

Nigg East Quay -Best Practicable Environmental Option Report



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Nigg East Quay -Best Practicable Environmental Option Report

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A Fugro Report

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1 INTRODUCTION

1.1 Scope of Report

Global Energy Nigg Ltd are required to undertake a Best Practicable Environmental Option (BPEO) assessment for the dredging and disposal of material from the proposed development of Nigg East Quay ('the proposed development').

Site investigation works were undertaken by Fugro Ltd. and the results are provided in Fugro Report G191005U, May 2019 which is provided in Appendix A of this report. Borehole locations are detailed within Figure B.1 within Appendix B of the Fugro report. The relevant laboratory analytical data from the marine boreholes is included in Appendix F of the Fugro report, and this data has been reviewed in line with the current Action Levels for disposing of sediment at sea.

The site investigation comprised 8 boreholes progressed to depths between 2.5 to 13m below seabed level with 4 of those boreholes progressed further into rock. The sediments overlying bedrock can be generally described as mixtures of sand and gravel, with sandy clay horizons also noted. Borehole logs are provided within Appendix C of the Fugro report.

The dredge for the development will remove $\leq 199,500m^3$ of material from the seabed All of this material is proposed to be disposed at sea. Previous plans had allowed for the reuse of up to $30,000m^3$ within the development, but this is no longer required due to further detailed review and design of the works.

The following report considers the available options for reuse and disposal of material in the context of the project.

1.2 Chemical Assessment

Review of the data provided by Fugro is summarised as follows:

- 24 samples collected from 8 boreholes between surface and 13.0m below surface;
- Samples were dominated in general by the presence of the sand sized fractions;
- No samples recorded metal concentrations greater than their respective Revised Action Level1 (RAL 1)
- No samples recorded tributyltin (TBT) levels above RAL1;
- 1 of 24 samples recorded an exceedance of RAL 1 for Dibenz(ah)anthracene in sample BH2 2.50-3.00m, no other exceedances were recorded;
- No samples recorded polychlorinated biphenyl (PCB) levels above RAL1;
- No samples recorded Total Hydrocarbon levels above RAL1.

In conclusion all 24 samples recorded contaminants of concern below RAL 1 with the exception of a single sample which recorded Dibenz(ah)anthracene in exceedance of RAL 1. There were no exceedances of RAL 2 where they are available.

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.

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?
Coast / Harbour	Do nothing Scenario/ Leave in situ	Not an option due to the intentions to develop the quay facility.	No
	Infilling of an existing dry dock/harbour facility	There are no suitable dry dock or harbour facilities requiring infill in the vicinity of the project and on this basis this option is not considered viable.	No
	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. There are no known beach nourishment projects in proximity to the proposed project.	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 is likely to require treatment first in a dewatering facility. There is 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.	
	Recycling/Re-use	Further review of the design has indicated that no dredged material is required for the construction project.	No
	Land Incineration	The dredged material consists of non-combustible material (silts) with a low combustible component and very high water content.	No

Location	Options	Screening Assessment	Carry forward?
	Application to Agricultural Land	The dredged material would need to be treated to reduce salt concentrations to acceptable levels. There would be a requirement for a detailed chemical analysis and assessment as well as a Waste Management License Exemption. Special precautions would be required 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.	No
Sea	Aquatic disposal direct to seabed.	All of the dredged material is proposed for sea disposal at CR019 – Sutors. Further consideration of this route is provided in Section 3.	Yes

2.2 Summary of Identified BPEO Options

Three options were identified for further assessment as follows:

- Landfill; and
- Sea Disposal.

2.2.1 Landfill Disposal

Dredged material is considered to be controlled waste for the purpose of transport, storage and disposal as per Section 34 (7) of the Environmental Protection Act 1990. The Landfill (Scotland) Regulations 2003 require the classification and characterisation (i.e. inert, non-hazardous or hazardous) of the dredged material to be determined prior to landfill acceptance.

Disposal to landfill would require several stages in material handling operations:

- Dredging and transport to shore;
- Transfer to shore to a dewatering facility;
- Dewatering;
- Transfer of dewatered material to storage area for stockpiling;
- Loading of lorries and transport to landfill site; and
- Disposal at Landfill site.

Transport to the shore would require the identification of an available jetty facility suitable for receiving material directly to the dewatering facility. Two options are available for off-loading; namely grabbing the spoil from the barge or hopper or pumping directly ashore.

The dewatering facility would require being purpose built and capable of receiving large quantities of bulk material. Currently no facility exists in proximity to the site in the Cromarty Firth. Settlement tanks, with the aid of sluices and rotational management, would allow solids to settle out and the water element drain off and return to the Cromarty Firth. Temporary mobilisation of bespoke mechanical dewatering equipment could also be utilised but at greater cost. The dewatered dredged sediment would then be removed from the facility and stockpiled for transfer via lorry to a suitably licensed landfill.

We understand that the type of vehicle most suitable for transporting the dewatered dredged material is either a rigid bodied tipper or an articulated tanker both with a 16 tonne load capacity. It is estimated that the dredge volume which cannot be utilised within the development equates to c. 390,000 tonnes of material and would require approximately 24,375 return trips would typically be required to transport the dewatered dredged material to landfill.

The number of landfills within a viable distance of the site at Nigg is considered to be low. In addition, the available capacity of each site is limited by the amount of material it can receive per annum. Due to the proposed quantity of material to be dredged it is therefore unlikely that any landfill within viable distance of the site will have the capacity to receive the dredged material.

2.2.2 Sea Disposal

This option handles material in a single stage namely transport to the disposal site. The existing licensed disposal site is approximately 0.9 nautical miles north-west of CR019 – Sutors disposal site. It is located in naturally deep water with ease of access, has capacity and is anticipated to be active for the foreseeable future.

3 FURTHER CONSIDERATION OF REMAINING DISPOSAL OPTIONS

3.1 Detailed BPEO Assessment

Each of the identified options was assessed against the criteria detailed in Table 3.1 below.

Primary Criteria	Description and Attributes	
Strategic	Operational aspects, including handling, transport etc.	
	Availability of suitable sites/facilities	
	General Public/local acceptability	
	Legislative Implications	
	Summary of the outcome of consultation with third parties	
Environmental	Safety Implications	
	Public Health Implications	
	Pollution/ Contamination Implications	
	General Ecological Implications	
	Interference with other legitimate activities e.g. fishing	
	Amenity/Aesthetic Implications	
Costs	Operating costs e.g. labour, site operations, environmental monitoring	
	Capital e.g. Transport, equipment hire	

Table3.1: BPEO Detailed Assessment Criteria

3.1.1 BPEO Strategic Assessment

Table 3.2 below provides details of the strategic assessment for each option taken forward for the detailed BPEO assessment:

Table 3.2: BPEO Strategic Assessment

Criteria	Landfill	Sea Disposal
Operational Aspects (inc. handling and transport)	Would involve double handling of material through dewatering and transportation to landfill. A facility would need to be built for dewatering purposes. Would also increase the number of HGVs on the road network.	There would be no double handling of the dredged material. Transportation to the disposal site would be by dredger or barge(s) depending on methodology.
Availability of suitable sites/facilities	The geotechnical composition of the dewatered dredged material is considered to be suitable for disposal via this route. However, there is typically a limit to the amount of waste that can be accepted both on a daily and annual basis at a landfill. The landfill capacity will therefore not be able to accommodate the quantity of material generated by the East Quay dredging activities and another disposal option will be required for the surplus material.	The marine disposal site has been designed to accommodate the quantities typically generated by dredging operations. The geotechnical composition of the proposed dredged material is suitable for disposal via this route.
General Public /Local acceptability	Increase traffic on haul routes therefore potential for increase in public complaints.	Traditionally accepted disposal route for dredged material and limited public impact.
Legislative Implications	Contravenes the principles of minimising waste and long term commitments by the government to reduce land filling.	This is an accepted disposal route as long as a licence is obtained.

3.1.2 BPEO Environmental Assessment

Table 3.3 details the environmental assessment for each option taken forward for detailed BPEO assessment.

Criteria	Landfill	Sea Disposal
Safety Implications	Double handling of material increases the potential for accidents to occur.	Minimal handling of material required as it is directly placed at the disposal site.
	Work would be undertaken in accordance with H&S legislation.	Work would be undertaken in accordance with H&S legislation.
Public Health	Measures will be required to limit human contact during transfer of material from dredger to dewatering facility and transportation to landfill. Security measures typically employed at licensed landfills which will minimise human contact once accepted and placed at site.	Low potential for human contact during dredging and disposal operations. Once deposited at disposal site pathways for human contact greatly reduced.
Pollution/contamination	Pumping /loading ashore to dewatering facility and transportation to landfill will all require energy. Road transport increases the carbon footprint of this disposal option. Potential for spillages to occur.	Pollutant concentrations limited to acceptable levels through regulatory licensing processes. Low disturbance of sediments by natural processes limits spread in existing disposal ground, although it is acknowledging some dispersal will occur.
General Ecological Implications	Licensed landfill would be away from protected species and habitats with measures in place to prevent or minimise pollution of the surrounding environment.	Disposal at Sutors disposal site has historically been used and is the closest licensed disposal site.

Criteria	Landfill	Sea Disposal
Interference with other legitimate activities	Potential from limited short term local impact to commercial operations in the area of the dredged material handling and road hauling principally related to noise and dust potential.	Designated disposal site, as such there is considered no significant impact to commercial vessels or commercial fishing.
Amenity / Aesthetic Implications	Odour release from dewatering facility. Increase traffic noise during transportation from dewatering facility to landfill facility. Potential for spillages on haul route. No significant additional visual/ odour/noise effects as using existing landfill site.	Limited short term visual / odour / noise effects as dredged material is transported by dredger and disposed of below sea level.

3.1.3 BPEO Cost Assessment

Costs were assessed for each of the options taken forward for detailed BPEO assessment. The BPEO assessment considered the typical costs associated with dredging, transportation to the disposal site, construction of treatment facilities (where applicable) and methods employed to protect the environment for each of the identified options. As costs are generally "Commercially Sensitive" the rates are based on experience within industry (as opposed to formal quotations).

For the purposes of comparing costs associated with each option a benchmark of 100,000 tonnes (approximately 50,500m³) of dredged material has been set.

The assumptions to calculate the costs are as follows:-

- Dredging costs are estimated to be £3.21 per m³;
- Ship transportation costs from the dredged area to disposal / transfer site have been calculated based on £1.85 per tonne;
- Costs associated with construction and operation of a dewatering facility are estimated to be in the order of £1,000,000 or greater;
- Cost associated with transfer of dewatered material to lorry are based on a wheeled shovel (costing £47 per hour) operating 2 hours per day for 6 days per week for ten weeks;
- It is assumed that handling of material for placement within the construction project is £3 per tonne;
- Transportation costs from a dewatering facility to landfill are estimated to be £4.85 per tonne; and
- Landfill gate fees are estimated to be £30 per tonne for a non-hazardous landfill (Note Maintenance dredgings are currently exempt from landfill tax as defined in HM Customs and Excise Notice LFT1, A general guide to landfill tax, November 2018, Section 8¹).

Table 3.4 provides details on the Cost assessment for each option taken forward for detailed BPEO assessment.

¹ https://www.gov.uk/government/publications/excise-notice-lft1-a-general-guide-to-landfill-tax/excise-notice-lft1-a-general-guide-to-landfill-tax#exemptions

Activity	Landfill Disposal	Sea Disposal
	(£)	(£)
Dredging	160,500	160,500
Transport by vessel to disposal site	185,000	185,000
Reception facility	70,000	-
Harbour / Dock Closure	-	-
Dewatering Facility	1,000,000	-
Onshore handling and Placement	-	-
Transfer of material to lorry	5,640	-
Transportation Cost	485,000	-
Landfill Gate Fee	3,000,000	-
Total Costs	4,906,140	345,500

Table 3.4: BPEO Cost Analysis (based on 100,000 tonnes	i only)
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Note: The above costs do not take into account the cost required to gain planning or licensing consents or potentially to purchase land (where applicable). They also do not take account of the influence volumes will have on costs (economies of scale).

3.2 **BPEO Assessment Discussion**

For each of the above assessment criteria the options were qualitatively and semi-quantitatively (for costs) assessed against feasibility/preference and awarded a ranking ranging from 1 - 4; 1 being the most acceptable and 4 being the least acceptable option. The assignment of rank was on the basis of professional judgement.

The individual assessment criteria rankings for each option were added up to give an overall hierarchy of preference. Table 3.5 below provides a summary of the BPEO assessment.

Criteria	Landfill Disposal	Sea Disposal
Environment	4	2
Strategic	4	2
Costs	4	1
TOTAL SCORE	12	5

Table 3.5: BPEO Summary

Disposal to landfill is considered to be the least suitable option for the dredged material. It contravenes the principles of minimising waste and reducing landfilling. Several stages in material handling operations would be required to dispose of the material by this route. The cost associated with setting up a suitable treatment facility to dewater the dredged material is significant. Transportation of material by road is also undesirable as a result of increased traffic and the potential for accidental spillages. Landfill capacity is also typically limited and potentially unable to accommodate the quantities of material typically generated by this project. Any surplus dredged material would likely therefore require to be considered for disposal via an alternative route.

Deposition of the dredged material at a licensed marine disposal site is traditionally acceptable. The licensed marine disposal site has been designed to allow easy access as well as being capable of accommodating the quantities of material typically generated by dredging activities. Material handling is limited to transportation thereby reducing the risk for pollution incidences occurring. Pollutant concentrations are also limited to acceptable levels through regulatory requirements. On comparison with other disposal options the cost associated with sea disposal of the dredged material is considered to be the most financially viable.

3.3 Conclusions

The Best Practicable Environmental Option based on those reviewed for disposal of the East Quay dredge area has therefore been assessed as sea based disposal. As identified in the sediment chemical quality section, further assessment is deemed necessary to confirm the suitability of the sediment for sea disposal. The following section details this assessment.

4 SEDIMENT FURTHER ASSESSMENT

4.1 Dredge Material Characteristics

Chemical analysis of the sediments to be dredged have shown key contaminants of concern below revised Action Level 1 in all cases with the exception of a single sample BH2 2.50-3.00m which recorded Dibenz(ah)anthracene at a concentration of 18μ g/kg. RAL 1 for Dibenz(ah)anthracene is 10μ g/kg.

Average concentrations of Dibenz(ah)anthracene are 2.2µg/kg which are well below RAL1.

The individual sample concentration and average concentration is considered to be well below the Canadian Probable Effects level (PEL) of $135\mu g/kg$. PELs (Marine) have been adopted from the Canadian Environmental Quality Guidelines²If a concentration is recorded above the PEL this is the probable effect range within which adverse effects frequently occur.

4.2 Chemical Assessment Conclusions

Analytical data for the proposed dredge material concludes that the material has little in the way of contamination with only 1 sample recording a single exceedance of RAL1. Average concentrations for all contaminants of concern are below RAL1 in all instances and it is considered that the material is suitable for sea based disposal.

² <u>http://www.ccme.ca/en/resources/canadian_environmental_quality_guidelines/</u>

5 WATER FRAMEWORK DIRECTIVE ASSESSMENT

This section details the assessment the dredge and disposal sites within the context of the Water Framework Directive as required by Marine Scotland.

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

- Hydromorphology;
- Biology habitats;
- Biology fish;
- Water quality; and
- Protected areas

Each of these points are considered in Table 5.1 below:

Table 5.1	: Receptor	Risk	Assessment
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Key ReceptorBrief Summary of PotentialEffects on Receptor		Further Consideration	Comment	
		Required?		
Hydromorphology	Morphological conditions, for example depth variation, the seabed and intertidal zone structure tidal patterns, for example dominant currents, freshwater flow and wave exposure.	Yes	Hydromorphology is discussed within Chapter 5: Water Environment, Soils and Coastal Processes in the supporting EIA Report.	
Biology - habitats	Included to assess potential impacts to sensitive/high value habitats.	Yes	Habitats and fish are covered in Chapter 4: Marine Ecology in the supporting EIA Report.	
Biology - fish	Consideration of fish both within the estuary and also potential effects on migratory fish in transit through the estuary.	Yes		
Water Quality	Consideration must be given to water quality when contaminants are present in exceedance of CEFAS RAL1.	Νο	Contaminants noted to be below CEFAS RAL1 within all sediment samples with the exception of one minor low level exceedance for a single PAH species. Organic contaminants like PAHs have a greater affinity for the organic materials which they are bound to, and are more likely to remain strongly bound to the sediment, or if become dissolved, quickly adsorbed onto organic matter. It is considered unlikely that there would be any water quality impact at the dredge or disposal site from the contaminant levels recorded within the sediments.	

Key Receptor	Brief Summary of Potential Effects on Receptor	Further Consideration Required?	Comment
Protected Areas	If your activity is within 2km of any WFD protected area, include each identified area in your impact assessment. • special areas of conservation (SAC) • special protection areas (SPA) • shellfish waters • bathing waters • nutrient sensitive areas	Yes	Protected areas can be viewed within Figure 1.3 of Volume 2 of the EIA – there are no protected areas within the site boundary. Further consideration of key protected areas is provided in section 5.1 below.

Source: Taken from <u>https://www.gov.uk/guidance/water-framework-directive-assessment-estuarine-and-</u> coastal-waters

5.1 Protected Areas

The development site is not within a protected area. The Moray Firth SAC is located just to the south of the proposed development and the disposal site is located within the SAC.

There are no designated bathing waters in close proximity to the development site or disposal site with the closest being noted at Rosemarkie³.

Shellfish protected waters are located at Udale and Cromarty Bay south of Invergordon and approximately 2.6 Km south west from the development site⁴.

The key potential risk to the sensitive features are considered to be attributed to the transport of suspended material from the dredge site during dredging and disposal operations. Sample results have indicated that there are very low levels of key contaminants of concern within the dredge material and on this basis the risks to protected areas from fugitive contamination are considered to be low.

³ <u>https://apps.sepa.org.uk/bathingwaters/Locations.aspx</u>

⁴ <u>https://www.gov.scot/binaries/content/documents/govscot/publications/map/2016/09/shellfish-water-protected-areas-maps/documents/323d324-f111-4fe0-a702-59ac4bf28953/323d3324-f111-4fe0-a702-59ac4bf28953/govscot%3Adocument/Cromarty%2BBay%2B-%2Bshellfish%2Bwater%2Bprotected%2Barea%2Bmap.pdf</u>

6 CONCLUSIONS

In summary, the BPEO for the proposed disposal of $\leq 199,500m^3$ of dredged material is sea based disposal at Sutors Disposal Site. Chemical analysis of the dredge material recorded 1 minor exceedance of Action Level 1 in a single sample from a total of 24 samples tested. None of the samples recorded exceedances of adopted Probable Effect Levels (where considered) or Action Level 2. On this basis there is not considered to be a significant risk associated with dredging or sea based disposal of the material.

Following the review of available information including chemical quality and consideration of potential impacts on the water environment, the potential risks associated with dredging and sea based disposal are considered to be Low.

REFERENCES

Canadian Council for Minsters of the Environment (CCME), Canadian Environmental Quality Guidelines, <u>https://www.ccme.ca/en/resources/canadian_environmental_guality_guidelines/</u>

Marine Scotland (2017). Pre-DredgeSampling Guidance Version 1: Scottish Government.

Marine Scotland (2018), National Marine Plan Interactive (NMPI), https://marinescotland.atkinsgeospatial.com/nmpi/

APPENDICES

A FUGRO REPORT



FUGRO

Ground Investigation without Geotechnical Evaluation Report East Quay Development - Marine Ground Investigation Nigg Bay, Scotland

Contact No.: G191005U Issue Date 1 May 2019

Global Energy Nigg Limited





Draft for Comment





FUGRO

Ground Investigation without Geotechnical Evaluation Report East Quay Development - Marine Ground Investigation Nigg Bay, Scotland

Contract No.: G191005U 1 May 2019

Draft for Comment

Prepared for:

Arch Henderson LLP 142 St Vincent Street Glasgow G2 5LA United Kingdom





Issue	Document Status	Prepared	Checked	Approved	Date
R					



Our ref: G191005U(01) Date: 1 May 2019

Arch Henderson LLP 142 St Vincent Street Glasgow G2 5LA United Kingdom Fugro GeoServices Limited Fugro House Hithercroft Road Wallingford OX10 9RB United Kingdom Tel:+44(0)1491820400 www.fugro.com

Attention: Mr Michael Shuttleworth

Dear Sir,

Ground Investigation without Geotechnical Evaluation Report: East Quay Development - Marine Ground Investigation, Nigg Bay, Scotland.

We have the pleasure of submitting our draft report on the above. This report was prepared by B Marsden under the supervision of N H Armstrong. This report contains all testing completed to date.

We hope that you find this report to your satisfaction; should you have any queries, please do not hesitate to contact us.

Yours faithfully,

B Marsden Reporting Engineer

N H Armstrong Engineering and Reporting Manager

Distribution: One electronic copy to Mr Michael Shuttleworth



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ABBREVIATIONS

ATN	Abortive Test Notice
BS	British Standard
bsl	Below seabed level
bgl	Below ground level
bml	Below mud level
CD	Chart Datum
СМ	Central Meridian
GRS	Geodetic Reference System
LAT	Lowest Astronomical Tide
MSL	Mean Sea Level
OD	Ordnance Datum NewyIn
OpCo	Operating Companies
RQD	Rock Quality Designation
SCR	Solid Core Recovery
TCR	Total Core Recovery
UKAS	United Kingdom Accreditation Service
UKHO	United Kingdom Hydrographic Office
UTM	Universal Transverse Mercator
WGS84	World Geodetic System 1984



1. INTRODUCTION

On the instructions and under the supervision of Arch Henderson LLP (the Investigation Supervisor) acting on behalf of Global Energy Nigg Limited (the Employer), a site investigation has been carried out by Fugro GeoServices Limited (FGSL) at Nigg Bay, Scotland.

It is proposed to construct a quay on the southern border of Global Energy Nigg Limited's Energy Park. The objective of the investigation was to determine the geotechnical and geoenvironmental conditions at the site and to provide information that would assist the Investigation Supervisor in the design of the proposed works. The scope of the investigation was determined by the Investigation Supervisor.

A ground investigation without geotechnical evaluation report, was requested including exploratory hole and field-testing records, laboratory test results, photographs and site plan. The report has been provided in .pdf format.

The nearshore site work was undertaken from the FGSL jack-up barge Skate 3A from 2 March to 18 March 2019, and comprised eight light cable tool percussion boreholes four of which were extended by rotary core drilling techniques to a maximum depth below seabed level (bsl) of 23.35 m.



2. THE SITE AND GEOLOGY

2.1 Site Location and Description

The proposed quay is to be located on the southern border of Global Energy Nigg Limited's Energy Park, Nigg Nay, Cromarty Firth, 8km east of Invergordon, Highland, Scotland.

2.2 Geology

The records of the British Geological Survey (BGS 1997), BGS Online (BGS 2018) and information provided by the Client indicate that the site is underlain by Marine Beach Deposits, comprising clays, silts, and sands, resting on the Raddery Sandstone Formation, consisting of reddish brown sandstone interbedded with marl.

Further background research such as a desk study was not required within the terms of reference for the work.



3. MARINE GEOTECHNICAL INVESTIGATION

3.1 Scope of Work

The original scope of works required eight boreholes to be constructed to depths up to 25 m bsl. On the instructions of the Investigation Supervisor the depths of the boreholes were reduced during the course of the site work. Five boreholes were constructed using light cable tool percussion boring techniques to depths ranging between 9.40 mbsl (BH02) and 22.10 mbsl (BH04) and three boreholes (BH01, BH03 and BH05) were constructed using a combination of light cable tool percussion boring and rotary coring techniques to depths between 17.50 m bsl (BH05) and 23.35 m bsl (BH01).

A site plan showing the location of the exploratory positions is given in Figure B.1 in Appendix B. A schedule of exploratory holes is presented in Table 3.1.

3.2 Vessels, Plant and Equipment

The site work was conducted using the Fugro jack-up barge Skate 3A which was specifically developed for performing nearshore, high quality geotechnical site investigations and construction works. The barge includes a four-leg jack-up system allowing works in the intertidal zone up to 30 m water depth. Drilling, testing and sampling equipment on the Skate 3A comprised:

- Comacchio MC–S 1200 hydraulic drill rig capable of both rotary and percussive drilling operations;
- Dando 2000 cable percussion winch;
- Mud mixing system used to mix and hold the drill flush used during drilling operations to stabilise the borehole;
- Heavy duty 7" diameter thick-walled casing used as a conductor casing from the barge to mudline;
- Terracore S-Geobor wireline triple barrel rotary coring system, with semi-rigid core liner and seawater, which produces a hole diameter of 146 mm and a core sample of 102 mm diameter (nominal) and, when deployed with a non-coring bit, produces an open hole of 146 mm diameter;
- Sliding hammers to drive thin-walled or thick-walled samples of 450 mm or 1000 mm nominal length into the ground in advance of the borehole;
- Trip hammers used to carry out standard penetration tests.

Equipment data sheets are presented in Appendix I.

Exploratory Position Reference	Eastings (m)	Northings (m)	Seabed Elevation (m OD) [m CD]	Depth to Base of Exploratory Position (m bsl)
BH1	279383.70	868963.58	-1.37 [0.85]	23.35
BH2	279342.91	868934.75	-11.32 [-9.10]	9.40
BH3	279380.53	868920.31	-2.97 [-0.75]	22.50
BH4	279380.77	868871.12	-4.24 [-2.02]	22.10
BH5	279379.79	868819.21	-8.97 [-6.75]	17.50
BH6	279381.64	868746.75	-11.82 [-9.60]	15.00
BH7	279451.07	868746.87	-6.23 [-4.01]	19.61
BH8	279448.06	868803.00	-3.04 [-0.82]	19.00
Note. Chart Datum at M	loray Firth is 2.22m below	OD (NTSLF, 2019)	•	•

Table 3.1: Schedule of Exploratory Boreholes

Contract No. G191005U



3.3 Marine Activities

3.3.1 Site Activities

The field operations were carried out twenty-four hours a day in two twelve-hour shifts. A breakdown of the site activities is given in Table 3.2.

Table 3.2: Summary of Activities

Activity	Duration (hrs)	
Mobilisation	3.50	
Drilling/General Operations	195	
Fugro Standby	0	
Standby (Other) 164		
Note: Refer to DPRs for details and breakdown of Standby (Other)		

Daily Progress Records (DPR) were completed for each 24-hour period during the site work, defined from midnight to midnight, and include information on the field operations and activities together with summary information relating to progress. The DPRs are presented in Appendix I.

3.3.2 Health, Safety and Environment

A Hazard Observation Card (HOC) system was operated on board allowing crew to report Unsafe Acts, Unsafe Conditions, Safe Acts, or make HSE suggestions. HOCs are uploaded to the Fugro IMPACT system which allow them to be tracked, monitored and responsibilities relating to their close out to be assigned with an automated follow-up system in place.

In addition to the HOC system, Fugro IMPACT is also used to report on more serious incidents. An incident includes any accident, near miss or dangerous occurrence and any accidents in which any employee was injured or any damage to equipment was suffered.

The health, safety and environment statistics for the site work period are summarised in Table 3.3.

Activity	Duration (hrs) / Number
Contractors total exposure (hours)	1860
HOCs	20
HSE Meetings	1
Safety Drills	7
Tool Box Talks	18
Incidents/Near Misses	0

Table 3.3: Health and Safety Statistics

3.3.3 Grouting Operations

All boreholes were grouted from the base of the borehole to rock head with a 2:1 Bentonite /cement grout, mixed at a solid to water ratio of 5:2 by weight. The grout was pumped bottom up in the borehole via a tremie pipe. This was process was conducted in 10 m increments and the borehole was dipped immediately afterwards before proceeding with the next interval.



3.4 Navigation and Positioning Survey

During primary positioning of the Skate 3A Jack Up Barge (JUB), Starfix HP/XP/G2 Systems were used. The heading was determined using a Meridian Gyrocompass with a ProTrack GNSS system providing a backup. Antenna position data was combined with the gyro compass data in StarFix.NG navigation software to compute the vessel position.

The JUB's positioning systems were configured to record all navigation data which enables the replay of barge movements and review offline. A mean position report was configured to the Client's specification to provide the positional information for each exploratory location. The mean position reports are reproduced in Appendix F.

3.5 Geodetic and Projection Parameters and Vertical Datum

3.5.1 Project Coordinate Reference System

Table 3.5 provides details of the geodetic datum and map projection adopted for the project.

Project Geodetic Datum		
Geodetic Datum:	WGS84	
Ellipsoid:	WGS84	
Semi major axis:	6337563.396	
Inverse Flattening:	299.3249646	
Project Projection Parameters		
Projection:	OSGB36	
Grid:	British National Grid	
Longitude of Origin:	2°00'00.0000"W	
Latitude of Origin:	49°00'00.0000"N	
False Easting:	400000.000 m	
False Northing:	-100000.000 m	
Scale factor on Central Meridian:	0.9996	
Units:	Metre	
Vertical Datum		
Datum:	Chart Datum (CD)	

Table 3.5: Project Geodetic and Projection Parameters

3.5.2 Vertical Datum

The vertical datum for this project is Chart Datum (CD).

3.5.3 Depth Measurement

The depth to seabed was measured by a sounding lead within the drill string prior to the commencement of boring. The depths stated on the borehole records are referenced as metres below seabed. The elevation of the seabed is also stated on the exploratory hole records.



4. GEOTECHNICAL ACTIVITIES

4.1.1 General

The investigation was carried out in accordance with BS 5930:2015, BS EN ISO 14688-1:2018, BS EN ISO 14689-1:2018 and BS EN ISO 10175:2011, as appropriate.

Details of the sampling and in situ testing carried out, together with the descriptions of the strata encountered, are given on the exploratory hole records in AppendixC.2.

An explanation of the symbols and abbreviations used on the borehole records, together with the method of strata description utilised is given in the Notes on Exploratory Hole Records in Appendix C.1.

Geotechnical and geoenvironmental samples were transported to the laboratories of Professional Soils Limited for examination and testing as scheduled by the Investigation Supervisor.

4.1.2 Boreholes

Eight, 178 mm minimum diameter, boreholes were sunk to depths between 4.45 m bsl (BH03 and BH05) and 22.10 m bsl (BH04) using light cable tool percussion boring techniques. On reaching bedrock, boreholes BH01, BH03 and BH05 were extended using rotary coring drilling techniques, to depths ranging between 17.25 m bsl (BH03) and 23.35 m bsl (BH01). The rotary coring was carried out using a deck mounted Comacchio MC-S1200 drill, a Terracore S-Geobor wireline system, triple tube core barrels and seawater flush. During core runs the driller constantly monitored and adjusted drill fluid circulation pressure, applied hydraulic pulldown pressure, rotation speed and feed rates to maintain a constant and efficient rate of penetration for the given formation, and to ensure the maximum core recovery possible. Where core recoveries were less than could reasonably have been expected, core run lengths were reduced to 50% of the previous length, unless otherwise directed by the Investigation Supervisor, to a minimum length of 0.5 m. On completion the boreholes were backfilled with cement to bentonite (2:1) grout as directed by the Investigation Supervisor.

The borehole records are given in Appendix C.2.

4.1.3 Sampling and Core Subsampling

The sample categories and achievable quality classes are defined in EN ISO 22475-1:2006 for each sample/sampler system.

In boreholes advanced by cable tool percussion boring techniques, disturbed samples were taken at each change in soil type and at regular vertical intervals during boring to identify and give a record of the strata encountered. Disturbed samples of soil were placed in a plastic tub or double sealed in plastic bags.

General purpose driven open tube (UT100) thin wall samples (100mm diameter thin walled OS-T/W, achievable quality Class 1) were taken of the cohesive strata where appropriate, and subsequently sealed to preserve their natural moisture contents. Thin wall push samples (100mm diameter thin walled OS-T/W, achievable quality Class 1) were taken where ground conditions permitted.



4.1.4 Photographic Records

Photographs of the rock core recovered are presented in Appendix D. The photographs are also presented as digital data in .jpeg format.

4.1.5 Standard Penetration Tests

Standard penetration tests (SPT) using a split spoon (S) or a solid 60° cone (C) were carried out in the granular and cohesive deposits and weathered rock at intervals stipulated by the Investigation Supervisor. The results are shown as S(N) and C(N) values on the borehole records at the relevant depths and tabulated in Appendix E together with the relevant SPT Calibration Report. The tests were carried out in accordance with BS EN ISO 22476-1:2005+A1:2011 'Geotechnical investigation and testing – Field testing. Part 3 Standard Penetration Testing'.

4.1.6 Groundwater Observations during Boring and Drilling

During the construction of boreholes in the marine environment the water level in the borehole is maintained at or above seawater level. Consequently, it was not possible to identify the inflow of groundwater into the borehole.



5. BOREHOLE RECORDS AND DESCRIPTION OF STRATA

An explanation of the symbols and abbreviations used on the borehole records, together with the method of strata description utilised, is given in the Notes on Exploratory Hole Records, in Appendix C.1

Details of the in situ sampling and testing carried out, together with the descriptions of the strata encountered are given on the borehole records, in Appendix C.2

The strata descriptions given in the borehole records, unless otherwise noted, are compiled from an examination of "disturbed" samples, "undisturbed" samples and rotary core samples, together with the results of any field testing and laboratory tests. Where there is a degree of uncertainty regarding the character of the soil or rock, the terms "probably" or "possibly" have been used and the descriptions should be treated with caution.

The consistency of cohesive strata is based on visual assessment alone; the identification and description of consistency is outlined in the Notes on Exploratory Hole Records, in Appendix C.1.

The Solid Core Recovery (SCR) and Rock Quality Designation (RQD) have been determined using the modified proposal, as given in Norbury et al (1986); that a "solid cylinder" should be defined as having a full diameter (but not necessarily a full circumference) without discontinuities and should be measured axially along the core. In a number of instances, the logging geologist assessed that some core from one run was recovered with the core from the next run. In these cases, the Total Core Recovery (TCR), SCR and RQD have been determined assuming that the core had been recovered from the core run in which it had first been drilled, and details are given in the remarks section of the borehole record. The description of rock is based on BS EN ISO 14689-1 (2003).

In his original work on the use of RQD in rock classification schemes, Deere (1968; 1989) advised that pieces of core which are not 'hard and sound' (ISRM 1978) should not be counted for the RQD even though they possess the requisite 4 in, (100 mm) length." Subsequently, 'sound core' was defined as any core which is fresh to moderately weathered and which has sufficient strength to resist hand breakage." This approached to RQD assessment is adopted by some international standards such as ASTM D6032.

In its current form BS5930 allows for the inclusion of both sound and weathered rock provided that it exhibits strength greater than 600 kPa. Thus, it may be expected that BS5930 RQD values will be much higher than that computed based on the Deere's original definition, particularly in "weak"/weathered rock sequences. Caution should therefore be exercised in using the BS5930 RQD values in rock mass classification systems which assume that RQD will be computed using Deere's original methodology.



6. GEOENVIRONMENTAL TESTING

Chemical analyses were scheduled by the Investigation Supervisor and carried out by RPS Bedford Ltd (RPS). A Schedule of Contamination Tests, presented in Table F.2 (Appendix F), gives details the number of tests undertaken. Information on sample collection, preservation, and deviating samples is given in Figure F.1.1 in Appendix F. The results are given in the RPS Certificate of Analysis Ref. No. 19-81762

The results, including details of any deviating samples and the reasons for any deviations and RPS UKAS accreditation certificates are presented in Appendix F.



7. DIGITAL DATA DELIVERABLES

Digital data to accompany the information presented within this report are listed in Table 7.1.

Table 7.1: Digital Data Deliverables

Digital Data	Folder Reference												
Exploratory Position Records, Field and Laboratory Tests:													
Association of Geotechnical Specialists (AGS) Version 4.0.4 AGS Data													
Photographic Records (cores):													
 Photographic records of core in .jpeg format 	Photography												
Geoenvironmental Laboratory Tests:													
 Geoenvironmental data as cross-tab tables in MS Excel Pre-dispersal Sampling Results Form in MS Excel 	Geoenvironmental Data												



8. REFERENCES

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APPENDICES

- A. LIMITATIONS ON USE OF DATA
- B. DRAWINGS
- C. EXPLORATORY HOLE RECORDS
- C.1 Keysheets
- C.2 Borehole Records
- D. CORE PHOTOGRAPHS
- E. FIELD TEST RECORDS
- E.1 Calibration Certificates
- E.2 Standard Penetration Test Results

F. GEOENVIRONMENTAL TESTING

- G. SURVEY
- H. MARINE ACTIVITIES
- I. VESSEL AND PLANT DATA SHEETS



A. LIMITATIONS ON USE OF DATA

The scope of the investigation was determined by Arch Henderson LLP for the particular project requirements set out in the Specification for the Contract. The data presented in this report reflects the site conditions encountered at the time the investigation was performed. The investigation has disclosed evidence of conditions at point locations across the site which provides information about discrete volumes of soil or rock. Accordingly, there may be ground conditions at the site which may not have been revealed by the investigation, and the passage of time may give rise to changes in the conditions encountered. Any interpolation or extrapolation of strata from the exploratory boreholes is subject to the interpretation of the reader. Any cross-sections or plots are generalised by necessity and have been based on information found at the exploratory boreholes and depths sampled and tested. The exploratory borehole records should be read in conjunction with the Notes on Exploratory Hole Records presented in this report.

The investigation has been carried out by Fugro GeoServices Limited and the report has been prepared for the sole internal use of Global Energy Nigg Limited. This report shall not be relied upon or transferred to any other parties without the express written authorisation of Fugro GeoServices Limited. If an unauthorised third party comes into possession of this report they rely upon it at their peril and the authors owe them no duty of care and skill.

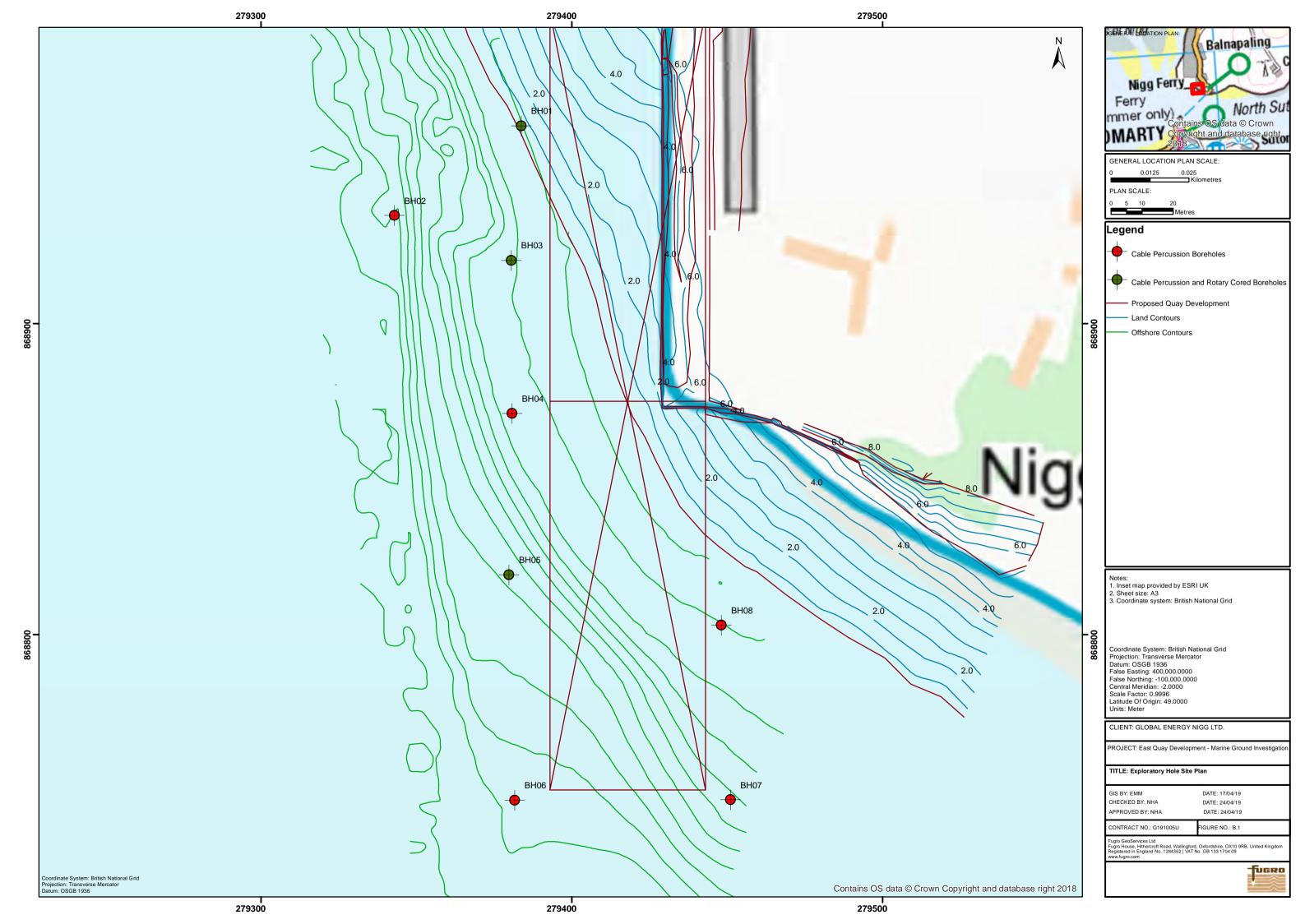
It is Fugro GeoServices Limited's understanding that this report is to be used for the purposes as described in the Specification for the investigation and as summarised in the text of the report. Should the purpose for which the report is used or the proposed use of the site change, this report may no longer be valid. Any further use or reliance upon the report in these circumstances by Global Energy Nigg Limited further review by and advice from Fugro GeoServices Limited shall be at their sole and own risk.



B. DRAWINGS

Exploratory Hole Site Plan

Figure B.1





C. EXPLORATORY HOLE RECORDS

C.1 Keysheets

General Notes on Exploratory Hole Records

C.2 Borehole Records

Borehole Records

Figure C.1

Figures BH01 to BH08



GENERAL NOTES

1 OPERATING PROCEDURES

The procedure used for cable percussion boring, rotary drilling, trial pitting, sampling, in situ and laboratory testing and sample descriptions are generally in accordance with BS5930:2015 'Code of practice for site investigations', BS EN ISO 14688-1:2002 'Geotechnical investigation and testing – Identification and classification of soil – Part 1 Identification and description', BS EN ISO 14689-1:2003 'Geotechnical investigation and testing – Identification and testing (SPT) is carried out in general accordance with EN ISO 22475-1 and Standard Penetration Testing (SPT) is carried out to EN ISO 22476-3:2005.

2 GROUNDWATER

Exploratory hole water levels are recorded together with the depths at which seepages or inflows of water are detected. These observations are noted on the Records, but may be misleading for the following reasons:

- a) The exploratory hole is rarely left open at the relevant depth for a sufficient time for the water level to reach equilibrium.
- b) A permeable stratum may have been sealed off by the borehole casing.
- c) Water may have been added to the borehole to facilitate progress.
- d) The permeability may have been altered by the excavation/boring/drilling process.

Standpipes or piezometers should be installed when an accurate record of groundwater level is required, however, it should be noted that groundwater levels may vary significantly due to seasonal, climatic or man made effects. Water levels recorded during the investigation and any advice or comment made accordingly may, therefore, not be appropriate to particular foundation, geotechnical design, or temporary works solutions. Long term monitoring of standpipes or piezometers is always recommended when water levels are likely to have a significant effect on design.

3 CHISELLING

The remarks in the Borehole Records contain information on the time spent advancing the borehole by 'Chiselling Techniques', and the depth of borehole over which it was required. Such information may be affected by a wide range of variable factors, unrelated to the geotechnical properties of the strata. Such factors include, but are not restricted to: plant, equipment and operator. The data should, therefore, only be used subjectively and with extreme caution.

4 IDENTIFICATION AND DESCRIPTION OF SOILS - SEE SEPARATE SHEET

The identification system follows the Company's Engineering: Geotechnical Procedures Manual which is based on BS EN ISO 14688-1:2002 and appropriate clarifications in the National Foreword, BS 5930:1999 and BS EN ISO 14689-1:2003

Relative density terms are given where supported by SPT N values, with the exception of Made Ground. The field assessment of compactness or relative density for coarse grained soils is only given on trial pit records where appropriate assessment of the soils has been undertaken.

Where the terms 'soft to firm', 'firm to stiff' etc. are used they indicate a strength which is close to the borderline between the two terms and cannot be precisely defined by inspection only, and/or which is indicated as borderline or ranging between the two terms after consideration also of in situ and laboratory test results. Consistencies may have been amended in the light of test results

Where 'to' links two terms, as in 'slightly sandy to sandy' this again represents a borderline case or a range, where the precise proportions cannot be determined as outlined previously.

The name of the geological formation is only given where this has been requested and can be determined with confidence (see Clause 41.5 of BS 5930:1999).

5 INTERPRETATION OF THE RESULTS OF THE INVESTIGATION

The description of ground conditions encountered and any engineering interpretation included in the report are based on the results of the boreholes and trial pits and the field and laboratory testing carried out. There may be ground conditions at the site which have not been revealed by the investigation and consequently have not been taken into account.

Any interpolation or extrapolation of strata between exploratory holes shown on any cross sections or site plans is an estimate only of the likely stratification based on general experience of the ground conditions and is subject to the interpretation of the reader.

The term "TOPSOIL" is used in this report to describe the surface, usually organic rich, layer including turf, subsoil and weathered material with roots. The use of this term may not imply that the soil satisfies the requirements of Clause 3 of BS 3882:1994, 'Specification for topsoil', or is suitable for general horticultural and agricultural purposes.

Laboratory test results in this report give the soil properties of individual specimens tested under specified conditions. Individual results or groups of results may not be appropriate for use as design parameters for some geotechnical analyses. The samples may be non-representative, disturbed internally, or prepared and tested under conditions suited for different geotechnical applications. Unless the selection of design parameters is discussed in this report, it is recommended that the advice of a Geotechnical Specialist is sought.



IN SITU TESTING AND SAMPLING

STANDARD PENETRATION TESTS

S()&C() Standard Penetration Test (SPT). S() denotes a 50mm diameter split barrel sampler, normally undertaken in cohesive and mixed soils and C() indicates the test was carried out using a 50mm diameter, 60 degree apex, solid cone normally used in coarse granular soils and weak rock. The tests are carried out in accordance with EN ISO 22476-3:2005

The distance that the SPT assembly sinks into the ground prior to the start of the test is measured and reported as Static Weight Penetration (SWP). The sampler or cone is driven up to 450mm into the soil using a 63.6kg hammer with a 760mm drop. An initial seating drive of 150mm (or 25 blows whichever is less) is undertaken to penetrate through any ground which may be disturbed at the base of the borehole. For the test drive, the number of blows required to obtain an additional 300mm penetration (or penetration for 50 / 100 blows) is recorded as the penetration resistance (also known as the 'N' value). The test is usually completed when the test drive attains the 300mm penetration or the number of blows recorded during the 'test drive' only reaches 50 in soils or 100 in weak rock.

If the sampler advances below the bottom of the borehole under the static weight of the drive rods with the hammer assembly on top, the corresponding penetration is not included as seating drive but the information is reported separately as SWP. The test is terminated in all cases before the non return valve reaches the level of the material at the base of the borehole, in effect about 600mm total penetration. If SWP (Static Weight Penetration) is greater than 150mm then test increments of 75mm are undertaken with the final increment being completed at less than 600mm total penetration including SWP.

If a sample is not recovered in the sampler, or the cone is used, a disturbed sample of appropriate size for the material is taken on completion of the test over the depth of the test zone. The sample is given the same depth as the top of the Standard Penetration Test drive.

The depth on the Borehole Record at the left hand side of the 'Depth' column is that at the start of the test Where full penetration of the test drive is obtained, the penetration resistance ('N' value) is reported in the 'SPT Blows/N' column. If full penetration in the test drive is not obtained, then the length of drive (test length in mm) and the penetration resistance (number of blows) are both reported. Full results, including the cone or barrel type, static weight penetration, blows and penetration of each of the Seating Drive and Test Drive increments, the calibration reference number for the SPT hammer assembly, the energy ratio and the 'N' value, as well as start and end depths and water and casing levels are given on the separate Standard Penetration Test Summary

* in the 'Test Length' column denotes that the blows and penetration include the initial Seating Drive blows.

OTHER IN SITU TESTS

The following in situ tests are reported on the **Exploratory Hole Records**, in the 'Test' or 'Type' and 'Results' columns where appropriate.

- k In situ Permeability Test refer to detailed test results for permeability values
- PMT Pressuremeter Test refer to detailed test results for modulus values, etc.
- FVN/R Borehole Shear Vane Test (undrained shear strength c_u in kPa) refer also to detailed test results, N 'Natural' or peak shear strength, R Remoulded shear strength
- HVN/R Hand Shear Vane Test (Direct reading of undrained shear strength in kPa). 'N' and 'R' as above. The values are indicative and should not be taken as being equivalent to laboratory test results. The Pilcon vane results have a factor varying from about a sixth for the 33mm vane to a third for the 19mm vane which reduces the BS1377 shear vane value. The values presented are therefore approximate and should be treated with great caution if used for design purposes
- PP Pocket Penetrometer. Unconfined Strength (UCS) reported in kg/cm² to the nearest 0.25 kg/cm² or kPa with the same accuracy. Equivalent c_u in kPa is very approximately UCS x 50. Pocket Penetrometers are an aid to logging of cohesive soils, the results are indicative and should not be relied upon. The equipment used is not calibrated
- TV Tor Shear Vane (direct reading of undrained shear strength in kPa). Tor vanes are an aid to logging of cohesive soils, the results are indicative and should not be relied upon. The equipment used is not calibrated
- CBR California Bearing Ratio Test (CBR%) refer also to detailed test results
- PID Photo-Ionisation Detector Readings in headspace of small disturbed chemical samples. Result given in ppm by volume



IN SITU TESTING AND SAMPLING

UNDISTURBED SAMPLES

All samples recovered are recorded and handled in accordance with EN ISO 22475-1.

U/UT General purpose open tube sample. Sample normally taken with open tube sampler approximately 0.1m diameter and 0.45m long and driven with an 80kg sinker bar and 56kg sliding hammer, unless noted otherwise. "XX" in U100 blows column denotes the number of hammer blows. The height of hammer drop can be variable depending on operator technique. Depths are given of the top of the sample if full penetration and recovery are achieved, otherwise actual lengths of penetration and recovery are given in the appropriate columns.

'U' denotes steel or plastic liner sample in general use up to year 2010 designated OS/TKW in accordance with BS EN ISO 22475-1 with an area ratio greater than 25%. 'UT' denotes thin wall open tube sampler designated OS/TW with an area ratio less than 15%, available from 2010.

- U/UT(X) General purpose open tube sample (X) mm diameter
- TW(X) Thin wall (push) sample (X) mm diameter
- P(X) Piston sample (X) mm diameter

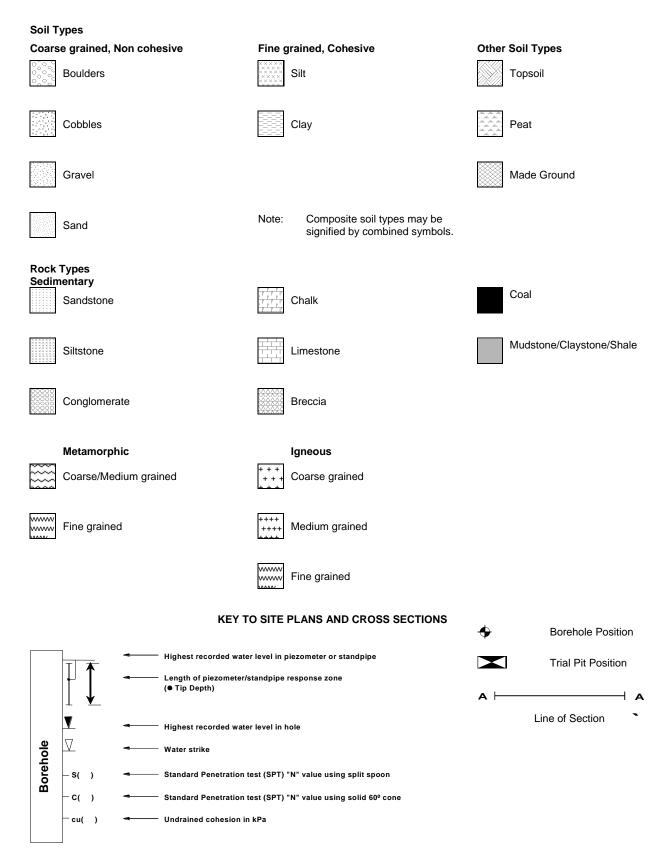
DISTURBED AND CORE SAMPLES

- CBR Sample taken in CBR Mould
- D Small disturbed sample (plastic tub or jar with air tight lid)
- B Bulk disturbed sample (polythene bag, tied at neck size dependent on purpose)
- LB Large Bulk disturbed sample (normally several bulk samples of the same material size dependent on purpose)
- W Water sample
- C Core sample
- CS Short core, generally about 100mm
- CL Long core, generally 250mm to 300mm
- # Sample not recovered

ENVIRONMENTAL SAMPLES

- CD Sample for chemical analysis in a plastic tub
- K Sample for chemical analysis in an amber glass jar
- V Sample for chemical analysis in a glass vial
- CDKV Set of samples for chemical analysis as above
- WAC Sample for Waste Acceptance Criteria
- EC Environmental Soil Sample
- EW Environmental Water Sample

KEY TO BOREHOLE AND TRIAL PIT RECORDS





DESCRIPTION OF ROCK CORES

DESCRIPTIVE ORDER

Strength, Structure, Colour, Texture, Grain Size, ROCK NAME. Minor constituents and additional information. (Geological formation - see comments under identification and description of soils). Mass characteristics - factual description of weathering state (if appropriate) and description of discontinuities and fracture state (if appropriate).

Term	Field identification	Strength (MPa)
Extremely weak	Can be indented by thumbnail. Gravel sized lumps crush between finger and thumb.	<1.0
Very weak	Crumbles under firm blows with point of geological hammer. Can be peeled by a pocket knife.	1 – 5
Weak	Peeled by a pocket knife with difficulty. Shallow indentations made by firm blow with point of geological hammer.	5 – 25
Medium strong	Cannot be scraped with pocket knife. Can be fractured with a single firm blow of geological hammer.	25 – 50
Strong	Requires more than one blow of geological hammer to fracture.	50 – 100
Very strong	Requires many blows of geological hammer to fracture.	100 – 250
Extremely strong	Can only be chipped with geological hammer.	> 250

DISCONTINUITIES

Spacing (mm)	Discontinuity Spacing			
>6000	Extremely widely spaced			
>2000 2000-6000	Very widely spaced			
600 - 2000	Widely spaced			
200 - 600	Medium spaced			
60 - 200	Closely spaced			
20 - 60	Very closely spaced			
6 – 20 <20	Extremely closely spaced			
<6				
	>6000 >2000 2000-6000 600 - 2000 200 - 600 60 - 200 20 - 60 60 - 20 <20			

For igneous and metamorphic rocks the appropriate descriptive term for planar structure should be used e.g. medium foliated gneiss, very narrowly cleaved slate, very thickly flow banded diorite.

WEATHERING

Standard descriptions of weathered rocks for engineering purposes should always include comments on the degree, extent and nature of any weathering effects at material or mass scales. This may allow subsequent classification and provide information for separating rock into zones of like character. Indications of weathering include

changes in colour	changes in fracture state	

reduction in strength		presence, character and extent of weathering products
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If a systematic classification following the guidelines given in the Standard can be applied unambiguously, this is described in the text of the report. Otherwise, the rocks are not classified in terms of weathering beyond the approach described above.

Weathering terms that may be used for description of rock material and these terms may be qualified or combined. Discoloured - The degree and type of colour change from original is described, and if for mass or particular mineral constituents Disintegrated - Fragmentation by physical weathering, bonding lost but material fabric intact. Material friable, not decomposed Decomposed - Chemical alteration of mineral grains so material fabric is intact but some or all grains are decomposed

For rock mass weathering the following terms may be used

Slightly - Discolouration on surfaces and / or of material Partially - Slightly reduced strength, slightly closer fracture spacing, weathering extending in from fractures.

Moderately - Less than half of mass decomposed/disintegrated. Fresh/discoloured rock as continuous material or corestones Highly - More than half decomposed/disintegrated. Fresh/discoloured rock as discontinuous framework or corestones Completely - All rock material decomposed and/or disintegrated. Original mass structure largely intact

Residual Soil - All material converted to soil, structure and fabric destroyed, may be volume change but material not moved The term 'Fresh' is used to indicate that there is no visible weathering or alteration, except possibly slight discolouration on major surfaces

The ease hereals commonly used by the Company in site investigations are as follows:



ROCK CORES

ROCK CORE SIZES

The core barrels commonly used by the Company in site investigations are as follows:												
Core Barrel	Borehole	Standard Core	Core Size using	Casing Size	Casing O.D	Casing I.D						
Туре	Diameter	Size	Rigid Plastic Liner	or Type	(mm)	(mm)						
	(mm)	(mm)	(mm)									
STA	NDARD BRITISH	SIZES										
NWM	75.7	54.7	51	NX	88.9	76.2						
HWF	98.8	76.2	72	HX	114.3	100.0						
HWAF	99.5	70.9	-	HX	114.3	100.0						
PWF	120.0	92.1	87	PX	139.7	122.3						
SWF	145.4	112.8	107	SX	168.3	147.7						
UWF	173.7	139.8	132	UX	193.7	176.2						
		S										
BQ	59.9	36.4	35									
NQ	75.7	47.6	45									
HQ	96.1	63.5	61									
PQ	122.7	85.0	82									
GEOBOR S	146.0	102.0	102	SX	168.3	147.7						
	THINWALL SIZE	S										
TNX	75.7	60.8	-	NX	88.9	76.2						
T2 66	66.1	51.9	-	74	74.3	67.3						
T2 76	76.1	61.9	-	84	84.3	77.3						
T2 86	86.1	71.9	68	98	98.0	89.0						
T2 101	101.1	83.9	80	113	113.0	104.0						
T6 116	116.1	92.9	89	128	128.0	118.0						
T6 131	131.1	107.9	104	143	143.0	133.3						
NON	N STANDARD BAI	RRELS										
4.12F	105.2	74.7	72	PX	139.7	122.3						
TRIEFUS												
5.5x4C	139.7	101.6	-	SX	168.3	147.7						
SINGLE												
TUBE												
B116	116	102	-	PX	139.7	122.3						
B146	146	132	-	SX	168.3	147.7						
Nata Oana dia		the second of the last second s										

Note: Core diameters may vary when different lining systems are in use.

NCB Non coring bit for GEOBOR S.

ROCK CORE CHARACTERISTICS

- TCR **Total Core Recovery.** The length of the total amount of core sample recovered, expressed as a percentage of the length of the core run.
- SCR **Solid Core Recovery.** The length of solid core recovered, expressed as a percentage of the length of the core run. Solid core is defined as that length of core which has a full diameter, but not necessarily a full circumference. Only natural fractures are considered. Drilling or handling induced fractures are ignored.
- RQD **Rock Quality Designation.** The length of solid core recovered in pieces each more than 100mm long as a percentage of the core run length.
- I_f **Fracture Index.** The number of discontinuities expressed as 'fractures per metre', measured over any convenient length of consistent fracture characteristics. Fracture index is normally measured axial along the core.
- F_s Fracture Spacing. The minimum, average and maximum spacing of discontinuities in mm, measured over any convenient length of consistent fracture characteristics. Fracture spacing is normally measured perpendicular to the discontinuity plane unless indicated otherwise.
- AZCL Assumed Zone of Core Loss

Zones of atypical fracturing of restricted extent which occur within a rock unit of uniform fracture characteristics are identified within the Description of Strata, but not given a separate I_f / F_s . NI - Not Intact NR - No Recovery NA - Not Applicable DI – Drilling Induced

 I_{s} Corrected Point Load Strength Index $I_{s(50)}$ which is given in MPa



IDENTIFICATION AND DESCRIPTION OF SOILS

	Basic Soil Typ	Particl be (mm)	5 3126	Visual Identification	Composite Soil T (Mixtures of basic		es)			Density / Con	isistency / Pea	at Condition	
VERY COARSE SOILS	BOULDER	RS	200	Large Boulders >630mm. These soils only seen complete in pit:		before	e, descripti		rincipal			ative descriptic and partic	
	COBBLE		63	or exposures. Often difficult to recove from boreholes. Easily visible to naked eye; particle	<pre>r Term before (term in '[]' may be used for 2ndry</pre>	Principal Soil Type	Descripti	on after	Approx % 2 nd ry soil	packaging.	netration Test		
izes)		coarse	20	shape can be described, grading can be described.	parts, matrix etc)	P_i N Di	Used to d	Jacoviho	type	for Coarse So			
els		mediur	n 6.3	Well graded: wide range of grain	Slightly (sandy*)	gLES	compone	ents of	<5	No of blows <4	Relative Den Very Loose	sity	
d Grav	GRAVEL	L	0.3	sizes, well distributed. Poorly graded not well graded. (May be uniform: size of most particles lies between		(COBBLES e Notes)	secondar constitue e.g. Grav	nts.		4-10	Loose		
COARSE SOILS (Typically over 65% Sand and Gravel Sizes)		fine		narrow limits; or gap graded; an intermediate size of particle is markedly under represented).	[some] Ø fi		fine and	medium lar fine	5 – 20	10-30	Medium Den	se	
2% 2			2	Visible to naked eye; no cohesion	Very (sandy*) [much / many]	, GRAVEL	mudston		20 to	30-50	Dense		
OILS /er 6		coarse	0.63	when dry; grading can be described. Well graded and poorly graded: as	[mden/many]	ND, O	and (san	d*) or	40†	>50	Very Dense		
SE Si ally o	SAND	mediur	n 0.2	above		SAS	and (cob	bles+)	50†	Slightly	Visual Exami	nation: pick in lumps whicl	
COAR		fine	0.2		 Fine or coarse Very coarse so described as fi 	oil type	- see Not	es	viour	cemented	can be abrad		
		coarse	0.063	Only coarse silt visible with hand lens	; Scale of secondary	const	ituents with	n fine soils			clayey SILT -		
			0.02	exhibits little plasticity and marked dilatancy; slightly granular or silky to	before, description	after p	orincipal co	nstituent.	Approx		ary constituent erial characteris		
	SILT	mediur	0.0063	touch. Disintegrates in water; lumps dry quickly; possesses cohesion but	Term before	erm before		Description after			ry' not applicat		
	The SOLS fine SOLS (Typically over 35% Silt and Clay Sizes)		0.002	powders easily between fingers.	ed,	Principal Soil Type	boompa		soil type	Consistency			
/ Sizes)			0.002	Term "SILT" or "CLAY" must be used "SILT/CLAY" not allowed.	Slightly (sandy*)		Used to o compone secondar	ents of	<35	Very soft		pushed in up udes betwee	
d Clay				Dry lumps can be broken but not powdered between the fingers; they	(sandy*)	or SILT	constitue e.g. sand	ly	35 to 65†	Soft		ied in up led by fingers	
Siltan	CLAY			also disintegrate under water but more slowly than silt; smooth to the touch; exhibits plasticity but no	Very (sandy*)	CLAY o	Gravel is coarse rounded quartzite		>65†	Firm	Thumb mail easily. Rolls t	kes impressi to thread	
s ver 35%				dilatancy; sticks to the fingers and dries slowly; shrinks appreciably on drying usually showing cracks.	* Coarse soil type a † or described as o behaviour			ding on m	ass	Stiff Can be inde thumb. Cruml		nted slightly bles if rolled	
SOILS ally ov				Intermediate and high plasticity clays	EXAMPLES OF CO	SITE TYPE		Very Stiff	Indented Cannot be m	by thumbna			
NE S				show these properties to a moderate and high degree, respectively.	(indicating preferre	r for descri	ption)		Hard	Can be scrate	ched by thumb		
ΕĽ				Containe ver in a amounte of arrania	 Loose brown very s with many pockets 					Firm Peat	nail		
≌	ORGAN			Contains varying amounts of organic vegetable matter - defined by colour:		Firm thinly interlaminated brown SILT and C						essed togethe	
ORGANIC SOILS	SILT SAND	or Varies		grey - slightly organic; dark grey – organic;					Spongy Peat	essible, open			
SO SO	0/110			black – very organic.	Dense light brown	clayey	fine and m	iedium SA	AND.	Plastic Peat	Moulded in h	and, smears Particle	
Structur	e											Nature	
Ferm	Fi	ield Identific	ition		Interval Scales							Particle Shape &	
Homo- geneous	D	eposit consi	sts essentially	v of one type	Scale of Bedding S	spacing	9	Mean Sp (mm)	bacing	Scale of Spac Discontinuities		Form Very angular	
nterbede nterlami	nated in	equal prop		g types. Pre-qualified by thickness term in wise thickness of, and spacing between,		d		over 200	0	Very widely sp large]	baced / [Very	(Sub) angula (Sub) rounde Well rounde	
letero- jeneous	A	mixture of t	rpes		Thickly bedded			2000-60	0	Widely spaced	d / [Large]	Low Spheric	
Veather granula	P P	articles may	be weakened	and may show concentric layering	Medium bedded			600-200		Medium space	ed / [Medium]	Flat or Elongate	
Weather (cohesiv	ed II	sually has c	umb or colum	nnar structure	Thinly bedded			200-60		Closely space	d / [Small]	High	
Fissured	В			polished discontinuities	Very thinly bedded			60-20		Very closely /	[Very small]	Sphericity Cubic	
Sheared			ocks along po	blished discontinuities	Thickly laminated			20-6		Extremely close	sely spaced	Dorticle	
ntact	DI	o fissures lant remains	recognisable	and retain some strength. When	Thinly laminated	als - '	A 110 - 1 4	under 6	h a h u	entinge (==)=(l hada c -	Particle Surface	
Fibrous I Pseudo-	Peat so	queezed onl lant remains	v water, no so recognisable	blids s, strength lost. Partial decomposition.	 Spacing terms may laminae, desiccation used for laminae let 	on crac	ks, rootlets	etc. Ter	ms such a	s partings or du		Texture Rough	
				ed, <50% solids s absent, full decomposition. When		JU UID	and	. 1000 UIdl		opoolivoiy.		Ť	
		queezed onl	paste with >	50% solids					's) rough, s		lating	Smooth	
Amorpho Peat			nlant & anima	al remains, maybe inorganic constituents	 Persistence/Openness) Large scale (m's) was 						Polished		
fibrous P Amorpho Peat Gyttja Humus	D			sms & inorganic constituents in topsoil	Persistence/Openr	iess)	Large s	scale (m's) wavy, cui	rved, straight			

Very Coarse Soils – described by initially removing very coarse materials and describing residue before adding back the very coarse soils. If residue is cohesive then described as '......(COBBLES / BOULDERS) with low (cobble / boulder) content with (some / much etc) matrix of' If residue is granular then described as ' with matrix of ' or as a coarse soil. Cobbles :- <10% - low cobble content; 10 to 20% - medium content; >20% - high content; Boulders <5% - low boulder content; 5 to 20% - medium content; >20% - high content

5 S		Sheet 1 of 3						
S	5	Status		Dra	Draft Ground			
		Depth (Thicknes (m)	ss) Level (m Datur	_{m)} Legen	nd Wate			
AND ı). lar).	(1.00))					
ell ica		- 1.00	-0.15					
		(2.80))					
ium/	um. /	3.80 (0.20) 4.00)					
		(1.00))					
d s (<2 x is fine	(<2 x	- 5.00	-4.15					
Gravel Irse of Ibbles Ineiss.	Gravel rse of bbles	(1.70))					
ainly d ogies.	d aies.	6.70						
d ds of nses and.	ls of ises	7.50						
AND nd is el is e of	nd is el is]						
e of arse.								

