Nigg East Quay -
Best Practicable Environmental Option Report

February 2022

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Client:	Global Energy Group Nigg
Document number:	8691
Project number:	671906
Status:	Final R2
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Date of issue:	9 February 2022
Filename:	Nigg East Quay BPEO_Final Rev 2

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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 ≤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.	Yes
	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.

Table3.1: BPEO Detailed Assessment Criteria

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

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.

Table 3.3: BPEO Environmental Assessment

Criteria	Landfill	Sea Disposal
Safety Implications	Double handling of material increases the potential for accidents to occur. Work would be undertaken in accordance with H&S legislation.	Minimal handling of material required as it is directly placed at the disposal site. 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 50,500m^3) of dredged material has been set.

The assumptions to calculate the costs are as follows:-

- Dredging costs are estimated to be £3.21 per m^3;
- 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 8[1]).

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

Table 3.4: BPEO Cost Analysis (based on 100,000 tonnes only)

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**

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.

Table 3.5: BPEO Summary

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

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 18µg/kg. RAL 1 for Dibenz(ah)anthracene is 10µg/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 135µg/kg. PELs (Marine) have been adopted from the Canadian Environmental Quality Guidelines[2]If 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] http://www.ccme.ca/en/resources/canadian_environmental_quality_guidelines/

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

Key Receptor	Brief Summary of Potential Effects on Receptor	Further Consideration Required?	Comment
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.	No	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 https://www.gov.uk/guidance/water-framework-directive-assessment-estuarine-and-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 Rosemarkie[3].

Shellfish protected waters are located at Udale and Cromarty Bay south of Invergordon and approximately 2.6 Km south west from the development site[4].

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] https://apps.sepa.org.uk/bathingwaters/Locations.aspx
[4] https://www.gov.scot/binaries/content/documents/govscot/publications/map/2016/09/shellfish-water-protected-areas-maps/documents/323d3324-f111-4fe0-a702-59ac4bf28953/323d3324-f111-4fe0-a702-59ac4bf28953/govscot%3Adocument/Cromarty%2BBay%2B-%2Bshellfish%2Bwater%2Bprotected%2Barea%2Bmap.pdf

6 CONCLUSIONS

In summary, the BPEO for the proposed disposal of ≤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, https://www.ccme.ca/en/resources/canadian_environmental_quality_guidelines/

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:

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Issue	**Document Status**	**Prepared**	**Checked**	**Approved**	**Date**

Our ref: G191005U(01)
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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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APPENDICES

TABLES IN THE MAIN TEXT

ABBREVIATIONS

ATN	Abortive Test Notice
BS	British Standard
bsl	Below seabed level
bgl	Below ground level
bml	Below mud level
CD	Chart Datum
CM	Central Meridian
GRS	Geodetic Reference System
LAT	Lowest Astronomical Tide
MSL	Mean Sea Level
OD	Ordnance Datum Newyln
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.

Table 3.1: Schedule of Exploratory Boreholes

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 Moray Firth is 2.22m below OD (NTSLF, 2019)				

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.

Table 3.3: Health and Safety Statistics

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

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.

Table 3.5: Project Geodetic and Projection Parameters

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)

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 60º 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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NATIONAL TIDAL AND SEA LEVEL FACILITY (NTSLF), 2019. Chart and Ordnance Datum [Online] Accessed 15 March 2019.

NORBURY, D.R., CHILD, G.H., and SPINK, T.W. 1986. 'A critical review of Sections 8 (BS 5930:1981), Soil and rock descriptions, Geological Society Engineering Geology Special Publication No 2, Proceedings of 20th Regional Meeting of the Engineering Group, Guildford

APPENDICES

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

279300 279400 279500

868900 868800

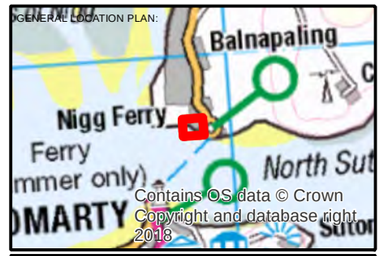
N

BH01 BH02 BH03 BH04 BH05 BH06 BH07 BH08

2.0 4.0 6.0 8.0

Coordinate System: British National Grid
Projection: Transverse Mercator
Datum: OSGB 1936

GENERAL LOCATION PLAN:



GENERAL LOCATION PLAN SCALE:
0 0.0125 0.025 Kilometres

PLAN SCALE:
0 5 10 20 Metres

Legend

- Cable Percussion Boreholes
- Cable Percussion and Rotary Cored Boreholes
- Proposed Quay Development
- Land Contours
- Offshore Contours

Notes:
1. Inset map provided by ESRI UK
2. Sheet size: A3
3. Coordinate system: British National Grid

Coordinate System: British National Grid
Projection: Transverse Mercator
Datum: OSGB 1936
False Easting: 400,000.0000
False Northing: -100,000.0000
Central Meridian: -2.0000
Scale Factor: 0.9996
Latitude Of Origin: 49.0000
Units: Meter

CLIENT: GLOBAL ENERGY NIGG LTD.

PROJECT: East Quay Development - Marine Ground Investigation

TITLE: Exploratory Hole Site Plan

GIS BY: EMM	DATE: 17/04/19
CHECKED BY: NHA	DATE: 24/04/19
APPROVED BY: NHA	DATE: 24/04/19

CONTRACT NO.: G191005U FIGURE NO.: B.1

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C. EXPLORATORY HOLE RECORDS

C.1 Keysheets

C.2 Borehole Records

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 classification of rock – Part 1 Identification and description' as appropriate, and BS1377:1990 'Methods of test for soils for civil engineering purposes', unless stated otherwise. Sampling 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/cm^2 to the nearest 0.25 kg/cm^2 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

Soil Types

Coarse grained, Non cohesive

- Boulders
- Cobbles
- Gravel
- Sand

Fine grained, Cohesive

- Silt
- Clay

Other Soil Types

- Topsoil
- Peat
- Made Ground

Note: Composite soil types may be signified by combined symbols.

Rock Types

Sedimentary

- Sandstone
- Siltstone
- Conglomerate
- Chalk
- Limestone
- Breccia
- Coal
- Mudstone/Claystone/Shale

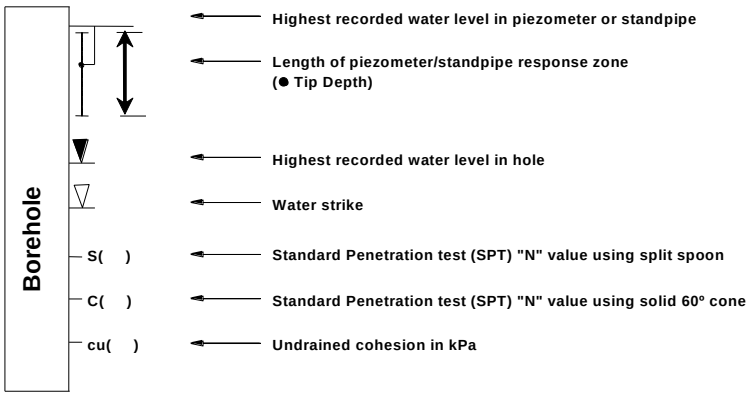
Metamorphic

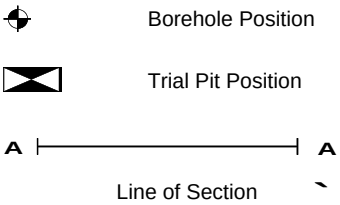
- Coarse/Medium grained
- Fine grained

Igneous

- Coarse grained
- Medium grained
- Fine grained

KEY TO SITE PLANS AND CROSS SECTIONS





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

Bedding Spacing & Planar Structures *	Spacing (mm)		Discontinuity Spacing
		>6000	Extremely widely spaced
Very thickly bedded	>2000	2000-6000	Very widely spaced
Thickly bedded	600	- 2000	Widely spaced
Medium bedded	200	- 600	Medium spaced
Thinly bedded	60	- 200	Closely spaced
Very thinly bedded	20	- 60	Very closely spaced
Thickly laminated (Sedimentary) narrow (Metamorphic & Igneous)	6 – 20	<20	Extremely closely spaced
Thinly laminated (Sedimentary) Very narrow (Metamorphic & Igneous)	<6		

* 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

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
.

ROCK CORES

ROCK CORE SIZES

The core barrels commonly used by the Company in site investigations are as follows:

Core Barrel Type	Borehole Diameter (mm)	Standard Core Size (mm)	Core Size using Rigid Plastic Liner (mm)	Casing Size or Type	Casing O.D (mm)	Casing I.D (mm)
STANDARD 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
WIRELINE SIZES						
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 SIZES						
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 STANDARD BARRELS						
4.12F TRIEFUS	105.2	74.7	72	PX	139.7	122.3
5.5x4C SINGLE TUBE	139.7	101.6	-	SX	168.3	147.7
B116	116	102	-	PX	139.7	122.3
B146	146	132	-	SX	168.3	147.7

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 Type	Particle Size (mm)		Visual Identification
VERY COARSE SOILS	BOULDERS		200	Large Boulders >630mm. These soils only seen complete in pits or exposures. Often difficult to recover from boreholes.
	COBBLES			
COARSE SOILS (Typically over 65% Sand and Gravel Sizes)	GRAVEL	coarse	63	Easily visible to naked eye; particle shape can be described, grading can be described. Well graded: wide range of grain sizes, well distributed. Poorly graded: not well graded. (May be uniform: size of most particles lies between narrow limits; or gap graded; an intermediate size of particle is markedly under represented).
		medium	20	
		fine	6.3	
	SAND	coarse	2	Visible to naked eye; no cohesion when dry; grading can be described. Well graded and poorly graded: as above
		medium	0.63	
		fine	0.2	
FINE SOILS (Typically over 35% Silt and Clay Sizes)	SILT	coarse	0.063	Only coarse silt visible with hand lens; exhibits little plasticity and marked dilatancy; slightly granular or silky to touch. Disintegrates in water; lumps dry quickly; possesses cohesion but powders easily between fingers. Term "SILT" or "CLAY" must be used, "SILT/CLAY" not allowed. Dry lumps can be broken but not powdered between the fingers; they also disintegrate under water but more slowly than silt; smooth to the touch; exhibits plasticity but no dilatancy; sticks to the fingers and dries slowly; shrinks appreciably on drying usually showing cracks. Intermediate and high plasticity clays show these properties to a moderate and high degree, respectively.
		medium	0.02	
		fine	0.0063	
	CLAY		0.002	
ORGANIC SOILS	ORGANIC CLAY, SILT or SAND	Varies		Contains varying amounts of organic vegetable matter - defined by colour: grey - slightly organic; dark grey – organic; black – very organic.

Composite Soil Types
(Mixtures of basic soil types)

Scale of secondary constituents with coarse and very coarse soils. Term before, description after principal

Term before (term in ' [ ] ' may be used for 2ndry parts, matrix etc)	Principal Soil Type	Description after	Approx % 2ndry soil type
Slightly (sandy*) [occasional / little]	SAND, GRAVEL; (COBBLES or BOULDERS See Notes)	Used to describe components of secondary constituents. e.g. Gravel is fine and medium subangular fine sandstone and mudstone.	<5
--(sandy*) [some]			5 – 20
Very (sandy*) [much / many]			20 to 40†
--		and (sand*) or and (cobbles+)	50†

* Fine or coarse soil type as appropriate
\+ Very coarse soil type – see Notes
† described as fine soil depending on behaviour

Scale of secondary constituents with fine soils. Terms before, description after principal constituent.

Term before	Principal Soil Type	Description after	Approx % 2ndry soil type
Slightly (sandy*)	CLAY or SILT	Used to describe components of secondary constituents e.g. sandy gravelly CLAY. Gravel is coarse rounded quartzite	<35
-- (sandy*)			35 to 65†
Very (sandy*)			>65†

* Coarse soil type as appropriate
† or described as coarse soil depending on mass behaviour

EXAMPLES OF COMPOSITE TYPES
(indicating preferred order for description)

Loose brown very sandy subangular coarse GRAVEL with many pockets (<5mm across) of soft grey clay.

Firm thinly interlaminated brown SILT and CLAY.

Dense light brown clayey fine and medium SAND.

Density / Consistency / Peat Condition

For very coarse soils qualitative description by inspection of voids and particle packaging.

Standard Penetration Test in Boreholes for Coarse Soils

No of blows	Relative Density
<4	Very Loose
4-10	Loose
10-30	Medium Dense
30-50	Dense
>50	Very Dense
Slightly cemented	Visual Examination: pick removes soil in lumps which can be abraded.

Silty CLAY or clayey SILT – use prefix only when secondary constituent has significant affect on material characteristics. Terms 'slightly' or 'very' not applicable.

Consistency

Very soft	Finger easily pushed in up to 25mm. Exudes between fingers
Soft	Finger pushed in up to 10mm. Moulded by fingers
Firm	Thumb makes impression easily. Rolls to thread
Stiff	Can be indented slightly by thumb. Crumbles if rolled
Very Stiff	Indented by thumbnail. Cannot be moulded
Hard	Can be scratched by thumb nail
Firm Peat	Fibres compressed together
Spongy Peat	Very compressible, open
Plastic Peat	Moulded in hand, smears

Structure

Term	Field Identification
Homo-geneous	Deposit consists essentially of one type
Interbedded or interlaminated	Alternating layers of varying types. Pre-qualified by thickness term if in equal proportions. Otherwise thickness of, and spacing between, subordinate layers defined
Hetero-geneous	A mixture of types
Weathered (granular)	Particles may be weakened and may show concentric layering
Weathered (cohesive)	Usually has crumb or columnar structure
Fissured	Breaks into blocks along unpolished discontinuities
Sheared	Breaks into blocks along polished discontinuities
Intact	No fissures
Fibrous Peat	Plant remains recognisable and retain some strength. When squeezed only water, no solids
Pseudo-fibrous Peat	Plant remains recognisable, strength lost. Partial decomposition. Turbid water when squeezed, <50% solids
Amorphous Peat	Recognisable plant remains absent, full decomposition. When squeezed only paste with >50% solids
Gyttja	Decomposed plant & animal remains, maybe inorganic constituents
Humus	Plant remains, living organisms & inorganic constituents in topsoil

Interval Scales

Scale of Bedding Spacing	Mean Spacing (mm)	Scale of Spacing of Other Discontinuities / [Blocks]
Very thickly bedded	over 2000	Very widely spaced / [Very large]
Thickly bedded	2000-600	Widely spaced / [Large]
Medium bedded	600-200	Medium spaced / [Medium]
Thinly bedded	200-60	Closely spaced / [Small]
Very thinly bedded	60-20	Very closely / [Very small]
Thickly laminated	20-6	Extremely closely spaced
Thinly laminated	under 6	

Spacing terms may also be used for distance between partings, isolated beds or laminae, desiccation cracks, rootlets etc. Terms such as partings or dustings may be used for laminae less than 2mm and less than 0.6mm respectively.

Discontinuity Shape (See Standard for Persistence/Openness)	Small scale (mm's) rough, smooth Medium scale (cm's) planar, stepped, undulating Large scale (m's) wavy, curved, straight

Particle Nature

Particle Shape & Form

Very angular
(Sub) angular
(Sub) rounded
Well rounded

Low Sphericity
Flat or Elongate

High Sphericity
Cubic

Particle Surface Texture

Rough

Smooth

Polished

NOTES Identification and descriptive method, and descriptions, generally in accordance with BS5930:1999 Section 6 clauses 41 and 43 and BS EN ISO 14688-1:2002
Additional notes relating to BS EN ISO 14688-2:2004 – modified terms for content of secondary fraction given in Annex B Table B1 are not comparable to 5930 and are not be used.
Organic Content :- Low – 2 to 6%; Medium - 6 to 20%; High - >20%. Terms not used on borehole records
Carbonate content :- Only noted if field test with dilute HCl undertaken – Carbonate free if no effervescence; Calcareous if slight effervescence; Highly calcareous if strong reaction
Undrained shear strength :- terms from laboratory or in situ tests not given on borehole records.
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

Contract Name	Nigg Energy Park, East Quay Development			Location ID
Client	Global Energy Nigg Ltd			**BH01**
Fugro Reference	G191005U			
Coordinates (m)	E279383.70 N868963.58	Ground Elevation (m Datum)	0.85	Sheet 1 of 3
Hole Type	Cable Percussion and Rotary Coring			Status: Draft

Depth (m)	Sampling and In Situ Testing			Core Recovery				Strata Details						Groundwater	
	Type	No.	Test Results	TCR (%)	SCR (%)	RQD (%)	FI (-)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation
0.00 - 0.50	D	2							Brown slightly gravelly, locally gravelly, SAND with frequent shell fragments (<1 x 1mm). Sand is fine to coarse. Gravel is subangular and subrounded fine to coarse of mixed lithologies.					
0.00 - 0.50	ES	1												
0.50 - 1.00	D	4								(1.00)				
0.50 - 1.00	ES	3												
1.00 - 1.50	D	6						1		1.00	-0.15			
1.00 - 1.50	ES	5							Greyish brown SAND with occasional shell fragments (<1 x 1 mm) and occasional mica flakes (<2 x 2mm).					
1.50 - 2.00	D	8												
1.50 - 2.00	ES	7												
2.00 - 2.50	D	10						2						
2.00 - 2.50	ES	9												
										(2.80)				
2.50 - 3.00	D	12												
2.50 - 3.00	ES	11												
3.00 - 3.50	D	14						3						
3.00 - 3.50	ES	13												
3.80 - 4.00	D	16								3.80	-2.95			
3.80 - 4.00	ES	15								(0.20)				
4.00 - 4.50	D	18						4	Soft dark brownish grey sandy CLAY with abundant mica flakes (<2 x 2mm) and sulphureous odour. Sand is fine and medium.	4.00	-3.15			
4.00 - 4.50	ES	17							Brown SAND with frequent mica flakes (<2 x 2mm).					
4.50 - 5.00	D	20								(1.00)				
4.50 - 5.00	ES	19												
5.00 - 5.50	D	22						5		5.00	-4.15			
5.00 - 5.50	ES	21							Brown SAND with occasional angular fragments (<60 x 60 x 40mm) of cemented sand (possible lens), frequent mica flakes (<2 x 2mm) and rare gravel and cobbles. Sand is fine to coarse. Becomes gravelly with depth. Gravel is subangular and subrounded fine to coarse of mixed lithologies including sandstone. Cobbles (<120 x 100 x 80mm) are subangular of gneiss.					
5.50 - 6.00	D	24												
5.50 - 6.00	ES	23												
										(1.70)				
6.00 - 6.50	D	26						6	Below 6.00m; becoming gravelly.					
6.00 - 6.50	ES	25												
6.70 - 6.80	D	27								6.70	-5.85			
6.80 - 7.00	ES	28							Brown slightly gravelly SAND. Sand is mainly fine and medium, gravel is subangular and subrounded fine to coarse of mixed lithologies. With frequent mica flakes (<1 x 1mm) and occasional locally frequent pockets or beds of very stiff grey silty clay with occasional lenses (<10 x 1mm) of brown fine and medium sand.					
7.00 - 7.50	D	30						7						
7.00 - 7.50	ES	29								(0.80)				
7.50 - 8.00	D	32								7.50	-6.65			
7.50 - 8.00	ES	31							Between 6.70m and 6.80m; clay pockets, soft.					
8.00 - 8.50	D	34						8	Brown slightly gravelly, locally gravelly, SAND with frequent mica flakes (<2 x 2mm). Sand is predominantly medium and coarse. Gravel is subangular and subrounded fine to coarse of mixed lithologies.					
8.00 - 8.50	ES	33												
8.50 - 9.00	D	36												
8.50 - 9.00	ES	35							Between 7.50m and 8.00m; sand is fine to coarse.					
9.00 - 9.50	D	38						9						
9.00 - 9.50	ES	37												
9.50 - 10.00	D	40												
9.50 - 10.00	ES	39												
10.00 - 10.50	D	42												
10.00 - 10.50	ES	41												

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Notes

- Abbreviations and results data defined on 'Notes on Exploratory Position Records'

Contract Name	Nigg Energy Park, East Quay Development			Location ID **BH01**
Client	Global Energy Nigg Ltd			
Fugro Reference	G191005U			
Coordinates (m)	E279383.70 N868963.58	Ground Elevation (m Datum)	0.85	Sheet 2 of 3
Hole Type	Cable Percussion and Rotary Coring			Status: Draft

Depth (m)	Sampling and In Situ Testing			Core Recovery				Strata Details						Groundwater	
	Type	No.	Test Results	TCR (%)	SCR (%)	RQD (%)	FI (-)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation
									Between 10.00m and 12.50m; sand is fine to coarse. Rare to occasional gravel.	(5.50)				
10.50 - 11.00	D	44												
10.50 - 11.00	ES	43												
11.00 - 11.50	D	46						11						
11.00 - 11.50	ES	45												
11.50 - 12.00	D	48												
11.50 - 12.00	ES	47												
12.00 - 12.50	D	50						12						
12.00 - 12.50	ES	49												
12.50 - 13.00	D	52												
12.50 - 13.00	ES	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 fine to coarse of mixed lithologies.	15.50	-14.65			
16.00 - 16.50	D	59						16	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?	16.60	-15.75			
17.00 - 17.35	D	61						17	Reddish-brown SANDSTONE. Recovered as slightly gravelly sand.	(0.75)				
17.35 - 17.45							NR		Assessed zone of core loss.	17.35 (0.10)	-16.50 -16.60			
17.45 - 17.75							0		Extremely weak reddish brown SANDSTONE. Slightly to moderately weathered. Discontinuities not observed.	17.45 (0.30) 17.75	-16.90			
17.35 - 18.85				93	93	93		18	Very weak, medium bedded, locally very thinly to thinly bedded (inclined 20°), reddish-brown 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. Discontinuities - see depth related remarks.					
17.75 - 20.35							1	19	Between 17.85m and 17.92m; occasional light greenish grey pockets (<20 x 50mm). At 17.92m; joint, subvertical (80°), undulating, 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°).	(2.60)				
18.85 - 20.35				100	100	95								

Continued next page

Notes

- Abbreviations and results data defined on 'Notes on Exploratory Position Records'

Contract Name	Nigg Energy Park, East Quay Development			Location ID **BH01**
Client	Global Energy Nigg Ltd			
Fugro Reference	G191005U			
Coordinates (m)	E279383.70 N868963.58	Ground Elevation (m Datum)	0.85	Sheet 3 of 3
Hole Type	Cable Percussion and Rotary Coring			Status: Draft

Depth (m)	Sampling and In Situ Testing			Core Recovery				Strata Details						Groundwater	
	Type	No.	Test Results	TCR (%)	SCR (%)	RQD (%)	FI (-)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend		Water Strike	Backfill / Installation
									Between 18.85m and 19.25m; thinly laminated. Between 19.04m and 19.10m; light greenish grey 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.	20.35	-19.50				
20.35 - 21.85				100	100	100		21	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.						
20.35 - 23.35							1		Between 20.70m and 20.80m; cross bedded. 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.	(3.00)					
21.85 - 23.35				100	100	100		22	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). 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.						
								23		23.35	-22.50				
								24	End of Borehole at 23.35 m						
								25							
								26							
								27							
								28							
								29							

