Scapa Deep Water Quay (SDWQ)
Dredging Best Practicable Environmental Option Report

May 2023

CONTROL SHEET

Client:	Orkney Islands Council
Project Title:	Scapa Deep Water Quay (SDWQ)
Report Title:	Dredging Best Practicable Environmental Option Report
Document number:	13145
Project number:	674795

Issue Record

Issue	Status	Author	Reviewer	Approver	Issue Date
1	Final	CCAS	GD	GD	11/05/2023
2	Rev1	CCAS	GD	IB	18/08/2023

EnviroCentre Limited Office Locations:

Glasgow **Edinburgh** **Inverness** **Banchory**

Registered Office: Craighall Business Park 8 Eagle Street Glasgow G4 9XA
Tel 0141 341 5040 info@envirocentre.co.uk www.envirocentre.co.uk

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VAT no. GB 348 6770 57.

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1 INTRODUCTION

EnviroCentre Ltd. has been appointed by Orkney Islands Council Harbour Authority (OICHA) to undertake a Best Practicable Environmental Options appraisal (BPEO) in support of the dredge licence for capital dredging to help develop the deepwater quay at Scapa. The development of Scapa Deep Water Quay comprises the design and construction of a new harbour facility comprising approx. 597m long main quayside berth with general -15m CD water depth, incorporating a 135m quayside pocket with -20m CD water depth. Further north tug (3No.) and pilot boat (2No.) berth approx. 180m long with depths between -6 and -9m CD. Laydown area directly behind quay face approx. 22.85 Hectares. There will also be an access road from the A961 to the site.

The main purpose of this facility would be to undertake any/multiple industry activity that requires both deep-water berthing and large laydown area. There are specific market opportunities in the offshore wind and oil and gas sectors.

As part of the licensing process applicants are required to undertake a Best Practicable Environmental Option (BPEO) assessment for the disposal routes for the prospective dredge material in conjunction with the assessment of the chemical and physical properties of the same material to ensure that quality of the material is suitable for the identified disposal route(s).

1.1 Background Information

As outlined above, the works will comprise an element of dredging split in to three phase areas

Sampling was undertaken in March and April 2022 which comprised collection of 13 boreholes and Washprobe samples from the dredge areas. The samples were predominately sand with variable silt and gravel content.

The proposed dredge areas and volumes are detailed in Table 1-1 below with the dredge areas presented and sample locations provided in drawing 21-1031-EHL-001 in Appendix A.

Table 1-1: Proposed Dredge Areas and Approximate Dredge Volumes

Dredge Area	Approximate Total Dredge Volume (m^3)	Target Dredge Depth (m below Chart Datum)	Dredge Thickness range (m)*
Phase 1 & 2	83,000	-15m	Variable <1.0m to c7m

1.2 Scope of Report

The purpose of this report is to review each of the available potential disposal options for the dredged materials. The options which are not considered to be practicable are rejected and the reasons for doing so are explained.

Those options which are practicable are examined in detail and assessed against the following considerations: -

- Environmental;
- Strategic; and

- Cost.

The report then compares the practicable disposal options and draws a conclusion on the BPEO.

1.3 Sediment Sampling and Nature of Marine Sediments on Site

Samples from the proposed dredge area were collected in March and April 2022 and submitted for analysis in line with Marine Scotland's guidance and the agreed sampling plan. The sample logs are provided in Appendix B with Laboratory certificates and data summary tables in Appendix C.

Due to extreme weather conditions during the sampling and extensive weather related delays, and associated mounting costs, a number of the original boreholes were abandoned, and samples collected and tested from the ones achieved. Correspondence was undertaken with Marine Scotland in December 2022 to highlight these constraints, and it was agreed that the available information was considered suitable for the dredge application and that no further sampling would be required.

Sediment type across all dredge areas was predominately sand with varying gravel and silt content.

The following sections details the exceedances of the Revised Action Levels (RALs) with further consideration of these exceedances undertaken in Section 3.

1.3.1 Metals

Exceedances of the RALs for metals can be summarised as follows:

- Arsenic –5 of 34 samples recorded arsenic levels above RAL1. The maximum concentration recorded was 27.8mg/kg.
- Cadmium –0 of 34 samples recorded cadmium levels above RAL1. The maximum concentration recorded was 0.13 mg/kg.
- Copper – 3 of 34 samples recorded copper levels above RAL1. The maximum concentration recorded was 84.1 mg/kg.
- Chromium – 1 of 34 samples recorded chromium levels above RAL1. The maximum concentration recorded was 51.4 mg/kg.
- Lead – 1 of 34 samples recorded lead levels above RAL1. The maximum concentration recorded was 50.7 mg/kg.
- Mercury – 0 of 34 samples recorded mercury levels above RAL1. The maximum concentration recorded was 0.13 mg/kg.
- Nickel – 1 of 34 samples recorded nickel levels above RAL1. The maximum concentration recorded was 31.8 mg/kg.
- Zinc – 1 of 34 samples recorded zinc levels above RAL1. The maximum concentration recorded was 161 mg/kg.

There were no exceedances of RAL2 for metals recorded within any of the 34 samples collected.

1.3.2 Tributyl Tin (TBT)

All samples were recorded below the laboratory limit of detection (LOD) and all samples recorded below RAL1.

1.3.3 Polyaromatic Hydrocarbons (PAHs)

No samples recorded PAH concentrations above RAL1.

1.3.4 Polychlorinated Biphenyls (PCBs)

All samples recorded individual PCB congeners below RAL1. The highest recorded total ICES 7 concentration was 0.0019 mg/kg.

1.3.5 Total Hydrocarbons (THC)

1 of 34 samples recoded hydrocarbons above RAL1. The maximum recorded is 123 mg/kg.

1.4 Report Usage

The information and recommendations contained within this report have been prepared in the specific context stated above and should not be utilised in any other context without prior written permission from EnviroCentre Limited.

If this report is to be submitted for regulatory approval more than 12 months following the report date, it is recommended that it is referred to EnviroCentre Limited for review to ensure that any relevant changes in data, best practice, guidance or legislation in the intervening period are integrated into an updated version of the report.

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2 DISCUSSION OF AVAILABLE DISPOSAL OPTIONS

The BPEO process is geared towards identifying a preferred overall strategy from the perspective of the environment as a whole, as opposed to detailed optimisation of any one selected scheme. It is a structured and systematic process to identify and compare strategic options in a transparent manner. Alternatives are evaluated in terms of their projected implications for the environment together with consideration of practicability, social and economic issues as well as within a wider strategic context.

The key stages of a BPEO are:

- Identification of options;
- Screening of options;
- Selection of assessment criteria;
- Analysis and evaluation of criteria; and
- Evaluation of BPEO.

Further details on methodology are provided within each section.

2.1 Identification and Screening of Available Disposal Options

A number of options are available for disposal of dredged sediments. The options considered are provided in Table 2-1 along with justification for screening out those options which have not been taken forward for further consideration.

Table 2-1: Initial Best Practicable Available Options

Location	Options	Screening Assessment	Carry forward?
Shore/Estuary/ Riverbank	Leave in situ	Not an option due to the project specific requirements to create berthing at the pier and navigable approaches.	No
	Infilling of an existing dry dock/harbour facility/development site (re-use)	The project requires a significant amount of infill behind the quay wall for reclamation. It is envisaged that up to 70% of all dredged material from Phase 1 and Phase 2. Will be utilised as infill with the remainder of structurally unsuitable material proposed to be disposed of at sea at a licensed disposal ground.	Yes
	Beach Nourishment	Specific beach nourishment projects would require to be supported by Environmental Assessments as a minimum to inform how the project could affect the environment as a result of disturbance to the intertidal area, changes to the sediment levels, the variable composition and quality of the material and measures devised from the assessment outcomes to minimise impacts on the environment. The dredge material comprises a mixture of gravel, sand and silt. Fine sediments (i.e. silt) is not suitable for beach nourishment in the traditional sense.	No
Land	Landfill Disposal	This is possible but it is unlikely that this option will offer long term solution due to lack of space at landfills. Landfill space is currently at a premium and does not offer a sustainable solution either financially or environmentally for the disposal of dredged arisings. Dredged material likely to require treatment first in a dewatering facility. Significant cost associated with set up of dewatering facility at the quayside plus transportation and additional costs associated with gaining the necessary planning and regulatory consents. OIC were contacted with regards to landfills in proximity to the site. Bossack Waste Transfer and Landfill Facility near Kirkwall has a daily capacity of 225 tonnes of inert waste or 5,000 tonnes /year so would not be a viable option for disposal. Transporting to another landfill would require marine transport plus road transport.	No
	Land Incineration	The dredged material consists of non-combustible material (silts, sands, gravels, shells) with a low combustible component and very high-water content.	No

	Application to Agricultural Land	The dredged material would need to be treated to reduce salt concentrations to acceptable levels. Would require detailed chemical analysis and assessment as well as a Waste Management License Exemption. Would require special precautions during spreading in relation to the risk of odour and watercourses / aquifers. The availability of land for this option will be limited within a reasonable haulage distance of the dredge arisings. Large volumes each year are unlikely to be viable to dispose of in this manner and would potentially have a detrimental effect on existing terrestrial habitats.	No
	Recycling	Recycling of dredged material is theoretically possible, however, due to the varied lithology there would need to be either segregation during dredging works to minimise the entrainment of fine-grained material into the sands, or energy and water rich processing on land.	No
Sea	Aquatic disposal direct to seabed.	Relatively low cost, minimal transportation requirements compared to all other options and potential for low environmental risk. The closest spoil grounds are Stromness B being the closest is located approximately 16km South. It would be proposed that only unsuitable material for construction works would be deposited within the disposal site i.e. material with high silt content.	Yes

2.2 Summary of Identified BPEO Options

Following review of the available options and the proposed construction requirements a combination of proposed reuse/sea disposal has been identified as the BPEO. The remote nature of the site and distance from the mainland, precludes the majority of the other options on the basis of not being practical options.

The chemical quality of the material is typically acceptable for sea based disposal, however further consideration of the RAL1 exceedances outlined previously is provided in Section 3.

3 FURTHER ASSESSMENT

3.1 Chemical Quality

Up to 5 samples from 34 in total recorded exceedances of RAL1 for metals and one sample recorded a marginal exceedance of Total Petroleum Hydrocarbons (TPH).

Further consideration is given to this result using the Canadian Council Ministers of the Environment (CCME) Canadian Sediment Quality Guidelines for the Protection of Aquatic Life considering both the Effects Range Low (ERL) and Probable Effects Level (PEL). This is summarised in the table below.

Table 3-1: Further Assessment Summary

Contaminant	Number of RAL1 Exceedances of 34 samples	Number of ERL Exceedances of 34 samples	Number of PEL Exceedances of 34 samples
Arsenic	5	N/A	0
Copper	3	3	0
Chromium	1	0	0
Lead	1	1	0
Nickle	1	N/A	N/A
Zinc	1	1	0
TPH	1	N/A	N/A

In summary, there are no exceedances of Probable Effect Levels or RAL2 where one is available for review.

3.2 Water Framework Directive Assessment

As outlined in the Water Framework Directive Assessment: estuarine and coastal waters, there are several key receptors which can be impacted upon which need considered.

- Hydromorphology
- Biology – habitats
- Biology – fish
- Water quality
- Protected areas

A WFD assessment has not been undertaken as the proposed works have an accompanying Environmental Impact Assessment Report detailing all of this information.

3.3 Potential Risk to Water Quality and Marine Life

The potential risks to water quality at the dredge sites and disposal site are further considered below.

Contaminant levels within the proposed dredge material for sea disposal are considered to be very low and not considered to represent a significant risk to the overall water quality either at the dredge site or proposed disposal site(s). The key risks to water quality are from the dredging exercise and also

disposal where there may be periods of higher suspended solids which are likely to be both localised and temporary in nature. The larger grained material like gravel and sands will drop to the sea floor quickly, and any changes in suspended solids/turbidity will be driven by the finer grained material content, silts and clay sized particles. Where finer grained materials are cohesive, they will sink to the sea floor rapidly. The bulk of the dredge material is to be used for reclamation/construction works, with the unsuitable, higher silt containing material, proposed to be disposed of at Stromness B. The average content of various particle sizes is detailed below om Table 3-2.

Table 3-2: Summary of PSA Data

Dredge Area	Gravel (>2mm)	Sand (0.063mm<Sand<2mm)	Silt & Clay (<0.063mm)	Quantity to be dredged m^3
SDWQ Phase 1 and 2	17%	60%	23%	83,000
	14,110m^3	49,800m^3	19,090m^3	

The dominant sediment type across the majority of the dredge areas is sand. Considering the dredge volume as a whole using averaged particle size analysis data, the dominant sediment type is sand comprising 60% of the total and the remainder made up of 23% silt and 17% comprising gravel sized fractions.

Given that an average of 60% of the sediment across all dredge areas comprises sand and gravel, it is considered that the majority of the deposited sediment will fall out of suspension quickly at the disposal site with limited lateral spread.

The remaining portion of the dredge 23% or 19,090m^3 of dredge material comprises silt/clay sized particles. This material is considered to have a longer suspension time than sand and gravel sized particles when in suspension. It is understood that the unsuitable material for engineering purposes may be disposed of and would likely have a larger proportion of silt. Any effects from the disposal of the material is considered to be both localised and temporary.

Marine Scotland do not hold any information on the disposal sites.

In summary, the associated risk with degradation of water quality directly associated with the proposed disposal is considered to be Low i.e. unlikely to cause a change in status of the waterbodies in question at both the dredge and disposal sites.

3.4 Conclusions and Recommendations

Review of available chemical quality information has low level/frequency exceedances for a arsenic (5), copper (3), Total Hydrocarbon content, chromium, lead, nickel and zinc recorded a single exceedance for their respective RAL1. Assessment of key receptors identified from the Water Framework Directive assessment for estuarine and coastal waters concluded that there is a low risk of the sediments impacting upon the overall ecological or chemical status. Additionally, the contaminants of concern levels recorded in the sediment are not considered likely to have a significant adverse impact on the sediment quality already located within the disposal grounds as the majority of the samples and associated contaminants of concern were recorded below RAL1.

Overall, based on the multiple lines of evidence approach adopted to further assess the exceedances identified in the sediment assessment, the material proposed for dredging is considered suitable for sea disposal, however, the majority of the material to be dredged will be re-used within the

construction of the proposed quay, with material which does not meet the requirements for engineering purposes proposed to be of disposed of at the closest disposal site.

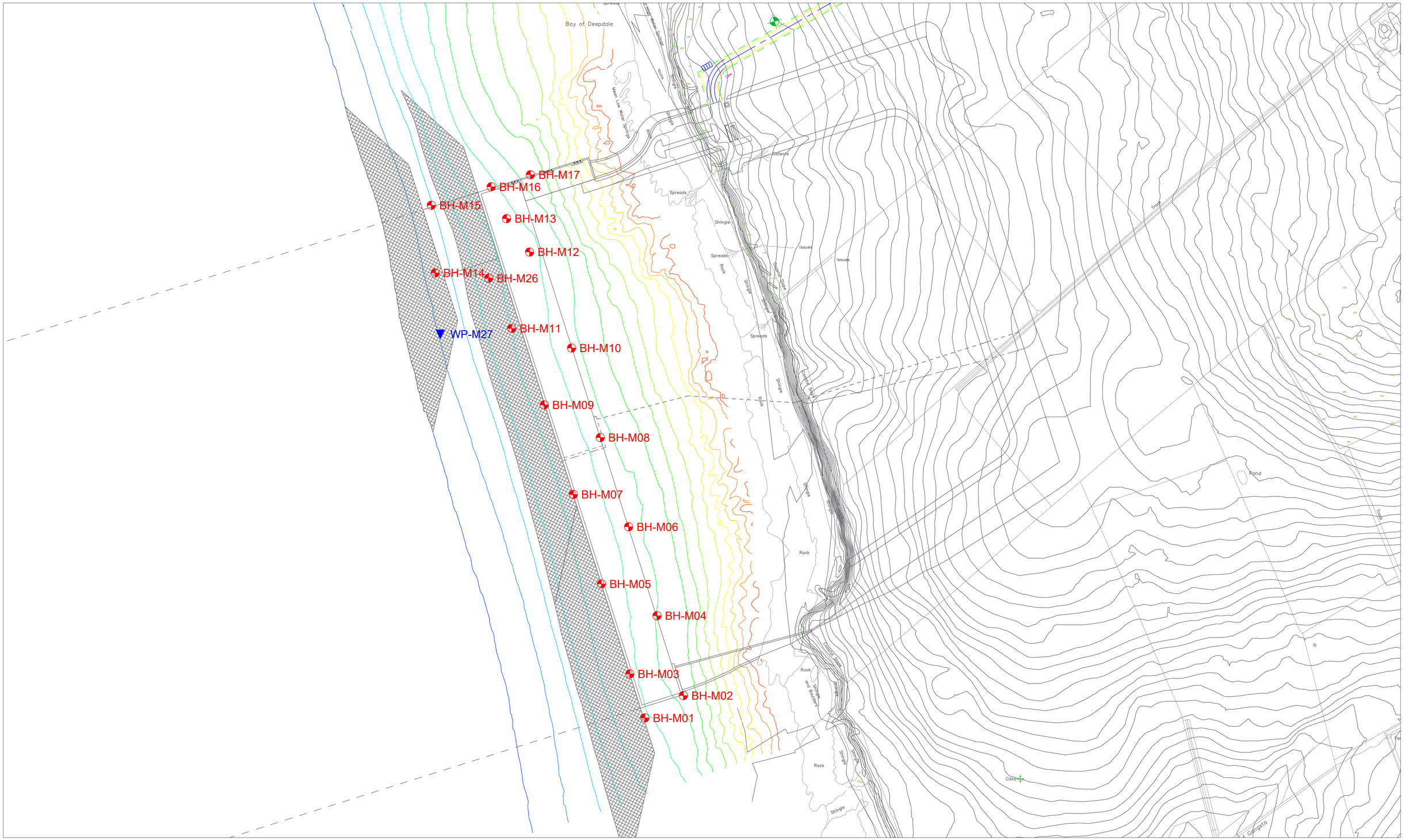
Based on the chemical quality of the sediment samples retrieved and tested from the dredge site, the sea disposal and re-use of the material is considered to have no significant long-term impact on the marine environment.

REFERENCES

Marine Scotland (2017). Pre-Dredge Sampling Guidance Version 2: Scottish Government.
Marine Scotland (2015). Guidance for Marine Licence Applicants Version 2: Scottish Government.

APPENDICES

A FIGURES



PROJECT: Scapa Deep Water Quay & Haston Pier Development - Marine GI

TITLE: Exploratory hole location plan (Scapa DWQ)

CLIENT: Orkney Islands Council

KEY:
- Borehole
- Wash Probes

ENGINEER: Arch Henderson LLP

CAUSEWAY GEOTECH

SCALE: NTS@A3	DATE: 16/05/2022		
DRWN: BS	SERIES: 1 of 1	DWG No: 21-1031-EHL-001	
CHCK: NH			

B SAMPLE LOGS

CAUSEWAY GEOTECH

APPENDIX B

BOREHOLE LOGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
21-1031	Scapa Deep Water Quay & Hatston Pier Development - Marine GI	BH-M01
	Client: Orkney Islands Council	
	Client's Rep: Arch Henderson LLP	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Sonic Drilling	Fraste Duo CXL Rotosonic	0.00	3.00	345139.28 E
Rotary Coring	Fraste Duo CXL Rotosonic	3.00	12.80	1003689.78 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 2
12.80 m	14/01/2022	MJ/KW	Scale: 1:50
Elevation: -10.10 mCD	**End Date:** 15/01/2022	**Logger:** JG+RC	FINAL

Depth (m)	Sample / Tests	Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 0.50	ES9	Marine Scotland - SS1										Medium dense grey slightly gravelly silty fine to medium SAND with shell fragments (up to 5mm). Gravel is subangular to subrounded fine of various lithologies.		
0.50	ES1													
0.50 - 1.50	B4													
1.00 - 1.50	ES10	Marine Scotland - SS2												
1.50	D7													
1.50 - 2.50	B5													
1.50 - 1.95	SPT (S)	N=18 (1,1/3,4,5,6) Hammer SN = 1353					1.50							
2.00	ES2													
2.50 - 3.00	B6								-12.60	2.50				
2.50 - 3.00	ES11	Marine Scotland - SS3										Orangish brown thinly laminated slightly gravelly silty fine to medium SAND. Gravel is angular fine to medium of various lithologies.		
3.00	D8						3.00		-13.10	3.00		Dark grey clayey slightly gravelly fine to coarse SAND. Gravel is angular fine to coarse of sandstone.		
3.00	ES3									(0.40)				
3.00 - 3.45	SPT(S) N=30 (4,6/7,7,8,8) Hammer SN = 1353		100	19	19				-13.50	3.40		Possible weathered SANDSTONE recovered as light orangish grey clayey gravelly fine to coarse sand. Gravel is angular fine to coarse of sandstone.		
									-13.80	(0.30) 3.70				
3.70	C1					6						Weak (locally medium strong) indistinctly thinly laminated fine grained light brownish orange and whitish grey SANDSTONE. Partially weathered: reduced strength and much closer fracture spacing. Discontinuities: 1. 0 to 20 degree joints closely spaced (50/110/250) planar, rough, unstained and clean. 2. 55 to 75 degree joints from 4.50m to 4.80m, 5.10m to 5.20m, 5.20m to 5.30m and 6.90m tom 7.00m, planar, rough, unstained and clean.		
3.80														
3.80	C2		100	85	47	15								
4.95	C3													
5.30										(3.30)				
5.40	C4					12								
5.60	C5		97	81	33	16								
6.80														
7.10	C6								-17.10	7.00		Medium strong (locally weak) indistinctly thinly laminated fine grained light brownish orange and whitish grey SANDSTONE. Partially weathered: slightly reduced strength, closer fracture spacing occasional heavy dark orangish brown discolouration and occasional clay infill. Discontinuities: 1. 0 to 20 degree joints closely spaced (30/140/300) planar, rough, occasional clay infill on joint surfaces up to 40mm deep. 2. 55 to 75 degree joints from 8.60m to 8.90m, 9.50m to 9.60m and 10.30m to 10.40m, planar, rough and occasional heavy dark orangish brown staining on joint surfaces up to 40mm deep.		
7.25	C7		100	93	53	7								
8.30														
8.50	C8		100	79	27									

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
3.00	177
12.80	150

Water Added

From (m)	To (m)

Remarks

Marine Borehole drilled off OCM 80 jack-up barge
Deck to Bed = 19.00m
All elevations/reduced levels given in mCD

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	29/06/2022

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
21-1031	Scapa Deep Water Quay & Hatston Pier Development - Marine GI	BH-M01
	Client: Orkney Islands Council	
	Client's Rep: Arch Henderson LLP	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Sonic Drilling	Fraste Duo CXL Rotosonic	0.00	3.00	345139.28 E
Rotary Coring	Fraste Duo CXL Rotosonic	3.00	12.80	1003689.78 N

Final Depth:	Start Date:	Driller:	Sheet 2 of 2
12.80 m	14/01/2022	MJ/KW	Scale: 1:50
Elevation: -10.10 mCD	**End Date:** 15/01/2022	**Logger:** JG+RC	FINAL

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
9.70	C9										Medium strong (locally weak) indistinctly thinly laminated fine grained light brownish orange and whitish grey SANDSTONE. Partially weathered: slightly reduced strength, closer fracture spacing occasional heavy dark orangish brown discolouration and occasional clay infill. Discontinuities: 1. 0 to 20 degree joints closely spaced (30/140/300) planar, rough, occasional clay infill on joint surfaces up to 40mm deep. 2. 55 to 75 degree joints from 8.60m to 8.90m, 9.50m to 9.60m and 10.30m to 10.40m, planar, rough and occasional heavy dark orangish brown staining on joint surfaces up to 40mm deep.		
9.80					9								
10.45	C10	83	75	37									
10.75	C11												
					AZCL				(5.80)		*11.00m to 11.30m: AZCL - Probable bed of extremely weak sandstone washed out during drilling.*		
11.30													
11.50	C12	100	97	67	8								
12.50	C13												
12.65	C14												
12.80								-22.90	12.80		End of Borehole at 12.80m		
		TCR	SCR	RQD	FI								

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Chiselling Details

From (m)	To (m)	Time (hh:mm)

Remarks

Marine Borehole drilled off OCM 80 jack-up barge
Deck to Bed = 19.00m
All elevations/reduced levels given in mCD

Casing Details

To (m)	Diam (mm)
3.00	177
12.80	150

Water Added

From (m)	To (m)

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	29/06/2022

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
21-1031	Scapa Deep Water Quay & Hatston Pier Development - Marine GI	BH-M02
	Client: Orkney Islands Council	
	Client's Rep: Arch Henderson LLP	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Sonic Drilling	Fraste Duo CXL Rotosonic	0.00	1.20	345180.32 E
Rotary Coring	Fraste Duo CXL Rotosonic	1.20	14.00	1003713.59 N

Final Depth:	14.00 m	Start Date:	20/01/2022	Driller:	KW	Sheet 1 of 2
Elevation:	-8.78 mCD	End Date:	20/01/2022	Logger:	JG+RC	Scale: 1:50
						FINAL