Print Date

25/04/2019

Template: FGSL/HBSI/FGSL Combined CP+RC FI.hbt/Config Fugro Rev5/21/02/2019/TS

		Cont	ract Name	Nigg	Ene	gy Pa	ark, E	East (Quay Development	Location ID						
-fua	RO	Clier	nt	Glob	al En	ergy	Nigg	Ltd			Bł	-10	1			
	\approx		o Reference		1005								′∎			
	\sim		dinates (m)	E279					B Ground Elevation (m Datum) 0.85	Sheet 2 Status	of 3	Draf	+			
	Samp		d In Situ Testing			ecove			Strata Details	Status		Diai	Groundw			
Depth (m)	Туре	No.	Test Results	TCR (%)	SCR (%)		FI (-)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill		
			Results	(70)	(70)	(,,,)	(-)		Between 10.00m and 12.50m; sand is fine to coarse. Rare to occasional gravel.							
- 10.50 - 11.00 10.50 - 11.00	D ES	44 43						-		(5.50)						
- 11.00 - 11.50 11.00 - 11.50	D ES	46 45						11 -								
- 11.50 - 12.00 11.50 - 12.00	D ES	48 47						-								
-12.00 - 12.50 12.00 - 12.50	D ES	50 49						12								
- 12.50 - 13.00 12.50 - 13.00	D ES	52 51						-	Between 12.50m and 13.00m; slightly gravelly. Gravel is subangular and subrounded fine and medium of mixed lithologies.							
-13.00 - 13.50	D	53						13	Brown SAND with abundant mica flakes (<2 x 1mm). Sand is fine to coarse.	13.00	-12.15					
- 13.50 - 13.85	D	54						- - - -								
-14.00 - 14.50	D	55						14 —		(2.50)						
14.50 - 15.00	D	56														
-15.00 - 15.50	D	57						15 —								
15.50 - 16.00	D	58						-	Brown slightly gravelly SAND with frequent mica flakes (<2 x 1mm). Sand is medium and coarse. Gravel is subangular and subrounded	15.50	-14.65					
-16.00 - 16.50	D	59						16	fine to coarse of mixed lithologies. Below 16.00m; gravelly.	(1.10)						
16.50 - 17.00	D	60							At 16.50m; 1 No. cobble (90 x 100 x 110mm) of dark grey psammite? Reddish-brown SANDSTONE. Recovered as slightly gravelly sand.	16.60	-15.75	••••				
-17.00 - 17.35	D	61						17 —		(0.75)	-16.50					
17.35 - 17.45 17.45 - 17.75 - 17.35 - 18.85				93	93	93	0 0		Assessed zone of core loss. Extremely weak reddish brown SANDSTONE. Slightly to moderately weathered. Discontinuities not observed. Very weak, medium bedded, locally very thinly to thinly bedded (inclined 20°), reddish-brown	(0.10) 17.45 (0.30) 17.75	-16.60					
17.55 - 10.65				33	55	55		-	locally light greenish grey SANDSTONE. Slightly weathered. With occasional subrounded clasts (<10 x 20mm) of quartz and occasional subangular to subrounded clasts (<20 x 10mm) of very stiff red clay.							
17.75 - 20.35							1	19 — 	Discontinuities - see depth related remarks. Between 17.85m and 17.92m; occasional light greenish grey pockets (<20 x 50mm). At 17.92m; joint, subvertical (80°), undulating,	(2.60)						
18.85 - 20.35				100	100	95			rough, very tight, clean. At 18.11m; bedding plane discontinuity, inclined (20°), planar, rough, very tight, micaceous. Between 18.15m and 18.30m; irregular light greenish grey bed inclined (20°).							
-								-	Continued next page			• • • •				
Notes Abbreviations	and res	sults da	ta defined on 'Note	s on E	xplor	atory I	Positio	on Re	cords'							
		Combined	CP+RC FI.hbt/Config Fu	aro Rev	5/21/02	(2019/T	s			Print Date		25/04/2	2019			

	ract Name	Nigg	Ener	gy P	ark, E											
<u>fua</u>	RO	Clier		Glob			Nigg	Ltd		BH01						
	\approx		o Reference	G19 ⁻												
	\sim		dinates (m)	E279						Shee Statu	t 3 of 3	Dra	F4			
Denth	Samp		Type d In Situ Testing		ore R				otary Coring Strata Details	Statu	5	Dia		ndwater		
Depth (m)	Туре	No.	Test Results	TCR (%)	SCR (%)	RQD (%)	FI (-)	Depth (m)	Strata Descriptions	Dep (Thickr (m	ness) (m Dot		Water Strike	Backfill / Installation		
-									Between 18.85m and 19.25m; thinly laminated. Between 19.04m and 19.10m; light greenish grey				•			
- - - - - 20.35 - 21.85				100	100	100		21 —	irregular lens. Between 19.90m and 20.00m; light reddish grey. At 20.19m; bedding plane discontinuity, inclined (20°), planar, rough, very tight, clean. At 20.27m; bedding plane discontinuity, inclined (20°), planar, rough, very tight, clean. Very weak thickly laminated locally very thinly to thickly bedded, reddish brown locally light grey and light greenish grey, SANDSTONE. Slightly weathered. Discontinuities - see depth related remarks. Between 20.70m and 20.80m; cross bedded.	20.3	35 -19.5		• • • • • • • • • • • • • • • • • • • •			
20.35 - 23.35				100	100	100	1	22	Between 20.95m and 21.12m; occasional pockets (<30 x 50mm) and laminae (<15mm thick) of light greenish grey sandstone. Between 21.45m and 21.57m; cross bedded. Below 21.85m; medium bedded with frequent subangular and subrounded clasts (<6mm) of mixed lithologies. Between 22.55m and 22.65m; angular clast (100 x 80mm) of very stiff red clay. Becoming reddish brown mottled light greenish grey with frequent clay clasts (<10 x 10mm).	(3.0	0)		•			
· · · · ·								23	Between 20.65m and 22.81m; light greenish grey sandstone with frequent subrounded and subangular clasts (<20 x 30mm) of very stiff red clay. At 23.18m; bedding plane discontinuity, inclined (20°), planar, rough, very tight, clean. Between 23.18m and 23.24m; laminae (10 to 15 mm thick) of light greenish grey sandstone. End of Borehole at 23.35 m	23.	35 -22.8		•			
· · · · ·																
- - - - - - - -								26 -								
								27								
								28								
- - - - - - - - -								29 — - - - - - - - - - - - - - - - - - - -								
Notes - Abbreviations	and res	sults da	ta defined on 'Note	s on E	Explora	atory I	Positi	on Re	cords'				<u> </u>			
Template: FGSL/HB	ISI/FGSL (Combined	CP+RC FI.hbt/Config Fu	gro Rev	5/21/02	/2019/T	S			Print Date 25/04/2019						

			Cor	ntract Nam	ne	Nigg E	Energy Pa	rk, East	t Quay	/ Deve	elopment					Locati	on ID		
-6	IGR	n	Clie	ent		Globa	I Energy N	liaa I ta	-							1	RI	HO	1
▏ੂ▋Ĕ				gro Refere	nce	G1910										1	DI	IU	
	\Rightarrow			, ordinates (83.70 N86	58963.5	58 (Groun	d Elevati	on (m l	Datu	m) 0.8	35	Sheet	1 of 2		
			Hol	е Туре		Cable	Percussic	on and I	Rotary	Corir	ng					Status		Draft	
									Equip	ment	1								
Depth From (m)	Depth To (m			Date From	Date To		quipment	Core Ba	rrel	Core Bit	Drilling C			Remarks					
0.00 10.00 17.35	10.00 17.35 23.35	C	;Р ;Р ;С	03/03/2019 04/03/2019 04/03/2019	04/03/2019 04/03/2019 04/03/2019	Da	ando 2000 ando 2000 acchio MC-S 1200	Terracor Geobo			JS/AC JL/SN JS/AC	1	BK BK BK						
				Progre	SS							Rotary	/ Det	ails				Core D	etails
Date (dd/mm/yyyy) (hh:mn	e h:ss)	Hole De (m)	0		th Weathe	er		Depth From (m)	Depth (m)	r.	л Туре			lush Colo	ur Run T (hh:m		n Depth To	Diameter (mm)
03/03/2019 04/03/2019 04/03/2019 04/03/2019 04/03/2019	0 0.00:00: 0.50 0.50 3.30 Dry 0 0.03:00: 1.00 0.50 3.30 Dry 0 01:00:00 1.50 0.50 3.50 Dry 0 01:30:00 2.00 0.50 3.50 3.50 0 02:00:00 2.50 0.50 3.70 3.70				0.00 17.35 18.85 20.35 21.85	17.35 18.85 20.35 21.85 23.35	5	W W W W W		0 100 100 100 100	Red Red Red Red	00:10 00:15 00:15 00:12	15 18.8 15 20.3	5 20.35 5 21.85	102 102 102 102				
04/03/2018 04/03/2018	0 02:30 0 02:30 0 03:20 0 03:20 0 03:40 0 03:40 0 04:40 0 04:40 0 04:40 0 04:40 0 05:00 0 06:20 0 06:20 0 06:20 0 06:20 0 06:40 0 06:20 0 06:40 0 06:20 0 06:40 0 08:40 0 08:41 0 11:35 11:246 15:10 15:10 15:10 16:50 16:50 00 00 00 00 00 00 00 35	:00 :00 :00 :00 :00 :00 :00 :00 :00 :00	3.000/3.000 4.505/5.000 5.500/5.500 5.500/5.500 6.500/7.500 8.000/7.50 8.000/7.50 8.000/7.50 8.000/7.50 8.000/7.50 8.000/7.50 8.000/7.50 8.000/7.50 8.000/7.50 8.500/7.500 10.000/7.500 11.500/7.500/7.500 11.500/7.	0 0.50 0 0.50 0 0.50 0 5.00 0 11.50 0 12.50 0 12.50 0 12.50 0 13.00 13.00 Hole and (tetr (mm) 0 0 5 5 6 0 0 0 0 0 0 0 0 0 0 0 0 0	3.70 3.80 4.10 5.50 5.50 5.50 5.50 5.50 5.50 5.50 5.50 5.50 5.20 5.00 5.00 5.00 1.30 5.00 1.30 1.30 1.30 1.30 1.70 1.30 1.73 1.70 1.70 1.73 1.70 1.73 1.70 1.73 1.70 1.73 1.70 1.73 1.75 1.70 1.75 1	ess	Casing Diamo 200 200 174 200 175 175 175 175												
		W	/ater	Strike			Water A	dded											
Strike At (m)	Rise To (m) Time (r	Elapsed mins)	Casing Depth	(m) Depth S	Sealed (m)	Depth From (m)	Depth To (m)											
								_											
		Wa	ter S	trike Rema	arks				ı	1		G	Sene	ral Ren	narks				1
Groundwate	r not obser	ved in m	narine e	environment.			leve	l was main	tained at	or above	er water from e seabed leve prehole condu	I. All depth	hs and	depth relation	ted remarl				
			stalla		•				Pi	·							Backfill		
Туре	ID	Res	sponse Z Top (m)	Zone Response Z Base (m	Zone I) Installati	on Date	ID Top	Depth (m)	Base Dep	oth (m) D	liameter (mm)	Туре		Depth From (0.00		To (m)	Backfill I Bent		Date
														0.00	23	1.35	Bent	n 1110	05/03/2019
Notes					1														
	ations ar	nd res	ults d	ata defined	on 'Note	s on Ex	ploratory P	osition F	Records	6'									
Checked By		1	NHA			E	levation Datum		Chart	Datum			0	Grid Coordi	nate Syste	em O	SGB		
Template: F	GSL/HBSI/	FGSL B	H Sum	mary.hbt/Config	g Fugro Rev	5/12/03/20	19/TS		1				1			Print Date	9	25/04/20	19

	Contract Name Nigg Energy Park, East Quay Development														Loca	tion I	D				
_FG	JGR		Clie	ent		Globa	I Fnerav	/ Nigg Lto	4			-						F	2 🏻	10	1
	$ \rightarrow $			gro Refer	ence	G191		- 661	<u>.</u>											IV	
	=			ordinates				1868963.	58	Grou	ind E	Elevation	(m Da	atur	n) 0.8	35	Shee	et 2 of	f 2		
				le Type				sion and							,		Statu			Draft	
									Equi	pmei	nt										
Depth From (m)	Depth To (n	n) Hol	е Туре	Date From	Date To	E	Equipment	Core Ba	arrel	Core B	Bit	Drilling Crew	Logge	d By	Remarks						
				ĺ																	
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				<u> </u>					$-\perp$												
Date	Tin	10	Hole De		ress epth Water Dep	th			Depth	Dept	th To		otary [Run	n Time	Depth	Depth To	
(dd/mm/yyyy 04/03/2019	y) (hh:mi	m:ss)	(m) 16.5) (m)	(m)	^{oth} Weath	.er		From (m	n) (m	n)	Flush Ty	pe	((%) F	Iush Colou	ir (hh	:mm)	From (m)	(m)	Diameter (mm)
04/03/2019	9 17:48	8:00	17.0	00 17.35	5 5.50																
04/03/2019			17.3		recognis	эd															
04/03/2019			18.8		recognis	эd															
04/03/2019	recogni				recognis	эd															
04/03/2019	recognis				эd																
05/03/2019			23.3		recognis	эd															
	03/2019 00:00:00 23.35 17.35 Not recognised				эd																
Hole and Casing																					
Depth	To (m)	Ho		neter (mm)	Depth To	(m)	Casing Dia	ameter (mm)	1												
					17.3	;	1	146	1												
			Chise	elling / Sl	ow Progr	ess	•		1												
Depth F	From (m)		Depth	To (m)	Duration (h	h:mm)	Tool /	Remark													
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		T	Vater le Elapsed	Strike			Water Depth From	r Added	-												
Strike At (m)	Rise To (n	n) '''''	(mins)	Casing Dep	th (m) Depth	Sealed (m)	(m)	Depth To (m)	-												
		144	- +				<u> </u>			_			0.								
Groundwate	er not obsei			Strike Ren environment.	narks			The borehole	was carr	ied out	over v	vater from iac			al Ren		udline =	5 50m	· deck lev	el = 6.35n	n CD. Water
Croundwate		vou in	manne	environment.			le	evel was mair Groundwater r	ntained a	at or abo	ove se	abed level. Al	ll depths	and o	depth rela	ted remarks					
								, our and the second	101 00000	i ou uo	50101		a in man								
		h	nstalla	ation					P	ipe								Back	fill		
Туре	ID		esponse	Zone Response	e Zone Installa	tion Date	ID .	Top Depth (m)	Base De	· 1	Diam	eter (mm)	Туре	De	epth From (m) Depth 1			ackfill Mat	terial	Date
			Top (m	n) Base	(m)				-								. ,				
Notes	tes																				
- Abbrevi	breviations and results data defined on 'Notes on Exploratory Position Records'																				
Checked By	y		NHA			E	Elevation Date	um	Char	rt Datum	n			G	rid Coordi	inate Syster	m	OSGB			
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		Con	tract Name	Nigg	Energy Park, East Quay Development	Locati	on ID			
-fua	RO	Clie	nt	Glob	al Energy Nigg Ltd	_	Rł	HO	2	
	\approx	Fug	ro Reference	G19	1005U			10		
	\gtrsim	_	rdinates (m)	-	0342.91 N868934.75 Ground Elevation (m Datum) -9.10		1 of 1			
		Hole	е Туре	Cabl	e Percussion	Status	;	Draf	t T	
Samp	ling an	d In Si	tu Testing		Strata Details				Grour	ndwate
Depth (m)	Туре	No.	Test Results	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill Installatio
0.00 - 0.50 0.00 - 0.50	D ES	2 1		-	Dark brownish grey SAND with rare pockets (<100 x 30 x 30mm) of very soft dark grey sandy clay and rare shell fragments (<5 x 10mm). Sand is fine to coarse.	(0.50)	0.00			
0.50 - 1.00 0.50 - 1.00	D ES	4 3		-	Dark greenish grey SAND with occasional pockets (<30 x 50mm) of very soft dark grey sandy clay and occasional shell fragments (<1 x 1mm).	0.50	-9.60			
1.00 - 1.50	ES	5		1-						
1.20 - 1.30	D	6		-	Between 1.20m and 1.30m; very soft dark grey sandy clay. Sand is fine to coarse. Slight organic odour.	(1.70)				
1.50 - 2.00 1.50 - 2.00	D ES	8 7		-						
				2 -						
2.20 - 2.50	D	10		-	Soft dark brownish grey sandy CLAY with abundant mica flakes	2.20	-11.30			
2.20 - 2.50 2.50 - 3.00	ES D	9 12			(<1 x 1mm) and sulphureous odour. Sand is predominantly fine and medium.					
2.50 - 3.00	ES	11		-	Between 2.50m and 3.00m; 1 No. decomposing wood fragment (15 x			<u> </u>		
0.00 0.50				-	50mm).	(1.30)				
3.00 - 3.50 3.00 - 3.50	D ES	14 13		3-						
				-						
3.50 - 4.00 3.50 - 4.00	D ES	16 15		-	Soft dark grey slightly gravelly sandy CLAY with abundant mica	3.50	-12.60			
					flakes, sulphureous odour and 1 No. wood fragment (80 x 60 x 50mm).	(0.50)				
4.00 - 4.50	D	17		4 -	Greyish brown slightly gravelly SAND with low cobble content, and	4.00	-13.10			
					abundant mica flakes(<1 x 1mm). Sand is fine to coarse. Gravel is subangular and subrounded mainly medium and coarse of mixed	(0.50)				
4.50 - 5.00	D	18		-	lithologies. Cobbles (<80 x 60 x 80mm) are subangular possibly of	4.50	-13.60			
				-	\gneiss. Greyish brown SAND with abundant mica flakes (<2 x 1mm). Sand					
5.00 - 5.50	D	19		5-	is fine to coarse.					
0.00 0.00		10		-	Between 5.00m and 6.00m; with occasional gravel. Gravel is subangular and subrounded fine to coarse of mixed lithologies (gneiss, pegmatite					
	_			-	and sandstone).					
5.50 - 6.00	D	20		-						
				-						
6.00 - 6.50	D	21		6 -	Between 6.00m and 8.00m; with rare to occasional gravel. Gravel is					
					subangular and subrounded fine to coarse of mixed lithologies.	(3.50)				
6.50 - 7.00	D	22		-						
				-						
7.00 - 7.50	D	23		7						
7.50 - 8.00	D	24		-						
00 - 0.00		27								
o oo										
8.00 - 8.50	D	25		8-	Greyish brown slightly gravelly SAND with abundant mica flakes	8.00	-17.10			
				-	(<2 x 1mm). Sand is fine to coarse. Gravel is subangular and subrounded fine to coarse of mixed lithologies, predominantly grey	(0.70)				
8.50 - 9.00	D	26		-	and red sandstone.					
				-	Probably red, grey and reddish brown SANDSTONE. Recovered	8.70	-17.80			
9.00 - 9.40	D	27		9	as gravelly sand. At 8.90 m; 1 No. cobble (120 x 80 x 60mm) sized fragments.	(0.70)				
				-						
				-	End of Borehole at 9.40 m	9.40	-18.50			
				-						
				-						
otes	_									
Abbreviations	s and res	sults da	ita defined on 'No	tes on E	Exploratory Position Records'					
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			Cor	ntract Nar	ne	Nigg	Energy F	Park, Eas	st Qu	ay De	velop	oment				Loc	ation	ID		
- fi u	IGR	0	Clie	ent		Globa	al Enera	/ Nigg Lto	d							_	F	3H	IN ¹	2
	-~			ro Refere	nce	G191	•••												IV.	
	\Rightarrow			, ordinates				868934.	75	Grou	und E	levation	(m Dat	tum)	-9.10	She	eet 1 c	of 1		
				е Туре			Percus							,		Sta	tus		Draft	
									Equ	iipme	nt									
(11)	Depth To (m		е Туре	Date From	Date To		Equipment	Core Ba	arrel	Core E	Bit	Drilling Crew	Logged		emarks					
0.00	9.40		CP	02/03/2019	03/03/201	9 0	ando 2000					JS/AC	BK/RL	•						
				Progre								Ro	tary D						Core Do	1
Date (dd/mm/yyyy)		n:ss)	(m)	pth Casing Dep (m)	(m)	weau	her		Dept From	th Dep (m) (r	oth To m)	Flush Typ	pe F	lush Re (%)	Flush Co	lour (Run Time (hh:mm)	Depth From (m)	Depth To (m)	Diameter (mm
02/03/2019 02/03/2019	20:00	0:00	0.00	1.00	2.30	Dry														
02/03/2019 02/03/2019	20:50	0:00	1.00	2.00	2.20															
02/03/2019	21:30	0:00	2.00	3.00	2.10															
02/03/2019 02/03/2019	21:55	5:00	3.00 3.50	4.00	2.00															
02/03/2019 02/03/2019	22:15	5:00	4.00 4.50	4.00	1.80															
02/03/2019 02/03/2019	22:30	0:00	5.00 5.50	4.00	1.60 1.50															
03/03/2019 03/03/2019	15:38	3:00	6.00 6.50	7.00	4.00															
03/03/2019 03/03/2019) 16:05) 16:20	5:00):00	7.00 7.50	7.50 8.00	4.00 4.00															
03/03/2019 03/03/2019	16:39	9:00	8.00 8.50	8.50	4.00 4.00															
03/03/2019			9.00		4.00															
				Hole and	Casing															
Depth		Ho		eter (mm)	Depth To		-	ameter (mm)	1											
6.0 9.4			22 22		4.00 9.40			200 200	1											
			Chise	elling / Slo	w Progr	ess														
Depth Fi	rom (m)		Depth 1	Го (m)	Duration (I	nh:mm)	Tool /	Remark												
		۲.	Vater	Strike			Water	r Added												
Strike At (m)	Rise To (m	1) Time	e Elapsed (mins)	Casing Depth	(m) Depth	Sealed (m)	Depth From (m)	Depth To (m)	1											
			/	1					1											
		Wa	ater S	trike Rem	arks		·	1		1			Gen	eral	Remarks	1		1	1	1
roundwater	r not obser			nvironment.									-up platfo	rm Sk	ate 3A. Deck to					
								evel was main Groundwater							oth related rem conment.	arks refe	r to depth	ns below s	eabed lev	ei.
		lr	nstalla	ation					F	Pipe				1			Bac	kfill		
Туре	ID			one Response	Zone Installa	tion Date	ID	Top Depth (m)	1	Depth (m)	Diame	ter (mm)	Туре	Depti	n From (m) Dep	th To (m	-	Backfill Mat	erial	Date
				- Jase (1	,									1	0.00	9.40		Bentonit	e	03/03/2019
														1						
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Votes				1	I	(1		1	I		1	I		1			1
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							,													
hecked By			NHA			E	Elevation Dat	tum	Ch	art Datur	m			Grid	Coordinate Sy	stem	OSGB	;		
				mary.hbt/Confi	g Fuaro Rev					-				<u> </u>	.,		Date		25/04/20	19
			- 4070	,																-

		Cont	tract Name	Nigg	Ene	rgy Pa	ark, E	East C	Quay Development	Location				
<u>-fua</u>	RO	Clier				ergy	Nigg	Ltd			Bł	40	3	
	\approx		o Reference	G19 ⁻										
	\sim		rdinates (m) Type					20.31 nd Ro	Ground Elevation (m Datum) -0.75	Sheet 1 Status	of 3	Draf		
	-								, ,	Otatus		Dian		
Depth (m)	Samp	-	d In Situ Testing Test			RQD	FI	Depth	Strata Details	Depth			Grour	ndwate Backfill
0.00 - 0.50	Type D	No.	Results	(%)	(%)	(%)	(-)	(m)	Strata Descriptions Loose dark brownish grey SAND with frequent	(Thickness) (m)	Level (m Datum)	Legend	Strike	Installatio
0.00 - 0.50	ES	1						-	shells and shell fragments (<10 x 30mm).					
0.50 - 1.00 0.50 - 1.00 0.50 - 1.00 0.50 - 0.95 - 1.00 - 1.50	B D ES SPT D	5 4 3 7	N = 9 (S)						Below 0.50m; slightly gravelly. Gravel is subangular to rounded fine to coarse of mixed lithologies.	(1.00)	-1.75			
1.00 - 1.50 1.50 - 2.00 1.50 - 2.00	ES B ES	, 6 9 8							Dense dark grey slightly gravelly, becoming gravelly, with depth, SAND with occasional wood and possible reed fragments (<10 x 10mm). Sand is fine to coarse. Gravel is subangular and subrounded fine to coarse of					
- 2.00 - 2.45 2.00 - 2.50	D ES	10 11						2-	mixed lithologies. Below 2.00m; sand is predominantly medium and	(2.00)				
2.00 - 2.45 2.50 - 3.00 2.50 - 3.00	SPT B ES	13 12	N = 31 (S)					-	coarse.					
- 3.00 - 3.50 3.00 - 3.50	D ES	15 14						3-	Medium dense dark grey gravelly SAND with abundant to frequent shells and shell fragments (<20 x 30mm). Sand is fine to coarse. Gravel	3.00	-3.75			
3.50 - 4.00 3.50 - 4.00	B ES	17 16						-	subangular to rounded fine to coarse of mixed lithologies. At 3.50m; 1 No. subrounded cobble of dark grey possible psammite (<70 x 70 x 70mm).					
- 4.00 - 4.45 4.00 - 4.50 4.00 - 4.45	D ES SPT	18 19	N = 17 (S)					4	Below 4.00m; slightly gravelly. Gravel is subangular and subrounded fine to coarse of mixed lithologies.	(2.00)				
4.50 - 5.00 4.50 - 5.00	B ES D	21 20 24								5.00	-5.75			
5.00 - 5.29 5.00 - 5.50 5.00 - 5.50 5.50 - 6.00	D D ES B	24 23 22 26						5	Dark brownish grey sandy GRAVEL. Sand is fine to coarse. Gravel is subangular and subrounded fine to coarse of mixed lithologies.	(0.74)	-5.75			
5.50 - 6.00 5.50 - 5.79 - 6.00 - 6.50	ES SPT D	25 28	50/140 mm (S)					6	Very dense brown SAND. Sand is fine to coarse.	5.74	-6.49			
6.00 - 6.50 6.50 - 7.00	ES B	27 30						-	Firm and stiff slightly gravelly sandy CLAY.	(0.76)	-7.25			
6.50 - 7.00 - 7.00 - 7.45 7.00 - 7.50	ES D ES	29 31 32						7-	Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of mixed lithologies. Below 6.50m; with occasional pockets or lenses of brown sandy clay (<80 x 80 x 100mm) and occasional angular to subrounded fine and	(0.79)				
7.00 - 7.45 7.50 - 8.00 7.50 - 8.00	SPT B ES	34 33	N = 37 (S)					-	medium gravel of mixed lithologies. Dense brown silty SAND with occasional lenses or bands (<100mm thick) of brown stiff clay. Sand is fine to coarse.	7.29 (0.71)	-8.04	× × × × ×		
- 8.00 - 8.50 8.00 - 8.50	D ES	36 35						8-	Very dense brown gravelly SAND with frequent mica flakes (<2 x 2mm). Sand is fine to coarse.	8.00	-8.75	× × × × ×		
8.50 - 9.00 8.50 - 9.00	B ES	38 37							Gravel is subangular and subrounded fine to coarse of pelite and sandstone. Between 8.00m and 9.00m; rare subrounded cobbles (<100 x 100 x 120mm) of pelite.					
9.00 - 9.33 9.00 - 9.50 9.00 - 9.33 9.50 - 10.00 9.50 - 10.00	D ES SPT B ES	39 40 42 41	50/180 mm (S)					9	Between 9.00m and 9.50m; occasional lenses or bands of stiff brown slightly gravelly slightly sandy clay. Sand is fine to coarse, gravel is subangular and subrounded of pegmatite. Below 9.50m; occasional subangular and subrounded fine and medium gravel of mixed	(2.00)				
-10.00 - 10.50	D	44 43						-	lithologies.	10.00	-10.75			

Template: FGSL/HBSI/FGSL Combined CP+RC FI.hbt/Config Fugro Rev5/21/02/2019/TS

25/04/2019

- Tugi	RO	Clier		Glob	al En	ergy			Quay Development	Locatior		-10	3
	\sim		o Reference rdinates (m)		1005 9380.		8689	20.31	Ground Elevation (m Datum) -0.75	Sheet 2	of 3		
		Hole	Туре	Cabl	e Pei	cuss	ion a	nd Ro	otary Coring	Status		Draf	t
Depth	Samp	ling an	id In Situ Testing	Co	ore R	ecove	ery		Strata Details				Groundw
(m)	Туре	No.	Test Results	TCR (%)	SCR (%)	RQD (%)	FI (-)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Bao Strike Insta
10.50 - 11.00 10.50 - 11.00	B ES	46 45						-	Dense reddish-brown, locally slightly gravelly SAND with frequent mica flakes (<2 x 2mm). Sand is fine to coarse. Gravel is subangular and subrounded fine and medium of mixed lithologies including pelite, quartzite and sandstone.				
- 11.00 - 11.45 11.00	D SPT	47						11 — - -					
11.50 - 12.00	В	48						-					
-12.00 - 12.50	D	49								(4.60)			
12.50 - 13.00	B	50 51						- - - - 13					
13.00 - 13.45 13.50 - 14.00	SPT B	52	N = 33 (S)										
13.70 - 13.75 14.00 - 14.50	D D	53 54						- - - 14 —	Between 13.70m and 13.75m; band or lens (<50 mm thick) of very stiff dark brown organic silt.				
14.50 - 15.00	в	55											
15.00 - 15.25 15.00 - 15.26	D SPT	56	50/105 mm (S)					- - - 15 — -	Very dense brown slightly gravelly, locally gravelly, SAND with high cobble content and frequent mica flakes (<2 x 2mm). Sand is fine to coarse, gravel is subangular and subrounded fine to coarse of pelite, quartzite and	— 14.60	-15.35		
15.50 - 16.00	В	57							sandstone. Cobbles (<150 x 120 x 120mm) are of pelite, quartzite and sandstone.	(1.60)			
16.20 - 16.50	D	58						16	Brown SAND with frequent mica flakes (1 x 1mm). Sand is predominantly fine and medium.	— 16.20 (0.55)	-16.95		
16.75 - 16.85 17.00 - 17.18	D SPT	59	50/30 mm (S)					- - - 17	Extremely weak locally very weak reddish brown SANDSTONE. Slightly to moderately weathered. Discontinuities not observed.	- 16.75	-17.50		- - - -
17.25 17.00 - 17.65 17.00 - 18.00	D	60		65	65	65	0		Between 17.25m and 17.30m; light grey. Between 17.25m and 17.40m; very weak.	(1.35)			•
17.65 - 18.10							NR	- - - 18	Between 17.65m and 18.10m; assessed zone of core loss.	18.10	-18.85		• • • •
18.00 - 19.50 18.10 - 19.50				93	93	93	1		Extremely weak thickly laminated to thinly bedded (inclined 20°), reddish brown SANDSTONE. Slightly to moderately weathered. With rare clasts (<10 x 15mm) of dark grey igneous? rock. Discontinuities. See depth related remarks.	(1.40)			- - - - - - -
-								19 — - - -	At 19.13m; joint, inclined (40°), planar, rough, very tight, clean.				• • • •
									Weak, locally thinly bedded to thickly laminated (inclined 10 to 20°), reddish-brown SANDSTONE locally grading into sandstone Continued next page	19.50	-20.25		- - - -
lotes Abbreviations	and res	sults da	ta defined on 'Note	s on E	Explor	atory I	Positi	on Re			<u> </u>	<u> </u>	<u> </u>

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Image: Network in the set of a set	JUG	RO						Nigg	Ltd			Вł	10	13	
Index Type Cately Percension and Rotary Coring Status Draft Dephy (m) Sampling and in Stu Testing Core Recovery Status Details Corevalues 18:0 - 21:0 No Transmitting and in Stu Testing Core Recovery Status Details Transmitting and in Stu Testing Core Recovery Status Details Transmitting and in Stu Testing Core Recovery Status Details Transmitting and in Stu Testing Core Recovery Status Details Transmitting and in Stu Testing Core Recovery Status Details Transmitting and in Stu Testing Core Recovery Status Details Transmitting and in Stu Testing Core Recovery Status Details Transmitting and in Stu Testing Core Recovery Status Details Transmitting and in Stu Testing Transmitestin Stu Testing Transmitting and in								0600	20.21	Ground Elevation (m Datum) 0.75					
Bamping and in Situ Testing Core Records Stata Descriptions State Descripions State Descriptions State												, 0, 0	Draf	t	
Type No. Results (%) (%	Depth	Samp												Ground	water
19:00. 21:00 100	(m)	Туре	No.			SCR (%)					(Thickness				
210 - 22 do 100 96 96 100 100 100 100 100 100 100 100 100 100 100 100 100 100 100 100 100 100	-				100	100	100	1	21 —	Between 19.50m and 19.60m; sandstone conglomerate. Clasts are rounded (<30 x 20mm). Between 19.65m and 19.70m; sandstone conglomerate. Clasts are subrounded and rounded (<10 x 10mm). Between 20.10m and 20.48m; light grey sandstone conglomerate. Clasts are subangular and subrounded (<30 x 20mm). Between 20.52m and 20.55 m; occasional flat clasts (60 x 5 mm inclined 30°) of reddish brown siltstone.	(3.00)				
Notes	 22.12 - 22.18				100	96	96			subrounded to subangular clasts (<10 x 20mm). Between 21.26m and 21.37m; greenish grey sandstone. Between 22.12m and 22.18m; non intact, recovered as fragments, possibly drilling affected, possibly extremely weak, very closely fractured. Between 22.35m and 22.41m; greenish grey coarse grained with occasional subangular clasts. Between 22.42m and 22.50m; extremely weak.	22.50	-23.25			
Notes															
Notes															
Notes	- - - - - - - - -								27						
Notes															
									29						
	Notes - Abbreviations	and res	sults da	ta defined on 'Note	s on E	xplora	atory	Positi	on Re	cords'	·		·	<u> </u>	
Template: FGSL/HBSI/FGSL Combined CP+RC FI.hbt/Config Fugro Rev5/21/02/2019/TS Print Date 25/04/2019	Template: FGSL/HB	SI/FGSL	Combined	CP+RC FI.hbt/Config Fu	gro Rev	5/21/02	/2019/T	s			Print Date		25/04/	2019	

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Pigge Reference Citized interview New 1 or 2 New 1 or 2 Coordination (m) Status Orall	-6	C		Clie	nt		Globa		/ Niga Li	łd							-			2
Contraster (m) E27830 8.33 NB80202.31 Grunde Elevation (m) But 1 of 2 List yp Cable Pencasion and Rotary Coords Status Orall Normality 1 and the interval of the interv	₌⊨					nce				lu							-	D	IU	5
Lines Cache Procession and Boary Coring Status Oral 100 Transmission and Ready Coring Equipment Equipment <t< td=""><td></td><td>\equiv</td><td></td><td></td><td></td><td></td><td></td><td></td><td>1868920</td><td>31</td><td>Gro</td><td>ound</td><td>Flevation</td><td>(m Dat</td><td>tum) -(</td><td>) 75</td><td>Sheet</td><td>1 of 2</td><td></td><td></td></t<>		\equiv							1868920	31	Gro	ound	Flevation	(m Dat	tum) -() 75	Sheet	1 of 2		
Barton III har Tow String Bart Tow String						()				-				(in Ba					Draf	t
Nime Nime <th< td=""><td></td><td></td><td></td><td></td><td>71</td><td></td><td>-</td><td></td><td></td><td>-</td><td></td><td></td><td>,</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></th<>					71		-			-			,							
State Table Open State of the state	Depth From	Depth To (r	m) Hol	е Туре	Date From	Date To	E	Equipment	Core E	<u>'</u>			Drilling Crew	Logged I	By Remark	ks				
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Name: 1 Name: 1 <t< td=""><td>(dd/mm/yyyy)</td><td>) (hh:m</td><td>nm:ss)</td><td>(m)</td><td>(m)</td><td>(m)</td><td>Weath</td><td>ier</td><td></td><td></td><td></td><td></td><td></td><td>pe F</td><td>(%)</td><td></td><td>ur (hh:r</td><td>nm) From</td><td>(m) Depth (m) (m)</td><td>Diameter (mm</td></t<>	(dd/mm/yyyy)) (hh:m	nm:ss)	(m)	(m)	(m)	Weath	ier						pe F	(%)		ur (hh:r	nm) From	(m) Depth (m) (m)	Diameter (mm
Depth From (m) Depth To (m) Duration (hh.mm) Tool / Remark 5.50 9.00 01.00 01.00 01.00 water Strike Water Strike Water Added mm Ar (m) Rise To (m) Depth (m) Depth (m) Depth from Depth from Water Strike Water Strike Remarks General Remarks Environment. Water Strike Remarks The borehole was carried out over water from jack-up platform State 3A. Deck to multime = 6.90m; deck level = 6.15m; CD. Water Strike Remarks metric to depths below seabed level. Troundwater not observed in marine environment. The borehole was carried out over water from jack-up platform State 3A. Deck to multime = 6.90m; deck level = 6.15m; CD. Water Strike Remarks metric to depths below seabed level. Troundwater not observed in marine environment. The borehole was carried out over water from jack-up platform State 3A. Deck to multime = 6.90m; deck level = 6.15m; CD. Water Groundwater not observed in marine environment. Base (m) Installation Pipe Base (m) Base (m) Base (m) Type ID Response (m) Base (m) Base (m) Base (m) Base (m) Strike Strike Remarks ID Top Depth (m) Base (m) Base (m) Based (m) Strike	08/03/2015 09/03/2015 09/03/	a) 13:4 b) 14:0 b) 14:3 b) 14:3 b) 14:4 b) 14:5 b) 14:5 b) 15:1 b) 15:1 c) 15:5 c) 15:5 c) 15:5 c) 15:3 c) 15:4 c) 15:5 c) 17:4 c) 18:3 c) 21:5 c) 22:4 c) 22:5 c) 23:2 c) 23:2 c) 23:2 c) 00:0 c)	9:00 0:00	1.000 2:500	1.50 2.00 2.50 3.00 3.50 4.40 4.45 5.00 6.50 6.50 6.50 7.00 7.50 8.00 8.50 9.00 9.50 9.00 9.11.50 11.50 11.50 11.50 11.50 11.50 11.50 11.50 11.50 11.50 11.50 11.50 11.50 11.50	1.90 2.00 2.20 2.20 2.20 2.20 2.20 2.20 2)		220 220 220 146	18. 19. 21.	00 50	19.50 21.00	w w		100 100	Red Red	00:	07 19.5	50 21.00) 102
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The borehole was carried out over water from jack-up platform Skate 3A. Deck to mudline = 6.90m; deck level = 6.15m CD. Water level was maintained at or above seabed level. All depths and depth related remarks refer to depths below seabed level. Croundwater not observed as borehole conducted in marine environment. Type ID Response Zone Response Zone Back fill Depth (m) Base Depth (m) Diameter (mm) Type Depth Trom (m) Depth Trom (m) Backfill Date 09/03/20 Iotes Abbreviations and results data defined on 'Notes on Exploratory Position Records' Elevation Datum Chart Datum Grid Coordinate System OSGB	Suike AL (III)	ruse io (i		(mins)	Casing Depir	r(m) Depin	sealed (m)	(m)	(m)											
The borehole was carried out over water from jack-up platform Skate 3A. Deck to mudline = 6.90m; deck level = 6.15m CD. Water level was maintained at or above seabed level. All depths and depth related remarks refer to depths below seabed level. Croundwater not observed as borehole conducted in marine environment. Type ID Response Zone Response Zone Back fill Depth (m) Base Depth (m) Diameter (mm) Type Depth Trom (m) Depth Trom (m) Backfill Date 09/03/20 Iotes Abbreviations and results data defined on 'Notes on Exploratory Position Records' Elevation Datum Chart Datum Grid Coordinate System OSGB			1.4/	ator O	trike Barr	orka		<u> </u>						0.00	orel D-	morke				
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	r								Equip	omen	nt										
Depth From (m)	Depth To (m)	Hole 1	Туре	Date From	Date To	E	quipment	Core Ba	arrel	Core Bi	t Dr	rilling Crew	Logged	d By	Remarks						
				Progre	266							Po	l tary D	Dota	vile					Core De	ataile
Date	Time	ŀ	Hole Dep	pth Casing De	pth Water Depth	Weath	er		Depth	Depth	n To	Flush Typ	-	Flush	Return	lush Colou	Ir Ru	n Time	Depth	Depth To	Diameter (mm)
(dd/mm/yyyy 09/03/2019	9 02:30:	00	(m) 15.00		(m) 2.40	Weath	51		From (m) (m))	r idon ry		(%)	10311 00100	4" (hl	h:mm)	From (m)	(m)	Bilaniotor (min)
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09/03/2019 09/03/2019	9 04:30:	00	16.50	17.00	3.30 3.80																
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Strike At (m)	Rise To (m)	Time E (m	Elapsed iins)	Casing Dept	h (m) Depth Se	ealed (m)	Depth From (m)	n Depth To (m)													
				trike Rem	arks										al Rem						
Groundwate	r not observ	ed in ma	arine e	nvironment.			i	The borehole evel was mair	ntained at	t or abov	ve seab	oed level. All	depths	and d	lepth relat	ted remark					
							1	Groundwater i	not obser	ved as t	borehole	e conducted	l in mariı	ne en	vironmen	t.					
		lu a		4														Deal			
Туре	ID	Resp	stalla	one Response	Zone Installatio	n Data	ID	Top Depth (m)	PI Base De	pe	Diamete	or (mm)	Туре	Do	pth From (m) Depth	To (m)	Back	ackfill Mat	orial	Date
Type			Top (m)	Base (r	n)	in Date		Top Deptit (iii)	Dase De	pur (iii)	Diamete		туре		,pur rom (i	iii) Depui	10 (11)			enai	Date
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		Con	tract Name	Nigg	Energy Park, East Quay Development	Locati	טו ווכ			
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	\approx		ro Reference		1005U				•	
	\sim		rdinates (m) e Type		9380.77 N868871.12 Ground Elevation (m Datum) -2.02	Sheet Status	1 of 3	Draf	t	
Samp	ling and		tu Testing	Cab	Strata Details	Otatus		Diai	Ground	dwate
Depth	Туре	No.	Test Results	Depth (m)	Strata Descriptions	Depth (Thickness)	Level (m Datum)	Legend	Water Strike	Backfill
(m) 0.00 - 0.50 0.00 - 0.50	B ES	2 1			Medium dense dark brownish grey slightly gravelly to gravelly SAND. Sand is fine to coarse. Gravel is subrounded and rounded fine and medium of mixed lithologies (sandstone, pelite, granite,	(m)				
0.50 - 0.95 0.50 - 1.00 0.50	D ES SPT	3 4		-	quartite, diorite and pegmatite). With frequent possible black wood fragments (<5 x 5 mm), frequent mica flakes (<2 x 2 mm) and occasional shell fragments (<2 x 1 mm).					
1.00 - 1.50 1.00 - 1.50	B ES	6 5		1	Between 1.00m and 1.50 m; with low cobble content. Cobbles (<80 x 60 x 80mm) are subrounded and rounded dark grey possible pelite.	(2.50)				
1.50 - 2.00 1.50 - 2.00	D ES	8 7								
- 2.00 - 2.45 2.00 - 2.50 2.00 - 2.45	D ES SPT	9 10	N = 16 (S)	2-						
2.50 - 3.00 2.50 - 3.00	B ES	11 12		-	Medium dense dark brownish grey slightly gravelly SAND with frequent mica flakes (<2 x 2mm) and black decomposing wood fragments (<5 x 5mm). Sand is predominantly fine and medium.	2.50	-4.52			
3.00 - 3.50 3.00 - 3.50	D ES	13 14		3-	Gravel is subangular and subrounded fine to coarse of mixed lithologies including sandstone.					
3.50 - 4.00 3.50 - 4.00	B ES	16 15		-						
4.00 - 4.45 4.00 - 4.50 4.00 - 4.45 4.50 - 5.00	D ES SPT D	17 18 20	N = 29 (S)	4		(3.70)				
4.50 - 5.00 4.50 - 5.00	D ES B	20 19 22			Between 4.50m and 5.00m; with low cobble content. Cobbles (<100 x 80 x 100 mm) are subrounded of sandstone.					
5.00 - 5.50 5.00 - 5.50 5.50 - 6.00	в ES D	22 21 24								
5.50 - 6.00 6.00 - 6.34	ES D	24 23 25		6-						
6.00 - 6.50 6.00 - 6.34 6.20 - 7.00 6.50 - 7.00	ES SPT B ES	26 27 28	50/190 mm (S)	-	Medium dense brownish grey and black sandy GRAVEL with low, becoming high with depth, cobble content. Sand is fine to coarse. Gravel is subangular to rounded fine to coarse of mixed lithologies. Cobbles (<100 x 100 x 120mm) are subrounded of sandstone and pelite.	6.20	-8.22			
7.00 - 7.50 7.00 - 7.50	D ES	30 29		7	At 7.20m; 2 No. pockets (<30 x 20mm) of very soft greyish brown sandy clay. Sand is fine and medium.	(1.90)		× × × × × × × × ×		
7.50 - 8.00 7.50 - 8.00	B ES	32 31		-				× × × × × × × × ×		
8.00 - 8.20 8.00 - 8.35 8.20 - 8.50 8.35 8.50 - 9.00 8.50 - 9.00	ES SPT D B ES	34 35 33 37 36	50/200 mm (S)	8 — - - - - - - - - - -	Very dense brownish grey gravelly SAND with low to medium cobble content. Sand is fine to coarse. Gravel is subangular to rounded fine to coarse of mixed lithologies. Cobbles (<80 x 100 x 140mm) are subangular and subrounded of mixed lithologies predominantly pelite and psammite.	8.10 (0.40) 8.50	-10.12 -10.52	××		
9.00 - 9.50 9.00 - 9.50	D ES	39 38		9	Dense dark brownish grey slightly sandy GRAVEL with medium to high cobble content. Sand is fine and medium. Gravel is angular and subrounded fine to coarse of mixed lithologies. Sand is fine to coarse. Gravel is subangular and subrounded fine to coarse of mixed lithologies. Cobbles (<100 x 100 x 100mm) are subangular					
9.50 - 10.00 9.50 - 10.00	B ES	41 40		-	mixed lithologies. Cobbles (<100 x 100 x 100mm) are subangular and subrounded of mixed lithologies probably pelite and psammite. With rare shells and shell fragments (<10 x 30mm) and occasional becoming frequent with depth lenses and pockets (<80	(2.10)				
-10.00 - 10.25 10.00 - 10.45	ES D	43 42			Continued next page					
Notes Abbreviations	and res	sults da	ata defined on 'Not	tes on E	Exploratory Position Records'					

		Con	tract Name	Nigg	Energy Park, East Quay Development	Locati	on ID		
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	\gtrsim		rdinates (m)	-	0380.77 N868871.12 Ground Elevation (m Datum) -2.02	Sheet	2 of 3		
		Hole	е Туре	Cabl	e Percussion	Status		Draf	t
Samp	ling an	d In Si	tu Testing		Strata Details		1	1	Groundwa
Depth (m)	Туре	No.	Test Results	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Back Strike Install
_ 10.00 - 10.45 _ 10.50 - 11.00	SPT B	44	N = 42 (S)		Dense dark brownish grey slightly sandy GRAVEL with medium to high cobble content. Sand is fine and medium. Gravel is angular and subrounded fine to coarse of mixed lithologies. Sand is fine to coarse. Gravel is subangular and subrounded fine to coarse of mixed lithologies. Cobbles (<100 x 100 x 100mm) are subangular and subrounded of mixed lithologies probably pelite and	10.60	-12.62		
	D	45		11	psammite. With rare shells and shell fragments (<10 x 30mm) and occasional becoming frequent with depth lenses and pockets (<80 x 100 x 120mm) of soft brown slightly gravelly sandy clay. Very dense brown slightly gravelly SAND. Sand is fine to coarse.				
- 11.50 - 12.00	В	46		-	Gravel is subangular to rounded fine to coarse predominantly fine and medium of mixed lithologies. Below 11.00m; gravelly.	(1.90)			
12.00 - 12.23 12.00 - 12.50 12.00 - 12.24	D D SPT	47 48	50/85 mm (S)	12	Below 12.00m; with low cobble content. Cobbles (<90 x 90 x 100mm) are subangular and subrounded of pelite and gneiss.				
- 12.50 - 12.80 	B D	49 50			Medium dense becoming very dense with depth brown slightly gravelly SAND with frequent mica flakes (<1 x 1 mm). Sand is fine to coarse. Gravel is subangular and subrounded fine to coarse of pelite, gneiss and psammite.	12.50	-14.52		
- 13.50 - 14.00	В	51			Between 12.50m and 13.00m; with rare to occasional gravel. Gravel is angular to subrounded medium and coarse. Sand is predominately fine and medium.				
	D SPT	52	N = 20 (S)	14					
- - - 14.50 - 15.00	В	53							
- - 	D	54							
- 15.50 - 16.00 - -	В	55		-					
	D SPT B	56	N = 34 (S)	16 — - - -					
- 16.50 - 17.00 - - - - -17.00 - 17.50	D	57 58							
- - - 17.50 - 18.00	в	59		-		(9.60)			
- 	D SPT	60	50/100 mm (S)	- - - - - -					
- - 18.50 - 19.00 -	в	61		-					
	D	62		19 — 					
- 19.50 - 20.00	В	63							
–20.00 - 20.25 20.00 - 20.25 Notes - Abbreviations	D SPT	64 sults da	50/100 mm (S) ata defined on 'Note	es on E	Continued next page			<u> </u>	
Template: FGSL/HE	BSI/FGSL (Cable Per	cussion.hbt/Config Fugro	Rev5/2	1/02/2019/TS	Print Date	е	25/04/	2019
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			Con	tract Name	Niaa	Energy Park, East Quay Development	Locati	on ID			
Purpose Fundamental Control Laboration Control Laboration Status Dirat Reserved Callel Percussion Strata Details Oversheet Goversheet Oversheet Strata Details Strata Details Strata Details </td <td>- Fue</td> <td>DN</td> <td></td> <td></td> <td></td> <td></td> <td>_</td> <td>DI</td> <td>ΛL</td> <td>Л</td> <td></td>	- F ue	DN					_	DI	ΛL	Л	
Coordinates (m) E27930.77 N80807.12 Ground Elevation (m Datum) -2.02 Sheet 3 of 3 Sampling and In Stat Testing Cable Percussion Strata Details One-contract of the strategy o		\approx					_	DI		4	
Sampling and in Situ Tosting Strata Details Orwardsate Depth (m) Type No. Test Results Omini Situ Table Descriptions Image: Strata Details		\gtrsim									
Depth (m) Type No. Test Results fund (m) Strate Descriptions manual (m) manual (m) </td <td></td> <td></td> <td></td> <td></td> <td>Cab</td> <td></td> <td>Status</td> <td>5</td> <td>Draf</td> <td></td> <td></td>					Cab		Status	5	Draf		
(m) (y) (v) (v) <th></th> <th>ling an</th> <th>d In Si</th> <th>tu Testing</th> <th></th> <th></th> <th></th> <th></th> <th>1</th> <th>Groun</th> <th>dwater</th>		ling an	d In Si	tu Testing					1	Groun	dwater
20:25:21:00 0 0:5 gravely SAVD with frequent miss fakes (<1 1 mm). Sand is firme politic gravity and subtransformed time to come of politic gravity and subtransformed time to come of politic gravity and subtransformed time to come of a politic gravity and subtras and subtras and subtras and subtransformed tindex subtransforme		Туре	No.	Test Results	Depth (m)		(Thickness)	Level (m Datum)	Legend		Backfill / Installation
22.00 - 22.08 SPT 5020 mm (s) 22 End of Boorbole at 22.10 m 22.10 -24.12 -22.00 - 22.08 SPT 5020 mm (s) 24 End of Boorbole at 22.10 m 22.10 -24.12 -22.00 - 22.08 SPT 5020 mm (s) 24 End of Boorbole at 22.10 m 22.10 -24.12 -22.00 - 22.08 SPT 5020 mm (s) 24 End of Boorbole at 22.10 m 22.10 -24.12 -20.01 -20.12 -24.12 -24.12 -24.12 -24.12 -24.12 -20.01 -24.12 -24.12 -24.12 -24.12 -24.12 -24.12 -21.01 -24.12 -24.12 -24.12 -24.12 -24.12 -24.12 -21.01 -24.12 -24.12 -24.12 -24.12 -24.12 -24.12 -21.01 -24.12 -24.12 -24.12 -24.12 -24.12 -24.12 -21.01 -24.12 -24.12 -24.12 -24.12 -24.12 -24.12 -24.12 -24.12 -24.12 -24.12 -24.12 -24.12 -24.12 -24.12 -24.12 <td>- - - </td> <td>в</td> <td>67</td> <td></td> <td>21-</td> <td>gravelly SAND with frequent mica flakes (<1 x 1 mm). Sand is fine to coarse. Gravel is subangular and subrounded fine to coarse of pelite, gneiss and psammite. Below 21.00m; rare subangular cobbles (<120 x 120 x 80mm) of</td> <td></td> <td></td> <td></td> <td></td> <td></td>	- - - 	в	67		21-	gravelly SAND with frequent mica flakes (<1 x 1 mm). Sand is fine to coarse. Gravel is subangular and subrounded fine to coarse of pelite, gneiss and psammite. Below 21.00m; rare subangular cobbles (<120 x 120 x 80mm) of					
End of Boohole at 22:10 m 22:10 24:12 24:12 23 23 24 24 24 24 24 24 24 24 25 24 24 24 24 26 25 24 24 24 26 25 24 24 24 26 25 24 24 24 27 28 28 24 24 28 28 28 24 24 28 28 28 28 28 28 28 28 28 28 29 28 28 28 28 29 28 28 28 28 29 29 28 28 28 29 29 29 29 29 10 10 10 10 10 11 10 10 10 10 10 12 10 10 10 10 10 14<	- - - - -		66		-	Between 21.20m and 21.25m; possible lenticular band of firm brown					
Notes	-22.00 - 22.08 - - - -	SPT		50/20 mm (S)	22	End of Borehole at 22.10 m	22.10	-24.12			
Notes	- - - - - - - -				23						
Notes	- - - - - - - - -				24						
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Template: FGSL/HBSI/FGSL Cable Percussion.hbt/Config Fugro Rev5/21/02/2019/TS Print Date 25/04/2019	- Abbreviations							1			

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-fu	IGRO		ient			Globa	l Energy	y Ni <u>g</u> a	Ltd							1	P	RH	10	Δ
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		Н	ole Ty	ре			Percus									Statu	s		Draft	
									Eq	uipme	ent									
Depth From (m) 0.00	Depth To (m) 22.10	Hole Type CP		From 3/2019	Date To 11/03/2019		Equipment ando 2000	Core	e Barrel	Core	Bit D	orilling Crew JL/CA	Logged E BK/RL		arks					
0.00	22.10	CP	10/03	5/2019	11/03/201	9 0	ando 2000					JL/CA	DK/KL							
				Progres								Po	tary De	otoile				0	ore D	otoile
Date	Time	Hole	Depth Ca	asing Depth	Water Dep	th Weath	er		De	pth Dep	pth To	Flush Ty		ush Retur (%)	n Flush Cold	Run	Time	Depth	Depth To	
(dd/mm/yyyy) 10/03/2019	03:00:00	4.	00	(m) 4.50	(m) 4.40				From	n (m) ((m)	1 4011 19		(%)		(hh:	mm)	From (m)	(m)	
11/03/2019 11/03/2019				9.00 16.00	6.00 4.00															
	1	1	Hole	and C	asina	- 1			\neg											
Depth 1	To (m)	Hole Dia			Depth To) (m)	Casing Di	iameter (m	m)											
22.1	10	2	220		16.00)		220												
		Chi	selling	J / Slow	Progr	ess	1													
Depth Fr	rom (m)	Dept	h To (m)	[Duration (h	h:mm)	Tool /	Remark												
6.5 7.0	50)0	7	7.00 7.50		01:00 01:30))														
7.5 9.5	50	8	3.00 0.00		01:00 01:00)														
11.5 12.0	50	1	2.00 2.50		01:06 01:03	6														
						-														
			r Strik	e				r Addeo	b											
Strike At (m)	Rise To (m)	Time Elaps (mins)	ed Cas	sing Depth (r	n) Depth	Sealed (m)	Depth From (m)	n Depth (m)	То											
]											
		Water	Strike	Rema	rks										emarks					
								level was r	naintaine	d at or ab	ove seal	bed level. Al	I depths an	nd depth	3A. Deck to i related remar					
												le conducted								
										<u> </u>							<u> </u>			
		Instal Response	lation	esponse Zo	ne					Pipe	1						Back			1
Туре	ID	Top (m)	Base (m)	ne Installat	ion Date	ID	Top Depth	(m) Base	e Depth (m)) Diamete	er (mm)	Туре	Depth Fr 0.0		n To (m) 2.10	Ba	ckfill Mate		Date 12/03/2019
														0.0	- 4			201101110	-	
lat																				
lotes	tion -		. به مام	afi		-		(D '''		- In al - I										
Abbrevia	ations and	results	data d	letined o	on 'Note	s on Ex	pioratory	/ Positio	n Reco	oras'										
														-						
hecked By		NHA					levation Da	itum	С	hart Datu	m			Grid Co	ordinate Syst		OSGB		0.517	
emplate: FC	GSL/HBSI/FG	SL BH Su	mmary.h	bt/Config I	-ugro Rev	5/12/03/20	J19/TS									Print Da	ate		25/04/20	19

-			tract Name						Quay Development			10		
TUG	RO	Clier				ergy	Nigg	Ltd			Bŀ	40	5	
			o Reference rdinates (m)		1005 9379		3688	19.21	Ground Elevation (m Datum) -6.75	Sheet 1	of 2			
			Туре						otary Coring	Status		Draf	t	
Depth	Samp	ling an	d In Situ Testing	Co	ore R	ecove	ery		Strata Details				Grour	ndwa
(m)	Туре	No.	Test Results	TCR (%)	SCR (%)	RQD (%)	FI (-)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Back Install
0.00 - 0.50 0.00 - 0.50	D ES	2 1						-	Possibly very loose becoming medium dense with depth black silty SAND with slight sulphureous odour.			× × × × × ×		
0.50 0.50 - 0.95 0.50 - 1.00 0.50 - 0.95	ES D B SPT	4 3 5	0/450 (S)					-	Below 0.50m; strong sulphureous odour.			^ × × × × × × × × ×		
1.00 - 1.50 1.00 - 1.50 1.50 - 2.00	D ES B	7 6 9						1	Between 1.00m and 2.00m; rare subangular to rounded medium and coarse gravel of mixed lithologies.	(2.50)				
1.50 - 2.00 1.50 - 2.00 2.00 - 2.45	ES D	8						2-				× × × × × × × × ×		
2.00 - 2.50 2.00 - 2.45 2.50 - 3.00	ES SPT B	11	N = 10 (S)					-		2.50	-9.25	× × × × × × × × ×		
2.50 - 3.00 3.00 - 3.50	ES D	12 15						3-	Dark grey SAND with frequent black organic debris (<1 x 1mm), frequent mica flakes (<1 x 1mm) and frequent shell fragments (<1 x 1mm).					
3.00 - 3.50	ES	14						-		(1.30)				
3.80 - 4.00 3.80 - 4.00 4.00 - 4.50 4.00 - 4.50 4.00 - 4.49	B ES D ES SPT	17 16 18 19	50/335 mm (S)					4	Very dense dark grey SAND. Sand is fine and medium. Possibly interbedded with very soft and soft dark grey sandy clay. With rare rounded and subrounded cobbles (<80 x 100 x		-10.55			
4.50 - 5.00 4.50 - 5.00	B ES	21 20						-	100mm) of gneiss. Grey slightly gravelly SAND with low cobble content. Sand is mainly fine and medium. Gravel is angular to subrounded fine to coarse	- 4.50 (0.50)	-11.25			
5.00 - 5.50 5.00 - 5.50 5.50 - 6.00	D ES B	23 22 24						5	of mixed lithologies. Cobbles (<100 x 80 x 60mm) are subrounded and rounded of pelite. Very dense slightly sandy, becoming sandy with depth, GRAVEL. Sand is fine to coarse. Gravel is subangular to rounded fine to coarse of	5.00	-11.75			
6.00 - 6.45 6.00 - 6.40	B SPT	25	50/245 mm (S)					6	mixed lithologies (pelite, granite, sandstone, gneiss, pegmatite).	(1.50)				
6.50 - 7.00	D	26	50/245 min (0)					-	Very stiff locally laminated brown slightly sandy	6.50	-13.25			
7.00 - 7.50	В	27						7-	to sandy CLAY with frequent pockets or bands of sand and gravel and occasional cobbles. Sand is mainly fine and medium. Gravel is subangular and subrounded fine to coarse of mixed lithologies. Cobbles ((<120 x 80 x 80mm) are as gravel.	(1.20)				
7.70 - 8.00 8.00 - 8.45	D D	28 29							Very dense brown slightly gravelly SAND with rare possible lenses (<15mm) of soft sandy clay. Sand is fine to coarse. Gravel is	7.70	-14.45			
8.50 - 9.00	SPT B	30	50/250 mm (S)						subangular and subrounded fine and medium of mixed lithologies.	(0.80)	-15.25			
9.00 - 9.50	D	31						9	Very dense multicoloured sandy, locally slightly sandy, GRAVEL with medium cobble content. Sand is fine to coarse. Gravel is subangular and subrounded fine to coarse of mixed lithologies (sandstone, pelite, psammite, quartz, and pegmatite). Cobbles (<150 x 120 x 100mm)					
9.50 - 10.00	В	32							are of mixed lithologies.					
0.00 - 10.45 0.00 - 10.38	D SPT	33	50/270 mm (S)					_	Continued next page	_				

Print Date

25/04/2019

Template: FGSL/HBSI/FGSL Combined CP+RC FI.hbt/Config Fugro Rev5/21/02/2019/TS

<u>-fua</u>	RO				Nigg Energy Park, East Quay Development Global Energy Nigg Ltd						BH05					
	Fugro Reference Coordinates (m) Hole Type			G191005U E279379.79 N868819.21 Ground Elevation (m Datum) -6.75 Cable Percussion and Rotary Coring							Sheet 2 of 2 Status Dra					
Depth	Sampling and In Situ Testing			Core Recovery					Strata Details				Groundwate			
(m)	Туре	No.	Test Results	TCR (%)	SCR (%)		FI (-)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water _{Backf} Strike ^{Installa}			
10.50 - 11.00	в	34							Between 10.50m and 11.00m; slightly gravelly sand. Sand is fine to coarse.	(4.00)						
11.00 - 11.50 11.50 - 12.00	D	35 36						11	Below 11.00m; slightly sandy.			0				
12.00 - 12.50 12.00 - 12.35 12.50 - 13.00	D SPT B	37 38	50/245 mm (S)					12 -	Brown becoming reddish-brown with depth		-19.25					
13.00 - 13.50	D	39						13 —	slightly gravelly SAND. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse	(1.20)						
13.50 - 14.00 14.00 - 14.18 14.00 - 14.18	D SPT	40 41	50/35 mm (S)					14 -	Extremely weak red and greenish grey SANDSTONE. Recovered as fragments.	— 13.70 (0.80)	-20.45					
14.50 - 14.90 14.90 - 15.25 14.50 - 16.00 15.25 - 15.70				73	73	63	NR NI 9	15 -	Assessed zone of core loss. Extremely weak and weak red SANDSTONE. Possibly moderately weathered. Non intact (Drilling affected) recovered as sandy gravel sized fragments (<50 x 60 x 60mm). Weak thinly laminated to thinly bedded red and greenish grey SANDSTONE with rare to occasional greenish grey reduction spots (<10 x 10mm). Slightly to moderately weathered.	14.50 (0.40) 14.90 (0.35) 15.25 (0.45) 15.70	-21.25 -21.65 -22.00 -22.45					
15.70 - 17.50 16.00 - 17.50				100	100	100	2	16	Discontinuities. Set # 1, bedding plane discontinuities - very closely to medium spaced, inclined (15°) planar, rough, very tight, clean. Set #2, joints - closely spaced, inclined (60°), planar, rough, very tight and clean or open and infilled with sand. Weak becoming moderately weak with depth,	(1.80)	-24.25					
								18	 #1, bedding plane discontinuities - closely to widely spaced subhorizontal (<10°), planar, rough, very tight, clean. Between 16.07m and 16.48m; red with frequent greenish grey reduction spots (<10 x 10mm) medium to coarse grained sandstone. Between 17.10m to 17.42m; rudaceous medium to coarse sandstone. Clasts are subangular and subrounded of mixed lithologies (<10 x 10 x 10mm). End of Borehole at 17.50 m 		2420					
								19 — 								
otes Abbreviations	and res	sults da	ta defined on 'Note	s on E	xplor	atory I	Positi	on Re	cords'							
nplate: FGSL/HE	SI/FGSL	Combined	CP+RC FI.hbt/Config Fu	igro Rev	5/21/02	/2019/T	s			Print Date		25/04/2	2019			

		Co	ontract Nar	ne	Nigg E	Energy Pa	rk, East	Quay	Devel	opment				Locatio	on ID		
-6	JGRC		ent		Globa	I Energy N	liga I tr								BH	10	5
			gro Refere	ence	G1910	07	199 210									IU.	J
	\Rightarrow		ordinates		-	379.79 N8	68819.2	21 0	Ground	Elevation	(m Dat	um) -6	.75	Sheet ⁻	1 of 1		
			le Type			Percussio					•			Status		Draft	
								Equip	ment								
Depth From (m)	Depth To (m)	Hole Type	Date From	Date To		Equipment	Core Ba	rrel C	Core Bit	Drilling Crew		By Remarks	8				
0.00 4.00	4.45 11.00	CP CP	13/03/2019 13/03/2019	13/03/201 14/03/201		ando 2000 nacchio MC-S				JW/CA MB/AC	BK/RL BK/RL						
11.00	14.18	CP	14/03/2019	14/03/201	9 Com	1200 nacchio MC-S				MB/AC	BK/RL						
14.18	17.50	RC	14/03/2019	14/03/201	9 Com	1200 nacchio MC-S	Terracore			JW/CA	BK/RL						
						1200	Geobo	r									
Data	Time	Hole D	Progre	ess oth Water Dep	- 44			Depth	Denth Te	1	otary De			Run Tir		Core De	
Date (dd/mm/yyyy 13/03/2019	y) (hh:mm:s	is) (m) (m)	(m)	^{pth} Weath	er		From (m) 0.00	Depth To (m) 14.50	Flush Ty W	/pe	(%) 100	Flush Colo Red	ur (hh:mn 00:06	n) From (m)	Depth To (m) 16.00	Diameter (mn 102
4. 11. 13. 14.	9 12:30:0	0 14. 0 17. Hole Diar 2 2 2 2 1 1	18 14.18	Depth To 4.00 11.0 13.0 13.5 14.5	0 0 0 0 0	Casing Diam. 220 200 275 146		14.50	16.00	W W		100 100	Red Red	00:06	\$ 16.00	17.50	102
12	-rom (m) 2.00	12 Water	To (m) 2.50 Strike	Duration († 01:3		Tool / Re Water A	dded										
Strike At (m)	Rise To (m)	Time Elapse (mins)	Casing Depti	n (m) Depth	Sealed (m)	Depth From (m)	Depth To (m)										
	1					1			1							1	1
		Water	Strike Rem	arks							Gene	eral Rer	narks				
∂roundwate	er not encount		Strike Rem			leve	el was main	tained at o	or above s	water from jac seabed level. Al shole conducte	k-up platfor Il depths an	m Skate 3A d depth rela	. Deck to n ated remark				
Groundwate	er not encount		ine environmen			leve	el was main	tained at o	or above s ed as bore	seabed level. A	k-up platfor Il depths an	m Skate 3A d depth rela	. Deck to n ated remark	s refer to d			
Groundwate	er not encount	Install	ine environmen ation _{Zone} Response	Zone Installa	tion Date	leve Gro	el was main	tained at o	or above s ed as bore	seabed level. A	k-up platfor Il depths an	m Skate 3A d depth rela	. Deck to n ated remark nt.	s refer to d	epths below s	seabed leve	J.
		lered in mar	ine environmen ation _{Zone} Response	Zone Installa	tion Date	leve Gro	el was main undwater n	tained at o ot observe Pip	or above s ed as bore	seabed level. A	k-up platfor II depths an d in marine	m Skate 3A d depth rela environmer	(m) Depth	s refer to d	epths below s ackfill	terial	Date
Type	ID	Install Response Top (r	ine environmen ation _{Zone} Response	Zone Installa		ID Top	el was main undwater n	Pip Base Dept	De be be b	seabed level. A	k-up platfor II depths an d in marine	m Skate 3A d depth rela environmer	(m) Depth	B. To (m)	epths below s ackfill Backfill Ma	terial	əl.
Type	ID iations and	Install Response Top (r	ation Zone Response n) Base (r	Zone Installa	es on Ex	ID Top	e Depth (m)	Pip Base Dept	De be th (m) Dia	seabed level. A	k-up platfor II depths an d in marine	m Skate 3A d depth rela environmer	(m) Depth 17	B. To (m) .50	epths below s ackfill Backfill Ma	terial	J.