Notes

- Abbreviations and results data defined on 'Notes on Exploratory Position Records'

Contract Name	Nigg Energy Park, East Quay Development			Location ID
Client	Global Energy Nigg Ltd			**BH01**
Fugro Reference	G191005U			
Coordinates (m)	E279383.70 N868963.58	Ground Elevation (m Datum)	0.85	Sheet 1 of 2
Hole Type	Cable Percussion and Rotary Coring			Status: Draft

Equipment

Depth From (m)	Depth To (m)	Hole Type	Date From	Date To	Equipment	Core Barrel	Core Bit	Drilling Crew	Logged By	Remarks
0.00	10.00	CP	03/03/2019	04/03/2019	Dando 2000			JS/AC	BK	
10.00	17.35	CP	04/03/2019	04/03/2019	Dando 2000			JL/SN	BK	
17.35	23.35	RC	04/03/2019	04/03/2019	Comacchio MC-S 1200	Terracore S-Geobor		JS/AC	BK	

Progress

Date (dd/mm/yyyy)	Time (hh:mm:ss)	Hole Depth (m)	Casing Depth (m)	Water Depth (m)	Weather
03/03/2019	23:45:00	0.00	0.50	3.30	Dry
04/03/2019	00:00:00	0.50	0.50	3.30	Dry
04/03/2019	00:30:00	1.00	0.50	3.30	Dry
04/03/2019	01:00:00	1.50	0.50	3.50	
04/03/2019	01:30:00	2.00	0.50	3.50	
04/03/2019	02:00:00	2.50	0.50	3.70	
04/03/2019	02:30:00	3.00	0.50	3.70	
04/03/2019	03:00:00	3.50	0.50	3.80	
04/03/2019	03:20:00	4.00	0.50	3.90	
04/03/2019	03:40:00	4.50	0.50	4.10	
04/03/2019	04:00:00	5.00	5.00	5.50	
04/03/2019	04:20:00	5.50	5.00	5.50	
04/03/2019	04:40:00	6.00	5.00	5.50	
04/03/2019	05:00:00	6.50	5.00	5.50	
04/03/2019	05:20:00	7.00	5.00	5.50	
04/03/2019	05:40:00	7.50	5.00	5.50	
04/03/2019	06:00:00	8.00	5.00	5.50	
04/03/2019	06:20:00	8.50	5.00	5.30	
04/03/2019	06:40:00	9.00	5.00	5.30	
04/03/2019	06:50:00	9.50	5.00	5.30	
04/03/2019	07:45:00	10.00	10.50	5.20	
04/03/2019	08:10:00	10.50	11.00	5.20	
04/03/2019	08:40:00	11.00	11.50	5.20	
04/03/2019	10:35:00	11.50	12.00	5.20	
04/03/2019	11:05:00	12.00	12.50	5.20	
04/03/2019	12:15:00	12.50	13.00	5.20	
04/03/2019	12:46:00	13.00	13.50	5.20	
04/03/2019	14:35:00	14.00	12.50	5.20	
04/03/2019	15:10:00	14.50	12.50	5.20	
04/03/2019	16:00:00	15.00	13.00	5.20	
04/03/2019	16:50:00	15.50	13.00	5.20	

Rotary Details

Depth From (m)	Depth To (m)	Flush Type	Flush Return (%)	Flush Colour	Run Time (hh:mm)
0.00	17.35	W	0		00:10
17.35	18.85	W	100	Red	00:15
18.85	20.35	W	100	Red	00:15
20.35	21.85	W	100	Red	00:12
21.85	23.35	W	100	Red	

Core Details

Depth From (m)	Depth To (m)	Diameter (mm)
17.35	18.85	102
18.85	20.35	102
20.35	21.85	102
21.85	23.35	102

Hole and Casing

Depth To (m)	Hole Diameter (mm)	Depth To (m)	Casing Diameter (mm)
5.00	220	0.50	200
10.00	220	5.00	200
13.00	220	12.50	174
17.00	175	13.00	200
17.35	175	13.50	175
23.35	146	17.00	175
		17.35	175

Chiselling / Slow Progress

Depth From (m)	Depth To (m)	Duration (hh:mm)	Tool / Remark

Water Strike

Strike At (m)	Rise To (m)	Time Elapsed (mins)	Casing Depth (m)	Depth Sealed (m)

Water Added

Depth From (m)	Depth To (m)

Water Strike Remarks

Groundwater not observed in marine environment.

General Remarks

The borehole was carried out over water from jack-up platform Skate 3A. Deck to mudline = 5.50m; deck level = 6.35m CD. Water level was maintained at or above seabed level. All depths and depth related remarks refer to depths below seabed level. Groundwater not observed as borehole conducted in marine environment.

Installation

Type	ID	Response Zone Top (m)	Response Zone Base (m)	Installation Date

Pipe

ID	Top Depth (m)	Base Depth (m)	Diameter (mm)	Type

Backfill

Depth From (m)	Depth To (m)	Backfill Material	Date
0.00	23.35	Bentonite	05/03/2019

Notes

- Abbreviations and results data defined on 'Notes on Exploratory Position Records'

Checked By	NHA	Elevation Datum	Chart Datum	Grid Coordinate System	OSGB
Template: FGSL/HBSI/FGSL BH Summary.hbt/Config Fugro Rev5/12/03/2019/TS				Print Date	25/04/2019

Contract Name	Nigg Energy Park, East Quay Development			Location ID **BH01**
Client	Global Energy Nigg Ltd			
Fugro Reference	G191005U			
Coordinates (m)	E279383.70 N868963.58	Ground Elevation (m Datum)	0.85	Sheet 2 of 2
Hole Type	Cable Percussion and Rotary Coring			Status: Draft

Equipment

Depth From (m)	Depth To (m)	Hole Type	Date From	Date To	Equipment	Core Barrel	Core Bit	Drilling Crew	Logged By	Remarks

Progress

Date (dd/mm/yyyy)	Time (hh:mm:ss)	Hole Depth (m)	Casing Depth (m)	Water Depth (m)	Weather
04/03/2019	17:16:00	16.50	17.00	5.20	
04/03/2019	17:48:00	17.00	17.35	5.50	
04/03/2019	20:45:00	0.00	17.35	Not recognised	
04/03/2019	21:30:00	17.35	17.35	Not recognised	
04/03/2019	22:00:00	18.85	17.35	Not recognised	
04/03/2019	22:30:00	20.35	17.35	Not recognised	
04/03/2019	23:00:00	21.85	17.35	Not recognised	
05/03/2019	00:00:00	23.35	17.35	Not recognised	

Rotary Details

Depth From (m)	Depth To (m)	Flush Type	Flush Return (%)	Flush Colour	Run Time (hh:mm)

Core Details

Depth From (m)	Depth To (m)	Diameter (mm)

Hole and Casing

Depth To (m)	Hole Diameter (mm)	Depth To (m)	Casing Diameter (mm)
		17.35	146

Chiselling / Slow Progress

Depth From (m)	Depth To (m)	Duration (hh:mm)	Tool / Remark

Water Strike

Strike At (m)	Rise To (m)	Time Elapsed (mins)	Casing Depth (m)	Depth Sealed (m)

Water Added

Depth From (m)	Depth To (m)

Water Strike Remarks

Groundwater not observed in marine environment.

General Remarks

The borehole was carried out over water from jack-up platform Skate 3A. Deck to mudline = 5.50m; deck level = 6.35m CD. Water level was maintained at or above seabed level. All depths and depth related remarks refer to depths below seabed level. Groundwater not observed as borehole conducted in marine environment.

Installation

Type	ID	Response Zone Top (m)	Response Zone Base (m)	Installation Date

Pipe

ID	Top Depth (m)	Base Depth (m)	Diameter (mm)	Type

Backfill

Depth From (m)	Depth To (m)	Backfill Material	Date

Notes

- Abbreviations and results data defined on 'Notes on Exploratory Position Records'

Checked By	NHA	Elevation Datum	Chart Datum	Grid Coordinate System	OSGB

Template: FGSL/HBSI/FGSL BH Summary.hbt/Config Fugro Rev5/12/03/2019/TS — Print Date: 25/04/2019

Contract Name	Nigg Energy Park, East Quay Development			Location ID
Client	Global Energy Nigg Ltd			**BH02**
Fugro Reference	G191005U			
Coordinates (m)	E279342.91 N868934.75	Ground Elevation (m Datum)	-9.10	Sheet 1 of 1
Hole Type	Cable Percussion			Status: Draft

Sampling and In Situ Testing				Strata Details						Groundwater	
Depth (m)	Type	No.	Test Results	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend		Water Strike	Backfill / Installation
0.00 - 0.50	D	2			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	ES	1				0.50	-9.60				
0.50 - 1.00	D	4			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 - 1.00	ES	3									
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	D	8									
1.50 - 2.00	ES	7									
				2							
2.20 - 2.50	D	10			Soft dark brownish grey sandy CLAY with abundant mica flakes (<1 x 1mm) and sulphureous odour. Sand is predominantly fine and medium.	2.20	-11.30				
2.20 - 2.50	ES	9									
2.50 - 3.00	D	12			Between 2.50m and 3.00m; 1 No. decomposing wood fragment (15 x 50mm).						
2.50 - 3.00	ES	11				(1.30)					
3.00 - 3.50	D	14		3							
3.00 - 3.50	ES	13									
3.50 - 4.00	D	16			Soft dark grey slightly gravelly sandy CLAY with abundant mica flakes, sulphureous odour and 1 No. wood fragment (80 x 60 x 50mm).	3.50	-12.60				
3.50 - 4.00	ES	15				(0.50)					
4.00 - 4.50	D	17		4	Greyish brown slightly gravelly SAND with low cobble content, and abundant mica flakes(<1 x 1mm). Sand is fine to coarse. Gravel is subangular and subrounded mainly medium and coarse of mixed lithologies. Cobbles (<80 x 60 x 80mm) are subangular possibly of gneiss.	4.00	-13.10				
						(0.50)					
4.50 - 5.00	D	18			Greyish brown SAND with abundant mica flakes (<2 x 1mm). Sand is fine to coarse.	4.50	-13.60				
5.00 - 5.50	D	19		5	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									
8.00 - 8.50	D	25		8	Greyish brown slightly gravelly SAND with abundant mica flakes (<2 x 1mm). Sand is fine to coarse. Gravel is subangular and subrounded fine to coarse of mixed lithologies, predominantly grey and red sandstone.	8.00	-17.10				
8.50 - 9.00	D	26				(0.70)					
					Probably red, grey and reddish brown SANDSTONE. Recovered as gravelly sand.	8.70	-17.80				
9.00 - 9.40	D	27		9	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				

Notes

- Abbreviations and results data defined on 'Notes on Exploratory Position Records'

Contract Name	Nigg Energy Park, East Quay Development			Location ID **BH02**
Client	Global Energy Nigg Ltd			
Fugro Reference	G191005U			
Coordinates (m)	E279342.91 N868934.75	Ground Elevation (m Datum)	-9.10	Sheet 1 of 1
Hole Type	Cable Percussion			Status: Draft

Equipment

Depth From (m)	Depth To (m)	Hole Type	Date From	Date To	Equipment	Core Barrel	Core Bit	Drilling Crew	Logged By	Remarks
0.00	9.40	CP	02/03/2019	03/03/2019	Dando 2000			JS/AC	BK/RL	

Progress

Date (dd/mm/yyyy)	Time (hh:mm:ss)	Hole Depth (m)	Casing Depth (m)	Water Depth (m)	Weather
02/03/2019	19:45:00	0.00	0.50	2.30	Dry
02/03/2019	20:00:00	0.50	1.00	2.20	
02/03/2019	20:20:00	1.00	1.50	2.20	
02/03/2019	20:50:00	1.50	2.00	2.10	
02/03/2019	21:10:00	2.00	2.50	2.10	
02/03/2019	21:30:00	2.50	3.00	2.00	
02/03/2019	21:50:00	3.00	3.50	2.00	
02/03/2019	21:55:00	3.50	4.00	1.90	
02/03/2019	22:05:00	4.00	4.00	1.80	
02/03/2019	22:15:00	4.50	4.00	1.70	
02/03/2019	22:20:00	5.00	4.00	1.60	
02/03/2019	22:30:00	5.50	4.00	1.50	
03/03/2019	14:55:00	6.00	6.00	4.00	
03/03/2019	15:38:00	6.50	7.00	4.00	
03/03/2019	16:05:00	7.00	7.50	4.00	
03/03/2019	16:20:00	7.50	8.00	4.00	
03/03/2019	16:39:00	8.00	8.50	4.00	
03/03/2019	17:00:00	8.50	9.00	4.00	
03/03/2019	17:30:00	9.00	9.40	4.00	

Rotary Details

Depth From (m)	Depth To (m)	Flush Type	Flush Return (%)	Flush Colour	Run Time (hh:mm)

Core Details

Depth From (m)	Depth To (m)	Diameter (mm)

Hole and Casing

Depth To (m)	Hole Diameter (mm)	Depth To (m)	Casing Diameter (mm)
6.00	220	4.00	200
9.40	220	9.40	200

Chiselling / Slow Progress

Depth From (m)	Depth To (m)	Duration (hh:mm)	Tool / Remark

Water Strike

Strike At (m)	Rise To (m)	Time Elapsed (mins)	Casing Depth (m)	Depth Sealed (m)

Water Added

Depth From (m)	Depth To (m)

Water Strike Remarks

Groundwater not observed in marine environment.

General Remarks

The borehole was carried out over water from jack-up platform Skate 3A. Deck to mudline = 14.60m; deck level = 5.50m CD. Water level was maintained at or above seabed level. All depths and depth related remarks refer to depths below seabed level. Groundwater not observed as borehole conducted in marine environment.

Installation

Type	ID	Response Zone Top (m)	Response Zone Base (m)	Installation Date

Pipe

ID	Top Depth (m)	Base Depth (m)	Diameter (mm)	Type

Backfill

Depth From (m)	Depth To (m)	Backfill Material	Date
0.00	9.40	Bentonite	03/03/2019

Notes

- Abbreviations and results data defined on 'Notes on Exploratory Position Records'

Checked By	NHA	Elevation Datum	Chart Datum	Grid Coordinate System	OSGB

Template: FGSL/HBSI/FGSL BH Summary.hbt/Config Fugro Rev5/12/03/2019/TS — Print Date: 25/04/2019

Contract Name	Nigg Energy Park, East Quay Development			Location ID
Client	Global Energy Nigg Ltd			**BH03**
Fugro Reference	G191005U			
Coordinates (m)	E279380.53 N868920.31	Ground Elevation (m Datum)	-0.75	Sheet 1 of 3
Hole Type	Cable Percussion and Rotary Coring			Status: Draft

Depth (m)	Sampling and In Situ Testing			Core Recovery				Strata Details						Groundwater	
	Type	No.	Test Results	TCR (%)	SCR (%)	RQD (%)	FI (-)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend		Water Strike	Backfill / Installation
0.00 - 0.50	D	2							Loose dark brownish grey SAND with frequent shells and shell fragments (<10 x 30mm).						
0.00 - 0.50	ES	1													
0.50 - 1.00	B	5							Below 0.50m; slightly gravelly. Gravel is subangular to rounded fine to coarse of mixed lithologies.	(1.00)					
0.50 - 1.00	D	4													
0.50 - 1.00	ES	3													
0.50 - 0.95	SPT		N = 9 (S)												
1.00 - 1.50	D	7						1	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 mixed lithologies.	1.00	-1.75				
1.00 - 1.50	ES	6													
1.50 - 2.00	B	9													
1.50 - 2.00	ES	8													
2.00 - 2.45	D	10						2	Below 2.00m; sand is predominantly medium and coarse.	(2.00)					
2.00 - 2.50	ES	11													
2.00 - 2.45	SPT		N = 31 (S)												
2.50 - 3.00	B	13													
2.50 - 3.00	ES	12													
3.00 - 3.50	D	15						3	Medium dense dark grey gravelly SAND with abundant to frequent shells and shell fragments (<20 x 30mm). Sand is fine to coarse. Gravel subangular to rounded fine to coarse of mixed lithologies.	3.00	-3.75				
3.00 - 3.50	ES	14							At 3.50m; 1 No. subrounded cobble of dark grey possible psammite (<70 x 70 x 70mm).						
3.50 - 4.00	B	17													
3.50 - 4.00	ES	16													
4.00 - 4.45	D	18						4	Below 4.00m; slightly gravelly. Gravel is subangular and subrounded fine to coarse of mixed lithologies.	(2.00)					
4.00 - 4.50	ES	19													
4.00 - 4.45	SPT		N = 17 (S)												
4.50 - 5.00	B	21													
4.50 - 5.00	ES	20													
5.00 - 5.29	D	24						5	Dark brownish grey sandy GRAVEL. Sand is fine to coarse. Gravel is subangular and subrounded fine to coarse of mixed lithologies.	5.00	-5.75				
5.00 - 5.50	D	23								(0.74)					
5.00 - 5.50	ES	22													
5.50 - 6.00	B	26													
5.50 - 6.00	ES	25													
5.50 - 5.79	SPT		50/140 mm (S)							5.74	-6.49				
6.00 - 6.50	D	28						6	Very dense brown SAND. Sand is fine to coarse.	(0.76)					
6.00 - 6.50	ES	27													
6.50 - 7.00	B	30								6.50	-7.25				
6.50 - 7.00	ES	29							Firm and stiff slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of mixed lithologies.	(0.79)					
7.00 - 7.45	D	31						7	Below 6.50m; with occasional pockets or lenses of brown sandy clay (<80 x 80 x 100mm) and occasional angular to subrounded fine and medium gravel of mixed lithologies.						
7.00 - 7.50	ES	32													
7.00 - 7.45	SPT		N = 37 (S)							7.29	-8.04				
7.50 - 8.00	B	34							Dense brown silty SAND with occasional lenses or bands (<100mm thick) of brown stiff clay. Sand is fine to coarse.	(0.71)					
7.50 - 8.00	ES	33													
8.00 - 8.50	D	36						8	Very dense brown gravelly SAND with frequent mica flakes (<2 x 2mm). Sand is fine to coarse. Gravel is subangular and subrounded fine to coarse of pelite and sandstone.	8.00	-8.75				
8.00 - 8.50	ES	35							Between 8.00m and 9.00m; rare subrounded cobbles (<100 x 100 x 120mm) of pelite.						
8.50 - 9.00	B	38													
8.50 - 9.00	ES	37													
9.00 - 9.33	D	39						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.	(2.00)					
9.00 - 9.50	ES	40													
9.00 - 9.33	SPT		50/180 mm (S)												
9.50 - 10.00	B	42							Below 9.50m; occasional subangular and subrounded fine and medium gravel of mixed lithologies.						
9.50 - 10.00	ES	41													
10.00 - 10.50	D	44								10.00	-10.75				
10.00 - 10.50	ES	43													

Continued next page

Notes

- Abbreviations and results data defined on 'Notes on Exploratory Position Records'

Contract Name	Nigg Energy Park, East Quay Development			Location ID
Client	Global Energy Nigg Ltd			**BH03**
Fugro Reference	G191005U			
Coordinates (m)	E279380.53 N868920.31	Ground Elevation (m Datum)	-0.75	Sheet 2 of 3
Hole Type	Cable Percussion and Rotary Coring			Status: Draft

Depth (m)	Sampling and In Situ Testing			Core Recovery				Strata Details						Groundwater	
	Type	No.	Test Results	TCR (%)	SCR (%)	RQD (%)	FI (-)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation
10.50 - 11.00	B	46						11	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.					
10.50 - 11.00	ES	45												
11.00 - 11.45	D	47												
11.00	SPT													
11.50 - 12.00	B	48												
12.00 - 12.50	D	49						12		(4.60)				
12.50 - 13.00	B	50												
13.00 - 13.45	D	51						13						
13.00 - 13.45	SPT		N = 33 (S)											
13.50 - 14.00	B	52												
13.70 - 13.75	D	53							Between 13.70m and 13.75m; band or lens (<50 mm thick) of very stiff dark brown organic silt.					
14.00 - 14.50	D	54						14						
14.50 - 15.00	B	55								14.60	-15.35			
15.00 - 15.25	D	56						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 sandstone. Cobbles (<150 x 120 x 120mm) are of pelite, quartzite and sandstone.					
15.00 - 15.26	SPT		50/105 mm (S)							(1.60)				
15.50 - 16.00	B	57												
16.20 - 16.50	D	58						16	Brown SAND with frequent mica flakes (1 x 1mm). Sand is predominantly fine and medium.	16.20	-16.95			
16.75 - 16.85	D	59								(0.55)				
17.00 - 17.18	SPT		50/30 mm (S)							16.75	-17.50			
17.25	D	60						17	Extremely weak locally very weak reddish brown SANDSTONE. Slightly to moderately weathered. Discontinuities not observed.					
17.00 - 17.65							0		Between 17.25m and 17.30m; light grey. Between 17.25m and 17.40m; very weak.	(1.35)				
17.00 - 18.00				65	65	65								
17.65 - 18.10							NR		Between 17.65m and 18.10m; assessed zone of core loss.					
18.00 - 19.50				93	93	93	1	18	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.	18.10	-18.85			
18.10 - 19.50										(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	19.50	-20.25			

Continued next page

Notes

- Abbreviations and results data defined on 'Notes on Exploratory Position Records'

	Contract Name	Nigg Energy Park, East Quay Development		Location ID **BH03**
	Client	Global Energy Nigg Ltd		
	Fugro Reference	G191005U		
	Coordinates (m)	E279380.53 N868920.31	Ground Elevation (m Datum) -0.75	Sheet 3 of 3
	Hole Type	Cable Percussion and Rotary Coring		Status Draft

Depth (m)	Sampling and In Situ Testing			Core Recovery				Strata Details						Groundwater	
	Type	No.	Test Results	TCR (%)	SCR (%)	RQD (%)	FI (-)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend		Water Strike	Backfill / Installation
19.50 - 21.00				100	100	100			conglomerate. Slightly weathered. 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. Between 21.00m and 21.10m; occasional subrounded to subangular clasts (<10 x 20mm). Between 21.26m and 21.37m; greenish grey sandstone.					
19.50 - 22.12							1	21		(3.00)					
21.00 - 22.50				100	96	96									
22.12 - 22.18							NI	22	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.					
22.18 - 22.50							3			22.50	-23.25				
									End of Borehole at 22.50 m						
								23							
								24							
								25							
								26							
								27							
								28							
								29							

Notes

- Abbreviations and results data defined on 'Notes on Exploratory Position Records'

Contract Name	Nigg Energy Park, East Quay Development		Location ID
Client	Global Energy Nigg Ltd		**BH03**
Fugro Reference	G191005U		
Coordinates (m)	E279380.53 N868920.31	Ground Elevation (m Datum) -0.75	Sheet 1 of 2
Hole Type	Cable Percussion and Rotary Coring		Status: Draft

