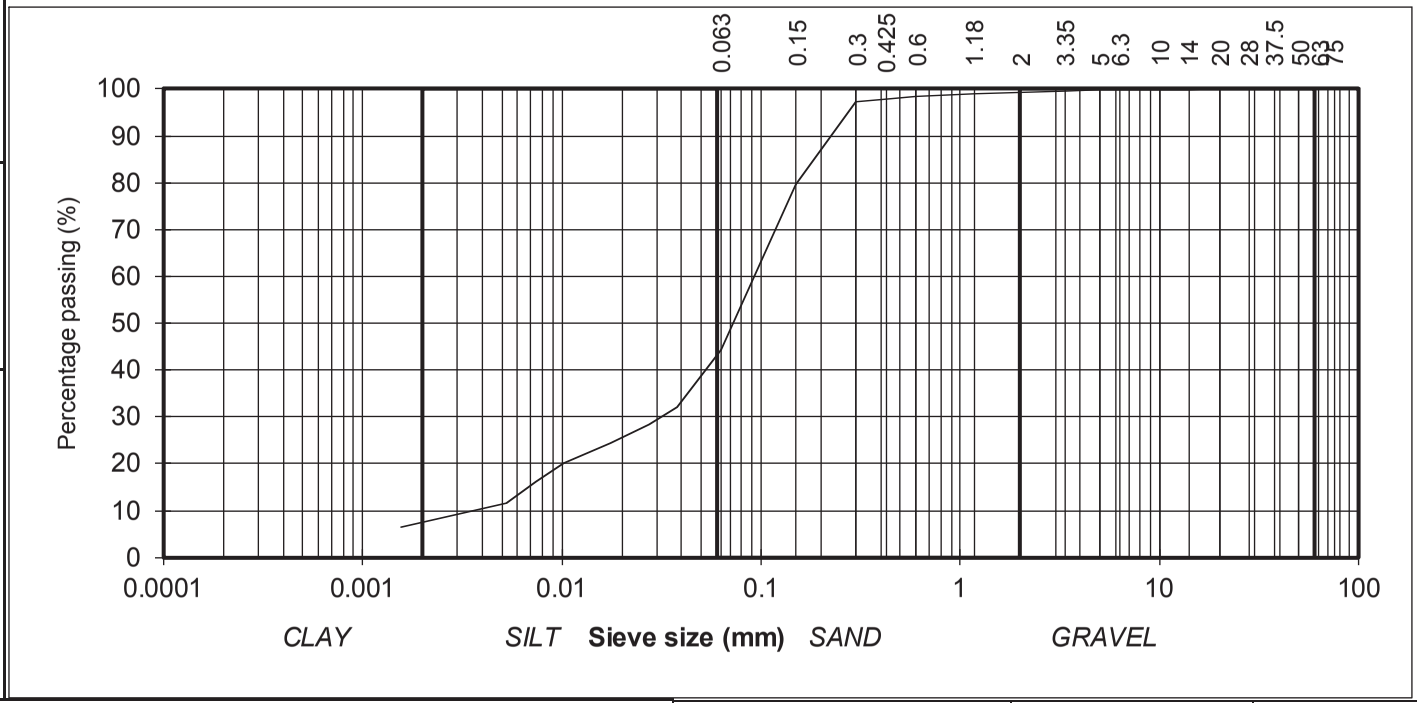
Sample Type: B

Depth (m) 1.00 Customer: Department of the Marine

Date Received 25/06/2014 Date Testing started 02/07/2014

Description: Grey brown sandy, slightly gravelly, SILT

Remarks



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
H Byrne	15/07/14	1 of 1

TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	100	
50	87	GRAVEL
37.5	87	
28	83	
20	81	
14	79	
10	78	
6.3	76	
5	76	
3.35	75	
2	73	
1.18	72	SAND
0.6	71	
0.425	70	
0.3	69	
0.15	62	
0.063	49	SILT/CLAY
0.037	38	
0.027	33	
0.017	28	
0.010	24	
0.007	19	
0.005	16	
0.002	8	

Contract No: 17585 Report No. R58284

Contract: Dun Laoghaire Harbour

BH/TP. Bh02

Sample No. AA0843 Lab. Sample No. A14/2019

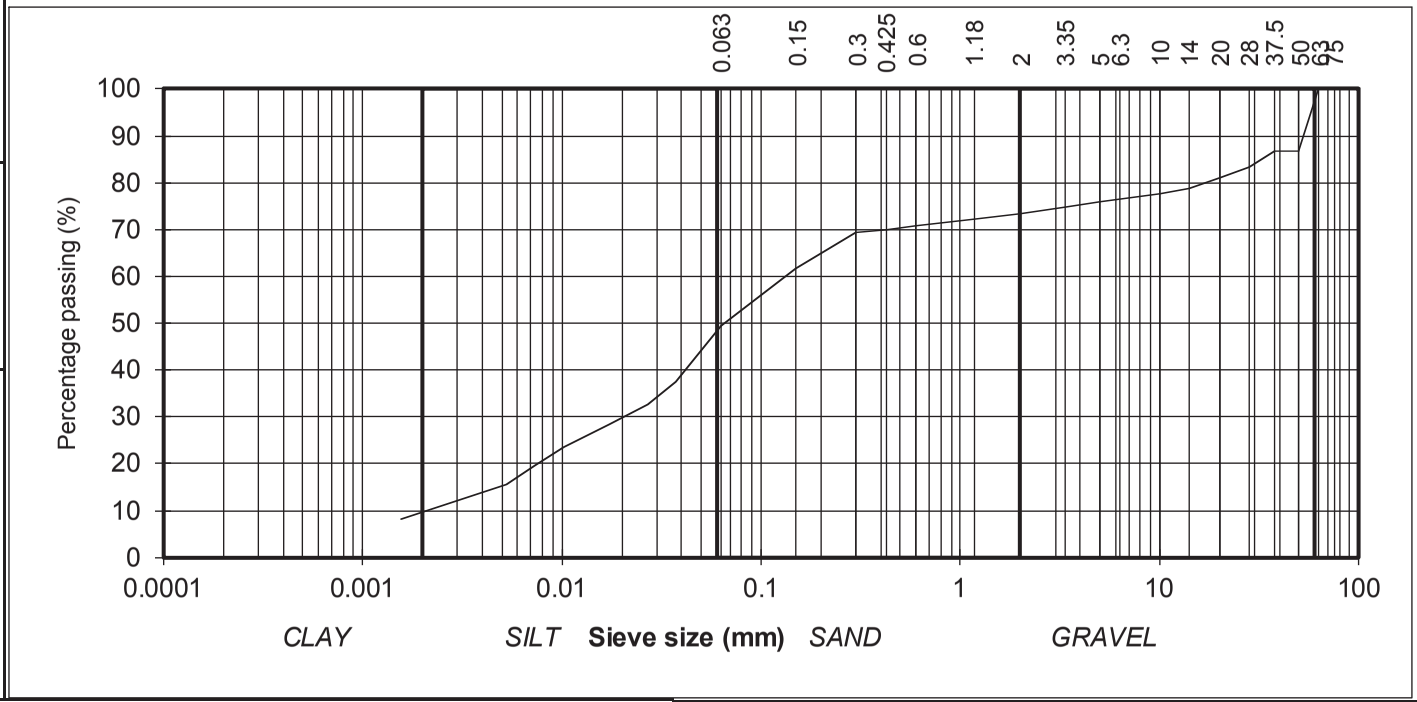
Sample Type: B

Depth (m) 8.50 Customer: Department of the Marine

Date Received 25/06/2014 Date Testing started 02/07/2014

Description: Grey brown slightly sandy, slightly gravelly, SILT

Remarks Sample size did not meet the requirements of BS1377



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
H Byrne	15/07/14	1 of 1

TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	100	
28	100	
20	100	
14	99	
10	99	
6.3	99	
5	99	
3.35	98	
2	98	
1.18	97	SAND
0.6	96	
0.425	96	
0.3	95	
0.15	21	
0.063	6	SILT/CLAY

Contract No: 17585 Report No. R58285

Contract: Dun Laoghaire Harbour

BH/TP. Bh04D

Sample No. AA24104 Lab. Sample No. A14/1998

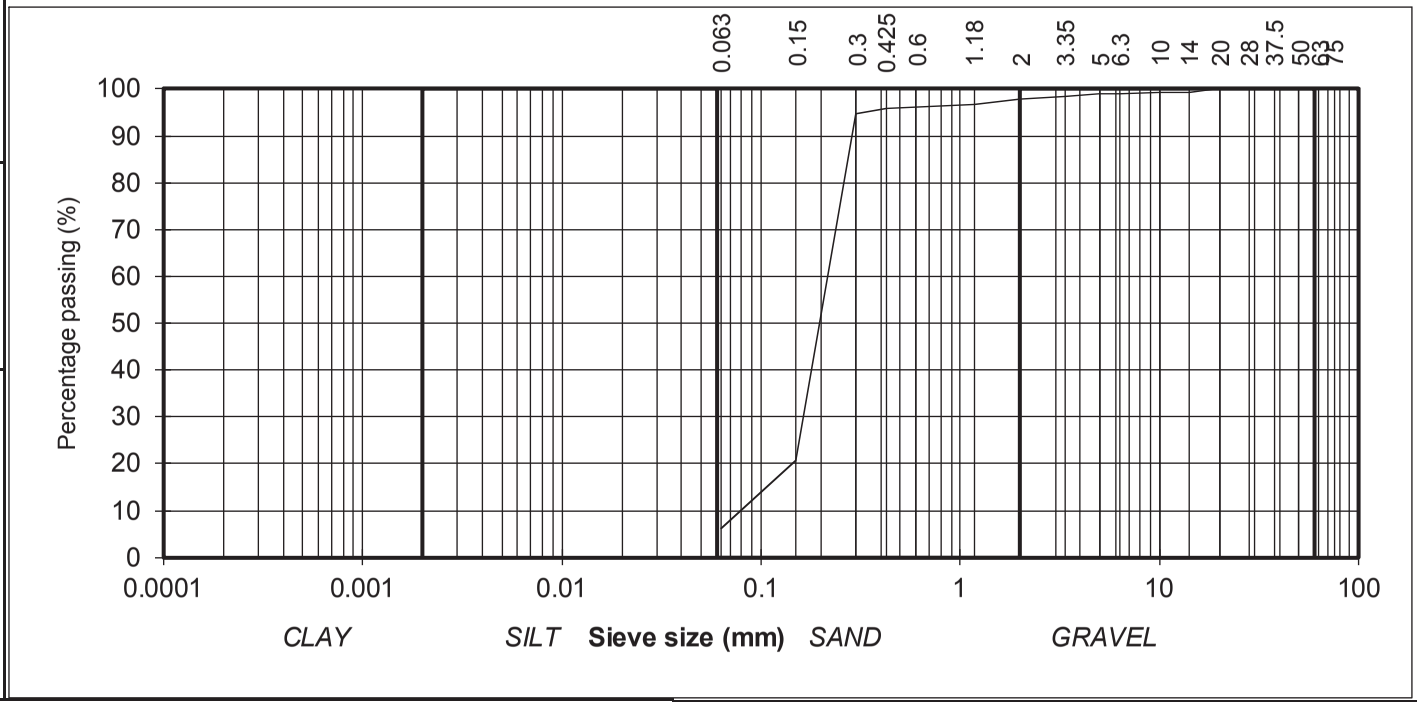
Sample Type: B

Depth (m) 1.00-2.00 Customer: Department of the Marine

Date Received 25/06/2014 Date Testing started 02/07/2014

Description: Grey brown silty, slightly gravelly, SAND

Remarks Shell fragments Throughout



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
H Byrne	15/07/14	1 of 1

TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	100	
28	98	
20	96	
14	92	
10	89	
6.3	82	
5	79	
3.35	72	
2	62	
1.18	53	SAND
0.6	45	
0.425	42	
0.3	40	
0.15	12	
0.063	2	SILT/CLAY

Contract No: 17585 Report No. R58286

Contract: Dun Laoghaire Harbour

BH/TP. Bh05D

Sample No. AA19101 Lab. Sample No. A14/2000

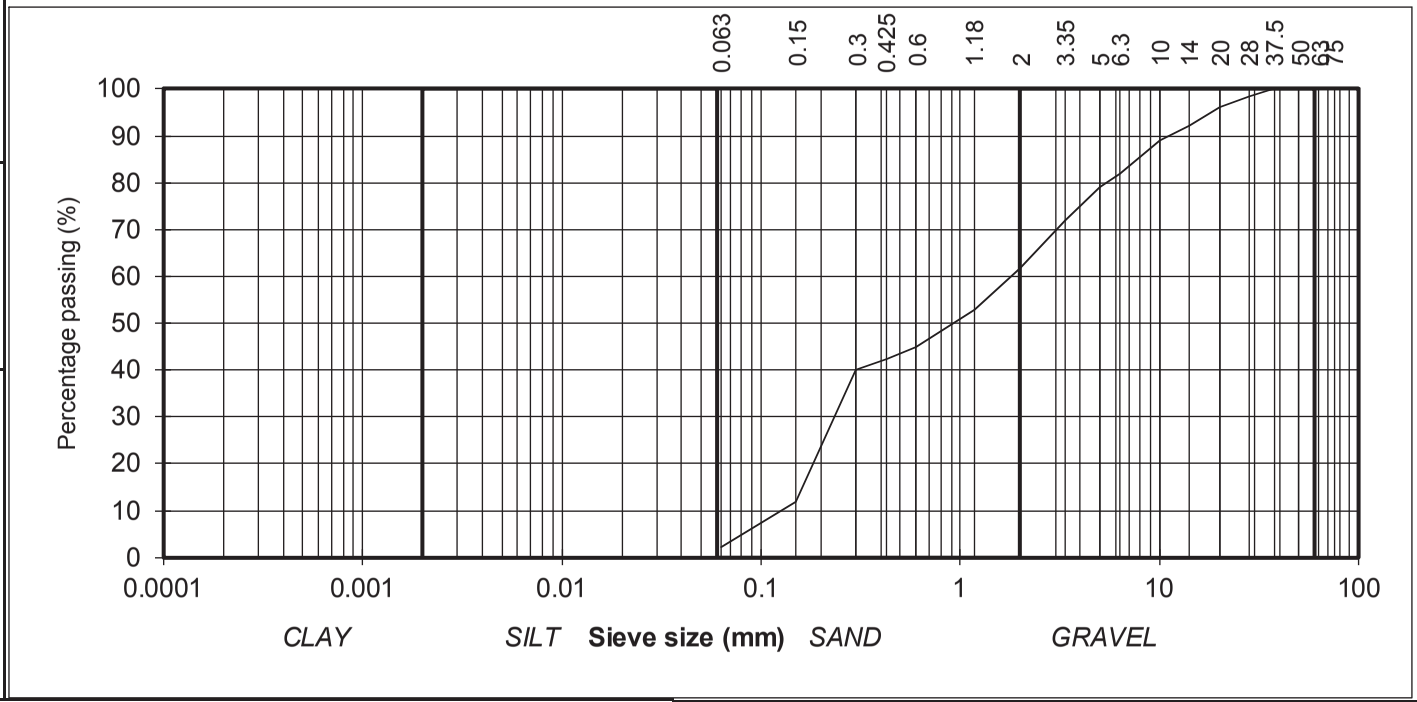
Sample Type: B

Depth (m) 0.0-0.5 Customer: Department of the Marine

Date Received 25/06/2014 Date Testing started 02/07/2014

Description: Grey brown slightly clayey/silty, very gravelly, SAND

Remarks Shell fragments Throughout



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
H Byrne	15/07/14	1 of 1

TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	100	
28	100	
20	100	
14	100	
10	100	
6.3	99	
5	99	
3.35	99	
2	98	
1.18	97	SAND
0.6	96	
0.425	96	
0.3	95	
0.15	26	
0.063	3	SILT/CLAY

Contract No: 17585 Report No. R58287

Contract: Dun Laoghaire Harbour

BH/TP. Bh05D

Sample No. AA19107 Lab. Sample No. A14/2001

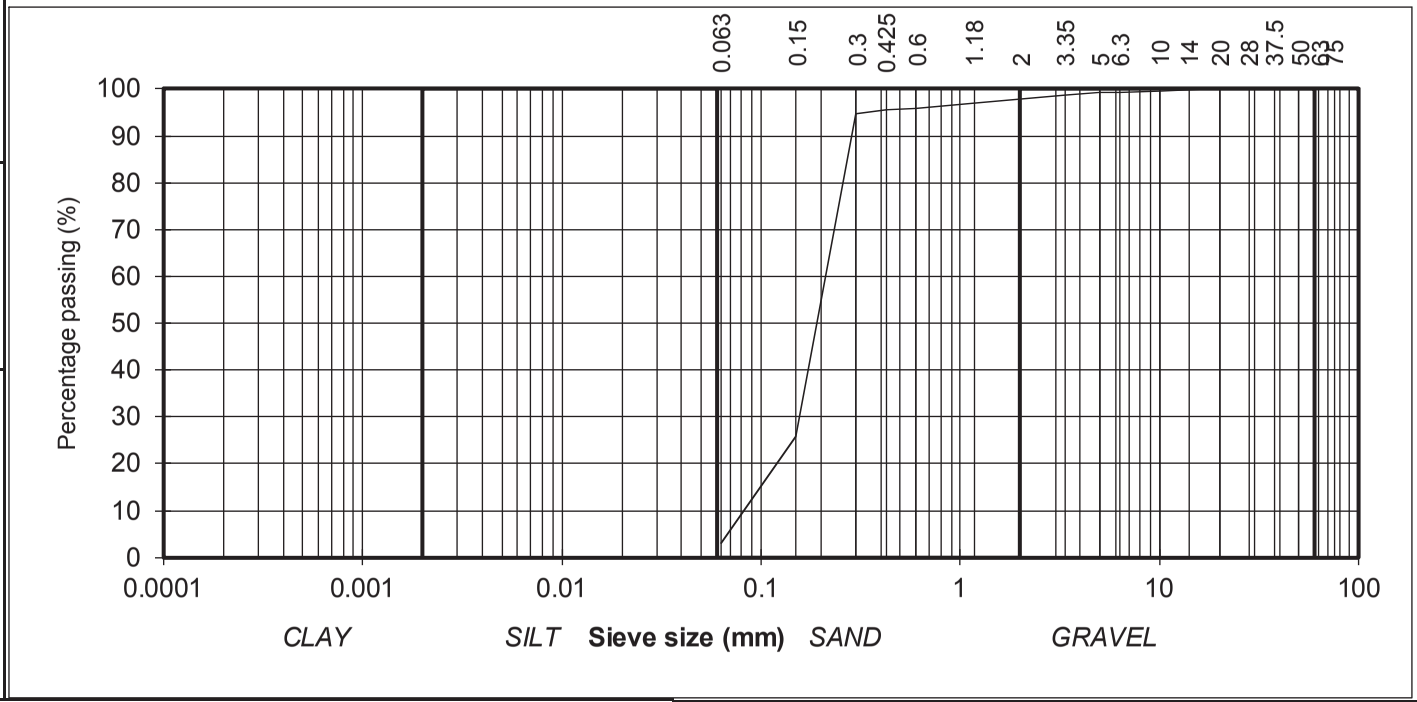
Sample Type: B

Depth (m) 2.0-3.0 Customer: Department of the Marine

Date Received 25/06/2014 Date Testing started 02/07/2014

Description: Grey brown slightly clayey/silty, slightly gravelly, SAND

Remarks Shell fragments Throughout



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
H Byrne	15/07/14	1 of 1

TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

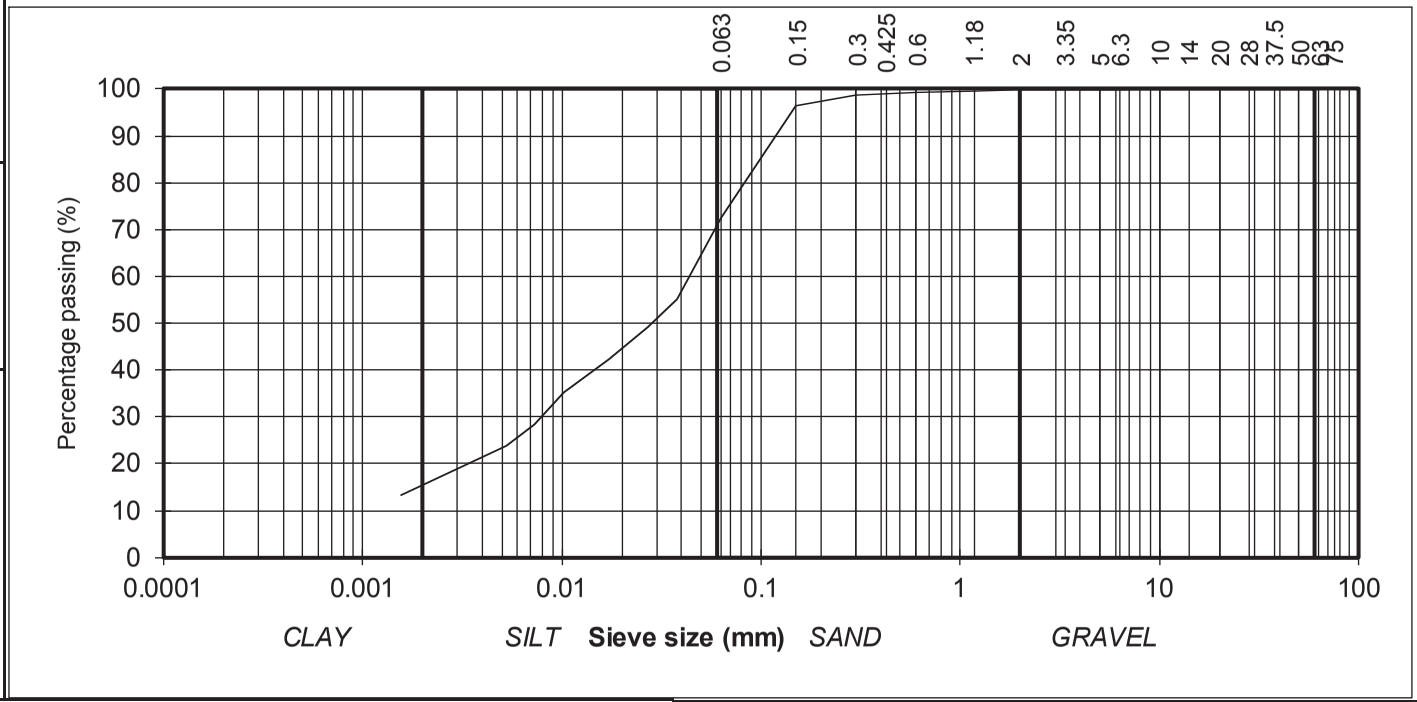
(note: Sedimentation stage not accredited)

ISO 17025 INAB ACCREDITED TESTING DETAILED SCHEDULE REG NO. 1321

Contract No: 17585 Report No. R58288
Contract: Dun Laoghaire Harbour
BH/TP. Bh05D
Sample No. AA19112 Lab. Sample No. A14/2002
Sample Type: B
Depth (m) 5.5-6.5 Customer: Department of the Marine
Date Received 25/06/2014 Date Testing started 02/07/2014
Description: Grey brown slightly sandy, SILT

Remarks

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	100	
28	100	
20	100	
14	100	
10	100	
6.3	100	
5	100	
3.35	100	
2	100	
1.18	100	SAND
0.6	99	
0.425	99	
0.3	99	
0.15	96	
0.063	72	SILT/CLAY
0.038	55	
0.027	49	
0.017	42	
0.010	35	
0.007	28	
0.005	24	
0.002	13	



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TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

ISO 17025 INAB ACCREDITED TESTING DETAILED SCHEDULE REG NO. 1321

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	100	
28	100	
20	100	
14	100	
10	100	
6.3	100	
5	100	
3.35	99	
2	99	
1.18	98	SAND
0.6	97	
0.425	97	
0.3	96	
0.15	59	
0.063	4	SILT/CLAY

Contract No: 17585 Report No. R58289

Contract: Dun Laoghaire Harbour

BH/TP. Bh06D

Sample No. AA19113 Lab. Sample No. A14/2003

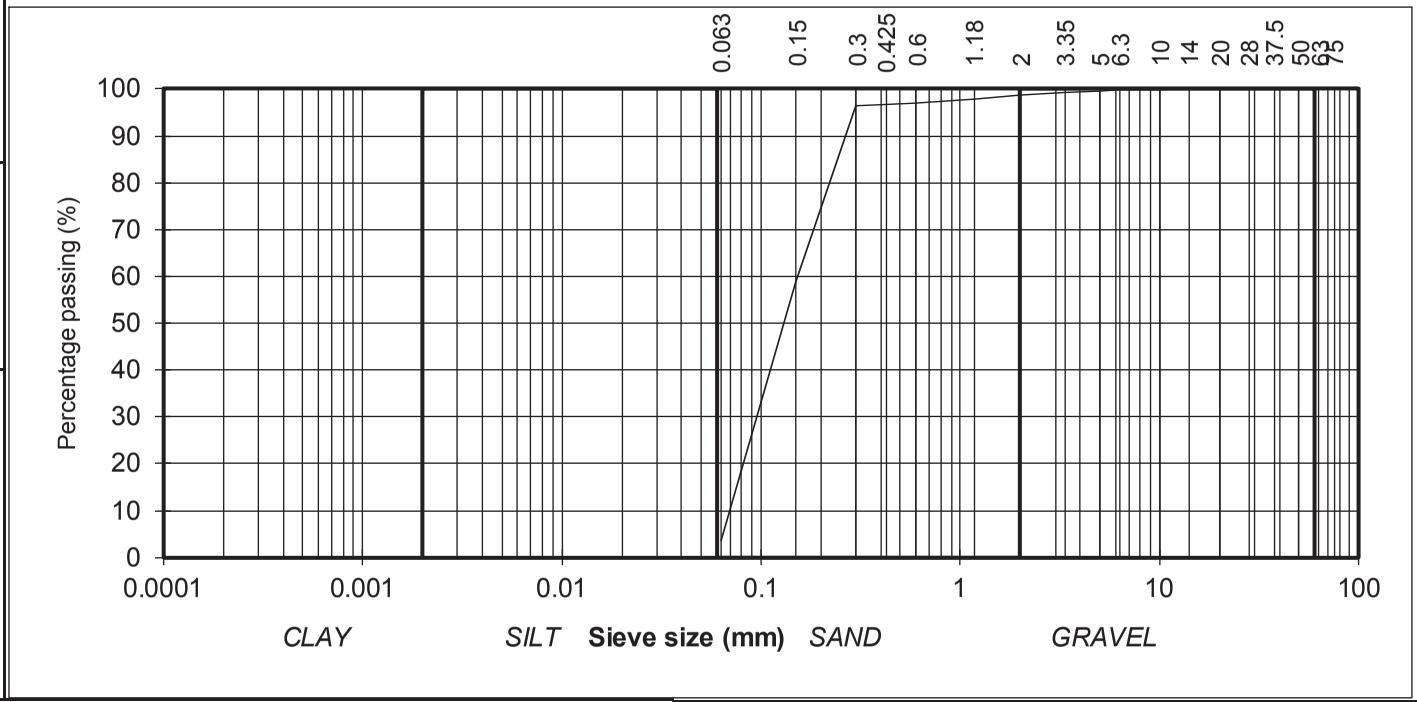
Sample Type: B

Depth (m) 1.0-2.0 Customer: Department of the Marine

Date Received 25/06/2014 Date Testing started 02/07/2014

Description: Grey slightly clayey/silty, slightly gravelly, SAND

Remarks Shell Fragments thoughout



IGSL Ltd Materials Laboratory

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TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

ISO 17025 INAB ACCREDITED TESTING DETAILED SCOPE REG NO. 1321

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	100	
28	100	
20	100	
14	100	
10	100	
6.3	100	
5	100	
3.35	100	
2	100	
1.18	100	SAND
0.6	100	
0.425	100	
0.3	100	
0.15	99	
0.063	48	SILT/CLAY
0.037	31	
0.027	27	
0.017	21	
0.010	17	
0.007	14	
0.005	10	
0.002	6	

Contract No: 17585 Report No. R58290

Contract: Dun Laoghaire Harbour

BH/TP. Bh06D

Sample No. AA19118 Lab. Sample No. A14/2004

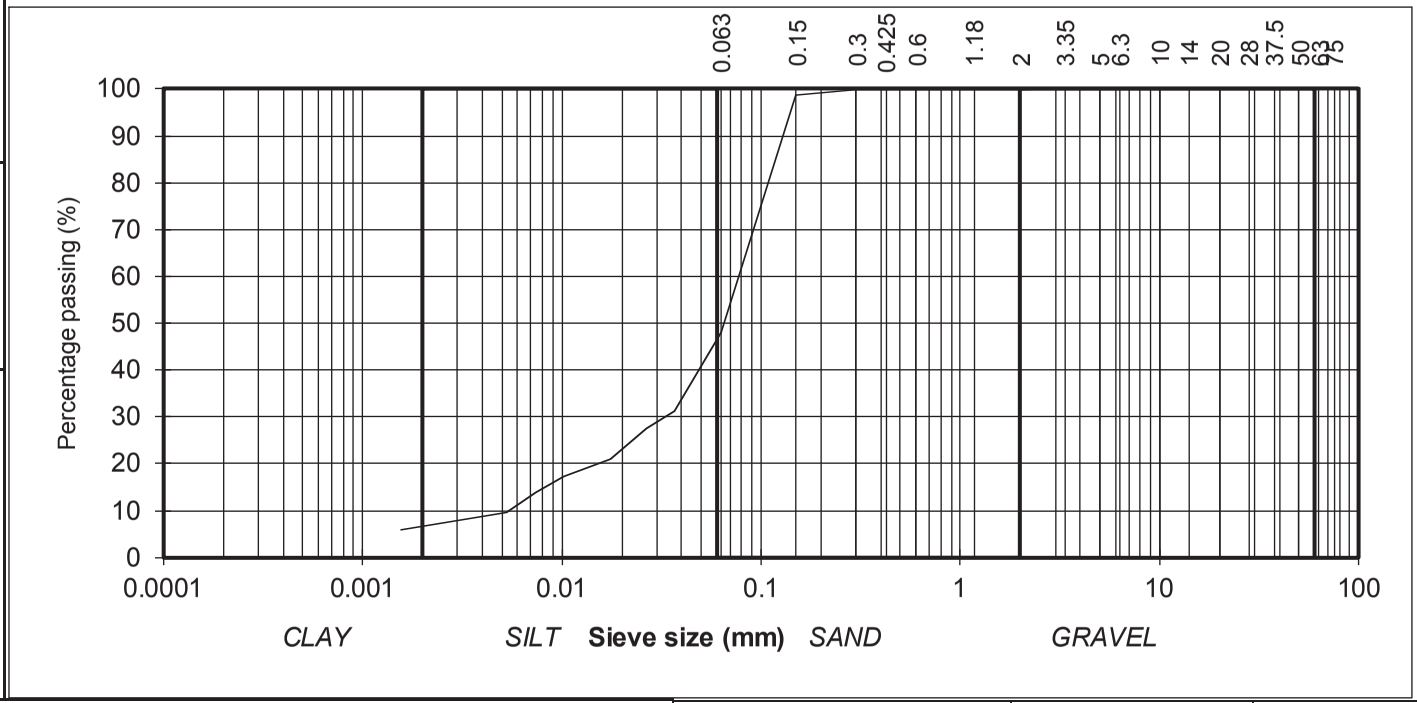
Sample Type: P

Depth (m) 5.5-6.0 Customer: Department of the Marine

Date Received 25/06/2014 Date Testing started 02/07/2014

Description: Grey sandy, SILT

Remarks



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TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	100	
28	100	
20	100	
14	100	
10	100	
6.3	99	
5	99	
3.35	98	
2	97	
1.18	96	SAND
0.6	95	
0.425	95	
0.3	93	
0.15	40	
0.063	5	SILT/CLAY