		Con	tract Name	Nigg	Energy Park, East Quay Development	Locati	on ID			
-fua	RO	Clie	nt	Glob	al Energy Nigg Ltd		Rł	HO	6	
	\approx		o Reference		1005U				U I	
	\sim		rdinates (m)	_	9381.64 N868746.75 Ground Elevation (m Datum) -9.60	Sheet Status	1 of 2	Draft		
Samp	ling an		tu Testing	Cabi	le Percussion Strata Details	Status		Groundwa		ndwater
Depth	Туре	No.	Test Results	Depth	Strata Descriptions	Depth (Thickness)	Level	Legend	Water	Backfill /
(m) . 0.00 - 0.50	D	2		(m)	Very soft and soft black sandy CLAY probably interbedded with	(m)	(m Datum)		Strike	Installation
- 0.00 - 0.50 - - 0.50 - 1.00 - 0.50 - 1.00	ES B ES	1 4 3		-	black clayey SAND. With rare shell fragments (<10 x 10 x 10mm) and slight sulphurous odour. Sand is fine to coarse.					
- 0.50 - 0.95 - 0.50 - 0.95 - 1.00 - 1.50 - 1.00 - 1.50	SPT D ES	6 5	0/450 (S)	- - 1						
- 1.50 - 2.00 - 1.50 - 2.00	BES	8 7		-		(3.00)				
- - 2.00 - 2.50 2.00 - 2.50 2.00 - 2.45	D ES SPT	10 9	0/450 (S)	2-						
- 2.50 - 3.00 -	в	11		-						
- 3.00 - 3.50	D	12		3-	Soft dark grey sandy CLAY possibly interbedded with dark grey clayey SAND. With frequent wood fragments (<10 x 20mm) and rare shell fragments (<5 x 10mm). Organic and slight sulphurous odour. Sand is fine to coarse.	3.00	-12.60			
- 3.50 - 4.00 - - - 4.00 - 4.45	B D	13			odour. Sand is line to coarse.				-	
4.00 - 4.45 4.40 - 5.00	SPT B	15	0/450 (S)			(2.50)				
- - - 5.00 - 5.50	D	16		5-						
- 5.50 - 6.00	В	17		-	Loose dark grey slightly clayey SAND with occasional wood and shell fragments (<5 x 10mm). Slight organic odour. Sand is fine to	5.50	-15.10		- - -	
6.00 - 6.45 - 6.00 - 6.45	D SPT	18	N = 8 (S)	6	coarse.	(1.00)				
- 6.50 - 7.00 -	В	19		-	Loose dark grey SAND with occasional wood fragments (<5 x 10mm). Sand is fine to coarse.	6.50	-16.10			
- 7.00 - 7.50 - - - - 7.50 - 8.00	D B	20 21		7		(2.00)				
- - - - 8.00 - 8.50	D	21		8-	Below 8.00m; 1 No. wood fragment (<5 x 10mm).	(2.00)				
8.00 - 8.45 - - - 8.50 - 9.00	SPT B	23	N = 5 (S)		Loose becoming medium dense with depth, dark grey SAND with	8.50	-18.10			
- - - 9.00 - 9.50	D	24		9-	occasional bands or lenses (<60 mm thick) of soft grey sandy clay, occasional wood fragments (<5 x 10mm) and occasional shell fragments (>5 x 5mm). Sand is fine to coarse.					
- - - 9.50 - 10.00 -	В	25								
- 	D SPT	26	N = 6 (S)	-	Continued next page					
	and res	sults da	ta defined on 'Not	tes on E	Exploratory Position Records'					
Template: EOOL # 15	SUFOOL (Cable Dr	aussion hht/Co-f- F	ro Pov ^E /2	4//02/0110/TS	Print Date		25/04/	2010	
rompiate. FGSL/HE	,51/1 ⁻ 03L (Javie Pér	cussion.hbt/Config Fug	10 IXEV0/2		Princ Date	~	20/04/	2013	

		Con	tract Name	Nigg	Energy Park, East Quay Development	Locati	on ID			
fug	RO	Clie	nt	Glob	al Energy Nigg Ltd		Bł	HO	6	
	\approx		ro Reference	-	1005U					
	\sim		rdinates (m) e Type	-	9381.64 N868746.75 Ground Elevation (m Datum) -9.60 e Percussion	Sheet Status	2 of 2	Draf	ł	
Samp	ling an		itu Testing	Cabi	Strata Details	Status	,	Diai		ndwater
Depth (m)	Туре	No.	Test Results	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation
- 10.50 - 11.00	В	27			Loose becoming medium dense with depth, dark grey SAND with occasional bands or lenses (<60 mm thick) of soft grey sandy clay, occasional wood fragments (<5 x 10mm) and occasional shell fragments (>5 x 5mm). Sand is fine to coarse.					
11.00 - 11.50	D	28		11	Below 11.00m; 1 No. shell fragment (<5 x 20mm).					
- 11.50 - 12.00	В	29				(6.50)				
-12.00 - 12.45 12.00 - 12.45 - 12.50 - 13.00	D SPT B	30 31	N = 11 (S)	12						
-13.00 - 13.50	D	32		13	Below 13.00m; sand is predominantly fine and medium. Occasional plant fibres.					
- 13.50 - 14.00 	B D SPT	33 34	N = 22 (S)							
- 14.50 - 15.00	В	35			Below 14.50m; 1 No. shell fragment (<5 x 20mm). Gravel is subrounded fine and medium.					
- 				15 — - - -	End of Borehole at 15.00 m	- 15.00	-24.60	<u>1986</u> 1		
- - - - - - - -				- 						
- - - - - -				- - - - - - - - - - - - - - -						
- - - - - -				- - - - - - - - - - - - - - - - - - -						
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Notes - Abbreviations	and res	sults da	 ata defined on 'No	tes on E	Exploratory Position Records'	<u> </u>	<u> </u>			
Template: FGSL/HE	BSI/FGSL	Cable Per	rcussion.hbt/Config Fug	ro Rev5/2	1/02/2019/TS	Print Dat	e	25/04/	2019	

			Co	ontra	ict Nan	ne	Nigg E	Energy	Park, Ea	ast Q	uay De	evelo	opment					Loca	tion I	D		
-6	JGR	_		ent					y Nigg L				·							3H		6
					Refere		G1910		y Nigg L												U	0
	\equiv			-	nates				N86874	6.75	Gro	und	Elevation	(m D)atu	m) -9	9.60	Shee	et 1 o	f 1		
				ole T		· /		Percus			1			(=				Statu			Draft	
										Ec	quipme	ent									1	
Depth From (m)	Depth To (n	n) He	ole Type	1	te From	Date To		quipment		Barrel	Core	Bit	Drilling Crew			Remark	ks					
0.00 13.00	13.00 15.00		CP CP		03/2019 03/2019	16/03/2019 16/03/2019		ando 2000 Iacchio MC					CA/JS MB/AC	R								
								1200														
Date	Tin		Hole D		Progre	th Water Depth					lepth De	pth To		otary				Bun	n Time	Depth	Core De	-
(dd/mm/yyyy 16/03/2019	r) (hh:mi	n:ss)	(m 0.0	ı)	(m) 0.50	(m) 2.10	Weath	er				(m)	Flush Ty	/pe	Flus	h Return (%)	Flush Colou		n:mm)	From (m)	Depth To (m)	Diameter (mm)
16/03/2019	21:3		14.	50	15.00	Not	4															
						looginoot																
	- / >	Τ.			e and (-																
Depth 6.	To (m) 00		Hole Diar	neter (20	mm)	Depth To (6.00	m)	-	iameter (mr 220	n)												
13	.00 .00		2	20 00		13.00 15.00			220 200													
			Chie	allin	a / Slo	u Drogro	~~															
Depth F	· · · · · · · · · · · · · · · · · · ·				-	W Progre		Teel	/ Remark													
Depth F	rom (m)	_	Deptr	i To (m)	Duration (nn	.mm)	1001	/ Remark													
			Water	- Stri	ko			Wate	r Added													
Strike At (m)	Rise To (n	1 7	ime Elapse		asing Depth	(m) Depth Se	aled (m)	Depth Fror	n Depth T													
Ounce At (III)	1430 10 (11	·/	(mins)		asing Depti	(iii) Departor	saice (m)	(m)	(m)													
		V	Vater 9	Strik	e Rem	arks								Ge	ener	al Re	marks					
Groundwate	er not obser								The boreho	le was	carried ou	t over	water from jac	k-up pla	atform	Skate 3	A. Deck to m	udline =	= 13.80r	m; deck le	vel = 4.20	m CD. Water
									level was m	aintain	ed at or al	bove se	eabed level. A hole conducte	II depths	s and	depth re	lated remark	s refer to	o depth	s below s	eabed leve	el.
			Install	atio	n						Pipe								Back	cfill		
Туре	ID		Response Top (r	Zone	Response Base (n	Zone Installatio	n Date	ID	Top Depth (n) Bas	se Depth (m) Dian	neter (mm)	Туре	D	epth Fron	n (m) Depth	To (m)	В	ackfill Mat	erial	Date
			·	.,		,																
Notes																						
- Abbrevi	ations a	nd r	esults	data	defined	on 'Notes	on Ex	plorator	y Positio	n Rec	ords'											
Checked By	/		NHA				E	levation Da	atum	0	Chart Datu	ım			G	Frid Coor	dinate Syste	m	OSGB			
Template: F	GSL/HBSI/	FGS	L BH Sur	nmary.	.hbt/Config	g Fugro Rev5	12/03/20)19/TS										Print Da	ate		25/04/20	19

		Con	tract Name	Nigg	Energy Park, East Quay Development	Locati	on ID			
<u>fu</u> g	RO	Clie		-	al Energy Nigg Ltd		Bł	HO	7	
	\approx		ro Reference	_	1005U	Cheat			-	
	\sim		rdinates (m) e Type		9451.07 N868746.87 Ground Elevation (m Datum) -4.01 e Percussion	Sheet	1 of 2	Draf	t	
Samp	oling an	d In Si	tu Testing		Strata Details				Grour	ndwate
Depth (m)	Туре	No.	Test Results	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill Installati
0.00 - 0.50 0.00 - 0.50	D ES	2 1			Loose dark brownish grey silty SAND with abundant shell fragments (<1 x 1mm). Sand is fine to coarse.			× × × × × ×		
0.50 - 0.95 0.50 - 1.00 0.50 - 1.00 0.50 - 0.95 1.00 - 1.50	D B ES SPT D	3 5 4 7	N = 9 (S)		Below 0.50m; thin and thick beds (<100 mm) of very soft dark grey sandy clay. Sand is fine to coarse. Strong sulphureous odour.					
1.00 - 1.50 1.50 - 2.00 1.50 - 2.00	ES B ES	6 8 9						× × × × × × × × ×		
2.00 - 2.45 2.00 - 2.50 2.00 - 2.45	D ES SPT	10 11	N = 6 (S)	2-		(3.50)		× × × × × × × × × × ×		
2.50 - 3.00 2.50 - 3.00 3.00 - 3.50	B ES D	13 12 15		3-						
3.00 - 3.50 3.50 - 4.00 3.50 - 4.00	ES B ES	14 17 16		-	Very soft dark brownish grey sandy CLAY with bands (possible <80mm) of clayey sand. Strong sulphureous odour. Sand is fine to	3.50	-7.51	× × × × × ×		
4.00 - 4.45 4.00 - 4.50 4.00	D ES SPT	18 19		4	coarse.	(1.50)				
4.50 - 5.00 4.50 - 5.00 5.00 - 5.50	B ES D	21 20 23			Medium dense grevish brown SAND with frequent shell fragments	5.00	-9.01			
5.00 - 5.50 5.50 - 6.00 5.50 - 6.00	ES B ES	22 25 24		-	(<1 x 1mm) and frequent mica flakes (<1 x 1mm). Sand is predominantly fine and medium.					
6.00 - 6.45 6.00 - 6.50 6.00 - 6.45	D ES SPT	26 27	N = 19 (S)	6-		(2.00)				
6.50 - 7.00 6.50 - 7.00	B ES D	29 28 31		-		7.00	11.01			
7.00 - 7.50 7.00 - 7.50 7.50 - 8.00 7.50 - 8.00	B ES	30 30 33 32		7-	Medium dense greyish brown SAND interbedded with soft dark greyish brown sandy clay. With frequent mica flakes (<1 x 1mm) and slight sulphureous odour. Sand is fine and medium.	7.00	-11.01			
8.00 - 8.45 8.00 - 8.45	D SPT	34	N = 17 (S)	8-						
8.50 - 9.00	В	35		-						
9.00 - 9.50	D	36		9-	Below 9.00m; slightly gravelly with occasional shell fragments (<20 x 20mm) and rare to occasional gravel. Gravel is subangular to subrounded fine and medium of mixed lithologies.	(4.00)				
9.50 - 10.00 10.00 - 10.45	B	37 38			Continued payt page					
10.00 - 10.45 otes	SPT		N = 20 (S)		Continued next page			<u> </u>		—

		Con	tract Name	Nigg	Energy Park, East Quay Development	Locati	ion ID			
-fua	RO	Clie	nt	Glob	al Energy Nigg Ltd	-	RI	-10	7	
	\approx	Fug	ro Reference	-	1005U			IU		
	\geq		rdinates (m)		9451.07 N868746.87 Ground Elevation (m Datum) -4.01		2 of 2			
		Hole	е Туре	Cab	le Percussion	Status	6	Draf	t I	
	ling an	d In Si	tu Testing	_	Strata Details	1	1		Groun	idwater
Depth (m)	Туре	No.	Test Results	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation
- - - 10.50 - 11.00	В	39		-	Medium dense greyish brown SAND interbedded with soft dark greyish brown sandy clay. With frequent mica flakes (<1 x 1mm) and slight sulphureous odour. Sand is fine and medium.					
- 	D	40		11 -	Medium dense brownish grey slightly gravelly SAND with low cobble content and frequent mica flakes (<1 x 1mm). Sand is fine	11.00	-15.01			
- 11.30 - 11.70 - -	В	41		-	to coarse. Gravel is subangular to rounded fine to coarse of mixed lithologies. Cobbles (<80 x 80 x 60mm) are of pelite.					
- 11.70 - 12.15 - 11.70 - 12.40 - 11.70 - 12.15 -	D B SPT	42 43	N = 23 (S)	12 -		(2.00)				
- 12.40 - 13.00 - 13.00 - 13.00 - 13.50	D B	44 45				13.00	-17.01			
	в	45 46		13	Dense brownish grey SAND with frequent mica flakes (1 x 1mm) and occasional thin beds (<60mm) of soft brownish grey sandy clay. Sand is fine to coarse.	13.00	-17.01			
- - 	D SPT	47	N = 34 (S)	14						
- 14.50 - 15.00	В	48		-		(3.00)				
	D	49		15 — - -						
- 15.50 - 16.00 - - - - - - - - - - - 16.00 - 16.45	B D	50 51			Below 15.50m; occasional gravel and frequent wood fragments (<5 x 5mm). Gravel is subangular and subrounded fine to coarse of mixed lithologies.	16.00	-20.01			
16.00 - 16.45 - - 16.50 - 17.00	SPT B	52	N = 17 (S)	-	Medium dense greyish brown SAND with frequent mica flakes (<1 x 1mm), occasional to frequent shell fragments and occasional wood fragments (<5 x 5mm).					
- - 17.00 - 17.50 -	D	53		17 -	Between 17.00m and 17.50m; rare very thin clay bands or lenses (<50mm).					
- - 17.50 - 18.00 - -	В	54		-		(3.61)				
	D SPT	55	N = 12 (S)	18						
- 18.50 - 19.00 - -	В	56		-						
- 	D	57		19 —						
- - 19.50 - 19.60 - - -	SPT		50/60 mm (S)	-	Below 19.50m; probable boulder (no recovery from SPT). End of Borehole at 19.61 m	19.61	-23.62			
Notes										
	and res	sults da	ata defined on 'No	tes on E	Exploratory Position Records'					
remplate: FGSL/HE	SI/FGSL	Jable Per	rcussion.hbt/Config Fug	ro Rev5/2	1/02/2019/TS	Print Dat	e	25/04/	2019	

			Co	ntract Na	ame	Nigg	Energy F	Park,	East	Quay	Deve	lopment					Loca	ation			
_fu	JG	RO	Clie		ranaa		al Energy	y Nig	g Ltd								-	E	3H	10	7
		\approx		gro Refe ordinates			005U 451.07 N	18687	746.8	7 G	iroun	d Elevatio	n (m	Datu	m) -4	4.01	She	et 1 c	of 2		
				le Type	()	-	e Percus								,		Stat	us		Draft	
Depth From								-		Equip					1						
(m) 0.00	Depth 19.		ole Type CP	Date From 07/03/2019			Equipment Dando 2000	С	ore Bar	rel C	ore Bit	Drilling Cre JS/AC	-	gged By BK	Remar	ks					
Date		Time	Hole D		ress Depth Water De	^{pth} Weat				Depth	Depth T			y Det	ails h Return	Flush Cold	R	un Time	C Depth	Depth To	
(dd/mm/yyyy 07/03/2019	9 0	nh:mm:ss) 00:00:00	(m) 9.00	(m) 0 9.50	(m) 0 3.30	weat	ner			From (m)	(m)	• Flush	гуре	_	(%)	Flush Cold	our (h	nh:mm)	From (m)	(m)	Diameter (mm)
07/03/2019 07/03/2019 07/03/2019	9 0	0:30:00 1:00:00 1:30:00	9.50 10.0 10.5	0 10.5	0 3.00																
07/03/2019	9 0)2:00:00)2:15:00	11.0	0 11.5	0 3.10																
07/03/2019 07/03/2019)2:30:00)2:45:00	12.0 12.5	0 12.5	0 3.40 0 3.50																
07/03/2019 07/03/2019	9 0)3:00:00)3:15:00	13.0 13.5	0 14.0	0 3.80																
07/03/2019 07/03/2019 07/03/2019	9 0)3:30:00)3:45:00)4:00:00	14.0 14.5 15.0	0 15.0	0 4.30																
07/03/2019 07/03/2019	9 0)4:30:00)4:45:00	15.5	0 16.0	0 5.00																
07/03/2019 07/03/2019		20:00:00 20:15:00	0.00	0.50	0 6.40 0 6.30																
07/03/2019 07/03/2019		20:30:00	1.00	0 2.00) 6.10																
07/03/2019 07/03/2019 07/03/2019	9 2	21:00:00 21:10:00 21:20:00	2.00 2.50 3.00	3.00) 5.70																
07/03/2019 07/03/2019 07/03/2019	9 2	21:30:00 21:45:00	3.50	0 4.00) 5.50																
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07/03/2019 07/03/2019	9 2	2:20:00 2:30:00	5.50 6.00	0 6.50) 4.60																
07/03/2019 07/03/2019 07/03/2019	9 2	22:40:00 22:50:00 23:00:00	6.50 7.00 7.50	0 7.50) 4.30																
07/03/2018	2	3.00.00		Hole and																	
Depth				eter (mm)	Depth 1		Casing Di		(mm)												
19.	.61		22	20	19.5	50		220													
			Chis	ellina / S	low Prog	ress															
Depth F	rom (n	1)	Depth		Duration (Tool /	/ Remar	k												
19.	.00		19.	50	01:0	00															
			Water	Striko			Wate	r Add	od												
Strike At (m)	Rise 1	To (m) T	ime Elapse		pth (m) Depth	Sealed (m	Depth From	n Dep	th To												
,			(mins)) (m)	()	m)												
Groundwate	r pot c			strike Rei environment.				The bo-	eholo	as carrie	loutor	er water from ja		-		marks	mudline	= 11 00	Im: deck !-	wel - 7 10	m CD Water
Signiuwate	i nul 0	Dev rec	anne (control intent.			1	level wa	s maint	ained at o	or above	er water from ja seabed level. rehole conduct	All dept	ths and	depth re	lated remar	ks refer	to depti	hs below s	eabed lev	el.
			Installa Response		e Zope					Pip	-							Bac			1
Туре		ID	Top (m) Base	(m) Install	ation Date	ID	Top Dep	th (m)	Base Dept	h (m) Di	iameter (mm)	Туре	e C	0.00		n To (m) 9.61	E	Backfill Ma Bentoni		Date 07/03/2019
Notes	otice	0 00-	oculta -	lata defin	od on Mirt		volorator	(Dool	tion D	0001-											
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			Con	tract Nar	ne l	Nigg E	Energy F	Park, Eas	t Quay	Deve	lopment					Loca	tion I	D		
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	\rightarrow			ro Refere		G1910		- 55-	<u> </u>										IV	
	\Rightarrow			rdinates		E2794	51.07 N	1868746.8	87 (Groun	d Elevatio	n (m [Datu	m) -4	4.01	Shee	et 2 of	f 2		
		=	Hole	е Туре	(Cable	Percus	sion	I							Statu	JS		Draft	
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Depth From (m)	Depth To (m)	Hole 1	Туре	Date From	Date To	E	quipment	Core Ba	arrel (Core Bit	Drilling Cre	w Logg	ged By	Remark	ks					
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									-				<u> </u>	<u> </u>						
Date	Time	ł	Hole Dept	th Casing Dep	pth Water Depth	¹ Weathe			Depth	Depth T		Rotary	Flus	sh Return	Flush Colou		n Time	Depth	Depth To	
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08/03/2019	9 05:15:0	00	8.50 16.50	8.00 17.00	3.30 5.40															
08/03/2019 08/03/2019	9 06:15:0	00	17.00 17.50	18.00	6.00															
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		W	ater S	Strike			Wate	r Added	1						ĺ					
Strike At (m)	Rise To (m)	Time E	Elapsed nins)	Casing Depth	h (m) Depth Se	ealed (m)	Depth From (m)	n Depth To (m)	1						ĺ					
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		Wat	er Str	rike Rem	arks							G	Sener	ral Re	marks					
Groundwate	er not observe	ed in ma	arine en	vironment.							er water from ja e seabed level.									
							(Groundwater r	not observ	ed as bo	orehole conduc	ted in ma	arine e	nvironme	ent.		·			
L																				
			stallat		Zone	\rightarrow			Pi								Back			
Туре	ID		Top (m)	Base (r	m) Installation	n Date	ID	Top Depth (m)	Base Dep	th (m) D	iameter (mm)	Туре	D	Depth Fron	m (m) Depth	To (m)	Ba	ackfill Mat	erial	Date
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Notes									<u> </u>											<u> </u>
	ations an	d resi	ults da	ita definer	d on 'Notes	on Ex	ploratory	/ Position F	Records	.'										
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Checked By	/	N	IHA			E,	levation Da	tum	Chart	Datum			G	Grid Coor	rdinate Syste	m	OSGB			
				ary.hbt/Confi	ig Fugro Rev5/											Print Da			25/04/201	19

		Con	tract Name	Nigg	Energy Park, East Quay Development	Locati	on ID		
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	\approx		ro Reference	-	1005U				0
	\sim		rdinates (m) e Type	-	0448.06 N868803.00 Ground Elevation (m Datum) -0.82	Sheet Status	1 of 2	Draf	ł
Samo	ling and		tu Testing	Cabi	Strata Details	Status	,	Diai	Groundwater
Depth	-		-	Depth		Depth	Laural		
(m)	Type D	No.	Test Results	(m)	Strata Descriptions Brown slightly gravelly SAND with occasional shell fragments (<5 x	(Thickness) (m)	Level (m Datum)	Legend	Water Backfill / Strike Installation
- 0.00 - 0.50 - 0.00 - 0.50 0.50 - 1.00	ES B	2 1 4		-	10mm) and frequent mica flakes (<1 x 1mm). Sand is fine to coarse. Gravel is subangular and subrounded fine to coarse of mixed lithologies	(0.50) 0.50	-1.32		
0.50 - 1.00	ES	3		-	Brown SAND with frequent mica flakes (<1 x 1mm). Sand is fine to coarse.	(1.00)			
- 1.00 - 1.50 1.00 - 1.50	D ES	6 5		1		(1.00)			
- 1.50 - 2.00 1.50 - 2.00	B ES	8 7			Greyish brown SAND with frequent mica flakes (1 x 1mm). Sand is fine to coarse.	1.50	-2.32		
- 2.00 - 2.50 2.00 - 2.50	D ES	10 9		2		(1.50)			
- - 2.50 - 3.00 - 2.50 - 3.00	B ES	12 11							
- - 3.00 - 3.50 - 3.00 - 3.50	D ES	14 13		3-	Brownish grey clayey SAND with frequent mica flakes (<1 x 1mm) and slight organic odour. Sand is fine to coarse	3.00	-3.82		
- - 3.50 - 4.00 - 3.50 - 4.00	B ES	16 15		-		(1.00)			
- - 4.00 - 4.50 - 4.00 - 4.50	D ES	18 17		4	Soft dark brownish grey sandy CLAY with abundant mica flakes (<1 x 1mm) and organic odour. Sand is fine to coarse.	4.00	-4.82		
- - 4.50 - 5.00 - 4.50 - 5.00 -	B ES	20 19		-					
- - 5.00 - 5.50 - 5.00 - 5.50	D ES	22 21		5					
- - 5.50 - 6.00 - 5.50 - 6.00	B ES	24 23		-	Below 5.50m; occasional to frequent decomposing wood fragments (<10 x 20mm).	(3.00)			
- - - 6.00 - 6.50 - 6.00 - 6.50	D ES	26 25		6-					
- - 6.50 - 7.00 - 6.50 - 7.00	B ES	28 27		-					
- - - 7.00 - 7.50 - 7.00 - 7.50	D ES	30 29		7-	Greenish brown clayey SAND interbedded with very soft sandy clay. Sand is fine and medium.	7.00	-7.82		
- - 7.50 - 8.00 - 7.50 - 8.00	D ES	32 31		-					
- - - 8.00 - 8.50 - 8.00 - 8.50 -	D ES	34 33		8-	Between 8.00m and 9.00m; bands (<50mm) of brown fibrous peat.				
- - 8.50 - 9.00 - 8.50 - 9.00	D ES	36 35		-					
- - - 9.00 - 9.50 - 9.00 - 9.50 -	D ES	38 37		9					
- - - 9.50 - 10.00 - 9.50 - 10.00	D ES	40 39		-		(5.55)			
- - -10.00 - 10.50 10.00 - 10.50	D ES	42 41		-	Continued next page	(5.50)			
Notes	ا- بريم	ult-	to define a later						
- Appreviations	and res	Suits da	ata defined on 'Not	es on E	Exploratory Position Records'				
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		Con	tract Name	Nigg	Energy Park, East Quay Development	Locati	on ID			
-Tugi	RO	Clie	nt ro Reference	-	pal Energy Nigg Ltd 1005U	_	Bł	10	8	
		Coo	rdinates (m) e Type	E279	9448.06 N868803.00 Ground Elevation (m Datum) -0.82 le Percussion	Sheet Status	2 of 2	Draf	+	
Samp	ling an		tu Testing	Cabi	Strata Details	Status	•	Diai		ndwater
Depth	Туре	No.	Test Results	Depth (m)	Strata Descriptions	Depth (Thickness)	Level (m Datum)	Legend	Water Strike	Backfill / Installation
(m)					Greenish brown clayey SAND interbedded with very soft sandy clay. Sand is fine and medium.	(m)	(Guike	
- - 10.50 - 11.00 - 10.50 - 11.00	D ES	44 43		-						
- 	D ES	46 45		11						
- 11.50 - 12.00	В	47		-						
- - 	D	48		12					-	
- - 12.50 - 13.00 -	В	49		-	Greyish brown clayey SAND with rare subangular and subrounded fine to coarse gravel of mixed lithologies. Sand is	12.50	-13.32			
- 	D	50		13 -	mainly fine and medium. Greyish brown clayey SAND with occasional bands of soft greyish brown sandy clay and occasional oyster shell fragments (<50 x 6 x 8mm). Sand is fine and medium.	13.00	-13.82			
- 13.50 - 14.00 -	В	51		-						
—14.00 - 14.50 - -	D	52		14		(2.00)				
- 14.50 - 15.00 - -	В	53		-						
—15.00 - 15.50 - - -	D	54		15	Greyish brown gravelly SAND with rare bands of soft sandy clay. Sand is mainly fine and medium. Gravel is subangular and subrounded fine to coarse of mixed lithologies.	(0.80)	-15.82			
- - - 15.80 - 16.00 - 	DB	55 56			COBBLES (<100 x 120 x 100mm) , subrounded of quartzite.	15.80 (0.20)	-16.62	0 0 0		
- 16.50 - 17.00	в	57			Grey and dark grey sandy GRAVEL with occasional shell fragments (<10 x 10mm). Sand is fine to coarse, gravel is angular to subrounded fine to coarse of mixed lithologies.	16.00 (0.50) 16.50	-17.32			
- - - 17.00 - 17.50	в	58			Recovered as sandy GRAVEL with high cobble content and possible boulders. Sand is fine to coarse, gravel is subangular and subrounded fine to coarse of mixed lithologies.					
- - - -						(1.20)				
- 17.70 - 18.00 - 	D B	59 60			Extremely weak reddish brown SANDSTONE. Recovered as fragments. Between 17.70m to 18.00m; grey.	17.70	-18.52	· · · · · · · · · · · · · · · · · · ·		
- - - -				-		(1.30)				
- - 18.90 - 19.00 	D	61		- - - - - - -	End of Borehole at 19.00 m	19.00	-19.82	• • • •		
- - -				-						
-				-						
Notes - Abbreviations	and res	sults da	ta defined on 'Not	es on E	Exploratory Position Records'					
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Inclument Calle Type Calle Procession Status Draft Integration The transmission The			\approx		-					N8688	03.00	G	round	Elevatio	on (m	n Datu	um) -().82	She	et 1 c	of 2		
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Image: Section of the sectin of the section of the section				CP										JS/AC									
Open Per Per <td>18.50</td> <td>19</td> <td>9.00</td> <td>RC</td> <td>06/03/2</td> <td>2019 0</td> <td>06/03/2019</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>JS/AC</td> <td>:</td> <td>BK/RL</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	18.50	19	9.00	RC	06/03/2	2019 0	06/03/2019							JS/AC	:	BK/RL							
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Water Strike Remarks General Remarks roundwater not observed in marine environment. The borehole was carried out over water from jack-up platform Skate 3A. Dock to mudline = 6.00m; deck level = 5.16m CD. Water level was marine environment. The borehole was carried out over water from jack-up platform Skate 3A. Dock to mudline = 6.00m; deck level = 5.16m CD. Water level was marine environment. The borehole was carried out over water from jack-up platform Skate 3A. Dock to mudline = 6.00m; deck level = 5.16m CD. Water level was marine environment. The borehole was carried out over water from jack-up platform Skate 3A. Dock to mudline = 6.00m; deck level = 5.16m CD. Water level was marine environment. The borehole was carried out over water from jack-up platform Skate 3A. Dock to mudline = 6.00m; deck level = 5.16m CD. Water level was marine environment. The borehole was carried out over water from jack-up platform Skate 3A. Dock to mudline = 6.00m; deck level = 5.16m CD. Water level was marine environment. The borehole was carried out over water from jack-up platform Skate 3A. Dock to mudline = 6.00m; deck level = 5.16m CD. Water level was marine environment. The borehole was carried out over water from jack-up platform Skate 3A. Dock to mudline = 6.00m; deck level = 5.16m CD. Water level as dock level = 5.16m CD. Water level = 5.1	Strike At (m)	Rise	To (m)	Time Elapse		-	n) Depth S	Sealed (m)	Depth From	m Dept	h To												
The borehole was carried out over water from jack-up platform Skate 3A. Deck to mudline = 6.00m; deck level = 5.18m CD. Water level was maintained and tor above seabed level. All depths and depth related remarks refer to depths below seabed level. Confirmed sandstone by logger. Tippe ID Response Zone Response Zone Base (m) Pipe Backfill Type ID Response Zone Response Zone Response Zone Base (m) Installation Date ID Top Depth (m) Base Depth (m) Diameter (mm) Type Depth To (m) Backfill Material Date IO Response Zone Re				((,		<u>,</u>												
The borehole was carried out over water from jack-up platform Skate 3A. Deck to mudline = 6.00m; deck level = 5.18m CD. Water level was maintained and tor above seabed level. All depths and depth related remarks refer to depths below seabed level. Confirmed sandstone by logger. Tippe ID Response Zone Response Zone Base (m) Pipe Backfill Type ID Response Zone Response Zone Response Zone Base (m) Installation Date ID Top Depth (m) Base Depth (m) Diameter (mm) Type Depth To (m) Backfill Material Date IO Response Zone Re			· · ·	Vater 9	 Strike P	Remar	'ks		L]							Gene	ral Re	marks			I		
Type ID Response Zone Top (m) Response Zone Base (m) Installation Date ID Top Depth (m) Base Depth (m) Diameter (mm) Type Depth From (m) Depth To (m) Backfill Material Date Image: Construction of the top (m) Image: Construction of top (m) Image: Construc	Groundwate	er not (level was Groundw	s mainta ater not	ined at or observe	above	seabed leve	jack-up I. All de	p platforn epths and	n Skate 3 I depth re	A. Deck to lated rema	irks refer	r to depth	ns below s	eabed lev	el.
Type ID Top (m) Base (m) Instantation Date ID Top Deput (m)						anonao Zor							-							-			
Image: Second state defined on 'Notes on Exploratory Position Records' hecked By NHA Elevation Datum Chart Datum Grid Coordinate System OSGB	Туре		ID	Top (r	n)	Base (m)	" Installati	on Date	ID	Top Dept	h (m) B	ase Depth	(m) Dia	meter (mm)	Ту	/pe I) E			Date 06/03/2019
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			Co	ntract Na	me	Nigg	Energy I	Park, Eas	t Quay	Devel	opment					Locat	ion ID		
-fi	JGR		Clie	ent		Globa	al Enera	y Nigg Lto	d								B		8
				gro Refer	ence		005U	<u>y nigg za</u>									DI	IU	U
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									Equipr	nent									
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Date	Time		Hole De	Progr	ess epth Water D	epth			Depth	Depth To	1	Rotary	,			Run	Time Dep	Core [
(dd/mm/yyyy 06/03/2019	/) (hh:mm 9 01:00	:ss) :00	(m) 15.5	(m) 0 16.00	(m) 2.60)	ner		From (m)	(m)	Flush	h Type		ush Return (%)	Flush Colou	r (hh:r		(m) (m)	O Diameter (mm)
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Groundwate	er not observ			environment.				The borehole	was carried	out over	water from	jack-up p	latfor	m Skate 3	A. Deck to m	udline =	6.00m; deck	level = 5.18	3m CD. Water
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D. CORE PHOTOGRAPHS

Rotary Core Photographs	
BH01	Plate BH01/1
BH03	Plates BH03/1 and BH03/2
BH05	Plate BH05/1

GLOBAL ENERGY NIGG LIMITED EAST QUAY DEVELOPMENT – MARINE GROUND INVESTIGATION



BH01; 17.35m to 18.85m



BH01; 20.35m to 21.85m



BH01; 21.85m to 23.35m



GLOBAL ENERGY NIGG LIMITED EAST QUAY DEVELOPMENT – MARINE GROUND INVESTIGATION



BH03; 17.00m to 18.00m



BH03; 18.00m to 19.50m



BH03; 19.50m to 21.00m









BH03; 21.00m to 22.50

GLOBAL ENERGY NIGG LIMITED EAST QUAY DEVELOPMENT – MARINE GROUND INVESTIGATION



BH05; 14.50m to 16.00m



BH05; 16.50m to 17.00m





E. FIELD TEST RECORDS

E.1 CALIBRATION CERTIFICATES

SPT Hammer Calibration Certificate

SPT08

E.2 STANDARD PENETRATION TEST RESULTS

Standard Penetration Test Results

Figures BH01 to BH08

SPT Hammer Energy Test Report

in accordance with BSEN ISO 22476-3:2005

ARCHWAY ENGINEERING (UK) LTD AINLEYS INDUSTRIAL ESTATE ELLAND WEST YORKSHIRE HX5 9JP

SPT Hammer Ref:SPT08Test Date:19/09/2018Report Date:19/09/2018File Name:SPT08.sptTest Operator:SH

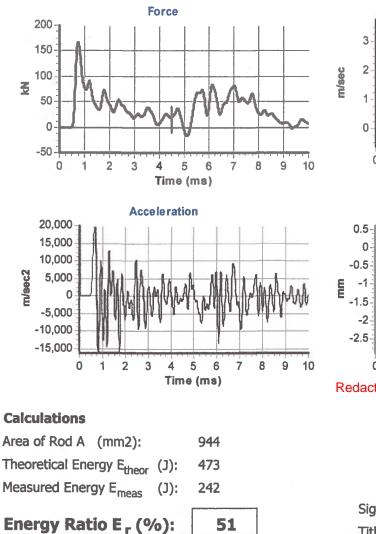
Instrumented Rod Data

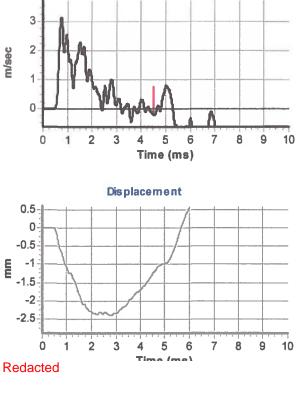
Diameter d _r (mm):	54
Wall Thickness tr (mm):	6.3
Assumed Modulus E _a (GPa):	200
Accelerometer No.1:	7080
Accelerometer No.2:	11609

SPT Hammer Informati	on
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Hammer Mass	m (kg):	63.5
Falling Height	h (mm):	760
SPT String Len	gth L (m):	10.0

Comments / Location





Velocity

Signed: S.HOWARTH Title: FITTER

The recommended calibration interval is 12 months

		Co	ontract Nar	me	Nigg Ene	ergy Park, East Qu	ay Deve	elopment			Locati	ion ID	
-6-	IGRC		ent			nergy Nigg Ltd					-	BH	N1
			gro Refere		G191005						-	DП	UI
	\rightarrow		ordinates			.70 N868963.58	Groun	d Elevation (n	n Datum)	0.85	Sheet	1 of 1	
			ole Type			ercussion and Rota					Status		Draft
		I		I		Standard Pene							
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Test Depth	h (m) Te	est Type	Self Weigh Penetration (r	^t nm) Test F	Result			Total Penetration (mm)	Hammer Ser Number	al Energy	Ratio (%)	Casing Depth (r	Mater Depth (m)
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			Со	ntract Na	ime	Nigg	Energ	gy Park, I	East Qu	ay Deve	elopment				Locat			
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				е Туре				cussion		·	·`				Status	S	Dra	aft
								Standa	rd Pene	tration T	est Results							
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Test Depth	n (m)	lest	lype	Penetration	(mm) I6	est Result					(mm)	N	umber	Energy	Ratio (%)	Casing De	ppth (m)	Water Depth (m)
							_											
Test Depth				est Resu		Undrained					eter Results ed Undrained Shear S	Planar -1						ation Detector
(m)	Test T		<u>Snear Str</u>	d Undrained ength (kPa)	snear Str	ength (kPa)		Fest Depth			(kPa)			st Depth				sult (ppm)
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			Contract Na	ame	Niga Ener	gy Park, East C	Juay Deve	elopment			Locati	on ID	
_ F .,	GRC		Client			ergy Nigg Ltd					_	BH	02
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						Standard Per	etration 7					1	
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			e Test Res			In Situ Hand F				Volatile Hea	dspace Test	ing by Photoioni	
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		Contract Nar	ne	Nigg Energy Park, East Qu	ay Deve	elopment			Locatio	on ID	
-fuge	20	Client		Global Energy Nigg Ltd					-	BH(ን ፈ
		Fugro Refere		G191005U							77
		Coordinates		E279380.77 N868871.12	Groun	d Elevation (n	n Datum)	-2.02	Sheet		
		Hole Type		Cable Percussion					Status	Dra	aft
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	С	ontract Na	me	Nigg Energy Park, East Qu	av Deve	elopment			Locatio	on ID	
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		ole Type	. /	Cable Percussion and Rota			/		Status	Dr	aft
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In Situ	u Vane	Test Resu	lts	In Situ Hand Pe	enetrome	eter Results	Volati	le Headsp	ace Testi	ng by Photoionis	ation Detector
Test Depth (m) Test Type	Undistur Shear S	bed Undrained Strength (kPa)	Residual Undr Shear Strength	Test Depth (m)	Undisturb	ed Undrained Shear S (kPa)	trength Te	est Depth	ı (m)	PID Re	sult (ppm)
Notes					-						
- Abbreviations a	nd resu	ılts data de	tined on	'Notes on Exploratory Positi	ion Reco	ords'					
Template: FGSL/HBSI/FG	GSL SPT S	ummary.hbt/Cor	nfig Fugro Re	v5/18/02/2019/TS					Print Date	25/)4/2019

			Co	ntract Na	me	Niga	Energy Park, East C		alonment			Locati	on ID	
								luay Dev	elopment					00
	IGF	20		ent			al Energy Nigg Ltd						BH	U6
				gro Refer			1005U							•••
		\leq		ordinates	s (m)		9381.64 N868746.75	Grour	d Elevation (n	n Datum) -9	.60	Sheet		
			Ho	le Type		Cabl	le Percussion					Status		raft
				Self Weig	iht 🖵		Standard Per	etration	Total Penetration	Hammer Serial				
Test Depth 0.50		Test T S		Self Weig Penetration 450	(mm) le	est Result =0 (0,0/0,			(mm) 450	Number 08	Energy	Ratio (%)	Casing Depth (n 1.00	n) Water Depth (m) 2.20
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(01)			arear SI	c.rgu (KPB)	unear Stre	ength (kPa)			(kPa)					3 1
							<u> </u>							
Notes - Abbrevi	iation	s and	resul	ts data de	efined o	on 'Note	es on Exploratory Pos	ition Rec	ords'					
Template: FG	GSL/HB	SI/FGSL \$	SPT Su	mmary.hbt/Co	onfig Fugro	Rev5/18/02	2/2019/TS					Print Dat	e 25	5/04/2019

		C	ontract Name	<u> </u>	Niga	Energy Park, East Qu		alonment				Locati	on ID	
– – – – – –	GRO		ient	•									BH	
			igro Referen	се		al Energy Nigg Ltd 1005U						-	DU	
	\approx		pordinates (n			451.07 N868746.87	Grour	d Elevation (n	n Datı	um) -4.(01	Sheet	1 of 1	
			ole Type	,	Cabl	e Percussion		````		,		Status	s Di	raft
						Standard Pene	etration 7							
Test Depth (n			Self Weight Penetration (mm) Test I	Result			(mm)	N	umber		Ratio (%)	Casing Depth (m	
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Test Depth Te		Undisturt	Test Results bed Undrained Responses	esidual Undi	rained	In Situ Hand Pe Test Depth (m)		eter Results	trength		<u>Headsp</u> t Depth		ing by Photoioni PID Re	sation Detector esult (ppm)
Notes							1						1	
- Abbreviat			Its data defir			s on Exploratory Posit	ion Rec	ords'				Print Date	e 25.	04/2019

			Со	ntract Na	ime	Nigg	Energy Park	, East Qua	ay Deve	lopment				Locati			
-6	JGR	10	Clie	ent		Globa	al Energy Nig	ag Ltd							BH	IN	8
				gro Refer	ence		005U									IU	U
	$ \rightarrow $			ordinates			448.06 N868	3803.00	Groun	d Elevation (r	n Datu	m) -0.8	2	Sheet	1 of 1		
				le Type			e Percussion		·					Status		Draf	t
							Stand	lard Penet	ration T	est Results							
Test Dept	h (m)	Test T	уре	Self Weig Penetration ((mm) Tes	st Result				Total Penetration (mm)	Hamm Nu	ner Serial mber	Energy R	atio (%)	Casing Depth	n (m) 🛝	Vater Depth (m)
Test Depti	h (m)	Test T	ype	Penetration ((mm) Tes	st Result					Nu	mber	Energy R	atio (%)	Casing Depth	1 (m) 1	Vater Depth (m)
		Ci+ \/	ono T	Toot Boou	ulto		In Site	Land Do	notrom	tor Doculto		Valatila I	laadana	aa Taati	ng hu Dhatai	ionioot	ion Dotostor
Test Depth	In Test T			est Resu d Undrained ength (kPa)	Residual L	Indrained	In Situ Test Dep			eter Results ed Undrained Shear S	Strength		leadspa				ion Detector It (ppm)
(m)					Shear Stree	7				(kPa)							
Notes - Abbrev	riations	s and	result	ts data de	efined o	n 'Notes	s on Explorat	tory Positio	on Reco	ords'							
Femplate: FC	GSL/HBS	I/FGSL \$	SPT Sur	mmary.hbt/Co	onfig Fugro	Rev5/18/02/	/2019/TS							Print Date	9	25/04/2	2019



F. GEOENVIRONMENTAL TESTING

General Notes on Laboratory Test Results	Figure F.1
Schedule of Contamination Testing	Table F.2
RPS Bedford Ltd (RPS), Certificates of Analysis Number:	19-81762



GUIDANCE NOTES

NOTES ON CHEMICAL ANALYSIS FOR CONTAMINATED LAND ASSESSMENT Sampling, Sample Preservation, Transport and Storage

Sampling of soils for environmental chemical analysis is undertaken to the standards set out in BS 10175:2011+A1:2013, sampling of groundwater is undertaken as per BS EN ISO 22475–1:2006 and BS ISO 5667–11:2009, sampling of surface waters as per BS EN ISO 5667–1:2006 and BS ISO 5667–6:2014, and sampling of ground gases for environmental testing as per CIRIA Guidance C665.

The sample container types used are dictated by the requirements of chemical testing as set out in the project specification and as provided by the selected environmental testing laboratory. Sample containers are filled as instructed by laboratory guidelines, ensuring minimisation of sample headspace.

Where sample volumes are limited by the sampling technique (e.g. dynamic sampling) certain sample container types may be prioritised to achieve the most comprehensive testing possible.

Samples on site are preserved by control of temperature to between 2 and 4 degrees Celsius unless otherwise stated. Samples are despatched to the analytical laboratory on the day of sampling under Chain of Custody (CoC) in temperature controlled cool-boxes. Sample temperature is measured on receipt at the designated analytical laboratory. Temperature control is maintained at the analytical laboratory prior to receipt of testing instructions, preparation and analysis.

Where testing instructions are to be provided by the Investigation Supervisor, blank testing schedules are provided as standard within 1 to 2 working days of sampling.

Scheduled Testing

The requested chemical analyses scheduled on available samples given on the relevant CoC.

The schedule lists the date of sampling, CoC number under which the samples were transported, tests requested and laboratory certificate reference for all samples.

Laboratory Analytical Methodologies and Accreditation

Analytical laboratories used by FGSL are accredited by UKAS (United Kingdom Accreditation Service). Dependent on Limits of Detection being achievable as requested at the time of scheduling, chemical analyses on soils, waters and gases will, where possible, be accredited by MCERTS (Monitoring Certification Scheme). MCERTS is the Environment Agency's performance standard for laboratories undertaking chemical testing. The accreditation applicable for individual tests is presented on the analytical laboratory test certificates in this report.

A summary of the methodologies used by the analytical laboratory in carrying out the requested analyses is presented on the summary pages of the analytical laboratory test certificates. Further information may be obtained on the test methodologies by contacting the laboratory concerned.

Where marine sediment samples are tested, principally as part of a dredging licence application, specific laboratory accreditation testing is required, as detailed in the relevant guidance documents from the



licensing agency. Details of these tests are given in relevant guidance documents reproduced in the appendix with the results.

Deviating Samples

UKAS is the accreditation body responsible for auditing laboratories to both ISO 17025 and MCERTS in the UK. All UKAS accredited laboratories are required to operate appropriate procedures for the handling of deviating samples.

Deviating (or non-conforming) samples are defined as those which may have been compromised in some way during sampling, transportation, storage or analysis, and which may cause the integrity of the analytical data to be in doubt.

Examples of deviating samples that can occur from sampling, transportation and storage issues include:

- Incorrect sample containers for analyses requested, for example, no separate volatile container supplied or samples for organics analysis supplied in plastic containers;
- Headspace present in containers for volatile compounds or Biological Oxygen Demand (BOD) analyses;
- No sampling date supplied (mandatory for MCERTS);
- No sampling time supplied (applicable for certain water parameters);
- Temperature exceeded;
- Holding time for the analysis exceeded.

Where deviating samples are subsequently analysed, UKAS requires that the competent laboratory "shall include a disclaimer in the report, clearly stating that the sample was deviating and that, as a result, the test result(s) may be invalid". It is also a condition of MCERTS that the whole results certificate is included in reports sent to Global Energy Nigg Limited, including all supporting information. and not just the results sheets. Each analytical report therefore contains a page detailing the deviating samples and the reasons for the non-conformity.

FGSL undertakes to sample, record, transport and store samples in such a way that deviating samples should not occur unless for reasons outside of FGSL's control.

Waste Acceptance Criteria Testing

Where samples have been scheduled for Waste Acceptance Criteria (WAC) testing to BS EN 12457, Part 3, analysis is undertaken for one of the Full, Hazardous or Inert WAC suites, as specified and as detailed below.

Full WAC Suite: The solid material from each sample is tested for: total organic carbon (TOC); loss on ignition (LOI); benzene, toluene, ethylbenzene and xylene (BTEX): Polychlorinated biphenyls (PCB's); Total petroleum hydrocarbons (TPH (C10 – C40)); Polycyclic aromatic hydrocarbons (PAHs); pH value; and acid neutralisation capacity. Two leachate specimens for each sample are prepared at liquid to solid ratios of 2:1 and then 8:1 and both are analysed for arsenic, barium, cadmium, chromium, copper, mercury, molybdenum, nickel, lead, antimony, selenium, zinc, chloride, fluoride, sulphate, total dissolved solids, phenol index and dissolved organic carbon.



Hazardous WAC Suite: The solid material from each sample is tested for total organic carbon, loss on ignition and acid neutralisation capacity. Two leachate specimens for each sample are prepared at liquid to solid ratios of 2:1 and then 8:1 and both are analysed for arsenic, barium, cadmium, chromium, copper, mercury, molybdenum, nickel, lead, antimony, selenium, zinc, chloride, fluoride, sulphate, total dissolved solids and dissolved organic carbon.

Inert WAC Suite: The solid material from each sample for total organic carbon, BTEX, PCB's, TPH (C10 – C40) and PAH. Two leachate specimens for each sample are prepared at liquid to solid ratios of 2:1 and then 8:1 and both analysed for arsenic, barium, cadmium, chromium, copper, mercury, molybdenum, nickel, lead, antimony, selenium, zinc, chloride, fluoride, sulphate, total dissolved solids, phenol index and dissolved organic carbon.

Results – calculation: The results of the testing of the 2:1 and 8:1 leachate specimens are then calculated to give a liquid to solid ratio of 10:1 result in mg/kg. These 10:1 results, and the results of the solid determinations, can be compared to the values set out in the guidance produced by the Environment Agency (2005) to assist with appropriate disposal to landfill, under Landfill Directive (1999/31/EC).

Chemical Analysis on Leachates Prepared from Soil Samples

Where artificially produced leachate specimens are requested from soil samples the leachate preparation technique is in accordance with British Standard BS EN 12457, as detailed on the Schedules.

The following is a summary of the different leaching preparations available:

- BS EN 12457–1: One stage test carried out at a liquid to solid ratio of 2:1;
- BS EN 12457–2: One stage test carried out at a liquid to solid ratio of 10:1;
- BS EN 12457–3: Two stage test carried out at a liquid to solid ratio of 2:1 followed by 8:1, giving a cumulative liquid to solid ratio of 10:1.

The resultant leachate specimens are then tested for the list of parameters as scheduled.

AGS Data for Chemistry Testing

Chemical testing results are provided in AGS 4.0 format where requested. It should be noted that where laboratory methodologies differ, or determinants tested do not appear on the AGS code list for chemical test names, a new and unique code may be used for an individual test.