Depth (m)	Sample / Tests	Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 0.70	B2											Grey very gravelly silty fine to coarse SAND with shell fragments (up to 5mm). Gravel is subangular to subrounded fine to coarse of various lithologies.		
0.50	ES1													
0.70 - 1.00	B3								-9.48	0.70		Orangish brown thinly laminated silty fine to medium SAND.		
1.00 - 1.20	B4								-9.78	1.00		Yellowish brown fine to medium SAND.		
						AZCL			-9.98	1.20		Dark brownish grey clayey slightly gravelly fine to coarse SAND. Gravel is subrounded fine to coarse of mixed lithologies.		
			75	18	0	NI				(0.50)		*1.20m to 1.40m: AZCL - Probable bed of sand and gravel washed out during drilling.*		
1.70	C1								-10.48	1.70		Very weak thinly laminated fine grained light brownish yellow and brownish white SANDSTONE. Partially weathered: reduced strength and much closer fracture spacing. Discontinuities: 1. 5 to 15 degree bedding fractures closely spaced (10/65/200) planar, smooth, unstained and clean. 2. 55 to 65 degree joints from 2.35m to 2.55m and 2.80m to 2.90m, undulating, rough, unstained and clean.		
2.00														
2.00	C2		100	71	23	14				(1.20)				
3.00	C3								-11.68	2.90		Weak indistinctly thinly laminated fine grained light brownish grey and light brownish yellow SANDSTONE. Partially weathered: slightly reduced strength, much closer fracture spacing and occasional heavy brownish black discolouration on fracture surfaces. Discontinuities: 1. 0 to 20 degree bedding fractures, closely spaced (10/75/200) planar, smooth, unstained, clean. 2. 55 to 65 degree joints from 3.30m to 3.50m, 3.60m to 3.70m and 3.80m to 3.90m, undulating, rough, occasional heavy brow black staining on joint surfaces up to 0.5mm deep and clean.		
3.20	C4													
3.50						>20								
3.80	C5									(2.10)				
			41	25	0	AZCL						*4.10m to 5.00m: AZCL - Probable bed of extremely weak sandstone washed out during drilling.*		
5.00									-13.78	5.00		Weak (locally medium strong) indistinctly thickly laminated fine grained dark brownish yellow SANDSTONE. Partially weathered: slightly reduced strength, much closer fracture spacing and occasional heavy dark orangish brown discolouration on fracture surfaces. Discontinuities: 1. 0 to 15 degree bedding fractures very closely spaced (10/50/150)m planar, smooth, occasional heavy dark orangish brown staining on fracture surfaces up to 40mm deep.		
5.45	C6		97	74	26	20				(1.35)				
6.30	C7								-15.13	6.35		Medium strong (locally weak) indistinctly thinly laminated fine grained light greyish orange and light brownish orange SANDSTONE. Partially weathered: slightly reduced strength, closer fracture spacing and occasional heavy dark orangish brown discolouration on fracture surfaces. Discontinuities: 1. 0 to 15 degree bedding fractures, closely spaced (10/150/500) planar, smooth, occasional heavy dark orangish brown staining on fracture surfaces up to 100mm deep. 2. 25 to 45 degree joints medium spaced (200/470/1500) planar, smooth, occasional heavy dark orangish brown staining on joint surfaces up to 5mm deep. 3. 65 to 75 degree joint from 11.40m to 11.65m, planar, rough, heavy dark brown staining on joint surface., 10mm deep.		
6.50														
6.85	C8		100	95	63	7								
7.60	C9													
7.70	C10													
8.00														
8.00	C11		100	90	79	11								
9.00	C12													
			TCR	SCR	RQD	FI								

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
1.20	177
14.00	150

Water Added

From (m)	To (m)

Remarks

Marine Borehole drilled off OCM 80 jack-up barge
Deck to Bed = 19.60m
All elevations/reduced levels given in mCD

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L		Terminated at scheduled depth	29/06/2022

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
21-1031	Scapa Deep Water Quay & Hatston Pier Development - Marine GI	BH-M02
	Client: Orkney Islands Council	
	Client's Rep: Arch Henderson LLP	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Sonic Drilling	Fraste Duo CXL Rotosonic	0.00	1.20	345180.32 E
Rotary Coring	Fraste Duo CXL Rotosonic	1.20	14.00	1003713.59 N

Final Depth:	14.00 m	Start Date:	20/01/2022	Driller:	KW	Sheet 2 of 2
Elevation:	-8.78 mCD	End Date:	20/01/2022	Logger:	JG+RC	Scale: 1:50
						FINAL

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
9.30	C13										Medium strong (locally weak) indistinctly thinly laminated fine grained light greyish orange and light brownish orange SANDSTONE. Partially weathered: slightly reduced strength, closer fracture spacing and occasional heavy dark orangish brown discolouration on fracture surfaces. Discontinuities: 1. 0 to 15 degree bedding fractures, closely spaced (10/150/500) planar, smooth, occasional heavy dark orangish brown staining on fracture surfaces up to 100mm deep. 2. 25 to 45 degree joints medium spaced (200/470/1500) planar, smooth, occasional heavy dark orangish brown staining on joint surfaces up to 5mm deep. 3. 65 to 75 degree joint from 11.40m to 11.65m, planar, rough, heavy dark brown staining on joint surface., 10mm deep. *9.50m to 9.70m: AZCL - Probable bed of extremely weak sandstone washed out during drilling.*		
9.50		80	53	34	AZCL								
					13								
					20								
11.00													
11.00	C14	96	82	62	8				(7.65)				
12.50					>20								
13.20	C15	100	97	45	9								
13.75	C16												
14.00								-22.78	14.00		End of Borehole at 14.00m		

TCR	SCR	RQD	FI

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Chiselling Details

From (m)	To (m)	Time (hh:mm)

Remarks

Marine Borehole drilled off OCM 80 jack-up barge
Deck to Bed = 19.60m
All elevations/reduced levels given in mCD

Casing Details

To (m)	Diam (mm)
1.20	177
14.00	150

Water Added

From (m)	To (m)

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L		Terminated at scheduled depth	29/06/2022

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
21-1031	Scapa Deep Water Quay & Hatston Pier Development - Marine GI	BH-M03
	Client: Orkney Islands Council	
	Client's Rep: Arch Henderson LLP	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Sonic Drilling	Fraste Duo CXL Rotosonic	0.00	4.50	345123.20 E
Rotary Coring	Fraste Duo CXL Rotosonic	4.50	11.90	1003736.66 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 2
11.90 m	24/01/2022	MJ	Scale: 1:50
Elevation: -10.42 mCD	**End Date:** 25/01/2022	**Logger:** JG+RC	FINAL

Depth (m)	Sample / Tests	Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 0.50	ES11	Marine Scotland - SS1										Loose to medium dense grey slightly gravelly silty fine to coarse SAND with shell fragments (up to 5mm). Gravel is subangular to subrounded fine of various lithologies.		
0.00 - 1.50	B5													
0.50	ES1													
1.00	ES2													
1.00 - 1.50	ES12	Marine Scotland - SS2												
1.50	D8													
1.50 - 3.00	B6													
1.50 - 1.95	SPT (S)	N=10 (1,0/2,2,3,3) Hammer SN = 1353					1.50							
2.00	ES3													
2.50 - 3.00	ES13	Marine Scotland - SS3												
3.00	D9								-13.42	3.00				
3.00	ES4											Medium dense grey slightly gravelly silty fine to coarse SAND with shell fragments (up to 3mm). Gravel is subrounded to rounded fine of various lithologies.		
3.00 - 4.30	B7													
3.00 - 3.45	SPT (S)	N=18 (3,4/4,5,4,5) Hammer SN = 1353					3.00							
									-14.72	4.30		Stiff yellowish brown very sandy silty CLAY. Sand is fine to medium.		
4.50	D10						4.50			(0.50)				
4.50 - 4.95	SPT(S) N=32 (5,6/7,7,8,10) Hammer SN = 1353								-15.22	4.80		Very stiff light yellowish grey sandy slightly gravelly silty CLAY. Sand is fine to medium. Gravel is angular fine to coarse of sandstone. (Possible weathered bedrock)		
4.70	C1		96	16	13					(0.80)				
									-16.02	5.60		Medium strong (locally weak) indistinctly thinly laminated fine grained light yellowish grey SANDSTONE. Partially weathered: slightly reduced strength, closer fracture spacing and occasional heavy dark orangish brown discolouration on fracture surfaces. Discontinuities: 1. 10 to 20 degree bedding fractures medium spaced (20/220/400) planar, rough, occasional heavy dark orangish brown staining on fracture surfaces up to 2mm deep. 2. 65 to 75 degree joints from 7.40m to 8.30m and 8.30m to 8.70m, planar, rough, occasional heavy dark orangish brown staining on joint surfaces up to 0.5mm.		
5.90														
6.15	C3		100	89	56	8								
6.80	C4													
6.95	C5									(3.10)				
7.40														
			97	77	33	9								
8.70	C6								-19.12	8.70		Medium strong (locally weak) indistinctly thinly laminated fine grained light orangish grey SANDSTONE. Partially weathered: slightly reduced strength. Discontinuities: 1. 10 to 20 degree bedding fractures, medium spaced (20/210/400) planar, rough, unstained and clean.		
8.90														
8.90	C7													
9.20	C8													

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
4.50	177
11.90	150

Water Added

From (m)	To (m)

Remarks

Marine Borehole drilled off OCM 80 jack-up barge
Deck to Bed = 18.60m
All elevations/reduced levels given in mCD

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	29/06/2022

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
21-1031	Scapa Deep Water Quay & Hatston Pier Development - Marine GI	BH-M03
	Client: Orkney Islands Council	
	Client's Rep: Arch Henderson LLP	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Sonic Drilling	Fraste Duo CXL Rotosonic	0.00	4.50	345123.20 E
Rotary Coring	Fraste Duo CXL Rotosonic	4.50	11.90	1003736.66 N

Final Depth:	Start Date:	Driller:	Sheet 2 of 2
11.90 m	24/01/2022	MJ	Scale: 1:50
Elevation: -10.42 mCD	**End Date:** 25/01/2022	**Logger:** JG+RC	FINAL

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
9.45	C9										Medium strong (locally weak) indistinctly thinly laminated fine grained light orangish grey SANDSTONE. Partially weathered: slightly reduced strength. Discontinuities: 1. 10 to 20 degree bedding fractures, medium spaced (20/210/400) planar, rough, unstained and clean.		
9.80	C10	95	95	79	5				(1.70)				
10.40								-20.82	10.40		Medium strong indistinctly thinly laminated fine grained dark greyish orange SANDSTONE. Partially weathered: slightly reduced strength and closer fracture spacing. Discontinuities: 1. 5 to 15 degree bedding fractures closely spaced (10/100/500) planar, rough, unstained and clean. 2. 55 to 65 degree joints from 11.10m to 11.25m and 11.70m to 11.90m, planar, rough, unstained and clean.		
10.40	C11												
		100	83	31	9				(1.50)				
11.50	C12												
11.90								-22.32	11.90		End of Borehole at 11.90m		

TCR	SCR	RQD	FI

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Chiselling Details

From (m)	To (m)	Time (hh:mm)

Remarks

Marine Borehole drilled off OCM 80 jack-up barge
Deck to Bed = 18.60m
All elevations/reduced levels given in mCD

Casing Details

To (m)	Diam (mm)
4.50	177
11.90	150

Water Added

From (m)	To (m)

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	29/06/2022

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
21-1031	Scapa Deep Water Quay & Hatston Pier Development - Marine GI	BH-M04
	Client: Orkney Islands Council	
	Client's Rep: Arch Henderson LLP	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Sonic Drilling	Fraste Duo CXL Rotosonic	0.00	3.00	345152.16 E
Rotary Coring	Fraste Duo CXL Rotosonic	3.00	13.50	1003798.70 N

Final Depth:	13.50 m	Start Date:	04/03/2022	Driller:	MJ	Sheet 1 of 2
Elevation:	-8.97 mCD	End Date:	05/03/2022	Logger:	NP+RC	Scale: 1:50
						FINAL

Depth (m)	Sample / Tests	Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 0.50	ES5	Marine Scotland - SS1										Loose to medium dense grey very gravelly silty fine to coarse SAND with shell fragments (up to 5mm). Gravel is subangular fine to medium of various lithologies.		
0.00 - 1.50	B8													
0.50	ES1													
1.00	ES2													
1.00 - 1.50	ES6	Marine Scotland - SS2												
1.50	D10								-10.47	1.50				
1.50 - 3.00	B9											Very stiff grey slightly sandy slightly gravelly silty CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse of various lithologies.		
1.50 - 1.95	SPT (S)	N=10 (1,1/2,2,3,3) Hammer SN = 1353					1.50							
2.00	ES3													
2.50 - 3.00	ES7	Marine Scotland - SS3												
									-11.87	2.90		Weathered SANDSTONE recovered as: white and orange fine to medium sand.		
3.00	D11						3.00		-11.97	3.00		Weathered SANDSTONE recovered as firm light brownish yellow very sandy gravelly clay. Sand is fine to coarse. Gravel is subangular fine to coarse of sandstone.		
3.00	ES4					AZCL								
3.00 - 3.45	SPT(S) N=48 (5,8/9,9,10,20) Hammer SN = 1353									(1.10)		*3.00m to 3.55m: AZCL - Disturbance due to SPT has lead to subsequent wash out of material.*		
3.70	C1		58	9	9	NI								
						11			-13.07	4.10		Medium strong (locally weak) indistinctly thinly laminated fine grained light brownish yellow and whitish grey SANDSTONE. Partially weathered: reduced strength, much closer fracture spacing and occasional clay infill on fracture surfaces. Discontinuities: 1. 0 to 15 degree bedding fractures, closely spaced (10/150/300) planar, rough, unstained and occasional clay infill on fracture surfaces up to 20mm thick. 2. 65 to 75 degree joints from 3.55m to 3.85m, planar, rough, unstained , clay infill on joint surfaces up to 20mm thick.		
										(0.40)				
4.50									-13.47	4.50				
5.00	C2		100	89	30	13								
						>20				(2.70)		Medium strong (locally weak) indistinctly thinly laminated fine grained light yellowish and brown and whitish grey SANDSTONE. Partially weathered: slightly reduced strength, much closer fracture spacing and occasional heavy dark orangish brown discolouration on fracture surface. Discontinuities: 1. 10 to 25 degree bedding fractures clsoely spaced (10/120/250) planar, rough, occasional heavy dark ornagish brown staining in fracture surfaces up to 20mm thick.		
6.00														
6.00	C3													
6.40	C4													
6.50	C5		87	73	29	18								
6.90	C6													
7.20	C7								-16.17	7.20				
7.50						AZCL						Medium strong indistinctly thinly laminated fine grained whitish grey SANDSTONE. Partially weathered: slightly reduced strength, closer fracture spacing, occasional light brownish orange discolouration on fracture surfaces and occasional clay infill on fracture surfaces. Discontinuities: 1. 0 to 20 degree bedding fractures, medium spaced (30/210/550) planar rough, occasional light brownish orange staining on fracture surfaces up to 0.5mm deep and occasional clay infill up to 30mm thick. 2. 55 to 75 degree joints from 7.50m to 7.70m, 8.20m to 8.40m and 10.50m to 10.80m, planar, rough, occasional light brownish orange staining on joint surfaces up to 0.5mm deep.		
7.70	C8		100	89	58	12								
8.60	C9													
9.00												*7.30m to 7.50m: AZCL - Probable bed of extremely weak sandstone washed out during drilling.*		

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
3.00	177
13.50	150

Water Added

From (m)	To (m)

Remarks

Marine Borehole drilled off OCM 80 jack-up barge
Deck to Bed = 16.10m
All elevations/reduced levels given in mCD

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	29/06/2022

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
21-1031	Scapa Deep Water Quay & Hatston Pier Development - Marine GI	BH-M04
	Client: Orkney Islands Council	
	Client's Rep: Arch Henderson LLP	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Sonic Drilling	Fraste Duo CXL Rotosonic	0.00	3.00	345152.16 E
Rotary Coring	Fraste Duo CXL Rotosonic	3.00	13.50	1003798.70 N

Final Depth:	13.50 m	Start Date:	04/03/2022	Driller:	MJ	Sheet 2 of 2
Elevation:	-8.97 mCD	End Date:	05/03/2022	Logger:	NP+RC	Scale: 1:50
						FINAL

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
9.40	C10	100	100	100	4						Medium strong indistinctly thinly laminated fine grained whitish grey SANDSTONE. Partially weathered: slightly reduced strength, closer fracture spacing, occasional light brownish orange discolouration on fracture surfaces and occasional clay infill on fracture surfaces. Discontinuities: 1. 0 to 20 degree bedding fractures, medium spaced (30/210/550) planar rough, occasional light brownish orange staining on fracture surfaces up to 0.5mm deep and occasional clay infill up to 30mm thick. 2. 55 to 75 degree joints from 7.50m to 7.70m, 8.20m to 8.40m and 10.50m to 10.80m, planar, rough, occasional light brownish orange staining on joint surfaces up to 0.5mm deep. *10.80m to 10.95m: Very weak indistinctly thinly laminated light greyish green MUDSTONE.*		
9.70	C11												
10.00	C12												
10.50		97	87	55	13				(6.30)				
11.20	C13												
12.00		100	91	77	7								
12.25	C14												
12.45	C15												
13.25	C16												
13.50								-22.47	13.50		End of Borehole at 13.50m		

TCR	SCR	RQD	FI

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Chiselling Details

From (m)	To (m)	Time (hh:mm)

Remarks

Marine Borehole drilled off OCM 80 jack-up barge
Deck to Bed = 16.10m
All elevations/reduced levels given in mCD

Casing Details

To (m)	Diam (mm)
3.00	177
13.50	150

Water Added

From (m)	To (m)

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	29/06/2022

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
21-1031	Scapa Deep Water Quay & Hatston Pier Development - Marine GI	BH-M05
	Client: Orkney Islands Council	
	Client's Rep: Arch Henderson LLP	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Sonic Drilling	Fraste Duo CXL Rotosonic	0.00	4.50	345092.93 E
Rotary Coring	Fraste Duo CXL Rotosonic	4.50	10.80	1003832.55 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 2
10.80 m	05/03/2022	MJ	Scale: 1:50
Elevation: -11.22 mCD	**End Date:** 06/03/2022	**Logger:** NP+EM	FINAL

Depth (m)	Sample / Tests	Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 0.50	ES5	Marine Scotland - SS1										Loose to medium dense greyish brown gravelly silty fine to coarse SAND with shell fragments (up to 5mm). Gravel is subangular fine to medium of various lithologies.		
0.00 - 1.50	B8													
0.50	ES1													
1.00	ES2													
1.00 - 1.50	ES6	Marine Scotland - SS2												
1.50	D11													
1.50 - 3.00	B9													
1.50 - 1.95	SPT (S)	N=23 (2,5/5,6,6,6) Hammer SN = 1353					1.50							
2.00	ES3													
2.50 - 3.00	ES7	Marine Scotland - SS3							-13.72	2.50		Stiff grey slightly sandy slightly gravelly silty CLAY. Sand is fine to coarse.. Gravel is subangular fine to medium of various lithologies and shell fragments (up to 4mm).		
3.00	D12													
3.00	ES4													
3.00 - 4.50	B10													
3.00 - 3.45	SPT (S)	N=26 (5,6/6,6,7,7) Hammer SN = 1353					3.00							
4.50	D13					AZCL	4.50		-15.72	4.50		Very stiff brown slightly sandy very gravelly CLAY with high cobble content. Sand is fine to coarse. Gravel is subangular fine to coarse of sandstone. Cobbles are subangular of sandstone and mudstone.		
4.50 - 4.87	SPT(S) N=50 (8,8/50 for 220mm) Hammer SN = 1353		60	46	23					(1.00)		*4.50m to 5.00m: AZCL - Disturbance due to SPT has lead to subsequent wash out of material.*		
5.60	C1					11			-16.72	5.50		Weak indistinctly thinly laminated well cemented SANDSTONE. Partially weathered: slightly reduced strength, slightly closer fracture spacing with discolouration and clay deposits on some fracture surfaces. Discontinuities: 1. 35 to 25 degree bedding fractures, medium spaced (150/408/450) slightly undulating, rough with strong patchy brown and orangish brown staining on some fracture surfaces. 2. 0 to 5 degree joint at 6.50m, planar, rough, clean. 3. 60 to 80 degree joint at 6.70m to 7.05m, slightly undulating, rough with strong dark brown staining and patchy greyish white clay deposists (up to 4mm thick) on joint surface.		
5.90	C2													
6.00														
6.30	C3					5				(1.90)				
			100	90	53	18								
7.50									-18.62	7.40		Weak thinly laminated light orangish brown medium grained moderately cemented SANDSTONE. Partially weathered: reduced strength, slightly closer fracture spacing with discolouration and clay deposits on fracture surfaces. Discontinuities: 1. 20 to 30 degree bedding fractures closely spaced (80/161/200) plana, rough with patchy orangish brown staining on few fracture surfaces and light orange clay deposits (up to 3mm thick) on most fracture surfaces. 2. 70 to 80 degree joint at 8.20m to 8.33m, planar, smooth to rough, clean.		
7.50	C4													
			100	94	26	10				(1.45)				
8.50	C5													
9.00									-20.07	8.85		Weak (locally medium strong) thinly laminated light orangish brown medium grained well cemented SANDSTONE. Partially weathered: closer fracture spacing with discolouration and clay deposits on fracture surfaces.		
9.30	C6													
			TCR	SCR	RQD	FI								

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
4.50	177
10.80	150

Water Added

From (m)	To (m)

Remarks

Marine Borehole drilled off OCM 80 jack-up barge
Deck to Bed = 18.0m
All elevations/reduced levels given in mCD

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	29/06/2022

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
21-1031	Scapa Deep Water Quay & Hatston Pier Development - Marine GI	BH-M05
	Client: Orkney Islands Council	
	Client's Rep: Arch Henderson LLP	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Sonic Drilling	Fraste Duo CXL Rotosonic	0.00	4.50	345092.93 E
Rotary Coring	Fraste Duo CXL Rotosonic	4.50	10.80	1003832.55 N

Final Depth:	Start Date:	Driller:	Sheet 2 of 2
10.80 m	05/03/2022	MJ	Scale: 1:50
Elevation: -11.22 mCD	**End Date:** 06/03/2022	**Logger:** NP+EM	FINAL

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
		100	96	26					(1.95)		Weak (locally medium strong) thinly laminated light orangish brown medium grained well cemented SANDSTONE. Partially weathered: closer fracture spacing with discolouration and clay deposits on fracture surfaces. 1. 20 to 30 degree bedding fractures closely spaced (560/162/300) planar, rough, with occasional patchy dark brown discolouration on some fracture surfaces and occasional patchy light greyish white clay deposits (up to 3mm thick) on some fracture surfaces. 2. 50 to 60 degree joint at 9.15m to 9.40m and 9.90m to 10.05m, slightly undulating rough with patchy dark brown discolouration on joint surface. *9.70m to 9.85m: Bed of extremely weak sandstone*		
10.50 10.50 10.60 10.80	C7 C8	100	83	50				-22.02	10.80		End of Borehole at 10.80m		
		TCR	SCR	RQD	FI								

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Chiselling Details

From (m)	To (m)	Time (hh:mm)

Remarks

Marine Borehole drilled off OCM 80 jack-up barge
Deck to Bed = 18.0m
All elevations/reduced levels given in mCD

Casing Details

To (m)	Diam (mm)
4.50	177
10.80	150

Water Added

From (m)	To (m)

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	29/06/2022

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
21-1031	Scapa Deep Water Quay & Hatston Pier Development - Marine GI	BH-M06
	Client: Orkney Islands Council	
	Client's Rep: Arch Henderson LLP	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Sonic Drilling	Fraste Duo CXL Rotosonic	0.00	3.00	345121.94 E
Rotary Coring	Fraste Duo CXL Rotosonic	3.00	12.00	1003893.44 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 2
12.00 m	06/03/2022	MJ	Scale: 1:50
Elevation: -10.51 mCD	**End Date:** 07/03/2022	**Logger:** NP+RC	FINAL

Depth (m)	Sample / Tests	Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 0.50	ES5	Marine Scotland - SS1										Loose to medium dense grey slightly gravelly silty fine to coarse SAND with shell fragments (up to 4mm). Gravel is subangular fine to medium.		
0.00 - 1.50	B8													
0.50	ES1													
1.00	ES2													
1.00 - 1.50	ES6	Marine Scotland - SS2												
1.50	D10								-12.01	1.50				
1.50 - 3.00	B9											Very stiff grey slightly sandy slightly gravelly silty CLAY. Sand is fine to coarse. Gravel is subangular fine to medium of various lithologies.		
1.50 - 1.95	SPT (S)	N=11 (1,2/2,3,3,3) Hammer SN = 1353					1.50							
2.00	ES3													
2.50 - 3.00	ES7	Marine Scotland - SS3												
3.00	D11						3.00							
3.00	ES4								-13.71	3.20				
3.00 - 3.45	SPT(S) N=32 (7,7/7,8,8,9) Hammer SN = 1353		84			6						Weak (locally medium strong) indistinctly thinly laminated fine grained orangish grey SANDSTONE. Partially weathered: reduced strength, much closer fracture spacing, occasional heavy dark orangish brown discolouration on fracture surfaces and occasional sandy clay infill on fracture surfaces. Discontinuities: 1. 5 to 20 degree bedding fractures, closely spaced (10/125/300) planar, smooth, occasional heavy dark orangish brown staining on fracture surfaces up to 1mm deep and occasional sandy clay infill on fracture surfaces up to 30mm thick. 2. 65 to 75 degree joints from 3.10m to 4.10m, 5.20m to 5.50m to 5.60m, 6.30m to 6.50m, 6.80m to 6.90m, 7.60m to 8.00m, 8.20m to 8.80m, 9.00m ti 9.40m, undulating, smooth and occasional heavy dark orangish brown staining on joint surfaces up to 1mm thick.		
3.15	C1													
3.30	C2													
4.50														
4.70	C3		94			10								
5.90	C4													
6.00														
6.30	C5									(8.80)				
6.55	C6		88											
7.50														
7.90	C7		94			9								
9.00														