Contract No: 17585 Report No. R58291

Contract: Dun Laoghaire Harbour

BH/TP. Bh08D

Sample No. AA19123 Lab. Sample No. A14/2007

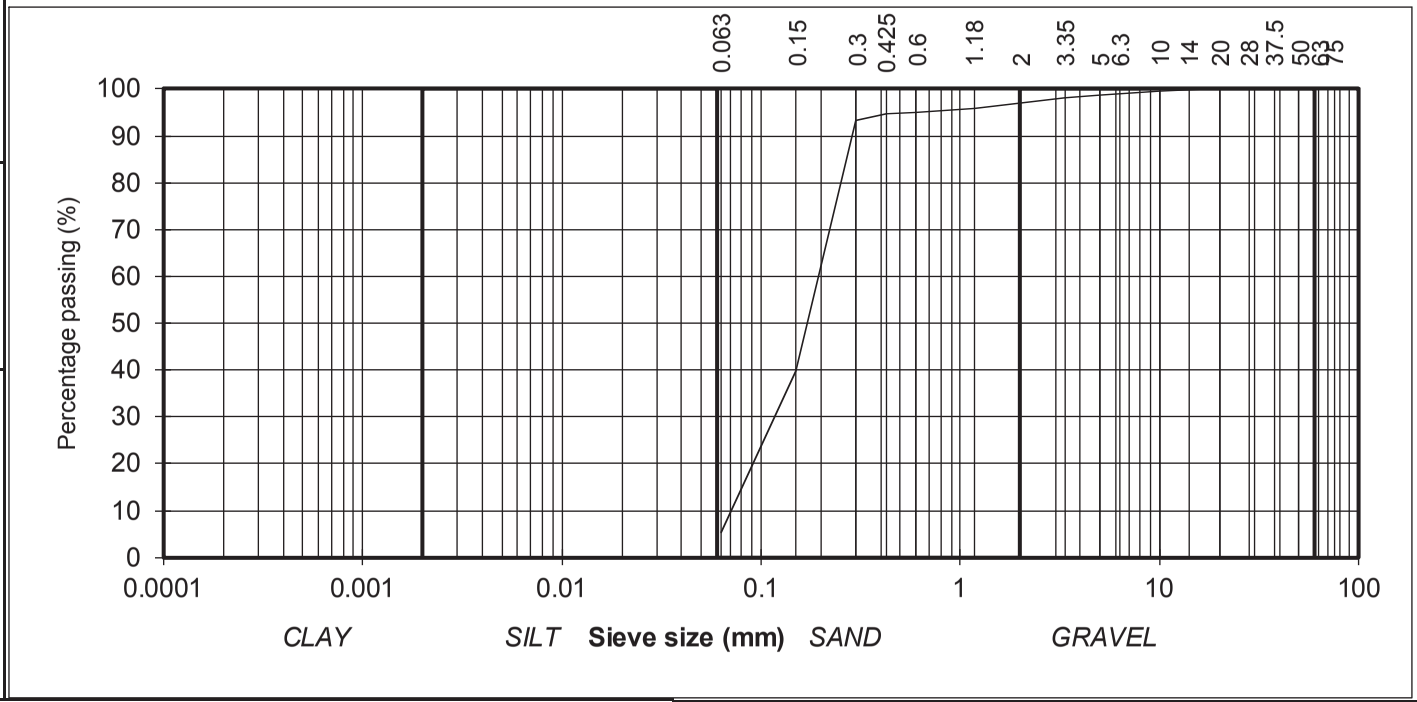
Sample Type: B

Depth (m) 1.5-2.0 Customer: Department of the Marine

Date Received 25/06/2014 Date Testing started 02/07/2014

Description: Grey clayey/silty, slightly gravelly, SAND

Remarks Shell fragments throughout



IGSL Ltd Materials Laboratory

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TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

ISO 17025 INAB ACCREDITED TESTING DETAILED SCHEDULE REG NO. 1321

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	100	
28	100	
20	100	
14	100	
10	100	
6.3	100	
5	100	
3.35	100	
2	100	
1.18	99	SAND
0.6	99	
0.425	99	
0.3	99	
0.15	85	
0.063	53	SILT/CLAY
0.038	42	
0.027	37	
0.017	32	
0.010	28	
0.007	24	
0.005	20	
0.002	13	

Contract No: 17585 Report No. R58292

Contract: Dun Laoghaire Harbour

BH/TP. Bh08D

Sample No. AA19128 Lab. Sample No. A14/2008

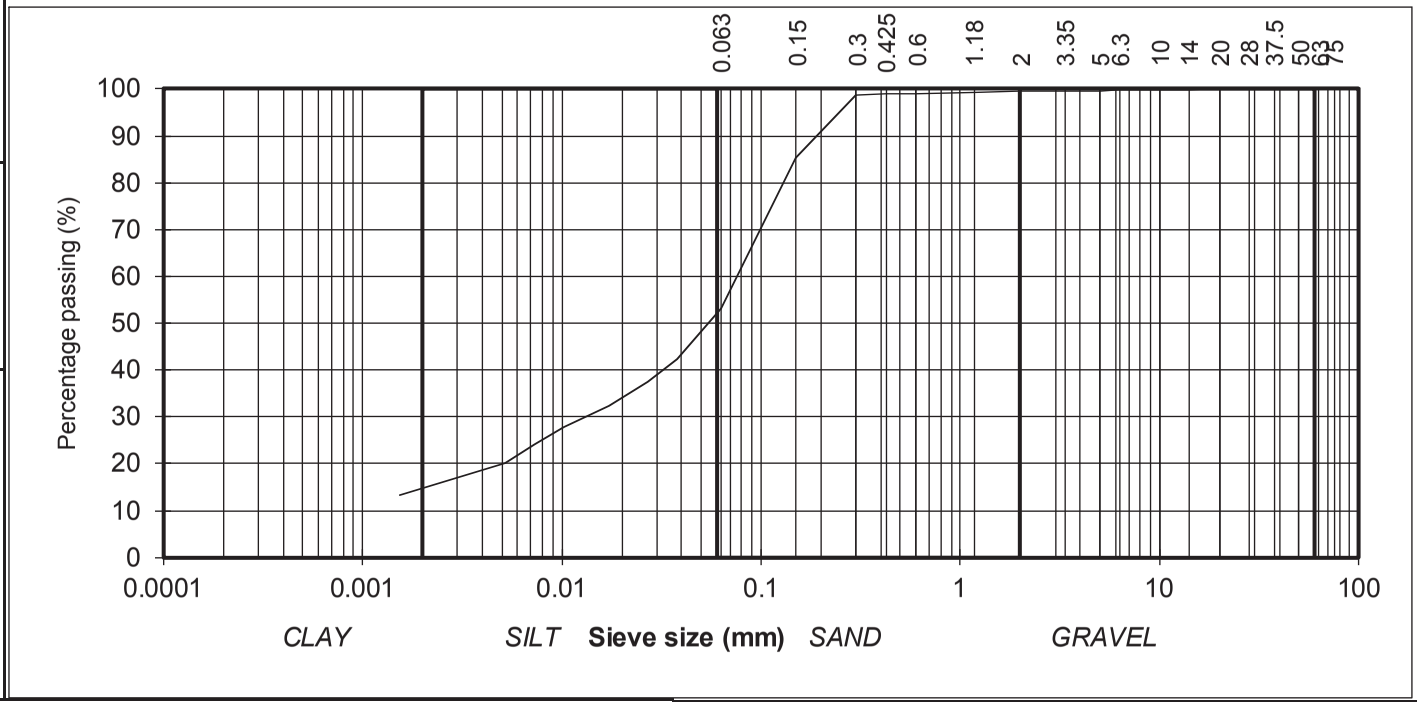
Sample Type: B

Depth (m) 5.5-6.0 Customer: Department of the Marine

Date Received 25/06/2014 Date Testing started 02/07/2014

Description: Grey sandy, SILT

Remarks Shell fragments throughout



IGSL Ltd Materials Laboratory

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TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

ISO 17025 INAB ACCREDITED TESTING DETAILED SCHEDULE REG NO. 1321

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	100	
28	100	
20	100	
14	100	
10	100	
6.3	100	
5	99	
3.35	99	
2	97	
1.18	96	SAND
0.6	94	
0.425	94	
0.3	92	
0.15	24	
0.063	4	SILT/CLAY

Contract No: 17585 Report No. R58293

Contract: Dun Laoghaire Harbour

BH/TP. Bh09D

Sample No. AA24113 Lab. Sample No. A14/2009

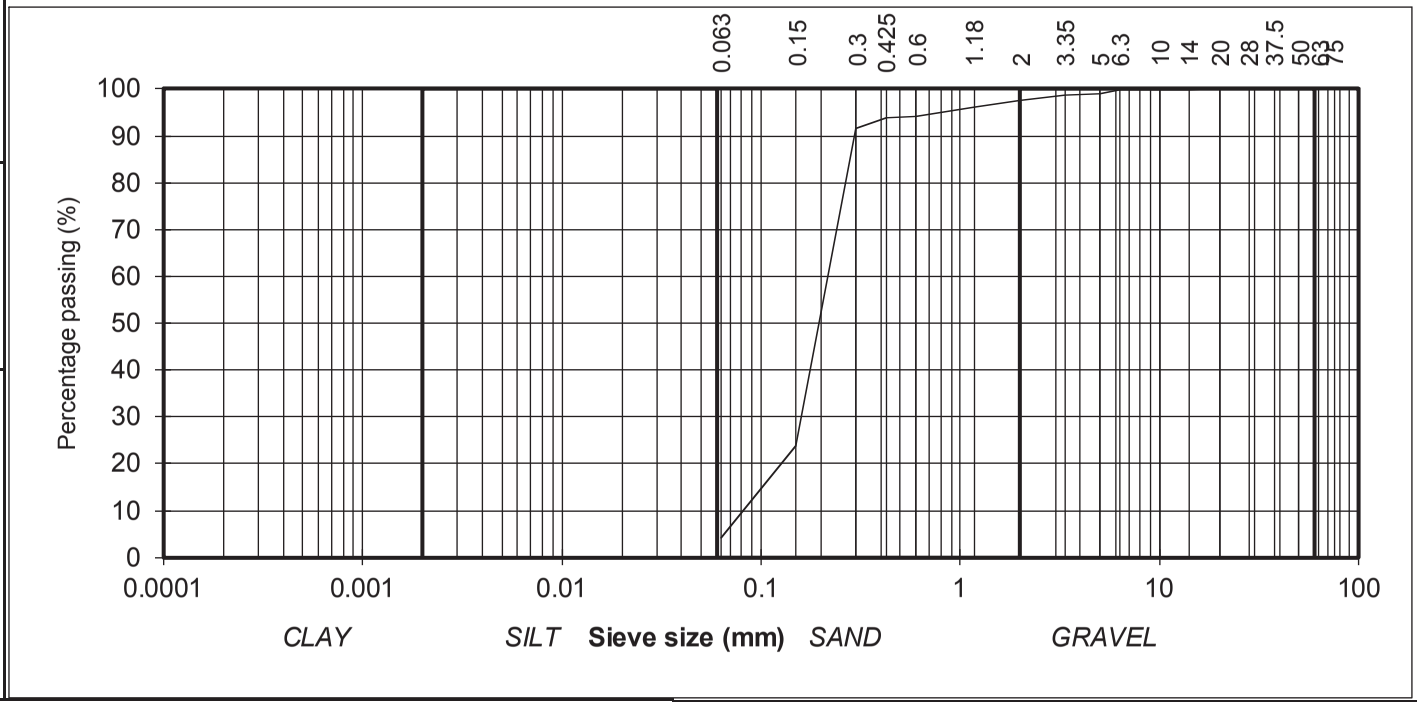
Sample Type: B

Depth (m) 1.0-2.0 Customer: Department of the Marine

Date Received 25/06/2014 Date Testing started 02/07/2014

Description: Grey slightly clayey/silty, slightly gravelly, SAND

Remarks Shell fragments throughout



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TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	100	
28	100	
20	100	
14	100	
10	100	
6.3	100	
5	100	
3.35	99	
2	99	
1.18	98	SAND
0.6	97	
0.425	97	
0.3	91	
0.15	22	
0.063	5	SILT/CLAY

Contract No: 17585 Report No. R58294

Contract: Dun Laoghaire Harbour

BH/TP. Bh10D

Sample No. AA19146 Lab. Sample No. A14/2010

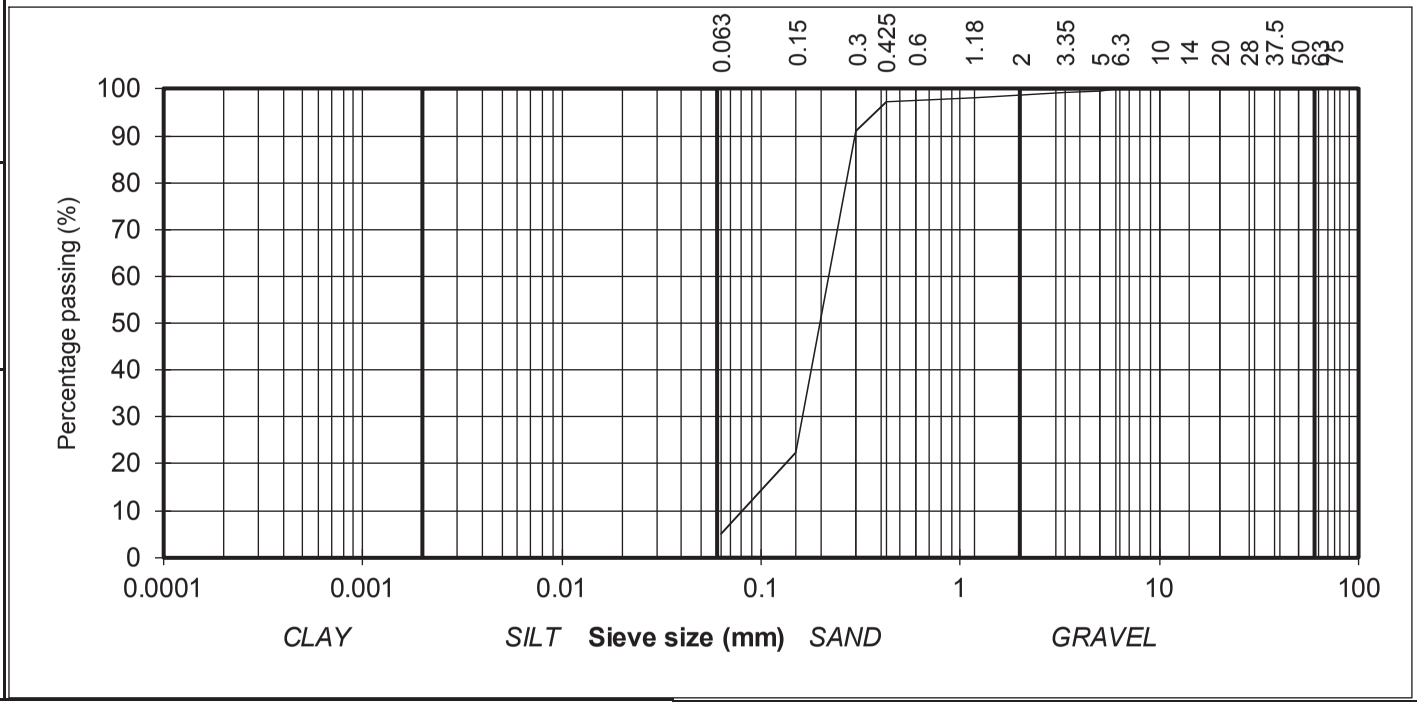
Sample Type: B

Depth (m) 1.0-2.0 Customer: Department of the Marine

Date Received 25/06/2014 Date Testing started 02/07/2014

Description: Grey brown slightly clayey/silty, slightly gravelly, SAND

Remarks Shell fragments throughout



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TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

ISO 17025 INAB ACCREDITED TESTING DETAILED SCHEDULE REG NO. 1321

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	100	
28	100	
20	100	
14	100	
10	100	
6.3	100	
5	100	
3.35	100	
2	100	
1.18	99	SAND
0.6	99	
0.425	99	
0.3	99	
0.15	79	
0.063	13	SILT/CLAY

Contract No: 17585 Report No. R58295

Contract: Dun Laoghaire Harbour

BH/TP. Bh11D

Sample No. AA19142 Lab. Sample No. A14/2013

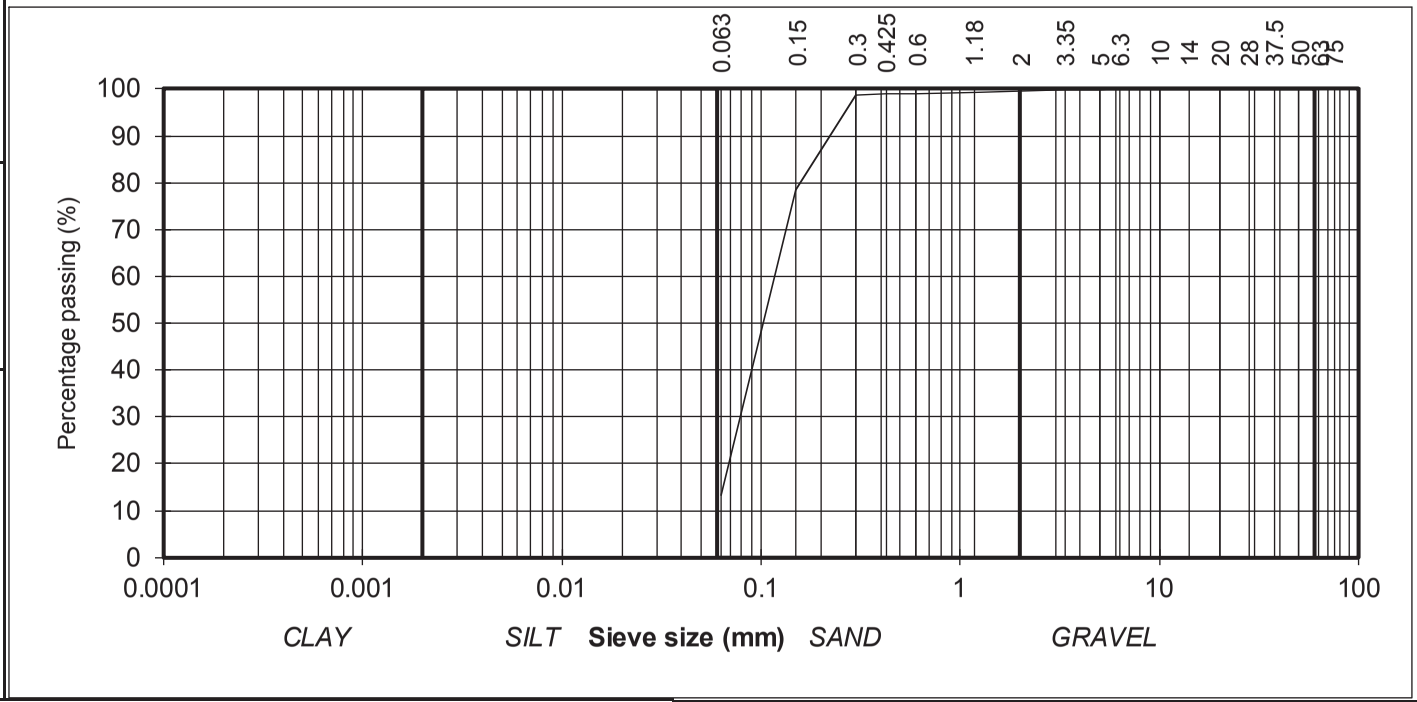
Sample Type: B

Depth (m) 3.0-3.5 Customer: Department of the Marine

Date Received 25/06/2014 Date Testing started 02/07/2014

Description: Grey brown silty, SAND

Remarks Shell fragments throughout



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TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

ISO 17025 INAB ACCREDITED TESTING DETAILED SCHEDULE REG NO. 1321

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	100	
28	100	
20	100	
14	100	
10	99	
6.3	99	
5	98	
3.35	97	
2	95	
1.18	93	SAND
0.6	92	
0.425	92	
0.3	91	
0.15	28	
0.063	5	SILT/CLAY

Contract No: 17585 Report No. R58296

Contract: Dun Laoghaire Harbour

BH/TP. Bh12D

Sample No. AA19131 Lab. Sample No. A14/2014

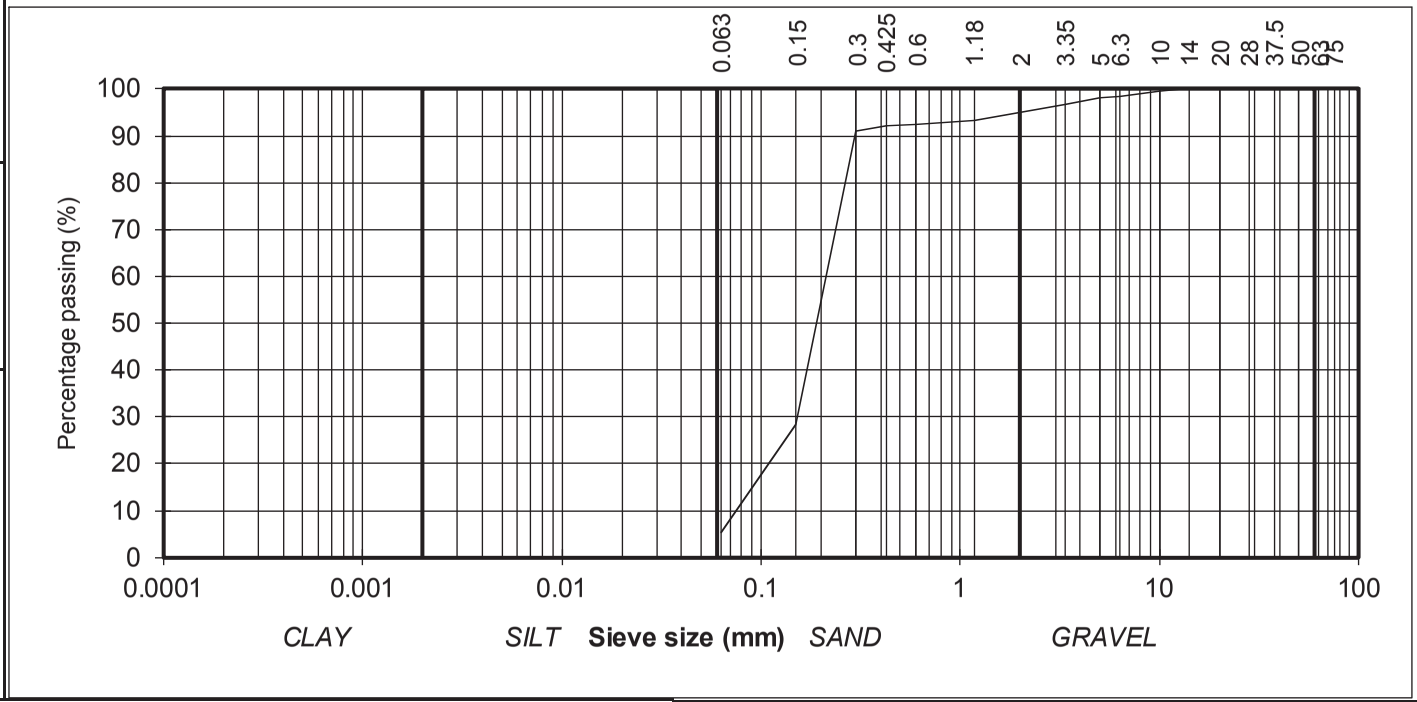
Sample Type: B

Depth (m) 0.0-1.0 Customer: Department of the Marine

Date Received 25/06/2014 Date Testing started 02/07/2014

Description: Brown clayey/silty, gravelly, SAND

Remarks Shell fragments throughout



IGSL Ltd Materials Laboratory

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TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)

ISO 17025 INAB ACCREDITED TESTING DETAILED SCHEDULE REG NO. 1321

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	100	
28	100	
20	100	
14	100	
10	100	
6.3	100	
5	100	
3.35	100	
2	100	
1.18	100	SAND
0.6	100	
0.425	100	
0.3	100	
0.15	99	
0.063	71	SILT/CLAY
0.038	56	
0.027	51	
0.017	44	
0.010	36	
0.007	28	
0.005	22	
0.002	11	

Contract No: 17585 Report No. R58297

Contract: Dun Laoghaire Harbour

BH/TP. Bh12D

Sample No. AA19136 Lab. Sample No. A14/2015

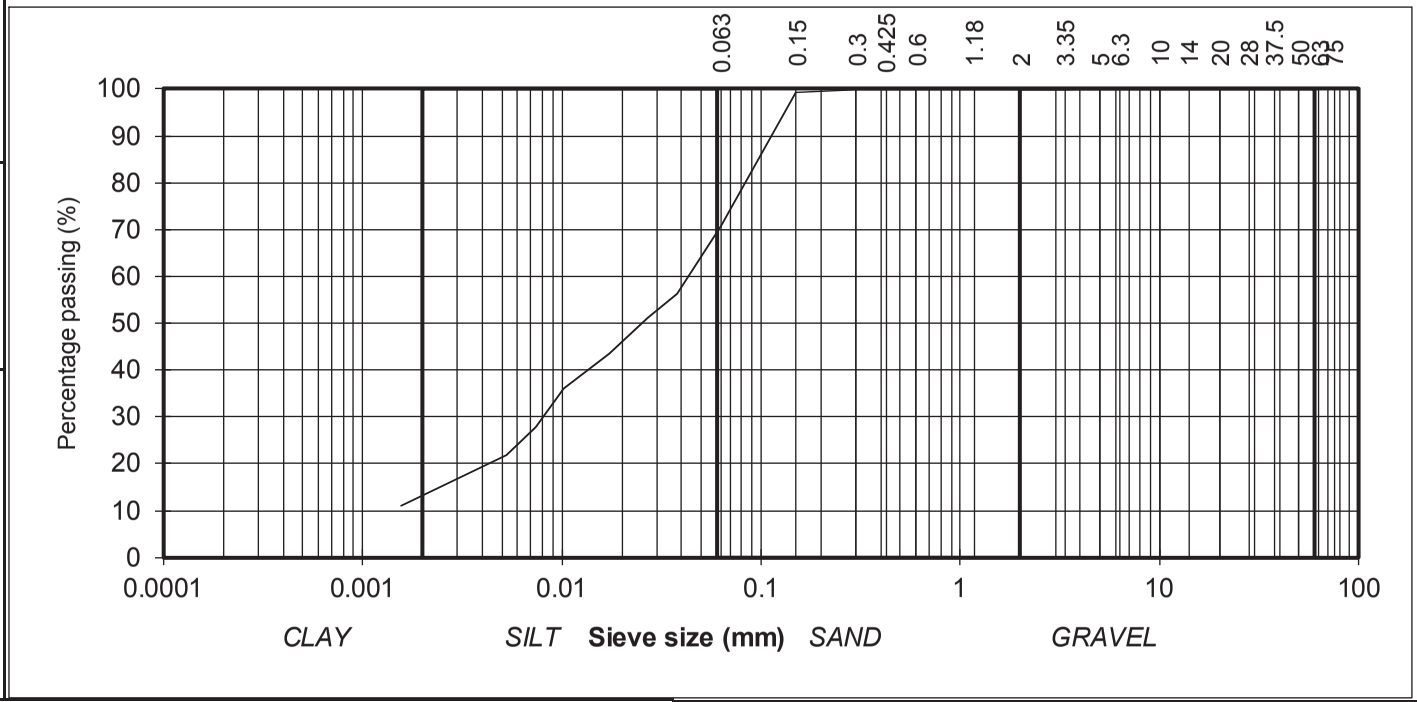
Sample Type: B

Depth (m) 3.5-4.0 Customer: Department of the Marine

Date Received 25/06/2014 Date Testing started 02/07/2014

Description: Grey slightly sandy, SILT

Remarks



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IGSL Ltd
Materialss Laboratory
M7 Business Park
Naas
Co. Kildare

Test Report

Undrained shear strength in triaxial compression
(without pore pressure measurement)

Tested in accordance with BS1377:Part 7:1990 clause 8
(definitive method)

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 1331

Report no: R58671

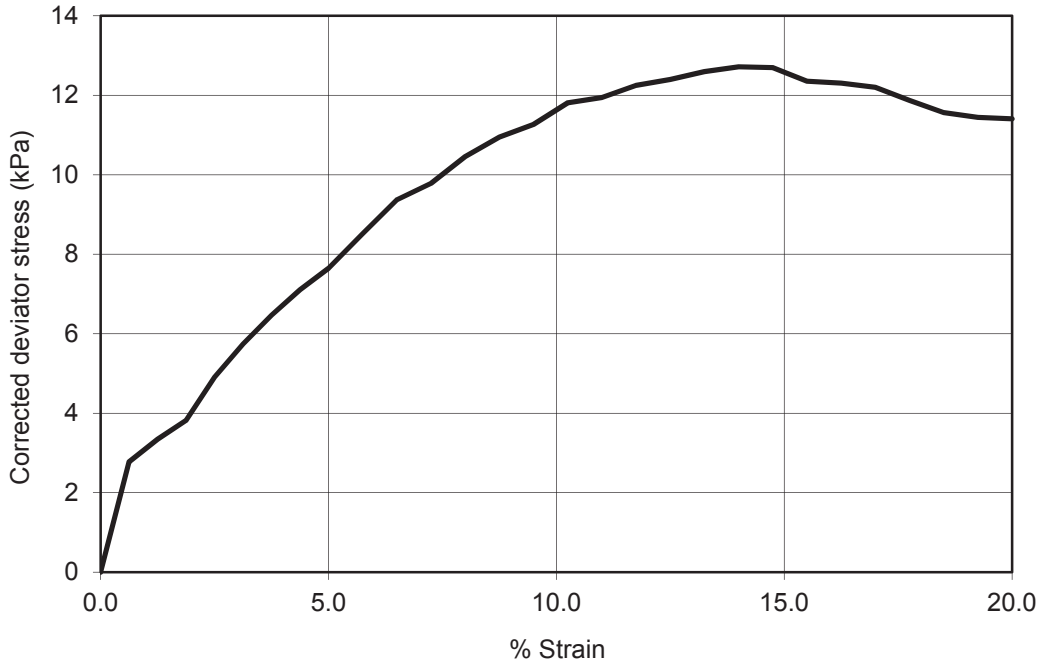
Contract Name: Dun Laoghaire Harbour Contract No: 17585