Equipment

Depth From (m)	Depth To (m)	Hole Type	Date From	Date To	Equipment	Core Barrel	Core Bit	Drilling Crew	Logged By	Remarks
0.00	4.45	CP	08/03/2019	08/03/2019	Dando 2000			JL/CA		
4.45	8.50	CP	08/03/2019	08/03/2019	Dando 2000			JL/SN		
8.50	17.25	CP	08/03/2019	09/03/2019	Dando 2000			JS/AC		
17.25	22.50	RC	09/03/2019	09/03/2019	Comacchio MC-S 1200		Terracore S-Geobor	JS/AC		

Progress

Date (dd/mm/yyyy)	Time (hh:mm:ss)	Hole Depth (m)	Casing Depth (m)	Water Depth (m)	Weather
08/03/2019	13:00:00	0.00	0.50	1.70	
08/03/2019	13:40:00	0.50	1.00	1.80	
08/03/2019	13:49:00	1.00	1.50	1.90	
08/03/2019	14:00:00	1.50	2.00	2.00	
08/03/2019	14:30:00	2.00	2.50	2.20	
08/03/2019	14:40:00	2.50	3.00	2.20	
08/03/2019	14:50:00	3.00	3.50	2.40	
08/03/2019	15:00:00	3.50	4.00	2.50	
08/03/2019	15:10:00	4.00	4.45	2.60	
08/03/2019	15:20:00	4.00	4.45	2.00	
08/03/2019	15:30:00	4.50	5.00	2.10	
08/03/2019	15:50:00	5.00	5.50	2.20	
08/03/2019	16:50:00	5.50	6.00	2.40	
08/03/2019	17:00:00	6.00	6.50	2.60	
08/03/2019	17:45:00	6.50	7.00	3.10	
08/03/2019	18:10:00	7.00	7.50	3.20	
08/03/2019	18:38:00	7.50	8.00	3.30	
08/03/2019	19:45:00	8.00	8.50	5.90	
08/03/2019	20:00:00	8.50	9.00	5.80	
08/03/2019	21:30:00	9.00	9.50	5.10	
08/03/2019	21:50:00	9.50	10.00	4.80	
08/03/2019	22:10:00	10.00	10.50	4.60	
08/03/2019	22:40:00	10.50	11.00	4.00	
08/03/2019	22:50:00	11.00	11.50	3.80	
08/03/2019	23:00:00	11.50	11.50	3.70	
08/03/2019	23:20:00	12.00	11.50	3.30	
08/03/2019	23:50:00	12.50	11.50	3.10	
09/03/2019	00:00:00	13.00	14.50	3.00	
09/03/2019	00:30:00	13.50	11.50	2.70	
09/03/2019	01:00:00	14.00	14.50	2.40	
09/03/2019	02:00:00	14.50	15.00	2.20	

Rotary Details

Depth From (m)	Depth To (m)	Flush Type	Flush Return (%)	Flush Colour	Run Time (hh:mm)
0.00	17.00	W	100	Red	00:03
17.00	18.00	W	100	Red	00:05
18.00	19.50	W	100	Red	00:07
19.50	21.00	W	100	Red	00:10
21.00	22.50	W	100	Red	

Core Details

Depth From (m)	Depth To (m)	Diameter (mm)
17.00	18.00	102
18.00	19.50	102
19.50	21.00	102
21.00	22.50	102

Hole and Casing

Depth To (m)	Hole Diameter (mm)	Depth To (m)	Casing Diameter (mm)
4.45	220	4.45	220
8.50	220	8.00	220
14.00	220	11.50	220
17.25	220	17.00	146
22.50	146	17.25	220

Chiselling / Slow Progress

Depth From (m)	Depth To (m)	Duration (hh:mm)	Tool / Remark
5.50	6.00	01:00	
8.50	9.00	01:30	

Water Strike

Strike At (m)	Rise To (m)	Time Elapsed (mins)	Casing Depth (m)	Depth Sealed (m)

Water Added

Depth From (m)	Depth To (m)

Water Strike Remarks

Groundwater not observed in marine environment.

General Remarks

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. Groundwater not observed as borehole conducted in marine environment.

Installation

Type	ID	Response Zone Top (m)	Response Zone Base (m)	Installation Date

Pipe

ID	Top Depth (m)	Base Depth (m)	Diameter (mm)	Type

Backfill

Depth From (m)	Depth To (m)	Backfill Material	Date
0.00	22.50	Bentonite	09/03/2019

Notes

- Abbreviations and results data defined on 'Notes on Exploratory Position Records'

Checked By	NHA	Elevation Datum	Chart Datum	Grid Coordinate System	OSGB
Template: FGSL/HBSI/FGSL BH Summary.hbt/Config Fugro Rev5/12/03/2019/TS				Print Date	25/04/2019

Contract Name	Nigg Energy Park, East Quay Development			Location ID **BH03**
Client	Global Energy Nigg Ltd			
Fugro Reference	G191005U			
Coordinates (m)	E279380.53 N868920.31	Ground Elevation (m Datum)	-0.75	Sheet 2 of 2
Hole Type	Cable Percussion and Rotary Coring			Status: Draft

Equipment

Depth From (m)	Depth To (m)	Hole Type	Date From	Date To	Equipment	Core Barrel	Core Bit	Drilling Crew	Logged By	Remarks

Progress

Date (dd/mm/yyyy)	Time (hh:mm:ss)	Hole Depth (m)	Casing Depth (m)	Water Depth (m)	Weather
09/03/2019	02:30:00	15.00	15.50	2.40	
09/03/2019	03:00:00	15.50	16.00	2.50	
09/03/2019	03:30:00	16.00	16.50	3.00	
09/03/2019	04:00:00	16.50	17.00	3.30	
09/03/2019	04:30:00	0.00	17.00	3.80	
09/03/2019	05:00:00	17.00	17.00	4.40	
09/03/2019	05:15:00	18.00	17.00	4.60	
09/03/2019	05:30:00	19.50	17.00	4.70	
09/03/2019	05:50:00	21.00	17.00	5.10	
09/03/2019	06:00:00	22.50	17.00	5.10	

Rotary Details

Depth From (m)	Depth To (m)	Flush Type	Flush Return (%)	Flush Colour	Run Time (hh:mm)

Core Details

Depth From (m)	Depth To (m)	Diameter (mm)

Hole and Casing

Depth To (m)	Hole Diameter (mm)	Depth To (m)	Casing Diameter (mm)

Chiselling / Slow Progress

Depth From (m)	Depth To (m)	Duration (hh:mm)	Tool / Remark

Water Strike

Strike At (m)	Rise To (m)	Time Elapsed (mins)	Casing Depth (m)	Depth Sealed (m)

Water Added

Depth From (m)	Depth To (m)

Water Strike Remarks

Groundwater not observed in marine environment.

General Remarks

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. Groundwater not observed as borehole conducted in marine environment.

Installation

Type	ID	Response Zone Top (m)	Response Zone Base (m)	Installation Date

Pipe

ID	Top Depth (m)	Base Depth (m)	Diameter (mm)	Type

Backfill

Depth From (m)	Depth To (m)	Backfill Material	Date

Notes

- Abbreviations and results data defined on 'Notes on Exploratory Position Records'

Checked By	NHA	Elevation Datum	Chart Datum	Grid Coordinate System	OSGB

Template: FGSL/HBSI/FGSL BH Summary.hbt/Config Fugro Rev5/12/03/2019/TS — Print Date: 25/04/2019

Contract Name	Nigg Energy Park, East Quay Development			Location ID
Client	Global Energy Nigg Ltd			**BH04**
Fugro Reference	G191005U			
Coordinates (m)	E279380.77 N868871.12	Ground Elevation (m Datum)	-2.02	Sheet 1 of 3
Hole Type	Cable Percussion			Status: Draft

Sampling and In Situ Testing				Strata Details					Groundwater	
Depth (m)	Type	No.	Test Results	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation
0.00 - 0.50	B	2			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, quartzite, 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).					
0.00 - 0.50	ES	1								
0.50 - 0.95	D	3								
0.50 - 1.00	ES	4								
0.50	SPT									
1.00 - 1.50	B	6		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)				
1.00 - 1.50	ES	5								
1.50 - 2.00	D	8								
1.50 - 2.00	ES	7								
2.00 - 2.45	D	9		2						
2.00 - 2.50	ES	10								
2.00 - 2.45	SPT		N = 16 (S)							
2.50 - 3.00	B	11			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. Gravel is subangular and subrounded fine to coarse of mixed lithologies including sandstone.	2.50	-4.52			
2.50 - 3.00	ES	12								
3.00 - 3.50	D	13		3						
3.00 - 3.50	ES	14								
3.50 - 4.00	B	16								
3.50 - 4.00	ES	15								
4.00 - 4.45	D	17		4						
4.00 - 4.50	ES	18								
4.00 - 4.45	SPT		N = 29 (S)			(3.70)				
4.50 - 5.00	D	20			Between 4.50m and 5.00m; with low cobble content. Cobbles (<100 x 80 x 100 mm) are subrounded of sandstone.					
4.50 - 5.00	ES	19								
5.00 - 5.50	B	22		5						
5.00 - 5.50	ES	21								
5.50 - 6.00	D	24								
5.50 - 6.00	ES	23								
6.00 - 6.34	D	25		6						
6.00 - 6.50	ES	26								
6.00 - 6.34	SPT		50/190 mm (S)			6.20	-8.22			
6.20 - 7.00	B	27			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.					
6.50 - 7.00	ES	28								
7.00 - 7.50	D	30		7						
7.00 - 7.50	ES	29			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	B	32								
7.50 - 8.00	ES	31								
8.00 - 8.20	ES	34		8						
8.00 - 8.35	SPT		50/200 mm (S)		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	-10.12			
8.20 - 8.50	D	35				(0.40)				
8.35	D	33								
8.50 - 9.00	B	37				8.50	-10.52			
8.50 - 9.00	ES	36								
9.00 - 9.50	D	39		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 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)				
9.00 - 9.50	ES	38								
9.50 - 10.00	B	41								
9.50 - 10.00	ES	40								
10.00 - 10.25	ES	43								
10.00 - 10.45	D	42								

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Notes

- Abbreviations and results data defined on 'Notes on Exploratory Position Records'

FUGRO	Contract Name	Nigg Energy Park, East Quay Development		Location ID	**BH04**
	Client	Global Energy Nigg Ltd			
	Fugro Reference	G191005U			
	Coordinates (m)	E279380.77 N868871.12	Ground Elevation (m Datum) -2.02	Sheet 2 of 3	
	Hole Type	Cable Percussion		Status	Draft

Sampling and In Situ Testing				Strata Details					Groundwater	
Depth (m)	Type	No.	Test Results	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation
10.00 - 10.45	SPT		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 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.	10.60	-12.62			
10.50 - 11.00	B	44								
11.00 - 11.50	D	45		11	Very dense brown slightly gravelly SAND. Sand is fine to coarse. Gravel is subangular to rounded fine to coarse predominantly fine and medium of mixed lithologies.	(1.90)				
11.50 - 12.00	B	46			Below 11.00m; gravelly.					
12.00 - 12.23	D	47		12	Below 12.00m; with low cobble content. Cobbles (<90 x 90 x 100mm) are subangular and subrounded of pelite and gneiss.					
12.00 - 12.50	D	48								
12.00 - 12.24	SPT		50/85 mm (S)							
12.50 - 12.80	B	49			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			
13.00 - 13.50	D	50		13	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.					
13.50 - 14.00	B	51								
14.00 - 14.45	D	52		14						
14.00 - 14.45	SPT		N = 20 (S)							
14.50 - 15.00	B	53								
15.00 - 15.50	D	54		15						
15.50 - 16.00	B	55								
16.00 - 16.45	D	56		16						
16.00 - 16.45	SPT		N = 34 (S)							
16.50 - 17.00	B	57								
17.00 - 17.50	D	58		17		(9.60)				
17.50 - 18.00	B	59								
18.00 - 18.25	D	60		18						
18.00 - 18.25	SPT		50/100 mm (S)							
18.50 - 19.00	B	61								
19.00 - 19.50	D	62		19						
19.50 - 20.00	B	63								
20.00 - 20.25	D	64								
20.00 - 20.25	SPT		50/100 mm (S)							

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Notes

- Abbreviations and results data defined on 'Notes on Exploratory Position Records'

	Contract Name	Nigg Energy Park, East Quay Development			Location ID
	Client	Global Energy Nigg Ltd			**BH04**
	Fugro Reference	G191005U			
	Coordinates (m)	E279380.77 N868871.12	Ground Elevation (m Datum)	-2.02	Sheet 3 of 3
	Hole Type	Cable Percussion			Status: Draft

Sampling and In Situ Testing				Strata Details					Groundwater	
Depth (m)	Type	No.	Test Results	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation
20.25 - 21.00	B	65			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.					
21.00 - 22.00	B	67		21	Below 21.00m; rare subangular cobbles (<120 x 120 x 80mm) of sandstone.					
21.20 - 21.25	D	66			Between 21.20m and 21.25m; possible lenticular band of firm brown sandy clay. Sand is fine.					
22.00 - 22.08	SPT		50/20 mm (S)	22	End of Borehole at 22.10 m	22.10	-24.12			
				23						
				24						
				25						
				26						
				27						
				28						
				29						

Notes

- Abbreviations and results data defined on 'Notes on Exploratory Position Records'

Contract Name	Nigg Energy Park, East Quay Development			Location ID **BH04**
Client	Global Energy Nigg Ltd			
Fugro Reference	G191005U			
Coordinates (m)	E279380.77 N868871.12	Ground Elevation (m Datum)	-2.02	Sheet 1 of 1
Hole Type	Cable Percussion			Status: Draft

Equipment

Depth From (m)	Depth To (m)	Hole Type	Date From	Date To	Equipment	Core Barrel	Core Bit	Drilling Crew	Logged By	Remarks
0.00	22.10	CP	10/03/2019	11/03/2019	Dando 2000			JL/CA	BK/RL	

Progress

Date (dd/mm/yyyy)	Time (hh:mm:ss)	Hole Depth (m)	Casing Depth (m)	Water Depth (m)	Weather
10/03/2019	03:00:00	4.00	4.50	4.40	
11/03/2019	09:20:00	8.50	9.00	6.00	
11/03/2019	21:00:00	21.50	16.00	4.00	

Rotary Details

Depth From (m)	Depth To (m)	Flush Type	Flush Return (%)	Flush Colour	Run Time (hh:mm)

Core Details

Depth From (m)	Depth To (m)	Diameter (mm)

Hole and Casing

Depth To (m)	Hole Diameter (mm)	Depth To (m)	Casing Diameter (mm)
22.10	220	16.00	220

Chiselling / Slow Progress

Depth From (m)	Depth To (m)	Duration (hh:mm)	Tool / Remark
6.50	7.00	01:00	
7.00	7.50	01:30	
7.50	8.00	01:00	
9.50	10.00	01:00	
11.50	12.00	01:06	
12.00	12.50	01:03	

Water Strike

Strike At (m)	Rise To (m)	Time Elapsed (mins)	Casing Depth (m)	Depth Sealed (m)

Water Added

Depth From (m)	Depth To (m)

Water Strike Remarks

General Remarks

The borehole was carried out over water from jack-up platform Skate 3A. Deck to mudline = X.XXm; deck level = X.XXm CD. Water level was maintained at or above seabed level. All depths and depth related remarks refer to depths below seabed level. Groundwater not observed as borehole conducted in marine environment.

Installation

Type	ID	Response Zone Top (m)	Response Zone Base (m)	Installation Date

Pipe

ID	Top Depth (m)	Base Depth (m)	Diameter (mm)	Type

Backfill

Depth From (m)	Depth To (m)	Backfill Material	Date
0.00	22.10	Bentonite	12/03/2019

Notes

- Abbreviations and results data defined on 'Notes on Exploratory Position Records'

Checked By	NHA	Elevation Datum	Chart Datum	Grid Coordinate System	OSGB

Template: FGSL/HBSI/FGSL BH Summary.hbt/Config Fugro Rev5/12/03/2019/TS — Print Date: 25/04/2019

Contract Name	Nigg Energy Park, East Quay Development			Location ID
Client	Global Energy Nigg Ltd			**BH05**
Fugro Reference	G191005U			
Coordinates (m)	E279379.79 N868819.21	Ground Elevation (m Datum)	-6.75	Sheet 1 of 2
Hole Type	Cable Percussion and Rotary Coring			Status: Draft

Depth (m)	Sampling and In Situ Testing			Core Recovery				Strata Details						Groundwater	
	Type	No.	Test Results	TCR (%)	SCR (%)	RQD (%)	FI (-)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation
0.00 - 0.50	D	2							Possibly very loose becoming medium dense with depth black silty SAND with slight sulphureous odour.					
0.00 - 0.50	ES	1												
0.50	ES	4							Below 0.50m; strong sulphureous odour.					
0.50 - 0.95	D	3												
0.50 - 1.00	B	5												
0.50 - 0.95	SPT		0/450 (S)											
1.00 - 1.50	D	7						1	Between 1.00m and 2.00m; rare subangular to rounded medium and coarse gravel of mixed lithologies.	(2.50)				
1.00 - 1.50	ES	6												
1.50 - 2.00	B	9												
1.50 - 2.00	ES	8												
2.00 - 2.45	D	10						2						
2.00 - 2.50	ES	11												
2.00 - 2.45	SPT		N = 10 (S)											
2.50 - 3.00	B	13							Dark grey SAND with frequent black organic debris (<1 x 1mm), frequent mica flakes (<1 x 1mm) and frequent shell fragments (<1 x 1mm).	2.50	-9.25			
2.50 - 3.00	ES	12												
3.00 - 3.50	D	15						3		(1.30)				
3.00 - 3.50	ES	14												
3.80 - 4.00	B	17							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 100mm) of gneiss.	3.80	-10.55			
3.80 - 4.00	ES	16												
4.00 - 4.50	D	18						4		(0.70)				
4.00 - 4.50	ES	19												
4.00 - 4.49	SPT		50/335 mm (S)											
4.50 - 5.00	B	21							Grey slightly gravelly SAND with low cobble content. Sand is mainly fine and medium. Gravel is angular to subrounded fine to coarse of mixed lithologies. Cobbles (<100 x 80 x 60mm) are subrounded and rounded of pelite.	4.50	-11.25			
4.50 - 5.00	ES	20								(0.50)				
5.00 - 5.50	D	23						5		5.00	-11.75			
5.00 - 5.50	ES	22												
5.50 - 6.00	B	24							Very dense slightly sandy, becoming sandy with depth, GRAVEL. Sand is fine to coarse. Gravel is subangular to rounded fine to coarse of mixed lithologies (pelite, granite, sandstone, gneiss, pegmatite).	(1.50)				
6.00 - 6.45	B	25						6						
6.00 - 6.40	SPT		50/245 mm (S)											
6.50 - 7.00	D	26							Very stiff locally laminated brown slightly sandy 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.	6.50	-13.25			
7.00 - 7.50	B	27						7		(1.20)				
7.70 - 8.00	D	28							Very dense brown slightly gravelly SAND with rare possible lenses (<15mm) of soft sandy clay. Sand is fine to coarse. Gravel is subangular and subrounded fine and medium of mixed lithologies.	7.70	-14.45			
8.00 - 8.45	D	29						8		(0.80)				
8.00 - 8.40	SPT		50/250 mm (S)											
8.50 - 9.00	B	30							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) are of mixed lithologies.	8.50	-15.25			
9.00 - 9.50	D	31						9						
9.50 - 10.00	B	32												
10.00 - 10.45	D	33												
10.00 - 10.38	SPT		50/270 mm (S)											

Continued next page

Notes

- Abbreviations and results data defined on 'Notes on Exploratory Position Records'

FUGRO	Contract Name	Nigg Energy Park, East Quay Development		Location ID	**BH05**
	Client	Global Energy Nigg Ltd			
	Fugro Reference	G191005U			
	Coordinates (m)	E279379.79 N868819.21	Ground Elevation (m Datum) -6.75	Sheet 2 of 2	
	Hole Type	Cable Percussion and Rotary Coring		Status	Draft

Depth (m)	Sampling and In Situ Testing			Core Recovery				Strata Details						Groundwater	
	Type	No.	Test Results	TCR (%)	SCR (%)	RQD (%)	FI (-)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation
10.50 - 11.00	B	34							Between 10.50m and 11.00m; slightly gravelly sand. Sand is fine to coarse.	(4.00)				
11.00 - 11.50	D	35						11	Below 11.00m; slightly sandy.					
11.50 - 12.00	B	36												
12.00 - 12.50	D	37						12						
12.00 - 12.35	SPT		50/245 mm (S)											
12.50 - 13.00	B	38							Brown becoming reddish-brown with depth slightly gravelly SAND. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of mixed lithologies. With occasional possible pockets or lenses of firm thickly laminated brown sandy silt (Possible destructured sandstone).	12.50	-19.25			
13.00 - 13.50	D	39						13		(1.20)				
13.50 - 14.00	B	40								13.70	-20.45			
14.00 - 14.18	D	41						14	Extremely weak red and greenish grey SANDSTONE. Recovered as fragments.					
14.00 - 14.18	SPT		50/35 mm (S)							(0.80)				
14.50 - 14.90							NR		Assessed zone of core loss.	14.50	-21.25			
										(0.40)				
14.90 - 15.25							NI			14.90	-21.65			
14.50 - 16.00				73	73	63		15	Extremely weak and weak red SANDSTONE. Possibly moderately weathered. Non intact (Drilling affected) recovered as sandy gravel sized fragments (<50 x 60 x 60mm).	(0.35)				
15.25 - 15.70							9			15.25	-22.00			
									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. 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.	(0.45)				
										15.70	-22.45			
15.70 - 17.50							2	16		(1.80)				
16.00 - 17.50				100	100	100								
								17	Weak becoming moderately weak with depth, thickly laminated to medium bedded red SANDSTONE with rare locally frequent greenish grey reduction spots (<10 x 10mm). Fresh to slightly weathered. Discontinuities. Set #1, bedding plane discontinuities - closely to widely spaced subhorizontal (<10°), planar, rough, very tight, clean.	17.50	-24.25			
								18	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					
								19						

Notes

- Abbreviations and results data defined on 'Notes on Exploratory Position Records'

Contract Name	Nigg Energy Park, East Quay Development			Location ID **BH05**
Client	Global Energy Nigg Ltd			
Fugro Reference	G191005U			
Coordinates (m)	E279379.79 N868819.21	Ground Elevation (m Datum)	-6.75	Sheet 1 of 1
Hole Type	Cable Percussion and Rotary Coring			Status: Draft

Equipment

Depth From (m)	Depth To (m)	Hole Type	Date From	Date To	Equipment	Core Barrel	Core Bit	Drilling Crew	Logged By	Remarks
0.00	4.45	CP	13/03/2019	13/03/2019	Dando 2000			JW/CA	BK/RL	
4.00	11.00	CP	13/03/2019	14/03/2019	Comacchio MC-S 1200			MB/AC	BK/RL	
11.00	14.18	CP	14/03/2019	14/03/2019	Comacchio MC-S 1200			MB/AC	BK/RL	
14.18	17.50	RC	14/03/2019	14/03/2019	Comacchio MC-S 1200	Terracore S-Geobor		JW/CA	BK/RL	

Progress

Date (dd/mm/yyyy)	Time (hh:mm:ss)	Hole Depth (m)	Casing Depth (m)	Water Depth (m)	Weather
13/03/2019	17:15:00	0.00	0.00		
13/03/2019	23:59:00	4.00	4.00		
14/03/2019	12:30:00	14.18	14.18		
14/03/2019	13:45:00	17.50	14.18		

Rotary Details

Depth From (m)	Depth To (m)	Flush Type	Flush Return (%)	Flush Colour	Run Time (hh:mm)
0.00	14.50	W	100	Red	00:06
14.50	16.00	W	100	Red	00:06
16.00	17.50	W	100	Red	

Core Details

Depth From (m)	Depth To (m)	Diameter (mm)
14.50	16.00	102
16.00	17.50	102

Hole and Casing

Depth To (m)	Hole Diameter (mm)	Depth To (m)	Casing Diameter (mm)
4.45	220	4.00	220
11.00	200	11.00	200
13.00	220	13.00	220
14.18	175	13.50	175
17.50	146	14.50	146

Chiselling / Slow Progress

Depth From (m)	Depth To (m)	Duration (hh:mm)	Tool / Remark
12.00	12.50	01:30	

Water Strike

Strike At (m)	Rise To (m)	Time Elapsed (mins)	Casing Depth (m)	Depth Sealed (m)

Water Added

Depth From (m)	Depth To (m)

Water Strike Remarks

Groundwater not encountered in marine environment.