Water Strikes			
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details	
To (m)	Diam (mm)
3.00	177
12.00	150

Water Added	
From (m)	To (m)

Remarks

Marine Borehole drilled off OCM 80 jack-up barge
Deck to Bed = 17.00m
All elevations/reduced levels given in mCD

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	29/06/2022

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
21-1031	Scapa Deep Water Quay & Hatston Pier Development - Marine GI	BH-M06
	Client: Orkney Islands Council	
	Client's Rep: Arch Henderson LLP	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Sonic Drilling	Fraste Duo CXL Rotosonic	0.00	3.00	345121.94 E
Rotary Coring	Fraste Duo CXL Rotosonic	3.00	12.00	1003893.44 N

Final Depth:	12.00 m	Start Date:	06/03/2022	Driller:	MJ	Sheet 2 of 2
Elevation:	-10.51 mCD	End Date:	07/03/2022	Logger:	NP+RC	Scale: 1:50
						FINAL

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
9.80	C8	100			7						Weak (locally medium strong) indistinctly thinly laminated fine grained orangish grey SANDSTONE. Partially weathered: reduced strength, much closer fracture spacing, occasional heavy dark orangish brown discolouration on fracture surfaces and occasional sandy clay infill on fracture surfaces. Discontinuities: 1. 5 to 20 degree bedding fractures, closely spaced (10/125/300) planar, smooth, occasional heavy dark orangish brown staining on fracture surfaces up to 1mm deep and occasional sandy clay infill on fracture surfaces up to 30mm thick. 2. 65 to 75 degree joints from 3.10m to 4.10m, 5.20m to 5.50m to 5.60m, 6.30m to 6.50m, 6.80m to 6.90m, 7.60m to 8.00m, 8.20m to 8.80m, 9.00m ti 9.40m, undulating, smooth and occasional heavy dark orangish brown staining on joint surfaces up to 1mm thick. *10.50m: Firm sandy clay infill on joint surfaces up to 50mm deep.* *11.25m to 12.00m: AZCL - Lower half of core run unable to be retrieved from base of borehole due to fractured nature of material.*		
10.50													
10.50	C9	51			>20								
					AZCL								
12.00								-22.51	12.00		End of Borehole at 12.00m		
		TCR	SCR	RQD	FI								

Water Strikes			
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Chiselling Details		
From (m)	To (m)	Time (hh:mm)

Casing Details	
To (m)	Diam (mm)
3.00	177
12.00	150

Water Added	
From (m)	To (m)

Remarks

Marine Borehole drilled off OCM 80 jack-up barge
Deck to Bed = 17.00m
All elevations/reduced levels given in mCD

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	29/06/2022

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
21-1031	Scapa Deep Water Quay & Hatston Pier Development - Marine GI	BH-M07
	Client: Orkney Islands Council	
	Client's Rep: Arch Henderson LLP	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Sonic Drilling	Fraste Duo CXL Rotosonic	0.00	4.50	345062.99 E
Rotary Coring	Fraste Duo CXL Rotosonic	4.50	12.00	1003927.90 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 2
12.00 m	07/03/2022	MJ	Scale: 1:50
Elevation: -11.32 mCD	**End Date:** 09/03/2022	**Logger:** RC+NP	FINAL

Depth (m)	Sample / Tests	Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 0.50	ES5	Marine Scotland - SS1										Medium dense grey gravelly silty fine to coarse SAND with shell fragments (up to 5mm). Gravel is subangular fine to medium of various lithologies.		
0.00 - 1.50	B8													
0.50	ES1													
1.00	ES2													
1.00 - 1.50	ES6	Marine Scotland - SS2												
1.50	D11													
1.50 - 3.00	B9													
1.50 - 1.95	SPT (C)	N=20 (3,4/4,5,5,6) Hammer SN = 1353					1.50							
2.00	ES3													
2.50 - 3.00	ES7	Marine Scotland - SS3							-13.82	2.50		Medium dense grey very gravelly silty fine to coarse SAND. Gravel is subangular fine of various lithologies.		
3.00	D12													
3.00	ES4													
3.00 - 4.50	B10													
3.00 - 3.45	SPT (S)	N=26 (5,6/6,7,6,7) Hammer SN = 1353					3.00		-14.72	3.40		Stiff to very stiff brownish grey sandy gravelly silty CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse of various lithologies.		
									-15.42	4.10		Very stiff dark greyish brown slightly sandy gravelly CLAY with medium cobble content. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of sandstone and mudstone. Cobbles are of mudstone.		
4.50	D13						4.50					*4.50m to 5.50m: AZCL - Disturbance due to SPT has lead to subsequent wash out of material.*		
4.50 - 4.93	SPT(S) N=50 (8,9/50 for 280mm) Hammer SN = 1353		33	0	0	AZCL						*6.00m to 6.50m: AZCL - Disturbance due to SPT has lead to subsequent wash out of material.*		
6.00							6.00			(3.00)		Weak indistinctly thinly laminated fine grained moderately cemented light orangish grey SANDSTONE. Partially weathered: reduced strength, much closer fracture spacing, occasional light brownish orange discolouration on fracture surfaces and occasional sandy clay infill on fracture surfaces. Discontinuities: 1. 5 to 20 degree bedding fractures closely spaced (10/70/100) planar, rough, occasional light brownish orange staining on fracture surfaces up to 1mm deep and occasional sandy clay infill up to 10mm thick. 2. 65 to 75 degree joints from 6.50m to 6.80m, 7.50m to 7.60m and 7.60m to 7.90m, undulating, rough, occasional light brownish orange staining and occasional sandy clay infill up to 3mm thick.		
6.00 - 6.40	SPT(C) N=50 (9,12/50 for 245mm) Hammer SN = 1353		60	9	0	AZCL >20			-18.42	7.10		Very weak (locally weak) indistinctly thinly laminated fine grained moderately cemented light greyish orange SANDSTONE. Partially weathered: reduced strength, closer fracture spacing and frequent heavy brownish orange discolouration on fracture surfaces. Discontinuities: 1. 5 to 20 degree bedding fractures closely spaced (30/130/450), planar, rough and frequent heavy light brownish orange staining up to the entire diameter of core. 2. 25 to 45 degree joints medium spaced (150/290/700) planar, rough and frequent heavy light brownish orange staining up to entire diameter of core. 3. 65 to 75 degree joints from 8.20m to 8.50m, 10.10m to 10.50m and 10.70m to 11.00m, undulating, rough and frequent heavy light brownish orange staining up to entire diameter of core.		
7.45	C1									(1.10)				
7.50						>20								
8.20	C2		80	28	0	10			-19.52	8.20				
8.60	C3					AZCL								
9.00														
9.10	C4													
9.30	C5											*8.65m to 9.00m: AZCL - Probable bed of extremely weak sandstone washed out during drilling.*		
			TCR	SCR	RQD	FI								

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
4.50	177
12.00	150

Water Added

From (m)	To (m)

Remarks

Marine Borehole drilled off OCM 80 jack-up barge
Deck to Bed = 22.00m
All elevations/reduced levels given in mCD

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	29/06/2022

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
21-1031	Scapa Deep Water Quay & Hatston Pier Development - Marine GI	BH-M07
	Client: Orkney Islands Council	
	Client's Rep: Arch Henderson LLP	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Sonic Drilling	Fraste Duo CXL Rotosonic	0.00	4.50	345062.99 E
Rotary Coring	Fraste Duo CXL Rotosonic	4.50	12.00	1003927.90 N

Final Depth:	12.00 m	Start Date:	07/03/2022	Driller:	MJ	Sheet 2 of 2
Elevation:	-11.32 mCD	End Date:	09/03/2022	Logger:	RC+NP	Scale: 1:50
						FINAL

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
9.40	C6	93	59	24	10						Very weak (locally weak) indistinctly thinly laminated fine grained moderately cemented light greyish orange SANDSTONE. Partially weathered: reduced strength, closer fracture spacing and frequent heavy brownish orange discolouration on fracture surfaces. Discontinuities: 1. 5 to 20 degree bedding fractures closely spaced (30/130/450), planar, rough and frequent heavy light brownish orange staining up to the entire diameter of core. 2. 25 to 45 degree joints medium spaced (150/290/700) planar, rough and frequent heavy light brownish orange staining up to entire diameter of core. 3. 65 to 75 degree joints from 8.20m to 8.50m, 10.10m to 10.50m and 10.70m to 11.00m, undulating, rough and frequent heavy light brownish orange staining up to entire diameter of core. *11.30m to 12.00m: AZCL - Lower half of core run unable to be retrieved from base of borehole due to fractured nature of material.*		
10.50					>20				(3.80)				
11.20	C7	53	0	0	AZCL								
12.00								-23.32	12.00		End of Borehole at 12.00m		
		TCR	SCR	RQD	FI								

Water Strikes				Chiselling Details			Remarks
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)	Marine Borehole drilled off OCM 80 jack-up barge Deck to Bed = 22.00m All elevations/reduced levels given in mCD

Casing Details		Water Added	
To (m)	Diam (mm)	From (m)	To (m)
4.50	177		
12.00	150		

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	29/06/2022

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
21-1031	Scapa Deep Water Quay & Hatston Pier Development - Marine GI	BH-M08
	Client: Orkney Islands Council	
	Client's Rep: Arch Henderson LLP	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Sonic Drilling	Fraste Duo CXL Rotosonic	0.00	3.00	345091.71 E
Rotary Coring	Fraste Duo CXL Rotosonic	3.00	12.00	1003988.52 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 2
12.00 m	22/03/2022	MJ	Scale: 1:50
Elevation: -10.31 mCD	**End Date:** 23/03/2022	**Logger:** NP+EM	FINAL

Depth (m)	Sample / Tests	Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 1.50	B5											Medium dense grey very gravelly silty fine to coarse SAND with shell fragments (up to 9mm). Gravel is subangular fine to coarse of various lithologies.		
0.50	ES1													
1.00	ES2													
1.50	D7								-11.81	1.50		Stiff to very stiff brownish grey slightly sandy slightly gravelly silty CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular fine to medium of various lithologies. Cobbles are subangular.		
1.50 - 3.00	B6													
1.50 - 1.95	SPT (S)	N=15 (2,2/4,3,4,4) Hammer SN = 1353					1.50							
2.00	ES3													
3.00	D8					AZCL	3.00		-13.31	3.00		Very stiff dark greyish brown slightly sandy slightly gravelly CLAY with medium cobble content. Sand is fine to coarse. Gravel is subangular fine to coarse of various lithologies. Cobbles are subrounded of mudstone.		
3.00	ES4											*3.00m to 4.10m: AZCL - Disturbance due to SPT has lead to subsequent wash out of material.*		
3.00 - 3.45	SPT(S) N=30 (6,7/7,7,8,8) Hammer SN = 1353		26							(2.00)				
4.50							4.50					*4.50m to 4.90m: AZCL - Disturbance due to SPT has lead to subsequent wash out of material.*		
4.50	D9					AZCL								
4.50 - 4.65	SPT(S) N=50 (25 for 90mm/50 for 60mm) Hammer SN = 1353		76	60	26				-15.31	5.00		Weak (locally medium strong) thinly laminated light orangish brown fine to medium grained moderately cemented SANDSTONE. Partially weathered: slightly reduced strength, slightly closer fracture spacing, with clay deposits on fracture surfaces. Discontinuities: 1. 10 to 20 degree bedding fractures, medium spaced (110/407/500), planar, rough, with patchy light orangish brown clay deposits (<1mm thick) on few fracture surfaces. 2. 60 to 90 degree joint at 5.50m to 5.80m, undulating, rough with patchy light greyish white clay deposits on joint surface. 3. Possible 90 degree joint at 6.30m to 7.10m, probably undulating, rough with orangish brown patchy staining on joint surface, otherwise clean. 4. 45 degree joint at 5.85m, slightly undulating, rough, clean.		
4.90	C1					6								
5.85	C2													
6.00														
6.20	C3													
6.90	C4		83	63	30	12				(4.30)				
7.05	C5											*7.20m to 7.50m: AZCL - Probable bed of extremely weak sandstone washed out during drilling.*		
7.50						AZCL								
7.50	C6													
9.00			100	25	16	12								
						NI								
			TCR	SCR	RQD	FI			-19.61	9.30				

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
3.00	177
12.00	150

Water Added

From (m)	To (m)

Remarks

Marine Borehole drilled off OCM 80 jack-up barge
Deck to Bed = 16.50m
All elevations/reduced levels given in mCD

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	29/06/2022

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
21-1031	Scapa Deep Water Quay & Hatston Pier Development - Marine GI	BH-M08
	Client: Orkney Islands Council	
	Client's Rep: Arch Henderson LLP	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Sonic Drilling	Fraste Duo CXL Rotosonic	0.00	3.00	345091.71 E
Rotary Coring	Fraste Duo CXL Rotosonic	3.00	12.00	1003988.52 N

Final Depth:	Start Date:	Driller:	Sheet 2 of 2
12.00 m	22/03/2022	MJ	Scale: 1:50
Elevation: -10.31 mCD	**End Date:** 23/03/2022	**Logger:** NP+EM	FINAL

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
9.35	C7										Medium strong (locally weak) thickly laminated light orangish brown medium grained well cemented SANDSTONE. Partially weathered: much closer fracture spacing, slightly reduced strength with discolouration and clay deposits on fracture surfaces. Discontinuities: 1. 15 to 25 degree bedding fractures, closely spaced (40/166/800) planar, rough with patchy brown clay deposits and orangish brown staining on fractures surfaces and fracture staining. 2. 70 to 90 degree joint at 8.10m to 9.00m, and 9.90m to 10.30m, undulating, rough with patchy faint orangish brow staining on joint surfaces, otherwise clean. 3. 50 to 60 degree joint at 7.70m to 7.80m, 11.75m to 12.00m, slightly undulating, rough, clean.		
9.60	C8												
9.80	C9	100	87	46									
10.50													
10.50	C10				4				(2.70)				
11.00	C11	100	95	65									
11.55	C12												
12.00								-22.31	12.00		End of Borehole at 12.00m		

TCR	SCR	RQD	FI

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Chiselling Details

From (m)	To (m)	Time (hh:mm)

Remarks

Marine Borehole drilled off OCM 80 jack-up barge
Deck to Bed = 16.50m
All elevations/reduced levels given in mCD

Casing Details

To (m)	Diam (mm)
3.00	177
12.00	150

Water Added

From (m)	To (m)

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	29/06/2022

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
21-1031	Scapa Deep Water Quay & Hatston Pier Development - Marine GI	BH-M09
	Client: Orkney Islands Council	
	Client's Rep: Arch Henderson LLP	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Sonic Drilling	Fraste Duo CXL Rotosonic	0.00	3.00	345032.04 E
Rotary Coring	Fraste Duo CXL Rotosonic	3.00	10.50	1004023.35 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 2
10.50 m	23/03/2022	MJ	Scale: 1:50
Elevation: -12.25 mCD	**End Date:** 24/03/2022	**Logger:** RC+NP	FINAL

Depth (m)	Sample / Tests	Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 0.50	ES5	Marine Scotland - SS1										Medium dense grey very gravelly silty fine to coarse SAND with shell fragments (up to 8mm). Gravel is subangular fine to medium of various lithologies.		
0.00 - 1.50	B8													
0.50	ES1													
1.00	ES2													
1.00 - 1.50	ES6	Marine Scotland - SS2												
1.50	D10													
1.50 - 3.00	B9													
1.50 - 1.95	SPT (S)	N=15 (2,3/3,4,4,4) Hammer SN = 1353					1.50							
2.00	ES3													
2.50 - 3.00	ES7	Marine Scotland - SS3							-14.75	2.50		Stiff to very stiff brownish grey sandy gravelly silty CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse of sandstone and mudstone.		
3.00	D11						3.00		-15.25	3.00		Medium strong (locally weak) indistinctly thinly laminated fine grained, moderately cemented SANDSTONE. Partially weathered: reduced strength, much closer fracture spacing and occasional heavy brownish black discolouration on fracture surfaces. Discontinuities: 1. 5 to 20 degree bedding fractures, closely spaced (10/65/100) planar, rough and occasional heavy brownish black staining on fracture surfaces up to 10mm deep. 2. 65 to 75 degree joints from 3.00m to 3.30m and 4.70m to 5.00m,. undulating, rough and occasional heavy brownish black staining on joint surfaces up to 1mm deep.		
3.00	ES4													
3.00 - 3.45	SPT(S) N=34 (6,7/8,8,9,9) Hammer SN = 1353		27	3	0	AZCL								
						>20								
4.50										(3.00)		*3.00m to 4.10m: AZCL - Disturbance due to SPT has lead to subsequent wash out of material.*		
4.50	C1													
4.60	C2					>20								
5.10	C3		53	20	0							*5.30m to 6.00m: AZCL - Probable bed of extremely weak sandstone washed out during drilling.*		
						AZCL								
6.00									-18.25	6.00		Medium strong to strong (locally weak) indistinctly thinly laminated fine grained moderately cemented light orangish grey SANDSTONE. Partially weathered: slightly reduced strength, closer fracture spacing, occasional heavy brownish ornate discolouration on fracture surfaces and occasional sandy clay infill on fracture surfaces. Discontinuities: 1. 5 to 25 degree bedding fractures closely spaced (20/140/300) planar, rough, occasional heavy brownish orange staining on fracture surfaces up to 1mm deep and occasional sandy clay infill on fracture surfaces up to 40mm thick. 2. 25 to 45 degree joints medium spaced (200/500/1000) planar, rough and frequent heavy brownish orange staining on joint surfaces up to 2mm deep. 3. 65 to 75 degree joints from 7.50m to 7.80m, 7.80m to 8.00m, 8.40m to 8.50m, 9.50m to 9.40m and 9.90m to 10.50m, undulating, rough and occasional light brownish orange staining up to 0.5mm deep.		
6.10	C4		100	89	55	10								
6.90	C5													
7.30	C6													
7.50										(4.50)				
8.10	C7		100	61	12	12								
9.00						20								
			TCR	SCR	RQD	FI								

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
3.00	177
10.50	150

Water Added

From (m)	To (m)

Remarks

Marine Borehole drilled off OCM 80 jack-up barge
Deck to Bed = 19.00m
All elevations/reduced levels given in mCD

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	29/06/2022

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
21-1031	Scapa Deep Water Quay & Hatston Pier Development - Marine GI	BH-M09
	Client: Orkney Islands Council	
	Client's Rep: Arch Henderson LLP	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Sonic Drilling	Fraste Duo CXL Rotosonic	0.00	3.00	345032.04 E
Rotary Coring	Fraste Duo CXL Rotosonic	3.00	10.50	1004023.35 N

Final Depth:	Start Date:	Driller:	Sheet 2 of 2
10.50 m	23/03/2022	MJ	Scale: 1:50
Elevation: -12.25 mCD	**End Date:** 24/03/2022	**Logger:** RC+NP	FINAL

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
9.50	C8										Medium strong to strong (locally weak) indistinctly thinly laminated fine grained moderately cemented light orangish grey SANDSTONE. Partially weathered: slightly reduced strength, closer fracture spacing, occasional heavy brownish ornate discolouration on fracture surfaces and occasional sandy clay infill on fracture surfaces. Discontinuities: 1. 5 to 25 degree bedding fractures closely spaced (20/140/300) planar, rough, occasional heavy brownish orange staining on fracture surfaces up to 1mm deep and occasional sandy clay infill on fracture surfaces up to 40mm thick. 2. 25 to 45 degree joints medium spaced (200/500/1000) planar, rough and frequent heavy brownish orange staining on joint surfaces up to 2mm deep. 3. 65 to 75 degree joints from 7.50m to 7.80m, 7.80m to 8.00m, 8.40m to 8.50m, 9.50m to 9.40m and 9.90m to 10.50m, undulating, rough and occasional light brownish orange staining up to 0.5mm deep.		
9.70	C9	100	56	26	14								
10.50								-22.75	10.50		End of Borehole at 10.50m		

TCR	SCR	RQD	FI

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Chiselling Details

From (m)	To (m)	Time (hh:mm)

Remarks

Marine Borehole drilled off OCM 80 jack-up barge
Deck to Bed = 19.00m
All elevations/reduced levels given in mCD

Casing Details

To (m)	Diam (mm)
3.00	177
10.50	150

Water Added

From (m)	To (m)

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	29/06/2022

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
21-1031	Scapa Deep Water Quay & Hatston Pier Development - Marine GI	BH-M10
	Client: Orkney Islands Council	
	Client's Rep: Arch Henderson LLP	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Sonic Drilling	Fraste Duo CXL Rotosonic	0.00	3.00	345061.10 E
Rotary Coring	Fraste Duo CXL Rotosonic	3.00	12.00	1004083.93 N

Final Depth:	12.00 m	Start Date:	24/03/2022	Driller:	MJ	Sheet 1 of 2
Elevation:	-10.05 mCD	End Date:	25/03/2022	Logger:	NP+RC	Scale: 1:50
						FINAL

Depth (m)	Sample / Tests	Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 1.50	B5											Loose to medium dense grey very gravelly silty fine to coarse SAND with shell fragments (up to 11mm). Gravel is subangular fine to medium of various lithologies.		
0.50	ES1													
1.00	ES2													
1.50	D7								-11.54	1.50				
1.50 - 3.00	B6											Stiff to very stiff brownish grey slightly gravelly very sandy silty CLAY. Sand is fine to coarse. Gravel is subangular fine to medium of various lithologies.		
1.50 - 1.95	SPT (S)	N=10 (1,1/2,2,3,3) Hammer SN = 1353					1.50							
2.00	ES3													
									-12.54	2.50		Highly weathered brown SANDSTONE. (Drillers description)		
									-12.90	2.85		Light brown and orangish brown banded SANDSTONE (Driller's description)		
3.00	D8					AZCL	3.00		-13.04	3.00		Weathered SANDSTONE recovered as: stiff dark greyish orange very sandy gravelly CLAY. Sand is fine to coarse. Gravel is angular fine to coarse of sandstone.		
3.00	ES4											*3.00m to 3.50m: AZCL - Disturbance due to SPT has lead to subsequent wash out of material.*		
3.00 - 3.42	SPT(S)	N=50 (6,7/50 for 275mm) Hammer SN = 1353	67	17	0					(0.80)				
									-13.84	3.80		Weak thinly laminated fine grained greyish orange SANDSTONE. Partially weathered: significantly reduced strength, closer fracture spacing, frequent heavy dark brownish orange discolouration on fracture surfaces. Discontinuities: 1. 5 to 20 degree bedding fractures closely spaced (20/165/250) planar rough, frequent heacy dark brownish orange staining up to whole diameter of core deep and frequent, light greenish grey sandy clay infill on fracture surfaces.		
4.35	C1					12				(1.15)				
4.50														
4.50	C2					13								
4.60	C3								-15.00	4.95				
			100	57	0							Weak indistinctly thinly laminated fine grained dark yellowish grey SANDSTONE. Partially weathered: reduced strength, much closer fracture spacing and occasional heavy brownish black discolouration on fracture surfaces and occasional sandy clay infill on fracture surfaces. Discontinuities: 1. 5 to 25 degree bedding fractures closely spaced (10/110/350) planar, rough, occasional orangish brown staining up to full diameter of core an occasional brownish black staining up to 0.5mm deep and occasional sandy clay infill up to 10mm thick. 2. 65 to 75 degree joints from 4.95m to 5.05m, 5.05m to 5.45m, 5.90m to 6.20m, 6.30m to 6.70m and 6.80m to 7.35m, undulating, rough and frequent heavy brownish black staining up to 1mm deep.		
6.00														
6.20	C4					9				(2.75)				
			100	78	21									
7.30	C5													
7.50									-17.74	7.70		Medium strong (locally weak) indistinctly thinly laminated fine grained light yellowish grey SANDSTONE. Partially weathered: slightly reduced strength, closer fracture spacing and occasional brownish black and brownish orange discolouration on fracture surfaces. Discontinuities: 1. 5 to 15 degree bedding fractures closely spaced (30/190/400) planar, rough and occasional heavy brownish black staining up to 1mm deep. 2. 45 to 55 degree joints at 9.20m, 10.00m and 11.70m, planar, rough and occasional brownish black staining up to 10mm deep. 3. 65 to 75 degree joints from 7.70m to 7.80m, 7.90m to 8.05m, 8.60m to 9.00m and 9.00m to 9.50m, undulating, rough and frequent heavy brownish black and orangish brown staining on joint surfaces up to 3mm deep.		
7.95	C6													
8.30	C7		100	85	55	13								
9.00														

TCR	SCR	RQD	FI

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
3.00	177
12.00	150

Water Added

From (m)	To (m)