Location: Bh04D @ 5.0m Lab Sample No. A14/1999

Description: Grey sandy SILT

Customer: Department of the Marine

Height (mm)	200	Diameter	100	Cell pressure	200
Moisture Content %	33	Bulk density (Mg/m^3)	2.27	Dry density (Mg/m^3)	1.71



Strain at failure %	14	Cohesion C_u (kPa) (Undrained shear strength kPa)	6
Rate of strain (%/minute)	1.9		
Thickness of membrane	0.4	Membrane correction (at failure)	1.15
Date received	25/06/14	Date tested	21/07/14

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IGSL Ltd
Materialss Laboratory
M7 Business Park
Naas
Co. Kildare

Test Report

Undrained shear strength in triaxial compression
(without pore pressure measurement)

Tested in accordance with BS1377:Part 7:1990 clause 8
(definitive method)

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 1331

Report no: R58672

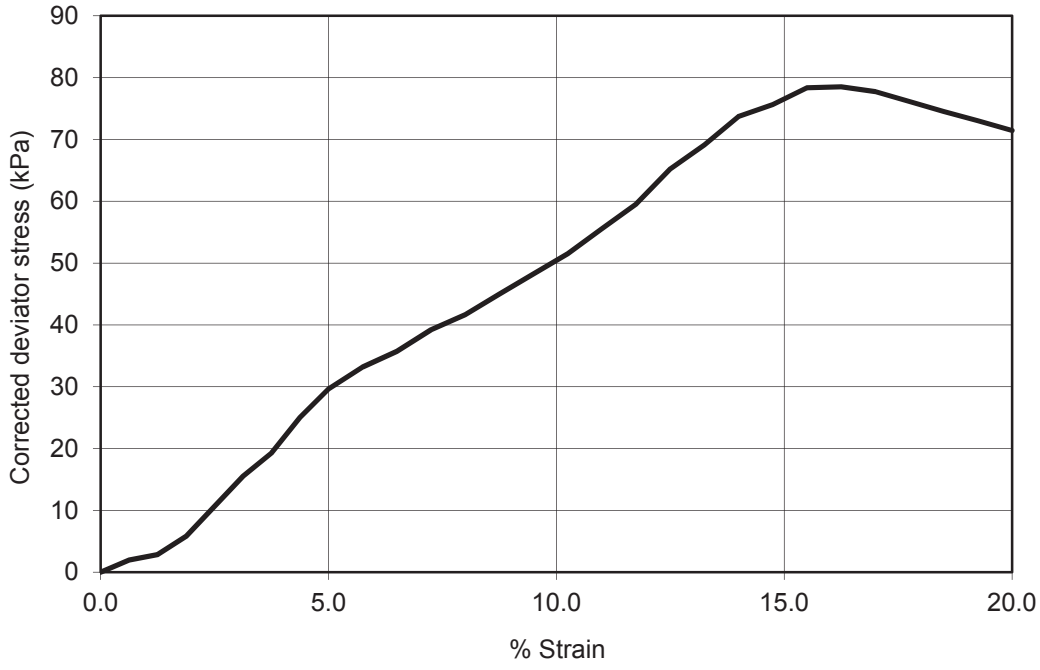
Contract Name: Dun Laoghaire Harbour Contract No: 17585

Location: Bh07D @ 6.0m Lab Sample No. A14/2006

Description: Grey sandy SILT

Customer: Department of the Marine

Height (mm)	200	Diameter	100	Cell pressure	200
Moisture Content %	44	Bulk density (Mg/m^3)	2.24	Dry density (Mg/m^3)	1.55



Strain at failure %	16.3	Cohesion C_u (kPa) (Undrained shear strength kPa)	39
Rate of strain (%/minute)	1.9		
Thickness of membrane	0.4	Membrane correction (at failure)	1.27
Date received	25/06/14	Date tested	21/07/14

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IGSL Ltd
Materialss Laboratory
M7 Business Park
Naas
Co. Kildare

Test Report

Undrained shear strength in triaxial compression
(without pore pressure measurement)

Tested in accordance with BS1377:Part 7:1990 clause 8
(definitive method)

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 1331

Report no: R58673

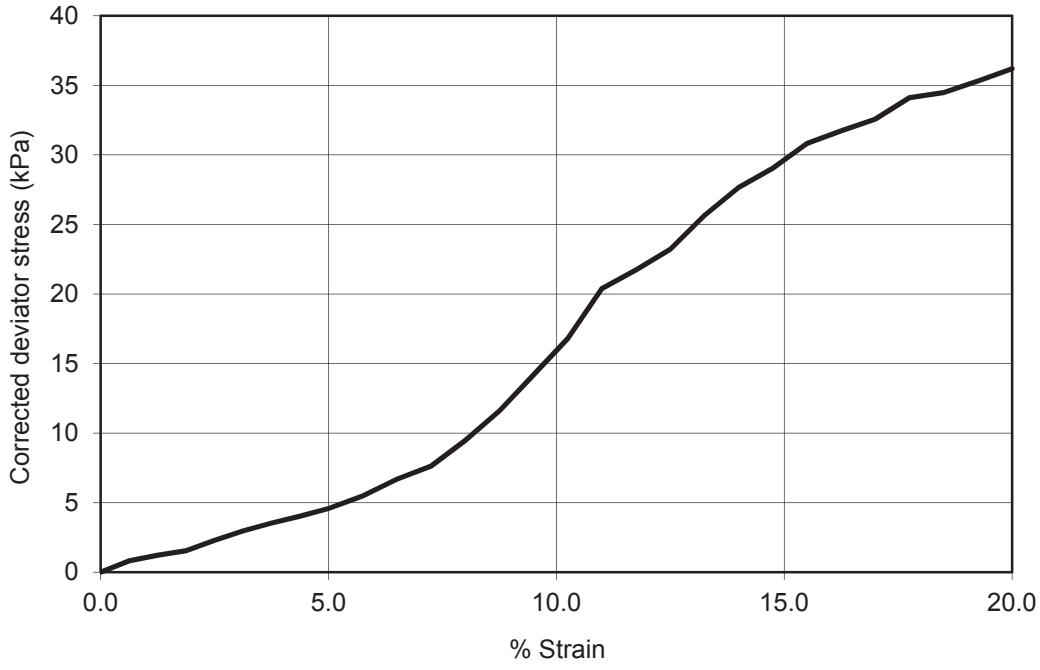
Contract Name: Dun Laoghaire Harbour Contract No: 17585

Location: Bh10D @ 4.5m Lab Sample No. A14/2012

Description: Grey sandy SILT

Customer: Department of the Marine

Height (mm)	200	Diameter	100	Cell pressure	200
Moisture Content %	32	Bulk density (Mg/m^3)	2.37	Dry density (Mg/m^3)	1.80



Strain at failure %	20	Cohesion C_u (kPa) (Undrained shear strength kPa)	18
Rate of strain (%/minute)	1.9		
Thickness of membrane	0.4	Membrane correction (at failure)	1.49
Date received	25/06/14	Date tested	21/07/14

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IGSL Ltd
Materialss Laboratory
M7 Business Park
Naas
Co. Kildare

Test Report

Undrained shear strength in triaxial compression
(without pore pressure measurement)

Tested in accordance with BS1377:Part 7:1990 clause 8
(definitive method)

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 1331

Report no: R58674

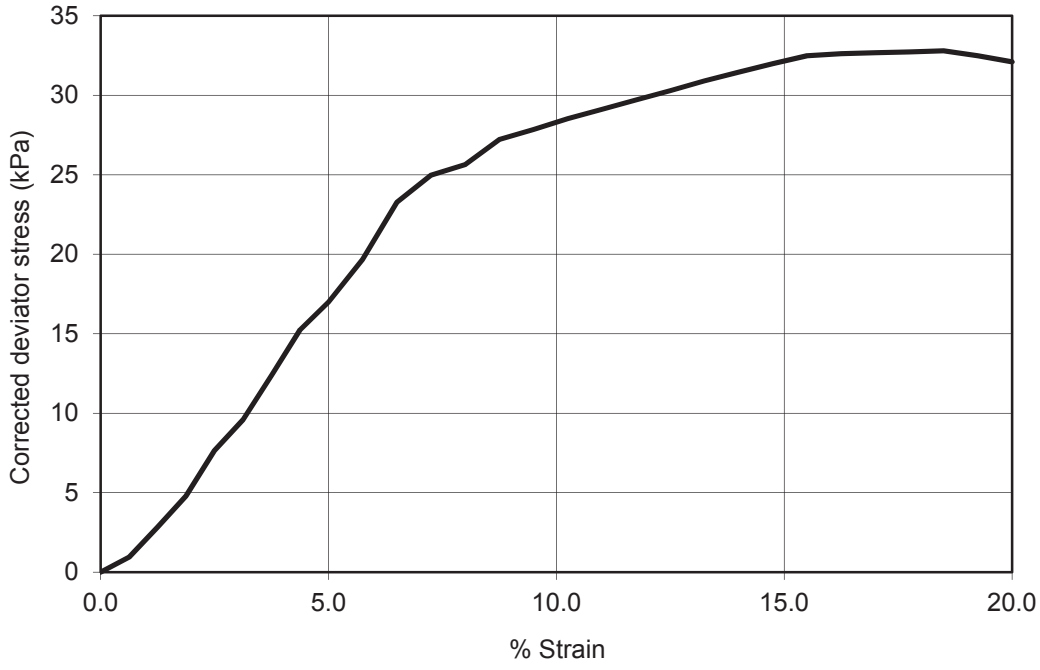
Contract Name: Dun Laoghaire Harbour Contract No: 17585

Location: Bh12D @ 3.5m Lab Sample No. A14/2015

Description: Grey slightly sandy, SILT

Customer: Department of the Marine

Height (mm)	200	Diameter	100	Cell pressure	200
Moisture Content %	33	Bulk density (Mg/m^3)	2.06	Dry density (Mg/m^3)	1.55



Strain at failure %	18.5	Cohesion C_u (kPa) (Undrained shear strength kPa)	16
Rate of strain (%/minute)	1.9		
Thickness of membrane	0.4	Membrane correction (at failure)	1.43
Date received	25/06/14	Date tested	21/07/14

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IGSL Ltd
Materialss Laboratory
M7 Business Park
Naas
Co. Kildare

Test Report

Undrained shear strength in triaxial compression
(without pore pressure measurement)

Tested in accordance with BS1377:Part 7:1990 clause 8
(definitive method)

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 1331

Report no: R58675

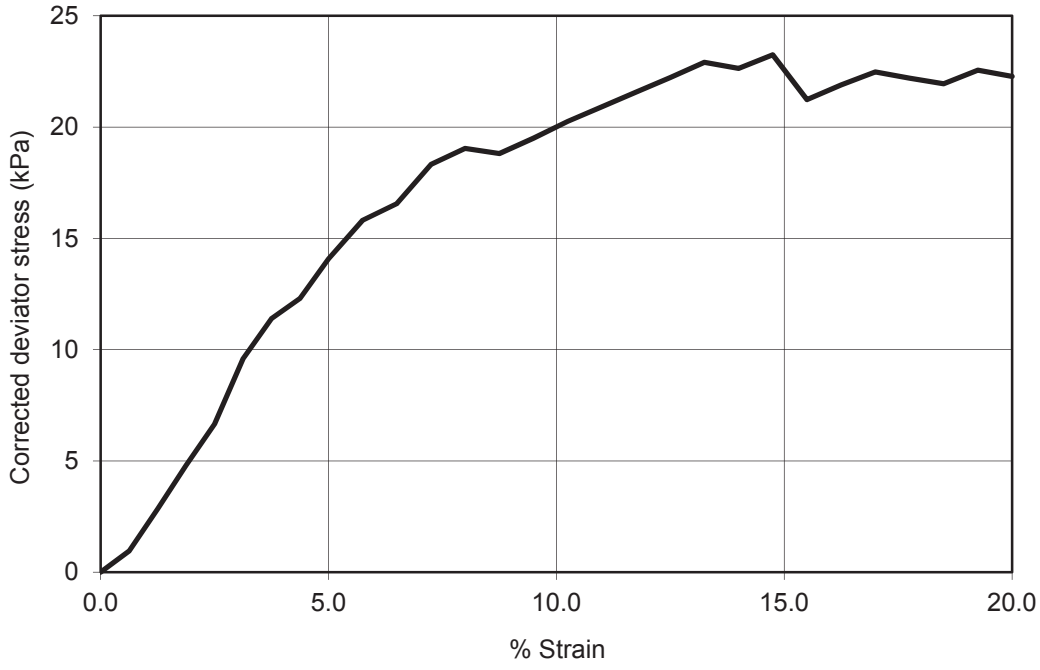
Contract Name: Dun Laoghaire Harbour Contract No: 17585

Location: Bh03 @ 5.5m Lab Sample No. A14/2016

Description: 5.5

Customer: Department of the Marine

Height (mm)	200	Diameter	100	Cell pressure	200
Moisture Content %	29	Bulk density (Mg/m^3)	2.24	Dry density (Mg/m^3)	1.74



Strain at failure %	14.8	Cohesion C_u (kPa) (Undrained shear strength kPa)	12
Rate of strain (%/minute)	1.9		
Thickness of membrane	0.4	Membrane correction (at failure)	1.2
Date received	25/06/14	Date tested	21/07/14

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IGSL Ltd
Materialss Laboratory
M7 Business Park
Naas
Co. Kildare

Test Report

Undrained shear strength in triaxial compression
(without pore pressure measurement)

Tested in accordance with BS1377:Part 7:1990 clause 8
(definitive method)

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 1331

Report no: R58676

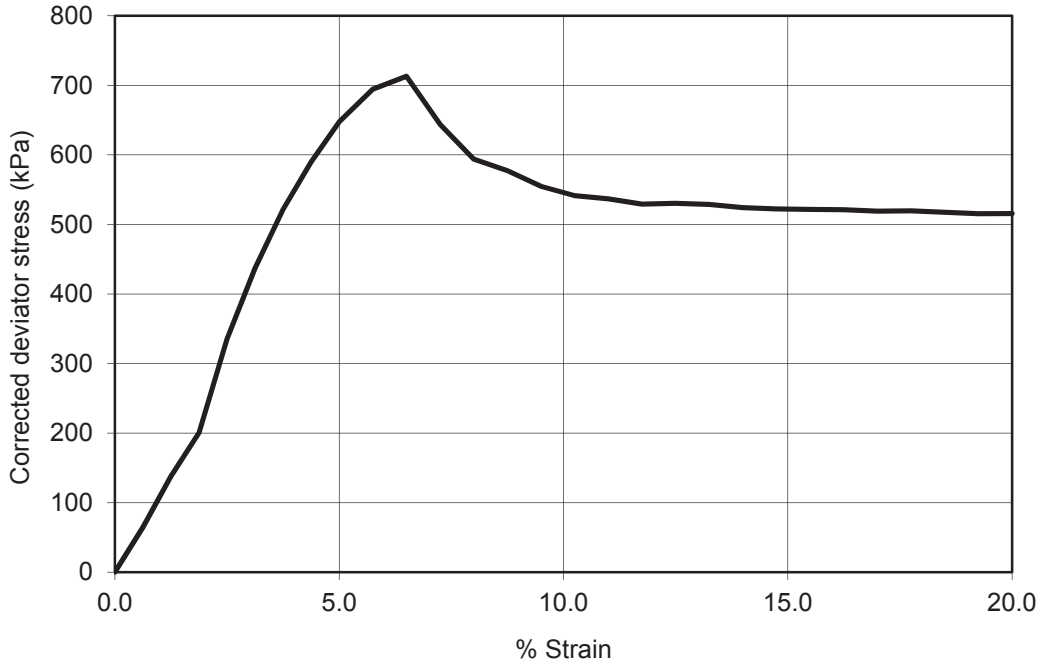
Contract Name: Dun Laoghaire Harbour Contract No: 17585

Location: Bh3 @ 6.5m Lab Sample No. A14/2017

Description: Grey SAND

Customer: Department of the Marine

Height (mm)	200	Diameter	100	Cell pressure	200
Moisture Content %	27	Bulk density (Mg/m^3)	1.74	Dry density (Mg/m^3)	1.38



Strain at failure %	6.5	Cohesion C_u (kPa) (Undrained shear strength kPa)	357
Rate of strain (%/minute)	1.9		
Thickness of membrane	0.4	Membrane correction (at failure)	0.68
Date received	25/06/14	Date tested	21/07/14

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Jones Environmental Laboratory

Registered Address : Unit 3 Deeside Point, Zone 3, Deeside Industrial Park, Deeside, CH5 2UA. UK

Unit 3 Deeside Point
Zone 3
Deeside Industrial Park
Deeside
CH5 2UA

Tel: +44 (0) 1244 833780
Fax: +44 (0) 1244 833781

IGSL
Unit F
M7 Business Park
Naas
Co Kildare
Ireland

Attention :	Darren Keogh
Date :	4th July, 2014
Your reference :	17585
Our reference :	Test Report 14/7578 Batch 1
Location :	Dunlaoghaire
Date samples received :	2nd July, 2014
Status :	Final report
Issue :	1

Eight samples were received for analysis on 2nd July, 2014. 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.

Compiled By:

Bruce Leslie
Project Co-ordinator

Bob Millward BSc FRSC
Principal Chemist

Client Name: IGSL
Reference: 17585
Location: Dunlaoghaire
Contact: Darren Keogh
JE Job No.: 14/7578

Report : Solid

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

J E Sample No.	1	2	3	4	5	6	7	8			LOD/LOR	Units	Method No.
Sample ID	BH2	BH2	BH1	BH1	BH1	RC1	RC3	RC3					
Depth	1.00	8.50	3.00	8.00	10.00	14.20-17.20	9.00-10.00	18.00-19.50					
COC No / misc													
Containers	J	J	J	J	J	J	J	J					
Sample Date	01/07/2014	01/07/2014	01/07/2014	01/07/2014	01/07/2014	01/07/2014	01/07/2014	01/07/2014					
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil					
Batch Number	1	1	1	1	1	1	1	1					
Date of Receipt	02/07/2014	02/07/2014	02/07/2014	02/07/2014	02/07/2014	02/07/2014	02/07/2014	02/07/2014					
Chloride (2:1 Ext BRE) #	3.305	3.506	3.075	1.899	3.093	0.458	0.851	0.853			<0.002	g/l	TM38/PM20
Sulphate as SO4 (2:1 Ext) #	0.4393	0.5220	0.4428	0.3896	0.4518	0.0996	0.4113	0.3506			<0.0015	g/l	TM38/PM20
pH #	8.44	8.64	8.45	8.39	8.10	8.11	7.94	7.90			<0.01	pH units	TM73/PM11

Please see attached notes for all abbreviations and acronyms

Client Name: IGSL
Reference: 17585
Location: Dunlaoghaire
Contact: Darren Keogh

J E Job No.	Batch	Sample ID	Depth	J E Sample No.	Analysis	Reason
No deviating sample report results for job 14/7578						

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.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 14/7578

SOILS

Please note we are only MCERTS accredited 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. If we are instructed to keep samples, a storage charge of £1 (1.5 Euros) per sample per month will be applied until we are asked to dispose of them.

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. 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.

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

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

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

WATERS

Please note we are not a Drinking Water Inspectorate (DWI) Approved Laboratory . It is important that detection limits are carefully considered when requesting water analysis.

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

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

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

DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any test results that may be compromised highlighted on your deviating samples report.

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.

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 UKAS requirement 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.

ABBREVIATIONS and ACRONYMS USED

#	UKAS accredited.
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.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to a Jones Environmental 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
OC	Outside Calibration Range

JE Job No: 14/7578

Test Method No.	Description	Prep Method No. (if appropriate)	Description	UKAS	MCERTS (soils only)	Analysis done on As Received (AR) or Air Dried (AD)	Reported on dry weight basis
TM38	Ionic analysis using the Thermo Aquakem Photometric Automatic Analyser. Accredited to ISO17025 and MCERTS for most analytes. All accreditation is matrix specific.	PM20	Solid samples are extracted with two parts de-ionised water to one part solid material for analysis of the extract for various parameters.	Yes		AD	Yes
TM73	pH in by Metrohm	PM11	1:2.5 soil/water extraction	Yes		AR	No

IGSL Limited
M7 Business Park, Naas, Co. Kildare.
Tel: 045-846176/846180/846182 Fax: 045-846187
Email: info@igsl.ie Web: www.igsl.ie

Ground Investigation & Geotechnical Specialists

Lab Reference Number related to Exploratory Borehole Records

INAB References:		Borehole References:		
Lab Reference No:	Depth	Borehole No:	Depth	Sample ID No:
A14/2011	2-3m	BH10D	2-3m	AA19148
A14/2005	4-5m	BH07D	4-5m	AA24123

Laboratory Report

2788

GEO Site & Testing Services Ltd

Contract Number: 23773

Client's Reference: **17585 PO 4256**

Report Date: **08-07-2014**

Client **Irish Geotechnical Services Limited**
M7 Business Park
Naas
Co. Kildare
Ireland

Contract Title: **Dunlaoghaire Harbour**

For the attention of: **Hugh Byrne**

Date Received: **03-07-2014**

Date Commenced: **03-07-2014**

Date Completed: **08-07-2014**

Test Description	Qty
Immediate Shear Strength - set of 3 60 x 60 mm Shear Box Specimens by Direct Shearing (note suitable for free draining material only) - @ Non Accredited Test	1

Notes: **Observations and Interpretations are outside the UKAS Accreditation**
*** - denotes test included in laboratory scope of accreditation**
 # - denotes test carried out by approved contractor
@ - denotes non accredited tests

Approved Signatories:
Alex Wynn (Associate Director) - Benjamin Sharp (Contracts Manager) - D V Edwards (Managing Director)
Emma Williams (Office Manager) - Paul Evans (Quality/Technical Manager)

GEO Site & Testing Services Ltd
Unit 4, Heol Aur, Dafen Ind Estate, Dafen, Llanelli, Carmarthenshire SA14 8QN
Tel: 01554 784040 Fax: 01554 784041 info@geo.uk.com geo.uk.com

Test Report: Quick Shearbox Test

BS1377:Part 7:4.5 :1990.

Borehole/Sample Number: A14/2005 Depth (m): 4.00m

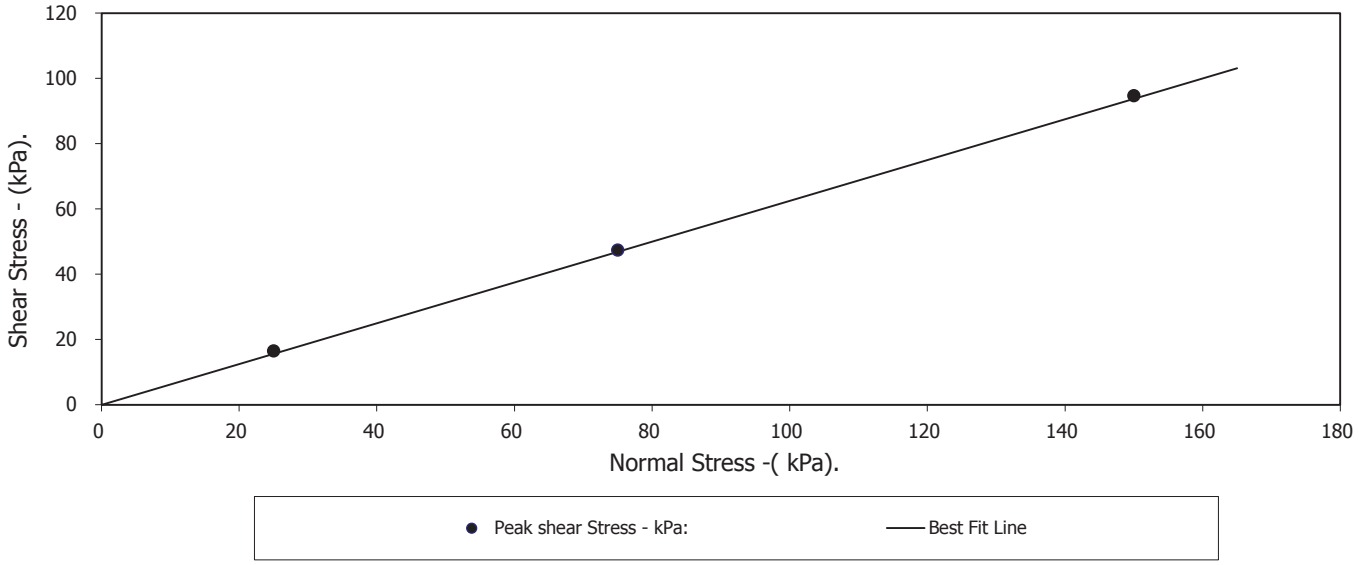
Sample Type:	Remoulded material above 2.50mm removed
Particle Density - Mg/m3:	2.65 (Assumed)
Specimen Tested:	Submerged

Sample Description:
Grey SAND (fine-medium) contains shell fragments

STAGE	**1**	**2**	**3**
Initial Conditions			
Height - mm:	24.66	24.66	24.66
Length - mm:	60.21	60.21	60.21
Moisture Content - %:	22	22	22
Bulk Density - Mg/m3:	1.78	1.79	1.80
Dry Density - Mg/m3:	1.46	1.47	1.48
Voids Ratio:	0.8093	0.8069	0.7909
Normal Pressure- kPa	25	75	150
Consolidation			
Consolidated Height - mm:	24.66	24.22	23.77
Shear			
Rate of Strain (mm/min)	1.250	1.250	1.250
Strain at peak shear stress (mm)	11.49	11.50	11.51
Peak shear Stress - kPa:	16	47	95

PEAK	
Angle of Shearing Resistance:(~~θ~~)	**32.0**
Effective Cohesion - kPa:	**0**

FAILURE CONDITIONS



D P Evans 08/07/14
Checked Page 1 by: Date

D P Evans 08/07/14
Approved Page 1 by: Date

Contract No.:
23773

Dunlaoghaire Harbour

Client Ref Number:
4256

GSTL
GEO SITE & TESTING SERVICES LTD

Laboratory Report

2788

GEO Site & Testing Services Ltd

Contract Number: 24083

Client's Reference: **17585 PO 4256**

Report Date: **29-08-2014**

Client **Irish Geotechnical Services Limited**
M7 Business Park
Naas
Co. Kildare
Ireland

Contract Title: **Dunlaoghaire Harbour**

For the attention of: **Hugh Byrne**

Date Received: **30-07-2014**

Date Commenced: **30-07-2014**

Date Completed: **29-08-2014**

Test Description	Qty
Consolidated Drained Peak Shear Strength - set of 3 - 60 x 60mm Shear Box Specimens by Direct Shearing (3 days) 1377 : 1990 Part 7 :4 - * UKAS	1

Notes: **Observations and Interpretations are outside the UKAS Accreditation**
*** - denotes test included in laboratory scope of accreditation**
 # - denotes test carried out by approved contractor
@ - denotes non accredited tests

Approved Signatories:
Alex Wynn (Associate Director) - Benjamin Sharp (Contracts Manager) - D V Edwards (Managing Director)
Emma Williams (Office Manager) - Paul Evans (Quality/Technical Manager)

GEO Site & Testing Services Ltd
Unit 4, Heol Aur, Dafen Ind Estate, Dafen, Llanelli, Carmarthenshire SA14 8QN
Tel: 01554 784040 Fax: 01554 784041 info@geo.uk.com geo.uk.com

Test Report: CONSOLIDATED DRAINED SHEARBOX TEST.

BS1377:Part 7:4.5 :1990.