General Remarks

The borehole was carried out over water from jack-up platform Skate 3A. Deck to mudline = 12.50m; deck level = 5.75m CD. Water level was maintained at or above seabed level. All depths and depth related remarks refer to depths below seabed level. Groundwater not observed as borehole conducted in marine environment.

Installation

Type	ID	Response Zone Top (m)	Response Zone Base (m)	Installation Date

Pipe

ID	Top Depth (m)	Base Depth (m)	Diameter (mm)	Type

Backfill

Depth From (m)	Depth To (m)	Backfill Material	Date
0.00	17.50	Bentonite	14/03/2019

Notes

- Abbreviations and results data defined on 'Notes on Exploratory Position Records'

Checked By	NHA	Elevation Datum	Chart Datum	Grid Coordinate System	OSGB

Template: FGSL/HBSI/FGSL BH Summary.hbt/Config Fugro Rev5/12/03/2019/TS — Print Date: 25/04/2019

Contract Name	Nigg Energy Park, East Quay Development			Location ID	
Client	Global Energy Nigg Ltd			**BH06**	
Fugro Reference	G191005U				
Coordinates (m)	E279381.64 N868746.75	Ground Elevation (m Datum)	-9.60	Sheet 1 of 2	
Hole Type	Cable Percussion			Status	Draft

Sampling and In Situ Testing				Strata Details						Groundwater	
Depth (m)	Type	No.	Test Results	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend		Water Strike	Backfill / Installation
0.00 - 0.50	D	2			Very soft and soft black sandy CLAY probably interbedded with black clayey SAND. With rare shell fragments (<10 x 10 x 10mm) and slight sulphurous odour. Sand is fine to coarse.						
0.00 - 0.50	ES	1									
0.50 - 1.00	B	4									
0.50 - 1.00	ES	3									
0.50 - 0.95	SPT		0/450 (S)								
1.00 - 1.50	D	6		1							
1.00 - 1.50	ES	5									
1.50 - 2.00	B	8				(3.00)					
1.50 - 2.00	ES	7									
2.00 - 2.50	D	10		2							
2.00 - 2.50	ES	9									
2.00 - 2.45	SPT		0/450 (S)								
2.50 - 3.00	B	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	B	13									
4.00 - 4.45	D	14		4							
4.00 - 4.45	SPT		0/450 (S)								
4.40 - 5.00	B	15				(2.50)					
5.00 - 5.50	D	16		5							
5.50 - 6.00	B	17			Loose dark grey slightly clayey SAND with occasional wood and shell fragments (<5 x 10mm). Slight organic odour. Sand is fine to coarse.	5.50	-15.10				
6.00 - 6.45	D	18		6		(1.00)					
6.00 - 6.45	SPT		N = 8 (S)								
6.50 - 7.00	B	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	D	20		7							
7.50 - 8.00	B	21				(2.00)					
8.00 - 8.50	D	22		8	Below 8.00m; 1 No. wood fragment (<5 x 10mm).						
8.00 - 8.45	SPT		N = 5 (S)								
8.50 - 9.00	B	23			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.	8.50	-18.10				
9.00 - 9.50	D	24		9							
9.50 - 10.00	B	25									
10.00 - 10.45	D	26									
10.00 - 10.45	SPT		N = 6 (S)		Continued next page						

Notes

- Abbreviations and results data defined on 'Notes on Exploratory Position Records'

FUGRO	Contract Name	Nigg Energy Park, East Quay Development		Location ID	**BH06**
	Client	Global Energy Nigg Ltd			
	Fugro Reference	G191005U			
	Coordinates (m)	E279381.64 N868746.75	Ground Elevation (m Datum) -9.60	Sheet 2 of 2	
	Hole Type	Cable Percussion		Status	Draft

Sampling and In Situ Testing				Strata Details					Groundwater	
Depth (m)	Type	No.	Test Results	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation
10.50 - 11.00	B	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	B	29				(6.50)				
12.00 - 12.45	D	30		12						
12.00 - 12.45	SPT		N = 11 (S)							
12.50 - 13.00	B	31								
13.00 - 13.50	D	32		13	Below 13.00m; sand is predominantly fine and medium. Occasional plant fibres.					
13.50 - 14.00	B	33								
14.00 - 14.45	D	34		14						
14.00 - 14.60	SPT		N = 22 (S)							
14.50 - 15.00	B	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			
				16						
				17						
				18						
				19						

Notes

- Abbreviations and results data defined on 'Notes on Exploratory Position Records'

Contract Name	Nigg Energy Park, East Quay Development			Location ID **BH06**
Client	Global Energy Nigg Ltd			
Fugro Reference	G191005U			
Coordinates (m)	E279381.64 N868746.75	Ground Elevation (m Datum)	-9.60	Sheet 1 of 1
Hole Type	Cable Percussion			Status: Draft

Equipment

Depth From (m)	Depth To (m)	Hole Type	Date From	Date To	Equipment	Core Barrel	Core Bit	Drilling Crew	Logged By	Remarks
0.00	13.00	CP	16/03/2019	16/03/2019	Dando 2000			CA/JS	RL	
13.00	15.00	CP	16/03/2019	16/03/2019	Comacchio MC-S 1200			MB/AC	RL	

Progress

Date (dd/mm/yyyy)	Time (hh:mm:ss)	Hole Depth (m)	Casing Depth (m)	Water Depth (m)	Weather
16/03/2019	08:00:00	0.00	0.50	2.10	
16/03/2019	21:35:00	14.50	15.00	Not recognised	

Hole and Casing

Depth To (m)	Hole Diameter (mm)	Depth To (m)	Casing Diameter (mm)
6.00	220	6.00	220
13.00	220	13.00	220
15.00	200	15.00	200

Chiselling / Slow Progress

Depth From (m)	Depth To (m)	Duration (hh:mm)	Tool / Remark

Water Strike

Strike At (m)	Rise To (m)	Time Elapsed (mins)	Casing Depth (m)	Depth Sealed (m)

Water Added

Depth From (m)	Depth To (m)

Rotary Details

Depth From (m)	Depth To (m)	Flush Type	Flush Return (%)	Flush Colour	Run Time (hh:mm)

Core Details

Depth From (m)	Depth To (m)	Diameter (mm)

Water Strike Remarks

Groundwater not observed in marine environment.

General Remarks

The borehole was carried out over water from jack-up platform Skate 3A. Deck to mudline = 13.80m; deck level = 4.20m CD. Water level was maintained at or above seabed level. All depths and depth related remarks refer to depths below seabed level. Groundwater not observed as borehole conducted in marine environment.

Installation

Type	ID	Response Zone Top (m)	Response Zone Base (m)	Installation Date

Pipe

ID	Top Depth (m)	Base Depth (m)	Diameter (mm)	Type

Backfill

Depth From (m)	Depth To (m)	Backfill Material	Date

Notes

- Abbreviations and results data defined on 'Notes on Exploratory Position Records'

Checked By	NHA	Elevation Datum	Chart Datum	Grid Coordinate System	OSGB

Template: FGSL/HBSI/FGSL BH Summary.hbt/Config Fugro Rev5/12/03/2019/TS — Print Date: 25/04/2019

Contract Name	Nigg Energy Park, East Quay Development			Location ID	
Client	Global Energy Nigg Ltd			**BH07**	
Fugro Reference	G191005U				
Coordinates (m)	E279451.07 N868746.87	Ground Elevation (m Datum)	-4.01	Sheet 1 of 2	
Hole Type	Cable Percussion			Status	Draft

Sampling and In Situ Testing				Strata Details						Groundwater	
Depth (m)	Type	No.	Test Results	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation
0.00 - 0.50	D	2			Loose dark brownish grey silty SAND with abundant shell fragments (<1 x 1mm). Sand is fine to coarse.					
0.00 - 0.50	ES	1								
0.50 - 0.95	D	3			Below 0.50m; thin and thick beds (<100 mm) of very soft dark grey sandy clay. Sand is fine to coarse. Strong sulphureous odour.					
0.50 - 1.00	B	5								
0.50 - 1.00	ES	4								
0.50 - 0.95	SPT		N = 9 (S)							
1.00 - 1.50	D	7		1						
1.00 - 1.50	ES	6								
1.50 - 2.00	B	8								
1.50 - 2.00	ES	9				(3.50)				
2.00 - 2.45	D	10		2						
2.00 - 2.50	ES	11								
2.00 - 2.45	SPT		N = 6 (S)							
2.50 - 3.00	B	13								
2.50 - 3.00	ES	12								
3.00 - 3.50	D	15		3						
3.00 - 3.50	ES	14								
3.50 - 4.00	B	17			Very soft dark brownish grey sandy CLAY with bands (possible <80mm) of clayey sand. Strong sulphureous odour. Sand is fine to coarse.	3.50	-7.51			
3.50 - 4.00	ES	16								
4.00 - 4.45	D	18		4						
4.00 - 4.50	ES	19								
4.00	SPT					(1.50)				
4.50 - 5.00	B	21								
4.50 - 5.00	ES	20								
5.00 - 5.50	D	23		5	Medium dense greyish brown SAND with frequent shell fragments (<1 x 1mm) and frequent mica flakes (<1 x 1mm). Sand is predominantly fine and medium.	5.00	-9.01			
5.00 - 5.50	ES	22								
5.50 - 6.00	B	25								
5.50 - 6.00	ES	24								
6.00 - 6.45	D	26		6		(2.00)				
6.00 - 6.50	ES	27								
6.00 - 6.45	SPT		N = 19 (S)							
6.50 - 7.00	B	29								
6.50 - 7.00	ES	28								
7.00 - 7.50	D	31		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			
7.00 - 7.50	ES	30								
7.50 - 8.00	B	33								
7.50 - 8.00	ES	32								
8.00 - 8.45	D	34		8						
8.00 - 8.45	SPT		N = 17 (S)							
8.50 - 9.00	B	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	B	37								
10.00 - 10.45	D	38								
10.00 - 10.45	SPT		N = 20 (S)							

Continued next page

Notes

- Abbreviations and results data defined on 'Notes on Exploratory Position Records'

FUGRO	Contract Name	Nigg Energy Park, East Quay Development		Location ID	**BH07**
	Client	Global Energy Nigg Ltd			
	Fugro Reference	G191005U			
	Coordinates (m)	E279451.07 N868746.87	Ground Elevation (m Datum) -4.01	Sheet 2 of 2	
	Hole Type	Cable Percussion		Status	Draft

Sampling and In Situ Testing				Strata Details					Groundwater	
Depth (m)	Type	No.	Test Results	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation
10.50 - 11.00	B	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.					
11.00 - 11.30	D	40		11	Medium dense brownish grey slightly gravelly SAND with low cobble content and frequent mica flakes (<1 x 1mm). Sand is fine to coarse. Gravel is subangular to rounded fine to coarse of mixed lithologies. Cobbles (<80 x 80 x 60mm) are of pelite.	11.00	-15.01			
11.30 - 11.70	B	41								
11.70 - 12.15	D	42								
11.70 - 12.40	B	43								
11.70 - 12.15	SPT		N = 23 (S)	12		(2.00)				
12.40 - 13.00	D	44								
13.00 - 13.50	B	45		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			
13.50 - 14.00	B	46								
14.00 - 14.45	D	47		14						
14.00 - 14.45	SPT		N = 34 (S)							
14.50 - 15.00	B	48				(3.00)				
15.00 - 15.50	D	49		15						
15.50 - 16.00	B	50			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 - 16.45	D	51		16	Medium dense greyish brown SAND with frequent mica flakes (<1 x 1mm), occasional to frequent shell fragments and occasional wood fragments (<5 x 5mm).	16.00	-20.01			
16.00 - 16.45	SPT		N = 17 (S)							
16.50 - 17.00	B	52								
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	B	54								
18.00 - 18.45	D	55		18		(3.61)				
18.00 - 18.45	SPT		N = 12 (S)							
18.50 - 19.00	B	56								
19.00 - 19.50	D	57		19						
19.50 - 19.60	SPT		50/60 mm (S)		Below 19.50m; probable boulder (no recovery from SPT).	19.61	-23.62			
					End of Borehole at 19.61 m					

Notes

- Abbreviations and results data defined on 'Notes on Exploratory Position Records'

Contract Name	Nigg Energy Park, East Quay Development			Location ID **BH07**
Client	Global Energy Nigg Ltd			
Fugro Reference	G191005U			
Coordinates (m)	E279451.07 N868746.87	Ground Elevation (m Datum)	-4.01	Sheet 1 of 2
Hole Type	Cable Percussion			Status: Draft

Equipment

Depth From (m)	Depth To (m)	Hole Type	Date From	Date To	Equipment	Core Barrel	Core Bit	Drilling Crew	Logged By	Remarks
0.00	19.61	CP	07/03/2019	08/03/2019	Dando 2000			JS/AC	BK	

Progress

Date (dd/mm/yyyy)	Time (hh:mm:ss)	Hole Depth (m)	Casing Depth (m)	Water Depth (m)	Weather
07/03/2019	00:00:00	9.00	9.50	3.30	
07/03/2019	00:30:00	9.50	10.00	3.15	
07/03/2019	01:00:00	10.00	10.50	3.00	
07/03/2019	01:30:00	10.50	11.00	3.00	
07/03/2019	02:00:00	11.00	11.50	3.10	
07/03/2019	02:15:00	11.50	12.00	3.20	
07/03/2019	02:30:00	12.00	12.50	3.40	
07/03/2019	02:45:00	12.50	13.00	3.50	
07/03/2019	03:00:00	13.00	13.50	3.60	
07/03/2019	03:15:00	13.50	14.00	3.80	
07/03/2019	03:30:00	14.00	14.50	4.10	
07/03/2019	03:45:00	14.50	15.00	4.30	
07/03/2019	04:00:00	15.00	15.50	4.50	
07/03/2019	04:30:00	15.50	16.00	5.00	
07/03/2019	04:45:00	16.00	16.00	5.20	
07/03/2019	20:00:00	0.00	0.50	6.40	
07/03/2019	20:15:00	0.50	1.00	6.30	
07/03/2019	20:30:00	1.00	1.50	6.20	
07/03/2019	20:45:00	1.50	2.00	6.10	
07/03/2019	21:00:00	2.00	2.50	5.90	
07/03/2019	21:10:00	2.50	3.00	5.70	
07/03/2019	21:20:00	3.00	3.50	5.60	
07/03/2019	21:30:00	3.50	4.00	5.50	
07/03/2019	21:45:00	4.00	4.50	5.30	
07/03/2019	22:00:00	4.50	5.00	5.10	
07/03/2019	22:10:00	5.00	5.50	4.90	
07/03/2019	22:20:00	5.50	6.00	4.70	
07/03/2019	22:30:00	6.00	6.50	4.60	
07/03/2019	22:40:00	6.50	7.00	4.40	
07/03/2019	22:50:00	7.00	7.50	4.30	
07/03/2019	23:00:00	7.50	8.00	4.20	

Rotary Details

Depth From (m)	Depth To (m)	Flush Type	Flush Return (%)	Flush Colour	Run Time (hh:mm)

Core Details

Depth From (m)	Depth To (m)	Diameter (mm)

Hole and Casing

Depth To (m)	Hole Diameter (mm)	Depth To (m)	Casing Diameter (mm)
19.61	220	19.50	220

Chiselling / Slow Progress

Depth From (m)	Depth To (m)	Duration (hh:mm)	Tool / Remark
19.00	19.50	01:00	

Water Strike

Strike At (m)	Rise To (m)	Time Elapsed (mins)	Casing Depth (m)	Depth Sealed (m)

Water Added

Depth From (m)	Depth To (m)

Water Strike Remarks

Groundwater not observed in marine environment.

General Remarks

The borehole was carried out over water from jack-up platform Skate 3A. Deck to mudline = 11.20m; deck level = 7.19m CD. Water level was maintained at or above seabed level. All depths and depth related remarks refer to depths below seabed level. Groundwater not observed as borehole conducted in marine environment.

Installation

Type	ID	Response Zone Top (m)	Response Zone Base (m)	Installation Date

Pipe

ID	Top Depth (m)	Base Depth (m)	Diameter (mm)	Type

Backfill

Depth From (m)	Depth To (m)	Backfill Material	Date
0.00	19.61	Bentonite	07/03/2019

Notes

- Abbreviations and results data defined on 'Notes on Exploratory Position Records'

Checked By	NHA	Elevation Datum	Chart Datum	Grid Coordinate System	OSGB

Template: FGSL/HBSI/FGSL BH Summary.hbt/Config Fugro Rev5/12/03/2019/TS — Print Date: 25/04/2019

Contract Name	Nigg Energy Park, East Quay Development			Location ID **BH07**
Client	Global Energy Nigg Ltd			
Fugro Reference	G191005U			
Coordinates (m)	E279451.07 N868746.87	Ground Elevation (m Datum)	-4.01	Sheet 2 of 2
Hole Type	Cable Percussion			Status: Draft

Equipment

Depth From (m)	Depth To (m)	Hole Type	Date From	Date To	Equipment	Core Barrel	Core Bit	Drilling Crew	Logged By	Remarks

Progress

Date (dd/mm/yyyy)	Time (hh:mm:ss)	Hole Depth (m)	Casing Depth (m)	Water Depth (m)	Weather
07/03/2019	23:30:00	8.00	8.00	3.70	
08/03/2019	00:00:00	8.50	8.00	3.30	
08/03/2019	05:15:00	16.50	17.00	5.40	
08/03/2019	05:45:00	17.00	17.50	5.70	
08/03/2019	06:15:00	17.50	18.00	6.00	
08/03/2019	07:55:00	18.00	18.50	5.80	
08/03/2019	08:09:00	18.50	19.00	5.70	
08/03/2019	08:30:00	19.00	19.50	5.60	
08/03/2019	09:55:00	19.50	19.50	5.40	

Rotary Details

Depth From (m)	Depth To (m)	Flush Type	Flush Return (%)	Flush Colour	Run Time (hh:mm)

Core Details

Depth From (m)	Depth To (m)	Diameter (mm)

Hole and Casing

Depth To (m)	Hole Diameter (mm)	Depth To (m)	Casing Diameter (mm)

Chiselling / Slow Progress

Depth From (m)	Depth To (m)	Duration (hh:mm)	Tool / Remark

Water Strike

Strike At (m)	Rise To (m)	Time Elapsed (mins)	Casing Depth (m)	Depth Sealed (m)

Water Added

Depth From (m)	Depth To (m)

Water Strike Remarks

Groundwater not observed in marine environment.

General Remarks

The borehole was carried out over water from jack-up platform Skate 3A. Deck to mudline = 11.20m; deck level = 7.19m CD. Water level was maintained at or above seabed level. All depths and depth related remarks refer to depths below seabed level. Groundwater not observed as borehole conducted in marine environment.