Remarks

Marine Borehole drilled off OCM 80 jack-up barge
Deck to Bed = 17.00m
All elevations/reduced levels given in mCD

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	29/06/2022

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
21-1031	Scapa Deep Water Quay & Hatston Pier Development - Marine GI	BH-M10
	Client: Orkney Islands Council	
	Client's Rep: Arch Henderson LLP	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Sonic Drilling	Fraste Duo CXL Rotosonic	0.00	3.00	345061.10 E
Rotary Coring	Fraste Duo CXL Rotosonic	3.00	12.00	1004083.93 N

Final Depth:	Start Date:	Driller:	Sheet 2 of 2
12.00 m	24/03/2022	MJ	Scale: 1:50
Elevation: -10.05 mCD	**End Date:** 25/03/2022	**Logger:** NP+RC	FINAL

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
9.70	C8	85	65	32	3				(4.30)		Medium strong (locally weak) indistinctly thinly laminated fine grained light yellowish grey SANDSTONE. Partially weathered: slightly reduced strength, closer fracture spacing and occasional brownish black and brownish orange discolouration on fracture surfaces. Discontinuities: 1. 5 to 15 degree bedding fractures closely spaced (30/190/400) planar, rough and occasional heavy brownish black staining up to 1mm deep. 2. 45 to 55 degree joints at 9.20m, 10.00m and 11.70m, planar, rough and occasional brownish black staining up to 10mm deep. 3. 65 to 75 degree joints from 7.70m to 7.80m, 7.90m to 8.05m, 8.60m to 9.00m and 9.00m to 9.50m, undulating, rough and frequent heavy brownish black and orangish brown staining on joint surfaces up to 3mm deep.		
10.00	C9												
10.50													
10.60	C10	100	90	81									
11.20	C11												
12.00								-22.04	12.00		End of Borehole at 12.00m		
		TCR	SCR	RQD	FI								

Water Strikes			
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Chiselling Details		
From (m)	To (m)	Time (hh:mm)

Remarks

Marine Borehole drilled off OCM 80 jack-up barge
Deck to Bed = 17.00m
All elevations/reduced levels given in mCD

Casing Details	
To (m)	Diam (mm)
3.00	177
12.00	150

Water Added	
From (m)	To (m)

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	29/06/2022

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
21-1031	Scapa Deep Water Quay & Hatston Pier Development - Marine GI	BH-M11
	Client: Orkney Islands Council	
	Client's Rep: Arch Henderson LLP	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Sonic Drilling	Fraste Duo CXL Rotosonic	0.00	3.00	344997.29 E
Rotary Coring	Fraste Duo CXL Rotosonic	3.00	9.00	1004104.77 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 2
9.00 m	26/03/2022	MJ	Scale: 1:50
Elevation: -14.41 mCD	**End Date:** 27/03/2022	**Logger:** NP	FINAL

Depth (m)	Sample / Tests	Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 0.50	ES5	Marine Scotland - SS1										Medium dense grey very gravelly silty fine to coarse SAND with shell fragments (up to 6mm). Gravel is subangular fine to medium of various lithologies.		
0.00 - 1.50	B8													
0.50	ES1													
1.00	ES2													
1.00 - 1.50	ES6	Marine Scotland - SS2												
1.50	D10													
1.50 - 3.00	B9													
1.50 - 1.95	SPT (S)	N=16 (2,3/3,4,4,5) Hammer SN = 1353					1.50							
									-16.41	2.00		Highly weathered white SANDSTONE recovered as sandy subangular fine to coarse gravel and subangular cobbles.		
2.00	ES3													
2.50 - 3.00	ES7	Marine Scotland - SS3												
3.00	D11						3.00					*3.00m to 4.10m: AZCL - Disturbance due to SPT has lead to subsequent wash out of material.*		
3.00	ES4											Very weak, probably thinly laminated, medium grained, well cemented, light orangish brown SANDSTONE.		
3.00 - 3.29	SPT(S) N=50 (6,8/50 for 140mm) Hammer SN = 1353		30	0	0	AZCL				(2.10)		Very weak, thinly laminated, fine grained, poorly cemented, light brown highly fractured SANDSTONE. Partially weathered, reduced strength, much closer fracture spacing with pervasive orangish brown discolouration, closed.		
									-18.51	4.10		Discontinuities:		
4.20	C1					12				(0.40)		1. 10 to 15 degree bedding fractures, very thinly spaced (5/40/60), planar, smooth, with pervasive light brown staining on fracture surfaces.		
4.50									-18.91	4.50		2. 80 to85 degree joints, probably very closely spaced, undulating, smooth.		
										(0.25)				
						>20			-19.16	4.75				
										(0.35)				
									-19.51	5.10		Weak, thinly bedded, medium grained, moderately well cemented, orangish brown SANDSTONE. Partially weathered, reduced strength, close fracture spacing with pervasive orangish brown discolouration.		
5.30	C2		100	72	40							Discontinuities:		
5.60	C3					3				(1.10)		1. 10 to 15 degree bedding fractures, thinly spaced (30/85/95), planar, rough, with orangish brown staining on fracture surfaces.		
6.00												2. 60 degree joint at 4.80m to 4.90m, undulating, smooth, with orangish brown fine sand deposits and orangish brown staining on joint surfaces.		
									-20.61	6.20		3. 70 to 80 degree joint at 4.90m to 5.10m, undulating, rough, with pervasive orangish brown staining on joint surfaces.		
6.40	C4											Extremely weak, probably very thinly laminated, orangish brown and greenish grey MUDSTONE. Highly weathered, highly reduced strength, pervasive greenish grey discolouration from 5.20m to 6.05m		
			100	97	55							Discontinuities:		
7.30	C5											1. 5 degree bedding fracture at 5.60m, planar, smooth, with pervasive greenish grey staining on fracture surfaces.		
7.50						5						2. 70 degree joints at 5.15m to 5.25m and 5.20m to 5.40m, planar, smooth, with pervasive greenish grey staining on joint surfaces.		
7.50	C6									(2.80)				
8.15	C7		100	100	34							Medium strong (locally weak), thinly laminated to thinly bedded, fine grained, well cemented, light orangish brown SANDSTONE. Partially weathered, slightly closer fracture spacing with occasional orangish brown discolouration.		
8.60	C8											Discontinuities:		
9.00									-23.41	9.00		1. 10 to 25 degree bedding fractures, medium spaced (100/345/800), planar, rough, with dark orangish brown staining on some fracture surfaces.		

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
3.00	177
9.00	150

Water Added

From (m)	To (m)

Remarks

Marine Borehole drilled off OCM 80 jack-up barge
Deck to Bed = 20.20m
All elevations/reduced levels given in mCD

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	29/06/2022

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
21-1031	Scapa Deep Water Quay & Hatston Pier Development - Marine GI	BH-M11
	Client: Orkney Islands Council	
	Client's Rep: Arch Henderson LLP	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Sonic Drilling	Fraste Duo CXL Rotosonic	0.00	3.00	344997.29 E
Rotary Coring	Fraste Duo CXL Rotosonic	3.00	9.00	1004104.77 N

Final Depth:	Start Date:	Driller:	Sheet 2 of 2
9.00 m	26/03/2022	MJ	Scale: 1:50
Elevation: -14.41 mCD	**End Date:** 27/03/2022	**Logger:** NP	FINAL

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
											Medium strong (locally weak), thinly laminated to thinly bedded, fine grained, well cemented, light orangish brown SANDSTONE. Partially weathered, slightly closer fracture spacing with occasional orangish brown discolouration. Discontinuities: 1. 10 to 25 degree bedding fractures, medium spaced (100/345/800), planar, rough, with dark orangish brown staining on some fracture surfaces. 2. 25 degree joint at 8.00m to 8.05m, planar, smooth. 3. 65 to 75 degree joints at 6.90m to 7.20m, 8.10m to 8.25m and 8.50m to 8.65m, slightly undulating, rough, with dark brown staining on 6.90m to 7.20m joint surfaces penetrating to the base of the strata. *8.25m to 8.65m: 65 to 75 degree probably closely spaced incipient joints.* End of Borehole at 9.00m		
		TCR	SCR	RQD	FI								

9.5 10.0 10.5 11.0 11.5 12.0 12.5 13.0 13.5 14.0 14.5 15.0 15.5 16.0 16.5 17.0 17.5 18.0 18.5

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Chiselling Details

From (m)	To (m)	Time (hh:mm)

Remarks

Marine Borehole drilled off OCM 80 jack-up barge
Deck to Bed = 20.20m
All elevations/reduced levels given in mCD

Casing Details

To (m)	Diam (mm)
3.00	177
9.00	150

Water Added

From (m)	To (m)

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	29/06/2022

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
21-1031	Scapa Deep Water Quay & Hatston Pier Development - Marine GI	BH-M12
	Client: Orkney Islands Council	
	Client's Rep: Arch Henderson LLP	

Method	Plant Used	Top (m)	Base (m)	Coordinates	Final Depth:	Start Date:	Driller:	Sheet 1 of 2
Sonic Drilling	Fraste Duo CXL Rotosonic	0.00	1.50	345016.39 E	12.00 m	27/03/2022	MJ	Scale: 1:50
Rotary Coring	Fraste Duo CXL Rotosonic	1.50	12.00	1004186.20 N	Elevation: -10.84 mCD	End Date: 28/03/2022	Logger: EM+NP	FINAL

Depth (m)	Sample / Tests	Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 1.50	B3											Medium dense grey very gravelly very silty fine to coarse SAND with shell fragments (up to 5mm). Gravel is subangular fine to coarse of various lithologies.		
0.50	ES1								-11.34	0.50		Highly weathered brown SANDSTONE recovered as subangular fine to coarse gravel and subangular cobbles.		
1.00	ES2													
1.50	D4						1.50		-12.34	1.50		Medium strong indistinctly thinly laminated light creamy brown fine grained moderately cemented SANDSTONE. Partially weathered: closer fracture spacing, slightly reduced strength with sandy clay deposits and discolouration on fracture surfaces. Discontinuities: 1. 30 to 40 degree bedding fractures closely spaced (40/93/150) planar, rough with patchy orangish brown sandy clay deposits (1mm thick) on rare surfaces and strong patchy orangish brown staining on most fracture surfaces. 2. 75 to 85 degree joint at 3.20m to 3.45m, planar, rough with patchy brown staining on joint surface. 3. 50 to 60 degree joint at 3.80m to 4.00m, planar, rough with orangish brown staining on joint surface. *1.50m to 2.25m: AZCL - Disturbance due to SPT has lead to subsequent wash out of material.*		
1.50 - 1.95	SPT(S) N=38 (6,7/7,9,10,12) Hammer SN = 1353	50	30	15	AZCL									
2.35	C1													
2.75	C2				6									
3.00										(2.90)				
3.00	C3													
3.45	C4	100	85	38	16									
4.50									-15.24	4.40		Medium strong (locally weak) thickly laminated light greyish white fine grained moderately cemented SANDSTONE. Partially weathered: closer fracture spacing, slightly reduced strength with discolouration and clay deposits and clay infill on fracture surfaces. Discontinuities: 1. 5 to 15 degree bedding fractures medium spaced (85/400/650) planar, rough with strong orangish brown staining on most fracture surfaces, patchy black staining on few fracture surfaces and patchy orangish brown sandy clay deposits (up to 5mm thick) on some fracture surfaces. 2. 50 to 60 degree joints at 5.10m to 5.40m, 5.60m to 5.80m, 6.60m to 6.95m, 7.50m to 7.70m, 8.10m to 8.25m, 8.50m to 8.65m, 10.70m to 10.85m, 10.95m to 11.15m, planar, rough with strong orangish brown staining on most joint surfaces, patchy black staining on few surfaces and occasional patchy light brown clay deposits on few surfaces. 3. 80 to 90 degree joint at 5.35m to 5.60m, 6.40m to 6.90m, 8.60m to 8.90m, planar to slightly undulating rough with orangish brown staining and black staining on some fracture surfaces. *7.50m to 7.60m: Light grey and orangish brown gravelly clay infill.*		
4.80	C5	100	82	42	7									
5.80	C6													
6.00					NI									
6.40	C7	100	86	38	5					(7.60)				
7.50														
7.70	C9													
8.25	C10	100	96	83	4									
9.00														

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
1.50	177
12.00	150

Water Added

From (m)	To (m)

Remarks

Marine Borehole drilled off OCM 80 jack-up barge
Deck to Bed = 16.30m
All elevations/reduced levels given in mCD

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	29/06/2022

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
21-1031	Scapa Deep Water Quay & Hatston Pier Development - Marine GI	BH-M12
	Client: Orkney Islands Council	
	Client's Rep: Arch Henderson LLP	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Sonic Drilling	Fraste Duo CXL Rotosonic	0.00	1.50	345016.39 E
Rotary Coring	Fraste Duo CXL Rotosonic	1.50	12.00	1004186.20 N

Final Depth:	Start Date:	Driller:	Sheet 2 of 2
12.00 m	27/03/2022	MJ	Scale: 1:50
Elevation: -10.84 mCD	**End Date:** 28/03/2022	**Logger:** EM+NP	FINAL

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
9.40	C11										Medium strong (locally weak) thickly laminated light greyish white fine grained moderately cemented SANDSTONE. Partially weathered: closer fracture spacing, slightly reduced strength with discolouration and clay deposits and clay infill on fracture surfaces. Discontinuities: 1. 5 to 15 degree bedding fractures medium spaced (85/400/650) planar, rough with strong orangish brown staining on most fracture surfaces, patchy black staining on few fracture surfaces and patchy orangish brown sandy clay deposits (up to 5mm thick) on some fracture surfaces. 2. 50 to 60 degree joints at 5.10m to 5.40m, 5.60m to 5.80m, 6.60m to 6.95m, 7.50m to 7.70m, 8.10m to 8.25m, 8.50m to 8.65m, 10.70m to 10.85m, 10.95m to 11.15m, planar, rough with strong orangish brown staining on most joint surfaces, patchy black staining on few surfaces and occasional patchy light brown clay deposits on few surfaces. 3. 80 to 90 degree joint at 5.35m to 5.60m, 6.40m to 6.90m, 8.60m to 8.90m, planar to slightly undulating rough with orangish brown staining and black staining on some fracture surfaces.		
		100	84	40									
10.10	C12												
10.50					11								
10.70	C13												
11.30	C14	93	81	73									
					4								
12.00								-22.84	12.00		End of Borehole at 12.00m		
		TCR	SCR	RQD	FI								

Water Strikes			
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Chiselling Details		
From (m)	To (m)	Time (hh:mm)

Remarks

Marine Borehole drilled off OCM 80 jack-up barge
Deck to Bed = 16.30m
All elevations/reduced levels given in mCD

Casing Details	
To (m)	Diam (mm)
1.50	177
12.00	150

Water Added	
From (m)	To (m)

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	29/06/2022

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
21-1031	Scapa Deep Water Quay & Hatston Pier Development - Marine GI	BH-M13
	Client: Orkney Islands Council	
	Client's Rep: Arch Henderson LLP	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Sonic Drilling	Fraste Duo CXL Rotosonic	0.00	3.00	344991.90 E
Rotary Coring	Fraste Duo CXL Rotosonic	3.00	10.50	1004221.83 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 2
10.50 m	28/03/2022	MJ	Scale: 1:50
Elevation: -11.57 mCD	**End Date:** 29/03/2022	**Logger:** NP	FINAL

Depth (m)	Sample / Tests	Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 0.50	ES5	Marine Scotland - SS1										Medium dense light grey gravelly silty fine to coarse SAND with shell fragments (up to 7mm). Gravel is subangular fine to coarse of various lithologies.		
0.00 - 1.50	B8													
0.50	ES1													
1.00	ES2													
1.00 - 1.50	ES6	Marine Scotland - SS2												
1.50	D10													
1.50 - 3.00	B9											*1.50m to 2.00m: Very silty from 1.50m*		
1.50 - 1.95	SPT (S)	N=13 (1,2/3,3,3,4) Hammer SN = 1353					1.50							
2.00	ES3								-13.57	2.00		Highly weathered brown SANDSTONE recovered as subangular coarse gravel and subangular cobbles.		
2.50 - 3.00	ES7	Marine Scotland - SS3												
3.00	D11						3.00		-14.57	3.00		Weathered SANDSTONE recovered as subangular medium to coarse gravel and subangular cobbles.		
3.00	ES4											*3.00m to 3.90m: AZCL - Disturbance due to SPT has lead to subsequent wash out of material.*		
3.00 - 3.44	SPT(S) N=50 (6,8/50 for 290mm) Hammer SN = 1353		40	0	0	AZCL				(1.50)				
4.10	C1					NI						Weak light brown indistinctly thinly bedded well cemented fine grained SANDSTONE. Partially weathered: slightly reduced strength slightly closer fracture spacing with dark orangish brown discolouration. Discontinuities: 1. Probable 5 to 15 degree bedding fractures, medium spaced (40/160/215) undulating, smooth. 2. 70 to 75 degree joints at 4.55m to 4.80m, 4.80m to 5.00m, undulating, rough with dark orangish brown staining on joint surfaces, penetrating up to 3mm from joint surfaces.		
4.50									-16.07	4.50				
5.00	C2					9				(0.65)				
5.20	C3		95	70	16				-16.72	5.15				
5.25	C4					>20				(0.75)				
6.00									-17.47	5.90		Weak (locally medium strong) light orangish brown thickly laminated poorly cemented fine grained SANDSTONE. Partially weathered: slightly reduced strength, closer fracture spacing with orangish brown discolouration. Discontinuities: 1. 0 to 5 degree bedding fractures, very closely spaced (20/50/180) planar, smooth, with orangish brown staining on some fracture surfaces. 2. 40 to 45 degree joint at 5.15m to 5.20m, an 5.50m to 5.55m planar, smooth. 3. 70 to 90 degree joints at 5.65m to 5.90m, undulating, rough with orangish brown staining on joint surfaces penetrating up to 3mm from joint surfaces.		
6.10	C5													
6.60	C6		97	97	53									
7.50						6				(4.60)		Medium strong to strong light orangish brown indistinctly thinly bedded moderately, well cemented fine grained SANDSTONE. Partially weathered: slightly reduced strength, slightly closer fracture spacing with localised pervasive orangish brown discolouration. Discontinuities: 1. 15 to 25 degree bedding fractures, medium spaced (40/350/820) planar, smooth with orangish brown staining on joint surfaces, locally penetrating up to 6mm fracture surfaces. 2. 50 to 70 degree joints, probably medium spaced, planar and undulating with orangish brown staining on joint surfaces, locally penetrating up to 5mm from joint surface.		
8.00	C7		96	80	33									
9.00												*8.50m to 9.00m: Dark orangish brown staining on fracture surfaces.*		
9.00	C8													
9.25	C9													
			TCR	SCR	RQD	FI								

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
3.00	177
10.50	150

Water Added

From (m)	To (m)

Remarks

Marine Borehole drilled off OCM 80 jack-up barge
Deck to Bed = 18.00m
All elevations/reduced levels given in mCD

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	29/06/2022

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
21-1031	Scapa Deep Water Quay & Hatston Pier Development - Marine GI	BH-M13
	Client: Orkney Islands Council	
	Client's Rep: Arch Henderson LLP	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Sonic Drilling	Fraste Duo CXL Rotosonic	0.00	3.00	344991.90 E
Rotary Coring	Fraste Duo CXL Rotosonic	3.00	10.50	1004221.83 N

Final Depth:	Start Date:	Driller:	Sheet 2 of 2
10.50 m	28/03/2022	MJ	Scale: 1:50
Elevation: -11.57 mCD	**End Date:** 29/03/2022	**Logger:** NP	FINAL

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
10.10	C10	100	96	59							Medium strong to strong light orangish brown indistinctly thinly bedded moderately, well cemented fine grained SANDSTONE. Partially weathered: slightly reduced strength, slightly closer fracture spacing with localised pervasive orangish brown discolouration. Discontinuities: 1. 15 to 25 degree bedding fractures, medium spaced (40/350/820) planar, smooth with orangish brown staining on joint surfaces, locally penetrating up to 6mm fracture surfaces. 2. 50 to 70 degree joints, probably medium spaced, planar and undulating with orangish brown staining on joint surfaces, locally penetrating up to 5mm from joint surface.		
10.50								-22.07	10.50		End of Borehole at 10.50m		

TCR	SCR	RQD	FI

9.5 10.0 10.5 11.0 11.5 12.0 12.5 13.0 13.5 14.0 14.5 15.0 15.5 16.0 16.5 17.0 17.5 18.0 18.5

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Chiselling Details

From (m)	To (m)	Time (hh:mm)

Remarks

Marine Borehole drilled off OCM 80 jack-up barge
Deck to Bed = 18.00m
All elevations/reduced levels given in mCD

Casing Details

To (m)	Diam (mm)
3.00	177
10.50	150

Water Added

From (m)	To (m)

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	29/06/2022

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
21-1031	Scapa Deep Water Quay & Hatston Pier Development - Marine GI	BH-M14
	Client: Orkney Islands Council	
	Client's Rep: Arch Henderson LLP	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Sonic Drilling	Fraste Duo CXL Rotosonic	0.00	3.00	344915.81 E
Rotary Coring	Fraste Duo CXL Rotosonic	3.00	9.00	1004164.01 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 2
9.00 m	29/03/2022	MJ	Scale: 1:50
Elevation: -18.13 mCD	**End Date:** 30/03/2022	**Logger:** EM+NP	FINAL

Depth (m)	Sample / Tests	Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description
0.00 - 0.50	ES5	Marine Scotland - SS1										Medium dense grey gravelly silty fine to coarse SAND with shell fragments (up to 9mm) and unfragmented gastropod shells (up to 19mm). Gravel is subangular fine to medium of various lithologies.
0.00 - 1.50	B8											
0.50	ES1											
1.00	ES2											
1.00 - 1.50	ES6	Marine Scotland - SS2										
1.50	D10											
1.50 - 3.00	B9											
1.50 - 1.95	SPT (S)	N=11 (1,1/2,2,3,4) Hammer SN = 1353					1.50					
2.00	ES3											
2.50 - 3.00	ES7	Marine Scotland - SS3										
3.00	D11						3.00		-21.13	3.00		Greyish brown subrounded fine to coarse GRAVEL of sandstone with high cobble content. Cobbles are subrounded of sandstone.
3.00	ES4									(0.30)		
3.00 - 3.45	SPT(S) N=28 (3,4/6,6,7,9) Hammer SN = 1353		100	63	23	11			-21.43	3.30		Weak thinly laminated light brown fine grained well cemented SANDSTONE. Partially weathered: slightly closer fractures spacing, slightly reduced strength with discolouration and clay deposits on fracture surfaces. Discontinuities: 1. 30 to 40 degree bedding fractures closely spaced (30/92/120) planar, smooth with patchy orangish brown staining on occasional surfaces and patchy light brown sandy clay deposits (<1mm thick) on most fracture surfaces. 2. 60 to 70 degree joint at 3.65m to 3.80m, undulating, rough with patchy brown andy clay deposits (up to 2mm thick) and patchy faint dark brown discolouration joint surface.
3.50	C1									(1.10)		
3.70	C2											
4.50						>20			-22.53	4.40		
									-22.88	(0.35) 4.75		
5.40	C3		100	88	43	7				(1.25)		Weak thinly laminated orangish brown fine grained medium cemented SANDSTONE. Partially weathered: reduced strength with clay deposits. Discontinuities: 1. 30 to 40 degree bedding fractures very closely spaced (10/28/80) slightly undulating, rough with frequent patchy light grey clay deposits (up to 4mm thick) on most fracture surface.
5.80	C4											
6.00									-24.13	6.00		
6.00	C5											Weak indistinctly thickly laminated light brown fine grained medium cemented SANDSTONE. Partially weathered; slightly closer fractures spacing with clay deposits and discolouration. Discontinuities: 1. 25 to 35 degree bedding fractures closely spaced (30/150/230) undulating, rough with patchy brown clay deposits (<2mm thick) on some fracture surfaces. 2. 0 to 5 degree joint at 4.85m, slightly undulating, rough with patchy light brown clay deposits (<1mm thick) on joint surface. 3. 80 to 85 degree joint at 5.20m to 5.30m planar, rough with patchy light brown clay deposits (<1mm thick) on joint surface.
6.50	C6		100	98	84	2				(1.40)		
7.05	C7											
7.40	C8								-25.53	7.40		
7.50						16						Medium strong thinly laminated light grey fine grained well cemented SANDSTONE. Partially weathered: slightly closer fracture spacing. Discolouration on fracture surfaces. Discontinuities: 1. 20 to 30 degree bedding fractures closely spaced (10/200/800) planar, rough with pervasive, orangish brown staining penetrating from fracture surfaces and patchy dark reddish brown discolouration on some fracture surfaces, otherwise clean.
8.40	C9		100	92	51	7				(1.60)		
9.00									-27.13	9.00		Weak (locally medium strong) thinly laminated light brown fine

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
3.00	177
9.00	150

Water Added

From (m)	To (m)

Remarks

Marine Borehole drilled off OCM 80 jack-up barge
Deck to Bed = 25.00m
All elevations/reduced levels given in mCD

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	29/06/2022

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
21-1031	Scapa Deep Water Quay & Hatston Pier Development - Marine GI	BH-M14
	Client: Orkney Islands Council	
	Client's Rep: Arch Henderson LLP	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Sonic Drilling	Fraste Duo CXL Rotosonic	0.00	3.00	344915.81 E
Rotary Coring	Fraste Duo CXL Rotosonic	3.00	9.00	1004164.01 N