Borehole/Sample Number: BH10D Depth (m): 2.00-3.00m

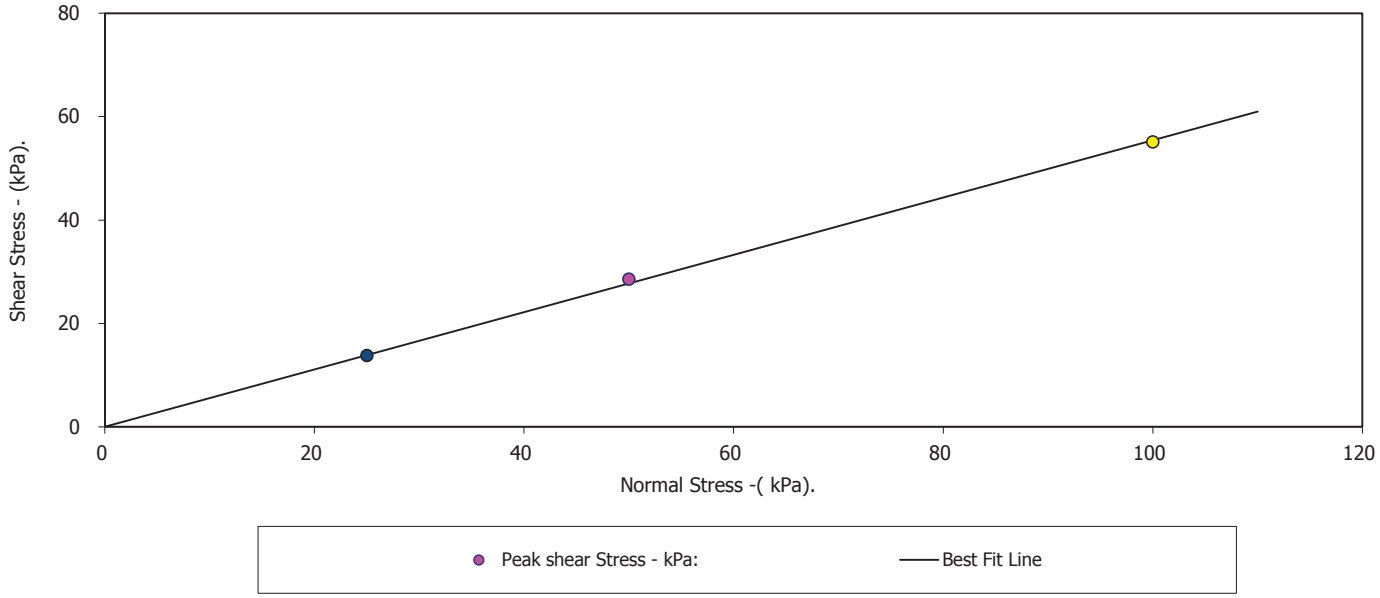
Sample Type:	Remoulded (Light Tamping) Material above 2mm removed.
Particle Density - Mg/m3:	2.65 (Assumed)
Specimen Tested:	Submerged

Sample Description:
Dark grey slightly gravelly (fine rounded) SAND (fine-coarse) (contains shell fragments)

STAGE	**1**	**2**	**3**
Initial Conditions			
Height - mm:	24.66	24.66	24.66
Length - mm:	60.21	60.21	60.21
Moisture Content - %:	18	18	18
Bulk Density - Mg/m3:	1.84	1.83	1.82
Dry Density - Mg/m3:	1.57	1.56	1.55
Voids Ratio:	0.6932	0.7028	0.7101
Normal Pressure- kPa	25	50	100
Consolidation			
Consolidated Height - mm:	24.45	24.30	24.15
Shear			
Rate of Strain (mm/min)	0.010	0.010	0.010
Strain at peak shear stress (mm)	10.49	10.33	10.16
Peak shear Stress - kPa:	14	29	55

PEAK	
Angle of Shearing Resistance:(~~θ~~)	**29.0**
Effective Cohesion - kPa:	**0**

FAILURE CONDITIONS



D P Evans 29/08/14
Checked Pages 1-4 by: Date:

D P Evans 29/08/14
Approved Pages 1-4 by: Date

Contract No.:
24083

Dunlaoghare Harbour

Client Ref Number:

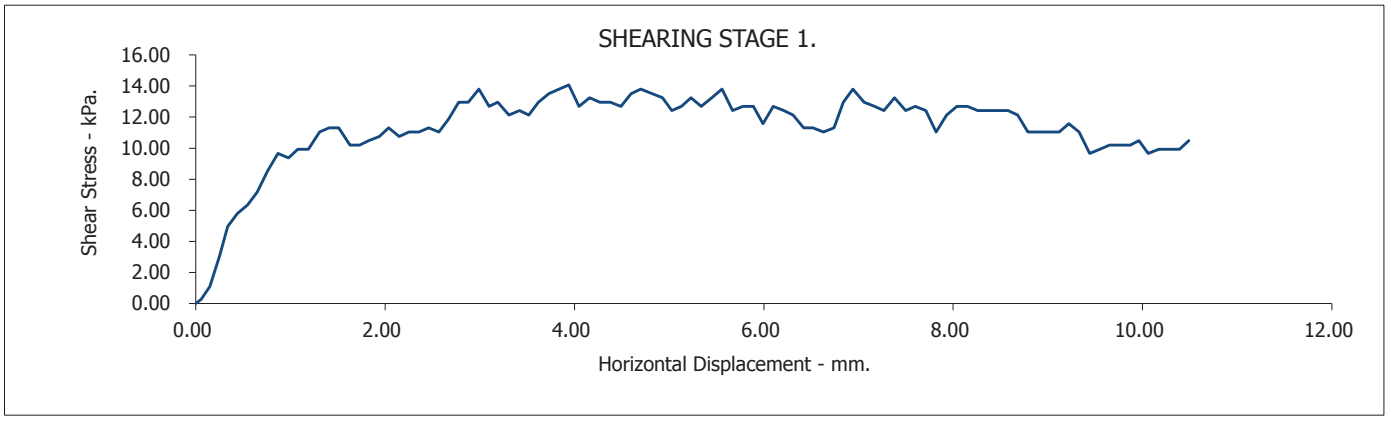
4256.00

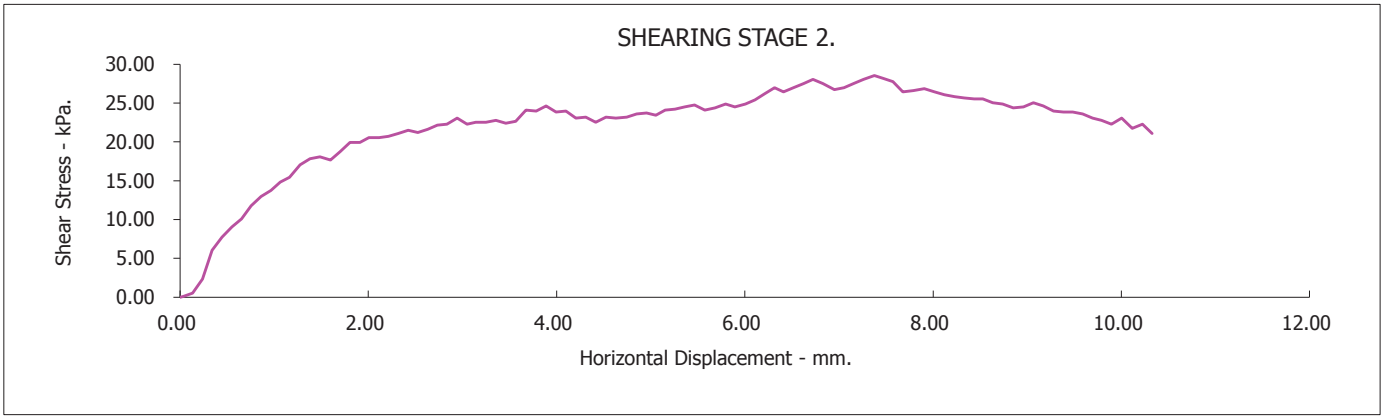
GSTL
GEO SITE & TESTING SERVICES LTD

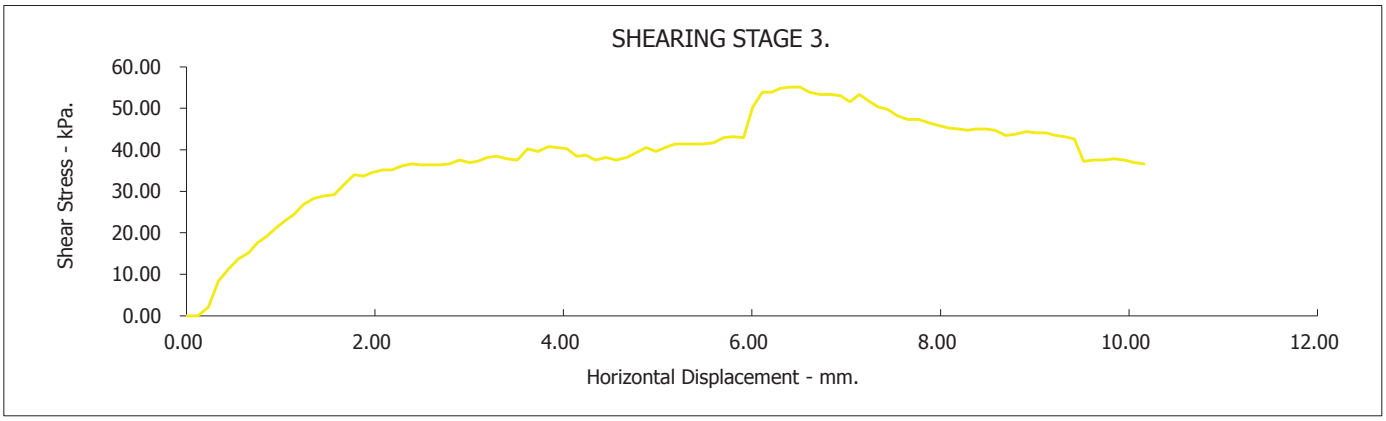
Test Report: CONSOLIDATED DRAINED SHEARBOX TEST.

BS1377:Part 7:4.5 :1990.

Borehole/Sample Number: BH10D Depth (m): 2.00-3.00m







Dunlaoghare Harbour

Contract No.: **24083**

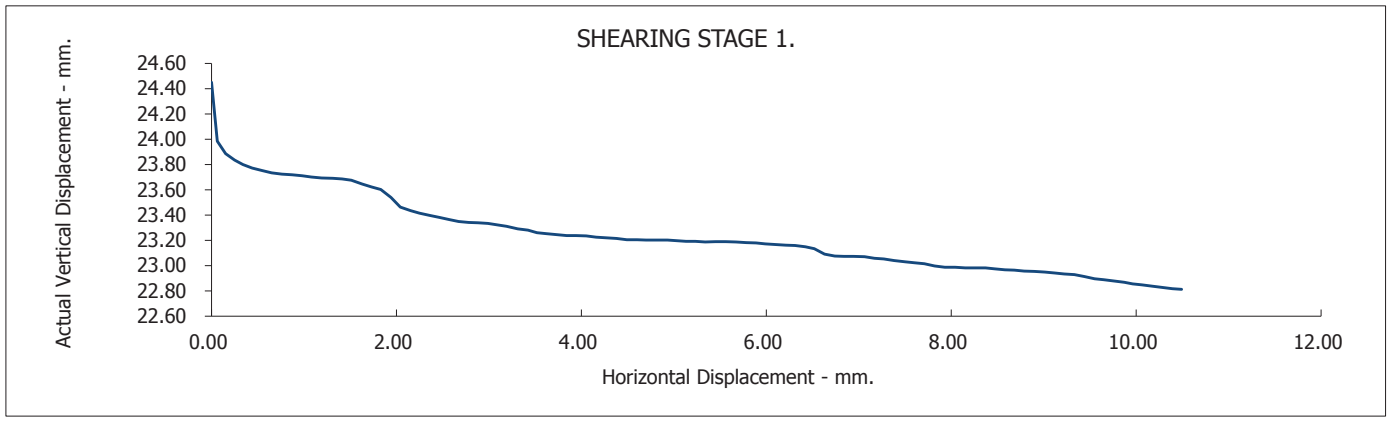
Client Ref Number: **4256.00**

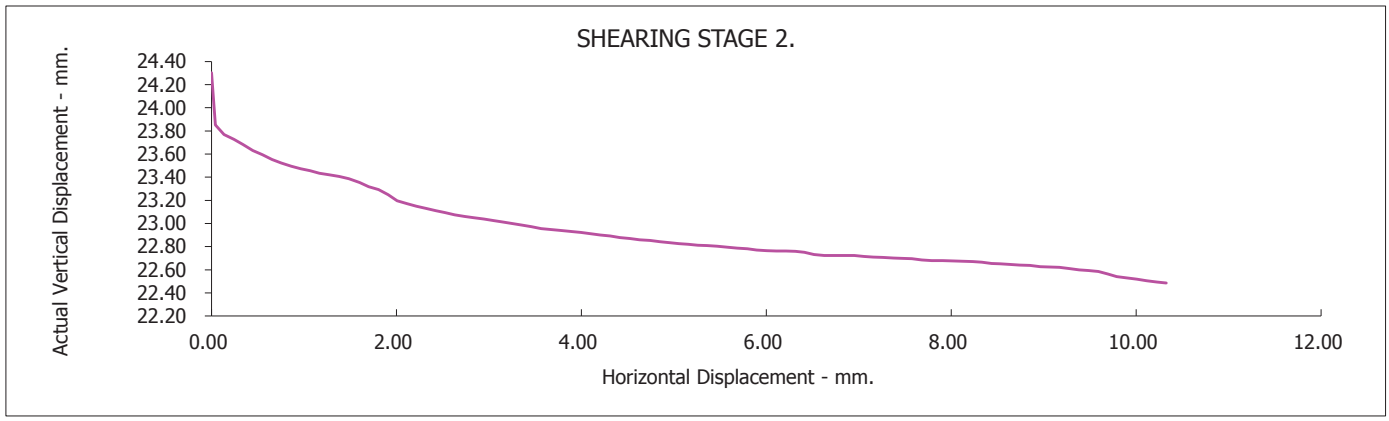
Figure.

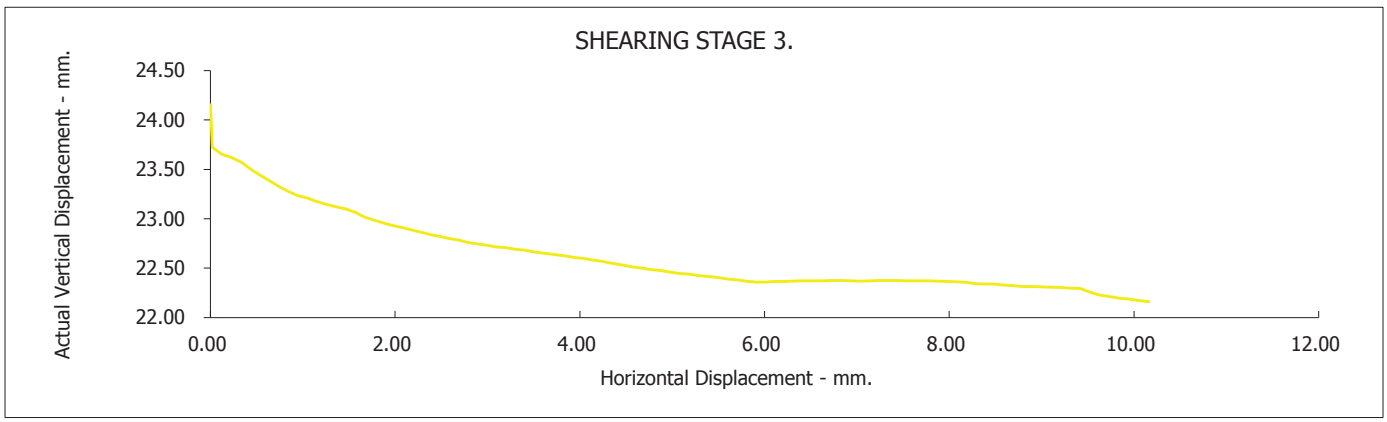
Test Report: CONSOLIDATED DRAINED SHEARBOX TEST.

BS1377:Part 7:4.5 :1990.

Borehole/Sample Number: BH10D Depth (m): 2.00-3.00m







Contract No.:
24083

Dunlaoghare Harbour

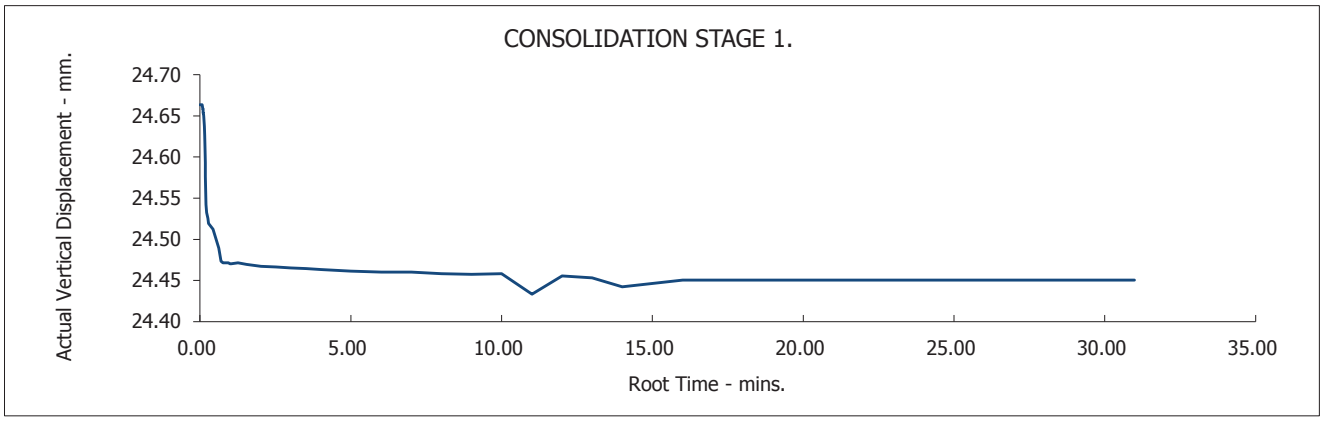
Client Ref Number:
4256.00

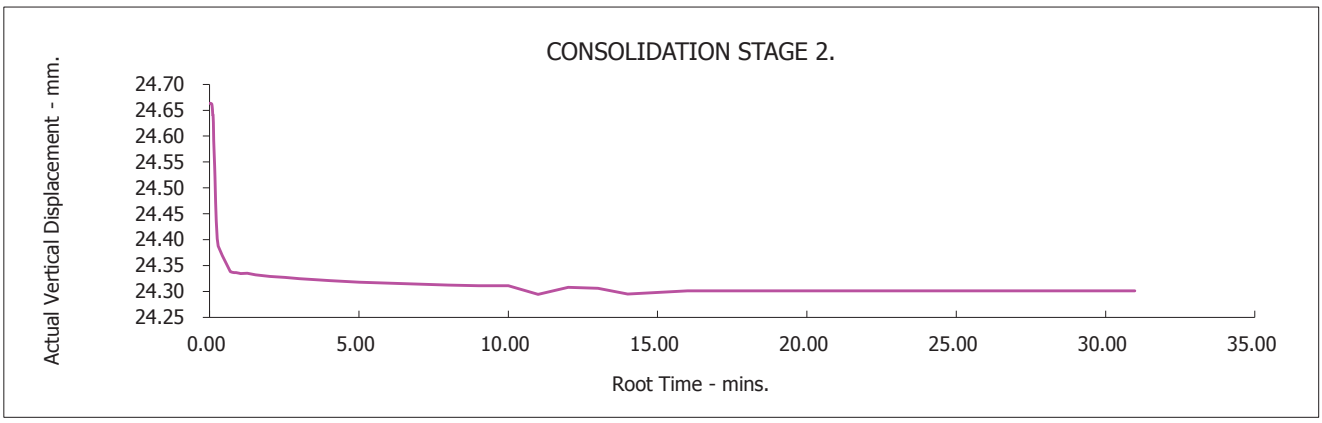
GSTL
GEO SITE & TESTING SERVICES LTD

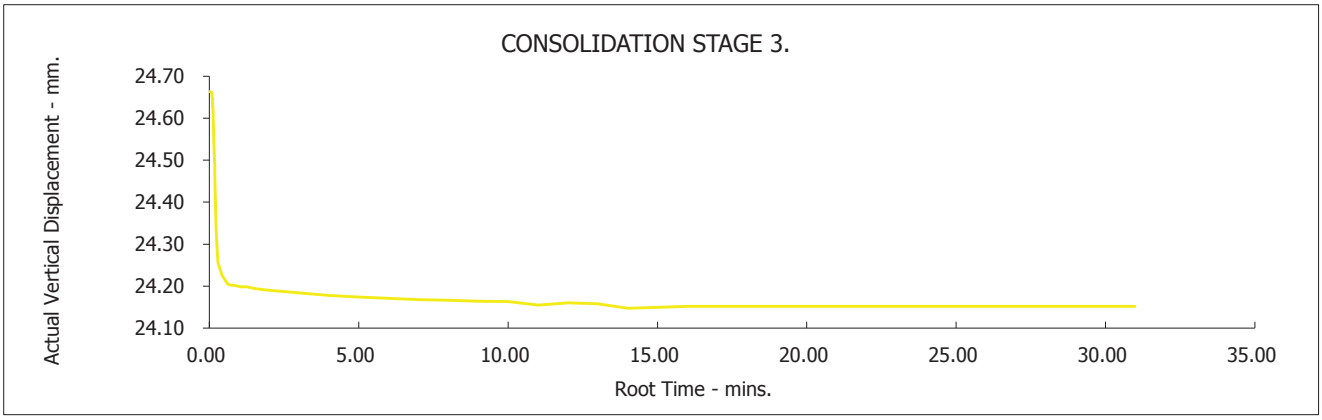
Test Report: CONSOLIDATED DRAINED SHEARBOX TEST.

BS1377:Part 7:4.5 :1990.

Borehole/Sample Number: BH10D Depth (m): 2.00-3.00m







Contract No.:
24083

Dunlaoghare Harbour

Client Ref Number:
4256.00

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GEO SITE & TESTING SERVICES LTD

Appendix 4

Laboratory Test Records (Rock)

POINT LOAD STRENGTH INDEX TEST DATA

Contract: Dun Laoaghaire Harbour Cruise
Facility - Site Investigation
Date of test: 25/6/14

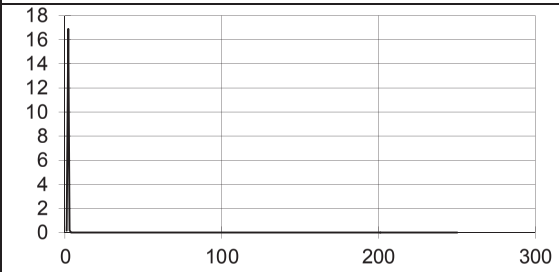
Sample Type: Core
Contract no. 17585

RC No.	Depth m	D (Diameter) mm	P (failure load) kN	F	Is (index strength) Mpa	Is(50) (index strength) Mpa	*UCS MPa	Type	Orienation
RC01	14.3 (Bclay)	80	0.7	1.236	0.11	0.14	2.03	PL	diametral
	14.5 (Bclay)	80	0.6	1.236	0.09	0.12	1.74	PL	diametral
	14.7 (Bclay)	80	0.8	1.236	0.13	0.15	2.32	PL	diametral
	14.8 (Bclay)	80	0.7	1.236	0.11	0.14	2.03	PL	diametral
	15.3 (Bclay)	80	0.8	1.236	0.13	0.15	2.32	PL	diametral
	15.5 (Bclay)	80	0.6	1.236	0.09	0.12	1.74	PL	diametral
	15.7 (Bclay)	80	0.8	1.236	0.13	0.15	2.32	PL	diametral
	15.8 (Bclay)	80	0.7	1.236	0.11	0.14	2.03	PL	diametral
	17 (Bclay)	80	0.7	1.236	0.11	0.14	2.03	PL	diametral
	17.1 (Bclay)	80	0.7	1.236	0.11	0.14	2.03	PL	diametral
RC03	9.2 (Bclay)	80	0.6	1.236	0.09	0.12	1.74	PL	diametral
	9.6 (Bclay)	80	0.8	1.236	0.13	0.15	2.32	PL	diametral
	9.7 (Bclay)	80	0.8	1.236	0.13	0.15	2.32	PL	diametral
	19.4 (Bclay)	80	0.4	1.236	0.06	0.08	1.16	PL	diametral

Statistical Summary Data	Is(50)	UCS*
Number of Samples Tested	14	14
Minimum	0.08	1
Average	0.13	2
Maximum	0.15	2
Standard Dev.	0.02	0
Upper 95% Confidence Limit	0.18	2.65
Lower 95% Confidence Limit	0.09	1.36

Comments:
*UCS taken as k x Point Load Is(50): k= 15

*UCS Normal Distribution Curve



Abbreviations	
i	irregular
a	axial
b	block
d	diametral

approx. orientation to planes of weakness/bedding

U	unknown
P	perpendicular
//	parallel

POINT LOAD STRENGTH INDEX TEST DATA

Contract: Dun Laoaghaire Harbour Cruise
Facility - Site Investigation
Date of test: 25/6/14

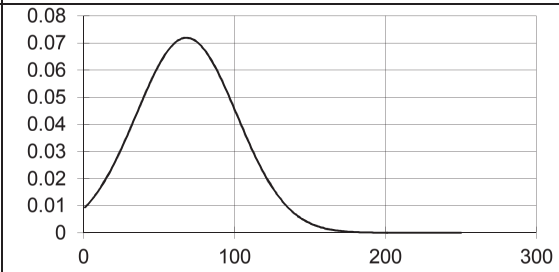
Sample Type: Core
Contract no. 17585

RC No.	Depth m	D (Diameter) mm	P (failure load) kN	F	Is (index strength) Mpa	Is(50) (index strength) Mpa	*UCS MPa	Type	Orienation
RC01	19.6 (Rock)	80	19.0	1.236	2.97	3.67	73.36	PL	diametral
	19.7 (Rock)	80	17.0	1.236	2.66	3.28	65.64	PL	diametral
	20.4 (Rock)	80	25.0	1.236	3.91	4.83	96.53	PL	diametral
	20.5 (Rock)	80	29.0	1.236	4.53	5.60	111.97	PL	diametral
	20.7 (Rock)	80	8.0	1.236	1.25	1.54	30.89	PL	diametral
	21.55 (Rock)	80	8.0	1.236	1.25	1.54	30.89	PL	diametral

Statistical Summary Data	Is(50)	UCS*
Number of Samples Tested	6	6
Minimum	1.54	31
Average	3.41	68
Maximum	5.60	112
Standard Dev.	1.66	33
Upper 95% Confidence Limit	6.67	133.43
Lower 95% Confidence Limit	0.15	3.00

Comments:
*UCS taken as k x Point Load Is(50): k= 20

*UCS Normal Distribution Curve



Abbreviations	
i	irregular
a	axial
b	block
d	diametral

approx. orientation to planes of weakness/bedding

U	unknown
P	perpendicular
//	parallel

Appendix 5

Laboratory Test Records (Environmental)

National Laboratory Service

Analytical Report

Final Report - Amended - Issue 3

Report ID - 20066786 - 3

Batch description: Dunlaoghaire

UKAS TESTING 0754

Reported on: 22-Aug-2014

Ciarán Killaly
IGSL Ltd
Unit F
M7 Business Park
Naas
Co. Kildare

Dear Ciarán

Please find attached the results for the batch of 11 samples described below.

Samples Registered on:	26-Jun-2014
Analysis Started on:	26-Jun-2014
Analysis Completed on:	22-Aug-2014
Results for Batch Number	20066786
Your Purchase Order Number:	4235

You will be invoiced shortly by our accounts department.

If we can be of further assistance then please do not hesitate to contact us.

Yours sincerely

William Fardon
Customer Services Team Manager
Tel: (0113) 231 2177
nls@environment-agency.gov.uk

National Laboratory Service

Analytical Report

Final Report - Amended - Issue 3

Report ID - 20066786 - 3

Batch description: Dunlaoghaire

UKAS TESTING 0754

Reported on: 22-Aug-2014

Client: IGSL Ltd

Project: Marine Sediment

Quote Description: Marine Sediment

Folder No: 002819527

Sampled on: 24-Jun-14 @ 13:00

Comments: BH11 - 1.00-2.00m

Quote No: 11280

Matrix: Sediment

Analyte	Result	Units	Flag	MRV	Accred	Lab ID	Testcode
Carbonate as C : Dry Wt	<0.830	%	DC		None	NLS	864
DDT : Sum of components : Dry Wt	NoResult	ug/kg			None	NLS	864
Moisture Content, Air dried 105 C	22.1	%	DC		None	NLS	864
PAH : Total : Dry Wt :- {Polynuclear Aromatic Hydrocarbon	<0.0290	mg/kg	DC		None	NLS	864
PCB : Total (28, 52, 101, 118, 138, 153, 180)	<0.000700	mg/kg	DC		None	NLS	864
Carbon : Dry Wt	1.23	%	DC	0.4	UKAS	LE	404
Carbon, Organic : Dry Wt as C	<0.4	%	DC	0.4	UKAS	LE	404
Grain Size Fraction : <1000 microns : {>0 phi}	99.5	%	DC	0	None	LE	1369
Grain Size Fraction : > 63000 microns : {< -6.0 phi}	0.00	%	DC	0	None	LE	1369
Grain Size Fraction : 1000 to 1400 mic : {0 to -0.5phi}	0.0438	%	DC	0	None	LE	1369
Grain Size Fraction : 11200 to 16000 mic : {-3.5 to -4.0phi}	0.0885	%	DC	0	None	LE	1369
Grain Size Fraction : 1400 to 2000 mic : {-0.5 to -1.0phi}	0.0465	%	DC	0	None	LE	1369
Grain Size Fraction : 16000 to 22400 mic : {-4.0 to -4.5phi}	0.00	%	DC	0	None	LE	1369
Grain Size Fraction : 2000 to 2800 mic : {-1.0 to -1.5phi}	0.0324	%	DC	0	None	LE	1369
Grain Size Fraction : 22400 to 31500 mic : {-4.5 to -5.0phi}	0.00	%	DC	0	None	LE	1369
Grain Size Fraction : 2800 to 4000 mic : {-1.5 to -2.0phi}	0.0622	%	DC	0	None	LE	1369
Grain Size Fraction : 31500 to 45000 mic : {-5.0 to -5.5phi}	0.00	%	DC	0	None	LE	1369
Grain Size Fraction : 4000 to 5600 mic : {-2.0 to -2.5phi}	0.0228	%	DC	0	None	LE	1369
Grain Size Fraction : 45000 to 63000 mic : {-5.5 to -6.0phi}	0.00	%	DC	0	None	LE	1369
Grain Size Fraction : 5600 to 8000 mic : {-2.5 to -3.0phi}	0.0631	%	DC	0	None	LE	1369
Grain Size Fraction : 8000 to 11200 mic : {-3.0 to -3.5phi}	0.149	%	DC	0	None	LE	1369
Particle Size Report	Report	Text	DC		None	LE	1369
The sample was a slightly gravelly sand. The entire sample was analysed.							
Raw Data Report	Report	Text	DC	0	None	LE	1369
NO_RESULT : Analyte not applicable							
Grain Size Inclusive Kurtosis	0.517	mm	DC	0	UKAS	LE	1368
Grain Size Inclusive Mean	0.123	mm	DC	0	UKAS	LE	1368
Inclusive Graphic Skewness :- {SKI}	0.0110	Unitless	DC	-1	UKAS	LE	1368
Kurtosis	0.952	Unitless	DC	0	UKAS	LE	1368
Particle Diameter : Mean	0.170	mm	DC	0	UKAS	LE	1368
Particle Diameter : Median	0.123	mm	DC	0	UKAS	LE	1368
Sorting Coefficient	0.608	Unitless	DC	0	UKAS	LE	1368
Grain Size Fraction : < 0.98 microns : {>10 phi}	0.00	%	DC	0	UKAS	LE	1370
Grain Size Fraction : >1000 microns : {<0 phi}	0.508	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 0.98 to 1.38 microns : {10 to 9.5 phi}	0.00	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 1.38 to 1.95 microns : {9.5 to 9 phi}	0.00	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 1.95 to 2.76 microns : {9 to 8.5 phi}	0.00	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 11.1 to 15.6 microns : {6.5 to 6 phi}	0.149	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 125 to 177 microns : {3 to 2.5 phi}	29.3	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 15.6 to 22.1 microns : {6 to 5.5 phi}	0.00	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 177 to 250 microns : {2.5 to 2 phi}	15.2	%	DC	0	UKAS	LE	1370

Grain Size Fraction : 2.76 to 3.91 microns : {8.5 to 8 phi}	0.00	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 22.1 to 31.3 microns : {5.5 to 5 phi}	0.00	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 250 to 354 microns : {2 to 1.5 phi}	3.32	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 3.91 to 5.52 microns : {8 to 7.5 phi}	0.00	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 31.3 to 44.2 microns : {5 to 4.5 phi}	0.0597	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 354 to 500 microns : {1.5 to 1 phi}	0.0398	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 44.2 to 62.5 microns : {4.5 to 4 phi}	3.72	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 5.52 to 7.81 microns : {7.5 to 7 phi}	0.149	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 500 to 707 microns : {1 to 0.5 phi}	0.00	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 62.5 to 88.4 microns : {4 to 3.5 phi}	16.8	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 7.81 to 11.1 microns : {7 to 6.5 phi}	0.239	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 707 to 1000 microns : {0.5 to 0 phi}	0.00	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 88.4 to 125 microns : {3.5 to 3 phi}	30.5	%	DC	0	UKAS	LE	1370
Hydrocarbons : Total : Dry Wt as Ekofisk	5.88	mg/kg		0.03	UKAS	LE	402
Mercury : Dry Wt	0.0138	mg/kg		0.002	UKAS	LE	1082
Aluminium, HF Digest : Dry Wt	24300	mg/kg	DC	50	UKAS	LE	756
Arsenic, HF Digest : Dry Wt	11.9	mg/kg		0.2	UKAS	LE	341
Cadmium, HF Digest : Dry Wt	0.270	mg/kg		0.01	UKAS	LE	341
Chromium, HF Digest : Dry Wt	505	mg/kg		3	UKAS	LE	341
Copper, HF Digest : Dry Wt	19.6	mg/kg		0.4	UKAS	LE	341
Lead, HF Digest : Dry Wt	15.5	mg/kg		0.2	UKAS	LE	341
Lithium, HF Digest : Dry Wt	18.5	mg/kg		0.1	UKAS	LE	341
Nickel, HF Digest : Dry Wt	21.2	mg/kg		0.6	UKAS	LE	341
Zinc : HF Digest : Dry Wt	52.3	mg/kg		0.05	UKAS	LE	341
Aldrin : Dry Wt	<0.5	ug/kg		0.5	UKAS	LE	672
DDE -pp : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
DDT -op : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
DDT -pp : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
Dieldrin : Dry Wt	<0.5	ug/kg		0.5	UKAS	LE	672
Endrin : Dry Wt	<0.5	ug/kg		0.5	UKAS	LE	672
HCH -alpha : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
HCH -beta : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
HCH -delta : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
HCH -gamma : Dry Wt :- {Lindane}	<0.1	ug/kg		0.1	UKAS	LE	672
Hexachlorobenzene : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
Hexachlorobutadiene : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
Isodrin : Dry Wt	<0.5	ug/kg		0.5	UKAS	LE	672
TDE - pp : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
Acenaphthene : Dry Wt	<1	ug/kg		1	UKAS	LE	1051
Acenaphthylene : Dry Wt	<1	ug/kg		1	None	LE	1051
Anthracene : Dry Wt	<1	ug/kg		1	UKAS	LE	1051
Benzo(a)anthracene : Dry Wt	<1	ug/kg		1	UKAS	LE	1051
Benzo(a)pyrene : Dry Wt	<1	ug/kg		1	UKAS	LE	1051
Benzo(b)fluoranthene : Dry Wt	<1	ug/kg		1	UKAS	LE	1051
Benzo(ghi)perylene : Dry Wt	<1	ug/kg		1	UKAS	LE	1051
Benzo(k)fluoranthene : Dry Wt	<1	ug/kg		1	UKAS	LE	1051
Chrysene : Dry Wt	<3	ug/kg		3	UKAS	LE	1051
Dibenzo(ah)anthracene : Dry Wt	<1	ug/kg		1	UKAS	LE	1051
Fluoranthene : Dry Wt	<1	ug/kg		1	UKAS	LE	1051
Fluorene : Dry Wt	<5	ug/kg		5	UKAS	LE	1051
Indeno(1,2,3-c,d)pyrene : Dry Wt	<1	ug/kg		1	UKAS	LE	1051

Naphthalene : Dry Wt	<5	ug/kg	*5*	UKAS	LE	1051
Phenanthrene : Dry Wt	<5	ug/kg	*5*	UKAS	LE	1051
Pyrene : Dry Wt	<1	ug/kg	*1*	UKAS	LE	1051
PCB - 028 : Dry Wt	<0.1	ug/kg	*0.1*	UKAS	LE	685
PCB - 052 : Dry Wt	<0.1	ug/kg	*0.1*	UKAS	LE	685
PCB - 101 : Dry Wt	<0.1	ug/kg	*0.1*	UKAS	LE	685
PCB - 118 : Dry Wt	<0.1	ug/kg	*0.1*	UKAS	LE	685
PCB - 138 : Dry Wt	<0.1	ug/kg	*0.1*	UKAS	LE	685
PCB - 153 : Dry Wt	<0.1	ug/kg	*0.1*	UKAS	LE	685
PCB - 180 : Dry Wt	<0.1	ug/kg	*0.1*	UKAS	LE	685
Dibutyl Tin : Dry Wt as Cation	<4	ug/kg ELEVATED_MRV : Dry weight calculation	*3*	UKAS	LE	897
Tributyl Tin : Dry Wt as Cation	<4	ug/kg ELEVATED_MRV : Dry weight calculation	*3*	UKAS	LE	897
Dry Solids @ 30°C	78.4	%	*0.5*	None	LE	1130
Dry Solids @ 105°C	77.9	%	*0.5*	UKAS	LE	911
Loss on Ignition @ 500°C	1.12	%	*0.5*	UKAS	LE	911
Accreditation Assessment	2	No.		None	LE	924
Sample Preparation	Report	Text		None	LE	924

The sample appeared to be dark-grey sandy-sediment with shells.