Table F.2 Schedule of Contamination Testing

BH Ref.	ES	Depth (m)	Matrix Type	Sampling Date	Marine Scotland Suite (exc. PSA) testing	RPS Report Number
BH1	1	0.00-0.50	Sediment	04/03/2019	1	19-81762
BH1	3	0.50-1.00	Sediment	04/03/2019		
BH1	5	1.00-1.50	Sediment	04/03/2019		
BH1	7	1.50-2.00	Sediment	04/03/2019		
BH1	9	2.00-2.50	Sediment	04/03/2019		
BH1	11	2.50-3.00	Sediment	04/03/2019		
BH1	13	3.00-3.50	Sediment	04/03/2019		
BH1	15	3.80-4.00	Sediment	04/03/2019		
BH1	17	4.00-4.50	Sediment	04/03/2019		
BH1	19	4.50-5.00	Sediment	04/03/2019		
BH1	21	5.00-5.50	Sediment	04/03/2019		
BH1	23	5.50-6.00	Sediment	04/03/2019		
BH1	25	6.00-6.50	Sediment	04/03/2019	1	19-81762
BH1	28	6.80-7.00	Sediment	04/03/2019		
BH1	29	7.00-7.50	Sediment	04/03/2019		
BH1	31	7.50-8.00	Sediment	04/03/2019		
BH1	33	8.00-8.50	Sediment	04/03/2019		
BH1	35	8.50-9.00	Sediment	04/03/2019		
BH1	37	9.00-9.50	Sediment	04/03/2019		
BH1	39	9.50-10.00	Sediment	04/03/2019		
BH1	41	10.00-10.50	Sediment	04/03/2019		
BH1	43	10.50-11.00	Sediment	04/03/2019		
BH1	45	11.00-11.50	Sediment	04/03/2019		
BH1	47	11.50-12.00	Sediment	04/03/2019		
BH1	49	12.00-12.50	Sediment	04/03/2019		
BH1	51	12.50-13.00	Sediment	04/03/2019	1	19-81762
BH2	1	0.00-0.50	Sediment	02/03/2019	1	19-81762
BH2	3	0.50-1.00	Sediment	02/03/2019		
BH2	5	1.00-1.50	Sediment	02/03/2019	1	19-81762
BH2	7	1.50-2.00	Sediment	02/03/2019		
BH2	9	2.20-2.50	Sediment	02/03/2019		
BH2	11	2.50-3.00	Sediment	02/03/2019	1	19-81762
BH2	13	3.00-3.50	Sediment	02/03/2019		
BH2	15	3.50-4.00	Sediment	02/03/2019		
BH3	1	0.00-0.50	Sediment	08/03/2019	1	19-81762
BH3	3	0.50-1.00	Sediment	08/03/2019		
BH3	6	1.00-1.50	Sediment	08/03/2019		
BH3	8	1.50-2.00	Sediment	08/03/2019		
BH3	11	2.00-2.50	Sediment	08/03/2019		
BH3	12	2.50-3.00	Sediment	08/03/2019		
BH3	14	3.00-3.50	Sediment	08/03/2019		
BH3	16	3.80-4.00	Sediment	08/03/2019		
BH3	19	4.00-4.50	Sediment	08/03/2019		
BH3	20	4.50-5.00	Sediment	08/03/2019		
BH3	22	5.00-5.50	Sediment	08/03/2019		

GLOBAL ENERGY NIGG LIMITED EAST QUAY DEVELOPMENT - MARINE GROUND INVESTIGATION



BH Ref.	ES	Depth (m)	Matrix Type	Sampling Date	Marine Scotland Suite (exc. PSA) testing	RPS Report Number
BH3	25	5.50-6.00	Sediment	08/03/2019	1	19-81762
BH3	27	6.00-6.50	Sediment	08/03/2019		
BH3	29	6.80-7.00	Sediment	08/03/2019		
BH3	32	7.00-7.50	Sediment	08/03/2019		
BH3	33	7.50-8.00	Sediment	08/03/2019		
BH3	35	8.00-8.50	Sediment	08/03/2019		
BH3	37	8.50-9.00	Sediment	08/03/2019		
BH3	40	9.00-9.50	Sediment	08/03/2019		
BH3	41	9.50-10.00	Sediment	08/03/2019		
BH3	43	10.00-10.50	Sediment	08/03/2019		
BH3	45	10.50-11.00	Sediment	08/03/2019	1	19-81762
BH4	1	0.00-0.50	Sediment	11/03/2019	1	19-81762
BH4	4	0.50-1.00	Sediment	11/03/2019		
BH4	5	1.00-1.50	Sediment	11/03/2019		
BH4	7	1.50-2.00	Sediment	11/03/2019		
BH4	10	2.00-2.50	Sediment	11/03/2019		
BH4	12	2.50-3.00	Sediment	11/03/2019		
BH4	14	3.00-3.50	Sediment	11/03/2019		
BH4	15	3.50-4.00	Sediment	11/03/2019		
BH4	18	4.00-4.50	Sediment	11/03/2019		
BH4	19	4.50-5.00	Sediment	11/03/2019	1	19-81762
BH4	21	5.00-5.50	Sediment	11/03/2019		
BH4	23	5.50-6.00	Sediment	11/03/2019		
BH4	26	6.00-6.50	Sediment	11/03/2019		
BH4	28	6.50-7.00	Sediment	11/03/2019		
BH4	29	7.00-7.50	Sediment	11/03/2019		
BH4	31	7.50-8.00	Sediment	11/03/2019		
BH4	34	8.00-8.20	Sediment	11/03/2019		
BH4	36	8.50-9.00	Sediment	11/03/2019		
BH4	38	9.00-9.50	Sediment	11/03/2019		
BH4	40	9.50-10.00	Sediment	11/03/2019	1	19-81762
BH4	43	10.00-10.25	Sediment	11/03/2019		
BH5	1	0.00-0.50	Sediment	13/03/2019	1	19-81762
BH5	4	0.50-1.00	Sediment	13/03/2019		
BH5	6	1.00-1.50	Sediment	13/03/2019		
BH5	8	1.50-2.00	Sediment	13/03/2019		
BH5	11	2.00-2.50	Sediment	13/03/2019		
BH5	12	2.50-3.00	Sediment	13/03/2019	1	19-81762
BH5	14	3.00-3.50	Sediment	13/03/2019		
BH5	16	3.50-4.00	Sediment	13/03/2019		
BH5	19	4.00-4.50	Sediment	13/03/2019		
BH5	20	4.50-5.00	Sediment	13/03/2019		
BH5	22	5.00-5.50	Sediment	13/03/2019	1	19-81762
BH6	1	0.00-0.50	Sediment	16/03/2018	1	19-81762
BH6	3	0.50-1.00	Sediment	16/03/2018		
BH6	5	1.00-1.50	Sediment	16/03/2018	1	19-81762

GLOBAL ENERGY NIGG LIMITED EAST QUAY DEVELOPMENT - MARINE GROUND INVESTIGATION



BH Ref.	ES	Depth (m)	Matrix Type	Sampling Date	Marine Scotland Suite (exc. PSA) testing	RPS Report Number
BH6	7	1.50-2.00	Sediment	16/03/2018		
BH6	9	2.00-2.50	Sediment	16/03/2018	1	19-81762
BH7	1	0.00-0.50	Sediment	07/03/2019	1	19-81762
BH7	4	0.50-1.00	Sediment	07/03/2019		
BH7	6	1.00-1.50	Sediment	07/03/2019		
BH7	9	1.50-2.00	Sediment	07/03/2019		
BH7	11	2.00-2.50	Sediment	07/03/2019		
BH7	12	2.50-3.00	Sediment	07/03/2019		
BH7	14	3.00-3.50	Sediment	07/03/2019	1	19-81762
BH7	16	3.50-4.00	Sediment	07/03/2019		
BH7	19	4.00-4.50	Sediment	07/03/2019		
BH7	20	4.50-5.00	Sediment	07/03/2019		
BH7	22	5.00-5.50	Sediment	07/03/2019		
BH7	24	5.50-6.00	Sediment	07/03/2019		
BH7	27	6.00-6.50	Sediment	07/03/2019	1	19-81762
BH7	28	6.50-7.00	Sediment	07/03/2019		
BH7	30	7.00-7.50	Sediment	07/03/2019		
BH7	32	7.50-8.00	Sediment	07/03/2019		
BH8	1	0.00-0.50	Sediment	05/03/2019	1	19-81762
BH8	3	0.50-1.00	Sediment	05/03/2019		
BH8	5	1.00-1.50	Sediment	05/03/2019		
BH8	7	1.50-2.00	Sediment	05/03/2019		
BH8	9	2.00-2.50	Sediment	05/03/2019		
BH8	11	2.50-3.00	Sediment	05/03/2019	1	19-81762
BH8	13	3.00-3.50	Sediment	05/03/2019		
BH8	15	3.50-4.00	Sediment	05/03/2019		
BH8	17	4.00-4.50	Sediment	05/03/2019		
BH8	19	4.50-5.00	Sediment	05/03/2019		
BH8	21	5.00-5.50	Sediment	05/03/2019	1	19-81762



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Certificate of Analysis

Report No.:	19-81762
Issue No.: Date of Issue	2 17/04/2019
Customer Details:	Fugro GeoServices Ltd, Fugro House, Hithercroft Road, Wallingford, Oxfordshire OX10 9RB.
Customer Contact:	Karen Blackmore
Customer Order No.:	78367KB-WAL
Customer Reference:	G191005U
Quotation Reference:	190318/04
Description:	24 sediment samples
Date Received:	19/03/2019
Date Started:	25/03/2019
Date Completed:	12/04/2019
Test Methods:	Details available on request (refer to SOP code against relevant result/s)
Notes:	Issue 2 replaces Issue 1 in its entirety Redacted

By:

Matthew Hickson, Laboratory Manager

This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. This certificate shall not be reproduced except in full without the prior written approval of the laboratory. Observations and interpretations are outside of the scope of UKAS accreditation. Results reported herein relate only to the items supplied to the laboratory for testing. Results on an Interim Report are not dry-weight corrected.



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13 St. Martins Way, Bedford, Bedfordshire, MK42 0LF T +44 (0)1462 480 400, F +44 (0)1462 480 403, E rpsmh@rpsgroup.cc

Results Summary - Dry Weights, Moisture, Total Organic Carbon, TPH, Organotins & Density

Report No.:	19-81762
Customer Reference:	G191005U
Customer Order No:	78367KB-WAL

			Cust	omer Samp	ole No							BH1 ES1	BH1 ES25	BH1 E51	BH2 ES1	BH2 ES5	BH2 ES11
Customer Sample ID							Certified Reference Material			AQC spike			6.00-6.50m	12.5-13.0m	0.00-0.50m	1.00-1.50m	2.50-3.00m
	RPS Sample No											398220	398221	398222	398223	398224	398225
Sample Type							SEDIMENT		SEDIMENT		SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	
Sample Location																	
				Sample Dep	th (m)							0.00-0.50m	6.00-6.50m	12.5-13.0m	0.00-0.50m	1.00-1.50m	2.50-3.00m
Sampling Date						CRM BCR-646 CRM NIST 1944			Spike on clean sediment			04/03/2019	04/03/2019	04/03/2019	02/03/2019	02/03/2019	02/03/2019
				Samplin	g Time		CKM N151 15										
	-					f ani an a d	Manager		a colore o d	Manager	-						
Determinand	CAS No	Codes	SOP	Units	RL	Assigned Value	Measured Value	Recovery %	Assigned Value	Measured Value	Recovery %						
dry solids (at 105°C)		N	397	%		n/a	n/a	n/a	n/a	n/a	n/a	82.5	81.2	79.7	79.7	77.7	66.0
total organic carbon		UO	404	%	0.3	4.4	4.52	102.7%	1.5	1.47	98.0%	0.6	< 0.3	< 0.3	0.5	0.7	1.7
total petroleum hydrocarbons by GCFID (C10 - C40)		Ν	In house	µg/kg	n/a	n/a	n/a	n/a	n/a	n/a	n/a	844	1320	1190	4590	8070	49800
dibutyltin (DBT)	1002-53-5	UO	395	ug/kg DW	5	770	547.88	71.2%	40	37.18	92.9%	< 5.00	< 5.00	< 5.00	< 5.00	< 5.00	< 5.00
tributyltin (TBT)	56573-85-4	UO	395	ug/kg DW	2	480	373.02	77.7%	40	40.34	100.9%	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	57.8



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Results Summary - Dry Weights, Moisture, Total Organic Carbon, TPH, Organotins & Density

Report No.:	19-81762
Customer Reference:	G191005U
Customer Order No:	78367KB-WAL

			Cust	omer Samp	ole No							BH3 ES1	BH3 ES25	BH3 ES45	BH4 ES1	BH4 ES19	BH4 ES40
Customer Sample ID							Certified Reference Material			AQC spike			5.50-6.00m	10.50-11.00m	0.00-0.50m	4.50-5.00m	9.50-10.0m
	RPS Sample No											398226	398227	398228	398229	398230	398231
Sample Type							SEDIMENT			SEDIMENT			SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
Sample Location																	
Sample Depth (m) Sampling Date												0.00-0.50m	5.50-6.00m	10.5-11.0m	0.00-0.50m	4.50-5.00m	9.50-10.0m
						CRM BCR-646 CRM NIST 1944			Spike on clean sediment			08/03/2019	08/03/2019	08/03/2019	11/03/2019	11/03/2019	11/03/2019
				Samplin	g Time		CKM N151 15										
	-					f ani an a d	Manager		a colore o d	Manager	-						
Determinand	CAS No	Codes	SOP	Units	RL	Assigned Value	Measured Value	Recovery %	Assigned Value	Measured Value	Recovery %						
dry solids (at 105°C)		N	397	%		n/a	n/a	n/a	n/a	n/a	n/a	79.2	81.8	82.5	86.0	86.0	79.5
total organic carbon		UO	404	%	0.3	4.4	4.52	102.7%	1.5	1.47	98.0%	1.1	< 0.3	< 0.3	0.5	< 0.3	0.6
total petroleum hydrocarbons by GCFID (C10 - C40)		N	In house	µg/kg	n/a	n/a	n/a	n/a	n/a	n/a	n/a	2340	1570	1360	2160	1600	4270
dibutyltin (DBT)	1002-53-5	UO	395	ug/kg DW	5	770	547.88	71.2%	40	37.18	92.9%	< 5.00	< 5.00	< 5.00	< 5.00	< 5.00	< 5.00
tributyltin (TBT)	56573-85-4	UO	395	ug/kg DW	2	480	373.02	77.7%	40	40.34	100.9%	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00



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Results Summary - Dry Weights, Moisture, Total Organic Carbon, TPH, Organotins & Density

Report No.:	19-81762
Customer Reference:	G191005U
Customer Order No:	78367KB-WAL

			Cust	omer Samp	ole No							BH5 ES1	BH5 ES12	BH5 ES22	BH6 ES1	BH6 ES5	BH6 ES9
Customer Sample ID							Certified Reference Material			AQC spike			2.50-3.00m	5.00-5.50m	0.00-0.50m	1.00-1.50m	2.00-2.50m
RPS Sample No												398232	398233	398234	398235	398236	398237
Sample Type							SEDIMENT		SEDIMENT			SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
	Sample Location																
Sample Depth (m) Sampling Date							CRM BCR-64					0.00-0.50m	2.50-3.00m	5.00-5.50m	0.00-0.50m	1.00-1.50m	2.00-2.50m
							CRM NIST 19	-	Spike on clean sediment			13/03/2019	13/03/2019	13/03/2019	16/03/0320	16/03/2019	16/03/2019
				Samplin	g Time												
						Assigned	Measured		Assigned	Measured							
Determinand	CAS No	Codes	SOP	Units	RL	Value	Value	Recovery %	Value	Value	Recovery %						
dry solids (at 105°C)		Ν	397	%		n/a	n/a	n/a	n/a	n/a	n/a	64.8	80.1	81.2	68.2	76.1	76.1
total organic carbon		UO	404	%	0.3	4.4	4.52	102.7%	1.5	1.47	98.0%	1.0	0.7	0.5	0.6	0.5	0.6
total petroleum hydrocarbons by GCFID (C10 - C40)		N	In house	µg/kg	n/a	n/a	n/a	n/a	n/a	n/a	n/a	8050	2110	2240	6400	3230	2590
dibutyltin (DBT)	1002-53-5	UO	395	ug/kg DW	5	770	547.88	71.2%	40	37.18	92.9%	< 5.00	< 5.00	< 5.00	< 5.00	< 5.00	< 5.00
tributyltin (TBT)	56573-85-4	UO	395	ug/kg DW	2	480	373.02	77.7%	40	40.34	100.9%	< 2.00	< 2.00	< 2.00	11.2	< 2.00	< 2.00



Results Summary - Dry Weights, Moisture, Total Organic Carbon, TPH, Organotins & Density

Report No.:	19-81762
Customer Reference:	G191005U
Customer Order No:	78367KB-WAL

			Cust	omer Samj	ole No							BH7 ES1	BH7 ES14	BH7 ES27	BH8 ES1	BH8 ES11	BH8 ES21
			Cu	ustomer San	nple ID	Certifie	Certified Reference Material			AQC spike			3.00-3.50m	6.00-6.50m	0.00-0.50m	2.50-3.00m	5.00-5.50m
				RPS Sam	ple No							398238	398239	398240	398241	398242	398243
				Sample	Type	SEDIMENT			SEDIMENT			SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
				Sample Lo	ocation												
				Sample Dep	oth (m)							0.00-0.50m	3.00-3.50m	6.00-6.50m	0.00-0.50m	2.50-3.00m	5.00-5.50m
				Samplin	g Date		CRM BCR-646 CRM NIST 1944 Spike on clean sediment					07/03/2019	07/03/2019	07/03/2019	05/03/2019	05/03/2019	05/03/2019
				Samplin	g Time		CKM (131 1944										
						Assigned	Measured	1	Assigned	Measured							
Determinand	CAS No	Codes	SOP	Units	RL	Value	Value	Recovery %	Value	Value	Recovery %						
dry solids (at 105°C)		Ν	397	%		n/a	n/a	n/a	n/a	n/a	n/a	74.0	71.6	80.8	80.2	78.0	75.2
total organic carbon		UO	404	%	0.3	4.4	4.52	102.7%	1.5	1.47	98.0%	0.8	0.9	0.5	0.5	0.6	0.9
total petroleum hydrocarbons by GCFID (C10 - C40)		Ν	In house	µg/kg	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1750	7860	2630	2690	2200	2770
dibutyltin (DBT)	1002-53-5	UO		ug/kg DW	5	770	547.88	71.2%	40	37.18	92.9%	< 5.00	< 5.00	< 5.00	< 5.00	< 5.00	< 5.00
tributyltin (TBT)	56573-85-4	UO	395	ug/kg DW	2	480	373.02	77.7%	40	40.34	100.9%	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00	< 2.00



Report No.:	19-81762
Customer Reference:	G191005U
Customer Order No:	78367KB-WAL

			Cu	stomer Sam	ple No				BH1 ES1	BH1 ES25	BH1 E51	BH2 ES1	BH2 ES5	BH2 ES11
				Customer San	nple ID	Standard Reference Material			0.00-0.50m	6.00-6.50m	12.5-13.0m	0.00-0.50m	1.00-1.50m	2.50-3.00m
	RPS Sample No									398221	398222	398223	398224	398225
Sample Type						SEDIMENT			SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
Sample Location														
				Sample Dep	oth (m)				0.00-0.50m	6.00-6.50m	12.5-13.0m	0.00-0.50m	1.00-1.50m	2.50-3.00m
				Samplin	ig Date		SRM-2702		04/03/2019	04/03/2019	04/03/2019	02/03/2019	02/03/2019	02/03/2019
				Samplin	g Time									
				-	-									
Determinand	CAS No	Codes	SOP	Units	RL	Assigned Value	Measured Value	Recovery %						
arsenic (HF digest)	7440-38-2	USI	M-129	mg/kg DW	0.5	45.3	48.5	107.1%	1.65	1.43	0.88	2.34	1.56	9.41
cadmium (HF digest)	7440-43-9	USI	M-129	mg/kg DW	0.1	0.817	0.94	115.1%	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.16
chromium (HF digest)	7440-47-3	USI	M-129	mg/kg DW	0.5	352	326	92.6%	2.87	7.03	6.58	4.08	4.27	41.1
copper (HF digest)	7440-50-8	USI	M-129	mg/kg DW	0.5	117.7	114	96.9%	1.66	2.22	2.21	1.69	1.85	13.9
lead (HF digest)	7439-92-1	USI	M-129	mg/kg DW	0.5	132.8	132	99.4%	3.61	6.69	8.57	4.42	4.29	25.8
mercury (HF digest)	7439-97-6	USI	M-129	mg/kg DW	0.01	0.4474	0.41	91.6%	0.02	0.02	0.02	0.03	0.02	0.19
nickel (HF digest)	7440-02-0	USI	M-129	mg/kg DW	0.5	75.4	72.6	96.3%	0.77	2.79	3.04	1.23	1.44	17.2
zinc (HF digest)	7440-66-6	USI	M-129	mg/kg DW	2	485.3	497	102.4%	7.50	9.06	9.67	9.77	8.15	83.4



Report No.:	19-81762
Customer Reference:	G191005U
Customer Order No:	78367KB-WAL

			Cu	stomer Sam	ple No				BH3 ES1	BH3 ES25	BH3 ES45	BH4 ES1	BH4 ES19	BH4 ES40
				Customer Sam	nple ID	Standard Reference Material			0.00-0.50m	5.50-6.00m	10.50-11.00m	0.00-0.50m	4.50-5.00m	9.50-10.0m
	RPS Sample No							1			398228	398229	398230	398231
Sample Type						SEDIMENT			SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
				Sample Dep	oth (m)				0.00-0.50m	5.50-6.00m	10.5-11.0m	0.00-0.50m	4.50-5.00m	9.50-10.0m
				Samplin	g Date		SRM-2702	1	08/03/2019	08/03/2019	08/03/2019	11/03/2019	11/03/2019	11/03/2019
				Samplin	g Time									
					-									
Determinand	CAS No	Codes	SOP	Units	RL	Assigned Value	Measured Value	Recovery %						
arsenic (HF digest)	7440-38-2	USI	M-129	mg/kg DW	0.5	45.3	48.5	107.1%	1.87	1.13	0.61	1.84	2.42	1.43
cadmium (HF digest)	7440-43-9	USI	M-129	mg/kg DW	0.1	0.817	0.94	115.1%	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
chromium (HF digest)	7440-47-3	USI	M-129	mg/kg DW	0.5	352	326	92.6%	4.12	7.11	6.26	3.08	25.4	3.38
copper (HF digest)	7440-50-8	USI	M-129	mg/kg DW	0.5	117.7	114	96.9%	1.35	2.18	2.82	6.72	8.54	1.46
lead (HF digest)	7439-92-1	USI	M-129	mg/kg DW	0.5	132.8	132	99.4%	4.63	8.40	8.41	3.47	12.5	3.98
mercury (HF digest)	7439-97-6	USI	M-129	mg/kg DW	0.01	0.4474	0.41	91.6%	0.03	0.02	0.02	0.02	0.03	0.03
nickel (HF digest)	7440-02-0	USI	M-129	mg/kg DW	0.5	75.4	72.6	96.3%	1.17	2.80	2.89	0.94	14.2	1.12
zinc (HF digest)	7440-66-6	USI	M-129	mg/kg DW	2	485.3	497	102.4%	6.71	9.56	8.65	7.61	32.5	8.37



Report No.:	19-81762
Customer Reference:	G191005U
Customer Order No:	78367KB-WAL

			Cu	stomer Sam	ple No				BH5 ES1	BH5 ES12	BH5 ES22	BH6 ES1	BH6 ES5	BH6 ES9
				Customer Sam	nple ID	Standard Reference Material			0.00-0.50m	2.50-3.00m	5.00-5.50m	0.00-0.50m	1.00-1.50m	2.00-2.50m
	RPS Sample No						1			398233	398234	398235	398236	398237
	Sample Type							SEDIMENT			SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
				Sample Dep	oth (m)				0.00-0.50m	2.50-3.00m	5.00-5.50m	0.00-0.50m	1.00-1.50m	2.00-2.50m
				Samplin	g Date		SRM-2702	1	13/03/2019	13/03/2019	13/03/2019	16/03/0320	16/03/2019	16/03/2019
				Samplin	g Time									
					-									
Determinand	CAS No	Codes	SOP	Units	RL	Assigned Value	Measured Value	Recovery %						
arsenic (HF digest)	7440-38-2	USI	M-129	mg/kg DW	0.5	45.3	48.5	107.1%	5.85	1.79	1.62	3.68	1.73	2.63
cadmium (HF digest)	7440-43-9	USI	M-129	mg/kg DW	0.1	0.817	0.94	115.1%	0.11	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
chromium (HF digest)	7440-47-3	USI	M-129	mg/kg DW	0.5	352	326	92.6%	24.7	5.93	5.20	17.1	7.86	13.4
copper (HF digest)	7440-50-8	USI	M-129	mg/kg DW	0.5	117.7	114	96.9%	6.79	2.10	1.24	5.65	2.46	2.98
lead (HF digest)	7439-92-1	USI	M-129	mg/kg DW	0.5	132.8	132	99.4%	15.2	5.57	4.55	13.9	7.45	8.18
mercury (HF digest)	7439-97-6	USI	M-129	mg/kg DW	0.01	0.4474	0.41	91.6%	0.08	0.04	0.03	0.06	0.03	0.03
nickel (HF digest)	7440-02-0	USI	M-129	mg/kg DW	0.5	75.4	72.6	96.3%	10.2	1.94	1.66	6.97	2.56	5.15
zinc (HF digest)	7440-66-6	USI	M-129	mg/kg DW	2	485.3	497	102.4%	38.1	20.2	7.71	34.8	12.7	16.2



Report No.:	19-81762
Customer Reference:	G191005U
Customer Order No:	78367KB-WAL

			Cu	stomer Sam	ple No				BH7 ES1	BH7 ES14	BH7 ES27	BH8 ES1	BH8 ES11	BH8 ES21
				Customer Sam	nple ID	Standard Reference Material			0.00-0.50m	3.00-3.50m	6.00-6.50m	0.00-0.50m	2.50-3.00m	5.00-5.50m
	RPS Sample No										398240	398241	398242	398243
Sample Type						SEDIMENT			SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
	Sample Depth (m)								0.00-0.50m	3.00-3.50m	6.00-6.50m	0.00-0.50m	2.50-3.00m	5.00-5.50m
				Samplin	g Date		SRM-2702		07/03/2019	07/03/2019	07/03/2019	05/03/2019	05/03/2019	05/03/2019
				Samplin	g Time									
Determinand	CAS No	Codes	SOP	Units	RL	Assigned Value	Measured Value	Recovery %						
arsenic (HF digest)	7440-38-2	USI	M-129	mg/kg DW	0.5	45.3	48.5	107.1%	1.72	3.44	0.93	0.98	1.16	2.51
cadmium (HF digest)	7440-43-9	USI	M-129	mg/kg DW	0.1	0.817	0.94	115.1%	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
chromium (HF digest)	7440-47-3	USI	M-129	mg/kg DW	0.5	352	326	92.6%	6.91	13.4	2.68	3.45	3.40	13.4
copper (HF digest)	7440-50-8	USI	M-129	mg/kg DW	0.5	117.7	114	96.9%	1.64	2.28	< 0.50	1.61	1.59	3.06
lead (HF digest)	7439-92-1	USI	M-129	mg/kg DW	0.5	132.8	132	99.4%	6.34	3.18	0.65	3.57	3.15	7.03
mercury (HF digest)	7439-97-6	USI	M-129	mg/kg DW	0.01	0.4474	0.41	91.6%	0.03	0.03	0.02	0.02	0.02	0.03
nickel (HF digest)	7440-02-0	USI	M-129	mg/kg DW	0.5	75.4	72.6	96.3%	2.46	6.36	1.10	0.88	1.10	5.14
zinc (HF digest)	7440-66-6	USI	M-129	mg/kg DW	2	485.3	497	102.4%	8.69	17.4	4.51	4.68	5.90	16.1



Report No.:	19-81762
Customer Reference:	G191005U
Customer Order No:	78367KB-WAL

			Cus	tomer Sam	ple No							BH1 ES1	BH1 ES25	BH1 E51	BH2 ES1	BH2 ES5
			(Customer San	nple ID	Certifi	ed Reference	Material		AQC spike		0.00-0.50m	6.00-6.50m	12.5-13.0m	0.00-0.50m	1.00-1.50m
				RPS Sam	Iple No							398220	398221	398222	398223	398224
				Sample			SEDIMENT	r	SEDIMENT			SEDIMENT	SEDIMENT		SEDIMENT	SEDIMENT
				Sample L				-		-						
				Sample Dep								0.00-0.50m	6.00-6.50m	12.5-13.0m	0.00-0.50m	1.00-1.50m
				Samplin			IAEA-459		Spike on clean sediment			04/03/2019	04/03/2019	04/03/2019	02/03/2019	02/03/2019
				Samplin	g Time											
		<u>т т</u>				Assigned	Managerad	1	Assigned	Manaurad						
Determinand	CAS No	Codes	SOP	Units	RL	Assigned Value	Measured Value	Recovery %	Assigned Value	Measured Value	Recovery %					
naphthalene	91-20-3	U	396	ug/kg DW	2.6	n/a	n/a	N/A	25	27.67	110.7%	< 2.6	< 2.6	< 2.6	< 2.6	5.51
acenaphthylene	208-96-8	U	396	ug/kg DW	2	3.06	3.71	121.2%	25	23.21	92.8%	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
acenaphthene	83-32-9	U	396	ug/kg DW	1.7	2.33	2.3172	99.5%	25	23.89	95.6%	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7
fluorene	86-73-7	U	396	ug/kg DW	1.6	5.02	5.89	117.3%	25	25.63	102.5%	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6
phenanthrene	85-01-8	U	396	ug/kg DW	3.9	27.54	33.63	122.1%	25	23.16	92.6%	< 3.9	< 3.9	< 3.9	< 3.9	10.5
anthracene	120-12-7	U	396	ug/kg DW	2.4	7.55	7.91	n/a	25	25.93	103.7%	< 2.4	< 2.4	< 2.4	< 2.4	3.53
fluoranthene	206-44-0	U	396	ug/kg DW	2.4	36.78	43.69	118.8%	25	24.94	99.8%	< 2.4	< 2.4	< 2.4	6.50	22.1
pyrene	129-00-0	U	396	ug/kg DW	2.8	41.5	49.39	119.0%	25	24.34	97.4%	< 2.8	< 2.8	< 2.8	5.57	20.2
benzo(a)anthracene	56-55-3	U	396	ug/kg DW	1.6	17.53	19.8	112.9%	25	26.24	105.0%	< 1.6	< 1.6	< 1.6	4.47	10.3
chrysene	218-01-9	U	396	ug/kg DW	1.7	N/A	N/A	N/A	25	23.66	94.6%	< 1.7	< 1.7	< 1.7	3.27	6.81
benzo(b+j)fluoranthene	205-99-2	U	396	ug/kg DW	1.6	52.02	55.32	106.3%	25	23.53	94.1%	< 1.6	< 1.6	< 1.6	6.77	17.5
benzo(k)fluoranthene	207-08-9	U	396	ug/kg DW	2	14.29	15	105.0%	25	23.11	92.4%	< 2.0	< 2.0	< 2.0	< 2.0	5.71
benzo(a)pyrene	50-32-8	U	396	ug/kg DW	0.9	18.58	20.16	108.5%	25	23.8	95.2%	< 0.9	< 0.9	< 0.9	5.18	9.77
indeno(1,2,3-c,d)pyrene	193-39-5	U	396	ug/kg DW	2.2	23.18	25.75	111.1%	25	25.7	102.8%	< 2.2	< 2.2	< 2.2	3.34	8.66
dibenzo(a,h)anthracene	53-70-3	U	396	ug/kg DW	1.6	N/A	N/A	N/A	25	22.52	90.1%	< 1.6	< 1.6	< 1.6	< 1.6	2.75
benzo(g,h,i)perylene	191-24-2	U	396	ug/kg DW	1.4	28.36	31.23	110.1%	25	22.1	88.4%	< 1.4	< 1.4	< 1.4	3.56	8.36



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Customer Reference:	G191005U
Customer Order No:	78367KB-WAL

			Cus	stomer Sam	ple No							BH2 ES11	BH3 ES1	BH3 ES25	BH3 ES45	BH4 ES1
				Customer San	nple ID	Certifi	ed Reference	Material		AQC spike		2.50-3.00m	0.00-0.50m	5.50-6.00m	10.50-11.00m	0.00-0.50m
				RPS Sam	Iple No							398225	398226	398227	398228	398229
				Sample			SEDIMENT	-		SEDIMENT		SEDIMENT				SEDIMENT
				Sample L						-						
				Sample Dep								2.50-3.00m	0.00-0.50m	5.50-6.00m	10.5-11.0m	0.00-0.50m
				Samplin			IAEA-459		Spike on clean sediment			02/03/2019	08/03/2019	08/03/2019	08/03/2019	11/03/2019
				Samplin	g Time											
						Assigned	Measured	1	Assigned	Measured	1					·
Determinand	CAS No	Codes	SOP	Units	RL	Value	Value	Recovery %	Value	Value	Recovery %					1
naphthalene	91-20-3	U	396	ug/kg DW	2.6	n/a	n/a	N/A	25	27.67	110.7%	18.1	< 2.6	< 2.6	< 2.6	< 2.6
acenaphthylene	208-96-8	U	396	ug/kg DW	2	3.06	3.71	121.2%	25	23.21	92.8%	12.3	< 2.0	< 2.0	< 2.0	< 2.0
acenaphthene	83-32-9	U	396	ug/kg DW	1.7	2.33	2.3172	99.5%	25	23.89	95.6%	44.8	< 1.7	< 1.7	< 1.7	< 1.7
fluorene	86-73-7	U	396	ug/kg DW	1.6	5.02	5.89	117.3%	25	25.63	102.5%	39.1	< 1.6	< 1.6	< 1.6	< 1.6
phenanthrene	85-01-8	U	396	ug/kg DW	3.9	27.54	33.63	122.1%	25	23.16	92.6%	43.4	< 3.9	< 3.9	< 3.9	< 3.9
anthracene	120-12-7	U	396	ug/kg DW	2.4	7.55	7.91	n/a	25	25.93	103.7%	17.9	< 2.4	< 2.4	< 2.4	< 2.4
fluoranthene	206-44-0	U	396	ug/kg DW	2.4	36.78	43.69	118.8%	25	24.94	99.8%	94.2	5.53	< 2.4	< 2.4	< 2.4
pyrene	129-00-0	U	396	ug/kg DW	2.8	41.5	49.39	119.0%	25	24.34	97.4%	98.8	4.04	< 2.8	< 2.8	< 2.8
benzo(a)anthracene	56-55-3	U	396	ug/kg DW	1.6	17.53	19.8	112.9%	25	26.24	105.0%	54.3	< 1.6	< 1.6	< 1.6	< 1.6
chrysene	218-01-9	U	396	ug/kg DW	1.7	N/A	N/A	N/A	25	23.66	94.6%	36.6	< 1.7	< 1.7	< 1.7	< 1.7
benzo(b+j)fluoranthene	205-99-2	U	396	ug/kg DW	1.6	52.02	55.32	106.3%	25	23.53	94.1%	96.5	< 1.6	< 1.6	< 1.6	< 1.6
benzo(k)fluoranthene	207-08-9	U	396	ug/kg DW	2	14.29	15	105.0%	25	23.11	92.4%	28.7	< 2.0	< 2.0	< 2.0	< 2.0
benzo(a)pyrene	50-32-8	U	396	ug/kg DW	0.9	18.58	20.16	108.5%	25	23.8	95.2%	50.0	< 0.9	< 0.9	< 0.9	< 0.9
indeno(1,2,3-c,d)pyrene	193-39-5	U	396	ug/kg DW	2.2	23.18	25.75	111.1%	25	25.7	102.8%	47.3	< 2.2	< 2.2	< 2.2	< 2.2
dibenzo(a,h)anthracene	53-70-3	U	396	ug/kg DW	1.6	N/A	N/A	N/A	25	22.52	90.1%	18.1	< 1.6	< 1.6	< 1.6	< 1.6
benzo(g,h,i)perylene	191-24-2	U	396	ug/kg DW	1.4	28.36	31.23	110.1%	25	22.1	88.4%	50.6	< 1.4	< 1.4	< 1.4	< 1.4



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			Cus	tomer Sam	ple No							BH4 ES19	BH4 ES40	BH5 ES1	BH5 ES12	BH5 ES22
			(Customer San	nple ID	Certifi	ed Reference	Material		AQC spike		4.50-5.00m	9.50-10.0m	0.00-0.50m	2.50-3.00m	5.00-5.50m
				RPS Sam	nple No							398230	398231	398232	398233	398234
				Sample			SEDIMENT			SEDIMENT		SEDIMENT	SEDIMENT		SEDIMENT	SEDIMENT
				Sample L						-						
				Sample Dep								4.50-5.00m	9.50-10.0m	0.00-0.50m	2.50-3.00m	5.00-5.50m
				Samplin		IAEA-459 Spike on cle					n sediment 11/0		11/03/2019	13/03/2019	13/03/2019	13/03/2019
				Samplin	g Time											i
		<u> </u>				Assigned	Manaurad		Assigned	Manaurad						
Determinand	CAS No	Codes	SOP	Units	RL	Assigned Value	Measured Value	Recovery %	Assigned Value	Measured Value	Recovery %					
naphthalene	91-20-3	U	396	ug/kg DW	2.6	n/a	n/a	N/A	25	27.67	110.7%	< 2.6	< 2.6	6.48	3.67	< 2.6
acenaphthylene	208-96-8	U	396	ug/kg DW	2	3.06	3.71	121.2%	25	23.21	92.8%	< 2.0	< 2.0	11.0	< 2.0	< 2.0
acenaphthene	83-32-9	U	396	ug/kg DW	1.7	2.33	2.3172	99.5%	25	23.89	95.6%	< 1.7	< 1.7	7.51	< 1.7	< 1.7
fluorene	86-73-7	U	396	ug/kg DW	1.6	5.02	5.89	117.3%	25	25.63	102.5%	< 1.6	< 1.6	17.3	2.04	< 1.6
phenanthrene	85-01-8	U	396	ug/kg DW	3.9	27.54	33.63	122.1%	25	23.16	92.6%	< 3.9	< 3.9	42.4	5.91	< 3.9
anthracene	120-12-7	U	396	ug/kg DW	2.4	7.55	7.91	n/a	25	25.93	103.7%	< 2.4	< 2.4	17.6	< 2.4	< 2.4
fluoranthene	206-44-0	U	396	ug/kg DW	2.4	36.78	43.69	118.8%	25	24.94	99.8%	4.11	< 2.4	81.8	8.21	< 2.4
pyrene	129-00-0	U	396	ug/kg DW	2.8	41.5	49.39	119.0%	25	24.34	97.4%	< 2.8	< 2.8	75.4	10.0	< 2.8
benzo(a)anthracene	56-55-3	U	396	ug/kg DW	1.6	17.53	19.8	112.9%	25	26.24	105.0%	< 1.6	< 1.6	36.9	3.87	< 1.6
chrysene	218-01-9	U	396	ug/kg DW	1.7	N/A	N/A	N/A	25	23.66	94.6%	< 1.7	< 1.7	27.6	2.79	< 1.7
benzo(b+j)fluoranthene	205-99-2	U	396	ug/kg DW	1.6	52.02	55.32	106.3%	25	23.53	94.1%	2.14	< 1.6	50.7	6.06	< 1.6
benzo(k)fluoranthene	207-08-9	U	396	ug/kg DW	2	14.29	15	105.0%	25	23.11	92.4%	< 2.0	< 2.0	17.5	< 2.0	< 2.0
benzo(a)pyrene	50-32-8	U	396	ug/kg DW	0.9	18.58	20.16	108.5%	25	23.8	95.2%	< 0.9	< 0.9	37.9	3.85	< 0.9
indeno(1,2,3-c,d)pyrene	193-39-5	U	396	ug/kg DW	2.2	23.18	25.75	111.1%	25	25.7	102.8%	< 2.2	< 2.2	18.7	2.86	< 2.2
dibenzo(a,h)anthracene	53-70-3	U	396	ug/kg DW	1.6	N/A	N/A	N/A	25	22.52	90.1%	< 1.6	< 1.6	7.67	< 1.6	< 1.6
benzo(g,h,i)perylene	191-24-2	U	396	ug/kg DW	1.4	28.36	31.23	110.1%	25	22.1	88.4%	< 1.4	< 1.4	21.0	3.06	< 1.4



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			Cus	tomer Samı	ole No							BH6 ES1	BH6 ES5	BH6 ES9	BH7 ES1	BH7 ES14
			(Customer San	ple ID	Certifi	ed Reference	Material		AQC spike		0.00-0.50m	1.00-1.50m	2.00-2.50m	0.00-0.50m	3.00-3.50m
				RPS Sam	Iple No							398235	398236	398237	398238	398239
				Sample			SEDIMENT			SEDIMENT		SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
				Sample Lo						-						
				Sample Dep	th (m)							0.00-0.50m	1.00-1.50m	2.00-2.50m	0.00-0.50m	3.00-3.50m
				Samplin			IAEA-459		Spik	e on clean se	diment	16/03/0320	16/03/2019	16/03/2019	07/03/2019	07/03/2019
				Samplin	g Time											
		1 1				Assigned	Measured		Assigned	Measured						
Determinand	CAS No	Codes	SOP	Units	RL	Value	Value	Recovery %	Value	Value	Recovery %					1
naphthalene	91-20-3	U	396	ug/kg DW	2.6	n/a	n/a	N/A	25	27.67	110.7%	8.96	< 2.6	< 2.6	< 2.6	< 2.6
acenaphthylene	208-96-8	U	396	ug/kg DW	2	3.06	3.71	121.2%	25	23.21	92.8%	8.35	< 2.0	< 2.0	< 2.0	< 2.0
acenaphthene	83-32-9	U	396	ug/kg DW	1.7	2.33	2.3172	99.5%	25	23.89	95.6%	11.4	< 1.7	< 1.7	< 1.7	< 1.7
fluorene	86-73-7	U	396	ug/kg DW	1.6	5.02	5.89	117.3%	25	25.63	102.5%	15.0	< 1.6	< 1.6	< 1.6	< 1.6
phenanthrene	85-01-8	U	396	ug/kg DW	3.9	27.54	33.63	122.1%	25	23.16	92.6%	31.5	< 3.9	< 3.9	< 3.9	< 3.9
anthracene	120-12-7	U	396	ug/kg DW	2.4	7.55	7.91	n/a	25	25.93	103.7%	9.58	< 2.4	< 2.4	< 2.4	< 2.4
fluoranthene	206-44-0	U	396	ug/kg DW	2.4	36.78	43.69	118.8%	25	24.94	99.8%	54.9	4.44	< 2.4	< 2.4	< 2.4
pyrene	129-00-0	U	396	ug/kg DW	2.8	41.5	49.39	119.0%	25	24.34	97.4%	54.6	4.64	< 2.8	< 2.8	< 2.8
benzo(a)anthracene	56-55-3	U	396	ug/kg DW	1.6	17.53	19.8	112.9%	25	26.24	105.0%	30.9	2.14	< 1.6	< 1.6	< 1.6
chrysene	218-01-9	U	396	ug/kg DW	1.7	N/A	N/A	N/A	25	23.66	94.6%	22.1	< 1.7	< 1.7	< 1.7	< 1.7
benzo(b+j)fluoranthene	205-99-2	U	396	ug/kg DW	1.6	52.02	55.32	106.3%	25	23.53	94.1%	48.6	4.24	< 1.6	< 1.6	< 1.6
benzo(k)fluoranthene	207-08-9	U	396	ug/kg DW	2	14.29	15	105.0%	25	23.11	92.4%	16.5	< 2.0	< 2.0	< 2.0	< 2.0
benzo(a)pyrene	50-32-8	U	396	ug/kg DW	0.9	18.58	20.16	108.5%	25	23.8	95.2%	34.1	2.47	< 0.9	< 0.9	< 0.9
indeno(1,2,3-c,d)pyrene	193-39-5	U	396	ug/kg DW	2.2	23.18	25.75	111.1%	25	25.7	102.8%	20.9	< 2.2	< 2.2	< 2.2	< 2.2
dibenzo(a,h)anthracene	53-70-3	U	396	ug/kg DW	1.6	N/A	N/A	N/A	25	22.52	90.1%	7.00	< 1.6	< 1.6	< 1.6	< 1.6
benzo(g,h,i)perylene	191-24-2	U	396	ug/kg DW	1.4	28.36	31.23	110.1%	25	22.1	88.4%	22.3	< 1.4	< 1.4	< 1.4	< 1.4



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			Cus	tomer Sam	ple No							BH7 ES27	BH8 ES1	BH8 ES11	BH8 ES21
			(Customer San	nple ID	Certifi	ed Reference	Material		AQC spike		6.00-6.50m	0.00-0.50m	2.50-3.00m	5.00-5.50m
				RPS Sam	Inle No							398240	398241	398242	398243
				Sample			SEDIMENT			SEDIMENT			SEDIMENT	SEDIMENT	SEDIMENT
				Sample L		SEDIFIENT						SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
				Sample Dep								6.00-6.50m	0.00-0.50m	2.50-3.00m	5.00-5.50m
				Samplin			IAEA-459		Spik	e on clean se	diment		05/03/2019		05/03/2019
				Samplin	g Time				-						
	-	т <u> </u>				Assigned	Measured		Assigned	Measured	-				
Determinand	CAS No	Codes	SOP	Units	RL	Value	Value	Recovery %	Value	Value	Recovery %				
naphthalene	91-20-3	U	396	ug/kg DW	2.6	n/a	n/a	N/A	25	27.67	110.7%	< 2.6	< 2.6	< 2.6	< 2.6
acenaphthylene	208-96-8	U	396	ug/kg DW	2	3.06	3.71	121.2%	25	23.21	92.8%	< 2.0	< 2.0	< 2.0	< 2.0
acenaphthene	83-32-9	U	396	ug/kg DW	1.7	2.33	2.3172	99.5%	25	23.89	95.6%	< 1.7	< 1.7	< 1.7	< 1.7
fluorene	86-73-7	U	396	ug/kg DW	1.6	5.02	5.89	117.3%	25	25.63	102.5%	< 1.6	< 1.6	< 1.6	< 1.6
phenanthrene	85-01-8	U	396	ug/kg DW	3.9	27.54	33.63	122.1%	25	23.16	92.6%	< 3.9	< 3.9	< 3.9	< 3.9
anthracene	120-12-7	U	396	ug/kg DW	2.4	7.55	7.91	n/a	25	25.93	103.7%	< 2.4	< 2.4	< 2.4	< 2.4
fluoranthene	206-44-0	U	396	ug/kg DW	2.4	36.78	43.69	118.8%	25	24.94	99.8%	< 2.4	< 2.4	< 2.4	< 2.4
pyrene	129-00-0	U	396	ug/kg DW	2.8	41.5	49.39	119.0%	25	24.34	97.4%	< 2.8	< 2.8	< 2.8	< 2.8
benzo(a)anthracene	56-55-3	U	396	ug/kg DW	1.6	17.53	19.8	112.9%	25	26.24	105.0%	< 1.6	< 1.6	< 1.6	< 1.6
chrysene	218-01-9	U	396	ug/kg DW	1.7	N/A	N/A	N/A	25	23.66	94.6%	< 1.7	< 1.7	< 1.7	< 1.7
benzo(b+j)fluoranthene	205-99-2	U	396	ug/kg DW	1.6	52.02	55.32	106.3%	25	23.53	94.1%	< 1.6	< 1.6	< 1.6	< 1.6
benzo(k)fluoranthene	207-08-9	U	396	ug/kg DW	2	14.29	15	105.0%	25	23.11	92.4%	< 2.0	< 2.0	< 2.0	< 2.0
benzo(a)pyrene	50-32-8	U	396	ug/kg DW	0.9	18.58	20.16	108.5%	25	23.8	95.2%	< 0.9	< 0.9	< 0.9	< 0.9
indeno(1,2,3-c,d)pyrene	193-39-5	U	396	ug/kg DW	2.2	23.18	25.75	111.1%	25	25.7	102.8%	< 2.2	< 2.2	< 2.2	< 2.2
dibenzo(a,h)anthracene	53-70-3	U	396	ug/kg DW	1.6	N/A	N/A	N/A	25	22.52	90.1%	< 1.6	< 1.6	< 1.6	< 1.6
benzo(g,h,i)perylene	191-24-2	U	396	ug/kg DW	1.4	28.36	31.23	110.1%	25	22.1	88.4%	< 1.4	< 1.4	< 1.4	< 1.4



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			Cu	stomer Sam	ple No							BH1 ES1	BH1 ES25	BH1 E51	BH2 ES1
				Customer San	nple ID	Certifi	ed Reference	Material		AQC spike		0.00-0.50m	6.00-6.50m	12.5-13.0m	0.00-0.50m
							398220	398221	398222	398223					
Sample Type							SEDIMENT			SEDIMENT		SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
	ocation														
	oth (m)								6.00-6.50m	12.5-13.0m	0.00-0.50m				
	g Date	CRM BCR-536 Spike on clean sed					liment 04/03/201		04/03/2019	04/03/2019	02/03/2019				
Sampling Time															
					-					-					
Determinand	CAS No	Codes	SOP	Units	RL	Assigned Value	Measured Value	Recovery %	Assigned Value	Measured Value	Recovery %				
PCB congener 28	7012-37-5	U	396	ug/kg DW	0.1	44	42.68	97.0%	2.5	2.15	86.0%	< 0.1	< 0.1	< 0.1	< 0.1
PCB congener 52	35693-99-3	U	396	ug/kg DW	0.2	38	41.52	109.3%	2.5	2.18	87.2%	< 0.2	< 0.2	< 0.2	< 0.2
PCB congener 101	37680-73-2	U	396	ug/kg DW	0.2	44	51.19	116.3%	2.5	2.25	90.0%	< 0.2	< 0.2	< 0.2	< 0.2
PCB congener 118	31508-00-6	U	396	ug/kg DW	0.2	27.5	31.36	114.0%	2.5	2.57	102.8%	< 0.2	< 0.2	< 0.2	< 0.2
PCB congener 138	35065-28-2	U	396	ug/kg DW	0.2	44.2	53.13	120.2%	2.5	2.62	104.8%	< 0.2	< 0.2	< 0.2	< 0.2
PCB congener 153	35065-27-1	U	396	ug/kg DW	0.2	50	59.39	118.8%	2.5	2.59	103.6%	< 0.2	< 0.2	< 0.2	< 0.2
PCB congener 180	35065-29-3	U	396	ug/kg DW	0.2	22.4	26.23	117.1%	2.5	2.6	104.0%	< 0.2	< 0.2	< 0.2	< 0.2



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			Cu	stomer Sam	ple No							BH2 ES5	BH2 ES11	BH3 ES1	BH3 ES25
				Customer San	nple ID	Certifi	ed Reference	Material		AQC spike		1.00-1.50m	2.50-3.00m	0.00-0.50m	5.50-6.00m
							398224	398225	398226	398227					
Sample Type							SEDIMENT			SEDIMENT		SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
	ocation														
	oth (m)							1.00-1.50m	2.50-3.00m	0.00-0.50m	5.50-6.00m				
	ig Date		CRM BCR-53	6	Spik	e on clean se	liment	02/03/2019	02/03/2019	08/03/2019	08/03/2019				
Sampling Time															
Determinand	CAS No	Codes	SOP	Units	RL	Assigned Value	Measured Value	Recovery %	Assigned Value	Measured Value	Recovery %				
PCB congener 28	7012-37-5	U	396	ug/kg DW	0.1	44	42.68	97.0%	2.5	2.15	86.0%	< 0.1	< 0.1	< 0.1	< 0.1
PCB congener 52	35693-99-3	U	396	ug/kg DW	0.2	38	41.52	109.3%	2.5	2.18	87.2%	< 0.2	< 0.2	< 0.2	< 0.2
PCB congener 101	37680-73-2	U	396	ug/kg DW	0.2	44	51.19	116.3%	2.5	2.25	90.0%	< 0.2	< 0.2	< 0.2	< 0.2
PCB congener 118	31508-00-6	U	396	ug/kg DW	0.2	27.5	31.36	114.0%	2.5	2.57	102.8%	< 0.2	< 0.2	< 0.2	< 0.2
PCB congener 138	35065-28-2	U	396	ug/kg DW	0.2	44.2	53.13	120.2%	2.5	2.62	104.8%	< 0.2	0.9	< 0.2	< 0.2
PCB congener 153	35065-27-1	U	396	ug/kg DW	0.2	50	59.39	118.8%	2.5	2.59	103.6%	< 0.2	0.7	< 0.2	< 0.2
PCB congener 180	35065-29-3	U	396	ug/kg DW	0.2	22.4	26.23	117.1%	2.5	2.6	104.0%	< 0.2	< 0.2	< 0.2	< 0.2



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			Cu	stomer Sam	ple No							BH3 ES45	BH4 ES1	BH4 ES19	BH4 ES40
				Customer San	nple ID	Certifi	ed Reference	Material		AQC spike		10.50-11.00m	0.00-0.50m	4.50-5.00m	9.50-10.0m
				RPS Sam	ple No							398228	398229	398230	398231
				Sample	e Type		SEDIMENT			SEDIMENT		SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
				Sample Lo	ocation										
	Sample Depth (m											10.5-11.0m	0.00-0.50m	4.50-5.00m	9.50-10.0m
Sampling Da							CRM BCR-53	6	Spik	e on clean seo	liment	08/03/2019	11/03/2019	11/03/2019	11/03/2019
Sampling Time															
											1				
Determinand	CAS No	Codes	SOP	Units	RL	Assigned Value	Measured Value	Recovery %	Assigned Value	Measured Value	Recovery %				
PCB congener 28	7012-37-5	U	396	ug/kg DW	0.1	44	42.68	97.0%	2.5	2.15	86.0%	< 0.1	< 0.1	< 0.1	< 0.1
PCB congener 52	35693-99-3	U	396	ug/kg DW	0.2	38	41.52	109.3%	2.5	2.18	87.2%	< 0.2	< 0.2	< 0.2	< 0.2
PCB congener 101	37680-73-2	U	396	ug/kg DW	0.2	44	51.19	116.3%	2.5	2.25	90.0%	< 0.2	< 0.2	< 0.2	< 0.2
PCB congener 118	8 31508-00-6 U 396 ug/kg DW (114.0%	2.5	2.57	102.8%	< 0.2	< 0.2	< 0.2	< 0.2
PCB congener 138	35065-28-2	U	396	ug/kg DW	0.2	44.2	53.13	120.2%	2.5	2.62	104.8%	< 0.2	< 0.2	< 0.2	< 0.2
PCB congener 153	35065-27-1	U	396	ug/kg DW	0.2	50	59.39	118.8%	2.5	2.59	103.6%	< 0.2	< 0.2	< 0.2	< 0.2
PCB congener 180	35065-29-3	Ū	396	ug/kg DW	0.2	22.4	26.23	117.1%	2.5	2.6	104.0%	< 0.2	< 0.2	< 0.2	< 0.2



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			Cu	stomer Sam	ple No							BH5 ES1	BH5 ES12	BH5 ES22	BH6 ES1
				Customer San	nple ID	Certifi	ed Reference	Material		AQC spike		0.00-0.50m	2.50-3.00m	5.00-5.50m	0.00-0.50m
				RPS Sam	ple No							398232	398233	398234	398235
				Sample	е Туре		SEDIMENT			SEDIMENT		SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
				Sample L	ocation										
	oth (m)							0.00-0.50m	2.50-3.00m	5.00-5.50m	0.00-0.50m				
Sampling Dat							CRM BCR-53	6	Spik	e on clean sec	liment	13/03/2019	13/03/2019	13/03/2019	16/03/0320
Sampling Time															
Determinand	CAS No	Codes	SOP	Units	RL	Assigned Value	Measured Value	Recovery %	Assigned Value	Measured Value	Recovery %				
PCB congener 28	7012-37-5	U	396	ug/kg DW	0.1	44	42.68	97.0%	2.5	2.15	86.0%	< 0.1	< 0.1	< 0.1	< 0.1
PCB congener 52	35693-99-3	U	396	ug/kg DW	0.2	38	41.52	109.3%	2.5	2.18	87.2%	< 0.2	< 0.2	< 0.2	< 0.2
PCB congener 101	37680-73-2	U	396	ug/kg DW	0.2	44	51.19	116.3%	2.5	2.25	90.0%	< 0.2	< 0.2	< 0.2	< 0.2
PCB congener 118							31.36	114.0%	2.5	2.57	102.8%	< 0.2	< 0.2	< 0.2	< 0.2
PCB congener 138	35065-28-2	U	396	ug/kg DW	0.2	44.2	53.13	120.2%	2.5	2.62	104.8%	< 0.2	< 0.2	< 0.2	< 0.2
PCB congener 153	35065-27-1	U	396	ug/kg DW	0.2	50	59.39	118.8%	2.5	2.59	103.6%	< 0.2	< 0.2	< 0.2	0.9
PCB congener 180	35065-29-3	U	396	ug/kg DW	0.2	22.4	26.23	117.1%	2.5	2.6	104.0%	< 0.2	< 0.2	< 0.2	< 0.2



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			Cus	stomer Sam	ple No							BH6 ES5	BH6 ES9	BH7 ES1	BH7 ES14
				Customer San	nple ID	Certifi	ed Reference	Material		AQC spike		1.00-1.50m	2.00-2.50m	0.00-0.50m	3.00-3.50m
				RPS Sam	ple No							398236	398237	398238	398239
				Sample	е Туре		SEDIMENT			SEDIMENT		SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
				Sample Lo	ocation										
	Sample Depth (m)											1.00-1.50m	2.00-2.50m	0.00-0.50m	3.00-3.50m
Sampling Da							CRM BCR-53	6	Spik	e on clean seo	liment	16/03/2019	16/03/2019	07/03/2019	07/03/2019
Sampling Time															
	-							-							
Determinand	CAS No	Codes	SOP	Units	RL	Assigned Value	Measured Value	Recovery %	Assigned Value	Measured Value	Recovery %				
PCB congener 28	7012-37-5	U	396	ug/kg DW	0.1	44	42.68	97.0%	2.5	2.15	86.0%	< 0.1	< 0.1	< 0.1	< 0.1
PCB congener 52	35693-99-3	U	396	ug/kg DW	0.2	38	41.52	109.3%	2.5	2.18	87.2%	< 0.2	< 0.2	< 0.2	< 0.2
PCB congener 101	37680-73-2	U	396	ug/kg DW	0.2	44	51.19	116.3%	2.5	2.25	90.0%	< 0.2	< 0.2	< 0.2	< 0.2
PCB congener 118	31508-00-6 U 396 ug/kg DW 0.2						31.36	114.0%	2.5	2.57	102.8%	< 0.2	< 0.2	< 0.2	< 0.2
PCB congener 138	35065-28-2	U	396	ug/kg DW	0.2	44.2	53.13	120.2%	2.5	2.62	104.8%	< 0.2	< 0.2	< 0.2	< 0.2
PCB congener 153	35065-27-1	U	396	ug/kg DW	0.2	50	59.39	118.8%	2.5	2.59	103.6%	< 0.2	< 0.2	< 0.2	< 0.2
PCB congener 180	35065-29-3	U	396	ug/kg DW	0.2	22.4	26.23	117.1%	2.5	2.6	104.0%	< 0.2	< 0.2	< 0.2	< 0.2



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			Cus	stomer Sam	ple No							BH7 ES27	BH8 ES1	BH8 ES11	BH8 ES21
				Customer San	nple ID	Certifi	ed Reference	Material		AQC spike		6.00-6.50m	0.00-0.50m	2.50-3.00m	5.00-5.50m
				RPS Sam	ple No							398240	398241	398242	398243
				Sample	е Туре		SEDIMENT			SEDIMENT		SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
				Sample Lo	ocation										
	Sample Depth (m)											6.00-6.50m	0.00-0.50m	2.50-3.00m	5.00-5.50m
	g Date		CRM BCR-53	6	Spik	e on clean seo	liment	07/03/2019	05/03/2019	05/03/2019	05/03/2019				
Sampling Time															
Determinand	CAS No	Codes	SOP	Units	RL	Assigned Value	Measured Value	Recovery %	Assigned Value	Measured Value	Recovery %				
PCB congener 28	7012-37-5	U	396	ug/kg DW	0.1	44	42.68	97.0%	2.5	2.15	86.0%	< 0.1	< 0.1	< 0.1	< 0.1
PCB congener 52	35693-99-3	U	396	ug/kg DW	0.2	38	41.52	109.3%	2.5	2.18	87.2%	< 0.2	< 0.2	< 0.2	< 0.2
PCB congener 101	37680-73-2	U	396	ug/kg DW	0.2	44	51.19	116.3%	2.5	2.25	90.0%	< 0.2	< 0.2	< 0.2	< 0.2
PCB congener 118	31508-00-6 U 396 ug/kg DW 0.						31.36	114.0%	2.5	2.57	102.8%	< 0.2	< 0.2	< 0.2	< 0.2
PCB congener 138	35065-28-2	U	396	ug/kg DW	0.2	44.2	53.13	120.2%	2.5	2.62	104.8%	< 0.2	< 0.2	< 0.2	< 0.2
PCB congener 153	35065-27-1	U	396	ug/kg DW	0.2	50	59.39	118.8%	2.5	2.59	103.6%	< 0.2	< 0.2	< 0.2	< 0.2
PCB congener 180	35065-29-3	U	396	ug/kg DW	0.2	22.4	26.23	117.1%	2.5	2.6	104.0%	< 0.2	< 0.2	< 0.2	< 0.2



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		(Customer S	ample No	BH1 ES1	BH1 ES25	BH1 E51	BH2 ES1	BH2 ES5	BH2 ES11	BH3 ES1	BH3 ES25	BH3 ES45
			Customer	Sample ID	0.00-0.50m	6.00-6.50m	12.5-13.0m	0.00-0.50m	1.00-1.50m	2.50-3.00m	0.00-0.50m	5.50-6.00m	10.50-11.00m
			RPS	Sample No	398220	398221	398222	398223	398224	398225	398226	398227	398228
					SEDIMENT		SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	
				ole Location									
					0.00-0.50m	6.00-6.50m	12.5-13.0m	0.00-0.50m	1.00-1.50m	2.50-3.00m	0.00-0.50m	5.50-6.00m	10.5-11.0m
			Śar	npling Date	04/03/2019	04/03/2019	04/03/2019	02/03/2019	02/03/2019	02/03/2019	08/03/2019	08/03/2019	08/03/2019
			San	npling Time									
Determinand	CAS No	Codes	SOP	Units									
	0.10110			•	Unimodal,	Trimodal,	Unimodal,	Unimodal,	Unimodal,	Polymodal,	Unimodal,		Unimodal,
					Moderately	Very Poorly	Moderately	Moderately	Very Poorly	Very Poorly	Moderately	Unimodal,	Moderately
sample type		S	In-house		Well Sorted	Sorted	Well Sorted	Sorted	Sorted	Sorted	· · ·	Poorly Sorted	
		-							Slightly			,	
					Slightly		Slightly		Gravelly		Slightly	Slightly	
textural group (GRADISTAT)		S	In-house		Gravelly Sand	Gravelly Sand	Gravelly Sand	Sand	Muddy Sand	Sandy Mud	Gravelly Sand	Gravelly Sand	Gravelly Sand
						,			Slightly Very				· · · ·
					Slightly Very	Very Coarse	Slightly Fine	Moderately	Fine Gravelly	Very Fine	Slightly Very	Slightly Very	Very Fine
					Fine Gravelly	Gravelly	Gravelly	Sorted	Coarse Silty	Sandy Very	Fine Gravelly	Fine Gravelly	Gravelly
sediment name		S	In-house		Medium Sand	Medium Sand	Medium Sand	Medium Sand	Medium Sand	Coarse Silt	Medium Sand	Medium Sand	Medium Sand
arithmetic mean (method of moments)		S	In-house	um	389	6700	399	355	308	103	421	409	694
arithmetic sorting (method of moments)		S	In-house	um	194	12900	390	156	226	158	848	262	1100
arithmetic skewness (method of moments)		S	In-house	um	5.33	1.76	9.89	0.502	1.56	2.11	13.5	2.85	5.23
arithmetic kurtosis (method of moments)		S	In-house	um	69.0	4.39	130	5.31	25.2	6.70	204	30.5	33.7
geometic mean (method of moments)		S	In-house	um	336	763	320	290	147	31.0	304	243	420
geometic sorting (method of moments)		S	In-house	um	2.01	8.44	2.21	2.41	5.69	5.87	2.32	5.23	3.27
geometic skewness (method of moments)		S	In-house	um	-5.57	0.309	-4.40	-4.19	-1.53	-0.500	-3.50	-2.79	-3.24
geometic kurtosis (method of moments)		S	In-house	um	52.2	3.90	39.8	26.9	4.67	3.28	32.0	10.5	22.2
logarithmic mean (method of moments)		S	In-house	phi	1.57	0.390	1.65	1.79	2.76	5.01	1.72	2.04	1.25
logarithmic sorting (method of moments)		S	In-house	phi	1.01	3.08	1.14	1.27	2.51	2.55	1.21	2.39	1.71
logarithmic skewness (method of moments)		S	In-house	phi	5.57	-0.309	4.40	4.19	1.53	0.500	3.50	2.79	3.24
logarithmic kurtosis (method of moments)		S	In-house	phi	52.2	3.90	39.8	26.9	4.67	3.28	32.0	10.5	22.2
mean (Folk and Ward method - um)		S	In-house	um	357	1240	338	326	150	34.0	320	358	443
sorting (Folk and Ward method - um)		S	In-house	um	1.47	8.08	1.61	1.66	4.84	6.01	1.61	2.97	1.86
skewness (Folk and Ward method - um)		S	In-house	um	-0.072	0.621	-0.161	-0.222	-0.720	-0.055	-0.097	-0.541	0.029
kurtosis (Folk and Ward method - um)		S	In-house	um	0.984	2.09	1.05	1.40	0.945	1.06	1.03	3.07	2.30



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		C	Customer S	Sample No	BH1 ES1	BH1 ES25	BH1 E51	BH2 ES1	BH2 ES5	BH2 ES11	BH3 ES1	BH3 ES25	BH3 ES45
			Customer	Sample ID	0.00-0.50m	6.00-6.50m	12.5-13.0m	0.00-0.50m	1.00-1.50m	2.50-3.00m	0.00-0.50m	5.50-6.00m	10.50-11.00m
			RPS	Sample No	398220	398221	398222	398223	398224	398225	398226	398227	398228
			Sai	mple Type	SEDIMENT	SEDIMENT							
				ole Location	-	-	-	-	-	-	-	-	
			Sample	Depth (m)	0.00-0.50m	6.00-6.50m	12.5-13.0m	0.00-0.50m	1.00-1.50m	2.50-3.00m	0.00-0.50m	5.50-6.00m	10.5-11.0m
			Sar	npling Date	04/03/2019	04/03/2019	04/03/2019	02/03/2019	02/03/2019	02/03/2019	08/03/2019	08/03/2019	08/03/2019
			San	npling Time									
Determinand	CAS No	Codes	SOP	Units									
mean (Folk and Ward method - phi)		S	In-house	phi	1.49	-0.315	1.57	1.62	2.74	4.88	1.65	1.48	1.17
sorting (Folk and Ward method - phi)		S	In-house	phi	0.555	3.01	0.684	0.730	2.28	2.59	0.682	1.57	0.892
skewness (Folk and Ward method - phi)		S	In-house	phi	0.072	-0.621	0.161	0.222	0.720	0.055	0.097	0.541	-0.029
kurtosis (Folk and Ward method - phi)		S	In-house	phi	0.984	2.09	1.05	1.40	0.945	1.06	1.03	3.07	2.30
						Very Coarse				Very Coarse			
mean description (Folk and Ward method)		S	In-house		Medium Sand	Sand		Medium Sand		Silt		Medium Sand	
					Moderately	Very Poorly	Moderately	Moderately	Very Poorly	Very Poorly	Moderately		Moderately
sorting description (Folk and Ward method)		S	In-house		Well Sorted	Sorted	Well Sorted	Sorted	Sorted	Sorted	Well Sorted	Poorly Sorted	Sorted
						Very Coarse			Very Fine			Very Fine	
skewness description (Folk and Ward method)		S	In-house		Symmetrical	Skewed	Fine Skewed	Fine Skewed	Skewed	Symmetrical	Symmetrical	Skewed	Symmetrical
		_				very						Extremely	very
kurtosis description (Folk and Ward method)		S	In-house		Mesokurtic	Leptokurtic	Mesokurtic	Leptokurtic	Mesokurtic	Mesokurtic	Mesokurtic	Leptokurtic	Leptokurtic
MODE 1 - um		S	In-house	um	428	428	428	428	428	38.1	428	428	428
MODE 2 - um		S	In-house	um		38300				428			
MODE 3 - um		S	In-house	um		13600				9.43			
MODE 1 - phi		S	In-house	phi	1.25	1.25	1.25	1.25	1.25	4.74	1.25	1.25	1.25
MODE 2 - phi		S	In-house	phi		-5.24				1.25			
MODE 3 - phi		S	In-house	phi		-3.74				6.75			
D10 - um		S	In-house	um	208	178	184	186	8.6	3.2	181	83.8	235
D50 - um		S	In-house	um	364	400	352	336	323	35.0	327	400	451
D90 - um		S	In-house	um	591	32600	601	562	584	370	582	653	762
(D90/D10) - um		S	In-house	um	2.84	183	3.27	3.03	67.5	117	3.22	7.80	3.25
(D90 - D10) - um		S	In-house	um	383	32400	417	376	575	367	401	569	528
(D75/D25) - um		S	In-house	um	1.70	3.26	1.86	1.77	9.11	9.27	1.90	2.03	1.63