Final Depth:	9.00 m	Start Date:	29/03/2022	Driller:	MJ	Sheet 2 of 2
Elevation:	-18.13 mCD	End Date:	30/03/2022	Logger:	EM+NP	Scale: 1:50
						FINAL

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
											Weak (locally medium strong) thinly laminated light brown fine grained moderately cemented SANDSTONE. Partially weathered: much closer fracture spacing with discolouration and clay deposits on fracture surfaces. Discontinuities: 1. 0 to 10 degree bedding fractures, closely spaced (5/80/180) planar, smooth with orangish brown staining on some fracture surfaces and light brown sandy clay deposits (up to 20mm thick) on fracture surfaces. *8.40m: Black staining on fracture surface.* *8.70m to 8.72m: Light brown sandy clay infill.* End of Borehole at 9.00m		

TCR	SCR	RQD	FI

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Chiselling Details

From (m)	To (m)	Time (hh:mm)

Remarks

Marine Borehole drilled off OCM 80 jack-up barge
Deck to Bed = 25.00m
All elevations/reduced levels given in mCD

Casing Details

To (m)	Diam (mm)
3.00	177
9.00	150

Water Added

From (m)	To (m)

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	29/06/2022

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
21-1031	Scapa Deep Water Quay & Hatston Pier Development - Marine GI	BH-M15
	Client: Orkney Islands Council	
	Client's Rep: Arch Henderson LLP	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Sonic Drilling	Fraste Duo CXL Rotosonic	0.00	3.00	344911.66 E
Rotary Coring	Fraste Duo CXL Rotosonic	3.00	9.00	1004235.99 N

Final Depth:	Start Date:	Driller:	Sheet 1 of 2
9.00 m	30/03/2022	MJ	Scale: 1:50
Elevation: -17.71 mCD	**End Date:** 31/03/2022	**Logger:** NP	FINAL

Depth (m)	Sample / Tests	Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 0.50	ES5	Marine Scotland - SS1										Loose to medium dense grey very gravelly silty fine to coarse SAND with shell fragments (up to 8mm) and unfragmented articulated brachiopod shells (up to 31mm). Gravel is subangular fine to medium of various lithologies.		
0.00 - 1.50	B8													
0.50	ES1													
1.00	ES2													
1.00 - 1.50	ES6	Marine Scotland - SS2												
1.50	D10								-19.21	1.50		Medium dense grey gravelly silty fine to coarse SAND with low cobble content and shell fragments (up to 7mm) and unfragmented gastropod shells (up to 12mm). Gravel is subangular fine to medium of various lithologies. Cobbles are subrounded of sandstone.		
1.50 - 3.00	B9													
1.50 - 1.95	SPT (S)	N=11 (1,1/2,3,3,3) Hammer SN = 1353					1.50							
2.00	ES3													
2.50 - 3.00	ES7	Marine Scotland - SS3												
3.00	D11						3.00		-20.71	3.00		Weathered SANDSTONE recovered as subangular fine to coarse gravel of sandstone with low cobble content. Cobbles are subangular of sandstone.		
3.00	ES4											*3.00m to 4.10m: AZCL - Disturbance due to SPT has lead to subsequent wash out of material.*		
3.00 - 3.45	SPT(S) N=34 (4,6/8,8,9,9) Hammer SN = 1353		33	0	0	AZCL				(1.40)		Highly weathered SANDSTONE recovered as silty fine sand.		
4.35	C1					NI			-22.11	4.40		Medium strong light orangish brown indistinctly thinly bedded fine grained moderately well cemented SANDSTONE. Partially weathered: slightly reduced strength, closer fracture spacing with orangish brown discolouration.		
4.50									-22.21	4.50		Discontinuities: 1. 5 to 15 degree bedding fractures, closely spaced (40/90/220), planar, smooth with patchy dark orangish brown staining on fracture surfaces ad light brown patchy clay deposits on some fracture surfaces. 2. 70 to 90 degree joint at 4.50m to 5.00m, 5.03m to 5.35m, 5.35m to 5.65m, 5.70m to 6.15, and 6.15m to 6.30m, undulating, smooth with dark orangish brown staining, penetrating up to 5mm from joint surfaces and patchy light brown clay deposits on some joint surfaces.		
5.20	C2		100	73	0	11								
5.40	C3									(1.80)				
6.00												Weak light brown mottled orangish brown indistinctly thinly bedded partly cemented fine grained SANDSTONE. Partially weathered: slightly reduced strength, slightly closer fracture spacing with dark orangish brown discolouration.		
6.20	C4								-24.01	6.30		Discontinuities: 1. 15 to 20 degree bedding fractures, closely spaced 930/85/110) planar, smooth with patchy dark orangish brown staining on joint surfaces and occasional light brown clay deposits on joint surfaces. 2. 80 to 85 degree joints at 6.30m to 6.70m and 6.35m to 6.70m, undulating, smooth with patchy dark orangish brown staining on joint surfaces and occasional light brown clay deposits on joint surfaces.		
			100	92	0	15 >20				(0.60)				
									-24.61	6.90				
										(0.50)				
7.50									-25.11	7.40				
						14				(0.50)				
									-25.61	7.90				
8.20	C5		100	95	19							Medium strong orangish brown very thinly bedded poorly cemented fine grained SANDSTONE. Partially weathered: reduced strength, closer fracture spacing with pervasive orangish brown discolouration. Discontinuities: 1. 15 to 20 degree bedding fracture, very closely spaced (10/25/70) planar, smooth with pervasive orangish brown staining on fracture surfaces. 2. 85 to 90 degree joints at 6.90m to 7.25m and 7.05m to 7.40m,		
8.50	C6									(1.10)				
9.00									-26.71	9.00				

Water Strikes			
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details	
To (m)	Diam (mm)
3.00	177
9.00	150

Water Added	
From (m)	To (m)

Remarks

Marine Borehole drilled off OCM 80 jack-up barge
Deck to Bed = 24.00m
All elevations/reduced levels given in mCD

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	29/06/2022

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
21-1031	Scapa Deep Water Quay & Hatston Pier Development - Marine GI	BH-M15
	Client: Orkney Islands Council	
	Client's Rep: Arch Henderson LLP	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Sonic Drilling	Fraste Duo CXL Rotosonic	0.00	3.00	344911.66 E
Rotary Coring	Fraste Duo CXL Rotosonic	3.00	9.00	1004235.99 N

Final Depth:	Start Date:	Driller:	Sheet 2 of 2
9.00 m	30/03/2022	MJ	Scale: 1:50
Elevation: -17.71 mCD	**End Date:** 31/03/2022	**Logger:** NP	FINAL

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
					11						Medium strong orangish brown very thinly bedded poorly cemented fine grained SANDSTONE. Partially weathered: reduced strength, closer fracture spacing with pervasive orangish brown discolouration. Discontinuities: 1. 15 to 20 degree bedding fracture, very closely spaced (10/25/70) planar, smooth with pervasive orangish brown staining on fracture surfaces. 2. 85 to 90 degree joints at 6.90m to 7.25m and 7.05m to 7.40m, undulating, smooth with dark orangish brown staining on joint surfaces. *7.25m: Thick light brown soft clay infill on 15 degree bedding fracture.* Medium strong light brown indistinctly thinly bedded well cemented fine grained SANDSTONE. Partially weathered: slightly reduced strength, slightly closer fracture spacing with patchy orangish brown discolouration. Discontinuities: 1. 5 to 15 degree bedding fractures, closely spaced (50/70/120) planar, smooth, with patchy orangish brown staining on fracture surfaces. Medium strong (locally weak) light orangish brown indistinctly thinly bedded very well cemented fine grained SANDSTONE. Partially weathered: slightly reduced strength, slightly closer fracture spacing with localised orangish brown and greenish grey discolouration. Discontinuities: 1. 15 to 25 degree bedding fractures, closely spaced (30/110/350) planar, smooth with patchy orangish brown staining on fracture surfaces. 2. 70 to 80 degree joints at 8.25m to 8.34m and 8.80m to 9.00m, undulating, rough with orangish brown staining on joint surfaces, penetrating up to 7mm from joint surface. *8.15m to 8.25m: Weak thickly laminated orangish brown and greenish grey poorly cemented sandstone.* End of Borehole at 9.00m		
		TCR	SCR	RQD	FI								

9.5 10.0 10.5 11.0 11.5 12.0 12.5 13.0 13.5 14.0 14.5 15.0 15.5 16.0 16.5 17.0 17.5 18.0 18.5

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Chiselling Details

From (m)	To (m)	Time (hh:mm)

Remarks

Marine Borehole drilled off OCM 80 jack-up barge
Deck to Bed = 24.00m
All elevations/reduced levels given in mCD

Casing Details

To (m)	Diam (mm)
3.00	177
9.00	150

Water Added

From (m)	To (m)

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	29/06/2022

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
21-1031	Scapa Deep Water Quay & Hatston Pier Development - Marine GI	BH-M16
	Client: Orkney Islands Council	
	Client's Rep: Arch Henderson LLP	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Sonic Drilling	Fraste Duo CXL Rotosonic	0.00	2.00	344975.43 E
Rotary Coring	Fraste Duo CXL Rotosonic	2.00	8.00	1004255.73 N

Final Depth:	8.00 m	Start Date:	02/04/2022	Driller:	KW	Sheet 1 of 1 Scale: 1:50
Elevation:	-10.09 mCD	End Date:	02/04/2022	Logger:	RC +TMcA	FINAL

Depth (m)	Sample / Tests	Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 0.50	ES3	Marine Scotland - SS1										Loose to medium dense grey slightly gravelly silty fine to coarse SAND with shell fragments (up to 5mm) and unfragmented articulated brachiopod shells (up to 25mm). Gravel is subangular fine of various lithologies.		
0.00 - 1.00	B5													
0.50	ES1													
1.00	ES2													
1.00 - 1.50	B6													
1.00 - 1.50	ES4	Marine Scotland - SS2												
1.50	D7													
1.50 - 1.95	SPT (S)	N=14 (2,4/3,3,4,4) Hammer SN = 1353					1.50		-11.89	1.80		Weathered yellowish white banded SANDSTONE. (Drillers description)		
2.00	C1		100	38	13	>20			-12.09	2.00		Medium strong (locally weak) indistinctly thinly laminated fine grained light yellowish grey SANDSTONE. Partially weathered: reduced strength, closer fracture spacing. occasional light brownish orange discolouration on fracture surfaces and occasional sandy clay infill on fracture surfaces. Discontinuities: 1. 5 to 25 degree bedding fractures closely spaced (10/115/300), planar, rough, occasional light brownish orange staining up to 1mm deep and occasional sandy clay infill on fracture surfaces up to 1mm thick. 2. 25 to 45 degree joints at 2.60m to 2.80m, 3.00m, 3.30m to 4.30m and 4.70m, planar, rough and staining on joint surfaces up to 1mm deep. 3. 65 to 75 degree joints from 2.30m to 2.60m, 3.10m to 3.50m, 3.80m to 4.10m, 4.10m to 4.40m, undulating, rough ad occasional light brownish orange staining on joint surfaces up to 1mm deep.		
2.85	C2													
3.00	D8						3.00							
3.00 - 3.45	SPT(S) N=34 (4,5/8,9,8,9) Hammer SN = 1353													
3.50														
4.10	C3		100	65	19	14				(4.30)				
5.00														
6.00	C4		100	63	9									
6.50						17			-16.39	6.30		Weak (locally medium strong) indistinctly thinly laminated fine grained dark yellowish grey SANDSTONE. Partially weathered: reduced strength, closer fracture spacing and frequent heavy brownish orange discolouration on fracture surfaces. Discontinuities: 1. 5 to 25 degree bedding fractures closely spaced (10/130/350) planar, rough and frequent heavy brownish orange staining up to 10mm deep. 2. 65 to 75 degree joints from 6.70m to 6.85m and 7.10m to 7.50m, undulating, rough and frequent heavy brownish orange staining up to 1mm deep.		
7.30	C5		100	62	29					(1.70)				
7.50	C6					9								
7.75	C7													
8.00									-18.09	8.00		End of Borehole at 8.00m		

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
2.00	177
8.00	150

Water Added

From (m)	To (m)

Remarks

Marine Borehole drilled off OCM 80 jack-up barge
Deck to Bed = 16.50m
All elevations/reduced levels given in mCD

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	29/06/2022

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
21-1031	Scapa Deep Water Quay & Hatston Pier Development - Marine GI	BH-M17
	Client: Orkney Islands Council	
	Client's Rep: Arch Henderson LLP	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Sonic Drilling	Fraste Duo CXL Rotosonic	0.00	1.00	345017.31 E
Rotary Coring	Fraste Duo CXL Rotosonic	1.00	7.00	1004268.57 N

Final Depth:	7.00 m	Start Date:	01/04/2022	Driller:	KW	Sheet 1 of 1 Scale: 1:50
Elevation:	-8.53 mCD	End Date:	01/04/2022	Logger:	NP +TMcA	FINAL

Depth (m)	Sample / Tests	Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 0.50	B3											Grey very gravelly silty fine to coarse SAND with shell fragments (up to 3mm). Gravel is subangular fine to medium of various lithologies.		
0.00 - 0.50	ES2	Marine Scotland - SS1												
0.50	ES1								-9.03	0.50		Weathered yellowish white banded SANDSTONE. (Drillers description)		
1.00	C1					NI			-9.53	1.00 (0.45)		Highly weathered SANDSTONE recovered as orangish brown gravelly fine to coarse SAND with low cobble content. Gravel is subangular fine to coarse. Cobbles are subangular.		
1.45	C2		100	12	8	>20			-9.98	1.45		Weak (locally very weak) indistinctly thinly bedded light orangish brown moderately well cemented fine grained SANDSTONE. Partially weathered: slightly reduced strength, closer fracture spacing with orangish brown discolouration. Discontinuities: 1. 15 to 20 degree bedding fractures, medium spaced (70/205/310) planar, smooth with dark orangish brown staining on fracture surfaces, penetrating up to 3mm from fracture surfaces, light brown clay deposits on some fracture surfaces. 2. 55 to 65 degree joints, widely spaced (120/1118/1550) planar and undulating, smooth, with dark orangish brown staining on joint surfaces. 3. 75 to 85 degree joints at 1.65m to 2.00m, 1.90m to 2.25m, 2.25m to 2.95m, 3.50m to 4.70m and 4.60m to 5.15m, undulating, smooth with dark orangish brown staining on joint surfaces, penetrating 3m from joint surface.		
2.50														
2.65	C3													
2.80	C4													
3.30	C5		100	59	0									
4.00														
4.15	C6													
4.30	C7		100	30	0	10				(5.55)				
5.50						14								
5.65	C8		65	0	0	AZCL						6.10m to 7.00m: AZCL - Lower section of core run unable to be retrieved from base of borehole due to fractured nature of material.		
7.00									-15.53	7.00		End of Borehole at 7.00m		

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
1.00	177
7.00	150

Water Added

From (m)	To (m)

Remarks

Marine Borehole drilled off OCM 80 jack-up barge
Deck to Bed = 15.00m
All elevations/reduced levels given in mCD

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	29/06/2022

AGS

CAUSEWAY GEOTECH

Project No.	Project Name: Scapa Deep Water Quay & Hatston Pier Development - Marine GI	Borehole ID
21-1031	Client: Orkney Islands Council	BH-M26
	Client's Rep: Arch Henderson LLP	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Sonic Drilling	Fraste Duo CXL Rotosonic	0.00	3.00	344972.76 E
Rotary Coring	Fraste Duo CXL Rotosonic	3.00	10.50	1004158.34 N

Final Depth: 10.50 m	Start Date: 31/03/2022	Driller: MJ	Sheet 1 of 2 Scale: 1:50
Elevation: -14.83 mCD	End Date: 01/04/2022	Logger: NP+RC	FINAL

Depth (m)	Sample / Tests	Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
0.00 - 1.50	B5											Loose grey gravelly silty fine to coarse SAND with shell fragments (up to 3mm). Gravel is subangular fine to medium of various lithologies.		
0.50	ES1													
1.00	ES2								-16.03	1.20				
1.50	D7											Medium dense grey very gravelly silty fine to coarse SAND with shell fragments (up to 4mm). Gravel is subangular fine to medium of various lithologies.		
1.50 - 3.00	B6													
1.50 - 1.95	SPT (S)	N=17 (3,4/4,3,5,5) Hammer SN = 1353					1.50							
2.00	ES3								-17.33	2.50		Highly weathered orangish brown SANDSTONE. (Drillers Description)		
3.00	D8						3.00		-17.83	3.00		Weak (locally medium strong) indistinctly thinly bedded fine grained light orangish grey SANDSTONE. Partially weathered: reduced strength, much closer fracture spacing, occasional light brownish orange discolouration on fracture surfaces and frequent sandy clay infill on fracture surfaces.		
3.00	ES4											Discontinuities:		
3.00 - 3.45	SPT(S) N=27 (5,5/6,6,7,8) Hammer SN = 1353											1. 5 to 20 degree bedding closely spaced (10/90/150) planar, smooth, occasional light brownish ornate staining up to 2m deep and frequent sandy clay infill on fracture surfaces up to 50mm thick.		
3.40	C1		100	6	0							2. 65 to 75 degree joints from 4.20m to 4.50m, 4.50m to 5.00m and 6.00m to 6.20m, planar, smooth and occasional light brownish orange staining up to 2mm deep.		
3.60	C2					>20								
4.45	C3													
4.50										(3.20)				
5.25	C4		61	5	0							*5.40m to 6.00m: AZCL - Probable bed of extremely weak sandstone washed out during drilling.*		
						AZCL								
6.00												Weak indistinctly thinly laminated fine grained light orangish grey SANDSTONE. Partially weathered: reduced strength, much closer fractures spacing and frequent heavy dark brownish orange discolouration on fracture surfaces.		
6.10	C5					19			-21.03	6.20		Discontinuities:		
6.60	C6		100	17	0							1. 10 to 25 degree bedding fractures, closely spaced (10/90/200) planar, rough and frequent heavy dark brownish orange staining up to 30mm deep.		
						>20				(1.80)		2. 45 to 55 degree joints closely spaced (50/180/450) planar, rough and frequent heavy dark brownish orange staining up to 50mm deep.		
7.50												3. 65 to 75 degree joints from 7.50m to 7.80m and 7.90m to 8.00m, planar, rough and frequent heavy dark brownish orange staining up to 50mm deep.		
									-22.83	8.00		Weak (locally medium strong) indistinctly thinly laminated fine grained light orangish grey SANDSTONE. Partially weathered: slightly reduced strength, much closer fracture spacing and occasional heavy dark brownish orange discolouration on fracture surfaces.		
			100	19	0							Discontinuities:		
8.50	C7					17				(2.50)		1. 15 to 25 degree bedding fractures, medium spaced (50/22/350) planar rough and occasional heavy dark brownish orange staining up to 0.5mm deep.		
9.00												2. 65 to 75 degree joints from 8.00m to 8.40m, 8.40m to 8.80m and 9.30m to 9.70m, planar, rough and occasional dark brownish orange staining up to 0.5mm deep.		
9.20	C8													
			TCR	SCR	RQD	FI								

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details

To (m)	Diam (mm)
3.00	177
10.50	150

Water Added

From (m)	To (m)

Remarks

Marine Borehole drilled off OCM 80 jack-up barge
Deck to Bed = 21.20m
All elevations/reduced levels given in mCD

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	29/06/2022

AGS

CAUSEWAY GEOTECH

Project No.	Project Name:	Borehole ID
21-1031	Scapa Deep Water Quay & Hatston Pier Development - Marine GI	BH-M26
	Client: Orkney Islands Council	
	Client's Rep: Arch Henderson LLP	

Method	Plant Used	Top (m)	Base (m)	Coordinates
Sonic Drilling	Fraste Duo CXL Rotosonic	0.00	3.00	344972.76 E
Rotary Coring	Fraste Duo CXL Rotosonic	3.00	10.50	1004158.34 N

Final Depth:	Start Date:	Driller:	Sheet 2 of 2
10.50 m	31/03/2022	MJ	Scale: 1:50
Elevation: -14.83 mCD	**End Date:** 01/04/2022	**Logger:** NP+RC	FINAL

Depth (m)	Samples / Field Records	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Level mCD	Depth (m)	Legend	Description	Water	Backfill
9.90	C9	71	25	0							Weak (locally medium strong) indistinctly thinly laminated fine grained light orangish grey SANDSTONE. Partially weathered: slightly reduced strength, much closer fracture spacing and occasional heavy dark brownish orange discolouration on fracture surfaces. Discontinuities: 1. 15 to 25 degree bedding fractures, medium spaced (50/22/350) planar rough and occasional heavy dark brownish orange staining up to 0.5mm deep. 2. 65 to 75 degree joints from 8.00m to 8.40m, 8.40m to 8.80m and 9.30m to 9.70m, planar, rough and occasional dark brownish orange staining up to 0.5mm deep. *10.00m to 10.50m: AZCL - Lower section of core run unable to be retrieved from base of borehole due to fractured nature of material.*		
					AZCL								
10.50								-25.33	10.50		End of Borehole at 10.50m		
		TCR	SCR	RQD	FI								

Water Strikes			
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Chiselling Details		
From (m)	To (m)	Time (hh:mm)

Casing Details	
To (m)	Diam (mm)
3.00	177
10.50	150

Water Added	
From (m)	To (m)

Remarks

Marine Borehole drilled off OCM 80 jack-up barge
Deck to Bed = 21.20m
All elevations/reduced levels given in mCD

Core Barrel	Flush Type	Termination Reason	Last Updated
SK6L	Polymer	Terminated at scheduled depth	29/06/2022

AGS

C DATA SUMMARY TABLES AND LAB CERTIFICATES

Summary Table A

Sampling Results Incorporated with BPEO Assessment (mg/kg)

Source	AL1	AL2	BAC CSEMP	ERL CSEMP	PEL Canada	BH-M01 (SS1) 0.00-0.50m	BH-M01 (SS2) 1.00-1.50m	BH-M01 (SS3) 2.50-3.00m	BH-M03 (SS1) 0.00-0.50m	BH-M03 (SS2) 1.00-1.50m	BH-M03 (SS3) 2.50-3.00m	BH-M07 (SS1) 0.00-0.50m	BH-M07 (SS2) 1.00-1.50m	BH-M07 (SS3) 2.50-3.00m	BH-M09 (SS1) 0.00-0.50m	BH-M09 (SS2) 1.00-1.50m	BH-M09 (SS3) 2.50-3.00m	BH-M11 (SS1) 0.00-0.50m
						Dredge Phase 1 and Phase 2												
Arsenic	20	70	25		41.6	3.5	3.7	27.8	7.9	19.5	21	10.4	4.1	5.1	13.3	12.6	19.6	19
Cadmium	0.4	4	0.31	1.2	4.2	0.07	0.1	0.07	0.14	0.11	0.11	0.07	0.06	0.05	0.07	0.09	0.13	0.15
Chromium	50	370	81	81	160	6.8	6.9	8.3	10.6	14.6	13.1	14.9	8.1	7.8	11.2	11.8	26.1	27.4
Copper	30	300	27	34	108	5.5	5.4	8.4	8.1	12.6	84.1	12.4	5.7	8.2	6.9	7.3	14.7	15
Mercury	0.25	1.5	0.07	0.15	0.7	0.02	0.01	0.09	0.01	0.02	0.03	0.01	0.01	0.01	0.01	0.01	0.05	0.02
Nickel	30	150	36	-	-	4.8	4.7	3.2	8.7	16.1	11.4	14.1	6.8	7.6	8.9	9.1	22.9	24.2
Lead	50	400	38	47	112	4.7	3.5	7.6	5.6	10.8	10.3	12.4	4.9	5.2	7.2	8.1	15.5	17.7
Zinc	130	600	122	150	271	13.8	11.4	15.5	19	32.4	18.6	32.5	12.6	21	15.6	16.5	46.3	47.3
Napthalene	0.1		0.08	0.16	0.391	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Acenaphthylene	0.1		-	-	0.128	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Acenaphthene	0.1		-	-	0.0889	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Fluorene	0.1		-	-	0.144	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Phenanthrene	0.1		0.032	0.24	0.544	0.001	0.001	0.001	0.00161	0.00185	0.001	0.00166	0.00166	0.001	0.001	0.0012	0.00157	0.00129
Anthracene	0.1		0.05	0.085	0.245	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Fluoranthene	0.1		0.039	0.6	1.494	0.001	0.001	0.001	0.00152	0.00166	0.001	0.00111	0.00133	0.001	0.00105	0.00142	0.00152	0.00106
Pyrene	0.1		0.024	0.665	1.398	0.00202	0.00171	0.001	0.00198	0.00212	0.001	0.00218	0.00196	0.001	0.0018	0.00249	0.0029	0.00207
Benzo(a)anthracene	0.1		0.016	0.261	0.693	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Chrysene	0.1		0.02	0.384	0.846	0.00302	0.0026	0.001	0.00381	0.003	0.00133	0.0034	0.00237	0.00106	0.00262	0.00404	0.00479	0.00371
Benzo(b)fluoranthene	0.1		-	-	-	0.00146	0.00113	0.001	0.00157	0.00172	0.001	0.00115	0.00165	0.001	0.00121	0.00185	0.00219	0.00107
Benzo(k)fluoranthene	0.1		-	-	-	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Benzo(a)pyrene	0.1		0.03	0.384	0.763	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Indeno(1,2,3cd)pyrene	0.1		0.103	0.24	-	0.001	0.001	0.001	0.001	0.00108	0.001	0.001	0.00104	0.001	0.001	0.001	0.001	0.001
Benzo(ghi)perylene	0.1		0.08	0.085	-	0.001	0.001	0.001	0.00147	0.00167	0.00138	0.00127	0.00161	0.001	0.00102	0.00116	0.00125	0.00116
Dibenzo(a,h)anthracene	0.01		-	-	0.135	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
TPH	100		-	-	-	8.68	10.6	2.58	40.9	25.3	34.4	13.2	12	9.73	9.76	21.2	36.5	14
PCBs	0.02	0.18	-	-	0.189	0.00056	0.00056	0.00056	0.00056	0.00056	0.00056	0.00056	0.00056	0.00056	0.00056	0.00056	0.00056	0.00056
TBT	0.1	0.5	-	-	-	0.001	0.001	0.001	0.001	0.001	0.001	0.005	0.005	0.005	0.005	0.005	0.005	0.005