485.75g of the sample was taken for drying at <30degC which gave 382.23g of dried sample (weights include tray weight).
The sample was crushed using a jaw crusher.
The sample was then sieved until it passed through a 2mm sieve.
The sample was received unpreserved.

All parameters are determined on the air-dried (<30degC) portion except those requiring a wet sample fraction where as received (wet) sample was used.

Dry Weight (DW) results are reported as determined at <30degC.

National Laboratory Service

Analytical Report

Final Report - Amended - Issue 3

Report ID - 20066786 - 3

Batch description: Dunlaoghaire

UKAS TESTING 0754

Reported on: 22-Aug-2014

Client: IGSL Ltd

Project: Marine Sediment

Quote Description: Marine Sediment

Folder No: 002819528

Sampled on: 24-Jun-14 @ 13:00

Comments: BH7 - GL-1.00m

Quote No: 11280

Matrix: Sediment

Analyte	Result	Units	Flag	MRV	Accred	Lab ID	Testcode
Carbonate as C : Dry Wt	<0.700	%	DC		None	NLS	864
DDT : Sum of components : Dry Wt	NoResult	ug/kg			None	NLS	864
Moisture Content, Air dried 105 C	19.5	%	DC		None	NLS	864
PAH : Total : Dry Wt :- {Polynuclear Aromatic Hydrocarbon	<0.0327	mg/kg	DC		None	NLS	864
PCB : Total (28, 52, 101, 118, 138, 153, 180)	<0.000700	mg/kg	DC		None	NLS	864
Carbon : Dry Wt	1.10	%	DC	0.4	UKAS	LE	404
Carbon, Organic : Dry Wt as C	<0.4	%	DC	0.4	UKAS	LE	404
Grain Size Fraction : <1000 microns : {>0 phi}	99.4	%	DC	0	None	LE	1369
Grain Size Fraction : > 63000 microns : {< -6.0 phi}	0.00	%	DC	0	None	LE	1369
Grain Size Fraction : 1000 to 1400 mic : {0 to -0.5phi}	0.154	%	DC	0	None	LE	1369
Grain Size Fraction : 11200 to 16000 mic : {-3.5 to -4.0phi}	0.00	%	DC	0	None	LE	1369
Grain Size Fraction : 1400 to 2000 mic : {-0.5 to -1.0phi}	0.162	%	DC	0	None	LE	1369
Grain Size Fraction : 16000 to 22400 mic : {-4.0 to -4.5phi}	0.00	%	DC	0	None	LE	1369
Grain Size Fraction : 2000 to 2800 mic : {-1.0 to -1.5phi}	0.116	%	DC	0	None	LE	1369
Grain Size Fraction : 22400 to 31500 mic : {-4.5 to -5.0phi}	0.00	%	DC	0	None	LE	1369
Grain Size Fraction : 2800 to 4000 mic : {-1.5 to -2.0phi}	0.0899	%	DC	0	None	LE	1369
Grain Size Fraction : 31500 to 45000 mic : {-5.0 to -5.5phi}	0.00	%	DC	0	None	LE	1369
Grain Size Fraction : 4000 to 5600 mic : {-2.0 to -2.5phi}	0.0384	%	DC	0	None	LE	1369
Grain Size Fraction : 45000 to 63000 mic : {-5.5 to -6.0phi}	0.00	%	DC	0	None	LE	1369
Grain Size Fraction : 5600 to 8000 mic : {-2.5 to -3.0phi}	0.00786	%	DC	0	None	LE	1369
Grain Size Fraction : 8000 to 11200 mic : {-3.0 to -3.5phi}	0.00	%	DC	0	None	LE	1369
Particle Size Report	Report	Text	DC		None	LE	1369
The sample was a slightly gravelly sand. The entire sample was analysed.							
Raw Data Report	Report	Text	DC	0	None	LE	1369
NO_RESULT : Analyte not applicable							
Grain Size Inclusive Kurtosis	0.505	mm	DC	0	UKAS	LE	1368
Grain Size Inclusive Mean	0.155	mm	DC	0	UKAS	LE	1368
Inclusive Graphic Skewness :- {SKI}	0.0110	Unitless	DC	-1	UKAS	LE	1368
Kurtosis	0.986	Unitless	DC	0	UKAS	LE	1368
Particle Diameter : Mean	0.179	mm	DC	0	UKAS	LE	1368
Particle Diameter : Median	0.156	mm	DC	0	UKAS	LE	1368
Sorting Coefficient	0.562	Unitless	DC	0	UKAS	LE	1368
Grain Size Fraction : < 0.98 microns : {>10 phi}	0.00	%	DC	0	UKAS	LE	1370
Grain Size Fraction : >1000 microns : {<0 phi}	0.568	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 0.98 to 1.38 microns : {10 to 9.5 phi}	0.00	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 1.38 to 1.95 microns : {9.5 to 9 phi}	0.00	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 1.95 to 2.76 microns : {9 to 8.5 phi}	0.00	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 11.1 to 15.6 microns : {6.5 to 6 phi}	0.249	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 125 to 177 microns : {3 to 2.5 phi}	36.4	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 15.6 to 22.1 microns : {6 to 5.5 phi}	0.0298	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 177 to 250 microns : {2.5 to 2 phi}	27.1	%	DC	0	UKAS	LE	1370

Grain Size Fraction : 2.76 to 3.91 microns : {8.5 to 8 phi}	0.189	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 22.1 to 31.3 microns : {5.5 to 5 phi}	0.00	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 250 to 354 microns : {2 to 1.5 phi}	8.47	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 3.91 to 5.52 microns : {8 to 7.5 phi}	0.229	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 31.3 to 44.2 microns : {5 to 4.5 phi}	0.00	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 354 to 500 microns : {1.5 to 1 phi}	0.398	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 44.2 to 62.5 microns : {4.5 to 4 phi}	0.0696	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 5.52 to 7.81 microns : {7.5 to 7 phi}	0.278	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 500 to 707 microns : {1 to 0.5 phi}	0.00	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 62.5 to 88.4 microns : {4 to 3.5 phi}	4.23	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 7.81 to 11.1 microns : {7 to 6.5 phi}	0.328	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 707 to 1000 microns : {0.5 to 0 phi}	0.00	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 88.4 to 125 microns : {3.5 to 3 phi}	21.5	%	DC	0	UKAS	LE	1370
Hydrocarbons : Total : Dry Wt as Ekofisk	9.19	mg/kg		0.03	UKAS	LE	402
Mercury : Dry Wt	0.0300	mg/kg		0.002	UKAS	LE	1082
Aluminium, HF Digest : Dry Wt	25400	mg/kg	DC	50	UKAS	LE	756
Arsenic, HF Digest : Dry Wt	12.3	mg/kg		0.2	UKAS	LE	341
Cadmium, HF Digest : Dry Wt	0.231	mg/kg		0.01	UKAS	LE	341
Chromium, HF Digest : Dry Wt	179	mg/kg		3	UKAS	LE	341
Copper, HF Digest : Dry Wt	20.5	mg/kg		0.4	UKAS	LE	341
Lead, HF Digest : Dry Wt	20.1	mg/kg		0.2	UKAS	LE	341
Lithium, HF Digest : Dry Wt	25.5	mg/kg		0.1	UKAS	LE	341
Nickel, HF Digest : Dry Wt	18.6	mg/kg		0.6	UKAS	LE	341
Zinc : HF Digest : Dry Wt	47.7	mg/kg		0.05	UKAS	LE	341
Aldrin : Dry Wt	<0.5	ug/kg		0.5	UKAS	LE	672
DDE -pp : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
DDT -op : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
DDT -pp : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
Dieldrin : Dry Wt	<0.5	ug/kg		0.5	UKAS	LE	672
Endrin : Dry Wt	<0.5	ug/kg		0.5	UKAS	LE	672
HCH -alpha : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
HCH -beta : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
HCH -delta : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
HCH -gamma : Dry Wt :- {Lindane}	<0.1	ug/kg		0.1	UKAS	LE	672
Hexachlorobenzene : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
Hexachlorobutadiene : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
Isodrin : Dry Wt	<0.5	ug/kg		0.5	UKAS	LE	672
TDE - pp : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
Acenaphthene : Dry Wt	<1	ug/kg		1	UKAS	LE	1051
Acenaphthylene : Dry Wt	<1	ug/kg		1	None	LE	1051
Anthracene : Dry Wt	<1	ug/kg		1	UKAS	LE	1051
Benzo(a)anthracene : Dry Wt	1.65	ug/kg		1	UKAS	LE	1051
Benzo(a)pyrene : Dry Wt	1.64	ug/kg		1	UKAS	LE	1051
Benzo(b)fluoranthene : Dry Wt	1.56	ug/kg		1	UKAS	LE	1051
Benzo(ghi)perylene : Dry Wt	<1	ug/kg		1	UKAS	LE	1051
Benzo(k)fluoranthene : Dry Wt	<1	ug/kg		1	UKAS	LE	1051
Chrysene : Dry Wt	<3	ug/kg		3	UKAS	LE	1051
Dibenzo(ah)anthracene : Dry Wt	<1	ug/kg		1	UKAS	LE	1051
Fluoranthene : Dry Wt	1.74	ug/kg		1	UKAS	LE	1051
Fluorene : Dry Wt	<5	ug/kg		5	UKAS	LE	1051
Indeno(1,2,3-c,d)pyrene : Dry Wt	<1	ug/kg		1	UKAS	LE	1051

Naphthalene : Dry Wt	<5	ug/kg	*5*	UKAS	LE	1051
Phenanthrene : Dry Wt	<5	ug/kg	*5*	UKAS	LE	1051
Pyrene : Dry Wt	2.13	ug/kg	*1*	UKAS	LE	1051
PCB - 028 : Dry Wt	<0.1	ug/kg	*0.1*	UKAS	LE	685
PCB - 052 : Dry Wt	<0.1	ug/kg	*0.1*	UKAS	LE	685
PCB - 101 : Dry Wt	<0.1	ug/kg	*0.1*	UKAS	LE	685
PCB - 118 : Dry Wt	<0.1	ug/kg	*0.1*	UKAS	LE	685
PCB - 138 : Dry Wt	<0.1	ug/kg	*0.1*	UKAS	LE	685
PCB - 153 : Dry Wt	<0.1	ug/kg	*0.1*	UKAS	LE	685
PCB - 180 : Dry Wt	<0.1	ug/kg	*0.1*	UKAS	LE	685
Dibutyl Tin : Dry Wt as Cation	<4	ug/kg ELEVATED_MRV : Dry weight calculation	*3*	UKAS	LE	897
Tributyl Tin : Dry Wt as Cation	<4	ug/kg ELEVATED_MRV : Dry weight calculation	*3*	UKAS	LE	897
Dry Solids @ 30°C	80.0	%	*0.5*	None	LE	1130
Dry Solids @ 105°C	80.5	%	*0.5*	UKAS	LE	911
Loss on Ignition @ 500°C	1.01	%	*0.5*	UKAS	LE	911
Accreditation Assessment	2	No.		None	LE	924
Sample Preparation	Report	Text		None	LE	924

The sample appeared to be dark-grey sandy-sediment with shells.

344.01g of the sample was taken for drying at <30degC which gave 276.36g of dried sample (weights include tray weight).
The sample was crushed using a jaw crusher.
The sample was then sieved until it passed through a 2mm sieve.
The sample was received unpreserved.

All parameters are determined on the air-dried (<30degC) portion except those requiring a wet sample fraction where as received (wet) sample was used.

Dry Weight (DW) results are reported as determined at <30degC.

National Laboratory Service

Analytical Report

Final Report - Amended - Issue 3

Report ID - 20066786 - 3

Batch description: Dunlaoghaire

UKAS TESTING 0754

Reported on: 22-Aug-2014

Client: IGSL Ltd

Project: Marine Sediment

Quote Description: Marine Sediment

Folder No: 002819529

Sampled on: 24-Jun-14 @ 13:00

Comments: BH10 - 3.00-4.00m

Quote No: 11280

Matrix: Sediment

Analyte	Result	Units	Flag	MRV	Accred	Lab ID	Testcode
Carbonate as C : Dry Wt	1.54	%	DC		None	NLS	864
DDT : Sum of components : Dry Wt	NoResult	ug/kg			None	NLS	864
Moisture Content, Air dried 105 C	29.8	%	DC		None	NLS	864
PAH : Total : Dry Wt :- {Polynuclear Aromatic Hydrocarbon	<0.0466	mg/kg	DC		None	NLS	864
PCB : Total (28, 52, 101, 118, 138, 153, 180)	<0.000700	mg/kg	DC		None	NLS	864
Carbon : Dry Wt	2.20	%	DC	0.4	UKAS	LE	404
Carbon, Organic : Dry Wt as C	0.662	%	DC	0.4	UKAS	LE	404
Grain Size Fraction : <1000 microns : {>0 phi}	99.9	%	DC	0	None	LE	1369
Grain Size Fraction : > 63000 microns : {< -6.0 phi}	0.00	%	DC	0	None	LE	1369
Grain Size Fraction : 1000 to 1400 mic : {0 to -0.5phi}	0.0160	%	DC	0	None	LE	1369
Grain Size Fraction : 11200 to 16000 mic : {-3.5 to -4.0phi}	0.00	%	DC	0	None	LE	1369
Grain Size Fraction : 1400 to 2000 mic : {-0.5 to -1.0phi}	0.0152	%	DC	0	None	LE	1369
Grain Size Fraction : 16000 to 22400 mic : {-4.0 to -4.5phi}	0.00	%	DC	0	None	LE	1369
Grain Size Fraction : 2000 to 2800 mic : {-1.0 to -1.5phi}	0.0112	%	DC	0	None	LE	1369
Grain Size Fraction : 22400 to 31500 mic : {-4.5 to -5.0phi}	0.00	%	DC	0	None	LE	1369
Grain Size Fraction : 2800 to 4000 mic : {-1.5 to -2.0phi}	0.00878	%	DC	0	None	LE	1369
Grain Size Fraction : 31500 to 45000 mic : {-5.0 to -5.5phi}	0.00	%	DC	0	None	LE	1369
Grain Size Fraction : 4000 to 5600 mic : {-2.0 to -2.5phi}	0.00	%	DC	0	None	LE	1369
Grain Size Fraction : 45000 to 63000 mic : {-5.5 to -6.0phi}	0.00	%	DC	0	None	LE	1369
Grain Size Fraction : 5600 to 8000 mic : {-2.5 to -3.0phi}	0.00	%	DC	0	None	LE	1369
Grain Size Fraction : 8000 to 11200 mic : {-3.0 to -3.5phi}	0.00	%	DC	0	None	LE	1369
Particle Size Report	Report	Text	DC		None	LE	1369
The sample was a slightly gravelly sandy mud. The entire sample was analysed.							
Raw Data Report	Report	Text	DC	0	None	LE	1369
NO_RESULT : Analyte not applicable							
Grain Size Inclusive Kurtosis	0.549	mm	DC	0	UKAS	LE	1368
Grain Size Inclusive Mean	0.0200	mm	DC	0	UKAS	LE	1368
Inclusive Graphic Skewness :- {SKI}	-0.387	Unitless	DC	-1	UKAS	LE	1368
Kurtosis	0.866	Unitless	DC	0	UKAS	LE	1368
Particle Diameter : Mean	0.0440	mm	DC	0	UKAS	LE	1368
Particle Diameter : Median	0.0300	mm	DC	0	UKAS	LE	1368
Sorting Coefficient	2.21	Unitless	DC	0	UKAS	LE	1368
Grain Size Fraction : < 0.98 microns : {>10 phi}	4.81	%	DC	0	UKAS	LE	1370
Grain Size Fraction : >1000 microns : {<0 phi}	0.0511	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 0.98 to 1.38 microns : {10 to 9.5 phi}	2.67	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 1.38 to 1.95 microns : {9.5 to 9 phi}	2.74	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 1.95 to 2.76 microns : {9 to 8.5 phi}	3.31	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 11.1 to 15.6 microns : {6.5 to 6 phi}	5.28	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 125 to 177 microns : {3 to 2.5 phi}	3.85	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 15.6 to 22.1 microns : {6 to 5.5 phi}	6.04	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 177 to 250 microns : {2.5 to 2 phi}	0.720	%	DC	0	UKAS	LE	1370

Grain Size Fraction : 2.76 to 3.91 microns : {8.5 to 8 phi}	4.25	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 22.1 to 31.3 microns : {5.5 to 5 phi}	7.33	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 250 to 354 microns : {2 to 1.5 phi}	0.00	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 3.91 to 5.52 microns : {8 to 7.5 phi}	4.45	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 31.3 to 44.2 microns : {5 to 4.5 phi}	9.76	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 354 to 500 microns : {1.5 to 1 phi}	0.00	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 44.2 to 62.5 microns : {4.5 to 4 phi}	12.6	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 5.52 to 7.81 microns : {7.5 to 7 phi}	4.87	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 500 to 707 microns : {1 to 0.5 phi}	0.00	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 62.5 to 88.4 microns : {4 to 3.5 phi}	13.0	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 7.81 to 11.1 microns : {7 to 6.5 phi}	5.16	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 707 to 1000 microns : {0.5 to 0 phi}	0.00	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 88.4 to 125 microns : {3.5 to 3 phi}	9.21	%	DC	0	UKAS	LE	1370
Hydrocarbons : Total : Dry Wt as Ekofisk	35.8	mg/kg		0.03	UKAS	LE	402
Mercury : Dry Wt	0.0160	mg/kg		0.002	UKAS	LE	1082
Aluminium, HF Digest : Dry Wt	43100	mg/kg	DC	50	UKAS	LE	756
Arsenic, HF Digest : Dry Wt	11.5	mg/kg		0.2	UKAS	LE	341
Cadmium, HF Digest : Dry Wt	0.201	mg/kg		0.01	UKAS	LE	341
Chromium, HF Digest : Dry Wt	94.0	mg/kg		3	UKAS	LE	341
Copper, HF Digest : Dry Wt	22.7	mg/kg		0.4	UKAS	LE	341
Lead, HF Digest : Dry Wt	14.7	mg/kg		0.2	UKAS	LE	341
Lithium, HF Digest : Dry Wt	47.3	mg/kg		0.1	UKAS	LE	341
Nickel, HF Digest : Dry Wt	30.6	mg/kg		0.6	UKAS	LE	341
Zinc : HF Digest : Dry Wt	60.4	mg/kg		0.05	UKAS	LE	341
Aldrin : Dry Wt	<0.5	ug/kg		0.5	UKAS	LE	672
DDE -pp : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
DDT -op : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
DDT -pp : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
Dieldrin : Dry Wt	<0.5	ug/kg		0.5	UKAS	LE	672
Endrin : Dry Wt	<0.5	ug/kg		0.5	UKAS	LE	672
HCH -alpha : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
HCH -beta : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
HCH -delta : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
HCH -gamma : Dry Wt :- {Lindane}	<0.1	ug/kg		0.1	UKAS	LE	672
Hexachlorobenzene : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
Hexachlorobutadiene : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
Isodrin : Dry Wt	<0.5	ug/kg		0.5	UKAS	LE	672
TDE - pp : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
Acenaphthene : Dry Wt	<1	ug/kg		1	UKAS	LE	1051
Acenaphthylene : Dry Wt	<1	ug/kg		1	None	LE	1051
Anthracene : Dry Wt	<1	ug/kg		1	UKAS	LE	1051
Benzo(a)anthracene : Dry Wt	1.52	ug/kg		1	UKAS	LE	1051
Benzo(a)pyrene : Dry Wt	1.78	ug/kg		1	UKAS	LE	1051
Benzo(b)fluoranthene : Dry Wt	4.96	ug/kg		1	UKAS	LE	1051
Benzo(ghi)perylene : Dry Wt	3.94	ug/kg		1	UKAS	LE	1051
Benzo(k)fluoranthene : Dry Wt	1.31	ug/kg		1	UKAS	LE	1051
Chrysene : Dry Wt	3.94	ug/kg		3	UKAS	LE	1051
Dibenzo(ah)anthracene : Dry Wt	<1	ug/kg		1	UKAS	LE	1051
Fluoranthene : Dry Wt	2.87	ug/kg		1	UKAS	LE	1051
Fluorene : Dry Wt	<5	ug/kg		5	UKAS	LE	1051
Indeno(1,2,3-c,d)pyrene : Dry Wt	<1	ug/kg		1	UKAS	LE	1051

Naphthalene : Dry Wt	<5	ug/kg	*5*	UKAS	LE	1051
Phenanthrene : Dry Wt	8.93	ug/kg	*5*	UKAS	LE	1051
Pyrene : Dry Wt	3.36	ug/kg	*1*	UKAS	LE	1051
PCB - 028 : Dry Wt	<0.1	ug/kg	*0.1*	UKAS	LE	685
PCB - 052 : Dry Wt	<0.1	ug/kg	*0.1*	UKAS	LE	685
PCB - 101 : Dry Wt	<0.1	ug/kg	*0.1*	UKAS	LE	685
PCB - 118 : Dry Wt	<0.1	ug/kg	*0.1*	UKAS	LE	685
PCB - 138 : Dry Wt	<0.1	ug/kg	*0.1*	UKAS	LE	685
PCB - 153 : Dry Wt	<0.1	ug/kg	*0.1*	UKAS	LE	685
PCB - 180 : Dry Wt	<0.1	ug/kg	*0.1*	UKAS	LE	685
Dibutyl Tin : Dry Wt as Cation	<4	ug/kg ELEVATED_MRV : Dry weight calculation	*3*	UKAS	LE	897
Tributyl Tin : Dry Wt as Cation	<4	ug/kg ELEVATED_MRV : Dry weight calculation	*3*	UKAS	LE	897
Dry Solids @ 30°C	73.9	%	*0.5*	None	LE	1130
Dry Solids @ 105°C	70.2	%	*0.5*	UKAS	LE	911
Loss on Ignition @ 500°C	3.90	%	*0.5*	UKAS	LE	911
Accreditation Assessment	2	No.		None	LE	924
Sample Preparation	Report	Text		None	LE	924

The sample appeared to be dark-grey clay sediment.

350.22g of the sample was taken for drying at <30degC which gave 260.17g of dried sample (weights include tray weight).
The sample was crushed using a jaw crusher.
The sample was then sieved until it passed through a 2mm sieve.
The sample was received unpreserved.

All parameters are determined on the air-dried (<30degC) portion except those requiring a wet sample fraction where as received (wet) sample was used.

Dry Weight (DW) results are reported as determined at <30degC.