Installation

Type	ID	Response Zone Top (m)	Response Zone Base (m)	Installation Date

Pipe

ID	Top Depth (m)	Base Depth (m)	Diameter (mm)	Type

Backfill

Depth From (m)	Depth To (m)	Backfill Material	Date

Notes

- Abbreviations and results data defined on 'Notes on Exploratory Position Records'

Checked By	NHA	Elevation Datum	Chart Datum	Grid Coordinate System	OSGB

Template: FGSL/HBSI/FGSL BH Summary.hbt/Config Fugro Rev5/12/03/2019/TS — Print Date: 25/04/2019

Contract Name	Nigg Energy Park, East Quay Development			Location ID	**BH08**
Client	Global Energy Nigg Ltd				
Fugro Reference	G191005U				
Coordinates (m)	E279448.06 N868803.00	Ground Elevation (m Datum)	-0.82	Sheet 1 of 2	
Hole Type	Cable Percussion			Status	Draft

Sampling and In Situ Testing				Strata Details						Groundwater	
Depth (m)	Type	No.	Test Results	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend		Water Strike	Backfill / Installation
0.00 - 0.50	D	2			Brown slightly gravelly SAND with occasional shell fragments (<5 x 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)					
0.00 - 0.50	ES	1									
0.50 - 1.00	B	4			Brown SAND with frequent mica flakes (<1 x 1mm). Sand is fine to coarse.	0.50	-1.32				
0.50 - 1.00	ES	3									
1.00 - 1.50	D	6		1		(1.00)					
1.00 - 1.50	ES	5									
1.50 - 2.00	B	8			Greyish brown SAND with frequent mica flakes (1 x 1mm). Sand is fine to coarse.	1.50	-2.32				
1.50 - 2.00	ES	7									
2.00 - 2.50	D	10		2		(1.50)					
2.00 - 2.50	ES	9									
2.50 - 3.00	B	12									
2.50 - 3.00	ES	11									
3.00 - 3.50	D	14		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				
3.00 - 3.50	ES	13									
3.50 - 4.00	B	16				(1.00)					
3.50 - 4.00	ES	15									
4.00 - 4.50	D	18		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				
4.00 - 4.50	ES	17									
4.50 - 5.00	B	20									
4.50 - 5.00	ES	19									
5.00 - 5.50	D	22		5							
5.00 - 5.50	ES	21									
5.50 - 6.00	B	24			Below 5.50m; occasional to frequent decomposing wood fragments (<10 x 20mm).	(3.00)					
5.50 - 6.00	ES	23									
6.00 - 6.50	D	26		6							
6.00 - 6.50	ES	25									
6.50 - 7.00	B	28									
6.50 - 7.00	ES	27									
7.00 - 7.50	D	30		7	Greenish brown clayey SAND interbedded with very soft sandy clay. Sand is fine and medium.	7.00	-7.82				
7.00 - 7.50	ES	29									
7.50 - 8.00	D	32									
7.50 - 8.00	ES	31									
8.00 - 8.50	D	34		8	Between 8.00m and 9.00m; bands (<50mm) of brown fibrous peat.						
8.00 - 8.50	ES	33									
8.50 - 9.00	D	36									
8.50 - 9.00	ES	35									
9.00 - 9.50	D	38		9							
9.00 - 9.50	ES	37									
9.50 - 10.00	D	40				(5.50)					
9.50 - 10.00	ES	39									
10.00 - 10.50	D	42									
10.00 - 10.50	ES	41			Continued next page						

Notes

- Abbreviations and results data defined on 'Notes on Exploratory Position Records'

FUGRO	Contract Name	Nigg Energy Park, East Quay Development		Location ID	**BH08**
	Client	Global Energy Nigg Ltd			
	Fugro Reference	G191005U			
	Coordinates (m)	E279448.06 N868803.00	Ground Elevation (m Datum) -0.82	Sheet 2 of 2	
	Hole Type	Cable Percussion		Status	Draft

Sampling and In Situ Testing				Strata Details					Groundwater	
Depth (m)	Type	No.	Test Results	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation
					Greenish brown clayey SAND interbedded with very soft sandy clay. Sand is fine and medium.					
10.50 - 11.00	D	44								
10.50 - 11.00	ES	43								
11.00 - 11.50	D	46		11						
11.00 - 11.50	ES	45								
11.50 - 12.00	B	47								
12.00 - 12.50	D	48		12						
12.50 - 13.00	B	49			Greyish brown clayey SAND with rare subangular and subrounded fine to coarse gravel of mixed lithologies. Sand is mainly fine and medium.	12.50 (0.50)	-13.32			
13.00 - 13.50	D	50		13	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	B	51								
14.00 - 14.50	D	52		14		(2.00)				
14.50 - 15.00	B	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.	15.00 (0.80)	-15.82			
15.80 - 16.00	D	55			COBBLES (<100 x 120 x 100mm) , subrounded of quartzite.	15.80 (0.20)	-16.62			
16.00 - 16.40	B	56		16	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)	-16.82			
16.50 - 17.00	B	57			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.	16.50	-17.32			
17.00 - 17.50	B	58		17		(1.20)				
17.70 - 18.00	D	59			Extremely weak reddish brown SANDSTONE. Recovered as fragments.	17.70	-18.52			
18.00 - 18.50	B	60		18	Between 17.70m to 18.00m; grey.	(1.30)				
18.90 - 19.00	D	61		19	End of Borehole at 19.00 m	19.00	-19.82			

Notes

- Abbreviations and results data defined on 'Notes on Exploratory Position Records'

Contract Name	Nigg Energy Park, East Quay Development			Location ID **BH08**
Client	Global Energy Nigg Ltd			
Fugro Reference	G191005U			
Coordinates (m)	E279448.06 N868803.00	Ground Elevation (m Datum)	-0.82	Sheet 1 of 2
Hole Type	Cable Percussion			Status: Draft

Equipment

Depth From (m)	Depth To (m)	Hole Type	Date From	Date To	Equipment	Core Barrel	Core Bit	Drilling Crew	Logged By	Remarks
0.00	10.00	CP	05/03/2019	05/03/2019	Dando 2000			JL/SN	BK/RL	
10.00	18.50	CP	05/03/2019	06/03/2019	Dando 2000			JS/AC	BK/RL	
18.50	19.00	RC	06/03/2019	06/03/2019	Comacchio : Skate_3A		Terracore S-Geobor	JS/AC	BK/RL	

Progress

Date (dd/mm/yyyy)	Time (hh:mm:ss)	Hole Depth (m)	Casing Depth (m)	Water Depth (m)	Weather
05/03/2019	12:15:00	0.00	0.50	1.60	
05/03/2019	12:45:00	0.50	1.00	1.60	
05/03/2019	13:18:00	1.00	1.50	1.80	
05/03/2019	14:20:00	1.50	2.00	2.20	
05/03/2019	14:41:00	2.00	2.50	2.50	
05/03/2019	15:22:00	2.50	3.00	2.80	
05/03/2019	16:00:00	3.00	3.50	2.90	
05/03/2019	16:28:00	3.50	4.00	3.10	
05/03/2019	16:48:00	4.00	4.50	3.20	
05/03/2019	17:00:00	4.50	5.00	3.30	
05/03/2019	18:00:00	5.00	5.50	3.60	
05/03/2019	18:15:00	5.50	6.00	3.90	
05/03/2019	18:30:00	6.00	6.50	4.30	
05/03/2019	19:00:00	6.50	7.00	4.30	
05/03/2019	20:10:00	7.00	7.50	4.30	
05/03/2019	20:40:00	7.50	8.00	4.30	
05/03/2019	21:10:00	8.00	8.50	4.30	
05/03/2019	21:20:00	8.50	9.00	4.30	
05/03/2019	21:30:00	9.00	9.50	4.30	
05/03/2019	21:45:00	9.50	10.00	4.30	
05/03/2019	22:00:00	10.00	10.50	3.10	
05/03/2019	22:10:00	10.50	11.00	3.00	
05/03/2019	22:30:00	11.00	11.50	2.80	
05/03/2019	22:50:00	11.50	12.00	2.60	
05/03/2019	23:00:00	12.00	12.50	2.50	
05/03/2019	23:20:00	12.50	13.00	2.50	
05/03/2019	23:40:00	13.00	13.50	2.30	
06/03/2019	00:00:00	13.50	14.00	2.20	
06/03/2019	00:20:00	14.00	14.50	2.10	
06/03/2019	00:30:00	14.50	15.00	2.10	
06/03/2019	00:50:00	15.00	15.50	2.30	

Rotary Details

Depth From (m)	Depth To (m)	Flush Type	Flush Return (%)	Flush Colour	Run Time (hh:mm)

Core Details

Depth From (m)	Depth To (m)	Diameter (mm)

Hole and Casing

Depth To (m)	Hole Diameter (mm)	Depth To (m)	Casing Diameter (mm)
5.00	220	5.00	220
10.00	220	10.00	220
17.00	220	17.00	146
18.50	146	17.00	220
19.00	146		

Chiselling / Slow Progress

Depth From (m)	Depth To (m)	Duration (hh:mm)	Tool / Remark
15.50	16.00	01:00	

Water Strike

Strike At (m)	Rise To (m)	Time Elapsed (mins)	Casing Depth (m)	Depth Sealed (m)

Water Added

Depth From (m)	Depth To (m)

Water Strike Remarks

Groundwater not observed in marine environment.

General Remarks

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 at or above seabed level. All depths and depth related remarks refer to depths below seabed level. Groundwater not observed as borehole conducted in marine environment. Final sample taken with Terracore S-Geobor. Confirmed sandstone by logger.

Installation

Type	ID	Response Zone Top (m)	Response Zone Base (m)	Installation Date

Pipe

ID	Top Depth (m)	Base Depth (m)	Diameter (mm)	Type

Backfill

Depth From (m)	Depth To (m)	Backfill Material	Date
0.00	19.00	Bentonite	06/03/2019

Notes

- Abbreviations and results data defined on 'Notes on Exploratory Position Records'

Checked By	NHA	Elevation Datum	Chart Datum	Grid Coordinate System	OSGB

Template: FGSL/HBSI/FGSL BH Summary.hbt/Config Fugro Rev5/12/03/2019/TS — Print Date: 25/04/2019

Contract Name	Nigg Energy Park, East Quay Development			Location ID **BH08**
Client	Global Energy Nigg Ltd			
Fugro Reference	G191005U			
Coordinates (m)	E279448.06 N868803.00	Ground Elevation (m Datum)	-0.82	Sheet 2 of 2
Hole Type	Cable Percussion			Status: Draft

Equipment

Depth From (m)	Depth To (m)	Hole Type	Date From	Date To	Equipment	Core Barrel	Core Bit	Drilling Crew	Logged By	Remarks

Progress

Date (dd/mm/yyyy)	Time (hh:mm:ss)	Hole Depth (m)	Casing Depth (m)	Water Depth (m)	Weather
06/03/2019	01:00:00	15.50	16.00	2.60	
06/03/2019	02:00:00	16.00	16.50	2.80	
06/03/2019	02:45:00	16.50	17.00	Not recognised	
06/03/2019	03:00:00	17.00	17.00	Not recognised	
06/03/2019	03:40:00	17.50	17.00	Not recognised	
06/03/2019	03:50:00	18.00	17.00	Not recognised	
06/03/2019	04:00:00	18.50	17.00	Not recognised	

Rotary Details

Depth From (m)	Depth To (m)	Flush Type	Flush Return (%)	Flush Colour	Run Time (hh:mm)

Core Details

Depth From (m)	Depth To (m)	Diameter (mm)

Hole and Casing

Depth To (m)	Hole Diameter (mm)	Depth To (m)	Casing Diameter (mm)

Chiselling / Slow Progress

Depth From (m)	Depth To (m)	Duration (hh:mm)	Tool / Remark

Water Strike

Strike At (m)	Rise To (m)	Time Elapsed (mins)	Casing Depth (m)	Depth Sealed (m)

Water Added

Depth From (m)	Depth To (m)

Water Strike Remarks

Groundwater not observed in marine environment.

General Remarks

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 at or above seabed level. All depths and depth related remarks refer to depths below seabed level. Groundwater not observed as borehole conducted in marine environment. Final sample taken with Terracore S-Geobor. Confirmed sandstone by logger.

Installation

Type	ID	Response Zone Top (m)	Response Zone Base (m)	Installation Date

Pipe

ID	Top Depth (m)	Base Depth (m)	Diameter (mm)	Type

Backfill

Depth From (m)	Depth To (m)	Backfill Material	Date

Notes

- Abbreviations and results data defined on 'Notes on Exploratory Position Records'

Checked By	NHA	Elevation Datum	Chart Datum	Grid Coordinate System	OSGB

Template: FGSL/HBSI/FGSL BH Summary.hbt/Config Fugro Rev5/12/03/2019/TS — Print Date: 25/04/2019

D. CORE PHOTOGRAPHS

Rotary Core Photographs

BH01	Plate BH01/1
BH03	Plates BH03/1 and BH03/2
BH05	Plate BH05/1

BH01; 17.35m to 18.85m

BH01; 20.35m to 21.85m

BH01; 21.85m to 23.35m

BH03; 17.00m to 18.00m

BH03; 18.00m to 19.50m

BH03; 19.50m to 21.00m

BH03; 21.00m to 22.50

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:	SPT08
Test Date:	19/09/2018
Report Date:	19/09/2018
File Name:	SPT08.spt
Test Operator:	SH

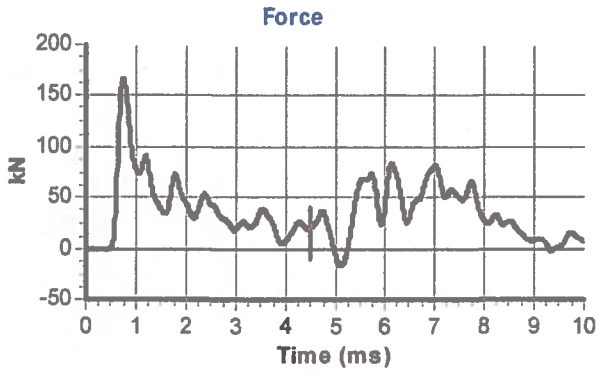
Instrumented Rod Data

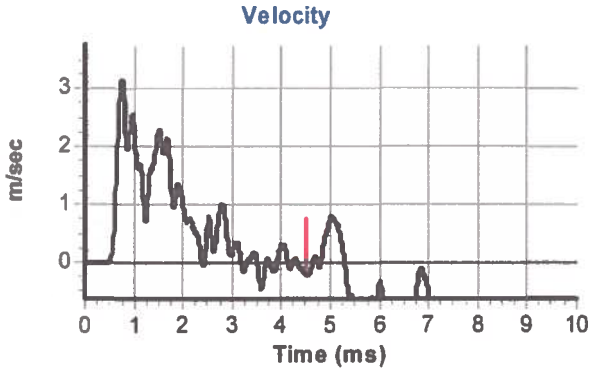
Diameter d_r (mm):	54
Wall Thickness t_r (mm):	6.3
Assumed Modulus E_a (GPa):	200
Accelerometer No.1:	7080
Accelerometer No.2:	11609

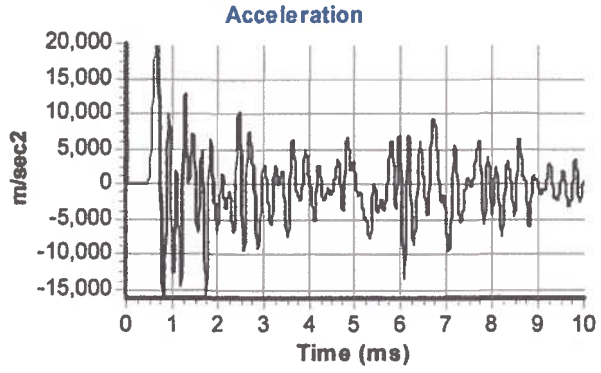
SPT Hammer Information

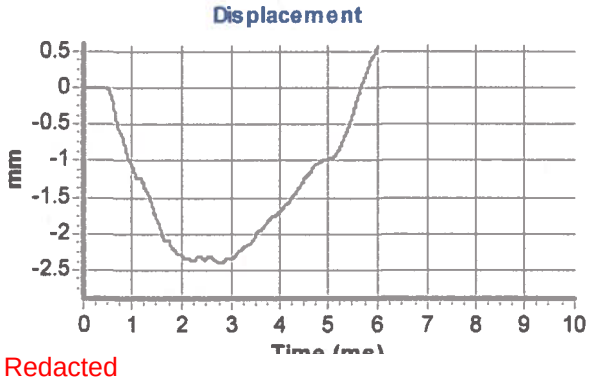
Hammer Mass m (kg):	63.5
Falling Height h (mm):	760
SPT String Length L (m):	10.0

Comments / Location









Redacted

Calculations

Area of Rod A (mm2):	944
Theoretical Energy E_{theor} (J):	473
Measured Energy E_{meas} (J):	242

Energy Ratio E_r (%): **51**

Signed: S.HOWARTH
Title: FITTER

The recommended calibration interval is 12 months

	Contract Name	Nigg Energy Park, East Quay Development			Location ID
	Client	Global Energy Nigg Ltd			**BH01**
	Fugro Reference	G191005U			
	Coordinates (m)	E279383.70 N868963.58	Ground Elevation (m Datum)	0.85	Sheet 1 of 1
	Hole Type	Cable Percussion and Rotary Coring			Status: Draft

Standard Penetration Test Results

Test Depth (m)	Test Type	Self Weight Penetration (mm)	Test Result	Total Penetration (mm)	Hammer Serial Number	Energy Ratio (%)	Casing Depth (m)	Water Depth (m)

In Situ Vane Test Results

Test Depth (m)	Test Type	Undisturbed Undrained Shear Strength (kPa)	Residual Undrained Shear Strength (kPa)

In Situ Hand Penetrometer Results

Test Depth (m)	Undisturbed Undrained Shear Strength (kPa)

Volatile Headspace Testing by Photoionisation Detector

Test Depth (m)	PID Result (ppm)

Notes

- Abbreviations and results data defined on 'Notes on Exploratory Position Records'

	Contract Name	Nigg Energy Park, East Quay Development		Location ID
	Client	Global Energy Nigg Ltd		**BH02**
	Fugro Reference	G191005U		
	Coordinates (m)	E279342.91 N868934.75	Ground Elevation (m Datum) -9.10	Sheet 1 of 1
	Hole Type	Cable Percussion		Status Draft

Standard Penetration Test Results

Test Depth (m)	Test Type	Self Weight Penetration (mm)	Test Result	Total Penetration (mm)	Hammer Serial Number	Energy Ratio (%)	Casing Depth (m)	Water Depth (m)

In Situ Vane Test Results

Test Depth (m)	Test Type	Undisturbed Undrained Shear Strength (kPa)	Residual Undrained Shear Strength (kPa)

In Situ Hand Penetrometer Results

Test Depth (m)	Undisturbed Undrained Shear Strength (kPa)

Volatile Headspace Testing by Photoionisation Detector

Test Depth (m)	PID Result (ppm)

Notes

- Abbreviations and results data defined on 'Notes on Exploratory Position Records'

	Contract Name	Nigg Energy Park, East Quay Development			Location ID
	Client	Global Energy Nigg Ltd			**BH03**
	Fugro Reference	G191005U			
	Coordinates (m)	E279380.53 N868920.31	Ground Elevation (m Datum)	-0.75	Sheet 1 of 1
	Hole Type	Cable Percussion and Rotary Coring			Status: Draft

Standard Penetration Test Results

Test Depth (m)	Test Type	Self Weight Penetration (mm)	Test Result	Total Penetration (mm)	Hammer Serial Number	Energy Ratio (%)	Casing Depth (m)	Water Depth (m)
0.50	S	0	N=9 (3,2/2,2,2,3)	450	08	51	1.00	1.80
2.00	S	0	N=31 (3,4/4,5,10,12)	450	08	51	2.50	2.20
4.00	S	0	N=17 (2,3/3,3,6,5)	450	08	51	4.45	2.60
5.50	S	0	50 (7,11/50 for 140mm)	290	08	51	6.00	2.40
7.00	S	0	N=37 (1,3/6,10,9,12)	450	08	51	7.50	3.20
9.00	S	0	50 (2,8/50 for 180mm)	330	08	51	9.50	5.10
11.00	S	450	N=0 (0 for 0mm/0 for 0mm)	0	08	51	11.50	3.80
13.00	S	0	N=33 (2,1/3,4,9,17)	450	08	51	11.50	3.00
15.00	S	0	50 (3,11/50 for 105mm)	255	08	51	15.50	2.40
17.00	S	0	50 (8,17/50 for 30mm)	180	08	51	17.25	3.80

In Situ Vane Test Results

Test Depth (m)	Test Type	Undisturbed Undrained Shear Strength (kPa)	Residual Undrained Shear Strength (kPa)

In Situ Hand Penetrometer Results

Test Depth (m)	Undisturbed Undrained Shear Strength (kPa)

Volatile Headspace Testing by Photoionisation Detector

Test Depth (m)	PID Result (ppm)

Notes

- Abbreviations and results data defined on 'Notes on Exploratory Position Records'

	Contract Name	Nigg Energy Park, East Quay Development		Location ID
	Client	Global Energy Nigg Ltd		**BH04**
	Fugro Reference	G191005U		
	Coordinates (m)	E279380.77 N868871.12	Ground Elevation (m Datum) -2.02	Sheet 1 of 1
	Hole Type	Cable Percussion		Status Draft

Standard Penetration Test Results

Test Depth (m)	Test Type	Self Weight Penetration (mm)	Test Result	Total Penetration (mm)	Hammer Serial Number	Energy Ratio (%)	Casing Depth (m)	Water Depth (m)
0.50	S	450	N=0 (0 for 0mm/0 for 0mm)	0	08	51	1.00	7.80
2.00	S	0	N=16 (4,4/4,4,4,4)	450	08	51	2.50	7.30
4.00	S	0	N=29 (2,4/7,6,8,8)	450	08	51	4.50	5.80
6.00	S	0	50 (1,0/50 for 190mm)	340	08	51	6.50	5.30
8.00	S	0	50 (4,11/50 for 200mm)	350	08	51	8.00	6.40
10.00	S	0	N=42 (7,9/8,11,10,13)	450	08	51	10.50	4.10
12.00	S	0	50 (7,18/50 for 85mm)	235	08	51	12.50	1.80
14.00	S	0	N=20 (2,3/3,5,5,7)	450	08	51	14.50	2.80
16.00	S	0	N=34 (2,4/6,9,8,11)	450	08	51	16.00	3.40
18.00	S	0	50 (2,9/50 for 100mm)	250	08	51	16.00	4.00
20.00	S	0	50 (4,9/50 for 100mm)	250	08	51	16.00	4.30
22.00	S	0	50 (25 for 60mm/50 for 20mm)	80	08	51	16.00	4.00

In Situ Vane Test Results

Test Depth (m)	Test Type	Undisturbed Undrained Shear Strength (kPa)	Residual Undrained Shear Strength (kPa)

In Situ Hand Penetrometer Results

Test Depth (m)	Undisturbed Undrained Shear Strength (kPa)

Volatile Headspace Testing by Photoionisation Detector

Test Depth (m)	PID Result (ppm)

Notes

- Abbreviations and results data defined on 'Notes on Exploratory Position Records'

	Contract Name	Nigg Energy Park, East Quay Development			Location ID
	Client	Global Energy Nigg Ltd			**BH05**
	Fugro Reference	G191005U			
	Coordinates (m)	E279379.79 N868819.21	Ground Elevation (m Datum)	-6.75	Sheet 1 of 1
	Hole Type	Cable Percussion and Rotary Coring			Status: Draft

Standard Penetration Test Results

Test Depth (m)	Test Type	Self Weight Penetration (mm)	Test Result	Total Penetration (mm)	Hammer Serial Number	Energy Ratio (%)	Casing Depth (m)	Water Depth (m)
0.50	S	150	N=0 (0,0/0,0,0,0)	450	08	51	1.00	3.40
2.00	S	0	N=10 (2,1/1,2,3,4)	450	08	51	2.00	3.70
4.00	S	0	50 (5,8/50 for 335mm)	485	08	51	4.00	3.70
6.00	S	0	50 (6,10/50 for 245mm)	395	08	51	6.00	DRY
8.00	S	0	50 (6,12/50 for 250mm)	400	08	51	8.00	DRY
10.00	S	0	50 (25 for 115mm/50 for 270mm)	385	08	51	10.00	DRY
12.00	S	0	50 (25 for 105mm/50 for 245mm)	350	08	51	12.50	3.10
14.00	S	0	50 (7,15/50 for 35mm)	185	08	51	13.50	3.20

In Situ Vane Test Results

Test Depth (m)	Test Type	Undisturbed Undrained Shear Strength (kPa)	Residual Undrained Shear Strength (kPa)

In Situ Hand Penetrometer Results

Test Depth (m)	Undisturbed Undrained Shear Strength (kPa)

Volatile Headspace Testing by Photoionisation Detector

Test Depth (m)	PID Result (ppm)

Notes

- Abbreviations and results data defined on 'Notes on Exploratory Position Records'

	Contract Name	Nigg Energy Park, East Quay Development		Location ID
	Client	Global Energy Nigg Ltd		**BH06**
	Fugro Reference	G191005U		
	Coordinates (m)	E279381.64 N868746.75	Ground Elevation (m Datum) -9.60	Sheet 1 of 1
	Hole Type	Cable Percussion		Status Draft