Source	BH-M11 (SS2) 1.00-1.50m	BH-M11 (SS3) 2.50-3.00m	BH-M13 (SS1) 0.00-0.50m	BH-M13 (SS2) 1.00-1.50m	BH-M13 (SS3) 2.50-3.00m	BH-M14 (SS1) 0.00-0.50m	BH-M14 (SS2) 1.00-1.50m	BH-M14 (SS3) 2.50-3.00m	BH-M15 (SS1) 0.00-0.50m	BH-M15 (SS2) 1.00-1.50m	BH-M15 (SS3) 2.50-3.00m	WP-M27 (SS1) 0.00-0.15m	BH-M16 (SS1) 0.00-0.50m	BH-M16 (SS2) 1.00-1.50m	BH-M17 (SS1) 0.00-0.50m	BH-M04 (SS1) 0.00-0.50m	BH-M04 (SS2) 1.00-1.50m	BH-M04 (SS3) 2.50-3.00m	BH-M05 (SS1) 0.00-0.50m	BH-M05 (SS2) 1.00-1.50m	BH-M05 (SS3) 2.50-3.00m
Arsenic	17.9	27.8	9.2	5.2	4.9	7.1	6.8	7.2	5.1	5.7	9.3	6.2	10	11.3	7.6	24.6	23.8	19.9	16.6	14.5	11.7
Cadmium	0.1	0.16	0.1	0.09	0.31	0.15	0.13	0.15	0.1	0.08	0.11	0.1	0.17	0.14	0.07	0.29	0.19	0.32	0.17	0.11	0.15
Chromium	17.6	14.9	11.1	10.1	11.6	14.8	13.1	12.7	9.7	10.3	16.6	11.2	16	19.7	6.4	51.4	34.5	36.5	27.8	24.6	23.3
Copper	8	21.6	9.5	5.9	46.4	18.3	8.9	10.1	6.2	6	10	8	8.6	11.7	7.1	40	18.4	21.4	11.9	9.9	10.3
Mercury	0.01	0.03	0.01	0.01	0.13	0.04	0.02	0.03	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.12	0.04	0.03	0.01	0.01	0.01
Nickel	11.4	20.6	10.8	8	8.3	12.2	10.7	10.5	7.7	8.8	14.5	9.9	13.6	16.3	5.1	31.8	27.4	29	18.6	16.3	15.7
Lead	9.8	15.4	7	5	16.6	10.6	7.5	9.3	5.6	5.5	9.1	6.4	8.9	11.5	23.6	50.7	25.8	23.5	12.8	10.2	8.9
Zinc	21.9	46.8	21.8	15	15.8	26.6	23.6	39.7	17.4	17	27.2	24.3	29	33.6	9.1	161	80.8	82.1	46.6	45.8	36.7
Napthalene	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.00138	0.00138	0.00143	0.00128	0.00122	0.00402
Acenaphthylene	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.00116
Acenaphthene	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.00134
Fluorene	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.00177
Phenanthrene	0.00176	0.001	0.00107	0.001	0.001	0.00296	0.00115	0.001	0.001	0.001	0.001	0.00155	0.00415	0.00148	0.001	0.0036	0.00448	0.00281	0.0011	0.00114	0.00667
Anthracene	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.00161	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.00192
Fluoranthene	0.00216	0.001	0.00159	0.00126	0.001	0.001	0.00205	0.00145	0.001	0.001	0.001	0.00269	0.0114	0.001	0.001	0.00174	0.00179	0.00123	0.00108	0.00154	0.00994
Pyrene	0.00355	0.001	0.00196	0.00181	0.001	0.00133	0.0026	0.00189	0.001	0.00103	0.00131	0.00318	0.0106	0.00108	0.001	0.00288	0.00264	0.00306	0.00305	0.00178	0.00932
Benzo(a)anthracene	0.00127	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.00116	0.00526	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.00494
Chrysene	0.00746	0.001	0.00297	0.00273	0.001	0.00167	0.00207	0.00183	0.00137	0.0016	0.00178	0.00257	0.00688	0.00171	0.001	0.00443	0.00383	0.00309	0.00322	0.00209	0.00767
Benzo(b)fluoranthene	0.00286	0.001	0.00222	0.00153	0.001	0.001	0.00234	0.00159	0.001	0.001	0.001	0.00235	0.00494	0.001	0.001	0.00183	0.00145	0.00165	0.0017	0.00184	0.00687
Benzo(k)fluoranthene	0.001	0.001	0.001	0.001	0.001	0.001	0.00143	0.001	0.001	0.001	0.001	0.00133	0.00289	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.00305
Benzo(a)pyrene	0.001	0.001	0.001	0.001	0.001	0.001	0.00103	0.001	0.001	0.001	0.001	0.00136	0.00478	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.00571
Indeno(1,2,3cd)pyrene	0.0011	0.001	0.00119	0.001	0.001	0.001	0.00193	0.001	0.001	0.001	0.001	0.00223	0.00309	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.0042
Benzo(ghi)perylene	0.00176	0.001	0.00153	0.00127	0.001	0.001	0.00232	0.00126	0.001	0.001	0.001	0.00247	0.00394	0.001	0.001	0.00175	0.00145	0.00144	0.00107	0.0013	0.00515
Dibenzo(a,h)anthracene	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.00128
TPH	16.1	38.9	21.5	15.5	3.83	9.28	14.2	18.6	8.15	8.23	11.7	17.4	11.2	13.5	7.09	59.9	46.8	123	42.2	20.2	23.6
PCBs	0.00056	0.00056	0.00056	0.00075	0.00056	0.00199	0.00056	0.00056	0.00056	0.00056	0.00056	0.00056	0.00056	0.00056	0.00056	0.00056	0.00056	0.0006	0.00056	0.00056	0.00056
TBT	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.001	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005

Source	MAX	AVERAGE	No. Exceed RAL 1	No. Exceed RAL 2	No.Exceed BAC?	No. Exceed ERL	No. Exceed PEL?
Arsenic	27.8	12.35	5	0	2	N/A	0
Cadmium	0.32	0.13	0	0	2	0	0
Chromium	51.4	16.51	1	0	0	0	0
Copper	84.1	14.49	3	0	3	3	0
Mercury	0.13	0.03	0	0	3	0	0
Nickel	31.8	13.23	1	0	0	N/A	N/A
Lead	50.7	11.68	1	0	1	1	0
Zinc	161	33.07	1	0	1	1	0
Napthalene	0.00402	0.001	0	N/A	0	0	0
Acenaphthylene	0.00116	0.001	0	N/A	N/A	N/A	0
Acenaphthene	0.00134	0.001	0	N/A	N/A	N/A	0
Fluorene	0.00177	0.001	0	N/A	N/A	N/A	0
Phenanthrene	0.00667	0.002	0	N/A	0	0	0
Anthracene	0.00192	0.001	0	N/A	0	0	0
Fluoranthene	0.0114	0.002	0	N/A	0	0	0
Pyrene	0.0106	0.002	0	N/A	0	0	0
Benzo(a)anthracene	0.00526	0.001	0	N/A	0	0	0
Chrysene	0.00767	0.003	0	N/A	0	0	0
Benzo(b)fluoranthene	0.00687	0.002	0	N/A	N/A	N/A	N/A
Benzo(k)fluoranthene	0.00305	0.001	0	N/A	N/A	N/A	N/A
Benzo(a)pyrene	0.00571	0.001	0	N/A	0	0	0
Indeno(1,2,3cd)pyrene	0.0042	0.001	0	N/A	0	0	N/A
Benzo(ghi)perylene	0.00515	0.001	0	N/A	0	0	N/A
Dibenzo(a,h)anthracene	0.00128	0.001	0	N/A	N/A	N/A	0
TPH	123	22.64	1	N/A	N/A	N/A	N/A
PCBs	0.00199	0.0006	0	0	N/A	N/A	0
TBT	0.00500	0.0042	0	0	N/A	N/A	N/A

Note: Underlined Values are   LOD. Values highlighted red are equal to or greater than AL1.
PEL Data Source: http://ceqg-rcqe.ccme.ca/en/index.html#void

Summary Table B

SDWQ Phase 1 and Phase 2 Dredge Areas

All units in mg/kg

	AL1	AL2	BAC	<ERL	PEL	Dredge Average	Exceed AL1?	Exceed AL2?	Exceed BAC?	Exceed ERL ?	Exceed PEL?
Source			CSEMP	CSEMP	Canada						
Arsenic	20	70	25	-	41.6	12.4	No	No	No	N/A	No
Cadmium	0.4	4	0.31	1.2	4.2	0.1	No	No	No	No	No
Chromium	50	370	81	81	160	16.5	No	No	No	No	No
Copper	30	300	27	34	108	14.5	No	No	No	No	No
Mercury	0.25	1.5	0.07	0.15	0.7	0.0	No	No	No	No	No
Nickel	30	150	36	-	-	13.2	No	No	No	N/A	N/A
Lead	50	400	38	47	112	11.7	No	No	No	No	No
Zinc	130	600	122	150	271	33.1	No	No	No	No	No
					-						
Napthalene	0.1	-	0.08	0.16	0.319	0.00	No	N/A	No	No	No
Acenaphthylene	0.1	-	-	-	0.128	0.00	No	N/A	N/A	N/A	No
Acenaphthene	0.1	-	-	-	0.0889	0.00	No	N/A	N/A	N/A	No
Fluorene	0.1	-	-	-	0.144	0.00	No	N/A	N/A	N/A	No
Phenanthrene	0.1	-	0.032	0.24	0.544	0.00	No	N/A	No	No	No
Anthracene	0.1	-	0.05	0.085	0.245	0.00	No	N/A	No	No	No
Fluoranthene	0.1	-	0.039	0.6	1.494	0.00	No	N/A	No	No	No
Pyrene	0.1	-	0.024	0.665	1.398	0.00	No	N/A	No	No	No
Benzo(a)anthracene	0.1	-	0.016	0.261	0.693	0.00	No	N/A	No	No	No
Chrysene	0.1	-	0.02	0.384	0.846	0.00	No	N/A	No	No	No
Benzo(b)fluoranthene	0.1	-	-	-	-	0.00	No	N/A	N/A	N/A	N/A
Benzo(k)fluoranthene	0.1	-	-	-	-	0.00	No	N/A	N/A	N/A	N/A
Benzo(a)pyrene	0.1	-	0.03	0.384	0.763	0.00	No	N/A	No	No	No
Indeno(1,2,3cd)pyrene	0.1	-	0.103	0.24	-	0.00	No	N/A	No	No	N/A
Benzo(ghi)perylene	0.1	-	0.08	0.085	-	0.00	No	N/A	No	No	N/A
Dibenzo(a,h)anthracene	0.01	-	-	-	0.135	0.00	No	N/A	N/A	N/A	No
TPH	100	-	-	-	-	22.64	No	N/A	N/A	N/A	N/A
PCBs	0.02	0.18	-	-	0.189	0.001	No	No	N/A	N/A	No
TBT	0.1	0.5	-	-	-	0.0042	No	No	N/A	N/A	N/A

Certificate of Analysis

Issuing Laboratory SOCOTEC, Marine Department, Advanced Chemistry and Research, Etwall House, Bretby Business Park, Ashby Road, Burton-upon-Trent DE15 0YZ

Test Report ID	**MAR1394**	
Issue Version	1	
Customer	Causeway Geotech Ltd, 8 Drumahiskey Road, Ballymoney, Co. Antrim, BT53 7QL	
Customer Reference	Scapa Flow Marie Scotland Sediment Testing	
Date Sampled	23-Mar- 02-Apr-2022	
Date Received	11-Apr-22	
Date Reported	09-May-22	
Condition of samples	Cold	Satisfactory

Authorised by: Marya Hubbard

Position: Laboratory Manager

Any additional opinions or interpretations found in this report, are outside the scope of UKAS accreditation.

Certificate of Analysis

Issuing Laboratory SOCOTEC, Marine Department, Advanced Chemistry and Research, Etwall House, Bretby Business Park, Ashby Road, Burton-upon-Trent DE15 0YZ

Test Report ID	MAR1394
Issue Version	1
Customer Reference	Scapa Flow Marie Scotland Sediment Testing

		Units	%	%	%	%	%	Mg/m3	N/A
		Method No	ASC/SOP/303	ASC/SOP/303	SUB_01*	SUB_01*	SUB_01*	SOCOTEC Doncaster*	SUB_02*
		Limit of Detection	0.2	0.2	N/A	N/A	N/A	N/A	N/A
		Accreditation	UKAS	UKAS	N	N	N	N	UKAS
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**Total Moisture @ 120°C**	**Total Solids**	**Gravel (>2mm)**	**Sand (63-2000 µm)**	**Silt (<63 µm)**	**Particle Density**	**Asbestos**
BH-M01 (SS1) 0.00-0.50m	MAR1394.01	Sediment	16.3	83.7	7.6	73.8	18.6	2.72	NAIIS
BH-M01 (SS2) 1.00-1.50m	MAR1394.02	Sediment	14.6	85.4	5.5	82.4	12.1	2.69	NAIIS
BH-M01 (SS3) 2.50-3.00m	MAR1394.03	Sediment	11.6	88.4	10.1	47.9	42.0	2.66	NAIIS
BH-M03 (SS1) 0.00-0.50m	MAR1394.04	Sediment	14.3	85.7	8.3	64.6	27.0	2.71	NAIIS
BH-M03 (SS2) 1.00-1.50m	MAR1394.05	Sediment	13.8	86.2	11.0	53.1	35.9	2.74	NAIIS
BH-M03 (SS3) 2.50-3.00m	MAR1394.06	Sediment	14.3	85.7	10.4	25.8	63.9	Not Amenable*	NAIIS
BH-M07 (SS1) 0.00-0.50m	MAR1394.07	Sediment	16.1	83.9	20.9	57.8	21.2	2.51	NAIIS
BH-M07 (SS2) 1.00-1.50m	MAR1394.08	Sediment	18.7	81.3	19.1	60.9	20.0	Not Amenable*	NAIIS
BH-M07 (SS3) 2.50-3.00m	MAR1394.09	Sediment	14.3	85.7	17.6	67.8	14.6	Not Amenable*	NAIIS
BH-M09 (SS1) 0.00-0.50m	MAR1394.10	Sediment	23.0	77.0	23.5	52.9	23.6	0.72	NAIIS
BH-M09 (SS2) 1.00-1.50m	MAR1394.11	Sediment	17.5	82.5	11.6	64.9	23.5	2.76	NAIIS
BH-M09 (SS3) 2.50-3.00m	MAR1394.12	Sediment	12.7	87.3	25.2	54.2	20.7	Not Amenable*	NAIIS
BH-M11 (SS1) 0.00-0.50m	MAR1394.13	Sediment	12.9	87.1	17.8	65.2	17.0	2.69	NAIIS
BH-M11 (SS2) 1.00-1.50m	MAR1394.14	Sediment	13.1	86.9	8.7	61.9	29.4	2.70	NAIIS
BH-M11 (SS3) 2.50-3.00m	MAR1394.15	Sediment	12.6	87.4	20.0	45.3	34.7	Not Amenable*	NAIIS
BH-M13 (SS1) 0.00-0.50m	MAR1394.16	Sediment	19.3	80.7	9.3	75.3	15.4	Not Amenable*	NAIIS
BH-M13 (SS2) 1.00-1.50m	MAR1394.17	Sediment	17.1	82.9	10.3	59.4	30.3	2.71	NAIIS
BH-M13 (SS3) 2.50-3.00m	MAR1394.18	Sediment	12.0	88.0	20.8	40.2	39.0	2.69	NAIIS
BH-M14 (SS1) 0.00-0.50m	MAR1394.19	Sediment	17.9	82.1	22.9	61.9	15.2	Not Amenable*	NAIIS
BH-M14 (SS2) 1.00-1.50m	MAR1394.20	Sediment	23.3	76.7	20.6	63.8	15.6	Not Amenable*	NAIIS
BH-M14 (SS3) 2.50-3.00m	MAR1394.21	Sediment	16.0	84.0	19.9	63.2	16.8	2.66	NAIIS
BH-M15 (SS1) 0.00-0.50m	MAR1394.22	Sediment	20.3	79.7	34.4	47.8	17.9	2.72	NAIIS
BH-M15 (SS2) 1.00-1.50m	MAR1394.23	Sediment	17.2	82.8	28.6	48.8	22.5	2.68	NAIIS
BH-M15 (SS3) 2.50-3.00m	MAR1394.24	Sediment	15.5	84.5	32.4	50.2	17.3	2.71	NAIIS
WP-M27 (SS1) 0.00-0.15m	MAR1394.25	Sediment	22.4	77.6	21.5	57.5	21.0	2.66	NAIIS
BH-M16 (SS1) 0.00-0.50m	MAR1394.26	Sediment	16.5	83.5	27.4	51.7	20.9	2.69	NAIIS
BH-M16 (SS2) 1.00-1.50m	MAR1394.27	Sediment	13.3	86.7	30.4	51.8	17.8	Not Amenable*	NAIIS
BH-M17 (SS1) 0.00-0.50m	MAR1394.28	Sediment	12.2	87.8	20.1	42.9	37.1	2.71	NAIIS
		Reference Material (% Recovery)	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		QC Blank	N/A	N/A	N/A	N/A	N/A	N/A	N/A

* See Report Notes

NAIIS - No Asbestos Identified In Sample

Certificate of Analysis

Issuing Laboratory SOCOTEC, Marine Department, Advanced Chemistry and Research, Etwall House, Bretby Business Park, Ashby Road, Burton-upon-Trent DE15 0YZ

Test Report ID	MAR1394
Issue Version	1
Customer Reference	Scapa Flow Marie Scotland Sediment Testing

		Units	% M/M
		Method No	WSLM59*
		Limit of Detection	0.02
		Accreditation	UKAS
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**TOC**
BH-M01 (SS1) 0.00-0.50m	MAR1394.01	Sediment	0.22
BH-M01 (SS2) 1.00-1.50m	MAR1394.02	Sediment	0.17
BH-M01 (SS3) 2.50-3.00m	MAR1394.03	Sediment	0.05
BH-M03 (SS1) 0.00-0.50m	MAR1394.04	Sediment	0.26
BH-M03 (SS2) 1.00-1.50m	MAR1394.05	Sediment	0.18
BH-M03 (SS3) 2.50-3.00m	MAR1394.06	Sediment	0.07
BH-M07 (SS1) 0.00-0.50m	MAR1394.07	Sediment	0.17
BH-M07 (SS2) 1.00-1.50m	MAR1394.08	Sediment	0.25
BH-M07 (SS3) 2.50-3.00m	MAR1394.09	Sediment	0.15
BH-M09 (SS1) 0.00-0.50m	MAR1394.10	Sediment	0.27
BH-M09 (SS2) 1.00-1.50m	MAR1394.11	Sediment	0.25
BH-M09 (SS3) 2.50-3.00m	MAR1394.12	Sediment	0.21
BH-M11 (SS1) 0.00-0.50m	MAR1394.13	Sediment	0.17
BH-M11 (SS2) 1.00-1.50m	MAR1394.14	Sediment	0.23
BH-M11 (SS3) 2.50-3.00m	MAR1394.15	Sediment	0.13
BH-M13 (SS1) 0.00-0.50m	MAR1394.16	Sediment	0.30
BH-M13 (SS2) 1.00-1.50m	MAR1394.17	Sediment	0.28
BH-M13 (SS3) 2.50-3.00m	MAR1394.18	Sediment	0.05
BH-M14 (SS1) 0.00-0.50m	MAR1394.19	Sediment	0.27
BH-M14 (SS2) 1.00-1.50m	MAR1394.20	Sediment	0.23
BH-M14 (SS3) 2.50-3.00m	MAR1394.21	Sediment	0.17
BH-M15 (SS1) 0.00-0.50m	MAR1394.22	Sediment	0.38
BH-M15 (SS2) 1.00-1.50m	MAR1394.23	Sediment	0.36
BH-M15 (SS3) 2.50-3.00m	MAR1394.24	Sediment	0.26
WP-M27 (SS1) 0.00-0.15m	MAR1394.25	Sediment	0.28
BH-M16 (SS1) 0.00-0.50m	MAR1394.26	Sediment	0.24
BH-M16 (SS2) 1.00-1.50m	MAR1394.27	Sediment	0.28
BH-M17 (SS1) 0.00-0.50m	MAR1394.28	Sediment	0.24
		Reference Material (% Recovery)	95
		QC Blank	<0.02

* See Report Notes

NAIIS - No Asbestos Identified In Sample

Certificate of Analysis

Issuing Laboratory SOCOTEC, Marine Department, Advanced Chemistry and Research, Etwall House, Bretby Business Park, Ashby Road, Burton-upon-Trent DE15 0YZ

Test Report ID	MAR1394
Issue Version	1
Customer Reference	Scapa Flow Marie Scotland Sediment Testing

		Units	mg/Kg (Dry Weight)							
		Method No	ICPMSS*							
		Limit of Detection	0.5	0.04	0.5	0.5	0.01	0.5	0.5	2
		Accreditation	UKAS	UKAS	UKAS	UKAS	UKAS	UKAS	UKAS	UKAS
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**Arsenic**	**Cadmium**	**Chromium**	**Copper**	**Mercury**	**Nickel**	**Lead**	**Zinc**
BH-M01 (SS1) 0.00-0.50m	MAR1394.01	Sediment	3.5	0.07	6.8	5.5	0.02	4.8	4.7	13.8
BH-M01 (SS2) 1.00-1.50m	MAR1394.02	Sediment	3.7	0.10	6.9	5.4	0.01	4.7	3.5	11.4
BH-M01 (SS3) 2.50-3.00m	MAR1394.03	Sediment	27.8	0.07	8.3	8.4	0.09	3.2	7.6	15.5
BH-M03 (SS1) 0.00-0.50m	MAR1394.04	Sediment	7.9	0.14	10.6	8.1	<0.01	8.7	5.6	19.0
BH-M03 (SS2) 1.00-1.50m	MAR1394.05	Sediment	19.5	0.11	14.6	12.6	0.02	16.1	10.8	32.4
BH-M03 (SS3) 2.50-3.00m	MAR1394.06	Sediment	21.0	0.11	13.1	84.1	0.03	11.4	10.3	18.6
BH-M07 (SS1) 0.00-0.50m	MAR1394.07	Sediment	10.4	0.07	14.9	12.4	<0.01	14.1	12.4	32.5
BH-M07 (SS2) 1.00-1.50m	MAR1394.08	Sediment	4.1	0.06	8.1	5.7	<0.01	6.8	4.9	12.6
BH-M07 (SS3) 2.50-3.00m	MAR1394.09	Sediment	5.1	0.05	7.8	8.2	<0.01	7.6	5.2	21.0
BH-M09 (SS1) 0.00-0.50m	MAR1394.10	Sediment	13.3	0.07	11.2	6.9	<0.01	8.9	7.2	15.6
BH-M09 (SS2) 1.00-1.50m	MAR1394.11	Sediment	12.6	0.09	11.8	7.3	<0.01	9.1	8.1	16.5
BH-M09 (SS3) 2.50-3.00m	MAR1394.12	Sediment	19.6	0.13	26.1	14.7	0.05	22.9	15.5	46.3
BH-M11 (SS1) 0.00-0.50m	MAR1394.13	Sediment	19.0	0.15	27.4	15	0.02	24.2	17.7	47.3
BH-M11 (SS2) 1.00-1.50m	MAR1394.14	Sediment	17.9	0.10	17.6	8.0	0.01	11.4	9.8	21.9
BH-M11 (SS3) 2.50-3.00m	MAR1394.15	Sediment	27.8	0.16	14.9	21.6	0.03	20.6	15.4	46.8
BH-M13 (SS1) 0.00-0.50m	MAR1394.16	Sediment	9.2	0.10	11.1	9.5	0.01	10.8	7.0	21.8
BH-M13 (SS2) 1.00-1.50m	MAR1394.17	Sediment	5.2	0.09	10.1	5.9	<0.01	8.0	5.0	15.0
BH-M13 (SS3) 2.50-3.00m	MAR1394.18	Sediment	4.9	0.31	11.6	46.4	0.13	8.3	16.6	15.8
BH-M14 (SS1) 0.00-0.50m	MAR1394.19	Sediment	7.1	0.15	14.8	18.3	0.04	12.2	10.6	26.6
BH-M14 (SS2) 1.00-1.50m	MAR1394.20	Sediment	6.8	0.13	13.1	8.9	0.02	10.7	7.5	23.6
BH-M14 (SS3) 2.50-3.00m	MAR1394.21	Sediment	7.2	0.15	12.7	10.1	0.03	10.5	9.3	39.7
BH-M15 (SS1) 0.00-0.50m	MAR1394.22	Sediment	5.1	0.10	9.7	6.2	0.01	7.7	5.6	17.4
BH-M15 (SS2) 1.00-1.50m	MAR1394.23	Sediment	5.7	0.08	10.3	6.0	<0.01	8.8	5.5	17.0
BH-M15 (SS3) 2.50-3.00m	MAR1394.24	Sediment	9.3	0.11	16.6	10.0	<0.01	14.5	9.1	27.2
WP-M27 (SS1) 0.00-0.15m	MAR1394.25	Sediment	6.2	0.10	11.2	8.0	<0.01	9.9	6.4	24.3
BH-M16 (SS1) 0.00-0.50m	MAR1394.26	Sediment	10.0	0.17	16.0	8.6	0.01	13.6	8.9	29.0
BH-M16 (SS2) 1.00-1.50m	MAR1394.27	Sediment	11.3	0.14	19.7	11.7	0.01	16.3	11.5	33.6
BH-M17 (SS1) 0.00-0.50m	MAR1394.28	Sediment	7.6	0.07	6.4	7.1	0.02	5.1	23.6	9.1
Certified Reference Material SETOC 774 (% Recovery)			99	96	93	97	90	99	93	98
QC Blank			<0.5	<0.04	<0.5	<0.5	<0.01	<0.5	<0.5	<2