National Laboratory Service

Analytical Report

Final Report - Amended - Issue 3

Report ID - 20066786 - 3

Batch description: Dunlaoghaire

UKAS TESTING 0754

Reported on: 22-Aug-2014

Client: IGSL Ltd

Project: Marine Sediment

Quote Description: Marine Sediment

Folder No: 002819530

Sampled on: 24-Jun-14 @ 13:00

Comments: BH7 - 3.00-4.00m

Quote No: 11280

Matrix: Sediment

Analyte	Result	Units	Flag	MRV	Accred	Lab ID	Testcode
Carbonate as C : Dry Wt	<1.40	%	DC		None	NLS	864
DDT : Sum of components : Dry Wt	NoResult	ug/kg			None	NLS	864
Moisture Content, Air dried 105 C	16.4	%	DC		None	NLS	864
PAH : Total : Dry Wt :- {Polynuclear Aromatic Hydrocarbon	<0.0290	mg/kg	DC		None	NLS	864
PCB : Total (28, 52, 101, 118, 138, 153, 180)	<0.000700	mg/kg	DC		None	NLS	864
Carbon : Dry Wt	1.80	%	DC	0.4	UKAS	LE	404
Carbon, Organic : Dry Wt as C	<0.4	%	DC	0.4	UKAS	LE	404
Grain Size Fraction : <1000 microns : {>0 phi}	98.9	%	DC	0	None	LE	1369
Grain Size Fraction : > 63000 microns : {< -6.0 phi}	0.00	%	DC	0	None	LE	1369
Grain Size Fraction : 1000 to 1400 mic : {0 to -0.5phi}	0.193	%	DC	0	None	LE	1369
Grain Size Fraction : 11200 to 16000 mic : {-3.5 to -4.0phi}	0.0366	%	DC	0	None	LE	1369
Grain Size Fraction : 1400 to 2000 mic : {-0.5 to -1.0phi}	0.230	%	DC	0	None	LE	1369
Grain Size Fraction : 16000 to 22400 mic : {-4.0 to -4.5phi}	0.00	%	DC	0	None	LE	1369
Grain Size Fraction : 2000 to 2800 mic : {-1.0 to -1.5phi}	0.193	%	DC	0	None	LE	1369
Grain Size Fraction : 22400 to 31500 mic : {-4.5 to -5.0phi}	0.00	%	DC	0	None	LE	1369
Grain Size Fraction : 2800 to 4000 mic : {-1.5 to -2.0phi}	0.226	%	DC	0	None	LE	1369
Grain Size Fraction : 31500 to 45000 mic : {-5.0 to -5.5phi}	0.00	%	DC	0	None	LE	1369
Grain Size Fraction : 4000 to 5600 mic : {-2.0 to -2.5phi}	0.151	%	DC	0	None	LE	1369
Grain Size Fraction : 45000 to 63000 mic : {-5.5 to -6.0phi}	0.00	%	DC	0	None	LE	1369
Grain Size Fraction : 5600 to 8000 mic : {-2.5 to -3.0phi}	0.0575	%	DC	0	None	LE	1369
Grain Size Fraction : 8000 to 11200 mic : {-3.0 to -3.5phi}	0.0139	%	DC	0	None	LE	1369
Particle Size Report	Report	Text	DC		None	LE	1369
The sample was a slightly gravelly sand. The entire sample was analysed.							
Raw Data Report	Report	Text	DC	0	None	LE	1369
NO_RESULT : Analyte not applicable							
Grain Size Inclusive Kurtosis	0.510	mm	DC	0	UKAS	LE	1368
Grain Size Inclusive Mean	0.126	mm	DC	0	UKAS	LE	1368
Inclusive Graphic Skewness :- {SKI}	0.00800	Unitless	DC	-1	UKAS	LE	1368
Kurtosis	0.972	Unitless	DC	0	UKAS	LE	1368
Particle Diameter : Mean	0.173	mm	DC	0	UKAS	LE	1368
Particle Diameter : Median	0.125	mm	DC	0	UKAS	LE	1368
Sorting Coefficient	0.633	Unitless	DC	0	UKAS	LE	1368
Grain Size Fraction : < 0.98 microns : {>10 phi}	0.00	%	DC	0	UKAS	LE	1370
Grain Size Fraction : >1000 microns : {<0 phi}	1.10	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 0.98 to 1.38 microns : {10 to 9.5 phi}	0.00	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 1.38 to 1.95 microns : {9.5 to 9 phi}	0.00	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 1.95 to 2.76 microns : {9 to 8.5 phi}	0.129	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 11.1 to 15.6 microns : {6.5 to 6 phi}	0.317	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 125 to 177 microns : {3 to 2.5 phi}	29.3	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 15.6 to 22.1 microns : {6 to 5.5 phi}	0.198	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 177 to 250 microns : {2.5 to 2 phi}	15.8	%	DC	0	UKAS	LE	1370

Grain Size Fraction : 2.76 to 3.91 microns : {8.5 to 8 phi}	0.228	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 22.1 to 31.3 microns : {5.5 to 5 phi}	0.00	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 250 to 354 microns : {2 to 1.5 phi}	3.74	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 3.91 to 5.52 microns : {8 to 7.5 phi}	0.218	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 31.3 to 44.2 microns : {5 to 4.5 phi}	0.0594	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 354 to 500 microns : {1.5 to 1 phi}	0.0891	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 44.2 to 62.5 microns : {4.5 to 4 phi}	3.32	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 5.52 to 7.81 microns : {7.5 to 7 phi}	0.218	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 500 to 707 microns : {1 to 0.5 phi}	0.0792	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 62.5 to 88.4 microns : {4 to 3.5 phi}	15.5	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 7.81 to 11.1 microns : {7 to 6.5 phi}	0.277	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 707 to 1000 microns : {0.5 to 0 phi}	0.208	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 88.4 to 125 microns : {3.5 to 3 phi}	29.3	%	DC	0	UKAS	LE	1370
Hydrocarbons : Total : Dry Wt as Ekofisk	4.54	mg/kg		0.03	UKAS	LE	402
Mercury : Dry Wt	0.0505	mg/kg		0.002	UKAS	LE	1082
Aluminium, HF Digest : Dry Wt	24600	mg/kg	DC	50	UKAS	LE	756
Arsenic, HF Digest : Dry Wt	11.6	mg/kg		0.2	UKAS	LE	341
Cadmium, HF Digest : Dry Wt	0.286	mg/kg		0.01	UKAS	LE	341
Chromium, HF Digest : Dry Wt	350	mg/kg		3	UKAS	LE	341
Copper, HF Digest : Dry Wt	18.7	mg/kg		0.4	UKAS	LE	341
Lead, HF Digest : Dry Wt	14.2	mg/kg		0.2	UKAS	LE	341
Lithium, HF Digest : Dry Wt	22.3	mg/kg		0.1	UKAS	LE	341
Nickel, HF Digest : Dry Wt	23.0	mg/kg		0.6	UKAS	LE	341
Zinc : HF Digest : Dry Wt	51.2	mg/kg		0.05	UKAS	LE	341
Aldrin : Dry Wt	<0.5	ug/kg		0.5	UKAS	LE	672
DDE -pp : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
DDT -op : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
DDT -pp : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
Dieldrin : Dry Wt	<0.5	ug/kg		0.5	UKAS	LE	672
Endrin : Dry Wt	<0.5	ug/kg		0.5	UKAS	LE	672
HCH -alpha : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
HCH -beta : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
HCH -delta : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
HCH -gamma : Dry Wt :- {Lindane}	<0.1	ug/kg		0.1	UKAS	LE	672
Hexachlorobenzene : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
Hexachlorobutadiene : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
Isodrin : Dry Wt	<0.5	ug/kg		0.5	UKAS	LE	672
TDE - pp : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
Acenaphthene : Dry Wt	<1	ug/kg		1	UKAS	LE	1051
Acenaphthylene : Dry Wt	<1	ug/kg		1	None	LE	1051
Anthracene : Dry Wt	<1	ug/kg		1	UKAS	LE	1051
Benzo(a)anthracene : Dry Wt	<1	ug/kg		1	UKAS	LE	1051
Benzo(a)pyrene : Dry Wt	<1	ug/kg		1	UKAS	LE	1051
Benzo(b)fluoranthene : Dry Wt	<1	ug/kg		1	UKAS	LE	1051
Benzo(ghi)perylene : Dry Wt	<1	ug/kg		1	UKAS	LE	1051
Benzo(k)fluoranthene : Dry Wt	<1	ug/kg		1	UKAS	LE	1051
Chrysene : Dry Wt	<3	ug/kg		3	UKAS	LE	1051
Dibenzo(ah)anthracene : Dry Wt	<1	ug/kg		1	UKAS	LE	1051
Fluoranthene : Dry Wt	<1	ug/kg		1	UKAS	LE	1051
Fluorene : Dry Wt	<5	ug/kg		5	UKAS	LE	1051
Indeno(1,2,3-c,d)pyrene : Dry Wt	<1	ug/kg		1	UKAS	LE	1051

Naphthalene : Dry Wt	<5	ug/kg	*5*	UKAS	LE	1051
Phenanthrene : Dry Wt	<5	ug/kg	*5*	UKAS	LE	1051
Pyrene : Dry Wt	<1	ug/kg	*1*	UKAS	LE	1051
PCB - 028 : Dry Wt	<0.1	ug/kg	*0.1*	UKAS	LE	685
PCB - 052 : Dry Wt	<0.1	ug/kg	*0.1*	UKAS	LE	685
PCB - 101 : Dry Wt	<0.1	ug/kg	*0.1*	UKAS	LE	685
PCB - 118 : Dry Wt	<0.1	ug/kg	*0.1*	UKAS	LE	685
PCB - 138 : Dry Wt	<0.1	ug/kg	*0.1*	UKAS	LE	685
PCB - 153 : Dry Wt	<0.1	ug/kg	*0.1*	UKAS	LE	685
PCB - 180 : Dry Wt	<0.1	ug/kg	*0.1*	UKAS	LE	685
Dibutyl Tin : Dry Wt as Cation	<4	ug/kg ELEVATED_MRV : Dry weight calculation	*3*	UKAS	LE	897
Tributyl Tin : Dry Wt as Cation	<4	ug/kg ELEVATED_MRV : Dry weight calculation	*3*	UKAS	LE	897
Dry Solids @ 30°C	82.8	%	*0.5*	None	LE	1130
Dry Solids @ 105°C	83.6	%	*0.5*	UKAS	LE	911
Loss on Ignition @ 500°C	1.03	%	*0.5*	UKAS	LE	911
Accreditation Assessment	2	No.		None	LE	924
Sample Preparation	Report	Text		None	LE	924

The sample appeared to be dark-grey sandy-sediment with shells.

313.30g of the sample was taken for drying at <30degC which gave 260.40g of dried sample (weights include tray weight).
The sample was crushed using a jaw crusher.
The sample was then sieved until it passed through a 2mm sieve.
The sample was received unpreserved.

All parameters are determined on the air-dried (<30degC) portion except those requiring a wet sample fraction where as received (wet) sample was used.

Dry Weight (DW) results are reported as determined at <30degC.

National Laboratory Service

Analytical Report

Final Report - Amended - Issue 3

Report ID - 20066786 - 3

Batch description: Dunlaoghaire

UKAS TESTING 0754

Reported on: 22-Aug-2014

Client: IGSL Ltd

Project: Marine Sediment

Quote Description: Marine Sediment

Folder No: 002819531

Sampled on: 24-Jun-14 @ 13:00

Comments: BH5 - 5.00-5.50m

Quote No: 11280

Matrix: Sediment

Analyte	Result	Units	Flag	MRV	Accred	Lab ID	Testcode
Carbonate as C : Dry Wt	1.41	%	DC		None	NLS	864
DDT : Sum of components : Dry Wt	NoResult	ug/kg			None	NLS	864
Moisture Content, Air dried 105 C	10.4	%	DC		None	NLS	864
PAH : Total : Dry Wt :- {Polynuclear Aromatic Hydrocarbon	<0.0558	mg/kg	DC		None	NLS	864
PCB : Total (28, 52, 101, 118, 138, 153, 180)	<0.000700	mg/kg	DC		None	NLS	864
Carbon : Dry Wt	1.99	%	DC	0.4	UKAS	LE	404
Carbon, Organic : Dry Wt as C	0.582	%	DC	0.4	UKAS	LE	404
Grain Size Fraction : <1000 microns : {>0 phi}	99.1	%	DC	0	None	LE	1369
Grain Size Fraction : > 63000 microns : {< -6.0 phi}	0.00	%	DC	0	None	LE	1369
Grain Size Fraction : 1000 to 1400 mic : {0 to -0.5phi}	0.122	%	DC	0	None	LE	1369
Grain Size Fraction : 11200 to 16000 mic : {-3.5 to -4.0phi}	0.525	%	DC	0	None	LE	1369
Grain Size Fraction : 1400 to 2000 mic : {-0.5 to -1.0phi}	0.105	%	DC	0	None	LE	1369
Grain Size Fraction : 16000 to 22400 mic : {-4.0 to -4.5phi}	0.00	%	DC	0	None	LE	1369
Grain Size Fraction : 2000 to 2800 mic : {-1.0 to -1.5phi}	0.0755	%	DC	0	None	LE	1369
Grain Size Fraction : 22400 to 31500 mic : {-4.5 to -5.0phi}	0.00	%	DC	0	None	LE	1369
Grain Size Fraction : 2800 to 4000 mic : {-1.5 to -2.0phi}	0.0717	%	DC	0	None	LE	1369
Grain Size Fraction : 31500 to 45000 mic : {-5.0 to -5.5phi}	0.00	%	DC	0	None	LE	1369
Grain Size Fraction : 4000 to 5600 mic : {-2.0 to -2.5phi}	0.0349	%	DC	0	None	LE	1369
Grain Size Fraction : 45000 to 63000 mic : {-5.5 to -6.0phi}	0.00	%	DC	0	None	LE	1369
Grain Size Fraction : 5600 to 8000 mic : {-2.5 to -3.0phi}	0.00	%	DC	0	None	LE	1369
Grain Size Fraction : 8000 to 11200 mic : {-3.0 to -3.5phi}	0.00	%	DC	0	None	LE	1369
Particle Size Report	Report	Text	DC		None	LE	1369
The sample was a slightly gravelly sandy mud. The entire sample was analysed.							
Raw Data Report	Report	Text	DC	0	None	LE	1369
NO_RESULT : Analyte not applicable							
Grain Size Inclusive Kurtosis	0.557	mm	DC	0	UKAS	LE	1368
Grain Size Inclusive Mean	0.0200	mm	DC	0	UKAS	LE	1368
Inclusive Graphic Skewness :- {SKI}	-0.280	Unitless	DC	-1	UKAS	LE	1368
Kurtosis	0.845	Unitless	DC	0	UKAS	LE	1368
Particle Diameter : Mean	0.129	mm	DC	0	UKAS	LE	1368
Particle Diameter : Median	0.0280	mm	DC	0	UKAS	LE	1368
Sorting Coefficient	2.37	Unitless	DC	0	UKAS	LE	1368
Grain Size Fraction : < 0.98 microns : {>10 phi}	4.94	%	DC	0	UKAS	LE	1370
Grain Size Fraction : >1000 microns : {<0 phi}	0.934	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 0.98 to 1.38 microns : {10 to 9.5 phi}	2.84	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 1.38 to 1.95 microns : {9.5 to 9 phi}	2.99	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 1.95 to 2.76 microns : {9 to 8.5 phi}	3.72	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 11.1 to 15.6 microns : {6.5 to 6 phi}	5.21	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 125 to 177 microns : {3 to 2.5 phi}	4.57	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 15.6 to 22.1 microns : {6 to 5.5 phi}	5.38	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 177 to 250 microns : {2.5 to 2 phi}	2.18	%	DC	0	UKAS	LE	1370

Grain Size Fraction : 2.76 to 3.91 microns : {8.5 to 8 phi}	4.86	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 22.1 to 31.3 microns : {5.5 to 5 phi}	6.20	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 250 to 354 microns : {2 to 1.5 phi}	1.22	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 3.91 to 5.52 microns : {8 to 7.5 phi}	5.08	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 31.3 to 44.2 microns : {5 to 4.5 phi}	8.24	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 354 to 500 microns : {1.5 to 1 phi}	0.525	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 44.2 to 62.5 microns : {4.5 to 4 phi}	10.6	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 5.52 to 7.81 microns : {7.5 to 7 phi}	5.48	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 500 to 707 microns : {1 to 0.5 phi}	0.0693	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 62.5 to 88.4 microns : {4 to 3.5 phi}	11.0	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 7.81 to 11.1 microns : {7 to 6.5 phi}	5.57	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 707 to 1000 microns : {0.5 to 0 phi}	0.00	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 88.4 to 125 microns : {3.5 to 3 phi}	8.35	%	DC	0	UKAS	LE	1370
Hydrocarbons : Total : Dry Wt as Ekofisk	35.9	mg/kg		0.03	UKAS	LE	402
Mercury : Dry Wt	0.0105	mg/kg		0.002	UKAS	LE	1082
Aluminium, HF Digest : Dry Wt	33800	mg/kg	DC	50	UKAS	LE	756
Arsenic, HF Digest : Dry Wt	8.80	mg/kg		0.2	UKAS	LE	341
Cadmium, HF Digest : Dry Wt	0.168	mg/kg		0.01	UKAS	LE	341
Chromium, HF Digest : Dry Wt	66.4	mg/kg		3	UKAS	LE	341
Copper, HF Digest : Dry Wt	18.4	mg/kg		0.4	UKAS	LE	341
Lead, HF Digest : Dry Wt	11.5	mg/kg		0.2	UKAS	LE	341
Lithium, HF Digest : Dry Wt	35.1	mg/kg		0.1	UKAS	LE	341
Nickel, HF Digest : Dry Wt	22.2	mg/kg		0.6	UKAS	LE	341
Zinc : HF Digest : Dry Wt	45.0	mg/kg		0.05	UKAS	LE	341
Aldrin : Dry Wt	<0.5	ug/kg		0.5	UKAS	LE	672
DDE -pp : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
DDT -op : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
DDT -pp : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
Dieldrin : Dry Wt	<0.5	ug/kg		0.5	UKAS	LE	672
Endrin : Dry Wt	<0.5	ug/kg		0.5	UKAS	LE	672
HCH -alpha : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
HCH -beta : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
HCH -delta : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
HCH -gamma : Dry Wt :- {Lindane}	<0.1	ug/kg		0.1	UKAS	LE	672
Hexachlorobenzene : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
Hexachlorobutadiene : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
Isodrin : Dry Wt	<0.5	ug/kg		0.5	UKAS	LE	672
TDE - pp : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
Acenaphthene : Dry Wt	<1	ug/kg		1	UKAS	LE	1051
Acenaphthylene : Dry Wt	<1	ug/kg		1	None	LE	1051
Anthracene : Dry Wt	1.27	ug/kg		1	UKAS	LE	1051
Benzo(a)anthracene : Dry Wt	3.44	ug/kg		1	UKAS	LE	1051
Benzo(a)pyrene : Dry Wt	2.94	ug/kg		1	UKAS	LE	1051
Benzo(b)fluoranthene : Dry Wt	4.33	ug/kg		1	UKAS	LE	1051
Benzo(ghi)perylene : Dry Wt	3.73	ug/kg		1	UKAS	LE	1051
Benzo(k)fluoranthene : Dry Wt	1.70	ug/kg		1	UKAS	LE	1051
Chrysene : Dry Wt	4.64	ug/kg		3	UKAS	LE	1051
Dibenzo(ah)anthracene : Dry Wt	<1	ug/kg		1	UKAS	LE	1051
Fluoranthene : Dry Wt	5.71	ug/kg		1	UKAS	LE	1051
Fluorene : Dry Wt	<5	ug/kg		5	UKAS	LE	1051
Indeno(1,2,3-c,d)pyrene : Dry Wt	1.85	ug/kg		1	UKAS	LE	1051

Naphthalene : Dry Wt	<5	ug/kg	*5*	UKAS	LE	1051
Phenanthrene : Dry Wt	8.64	ug/kg	*5*	UKAS	LE	1051
Pyrene : Dry Wt	6.42	ug/kg	*1*	UKAS	LE	1051
PCB - 028 : Dry Wt	<0.1	ug/kg	*0.1*	UKAS	LE	685
PCB - 052 : Dry Wt	<0.1	ug/kg	*0.1*	UKAS	LE	685
PCB - 101 : Dry Wt	<0.1	ug/kg	*0.1*	UKAS	LE	685
PCB - 118 : Dry Wt	<0.1	ug/kg	*0.1*	UKAS	LE	685
PCB - 138 : Dry Wt	<0.1	ug/kg	*0.1*	UKAS	LE	685
PCB - 153 : Dry Wt	<0.1	ug/kg	*0.1*	UKAS	LE	685
PCB - 180 : Dry Wt	<0.1	ug/kg	*0.1*	UKAS	LE	685
Dibutyl Tin : Dry Wt as Cation	<4	ug/kg ELEVATED_MRV : Dry weight calculation	*3*	UKAS	LE	897
Tributyl Tin : Dry Wt as Cation	<4	ug/kg ELEVATED_MRV : Dry weight calculation	*3*	UKAS	LE	897
Dry Solids @ 30°C	75.9	%	*0.5*	None	LE	1130
Dry Solids @ 105°C	89.6	%	*0.5*	UKAS	LE	911
Loss on Ignition @ 500°C	3.06	%	*0.5*	UKAS	LE	911
Accreditation Assessment	2	No.		None	LE	924
Sample Preparation	Report	Text		None	LE	924

The sample appeared to be dark-grey clay-sediment.

384.44g of the sample was taken for drying at <30degC which gave 293.30g of dried sample (weights include tray weight).
The sample was crushed using a jaw crusher.
The sample was then sieved until it passed through a 2mm sieve.
The sample was received unpreserved.

All parameters are determined on the air-dried (<30degC) portion except those requiring a wet sample fraction where as received (wet) sample was used.

Dry Weight (DW) results are reported as determined at <30degC.

National Laboratory Service

Analytical Report

Final Report - Amended - Issue 3

Report ID - 20066786 - 3

Batch description: Dunlaoghaire

UKAS TESTING 0754

Reported on: 22-Aug-2014

Client: IGSL Ltd

Project: Marine Sediment

Quote Description: Marine Sediment

Folder No: 002819532

Sampled on: 24-Jun-14 @ 13:00

Comments: BH4 - 3.00-4.00m

Quote No: 11280

Matrix: Sediment

Analyte	Result	Units	Flag	MRV	Accred	Lab ID	Testcode
Carbonate as C : Dry Wt	<0.970	%	DC		None	NLS	864
DDT : Sum of components : Dry Wt	NoResult	ug/kg			None	NLS	864
Moisture Content, Air dried 105 C	25.1	%	DC		None	NLS	864
PAH : Total : Dry Wt :- {Polynuclear Aromatic Hydrocarbon	<0.109	mg/kg	DC		None	NLS	864
PCB : Total (28, 52, 101, 118, 138, 153, 180)	<0.000700	mg/kg	DC		None	NLS	864
Carbon : Dry Wt	1.37	%	DC	0.4	UKAS	LE	404
Carbon, Organic : Dry Wt as C	<0.4	%	DC	0.4	UKAS	LE	404
Grain Size Fraction : <1000 microns : {>0 phi}	99.4	%	DC	0	None	LE	1369
Grain Size Fraction : > 63000 microns : {< -6.0 phi}	0.00	%	DC	0	None	LE	1369
Grain Size Fraction : 1000 to 1400 mic : {0 to -0.5phi}	0.157	%	DC	0	None	LE	1369
Grain Size Fraction : 11200 to 16000 mic : {-3.5 to -4.0phi}	0.00	%	DC	0	None	LE	1369
Grain Size Fraction : 1400 to 2000 mic : {-0.5 to -1.0phi}	0.196	%	DC	0	None	LE	1369
Grain Size Fraction : 16000 to 22400 mic : {-4.0 to -4.5phi}	0.00	%	DC	0	None	LE	1369
Grain Size Fraction : 2000 to 2800 mic : {-1.0 to -1.5phi}	0.130	%	DC	0	None	LE	1369
Grain Size Fraction : 22400 to 31500 mic : {-4.5 to -5.0phi}	0.00	%	DC	0	None	LE	1369
Grain Size Fraction : 2800 to 4000 mic : {-1.5 to -2.0phi}	0.103	%	DC	0	None	LE	1369
Grain Size Fraction : 31500 to 45000 mic : {-5.0 to -5.5phi}	0.00	%	DC	0	None	LE	1369
Grain Size Fraction : 4000 to 5600 mic : {-2.0 to -2.5phi}	0.0457	%	DC	0	None	LE	1369
Grain Size Fraction : 45000 to 63000 mic : {-5.5 to -6.0phi}	0.00	%	DC	0	None	LE	1369
Grain Size Fraction : 5600 to 8000 mic : {-2.5 to -3.0phi}	0.00791	%	DC	0	None	LE	1369
Grain Size Fraction : 8000 to 11200 mic : {-3.0 to -3.5phi}	0.00	%	DC	0	None	LE	1369
Particle Size Report	Report	Text	DC		None	LE	1369
The sample was a slightly gravelly muddy sand. The entire sample was analysed.							
Raw Data Report	Report	Text	DC	0	None	LE	1369
NO_RESULT : Analyte not applicable							
Grain Size Inclusive Kurtosis	0.263	mm	DC	0	UKAS	LE	1368
Grain Size Inclusive Mean	0.106	mm	DC	0	UKAS	LE	1368
Inclusive Graphic Skewness :- {SKI}	-0.392	Unitless	DC	-1	UKAS	LE	1368
Kurtosis	1.93	Unitless	DC	0	UKAS	LE	1368
Particle Diameter : Mean	0.136	mm	DC	0	UKAS	LE	1368
Particle Diameter : Median	0.116	mm	DC	0	UKAS	LE	1368
Sorting Coefficient	1.26	Unitless	DC	0	UKAS	LE	1368
Grain Size Fraction : < 0.98 microns : {>10 phi}	0.894	%	DC	0	UKAS	LE	1370
Grain Size Fraction : >1000 microns : {<0 phi}	0.640	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 0.98 to 1.38 microns : {10 to 9.5 phi}	0.556	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 1.38 to 1.95 microns : {9.5 to 9 phi}	0.566	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 1.95 to 2.76 microns : {9 to 8.5 phi}	0.686	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 11.1 to 15.6 microns : {6.5 to 6 phi}	1.48	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 125 to 177 microns : {3 to 2.5 phi}	25.1	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 15.6 to 22.1 microns : {6 to 5.5 phi}	2.12	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 177 to 250 microns : {2.5 to 2 phi}	14.7	%	DC	0	UKAS	LE	1370

Grain Size Fraction : 2.76 to 3.91 microns : {8.5 to 8 phi}	0.924	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 22.1 to 31.3 microns : {5.5 to 5 phi}	1.96	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 250 to 354 microns : {2 to 1.5 phi}	3.97	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 3.91 to 5.52 microns : {8 to 7.5 phi}	0.964	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 31.3 to 44.2 microns : {5 to 4.5 phi}	1.37	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 354 to 500 microns : {1.5 to 1 phi}	0.0894	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 44.2 to 62.5 microns : {4.5 to 4 phi}	4.24	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 5.52 to 7.81 microns : {7.5 to 7 phi}	0.974	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 500 to 707 microns : {1 to 0.5 phi}	0.00	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 62.5 to 88.4 microns : {4 to 3.5 phi}	13.5	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 7.81 to 11.1 microns : {7 to 6.5 phi}	1.05	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 707 to 1000 microns : {0.5 to 0 phi}	0.00	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 88.4 to 125 microns : {3.5 to 3 phi}	24.2	%	DC	0	UKAS	LE	1370
Hydrocarbons : Total : Dry Wt as Ekofisk	21.6	mg/kg		0.03	UKAS	LE	402
Mercury : Dry Wt	0.0285	mg/kg		0.002	UKAS	LE	1082
Aluminium, HF Digest : Dry Wt	33500	mg/kg	DC	50	UKAS	LE	756
Arsenic, HF Digest : Dry Wt	12.7	mg/kg		0.2	UKAS	LE	341
Cadmium, HF Digest : Dry Wt	0.224	mg/kg		0.01	UKAS	LE	341
Chromium, HF Digest : Dry Wt	176	mg/kg		3	UKAS	LE	341
Copper, HF Digest : Dry Wt	21.1	mg/kg		0.4	UKAS	LE	341
Lead, HF Digest : Dry Wt	13.5	mg/kg		0.2	UKAS	LE	341
Lithium, HF Digest : Dry Wt	34.2	mg/kg		0.1	UKAS	LE	341
Nickel, HF Digest : Dry Wt	24.7	mg/kg		0.6	UKAS	LE	341
Zinc : HF Digest : Dry Wt	56.0	mg/kg		0.05	UKAS	LE	341
Aldrin : Dry Wt	<0.5	ug/kg		0.5	UKAS	LE	672
DDE -pp : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
DDT -op : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
DDT -pp : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
Dieldrin : Dry Wt	<0.5	ug/kg		0.5	UKAS	LE	672
Endrin : Dry Wt	<0.5	ug/kg		0.5	UKAS	LE	672
HCH -alpha : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
HCH -beta : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
HCH -delta : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
HCH -gamma : Dry Wt :- {Lindane}	<0.1	ug/kg		0.1	UKAS	LE	672
Hexachlorobenzene : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
Hexachlorobutadiene : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
Isodrin : Dry Wt	<0.5	ug/kg		0.5	UKAS	LE	672
TDE - pp : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
Acenaphthene : Dry Wt	<1	ug/kg		1	UKAS	LE	1051
Acenaphthylene : Dry Wt	<1	ug/kg		1	None	LE	1051
Anthracene : Dry Wt	4.22	ug/kg		1	UKAS	LE	1051
Benzo(a)anthracene : Dry Wt	10.2	ug/kg		1	UKAS	LE	1051
Benzo(a)pyrene : Dry Wt	10.5	ug/kg		1	UKAS	LE	1051
Benzo(b)fluoranthene : Dry Wt	7.88	ug/kg		1	UKAS	LE	1051
Benzo(ghi)perylene : Dry Wt	5.89	ug/kg		1	UKAS	LE	1051
Benzo(k)fluoranthene : Dry Wt	4.54	ug/kg		1	UKAS	LE	1051
Chrysene : Dry Wt	8.31	ug/kg		3	UKAS	LE	1051
Dibenzo(ah)anthracene : Dry Wt	2.16	ug/kg		1	UKAS	LE	1051
Fluoranthene : Dry Wt	15.7	ug/kg		1	UKAS	LE	1051
Fluorene : Dry Wt	<5	ug/kg		5	UKAS	LE	1051
Indeno(1,2,3-c,d)pyrene : Dry Wt	4.81	ug/kg		1	UKAS	LE	1051

Naphthalene : Dry Wt	<5	ug/kg	*5*	UKAS	LE	1051
Phenanthrene : Dry Wt	11.1	ug/kg	*5*	UKAS	LE	1051
Pyrene : Dry Wt	16.5	ug/kg	*1*	UKAS	LE	1051
PCB - 028 : Dry Wt	<0.1	ug/kg	*0.1*	UKAS	LE	685
PCB - 052 : Dry Wt	<0.1	ug/kg	*0.1*	UKAS	LE	685
PCB - 101 : Dry Wt	<0.1	ug/kg	*0.1*	UKAS	LE	685
PCB - 118 : Dry Wt	<0.1	ug/kg	*0.1*	UKAS	LE	685
PCB - 138 : Dry Wt	<0.1	ug/kg	*0.1*	UKAS	LE	685
PCB - 153 : Dry Wt	<0.1	ug/kg	*0.1*	UKAS	LE	685
PCB - 180 : Dry Wt	<0.1	ug/kg	*0.1*	UKAS	LE	685
Dibutyl Tin : Dry Wt as Cation	<4	ug/kg ELEVATED_MRV : Dry weight calculation	*3*	UKAS	LE	897
Tributyl Tin : Dry Wt as Cation	<4	ug/kg ELEVATED_MRV : Dry weight calculation	*3*	UKAS	LE	897
Dry Solids @ 30°C	76.0	%	*0.5*	None	LE	1130
Dry Solids @ 105°C	74.9	%	*0.5*	UKAS	LE	911
Loss on Ignition @ 500°C	2.60	%	*0.5*	UKAS	LE	911
Accreditation Assessment	2	No.		None	LE	924
Sample Preparation	Report	Text		None	LE	924

The sample appeared to be dark-brown sandy-sediment.

294.93g of the sample was taken for drying at <30degC which gave 225.56g of dried sample (weights include tray weight).
The sample was crushed using a jaw crusher.
The sample was then sieved until it passed through a 2mm sieve.
The sample was received unpreserved.

All parameters are determined on the air-dried (<30degC) portion except those requiring a wet sample fraction where as received (wet) sample was used.

Dry Weight (DW) results are reported as determined at <30degC.