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		c	Customer S	ample No	BH1 ES1	BH1 ES25	BH1 E51	BH2 ES1	BH2 ES5	BH2 ES11	BH3 ES1	BH3 ES25	BH3 ES45
			Customer	Sample ID	0.00-0.50m	6.00-6.50m	12.5-13.0m	0.00-0.50m	1.00-1.50m	2.50-3.00m	0.00-0.50m	5.50-6.00m	10.50-11.00m
			RPS	Sample No	398220	398221	398222	398223	398224	398225	398226	398227	398228
			Sa	nple Type	SEDIMENT								
			Sam	ole Location									
			Sample	Depth (m)	0.00-0.50m	6.00-6.50m	12.5-13.0m	0.00-0.50m	1.00-1.50m	2.50-3.00m	0.00-0.50m	5.50-6.00m	10.5-11.0m
					04/03/2019	04/03/2019	04/03/2019	02/03/2019	02/03/2019	02/03/2019	08/03/2019	08/03/2019	08/03/2019
			Sar	npling Time									
Determinand	CAS No	Codes	SOP	Units	100	570	215	102	102	04.0	211	267	227
(D75 - D25) - um		S	In-house	um	192 0.759	579 -5.03	215 0.735	193 0.833	403 0.777	84.8	211 0.781	267 0.614	227 0.391
D10 - phi D50 - phi		S S	In-house In-house	phi phi	0.759	-5.03	0.735	0.833	1.63	1.43 4.84	0.781	1.32	1.15
D90 - phi		5	In-house	phi	2.27	2.49	2.44	2.43	6.85	8.31	2.47	3.58	2.09
(D90/D10) - phi		S	In-house	phi	2.27	-0.495	3.33	2.43	8.82	5.80	3.16	5.82	5.34
(D90 - D10) - phi		S	In-house	phi	1.51	7.52	1.71	1.60	6.08	6.87	1.69	2.96	1.70
(D75/D25) - phi		S	In-house	phi	1.70	7.58	1.81	1.70	3.79	1.95	1.80	2.10	1.92
(D75 - D25) - phi		S	In-house	phi	0.769	1.70	0.896	0.821	3.19	3.21	0.927	1.02	0.702
% gravel		S	In-house	%	0.21	23.7	0.77	0.00	0.05	0.00	1.05	0.22	5.13
% sand		S	In-house	%	97.9	71.7	97.1	95.3	73.6	32.4	96.2	89.9	92.0
% mud		Š	In-house	%	1.86	4.61	2.18	4.69	26.4	67.6	2.78	9.88	2.85
% very coarse gravel (>32<64mm or <-5>-6phi)		S	In-house	%	0.00	10.6	0.00	0.00	0.00	0.00	0.00	0.00	0.00
% coarse gravel (>16<32mm or <-4>-5phi)		S	In-house	%	0.00	6.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
% medium gravel (>8<16mm or <-3>-4phi)		S	In-house	%	0.00	4.91	0.00	0.00	0.00	0.00	0.34	0.00	0.46
% fine gravel (>4<8mm or <-2>-3phi)		S	In-house	%	0.00	1.24	0.41	0.00	0.01	0.00	0.25	0.02	2.15
% very fine gravel (>2<4mm or <-1>-2phi)		S	In-house	%	0.21	0.98	0.36	0.00	0.05	0.00	0.46	0.20	2.53
% very coarse sand (>1<2mm or <0>-1phi)		S	In-house	%	0.40	0.83	0.43	0.09	0.10	0.00	0.28	1.89	3.26
% coarse sand (>0.5<1mm or <1>0phi)		S	In-house	%	16.9	12.0	17.2	14.3	16.7	4.25	14.5	26.4	29.6
% medium sand (>0.25<0.5mm or <2>1phi)		S	In-house	%	64.9	40.0	56.5	61.2	46.8	10.1	55.5	48.1	51.3
% fine sand (>0.125<0.25mm or <3>2phi)		S	In-house	%	15.4	17.6	21.3	19.1	9.34	6.65	24.5	12.4	6.23
% very fine sand (>0.0625<0.125mm or <4>3phi)		S	In-house	%	0.25	1.30	1.61	0.64	0.68	11.5	1.44	1.18	1.64
% very coarse silt (>0.03125<0.0625mm or <5>4phi		S	In-house	%	0.51	1.40	0.88	1.42	5.78	21.2	1.02	0.40	0.09
% coarse silt (>0.015625<0.03125mm or <6>5phi)		S	In-house	%	0.44	0.91	0.36	1.20	6.92	16.5	0.57	0.28	0.17
% medium silt (>0.007813<0.015625mm or <7>6phi)		S	In-house	%	0.15	0.45	0.10	0.53	4.41	8.57	0.20	1.87	0.46
% fine silt (>0.003906<0.007813mm or <8>7phi)		S	In-house	%	0.15	0.47	0.12	0.57	4.41	9.05	0.22	2.10	0.39
% very fine silt (>0.001953<0.003906mm or <9>8phi		S	In-house	%	0.15	0.44	0.14	0.40	2.54	6.15	0.20	1.58	0.39
% clay (<0.001953mm or >9phi)		S	In-house	%	0.45	0.94	0.57	0.58	2.33	6.05	0.56	3.65	1.34



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			Customer S	Sample No	BH4 ES1	BH4 ES19	BH4 ES40	BH5 ES1	BH5 ES12	BH5 ES22	BH6 ES1	BH6 ES5	BH6 ES9
			Customer	Sample ID	0.00-0.50m	4.50-5.00m	9.50-10.0m	0.00-0.50m	2.50-3.00m	5.00-5.50m	0.00-0.50m	1.00-1.50m	2.00-2.50m
			RPS	Sample No	398229	398230	398231	398232	398233	398234	398235	398236	398237
					SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
				ole Location									
					0.00-0.50m	4.50-5.00m	9.50-10.0m	0.00-0.50m	2.50-3.00m	5.00-5.50m	0.00-0.50m	1.00-1.50m	2.00-2.50m
			Śar	npling Date	11/03/2019	11/03/2019	11/03/2019	13/03/2019	13/03/2019	13/03/2019	16/03/0320	16/03/2019	16/03/2019
			Sar	npling Time									
Determinand	CAS No	Codes	SOP	Units									
						Bimodal,	Trimodal,	Polymodal,		Bimodal,	Polymodal,		Trimodal,
					Trimodal,	Very Poorly	Very Poorly	Very Poorly	Unimodal,	Very Poorly	Very Poorly	Unimodal,	Very Poorly
sample type		S	In-house		Poorly Sorted	Sorted	Sorted	Sorted	Poorly Sorted	Sorted	Sorted	Poorly Sorted	Sorted
									Slíghtly Gravelly			Slightly Gravelly	
		~										/	
textural group (GRADISTAT)		S	In-house		Gravelly Sand	Sandy Gravel	Gravel	Muddy Sand		Sandy Gravel	Muddy Sand		Muddy Sand
						Canada Maria			Slightly			Slightly Very	
					F: 0 "	Sandy Very		Very Coarse	Medium		Very Coarse	,	· ·
		~			Fine Gravelly	Coarse	Very Coarse	Silty Very		Sandy Coarse		Coarse Silty	Silty Fine
sediment name		S	In-house		Medium Sand	Gravel	Gravel	Fine Sand	Coarse Silty	Gravel		Medium Sand	
arithmetic mean (method of moments)		S	In-house	um	2370	15600	24000	165	445	15200	117	274	173
arithmetic sorting (method of moments)		S	In-house	um	4420	16200	20300	200	983	12500	124	172	177
arithmetic skewness (method of moments)		S	In-house	um	2.61	0.343	0.396	1.49	8.61	0.417	1.88	2.45	1.19
arithmetic kurtosis (method of moments)		S	In-house	um	9.25	1.39	1.65	4.19	79.3	2.01	8.01	33.9	3.91
geometic mean (method of moments)		S	In-house	um	713	3240	8540	62.2	231	6180	51.1	194	71.6
geometic sorting (method of moments)		S	In-house	um	4.26	9.76	11.3	5.47	4.05	6.59	5.22	3.12	5.41
geometic skewness (method of moments)		S	In-house	um	0.339	-0.235	-2.36	-0.870	-2.10	-1.34	-1.17	-2.84	-1.03
geometic kurtosis (method of moments)		S	In-house	um	5.43	1.75	9.04	3.92	9.28	4.68	4.27	13.7	3.95
logarithmic mean (method of moments)		S	In-house	phi	0.488	-1.70	-3.10	4.01	2.11	-2.63	4.29	2.37	3.80
logarithmic sorting (method of moments)		S	In-house	phi	2.09	3.29	3.50 2.36	2.45 0.870	2.02	2.72	2.38	1.64	2.44
logarithmic skewness (method of moments) logarithmic kurtosis (method of moments)		S	In-house	phi phi	-0.339 5.43	0.235	2.36	3.92	2.10 9.28	1.34 4.68	1.17 4.27	2.84 13.7	1.03 3.95
		5	In-house			1.75						-	3.95
mean (Folk and Ward method - um)		S	In-house	um	804	4810	12600	71.8	300	5570	54.8	236	
sorting (Folk and Ward method - um)		S	In-house	um	3.95	7.50	8.30	5.39	2.62	6.16	4.73	2.26	4.86
skewness (Folk and Ward method - um)		S	In-house	um	0.627	-0.494	-0.582 1.58	-0.143	-0.468 2.39	-0.603	-0.394	-0.267 1.94	-0.345 0.928
kurtosis (Folk and Ward method - um)		5	In-house	um	1.01	0.489	1.58	1.04	2.39	0.866	1.01	1.94	0.928



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		c	Customer S	ample No	BH4 ES1	BH4 ES19	BH4 ES40	BH5 ES1	BH5 ES12	BH5 ES22	BH6 ES1	BH6 ES5	BH6 ES9
			Customer	Sample ID	0.00-0.50m	4.50-5.00m	9.50-10.0m	0.00-0.50m	2.50-3.00m	5.00-5.50m	0.00-0.50m	1.00-1.50m	2.00-2.50m
			RPS	Sample No	398229	398230	398231	398232	398233	398234	398235	398236	398237
			Sai	mple Type	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
			Samp	ole Location									
			Sample	Depth (m)	0.00-0.50m	4.50-5.00m	9.50-10.0m	0.00-0.50m	2.50-3.00m	5.00-5.50m	0.00-0.50m	1.00-1.50m	2.00-2.50m
				npling Date	11/03/2019	11/03/2019	11/03/2019	13/03/2019	13/03/2019	13/03/2019	16/03/0320	16/03/2019	16/03/2019
			San	npling Time									
Determinand	CAS No	Codes	SOP	Units									
mean (Folk and Ward method - phi)		S	In-house	phi	0.315	-2.27	-3.65	3.80	1.74	-2.48	4.19	2.08	3.60
sorting (Folk and Ward method - phi)		S	In-house	phi	1.98	2.91	3.05	2.43	1.39	2.62	2.24	1.18	2.28
skewness (Folk and Ward method - phi)		5	In-house	phi	-0.627	0.494	0.582	0.143	0.468	0.603	0.394	0.267	0.345
kurtosis (Folk and Ward method - phi)		S	In-house	phi	1.01	0.489	1.58 Medium	1.04 Very Fine	2.39	0.866	1.01 Very Coarse	1.94	0.928 Very Fine
mean description (Folk and Ward method)		S	In-house		Coarse Sand	Fine Gravel	Gravel	'	Medium Sand	Fine Gravel	Silt	Fine Sand	Sand
		3	III-House		Coarse Sanu	Very Poorly	Very Poorly	Very Poorly	Medium Sanu	Very Poorly	Very Poorly	FILLE Sallu	Very Poorly
sorting description (Folk and Ward method)		S	In-house		Poorly Sorted	Sorted	Sorted	Sorted	Poorly Sorted	Sorted		Poorly Sorted	Sorted
					Very Coarse	Very Fine	Very Fine		Very Fine	Very Fine	Very Fine	,	Very Fine
skewness description (Folk and Ward method)		S	In-house		Skewed	Skewed	Skewed	Fine Skewed	Skewed	Skewed	Skewed	Fine Skewed	Skewed
						very	very		very			very	
kurtosis description (Folk and Ward method)		S	In-house		Mesokurtic	Platykurtic	Leptokurtic	Mesokurtic	Leptokurtic	Platykurtic	Mesokurtic	Leptokurtic	Mesokurtic
MODE 1 - um		S	In-house	um	428	38300	54000	108	428	27000	215	215	215
MODE 2 - um		S	In-house	um	6800	428	27000	605		428	108		38.1
MODE 3 - um		S	In-house	um	19200		9600	38.1			38.1		9.43
MODE 1 - phi		S	In-house	phi	1.25	-5.24	-5.74	3.24	1.25	-4.73	2.24	2.24	2.24
MODE 2 - phi		S	In-house	phi	-2.74	1.25	-4.73	0.747		1.25	3.24		4.74
MODE 3 - phi		S	In-house	phi	-4.24		-3.24	4.74			4.74		6.75
D10 - um		S	In-house	um	218	250	573	6.1	32.3	329	4.7	60.1	6.6
D50 - um		S	In-house	um	430	10700	19700	77.3	333	13300	80.2	243	113
D90 - um		S	In-house	um	7840	39000	55000	515	600	33100	255	489	433
(D90/D10) - um		S	In-house	um	36.0	156	96.1	84.5	18.6	101	54.0	8.15	65.3
(D90 - D10) - um		S	In-house	um	7620	38800	54400	509	568	32800	250	429	427
(D75/D25) - um		S	In-house	um	5.57	87.8	9.34	8.30	2.12	11.3	7.81	2.05	9.84



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		c	Customer S	ample No	BH4 ES1	BH4 ES19	BH4 ES40	BH5 ES1	BH5 ES12	BH5 ES22	BH6 ES1	BH6 ES5	BH6 ES9
			Customer	Sample ID	0.00-0.50m	4.50-5.00m	9.50-10.0m	0.00-0.50m	2.50-3.00m	5.00-5.50m	0.00-0.50m	1.00-1.50m	2.00-2.50m
			RPS	Sample No	398229	398230	398231	398232	398233	398234	398235	398236	398237
			Sai	nple Type	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
			Samp	le Location									
					0.00-0.50m	4.50-5.00m	9.50-10.0m	0.00-0.50m	2.50-3.00m	5.00-5.50m	0.00-0.50m	1.00-1.50m	2.00-2.50m
					11/03/2019	11/03/2019	11/03/2019	13/03/2019	13/03/2019	13/03/2019	16/03/0320	16/03/2019	16/03/2019
			San	npling Time									
Determinand	CAS No	Codes	SOP	Units	1250	21200	20700	102	241	22400	150	100	227
(D75 - D25) - um D10 - phi		5	In-house	um phi	1350 -2.97	31200 -5.29	39700 -5.78	183 0.958	241 0.736	22400 -5.05	156 1.97	180 1.03	237 1.21
D10 - phi D50 - phi		S	In-house In-house	phi phi	-2.97	-5.29 -3.42	-5.78 -4.30	0.958	1.59	-5.05	3.64	2.04	3.15
D90 - phi		S S	In-house	phi	2.20	-3.42	-4.30	7.36	4.95	-3.73	7.73	4.06	7.24
(D90/D10) - phi		5	In-house	phi	-0.740	-0.379	-0.139	7.68	6.73	-0.317	3.92	3.94	6.00
(D90 - D10) - phi		S	In-house	phi	5.17	7.29	6.59	6.40	4.22	6.65	5.76	3.03	6.03
(D75/D25) - phi		5	In-house	phi	-2.45	-0.297	0.411	2.35	1.96	0.243	2.20	1.69	2.71
(D75 - D25) - phi		S	In-house	phi	2.48	6.46	3.22	3.05	1.08	3.50	2.20	1.09	3.30
% gravel		S	In-house	%	23.8	52.1	84.0	0.00	1.38	75.3	0.00	0.03	0.00
% sand		S	In-house	%	75.0	47.1	10.6	54.6	85.8	23.2	54.8	89.9	57.3
% mud		Š	In-house	%	1.12	0.88	5.47	45.4	12.8	1.47	45.2	10.1	42.7
% very coarse gravel (>32<64mm or <-5>-6phi)		S	In-house	%	0.00	24.0	31.9	0.00	0.00	11.1	0.00	0.00	0.00
% coarse gravel (>16<32mm or <-4>-5phi)		S	In-house	%	3.78	21.7	23.6	0.00	0.00	32.1	0.00	0.00	0.00
% medium gravel (>8<16mm or <-3>-4phi)		S	In-house	%	5.97	5.15	11.2	0.00	1.03	21.6	0.00	0.00	0.00
% fine gravel (>4<8mm or <-2>-3phi)		S	In-house	%	8.16	0.57	10.6	0.00	0.13	7.35	0.00	0.00	0.00
% very fine gravel (>2<4mm or <-1>-2phi)		S	In-house	%	5.94	0.62	6.59	0.00	0.22	3.12	0.00	0.03	0.00
% very coarse sand (>1<2mm or <0>-1phi)		S	In-house	%	3.44	0.49	3.40	0.00	0.21	1.74	0.00	0.05	0.00
% coarse sand (>0.5<1mm or <1>0phi)		S	In-house	%	12.2	7.64	4.05	10.8	16.2	4.65	1.90	8.97	6.26
% medium sand (>0.25<0.5mm or <2>1phi)		S	In-house	%	45.9	29.8	3.11	9.98	51.3	12.5	8.44	38.6	20.5
% fine sand (>0.125<0.25mm or <3>2phi)		S	In-house	%	13.3	8.95	0.00	15.9	17.0	4.08	26.4	37.1	21.7
% very fine sand (>0.0625<0.125mm or <4>3phi)		S	In-house	%	0.27	0.21	0.00	18.0	1.10	0.22	18.1	5.21	8.88
% very coarse silt (>0.03125<0.0625mm or <5>4phi		S	In-house	%	0.34	0.28	0.00	16.0	2.96	0.31	14.4	2.94	14.6
% coarse silt (>0.015625<0.03125mm or <6>5phi)	ļ	S	In-house	%	0.23	0.19	0.09	11.4	3.24	0.31	10.8	2.95	11.5
% medium silt (>0.007813<0.015625mm or <7>6phi)	ļ	S	In-house	%	0.07	0.07	0.97	5.80	1.88	0.24	5.60	1.09	5.35
% fine silt (>0.003906<0.007813mm or <8>7phi)		S	In-house	%	0.08	0.07	1.22	5.56	2.04	0.22	5.92	1.20	4.94
% very fine silt (>0.001953<0.003906mm or <9>8phi		S	In-house	%	0.08	0.07	0.99	3.20	1.31	0.15	4.00	0.83	3.06
% clay (<0.001953mm or >9phi)		S	In-house	%	0.32	0.21	2.20	3.39	1.36	0.25	4.45	1.11	3.23



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			Customer S	Sample No	BH7 ES1	BH7 ES14	BH7 ES27	BH8 ES1	BH8 ES11	BH8 ES21
			Customer	r Sample ID	0.00-0.50m	3.00-3.50m	6.00-6.50m	0.00-0.50m	2.50-3.00m	5.00-5.50m
			RPS	Sample No	398238	398239	398240	398241	398242	398243
					SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
				ole Location						
					0.00-0.50m	3.00-3.50m	6.00-6.50m	0.00-0.50m	2.50-3.00m	5.00-5.50m
			Śar	npling Date	07/03/2019	07/03/2019	07/03/2019	05/03/2019	05/03/2019	05/03/2019
			Sar	npling Time						
Determinand	CAS No	Codes	SOP	Units						
						Trimodal,		Bimodal,	Unimodal,	
					Unimodal,	Very Poorly	Unimodal,	Very Poorly	Moderately	Unimodal,
sample type		S	In-house		Poorly Sorted	Sorted	Poorly Sorted	Sorted	Well Sorted	Poorly Sorted
					Slightly					
					Gravelly		Slightly			
textural group (GRADISTAT)		S	In-house			Muddy Sand	Gravelly Sand	Gravelly Sand	Sand	Sand
					Slightly Fine					
					Gravelly Very	Very Coarse	Slightly Very	Coarse	Moderately	
					Coarse Silty	Silty Fine	Fine Gravelly	Gravelly	Well Sorted	Poorly Sorted
sediment name		S	In-house		Medium Sand			Medium Sand		
arithmetic mean (method of moments)		S	In-house	um	305	170	441	5480	331	284
arithmetic sorting (method of moments)		S	In-house	um	349	167	544	9840	134	161
arithmetic skewness (method of moments)		S	In-house	um	10.9	1.24	5.51	1.56	0.724	0.597
arithmetic kurtosis (method of moments)		S	In-house	um	165	4.28	41.6	3.61	4.33	3.55
geometic mean (method of moments)		S	In-house	um	199	76.8	294	850	287	206
geometic sorting (method of moments)		S	In-house	um	3.39	5.05	2.91	6.51	2.04	3.01
geometic skewness (method of moments)		S	In-house	um	-2.58	-1.20	-2.67	0.692	-5.56	-3.06
geometic kurtosis (method of moments)		S	In-house	um	12.0	4.52	16.6	3.58	49.2	15.7
logarithmic mean (method of moments)		S	In-house	phi	2.33	3.70	1.77	0.235	1.80	2.28
logarithmic sorting (method of moments)		S	In-house	phi	1.76	2.34	1.54	2.70	1.03	1.59
logarithmic skewness (method of moments) logarithmic kurtosis (method of moments)		S S	In-house In-house	phi phi	2.58 12.0	1.20 4.52	2.67 16.6	-0.692 3.58	5.56 49.2	3.06 15.7
mean (Folk and Ward method - um)		S				-	325	1260	-	247
		S	In-house	um	246 2.39	88.4 4.44	325	6.43	306 1.50	247
sorting (Folk and Ward method - um) skewness (Folk and Ward method - um)		S	In-house	um	-0.340	-0.378	-0.200	0.739	-0.012	-0.309
kewness (Folk and Ward method - um) kurtosis (Folk and Ward method - um)		S	In-house	um	-0.340	-0.378	-0.200	0.739	-0.012	-0.309
kultosis (Foik and Ward method - um)		5	In-house	um	2.03	0.989	1.90	1.0/	1.04	1.04



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		c	Customer S	ample No	BH7 ES1	BH7 ES14	BH7 ES27	BH8 ES1	BH8 ES11	BH8 ES21
			Customer	Sample ID	0.00-0.50m	3.00-3.50m	6.00-6.50m	0.00-0.50m	2.50-3.00m	5.00-5.50m
			RPS	Sample No	398238	398239	398240	398241	398242	398243
					SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
				le Location						
			Sample	Depth (m)	0.00-0.50m	3.00-3.50m	6.00-6.50m	0.00-0.50m	2.50-3.00m	5.00-5.50m
					07/03/2019	07/03/2019	07/03/2019	05/03/2019	05/03/2019	05/03/2019
			San	npling Time						
Determinand	CAS No	Codes	SOP	Units						
mean (Folk and Ward method - phi)	CAS NO	S	In-house	phi	2.02	3.50	1.62	-0.337	1.71	2.02
sorting (Folk and Ward method - phi)		S	In-house	phi	1.26	2.15	1.02	2.68	0.588	1.12
skewness (Folk and Ward method - phi)		S	In-house	phi	0.340	0.378	0.200	-0.739	0.012	0.309
kurtosis (Folk and Ward method - phi)		S	In-house	phi	2.03	0.989	1.98	1.87	1.04	1.84
			111110000	pin	2.00	Very Fine	1.50	Very Coarse	2.01	2101
mean description (Folk and Ward method)		S	In-house		Fine Sand	Sand	Medium Sand	Sand	Medium Sand	Fine Sand
						Very Poorly		Very Poorly	Moderately	
sorting description (Folk and Ward method)		S	In-house		Poorly Sorted	Sorted	Poorly Sorted	Sorted	Well Sorted	Poorly Sorted
					Very Fine	Very Fine		Very Coarse		Very Fine
skewness description (Folk and Ward method)		S	In-house		Skewed	Skewed	Fine Skewed	Skewed	Symmetrical	Skewed
In other signal and the second Manual as a blood of		6	The landscore		very	Manaluutia	very	very	Manaluutia	very
kurtosis description (Folk and Ward method)		S	In-house		Leptokurtic	Mesokurtic	Leptokurtic	Leptokurtic	Mesokurtic	Leptokurtic
MODE 1 - um		S	In-house	um	303	215	303	303	303	303
MODE 2 - um		S	In-house	um		38.1		27000		
MODE 3 - um		S	In-house	um	1 75	9.43	1.75	1 75	1.75	1 75
MODE 1 - phi		S	In-house	phi	1.75	2.24	1.75	1.75	1.75	1.75
MODE 2 - phi MODE 3 - phi		S	In-house In-house	phi phi		4.74 6.75		-4.73		
		_			AE 1	1	166	212	188	64.6
D10 - um D50 - um		S S	In-house In-house	um	45.1 262	7.7 122	331	400	306	64.6 262
D90 - um		S	In-house	um um	262 504	406	622	25200	495	491
(D90/D10) - um		S	In-house	um	11.2	53.0	3.75	118	2.63	7.59
(D90 - D10) - um		S	In-house	um	459	398	456	24900	307	426
(D75/D25) - um		S	In-house	um	2.10	7.96	1.89	3.01	1.72	2.01



Report No.:	19-81762
Customer Reference:	G191005U
Customer Order No:	78367KB-WAL

		(Customer S	ample No	BH7 ES1	BH7 ES14	BH7 ES27	BH8 ES1	BH8 ES11	BH8 ES21
			Customer	Sample ID	0.00-0.50m	3.00-3.50m	6.00-6.50m	0.00-0.50m	2.50-3.00m	5.00-5.50m
			RPS	Sample No	398238	398239	398240	398241	398242	398243
			Sar	mple Type	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
				ole Location						
			Sample	Depth (m)	0.00-0.50m	3.00-3.50m	6.00-6.50m	0.00-0.50m	2.50-3.00m	5.00-5.50m
			San	npling Date	07/03/2019	07/03/2019	07/03/2019	05/03/2019	05/03/2019	05/03/2019
			San	npling Time						
	-									
Determinand	CAS No	Codes	SOP	Units						
(D75 - D25) - um		S	In-house	um	199	219	214	567	169	185
D10 - phi		S	In-house	phi	0.990	1.30	0.685	-4.65	1.02	1.03
D50 - phi		S	In-house	phi	1.93	3.04	1.60	1.32	1.71	1.94
D90 - phi		S	In-house	phi	4.47	7.03	2.59	2.24	2.41	3.95
(D90/D10) - phi		S	In-house	phi	4.52	5.41	3.78	-0.480	2.38	3.85
(D90 - D10) - phi		S	In-house	phi	3.48	5.73	1.91	6.89	1.40	2.92
(D75/D25) - phi		S	In-house	phi	1.77	2.50	1.81	7.75	1.60	1.70
(D75 - D25) - phi		S	In-house	phi	1.07	2.99	0.921	1.59	0.784	1.00
% gravel		S	In-house	%	0.47	0.00	2.66	24.1	0.00	0.00
% sand		S	In-house	%	88.4	61.8	91.3	74.5	97.7	90.1
% mud		S	In-house	%	11.1	38.2	6.06	1.45	2.26	9.86
% very coarse gravel (>32<64mm or <-5>-6phi)		S	In-house	%	0.00	0.00	0.00	0.00	0.00	0.00
% coarse gravel (>16<32mm or <-4>-5phi)		S	In-house	%	0.00	0.00	0.00	18.0	0.00	0.00
% medium gravel (>8<16mm or <-3>-4phi)		S	In-house	%	0.00	0.00	0.00	3.83	0.00	0.00
% fine gravel (>4<8mm or <-2>-3phi)		S	In-house	%	0.32	0.00	0.48	1.53	0.00	0.00
% very fine gravel (>2<4mm or <-1>-2phi)		S	In-house	%	0.15	0.00	2.18	0.71	0.00	0.00
% very coarse sand (>1<2mm or <0>-1phi)		S	In-house	%	0.06	0.00	2.12	0.65	0.00	0.00
% coarse sand (>0.5<1mm or <1>0phi)		S	In-house	%	9.65	5.19	12.4	9.74	9.23	8.98
% medium sand (>0.25<0.5mm or <2>1phi)		S	In-house	%	43.0	19.8	55.7	49.3	61.5	44.4
% fine sand (>0.125<0.25mm or <3>2phi)		S	In-house	%	31.2	24.4	20.1	14.5	26.5	31.9
% very fine sand (>0.0625<0.125mm or <4>3phi)		S	In-house	%	4.43	12.4	1.02	0.25	0.52	4.88
% very coarse silt (>0.03125<0.0625mm or <5>4phi		S	In-house	%	3.09	13.3	1.93	0.38	0.69	4.00
% coarse silt (>0.015625<0.03125mm or <6>5phi)		S	In-house	%	3.03	10.1	1.43	0.35	0.50	2.54
% medium silt (>0.007813<0.015625mm or <7>6phi)		S	In-house	%	1.43	4.63	0.68	0.12	0.18	0.74
% fine silt (>0.003906<0.007813mm or <8>7phi)		S	In-house	%	1.39	4.47	0.74	0.13	0.20	0.79
% very fine silt (>0.001953<0.003906mm or <9>8phi		S	In-house	%	0.92	2.71	0.52	0.13	0.18	0.67
% clay (<0.001953mm or >9phi)		S	In-house	%	1.25	2.95	0.75	0.35	0.51	1.13



Results Summary PSA Size Class & Statistics Report No.: 19-81762

Customer Reference: G191005U Customer Order No: 78367KB-WAL

	Custo	mer San	ple No	BH1 ES1	BH1 ES25	BH1 E51	BH2 ES1	BH2 ES5	BH2 ES11	BH3 ES1	BH3 ES25	BH3 ES45	BH4 ES1	BH4 ES19	BH4 ES40	BH5 ES1	BH5 ES12
	Cus	stomer Sa	mple ID	0.00-0.50m	6.00-6.50m	12.5-13.0m	0.00-0.50m	1.00-1.50m	2.50-3.00m	0.00-0.50m	5.50-6.00m	10.50-11.00m	0.00-0.50m	4.50-5.00m	9.50-10.0m	0.00-0.50m	2.50-3.00m
		RPS Sa	mple No	398220	398221	398222	398223	398224	398225	398226	398227	398228	398229	398230	398231	398232	398233
					SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
		Sample															
	S			0.00-0.50m		12.5-13.0m	0.00-0.50m		2.50-3.00m	0.00-0.50m	5.50-6.00m	10.5-11.0m	0.00-0.50m	4.50-5.00m		0.00-0.50m	
			3	- 1 1	04/03/2019	04/03/2019	02/03/2019	02/03/2019	02/03/2019	08/03/2019	08/03/2019	08/03/2019	11/03/2019	11/03/2019	11/03/2019	13/03/2019	13/03/2019
			ng Time														
Sediment	mm	phi ø	Units														
Very coarse gravel	>32<64	<-5>-6	%	0.00	10.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	24.00	31.90	0.00	0.00
Coarse gravel	>16<32 >8<16	<-4>-5	%	0.00	6.01 4.91	0.00	0.00	0.00	0.00	0.00 0.34	0.00	0.00	3.78 5.97	21.70 5.15	23.60 11.20	0.00	0.00
Medium gravel Fine gravel	>8<16	<-3>-4 <-2>-3	% %	0.00	4.91	0.00	0.00	0.00	0.00	0.34	0.00	2.15	8.16	0.57	11.20	0.00	0.13
Very fine gravel	>2<4	<-1>-2	-70 %	0.00	0.98	0.41	0.00	0.01	0.00	0.25	0.02	2.13	5.94	0.62	6.59	0.00	0.13
Very coarse sand	>1<2	<0>-1	%	0.21	0.90	0.43	0.00	0.05	0.00	0.40	1.89	3.26	3.44	0.02	3.40	0.00	0.22
Coarse sand	>0.5<1	<1>0	%	16.90	12.00	17.20	14.30	16.70	4.25	14.50	26.40	29.60	12.20	7.64	4.05	10.80	16.20
Medium sand	>0.25<0.5	<2>1	%	64.90	40.00	56.50	61.20	46.80	10.10	55.50	48.10	51.30	45.90	29.80	3.11	9.98	51.30
Fine sand	>0.125<0.25	<3>2	%	15.40	17.60	21.30	19.10	9.34	6.65	24.50	12.40	6.23	13.30	8.95	0.00	15.90	17.00
Very fine sand	>0.0625<0.125	<4>3	%	0.25	1.30	1.61	0.64	0.68	11.50	1.44	1.18	1.64	0.27	0.21	0.00	18.00	1.10
Very coarse silt	>0.03125<0.0625	<5>4	%	0.51	1.40	0.88	1.42	5.78	21.20	1.02	0.40	0.09	0.34	0.28	0.00	16.00	2.96
Coarse silt	>0.015625<0.03125	<6>5	%	0.44	0.91	0.36	1.20	6.92	16.50	0.57	0.28	0.17	0.23	0.19	0.09	11.40	3.24
Medium silt	>0.007813<0.015625	<7>6	%	0.15	0.45	0.10	0.53	4.41	8.57	0.20	1.87	0.46	0.07	0.07	0.97	5.80	1.88
Fine silt	>0.003906<0.007813	<8>7	%	0.15	0.47	0.12	0.57	4.41	9.05	0.22	2.10	0.39	0.08	0.07	1.22	5.56	2.04
Very fine silt	>0.001953<0.003906	<9>8	%	0.15	0.44	0.14	0.40	2.54	6.15	0.20	1.58	0.39	0.08	0.07	0.99	3.20	1.31
Clay	<0.001953	>9	%	0.45	0.94	0.57	0.58	2.33	6.05	0.56	3.65	1.34	0.32	0.21	2.20	3.39	1.36
Statistics*	Mean (phi)			1.49	-0.315	1.57	1.62	2.74	4.88	1.65	1.48	1.17	0.315	-2.27	-3.65	3.80	1.74
	Sorting			0.555	3.01	0.684	0.730	2.28	2.59	0.682	1.57	0.892	1.98	2.91	3.05	2.43	1.39
	Skewness			0.072	-0.621	0.161	0.222	0.720	0.055	0.097	0.541	-0.029	-0.627	0.494	0.582	0.143	0.468
	Kurtosis			0.984	2.09	1.05	1.40	0.945	1.06	1.03	3.07	2.30	1.01	0.489	1.58	1.04	2.39
1	% Silt/Clay		%	1.85	4.61	2.17	4.70	26.39	67.52	2.77	9.88	2.84	1.12	0.89	5.47	45.35	12.79
	Textural Group*	*		Slightly Gravelly Sand	Gravelly Sand	Slightly Gravelly Sand	Sand	Gravelly Mude	Sandy Mud	htly Gravelly S	htly Gravelly S	Gravelly Sand	Gravelly Sand	Sandy Gravel	Gravel	Muddy Sand	Gravelly Mude

* Folk & Ward

** GRADISTAT classification system (Blott, S. J. & Pye, K., 2001)



Results Summary PSA Size Class & Statistics Report No.: 19-81762

Customer Reference: G191005U Customer Order No: 78367KB-WAL

	Custo	mer Sam	ple No	BH5 ES22	BH6 ES1	BH6 ES5	BH6 ES9	BH7 ES1	BH7 ES14	BH7 ES27	BH8 ES1	BH8 ES11	BH8 ES21
	Cus	stomer Sar	mple ID	5.00-5.50m	0.00-0.50m	1.00-1.50m	2.00-2.50m	0.00-0.50m	3.00-3.50m	6.00-6.50m	0.00-0.50m	2.50-3.00m	5.00-5.50m
		RPS Sar	nple No	398234	398235	398236	398237	398238	398239	398240	398241	398242	398243
				SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
		Sample L											i
	9	Sample De	pth (m)	5.00-5.50m	0.00-0.50m	1.00-1.50m	2.00-2.50m	0.00-0.50m	3.00-3.50m	6.00-6.50m	0.00-0.50m	2.50-3.00m	5.00-5.50m
		Samplii	ng Date	13/03/2019	16/03/0320	16/03/2019	16/03/2019	07/03/2019	07/03/2019	07/03/2019	05/03/2019	05/03/2019	05/03/2019
		Samplir	ng Time										1
Sediment	mm	phi ø	Units							-			
Very coarse gravel	>32<64	<-5>-6	%	11.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Coarse gravel	>16<32	<-4>-5	%	32.10	0.00	0.00	0.00	0.00	0.00	0.00	18.00	0.00	0.00
Medium gravel	>8<16	<-3>-4	%	21.60	0.00	0.00	0.00	0.00	0.00	0.00	3.83	0.00	0.00
Fine gravel	>4<8	<-2>-3	%	7.35	0.00	0.00	0.00	0.32	0.00	0.48	1.53	0.00	0.00
Very fine gravel	>2<4	<-1>-2	%	3.12	0.00	0.03	0.00	0.15	0.00	2.18	0.71	0.00	0.00
Very coarse sand	>1<2	<0>-1	%	1.74	0.00	0.05	0.00	0.06	0.00	2.12	0.65	0.00	0.00
Coarse sand	>0.5<1	<1>0	%	4.65	1.90	8.97	6.26	9.65	5.19	12.40	9.74	9.23	8.98
Medium sand	>0.25<0.5	<2>1	%	12.50	8.44	38.60	20.50	43.00	19.80	55.70	49.30	61.50	44.40
Fine sand	>0.125<0.25	<3>2	%	4.08	26.40	37.10	21.70	31.20	24.40	20.10	14.50	26.50	31.90
Very fine sand	>0.0625<0.125	<4>3	%	0.22	18.10	5.21	8.88	4.43	12.40	1.02	0.25	0.52	4.88
Very coarse silt	>0.03125<0.0625	<5>4	%	0.31	14.40	2.94	14.60	3.09	13.30	1.93	0.38	0.69	4.00
Coarse silt	>0.015625<0.03125	<6>5	%	0.31	10.80	2.95	11.50	3.03	10.10	1.43	0.35	0.50	2.54
Medium silt	>0.007813<0.015625	<7>6	%	0.24	5.60	1.09	5.35	1.43	4.63	0.68	0.12	0.18	0.74
Fine silt	>0.003906<0.007813	<8>7	%	0.22 0.15	5.92 4.00	1.20 0.83	4.94	1.39	4.47	0.74	0.13	0.20	0.79 0.67
Very fine silt	>0.001953<0.003906	<9>8	%	0.15	4.00	0.83	3.06 3.23	0.92	2.71	0.52	0.13	0.18	1.13
Clay	< 0.001953	>9	%	0.25	4.45	1.11	3.23	1.25	2.95	0.75	0.35	0.51	1.15
Statistics*	Mean (phi)			-2.48	4.19	2.08	3.60	2.02	3.50	1.62	-0.337	1.71	2.02
	Sorting			2.62	2.24	1.18	2.28	1.26	2.15	1.02	2.68	0.588	1.12
	Skewness			0.603	0.394	0.267	0.345	0.340	0.378	0.200	-0.739	0.012	0.309
	Kurtosis			0.866	1.01	1.94	0.928	2.03	0.989	1.98	1.87	1.04	1.84
	% Silt/Clay %		%	1.48	45.17	10.12	42.68	11.11	38.16	6.05	1.46	2.26	9.87
	Textural Group**			Sandy Gravel	Muddy Sand	Gravelly Mude	Muddy Sand	Gravelly Mude	Muddy Sand	htly Gravelly S	Gravelly Sand	Sand	Sand

* Folk & Ward

** GRADISTAT classification system (Blott, S. J. & Pye, K., 2001)



Results Summary PSA Wentworth Scale

 Report No.:
 19-81762

 Customer Reference:
 G191005U

 Customer Order No:
 78367KB-WAL

Customer Sample	No	BH1 ES1	BH1 ES25	BH1 E51	BH2 ES1	BH2 ES5	BH2 ES11	BH3 ES1	BH3 ES25	BH3 ES45	BH4 ES1	BH4 ES19	BH4 ES40	BH5 ES1
Customer Sampl	e ID	0.00-0.50m	6.00-6.50m	12.5-13.0m	0.00-0.50m	1.00-1.50m	2.50-3.00m	0.00-0.50m	5.50-6.00m	10.50-11.00m	0.00-0.50m	4.50-5.00m	9.50-10.0m	0.00-0.50m
RPS Sample	e No	398220	398221	398222	398223	398224	398225	398226	398227	398228	398229	398230	398231	398232
		SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT								
Sample Loca Sample Depth		0.00-0.50m	6.00-6.50m	12.5-13.0m	0.00-0.50m	1.00-1.50m	2.50-3.00m	0.00-0.50m	5.50-6.00m	10.5-11.0m	0.00-0.50m	4.50-5.00m	9.50-10.0m	0.00-0.50m
				04/03/2019	02/03/2019	02/03/2019	02/03/2019	08/03/2019	08/03/2019	08/03/2019	11/03/2019	11/03/2019	11/03/2019	13/03/2019
Sampling	Гime													
Parameter U	nits													
Pebble	%	0.00	22.76	0.41	0.00	0.01	0.00	0.59	0.02	2.61	17.91	51.42	77.30	0.00
Granule	%	0.21	0.98	0.36	0.00	0.05	0.00	0.46	0.20	2.53	5.94	0.62	6.59	0.00
Very coarse sand	%	0.40	0.83	0.43	0.09	0.10	0.00	0.28	1.89	3.26	3.44	0.49	3.40	0.00
Coarse sand	%	16.90	12.00	17.20	14.30	16.70	4.25	14.50	26.40	29.60	12.20	7.64	4.05	10.80
Medium sand	%	64.90	40.00	56.50	61.20	46.80	10.10	55.50	48.10	51.30	45.90	29.80	3.11	9.98
Fine sand	%	15.40	17.60	21.30	19.10	9.34	6.65	24.50	12.40	6.23	13.30	8.95	0.00	15.90
Very fine sand	%	0.25	1.30	1.61	0.64	0.68	11.50	1.44	1.18	1.64	0.27	0.21	0.00	18.00
Silt Clay	%	1.85	4.61	2.17	4.70	26.39	67.52	2.77	9.88	2.84	1.12	0.89	5.47	45.35
Total	%	99.9	100.1	100.0	100.0	100.1	100.0	100.0	100.1	100.0	100.1	100.0	99.9	100.0



Results Summary PSA Wentworth Scale

 Report No.:
 19-81762

 Customer Reference:
 G191005U

 Customer Order No:
 78367KB-WAL

Customer Sam	ple No	BH5 ES12	BH5 ES22	BH6 ES1	BH6 ES5	BH6 ES9	BH7 ES1	BH7 ES14	BH7 ES27	BH8 ES1	BH8 ES11	BH8 ES21
Customer Sar	nple ID	2.50-3.00m	5.00-5.50m	0.00-0.50m	1.00-1.50m	2.00-2.50m	0.00-0.50m	3.00-3.50m	6.00-6.50m	0.00-0.50m	2.50-3.00m	5.00-5.50m
RPS San			398234	398235	398236	398237	398238	398239	398240	398241	398242	398243
Sampl			SEDIMENT									
Sample L			E 00 E E0	0.00.0 50	1.00.1.50	2 00 2 50	0.00.0.50	2 00 2 50	C 00 C E0	0.00.0 50	2 50 2 00	E 00 E E0
Sample De	ng Date		5.00-5.50m 13/03/2019	0.00-0.50m 16/03/0320	1.00-1.50m 16/03/2019	2.00-2.50m 16/03/2019	0.00-0.50m 07/03/2019	3.00-3.50m 07/03/2019	6.00-6.50m 07/03/2019	0.00-0.50m 05/03/2019	2.50-3.00m 05/03/2019	5.00-5.50m 05/03/2019
Samplir	5		13/03/2019	10/03/0320	10/03/2019	10/03/2019	07/03/2019	07/03/2019	07/03/2019	03/03/2019	03/03/2019	03/03/2019
Parameter	Units											
			70.45	0.00	0.00	0.00	0.00	0.00	0.40	22.26	0.00	0.00
Pebble	%	1.16	72.15	0.00	0.00	0.00	0.32	0.00	0.48	23.36	0.00	0.00
Granule	%	0.22	3.12	0.00	0.03	0.00	0.15	0.00	2.18	0.71	0.00	0.00
Very coarse sand	%	0.21	1.74	0.00	0.05	0.00	0.06	0.00	2.12	0.65	0.00	0.00
Coarse sand	%	16.20	4.65	1.90	8.97	6.26	9.65	5.19	12.40	9.74	9.23	8.98
Medium sand	%	51.30	12.50	8.44	38.60	20.50	43.00	19.80	55.70	49.30	61.50	44.40
Fine sand	%	17.00	4.08	26.40	37.10	21.70	31.20	24.40	20.10	14.50	26.50	31.90
Very fine sand	%	1.10	0.22	18.10	5.21	8.88	4.43	12.40	1.02	0.25	0.52	4.88
Silt Clay	%	12.79	1.48	45.17	10.12	42.68	11.11	38.16	6.05	1.46	2.26	9.87
Total	%	100.0	99.9	100.0	100.1	100.0	99.9	100.0	100.1	100.0	100.0	100.0



Report No.: 19-81762 Customer Reference: G191005U Customer Order No: 78367KB-WAL

Comments

RPS Sample Number	Customer Number	Sample Comments
398220	BH1 ES1	Visual Inspection: Colour: Light brown Texture: Sandy Odour: Sea Biota: none Anthropogenic Inputs: none
398221	BH1 ES25	Visual Inspection: Colour: Light brown Texture: Sandy Odour: none Biota: none Anthropogenic Inputs: none
398222	BH1 E51	Visual Inspection: Colour: Light brown Texture: Sandy Odour: Sea Biota: Rocks Anthropogenic Inputs: none
398223	BH2 ES1	Visual Inspection: Colour: Dark brown/black Texture: Sandy Odour: Sea Biota: none Anthropogenic Inputs: none
398224	BH2 ES5	Visual Inspection: Colour: Black Texture: Sandy Odour: none Biota: none Anthropogenic Inputs: none
398225	BH2 ES11	Visual Inspection: Colour: Black Texture: Clay Odour: Sulphur Biota: none Anthropogenic Inputs: none
398226	BH3 ES1	Visual Inspection: Colour: Grey Texture: Sand Odour: Sea Sweet Biota: none Anthropogenic Inputs: none
398227	BH3 ES25	Visual Inspection: Colour: Brown Texture: Sand Odour: none Biota: none Anthropogenic Inputs: none
398228	BH3 ES45	Visual Inspection: Colour: Light brown Texture: Sand Odour: Sweet Biota: none Anthropogenic Inputs: none
398229	BH4 ES1	Visual Inspection: Colour: Brown Texture: Sandy/Rocky Odour: Sea Biota: Rocks Anthropogenic Inputs: none



Report No.: 19-81762 Customer Reference: G191005U Customer Order No: 78367KB-WAL

Comments

RPS Sample Number	Customer Number	Sample Comments
398230	BH4 ES19	Visual Inspection: Colour: Brown Texture: Clay/Rocky Odour: none Biota: Rocks Anthropogenic Inputs: none
398231	BH4 ES40	Visual Inspection: Colour: Black Texture: Sandy/Rocky Odour: none Biota: Rocks Anthropogenic Inputs: none
398232	BH5 ES1	Visual Inspection: Colour: Black Texture: Sludge Odour: Fish Biota: none Anthropogenic Inputs: none
398233	BH5 ES12	Visual Inspection: Colour: Black Texture: Sand Odour: none Biota: none Anthropogenic Inputs: none
398234	BH5 ES22	Visual Inspection: Colour: Brown Texture: Sandy rock Odour: none Biota: Rock Anthropogenic Inputs: none
398235	BH6 ES1	Visual Inspection: Colour: Black Texture: Sludge/Sandy Odour: Light Sulphur Biota: none Anthropogenic Inputs: none
398236	BH6 ES5	Visual Inspection: Colour: Black Texture: Sandy Odour: none Biota: none Anthropogenic Inputs: none
398237	BH6 ES9	Visual Inspection: Colour: Brown/Black Texture: Sludge/Sandy Odour: Sulphur Biota: none Anthropogenic Inputs: none
398238	BH7 ES1	Visual Inspection: Colour: Brown/grey Texture: Sandy Odour: Sweet Biota: none Anthropogenic Inputs: none
398239	BH7 ES14	Visual Inspection: Colour: Brown Texture: Clay/Sandy Odour: Sulphur Biota: none Anthropogenic Inputs: none



Report No.: 19-81762 Customer Reference: G191005U Customer Order No: 78367KB-WAL

Comments

RPS Sample Number	Customer Number	Sample Comments
398240	BH7 ES27	Visual Inspection: Colour: Brown Texture: Sandy Odour: none Biota: Shell Anthropogenic Inputs: none
398241	BH8 ES1	Visual Inspection: Colour: Brown Texture: Sandy Odour: Sea Biota: Shell/Rock Anthropogenic Inputs: none
398242	BH8 ES11	Visual Inspection: Colour: Brown Texture: Sandy Odour: none Biota: none Anthropogenic Inputs: none
398243	BH8 ES21	Visual Inspection: Colour: Dark brown Texture: Clay/Sandy Odour: Sulphur Biota: none Anthropogenic Inputs: none

Deviating Samples

Report No.:	19-81762				
Customer Reference:	G191005U				
Customer Order No:	78367KB-WAL				

Our policy on Deviating Samples and reference list of Holding Times applied can be supplied on request. These have been implemented in accordance with UKAS Policy on Deviating Samples (TPS63). RPS is not responsible for the integrity of samples as received, unless RPS personnel performed the sampling, and it is possible that samples submitted may be declared to be deviating. Where applicable the analysis method remains UKAS accredited, however results reported for a deviating sample may be invalid. The reason for a sample being declared to be deviating is indicated below. Where no sampling date was supplied, samples have been declared to be deviating. However, if a date of sampling can be supplied, the results may be reissued with the deviating sample status removed. Where the sample container used was unsuitable, the appropriate Holding Time was exceeded, or the sample is flagged as deviating for some other reason, re-sampling/re-submisson may be required.

RPS No.	Customer No.	Customer ID	Date Sampled	Containers Received	Deviating Sample	Reason for Sample Deviation
398220	BH1 ES1		04/03/2019	plastic & metal containers	No	•
398221	BH1 ES25		04/03/2019	plastic & metal containers	No	
398222	BH1 E51		04/03/2019	plastic & metal containers	No	
398223	BH2 ES1		02/03/2019	plastic & metal containers	No	
398224	BH2 ES5		02/03/2019	plastic & metal containers	No	
398225	BH2 ES11		02/03/2019	plastic & metal containers	No	
398226	BH3 ES1		08/03/2019	plastic & metal containers	No	
398227	BH3 ES25		08/03/2019	plastic & metal containers	No	
398228	BH3 ES45		08/03/2019	plastic & metal containers	No	
398229	BH4 ES1		11/03/2019	plastic & metal containers	No	
98230	BH4 ES19		11/03/2019	plastic & metal containers	No	
98231	BH4 ES40		11/03/2019	plastic & metal containers	No	
398232	BH5 ES1		13/03/2019	plastic & metal containers	No	
398233	BH5 ES12		13/03/2019	plastic & metal containers	No	
398234	BH5 ES22		13/03/2019	plastic & metal containers	No	
398235	BH6 ES1		16/03/320	plastic & metal containers	No	
398236	BH6 ES5		16/03/2019	plastic & metal containers	No	
398237	BH6 ES9		16/03/2019	plastic & metal containers	No	
398238	BH7 ES1		07/03/2019	plastic & metal containers	No	
398239	BH7 ES14		07/03/2019	plastic & metal containers	No	
398240	BH7 ES27		07/03/2019	plastic & metal containers	No	
98241	BH8 ES1		05/03/2019	plastic & metal containers	No	
398242	BH8 ES11		05/03/2019	plastic & metal containers	No	
398243	BH8 ES21		05/03/2019	plastic & metal containers	No	



2 Shaftesbury Industrial Centre, Icknield Way, Letchworth Garden City, Hertfordshire, SG6 1HE T +44 (0)1462 480 400, F +44 (0)1462 480 403, E rpsmh@rpsgroup.com, W rpsgroup.com

Report Information

Key to Report Codes	
U	UKAS Accredited
F	UKAS Flexible Scope
Μ	MCERTS Accredited
Ν	Not Accredited
0	Marine Management Organisation (MMO) Validated
S	Subcontracted to approved laboratory
US	Subcontracted to approved laboratory UKAS Accredited for the test
MS	Subcontracted to approved laboratory MCERTS/UKAS Accredited for the test
SI	Subcontracted to internal RPS Group Laboratory
USI	Subcontracted to internal RPS Group Laboratory UKAS Accredited for the test
MSI	Subcontracted to internal RPS Group Laboratory MCERTS/UKAS Accredited for the test
I/S (in results)	Insufficient Sample
U/S (in results)	Unsuitable Sample
S/C (in results)	See Comments
ND (in results)	Not Detected
DW (in units)	Results are expressed on a dry weight basis

Sample Retention and Disposal

Samples will generally* be retained for the following times prior to disposal:					
les, e.g. foodstuffs 1 month (if frozen) from the issue date of this report					
2 weeks from the issue date of this report					
Other Liquids 1 months from the issue date of this report					
1 months from the issue date of this report					

*Sample retention may be subject to agreement with the customer for particular projects

Analytical Methods

PAH's and PCB's	GCMS analysis following extraction of the wet sediment with DCM:acetone by ASE 350 extraction. Extract cleaned-up with silica and activated copper.		
Metals	ICP-MS analysis following microwave assisted digestion in hydrofluoric acid of the dried (<30°C) and ground sediment.		
TOC	Combustion and infrared analysis following carbonate removal with hydrochloric acid.		
PSA	Wet and dry sieving follewed by laser diffraction analysis.		
Density	Determination of density from the dry sediment by gravimetric analysis of a known volume of sediment.		
Dry solids at 105°C	A portion of the wet sediment is dried at 105°C to constant weight.		
TBT and DBT	GCMS analysis following the extraction of the wet sediment and subsequent derivatisation.		
Please note:	All testing carried out using the <2mm fraction		
Laboratories			
RPS Letchworth RPS Manchester (Metals only) Ocean Ecology PSA only	UKAS Accreditation Laboratory No. 1663 UKAS Accreditation Laboratory No. 0605 NMBAQC		

RPS Letchworth and Manchester Laboratories participate in the QUASIMEME Proficiency Testing Scheme



G. SURVEY

Mean Position Reports

18 Pages

STARFIX MEAN POSITION REPORT



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Project ID	C1982		
Project Name	192186 Nigg East Quay Development		
Fugro OPCO	FGBNM (Fugro Great Britain North Marine)	Location	Nigg
Client	Fugro Geoservices Ltd	Vessel	Skate 3A
Comment	DTM = 5.50m, DTW = 3.40m Deck Height Above CD = 6.35m		

Session Name: C1982 BH01

Records Used: 294 of 301 Session Length: 00:05:01

Start Time: 04 Mar 2019, 00:03:01+00:00 End Time: 04 Mar 2019, 00:08:02+00:00

Mean Position for Skate 3A CommonReferencePoint		
	OSGB 1936 / British National Grid [OSGB-UK Gbr02 NT]	ETRS89(2D)
Latitude	57°41'40.35536"N	57°41'39.30291"N
Longitude	004°01'25.47428"W	004°01'30.48544"W
Height	57.109m Ell.	57.109m Ell.
Easting	279,383.704m E(SD: ±0.01m)	
Northing	868,963.576m N(SD: ±0.01m)	
Height	4.295m Ort. (SD: ±0.02m Ort.)	