Standard Penetration Test Results

Test Depth (m)	Test Type	Self Weight Penetration (mm)	Test Result	Total Penetration (mm)	Hammer Serial Number	Energy Ratio (%)	Casing Depth (m)	Water Depth (m)
0.50	S	450	N=0 (0,0/0,0,0,0)	450	08		1.00	2.20
2.00	S	450	N=0 (0,0/0,0,0,0)	450	08		2.50	2.50
4.00	S	450	N=0 (0,0/0,0,0,0)	450	08		4.50	3.00
6.00	S	0	N=8 (1,2/1,2,3,2)	450	08		6.50	3.30
8.00	S	75	N=5 (0,1/1,1,1,2)	450	08		8.50	3.20
10.00	S	0	N=6 (2,1/1,2,2,1)	450	08		10.50	3.10
12.00	S	0	N=11 (2,2/3,2,3,3)	450	08		12.50	2.20
14.00	S	0	N=22 (3,3/22 for 450mm)	600	08		14.50	DRY

In Situ Vane Test Results

Test Depth (m)	Test Type	Undisturbed Undrained Shear Strength (kPa)	Residual Undrained Shear Strength (kPa)

In Situ Hand Penetrometer Results

Test Depth (m)	Undisturbed Undrained Shear Strength (kPa)

Volatile Headspace Testing by Photoionisation Detector

Test Depth (m)	PID Result (ppm)

Notes

- Abbreviations and results data defined on 'Notes on Exploratory Position Records'

Contract Name	Nigg Energy Park, East Quay Development			Location ID
Client	Global Energy Nigg Ltd			**BH07**
Fugro Reference	G191005U			
Coordinates (m)	E279451.07 N868746.87	Ground Elevation (m Datum)	-4.01	Sheet 1 of 1
Hole Type	Cable Percussion			Status: Draft

Standard Penetration Test Results

Test Depth (m)	Test Type	Self Weight Penetration (mm)	Test Result	Total Penetration (mm)	Hammer Serial Number	Energy Ratio (%)	Casing Depth (m)	Water Depth (m)
0.50	S	150	N=9 (0,0/2,2,2,3)	450	08	51	1.00	6.30
2.00	S	0	N=6 (1,1/1,0,1,4)	450	08	51	2.50	5.90
4.00	S	450	N=0 (0 for 0mm/0 for 0mm)	0	08	51	4.50	5.30
6.00	S	0	N=19 (2,3/4,3,5,7)	450	08	51	6.50	4.60
8.00	S	0	N=17 (2,3/4,4,4,5)	450	08	51	8.00	3.70
10.00	S	0	N=20 (3,3/4,4,5,7)	450	08	51	10.50	3.00
11.70	S	0	N=23 (4,4/6,6,5,6)	450	08	51	12.00	3.20
14.00	S	0	N=34 (4,4/6,7,10,11)	450	08	51	14.50	4.10
16.00	S	0	N=17 (3,4/3,3,4,7)	450	08	51	16.00	5.20
18.00	S	0	N=12 (3,2/3,3,3,3)	450	08	51	18.50	5.80
19.50	S	0	50 (25 for 40mm/50 for 60mm)	100	08	51	19.50	5.40

In Situ Vane Test Results

Test Depth (m)	Test Type	Undisturbed Undrained Shear Strength (kPa)	Residual Undrained Shear Strength (kPa)

In Situ Hand Penetrometer Results

Test Depth (m)	Undisturbed Undrained Shear Strength (kPa)

Volatile Headspace Testing by Photoionisation Detector

Test Depth (m)	PID Result (ppm)

Notes

- Abbreviations and results data defined on 'Notes on Exploratory Position Records'

Contract Name	Nigg Energy Park, East Quay Development			Location ID **BH08**
Client	Global Energy Nigg Ltd			
Fugro Reference	G191005U			
Coordinates (m)	E279448.06 N868803.00	Ground Elevation (m Datum)	-0.82	Sheet 1 of 1
Hole Type	Cable Percussion			Status: Draft

Standard Penetration Test Results

Test Depth (m)	Test Type	Self Weight Penetration (mm)	Test Result	Total Penetration (mm)	Hammer Serial Number	Energy Ratio (%)	Casing Depth (m)	Water Depth (m)

In Situ Vane Test Results

Test Depth (m)	Test Type	Undisturbed Undrained Shear Strength (kPa)	Residual Undrained Shear Strength (kPa)

In Situ Hand Penetrometer Results

Test Depth (m)	Undisturbed Undrained Shear Strength (kPa)

Volatile Headspace Testing by Photoionisation Detector

Test Depth (m)	PID Result (ppm)

Notes

- Abbreviations and results data defined on 'Notes on Exploratory Position Records'

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		

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

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.: **2**
Date of Issue **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.

UKAS TESTING
1663

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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

						Customer Sample No	**Certified Reference Material**		**AQC spike**			**BH1 ES1**	**BH1 ES25**	**BH1 E51**	**BH2 ES1**	**BH2 ES5**	**BH2 ES11**
						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
						RPS Sample No						398220	398221	398222	398223	398224	398225
						Sample Type	**SEDIMENT**		**SEDIMENT**			**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**
						Sample Location											
						Sample Depth (m)	**CRM BCR-646 CRM NIST 1944**		**Spike on clean sediment**			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						04/03/2019	04/03/2019	04/03/2019	02/03/2019	02/03/2019	02/03/2019
						Sampling Time											
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)		N	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

						Customer Sample No	**Certified Reference Material**		**AQC spike**			**BH3 ES1**	**BH3 ES25**	**BH3 ES45**	**BH4 ES1**	**BH4 ES19**	**BH4 ES40**
						Customer Sample ID						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						398226	398227	398228	398229	398230	398231
						Sample Type	**SEDIMENT**		**SEDIMENT**			**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**
						Sample Location											
						Sample Depth (m)	**CRM BCR-646**		**Spike on clean sediment**			0.00-0.50m	5.50-6.00m	10.5-11.0m	0.00-0.50m	4.50-5.00m	9.50-10.0m
						Sampling Date	**CRM NIST 1944**					08/03/2019	08/03/2019	08/03/2019	11/03/2019	11/03/2019	11/03/2019
						Sampling Time											
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

						Customer Sample No	**Certified Reference Material**		**AQC spike**			**BH5 ES1**	**BH5 ES12**	**BH5 ES22**	**BH6 ES1**	**BH6 ES5**	**BH6 ES9**
						Customer Sample ID						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						398232	398233	398234	398235	398236	398237
						Sample Type	**SEDIMENT**		**SEDIMENT**			**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**
						Sample Location											
						Sample Depth (m)	**CRM BCR-646 CRM NIST 1944**		**Spike on clean sediment**			0.00-0.50m	2.50-3.00m	5.00-5.50m	0.00-0.50m	1.00-1.50m	2.00-2.50m
						Sampling Date						13/03/2019	13/03/2019	13/03/2019	16/03/0320	16/03/2019	16/03/2019
						Sampling Time											
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	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

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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

						Customer Sample No	**Certified Reference Material**		**AQC spike**			**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
						Sample Type	**SEDIMENT**		**SEDIMENT**			**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**
						Sample Location											
						Sample Depth (m)	**CRM BCR-646**		**Spike on clean sediment**			0.00-0.50m	3.00-3.50m	6.00-6.50m	0.00-0.50m	2.50-3.00m	5.00-5.50m
						Sampling Date	**CRM NIST 1944**					07/03/2019	07/03/2019	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 %**						
dry solids (at 105°C)		N	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)		N	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	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 - Metals

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

						Customer Sample No	**Standard Reference Material**		**BH1 ES1**	**BH1 ES25**	**BH1 E51**	**BH2 ES1**	**BH2 ES5**	**BH2 ES11**
						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
						RPS Sample No			398220	398221	398222	398223	398224	398225
						Sample Type	**SEDIMENT**		**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**
						Sample 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
						Sampling Date	**SRM-2702**		04/03/2019	04/03/2019	04/03/2019	02/03/2019	02/03/2019	02/03/2019
						Sampling 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

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Results Summary - Metals

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

						Customer Sample No	**Standard Reference Material**		**BH3 ES1**	**BH3 ES25**	**BH3 ES45**	**BH4 ES1**	**BH4 ES19**	**BH4 ES40**
						Customer Sample ID			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			398226	398227	398228	398229	398230	398231
						Sample Type	**SEDIMENT**		**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**
						Sample Location								
						Sample Depth (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
						Sampling Date	**SRM-2702**		08/03/2019	08/03/2019	08/03/2019	11/03/2019	11/03/2019	11/03/2019
						Sampling 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

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Results Summary - Metals

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

						Customer Sample No	**Standard Reference Material**		**BH5 ES1**	**BH5 ES12**	**BH5 ES22**	**BH6 ES1**	**BH6 ES5**	**BH6 ES9**
						Customer Sample ID			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			398232	398233	398234	398235	398236	398237
						Sample Type	**SEDIMENT**		**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**
						Sample Location								
						Sample Depth (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
						Sampling Date	**SRM-2702**		13/03/2019	13/03/2019	13/03/2019	16/03/0320	16/03/2019	16/03/2019
						Sampling 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

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Results Summary - Metals

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

						Customer Sample No	**Standard Reference Material**		**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
						Sample Type	**SEDIMENT**		**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**
						Sample 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
						Sampling Date	**SRM-2702**		07/03/2019	07/03/2019	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 %**						
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

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Results Summary - Polycyclic Aromatic Hydrocarbons

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

						Customer Sample No	**Certified Reference Material**		**AQC spike**			**BH1 ES1**	**BH1 ES25**	**BH1 E51**	**BH2 ES1**	**BH2 ES5**
						Customer Sample ID						0.00-0.50m	6.00-6.50m	12.5-13.0m	0.00-0.50m	1.00-1.50m
						RPS Sample No						398220	398221	398222	398223	398224
						Sample Type	**SEDIMENT**		**SEDIMENT**			**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**
						Sample Location										
						Sample Depth (m)						0.00-0.50m	6.00-6.50m	12.5-13.0m	0.00-0.50m	1.00-1.50m
						Sampling Date	**IAEA-459**		**Spike on clean sediment**			04/03/2019	04/03/2019	04/03/2019	02/03/2019	02/03/2019
						Sampling Time										
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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Results Summary - Polycyclic Aromatic Hydrocarbons

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

						Customer Sample No	**Certified Reference Material**		**AQC spike**			**BH2 ES11**	**BH3 ES1**	**BH3 ES25**	**BH3 ES45**	**BH4 ES1**
						Customer Sample ID						2.50-3.00m	0.00-0.50m	5.50-6.00m	10.50-11.00m	0.00-0.50m
						RPS Sample No						398225	398226	398227	398228	398229
						Sample Type	**SEDIMENT**		**SEDIMENT**			**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**
						Sample Location										
						Sample Depth (m)						2.50-3.00m	0.00-0.50m	5.50-6.00m	10.5-11.0m	0.00-0.50m
						Sampling Date	**IAEA-459**		**Spike on clean sediment**			02/03/2019	08/03/2019	08/03/2019	08/03/2019	11/03/2019
						Sampling Time										
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%	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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Results Summary - Polycyclic Aromatic Hydrocarbons

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

						Customer Sample No	**Certified Reference Material**		**AQC spike**			**BH4 ES19**	**BH4 ES40**	**BH5 ES1**	**BH5 ES12**	**BH5 ES22**
						Customer Sample ID						4.50-5.00m	9.50-10.0m	0.00-0.50m	2.50-3.00m	5.00-5.50m
						RPS Sample No						398230	398231	398232	398233	398234
						Sample Type	**SEDIMENT**		**SEDIMENT**			**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**
						Sample Location										
						Sample Depth (m)						4.50-5.00m	9.50-10.0m	0.00-0.50m	2.50-3.00m	5.00-5.50m
						Sampling Date	**IAEA-459**		**Spike on clean sediment**			11/03/2019	11/03/2019	13/03/2019	13/03/2019	13/03/2019
						Sampling Time										
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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Results Summary - Polycyclic Aromatic Hydrocarbons

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

						Customer Sample No	**Certified Reference Material**		**AQC spike**			**BH6 ES1**	**BH6 ES5**	**BH6 ES9**	**BH7 ES1**	**BH7 ES14**
						Customer Sample ID						0.00-0.50m	1.00-1.50m	2.00-2.50m	0.00-0.50m	3.00-3.50m
						RPS Sample No						398235	398236	398237	398238	398239
						Sample Type	**SEDIMENT**		**SEDIMENT**			**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**
						Sample Location										
						Sample Depth (m)						0.00-0.50m	1.00-1.50m	2.00-2.50m	0.00-0.50m	3.00-3.50m
						Sampling Date	**IAEA-459**		**Spike on clean sediment**			16/03/0320	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 %**					
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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Results Summary - Polycyclic Aromatic Hydrocarbons

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

						Customer Sample No	**Certified Reference Material**		**AQC spike**			**BH7 ES27**	**BH8 ES1**	**BH8 ES11**	**BH8 ES21**
						Customer Sample ID						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**
						Sample Location									
						Sample Depth (m)						6.00-6.50m	0.00-0.50m	2.50-3.00m	5.00-5.50m
						Sampling Date	**IAEA-459**		**Spike on clean sediment**			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 %**				
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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Results Summary - Polychlorinated Biphenyls

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

					Customer Sample No	**Certified Reference Material**			**AQC spike**			**BH1 ES1**	**BH1 ES25**	**BH1 E51**	**BH2 ES1**
					Customer Sample ID							0.00-0.50m	6.00-6.50m	12.5-13.0m	0.00-0.50m
					RPS Sample No							398220	398221	398222	398223
					Sample Type	**SEDIMENT**			**SEDIMENT**			**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**
					Sample Location										
					Sample Depth (m)							0.00-0.50m	6.00-6.50m	12.5-13.0m	0.00-0.50m
					Sampling Date	**CRM BCR-536**			**Spike on clean sediment**			04/03/2019	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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Results Summary - Polychlorinated Biphenyls

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

					Customer Sample No	**Certified Reference Material**			**AQC spike**			**BH2 ES5**	**BH2 ES11**	**BH3 ES1**	**BH3 ES25**
					Customer Sample ID							1.00-1.50m	2.50-3.00m	0.00-0.50m	5.50-6.00m
					RPS Sample No							398224	398225	398226	398227
					Sample Type	**SEDIMENT**			**SEDIMENT**			**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**
					Sample Location										
					Sample Depth (m)							1.00-1.50m	2.50-3.00m	0.00-0.50m	5.50-6.00m
					Sampling Date	**CRM BCR-536**			**Spike on clean sediment**			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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Results Summary - Polychlorinated Biphenyls

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

					Customer Sample No	**Certified Reference Material**			**AQC spike**			**BH3 ES45**	**BH4 ES1**	**BH4 ES19**	**BH4 ES40**
					Customer Sample ID							10.50-11.00m	0.00-0.50m	4.50-5.00m	9.50-10.0m
					RPS Sample No							398228	398229	398230	398231
					Sample Type	**SEDIMENT**			**SEDIMENT**			**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**
					Sample Location										
					Sample Depth (m)							10.5-11.0m	0.00-0.50m	4.50-5.00m	9.50-10.0m
					Sampling Date	**CRM BCR-536**			**Spike on clean sediment**			08/03/2019	11/03/2019	11/03/2019	11/03/2019
					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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Results Summary - Polychlorinated Biphenyls

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

					Customer Sample No	**Certified Reference Material**			**AQC spike**			**BH5 ES1**	**BH5 ES12**	**BH5 ES22**	**BH6 ES1**
					Customer Sample ID							0.00-0.50m	2.50-3.00m	5.00-5.50m	0.00-0.50m
					RPS Sample No							398232	398233	398234	398235
					Sample Type	**SEDIMENT**			**SEDIMENT**			**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**
					Sample Location										
					Sample Depth (m)							0.00-0.50m	2.50-3.00m	5.00-5.50m	0.00-0.50m
					Sampling Date	**CRM BCR-536**			**Spike on clean sediment**			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	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	0.9
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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Results Summary - Polychlorinated Biphenyls

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

					Customer Sample No	**Certified Reference Material**			**AQC spike**			**BH6 ES5**	**BH6 ES9**	**BH7 ES1**	**BH7 ES14**
					Customer Sample ID							1.00-1.50m	2.00-2.50m	0.00-0.50m	3.00-3.50m
					RPS Sample No							398236	398237	398238	398239
					Sample Type	**SEDIMENT**			**SEDIMENT**			**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**
					Sample Location										
					Sample Depth (m)							1.00-1.50m	2.00-2.50m	0.00-0.50m	3.00-3.50m
					Sampling Date	**CRM BCR-536**			**Spike on clean sediment**			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	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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Results Summary - Polychlorinated Biphenyls

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

					Customer Sample No	**Certified Reference Material**			**AQC spike**			**BH7 ES27**	**BH8 ES1**	**BH8 ES11**	**BH8 ES21**
					Customer Sample ID							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**
					Sample Location										
					Sample Depth (m)							6.00-6.50m	0.00-0.50m	2.50-3.00m	5.00-5.50m
					Sampling Date	**CRM BCR-536**			**Spike on clean sediment**			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	0.2	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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Results Summary
PSA Results

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

				Customer Sample No	**BH1 ES1**	**BH1 ES25**	**BH1 ES1**	**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
				Sample Type	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**
				Sample 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
				Sampling 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
				Sampling Time									
Determinand	**CAS No**	**Codes**	**SOP**	**Units**									
sample type		S	In-house		Unimodal, Moderately Well Sorted	Trimodal, Very Poorly Sorted	Unimodal, Moderately Well Sorted	Unimodal, Moderately Sorted	Unimodal, Very Poorly Sorted	Polymodal, Very Poorly Sorted	Unimodal, Moderately Well Sorted	Unimodal, Poorly Sorted	Unimodal, Moderately Sorted
textural group (GRADISTAT)		S	In-house		Slightly Gravelly Sand	Gravelly Sand	Slightly Gravelly Sand	Sand	Slightly Gravelly Muddy Sand	Sandy Mud	Slightly Gravelly Sand	Slightly Gravelly Sand	Gravelly Sand
sediment name		S	In-house		Slightly Very Fine Gravelly Medium Sand	Very Coarse Gravelly Medium Sand	Slightly Fine Gravelly Medium Sand	Moderately Sorted Medium Sand	Slightly Very Fine Gravelly Coarse Silty Medium Sand	Very Fine Sandy Very Coarse Silt	Slightly Very Fine Gravelly Medium Sand	Slightly Very Fine Gravelly Medium Sand	Very Fine Gravelly 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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Results Summary
PSA Results

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

				Customer Sample No	**BH1 ES1**	**BH1 ES25**	**BH1 ES1**	**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
				Sample Type	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**
				Sample 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
				Sampling 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
				Sampling 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
mean description (Folk and Ward method)		S	In-house		Medium Sand	Very Coarse Sand	Medium Sand	Medium Sand	Fine Sand	Very Coarse Silt	Medium Sand	Medium Sand	Medium Sand
sorting description (Folk and Ward method)		S	In-house		Moderately Well Sorted	Very Poorly Sorted	Moderately Well Sorted	Moderately Sorted	Very Poorly Sorted	Very Poorly Sorted	Moderately Well Sorted	Poorly Sorted	Moderately Sorted
skewness description (Folk and Ward method)		S	In-house		Symmetrical	Very Coarse Skewed	Fine Skewed	Fine Skewed	Very Fine Skewed	Symmetrical	Symmetrical	Very Fine Skewed	Symmetrical
kurtosis description (Folk and Ward method)		S	In-house		Mesokurtic	Very Leptokurtic	Mesokurtic	Leptokurtic	Mesokurtic	Mesokurtic	Mesokurtic	Extremely Leptokurtic	Very 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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Results Summary
PSA Results

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

	Customer Sample No	BH1 ES1	BH1 ES25	BH1 ES1	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
	Sample Type	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**
	Sample 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
	Sampling 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
	Sampling Time									
Determinand	**CAS No**	**Codes**	**SOP**	**Units**						
(D75 - D25) - um		S	In-house	um	192	579	215	193	403	84.8	211	267	227
D10 - phi		S	In-house	phi	0.759	-5.03	0.735	0.833	0.777	1.43	0.781	0.614	0.391
D50 - phi		S	In-house	phi	1.46	1.32	1.51	1.57	1.63	4.84	1.61	1.32	1.15
D90 - phi		S	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	2.99	-0.495	3.33	2.92	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		S	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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Results Summary
PSA Results

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

				Customer 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
				Sample Type	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**
				Sample 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
				Sampling 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
				Sampling Time									
Determinand	**CAS No**	**Codes**	**SOP**	**Units**									
sample type		S	In-house		Trimodal, Poorly Sorted	Bimodal, Very Poorly Sorted	Trimodal, Very Poorly Sorted	Polymodal, Very Poorly Sorted	Unimodal, Poorly Sorted	Bimodal, Very Poorly Sorted	Polymodal, Very Poorly Sorted	Unimodal, Poorly Sorted	Trimodal, Very Poorly Sorted
textural group (GRADISTAT)		S	In-house		Gravelly Sand	Sandy Gravel	Gravel	Muddy Sand	Slightly Gravelly Muddy Sand	Sandy Gravel	Muddy Sand	Slightly Gravelly Muddy Sand	Muddy Sand
sediment name		S	In-house		Fine Gravelly Medium Sand	Sandy Very Coarse Gravel	Very Coarse Gravel	Very Coarse Silty Very Fine Sand	Slightly Medium Gravelly Coarse Silty	Sandy Coarse Gravel	Very Coarse Silty Fine Sand	Slightly Very Fine Gravelly Coarse Silty Medium Sand	Very Coarse Silty Fine 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	2.45	2.02	2.72	2.38	1.64	2.44
logarithmic skewness (method of moments)		S	In-house	phi	-0.339	0.235	2.36	0.870	2.10	1.34	1.17	2.84	1.03
logarithmic kurtosis (method of moments)		S	In-house	phi	5.43	1.75	9.04	3.92	9.28	4.68	4.27	13.7	3.95
mean (Folk and Ward method - um)		S	In-house	um	804	4810	12600	71.8	300	5570	54.8	236	82.5
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	-0.143	-0.468	-0.603	-0.394	-0.267	-0.345
kurtosis (Folk and Ward method - um)		S	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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Results Summary
PSA Results

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

				Customer 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
				Sample Type	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**
				Sample 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
				Sampling 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
				Sampling 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)		S	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	1.04	2.39	0.866	1.01	1.94	0.928
mean description (Folk and Ward method)		S	In-house		Coarse Sand	Fine Gravel	Medium Gravel	Very Fine Sand	Medium Sand	Fine Gravel	Very Coarse Silt	Fine Sand	Very Fine Sand
sorting description (Folk and Ward method)		S	In-house		Poorly Sorted	Very Poorly Sorted	Very Poorly Sorted	Very Poorly Sorted	Poorly Sorted	Very Poorly Sorted	Very Poorly Sorted	Poorly Sorted	Very Poorly Sorted
skewness description (Folk and Ward method)		S	In-house		Very Coarse Skewed	Very Fine Skewed	Very Fine Skewed	Fine Skewed	Very Fine Skewed	Very Fine Skewed	Very Fine Skewed	Fine Skewed	Very Fine Skewed
kurtosis description (Folk and Ward method)		S	In-house		Mesokurtic	very Platykurtic	very Leptokurtic	Mesokurtic	very Leptokurtic	Platykurtic	Mesokurtic	very 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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Results Summary
PSA Results