Client: IGSL Ltd

Project: Marine Sediment

Quote Description: Marine Sediment

Folder No: 002819533

Sampled on: 24-Jun-14 @ 13:00

Comments: BH12 - 1.00-2.00m

Quote No: 11280

Matrix: Sediment

Analyte	Result	Units	Flag	MRV	Accred	Lab ID	Testcode
Carbonate as C : Dry Wt	<1.26	%	DC		None	NLS	864
DDT : Sum of components : Dry Wt	NoResult	ug/kg			None	NLS	864
Moisture Content, Air dried 105 C	21.4	%	DC		None	NLS	864
PAH : Total : Dry Wt :- {Polynuclear Aromatic Hydrocarbon	<0.0304	mg/kg	DC		None	NLS	864
PCB : Total (28, 52, 101, 118, 138, 153, 180)	<0.000700	mg/kg	DC		None	NLS	864
Carbon : Dry Wt	1.66	%	DC	0.4	UKAS	LE	404
Carbon, Organic : Dry Wt as C	<0.4	%	DC	0.4	UKAS	LE	404
Grain Size Fraction : <1000 microns : {>0 phi}	98.8	%	DC	0	None	LE	1369
Grain Size Fraction : > 63000 microns : {< -6.0 phi}	0.00	%	DC	0	None	LE	1369
Grain Size Fraction : 1000 to 1400 mic : {0 to -0.5phi}	0.260	%	DC	0	None	LE	1369
Grain Size Fraction : 11200 to 16000 mic : {-3.5 to -4.0phi}	0.00	%	DC	0	None	LE	1369
Grain Size Fraction : 1400 to 2000 mic : {-0.5 to -1.0phi}	0.322	%	DC	0	None	LE	1369
Grain Size Fraction : 16000 to 22400 mic : {-4.0 to -4.5phi}	0.00	%	DC	0	None	LE	1369
Grain Size Fraction : 2000 to 2800 mic : {-1.0 to -1.5phi}	0.251	%	DC	0	None	LE	1369
Grain Size Fraction : 22400 to 31500 mic : {-4.5 to -5.0phi}	0.00	%	DC	0	None	LE	1369
Grain Size Fraction : 2800 to 4000 mic : {-1.5 to -2.0phi}	0.243	%	DC	0	None	LE	1369
Grain Size Fraction : 31500 to 45000 mic : {-5.0 to -5.5phi}	0.00	%	DC	0	None	LE	1369
Grain Size Fraction : 4000 to 5600 mic : {-2.0 to -2.5phi}	0.0899	%	DC	0	None	LE	1369
Grain Size Fraction : 45000 to 63000 mic : {-5.5 to -6.0phi}	0.00	%	DC	0	None	LE	1369
Grain Size Fraction : 5600 to 8000 mic : {-2.5 to -3.0phi}	0.0342	%	DC	0	None	LE	1369
Grain Size Fraction : 8000 to 11200 mic : {-3.0 to -3.5phi}	0.0252	%	DC	0	None	LE	1369
Particle Size Report	Report	Text	DC		None	LE	1369
The sample was a slightly gravelly sand. The entire sample was analysed.							
Raw Data Report	Report	Text	DC	0	None	LE	1369
NO_RESULT : Analyte not applicable							
Grain Size Inclusive Kurtosis	0.476	mm	DC	0	UKAS	LE	1368
Grain Size Inclusive Mean	0.123	mm	DC	0	UKAS	LE	1368
Inclusive Graphic Skewness :- {SKI}	0.0710	Unitless	DC	-1	UKAS	LE	1368
Kurtosis	1.07	Unitless	DC	0	UKAS	LE	1368
Particle Diameter : Mean	0.173	mm	DC	0	UKAS	LE	1368
Particle Diameter : Median	0.121	mm	DC	0	UKAS	LE	1368
Sorting Coefficient	0.721	Unitless	DC	0	UKAS	LE	1368
Grain Size Fraction : < 0.98 microns : {>10 phi}	0.00	%	DC	0	UKAS	LE	1370
Grain Size Fraction : >1000 microns : {<0 phi}	1.23	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 0.98 to 1.38 microns : {10 to 9.5 phi}	0.00	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 1.38 to 1.95 microns : {9.5 to 9 phi}	0.00	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 1.95 to 2.76 microns : {9 to 8.5 phi}	0.00	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 11.1 to 15.6 microns : {6.5 to 6 phi}	0.237	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 125 to 177 microns : {3 to 2.5 phi}	25.9	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 15.6 to 22.1 microns : {6 to 5.5 phi}	0.0297	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 177 to 250 microns : {2.5 to 2 phi}	14.1	%	DC	0	UKAS	LE	1370

Grain Size Fraction : 2.76 to 3.91 microns : {8.5 to 8 phi}	0.00	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 22.1 to 31.3 microns : {5.5 to 5 phi}	0.00	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 250 to 354 microns : {2 to 1.5 phi}	4.27	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 3.91 to 5.52 microns : {8 to 7.5 phi}	0.0297	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 31.3 to 44.2 microns : {5 to 4.5 phi}	0.237	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 354 to 500 microns : {1.5 to 1 phi}	0.603	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 44.2 to 62.5 microns : {4.5 to 4 phi}	5.39	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 5.52 to 7.81 microns : {7.5 to 7 phi}	0.188	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 500 to 707 microns : {1 to 0.5 phi}	0.623	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 62.5 to 88.4 microns : {4 to 3.5 phi}	17.9	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 7.81 to 11.1 microns : {7 to 6.5 phi}	0.257	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 707 to 1000 microns : {0.5 to 0 phi}	0.633	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 88.4 to 125 microns : {3.5 to 3 phi}	28.4	%	DC	0	UKAS	LE	1370
Hydrocarbons : Total : Dry Wt as Ekofisk	3.58	mg/kg		0.03	UKAS	LE	402
Mercury : Dry Wt	0.263	mg/kg		0.002	UKAS	LE	1082
Aluminium, HF Digest : Dry Wt	23200	mg/kg	DC	50	UKAS	LE	756
Arsenic, HF Digest : Dry Wt	11.8	mg/kg		0.2	UKAS	LE	341
Cadmium, HF Digest : Dry Wt	0.294	mg/kg		0.01	UKAS	LE	341
Chromium, HF Digest : Dry Wt	433	mg/kg		3	UKAS	LE	341
Copper, HF Digest : Dry Wt	19.8	mg/kg		0.4	UKAS	LE	341
Lead, HF Digest : Dry Wt	14.9	mg/kg		0.2	UKAS	LE	341
Lithium, HF Digest : Dry Wt	19.6	mg/kg		0.1	UKAS	LE	341
Nickel, HF Digest : Dry Wt	21.2	mg/kg		0.6	UKAS	LE	341
Zinc : HF Digest : Dry Wt	51.0	mg/kg		0.05	UKAS	LE	341
Aldrin : Dry Wt	<0.5	ug/kg		0.5	UKAS	LE	672
DDE -pp : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
DDT -op : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
DDT -pp : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
Dieldrin : Dry Wt	<0.5	ug/kg		0.5	UKAS	LE	672
Endrin : Dry Wt	<0.5	ug/kg		0.5	UKAS	LE	672
HCH -alpha : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
HCH -beta : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
HCH -delta : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
HCH -gamma : Dry Wt :- {Lindane}	<0.1	ug/kg		0.1	UKAS	LE	672
Hexachlorobenzene : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
Hexachlorobutadiene : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
Isodrin : Dry Wt	<0.5	ug/kg		0.5	UKAS	LE	672
TDE - pp : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
Acenaphthene : Dry Wt	<1	ug/kg		1	UKAS	LE	1051
Acenaphthylene : Dry Wt	<1	ug/kg		1	None	LE	1051
Anthracene : Dry Wt	<1	ug/kg		1	UKAS	LE	1051
Benzo(a)anthracene : Dry Wt	1.20	ug/kg		1	UKAS	LE	1051
Benzo(a)pyrene : Dry Wt	<1	ug/kg		1	UKAS	LE	1051
Benzo(b)fluoranthene : Dry Wt	<1	ug/kg		1	UKAS	LE	1051
Benzo(ghi)perylene : Dry Wt	<1	ug/kg		1	UKAS	LE	1051
Benzo(k)fluoranthene : Dry Wt	<1	ug/kg		1	UKAS	LE	1051
Chrysene : Dry Wt	<3	ug/kg		3	UKAS	LE	1051
Dibenzo(ah)anthracene : Dry Wt	<1	ug/kg		1	UKAS	LE	1051
Fluoranthene : Dry Wt	1.46	ug/kg		1	UKAS	LE	1051
Fluorene : Dry Wt	<5	ug/kg		5	UKAS	LE	1051
Indeno(1,2,3-c,d)pyrene : Dry Wt	<1	ug/kg		1	UKAS	LE	1051

Naphthalene : Dry Wt	<5	ug/kg	*5*	UKAS	LE	1051
Phenanthrene : Dry Wt	<5	ug/kg	*5*	UKAS	LE	1051
Pyrene : Dry Wt	1.78	ug/kg	*1*	UKAS	LE	1051
PCB - 028 : Dry Wt	<0.1	ug/kg	*0.1*	UKAS	LE	685
PCB - 052 : Dry Wt	<0.1	ug/kg	*0.1*	UKAS	LE	685
PCB - 101 : Dry Wt	<0.1	ug/kg	*0.1*	UKAS	LE	685
PCB - 118 : Dry Wt	<0.1	ug/kg	*0.1*	UKAS	LE	685
PCB - 138 : Dry Wt	<0.1	ug/kg	*0.1*	UKAS	LE	685
PCB - 153 : Dry Wt	<0.1	ug/kg	*0.1*	UKAS	LE	685
PCB - 180 : Dry Wt	<0.1	ug/kg	*0.1*	UKAS	LE	685
Dibutyl Tin : Dry Wt as Cation	<4	ug/kg ELEVATED_MRV : Dry weight calculation	*3*	UKAS	LE	897
Tributyl Tin : Dry Wt as Cation	<4	ug/kg ELEVATED_MRV : Dry weight calculation	*3*	UKAS	LE	897
Dry Solids @ 30°C	78.9	%	*0.5*	None	LE	1130
Dry Solids @ 105°C	78.6	%	*0.5*	UKAS	LE	911
Loss on Ignition @ 500°C	1.03	%	*0.5*	UKAS	LE	911
Accreditation Assessment	2	No.		None	LE	924
Sample Preparation	Report	Text		None	LE	924

The sample appeared to be dark-brown sandy-sediment with shells.

328.15g of the sample was taken for drying at <30degC which gave 259.98g of dried sample (weights include tray weight).
The sample was crushed using a jaw crusher.
The sample was then sieved until it passed through a 2mm sieve.
The sample was received unpreserved.

All parameters are determined on the air-dried (<30degC) portion except those requiring a wet sample fraction where as received (wet) sample was used.

Dry Weight (DW) results are reported as determined at <30degC.

National Laboratory Service

Analytical Report

Final Report - Amended - Issue 3

Report ID - 20066786 - 3

Batch description: Dunlaoghaire

UKAS TESTING 0754

Reported on: 22-Aug-2014

Client: IGSL Ltd

Project: Marine Sediment

Quote Description: Marine Sediment

Folder No: 002819534

Sampled on: 24-Jun-14 @ 13:00

Comments: BH8 - 3.00-4.00m

Quote No: 11280

Matrix: Sediment

Analyte	Result	Units	Flag	MRV	Accred	Lab ID	Testcode
Carbonate as C : Dry Wt	<1.32	%	DC		None	NLS	864
DDT : Sum of components : Dry Wt	NoResult	ug/kg			None	NLS	864
Moisture Content, Air dried 105 C	21.8	%	DC		None	NLS	864
PAH : Total : Dry Wt :- {Polynuclear Aromatic Hydrocarbon	<0.0290	mg/kg	DC		None	NLS	864
PCB : Total (28, 52, 101, 118, 138, 153, 180)	<0.000700	mg/kg	DC		None	NLS	864
Carbon : Dry Wt	1.72	%	DC	0.4	UKAS	LE	404
Carbon, Organic : Dry Wt as C	<0.4	%	DC	0.4	UKAS	LE	404
Grain Size Fraction : <1000 microns : {>0 phi}	94.9	%	DC	0	None	LE	1369
Grain Size Fraction : > 63000 microns : {< -6.0 phi}	0.00	%	DC	0	None	LE	1369
Grain Size Fraction : 1000 to 1400 mic : {0 to -0.5phi}	1.03	%	DC	0	None	LE	1369
Grain Size Fraction : 11200 to 16000 mic : {-3.5 to -4.0phi}	0.286	%	DC	0	None	LE	1369
Grain Size Fraction : 1400 to 2000 mic : {-0.5 to -1.0phi}	1.20	%	DC	0	None	LE	1369
Grain Size Fraction : 16000 to 22400 mic : {-4.0 to -4.5phi}	0.0919	%	DC	0	None	LE	1369
Grain Size Fraction : 2000 to 2800 mic : {-1.0 to -1.5phi}	0.969	%	DC	0	None	LE	1369
Grain Size Fraction : 22400 to 31500 mic : {-4.5 to -5.0phi}	0.00	%	DC	0	None	LE	1369
Grain Size Fraction : 2800 to 4000 mic : {-1.5 to -2.0phi}	0.797	%	DC	0	None	LE	1369
Grain Size Fraction : 31500 to 45000 mic : {-5.0 to -5.5phi}	0.00	%	DC	0	None	LE	1369
Grain Size Fraction : 4000 to 5600 mic : {-2.0 to -2.5phi}	0.328	%	DC	0	None	LE	1369
Grain Size Fraction : 45000 to 63000 mic : {-5.5 to -6.0phi}	0.00	%	DC	0	None	LE	1369
Grain Size Fraction : 5600 to 8000 mic : {-2.5 to -3.0phi}	0.262	%	DC	0	None	LE	1369
Grain Size Fraction : 8000 to 11200 mic : {-3.0 to -3.5phi}	0.107	%	DC	0	None	LE	1369
Particle Size Report	Report	Text	DC		None	LE	1369
The sample was a slightly gravelly sand. The entire sample was analysed.							
Raw Data Report	Report	Text	DC	0	None	LE	1369
NO_RESULT : Analyte not applicable							
Grain Size Inclusive Kurtosis	0.326	mm	DC	0	UKAS	LE	1368
Grain Size Inclusive Mean	0.155	mm	DC	0	UKAS	LE	1368
Inclusive Graphic Skewness :- {SKI}	0.224	Unitless	DC	-1	UKAS	LE	1368
Kurtosis	1.62	Unitless	DC	0	UKAS	LE	1368
Particle Diameter : Mean	0.343	mm	DC	0	UKAS	LE	1368
Particle Diameter : Median	0.153	mm	DC	0	UKAS	LE	1368
Sorting Coefficient	0.938	Unitless	DC	0	UKAS	LE	1368
Grain Size Fraction : < 0.98 microns : {>10 phi}	0.00	%	DC	0	UKAS	LE	1370
Grain Size Fraction : >1000 microns : {<0 phi}	5.07	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 0.98 to 1.38 microns : {10 to 9.5 phi}	0.00	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 1.38 to 1.95 microns : {9.5 to 9 phi}	0.00	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 1.95 to 2.76 microns : {9 to 8.5 phi}	0.00	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 11.1 to 15.6 microns : {6.5 to 6 phi}	0.296	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 125 to 177 microns : {3 to 2.5 phi}	29.0	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 15.6 to 22.1 microns : {6 to 5.5 phi}	0.105	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 177 to 250 microns : {2.5 to 2 phi}	21.5	%	DC	0	UKAS	LE	1370

Grain Size Fraction : 2.76 to 3.91 microns : {8.5 to 8 phi}	0.210	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 22.1 to 31.3 microns : {5.5 to 5 phi}	0.00	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 250 to 354 microns : {2 to 1.5 phi}	9.11	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 3.91 to 5.52 microns : {8 to 7.5 phi}	0.267	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 31.3 to 44.2 microns : {5 to 4.5 phi}	0.00	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 354 to 500 microns : {1.5 to 1 phi}	1.37	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 44.2 to 62.5 microns : {4.5 to 4 phi}	0.858	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 5.52 to 7.81 microns : {7.5 to 7 phi}	0.305	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 500 to 707 microns : {1 to 0.5 phi}	0.181	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 62.5 to 88.4 microns : {4 to 3.5 phi}	8.49	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 7.81 to 11.1 microns : {7 to 6.5 phi}	0.334	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 707 to 1000 microns : {0.5 to 0 phi}	0.591	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 88.4 to 125 microns : {3.5 to 3 phi}	22.3	%	DC	0	UKAS	LE	1370
Hydrocarbons : Total : Dry Wt as Ekofisk	5.02	mg/kg		0.03	UKAS	LE	402
Mercury : Dry Wt	0.0143	mg/kg		0.002	UKAS	LE	1082
Aluminium, HF Digest : Dry Wt	22800	mg/kg	DC	50	UKAS	LE	756
Arsenic, HF Digest : Dry Wt	16.3	mg/kg		0.2	UKAS	LE	341
Cadmium, HF Digest : Dry Wt	0.335	mg/kg		0.01	UKAS	LE	341
Chromium, HF Digest : Dry Wt	457	mg/kg		3	UKAS	LE	341
Copper, HF Digest : Dry Wt	19.6	mg/kg		0.4	UKAS	LE	341
Lead, HF Digest : Dry Wt	15.9	mg/kg		0.2	UKAS	LE	341
Lithium, HF Digest : Dry Wt	23.6	mg/kg		0.1	UKAS	LE	341
Nickel, HF Digest : Dry Wt	23.5	mg/kg		0.6	UKAS	LE	341
Zinc : HF Digest : Dry Wt	56.0	mg/kg		0.05	UKAS	LE	341
Aldrin : Dry Wt	<0.5	ug/kg		0.5	UKAS	LE	672
DDE -pp : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
DDT -op : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
DDT -pp : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
Dieldrin : Dry Wt	<0.5	ug/kg		0.5	UKAS	LE	672
Endrin : Dry Wt	<0.5	ug/kg		0.5	UKAS	LE	672
HCH -alpha : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
HCH -beta : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
HCH -delta : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
HCH -gamma : Dry Wt :- {Lindane}	<0.1	ug/kg		0.1	UKAS	LE	672
Hexachlorobenzene : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
Hexachlorobutadiene : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
Isodrin : Dry Wt	<0.5	ug/kg		0.5	UKAS	LE	672
TDE - pp : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
Acenaphthene : Dry Wt	<1	ug/kg		1	UKAS	LE	1051
Acenaphthylene : Dry Wt	<1	ug/kg		1	None	LE	1051
Anthracene : Dry Wt	<1	ug/kg		1	UKAS	LE	1051
Benzo(a)anthracene : Dry Wt	<1	ug/kg		1	UKAS	LE	1051
Benzo(a)pyrene : Dry Wt	<1	ug/kg		1	UKAS	LE	1051
Benzo(b)fluoranthene : Dry Wt	<1	ug/kg		1	UKAS	LE	1051
Benzo(ghi)perylene : Dry Wt	<1	ug/kg		1	UKAS	LE	1051
Benzo(k)fluoranthene : Dry Wt	<1	ug/kg		1	UKAS	LE	1051
Chrysene : Dry Wt	<3	ug/kg		3	UKAS	LE	1051
Dibenzo(ah)anthracene : Dry Wt	<1	ug/kg		1	UKAS	LE	1051
Fluoranthene : Dry Wt	<1	ug/kg		1	UKAS	LE	1051
Fluorene : Dry Wt	<5	ug/kg		5	UKAS	LE	1051
Indeno(1,2,3-c,d)pyrene : Dry Wt	<1	ug/kg		1	UKAS	LE	1051

Naphthalene : Dry Wt	<5	ug/kg	*5*	UKAS	LE	1051
Phenanthrene : Dry Wt	<5	ug/kg	*5*	UKAS	LE	1051
Pyrene : Dry Wt	<1	ug/kg	*1*	UKAS	LE	1051
PCB - 028 : Dry Wt	<0.1	ug/kg	*0.1*	UKAS	LE	685
PCB - 052 : Dry Wt	<0.1	ug/kg	*0.1*	UKAS	LE	685
PCB - 101 : Dry Wt	<0.1	ug/kg	*0.1*	UKAS	LE	685
PCB - 118 : Dry Wt	<0.1	ug/kg	*0.1*	UKAS	LE	685
PCB - 138 : Dry Wt	<0.1	ug/kg	*0.1*	UKAS	LE	685
PCB - 153 : Dry Wt	<0.1	ug/kg	*0.1*	UKAS	LE	685
PCB - 180 : Dry Wt	<0.1	ug/kg	*0.1*	UKAS	LE	685
Dibutyl Tin : Dry Wt as Cation	<4	ug/kg ELEVATED_MRV : Dry weight calculation	*3*	UKAS	LE	897
Tributyl Tin : Dry Wt as Cation	<4	ug/kg ELEVATED_MRV : Dry weight calculation	*3*	UKAS	LE	897
Dry Solids @ 30°C	78.8	%	*0.5*	None	LE	1130
Dry Solids @ 105°C	78.2	%	*0.5*	UKAS	LE	911
Loss on Ignition @ 500°C	0.940	%	*0.5*	UKAS	LE	911
Accreditation Assessment	2	No.		None	LE	924
Sample Preparation	Report	Text		None	LE	924

The sample appeared to be dark-brown sandy-sediment with shells.

320.87g of the sample was taken for drying at <30degC which gave 254.09g of dried sample (weights include tray weight).
The sample was crushed using a jaw crusher.
The sample was then sieved until it passed through a 2mm sieve.
The sample was received unpreserved.

All parameters are determined on the air-dried (<30degC) portion except those requiring a wet sample fraction where as received (wet) sample was used.

Dry Weight (DW) results are reported as determined at <30degC.

National Laboratory Service

Analytical Report

Final Report - Amended - Issue 3

Report ID - 20066786 - 3

Batch description: Dunlaoghaire

UKAS TESTING 0754

Reported on: 22-Aug-2014

Client: IGSL Ltd

Project: Marine Sediment

Quote Description: Marine Sediment

Folder No: 002819535

Sampled on: 24-Jun-14 @ 13:00

Comments: BH03 - GL-1.00m

Quote No: 11280

Matrix: Sediment

Analyte	Result	Units	Flag	MRV	Accred	Lab ID	Testcode
Carbonate as C : Dry Wt	0.217	%	DC		None	NLS	864
DDT : Sum of components : Dry Wt	NoResult	ug/kg			None	NLS	864
Moisture Content, Air dried 105 C	23.5	%	DC		None	NLS	864
PAH : Total : Dry Wt :- {Polynuclear Aromatic Hydrocarbon	<0.0403	mg/kg	DC		None	NLS	864
PCB : Total (28, 52, 101, 118, 138, 153, 180)	<0.000700	mg/kg	DC		None	NLS	864
Carbon : Dry Wt	1.03	%	DC	0.4	UKAS	LE	404
Carbon, Organic : Dry Wt as C	0.813	%	DC	0.4	UKAS	LE	404
Grain Size Fraction : <1000 microns : {>0 phi}	98.8	%	DC	0	None	LE	1369
Grain Size Fraction : > 63000 microns : {< -6.0 phi}	0.00	%	DC	0	None	LE	1369
Grain Size Fraction : 1000 to 1400 mic : {0 to -0.5phi}	0.198	%	DC	0	None	LE	1369
Grain Size Fraction : 11200 to 16000 mic : {-3.5 to -4.0phi}	0.0172	%	DC	0	None	LE	1369
Grain Size Fraction : 1400 to 2000 mic : {-0.5 to -1.0phi}	0.256	%	DC	0	None	LE	1369
Grain Size Fraction : 16000 to 22400 mic : {-4.0 to -4.5phi}	0.00	%	DC	0	None	LE	1369
Grain Size Fraction : 2000 to 2800 mic : {-1.0 to -1.5phi}	0.229	%	DC	0	None	LE	1369
Grain Size Fraction : 22400 to 31500 mic : {-4.5 to -5.0phi}	0.00	%	DC	0	None	LE	1369
Grain Size Fraction : 2800 to 4000 mic : {-1.5 to -2.0phi}	0.251	%	DC	0	None	LE	1369
Grain Size Fraction : 31500 to 45000 mic : {-5.0 to -5.5phi}	0.00	%	DC	0	None	LE	1369
Grain Size Fraction : 4000 to 5600 mic : {-2.0 to -2.5phi}	0.109	%	DC	0	None	LE	1369
Grain Size Fraction : 45000 to 63000 mic : {-5.5 to -6.0phi}	0.00	%	DC	0	None	LE	1369
Grain Size Fraction : 5600 to 8000 mic : {-2.5 to -3.0phi}	0.0641	%	DC	0	None	LE	1369
Grain Size Fraction : 8000 to 11200 mic : {-3.0 to -3.5phi}	0.0391	%	DC	0	None	LE	1369
Particle Size Report	Report	Text	DC		None	LE	1369
The sample was a slightly gravelly sand. The entire sample was analysed.							
Raw Data Report	Report	Text	DC	0	None	LE	1369
NO_RESULT : Analyte not applicable							
Grain Size Inclusive Kurtosis	0.474	mm	DC	0	UKAS	LE	1368
Grain Size Inclusive Mean	0.149	mm	DC	0	UKAS	LE	1368
Inclusive Graphic Skewness :- {SKI}	-0.0530	Unitless	DC	-1	UKAS	LE	1368
Kurtosis	1.08	Unitless	DC	0	UKAS	LE	1368
Particle Diameter : Mean	0.194	mm	DC	0	UKAS	LE	1368
Particle Diameter : Median	0.150	mm	DC	0	UKAS	LE	1368
Sorting Coefficient	0.633	Unitless	DC	0	UKAS	LE	1368
Grain Size Fraction : < 0.98 microns : {>10 phi}	0.00	%	DC	0	UKAS	LE	1370
Grain Size Fraction : >1000 microns : {<0 phi}	1.16	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 0.98 to 1.38 microns : {10 to 9.5 phi}	0.0395	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 1.38 to 1.95 microns : {9.5 to 9 phi}	0.217	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 1.95 to 2.76 microns : {9 to 8.5 phi}	0.356	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 11.1 to 15.6 microns : {6.5 to 6 phi}	0.544	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 125 to 177 microns : {3 to 2.5 phi}	34.5	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 15.6 to 22.1 microns : {6 to 5.5 phi}	0.445	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 177 to 250 microns : {2.5 to 2 phi}	24.8	%	DC	0	UKAS	LE	1370

Grain Size Fraction : 2.76 to 3.91 microns : {8.5 to 8 phi}	0.553	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 22.1 to 31.3 microns : {5.5 to 5 phi}	0.0692	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 250 to 354 microns : {2 to 1.5 phi}	7.51	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 3.91 to 5.52 microns : {8 to 7.5 phi}	0.593	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 31.3 to 44.2 microns : {5 to 4.5 phi}	0.00	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 354 to 500 microns : {1.5 to 1 phi}	0.277	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 44.2 to 62.5 microns : {4.5 to 4 phi}	0.148	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 5.52 to 7.81 microns : {7.5 to 7 phi}	0.573	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 500 to 707 microns : {1 to 0.5 phi}	0.00	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 62.5 to 88.4 microns : {4 to 3.5 phi}	5.39	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 7.81 to 11.1 microns : {7 to 6.5 phi}	0.553	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 707 to 1000 microns : {0.5 to 0 phi}	0.00	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 88.4 to 125 microns : {3.5 to 3 phi}	22.2	%	DC	0	UKAS	LE	1370
Hydrocarbons : Total : Dry Wt as Ekofisk	6.13	mg/kg		0.03	UKAS	LE	402
Mercury : Dry Wt	0.0311	mg/kg		0.002	UKAS	LE	1082
Aluminium, HF Digest : Dry Wt	28000	mg/kg	DC	50	UKAS	LE	756
Arsenic, HF Digest : Dry Wt	20.1	mg/kg		0.2	UKAS	LE	341
Cadmium, HF Digest : Dry Wt	0.214	mg/kg		0.01	UKAS	LE	341
Chromium, HF Digest : Dry Wt	120	mg/kg		3	UKAS	LE	341
Copper, HF Digest : Dry Wt	20.4	mg/kg		0.4	UKAS	LE	341
Lead, HF Digest : Dry Wt	20.5	mg/kg		0.2	UKAS	LE	341
Lithium, HF Digest : Dry Wt	31.8	mg/kg		0.1	UKAS	LE	341
Nickel, HF Digest : Dry Wt	18.8	mg/kg		0.6	UKAS	LE	341
Zinc : HF Digest : Dry Wt	50.0	mg/kg		0.05	UKAS	LE	341
Aldrin : Dry Wt	<0.5	ug/kg		0.5	UKAS	LE	672
DDE -pp : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
DDT -op : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
DDT -pp : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
Dieldrin : Dry Wt	<0.5	ug/kg		0.5	UKAS	LE	672
Endrin : Dry Wt	<0.5	ug/kg		0.5	UKAS	LE	672
HCH -alpha : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
HCH -beta : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
HCH -delta : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
HCH -gamma : Dry Wt :- {Lindane}	<0.1	ug/kg		0.1	UKAS	LE	672
Hexachlorobenzene : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
Hexachlorobutadiene : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
Isodrin : Dry Wt	<0.5	ug/kg		0.5	UKAS	LE	672
TDE - pp : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
Acenaphthene : Dry Wt	<1	ug/kg		1	UKAS	LE	1051
Acenaphthylene : Dry Wt	<1	ug/kg		1	None	LE	1051
Anthracene : Dry Wt	<1	ug/kg		1	UKAS	LE	1051
Benzo(a)anthracene : Dry Wt	2.40	ug/kg		1	UKAS	LE	1051
Benzo(a)pyrene : Dry Wt	3.10	ug/kg		1	UKAS	LE	1051
Benzo(b)fluoranthene : Dry Wt	2.24	ug/kg		1	UKAS	LE	1051
Benzo(ghi)perylene : Dry Wt	1.87	ug/kg		1	UKAS	LE	1051
Benzo(k)fluoranthene : Dry Wt	1.34	ug/kg		1	UKAS	LE	1051
Chrysene : Dry Wt	<3	ug/kg		3	UKAS	LE	1051
Dibenzo(ah)anthracene : Dry Wt	<1	ug/kg		1	UKAS	LE	1051
Fluoranthene : Dry Wt	3.27	ug/kg		1	UKAS	LE	1051
Fluorene : Dry Wt	<5	ug/kg		5	UKAS	LE	1051
Indeno(1,2,3-c,d)pyrene : Dry Wt	1.75	ug/kg		1	UKAS	LE	1051

Naphthalene : Dry Wt	<5	ug/kg	*5*	UKAS	LE	1051
Phenanthrene : Dry Wt	<5	ug/kg	*5*	UKAS	LE	1051
Pyrene : Dry Wt	4.11	ug/kg	*1*	UKAS	LE	1051
PCB - 028 : Dry Wt	<0.1	ug/kg	*0.1*	UKAS	LE	685
PCB - 052 : Dry Wt	<0.1	ug/kg	*0.1*	UKAS	LE	685
PCB - 101 : Dry Wt	<0.1	ug/kg	*0.1*	UKAS	LE	685
PCB - 118 : Dry Wt	<0.1	ug/kg	*0.1*	UKAS	LE	685
PCB - 138 : Dry Wt	<0.1	ug/kg	*0.1*	UKAS	LE	685
PCB - 153 : Dry Wt	<0.1	ug/kg	*0.1*	UKAS	LE	685
PCB - 180 : Dry Wt	<0.1	ug/kg	*0.1*	UKAS	LE	685
Dibutyl Tin : Dry Wt as Cation	<4	ug/kg ELEVATED_MRV : Dry weight calculation	*3*	UKAS	LE	897
Tributyl Tin : Dry Wt as Cation	<4	ug/kg ELEVATED_MRV : Dry weight calculation	*3*	UKAS	LE	897
Dry Solids @ 30°C	75.8	%	*0.5*	None	LE	1130
Dry Solids @ 105°C	76.5	%	*0.5*	UKAS	LE	911
Loss on Ignition @ 500°C	1.05	%	*0.5*	UKAS	LE	911
Accreditation Assessment	2	No.		None	LE	924
Sample Preparation	Report	Text		None	LE	924

The sample appeared to be dark-brown sandy-sediment with shells.

294.75g of the sample was taken for drying at <30degC which gave 224.76g of dried sample (weights include tray weight).
The sample was crushed using a jaw crusher.
The sample was then sieved until it passed through a 2mm sieve.
The sample was received unpreserved.

All parameters are determined on the air-dried (<30degC) portion except those requiring a wet sample fraction where as received (wet) sample was used.

Dry Weight (DW) results are reported as determined at <30degC.