Sensors	Sensor Averages	SD
Heading	50.00°T 51.71°G	±0.0°
Pitch		
Roll		
Depth (Sounder)	0.0m	±0.00m
Depth (Manual)	0.0m	N/A

DTM = 5.50m, DTW = 3.40m Deck Height Above CD = 6.35m

Mean Position to Waypoint				
BH12				
279,384.000m E				
868,964.000m N				
0.52m Geodetic				
33.18°True				
213.18°True				

Theo Cleave Party Chief Fugro Geoservices Ltd

Arch 💭 Henderso			-Fuci	20			RE DAILY P Park - Marin		S REPORT	Daily Report No.
Celebrating 100 Ye	ars		:1982		Ves		Skate 3A		Date	Saturday 02-Mar-19
• ANeillings@a	@fugro.com	.co.uk			Attn. Attn. Attn. Attn. Attn. Attn. Attn. Attn.	Andy Neilli Michael Sh Stuart Inn Mathew Cl Nicholas A	ings nuttleworth		0141 227 3060 Redact ed	
Observed Weat Time 00:00		Wi eed Knts	ind Dir	s	Swell (Hs)		Sea State	Visibility		Weather Forecast
00:00	- Opt	5	SW		N/A		smooth	good		See Below
06:00		10 8	SW S		N/A N/A		smooth smooth	good good		See Delow
18:00		20	S		N/A		smooth	good		
00:00		31 Leg Pene	SSW etration (m)		N/A		smooth	good	_	
BH no).	1	2	3	4	Ļ			Operational Stat	us
BH02	2	3.3	1.9	2.6	1.	3	Jack	ed in Moray Firl	h awaiting tide/weather t	for towage to Nigg Energy Park
					Summary	of Operati	ons / Borehole Drilli	ng - last 24hrs:		
From 00:00	To 05:45	ŀ	Hrs (No.)	Code Single Shift S		akad in Mar	ov Firth / Awaiting tou	uago to Nigg Epo	Description	de .
05:45	05:45		5.75 0.75	Single Shift S Crew Change					rgy Park at high water slac on Towing Operations	к.
06:30	07:20		0.83	Moving & Ja					onstructor arrival on site.	de a la del a companya de la condece companya
07:20 08:00	08:00 11:35		0.67 3.58	Moving & Ja Moving & Ja						ving bridle connected and secured Nigg Energy Park / Lower legs and disconnect to
11:35	12:10		0.58	Moving & Ja	-		ongside Berth 3 / Prelo			
12:10 15:40	15:40 17:25		3.50 1.75	Mobilisati Moving & Ja					to safe working height.	nables / General R&M on deck.
17:25	19:15		1.83	Cable Percu						/ High winds observed, continue to monitor
19:15 20:00	20:00 23:30		0.75 3.50	Crew Change Cable Percu			P drilling from 0.00m		Nightshift transfer to JUB	/ TBT on Rig Abandonment Drill
23:30	00:00		0.50	Moving & Ja	acking Ja	ck up anoth	er 1.50m as wind con	tinues to increase	>30kts and swell >1.00m	
						v	Veather forecast			
ealth Safety & th	e Environment		Wind Dim 10m Wind Spd 10m Gust 50m Wind Spd 50m Gust 100m Wind Spd 100m Gust Sig Wav Hgt Sig Wav Hgt Swell Dim Swell Hgt Swell Prd	06 5W 6 8 11 8 11 -99 0 -99 0 -99 0	-Mar-2019 09 12 WSW SE 5 4 7 6 5 5 9 7 7 5 10 8 -99.0 -99.0 -99.0 -99.0 -99.0 -99.0 -99.0 -99.0 99.99 N/A N/A -99.0 -99.0	8 5 12 7 13 9 16 12 14 9 19 13 -99.0 -99 -99.0 -99 -99 -99 N/A N/A	17 17 22 17 24 31 18 21 28 25 30 39 20 23 30 27 32 42 0.990.990.990.990.990. 99.99.990.990.990. 99.99.990.990.990. 0.990.990.990.990. 0.990.990.990.990. 0.990.990.990.990.	06 09 12 SSW SW SW 18 16 16 25 22 23 35 31 32 27 24 23 38 34 34 -99.0 -99.0 -9 -99.0 -99.0 -9 -99.0 -99.0 -9 -99.0 -99.0 -9 -99.0 -99.0 -9 -99.0 -99.0 -9 -99.0 -99.0 -9 -99.0 -99.0 -9 -99.0 -99.0 -9	14 10 20 14 19 14 27 20 21 15 30 22 00 -99.0 -99.0 0 -99.0 -99.0 9 -99 -99 4 N/A N/A 0 -99.0 -99.0	
	A 1									
GSL Rep: The	o Cleave						Client R	ep:		

Arch Min NIC				-				RESS REF	-		Daily Report No.	
Celebrating 100 Years	я к		Nigg E	nerg	y Park	- Marine	Grou	nd Investi	gation		01	
Activity Time Sum	nary		Today	To Da	ate	Day Shift		Night Shift	Com	pany	Positi	ion
obilisation			0.00	0.00				Onboard JUB (n				
oving & Jacking			0.00	0.00		Jimmy Wilso		Joshua Sandy		oServices	Bargem	
otary Drilling (Coring) able Percussion			0.00	0.00		James Laws Callum Allard		Adam Cook Ashley Lowthia		oServices oServices	Drille Assistant	
tandby (Fugro)			0.00	0.00		Stuart Nye		Addition Lowering		oServices	Assistant	
tandby (Other)			0.00	0.00		,						
tandby weather			0.00	0.00		Richard Luk	er	Bart Kot	Fug	gro	Geotechnical	l Engine
ngle Shift Standby			0.00	0.00		-						
ther Operations rew Change / TBT			0.00	0.00		Theo Cleav	e		Fugro Ge	oServices	Project Er	ngineer
lew change / TDT			0.00	0.00								
			0.00	0.00								
			0.00	0.00								
			0.00	0.00								
			0.00	0.00								
			0.00	0.00	,				Total Man			
	To	otal	0.00	0.00)	No. Personn	iel	10	Hours Worked		120	
Project Program / Prog			rogramme			loday		ctual To Date		% Program	n Completed	
Activity eneral Items. Provisional Services	BoQ Item	m.	No.	Hours	m.	No. Hours	m.	No. Ho	Irs 0			
	A		1.0			1.0	0	1 0.0				
stablish all plant, equipment, crew on site	A2	-	1.0				0	0 0.0				
anding Time for plant, equipment and crew	B11 C19	1	1	R/O			0	0 0.0				
g prant, equipment and ordw		1	1				0	0 0.0				
ercussion Boring	В								0.0			
ove boring plant to site of each exploratory hole	B1	1	8.00			1	0	1 0.0		;		
ktra over B1 for setting up on a gradient >20%	B2		R/O				0	0 0.0				
reak out surface obstructions where present	B3	<u> </u>		R/O			0	0 0.0				
dvance BH between groundlevel and 10m depth		80.00			3.00		3	0 0.0	0.0			
s B4 but between 10m and 20m	B5	36.50					0	0 0.0				
s B4 but between 20m and 30m s B4 but between 30m and 40m	B6 B7	R/0 R/0					0	0 0.0				
dvance BH through hard stratum or obstruction	B7 B9	R/U		R/O			0	0 0.0				
avance bit through hard stratum or obstruction		-		100			0	0 0.0				
otary Drilling	С						0	0 0.0	0.0			
love rotary plant to site of each exploratory hole	C15		6.00				0	0 0.0	0.0			
C drilling between groundlevel and 10m depth	C41	R/O					0	0 0.0				
s C41 but between 10m and 20m	C42	20.50					0	0 0.0				
s C41 but between 20m and 30m	C43	9.50					0	0 0.0				
ore box to be retained by client	C49	-	21.00				0	0 0.0				
ampling, Monitoring during investigation	E	-					0	0 0.0	0.0			
mall Disturbed Sample	E1	_	59.00				0	0 0.0				
ulk Disturbed Sample	E2	-	59.00				0	0 0.0	-			
arge Bulk disturbed sample	E3		R/O				0	0 0.0				
							0	0 0.0	0.0			
isitu Testing	Н								0.0			
tandard Penetration Test in Borehole	H1	-	40				0	0 0.0				
tandard Penetration Test in Rotary Drill Hole	H2	4	R/O				0	0 0.0				
		1	1				0	0 0.0	0.0			
oconvironmental Laboratory Testing									0.0			
	L2		121				0	0 00	0.0			
	L2		121				0	0 0.0				
arine Scotland Sample			121				0	0 0.0	-			
arine Scotland Sample			121						0.0			
arine Scotland Sample			121				0	0 0.0	0.0 0.0 0.0 0.0 0.0 0.0			
eoenvironmental Laboratory Testing larine Scotland Sample dditional Items			121				0 0 0 0	0 0.0 0 0.0 0 0.0 0 0.0	0 0.0 0.0 0 0.0 0 0.0 0 0.0 0 0.0			
arine Scotland Sample			121				0 0 0 0 0	0 0.0 0 0.0 0 0.0 0 0.0 0 0.0	0 0.0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0			
arine Scotland Sample dditional Items							0 0 0 0	0 0.0 0 0.0 0 0.0 0 0.0	0 0.0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0	Damagod		
arine Scotland Sample			121		Actu	al To Date	0 0 0 0 0	0 0.0 0 0.0 0 0.0 0 0.0 0 0.0	0 0.0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0	Damaged		
arine Scotland Sample ditional items Health & Safety Sumn Hoc Cards Safety Drills			Today 2 2		Actu	5 4	0 0 0 0 0	0 0.0 0 0.0 0 0.0 0 0.0 0 0.0	0 0.0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0	Damaged		
arine Scotland Sample ditional items Health & Safety Summ Hoc Cards Safety Drills Tool Box Talks			Today 2 2 1		Actu	5 4 3	0 0 0 0 0	0 0.0 0 0.0 0 0.0 0 0.0 0 0.0	0 0.0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0	Damaged		
arine Scotland Sample dditional Items Health & Safety Summ Hoc Cards Safety Drills Tool Box Talks HSE Meetings	L2		Today 2 2		Actu	5 4 3 1	0 0 0 0 0	0 0.0 0 0.0 0 0.0 0 0.0 0 0.0	0 0.0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0	Damaged		
arine Scotland Sample dditional items Health & Safety Summ Hoc Cards Safety Drills Tool Box Talks	L2		Today 2 2 1		Actu	5 4 3	0 0 0 0 0	0 0.0 0 0.0 0 0.0 0 0.0 0 0.0	0 0.0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0	Damaged		
arine Scotland Sample ditional Items Health & Safety Summ Hoc Cards Safety Drills Tool Box Taiks HSE Meetings Incidents/Near Miss Environmental Hours Worked	L2		Today 2 2 1		Actu	5 4 3 1 0 0 120		0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0	0 0.0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0	Damaged		
arine Scotland Sample dditional Items Health & Safety Summ Hoc Cards Safety Drills Tool Box Taiks HSE Meetings Incidents/Near Miss Environmental Hours Worked	L2		Today 2 2 1 1		Actu	5 4 3 1 0 0 120		0 0.0 0 0.0 0 0.0 0 0.0 0 0.0	0 0.0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0	Damaged		
arine Scotland Sample dditional Items Health & Safety Sumn Hoc Cards Safety Drills Tool Box Talks HSE Meetings Incidents/Near Miss Environmental	L2		Today 2 2 1 1			5 4 3 1 0 0 120		0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0	0 0.0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0	Damaged		
arine Scotland Sample diditional Items Health & Safety Summ Hoc Cards Safety Drills Tool Box Talks HSE Meetings Incidents/Near Miss Environmental Hours Worked ugro GeoServices Representative Comr	L2		Today 2 2 1 1		Actu	5 4 3 1 0 0 120 120 Client Repu	0 0 0 0 0	0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0	0 0.0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0	Damaged		
Irine Scotland Sample Iditional Items Health & Safety Summ Hoc Cards Safety Drills Tool Box Taiks HSE Meetings Incidents/Near Miss Environmental Hours Worked	L2		Today 2 2 1 1		Actu	5 4 3 1 0 0 120	0 0 0 0 0	0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0	0 0.0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0	Damaged		

Arch Henderso	ENERGY	G	UGR			RSHORE DAILY Energy Park - Mari			Daily Report No.
Job No		C1982		•	Ve	ssel Skate 3A		Date	Sunday 03-Mar-19
mshuttleworti stuart.innes@ m.chappell@f n.armstrong@ g.crisp@fugro	fugro.com Dfugro.com D.com				Attn. Attn. Attn. Attn. Attn. Attn.	Andy Neillings Michael Shuttleworth Stuart Innes Mathew Chappell - Nearshore M Nicholas Armstrong - Reportin Glen Crisp - Project Manager		Redact Redact	
Observed Weath Time 00:00	her Speed K	Wind	Dir	s	Swell (Hs)	Sea State	Visibility		Weather Forecast
00:00	28		S		N/A	Slight	Poor		
06:00	34		SW		N/A	Slight/Moderate	Very Poor		See Below
12:00 18:00	35		SW SSW	_	N/A N/A	Slight/Moderate Slight	Very Poor moderate		
00:00	10		SW		N/A	Smooth	good		
		Leg Penetratio	n (m)					Operational Status	
BH no.		1	2	3		4		Operational Status	
BH02		3.3	1.9	2.6		1.3			
BH01		1.0 '	1.0	2.2	;	3.1		Jacked up on BH02. Cable percussion drilling ur	
								Cable percussion anning a	inci way.
					Summary	of Operations / Borehole Drill	ing - last 24hrs:		
From	То	Hrs (No		Code				Description	
00:00 02:15	02:15 03:00	2.25		Cable Percu Other Opera		ontinue CP from 3.00m to 6.00r ghtshift return to shore as wind/			active wind apood / >25ktp
03:00	05:00	2.00		Standby wea		onditions still in excess of opera			
05:00	07:30	2.50		Standby wea		onditions still in excess of opera			
07:30	08:00	0.50		Crew Change		O.S / Nightshift handover at acc			
08:00	14:00	6.00		Standby we		ontinue to monitor weather with			1200 / Transit to CTV Quay
14:00 14:30	14:30 18:30	0.50		Other Opera Cable Percu		ayshift transfer to JUB / Prepare ontinue CP from 6.00m to 9.40 m			stered
18:30	19:15	0.75		Other Opera		ear and wash down deck for E.0			
19:15	20:00	0.75		Crew Change		ayshift transfer to shore / Hando		-	T on Lifting Operations
20:00	22:00	2.00		Standby (T		aiting on tide to move to BH01 /			
22:00 23:45	23:45 00:00	1.75		Moving & Ja Cable Percu	-	ove from BH02 to BH01 / Preloa un in casing to mudline and prep			
						5 11			
					$-\top$				
		1							
		1							
			Local time	i o	2 1:00 2:00 3:0	Weather forecast	12 00 13:00 14:00 15:00 16:0	0 17 10 18.00 19 00 20 00 21:00 22:00 23:00	
			Wind direction Wind speed (kts)	5.59	V SSW SW SI	WSWWSWISW SW SW WSWWSWWSW	WSWWSWWSW WSW SV	SW SW SW SW SW SW	
				30	29 .29 21	28 27 22 21 25 26 26 26	27 24 24 20 18	16 14 13 13 12 12 14	
			Wind gusts (max)						
			Cloud cover	0	-				
			Precipitation type Precipitation (mm		62 61 8	0 0 0 0 0 0 0 0 01 01 01 02 02 02 01			
			Air temperature (* Feels like (*C)	C)	1 1 1	2 2 2 2 2 2 3 2	2 3 3 2 3	2 2 4 1 1 1 1 1	
			Relative humidity Air pressure (hPa			78 77 83 83 81 79 78 82 975 976 976 976 977 978 978 979	79 86 75 78 80		
			Tide type Time	3/6		and and and and an			
			Tate Tide height (m)	5	24 2 1	430 10.00 1 17 13 21 27 12 15 13 35	32 28 2 17 16		
alth Safety & the									
nds in excess of o	perational and emerg	gency limits. Cre	ew continue	to monitor we	eather with	anomometer and updated foreca	asts for safe transfe	er window.	
GSL Rep: Theo	Cleave					Client	Rep:		
gned:						Signed			

Arch	ch Inderson NIGCE I NEARSHORI											Daily Report No).
Celebrating 100 Years				-	-							02	
Activity Time Summar Mobilisation	У		oday 0.00	To Da 3.50		Day Shi	ť	Night Onboard		Comp ination)	bany	Posi	tion
Moving & Jacking			1.75	9.67		Jimmy Wil	son	Joshua		Fugro Geo	Services	Barger	naster
Rotary Drilling (Coring)			00.0	0.00		James Law		Adam		Fugro Geo		Dril	ler
Cable Percussion			6.50	11.8		Callum Allar		Ashley L	owthian	Fugro Geo		Assistan Assistan	
Standby (Fugro) Standby (Tide)			2.00	0.00		Stuart Ny	e			Fugro Geo	Services	Assistan	t Driller
Standby weather			0.50	10.5		Richard Lu	ker	Bart	Kot	Fug	ro	Geotechnica	al Engineer
Single Shift Standby			0.00	5.75									
Other Operations Crew Change / TBT			2.00	2.00		Theo Clea	ve			Fugro Geo	Services	Project E	ingineer
Clew Change / TBT			0.00	0.00									
		(0.00	0.00)								
			0.00	0.00	_								
			0.00	0.00									
			0.00	0.00									
	Total	2	4.00	24.0	0	No. Persor	inel	10)	Total Man Hours Worked		120	
Project Program / Progres Activity	s BoQ Item	Pro m.	ogrammeo No.	d Hours	m.	Today No. Hour		Actual To Da No.	ate Hours		% Progran	n Completed	
General Items, Provisional Services	A									0			
Establish all plant, equipment, crew on site	A2		1.0				0	1	0.00				100.0
				DIS			0	0	0.00	0.0			
Standing Time for plant, crew, etc - WEATHER	B11 C19			R/0 R/0		10.5	-	0	10.50	0.0 0.0			
Standing Time for plant, crew, etc - TIDE	B11 C19			R/U		2.00	0	0	2.00 0.00	0.0			
Percussion Boring	В			1				5	5.00	0.0			
Move boring plant to site of each exploratory hole	B1		8.00			1	0	2	0.00		25.0		
Extra over B1 for setting up on a gradient >20%	B2		R/O				0	0	0.00	0.0			
Break out surface obstructions where present	B3	00.00		R/O	C 40		0	0	0.00	0.0			
Advance BH between groundlevel and 10m depth As B4 but between 10m and 20m	B4 B5	80.00 36.50			6.40		9 0	0	0.00	0.0			
As B4 but between 20m and 30m	B6	R/0					0	0	0.00	0.0			
As B4 but between 30m and 40m	B7	R/O					0	0	0.00	0.0			
Advance BH through hard stratum or obstruction	B9			R/O			0	0	0.00	0.0 0.0			
Rotary Drilling	С						0	0	0.00	0.0			
Move rotary plant to site of each exploratory hole	C15		6.00			1	0	1	0.00	16	.7		
							0	0	0.00	0.0			
RC drilling between groundlevel and 10m depth	C41	R/O					~			0.0			
RC drilling between groundlevel and 10m depth As C41 but between 10m and 20m As C41 but between 20m and 30m	C41 C42 C43	20.50 9.50					0	0	0.00	0.0 0.0			
As C41 but between 10m and 20m	C42	20.50	21.00				0 0 0						
As C41 but between 10m and 20m As C41 but between 20m and 30m Core box to be retained by client	C42 C43 C49	20.50	21.00				0	0	0.00	0.0 0.0 0.0			
As C41 but between 10m and 20m As C41 but between 20m and 30m Core box to be retained by client Sampling, Monitoring during investigation	C42 C43 C49 E	20.50				10	0 0 0	0 0 0	0.00 0.00 0.00 0.00	0.0 0.0	32.2		
As C41 but between 10m and 20m As C41 but between 20m and 30m Core box to be retained by client	C42 C43 C49	20.50	21.00 59.00 59.00			19	0 0 0	0 0 0 0 19	0.00 0.00 0.00 0.00 0.00	0.0 0.0 0.0	32.2		
As C41 but between 10m and 20m As C41 but between 20m and 30m Core box to be retained by client Sampling, Monitoring during investigation Small Disturbed Sample	C42 C43 C49 E E1	20.50	59.00			19	0 0 0	0 0 0	0.00 0.00 0.00 0.00	0.0 0.0 0.0 0.0	32.2		
As C41 but between 10m and 20m As C41 but between 20m and 30m Core box to be retained by client Sampling, Monitoring during Investigation Small Disturbed Sample Bulk Disturbed Sample Large Bulk disturbed sample	C42 C43 C49 E E1 E2 E3 E3	20.50	59.00 59.00	- - - - - - - - - - - - - - - - - - - - - - - -		19	0 0 0 0	0 0 0 0 19 0	0.00 0.00 0.00 0.00 0.00 0.00	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	32.2		
As C41 but between 10m and 20m As C41 but between 20m and 30m Core box to be retained by dient Sampling, Monitoring during investigation Small Disturbed Sample Bulk Disturbed Sample Large Bulk disturbed sample insitu Testing	C42 C43 C49 E E1 E2 E3 H	20.50	59.00 59.00 R/O			19	0 0 0 0 0 0 0 0	0 0 0 19 0 0 0 0	0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	32.2		
As C41 but between 10m and 20m As C41 but between 20m and 30m Core box to be retained by client Sampling, Monitoring during Investigation Small Disturbed Sample Bulk Disturbed Sample Large Bulk disturbed sample Insitu Testing Standard Penetration Test in Borehole	C42 C43 C49 E1 E1 E2 E3 H H1	20.50	59.00 59.00 R/O 40			19	0 0 0 0 0 0 0 0 0	0 0 0 0 19 0 0 0 0	0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	32.2		
As C41 but between 10m and 20m As C41 but between 20m and 30m Core box to be retained by dient Sampling, Monitoring during investigation Small Disturbed Sample Bulk Disturbed Sample Large Bulk disturbed sample insitu Testing	C42 C43 C49 E E1 E2 E3 H	20.50	59.00 59.00 R/O			19	0 0 0 0 0 0 0 0	0 0 0 19 0 0 0 0	0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	32.2		
As C41 but between 10m and 20m As C41 but between 20m and 30m Core box to be retained by client Sampling, Monitoring during investigation Small Disturbed Sample Bulk Disturbed Sample Large Bulk disturbed sample Insitu Testing Standard Penetration Test in Borehole	C42 C43 C49 E1 E1 E2 E3 H H1	20.50	59.00 59.00 R/O 40 R/O				0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 19 0 0 0 0 0 0 0 0	0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	32.2		
As C41 but between 10m and 20m As C41 but between 20m and 30m Core box to be retained by client Sampling, Monitoring during investigation Small Disturbed Sample Bulk Disturbed Sample Large Bulk disturbed sample Insitu Testing Standard Penetration Test in Borehole Standard Penetration Test in Rotary Drill Hole	C42 C43 C49 E E1 E2 E3 H H1 H2	20.50	59.00 59.00 R/O 40			19 19 8	0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 19 0 0 0 0 0 0 0 0 0 8	0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	32.2		
As C41 but between 10m and 20m As C41 but between 20m and 30m Core box to be retained by client Sampling, Monitoring during investigation Small Disturbed Sample Bulk Disturbed Sample Large Bulk disturbed sample Insitu Testing Standard Penetration Test in Borehole Standard Penetration Test in Rotary Drill Hole Geoenvironmental Laboratory Testing Marine Scotland Sample	C42 C43 C49 E1 E2 E3 H H1 H1 H2 L	20.50	59.00 59.00 R/O 40 R/O				0 0 0 0 0 0 0 0 0 0 0	0 0 0 19 0 0 0 0 0 0 0 0 0 0	0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	32.2		
As C41 but between 10m and 20m As C41 but between 20m and 30m Core box to be retained by client Sampling, Monitoring during investigation Small Disturbed Sample Bulk Disturbed Sample Large Bulk disturbed sample Insitu Testing Standard Penetration Test in Borehole Standard Penetration Test in Rotary Drill Hole Geoenvironmental Laboratory Testing	C42 C43 C49 E1 E2 E3 H H1 H1 H2 L	20.50	59.00 59.00 R/O 40 R/O				0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 19 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	32.2		
As C41 but between 10m and 20m As C41 but between 20m and 30m Core box to be retained by client Sampling, Monitoring during investigation Small Disturbed Sample Bulk Disturbed Sample Large Bulk disturbed sample Insitu Testing Standard Penetration Test in Borehole Standard Penetration Test in Rotary Drill Hole Geoenvironmental Laboratory Testing Marine Scotland Sample	C42 C43 C49 E1 E2 E3 H H1 H1 H2 L	20.50	59.00 59.00 R/O 40 R/O				0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 19 0 0 0 0 0 0 0 0 0 8	0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	32.2		
As C41 but between 10m and 20m As C41 but between 20m and 30m Core box to be retained by client Sampling, Monitoring during investigation Small Disturbed Sample Bulk Disturbed Sample Large Bulk disturbed sample Insitu Testing Standard Penetration Test in Borehole Standard Penetration Test in Rotary Drill Hole Geoenvironmental Laboratory Testing Marine Scotland Sample	C42 C43 C49 E1 E2 E3 H H1 H1 H2 L	20.50	59.00 59.00 R/O 40 R/O				0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	32.2		
As C41 but between 10m and 20m As C41 but between 20m and 30m Core box to be retained by client Sampling, Monitoring during investigation Small Disturbed Sample Bulk Disturbed Sample Large Bulk disturbed sample Insitu Testing Standard Penetration Test in Borehole Standard Penetration Test in Rotary Drill Hole Geoenvironmental Laboratory Testing Marine Scotland Sample	C42 C43 C49 E1 E2 E3 H H1 H1 H2 L	20.50	59.00 59.00 R/O 40 R/O					0 0 0 19 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.00 0.00	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	32.2		
As C41 but between 10m and 20m As C41 but between 20m and 30m Core box to be retained by client Sampling, Monitoring during investigation Small Disturbed Sample Bulk Disturbed Sample Large Bulk disturbed sample Insitu Testing Standard Penetration Test in Borehole Standard Penetration Test in Rotary Drill Hole Geoenvironmental Laboratory Testing Marine Scotland Sample Additional Items	C42 C43 C49 E1 E2 E3 H H1 H2 L2 L2 L2	20.50	59.00 59.00 R/O 40 R/O 121			8		0 0 0 19 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.00 0.00	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0			
As C41 but between 10m and 20m As C41 but between 20m and 30m Core box to be retained by dient Sampling, Monitoring during investigation Small Disturbed Sample Bulk Disturbed Sample Large Bulk disturbed sample Insitu Testing Standard Penetration Test in Borehole Standard Penetration Test in Rotary Drill Hole Geoenvironmental Laboratory Testing Marine Scotland Sample Additional Items Health & Safety Summar	C42 C43 C49 E1 E2 E3 H H1 H2 L2 L2 L2	20.50	59.00 59.00 R/O 40 R/O 121 121			8 8 uual To Date		0 0 0 19 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.00 0.00	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0			
As C41 but between 10m and 20m As C41 but between 20m and 30m Core box to be retained by client Sampling, Monitoring during investigation Small Disturbed Sample Bulk Disturbed Sample Large Bulk disturbed sample Insitu Testing Standard Penetration Test in Borehole Standard Penetration Test in Rotary Drill Hole Geoenvironmental Laboratory Testing Marine Scotland Sample Additional Items Health & Safety Summarr Hoc Cards Safety Drills	C42 C43 C49 E1 E2 E3 H H1 H2 L2 L2 L2	20.50	59.00 59.00 R/O 40 R/O 121 121			8 8 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		0 0 0 19 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.00 0.00	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0			
As C41 but between 10m and 20m As C41 but between 20m and 30m Core box to be retained by client Sampling, Monitoring during investigation Small Disturbed Sample Bulk Disturbed Sample Large Bulk disturbed sample Insitu Testing Standard Penetration Test in Borehole Standard Penetration Test in Rotary Drill Hole Geoenvironmental Laboratory Testing Marine Scotland Sample Additional Items Health & Safety Summary Hoc Cards Safety Drills Tool Box Talks	C42 C43 C49 E1 E2 E3 H H1 H2 L2 L2 L2	20.50	59.00 59.00 R/O 121 121 Today 1 0 1			8 8 4 4		0 0 0 19 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.00 0.00	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0			
As C41 but between 10m and 20m As C41 but between 20m and 30m Core box to be retained by client Sampling, Monitoring during investigation Small Disturbed Sample Bulk Disturbed Sample Large Bulk disturbed sample Insitu Testing Standard Penetration Test in Borehole Standard Penetration Test in Rotary Drill Hole Geoenvironmental Laboratory Testing Marine Scotland Sample Additional Items Health & Safety Summarr Hoc Cards Safety Drills	C42 C43 C49 E1 E2 E3 H H1 H2 L2 L2 L2	20.50	59.00 59.00 R/O 40 R/O 121 121			8 8 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		0 0 0 19 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.00 0.00	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0			
As C41 but between 10m and 20m As C41 but between 20m and 30m Core box to be retained by dient Sampling, Monitoring during investigation Small Disturbed Sample Bulk Disturbed Sample Large Bulk disturbed sample Insitu Testing Standard Penetration Test in Borehole Standard Penetration Test in Rotary Drill Hole Geoenvironmental Laboratory Testing Marine Scotland Sample Additional Items Health & Safety Summar, Hoc Cards Safety Drills Tool Box Talks HSE Meetings Incidents/Near Miss Environmental	C42 C43 C49 E1 E2 E3 H H1 H2 L2 L2 L2	20.50	59.00 59.00 R/O 121 121 121 121 121 121 121 0 0 0 0 0 0			8 1 1 0 0		0 0 0 19 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.00 0.00	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0			
As C41 but between 10m and 20m As C41 but between 20m and 30m Core box to be retained by client Sampling, Monitoring during investigation Small Disturbed Sample Bulk Disturbed Sample Large Bulk disturbed sample Insitu Testing Standard Penetration Test in Borehole Standard Penetration Test in Rotary Drill Hole Geoenvironmental Laboratory Testing Marine Scotland Sample Additional Items Health & Safety Summary Hoc Cards Safety Drills Tool Box Talks HSE Meetings Incidents/Near Miss Environmental Hours Worked	C42 C43 C49 E1 E2 E3 H H1 H2 L2 C49 C49 C49 C49 C49 C49 C49 C49	20.50	59.00 59.00 R/O 121 121 121 121 0 1 0 0 0			8 8 1 1 1 0 240		0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.00 0.00	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0			
As C41 but between 10m and 20m As C41 but between 20m and 30m Core box to be retained by dient Sampling, Monitoring during investigation Small Disturbed Sample Bulk Disturbed Sample Large Bulk disturbed sample Insitu Testing Standard Penetration Test in Borehole Standard Penetration Test in Rotary Drill Hole Geoenvironmental Laboratory Testing Marine Scotland Sample Additional Items Health & Safety Summar, Hoc Cards Safety Drills Tool Box Talks HSE Meetings Incidents/Near Miss Environmental	C42 C43 C49 E1 E2 E3 H H1 H2 L2 C49 C49 C49 C49 C49 C49 C49 C49	20.50	59.00 59.00 R/O 121 121 121 121 121 121 121 0 0 0 0 0 0			8 8 1 1 1 0 240		0 0 0 19 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.00 0.00	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0			
As C41 but between 10m and 20m As C41 but between 20m and 30m Core box to be retained by client Sampling, Monitoring during investigation Small Disturbed Sample Bulk Disturbed Sample Large Bulk disturbed sample Standard Penetration Test in Borehole Standard Penetration Test in Rotary Drill Hole Geoenvironmental Laboratory Testing Marine Scotland Sample Additional Items Health & Safety Summar Hoc Cards Safety Drills Tool Box Hass HSE Meetings Incidents/Near Miss Environmental Hours Worked Fugro GeoServices Representative Comments	C42 C43 C49 E1 E2 E3 H H1 H2 L2 C49 C49 C49 C49 C49 C49 C49 C49	20.50	59.00 59.00 R/O 121 121 121 121 121 121 121 0 0 0 0 0 0			8 8 4 4 4 1 0 240 Client Re	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.00 0.00	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0			
As C41 but between 10m and 20m As C41 but between 20m and 30m Core box to be retained by dient Sampling, Monitoring during investigation Small Disturbed Sample Bulk Disturbed Sample Large Bulk disturbed sample Insitu Testing Standard Penetration Test in Borehole Standard Penetration Test in Rotary Drill Hole Geoenvironmental Laboratory Testing Marine Scotland Sample Additional Items Health & Safety Summary Hoc Cards Safety Drills Tool Box Talks HSE Meetings Incidents/Near Miss Environmental Hours Worked	C42 C43 C49 E1 E2 E3 H H1 H2 L2 C49 C49 C49 C49 C49 C49 C49 C49	20.50	59.00 59.00 R/O 121 121 121 121 121 121 121 0 0 0 0 0 0			8 8 1 1 1 0 240	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.00 0.00	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0			

Arch Henderso		G Tur	RD		RSHORE DAILY P Energy Park - Marin			Daily Report No.
Job No		C1982		Ves	sel Skate 3A		Date	Monday 04-Mar-19
mshuttleworth stuart.innes@ m.chappell@fi n.armstrong@ g.crisp@fugro	ugro.com Ifugro.com .com			Attn. Attn. Attn. Attn. Attn. Attn. Attn.	Andy Neillings Michael Shuttleworth Stuart Innes Mathew Chappell - Nearshore Mai Nicholas Armstrong - Reporting Glen Crisp - Project Manager		Redact Redact Redact Redact	
Observed Weath Time 00:00	er Speed Kn	Wind ts Dir	s	well (Hs)	Sea State	Visibility		Weather Forecast
00:00	10	SW		N/A	smooth	good		See Below
06:00 12:00	11	W		N/A N/A	smooth smooth	good good		See Below
12:00	20	W		N/A	smooth	good		
00:00	17	SW		N/A	smooth	good		
		g Penetration (m)					Operational Status	
BH no.		2	3	4				
BH01	1.0	0 1.0	2.2	3		R	Jacked up on BH01 eady to commence CP fror	
				Summary of	of Operations / Borehole Drillin	g - last 24hrs:		
From	To	Hrs (No.)	Code				Description	
00:00 07:15	07:15 08:00	7.25	Cable Percus Crew Change		mmence CP drilling from 0.00m t htshift transfer to shore / Handov		Davshift transfer to ILIP / TP	T on Site Rules
08:00	17:20	9.33	Cable Percus		ntinue CP from 10.00m to 17.35		Dayshint dansier to 00D7 TE	
17:20	18:50	1.50	Rotary Drilling (n in Geobor to depth / Flush hole			
18:50 19:15	19:15 20:00	0.42	Other Opera Crew Change		el all plant / Wash down and clea yshift transfer to shore / Handove		Nightshift transfer to JUB / TE	3T on Site Rules
20:00	00:00	4.00	Rotary Drilling (mmence RC drilling from 17.35m	,	0	
		Local the West goes West goes West goes	on 5% ((81) 12 (max kts) 63 s type	3w wsw ws s in 12	Weather forecast 4 46 46 76 86 90 100 4 46 46 76 80 70 70 70 4 46 46 90 80 70 70 70 4 46 46 90 80 90 70 70	500 Wishi wishi Wali Wali 20 21 21 20 20 31 11 10 20 20	V WEW WEW WEW SW SW SW SW SW 20 18 Ht 17 15 18 19 28 28 25 27 28 28 28 29	v 50w
alth Safety & the I	Environment	Procedula A temper Felts the A greene Table to Table hold Table hold	ture (°C) °C) 1 indey (%) 38 indey (%) 877 S2	976 977 970 10 70 70	A3 A3 B1 B4 B3 F9 75 1 976 976 976 976 976 977 9 11 34 75 17 976 977 9	78 979 979 979 800 78 34 34 34 34 554	4 b 7 0 4 1 -1	2 H4Z 7 274 23.50
SSL Rep: Theo	Cleave				Client R	ep:		

Arch Menderson	Fugro								ESS R				Daily Report No	
Celebrating 100 Years			NIGG E	nerg	y Pai	"K - IVI	arine	Grou	nd Inve	stigati	on		03	
Activity Time Summa	ry		oday	To Da		Da	ay Shift		Night		Com	pany	Posi	tion
Mobilisation Moving & Jacking			0.00	3.50 9.67		lim	ny Wilso	0	Onboard J Joshua		isation) Fugro Geo	Senices	Bargen	aster
Rotary Drilling (Coring)			5.50	5.50			es Lawso		Adam		Fugro Geo		Daigen	
Cable Percussion			6.58	28.4			n Allardy		Ashley L		Fugro Geo		Assistan	
Standby (Fugro)			0.00	0.00		Stu	uart Nye				Fugro Geo	oServices	Assistan	t Driller
Standby (Tide)			0.00	2.00										
Standby weather Single Shift Standby			0.00	10.5 5.75		Rich	ard Luke	er	Bart	Kot	Fug	ro	Geotechnica	al Engineer
Other Operations			0.00	2.42		The	o Cleave				Fugro Geo	oServices	Project E	ngineer
Crew Change / TBT			1.50	4.25									,	
			0.00	0.00										
			0.00	0.00										
			0.00	0.00										
			0.00	0.00										
			0.00	0.00										
	Total	2	24.00	24.0	0	No. F	Personn	el	10	0	Total Man Hours Worked		120	
Project Program / Progre			ogrammed			Today			ctual To Da			% Program	n Completed	
Activity	BoQ Item	m.	No.	Hours	m.	No.	Hours	m.	No.	Hours	0			
General Items, Provisional Services	A		1.0	-						0.00	0			100.0
Establish all plant, equipment, crew on site	A2		1.0			-		0.0	1	0.00	0.0			100.0
Standing Time for plant, crew, etc - WEATHER	B11 C19			R/O		-	10.50	0.0	0	10.50	0.0			
Standing Time for plant, crew, etc - WEATHER Standing Time for plant, crew, etc - TIDE	B11 C19 B11 C19			R/O			2.00	0.0	0	2.00	0.0			
,,, (ioc					1			0.0	0	2.00	0.0			
Percussion Boring	В										0.0			
Move boring plant to site of each exploratory hole	B1		8.00					0.0	2	0.00		25.0		
Extra over B1 for setting up on a gradient >20%	B2		R/O					0.0	0	0.00	0.0			
Break out surface obstructions where present	B3			R/O				0.0	0	0.00	0.0	0.00 (
Advance BH between groundlevel and 10m depth	B4	80.00			17.35			26.8	0	0.00	0.0	33.4		
As B4 but between 10m and 20m As B4 but between 20m and 30m	B5 B6	36.50 R/O						0.0	0	0.00	0.0 0.0			
As B4 but between 20m and 30m As B4 but between 30m and 40m	B7	R/0						0.0	0	0.00	0.0			
Advance BH through hard stratum or obstruction	B9	100		R/O				0.0	0	0.00	0.0			
								0.0	0	0.00	0.0			
Rotary Drilling	С							0.0	Ŭ	0.00	0.0			
Move rotary plant to site of each exploratory hole	C15		6.00					0.0	1	0.00	16	6.7		
RC drilling between groundlevel and 10m depth	C41	R/O						0.0	0	0.00	0.0			
As C41 but between 10m and 20m	C42	20.50			2.65			2.7	0	0.00	12.9			
As C41 but between 20m and 30m	C43	9.50	01.00		3.35			3.4	0	0.00	0.0	35.3		
Core box to be retained by client	C49		21.00					0.0	0	0.00	0.0			
Sampling Monitoring during investigation	F							0.0	0	0.00	0.0			
Sampling, Monitoring during investigation Small Disturbed Samole	E E1		59.00			35					0.0			91.5
Sampling, Monitoring during investigation Small Disturbed Sample Bulk Disturbed Sample	E E1 E2		59.00 59.00			35		0.0	0 54 0	0.00				91.5
Small Disturbed Sample	E1					35		0.0	54	0.00	0.0			91.5
Small Disturbed Sample Bulk Disturbed Sample Large Bulk disturbed sample	E1 E2 E3		59.00			35		0.0	54 0	0.00	0.0 0.0 0.0 0.0			91.5
Small Disturbed Sample Bulk Disturbed Sample Large Bulk disturbed sample Insitu Testing	E1 E2 E3 H		59.00 R/O			35		0.0 0.0 0.0 0.0	54 0 0 0	0.00 0.00 0.00 0.00	0.0 0.0 0.0 0.0 0.0			91.5
Small Disturbed Sample Bulk Disturbed Sample Large Bulk disturbed sample Insitu Testing Standard Penetration Test in Borehole	E1 E2 E3 H H1		59.00 R/O 40			35		0.0 0.0 0.0 0.0 0.0	54 0 0 0	0.00 0.00 0.00 0.00 0.00	0.0 0.0 0.0 0.0 0.0 0.0			91.5
Small Disturbed Sample Bulk Disturbed Sample Large Bulk disturbed sample Insitu Testing	E1 E2 E3 H		59.00 R/O			35		0.0 0.0 0.0 0.0 0.0 0.0	54 0 0 0 0	0.00 0.00 0.00 0.00 0.00 0.00	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0			91.5
Small Disturbed Sample Bulk Disturbed Sample Large Bulk disturbed sample Insitu Testing Standard Penetration Test in Borehole Standard Penetration Test in Rotary Drill Hole	E1 E2 E3 H H1 H2		59.00 R/O 40			35		0.0 0.0 0.0 0.0 0.0	54 0 0 0	0.00 0.00 0.00 0.00 0.00	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0			91.5
Small Disturbed Sample Bulk Disturbed Sample Large Bulk disturbed sample Insitu Testing Standard Penetration Test in Borehole	E1 E2 E3 H H1		59.00 R/O 40			26		0.0 0.0 0.0 0.0 0.0 0.0 0.0	54 0 0 0 0 0 0 0	0.00 0.00 0.00 0.00 0.00 0.00 0.00	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	28.1		91.5
Small Disturbed Sample Bulk Disturbed Sample Large Bulk disturbed sample insitu Testing Standard Penetration Test in Borehole Standard Penetration Test in Rotary Drill Hole Geoenvironmental Laboratory Testing	E1 E2 E3 H H1 H2 H2 L		59.00 R/O 40 R/O					0.0 0.0 0.0 0.0 0.0 0.0	54 0 0 0 0	0.00 0.00 0.00 0.00 0.00 0.00	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	28.1		91.5
Small Disturbed Sample Bulk Disturbed Sample Large Bulk disturbed sample insitu Testing Standard Penetration Test in Borehole Standard Penetration Test in Rotary Drill Hole Geoenvironmental Laboratory Testing	E1 E2 E3 H H1 H2 H2 L		59.00 R/O 40 R/O					0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	54 0 0 0 0 0 0 0 0 34	0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	28.1		91.5
Small Disturbed Sample Bulk Disturbed Sample Large Bulk disturbed sample insitu Testing Standard Penetration Test in Borehole Standard Penetration Test in Rotary Drill Hole Geoenvironmental Laboratory Testing Marine Scotland Sample	E1 E2 E3 H H1 H2 H2 L		59.00 R/O 40 R/O					0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	54 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	28.1		91.5
Small Disturbed Sample Bulk Disturbed Sample Large Bulk disturbed sample insitu Testing Standard Penetration Test in Borehole Standard Penetration Test in Rotary Drill Hole Geoenvironmental Laboratory Testing Marine Scotland Sample	E1 E2 E3 H H1 H2 H2 L		59.00 R/O 40 R/O					0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	54 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	28.1		91.5
Small Disturbed Sample Bulk Disturbed Sample Large Bulk disturbed sample insitu Testing Standard Penetration Test in Borehole Standard Penetration Test in Rotary Drill Hole Geoenvironmental Laboratory Testing Marine Scotland Sample	E1 E2 E3 H H1 H2 H2 L		59.00 R/O 40 R/O					0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	54 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	28.1		91.5
Small Disturbed Sample Bulk Disturbed Sample Large Bulk disturbed sample insitu Testing Standard Penetration Test in Borehole Standard Penetration Test in Rotary Drill Hole Geoenvironmental Laboratory Testing Marine Scotland Sample	E1 E2 E3 H H1 H2 H2 L		59.00 R/O 40 R/O					0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	54 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	28.1		91.5
Small Disturbed Sample Bulk Disturbed Sample Large Bulk disturbed sample Insitu Testing Standard Penetration Test in Borehole Standard Penetration Test in Rotary Drill Hole Geoenvironmental Laboratory Testing Marine Scotland Sample Additional Items	E1 E2 E3 H H1 H2 L2 L2		59.00 R/O 40 R/O 121			26		0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	54 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0			91.5
Small Disturbed Sample Buik Disturbed Sample Large Buik disturbed sample Insitu Testing Standard Penetration Test in Borehole Standard Penetration Test in Rotary Drill Hole Geoenvironmental Laboratory Testing Marine Scotland Sample Additional Items Health & Safety Summal	E1 E2 E3 H H1 H2 L2 L2		59.00 R/O 40 R/O		Ac		Date	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	54 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0			91.5
Small Disturbed Sample Bulk Disturbed Sample Large Bulk disturbed sample insitu Testing Standard Penetration Test in Borehole Standard Penetration Test in Rotary Drill Hole Geoenvironmental Laboratory Testing Marine Scotland Sample Additional Items Health & Safety Summan Hoc Cards Safety Drills	E1 E2 E3 H H1 H2 L2 L2		59.00 R/O 40 R/O 121 121 Today 1 0			26)ate	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	54 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0			91.5
Small Disturbed Sample Buik Disturbed Sample Large Buik disturbed sample Insitu Testing Standard Penetration Test in Borehole Standard Penetration Test in Rotary Drill Hole Geoenvironmental Laboratory Testing Marine Scotland Sample Additional Items Health & Safety Summal Hoc Cards Safety Drills Tool Box Talks	E1 E2 E3 H H1 H2 L2 L2		59.00 R/O 40 R/O 121 121 Today 1 0 1			26 26 tual To C 7 4 5	late	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	54 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0			91.5
Small Disturbed Sample Bulk Disturbed Sample Large Bulk disturbed sample Insitu Testing Standard Penetration Test in Borehole Standard Penetration Test in Rotary Drill Hole Geoenvironmental Laboratory Testing Marine Scotland Sample Additional Items Health & Safety Summan Hoc Cards Safety Drills Tool Box Talks HSE Meetings	E1 E2 E3 H H1 H2 L2 L2		59.00 R/O 40 R/O 121 121 Today 1 0 1 0			26 26 tual To E 7 4 5 1	Pate	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	54 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0			91.5
Small Disturbed Sample Bulk Disturbed Sample Large Bulk disturbed sample Insitu Testing Standard Penetration Test in Borehole Standard Penetration Test in Rotary Dnill Hole Geoenvironmental Laboratory Testing Marine Scotland Sample Additional Items Health & Safety Summar Hoc Cards Safety Drills Tool Box Talks HSE Meetings Incidents/Near Miss	E1 E2 E3 H H1 H2 L2 L2		59.00 R/O 40 R/O 121 121 50 0 1 0 1 0 0 0			26 26 tual To E 7 4 5 1 0	Vate	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	54 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0			91.5
Small Disturbed Sample Bulk Disturbed Sample Large Bulk disturbed sample Insitu Testing Standard Penetration Test in Borehole Standard Penetration Test in Rotary Drill Hole Geoenvironmental Laboratory Testing Marine Scotland Sample Additional Items Health & Safety Summan Hoc Cards Safety Drills Tool Box Talks HSE Meetings	E1 E2 E3 H H1 H2 L2 L2		59.00 R/O 40 R/O 121 121 Today 1 0 1 0			26 26 tual To E 7 4 5 1	bate	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	54 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0			91.5
Small Disturbed Sample Buik Disturbed Sample Large Buik disturbed sample Insitu Testing Standard Penetration Test in Borehole Standard Penetration Test in Rotary Drill Hole Gecenvironmental Laboratory Testing Marine Scotland Sample Additional Items Health & Safety Summat Hoc Cards Safety Drills Tool Box Talks HSE Meetings Incidents/Near Miss Environmental	E1 E2 E3 H H1 H2 L2 L2 V		59.00 R/O 40 R/O 121 121 121 121 121 121 121 121 0 11 0 0 0 0			26 26 7 7 4 5 1 0 0 360		0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	54 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0			91.5
Small Disturbed Sample Bulk Disturbed Sample Large Bulk disturbed sample Insitu Testing Standard Penetration Test in Borehole Standard Penetration Test in Rotary Drill Hole Geoenvironmental Laboratory Testing Marine Scotland Sample Additional Items Health & Safety Summan Hoc Cards Safety Drills Tool Box Talks HSE Meetings Incidents/Near Miss Environmental Hours Worked	E1 E2 E3 H H1 H2 L2 L2 V		59.00 R/O 40 R/O 121 121 121 121 121 121 121 121 0 11 0 0 0 0			26 26 7 7 4 5 1 0 0 360		0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	54 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0			91.5
Small Disturbed Sample Bulk Disturbed Sample Large Bulk disturbed sample Insitu Testing Standard Penetration Test in Borehole Standard Penetration Test in Rotary Drill Hole Gecenvironmental Laboratory Testing Marine Scotland Sample Additional Items Health & Safety Summan Hoc Cards Safety Drills Tool Box Talks HSE Meetings Incidents/Near Miss Environmental Hours Worked Fugro GeoServices Representative Comment	E1 E2 E3 H H1 H2 L2 L2 V		59.00 R/O 40 R/O 121 121 121 121 121 121 121 121 0 11 0 0 0 0			26 26 7 7 4 5 1 0 0 360 Clie	ent Repr	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	54 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0			91.5
Small Disturbed Sample Bulk Disturbed Sample Large Bulk disturbed sample Insitu Testing Standard Penetration Test in Borehole Standard Penetration Test in Rotary Drill Hole Gecenvironmental Laboratory Testing Marine Scotland Sample Additional Items Health & Safety Summan Hoc Cards Safety Drills Tool Box Talks HSE Meetings Incidents/Near Miss Environmental Hours Worked	E1 E2 E3 H H1 H2 L2 L2 V		59.00 R/O 40 R/O 121 121 121 121 121 121 121 121 0 11 0 0 0 0			26 26 7 7 4 5 1 0 0 360 Clie		0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	54 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0			91.5

rch enderso			RD		RSHORE DAILY P			Daily Report No.
Job No		C1982	<u> </u>	V	essel Skate 3A		Date	Tuesday 05-Mar-19
mshuttlewo stuart.innes m.chappell@ n.armstrong g.crisp@fug	@fugro.com ro.com			Attn. Attn. Attn. Attn. Attn. Attn. Attn.	Andy Neillings Michael Shuttleworth Stuart Innes Mathew Chappell - Nearshore Man Nicholas Armstrong - Reporting Glen Crisp - Project Manager		Redact Redact Redact Redact	
Observed Wea Time 00:00		Wind Ints Dir	s	Swell (Hs)	Sea State	Visibility		Weather Forecast
00:00	6	SSW		N/A	smooth	good		
06:00	4	SSW		N/A	smooth	good		See Below
12:00 18:00	5	SW		N/A N/A	smooth smooth	good good		
00:00	9	NE		N/A	smooth	good		
	I	eg Penetration (m)					Operational Statu	
BH n	0.	1 2	3		4		operational Statu	
BH0	1 1	1.0 1.0	2.2		3.1			
BH0	8 (0.3 0.9	1.4		1.3	Р	Rotary drilling underway repare to move to BH08 at	
						·		· · · · ·
				Summary	of Operations / Borehole Drilling	- last 24hrs:		
From	То	Hrs (No.)	Code				Description	
00:00	00:20	0.33	Rotary Drilling (ommence RC drilling from 17.35m			.85m below mudline
00:20	02:30	2.17 4.50	Other Opera Standby (Ti		ull all Geobor to deck / Pull all casir nable to move JUB until high water			M
02:30	07:00	1.00	Crew Change		ightshift transfer to shore / Handov			
08:00	10:30	2.50	Standby (Ti		nable to move JUB until high water			
10:30	11:50	1.33	Moving & Jac		omplete move from BH01 to BH08			
11:50 18:45	18:45 19:15	6.92 0.50	Cable Percus		un in casing to mudline / Commend /ash and clear down deck for E.O.S		0.00m to 7.00m BML	
18:45	20:00	0.50	Other Opera Crew Change		ash and clear down deck for E.O.S ayshift transfer to shore / Handover		Nightshift transfer to JUB / TI	BT on Rotary Drilling Operations
20:00	00:00	4.00	Cable Percus	ssion C	ontinue CP drilling from 7.00m to 1	3.00m BML		
					Weather forecast			
			direction 51	W 599 3W	1.00 4.00 5.00 10.0 7.00 8.00 8.00 10.00 5W 5W 5W 5W 5W 5W N E	E ENE NE NE	HE ENG ENG NE HAVE HAVE NAME	N N
			gusits (max kts)	N 24 171	12 10 4 1 7 1 2 4 10 10 11 11 11 2 4 10 10 10 11 11 1 2 1	A 10. 14 100		0.0
		Prece Air to	station type station (mm / h) sperature (°C)	1 1 1	4 4 4 4 4 4 4	A 14 14 14	0 0 0 0 0 03 04 03 01 07	0.1 0.2
		Potat Air pr Tide 1 Time	ve humidity (%) 80 issure (%*a) 80 ipe 5	ыс на ёх на нас. нас. У У У	hp A6 A0 A9 A0 A4 A1 TP mass seast seast	17 78 78 80 1668 1689 569 568 77 278 3 3 1932	689 589 581 995 998 998 998 998 전 전 전 <u>12</u> 년 년 년 17.58	60 13
Ith Safety & th	e Environment	Tide I	eight (m) [3)	a, 34 28	18 16 14 14 18 25 32 38	41 41 50 28	2 15 12 11 13 19 27	-2424
	a Classica							
SL Rep: The	o Cleave				Client Re	ep:		

Arch		UGRO		NEAF	SHC	ORE	DAIL	Y PF	ROGR	ESS R	EPOF	RT		Daily Report No	
Celebrating 100 Years				Nigg E	nerg	y Par	'k - M	arine	Grour	nd Inve	stigati	on		04	
Activity Time Su	immary			oday	To Da		D	ay Shift		Night		Com	oany	Posit	tion
Mobilisation Moving & Jacking				0.00	3.50 11.00	_	lim	my Wilso		Onboard J Joshua		isation) Fugro Geo	Senvices	Bargen	aster
Rotary Drilling (Coring)				0.33	5.83			es Lawso		Adam		Fugro Geo		Daigen	
Cable Percussion				0.92	39.3			m Allardy	ce	Ashley Lo	owthian	Fugro Geo		Assistan	
Standby (Fugro) Standby (Tide)				0.00 7.00	0.00		St	uart Nye				Fugro Geo	Services	Assistan	t Driller
Standby weather				0.00	10.5		Rich	nard Luke	er	Bart	Kot	Fug	ro	Geotechnica	al Engineer
Single Shift Standby				0.00	5.75								a		
Other Operations Crew Change / TBT				2.67 1.75	5.08		The	eo Cleave)			Fugro Geo	Services	Project E	ngineer
				0.00	0.00										
				0.00	0.00										
				0.00	0.00										
				0.00	0.00										
				0.00	0.00)						Total Man			
		Total	2	24.00	24.0	0	No. I	Personn	el	10		Hours Worked		120	
Project Program / Pr Activity	rogress	BoQ Item	Pro m.	ogrammed No.	l Hours	m.	Today No.	Hours	Ac m.	ctual To Da No.	te Hours		% Program	n Completed	
General Items, Provisional Services		A		110.			110.			110.		0			
Establish all plant, equipment, crew on site		A2		1.0					0.0	1	0.00				100.0
					R/O				0.0	0	0.00	0.0 0.0			
Standing Time for plant, crew, etc - WEATHER Standing Time for plant, crew, etc - TIDE		B11 C19 B11 C19			R/0 R/0			7.00	0.0	0	10.50 9.00	0.0			
									0.0	0	0.00	0.0			
Percussion Boring		В							-			0.0			
Move boring plant to site of each exploratory hol Extra over B1 for setting up on a gradient >20%	e	B1 B2		8.00 R/O			1		0.0	3	0.00	0.0	37.5		
Extra over B1 for setting up on a gradient >20% Break out surface obstructions where present		B2 B3		100	R/O				0.0	0	0.00	0.0			
Advance BH between groundlevel and 10m dep	th	B4	80.00			10.00			29.4	0	0.00		36.8		
As B4 but between 10m and 20m		B5	36.50			3.00			10.4	0	0.00		28.4		
As B4 but between 20m and 30m As B4 but between 30m and 40m		B6 B7	R/0 R/0						0.0	0	0.00	0.0 0.0			
Advance BH through hard stratum or obstruction	ı	B9	100		R/O				0.0	0	0.00	0.0			
									0.0	0	0.00	0.0			
Rotary Drilling		C		6.00								0.0			
Move rotary plant to site of each exploratory hole RC drilling between groundlevel and 10m depth	9	C15 C41	R/O	6.00					0.0	1 0	0.00	0.0			
As C41 but between 10m and 20m		C42	20.50						2.7	0	0.00	12.9			
As C41 but between 20m and 30m		C43	9.50						3.4	0	0.00		35.3		
Core box to be retained by client		C49		21.00					0.0	0	0.00	0.0 0.0			
Sampling, Monitoring during investigation		E							0.0	0	0.00	0.0			
Small Disturbed Sample		E1		59.00					0.0	54	0.00				91.5
Bulk Disturbed Sample Large Bulk disturbed sample		E2 E3		59.00 R/O					0.0	0	0.00	0.0 0.0			
as bain aiota bed annipio				140					0.0	0	0.00	0.0			
Insitu Testing		Н		l				-		0	0.00	0.0			
Standard Penetration Test in Borehole Standard Penetration Test in Rotary Drill Hole												0.0			
		H1 H2		40 R/O					0.0	0	0.00	0.0 0.0			
		H1 H2		40 R/O					0.0	0	0.00	0.0			
Geoenvironmental Laboratory Testing		H2		R/O						0	0.00	0.0 0.0 0.0			
		H2							0.0 0.0 0.0	0 0 0 34	0.00 0.00 0.00 0.00	0.0 0.0 0.0 0.0 0.0	28.1		
Geoenvironmental Laboratory Testing Marine Scotland Sample		H2		R/O					0.0	0 0 0	0.00 0.00 0.00	0.0 0.0 0.0 0.0 0.0 0.0	28.1		
Geoenvironmental Laboratory Testing		H2		R/O					0.0 0.0 0.0	0 0 0 34	0.00 0.00 0.00 0.00	0.0 0.0 0.0 0.0 0.0	28.1		
Geoenvironmental Laboratory Testing Marine Scotland Sample		H2		R/O					0.0 0.0 0.0 0.0 0.0 0.0	0 0 34 0 0 0 0	0.00 0.00 0.00 0.00 0.00 0.00 0.00	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	28.1		
Geoenvironmental Laboratory Testing Marine Scotland Sample		H2		R/O					0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	0 0 34 0 0 0 0 0 0	0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	28.1		
Geoenvironmental Laboratory Testing Marine Scotland Sample		H2		R/O					0.0 0.0 0.0 0.0 0.0 0.0	0 0 34 0 0 0 0	0.00 0.00 0.00 0.00 0.00 0.00 0.00	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	28.1		
Gecenvironmental Laboratory Testing Marine Scotland Sample Additional Items Health & Safety Sur	mmary	H2		R/O		Act		Date	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	0 0 34 0 0 0 0 0 0	0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0			
Geoenvironmental Laboratory Testing Marine Scotland Sample Additional Items Health & Safety Sur Hoc Cards	mmary	H2		R/O 121 Today		Act	8	Date	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	0 0 34 0 0 0 0 0 0	0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0			
Geoenvironmental Laboratory Testing Marine Scotland Sample Additional Items Health & Safety Sur Hoc Cards Safety Drills Tool Box Talk	5	H2		R/O 121 Today 1 0 1		Act	8 4 6	Date	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	0 0 34 0 0 0 0 0 0	0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0			
Gecenvironmental Laboratory Testing Marine Scotland Sample Additional Items Health & Safety Sur Hoc Cards Safety Drills Tool Box Talk HSE Meetings	5	H2		R/O 121 Today 1 0 1 0		Act	8 4 6 1	Date	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	0 0 34 0 0 0 0 0 0	0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0			
Gecenvironmental Laboratory Testing Marine Scotland Sample Additional Items Health & Safety Sur Hoc Cards Safety Drils Tool Box Talk Tool Box Talk	s S Iiss	H2		R/O 121 Today 1 0 1		Act	8 4 6	Date	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	0 0 34 0 0 0 0 0 0	0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0			
Gecenvironmental Laboratory Testing Marine Scotland Sample Additional Items Health & Safety Sul Hoc Cards Safety Drills Tool Box Talk HSE Meetings Incidents/Near M Environmenta Hours Worked	s 3 liss I	H2		R/O 121 Today 1 0 1 0 0 0		Act	8 4 6 1 0 0 480		0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	0 0 34 0 0 0 0 0 0 0 0	0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0			
Geoenvironmental Laboratory Testing Marine Scotland Sample Additional Items Health & Safety Su Hoc Cards Safety Drills Tool Box Talk: HSE Meetings Incidents/Near M Environmenta	s 3 liss I	H2		R/O 121 Today 1 0 1 0 0 0 0		Act	8 4 6 1 0 0 480		0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	0 0 34 0 0 0 0 0 0	0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0			
Geoenvironmental Laboratory Testing Marine Scotland Sample Additional Items Health & Safety Sul Hoc Cards Safety Drills Tool Box Talk HSE Meetings Incidents/Near M Environmenta Hours Worked	s 3 liss I	H2		R/O 121 Today 1 0 1 0 0 0 0		Act	8 4 6 1 0 0 480		0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	0 0 34 0 0 0 0 0 0 0 0	0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0			
Gecenvironmental Laboratory Testing Marine Scotland Sample Additional Items Health & Safety Sur Hoc Cards Safety Drils Tool Box Talk HSE Meeting Incidents/Near M Environmenta Hours Worked Fugro GeoServices Representative Com	s 3 liss I	H2		R/O 121 Today 1 0 1 0 0 0 0		Act	8 4 6 1 0 0 480 Clie	ent Repr	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	0 0 34 0 0 0 0 0 0 0 0	0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0			
Gecenvironmental Laboratory Testing Marine Scotland Sample Additional Items Health & Safety Sul Hoc Cards Safety Drills Tool Box Talk HSE Meetings Incidents/Near M Environmenta Hours Worked	s 3 liss I	H2		R/O 121 Today 1 0 1 0 0 0 0		Act	8 4 6 1 0 0 480 Clie Clie		0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	0 0 34 0 0 0 0 0 0 0 0	0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0			

Arch lenderson		G	RO		RSHORE DAILY F Energy Park - Marir	_		Daily Report No.
Job No		C1982	I	Ves	sel Skate 3A		Date	Wednesday 06-Mar-19
mshuttleworth stuart.innes@ m.chappell@f n.armstrong@ g.crisp@fugro	ugro.com Ofugro.com com			Attn. Attn. Attn. Attn. Attn. Attn. Attn.	Andy Neillings Michael Shuttleworth Stuart Innes Mathew Chappell - Nearshore Ma Nicholas Armstrong - Reporting Glen Crisp - Project Manager		Redact Redact Redact Redact	
Observed Weath Time 00:00	ner Speed K	Wind Ints Dir	s	well (Hs)	Sea State	Visibility		Weather Forecast
00:00	7	ENE		N/A	smooth	good		
06:00	15	ENE		N/A N/A	smooth	good		See Below
12:00	27	ENE		N/A N/A	smooth smooth	good good		
00:00	21	NE		N/A	smooth	good		
	I	eg Penetration (m)					Operational Status	
BH no.		1 2	3	4			operational oldlus	
BH08	(0.3 0.9	1.4	1	3			
							CP drilling underway on	BH08
	<u> </u>	1	1	Summary	of Operations / Borehole Drillin	ng - last 24hrs:		
From	То	Hrs (No.)	Code				Description	
00:00	02:45	2.75	Cable Percus	-	ntinue CP from 13.00m to 15.82			
02:45	04:30	1.75	Cable Percus		08 continued from 15.82 to 19.0			
04:30 07:00	07:00 08:00	2.50	Standby (Ti Crew Change		iting on high water to move to B htshift transfer to shore / Hando			
07:00	10:45	2.75	Moving & Jac	,	l legs and start move to BH07 /	,	,	
10:45	12:15	1.50	Moving & Jac					and jack up to await safe weather window.
12:15	14:00	1.75	Standby (wea		3 jacked up ~30m from BH07 / 0			
14:00	19:00	5.00	Standby (wea					Rep transits to shore after inspection
19:00 20:00	20:00 00:00	1.00 4.00	Crew Change Standby (wea		yshift transfer to shore / Handov nd recorded at 24kt average, sw			
20.00	00.00	4.00	otanaby (not		la roborada al 2 na aronago, on			
			-					
		+						
		1						
	1	1			Weather forecast			
		Local time	0.00 1.00	7.00 1.00 4.00	5.80 8.00 7.00 8.06 9.00 10.00 11.00 12	00 13.00 14.00 15.00 16.00	17:00 12:00 19:00 20:00 21:00 22:00 23:00	
		Wind direction Wind speed (k	N NE	ENE ENE ENE	THE ENE ENE ENE ENE ENE ENE	IE NE NE NE NE	WE HE NOT THE MORE NOT THE	
			1 1	10 12 11	12 15 18 19 19 22 22 2	20 21 22 21	20 28 20 17 18 14 12	
		Wind gusts (m		1 (10) (10)	11 12 24 25 75 76 20 2			
		Cloud cover Precipitation ty	0.5	0.0.0	n 0 0 0 0 0 0 0			
		Precipitation ()	nm / h)			4 1.5 1.0 1.2 1.2	1 05 02 03 03 08 03	
		Air temperatur Feets like (°C)	0 1	4 4 4	4 8 8 4 8 4 4 4			
		Relative humid Air pressure ()	Pa) 982 982	991 995 BWE	03 83 83 91 92 94 96 9 907 908 687 986 985 984 983 98	2 481 980 979 978	978 977 977 978 976 076 976	
		Tide type Time	0.04		з <u>з</u> я я я я я я я 100 02	00	5 5 5 7 7 7 5 5 69	
olth Cofet . 9 4	Environment			21 22 16	13 12 15 21 28 38 4 4			
ealth Safety & the	Environment							
SSL Rep: Theo	Cleave				Client F	Rep:		
SL Rep: Theo	Cleave				Client F	Rep:		

Arch	-fugeo	l	NEAF	RSHC	ORE	DAIL	Y PF	ROGR	ESS F	REPOF	RT		Daily Report No).
Henderson Celebrating 100 Years		1	Nigg E	Inerg	y Pa	rk - M	arine	Grou	nd Inve	stigati	on		05	
Activity Time Sumn	nary	Тс	oday	To Da	ite	D	ay Shift		Night	Shift	Com	bany	Posi	tion
Mobilisation Moving & Jacking			.00 .25	3.50 15.2		lim	my Wilso	2	Onboard J Joshua	· ·	lisation) Fugro Geo	Sonicos	Barger	master
Rotary Drilling (Coring)			0.00	5.83			es Lawso		Adam		Fugro Geo		Daigei	
Cable Percussion			.50	43.8			m Allardy uart Nye	ce	Ashley L	owthian	Fugro Geo		Assistar Assistar	
Standby (Fugro) Standby (Tide)		_	2.50	0.00		31	uartinye				Fugro Geo	Services	Assistar	It Driller
Standby (weather)			0.75	21.2		Rich	hard Luke	er	Bart	Kot	Fug	0	Geotechnic	al Engineer
Single Shift Standby Other Operations			0.00	5.75		The	eo Cleave	•			Fugro Geo	Services	Project E	Ingineer
Crew Change / TBT			2.00	8.00										
			0.00	0.00										
			0.00	0.00										
		_	0.00	0.00										
			0.00	0.00							Total Man			
	Total	24	4.00	24.0	0	No.	Personn	el	10)	Hours Worked		120	
Project Program / Prog Activity	BoQ Item	Pro m.	grammed No.	i Hours	m.	Today No.	Hours	A m.	ctual To Da No.	te Hours		% Program	Completed	
General Items, Provisional Services	A										0			
Establish all plant, equipment, crew on site	A2		1.0					0.0	1	0.00	0.0			100.0
Standing Time for plant, crew, etc - WEATHER	B11 C19			R/O			10.75	0.0	0	0.00	0.0			
Standing Time for plant, crew, etc - TIDE	B11 C19			R/O			2.50	0.0	0	11.50	0.0			
Percussion Boring	В							0.0	0	0.00	0.0 0.0			
Move boring plant to site of each exploratory hole	B1		8.00					0.0	3	0.00	0.0	37.5	;	
Extra over B1 for setting up on a gradient >20%	B2		R/O					0.0	0	0.00	0.0			
Break out surface obstructions where present Advance BH between groundlevel and 10m depth	B3 B4	80.00		R/O				0.0 29.4	0	0.00	0.0	36.8		
As B4 but between 10m and 20m	B5	36.50			6.00			16.4	0	0.00			44.8	
As B4 but between 20m and 30m	B6	R/0						0.0	0	0.00	0.0			
As B4 but between 30m and 40m Advance BH through hard stratum or obstruction	B7 B9	R/O		R/O				0.0	0	0.00	0.0 0.0			
								0.0	0	0.00	0.0			
Rotary Drilling	C C15		6.00								0.0	-		
Move rotary plant to site of each exploratory hole RC drilling between groundlevel and 10m depth	C15 C41	R/O	6.00					0.0	1 0	0.00	0.0			
As C41 but between 10m and 20m		20.50						2.7	0	0.00	12.9			
As C41 but between 20m and 30m Core box to be retained by client	C43 C49	9.50	21.00					3.4 0.0	0	0.00	0.0	35.3		
	010		21.00					0.0	0	0.00	0.0			
Sampling, Monitoring during investigation	E					10					0.0			
Small Disturbed Sample Bulk Disturbed Sample	E1 E2		59.00 59.00			19 19		0.0	73 19	0.00		32.2		
Large Bulk disturbed sample	E3		R/O					0.0	0	0.00	0.0			
Insitu Testing	н							0.0	0	0.00	0.0 0.0			
Standard Penetration Test in Borehole	H1		40					0.0	0	0.00	0.0			
Standard Penetration Test in Rotary Drill Hole	H2		R/O					0.0	0	0.00	0.0			
Geoenvironmental Laboratory Testing	L							0.0	0	0.00	0.0 0.0			
Marine Scotland Sample	L2		121			11		0.0	45	0.00		37.2		
Additional Items								0.0	0	0.00	0.0 0.0			
								0.0	0	0.00	0.0			
								0.0	0	0.00	0.0			
	+							0.0	0	0.00	0.0 0.0			
								0.0	0	0.00	0.0			
Health & Safety Summ Hoc Cards	ary		Today 1		Ac	tual To I 9	Date				Lost & D	amaged		
Safety Drills			0			4								
Tool Box Talks HSE Meetings			1			7								
Incidents/Near Miss			0			0								
Environmental Hours Worked			0 120			0 600								
Fugro GeoServices Representative Comme	nts						ent Repr	esentative	e Comment	S				
JUB was waiting o Additional	BH08 was continued below scheduled depth of -15mCD to confirm rockhead. JUB was waiting on tide during this additional driling time. Additional data down to rockhead available, Alternatively, this period may be charged at standing rate if information is not required.													
FGSL Rep: Theo Cleave						CII	ent Re	o:						
							gned:							
Signed:														

	ch endersol				RO			_			S REPORT		Daily Report No.
	Job No			C1982			Vessel	-	ate 3A		Date		Thursday 07-Mar-19
To cc cc cc cc cc cc	ANeillings@ar mshuttlewortl stuart.innes@ m.chappell@f n.armstrong@ g.crisp@fugro	n@arch-hend gegroup.com ugro.com fugro.com .com	lerson.co.uk			At At At At At	tn. M tn. St tn. tn. M tn. Ni	idy Neillings ichael Shuttleworth uart Innes athew Chappell - Ne cholas Armstrong en Crisp - Project	Reporting Ma		Redact Redact Redact Redact		
0	Diserved Weath Time 00:00		v peed Knts	Vind Dir		Swell	(Hs)	Sea St	ate	Visibility		We	eather Forecast
	00:00		21	NE		N/A		smooth/s	-	good			See Below
	06:00		24 28	E NE		N/#		sligh sligh		good good			See Delow
	18:00		19	NNW		N/#		smoo		good			
	00:00		16	NW		N//	1	smoo	th	good			
			Leg Per	netration (m)	-						Operation	al Status	
_	BH no.		1	2	3		4				•		
	BH07		3.2	4.4	4.4		3.4			laak	ed up ~30m from Bl	J07 offer ab	orted move
											suitable weather v		
			<u> </u>										
	_		-		n -		mary of C	perations / Borel	ole Drilling -	last 24hrs:			
	From 00:00	To 07:00	1	Hrs (No.) 7.00		ode (weather)	II IB ia	cked up ~30m fror	n BH07 / await	t weather wind	Description ow to complete move	2	
	07:00	07:00		1.00		ange / TB							T on Moving & Jacking Ops
	08:00	16:30		8.50		(weather)	JUB ja	cked up ~30m fror	n BH07 / Wind	l and swell in e	excess of operational	l limits / Days	shift continue to monitor conditions
	16:30	17:30		1.00		(weather)					W forecast / Crew p		
	17:30 19:45	19:4: 20:1:		2.25 0.50		& Jacking ange / TB							ad and jack up to safe working height nsfer to shore / TBT as above
	20:15	00:00		3.75		Percussion	v v				0	,	l below CD = 4.01m
							_						
							-						
							_						
							-						
							-						
							_						
							_						
							_						
							+						
			ł		u			Weather for	ecast				
				Local time Wind directio			100 400 50 N N N		10.00 11.00 12.00 13.0 N N N N		17.00 18.00 19.00 20.00 21.00 N NRW MEN NRW NV	22.99 21.00	
				Wind speed						- 14 1- 14	22 20 18 17 17		
					-	2. 14 . 18	13 14 1				10 31 10 30 81	10 17	
				Wind gusts () Cloud cover			0.0.0				H H D H D H		
				Precipitation Precipitation	type	0 5	4 0 1	02 03 08 08	1 0 0 1				
				Air temperatu Feets like (*C	ire (°C)		1.1.2.1.1	0 0 1 1	******	1 N	4 4 4 4 4		
				Relative hum Air pressure	idity (%)	6 92 94	92 93 9	0 00 01 87 80	65 ET F1 E	2 78 76 85	78 78 79 73 73 74 997 993 994 995 599		
				Tide type Time		5 71 4	Se 34 3	1 24 21 21 21	3 3 3 7	N 26 26 26	2 2 24 2 11	21 21	
				Titte height (m)	835 41 .58	24 14 1	111 12 17 25	12 33 38 42 44		13 1 88 12 19	27 .34	
Health	Safety & the	Environmen	t										
FGS	Rep: Theo	Cleave							Client Rep:				
Sign	ed:								Signed:				