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

				Customer 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
				Sample Type	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**
				Sample 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
				Sampling 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
				Sampling Time									
Determinand	**CAS No**	**Codes**	**SOP**	**Units**									
(D75 - D25) - um		S	In-house	um	1350	31200	39700	183	241	22400	156	180	237
D10 - phi		S	In-house	phi	-2.97	-5.29	-5.78	0.958	0.736	-5.05	1.97	1.03	1.21
D50 - phi		S	In-house	phi	1.22	-3.42	-4.30	3.69	1.59	-3.73	3.64	2.04	3.15
D90 - phi		S	In-house	phi	2.20	2.00	0.805	7.36	4.95	1.60	7.73	4.06	7.24
(D90/D10) - phi		S	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		S	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	2.97	1.04	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		S	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)		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)		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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Results Summary
PSA Results

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

				Customer Sample 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
				Sample Type	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**
				Sample 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
				Sampling Date	07/03/2019	07/03/2019	07/03/2019	05/03/2019	05/03/2019	05/03/2019
				Sampling Time						
Determinand	**CAS No**	**Codes**	**SOP**	**Units**						
sample type		S	In-house		Unimodal, Poorly Sorted	Trimodal, Very Poorly Sorted	Unimodal, Poorly Sorted	Bimodal, Very Poorly Sorted	Unimodal, Moderately Well Sorted	Unimodal, Poorly Sorted
textural group (GRADISTAT)		S	In-house		Slightly Gravelly Muddy Sand	Muddy Sand	Slightly Gravelly Sand	Gravelly Sand	Sand	Sand
sediment name		S	In-house		Slightly Fine Gravelly Very Coarse Silty Medium Sand	Very Coarse Silty Fine Sand	Slightly Very Fine Gravelly Medium Sand	Coarse Gravelly Medium Sand	Moderately Well Sorted Medium Sand	Poorly Sorted 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)		S	In-house	phi	2.58	1.20	2.67	-0.692	5.56	3.06
logarithmic kurtosis (method of moments)		S	In-house	phi	12.0	4.52	16.6	3.58	49.2	15.7
mean (Folk and Ward method - um)		S	In-house	um	246	88.4	325	1260	306	247
sorting (Folk and Ward method - um)		S	In-house	um	2.39	4.44	2.02	6.43	1.50	2.17
skewness (Folk and Ward method - um)		S	In-house	um	-0.340	-0.378	-0.200	0.739	-0.012	-0.309
kurtosis (Folk and Ward method - um)		S	In-house	um	2.03	0.989	1.98	1.87	1.04	1.84

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Results Summary
PSA Results

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

				Customer Sample 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
				Sample Type	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**
				Sample 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
				Sampling Date	07/03/2019	07/03/2019	07/03/2019	05/03/2019	05/03/2019	05/03/2019
				Sampling Time						
Determinand	**CAS No**	**Codes**	**SOP**	**Units**						
mean (Folk and Ward method - phi)		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
mean description (Folk and Ward method)		S	In-house		Fine Sand	Very Fine Sand	Medium Sand	Very Coarse Sand	Medium Sand	Fine Sand
sorting description (Folk and Ward method)		S	In-house		Poorly Sorted	Very Poorly Sorted	Poorly Sorted	Very Poorly Sorted	Moderately Well Sorted	Poorly Sorted
skewness description (Folk and Ward method)		S	In-house		Very Fine Skewed	Very Fine Skewed	Fine Skewed	Very Coarse Skewed	Symmetrical	Very Fine Skewed
kurtosis description (Folk and Ward method)		S	In-house		very Leptokurtic	Mesokurtic	very Leptokurtic	very Leptokurtic	Mesokurtic	very 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		9.43				
MODE 1 - phi		S	In-house	phi	1.75	2.24	1.75	1.75	1.75	1.75
MODE 2 - phi		S	In-house	phi		4.74		-4.73		
MODE 3 - phi		S	In-house	phi		6.75				
D10 - um		S	In-house	um	45.1	7.7	166	212	188	64.6
D50 - um		S	In-house	um	262	122	331	400	306	262
D90 - um		S	In-house	um	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

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Results Summary
PSA Results

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

	Customer Sample 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
	Sample Type	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**
	Sample 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
	Sampling Date	07/03/2019	07/03/2019	07/03/2019	05/03/2019	05/03/2019	05/03/2019
	Sampling 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

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Results Summary
PSA Size Class & Statistics

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

			Customer Sample No	**BH1 ES1**	**BH1 ES25**	**BH1 ES51**	**BH2 ES1**	**BH2 ES5**	**BH2 ES11**	**BH3 ES1**	**BH3 ES25**	**BH3 ES45**	**BH4 ES1**	**BH4 ES19**	**BH4 ES40**	**BH5 ES1**	**BH5 ES12**
			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	0.00-0.50m	4.50-5.00m	9.50-10.0m	0.00-0.50m	2.50-3.00m
			RPS Sample No	398220	398221	398222	398223	398224	398225	398226	398227	398228	398229	398230	398231	398232	398233
			Sample Type	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**
			Sample 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	0.00-0.50m	4.50-5.00m	9.50-10.0m	0.00-0.50m	2.50-3.00m
			Sampling 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	11/03/2019	11/03/2019	11/03/2019	13/03/2019	13/03/2019
			Sampling Time														
Sediment	**mm**	**phi ϕ**	**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	<-4>-5	%	0.00	6.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.78	21.70	23.60	0.00	0.00
Medium gravel	>8<16	<-3>-4	%	0.00	4.91	0.00	0.00	0.00	0.00	0.34	0.00	0.46	5.97	5.15	11.20	0.00	1.03
Fine gravel	>4<8	<-2>-3	%	0.00	1.24	0.41	0.00	0.01	0.00	0.25	0.02	2.15	8.16	0.57	10.60	0.00	0.13
Very fine gravel	>2<4	<-1>-2	%	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	0.22
Very coarse sand	>1<2	<0>-1	%	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	0.21
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
	% 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 Mud	Sandy Mud	ntly Gravelly S	ntly Gravelly S	Gravelly Sand	Gravelly Sand	Sandy Gravel	Gravel	Muddy Sand	Gravelly Mud

* Folk & Ward

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Results Summary
PSA Size Class & Statistics

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

			Customer Sample No	**BH5 ES22**	**BH6 ES1**	**BH6 ES5**	**BH6 ES9**	**BH7 ES1**	**BH7 ES14**	**BH7 ES27**	**BH8 ES1**	**BH8 ES11**	**BH8 ES21**
			Customer Sample 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 Sample No	398234	398235	398236	398237	398238	398239	398240	398241	398242	398243
			Sample Type	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**
			Sample Location										
			Sample Depth (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
			Sampling 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
			Sampling Time										
Sediment	**mm**	**phi ϕ**	**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	5.92	1.20	4.94	1.39	4.47	0.74	0.13	0.20	0.79
Very fine silt	>0.001953<0.003906	<9>8	%	0.15	4.00	0.83	3.06	0.92	2.71	0.52	0.13	0.18	0.67
Clay	<0.001953	>9	%	0.25	4.45	1.11	3.23	1.25	2.95	0.75	0.35	0.51	1.13
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 Mud	Muddy Sand	Gravelly Mud	Muddy Sand	ntly Gravelly S	Gravelly Sand	Sand	Sand

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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 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	0.00-0.50m	4.50-5.00m	9.50-10.0m	0.00-0.50m
RPS Sample No		398220	398221	398222	398223	398224	398225	398226	398227	398228	398229	398230	398231	398232
Sample Type		**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**
Sample 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	0.00-0.50m	4.50-5.00m	9.50-10.0m	0.00-0.50m
Sampling 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	11/03/2019	11/03/2019	11/03/2019	13/03/2019
Sampling Time														
Parameter	**Units**													
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

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Results Summary
PSA Wentworth Scale

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

Customer Sample No		**BH5 ES12**	**BH5 ES22**	**BH6 ES1**	**BH6 ES5**	**BH6 ES9**	**BH7 ES1**	**BH7 ES14**	**BH7 ES27**	**BH8 ES1**	**BH8 ES11**	**BH8 ES21**
Customer Sample 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 Sample No		398233	398234	398235	398236	398237	398238	398239	398240	398241	398242	398243
Sample Type		**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**	**SEDIMENT**
Sample Location												
Sample Depth (m)		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
Sampling Date		13/03/2019	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
Sampling Time												
Parameter	**Units**											
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

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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

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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

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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

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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	
398230	BH4 ES19		11/03/2019	plastic & metal containers	No	
398231	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	
398241	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	

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Report Information

Key to Report Codes

U	UKAS Accredited
F	UKAS Flexible Scope
M	MCERTS Accredited
N	Not Accredited
O	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:

Perishables, e.g. foodstuffs	1 month (if frozen) from the issue date of this report
Waters	2 weeks from the issue date of this report
Other Liquids	1 months from the issue date of this report
Solids (including Soils)	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 followed 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	UKAS Accreditation Laboratory No. 1663
RPS Manchester (Metals only)	UKAS Accreditation Laboratory No. 0605
Ocean Ecology PSA only	NMBAQC

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

G. SURVEY

Mean Position Reports 18 Pages

STARFIX

MEAN POSITION REPORT

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

Start Time: 04 Mar 2019, 00:03:01+00:00 End Time: 04 Mar 2019, 00:08:02+00:00 Session Length: 00:05:01

Mean Position for Skate 3A CommonReferencePoint		
	OSGB 1936 / British National Grid [OSGB-UK Gbr02 NT]	**ETRS89(2D)**
Latitude	57°41'40.35536"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	
Waypoint	BH12
Easting	279,384.000m E
Northing	868,964.000m N
Range	0.52m Geodetic
Bearing TO	33.18°True
Bearing FROM	213.18°True

Jimmy Wilson
Party Chief
FGSL (Fugro GeoServices Ltd UK)

Theo Cleave
Party Chief
Fugro Geoservices Ltd

NEARSHORE DAILY PROGRESS REPORT

Nigg Energy Park - Marine Ground Investigation

Daily Report No. 01

Job No	C1982	Vessel	Skate 3A	Date	Saturday 02-Mar-19

To	ANeillings@arch-henderson.co.uk	Attn.	Andy Neillings	No./email	0141 227 3060
cc	mshuttleworth@arch-henderson.co.uk	Attn.	Michael Shuttleworth	No./email	Redacted
cc	stuart.innes@gegroup.com	Attn.	Stuart Innes	No./email	
cc		Attn.		No./email	
cc	m.chappell@fugro.com	Attn.	Mathew Chappell - Nearshore Manager	No./email	
cc	n.armstrong@fugro.com	Attn.	Nicholas Armstrong - Reporting Man	No./email	
cc	g.crisp@fugro.com	Attn.	Glen Crisp - Project Manager	No./email	

Observed Weather	Wind		Swell (Hs)	Sea State	Visibility	Weather Forecast
Time 00:00	Speed Knts	Dir				
00:00	5	SW	N/A	smooth	good	See Below
06:00	10	SW	N/A	smooth	good	
12:00	8	S	N/A	smooth	good	
18:00	20	S	N/A	smooth	good	
00:00	31	SSW	N/A	smooth	good	

Leg Penetration (m)					Operational Status
BH no.	1	2	3	4	
BH02	**3.3**	**1.9**	**2.6**	**1.3**	**Jacked in Moray Firth awaiting tide/weather for towage to Nigg Energy Park**

Summary of Operations / Borehole Drilling - last 24hrs:

From	To	Hrs (No.)	Code	Description
00:00	05:45	5.75	Single Shift Standby	Jacked in Moray Firth / Awaiting towage to Nigg Energy Park at high water slack.
05:45	06:30	0.75	Crew Change / TBT	Dayshift Trasfer to JUB from Inverness Marina / TBT on Towing Operations
06:30	07:20	0.83	Moving & Jacking	Jack down and move NE into deeper water / Forth Constructor arrival on site.
07:20	08:00	0.67	Moving & Jacking	BM Transfers to Tug with RHIB and discuss operations / Tug alongside and towing bridle connected and secured
08:00	11:35	3.58	Moving & Jacking	Pull legs and commence tow to Berth 3 / Complete fire drill onboard / Arrival at Nigg Energy Park / Lower legs and disconnect tow.
11:35	12:10	0.58	Moving & Jacking	Move JUB alongside Berth 3 / Preload and jack up to safe working height.
12:10	15:40	3.50	Mobilisation	Offload CPT equipment, samples etc. / Load additional drill pipe, IBCs, consumables / General R&M on deck.
15:40	17:25	1.75	Moving & Jacking	Jack down and move to BH02 / Preload and jack up to safe working height.
17:25	19:15	1.83	Cable Percussion	Lift casing into position and prepare drill deck / Lower 8" casing, **DML=14.10m / High winds observed, continue to monitor**
19:15	20:00	0.75	Crew Change / TBT	Dayshift transfer to shore / Handover at CTV Quay / Nightshift transfer to JUB / TBT on Rig Abandonment Drill
20:00	23:30	3.50	Cable Percussion	Commence CP drilling from 0.00m to 3.00m BML
23:30	00:00	0.50	Moving & Jacking	Jack up another 1.50m as wind continues to increase >30kts and swell >1.00m.

Weather forecast

	Sat 02-Mar-2019						Sun 03-Mar-2019						
	06	09	12	15	18	21	00	03	06	09	12	15	18
Wind Dim	SW	WSW	SE	SSE	SW	SSW	SSW	SSW	SSW	SW	SW	SW	SSW
10m Wnd Spd	6	5	4	8	5	12	17	22	18	16	16	14	10
10m Gust	8	7	6	12	7	17	24	31	25	22	23	20	14
50m Wnd Spd	8	6	5	13	9	18	21	28	25	22	23	19	14
50m Gust	11	9	7	18	12	25	30	39	35	31	32	27	20
100m Wnd Spd	8	7	5	14	9	20	23	30	27	24	25	21	15
100m Gust	11	10	8	19	13	27	32	42	38	34	34	30	22
Sig Wav Hgt	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0
Max Wav Hgt	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0
Sig Wav Prd	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
Swell Dim	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Swell Hgt	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	-99.0
Swell Prd	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99

Health Safety & the Environment

FGSL Rep: Theo Cleave	Client Rep:
Signed:	Signed:

NEARSHORE DAILY PROGRESS REPORT

Nigg Energy Park - Marine Ground Investigation

Daily Report No. 01

Activity Time Summary		Today	To Date	Day Shift	Night Shift	Company	Position
Mobilisation		0.00	0.00	Onboard JUB (mobilisation)			
Moving & Jacking		0.00	0.00	Jimmy Wilson	Joshua Sandy	Fugro GeoServices	Bargemaster
Rotary Drilling (Coring)		0.00	0.00	James Lawson	Adam Cook	Fugro GeoServices	Driller
Cable Percussion		0.00	0.00	Callum Allardyce	Ashley Lowthian	Fugro GeoServices	Assistant Driller
Standby (Fugro)		0.00	0.00	Stuart Nye		Fugro GeoServices	Assistant Driller
Standby (Other)		0.00	0.00				
Standby weather		0.00	0.00	Richard Luker	Bart Kot	Fugro	Geotechnical Engineer
Single Shift Standby		0.00	0.00				
Other Operations		0.00	0.00	Theo Cleave		Fugro GeoServices	Project Engineer
Crew Change / TBT		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				
	Total	0.00	0.00	**No. Personnel**	**10**	**Total Man Hours Worked**	120

Project Program / Progress		Programmed			Today			Actual To Date			% Program Completed
Activity	BoQ Item	m.	No.	Hours	m.	No.	Hours	m.	No.	Hours	
General Items, Provisional Services	**A**										0
Establish all plant, equipment, crew on site	A2		1.0			1.0		0	1	0.00	100.0
								0	0	0.00	0.0
Standing Time for plant, equipment and crew	B11 C19			R/O				0	0	0.00	0.0
								0	0	0.00	0.0
Percussion Boring	**B**										0.0
Move boring plant to site of each exploratory hole	B1		8.00			1		0	1	0.00	12.5
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			R/O				0	0	0.00	0.0
Advance BH between groundlevel and 10m depth	B4	80.00			3.00			3	0	0.00	3.8
As B4 but between 10m and 20m	B5	36.50						0	0	0.00	0.0
As B4 but between 20m and 30m	B6	R/O						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	0.00	0.0
Rotary Drilling	**C**										0.0
Move rotary plant to site of each exploratory hole	C15		6.00					0	0	0.00	0.0
RC drilling between groundlevel and 10m depth	C41	R/O						0	0	0.00	0.0
As C41 but between 10m and 20m	C42	20.50						0	0	0.00	0.0
As C41 but between 20m and 30m	C43	9.50						0	0	0.00	0.0
Core box to be retained by client	C49		21.00					0	0	0.00	0.0
								0	0	0.00	0.0
Sampling, Monitoring during investigation	**E**										0.0
Small Disturbed Sample	E1		59.00					0	0	0.00	0.0
Bulk Disturbed Sample	E2		59.00					0	0	0.00	0.0
Large Bulk disturbed sample	E3		R/O					0	0	0.00	0.0
								0	0	0.00	0.0
Insitu Testing	**H**										0.0
Standard Penetration Test in Borehole	H1		40					0	0	0.00	0.0
Standard Penetration Test in Rotary Drill Hole	H2		R/O					0	0	0.00	0.0
								0	0	0.00	0.0
Geoenvironmental Laboratory Testing	**L**										0.0
Marine Scotland Sample	L2		121					0	0	0.00	0.0
								0	0	0.00	0.0
Additional Items											0.0
								0	0	0.00	0.0
								0	0	0.00	0.0
								0	0	0.00	0.0
								0	0	0.00	0.0
								0	0	0.00	0.0

Health & Safety Summary	Today	Actual To Date	Lost & Damaged
Hoc Cards	2	5	
Safety Drills	2	4	
Tool Box Talks	1	3	
HSE Meetings	1	1	
Incidents/Near Miss		0	
Environmental		0	
Hours Worked	120	120	

Fugro GeoServices Representative Comments	Client Representative Comments

FGSL Rep: Theo Cleave **Signed:**	**Client Rep:** **Signed:**

NEARSHORE DAILY PROGRESS REPORT

Nigg Energy Park - Marine Ground Investigation

Daily Report No. 02

Job No	C1982	Vessel	Skate 3A	Date	Sunday 03-Mar-19

To	ANeillings@arch-henderson.co.uk	Attn.	Andy Neillings	No./email	0141 227 3060
cc	mshuttleworth@arch-henderson.co.uk	Attn.	Michael Shuttleworth	No./email	Redact
cc	stuart.innes@gegroup.com	Attn.	Stuart Innes	No./email	Redact
cc		Attn.		No./email	
cc	m.chappell@fugro.com	Attn.	Mathew Chappell - Nearshore Manager	No./email	
cc	n.armstrong@fugro.com	Attn.	Nicholas Armstrong - Reporting Mana	No./email	Redact
cc	g.crisp@fugro.com	Attn.	Glen Crisp - Project Manager	No./email	Redact

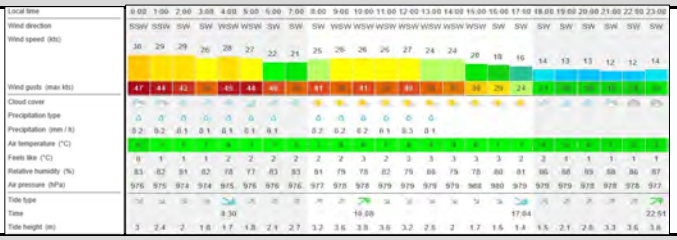
Observed Weather	Wind		Swell (Hs)	Sea State	Visibility	Weather Forecast
Time 00:00	Speed Knts	Dir				
00:00	28	S	N/A	Slight	Poor	See Below
06:00	34	SW	N/A	Slight/Moderate	Very Poor	
12:00	35	SW	N/A	Slight/Moderate	Very Poor	
18:00	21	SSW	N/A	Slight	moderate	
00:00	10	SW	N/A	Smooth	good	

Leg Penetration (m)					Operational Status
BH no.	1	2	3	4	
BH02	**3.3**	**1.9**	**2.6**	**1.3**	**Jacked up on BH02.** **Cable percussion drilling underway.**
BH01	**1.0**	**1.0**	**2.2**	**3.1**	

Summary of Operations / Borehole Drilling - last 24hrs:

From	To	Hrs (No.)	Code	Description
00:00	02:15	2.25	Cable Percussion	Continue CP from **3.00m to 6.00m BML** / Secure deck against gale force winds /
02:15	03:00	0.75	Other Operations	Nightshift return to shore as wind/swell continues to increase / Secure RHIB and measure wind speed / >35kts
03:00	05:00	2.00	Standby weather	Conditions still in excess of operational limits / Crew periodically confirm conditions from shore.
05:00	07:30	2.50	Standby weather	Conditions still in excess of operational limits / RHIB checked at low water / wind >30kts, swell >1m
07:30	08:00	0.50	Crew Change / TBT	E.O.S / Nightshift handover at accomodation / TBT on Operational Limitations and Emergency Drills
08:00	14:00	6.00	Standby weather	Continue to monitor weather with forecasts and anomemeter / Wind dropping after 1200 / Transit to CTV Quay
14:00	14:30	0.50	Other Operations	Dayshift transfer to JUB / Prepare drill deck to continue CP drilling operations.
14:30	18:30	4.00	Cable Percussion	Continue CP from **6.00m to 9.40m BML / E.O.H @ -18.50mCD** / Rockhead encountered.
18:30	19:15	0.75	Other Operations	Clear and wash down deck for E.O.S / Fuel all plant & RHIB / Begin pulling all casing to deck.
19:15	20:00	0.75	Crew Change / TBT	Dayshift transfer to shore / Handover on CTV Quay / Nightshift transfer to JUB / TBT on Lifting Operations
20:00	22:00	2.00	Standby (Tide)	Waiting on tide to move to BH01 / Prepare JUB for move / Jack down and pull legs
22:00	23:45	1.75	Moving & Jacking	Move from BH02 to **BH01** / Preload and jack up to safe working height
23:45	00:00	0.25	Cable Percussion	Run in casing to mudline and prepare deck for CP ops / **DTM=5.50m**

Weather forecast



Health Safety & the Environment

Winds in excess of operational and emergency limits. Crew continue to monitor weather with anomometer and updated forecasts for safe transfer window.