* See Report Notes

Certificate of Analysis

Issuing Laboratory SOCOTEC, Marine Department, Advanced Chemistry and Research, Etwall House, Bretby Business Park, Ashby Road, Burton-upon-Trent DE15 0YZ

Test Report ID	MAR1394
Issue Version	1
Customer Reference	Scapa Flow Marie Scotland Sediment Testing

		Units	µg/Kg (Dry Weight)	
		Method No	ASC/SOP/301	
		Limit of Detection	1	1
		Accreditation	UKAS	UKAS
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**Dibutyltin (DBT)**	**Tributyltin (TBT)**
BH-M01 (SS1) 0.00-0.50m	MAR1394.01	Sediment	<1	<1
BH-M01 (SS2) 1.00-1.50m	MAR1394.02	Sediment	<1	<1
BH-M01 (SS3) 2.50-3.00m	MAR1394.03	Sediment	<1	<1
BH-M03 (SS1) 0.00-0.50m	MAR1394.04	Sediment	<1	<1
BH-M03 (SS2) 1.00-1.50m	MAR1394.05	Sediment	<1	<1
BH-M03 (SS3) 2.50-3.00m	MAR1394.06	Sediment	<1	<1
BH-M07 (SS1) 0.00-0.50m	MAR1394.07	Sediment	<5	<5
BH-M07 (SS2) 1.00-1.50m	MAR1394.08	Sediment	<5	<5
BH-M07 (SS3) 2.50-3.00m	MAR1394.09	Sediment	<5	<5
	Certified Reference Material QSP076MS(% Recovery)		51	56
	QC Blank		<1	<1

* See Report Notes

Certificate of Analysis

Issuing Laboratory SOCOTEC, Marine Department, Advanced Chemistry and Research, Etwall House, Bretby Business Park, Ashby Road, Burton-upon-Trent DE15 0YZ

Test Report ID	MAR1394
Issue Version	1
Customer Reference	Scapa Flow Marie Scotland Sediment Testing

		Units	µg/Kg (Dry Weight)	
		Method No	ASC/SOP/301	
		Limit of Detection	1	1
		Accreditation	UKAS	UKAS
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**Dibutyltin (DBT)**	**Tributyltin (TBT)**
BH-M09 (SS1) 0.00-0.50m	MAR1394.10	Sediment	<5	<5
BH-M09 (SS2) 1.00-1.50m	MAR1394.11	Sediment	<5	<5
BH-M09 (SS3) 2.50-3.00m	MAR1394.12	Sediment	<5	<5
BH-M11 (SS1) 0.00-0.50m	MAR1394.13	Sediment	<5	<5
BH-M11 (SS2) 1.00-1.50m	MAR1394.14	Sediment	<5	<5
BH-M11 (SS3) 2.50-3.00m	MAR1394.15	Sediment	<5	<5
BH-M13 (SS1) 0.00-0.50m	MAR1394.16	Sediment	<5	<5
BH-M13 (SS2) 1.00-1.50m	MAR1394.17	Sediment	<5	<5
BH-M13 (SS3) 2.50-3.00m	MAR1394.18	Sediment	<5	<5
		Certified Reference Material QSP076MS (% Recovery)	85	60
		QC Blank	<1	<1

* See Report Notes

Certificate of Analysis

Issuing Laboratory SOCOTEC, Marine Department, Advanced Chemistry and Research, Etwall House, Bretby Business Park, Ashby Road, Burton-upon-Trent DE15 0YZ

Test Report ID	MAR1394
Issue Version	1
Customer Reference	Scapa Flow Marie Scotland Sediment Testing

		Units	µg/Kg (Dry Weight)	
		Method No	ASC/SOP/301	
		Limit of Detection	1	1
		Accreditation	UKAS	UKAS
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**Dibutyltin (DBT)**	**Tributyltin (TBT)**
BH-M14 (SS1) 0.00-0.50m	MAR1394.19	Sediment	<5	<5
BH-M14 (SS2) 1.00-1.50m	MAR1394.20	Sediment	<5	<5
BH-M14 (SS3) 2.50-3.00m	MAR1394.21	Sediment	<1	<1
BH-M15 (SS1) 0.00-0.50m	MAR1394.22	Sediment	<5	<5
BH-M15 (SS2) 1.00-1.50m	MAR1394.23	Sediment	<5	<5
BH-M15 (SS3) 2.50-3.00m	MAR1394.24	Sediment	<5	<5
WP-M27 (SS1) 0.00-0.15m	MAR1394.25	Sediment	<5	<5
BH-M16 (SS1) 0.00-0.50m	MAR1394.26	Sediment	<5	<5
BH-M16 (SS2) 1.00-1.50m	MAR1394.27	Sediment	<5	<5
BH-M17 (SS1) 0.00-0.50m	MAR1394.28	Sediment	<5	<5
Certified Reference Material QSP077MS (% Recovery)			116	169
QC Blank			<1	<1

* See Report Notes

Certificate of Analysis

Issuing Laboratory SOCOTEC, Marine Department, Advanced Chemistry and Research, Etwall House, Bretby Business Park, Ashby Road, Burton-upon-Trent DE15 0YZ

Test Report ID	MAR1394
Issue Version	1
Customer Reference	Scapa Flow Marie Scotland Sediment Testing

		Units	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)
		Method No	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304
		Limit of Detection	1	1	1	1	1	1
		Accreditation	UKAS	UKAS	UKAS	UKAS	UKAS	UKAS
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**ACENAPTH**	**ACENAPHY**	**ANTHRACN**	**BAA**	**BAP**	**BBF**
BH-M01 (SS1) 0.00-0.50m	MAR1394.01	Sediment	<1	<1	<1	<1	<1	1.46
BH-M01 (SS2) 1.00-1.50m	MAR1394.02	Sediment	<1	<1	<1	<1	<1	1.13
BH-M01 (SS3) 2.50-3.00m	MAR1394.03	Sediment	<1	<1	<1	<1	<1	<1
BH-M03 (SS1) 0.00-0.50m	MAR1394.04	Sediment	<1	<1	<1	<1	<1	1.57
BH-M03 (SS2) 1.00-1.50m	MAR1394.05	Sediment	<1	<1	<1	<1	<1	1.72
BH-M03 (SS3) 2.50-3.00m	MAR1394.06	Sediment	<1	<1	<1	<1	<1	<1
BH-M07 (SS1) 0.00-0.50m	MAR1394.07	Sediment	<1	<1	<1	<1	<1	1.15
BH-M07 (SS2) 1.00-1.50m	MAR1394.08	Sediment	<1	<1	<1	<1	<1	1.65
BH-M07 (SS3) 2.50-3.00m	MAR1394.09	Sediment	<1	<1	<1	<1	<1	<1
BH-M09 (SS1) 0.00-0.50m	MAR1394.10	Sediment	<1	<1	<1	<1	<1	1.21
BH-M09 (SS2) 1.00-1.50m	MAR1394.11	Sediment	<1	<1	<1	<1	<1	1.85
BH-M09 (SS3) 2.50-3.00m	MAR1394.12	Sediment	<1	<1	<1	<1	<1	2.19
BH-M11 (SS1) 0.00-0.50m	MAR1394.13	Sediment	<1	<1	<1	<1	<1	1.07
BH-M11 (SS2) 1.00-1.50m	MAR1394.14	Sediment	<1	<1	<1	1.27	<1	2.86
Certified Reference Material Quasimeme QPH105MS (% Recovery)			82	140	90	81	86	70
QC Blank			<1	<1	<1	<1	<1	<1

For full analyte name see method summaries

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Certificate of Analysis

Issuing Laboratory SOCOTEC, Marine Department, Advanced Chemistry and Research, Etwall House, Bretby Business Park, Ashby Road, Burton-upon-Trent DE15 0YZ

Test Report ID	MAR1394
Issue Version	1
Customer Reference	Scapa Flow Marie Scotland Sediment Testing

		Units	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)
		Method No	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304
		Limit of Detection	1	1	1	1	1	1
		Accreditation	UKAS	UKAS	UKAS	UKAS	UKAS	UKAS
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**BENZGHIP**	**BKF**	**CHRYSENE**	**DBENZAH**	**FLUORANT**	**FLUORENE**
BH-M01 (SS1) 0.00-0.50m	MAR1394.01	Sediment	<1	<1	3.02	<1	<1	<1
BH-M01 (SS2) 1.00-1.50m	MAR1394.02	Sediment	<1	<1	2.60	<1	<1	<1
BH-M01 (SS3) 2.50-3.00m	MAR1394.03	Sediment	<1	<1	<1	<1	<1	<1
BH-M03 (SS1) 0.00-0.50m	MAR1394.04	Sediment	1.47	<1	3.81	<1	1.52	<1
BH-M03 (SS2) 1.00-1.50m	MAR1394.05	Sediment	1.67	<1	3.00	<1	1.66	<1
BH-M03 (SS3) 2.50-3.00m	MAR1394.06	Sediment	1.38	<1	1.33	<1	<1	<1
BH-M07 (SS1) 0.00-0.50m	MAR1394.07	Sediment	1.27	<1	3.40	<1	1.11	<1
BH-M07 (SS2) 1.00-1.50m	MAR1394.08	Sediment	1.61	<1	2.37	<1	1.33	<1
BH-M07 (SS3) 2.50-3.00m	MAR1394.09	Sediment	<1	<1	1.06	<1	<1	<1
BH-M09 (SS1) 0.00-0.50m	MAR1394.10	Sediment	1.02	<1	2.62	<1	1.05	<1
BH-M09 (SS2) 1.00-1.50m	MAR1394.11	Sediment	1.16	<1	4.04	<1	1.42	<1
BH-M09 (SS3) 2.50-3.00m	MAR1394.12	Sediment	1.25	<1	4.79	<1	1.52	<1
BH-M11 (SS1) 0.00-0.50m	MAR1394.13	Sediment	1.16	<1	3.71	<1	1.06	<1
BH-M11 (SS2) 1.00-1.50m	MAR1394.14	Sediment	1.76	<1	7.46	<1	2.16	<1
Certified Reference Material Quasimeme QPH105MS (% Recovery)			100	85	80	87	82	87
QC Blank			<1	<1	<1	<1	<1	<1

For full analyte name see method summaries

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Certificate of Analysis

Issuing Laboratory SOCOTEC, Marine Department, Advanced Chemistry and Research, Etwall House, Bretby Business Park, Ashby Road, Burton-upon-Trent DE15 0YZ

Test Report ID	MAR1394
Issue Version	1
Customer Reference	Scapa Flow Marie Scotland Sediment Testing

		Units	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)
		Method No	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/306
		Limit of Detection	1	1	1	1	100
		Accreditation	UKAS	UKAS	UKAS	UKAS	N
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**INDPYR**	**NAPTH**	**PHENANT**	**PYRENE**	**THC**
BH-M01 (SS1) 0.00-0.50m	MAR1394.01	Sediment	<1	<1	<1	2.02	8680
BH-M01 (SS2) 1.00-1.50m	MAR1394.02	Sediment	<1	<1	<1	1.71	10600
BH-M01 (SS3) 2.50-3.00m	MAR1394.03	Sediment	<1	<1	<1	<1	2580
BH-M03 (SS1) 0.00-0.50m	MAR1394.04	Sediment	<1	<1	1.61	1.98	40900
BH-M03 (SS2) 1.00-1.50m	MAR1394.05	Sediment	1.08	<1	1.85	2.12	25300
BH-M03 (SS3) 2.50-3.00m	MAR1394.06	Sediment	<1	<1	<1	<1	34400
BH-M07 (SS1) 0.00-0.50m	MAR1394.07	Sediment	<1	<1	1.66	2.18	13200
BH-M07 (SS2) 1.00-1.50m	MAR1394.08	Sediment	1.04	<1	1.66	1.96	12000
BH-M07 (SS3) 2.50-3.00m	MAR1394.09	Sediment	<1	<1	<1	<1	9730
BH-M09 (SS1) 0.00-0.50m	MAR1394.10	Sediment	<1	<1	<1	1.80	9760
BH-M09 (SS2) 1.00-1.50m	MAR1394.11	Sediment	<1	<1	1.20	2.49	21200
BH-M09 (SS3) 2.50-3.00m	MAR1394.12	Sediment	<1	<1	1.57	2.90	36500
BH-M11 (SS1) 0.00-0.50m	MAR1394.13	Sediment	<1	<1	1.29	2.07	14000
BH-M11 (SS2) 1.00-1.50m	MAR1394.14	Sediment	1.10	<1	1.76	3.55	16100
Certified Reference Material Quasimeme QPH105MS (% Recovery)			88	100	85	88	98~
QC Blank			<1	<1	<1	<1	<100

For full analyte name see method summaries

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Certificate of Analysis

Issuing Laboratory SOCOTEC, Marine Department, Advanced Chemistry and Research, Etwall House, Bretby Business Park, Ashby Road, Burton-upon-Trent DE15 0YZ

Test Report ID	MAR1394
Issue Version	1
Customer Reference	Scapa Flow Marie Scotland Sediment Testing

		Units	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)
		Method No	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304
		Limit of Detection	1	1	1	1	1	1
		Accreditation	UKAS	UKAS	UKAS	UKAS	UKAS	UKAS
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**ACENAPTH**	**ACENAPHY**	**ANTHRACN**	**BAA**	**BAP**	**BBF**
BH-M11 (SS3) 2.50-3.00m	MAR1394.15	Sediment	<1	<1	<1	<1	<1	<1
BH-M13 (SS1) 0.00-0.50m	MAR1394.16	Sediment	<1	<1	<1	<1	<1	2.22
BH-M13 (SS2) 1.00-1.50m	MAR1394.17	Sediment	<1	<1	<1	<1	<1	1.53
BH-M13 (SS3) 2.50-3.00m	MAR1394.18	Sediment	<1	<1	<1	<1	<1	<1
BH-M14 (SS1) 0.00-0.50m	MAR1394.19	Sediment	<1	<1	<1	<1	<1	<1
BH-M14 (SS2) 1.00-1.50m	MAR1394.20	Sediment	<1	<1	<1	<1	1.03	2.34
BH-M14 (SS3) 2.50-3.00m	MAR1394.21	Sediment	<1	<1	<1	<1	<1	1.59
BH-M15 (SS1) 0.00-0.50m	MAR1394.22	Sediment	<1	<1	<1	<1	<1	<1
BH-M15 (SS2) 1.00-1.50m	MAR1394.23	Sediment	<1	<1	<1	<1	<1	<1
BH-M15 (SS3) 2.50-3.00m	MAR1394.24	Sediment	<1	<1	<1	<1	<1	<1
WP-M27 (SS1) 0.00-0.15m	MAR1394.25	Sediment	<1	<1	<1	1.16	1.36	2.35
BH-M16 (SS1) 0.00-0.50m	MAR1394.26	Sediment	<1	<1	1.61	5.26	4.78	4.94
BH-M16 (SS2) 1.00-1.50m	MAR1394.27	Sediment	<1	<1	<1	<1	<1	<1
BH-M17 (SS1) 0.00-0.50m	MAR1394.28	Sediment	<1	<1	<1	<1	<1	<1
Certified Reference Material Quasimeme QPH105MS (% Recovery)			81	113	92	76	78	66
QC Blank			<1	<1	<1	<1	<1	<1

For full analyte name see method summaries

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Certificate of Analysis

Issuing Laboratory SOCOTEC, Marine Department, Advanced Chemistry and Research, Etwall House, Bretby Business Park, Ashby Road, Burton-upon-Trent DE15 0YZ

Test Report ID	MAR1394
Issue Version	1
Customer Reference	Scapa Flow Marie Scotland Sediment Testing

		Units	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)
		Method No	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304
		Limit of Detection	1	1	1	1	1	1
		Accreditation	UKAS	UKAS	UKAS	UKAS	UKAS	UKAS
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**BENZGHIP**	**BKF**	**CHRYSENE**	**DBENZAH**	**FLUORANT**	**FLUORENE**
BH-M11 (SS3) 2.50-3.00m	MAR1394.15	Sediment	<1	<1	<1	<1	<1	<1
BH-M13 (SS1) 0.00-0.50m	MAR1394.16	Sediment	1.53	<1	2.97	<1	1.59	<1
BH-M13 (SS2) 1.00-1.50m	MAR1394.17	Sediment	1.27	<1	2.73	<1	1.26	<1
BH-M13 (SS3) 2.50-3.00m	MAR1394.18	Sediment	<1	<1	<1	<1	<1	<1
BH-M14 (SS1) 0.00-0.50m	MAR1394.19	Sediment	<1	<1	1.67	<1	<1	<1
BH-M14 (SS2) 1.00-1.50m	MAR1394.20	Sediment	2.32	1.43	2.07	<1	2.05	<1
BH-M14 (SS3) 2.50-3.00m	MAR1394.21	Sediment	1.26	<1	1.83	<1	1.45	<1
BH-M15 (SS1) 0.00-0.50m	MAR1394.22	Sediment	<1	<1	1.37	<1	<1	<1
BH-M15 (SS2) 1.00-1.50m	MAR1394.23	Sediment	<1	<1	1.60	<1	<1	<1
BH-M15 (SS3) 2.50-3.00m	MAR1394.24	Sediment	<1	<1	1.78	<1	<1	<1
WP-M27 (SS1) 0.00-0.15m	MAR1394.25	Sediment	2.47	1.33	2.57	<1	2.69	<1
BH-M16 (SS1) 0.00-0.50m	MAR1394.26	Sediment	3.94	2.89	6.88	<1	11.4	<1
BH-M16 (SS2) 1.00-1.50m	MAR1394.27	Sediment	<1	<1	1.71	<1	<1	<1
BH-M17 (SS1) 0.00-0.50m	MAR1394.28	Sediment	<1	<1	<1	<1	<1	<1
Certified Reference Material Quasimeme QPH105MS (% Recovery)			83	85	78	74	83	80
QC Blank			<1	<1	<1	<1	<1	<1

For full analyte name see method summaries

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Certificate of Analysis

Issuing Laboratory SOCOTEC, Marine Department, Advanced Chemistry and Research, Etwall House, Bretby Business Park, Ashby Road, Burton-upon-Trent DE15 0YZ

Test Report ID	MAR1394
Issue Version	1
Customer Reference	Scapa Flow Marie Scotland Sediment Testing

		Units	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)
		Method No	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/306
		Limit of Detection	1	1	1	1	100
		Accreditation	UKAS	UKAS	UKAS	UKAS	N
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**INDPYR**	**NAPTH**	**PHENANT**	**PYRENE**	**THC**
BH-M11 (SS3) 2.50-3.00m	MAR1394.15	Sediment	<1	<1	<1	<1	38900
BH-M13 (SS1) 0.00-0.50m	MAR1394.16	Sediment	1.19	<1	1.07	1.96	21500
BH-M13 (SS2) 1.00-1.50m	MAR1394.17	Sediment	<1	<1	<1	1.81	15500
BH-M13 (SS3) 2.50-3.00m	MAR1394.18	Sediment	<1	<1	<1	<1	3830
BH-M14 (SS1) 0.00-0.50m	MAR1394.19	Sediment	<1	<1	2.96	1.33	9280
BH-M14 (SS2) 1.00-1.50m	MAR1394.20	Sediment	1.93	<1	1.15	2.60	14200
BH-M14 (SS3) 2.50-3.00m	MAR1394.21	Sediment	<1	<1	<1	1.89	18600
BH-M15 (SS1) 0.00-0.50m	MAR1394.22	Sediment	<1	<1	<1	<1	8150
BH-M15 (SS2) 1.00-1.50m	MAR1394.23	Sediment	<1	<1	<1	1.03	8230
BH-M15 (SS3) 2.50-3.00m	MAR1394.24	Sediment	<1	<1	<1	1.31	11700
WP-M27 (SS1) 0.00-0.15m	MAR1394.25	Sediment	2.23	<1	1.55	3.18	17400
BH-M16 (SS1) 0.00-0.50m	MAR1394.26	Sediment	3.09	<1	4.15	10.6	11200
BH-M16 (SS2) 1.00-1.50m	MAR1394.27	Sediment	<1	<1	1.48	1.08	13500
BH-M17 (SS1) 0.00-0.50m	MAR1394.28	Sediment	<1	<1	<1	<1	7090
Certified Reference Material Quasimeme QPH105MS (% Recovery)			76	93	90	87	100~
QC Blank			<1	<1	<1	<1	<100

For full analyte name see method summaries

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Certificate of Analysis

Issuing Laboratory SOCOTEC, Marine Department, Advanced Chemistry and Research, Etwall House, Bretby Business Park, Ashby Road, Burton-upon-Trent DE15 0YZ

Test Report ID	MAR1394
Issue Version	1
Customer Reference	Scapa Flow Marie Scotland Sediment Testing

		Units	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)
		Method No	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302
		Limit of Detection	0.08	0.08	0.08	0.08	0.08	0.08	0.08
		Accreditation	UKAS	UKAS	UKAS	UKAS	UKAS	UKAS	UKAS
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**PCB28**	**PCB52**	**PCB101**	**PCB118**	**PCB138**	**PCB153**	**PCB180**
BH-M01 (SS1) 0.00-0.50m	MAR1394.01	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
BH-M01 (SS2) 1.00-1.50m	MAR1394.02	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
BH-M01 (SS3) 2.50-3.00m	MAR1394.03	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
BH-M03 (SS1) 0.00-0.50m	MAR1394.04	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
BH-M03 (SS2) 1.00-1.50m	MAR1394.05	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
BH-M03 (SS3) 2.50-3.00m	MAR1394.06	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
BH-M07 (SS1) 0.00-0.50m	MAR1394.07	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
BH-M07 (SS2) 1.00-1.50m	MAR1394.08	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
BH-M07 (SS3) 2.50-3.00m	MAR1394.09	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
BH-M09 (SS1) 0.00-0.50m	MAR1394.10	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
BH-M09 (SS2) 1.00-1.50m	MAR1394.11	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
BH-M09 (SS3) 2.50-3.00m	MAR1394.12	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
BH-M11 (SS1) 0.00-0.50m	MAR1394.13	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
BH-M11 (SS2) 1.00-1.50m	MAR1394.14	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
BH-M11 (SS3) 2.50-3.00m	MAR1394.15	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
BH-M13 (SS1) 0.00-0.50m	MAR1394.16	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
BH-M13 (SS2) 1.00-1.50m	MAR1394.17	Sediment	<0.08	<0.08	<0.08	<0.08	0.13	0.22	<0.08
BH-M13 (SS3) 2.50-3.00m	MAR1394.18	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
BH-M14 (SS1) 0.00-0.50m	MAR1394.19	Sediment	0.21	0.26	0.28	0.31	0.30	0.29	0.34
Certified Reference Material Quasimeme QOR145MS (% Recovery)			103~	87	96~	96~	98~	97~	96~
QC Blank			<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08

For full analyte name see method summaries

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Certificate of Analysis

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Test Report ID	MAR1394
Issue Version	1
Customer Reference	Scapa Flow Marie Scotland Sediment Testing

		Units	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)
		Method No	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302
		Limit of Detection	0.08	0.08	0.08	0.08	0.08	0.08	0.08
		Accreditation	UKAS	UKAS	UKAS	UKAS	UKAS	UKAS	UKAS
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**PCB28**	**PCB52**	**PCB101**	**PCB118**	**PCB138**	**PCB153**	**PCB180**
BH-M14 (SS2) 1.00-1.50m	MAR1394.20	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
BH-M14 (SS3) 2.50-3.00m	MAR1394.21	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
BH-M15 (SS1) 0.00-0.50m	MAR1394.22	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
BH-M15 (SS2) 1.00-1.50m	MAR1394.23	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
BH-M15 (SS3) 2.50-3.00m	MAR1394.24	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
WP-M27 (SS1) 0.00-0.15m	MAR1394.25	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
BH-M16 (SS1) 0.00-0.50m	MAR1394.26	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
BH-M16 (SS2) 1.00-1.50m	MAR1394.27	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
BH-M17 (SS1) 0.00-0.50m	MAR1394.28	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
Certified Reference Material Quasimeme QOR145MS (% Recovery)			97~	87	98~	88	97~	98~	98~
QC Blank			<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08

For full analyte name see method summaries

~ Indicates result is for an In-house Reference Material as no Certified Reference Materials are avaliable.