Arch	-fugeo		NEAF	RSHO	ORE	DAIL	Y PF	ROGR	ESS F	REPOF	RT		Daily Report No	
Henderson Celebrating 100 Years		I	Nigg E	inerg	y Pai	rk - M	arine	Grou	nd Inve	stigati	on		06	
Activity Time Summa	Ŋ		oday	To Da		D	ay Shift		Night		Comp	bany	Posi	tion
Mobilisation Moving & Jacking		_	0.00 2.25	3.50 17.5		Jim	my Wilso	n	Onboard Joshua	JUB (mobil Sandy	isation) Fugro Geo	Services	Bargen	naster
Rotary Drilling (Coring)		(0.00	5.83	3	Jam	es Lawso	n	Adam	Cook	Fugro Geo	Services	Dril	er
Cable Percussion Standby (Fugro)			3.75).00	47.5			m Allardy uart Nye	ce	Ashley L	owthian	Fugro Geo Fugro Geo		Assistan Assistan	
Standby (Tide)			0.00	11.5		51	uart Nye				i ugio Geo	Joervices	Assistan	Dillei
Standby (weather)			6.50	37.7	_	Rich	ard Luke	er	Bart	Kot	Fugi	ro	Geotechnica	al Engineer
Single Shift Standby Other Operations		_	0.00	5.75		The	o Cleave	\$			Fugro Geo	Services	Project E	ngineer
Crew Change / TBT			1.50	9.50			io olouri	-			r ugro obo		110,000	nginooi
			0.00	0.00										
			0.00	0.00										
			0.00	0.00										
			0.00	0.00										
	Total		4.00	24.0		No. I	Personn	el	10	0	Total Man Hours		120	
Project Program / Progres	s	Pro	grammed	1		Today		А	ctual To Da	ate	Worked	% Program	Completed	
Activity	BoQ Item	m.	No.	Hours	m.	No.	Hours	m.	No.	Hours		,grull		
General Items, Provisional Services	A		1.0					0.0	4	0.00	0			100.0
Establish all plant, equipment, crew on site	A2		1.0			<u> </u>		0.0	1 0	0.00	0.0			100.0
Standing Time for plant, crew, etc - WEATHER	B11 C19			R/O			16.50	0.0	0	37.75	0.0			
Standing Time for plant, crew, etc - TIDE	B11 C19			R/O				0.0	0	11.50	0.0			
Percussion Boring	В							0.0	0	0.00	0.0			
Move boring plant to site of each exploratory hole	B1		8.00			1		0.0	4	0.00	0.0		50.0	
Extra over B1 for setting up on a gradient >20%	B2		R/O					0.0	0	0.00	0.0			
Break out surface obstructions where present	B3	00.00		R/O	0.00			0.0	0	0.00	0.0		46.8	
Advance BH between groundlevel and 10m depth As B4 but between 10m and 20m	B4 B5	80.00 36.50			8.00			37.4 16.4	0	0.00	-		40.0	
As B4 but between 20m and 30m	B6	R/O						0.0	0	0.00	0.0			
As B4 but between 30m and 40m	B7	R/O						0.0	0	0.00	0.0			
Advance BH through hard stratum or obstruction	B9			R/O				0.0	0	0.00	0.0 0.0			
Rotary Drilling	С							0.0	Ŭ	0.00	0.0			
Move rotary plant to site of each exploratory hole	C15 C41	R/0	6.00			1		0.0	2	0.00	0.0	33.3		
RC drilling between groundlevel and 10m depth As C41 but between 10m and 20m	C41	20.50						0.0	0	0.00	12.9			
As C41 but between 20m and 30m	C43	9.50						3.4	0	0.00		35.3		
Core box to be retained by client	C49		21.00					0.0	0	0.00	0.0 0.0			
Sampling, Monitoring during investigation	E							0.0	Ŭ	0.00	0.0			
Small Disturbed Sample Bulk Disturbed Sample	E1 E2		59.00 59.00					0.0	73	0.00		32.2		
Large Bulk disturbed sample	E3		R/0					0.0	19 0	0.00	0.0	52.2		
								0.0	0	0.00	0.0			
Insitu Testing	Н		10								0.0			
Standard Penetration Test in Borehole Standard Penetration Test in Rotary Drill Hole	H1 H2		40 R/O					0.0	0	0.00	0.0			
								0.0	0	0.00	0.0			
Geoenvironmental Laboratory Testing	L										0.0			
Marine Scotland Sample	L2		121					0.0	45 0	0.00	0.0	37.2		
Additional Items						<u> </u>		0.0	U	0.00	0.0			
								0.0	0	0.00	0.0			
	├ ──── │							0.0	0	0.00	0.0			
						-		0.0	0	0.00	0.0			
								0.0	0	0.00	0.0			
Health & Safety Summar	y line line line line line line line line		Today		Ac	tual To [Date				Lost & D	amaged		
Hoc Cards Safety Drills			1			10 4								
Tool Box Talks			1			8								
HSE Meetings Incidents/Near Miss			0			1								
Environmental			0			0								
Hours Worked Fugro GeoServices Representative Comments			120			720	ont Por-	ocontotiv	Comment	e				
	-													
FGSL Rep: Theo Cleave						Cli	ent Re	p:						
Signed:						Siz	gned:							
						0.6	,							

Arch for the second sec			F ug	RO			RE DAILY P			Daily Report No.
Job No			C1982		V	essel	Skate 3A		Date	Friday 08-Mar-19
mshuttleworti stuart.innes@ m.chappell@f n.armstrong@ g.crisp@fugro	fugro.com Øfugro.com 0.com	on.co.uk			Attn. Attn. Attn. Attn. Attn. Attn. Attn.	Stuart Inr Mathew C Nicholas	huttleworth		Redact Redact Redact Redact	
Observed Weath Time 00:00		W ed Knts	/ind Dir	s	Swell (Hs)		Sea State	Visibility		Weather Forecast
00:00		16	NW		N/A		smooth	good		
06:00		8 21	SW SSW		N/A N/A		smooth smooth	good		See Below
12:00		21 25	SSW		N/A N/A		smooth	good good		
00:00		20	SSW		N/A		smooth	good		
		Leg Pen	etration (m)						Operational Status	
BH no.		1	2	3		4				
BH07		3.2	4.4	4.4		3.4			lacked up on DUM	
BH03		2.3	0.8	1.9		2.7			Jacked up on BH07 CP underway at approx12	
						of Operation	ons / Borehole Drilling	g - last 24hrs:		
From	To		Hrs (No.)	Code		Continue CD	deillie e fee ee 0.00ee te 4	0.45 DMI	Description	
00:00 07:15	07:15 08:00		7.25 0.75	Cable Percu Crew Change			drilling from 8.00m to 1 sfer to shore / Handoy		Dayshift transfer to JUB / TB	on Working at Height
08:00	09:30		1.50	Cable Percu						51mCD / SPT tested to -23.62mCD
09:30	10:10		0.67	Other Opera	ations P	ull all casing	/ Wash down and clea	ar deck / Prepare	JUB for move	
10:10	12:45		2.58	Moving & Ja					Preload and jack up to safe wo	
12:45	19:00		6.25	Cable Percu Other Opera			to mudline / Commend to clear deck for E.O.S		0.00m to 8.00m BML / Seal	bed = -0.75mCD
19:00 19:30	19:30 20:00		0.50	Crew Change					Nightshift transfer to JUB / TB	T on Working at Height
20:00	00:00		4.00	Cable Percu			drilling from 8.00m to 1			
				-						
				•						
							leather forecast			
			Local tin Wind dir						99 16:00 17:00 18:00 19:00 20:00 21:00 22 W Still Sill Sill Wisk work work work w	
			Wind sp						47 18 17 17 28 16 1	
									12 26 34 12 11 27 3	
			Cloud or		2.2.	7 10 11		0000		
				ation type ation (mm / h)			0	0 0 0 0		
				erature (*C)	1 8		2 (2) (3) (4) (2) (3)			
			Relative	humidity (%) 78	77 76	15 18 78	80 81 80 77 76 8	3 90 84 87 85	5 85 88 90 85 83 82 1	9 76
			Air press Tide typ			HOD 1000 1000 1		7 7 2 3		1 21
			Time Tide hei		1:05		#32	12:10	19/21 19/21 15 14 08 09 15 2	4 31
alth Safety & the	Environment									
<u></u>	<u>.</u>									
SL Rep: Theo	Cleave						Client Re	ep:		

Henderson Activity Time Summ Mobilisation Moving & Jacking Mobilisation Moving & Jacking Rotary Drilling (Coring) Cable Percussion Standby (Fugro) Standby (Fugro) Standby (Tide) Standby (Meather) Single Shift Standby Other Operations Crew Change / TBT Enderson	n x		Today 0.00	To Da	ite		larine	Grou	nd Inve	-			07	
Mobilisation Moving & Jacking Rotary Drilling (Coring) Cable Percussion Standby (Fugro) Standby (Fugro) Standby (Tide) Standby (Weather) Single Shift Standby Other Operations	nary		0.00			D	av Shift							
Moving & Jacking Rotary Drilling (Coring) Cable Percussion Standby (Fugro) Standby (Tide) Standby (Weather) Single Shift Standby Other Operations				3 50			ay Shint		Night		Comp	bany	Posi	tion
Rotary Drilling (Coring) Cable Percussion Standby (Fugro) Standby (Tide) Standby (weather) Single Shift Standby Other Operations						line		-	Onboard J		-	Continue	Deeree	
Cable Percussion Standby (Fugro) Standby (Tide) Standby (Weather) Standby (Weather) Other Operations			2.58	20.0			imy Wilso nes Lawso		Joshua Adam		Fugro Geo Fugro Geo		Bargen Dril	
Standby (Tide) Standby (weather) Single Shift Standby Other Operations			19.00	66.5			im Allardy		Ashley Lo		Fugro Geo		Assistan	
Standby (weather) Single Shift Standby Other Operations			0.00	0.00			tuart Nye		,		Fugro Geo		Assistan	
Single Shift Standby Other Operations			0.00	11.5										
Other Operations			0.00	37.7		Ric	hard Luke	r	Bart	Kot	Fugr	°0	Geotechnica	al Engineer
			0.00	5.75		Th	eo Cleave				Fugro Geo	Services	Project E	ngineer
			1.17	10.7			eo cleave				i ugio Geo	ISEI VICES	FIDJECT	Ingineer
			0.00	0.00										
			0.00	0.00										
			0.00	0.00										
			0.00	0.00										
			0.00	0.00										
	Tot	al	24.00	24.0	0	No.	Personn	əl	10)	Total Man Hours Worked		120	
Project Program / Prog			ogramme			Today	/ Hours		ctual To Da	ite Hours		% Program	Completed	
Activity General Items, Provisional Services	BoQ Item	m.	No.	Hours	m.	No.	nours	m.	No.	nours	0			
Establish all plant, equipment, crew on site	A A2	1	1.0					0.0	1	0.00				100.
, , , , , , , , , , , , , , , , , , , ,						L		0.0	0	0.00	0.0			
Standing Time for plant, crew, etc - WEATHER	B11 C19			R/O				0.0	0	37.75	0.0			
Standing Time for plant, crew, etc - TIDE	B11 C19	L		R/O		<u> </u>		0.0	0	11.50	0.0			
		l				<u> </u>		0.0	0	0.00	0.0			
Percussion Boring	B1		8.00			1		0.0		0.00	0.0		62.5	
Move boring plant to site of each exploratory hole Extra over B1 for setting up on a gradient >20%	B1 B2	ł	8.00 R/O					0.0	5 0	0.00	0.0		02.5	
Break out surface obstructions where present	B3		1.00	R/O				0.0	0	0.00	0.0			
Advance BH between groundlevel and 10m depth	B4	80.00			12.00			49.4	0	0.00			61.8	
As B4 but between 10m and 20m	B5	36.50			12.50			28.9	0	0.00				79.0
As B4 but between 20m and 30m	B6	R/O						0.0	0	0.00	0.0			
As B4 but between 30m and 40m	B7	R/O						0.0	0	0.00	0.0			
Advance BH through hard stratum or obstruction	B9			R/O			3.00	0.0	0	3.00	0.0 0.0			
Rotary Drilling	с							0.0	0	0.00	0.0			
Move rotary plant to site of each exploratory hole	C15		6.00			1		0.0	3	0.00	0.0		50.0	
RC drilling between groundlevel and 10m depth	C41	R/O						0.0	0	0.00	0.0			
As C41 but between 10m and 20m	C42	20.50						2.7	0	0.00	12.9			
As C41 but between 20m and 30m	C43	9.50						3.4	0	0.00		35.3		
Core box to be retained by client	C49		21.00				_	0.0	0	0.00	0.0			
Sampling, Monitoring during investigation	E							0.0	0	0.00	0.0 0.0			
Small Disturbed Sample	E1		59.00			21		0.0	94	0.00	0.0			
Bulk Disturbed Sample	E2	1	59.00		1	19		0.0	38	0.00			64.4	
Large Bulk disturbed sample	E3		R/O					0.0	0	0.00	0.0			
						<u> </u>		0.0	0	0.00	0.0			
Insitu Testing Standard Reportation Test in Recebule	H		40			44		0.0	-	0.00	0.0	27.5		
Standard Penetration Test in Borehole Standard Penetration Test in Rotary Drill Hole	H1 H2	1	40 R/O			11		0.0	11 0	0.00	0.0	21.0		
		1						0.0	0	0.00	0.0			
Geoenvironmental Laboratory Testing	L			1		<u> </u>		0.0		0.00	0.0			
Marine Scotland Sample	L2		121			16		0.0	61	0.00			50.4	
								0.0	0	0.00	0.0			
Additional Items											0.0			
							+	0.0	0	0.00	0.0 0.0			
		1	-				+	0.0	0	0.00	0.0			
	1	1	1					0.0	0	0.00	0.0			
						L		0.0	0	0.00	0.0			
Health & Safety Sumn	nary		Today		Act	tual To	Date				Lost & Da	amaged		
Hoc Cards Safety Drills			1			11 4								
Tool Box Talks			1			9								
HSE Meetings		0			1									
Incidents/Near Miss	I	0			0									
Environmental			0			0 840								
Hours Worked	ents		.20				ient Repr	esentative	Comment	s				
Hours Worked Fugro GeoServices Representative Comme		ah winds a	nd current	t stage o			"As per c	ur discus					D. This should	allow you to
				fore con	ditions					complete	and move befo	ore 10AM."		
Fugro GeoServices Representative Comme Client rep contacted at shift change to	CD and then pull casing			fore con	ditions	CI	ient Rej) :		complete	and move before	ore 10AM."		

	ch 201 endersor		Ģ	fug	RO			DRE DAILY P			Daily Report No.
	Job No			C1982		Ve	essel	Skate 3A		Date	Saturday 09-Mar-19
To cc cc cc cc cc cc	ANeillings@ard mshuttleworth stuart.innes@g m.chappell@fu n.armstrong@ g.crisp@fugro.	i@arch-hende gegroup.com ugro.com fugro.com com	erson.co.uk	Vind		Attn. Attn. Attn. Attn. Attn. Attn. Attn.	Stuart Ir Mathew Nicholas	Shuttleworth		Redact Redact	
0	bserved Weath Time 00:00		veed Knts	Vind Dir	s	well (Hs)		Sea State	Visibility	,	Neather Forecast
-	00:00	50	20	SSW	-	N/A	_	smooth/slight	good		
	06:00		31	SSW		N/A		slight	good		See Below
	12:00		28	WSW		N/A		slight	good		
	18:00		26	W		N/A		slight	good		
	00:00		19	WSW		N/A		smooth/slight	good		
				netration (m)	-	_				Operational Status	
	BH no.		1	2	3		4				
	BH03		2.3	0.8	1.9		2.7				
									С	P drilling operations underwa	y on BH03
						Summary	of Operat	ions / Borehole Drilling	- last 24hrs:		
	From	То		Hrs (No.)	Code			• • • • • •		Description	
	00:00	06:30		6.50	Cable Percu	ssion C	ontinue CP	o drilling from 13.00m to	17.00 BML / Ur	able to advance casing further	
	06:30	07:00		0.50	Rotary Drilling					Run in Geobor S and continue	BH from 17.00m
	07:00	08:00		1.00	Crew Change					/ Dayshift transfer to JUB / TBT	
	08:00 09:00	09:00		1.00	Rotary Drilling Standby (we					-23.25mCD / begin to pull case	sing to deck w onboard monitoring conditions
	19:00	20:00		1.00	Crew Change					Nightshift transfer to JUB / TB	
	20:00	00:00		4.00	Standby (wea		,		,	0	for suitable weather window to move
								-			
						-					
						-					
							1	Weather forecast			
					Local time	0.96 1	0 2.60 3.00	400 5.00 8.00 7.00 8.00 9.00	10.00 11.00 12.00 13.0	1 34.00 19.00 19.00 17.96 18.00 19.00 20.96 2	90 32.00 23.00
					Wind direction Wind speed (kts)					W W W W WSW SH SH A	Star W YUSHN
						12 1	14 15.	st 72 22 23 23 28	26 21 21 29	28 25 23 16 14 13 12	2 0 2
					Wind gusts (max kts)	24	F 31	-		H 11 H 24 14 19 19	100
					Cloud cover Precipitation type	1		*****			0 - 0
					Precipitation (mm / h)	4.2	-			and the second second	0.5
					Air temperature ("C) Feets like ("C)	-4 -3	4 4	4 4 4 4 4	4 4 4 4	4 4 4 4 4 4 4	2 -2 -2
					Relative humidity (%) Air pressure (hPa)			77 75 75 74 73 68 881 891 891 991 892 893		58 65 01 65 78 80 62 -	
					Tide type			54 54 74 54 54 54 54 54 721			
					Time Tide height (m)	37 -	41 24		25 35 30 42	43 38 20 10 13 1 00 1	2 18 28
Healt	h Safety & the E	Environment									
	steep seabed gra				material.						
	s require more ti additional time ar				el need to be con	sidered wh	en judging	weather windows.			
	L Rep: Theo		-					Client Re			
, 33	- Kep. Theo	SIGUYE						Chefit Re	·P·		
Sign	ed:							Signed:			

Arch Henderson Celebrating 100 Years									ESS F				Daily Report No.	
Activity Time Su	mmary	 1	oday	To Da	ate	D	ay Shift		Night	Shift	Com	bany	Positi	on
Mobilisation			0.00	3.50		line		-		IUB (mobil		Cariana	Darrage	
Moving & Jacking Rotary Drilling (Coring)			0.00	20.0 7.33			my Wilso es Lawso		Joshua Adam		Fugro Geo Fugro Geo		Bargema	
Cable Percussion			6.50	73.0			m Allardy		Ashley L		Fugro Geo		Assistant	Driller
Standby (Fugro)			0.00	0.00		St	uart Nye				Fugro Geo	Services	Assistant	Driller
Standby (Tide) Standby (weather)			0.00	11.5 51.7		Piel	nard Luke	or.	Bart	Kot	Fug	0	Geotechnical	Engineer
Single Shift Standby			0.00	51.7		Rici		31	Dan	KUL	Fug	0	Geolechnical	Eligineei
Other Operations			0.00	6.25	5	The	eo Cleave	э			Fugro Geo	Services	Project En	gineer
Crew Change / TBT			2.00	12.7										
			0.00	0.00										
			0.00	0.00										
			0.00	0.00										
			0.00	0.00										
	To		24.00	24.0		No.	Personn	el	1)	Total Man Hours Worked		120	
Project Program / Pr	ogress	Pr	ogrammed	1		Today		Δ	ctual To D	ate		% Program	n Completed	
Activity	BoQ Item	m.	No.	Hours	m.	No.	Hours	m.	No.	Hours				
General Items, Provisional Services	A		4.0								0			400.0
Establish all plant, equipment, crew on site	A2		1.0					0.0	1	0.00	0.0			100.0
Standing Time for plant, crew, etc - WEATHER	B11 C19	1		R/O			14.00	0.0	0	0.00	0.0			
Standing Time for plant, crew, etc - TIDE	B11 C19	1		R/O				0.0	0	11.50	0.0			
								0.0	0	0.00	0.0			
Percussion Boring	В										0.0			
Move boring plant to site of each exploratory hol	B1 B2	-	8.00 R/O					0.0	5	0.00	0.0		62.5	
Extra over B1 for setting up on a gradient >20% Break out surface obstructions where present	B2 B3		R/U	R/O				0.0	0	0.00	0.0			
Advance BH between groundlevel and 10m dep		80.00						49.4	0	0.00			61.8	
As B4 but between 10m and 20m	B5	36.50			4.00			32.9	0	0.00				90.0
As B4 but between 20m and 30m	B6	R/O						0.0	0	0.00	0.0			
As B4 but between 30m and 40m	B7	R/O		D/O				0.0	0	0.00	0.0			
Advance BH through hard stratum or obstruction	B9			R/O				0.0	0	3.00	0.0 0.0			
Rotary Drilling	С							0.0	0	0.00	0.0			
Move rotary plant to site of each exploratory hole			6.00					0.0	3	0.00			50.0	
RC drilling between groundlevel and 10m depth	C41	R/O						0.0	0	0.00	0.0			
As C41 but between 10m and 20m	C42	20.50			3.00			5.7	0	0.00		27.6		
As C41 but between 20m and 30m Core box to be retained by client	C43 C49	9.50	21.00		2.50			5.9	0	0.00	0.0		61.6	
Core box to be retained by circlic	043		21.00					0.0	0	0.00	0.0			
Sampling, Monitoring during investigation	E										0.0			
Small Disturbed Sample	E1		59.00			22		0.0	116	0.00				
Bulk Disturbed Sample	E2	 	59.00			16		0.0	54	0.00	0.0			91.5
Large Bulk disturbed sample	E3		R/O	-		-		0.0	0	0.00	0.0 0.0			
Insitu Testing	н			<u> </u>				0.0	U	0.00	0.0			
Standard Penetration Test in Borehole	H1		40			10		0.0	21	0.00			52.5	
Standard Penetration Test in Rotary Drill Hole	H2		R/O					0.0	0	0.00	0.0			
Geographiconmontal Laboratory Testing				<u> </u>				0.0	0	0.00	0.0 0.0			
Geoenvironmental Laboratory Testing Marine Scotland Sample	L2		121			22		0.0	83	0.00	0.0		68.6	5
,		1						0.0	0	0.00	0.0			
Additional Items											0.0			
				<u> </u>				0.0	0	0.00	0.0			
		1						0.0	0	0.00	0.0 0.0			
	1	1				1		0.0	0	0.00	0.0			
								0.0	0	0.00	0.0			
Health & Safety Su	nmary		Today		Ac	tual To I	Date				Lost & D	amaged		
Hoc Cards	1	1			12 4									
Safety Drills		-	1			10								
Tool Box Talk						1								
Tool Box Talk HSE Meetings			0			0								
Tool Box Talk HSE Meetings Incidents/Near M	iss		0 0 0 0			0								
Tool Box Talk HSE Meeting Incidents/Near M Environmenta Hours Worked	iss		0											
Tool Box Talk HSE Meetings Incidents/Near M Environmenta	iss		0			0 960	ent Repr	esentative	e Commen	s				
Tool Box Talk HSE Meeting Incidents/Near M Environmenta Hours Worked Fugro GeoServices Representative Com Wind speed recorded and monitore	nents		0 0 120	-inder e	tc.) and	0 960 Cli	ent Repr	esentative	e Commen	S				
Tool Box Talk HSE Meeting Incidents/Near M Environmenta Hours Worked Fugro GeoServices Representative Com Wind speed recorded and monitore anonome	iss nents d using forecasting system		0 0 120	Finder e	tc.) and	0 960 Cli			e Commen	S				
Tool Box Talk HSE Meeting Incidents/Near M Environmenta Hours Worked Fugro GeoServices Representative Com Wind speed recorded and monitore	iss nents d using forecasting system		0 0 120	Finder e	tc.) and	0 960 Cli	ent Repr ient Rej gned:		e Commen	S				

Arch 2015 Henderson			RD		SHORE DAILY F			Daily Report No.
Job No		C1982		Ves	sel Skate 3A		Date	Sunday 10-Mar-19
	gro.com ugro.com	-		Attn. Attn. Attn. Attn. Attn. Attn. Attn.	Andy Neillings Michael Shuttleworth Stuart Innes Mathew Chappell - Nearshore Ma Nicholas Armstrong - Reportin Glen Crisp - Project Manager		Redact Redact Redact Redact	
Observed Weathe Time 00:00	er Speed	Wind Knts Dir	S	well (Hs)	Sea State	Visibility		Weather Forecast
00:00	19		-	N/A	smooth	good		
06:00	20			N/A	smooth/slight	good		See Below
12:00 18:00	25			N/A N/A	slight slight	poor poor		
00:00	28	W		N/A	smooth/slight	poor		
		Leg Penetration (m)					Operational Status	
BH no. BH03		1 2	3	2	,			
BH03 BH04		2.3 0.8 2.4 0.7	1.9 1.6	2			BH03 completed.	
DHU4		<u></u>	1.0	2	, 	Awaiting	suitable weather window f	or move to BH04.
		<u>_</u>	L	Summary	f Operations / Borehole Drillin	ng - last 24hrs:		
From	То	Hrs (No.)	Code	,	,	J	Description	
00:00	03:00	3.00	Standby (wea					for suitable weather window to move
03:00	03:30	0.50	Standby (wea		t for suitable weather window to			
03:30 06:00	06:00 07:30	2.50	Moving & Jac Cable Percus		in casing to depth / Commenc			nd jack to sage working height
07:30	08:00	0.50	Crew Change		shift transfer to JUB / Handove			rew - Crew Transfers
08:00	11:00	3.00	Cable Percus		tinue CP drilling from 1.00m to		3	
11:00	11:45	0.75	Other Operat	tions Pre	oare deck for forecast storm / ja	ack up beyond fore	cast Hmax and secure all dec	k items
11:45	12:00	0.25	Crew Change		sfer Dayshift to shore as a pre			ns and evacuation limits.
12:00 19:00	19:00 19:45	7.00	Standby (wea Crew Change		tinue to monitor storm from sho dover with nightshift at accome			
19:45	00:00	4.25	Standby (wea		tinue to monitor storm from sho			
					Weather forecast			
		Local time			5.00 6.00 7.00 8.00 9.00 10.00 11.00			
		Wind direction Wind speed (kts)	VISW WSW	WOW SOW SV	55W 55W 5W 5SE 5SE ESE			al statute
		Wind speed (kts)				22 27 32 30	34 37 26 35 28 21 23	22
		Wind gusts (max)	(1) (1)	6 R 7	0 6 5 5 9 10 10			
		Cloud cover	12.00	0 1 0	00000000	0.00	47 31 49 49 49 C	0
		Precipitation type Precipitation (mm	/h) 0.2		0 1	10 G D2	0 4 4 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	
		Air temperature (*			2222448	A 1 A 1 A 1 A		
		Feels like (*C) Relative humidity		1	12 10 10 0 0 11 3 10 79 10 79 79 19 90 91	70 76 75 80	A A A A A A A A A A A A A A A A A A A	ir.
		Air pressure (hPa Tide type	880 890 L	107 007 000 7 4 4	105 005 094 004 003 002 001 카, 카, 카, 10 10 12 12 12 12	100 008 008 087	1987 588 588 1992 933 995 988 1997 199 199 199 199 199	20
		Time Tide height (m)		206	101	14 10	2018	23
alth Safety & the E	nvironment	i nue mengeni (III)						
					n Monday for details due to con	nplexity in moveme	ent and development of the sv	noptic pattern."
et Office - "High for						<i>p</i>		
et Office - "High for ontinue to monitor	multiple complex	ns for much of the period lows over the next few			xceeding 50kts.			
et Office - "High for	multiple complex							

Arch	-Fugeo		NEAF	RSHC	ORE	DAIL	Y PF	ROGR	ESS F	REPOR	RT		Daily Report N	0.
		I	Nigg E	Energ	y Pai	rk - M	larine	Grou	nd Inve	stigati	on		09	
Activity Time Summa	ary		oday	To Da	ite	D	ay Shift		Night	Shift	Com	bany	Pos	ition
Mobilisation Moving & Jacking			0.00 2.50	3.50 22.58		Jim	my Wilso	n	Onboard Joshua	JUB (mobil Sandy	isation) Fugro Geo	Services	Barge	master
Rotary Drilling (Coring)			0.00	7.33			es Lawso		Adam		Fugro Geo		Dri	
Cable Percussion			4.50	77.5			m Allardy	/ce	Ashley L	owthian	Fugro Geo		Assistar Assistar	
Standby (Fugro) Standby (Tide)			0.00	0.00		51	uart Nye				Fugro Geo	Services	Assistar	11 Driller
Standby (weather)		1	4.75	66.5	0	Rich	hard Luke	er	Bart	Kot	Fug	0	Geotechnic	al Engineer
Single Shift Standby Other Operations).00).75	5.75		The	eo Cleave				Fugro Geo	Services	Project E	ngineer
Crew Change / TBT			1.50	14.2		THE	eo cleave	5			i ugio dec	idel vices	Project	Ingineer
			0.00	0.00										
			0.00	0.00										
			0.00	0.00)									
			0.00	0.00										
	Total		4.00	24.0		No.	Personn	el	10	0	Total Man Hours Worked		120	
Project Program / Progre	255	Pro	ogrammed	1		Today		А	ctual To Da	ate	Worked	% Program	n Completed	
Activity	BoQ Item	m.	No.	Hours	m.	No.	Hours	m.	No.	Hours				
General Items, Provisional Services	A		1.0					0.0		0.00	0			100.0
Establish all plant, equipment, crew on site	A2		1.0			-		0.0	1 0	0.00	0.0			100.0
Standing Time for plant, crew, etc - WEATHER	B11 C19			R/O			14.75	0.0	0	66.50	0.0			
Standing Time for plant, crew, etc - TIDE	B11 C19			R/O				0.0	0	11.50	0.0			
Percussion Boring	В							0.0	0	0.00	0.0 0.0			
Move boring plant to site of each exploratory hole	B1		8.00			1		0.0	6	0.00				75.0
Extra over B1 for setting up on a gradient >20%	B2		R/0					0.0	0	0.00	0.0			
Break out surface obstructions where present Advance BH between groundlevel and 10m depth	B3 B4	80.00		R/O	4.00			0.0	0	0.00	0.0		66.	8
As B4 but between 10m and 20m	B5	36.50			4.00			53.4 32.9	0	0.00				90.0
As B4 but between 20m and 30m	B6	R/O						0.0	0	0.00	0.0			
As B4 but between 30m and 40m	B7	R/O		D/O				0.0	0	0.00	0.0			
Advance BH through hard stratum or obstruction	B9			R/O				0.0	0	3.00 0.00	0.0 0.0			
Rotary Drilling	С							0.0	U	0.00	0.0			
Move rotary plant to site of each exploratory hole	C15		6.00			1		0.0	4	0.00			66.	7
RC drilling between groundlevel and 10m depth	C41 C42	R/O 20.50						0.0	0	0.00	0.0	27.6		
As C41 but between 10m and 20m As C41 but between 20m and 30m	C42 C43	9.50						5.7 5.9	0	0.00		27.0	61.6	
Core box to be retained by client	C49		21.00					0.0	0	0.00	0.0			
								0.0	0	0.00	0.0			
Sampling, Monitoring during investigation Small Disturbed Sample	E E1		59.00					0.0	116	0.00	0.0			
Bulk Disturbed Sample	E2		59.00					0.0	54	0.00				91.5
Large Bulk disturbed sample	E3		R/O					0.0	0	0.00	0.0			
Insitu Testing	н							0.0	0	0.00	0.0 0.0			
Standard Penetration Test in Borehole	H1		40					0.0	21	0.00			52.5	
Standard Penetration Test in Rotary Drill Hole	H2		R/O					0.0	0	0.00	0.0			
Geoenvironmental Laboratory Testing	L							0.0	0	0.00	0.0 0.0			
Marine Scotland Sample	L2		121					0.0	83	0.00			68	3.6
								0.0	0	0.00	0.0			
Additional Items								0.0	0	0.00	0.0 0.0			
	+							0.0	0	0.00	0.0			
								0.0	0	0.00	0.0			
	╡───┤							0.0	0	0.00	0.0			
Health & Safety Summa	iry		Today	L	Ac	tual To I	Date	0.0	U	0.00	0.0 Lost & D	amaged		
Hoc Cards		1			13									
Safety Drills Tool Box Talks			0			4								
HSE Meetings			0			1								
Incidents/Near Miss Environmental			0			0								
Hours Worked			120			1080								
	ts					Cli	ent Repr	esentative	e Comment	is				
Fugro GeoServices Representative Comment		r neriod												
	low passes over this 24h towards North Sea, forec		rive on sit	e in 48h	Irs.									
First complex I Second low currently tracking East			rive on sit	e in 48h	irs.	Cli	ient Rei	D :						
First complex I			rive on sit	e in 48h	irs.		ient Rej gned:	p:						

Are He	ndersor			Fug	RO		g Ene	rgy Park -	Marine C		SS REPOR		Daily Report No.
То	Job No ANeillings@ar	ch handarson	oo uk	C1982		Attn	Vessel	Neillings	ate 3A	No./emai	Date 0141 227 30	60	Monday 11-Mar-19
CC CC CC CC CC CC	mshuttleworth stuart.innes@p m.chappell@finn.armstrong@ g.crisp@fugro.	n@arch-hende gegroup.com ugro.com fugro.com com	rson.co.uk			Attn Attn Attn Attn Attn Attn	Mich Stua Math	ael Shuttleworth Int Innes new Chappell - Ne olas Armstrong - I Crisp - Project I	Reporting Mar	No./emai No./emai No./emai No./emai	Redac Redac	t t	
0	bserved Weath Time 00:00		eed Knts	Vind Dir		Swell (H	s)	Sea St	ate	Visibility		We	eather Forecast
	00:00	00	28	W		N/A		smooth/s	light	good			
	06:00		19 20	SW WSW		N/A N/A		smoo		good good			See Below
	18:00		8	SW		N/A		smoo		good			
	00:00		29	SSW		N/A		sligh	t I	good			
	BH no.		Leg Pe	netration (m) 2	3		4				Operati	onal Status	
	BH04		2.4	0.7	1.6		2.9						
											CP drilling un Rockhead expecte	nderway on BH ed at approx	
							ary of Ope	erations / Boreh	ole Drilling - la	ast 24hrs:			
	From 00:00	то 02:15		Hrs (No.) 2.25	Co		Windo m	orginal with quat	a in avagana of	limite / Sur	Descriptio		r suitable weather window to move
	00:00	02:15		0.50	Standby (Crew Cha			t transfer to JUB			all ~ I'm on sheiving i	beach / wait to	or suitable weather window to move
	02:45	07:00		4.25	Cable Pe						ra scraps etc. / Cont	tinue CP from 4	4.00m to 7.50m BML
	07:00	07:15		0.25	Other Op			olant / Wash dow					
	07:15 08:00	08:00 15:40		0.75	Crew Cha Cable Pe						/ / Dayshift transfer Chiselling through ve		
	15:40	19:20		3.67	Cable Pe						0m to 18m BML	ery course grav	615
	19:20	20:00		0.67	Crew Cha	0	,			,	/ Nightshift transfer		
	20:00	22:35		2.58	Cable Pe								elow Chart Datum = 2.00m
	22:35	00:00		1.42	Other Op	erations	Pull all ca	asing to deck / V	ash down and	clear deck	for E.O.H / Fuel all	plant / General	R&M
							t						
<u> </u>					┣────								
							<u> </u>						
			1					Weather fore	cast				
				Local time Wind direct	ion .						00 14:00 15:00 16:00 17:0		
				Wind speed							w sw ssw ssw s		
						20 1	u 18 18	37 10 15.	74 35 15	16 18 19	14 tế tế 12	12 17 16	17 14
				Wind gusts				25 21 24			C 10/2 C m 1 m 1 m	20 11	04 29 30
				Cloud cove Precipitatio		3 0 1	001	8 8			0.000		
				Precipitatio Air tempera	n (mm / h)	-		01 01				01 02	04 08 18
				Feels like (°C)								
				Relative hu Air pressure							3 67 66 75 80 12 1010 1010 1009 100		
				Tide type				N N N N		7 1 2			20.38
				Tide height	(m)	31 36 3				24 32 3	1441	2 14 12	
Healt	h Safety & the I	Environment											
									nt ridge builds	over UK an	d drifts into the cent	tral and southe	rn North Sea."
			plex lows o	ver the next few	days, foreca	asts up to a	and excee	ding 40kts.					
FGS	L Rep: Theo	Cleave							Client Rep:				
Sign	ed:								Signed:				
_													

Arch	-fugro		NEAF	RSHC	ORE	DAIL	Y PF	ROGR	ESS F	REPOF	RT		Daily Report N	lo.
Arch Henderson Celebrating 100 Years		I	Nigg E	Inerg	y Par	'k - M	larine	Grou	nd Inve	stigati	on		10	
Activity Time Summa	Ŋ		oday	To Da		D	ay Shift		Night		Com	oany	Pos	sition
Mobilisation Moving & Jacking			0.00	3.50 22.5	_	Jim	my Wilso		Onboard J Joshua		isation) Fugro Geo	Services	Barge	master
Rotary Drilling (Coring)		(0.00	7.33	3	Jam	ies Lawso	on	Adam	Cook	Fugro Geo	Services	Dr	iller
Cable Percussion Standby (Fugro)			8.17	95.7			m Allardy tuart Nye	ce	Ashley L	owthian	Fugro Geo Fugro Geo			nt Driller nt Driller
Standby (Tide)		(00.00	11.5	0		-							
Standby (weather) Single Shift Standby			2.25	68.7 5.75		Ric	hard Luke	er	Bart	Kot	Fug	го	Geotechni	cal Engineer
Other Operations			1.67	8.67		The	eo Cleave	•			Fugro Geo	Services	Project	Engineer
Crew Change / TBT			1.92).00	16.1 0.00										
			0.00	0.00										
			0.00	0.00										
).00	0.00										
		(0.00	0.00)						Total Man			
	Total	2	4.00	24.0	0	No.	Personn	el	10)	Hours Worked		120	
Project Program / Progres Activity	ss BoQ Item	Pro m.	ogrammed No.	i Hours	m.	Today No.	Hours	A m.	ctual To Da No.	te Hours		% Program	n Completed	
General Items, Provisional Services	A		NO.	nours		140.	Tioura		140.	Hours	0			
Establish all plant, equipment, crew on site	A2		1.0					0.0	1	0.00	0.0			100.0
Standing Time for plant, crew, etc - WEATHER	B11 C19			R/O				0.0	0	0.00	0.0 0.0			
Standing Time for plant, crew, etc - WEATHER Standing Time for plant, crew, etc - TIDE	B11 C19 B11 C19			R/O				0.0	0	11.50	0.0			
								0.0	0	0.00	0.0			
Percussion Boring Move boring plant to site of each exploratory hole	B B1		8.00					0.0	6	0.00	0.0			75.0
Extra over B1 for setting up on a gradient >20%	B2		R/O					0.0	0	0.00	0.0			
Break out surface obstructions where present Advance BH between groundlevel and 10m depth	B3 B4	80.00		R/O	6.00			0.0	0	0.00	0.0			74.3
As B4 but between 10m and 20m	B4 B5	36.50			10.00			59.4 42.9	0	0.00				14.0
As B4 but between 20m and 30m	B6	R/0			2.10			2.1	0	0.00	0.0			
As B4 but between 30m and 40m Advance BH through hard stratum or obstruction	B7 B9	R/O		R/O			6.08	0.0	0	0.00	0.0 0.0			
				100			0.00	0.0	0	0.00	0.0			
Rotary Drilling	С		0.00								0.0			-
Move rotary plant to site of each exploratory hole RC drilling between groundlevel and 10m depth	C15 C41	R/O	6.00					0.0	4	0.00	0.0		66	
As C41 but between 10m and 20m	C42	20.50						5.7	0	0.00		27.6		
As C41 but between 20m and 30m Core box to be retained by client	C43 C49	9.50	21.00					5.9	0	0.00	0.0		61.6	
	043		21.00					0.0	0	0.00	0.0			
Sampling, Monitoring during investigation	E										0.0			
Small Disturbed Sample Bulk Disturbed Sample	E1 E2		59.00 59.00			25 21		0.0	141 75	0.00			- 1	
Large Bulk disturbed sample	E3		R/O					0.0	0	0.00	0.0			
Insitu Testing	Н							0.0	0	0.00	0.0 0.0			
Standard Penetration Test in Borehole	H1		40			12		0.0	33	0.00	0.0			82.5
Standard Penetration Test in Rotary Drill Hole	H2		R/O					0.0	0	0.00	0.0			
Geoenvironmental Laboratory Testing	L							0.0	0	0.00	0.0 0.0			
Marine Scotland Sample	L2		121			21		0.0	104	0.00				86.0
Additional Items							-	0.0	0	0.00	0.0 0.0			
					L			0.0	0	0.00	0.0			
								0.0	0	0.00	0.0			
	├							0.0	0	0.00	0.0 0.0			
			Today					0.0	0	0.00	0.0			
Health & Safety Summar Hoc Cards	Hoc Cards						Date				Lost & D	amaged		
Safety Drills			1			14 5								
Tool Box Talks HSE Meetings			1			12 1								
Incidents/Near Miss			0			0								
Environmental Hours Worked	Hours Worked													
Fugro GeoServices Representative Comments	ro GeoServices Representative Comments							esentative	e Comment	S				
FGSL Rep: Theo Cleave						CI	ient Re	p:						
Signadi							anod							
Signed:						51	gned:							

Are He	ch 2019 enderson		C	P A R	fug	20		_	-		-	_	SS REPOR		Daily Report No.
	Job No				C1982			Vessel		Skate 3A			Date		Tuesday 12-Mar-19
To cc cc cc cc cc cc	ANeillings@an mshuttleworth stuart.innes@p m.chappell@fu n.armstrong@ g.crisp@fugro.	n@arch-h gegroup.n ugro.com fugro.cor	<u>nenderson.a</u> <u>com</u> 1				At At At At At	tn. Mic tn. Stu tn. Mat tn. Mat	holas Armstr	rorth I - Nearshore Mana rong - Reporting M oject Manager	ger Nana	No./email No./email No./email No./email No./email No./email No./email	Redac Redac	t t	
0	bserved Weath				/ind		Swell			ea State	v	isibility			eather Forecast
_	Time 00:00 00:00		Speed M 28	Knts	Dir W	-	N/A			slight		good			
	06:00		20		SW		N/A			ooth/slight		good			See Below
	12:00 18:00		31 36		SW SSW		N/A			slight slight		good good			
	00:00		23		W		N/A			slight	-	good			
			-		etration (m)	-			_				Operati	onal Status	
_	BH no. BH04			1 2.4	2 0.7	3 1.6		4							
	D1104			2.4	0.7	1.0		2.9						sing on BH04 to -24.10mCD	
												Мог	nitor weather for s		
							Sum	mary of Op	erations / E	orehole Drilling	- las	t 24hrs:			
	From		То		Hrs (No.)	Co							Descriptio		
	00:00 00:45		0:45 7:00		0.75 6.25	Other Op Standby (ck / Wash down a m moving over sit			or E.O.H / Fuel all	plant / General	R&M
	07:00		8:00		1.00	Crew Cha							transfer to quaysid	e to monitor we	eather
	08:00		9:00		11.00	Standby (~30kts, gusts >50	kts / Crew not	onboard through v.high winds
	19:00 20:00		0:00		1.00 4.00	Crew Char Standby (/ Handover with r m moving over sit			~22kts, gusts >30	kts /	
	20.00		0.00		4.00	otanaby	iroaanor)	Laigo ii	outrior offoto	in morning or on on		rindo arg.	E ELILO, GUOLO - OO		
								_							
								_							
								_							
						-		-							
				+											
<u> </u>				+											
									Weathe	r forecast					
						cal time	0.00	1.00 2.00 3	00 4.00 5.00	6.00 7.00 8.00 9.00	10.00	11.00 12.00	13.00 14.00 15.00 16.00 1	7.00 18:00 19:00 20.0	0 21:00 22:00 23:00
						nd direction nd speed (kts)		SW /WSW 3					SW SW SSW SSW S		
							23	25 20	6 16 15	16 17 20 17	29	26 .28	22 34 34 35	21 21 23 23	3 20 20 18
					W	nd gusts (max kts)	42	100	26 26		14		45 48 54 57	0 3 0 0	TL 05 TE
						ud cover	63		8 6 8		٠				
						cipitation (mm / h) temperature (*C)		11.7 D	1 0.1	05 0.1 02		Ú.T		ti 04 tā 01	8 84 85 TE
					Fe	els like ("C)			1 8 0	a -1 -1 -1	8			-3 0 -1 0	
						lative humidity (%) pressure (hPa)	76 968		10 87 86 86 985 985	86 85 81 84 964 964 983 983	73 982		978 976 974 972 9	92 86 89 65 170 968 968 96	
					Te	e type se	3	3	74 J J D6	9 9 <u>39</u> 7 828	7		15 18		20:56
Healt	h Safety & the I	Environn	nent		Te	e height (m)	27	3.3 37 3	8 27 31	22 16 13 13	15	2 2.6	32 37 4 39 3	04 26 (8 t.	4 17 14 17
	Office - "Large a inue to monitor										nd ir	nto souther	m Scandinavia on I	Wednesday."	
	L Rep: Theo						- to up t			Client Re	p:				
	•										•				
Sign	led:									Signed:					

Arch	-fugeo	N	IEAR	RSHO	RE I	DAIL	Y PF	ROGR	ESS F	REPOF	RT		Daily Report N	0.
Arch Henderson Celebrating 100 Years		N	igg E	inergy	Par	'k - M	arine	Grou	nd Inve	stigati	on		11	
Activity Time Summ	ary	Tod	iay	To Date)	D	ay Shift		Night	Shift	Comp	any	Pos	ition
Mobilisation Moving & Jacking		0.0		3.50 22.58		lim	ny Wilso	2	Onboard Joshua	IUB (mobil Sandy	isation) Fugro Geo	Services	Barga	master
Rotary Drilling (Coring)		0.0		7.33			es Lawso		Adam	Cook	Fugro Geo		Dr	iller
Cable Percussion Standby (Fugro)		0.0		95.75 0.00			m Allardy uart Nye	ce	Ashley L	owthian	Fugro Geo Fugro Geo			nt Driller nt Driller
Standby (Fugio) Standby (Tide)		0.0		11.50		31	uart inye				Fugio Geo	Services	Assista	ni Dillei
Standby (weather) Single Shift Standby		21.		90.00		Rich	ard Luke	er	Bart	Kot	Fugi	0	Geotechnic	al Engineer
Other Operations		0.0		5.75 9.42		The	o Cleave	•			Fugro Geo	Services	Project	Engineer
Crew Change / TBT		2.0		18.17										
		0.0		0.00	_									
		0.0		0.00										
		0.0		0.00										
		0.0	00	0.00							Total Man			
	Total	24.	00	24.00		No. I	Personn	el	11)	Hours Worked		120	
Project Program / Progr	BoQ Item		rammed No.	Hours	m	Today No.	Hours		ctual To Da No.	te Hours		% Program	n Completed	
Activity General Items, Provisional Services	BoQ Item A	m.	INO.	nours	m.	190.	HOUIS	m.	NO.	nours	0			
Establish all plant, equipment, crew on site	A2		1.0					0.0	1	0.00				100.0
Standing Time for plant, crew, etc - WEATHER	B11 C19			R/O			21.25	0.0	0	0.00	0.0 0.0			
Standing Time for plant, crew, etc - WEATHER Standing Time for plant, crew, etc - TIDE	B11 C19 B11 C19			R/O			220	0.0	0	87.75	0.0			
								0.0	0	0.00	0.0			
Percussion Boring Move boring plant to site of each exploratory hole	B B1		8.00					0.0	6	0.00	0.0			75.0
Extra over B1 for setting up on a gradient >20%	B2		R/O					0.0	0	0.00	0.0			
Break out surface obstructions where present	B3 B4	80.00		R/O				0.0	0	0.00	0.0			74.3
Advance BH between groundlevel and 10m depth As B4 but between 10m and 20m		36.50						59.4 42.9	0	0.00				74.5
As B4 but between 20m and 30m	B6	R/O						2.1	0	0.00	0.0			
As B4 but between 30m and 40m Advance BH through hard stratum or obstruction	B7 B9	R/O		R/O				0.0	0	0.00	0.0 0.0			
Advance bit through hard stratum of obstraction	53			R/U				0.0	0	9.08 0.00	0.0			
Rotary Drilling	С								-		0.0			
Move rotary plant to site of each exploratory hole RC drilling between groundlevel and 10m depth	C15 C41	R/O	6.00					0.0	4 0	0.00	0.0		66	.7
As C41 but between 10m and 20m		20.50						5.7	0	0.00	0.0	27.6		
As C41 but between 20m and 30m	C43	9.50						5.9	0	0.00			61.6	
Core box to be retained by client	C49		21.00					0.0	0	0.00	0.0 0.0			
Sampling, Monitoring during investigation	E										0.0			
Small Disturbed Sample Bulk Disturbed Sample	E1 E2		59.00 59.00					0.0	141	0.00				
Large Bulk disturbed sample	E3		R/0					0.0	75 0	0.00	0.0			
								0.0	0	0.00	0.0			
Insitu Testing Standard Penetration Test in Borehole	H H1		40					0.0	33	0.00	0.0			82.5
Standard Penetration Test in Rotary Drill Hole	H2		R/O					0.0	0	0.00	0.0			
Geoenvironmental Laboratory Testing	L			⊨[]			0.0	0	0.00	0.0 0.0			
Marine Scotland Sample	L2		121					0.0	104	0.00	0.0			86.0
								0.0	0	0.00	0.0			
Additional Items								0.0	0	0.00	0.0 0.0			
								0.0	0	0.00	0.0			
	$+$ $\overline{+}$			-				0.0	0	0.00	0.0 0.0			
	+			 				0.0	0	0.00	0.0			
Health & Safety Summa	T	oday		Act	ual To [Date				Lost & D	amaged			
Hoc Cards Safety Drills		1 0			15 5									
Tool Box Talks HSE Meetings			1			13 1								
Incidents/Near Miss		0			0									
Environmental Hours Worked			0 120	_		0 1320								
Fugro GeoServices Representative Commen	ts		120				ent Repr	esentativ	e Comment	s				
	systems developing over to pment for possible move to the top of		4 hrs.											
FGSL Rep: Theo Cleave						Cli	ent Re	o:						
							-							
Signed:			Się	ned:										

rch 2013 enderson			RO		RSHORE DAILY PF Energy Park - Marine			Daily Report No.
Job No		C1982		Ve	ssel Skate 3A		Date	Wednesday 13-Mar-19
mshuttleworth stuart.innes@p m.chappell@fu n.armstrong@ g.crisp@fugro.	ugro.com Ofugro.com com			Attn. Attn. Attn. Attn. Attn. Attn. Attn.	Andy Neillings Michael Shuttleworth Stuart Innes Mathew Chappell - Nearshore Mana Nicholas Armstrong - Reporting N Glen Crisp - Project Manager	•	Redact Redact Redact Redact	
Observed Weath Time 00:00	ner Speed K	Wind nts Dir	s	well (Hs)	Sea State	Visibility		Weather Forecast
00:00 06:00 12:00 18:00 00:00	28 37 21 34 23	W WNW W WSW SSW		N/A N/A N/A N/A N/A	slight smooth smooth slight smooth/slight	good good good good good		See Below
BH no.		eg Penetration (m)	3		4		Operational Status	
BH04		.4 0.7	1.6	_	.9			
							BH04 complete aiting weather window to m	ove to BH05
From	То		Code	Summary	of Operations / Borehole Drilling	- last 24hrs:	Description	
00:00	00:45	Hrs (No.) 0.75	Standby (wea	ather) Av	vait weather window for move to BH	105 / Nightshift c	Description ontinue to monitor	
00:45	07:00	6.25	Standby (wea	ather) Av	vait weather window for move to BH	105 / Wind avera	ge <30kts	
07:00 08:00	08:00 13:00	1.00 5.00	Crew Change Standby (wea		ghtshift transfer to shore / Handove vait weather window for move to BH	,	,	
13:00	15:15	2.25	Moving & Ja		ck down and pull legs / Move ~53m			
15:15	16:45	1.50	Standby (wea		ck up and await window / Client cor			
16:45	19:00	2.25	Cable Percu	ssion Ru	in in 8" casing to mudline / Comme	nce CP drilling fr	om 0.00m to 2.00m BML	
19:00	19:20	0.33	Other Opera		el all plant and RHIB / Wash down			
19:20 20:00	20:00 00:00	0.67 4.00	Crew Change Cable Percus		yshift transfer to shore / Handover ontinue CP drilling from 2.00m to 7.		Nightshift transfer to JUB / TB	T & Abandonment Drill
					Weather forecast 2% 3% 4% 5% 6% 7% 8% 9% 9%			
			Wind direction Wind speed (kts)		WHEN NOV ROW ROW NOV NOV NOV NOV	NW NW WINN WAR	w w w w wsw sw sw :	SW SW SW SSW
			Wind gusts (max kts)	25 28	20 22 25 25 27 27 27 27 27 27 27 27 27 27 27 27 27	26 26 21 16	14 ²⁰ 17 18 17 16 26 29 29 28 25 19	17 13 12 12 24 29
			Cloud cover Precipitation type Precipitation (mm / h)	6			• 0 0 0 0 0 0 0 0 11 12	
			Air temperature (°C) Feets like (°C)	6 6		1 1 2 3	2 1 1 0 0 0	
			Relative humidity (%) Air pressure (hPa)		65 64 84 83 82 80 79 77 9/1 9/3 9/5 9/6 961 963 965 963	76 75 77 73	in 12 54 10 12 83	
			Tide type Time	2.5	3 3 78 4 4 4 4 24 343 992	2 2 2 2		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
				22 28			37 36 38 36 31 24	
	-		Tide height (m)	8.6 6.0				
Office - "Deep lo central and south	ow in central North Se thern North Sea over		northern Denma			other low moves	from near Iceland on a simila	r track on Thur with ridge briefly moving eas
central and south	ow in central North Se thern North Sea overn r onditions closely, 1	night into Fri."	northern Denma				from near Iceland on a simila	

Arch	-fugeo		NEAF	RSHC	RE	DAIL	Y PF	ROGR	ESS F	REPOF	RT		Daily Report No	
Arch Henderson Celebrating 100 Years		I	Nigg E	Energ	y Pai	rk - N	larine	Grou	nd Inve	stigati	on		12	
Activity Time Summ	nary		oday	To Da		D	ay Shift		Night	Shift	Com	bany	Posit	tion
Mobilisation Moving & Jacking			0.00 2.25	3.50 24.8		lim	my Wilso	n	Onboard J Mark		isation) Fugro Geo	Services	Bargen	naster
Rotary Drilling (Coring)			0.00	7.33			m Allardy		Adam	-	Fugro Geo		Daigen	
Cable Percussion			6.25	102.0		St	tuart Nye		Ashley L	owthian	Fugro Geo		Assistan	
Standby (Fugro) Standby (Tide)			0.00	0.00							Fugro Geo	Services	Assistan	t Driller
Standby (weather)		1	3.50	103.5	0	Ric	hard Luke	er	Bart	Kot	Fug	ro	Geotechnica	al Engineer
Single Shift Standby Other Operations			0.00 0.33	5.75 9.75		The	eo Cleave				Fugro Geo	Sonicos	Project E	nginoor
Crew Change / TBT			1.67	9.75		TIR	eo cleave	3			Fugio Geo	Joeivices	FIOJECI E	ngineer
			00.0	0.00										
		_	0.00	0.00										
			0.00	0.00										
			0.00	0.00										
	Total		4.00	24.0		No.	Personn	el	9		Total Man Hours Worked		108	
Project Program / Progr	ress	Pro	ogrammed	1		Today		А	ctual To Da	ite		% Program	n Completed	
Activity	BoQ Item	m.	No.	Hours	m.	No.	Hours	m.	No.	Hours	0	- 3. 41		
General Items, Provisional Services	A A2		1.0					0.0	1	0.00	0			100.0
Establish all plant, equipment, crew on site	M2							0.0	0	0.00	0.0			
Standing Time for plant, crew, etc - WEATHER	B11 C19			R/O				0.0	0	87.75	0.0			
Standing Time for plant, crew, etc - TIDE	B11 C19			R/O				0.0	0	11.50 0.00	0.0 0.0			
Percussion Boring	В					1		0.0	U	0.00	0.0			
Move boring plant to site of each exploratory hole	B1		8.00			1		0.0	7	0.00				87.5
Extra over B1 for setting up on a gradient >20%	B2 B3		R/O	R/O				0.0	0	0.00	0.0 0.0			
Break out surface obstructions where present Advance BH between groundlevel and 10m depth	B3 B4	80.00		R/U	7.00			0.0	0	0.00	0.0			83.0
As B4 but between 10m and 20m	B5	36.50			1.00			42.9	0	0.00				
As B4 but between 20m and 30m	B6	R/O						2.1	0	0.00	0.0			
As B4 but between 30m and 40m	B7 B9	R/O		R/O				0.0	0	0.00	0.0 0.0			
Advance BH through hard stratum or obstruction	Da			R/U				0.0	0	9.08 0.00	0.0			
Rotary Drilling	С							0.0	Ū	0.00	0.0			
Move rotary plant to site of each exploratory hole	C15	810	6.00			1		0.0	5	0.00				83.3
RC drilling between groundlevel and 10m depth As C41 but between 10m and 20m	C41 C42	R/O 20.50						0.0	0	0.00	0.0	27.6		
As C41 but between 20m and 30m	C43	9.50						5.9	0	0.00		27.0	61.6	
Core box to be retained by client	C49		21.00					0.0	0	0.00	0.0			
Sampling, Monitoring during investigation	E							0.0	0	0.00	0.0 0.0			
Small Disturbed Sample	E1		59.00					0.0	142	0.00	0.0			
Bulk Disturbed Sample	E2		59.00					0.0	75	0.00				
Large Bulk disturbed sample	E3		R/O					0.0	0	0.00	0.0 0.0			
Insitu Testing	н					-		0.0	0	0.00	0.0			
Standard Penetration Test in Borehole	H1		40					0.0	33	0.00				82.5
Standard Penetration Test in Rotary Drill Hole	H2		R/O				<u> </u>	0.0	0	0.00	0.0 0.0			
Geoenvironmental Laboratory Testing	L					-		0.0	0	0.00	0.0			
Marine Scotland Sample	L2		121					0.0	104	0.00				86.0
Additional Items								0.0	0	0.00	0.0 0.0			
								0.0	0	0.00	0.0			
								0.0	0	0.00	0.0			
	+ T			$\left - \right $				0.0	0	0.00	0.0			
L	+							0.0	0	0.00	0.0 0.0			
Health & Safety Summ	ary		Today		Ac	tual To I	Date				Lost & D	amaged		
Hoc Cards Safety Drills		1 1			16 6									
Tool Box Talks		1			6 14									
HSE Meetings		0			1 0									
Incidents/Near Miss Environmental	Environmental													
Hours Worked Fugro GeoServices Representative Commen			0 108			0 1428			e Comment					
r ugio devoervices representative commen								esentativ	Comment	3				
FGSL Rep: Theo Cleave						CI	ient Re	p:						
Signed:						Si	gned:							

	nderson	NIG		20		RSHORE DAILY P Energy Park - Marin	Daily Report No.		
	Job No		C1982		Ve	sel Skate 3A		Date	Thursday 14-Mar-19
	ANeillings@arch-l	arch-henderson.co.r roup.com o.com ro.com			Attn. Attn. Attn. Attn. Attn. Attn. Attn.	Andy Neillings Michael Shuttleworth Stuart Innes Mathew Chappell - Nearshore Mar Nicholas Armstrong - Reporting Glen Crisp - Project Manager	No./email No./email No./email No./email No./email	Redact Redact Redact Redact	
Ob	served Weather		Wind	Swe	ell (Hs)	Sea State	Visibility		Weather Forecast
	Time 00:00 00:00	Speed Knt 23	s Dir SSW		N/A	smooth	good		
	06:00	25	WSW		N/A	smooth	good		See Below
	12:00	22	WSW		N/A	smooth	good		
	18:00	22	SW		N/A	smooth	good		
	00:00	22	WSW		N/A	smooth	good		
	BH no.	1	Penetration (m)	3				Operational Status	
	BH NO. BH05	1.8		2.5	2				
	BH03	1.0	1.7	2.5	2	6		0.0.1.11	Russ
						—		CP drilling underway on	COUR
						(0			
	From	То			ummary	of Operations / Borehole Drillin	g - last 24hrs:	Description	
	From 00:00	To 07:00	Hrs (No.) 7.00	Code Cable Percussi	ion Co	ntinue CP drilling from 7.00m to	12.00m BML / Bre	Description ak down and swap over baile	r
	07:00	07:15	0.25	Other Operatio	ons W	sh down clear down for E.O.S / I	uel all plant		
-	07:15	08:00	0.75	Crew Change /		htshift transfer to shore / Handov			
	08:00 12:15	12:15 16:00	4.25 3.75	Cable Percussi Rotary Drilling (Co		ntinue CP drilling from 12.00m to			
	16:00	19:30	3.50	Standby (weath		n in Geobor S / Continue from 14 ait weather window for move to B			
	19:30	20:15	0.75	Crew Change /		yshift transfer to shore / Handove			
	20:15	00:00	3.75	Standby (weath	ner) Av	ait weather window for move to B	H05 / Nightshift co	ontinue to monitor	
					_				
_									
				ļ					
				i		Weather forecast			
			Local time	0.00 1.00 2.00	2.00 4.00	5.00 5.00 7.00 8.00 0.00 10.00 11.0	0 12:00 13:00 14:00 15	00 15:00 17:00 18:00 19:00 20:00 21	00 22:00 23:00
			Wind direction Wind speed (kts)	aw aw w	W WSW	WWW WSW W W W W	W WSW WSW WS	SW WSW WSW SW SW SW SI	W WSW WSW
			shows forst	14 17 14	H 13	14 15 17 15 16 18 17	17 17 15 1	6 10 15 14 16 17 11	1 10 13
			Wind gusts (max kts)	10 Im 21	10 DI	25 25 25 27 10 20	21 21 21 2	8 21 77 arr 11 (3	Cont and
			Cloud cover	P 2 1	3.3	******			0.0
			Precipitation type Precipitation (mm / h)			0 0 0 03 02 0.1	0 0 0		
			Air temperature (°C)	1 2 2	2 1				
			Feels like ("C) Relative humidity (%)	88 80 80	87. 87	85 85 84 83 81 77 77	75 81 81 8	1 80 81 83 84 86 8	
			Air pressure (hPa) Tide type	285 985 994	904 904	985 985 986 987 986 989 989 7* 도 도 도 도 도	990 990 991 99 2 5 5 5 5	the second second second second second second second second	
			Time			4.33 9.56		17.03	22.40
alth	Safety & the Env	vironment	Tide height (m)	19 23 28	32 15	35 32 27 21 17 16 17	1.9 22 28 3	1 34 36 35 3 25 2	18 18
t O	ffice: "A low move	s east near Shetlan	d on Friday morning t Sea early on Sunday		ay on Sa	urday morning. Another low is ex	pected over Irelan	d deepening as it pushes nor	theast through the UK. This low continues to
- 00	Rep: Theo Cl		224 oany on ounday			Client R			
125									
3SI		curc				onent iv	σþ.		