National Laboratory Service

Analytical Report

Final Report - Amended - Issue 3

Report ID - 20066786 - 3

Batch description: Dunlaoghaire

UKAS TESTING 0754

Reported on: 22-Aug-2014

Client: IGSL Ltd

Project: Marine Sediment

Quote Description: Marine Sediment

Folder No: 002819536

Sampled on: 24-Jun-14 @ 13:00

Comments: BH01 - GL-1.00m

Quote No: 11280

Matrix: Sediment

Analyte	Result	Units	Flag	MRV	Accred	Lab ID	Testcode
Carbonate as C : Dry Wt	0.450	%	DC		None	NLS	864
DDT : Sum of components : Dry Wt	NoResult	ug/kg			None	NLS	864
Moisture Content, Air dried 105 C	24.9	%	DC		None	NLS	864
PAH : Total : Dry Wt :- {Polynuclear Aromatic Hydrocarbon	1.45	mg/kg	DC		None	NLS	864
PCB : Total (28, 52, 101, 118, 138, 153, 180)	0.00211	mg/kg	DC		None	NLS	864
Carbon : Dry Wt	2.61	%	DC	0.4	UKAS	LE	404
Carbon, Organic : Dry Wt as C	2.16	%	DC	0.4	UKAS	LE	404
Grain Size Fraction : <1000 microns : {>0 phi}	98.4	%	DC	0	None	LE	1369
Grain Size Fraction : > 63000 microns : {< -6.0 phi}	0.00	%	DC	0	None	LE	1369
Grain Size Fraction : 1000 to 1400 mic : {0 to -0.5phi}	0.0815	%	DC	0	None	LE	1369
Grain Size Fraction : 11200 to 16000 mic : {-3.5 to -4.0phi}	0.387	%	DC	0	None	LE	1369
Grain Size Fraction : 1400 to 2000 mic : {-0.5 to -1.0phi}	0.104	%	DC	0	None	LE	1369
Grain Size Fraction : 16000 to 22400 mic : {-4.0 to -4.5phi}	0.315	%	DC	0	None	LE	1369
Grain Size Fraction : 2000 to 2800 mic : {-1.0 to -1.5phi}	0.125	%	DC	0	None	LE	1369
Grain Size Fraction : 22400 to 31500 mic : {-4.5 to -5.0phi}	0.00	%	DC	0	None	LE	1369
Grain Size Fraction : 2800 to 4000 mic : {-1.5 to -2.0phi}	0.120	%	DC	0	None	LE	1369
Grain Size Fraction : 31500 to 45000 mic : {-5.0 to -5.5phi}	0.00	%	DC	0	None	LE	1369
Grain Size Fraction : 4000 to 5600 mic : {-2.0 to -2.5phi}	0.0720	%	DC	0	None	LE	1369
Grain Size Fraction : 45000 to 63000 mic : {-5.5 to -6.0phi}	0.00	%	DC	0	None	LE	1369
Grain Size Fraction : 5600 to 8000 mic : {-2.5 to -3.0phi}	0.0576	%	DC	0	None	LE	1369
Grain Size Fraction : 8000 to 11200 mic : {-3.0 to -3.5phi}	0.329	%	DC	0	None	LE	1369
Particle Size Report	Report	Text	DC		None	LE	1369
The sample was a slightly gravelly sandy mud. The entire sample was analysed.							
Raw Data Report	Report	Text	DC	0	None	LE	1369
NO_RESULT : Analyte not applicable							
Grain Size Inclusive Kurtosis	0.736	mm	DC	0	UKAS	LE	1368
Grain Size Inclusive Mean	0.0290	mm	DC	0	UKAS	LE	1368
Inclusive Graphic Skewness :- {SKI}	-0.297	Unitless	DC	-1	UKAS	LE	1368
Kurtosis	0.736	Unitless	DC	0	UKAS	LE	1368
Particle Diameter : Mean	0.231	mm	DC	0	UKAS	LE	1368
Particle Diameter : Median	0.0410	mm	DC	0	UKAS	LE	1368
Sorting Coefficient	2.45	Unitless	DC	0	UKAS	LE	1368
Grain Size Fraction : < 0.98 microns : {>10 phi}	2.82	%	DC	0	UKAS	LE	1370
Grain Size Fraction : >1000 microns : {<0 phi}	1.59	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 0.98 to 1.38 microns : {10 to 9.5 phi}	1.95	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 1.38 to 1.95 microns : {9.5 to 9 phi}	2.46	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 1.95 to 2.76 microns : {9 to 8.5 phi}	3.59	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 11.1 to 15.6 microns : {6.5 to 6 phi}	4.53	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 125 to 177 microns : {3 to 2.5 phi}	11.8	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 15.6 to 22.1 microns : {6 to 5.5 phi}	4.64	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 177 to 250 microns : {2.5 to 2 phi}	7.43	%	DC	0	UKAS	LE	1370

Grain Size Fraction : 2.76 to 3.91 microns : {8.5 to 8 phi}	5.22	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 22.1 to 31.3 microns : {5.5 to 5 phi}	4.77	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 250 to 354 microns : {2 to 1.5 phi}	2.36	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 3.91 to 5.52 microns : {8 to 7.5 phi}	5.52	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 31.3 to 44.2 microns : {5 to 4.5 phi}	4.78	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 354 to 500 microns : {1.5 to 1 phi}	0.0590	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 44.2 to 62.5 microns : {4.5 to 4 phi}	5.70	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 5.52 to 7.81 microns : {7.5 to 7 phi}	5.57	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 500 to 707 microns : {1 to 0.5 phi}	0.00	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 62.5 to 88.4 microns : {4 to 3.5 phi}	8.42	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 7.81 to 11.1 microns : {7 to 6.5 phi}	5.13	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 707 to 1000 microns : {0.5 to 0 phi}	0.00	%	DC	0	UKAS	LE	1370
Grain Size Fraction : 88.4 to 125 microns : {3.5 to 3 phi}	11.7	%	DC	0	UKAS	LE	1370
Hydrocarbons : Total : Dry Wt as Ekofisk	340	mg/kg		0.03	UKAS	LE	402
Mercury : Dry Wt	0.234	mg/kg		0.002	UKAS	LE	1082
Aluminium, HF Digest : Dry Wt	46900	mg/kg	DC	50	UKAS	LE	756
Arsenic, HF Digest : Dry Wt	15.4	mg/kg		0.2	UKAS	LE	341
Cadmium, HF Digest : Dry Wt	0.292	mg/kg		0.01	UKAS	LE	341
Chromium, HF Digest : Dry Wt	88.4	mg/kg		3	UKAS	LE	341
Copper, HF Digest : Dry Wt	40.7	mg/kg		0.4	UKAS	LE	341
Lead, HF Digest : Dry Wt	54.5	mg/kg		0.2	UKAS	LE	341
Lithium, HF Digest : Dry Wt	66.2	mg/kg		0.1	UKAS	LE	341
Nickel, HF Digest : Dry Wt	33.8	mg/kg		0.6	UKAS	LE	341
Zinc : HF Digest : Dry Wt	137	mg/kg		0.05	UKAS	LE	341
Aldrin : Dry Wt	<0.5	ug/kg		0.5	UKAS	LE	672
DDE -pp : Dry Wt	0.297	ug/kg		0.1	UKAS	LE	672
DDT -op : Dry Wt	0.327	ug/kg		0.1	UKAS	LE	672
DDT -pp : Dry Wt	1.65	ug/kg		0.1	UKAS	LE	672
Dieldrin : Dry Wt	<0.5	ug/kg		0.5	UKAS	LE	672
Endrin : Dry Wt	<0.5	ug/kg		0.5	UKAS	LE	672
HCH -alpha : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
HCH -beta : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
HCH -delta : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
HCH -gamma : Dry Wt :- {Lindane}	<0.1	ug/kg		0.1	UKAS	LE	672
Hexachlorobenzene : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
Hexachlorobutadiene : Dry Wt	<0.1	ug/kg		0.1	UKAS	LE	672
Isodrin : Dry Wt	<0.5	ug/kg		0.5	UKAS	LE	672
TDE - pp : Dry Wt	1.06	ug/kg		0.1	UKAS	LE	672
Acenaphthene : Dry Wt	10.8	ug/kg		1	UKAS	LE	1051
Acenaphthylene : Dry Wt	4.54	ug/kg		1	None	LE	1051
Anthracene : Dry Wt	36.6	ug/kg		1	UKAS	LE	1051
Benzo(a)anthracene : Dry Wt	138	ug/kg		1	UKAS	LE	1051
Benzo(a)pyrene : Dry Wt	153	ug/kg		1	UKAS	LE	1051
Benzo(b)fluoranthene : Dry Wt	153	ug/kg		1	UKAS	LE	1051
Benzo(ghi)perylene : Dry Wt	129	ug/kg		1	UKAS	LE	1051
Benzo(k)fluoranthene : Dry Wt	87.7	ug/kg		1	UKAS	LE	1051
Chrysene : Dry Wt	97.8	ug/kg		3	UKAS	LE	1051
Dibenzo(ah)anthracene : Dry Wt	30.6	ug/kg		1	UKAS	LE	1051
Fluoranthene : Dry Wt	206	ug/kg		1	UKAS	LE	1051
Fluorene : Dry Wt	19.5	ug/kg		5	UKAS	LE	1051
Indeno(1,2,3-c,d)pyrene : Dry Wt	118	ug/kg		1	UKAS	LE	1051

Naphthalene : Dry Wt	39.2	ug/kg	*5*	UKAS	LE	1051
Phenanthrene : Dry Wt	122	ug/kg	*5*	UKAS	LE	1051
Pyrene : Dry Wt	225	ug/kg	*1*	UKAS	LE	1051
PCB - 028 : Dry Wt	0.425	ug/kg	*0.1*	UKAS	LE	685
PCB - 052 : Dry Wt	0.178	ug/kg	*0.1*	UKAS	LE	685
PCB - 101 : Dry Wt	0.318	ug/kg	*0.1*	UKAS	LE	685
PCB - 118 : Dry Wt	0.419	ug/kg	*0.1*	UKAS	LE	685
PCB - 138 : Dry Wt	0.225	ug/kg	*0.1*	UKAS	LE	685
PCB - 153 : Dry Wt	0.385	ug/kg	*0.1*	UKAS	LE	685
PCB - 180 : Dry Wt	0.163	ug/kg	*0.1*	UKAS	LE	685
Dibutyl Tin : Dry Wt as Cation	<4	ug/kg ELEVATED_MRV : Dry weight calculation	*3*	UKAS	LE	897
Tributyl Tin : Dry Wt as Cation	<4	ug/kg ELEVATED_MRV : Dry weight calculation	*3*	UKAS	LE	897
Dry Solids @ 30°C	70.3	%	*0.5*	None	LE	1130
Dry Solids @ 105°C	75.1	%	*0.5*	UKAS	LE	911
Loss on Ignition @ 500°C	3.90	%	*0.5*	UKAS	LE	911
Accreditation Assessment	2	No.		None	LE	924
Sample Preparation	Report	Text		None	LE	924

The sample appeared to be dark-brown clay-sediment.

261.87g of the sample was taken for drying at <30degC which gave 185.70g of dried sample (weights include tray weight).
The sample was crushed using a jaw crusher.
The sample was then sieved until it passed through a 2mm sieve.
The sample was received unpreserved.

All parameters are determined on the air-dried (<30degC) portion except those requiring a wet sample fraction where as received (wet) sample was used.

Dry Weight (DW) results are reported as determined at <30degC.

National Laboratory Service

Analytical Report

Final Report - Amended - Issue 3

Report ID - 20066786 - 3

Batch description: Dunlaoghaire

UKAS TESTING 0754

Reported on: 22-Aug-2014

Client: IGSL Ltd

Project: Marine Sediment

Quote Description: Marine Sediment

Folder No: 002873239

Sampled on: Date Not Supplied

Comments: CRM

Quote No: 11280

Matrix: Sediment

Analyte	Result	Units	Flag	MRV	Accred	Lab ID	Testcode
Carbonate as C : Dry Wt	<0.240	%	DA, DC		None	NLS	864
DDT : Sum of components : Dry Wt	NoResult	ug/kg	DA		None	NLS	864
Moisture Content, Air dried 105 C	100	%	DA, DC		None	NLS	864
PAH : Total : Dry Wt :- {Polynuclear Aromatic Hydrocarbon	4.18	mg/kg	DA, DC		None	NLS	864
PCB : Total (28, 52, 101, 118, 138, 153, 180)	0.0332	mg/kg	DA, DC		None	NLS	864
Carbon : Dry Wt	0.640	%	DA, DC	0.4	UKAS	LE	404
Carbon, Organic : Dry Wt as C	<0.4	%	DA, DC	0.4	UKAS	LE	404
Mercury : Dry Wt	0.0900	mg/kg	DA	0.002	UKAS	LE	1082
Aluminium, HF Digest : Dry Wt	77200	mg/kg	DA, DC	50	UKAS	LE	756
Arsenic, HF Digest : Dry Wt	22.3	mg/kg	DA	0.2	UKAS	LE	341
Cadmium, HF Digest : Dry Wt	0.233	mg/kg	DA	0.01	UKAS	LE	341
Chromium, HF Digest : Dry Wt	101	mg/kg	DA	3	UKAS	LE	341
Copper, HF Digest : Dry Wt	44.5	mg/kg	DA	0.4	UKAS	LE	341
Lead, HF Digest : Dry Wt	19.4	mg/kg	DA	0.2	UKAS	LE	341
Lithium, HF Digest : Dry Wt	86.3	mg/kg	DA	0.1	UKAS	LE	341
Nickel, HF Digest : Dry Wt	46.5	mg/kg	DA	0.6	UKAS	LE	341
Zinc : HF Digest : Dry Wt	161	mg/kg	DA	0.05	UKAS	LE	341
Aldrin : Dry Wt	<0.5	ug/kg	DA	0.5	UKAS	LE	672
DDE -pp : Dry Wt	3.39	ug/kg	DA	0.1	UKAS	LE	672
DDT -op : Dry Wt	<0.1	ug/kg	DA	0.1	UKAS	LE	672
DDT -pp : Dry Wt	1.27	ug/kg	DA	0.1	UKAS	LE	672
Dieldrin : Dry Wt	<0.5	ug/kg	DA	0.5	UKAS	LE	672
Endrin : Dry Wt	<0.5	ug/kg	DA	0.5	UKAS	LE	672
HCH -alpha : Dry Wt	0.287	ug/kg	DA	0.1	UKAS	LE	672
HCH -beta : Dry Wt	0.947	ug/kg	DA	0.1	UKAS	LE	672
HCH -delta : Dry Wt	0.961	ug/kg	DA	0.1	UKAS	LE	672
HCH -gamma : Dry Wt :- {Lindane}	0.685	ug/kg	DA	0.1	UKAS	LE	672
Hexachlorobenzene : Dry Wt	6.86	ug/kg	DA	0.1	UKAS	LE	672
Hexachlorobutadiene : Dry Wt	<0.1	ug/kg	DA	0.1	UKAS	LE	672
Isodrin : Dry Wt	<0.5	ug/kg	DA	0.5	UKAS	LE	672
TDE - pp : Dry Wt	3.37	ug/kg	DA	0.1	UKAS	LE	672
Acenaphthene : Dry Wt	30.4	ug/kg	DA	1	UKAS	LE	1051
Acenaphthylene : Dry Wt	38.2	ug/kg	DA	1	None	LE	1051
Anthracene : Dry Wt	168	ug/kg	DA	1	UKAS	LE	1051
Benzo(a)anthracene : Dry Wt	297	ug/kg	DA	1	UKAS	LE	1051
Benzo(a)pyrene : Dry Wt	262	ug/kg	DA	1	UKAS	LE	1051
Benzo(b)fluoranthene : Dry Wt	413	ug/kg	DA	1	UKAS	LE	1051
Benzo(ghi)perylene : Dry Wt	271	ug/kg	DA	1	UKAS	LE	1051
Benzo(k)fluoranthene : Dry Wt	217	ug/kg	DA	1	UKAS	LE	1051
Chrysene : Dry Wt	276	ug/kg	DA	3	UKAS	LE	1051
Dibenzo(ah)anthracene : Dry Wt	75.3	ug/kg	DA	1	UKAS	LE	1051
Fluoranthene : Dry Wt	599	ug/kg	DA	1	UKAS	LE	1051

Fluorene : Dry Wt	62.1	ug/kg	DA	5	UKAS	LE	1051
Indeno(1,2,3-c,d)pyrene : Dry Wt	245	ug/kg	DA	1	UKAS	LE	1051
Naphthalene : Dry Wt	714	ug/kg	DA	5	UKAS	LE	1051
Phenanthrene : Dry Wt	319	ug/kg	DA	5	UKAS	LE	1051
Pyrene : Dry Wt	438	ug/kg	DA	1	UKAS	LE	1051
PCB - 028 : Dry Wt	4.68	ug/kg	DA	0.1	UKAS	LE	685
PCB - 052 : Dry Wt	5.43	ug/kg	DA	0.1	UKAS	LE	685
PCB - 101 : Dry Wt	5.78	ug/kg	DA	0.1	UKAS	LE	685
PCB - 118 : Dry Wt	4.98	ug/kg	DA	0.1	UKAS	LE	685
PCB - 138 : Dry Wt	3.50	ug/kg	DA	0.1	UKAS	LE	685
PCB - 153 : Dry Wt	5.21	ug/kg	DA	0.1	UKAS	LE	685
PCB - 180 : Dry Wt	3.61	ug/kg	DA	0.1	UKAS	LE	685
Dibutyl Tin : Dry Wt as Cation	666	ug/kg	DA	3	UKAS	LE	897
Tributyl Tin : Dry Wt as Cation	478	ug/kg	DA	3	UKAS	LE	897

National Laboratory Service

Analytical Report

Final Report - Amended - Issue 3

Report ID - 20066786 - 3

Batch description: Dunlaoghaire

0754

Reported on: 22-Aug-2014

Method Description Summary for all samples in batch Number 20066786

341	LE M Metals ICP-MS Sediment - HF Digest Open Vessel Hotplate Digest, determined by ICPMS, samples are sieved to <63um.
402	LE I Hydrocarbons by UV- methanol digested, pentane xch, by UV fluorescence spectrometry
404	LL I CHN 11.2 & 11.3 - combusted; determined by TCD; Organic C - acid pretreated to remove inorganic carbonates
672	LE O OCP_PAH_PCB in Marine Biota and Sediment - solvent extracted, determined by GCMS QQQ
685	LE O OCP_PAH_PCB in Marine Biota and Sediment - solvent extracted, determined by GCMS QQQ
756	LE M Metals Marine (ICPOES) - Open Vessel Hotplate HF digest, determined by ICPOES, samples are sieved to <63um.
864	Parameter by calculation
897	LE O Organotins (GCMS) 01 - acetic acid/methanol extracted; derivatised; determined GCMS (SIM); from "as received" sample
911	LE I Dry Solids & LoI 01 - Dry Solids (105C), Loss on Ignition (500C) - thermally treated; determined by gravimetry
924	Sample Preparation; Dry Solids (30°C); from "as received" sample
1051	LE O OCP_PAH_PCB in Marine Biota and Sediment - solvent extracted, determined by GCMS QQQ
1082	LE M Mercury CSEMP - microwave aqua regia digested, acidic SnCl2 reduced, determined by CV-AFS, samples are sieved to <63um.
1130	LE P Soil Preparation 01: The sample is air-dried at <30ºC in a controlled environment until a constant weight it achieved.
1368	LE P Particle Size Sediment by Laser Diffraction - various parameters calculated from the band sizes produced by laser beam diffraction technique
1369	LE P Particle Size Sediment Sieve - various band sizes >1000mm - determined by manual sieving.
1370	LE P Particle Size Sediment by Laser Diffraction - various band sizes <1000mm - determined by laser beam diffraction instrumentation.

Steve Moss
Laboratory Site Manager

All reporting limits quoted are those achievable for clean samples of the relevant matrix. No allowance is made for instances when dilutions are necessary owing to the nature of the sample or insufficient volume of the sample being available. In these cases higher reporting limits may be quoted and will be above the MRV.

Solid sample results are determined on a "dried" sample fraction except for parameters where the method description identifies that "as received" sample was used.

Key to Results Flags:

DA Sampling date/time has not been provided and no assessment of sample stability can be made. It is possible that the results may be compromised.

DC Analysis started outside of specified holding time. It is possible that the results may be compromised.

D2 Sample has been provided in a condition unsuitable for analysis. This will put the analysis outside the scope of our UKAS accreditation and it is possible results may be compromised

The analysis start date specified is the date of the first test, dates for other analysis are available on request.

Please note all samples will be retained for 10 working days for aqueous samples and 30 working days for solid samples after reporting unless otherwise agreed with Customer Services

Key to Accreditation: UKAS = Methodology accredited to ISO/IEC 17025:2005, MCertS = Methodology accredited to MCertS Performance Standard for testing of soils, none = Methodology not accredited

Key to Lab ID: LE = Leeds, NM = Nottingham, SX = Starcross, SC = Sub-Contracted outside NLS, FI = Field Data - outside NLS, NLS = Calculated

Any subsequent version of this report denoted with a higher version number will supersede this and any previous versions

END OF TEST REPORT

NLS Leeds
Olympia House
Gelderd Lane
Gelderd Road
Leeds LS12 6DD

NLS Nottingham
Meadow Lane
Nottingham
NG2 3HN

NLS Starcross
Staplake Mount
Starcross
Exeter
EX6 8FD

Environment Agency

EUROPEAN COMMISSION
JOINT RESEARCH CENTRE
Institute for Reference Materials and Measurements

CERTIFIED REFERENCE MATERIAL
BCR® – 646

CERTIFICATE OF ANALYSIS

FRESH WATER SEDIMENT		
	Mass fraction based on dry mass	
	Certified value [1] [µg/kg]	Uncertainty [2] [µg/kg]
TBT: $Sn(C_4H_9)_3^+$	480	80
DBT: $Sn(C_4H_9)_2^{2+}$	770	90
MBT: $Sn(C_4H_9)^{3+}$	610	120
TPhT: $Sn(C_6H_5)_3^+$	29	11
DPhT: $Sn(C_6H_9)_2^{2+}$	36	8
MPhT: $Sn(C_6H_5)^{3+}$	69	18

1) Unweighted mean value of the means of 6-14 accepted sets of data. The certified value is valid for the cation indicated. Unweighted mean of accepted mean values, independently obtained by 6 - 14 laboratories. The value is traceable to the International System of Units (SI).
2) The certified uncertainty is the expanded uncertainty with a coverage factor k = 2, corresponding to a level of confidence of about 95 %, comprising uncertainties from the characterisation and inhomogeneity studies .

This certificate is valid for one year after purchase.

Sales date:

The minimum amount of sample to be used is 600 mg.

NOTE

This material has been certified by BCR (Community Bureau of Reference, the former reference materials programme of the European Commission). The certificate has been revised under the responsibility of IRMM.

Brussels, December 2000
Latest revision: May 2007

Signed: 

Prof. Dr. Hendrik Emons
Unit for Reference Materials
EC-JRC-IRMM
Retieseweg 111
2440 Geel, Belgium

DESCRIPTION OF THE SAMPLE

The material consists of a dried and ground sediment sample with a particle size < 90 micrometer stored in an amber glass bottle. The bottle contains about 40 g of powder. Additional information on the preparation and the certified values is given in the certification report.

ANALYTICAL METHOD USED FOR CERTIFICATION

- Gas chromatography-quartz furnace atomic absorption spectrometry, (GC-QTAAS)
- Gas chromatography-flame photometric detection, (GC-FPD)
- Gas chromatography-mass spectrometry, (GC-MS)
- Gas chromatography-microwave induced plasma atomic emission spectrometry, (GC-MIP-AES)
- Gas chromatography-inductively coupled plasma mass spectrometry, GC-ICP-MS)
- High performance liquid chromatography-inductively coupled plasma mass spectrometry, (HPLC-ICP-MS)
- High performance liquid chromatography-fluorescence spectrometry, (HPLC-FLD)
- Polarography

PARTICIPANTS

- CEFAS, Burnham-on-Crouch (GB)
- CID-CSIC, Department of Environmental Chemistry, Barcelona (ES)
- CNRS, Laboratoire de Chimie Bio-inorganique & Environnement, Pau (FR)
- ENEA, Casaccia, Divisione di Chimica Ambientale, Roma (IT)
- GALAB, Geesthacht (DE)
- International Tin Research Institute, Uxbridge (GB)
- Natl.Technical University of Athens, Lab of Inorganic and Analytical Chem., Athens (GR)
- Rijkswaterstaat, RIKZ, Haren (NL)
- Technische Universität Wien, Institut für analytische Chemie, Wien (AT)
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- Université de Pau et des Pays de l'Adour, Laboratoire de Chimie Analytique, Pau (FR)
- University of Plymouth, Department of Environmental Sciences, Plymouth, UK
- Universidad de Santiago, Depto. de Química Analítica, Santiago de Compostela (ES)
- Vrije Universiteit Amsterdam, Instituut voor Milieuvraagstukken, Amsterdam (NL)
- European Commission, Joint Research Centre, Institute for Reference Materials and Measurements, Geel (BE)

SAFETY INFORMATION

The usual laboratory safety precautions apply.

INSTRUCTIONS FOR USE

The material is intended for analytical purposes. The sample can be used as is from the bottle. Before a bottle is opened, it should be shaken manually for 5 min so that the material is thoroughly re-mixed. The correction to dry mass should be made on a separate portion of 100 mg which should be dried in an oven at 105 ºC for 3-4 h until constant mass is attained. The reuse of the material after opening of the bottle is under the responsibility of the user, i.e. the certified values are not guaranteed in bottles that have been opened and further stored. Moreover, taking into account the potential instability of the tin compounds, it is recommended that no bottles be used if the history of the storage conditions in the laboratory is not known in detail. Care has been taken to ensure that the certified value represents the "true" value at the time of arrival at the customer as closely as possible. When the reference material is used to assess the performance of a procedure, the user should refer to the recommendations of the certification report.

STORAGE

The tightly closed bottles should be kept at - 30 ºC in the dark for long term storage periods. Before closing the bottle after use, it is advisable to flush the bottle with a dry, inert gas. However, the European Commission cannot be held responsible for changes that happen during storage of the material at the customer's premises, especially of opened samples.

LEGAL NOTICE

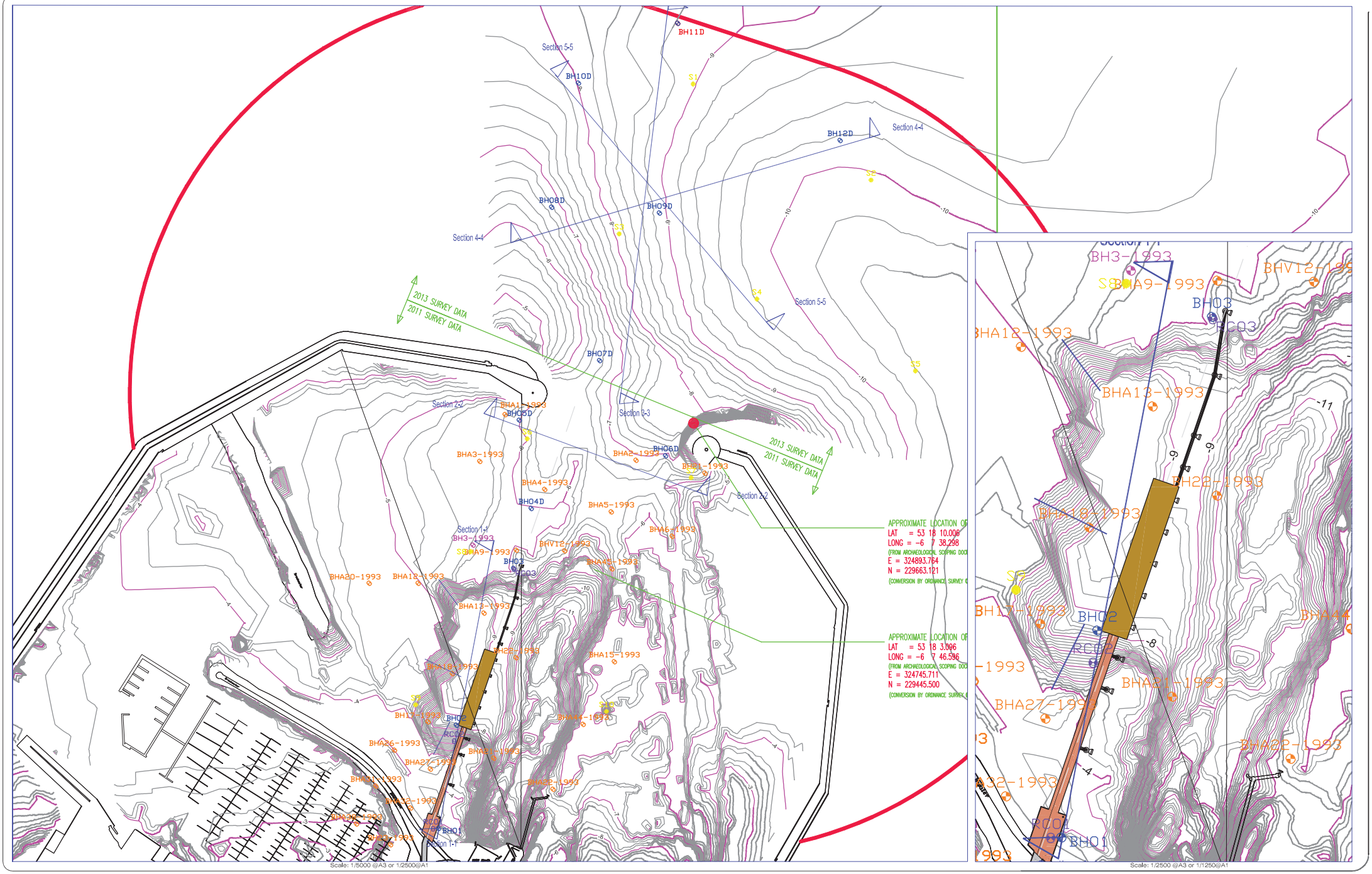
NOTE

A technical report on the production of BCR-646 is available on the internet (http://www.irmm.jrc.be). A paper copy can be obtained from IRMM on request.

European Commission – Joint Research Centre
Institute for Reference Materials and Measurements (IRMM)
Retieseweg 111, 2440 Geel (Belgium)
Telephone: +32-(0)14-571.722 - Telefax: +32-(0)14-590.406

Appendix 6

Site Plan / Drawings



North

Site Location

- Chart Datum: ODM
- Datum: ING

BH04D Borehole Location

Rotary Corehole Location

Borehole(1993 SI) Location

Rotary Corehole(1993) Location

Marine Sampling location(2013) Location

Notes:
The 1993 Site Investigation report does not include the x,y on the exploratory locations. IGSL have interpolated the locations above and presented same for reference use only.

IGSL Limited
Unit 7 NXT Business Park, Naas, Co.Kildare
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SITE INVESTIGATION & GEOTECHNICAL SPECIALISTS

Rev	By	Date	Description
0	CK	24/06	Layout Plan
1	CK	25/07	Section and Plan

Project:	Dun Laoghaire Harbour Cruise Facility
Component:	Ground Investigation Contract
Title:	Master Location Plan

Designed:	CK	Date: 06/06	File Name:	17585	Drawing No: 17585-000-101
Drawn:	CK	Date: 06/06	Original Scale:	1/5000 @A3 1/2500@A1	
Checked:	DC	Date: 06/06	Date:	06/06/2014	