Certificate of Analysis

Issuing Laboratory SOCOTEC, Marine Department, Advanced Chemistry and Research, Etwall House, Bretby Business Park, Ashby Road, Burton-upon-Trent DE15 0YZ

Test Report ID MAR1394
Issue Version 1
Customer Reference Scapa Flow Marie Scotland Sediment Testing

REPORT NOTES

Method Code	Sample ID	The following information should be taken into consideration when using the data contained within this report
WSLM59*	MAR1394.01-28	Analysis was conducted by an internal SOCOTEC laboratory. UKAS accredited analysis by this laboratory is under UKAS number 1252.
ICPMSS*	MAR1394.01-28	Analysis was conducted by an internal SOCOTEC laboratory. UKAS accredited analysis by this laboratory is under UKAS number 1252.
SOCOTEC Doncaster*	MAR1394.01-28	Analysis was conducted by an internal SOCOTEC laboratory.
SOCOTEC Doncaster*	MAR1394.06, 08, 09, 12, 15, 16, 19, 20, 27	Unsuitable to test due to Gravel and Shell content.
SUB_01*	MAR1394.01-28	Analysis was conducted by an approved subcontracted laboratory.
SUB_02*	MAR1394.01-28	Analysis was conducted by an approved subcontracted laboratory.
ASC/SOP/301	MAR1394.07-20, 22-28	The matrix of this sample has been found to interfere with the result for this test. The sample has therefore been diluted, but in doing so, the detection limit for this test has been elevated.
ASC/SOP/303/304	MAR1394.01-28	Chrysene is known to coelute with Triphenylene and these peaks can not be resolved. It is believed Triphenylene is present in these samples therefore it is suggested that the Chrysene results should be taken as a Chrysene (inc. Triphenylene).This should be taken into consideration when utilising the data.

DEVIATING SAMPLE STATEMENT

Deviation Code	Deviation Definition	Sample ID	Deviation Details. The following information should be taken into consideration when using the data contained within this report
D1	Holding Time Exceeded	N/A	N/A
D2	Sample Contaminated through Damaged Packaging	N/A	N/A
D3	Sample Contaminated through Sampling	N/A	N/A
D4	Inappropriate Container/Packaging	N/A	N/A
D5	Damaged in Transit	N/A	N/A
D6	Insufficient Quantity of Sample	N/A	N/A
D7	Inappropriate Headspace	N/A	N/A
D8	Retained at Incorrect Temperature	N/A	N/A
D9	Lack of Date & Time of Sampling	N/A	N/A
D10	Insufficient Sample Details	N/A	N/A
D11	Sample integrity compromised or not suitable for analysis	N/A	N/A

Certificate of Analysis

Issuing Laboratory SOCOTEC, Marine Department, Advanced Chemistry and Research, Etwall House, Bretby Business Park, Ashby Road, Burton-upon-Trent DE15 0YZ

Test Report ID	MAR1394
Issue Version	1
Customer Reference	Scapa Flow Marie Scotland Sediment Testing

Method	Sample and Fraction Size	Method Summary
Total Solids	Wet Sediment	Calculation (100%-Moisture Content).Moisture content determined by drying a portion of the sample at 120°C to constant weight.
Particle Size Analysis	Wet Sediment	Wet and dry sieving followed by laser diffraction analysis.
Total Organic Carbon (TOC)	Air dried and ground	Carbonate removal and sulphurous acid/combustion at 1600°C/NDIR.
Metals	Air dried and seived to <63µm	Aqua-regia extraction followed by ICP analysis.
Organotins	Wet Sediment	Solvent extraction and derivatisation followed by GC-MS analysis.
Polyaromatic Hydrocarbons (PAH)	Wet Sediment	Solvent extraction and clean up followed by GC-MS analysis.
Total Hydrocarbon Content (THC)	Wet Sediment	Solvent extraction and clean up followed by GC-FID analysis.
Polychlorinated Biphenyls (PCBs)	Air dried and seived to <2mm	Solvent extraction and clean up followed by GC-MS-MS analysis.
Organochlorine Pesticides (OCPs)	Air dried and seived to <2mm	Solvent extraction and clean up followed by GC-MS-MS analysis.

Analyte Definitions					
Analyte Abbreviation	Full Analyte name	Analyte Abbreviation	Full Analyte name	Analyte Abbreviation	Full Analyte name
ACENAPTH	Acenaphthene	C2N	C2-naphthalenes	THC	Total Hydrocarbon Content
ACENAPHY	Acenaphthylene	C3N	C3-naphthalenes	AHCH	alpha-Hexachlorcyclohexane
ANTHRACN	Anthracene	CHRYSENE	Chrysene	BHCH	beta-Hexachlorcyclohexane
BAA	Benzo[a]anthracene	DBENZAH	Dibenzo[ah]anthracene	GHCH	gamma-Hexachlorcyclohexane
BAP	Benzo[a]pyrene	FLUORANT	Fluoranthene	DIELDRIN	Dieldrin
BBF	Benzo[b]fluoranthene	FLUORENE	Fluorene	HCB	Hexachlorobenzene
BEP	Benzo[e]pyrene	INDPYR	Indeno[1,2,3-cd]pyrene	DDD	p,p'-Dichlorodiphenyldichloroethane
BENZGHIP	Benzo[ghi]perylene	NAPTH	Naphthalene	DDE	p,p'-Dichlorodiphenyldichloroethylene
BKF	Benzo[k]fluoranthene	PERYLENE	Perylene	DDT	p,p'-Dichlorodiphenyltrichloroethane
C1N	C1-naphthalenes	PHENANT	Phenanthrene		
C1PHEN	C1-phenanthrene	PYRENE	Pyrene		

Certificate of Analysis

Issuing Laboratory SOCOTEC, Marine Department, Advanced Chemistry and Research, Etwall House, Bretby Business Park, Ashby Road, Burton-upon-Trent DE15 0YZ

Test Report ID	**MAR01357**
Issue Version	1
Customer	Causeway Geotech Ltd, 8 Drumahiskey Road, Ballymoney, Co. Antrim, BT53 7QL
Customer Reference	Scapa Flow Marine Scotland Sediment Testing
Date Sampled	04-05-Mar-2022
Date Received	16-Mar-22
Date Reported	12-Apr-22
Condition of samples	Cold Satisfactory

Authorised by: Marya Hubbard

Position: Laboratory Manager

Any additional opinions or interpretations found in this report, are outside the scope of UKAS accreditation.

Certificate of Analysis

Issuing Laboratory SOCOTEC, Marine Department, Advanced Chemistry and Research, Etwall House, Bretby Business Park, Ashby Road, Burton-upon-Trent DE15 0YZ

Test Report ID MAR01357
Issue Version 1
Customer Reference Scapa Flow Marine Scotland Sediment Testing

		Units	%	%	%	%	%	Mg/m3	N/A
		Method No	ASC/SOP/303	ASC/SOP/303	SUB_01*	SUB_01*	SUB_01*	SOCOTEC Doncaster*	SUB_02*
		Limit of Detection	0.2	0.2	N/A	N/A	N/A	N/A	N/A
		Accreditation	UKAS	UKAS	N	N	N	N	UKAS
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**Total Moisture @ 120°C**	**Total Solids**	**Gravel (>2mm)**	**Sand (63-2000 µm)**	**Silt (<63 µm)**	**Particle Density**	**Asbestos**
BH-M04 (SS1) 0.00-0.50m	MAR01357.001	Sediment	15.6	84.4	14.1	69.1	16.8	2.66	NAIIS
BH-M04 (SS2) 1.00-1.50m	MAR01357.002	Sediment	13.3	86.7	14.2	66.6	19.2	2.72	NAIIS
BH-M04 (SS3) 2.50-3.00m	MAR01357.003	Sediment	13.3	86.7	20.0	65.8	14.2	2.67	NAIIS
BH-M05 (SS1) 0.00-0.50m	MAR01357.004	Sediment	12.7	87.3	15.1	59.5	25.4	2.73	NAIIS
BH-M05 (SS2) 1.00-1.50m	MAR01357.005	Sediment	12.9	87.1	14.2	69.6	16.2	2.72	NAIIS
BH-M05 (SS3) 2.50-3.00m	MAR01357.006	Sediment	21.0	79.0	10.9	72.6	16.5	2.54	NAIIS
Reference Material (% Recovery)			N/A	N/A	N/A	N/A	N/A	N/A	N/A
QC Blank			N/A	N/A	N/A	N/A	N/A	N/A	N/A

* See Report Notes
NAIIS - No Asbestos Identified In Sample

Certificate of Analysis

Issuing Laboratory SOCOTEC, Marine Department, Advanced Chemistry and Research, Etwall House, Bretby Business Park, Ashby Road, Burton-upon-Trent DE15 0YZ

Test Report ID	MAR01357
Issue Version	1
Customer Reference	Scapa Flow Marine Scotland Sediment Testing

		Units	% M/M
		Method No	WSLM59*
		Limit of Detection	0.02
		Accreditation	UKAS
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**TOC**
BH-M04 (SS1) 0.00-0.50m	MAR01357.001	Sediment	0.26
BH-M04 (SS2) 1.00-1.50m	MAR01357.002	Sediment	0.21
BH-M04 (SS3) 2.50-3.00m	MAR01357.003	Sediment	0.23
BH-M05 (SS1) 0.00-0.50m	MAR01357.004	Sediment	0.22
BH-M05 (SS2) 1.00-1.50m	MAR01357.005	Sediment	0.25
BH-M05 (SS3) 2.50-3.00m	MAR01357.006	Sediment	0.27
		Reference Material (% Recovery)	105
		QC Blank	<0.02

* See Report Notes

NAIIS - No Asbestos Identified In Sample

Certificate of Analysis

Issuing Laboratory SOCOTEC, Marine Department, Advanced Chemistry and Research, Etwall House, Bretby Business Park, Ashby Road, Burton-upon-Trent DE15 0YZ

Test Report ID	MAR01357
Issue Version	1
Customer Reference	Scapa Flow Marine Scotland Sediment Testing

		Units	mg/Kg (Dry Weight)							
		Method No	ICPMSS*							
		Limit of Detection	0.5	0.04	0.5	0.5	0.01	0.5	0.5	2
		Accreditation	UKAS	UKAS	UKAS	UKAS	UKAS	UKAS	UKAS	UKAS
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**Arsenic**	**Cadmium**	**Chromium**	**Copper**	**Mercury**	**Nickel**	**Lead**	**Zinc**
BH-M04 (SS1) 0.00-0.50m	MAR01357.001	Sediment	24.6	0.29	51.4	40.0	0.12	31.8	50.7	161
BH-M04 (SS2) 1.00-1.50m	MAR01357.002	Sediment	23.8	0.19	34.5	18.4	0.04	27.4	25.8	80.8
BH-M04 (SS3) 2.50-3.00m	MAR01357.003	Sediment	19.9	0.32	36.5	21.4	0.03	29.0	23.5	82.1
BH-M05 (SS1) 0.00-0.50m	MAR01357.004	Sediment	16.6	0.17	27.8	11.9	<0.01	18.6	12.8	46.6
BH-M05 (SS2) 1.00-1.50m	MAR01357.005	Sediment	14.5	0.11	24.6	9.9	<0.01	16.3	10.2	45.8
BH-M05 (SS3) 2.50-3.00m	MAR01357.006	Sediment	11.7	0.15	23.3	10.3	<0.01	15.7	8.9	36.7
Certified Reference Material SETOC 774 (% Recovery)			107	105	109	108	101	107	103	103
QC Blank			<0.5	<0.04	<0.5	<0.5	<0.01	<0.5	<0.5	<2

* See Report Notes

Certificate of Analysis

Issuing Laboratory SOCOTEC, Marine Department, Advanced Chemistry and Research, Etwall House, Bretby Business Park, Ashby Road, Burton-upon-Trent DE15 0YZ

Test Report ID	MAR01357
Issue Version	1
Customer Reference	Scapa Flow Marine Scotland Sediment Testing

		Units	µg/Kg (Dry Weight)	
		Method No	ASC/SOP/301	
		Limit of Detection	1	1
		Accreditation	UKAS	UKAS
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**Dibutyltin (DBT)**	**Tributyltin (TBT)**
BH-M04 (SS1) 0.00-0.50m	MAR01357.001	Sediment	<5	<5
BH-M04 (SS2) 1.00-1.50m	MAR01357.002	Sediment	<5	<5
BH-M04 (SS3) 2.50-3.00m	MAR01357.003	Sediment	<5	<5
BH-M05 (SS1) 0.00-0.50m	MAR01357.004	Sediment	<5	<5
BH-M05 (SS2) 1.00-1.50m	MAR01357.005	Sediment	<5	<5
BH-M05 (SS3) 2.50-3.00m	MAR01357.006	Sediment	<5	<5
Certified Reference Material QSP076MS (% Recovery)			93	104
QC Blank			<1	<1

* See Report Notes

Certificate of Analysis

Issuing Laboratory SOCOTEC, Marine Department, Advanced Chemistry and Research, Etwall House, Bretby Business Park, Ashby Road, Burton-upon-Trent DE15 0YZ

Test Report ID	MAR01357
Issue Version	1
Customer Reference	Scapa Flow Marine Scotland Sediment Testing

		Units	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)
		Method No	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304
		Limit of Detection	1	1	1	1	1	1
		Accreditation	UKAS	UKAS	UKAS	UKAS	UKAS	UKAS
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**ACENAPTH**	**ACENAPHY**	**ANTHRACN**	**BAA**	**BAP**	**BBF**
BH-M04 (SS1) 0.00-0.50m	MAR01357.001	Sediment	<1	<1	<1	<1	<1	1.83
BH-M04 (SS2) 1.00-1.50m	MAR01357.002	Sediment	<1	<1	<1	<1	<1	1.45
BH-M04 (SS3) 2.50-3.00m	MAR01357.003	Sediment	<1	<1	<1	<1	<1	1.65
BH-M05 (SS1) 0.00-0.50m	MAR01357.004	Sediment	<1	<1	<1	<1	<1	1.70
BH-M05 (SS2) 1.00-1.50m	MAR01357.005	Sediment	<1	<1	<1	<1	<1	1.84
BH-M05 (SS3) 2.50-3.00m	MAR01357.006	Sediment	1.34	1.16	1.92	4.94	5.71	6.87
Certified Reference Material Quasimeme QPH105MS (% Recovery)			88	127	97	89	91	73
QC Blank			<1	<1	<1	<1	<1	<1

For full analyte name see method summaries

~ Indicates result is for an In-house Reference Material as no Certified Reference Materials are avaliable.

As the method uses surrogate standards to correct for losses, the RM results are reported as percentage trueness, not recovery.

Certificate of Analysis

Issuing Laboratory SOCOTEC, Marine Department, Advanced Chemistry and Research, Etwall House, Bretby Business Park, Ashby Road, Burton-upon-Trent DE15 0YZ

Test Report ID	MAR01357
Issue Version	1
Customer Reference	Scapa Flow Marine Scotland Sediment Testing

		Units	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)
		Method No	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304
		Limit of Detection	1	1	1	1	1	1
		Accreditation	UKAS	UKAS	UKAS	UKAS	UKAS	UKAS
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**BENZGHIP**	**BKF**	**CHRYSENE**	**DBENZAH**	**FLUORANT**	**FLUORENE**
BH-M04 (SS1) 0.00-0.50m	MAR01357.001	Sediment	1.75	<1	4.43	<1	1.74	<1
BH-M04 (SS2) 1.00-1.50m	MAR01357.002	Sediment	1.45	<1	3.83	<1	1.79	<1
BH-M04 (SS3) 2.50-3.00m	MAR01357.003	Sediment	1.44	<1	3.09	<1	1.23	<1
BH-M05 (SS1) 0.00-0.50m	MAR01357.004	Sediment	1.07	<1	3.22	<1	1.08	<1
BH-M05 (SS2) 1.00-1.50m	MAR01357.005	Sediment	1.30	<1	2.09	<1	1.54	<1
BH-M05 (SS3) 2.50-3.00m	MAR01357.006	Sediment	5.15	3.05	7.67	1.28	9.94	1.77
Certified Reference Material Quasimeme QPH105MS (% Recovery)			96	99	90	96	98	86
QC Blank			<1	<1	<1	<1	<1	<1

For full analyte name see method summaries

~ Indicates result is for an In-house Reference Material as no Certified Reference Materials are avaliable.

As the method uses surrogate standards to correct for losses, the RM results are reported as percentage trueness, not recovery.

Certificate of Analysis

Issuing Laboratory SOCOTEC, Marine Department, Advanced Chemistry and Research, Etwall House, Bretby Business Park, Ashby Road, Burton-upon-Trent DE15 0YZ

Test Report ID MAR01357
Issue Version 1
Customer Reference Scapa Flow Marine Scotland Sediment Testing

		Units	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)
		Method No	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/306
		Limit of Detection	1	1	1	1	100
		Accreditation	UKAS	UKAS	UKAS	N	N
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**INDPYR**	**NAPTH**	**PHENANT**	**PYRENE**	**THC**
BH-M04 (SS1) 0.00-0.50m	MAR01357.001	Sediment	<1	1.38	3.60	2.88	59900
BH-M04 (SS2) 1.00-1.50m	MAR01357.002	Sediment	<1	1.38	4.48	2.64	46800
BH-M04 (SS3) 2.50-3.00m	MAR01357.003	Sediment	<1	1.43	2.81	3.06	123000
BH-M05 (SS1) 0.00-0.50m	MAR01357.004	Sediment	<1	1.28	1.10	3.05	42200
BH-M05 (SS2) 1.00-1.50m	MAR01357.005	Sediment	<1	1.22	1.14	1.78	20200
BH-M05 (SS3) 2.50-3.00m	MAR01357.006	Sediment	4.20	4.02	6.67	9.32	23600
Certified Reference Material Quasimeme QPH105MS (% Recovery)			90	103	94	101	92~
QC Blank			<1	<1	<1	<1	<1

For full analyte name see method summaries
~ Indicates result is for an In-house Reference Material as no Certified Reference Materials are avaliable.
As the method uses surrogate standards to correct for losses, the RM results are reported as percentage trueness, not recovery.

Certificate of Analysis

Issuing Laboratory SOCOTEC, Marine Department, Advanced Chemistry and Research, Etwall House, Bretby Business Park, Ashby Road, Burton-upon-Trent DE15 0YZ

Test Report ID	MAR01357
Issue Version	1
Customer Reference	Scapa Flow Marine Scotland Sediment Testing

		Units	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)
		Method No	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302
		Limit of Detection	0.08	0.08	0.08	0.08	0.08	0.08	0.08
		Accreditation	UKAS	UKAS	UKAS	UKAS	UKAS	UKAS	UKAS
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**PCB28**	**PCB52**	**PCB101**	**PCB118**	**PCB138**	**PCB153**	**PCB180**
BH-M04 (SS1) 0.00-0.50m	MAR01357.001	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
BH-M04 (SS2) 1.00-1.50m	MAR01357.002	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
BH-M04 (SS3) 2.50-3.00m	MAR01357.003	Sediment	<0.08	0.12	<0.08	<0.08	<0.08	<0.08	<0.08
BH-M05 (SS1) 0.00-0.50m	MAR01357.004	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
BH-M05 (SS2) 1.00-1.50m	MAR01357.005	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
BH-M05 (SS3) 2.50-3.00m	MAR01357.006	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
Certified Reference Material Quasimeme QOR143MS (% Recovery)			79	103	96	108	98	101	91
QC Blank			<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08

For full analyte name see method summaries

~ Indicates result is for an In-house Reference Material as no Certified Reference Materials are avaliable.

Certificate of Analysis

Issuing Laboratory SOCOTEC, Marine Department, Advanced Chemistry and Research, Etwall House, Bretby Business Park, Ashby Road, Burton-upon-Trent DE15 0YZ

Test Report ID MAR01357
Issue Version 1
Customer Reference Scapa Flow Marine Scotland Sediment Testing

REPORT NOTES

Method Code	Sample ID	The following information should be taken into consideration when using the data contained within this report
WSLM59*	MAR01357.001-006	Analysis was conducted by an internal SOCOTEC laboratory. UKAS accredited analysis by this laboratory is under UKAS number 1252.
ICPMSS*	MAR01357.001-006	Analysis was conducted by an internal SOCOTEC laboratory. UKAS accredited analysis by this laboratory is under UKAS number 1252.
SOCOTEC Doncaster*	MAR01357.001-006	Analysis was conducted by an internal SOCOTEC laboratory.
SUB_01*	MAR01357.001-006	Analysis was conducted by an approved subcontracted laboratory.
SUB_02*	MAR01357.001-006	Analysis was conducted by an approved subcontracted laboratory.
ASC/SOP/301	MAR01357.001-006	The matrix of this sample has been found to interfere with the result for this test. The sample has therefore been diluted, but in doing so, the detection limit for this test has been elevated.
ASC/SOP/303/304	MAR01357.001-006	Chrysene is known to coelute with Triphenylene and these peaks can not be resolved. It is believed Triphenylene is present in these samples therefore it is suggested that the Chrysene results should be taken as a Chrysene (inc. Triphenylene).This should be taken into consideration when utilising the data.

DEVIATING SAMPLE STATEMENT

Deviation Code	Deviation Definition	Sample ID	Deviation Details. The following information should be taken into consideration when using the data contained within this report
D1	Holding Time Exceeded	N/A	N/A
D2	Handling Time Exceeded	N/A	N/A
D3	Sample Contaminated through Damaged Packaging	N/A	N/A
D4	Sample Contaminated through Sampling	N/A	N/A
D5	Inappropriate Container/Packaging	N/A	N/A
D6	Damaged in Transit	N/A	N/A
D7	Insufficient Quantity of Sample	N/A	N/A
D8	Inappropriate Headspace	N/A	N/A
D9	Retained at Incorrect Temperature	N/A	N/A
D10	Lack of Date & Time of Sampling	N/A	N/A
D11	Insufficient Sample Details	N/A	N/A
D12	Sample integrity compromised or not suitable for analysis	N/A	N/A

Certificate of Analysis

Issuing Laboratory SOCOTEC, Marine Department, Advanced Chemistry and Research, Etwall House, Bretby Business Park, Ashby Road, Burton-upon-Trent DE15 0YZ

Test Report ID	MAR01357
Issue Version	1
Customer Reference	Scapa Flow Marine Scotland Sediment Testing

Method	Sample and Fraction Size	Method Summary
Total Solids	Wet Sediment	Calculation (100%-Moisture Content).Moisture content determined by drying a portion of the sample at 120°C to constant weight.
Particle Size Analysis	Wet Sediment	Wet and dry sieving followed by laser diffraction analysis.
Total Organic Carbon (TOC)	Air dried and ground	Carbonate removal and sulphurous acid/combustion at 1600°C/NDIR.
Metals	Air dried and seived to <63µm	Aqua-regia extraction followed by ICP analysis.
Organotins	Wet Sediment	Solvent extraction and derivatisation followed by GC-MS analysis.
Polyaromatic Hydrocarbons (PAH)	Wet Sediment	Solvent extraction and clean up followed by GC-MS analysis.
Total Hydrocarbon Content (THC)	Wet Sediment	Solvent extraction and clean up followed by GC-FID analysis.
Polychlorinated Biphenyls (PCBs)	Air dried and seived to <2mm	Solvent extraction and clean up followed by GC-MS-MS analysis.

Analyte Definitions

Analyte Abbreviation	Full Analyte name	Analyte Abbreviation	Full Analyte name	Analyte Abbreviation	Full Analyte name
ACENAPTH	Acenaphthene	C2N	C2-naphthalenes	THC	Total Hydrocarbon Content
ACENAPHY	Acenaphthylene	C3N	C3-naphthalenes	AHCH	alpha-Hexachlorcyclohexane
ANTHRACN	Anthracene	CHRYSENE	Chrysene	BHCH	beta-Hexachlorcyclohexane
BAA	Benzo[a]anthracene	DBENZAH	Dibenzo[ah]anthracene	GHCH	gamma-Hexachlorcyclohexane
BAP	Benzo[a]pyrene	FLUORANT	Fluoranthene	DIELDRIN	Dieldrin
BBF	Benzo[b]fluoranthene	FLUORENE	Fluorene	HCB	Hexachlorobenzene
BEP	Benzo[e]pyrene	INDPYR	Indeno[1,2,3-cd]pyrene	DDD	p,p'-Dichlorodiphenyldichloroethane
BENZGHIP	Benzo[ghi]perylene	NAPTH	Naphthalene	DDE	p,p'-Dichlorodiphenyldichloroethylene
BKF	Benzo[k]fluoranthene	PERYLENE	Perylene	DDT	p,p'-Dichlorodiphenyltrichloroethane
C1N	C1-naphthalenes	PHENANT	Phenanthrene		
C1PHEN	C1-phenanthrene	PYRENE	Pyrene		