Arch	-fugeo		NEAF	RSHC	RE	DAIL	_Y PF	ROGR	ESS F	REPOF	RT		Daily Report No	
Arch Henderson Celebrating 100 Years	Р	I	Nigg E	Energ	y Pa	rk - N	larine	Grou	nd Inve	stigati	on		13	
Activity Time Summ	ary	То	oday	To Da	te	D	ay Shift		Night	Shift	Com	bany	Posit	ion
Mobilisation Moving & Jacking			0.00	3.50 24.8		lim	my Wilso	n	Onboard J Mark		isation) Fugro Geo	Services	Bargerr	aster
Rotary Drilling (Coring)			3.75	11.08			im Allardy		Adam	-	Fugro Geo		Daigen	
Cable Percussion			1.25	113.2		Ju	stin Smith	ı	Ashley L	owthian	Fugro Geo		Assistan Assistan	
Standby (Fugro) Standby (Tide)			0.00	0.00							Fugro Geo	Services	Assistan	Driller
Standby (weather)		7	7.25	110.7	5	Ric	hard Luke	er	Bart	Kot	Fug	ro	Geotechnica	l Engineer
Single Shift Standby Other Operations).00).25	5.75		Th	eo Cleave				Fugro Geo	Services	Project E	ngineer
Crew Change / TBT			1.50	21.3		110	co olcavi	5			i ugio occ	00111003	TOJOOLE	ngineer
			0.00	0.00										
			0.00	0.00										
			0.00	0.00										
			0.00	0.00										
	Total	2	4.00	24.0	D	No.	Personn	el	9		Total Man Hours Worked		108	
Project Program / Progr			ogrammed			Today			ctual To Da			% Program	n Completed	
Activity General Items, Provisional Services	BoQ Item A	m.	No.	Hours	m.	No.	Hours	m.	No.	Hours	0			
Establish all plant, equipment, crew on site	A2		1.0					0.0	1	0.00				100.0
Other days the standard in the standard sector of the standard sector sector sector of the standard sector of the	D11 010		<u> </u>	R/O			-	0.0	0	0.00	0.0 0.0			
Standing Time for plant, crew, etc - WEATHER Standing Time for plant, crew, etc - TIDE	B11 C19 B11 C19			R/0 R/0			-	0.0	0	87.75 11.50	0.0			
,,								0.0	0	0.00	0.0			
Percussion Boring Move boring plant to site of each exploratory hole	B B1		8.00					0.5		0.00	0.0			87.5
Extra over B1 for setting up on a gradient >20%	B1 B2		8.00 R/O					0.0	7 0	0.00	0.0			01.3
Break out surface obstructions where present	B3			R/O				0.0	0	0.00	0.0			
Advance BH between groundlevel and 10m depth As B4 but between 10m and 20m	B4 B5	80.00 36.50			3.00 4.50			69.4 47.4	0	0.00	-			86.8
As B4 but between 20m and 30m	B6	R/0			4.00			2.1	0	0.00	0.0			
As B4 but between 30m and 40m	B7	R/0						0.0	0	0.00	0.0			
Advance BH through hard stratum or obstruction	B9			R/O				0.0	0	9.08 0.00	0.0 0.0			
Rotary Drilling	С							0.0	0	0.00	0.0			
Move rotary plant to site of each exploratory hole	C15	D/O	6.00					0.0	5	0.00				83.3
RC drilling between groundlevel and 10m depth As C41 but between 10m and 20m	C41 C42	R/O 20.50			3.00			0.0	0	0.00	0.0		2.2	
As C41 but between 20m and 30m	C43	9.50						5.9	0	0.00			61.6	
Core box to be retained by client	C49		21.00					0.0	0	0.00	0.0 0.0			
Sampling, Monitoring during investigation	E							0.0	U	0.00	0.0			
Small Disturbed Sample	E1		59.00			16		0.0	158	0.00				
Bulk Disturbed Sample Large Bulk disturbed sample	E2 E3		59.00 R/O			14		0.0	89 0	0.00	0.0			
						1		0.0	0	0.00	0.0			
Insitu Testing	Н		10								0.0			
Standard Penetration Test in Borehole Standard Penetration Test in Rotary Drill Hole	H1 H2		40 R/O			8		0.0	41 0	0.00	0.0			
								0.0	0	0.00	0.0			
Geoenvironmental Laboratory Testing Marine Scotland Sample	L L2		121			10				0.00	0.0			04.0
manine occuano odmpie	L2		121			10		0.0	114 0	0.00	0.0			<mark>9</mark> 4.2
Additional Items											0.0			
	+						-	0.0	0	0.00	0.0 0.0			
	<u>+</u> ł					1		0.0	0	0.00	0.0			
								0.0	0	0.00	0.0			
Health & Safety Summa	iry		Today	L	Ac	tual To	Date	0.0	0	0.00	0.0 Lost & D	amaged		
Hoc Cards			1			17								
Safety Drills Tool Box Talks			1			7 15								
HSE Meetings			0			1								
Incidents/Near Miss Environmental			0			0								
Hours Worked			108			1536			_					
Fugro GeoServices Representative Commen	15						ent Kepr	esentativo	e Comment	5				
FGSL Rep: Theo Cleave						CI	ient Re	p:						
Signed:						Si	gned:							

Arch Henders	SON Years			fugi	20	Nigg	g Enei	rgy Park -	Marine G	_	SS REPOR		Daily Report No.
Job No To ANeillings	s@arch-hen	iderson.co.ul		C1982		Attn.	Vessel	Neillings	te 3A	No./emai	Date il 0141 227 30	60	Friday 15-Mar-19
		n-henderson.				Attn.		ael Shuttleworth		No./emai			
cc <u>stuart.inn</u> cc	ies@gegrou	ip.com				Attn. Attn.	Stuar	t Innes		No./emai No./emai	Redac	t	
	ell@fugro.co	om				Attn.	Math	ew Chappell - Near	shore Manager	No./emai			
	ong@fugro.	<u>com</u>				Attn. Attn.		olas Armstrong - Re		No./emai	neual.	t	
cc g.crisp@f Observed W	ugro.com leather		w	/ind			<u> </u>	Crisp - Project Man		No./emai	-Redac		
Time 00		Speed I		Dir	5	well (Hs	5)	Sea Stat		/isibility		vv	eather Forecast
00:00		22		WSW W		N/A N/A		smooth smooth/sli		good good	-		See Below
12:00)	38		W		N/A		slight	5	good			
18:00		29 23		W SW		N/A N/A		slight smooth		good	-		
00.00	,			etration (m)		N/A		SINOUL	·	good			
BH	ł no.		1	2	3		4	_			Operati	onal Status	
B	H05		1.8	1.7	2.5		2.6						
										A	waiting weather w	indow to mov	e to BH06
						Summa	ry of Ope	erations / Boreho	le Drilling - la	st 24hrs:			
From		To		Hrs (No.)	Code		A		L DUIDE		Description t continue to monito		
00:00		07:00 08:00		7.00	Standby (wea Crew Change								inue to monitor weather
08:00		11:00		3.00	Standby (wea		•				eneral R&M to JUB		
11:00		14:00		3.00	Standby (wea						Shoreside storage	area prepared i	for demobilisation
14:00 19:00		19:00 20:00	-	5.00 1.00	Standby (wea Crew Change						y to move to BH06	fer to Quay to	continue monitoring conditions
20:00		00:00		4.00	Standby (wea						ity to move to BH06		
								Weather fored	ast				
				Local time Wind direction			300 400 1 SW SW V		10.00 10.00 12 W W W W		15.00 15.00 17.00 15.00 15 W W W W		23.00 / EW
				Wind speed (34 32 39 28 2		
						12 14	15 13	16 20				21 17	14
				Wind gusts (r	nax kts)		25. 10		12 45 45 4	5 61 48	51 50 43 41		<i>0</i> 5.
				Precipitation t Precipitation			83	29 EJ EJ	81 84 82	10.0			
				Air temperatu	re (*C)	1 1	- E -	4 4 4 4 4 4 1	* * * *		ALC: NO ACCRUCK	en en ante	
				Feels like ("C Relative humi	Sty (%) D6	87 85	85 91	90 03 00 70	75 74 74 7	4 71 72	1 4 4 4 4		
				Air pressure (Tide type			985 984 1 77 77	4 4 K K	2 2 24 7		900 990 991 9 7 7 7 7		
				Time Tide height (r	1.8	2 25	27 11	4.38 14 14 12 27	11.27 22 19 18 11	0 18 2	18-16 24 28 37 35 3	4 34 27 23	2
Health Safety &	the Enviro	nment											
Met Office: "A lo deepen as as it i						way on	Saturday	morning. Another	low is expecte	ed over Irei	land deepening as i	t pushes northe	east through the UK. This low continues to
FGSL Rep: T								lo	lient Rep:				
-									•				
Signed:								5	Signed:				

Arch	-Fugro		NEAF	RSHO	RE D	AILY PF	ROGR	ESS F	REPOF	RT		Daily Report No	
Henderson Celebrating 100 Years			Nigg E	Energy	Park	- Marine	Grou	nd Inve	stigati	on		14	
Activity Time Summa	ry		oday	To Date	1	Day Shift		Night	Shift	Com	oany	Posit	ion
Mobilisation Moving & Jacking			0.00	3.50 24.83		Jimmy Wilso	n	Onboard Mark		isation) Fugro Geo	Services	Bargen	aster
Rotary Drilling (Coring)		(0.00	11.08 113.25	(Callum Allardy	rce	Adam	Cook	Fugro Geo	Services	Drill	er
Cable Percussion Standby (Fugro)			0.00			Justin Smith	1	Ashley L	owthian	Fugro GeoServices Fugro GeoServices		Assistan Assistan	
Standby (Tide)		(0.00	0.00						_			
Standby (weather) Single Shift Standby			2.00	132.75 5.75	_	Richard Luke	er	Bart	Kot	Fug	ro	Geotechnica	I Engineer
Other Operations		(0.00	10.00		Theo Cleave				Fugro Geo	Services	Project E	ngineer
Crew Change / TBT			2.00	23.33 0.00	-								
		(0.00	0.00									
			0.00	0.00									
		(0.00	0.00									
	Total		0.00 24.00	0.00		No. Personn	el	9		Total Man Hours		108	
					_					Worked			
Project Program / Progre Activity	ss BoQ Item	m.	No.	d Hours		oday No. Hours	m.	ctual To Da No.	ate Hours		% Program	n Completed	
General Items, Provisional Services	A		1.0	├ [0.0	1	0.00	0			100.
Establish all plant, equipment, crew on site	A2		1.0				0.0	1 0	0.00	0.0			100.
Standing Time for plant, crew, etc - WEATHER	B11 C19			R/O		22.00	0.0	0	132.75	0.0			
Standing Time for plant, crew, etc - TIDE	B11 C19			R/O			0.0	0	11.50 0.00	0.0 0.0			
Percussion Boring	В						0.0		5.00	0.0			
Move boring plant to site of each exploratory hole Extra over B1 for setting up on a gradient >20%	B1 B2		8.00 R/O				0.0	7	0.00	0.0			87.5
Break out surface obstructions where present	B2 B3		NO	R/O			0.0	0	0.00	0.0			
Advance BH between groundlevel and 10m depth	B4	80.00					69.4	0	0.00				86.8
As B4 but between 10m and 20m As B4 but between 20m and 30m	B5 B6	36.50 R/O					47.4 2.1	0	0.00	0.0			
As B4 but between 30m and 40m	B7	R/O					0.0	0	0.00	0.0			
Advance BH through hard stratum or obstruction	B9			R/O			0.0	0	9.08 0.00	0.0 0.0			
Rotary Drilling	C		0.00							0.0			83.3
Move rotary plant to site of each exploratory hole RC drilling between groundlevel and 10m depth	C15 C41	R/O	6.00				0.0	5 0	0.00	0.0			03.3
As C41 but between 10m and 20m	C42	20.50					8.7	0	0.00		4	2.2	
As C41 but between 20m and 30m Core box to be retained by client	C43 C49	9.50	21.00				5.9 0.0	0	0.00	0.0		61.6	
							0.0	0	0.00	0.0			
Sampling, Monitoring during investigation Small Disturbed Sample	E E1		59.00				0.0	450	0.00	0.0			
Bulk Disturbed Sample	E1 E2		59.00				0.0	158 89	0.00				
Large Bulk disturbed sample	E3		R/O				0.0	0	0.00	0.0			
Insitu Testing	н						0.0	0	0.00	0.0 0.0			
Standard Penetration Test in Borehole	H1		40				0.0	41	0.00				
Standard Penetration Test in Rotary Drill Hole	H2		R/O				0.0	0	0.00	0.0 0.0			
Geoenvironmental Laboratory Testing	L						5.0	0	0.00	0.0			
Marine Scotland Sample	L2		121				0.0	<u>114</u> 0	0.00	0.0			9 <mark>4</mark> .
Additional Items							0.0	U	0.00	0.0			
							0.0	0	0.00	0.0			
	<u>├</u>						0.0	0	0.00	0.0 0.0			
							0.0	0	0.00	0.0			
Health & Safety Summar	v		Today		Actual	To Date	0.0	0	0.00	0.0 Lost & D	amaged		
Hoc Cards			1			18							
Safety Drills Tool Box Talks			0			7 16							
HSE Meetings			0			1							
Incidents/Near Miss Environmental			0	_ +		0							
Hours Worked Fugro GeoServices Representative Comment			108		1	644 Client Repr	osontativ	Common	e				
	<u>.</u>												
FGSL Rep: Theo Cleave						Client Re	p:						
Signed:						Signed:							

	nderso									Daily Report No.					
To cc cc cc cc cc	Job No ANeillings@a mshuttlewor stuart.innes@ m.chappell@ n.armstrong(th@arch- @gegroup)fugro.cor	<u>-henderso</u> b.com m	o.uk	C1982		Attr Attr Attr Attr Attr Attr	n. Mich n. Stuar n. Math	Neillings ael Shuttleworth t Innes ew Chappell - Ne plas Armstrong - F		No./ No./ No./	/email /email /email /email /email /email	Date 0141 227 306 Redact Redact		Saturday 16-Mar-19
сс	g.crisp@fugr	o.com		W	/ind		Attr	n. Glen	Crisp - Project Ma	anager	No./	/email	Redact		
	Time 00:00			ed Knts	Dir		Swell (H	Hs)	Sea St	ate	Visibil	ility		W	eather Forecast
	00:00			23 11	SW SW		N/A N/A		smoo smoo		good good				See Below
	12:00			3	NE		N/A		smoo		good				
	18:00			8	NNW		N/A		smoo		good				
	00:00			22	NW		N/A		smoo	th	good	d			
	BH no		<u> </u>	Leg Pen	etration (m) 2	3	-	4	_				Operatio	onal Status	
	BH05			1.8	1.7	2.5	_	2.6							
	BH06		_	3.2	5.2	3.4		2.0	_			٨	aiting weather wi	ndow to mov	
	DIIOC	,		5.2	J.2	5.4		2.5	-			-	aiting weather wi		
							e	nome of One	rations / Borel	olo Drilling I	oot 24	hrou			
	From	1	То	-	Hrs (No.)	Code		nary or Ope	auons / Borer	Iole Drilling - I	d51 241	ans.	Descriptio	n	
-	00:00	(04:30		4.50	Standby (we		Nightshif	continue to mo	nitor weather fo	or oppo	ortunity	to move to BH06	1	
	04:20		06:25		2.08	Moving & J								/ Preload and	I jack up to safe working height
	06:25		07:15		0.83	Other Oper							lashings etc. / Fue		
	07:15		07:45		0.50	Crew Chang		ÿ					Dayshift transfer t		n CP Operations
	07:45		18:45 19:15		0.50	Cable Perc Other Oper			d wash down de				om 0.00m to 10.50		
<u> </u>	19:15		20:00		0.75	Crew Chang							Nightshift transfer	to JUB / TBT (on CP Operations
	20:00	C	00:00		4.00	Cable Perc	ussion	Continue	CP drilling from	10.50m to 15.	.00m B	BML / E	.O.H @ -24.6mCD		
								-							
								+							
		1						1							
					Long Barr	0.00		(10) 7.00	Weather fore			11.65			246 246
					Local time Wind direction								00 16:00 17:00 18:00 19 E NE N NWW N		
					Wind speed (kts)	13 14 1	11	10 10	9 7 -				5 6 7	9 10 11	14 15
										3 1 1					
					Wind gusts (max kts)	6.6.1	26	6 6 6		000				4 9 9	2 B
I					Precipitation type				0 0 0	03 02 01			03 16 0	à à.	
					Precipitation (mm / h) Air temperature (*C)	11041	1.4	4.000	1.2.1.1.2.	1.1	$1 \le 1$		1.00	 14 (1) 	
					Feels like (°C) Relative humidity (%)	-1 -1 - 82 80 8		a a a	6 91 93 95	1 3 4 94 92 88		2 2		-1 -1 -1 15 87 82	-t -1 79 78
					Air pressure (hPa)	994 994 9	ini ini	992 991 90	989 066 066 11	988 988 587	586	506 508	5 564 564 564 3	54 354 354 5	805 005
I					Tide type Time	N. 34 052	1. E.	2 4 3	657 X X	8 8 8		14:01	3 3 3	77 34 19(41	8 8
					Tide height (m)		9 21	75 3 3		25 21 18	1.7	1.6 1.7	21 25 32 3		3 25
Healt	n Safety & the	Environ	ment												
	ffice: "A deep s from the wes			NE across I	reland the centra	I UK and into t	he Norti	h Sea today	and then into s	outhern Scandi	inavia d	on Sun	day. A ridge of hig	h pressure the	n topples across the UK and surrounding
FGS	Rep: The	o Cleav	е							Client Rep:					
<u>.</u>										o					
Sign	ed:									Signed:					

Arch	-fugeo		NEAF	RSHC	ORE	DAIL	Y PF	ROGR	ESS R	REPOF	RT		Daily Report No.	
Henderson Celebrating 100 Years			Nigg E	nerg	y Pai	rk - M	larine	Grou	nd Inve	stigati	on		15	
Activity Time Summar	<i>y</i>	Т	oday	To Da	ite	D	ay Shift		Night	Shift	Com	pany	Positi	on
Mobilisation			0.00	3.50					Onboard J					
Moving & Jacking Rotary Drilling (Coring)			1.92 0.00	26.7			my Wilso m Allardy		Mark Adam	-	Fugro Ge Fugro Ge		Bargema	
Cable Percussion			15.00	128.2			stin Smith		Ashley L		Fugro Ge		Assistant	
Standby (Fugro)			0.00	0.00							Fugro Ge	Services	Assistant	Driller
Standby (Tide) Standby (weather)			0.00 4.50	11.50 137.2		Rick	hard Luke	ar.	Bart	Kot	Fug	r0	Geotechnical	Engineer
Single Shift Standby			0.00	5.75		TUO		,	Dart	not	1 49	10	Geolecimical	Engineer
Other Operations		_	1.33	11.3		The	eo Cleave	9			Fugro Ge	Services	Project En	igineer
Crew Change / TBT		_	1.25 0.00	24.5										
		(0.00	0.00)									
			0.00	0.00										
		_	0.00	0.00										
			0.00	0.00)						Total Man	0		
	Total	2	24.00	24.0	0	No.	Personn	el	9		Hours Worked		108	
Project Program / Progress			ogrammed			Today			ctual To Da			% Program	n Completed	
Activity General Items, Provisional Services	BoQ Item	m.	No.	Hours	m.	No.	Hours	m.	No.	Hours	0			
Establish all plant, equipment, crew on site	A A2		1.0		L			0.0	1	0.00				100.0
								0.0	0	0.00	0.0			
Standing Time for plant, crew, etc - WEATHER	B11 C19			R/O R/O			4.50	0.0	0	137.25	0.0 0.0			
Standing Time for plant, crew, etc - TIDE	B11 C19			NU		-		0.0	0	11.50 0.00	0.0			
Percussion Boring	В										0.0			
Move boring plant to site of each exploratory hole	B1	-	8.00			1		0.0	8	0.00	0.0			100.0
Extra over B1 for setting up on a gradient >20% Break out surface obstructions where present	B2 B3		R/O	R/O				0.0	0	0.00	0.0 0.0			
Advance BH between groundlevel and 10m depth		80.00			10.00			0.0	0	0.00				99.3
As B4 but between 10m and 20m		36.50			5.00			52.4	0	0.00				
As B4 but between 20m and 30m	B6	R/O						2.1	0	0.00	0.0			
As B4 but between 30m and 40m Advance BH through hard stratum or obstruction	B7 B9	R/O		R/O			1.50	0.0	0	0.00	0.0 0.0			
							1.00	0.0	0	0.00	0.0			
Rotary Drilling	С										0.0			
Move rotary plant to site of each exploratory hole	C15 C41	R/O	6.00			1		0.0	6	0.00	0.0			100.0
RC drilling between groundlevel and 10m depth As C41 but between 10m and 20m		20.50						0.0	0	0.00	0.0	4	2.2	
As C41 but between 20m and 30m	C43	9.50						5.9	0	0.00			61.6	
Core box to be retained by client	C49		21.00					0.0	0	0.00	0.0			
Sampling, Monitoring during investigation	E							0.0	0	0.00	0.0 0.0			
Small Disturbed Sample	E1		59.00		L	15		0.0	173	0.00				
Bulk Disturbed Sample	E2		59.00			15		0.0	104	0.00				
Large Bulk disturbed sample	E3		R/O					0.0	0	0.00	0.0 0.0			
Insitu Testing	н		-					0.0	0	0.00	0.0			
Standard Penetration Test in Borehole	H1		40			8		0.0	49	0.00				
Standard Penetration Test in Rotary Drill Hole	H2		R/O					0.0	0	0.00	0.0			
Geoenvironmental Laboratory Testing	L							0.0	0	0.00	0.0 0.0			
Marine Scotland Sample	L2		121			5		0.0	119	0.00				98.3
		-						0.0	0	0.00	0.0			
Additional Items								0.0	0	0.00	0.0 0.0			
			-					0.0	0	0.00	0.0			
								0.0	0	0.00	0.0			
								0.0	0	0.00	0.0			
Health & Safety Summary			Today	I	Ac	tual To I	Date	0.0	0	0.00	0.0 Lost & D	amaged		
Hoc Cards			1			19								
Safety Drills Tool Box Talks			0			7 17								
HSE Meetings			0			1								
Incidents/Near Miss Environmental			0			0								
Environmental Hours Worked			108			1752		L						
Fugro GeoServices Representative Comments							ent Repr	esentative	e Comment	S				
FGSL Rep: Theo Cleave						CI	ient Re	p:						

	ch 201 endersor		G		RO	NEARSHORE DAILY PROGRESS REPORT Nigg Energy Park - Marine Ground Investigation							Daily Report No.
	Job No			C1982			Vessel	5	kate 3A		Date	I	Sunday 17-Mar-19
To cc cc cc cc cc cc	ANeillings@arc mshuttleworth m.chappell@fu n.armstrong@ g.crisp@fugro.	u@arch-hencu ugro.com fugro.com				Attn. Attn. Attn. Attn. Attn. Attn.	Mich Mati		learshore Manage g - Reporting Ma		RerRe Redact	-	· · ·
0	bserved Weath Time 00:00		Prood Knto	Wind Dir		Swell (H	s)	Sea S	State	Visibility			ather Forecast
	00:00	3	25	NW		N/A		smo	oth	good			
	06:00		21	NW		N/A		smo		good			See Below
	12:00		26 27	NNW		N/A N/A		smooth		good			
-	18:00 00:00		16	WSW		N/A		smooth smo		good good			
	00.00			enetration (m)				01110	our	good			
	BH no.		1	2	3		4				Operatio	onal Status	
	BH06		3.2	5.2	3.4		2.9						
											Finishing BH06 a		
										Awaitin	g weather window	to move to par	rk up location
						Summ	any of On	orations / Borr	ehole Drilling - I	act 24bre			
	From	То		Hrs (No.)	Code			crations / Bort	shole brining - i	ust 24113.	Description	n	
	00:00	03:0		3.00	Other Ope		Pull all c	asing to deck /	Break casing do	wn onto stilla	ages / Clear down a		
	03:00	07:3		4.50	Standby (w						Nightshift continue		
	07:30	08:0		0.50	Crew Chang						/ Dayshift transfer to		
	08:00	19:0		11.00	Standby (w						Dayshift continue to		
	19:00	19:3		0.50	Crew Chang				re for end of shif				
	19:30	00:0	10	4.50	Single Shift	Standby	No Nigh	tshift as crew p	repares for demo	obilisation / N	lightshift resting to o	change shift pat	tern
-													
					-								
							1						
							I					-	
<u> </u>					1	_	L						
								Weather fo					
				I time 0							17:00 18:00 19:00 28:08 3 NNW NW NW NW		
			Win	I speed (kts)							19 17 18 17		
						12 10	14. 13	1/ 15 15	13 13		19 17 38 17	15 10 7	
			Win	I gusts (max kts)	77 33 88 25	ZI 29	10 20	24 27 24	79 27 28	28 28 29	28 28 27 75	25 28, 11	
				d cover -							*****	1	
					2 65			0.2 0.1 0.1	0.2				
				s like ("C)	1 2 2 4	-t 0	t 0.	0 1 0	1 1 0	0 0 0	1 7 2 2		
1			Rela	tive humidity (%)	12 78 78 83	82 84	25 84	84. 85 85	74 70 74	70 68 69	72 76 77 78	78. 79 77	
1			Air p Tide	han	83 963 963 963					08 1000 1001			
			Time		2 2 2 2 2	2		821		1522		21:00	
				height (m)	1 19 17 17	19 24	29 34	36 35 12	27 21 17 1	15 13 14	18 25 32 36	38 17 32	
Healt	th Safety & the E	nvironmen	nt										
	ightshift as crev le Shift Standby			allow move to co	incide with ber	nine fored	cast on M	onday.					
_	L Rep: Theo								Client Rep:				
1													
Sigr	ned:								Signed:				
									1				

Arch	-fugro		NEAF	RSHOP	RE DA	ILY PF	ROGR	ESS F	REPOF	RT		Daily Report No.	
Henderson Celebrating 100 Years		I	Nigg E	Energy	Park -	Marine	Grou	nd Inve	stigati	on		16	
Activity Time Summar	1	T	oday	To Date		Day Shift		Night	Shift	Com	bany	Positi	on
Nobilisation Noving & Jacking			0.00	3.50 26.75	J	immy Wilso		Onboard J Mark		isation) Fugro Geo	Services	Bargema	aster
totary Drilling (Coring)		(0.00	11.08	Ca	llum Allardy	/ce	Adam	Cook	Fugro Geo	Services	Drille	er
Cable Percussion Standby (Fugro)		_	0.00	128.25 0.00		Justin Smith	ı	Ashley L	owthian	Fugro Geo Fugro Geo		Assistant Assistant	
tandby (Tide)		_	0.00	11.50						T ugio Occ	00111003	Abbistant	Dille
itandby (weather)			5.50	152.75	F	tichard Luke	er	Bart	Kot	Fug	го	Geotechnical	Engineer
ingle Shift Standby ther Operations			4.50 3.00	10.25 14.33	-	Theo Cleave	9			Fugro Geo	Services	Project En	aineer
rew Change / TBT			1.00	25.58						5		,	5
			0.00	0.00	-								
		_	0.00	0.00									
			0.00	0.00									
			0.00	0.00									
	Total	2	24.00	24.00	N	o. Personn	el	9		Total Man Hours Worked		108	
Project Program / Progress			ogrammed		Tod			ctual To Da			% Program	n Completed	
Activity eneral Items. Provisional Services	BoQ Item	m.	No.	Hours	m. No	. Hours	m.	No.	Hours	0			
stablish all plant, equipment, crew on site	A2		1.0				0.0	1	0.00				10
				D/C		45.50	0.0	0	0.00	0.0			
tanding Time for plant, crew, etc - WEATHER tanding Time for plant, crew, etc - TIDE	B11 C19 B11 C19			R/0 R/0		15.50	0.0	0	152.75 11.50	0.0 0.0			
anoing rime for plant, crew, etc - HDE	611 019			100			0.0	0	0.00	0.0			
ercussion Boring	В									0.0			
ove boring plant to site of each exploratory hole ktra over B1 for setting up on a gradient >20%	B1 B2		8.00 R/O	\vdash			0.0	8	0.00	0.0			1
reak out surface obstructions where present	B2 B3		100	R/O			0.0	0	0.00	0.0			
dvance BH between groundlevel and 10m depth	B4	80.00					79.4	0	0.00				
s B4 but between 10m and 20m	B5	36.50					52.4	0	0.00	0.0			
s B4 but between 20m and 30m s B4 but between 30m and 40m	B6 B7	R/0 R/0					2.1 0.0	0	0.00	0.0 0.0			
dvance BH through hard stratum or obstruction	B9			R/O			0.0	0	10.58 0.00	0.0 0.0			
otary Drilling	C		0.00							0.0			1
ove rotary plant to site of each exploratory hole C drilling between groundlevel and 10m depth	C15 C41	R/O	6.00				0.0	6 0	0.00	0.0			
s C41 but between 10m and 20m	C42	20.50					8.7	0	0.00		4	2.2	
s C41 but between 20m and 30m ore box to be retained by client	C43 C49	9.50	21.00				5.9	0	0.00	0.0		61.6	
ore box to be retained by client	049		21.00				0.0	0	0.00	0.0			
ampling, Monitoring during investigation	E									0.0			
mall Disturbed Sample ulk Disturbed Sample	E1 E2		59.00 59.00				0.0	173	0.00			- 1	
arge Bulk disturbed sample	E3		R/O				0.0	104 0	0.00	0.0			
							0.0	0	0.00	0.0			
situ Testing tandard Penetration Test in Borehole	H H1		40				0.0	49	0.00	0.0			
tandard Penetration Test in Rotary Drill Hole	H2		R/O				0.0	0	0.00	0.0			
							0.0	0	0.00	0.0			
eoenvironmental Laboratory Testing arine Scotland Sample	L2		121			-	0.0	119	0.00	0.0			
							0.0	0	0.00	0.0			
dditional Items				\vdash T				_	0.00	0.0			
						-	0.0	0	0.00	0.0 0.0			
							0.0	0	0.00	0.0			
	T					_	0.0	0	0.00	0.0			
Health & Safety Summary			Today		Actual T	o Date	0.0	U	0.00	0.0 Lost & D	amaged		
Hoc Cards			1		20								
Safety Drills Tool Box Talks			0		7								
HSE Meetings			0		1								
Incidents/Near Miss Environmental			0		0								
Hours Worked			108		186	i0							
ugro GeoServices Representative Comments						Client Repr	esentative	Comment	5				
GSL Rep: Theo Cleave						Client Re	p:						



Geodetic Parameters

Name : OSGB 1936 / British National Grid	lame : OSGB 1936 / British National Grid [OSGB-UK Gbr02 NT]									
EPSG Code	EPSG::27700	EPSG::27700								
Local Geodetic Datum Parameters										
Datum	OSGB 1936	EPSG::6277								
Ellipsoid	Airy 1830									
Semi major axis	a = 6,377,563.396 m									
Inverse flattening	1/f = 299.3249646									
Datum Transformation Parameters from E	TRS89 to OSGB 1936									
OSGB 1936 to ETRS89 (1)	NTv2	EPSG::5338								
Latitude and longitude difference file	OSTN02_NTv2.gsb									
Local Projection Parameters										
Map Projection	Transverse Mercator									
Grid System	British National Grid	EPSG::19916								
Latitude Origin	49°00'00.000"N									
Central Meridian	002°00'00.000"W									
Scale Factor on Central Meridian	0.999601272									
False Easting	400,000 m									
False Northing	-100,000 m									



Project ID	C1982		
Project Name	192186 Nigg East Quay Development	1	
Fugro OPCO	FGBNM (Fugro Great Britain North Marine)	Location	Nigg
Client	Fugro Geoservices Ltd	Vessel	Skate 3A
Comment	DML=14.6m DWL=4.2m Height above Cl	D=5.5m	

Session Name: 20190303-160430

Records Used: 301 of 301 Session Length: 00:05:01

Start Time: 03 Mar 2019, 16:05:44+00:00 End Time: 03 Mar 2019, 16:10:45+00:00

Mean Position for Skate 3A CommonReferencePoint								
	OSGB 1936 / British National Grid [OSGB-UK Gbr02 NT]	ETRS89(2D)						
Latitude	57°41'39.38423"N	57°41'38.33184"N						
Longitude	004°01'27.88485"W	004°01'32.89565"W						
Height	56.111m Ell.	56.111m Ell.						
Easting	279,342.906m E(SD: ±0.01m)							
Northing	868,934.747m N(SD: ±0.02m)							
Height	3.295m Ort. (SD: ±0.03m Ort.)							

Sensors	Sensor Averages	SD
Heading	5.61°T 7.32°G	±0.1°
Pitch		
Roll		
Depth (Sounder)	0.0m	±0.00m
Depth (Manual)	0.0m	N/A

Mean Position to Waypoint			
BH2			
279,344.000m E			
868,935.000m N			
1.12m Geodetic			
75.28°True			
255.28°True			

Theo Cleave Site Manager/Supervisor Fugro Geoservices Ltd

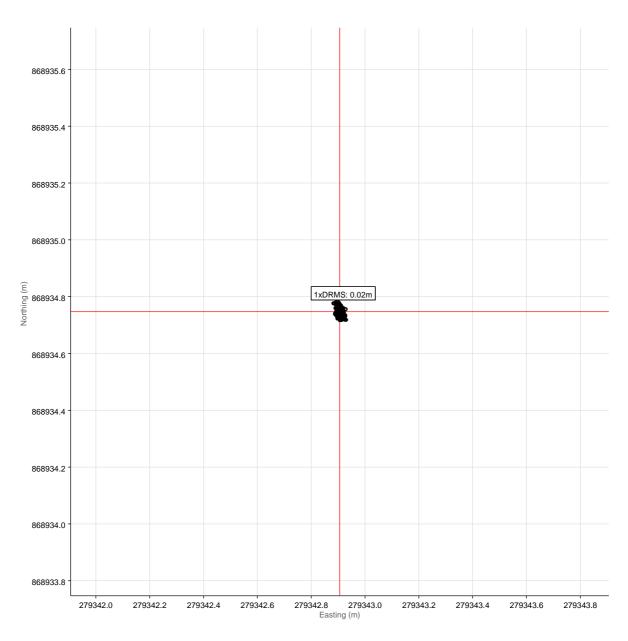


Geodetic Parameters

Name : OSGB 1936 / British National Grid [OSGB-UK Gbr02 NT]					
EPSG Code	EPSG::27700				
Local Geodetic Datum Parameters					
Datum	OSGB 1936	EPSG::6277			
Ellipsoid	Airy 1830	Airy 1830			
Semi major axis	a = 6,377,563.396 m				
Inverse flattening	1/f = 299.3249646				
Datum Transformation Parameters from ETRS89 to OSGB 1936					
OSGB 1936 to ETRS89 (1)	NTv2	EPSG::5338			
Latitude and longitude difference file	OSTN02_NTv2.gsb	OSTN02_NTv2.gsb			
Local Projection Parameters					
Map Projection	Transverse Mercator				
Grid System	British National Grid	EPSG::19916			
Latitude Origin	49°00'00.000"N				
Central Meridian	002°00'00.000"W				
Scale Factor on Central Meridian	0.999601272				
False Easting	400,000 m				
False Northing	-100,000 m				



Scatter Plot

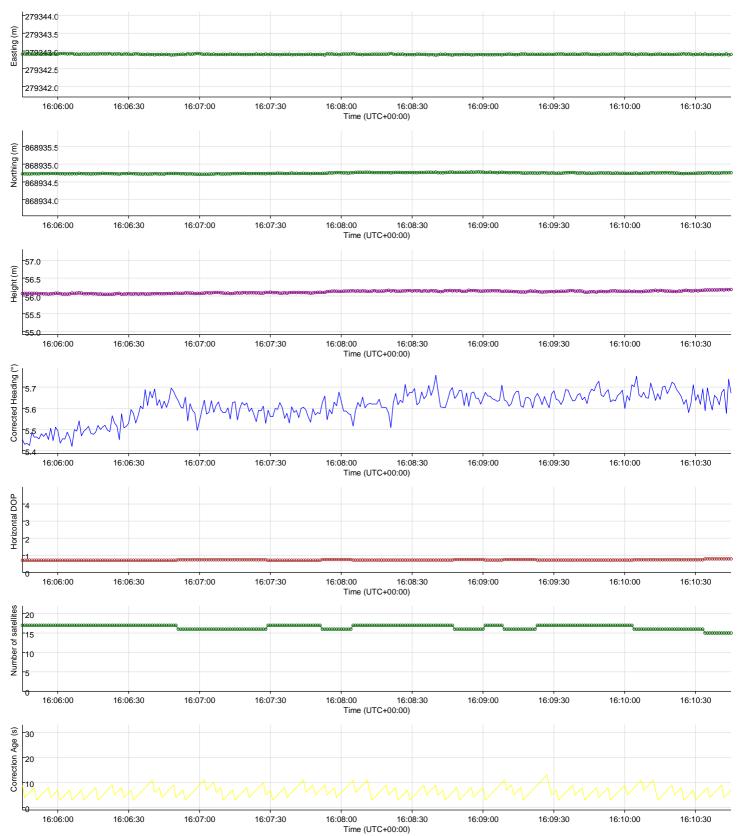


Mean Position

	Easting	Northing
Skate 3A	279,342.906m E	868,934.747m N



Time Series Plots for Skate 3A





Project ID	C1982		
Project Name	192186 Nigg East Quay Development		
Fugro OPCO	FGBNM (Fugro Great Britain North Marine)	Location	Nigg
Client	Fugro Geoservices Ltd	Vessel	Skate 3A
Comment	DTM = 6.90m, DTW = 2.40m Deck Height Above CD = 6.15m		

End Time: 08 Mar 2019, 13:21:05+00:00

Session Name: MorganMap 20190308-131604

Start Time: 08 Mar 2019, 13:16:04+00:00

Records Used: 291 of 301 Session Length: 00:05:01

Mean Position for Skate 3A CommonReferencePoint		
	OSGB 1936 / British National Grid [OSGB-UK Gbr02 NT]	ETRS89(2D)
Latitude	57°41'38.95397"N	57°41'37.90167"N
Longitude	004°01'25.58768"W	004°01'30.59877"W
Height	56.815m Ell.	56.815m Ell.
Easting	279,380.533m E(SD: ±0.01m)	
Northing	868,920.311m N(SD: ±0.02m)	
Height	4.001m Ort. (SD: ±0.02m Ort.)	

Sensors	Sensor Averages	SD
Heading	44.11°T 45.83°G	±0.0°
Pitch		
Roll		
Depth (Sounder)	0.0m	±0.00m
Depth (Manual)	0.0m	N/A

Mean Position to Waypoint			
Waypoint BH3			
Easting	279,382.000m E		
Northing	868,920.000m N		
Range	1.50m Geodetic		
Bearing TO	100.25°True		
Bearing FROM	280.25°True		
	200.20 1106		



Name : OSGB 1936 / British National Grid [OSGB-UK Gbr02 NT]					
EPSG Code	EPSG::27700				
Local Geodetic Datum Parameters	Local Geodetic Datum Parameters				
Datum	OSGB 1936	OSGB 1936 EPSG::6277			
Ellipsoid	Airy 1830				
Semi major axis	a = 6,377,563.396 m				
Inverse flattening	1/f = 299.3249646				
Datum Transformation Parameters from ET	RS89 to OSGB 1936				
OSGB 1936 to ETRS89 (1)	NTv2	EPSG::5338			
Latitude and longitude difference file	OSTN02_NTv2.gsb				
Local Projection Parameters					
Map Projection	Transverse Mercator				
Grid System	British National Grid EPSG::19916				
Latitude Origin	49°00'00.000"N				
Central Meridian	002°00'00.000"W				
Scale Factor on Central Meridian	0.999601272				
False Easting	400,000 m				
False Northing	-100,000 m				



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Project ID	C1982		
Project Name	192186 Nigg East Quay Development		
Fugro OPCO	FGBNM (Fugro Great Britain North Marine)	Location	Nigg
Client	Fugro Geoservices Ltd	Vessel	Skate 3A
Comment	DTM = 10.00m, DTW = 4.60m Deck Height Above CD = 7.98m		

Session Name: MorganMap 20190311-023904

Records Used: 301 of 301 Session Length: 00:05:01

Start Time: 11 Mar 2019, 02:39:04+00:00 End Time: 11 Mar 2019, 02:44:05+00:00

Mean Position for Skate 3A CommonReferencePoint		
	OSGB 1936 / British National Grid [OSGB-UK Gbr02 NT]	ETRS89(2D)
Latitude	57°41'37.36438"N	57°41'36.31226"N
Longitude	004°01'25.48464"W	004°01'30.49567"W
Height	58.729m Ell.	58.729m Ell.
Easting	279,380.771m E(SD: ±0.01m)	
Northing	868,871.120m N(SD: ±0.02m)	
Height	5.915m Ort. (SD: ±0.02m Ort.)	

Sensors	Sensor Averages	SD
Heading	27.61°T 29.32°G	±0.1°
Pitch		
Roll		
Depth (Sounder)	0.0m	±0.00m
Depth (Manual)	0.0m	N/A

Mean Position to Waypoint			
BH4			
279,382.000m E			
868,872.000m N			
1.51m Geodetic			
52.68°True			
232.68°True			



Name : OSGB 1936 / British National Grid [OSGB-UK Gbr02 NT]				
EPSG Code	EPSG::27700			
Local Geodetic Datum Parameters				
Datum	OSGB 1936	EPSG::6277		
Ellipsoid	Airy 1830			
Semi major axis	a = 6,377,563.396 m			
Inverse flattening	1/f = 299.3249646			
Datum Transformation Parameters from E	ETR 589 to OSGB 1936			
OSGB 1936 to ETRS89 (1)	NTv2	NTv2 EPSG::5338		
Latitude and longitude difference file	OSTN02_NTv2.gsb			
Local Projection Parameters				
Map Projection	Transverse Mercator			
Grid System	British National Grid	British National Grid EPSG::19916		
Latitude Origin	49°00'00.000"N	49°00'00.000"N		
Central Meridian	002°00'00.000"W	002°00'00.000"W		
Scale Factor on Central Meridian	0.999601272	0.999601272		
False Easting	400,000 m			
False Northing	-100,000 m	-100,000 m		



Project ID	C1982		
Project Name	192186 Nigg East Quay Development		
Fugro OPCO	FGBNM (Fugro Great Britain North Marine)	Location	Nigg
Client	Fugro Geoservices Ltd	Vessel	Skate 3A
Comment	DTM = 12.50m, DTW = 3.20m Deck Height Above CD = 5.75m		

End Time: 13 Mar 2019, 17:53:39+00:00

Session Name: MorganMap 20190313-174839

Start Time: 13 Mar 2019, 17:48:39+00:00

Records Used: 296 of 301 Session Length: 00:05:00

Mean Position for Skate 3A CommonReferencePoint		
	OSGB 1936 / British National Grid [OSGB-UK Gbr02 NT]	ETRS89(2D)
Latitude	57°41'35.68569"N	57°41'34.63376"N
Longitude	004°01'25.45040"W	004°01'30.46137"W
Height	56.419m Ell.	56.419m Ell.
Easting	279,379.788m E(SD: ±0.01m)	
Northing	868,819.209m N(SD: ±0.02m)	
Height	3.605m Ort. (SD: ±0.04m Ort.)	

Sensors	Sensor Averages	SD
Heading	55.42°T 57.13°G	±0.0°
Pitch		
Roll		
Depth (Sounder)	0.0m	±0.00m
Depth (Manual)	0.0m	N/A

Mean Position to Waypoint		
Waypoint BH5		
Easting	279,367.000m E	
Northing	868,808.000m N	
Range	17.01m Geodetic	
Bearing TO	227.05°True	
Bearing FROM	47.05°True	



Name : OSGB 1936 / British National Grid [OSGB-UK Gbr02 NT]				
EPSG Code	EPSG::27700			
Local Geodetic Datum Parameters				
Datum	OSGB 1936	EPSG::6277		
Ellipsoid	Airy 1830			
Semi major axis	a = 6,377,563.396 m			
Inverse flattening	1/f = 299.3249646			
Datum Transformation Parameters from E	TRS89 to OSGB 1936			
OSGB 1936 to ETRS89 (1)	NTv2	NTv2 EPSG::5338		
Latitude and longitude difference file	OSTN02_NTv2.gsb	OSTN02_NTv2.gsb		
Local Projection Parameters				
Map Projection	Transverse Mercator			
Grid System	British National Grid	British National Grid EPSG::19916		
Latitude Origin	49°00'00.000"N			
Central Meridian	002°00'00.000"W			
Scale Factor on Central Meridian	0.999601272	0.999601272		
False Easting	400,000 m	400,000 m		
False Northing	-100,000 m	-100,000 m		



Project ID	C1982		
Project Name	192186 Nigg East Quay Development		
Fugro OPCO	FGBNM (Fugro Great Britain North Marine) Nigg		
Client	Fugro Geoservices Ltd	Vessel	Skate 3A
Comment	DTM = 13.80m, DTW = 2.30m Deck Height Above CD = 4.20m		

Session Name: MorganMap 20190316-100855

Start Time: 16 Mar 2019, 10:08:56+00:00 End Time: 16 Mar 2019, 10:13:56+00:00

Records Used: 301 of 301 Session Length: 00:05:00

Mean Position for Skate 3A CommonReferencePoint			
	OSGB 1936 / British National Grid [OSGB-UK Gbr02 NT]	ETRS89(2D)	
Latitude	57°41'33.34574"N	57°41'32.29407"N	
Longitude	004°01'25.20824"W	004°01'30.21914"W	
Height	54.946m Ell.	54.946m Ell.	
Easting	279,381.637m E(SD: ±0.01m)		
Northing	868,746.754m N(SD: ±0.01m)		
Height	2.133m Ort. (SD: ±0.03m Ort.)		

Sensors	Sensor Averages	SD
Heading	88.51°T 90.22°G	±0.0°
Pitch		
Roll		
Depth (Sounder)	0.0m	±0.00m
Depth (Manual)	0.0m	N/A

Mean Position to Waypoint		
Waypoint BH6		
Easting	279,382.000m E	
Northing	868,746.000m N	
Range	0.84m Geodetic	
-		
Bearing TO Bearing FROM	152.56°True 332.56°True	



Name : OSGB 1936 / British National Grid [OSGB-UK Gbr02 NT]				
EPSG Code	EPSG::27700			
Local Geodetic Datum Parameters				
Datum	OSGB 1936	EPSG::6277		
Ellipsoid	Airy 1830			
Semi major axis	a = 6,377,563.396 m			
Inverse flattening	1/f = 299.3249646			
Datum Transformation Parameters from E	TRS89 to OSGB 1936			
OSGB 1936 to ETRS89 (1)	NTv2	NTv2 EPSG::5338		
Latitude and longitude difference file	OSTN02_NTv2.gsb	OSTN02_NTv2.gsb		
Local Projection Parameters				
Map Projection	Transverse Mercator			
Grid System	British National Grid	British National Grid EPSG::19916		
Latitude Origin	49°00'00.000"N			
Central Meridian	002°00'00.000"W			
Scale Factor on Central Meridian	0.999601272	0.999601272		
False Easting	400,000 m	400,000 m		
False Northing	-100,000 m	-100,000 m		



Project ID	C1982		
Project Name	192186 Nigg East Quay Development		
Fugro OPCO	FGBNM (Fugro Great Britain North Marine) Nigg		
Client	Fugro Geoservices Ltd	Vessel	Skate 3A
Comment	DTM = 11.20m, DTW = 6.40m Deck Height Above CD = 7.19m		

End Time: 07 Mar 2019, 20:17:14+00:00

Session Name: MorganMap 20190307-201214

Start Time: 07 Mar 2019, 20:12:14+00:00

Records Used: 299 of 301 Session Length: 00:05:00

Mean Position for Skate 3A CommonReferencePoint			
	OSGB 1936 / British National Grid [OSGB-UK Gbr02 NT]	ETRS89(2D)	
Latitude	57°41'33.41635"N	57°41'32.36476"N	
Longitude	004°01'21.01763"W	004°01'26.02909"W	

Height	57.844m Ell.	57.844m Ell.
Easting	279,451.072m E(SD: ±0.01m)	
Northing	868,746.866m N(SD: ±0.01m)	
Height	5.035m Ort. (SD: ±0.02m Ort.)	

Sensors	Sensor Averages	SD
Heading	83.63°T 85.34°G	±0.0°
Pitch		
Roll		
Depth (Sounder)	0.0m	±0.00m
Depth (Manual)	0.0m	N/A

Mean Position to Waypoint	
Waypoint	BH7
Easting	279,450.000m E
Northing	868,746.000m N
Range	1.38m Geodetic
Bearing TO	229.36°True
Bearing FROM	49.36°True



Name : OSGB 1936 / British National Grid [C	SGB-UK Gbr02 NT]	
EPSG Code	EPSG::27700	
Local Geodetic Datum Parameters		
Datum	OSGB 1936	EPSG::6277
Ellipsoid	Airy 1830	
Semi major axis	a = 6,377,563.396 m	
Inverse flattening	1/f = 299.3249646	
Datum Transformation Parameters from ET	RS89 to OSGB 1936	
OSGB 1936 to ETRS89 (1)	NTv2	EPSG::5338
Latitude and longitude difference file	OSTN02_NTv2.gsb	
Local Projection Parameters	_	
Map Projection	Transverse Mercator	_
Grid System	British National Grid	EPSG::19916
Latitude Origin	49°00'00.000"N	
Central Meridian	002°00'00.000"W	
Scale Factor on Central Meridian	0.999601272	
False Easting	400,000 m	
False Northing	-100,000 m	



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Project ID	C1982		
Project Name	192186 Nigg East Quay Development		
Fugro OPCO	FGBNM (Fugro Great Britain North Marine)	Location	Nigg
Client	Fugro Geoservices Ltd	Vessel	Skate 3A
Comment	DTM = 6.00m, DTW = 1.60m Dech Heigh	nt Above CD = 5.1	8m

Session Name: MorganMap 20190305-114536

Records Used: 300 of 301 Session Length: 00:05:00

Start Time: 05 Mar 2019, 11:45:36+00:00	End Time: 05 Mar 2019, 11:50:36+00:00	S

Mean Position for Skate 3A CommonReferencePoint		
	OSGB 1936 / British National Grid [OSGB-UK Gbr02 NT]	ETRS89(2D)
Latitude	57°41'35.22782"N	57°41'34.17603"N
Longitude	004°01'21.30072"W	004°01'26.31222"W
Height	55.914m Ell.	55.914m Ell.
Easting	279,448.057m E(SD: ±0.01m)	
Northing	868,803.004m N(SD: ±0.01m)	
Height	3.104m Ort. (SD: ±0.02m Ort.)	

Sensors	Sensor Averages	SD
Heading	46.50°T 48.21°G	±0.0°
Pitch		
Roll		
Depth (Sounder)	0.0m	±0.00m
Depth (Manual)	0.0m	N/A

Mean Position to Waypoint	
Waypoint	BH8
Easting	279,448.000m E
Northing	868,803.000m N
Range	0.06m Geodetic
Bearing TO	264.09°True
Bearing FROM	84.09°True
Bearing FRON	04.09 1100



Name : OSGB 1936 / British National Grid	[OSGB-UK Gbr02 NT]		
EPSG Code	EPSG::27700		
Local Geodetic Datum Parameters			
Datum	OSGB 1936	EPSG::6277	
Ellipsoid	Airy 1830		
Semi major axis	a = 6,377,563.396 m		
Inverse flattening	1/f = 299.3249646		
Datum Transformation Parameters from E	TRS89 to OSGB 1936		
OSGB 1936 to ETRS89 (1)	NTv2	EPSG::5338	
Latitude and longitude difference file	OSTN02_NTv2.gsb		
Local Projection Parameters			
Map Projection	Transverse Mercator		
Grid System	British National Grid	EPSG::19916	
Latitude Origin	49°00'00.000"N		
Central Meridian	002°00'00.000"W		
Scale Factor on Central Meridian	0.999601272		
False Easting	400,000 m		
False Northing	-100,000 m		



H. MARINE ACTIVITIES

Daily Progress Reports

32 Pages

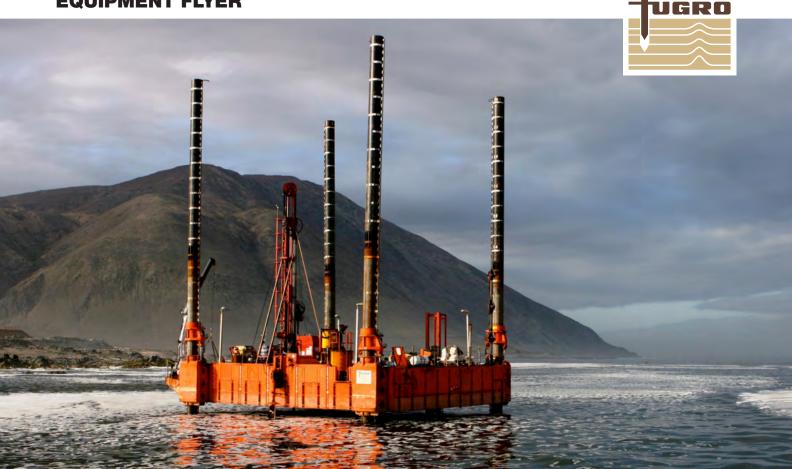


I. VESSEL AND PLANT DATA SHEETS

Skate 3A

Comacchio MC1200

Terracore S-Geobor



FUGRO SKATE 3

The Skate 3 range consists of medium sized, high payload, container transportable jack-up platforms. These platforms have low international transport cost coupled with high performance capabilities.

Skate 3's modular design means that jack-ups can be provided in a variety of sizes, with deck areas ranging from 178 $m^{\rm 2}$ to 238.1 m² and the capability of operating in water depths between 1-30 m. Each craft in the Skate range has a rapid deck elevating system and is equipped with four legs mounted externally to provide maximum stability.

All pontoon components and equipment are designed around the container freight concept. In transit, the pontoons double as containers in which the jack-up legs, power units and all other ancillary equipment are housed. This allows cost-effective international transportation by road, rail or container ship. Assembly and

commissioning of the jack-up is achieved in under two shifts.

The jack-ups can be fitted with one of the range of Fugro hydraulic thrusters to provide self-propulsion. In compact configurations, these fast elevating, self propelled jack-up craft are ideal for confined intertidal areas, where swift, accurate moving and positioning is required. In their larger configuration, Skate 3 jack-ups are capable of working safely in exposed open seas.

For maximum safety, they are equipped with rigid steel bulwarks and 110 V fluorescent lights providing full inboard and outboard illumination for 24 hour working.

All Fugro jack-ups are equipped with VHF radios, life saving and first aid equipment, and high speed outboard driven personnel launches.

Operated and maintained exclusively by Fugro's trained and experienced marine engineers, the Skate 3 jack-up is a versatile, stable, self-elevating platform for overwater work.



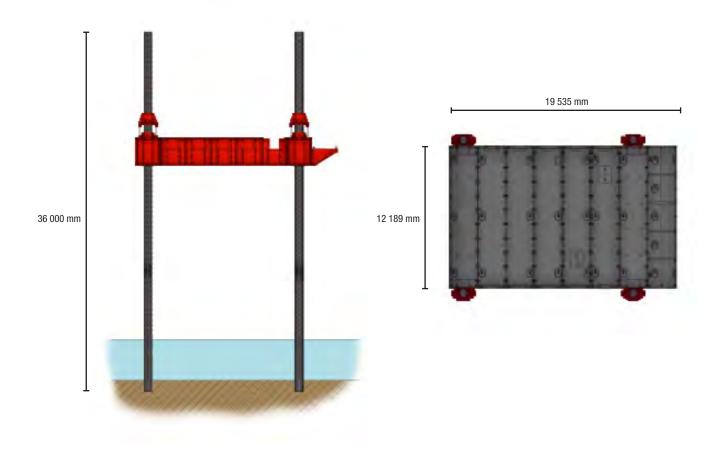
Skate 3 on site in Uruguay.



SPECIFICATIONS

Skate 3 Jack-up Barge

Max. separation:	32 m
Working draft:	0.985 m
No. of containers:	7
Deck area:	238.1 m ²
Leg size:	762 mm diameter
Elevating system:	Hydraulic ram & duo pin rack
Accommodation:	Workshop/canteen container
/ locommodation.	nontonop/ cancorr container



WWW.FUGRO.COM

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FUGRO COMACCHIO MC1200

The MC1200 is a hydraulic skid mounted drilling rig capable of operating all rotary and/or rotary percussive drilling systems.

During the design stage, Fugro worked closely with Comacchio to ensure the development of a fully integrated drilling unit capable of withstanding both the complex and rigorous nature of marine works. For example, the MC1200 has a unique triple holding clamp and breakout arrangement for handling the various casings required. These are complimented by a set of hydraulically adjusted drill string centralisers.

The main mast is equipped with a crane boom and a drill string manipulator arm that enables drill rods and casings to be manoeuvred to and from the working deck with minimal manual intervention.

The main power supply is fully silenced and the hydraulics operate a closed system with biodegradable oil.

The control console is deployed on a multipositional arm, providing the driller with an uninterrupted view of all drilling activities. All rotating parts are guarded within a fully interlocked cage.

The MC1200 is suitable for all aspects of rotary soil investigations, core drilling as well as specialised civil engineering works such as micropiles, anchors and ground consolidation works.



MC1200 deck layout on Excalibur jack-up.



SPECIFICATIONS

MC1200 Marine Drill

Power Pack

Diesel engine:	New generation 132 kW DEUTZ diesel engine series 2012
Engine power:	132 kW (180 HP)/2300 rpm
Main pump:	2 x 190 lt/min./2 x 50, 2 gal/min.
Oil tank:	400 lt / 105.6 gal
Fuel tank:	350 lt / 92.5 gal
Mast	
Mast	
Feed stroke:	4750/7200/10 200 mm
	4750/7200/10 200 mm 7100/9550/12 550 mm/ 23,3/31,3/41,2 ft
Feed stroke:	

Clamps

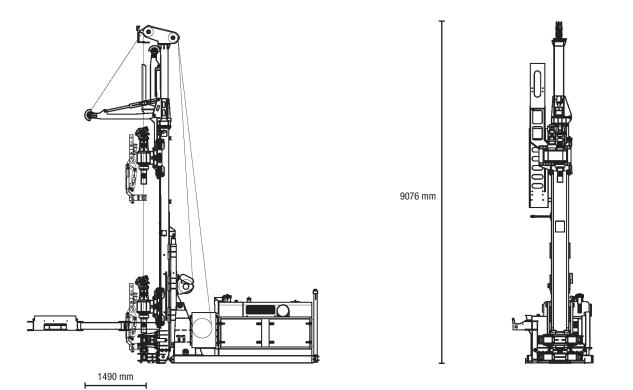
Min. handling:	45 mm / 1,8"
Max. handling:	360 mm /14.1"
Clamping force:	280 kN / 62 946 lbs
Breaking torque:	3500 daNm / 25 814 lb ft

Rotary Head

Gears:	6
Max torque:	1230 daNm/ 9072 lb ft
Max speed:	340 (550) rpm
Head passage:	93 mm/3,6"
Swivel passage:	2"

Winch

Max line pull:	2000 daN/4496 lbs	
Drum capacity:	50 mt/164 ft	
Rope speed:	30 mt/min./98 ft/min	
Rope diameter:	10 mm/0.39"	



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FUGRO GEOBOR-S

With 40 years of drilling experience, Fugro has examined and tested many methods of coring - aiming to minimise core disturbance and maximise core recovery and quality.

GEOBOR-S SYSTEM

Our experience leads us to recommend the use of Geobor-S triple tube wireline drilling system, which has been specially developed for core drilling and undisturbed sampling in a wide variety of soil and rock formations. The Geobor-S is a triple tube core barrel which cuts an "S" size core sample. It has a plastic core liner, which is seated within the inner barrel assembly, considerably reducing friction between the core and the inner tube and enhancing core recovery.

SAMPLE RECOVERY

A nominal 102 mm diameter core sample is recovered from this system, generally in 1.5 m lengths.

The relatively large diameter enhances drilling performance whilst obtaining high-quality core samples, for soil and rock testing.

We provide a wide range of coring bits including but not limited to:

- annular and face discharge,
- surface set and impregnated diamond,
- tungsten carbide saw tooth, н.
- PCD (polycrystalline diamond).

The core barrel itself is designed for flushing with water, mud or air, and can easily be adapted for most soil and rock conditions by the use of an appropriate core bit or non-coring device.





CORE LINER

The core liner is a rigid, transparent PVC tube with a wall thickness of approximately 1 mm that fits snugly inside the Geobor-S core barrel inner tube, trimmed to 1.5 m lengths. This is provided for all coring works.

The core samples are recovered within the core liner tube and removed from the inner barrel between each consecutive run. The sample can be retained within the core liner tube sealed at both ends and placed into the core box. This minimises handling induced core disturbance, both on the drill deck and during subsequent transport of the core sample to the onshore core store and testing laboratories.

From our experience, the combination of the Geobor-S system used with core liners:

- reduces coring and transport induced disturbance,
- maintains sample quality,
- significantly enhances recovery especially in mixed formations.

Furthermore, we monitor the effectiveness of the various bit types throughout drilling, selecting bits appropriate to varying ground conditions as each borehole progresses. This allows us to maximise core quality and recovery in an appropriate and cost effective manner.

Four methods can be used to suit varying ground conditions:

- In medium to hard formations, many types of core bits can be used depending on the formation.
- For coring in soft soil formations, TC-set bits are used and the bit consists of two parts (pilot and reamer).



Geobor-S Core Liner.

Technical Specifications	Metric	Imperial
Hole diameter, method 1 & 4:	146.0 mm	5.75 in
Hole diameter, method 2 & 3:	150.0 mm	5.90 in
Drill bit outer diameter:	145.6 / 149.6 mm	5.73 / 5.90 in
Drill rod outer diameter:	139.7 mm	5.58 in
Bit kerf, method 1:	21.8 mm	0.86 in
Bit kerf, method 2 & 3:	23.8 mm	0.94 in
Core diameter:	102.0 mm	4.05 in
Hole area (od 146/150):	167.3 / 176.7 cm ²	26.0 / 27.4 in ²
Core area:	81.7 cm ²	12.7 in ²
Cutting area in % of hole area:	51.7 %	51.7 %

- For coring in very soft or loose formations, TC-set bits are used. The bit is in two parts as in method two but one core lifter is extended to run 25 mm in front of the bit.
- For coring in very soft, loose formations with varying layers. The spring-loaded inner tube assembly is extended to run in front of the bit, but is retractable for optimised adaptation to the consistency and density of the ground.

OTHER ADVANTAGES

The advantages of wireline coring over conventional coring (using drill rods and core barrels) include:

- Separate temporary lining casing for borehole stabilisation may not be required.
- The drill string is more rigid.
- The core barrel may be recovered without removing the outer drill rod, thus reducing disturbance to the borehole wall.
- The small annulus between the drill pipe and borehole wall requires significantly lower volumes of flush fluid compared to conventional drilling to achieve adequate uphole velocity for removal of cuttings from the hole. As a consequence, erosion of the formation (particulary at the bit face) is reduced.

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