FGSL Rep: Theo Cleave	**Client Rep:**
Signed:	**Signed:**

NEARSHORE DAILY PROGRESS REPORT

Nigg Energy Park - Marine Ground Investigation

Daily Report No. 02

Activity Time Summary		Today	To Date	Day Shift	Night Shift	Company	Position
Mobilisation		0.00	3.50	Onboard JUB (mobilisation)			
Moving & Jacking		1.75	9.67	Jimmy Wilson	Joshua Sandy	Fugro GeoServices	Bargemaster
Rotary Drilling (Coring)		0.00	0.00	James Lawson	Adam Cook	Fugro GeoServices	Driller
Cable Percussion		6.50	11.83	Callum Allardyce	Ashley Lowthian	Fugro GeoServices	Assistant Driller
Standby (Fugro)		0.00	0.00	Stuart Nye		Fugro GeoServices	Assistant Driller
Standby (Tide)		2.00	2.00				
Standby weather		10.50	10.50	Richard Luker	Bart Kot	Fugro	Geotechnical Engineer
Single Shift Standby		0.00	5.75				
Other Operations		2.00	2.00	Theo Cleave		Fugro GeoServices	Project Engineer
Crew Change / TBT		1.25	2.75				
		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	24.00	24.00	**No. Personnel**	**10**	**Total Man Hours Worked**	120

Project Program / Progress		Programmed			Today			Actual To Date			% Program Completed
Activity	BoQ Item	m.	No.	Hours	m.	No.	Hours	m.	No.	Hours	
General Items, Provisional Services	**A**										0
Establish all plant, equipment, crew on site	A2		1.0					0	1	0.00	100.0
								0	0	0.00	0.0
Standing Time for plant, crew, etc - WEATHER	B11 C19			R/O			10.50	0	0	10.50	0.0
Standing Time for plant, crew, etc - TIDE	B11 C19			R/O			2.00	0	0	2.00	0.0
								0	0	0.00	0.0
Percussion Boring	**B**										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			R/O				0	0	0.00	0.0
Advance BH between groundlevel and 10m depth	B4	80.00			6.40			9	0	0.00	11.8
As B4 but between 10m and 20m	B5	36.50						0	0	0.00	0.0
As B4 but between 20m and 30m	B6	R/O						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	0.00	0.0
Rotary Drilling	**C**										0.0
Move rotary plant to site of each exploratory hole	C15		6.00			1		0	1	0.00	16.7
RC drilling between groundlevel and 10m depth	C41	R/O						0	0	0.00	0.0
As C41 but between 10m and 20m	C42	20.50						0	0	0.00	0.0
As C41 but between 20m and 30m	C43	9.50						0	0	0.00	0.0
Core box to be retained by client	C49		21.00					0	0	0.00	0.0
								0	0	0.00	0.0
Sampling, Monitoring during investigation	**E**										0.0
Small Disturbed Sample	E1		59.00			19		0	19	0.00	32.2
Bulk Disturbed Sample	E2		59.00					0	0	0.00	0.0
Large Bulk disturbed sample	E3		R/O					0	0	0.00	0.0
								0	0	0.00	0.0
Insitu Testing	**H**										0.0
Standard Penetration Test in Borehole	H1		40					0	0	0.00	0.0
Standard Penetration Test in Rotary Drill Hole	H2		R/O					0	0	0.00	0.0
								0	0	0.00	0.0
Geoenvironmental Laboratory Testing	**L**										0.0
Marine Scotland Sample	L2		121			8		0	8	0.00	6.6
								0	0	0.00	0.0
Additional Items											0.0
								0	0	0.00	0.0
								0	0	0.00	0.0
								0	0	0.00	0.0
								0	0	0.00	0.0
								0	0	0.00	0.0

Health & Safety Summary	Today	Actual To Date	Lost & Damaged
Hoc Cards	1	6	
Safety Drills	0	4	
Tool Box Talks	1	4	
HSE Meetings	0	1	
Incidents/Near Miss	0	0	
Environmental	0	0	
Hours Worked	120	240	

Fugro GeoServices Representative Comments

Client Representative Comments

FGSL Rep: Theo Cleave

Signed:

Client Rep:

Signed:

NEARSHORE DAILY PROGRESS REPORT

Nigg Energy Park - Marine Ground Investigation

Daily Report No. 03

Job No	C1982	Vessel	Skate 3A	Date	Monday 04-Mar-19

To	ANeillings@arch-henderson.co.uk	Attn.	Andy Neillings	No./email	0141 227 3060
cc	mshuttleworth@arch-henderson.co.uk	Attn.	Michael Shuttleworth	No./email	Redact
cc	stuart.innes@gegroup.com	Attn.	Stuart Innes	No./email	Redact
cc		Attn.		No./email	
cc	m.chappell@fugro.com	Attn.	Mathew Chappell - Nearshore Manager	No./email	
cc	n.armstrong@fugro.com	Attn.	Nicholas Armstrong - Reporting Mana	No./email	Redact
cc	g.crisp@fugro.com	Attn.	Glen Crisp - Project Manager	No./email	Redact

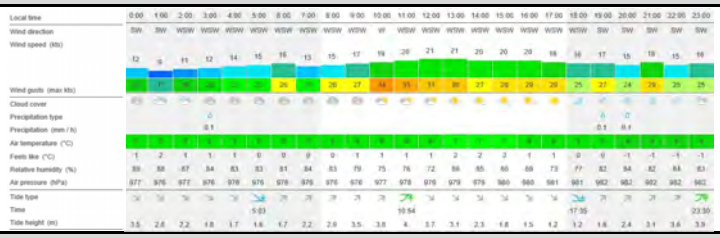
Observed Weather	Wind		Swell (Hs)	Sea State	Visibility	Weather Forecast
Time 00:00	Speed Knts	Dir				
00:00	10	SW	N/A	smooth	good	See Below
06:00	11	W	N/A	smooth	good	
12:00	18	W	N/A	smooth	good	
18:00	20	W	N/A	smooth	good	
00:00	17	SW	N/A	smooth	good	

Leg Penetration (m)					Operational Status
BH no.	1	2	3	4	
BH01	**1.0**	**1.0**	**2.2**	**3.1**	**Jacked up on BH01** **Ready to commence CP from mudline**

Summary of Operations / Borehole Drilling - last 24hrs:

From	To	Hrs (No.)	Code	Description
00:00	07:15	7.25	Cable Percussion	Commence CP drilling from **0.00m to 10.00m BML**
07:15	08:00	0.75	Crew Change / TBT	Nightshift transfer to shore / Handover on CTV Quay / Dayshift transfer to JUB / TBT on Site Rules
08:00	17:20	9.33	Cable Percussion	Continue CP from **10.00m to 17.35m BML**
17:20	18:50	1.50	Rotary Drilling (Coring)	Run in Geobor to depth / Flush hole
18:50	19:15	0.42	Other Operations	Fuel all plant / Wash down and clear deck for E.O.S
19:15	20:00	0.75	Crew Change / TBT	Dayshift transfer to shore / Handover on CTV Quay / Nightshift transfer to JUB / TBT on Site Rules
20:00	00:00	4.00	Rotary Drilling (Coring)	Commence RC drilling from **17.35m to 23.35m BML / E.O.H at -22.50mCD** / CD 0.85m below mudline

Weather forecast



Health Safety & the Environment

FGSL Rep: Theo Cleave	Client Rep:
Signed:	Signed:

NEARSHORE DAILY PROGRESS REPORT

Nigg Energy Park - Marine Ground Investigation

Daily Report No. 03

Activity Time Summary		Today	To Date	Day Shift	Night Shift	Company	Position
Mobilisation		0.00	3.50	Onboard JUB (mobilisation)			
Moving & Jacking		0.00	9.67	Jimmy Wilson	Joshua Sandy	Fugro GeoServices	Bargemaster
Rotary Drilling (Coring)		5.50	5.50	James Lawson	Adam Cook	Fugro GeoServices	Driller
Cable Percussion		16.58	28.42	Callum Allardyce	Ashley Lowthian	Fugro GeoServices	Assistant Driller
Standby (Fugro)		0.00	0.00	Stuart Nye		Fugro GeoServices	Assistant Driller
Standby (Tide)		0.00	2.00				
Standby weather		0.00	10.50	Richard Luker	Bart Kot	Fugro	Geotechnical Engineer
Single Shift Standby		0.00	5.75				
Other Operations		0.42	2.42	Theo Cleave		Fugro GeoServices	Project Engineer
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				
		0.00	0.00				
	Total	24.00	24.00	**No. Personnel**	**10**	**Total Man Hours Worked**	120

Project Program / Progress		Programmed			Today			Actual To Date			% Program Completed
Activity	BoQ Item	m.	No.	Hours	m.	No.	Hours	m.	No.	Hours	
General Items, Provisional Services	**A**										0
Establish all plant, equipment, crew on site	A2		1.0					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			10.50	0.0	0	10.50	0.0
Standing Time for plant, crew, etc - TIDE	B11 C19			R/O			2.00	0.0	0	2.00	0.0
								0.0	0	2.00	0.0
Percussion Boring	**B**										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
Advance BH between groundlevel and 10m depth	B4	80.00			17.35			26.8	0	0.00	33.4
As B4 but between 10m and 20m	B5	36.50						0.0	0	0.00	0.0
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	0	0.00	0.0
Rotary Drilling	**C**										0.0
Move rotary plant to site of each exploratory hole	C15		6.00					0.0	1	0.00	16.7
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			3.35			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	0	0.00	0.0
Sampling, Monitoring during investigation	**E**										0.0
Small Disturbed Sample	E1		59.00			35		0.0	54	0.00	91.5
Bulk Disturbed Sample	E2		59.00					0.0	0	0.00	0.0
Large Bulk disturbed sample	E3		R/O					0.0	0	0.00	0.0
								0.0	0	0.00	0.0
Insitu Testing	**H**										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
								0.0	0	0.00	0.0
Geoenvironmental Laboratory Testing	**L**										0.0
Marine Scotland Sample	L2		121			26		0.0	34	0.00	28.1
								0.0	0	0.00	0.0
Additional Items											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
								0.0	0	0.00	0.0

Health & Safety Summary	Today	Actual To Date	Lost & Damaged
Hoc Cards	1	7	
Safety Drills	0	4	
Tool Box Talks	1	5	
HSE Meetings	0	1	
Incidents/Near Miss	0	0	
Environmental	0	0	
Hours Worked	120	360	

Fugro GeoServices Representative Comments

Client Representative Comments

FGSL Rep: Theo Cleave

Signed:

Client Rep:

Signed:

NEARSHORE DAILY PROGRESS REPORT

Nigg Energy Park - Marine Ground Investigation

Daily Report No. 04

Job No	C1982	Vessel	Skate 3A	Date	Tuesday 05-Mar-19

To	ANeillings@arch-henderson.co.uk	Attn.	Andy Neillings	No./email	0141 227 3060
cc	mshuttleworth@arch-henderson.co.uk	Attn.	Michael Shuttleworth	No./email	Redact
cc	stuart.innes@gegroup.com	Attn.	Stuart Innes	No./email	Redact
cc		Attn.		No./email	
cc	m.chappell@fugro.com	Attn.	Mathew Chappell - Nearshore Manager	No./email	
cc	n.armstrong@fugro.com	Attn.	Nicholas Armstrong - Reporting Mana	No./email	Redact
cc	g.crisp@fugro.com	Attn.	Glen Crisp - Project Manager	No./email	Redact

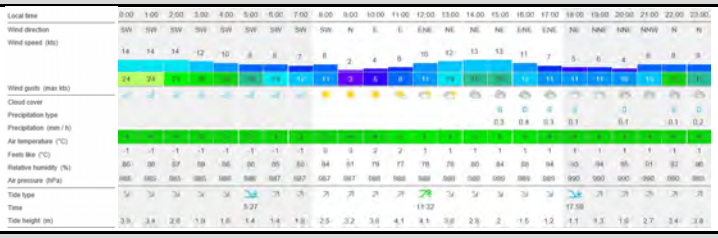
Observed Weather	Wind		Swell (Hs)	Sea State	Visibility	Weather Forecast
Time 00:00	Speed Knts	Dir				
00:00	6	SSW	N/A	smooth	good	See Below
06:00	4	SSW	N/A	smooth	good	
12:00	5	SW	N/A	smooth	good	
18:00	8	NE	N/A	smooth	good	
00:00	9	NE	N/A	smooth	good	

Leg Penetration (m)					Operational Status
BH no.	1	2	3	4	
BH01	**1.0**	**1.0**	**2.2**	**3.1**	**Rotary drilling underway on BH01** **Prepare to move to BH08 at high water**
BH08	**0.3**	**0.9**	**1.4**	**1.3**	

Summary of Operations / Borehole Drilling - last 24hrs:

From	To	Hrs (No.)	Code	Description
00:00	00:20	0.33	Rotary Drilling (Coring)	Commence RC drilling from **17.35m to 23.35m BML / E.O.H at -22.50mCD / CD 0.85m below mudline**
00:20	02:30	2.17	Other Operations	Pull all Geobor to deck / Pull all casing to deck / Wash down and clear deck
02:30	07:00	4.50	Standby (Tide)	Unable to move JUB until high water / Prepare, secure deck for move / General R&M
07:00	08:00	1.00	Crew Change / TBT	Nightshift transfer to shore / Handover on CTV Quay / Dayshift transfer to JUB / TBT on Rotary Drilling Operations
08:00	10:30	2.50	Standby (Tide)	Unable to move JUB until high water / Prepare, secure deck for move / Jack down and pull legs
10:30	11:50	1.33	Moving & Jacking	Complete move from BH01 to BH08 / Preload and jack up to safe working height.
11:50	18:45	6.92	Cable Percussion	Run in casing to mudline / Commence CP drilling from **0.00m to 7.00m BML**
18:45	19:15	0.50	Other Operations	Wash and clear down deck for E.O.S / Fuel all plant
19:15	20:00	0.75	Crew Change / TBT	Dayshift transfer to shore / Handover on CTV Quay / Nightshift transfer to JUB / TBT on Rotary Drilling Operations
20:00	00:00	4.00	Cable Percussion	Continue CP drilling from **7.00m to 13.00m BML**

Weather forecast



Health Safety & the Environment

FGSL Rep: Theo Cleave	Client Rep:
Signed:	Signed:

NEARSHORE DAILY PROGRESS REPORT

Nigg Energy Park - Marine Ground Investigation

Daily Report No. 04

Activity Time Summary		Today	To Date	Day Shift	Night Shift	Company	Position
Mobilisation		0.00	3.50	Onboard JUB (mobilisation)			
Moving & Jacking		1.33	11.00	Jimmy Wilson	Joshua Sandy	Fugro GeoServices	Bargemaster
Rotary Drilling (Coring)		0.33	5.83	James Lawson	Adam Cook	Fugro GeoServices	Driller
Cable Percussion		10.92	39.33	Callum Allardyce	Ashley Lowthian	Fugro GeoServices	Assistant Driller
Standby (Fugro)		0.00	0.00	Stuart Nye		Fugro GeoServices	Assistant Driller
Standby (Tide)		7.00	9.00				
Standby weather		0.00	10.50	Richard Luker	Bart Kot	Fugro	Geotechnical Engineer
Single Shift Standby		0.00	5.75				
Other Operations		2.67	5.08	Theo Cleave		Fugro GeoServices	Project Engineer
Crew Change / TBT		1.75	6.00				
		0.00	0.00				
		0.00	0.00				
		0.00	0.00				
		0.00	0.00				
		0.00	0.00				
		0.00	0.00				
	Total	24.00	24.00	**No. Personnel**	**10**	**Total Man Hours Worked**	120

Project Program / Progress		Programmed			Today			Actual To Date			% Program Completed
Activity	BoQ Item	m.	No.	Hours	m.	No.	Hours	m.	No.	Hours	
General Items, Provisional Services	**A**										0
Establish all plant, equipment, crew on site	A2		1.0					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				0.0	0	10.50	0.0
Standing Time for plant, crew, etc - TIDE	B11 C19			R/O			7.00	0.0	0	9.00	0.0
								0.0	0	0.00	0.0
Percussion Boring	**B**										0.0
Move boring plant to site of each exploratory hole	B1		8.00			1		0.0	3	0.00	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	B3			R/O				0.0	0	0.00	0.0
Advance BH between groundlevel and 10m depth	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	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	0	0.00	0.0
Rotary Drilling	**C**										0.0
Move rotary plant to site of each exploratory hole	C15		6.00					0.0	1	0.00	16.7
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						2.7	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	0	0.00	0.0
Sampling, Monitoring during investigation	**E**										0.0
Small Disturbed Sample	E1		59.00					0.0	54	0.00	91.5
Bulk Disturbed Sample	E2		59.00					0.0	0	0.00	0.0
Large Bulk disturbed sample	E3		R/O					0.0	0	0.00	0.0
								0.0	0	0.00	0.0
Insitu Testing	**H**										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
								0.0	0	0.00	0.0
Geoenvironmental Laboratory Testing	**L**										0.0
Marine Scotland Sample	L2		121					0.0	34	0.00	28.1
								0.0	0	0.00	0.0
Additional Items											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
								0.0	0	0.00	0.0

Health & Safety Summary	Today	Actual To Date	Lost & Damaged
Hoc Cards	1	8	
Safety Drills	0	4	
Tool Box Talks	1	6	
HSE Meetings	0	1	
Incidents/Near Miss	0	0	
Environmental	0	0	
Hours Worked	120	480	

Fugro GeoServices Representative Comments

Client Representative Comments

FGSL Rep: Theo Cleave

Signed:

Client Rep:

Signed:

NEARSHORE DAILY PROGRESS REPORT

Nigg Energy Park - Marine Ground Investigation

Daily Report No. 05

Job No	C1982	Vessel	Skate 3A	Date	Wednesday 06-Mar-19

To	ANeillings@arch-henderson.co.uk	Attn.	Andy Neillings	No./email	0141 227 3060
cc	mshuttleworth@arch-henderson.co.uk	Attn.	Michael Shuttleworth	No./email	Redact
cc	stuart.innes@gegroup.com	Attn.	Stuart Innes	No./email	Redact
cc		Attn.		No./email	
cc	m.chappell@fugro.com	Attn.	Mathew Chappell - Nearshore Manager	No./email	
cc	n.armstrong@fugro.com	Attn.	Nicholas Armstrong - Reporting Mana	No./email	Redact
cc	g.crisp@fugro.com	Attn.	Glen Crisp - Project Manager	No./email	Redact

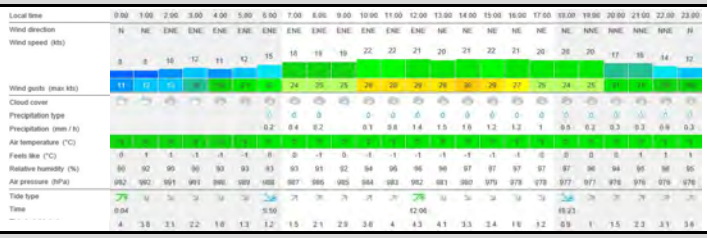
Observed Weather	Wind		Swell (Hs)	Sea State	Visibility	Weather Forecast
Time 00:00	Speed Knts	Dir				
00:00	7	ENE	N/A	smooth	good	See Below
06:00	15	ENE	N/A	smooth	good	
12:00	27	ENE	N/A	smooth	good	
18:00	25	ENE	N/A	smooth	good	
00:00	21	NE	N/A	smooth	good	

Leg Penetration (m)					Operational Status
BH no.	1	2	3	4	
BH08	0.3	0.9	1.4	1.3	CP drilling underway on BH08

Summary of Operations / Borehole Drilling - last 24hrs:

From	To	Hrs (No.)	Code	Description
00:00	02:45	2.75	Cable Percussion	Continue CP from **13.00m to 15.82m BML / -15mCD**
02:45	04:30	1.75	Cable Percussion	BH08 continued from **15.82 to 19.00m BML / -18.18mCD** / Rockhead confirmed
04:30	07:00	2.50	Standby (Tide)	Waiting on high water to move to BH07 / Wash down and clear deck / Secure deck for move
07:00	08:00	1.00	Crew Change / TBT	Nightshift transfer to shore / Handover on CTV Quay / Dayshift transfer to JUB / TBT on
08:00	10:45	2.75	Moving & Jacking	Pull legs and start move to BH07 / Wind speed and swell increasing / Move aborted
10:45	12:15	1.50	Moving & Jacking	JUB ~30m from BH07 / wind, swell and steep contours preventing move / Preload and jack up to await safe weather window.
12:15	14:00	1.75	Standby (weather)	JUB jacked up ~30m from BH07 / Client Rep tranfers to JUB after witnessing attempted move from shore.
14:00	19:00	5.00	Standby (weather)	JUB jacked up ~30m from BH07 / await weather window to complete move / Client Rep transits to shore after inspection
19:00	20:00	1.00	Crew Change / TBT	Dayshift transfer to shore / Handover on CTV Quay / Nightshift transfer to JUB / TBT on
20:00	00:00	4.00	Standby (weather)	Wind recorded at 24kt average, swell <1m / Continue to monitor weather and await window to complete move.

Weather forecast



Health Safety & the Environment

FGSL Rep: Theo Cleave	Client Rep:
Signed:	Signed:

NEARSHORE DAILY PROGRESS REPORT

Nigg Energy Park - Marine Ground Investigation

Daily Report No. 05

Activity Time Summary		Today	To Date	Day Shift	Night Shift	Company	Position
Mobilisation		0.00	3.50	Onboard JUB (mobilisation)			
Moving & Jacking		4.25	15.25	Jimmy Wilson	Joshua Sandy	Fugro GeoServices	Bargemaster
Rotary Drilling (Coring)		0.00	5.83	James Lawson	Adam Cook	Fugro GeoServices	Driller
Cable Percussion		4.50	43.83	Callum Allardyce	Ashley Lowthian	Fugro GeoServices	Assistant Driller
Standby (Fugro)		0.00	0.00	Stuart Nye		Fugro GeoServices	Assistant Driller
Standby (Tide)		2.50	11.50				
Standby (weather)		10.75	21.25	Richard Luker	Bart Kot	Fugro	Geotechnical Engineer
Single Shift Standby		0.00	5.75				
Other Operations		0.00	5.08	Theo Cleave		Fugro GeoServices	Project Engineer
Crew Change / TBT		2.00	8.00				
		0.00	0.00				
		0.00	0.00				
		0.00	0.00				
		0.00	0.00				
		0.00	0.00				
		0.00	0.00				
	Total	24.00	24.00	**No. Personnel**	**10**	**Total Man Hours Worked**	120

Project Program / Progress		Programmed			Today			Actual To Date			% Program Completed
Activity	BoQ Item	m.	No.	Hours	m.	No.	Hours	m.	No.	Hours	
General Items, Provisional Services	**A**										0
Establish all plant, equipment, crew on site	A2		1.0					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			10.75	0.0	0	21.25	0.0
Standing Time for plant, crew, etc - TIDE	B11 C19			R/O			2.50	0.0	0	11.50	0.0
								0.0	0	0.00	0.0
Percussion Boring	**B**										0.0
Move boring plant to site of each exploratory hole	B1		8.00					0.0	3	0.00	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	B3			R/O				0.0	0	0.00	0.0
Advance BH between groundlevel and 10m depth	B4	80.00						29.4	0	0.00	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/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	0	0.00	0.0
Rotary Drilling	**C**										0.0
Move rotary plant to site of each exploratory hole	C15		6.00					0.0	1	0.00	16.7
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						2.7	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	0	0.00	0.0
Sampling, Monitoring during investigation	**E**										0.0
Small Disturbed Sample	E1		59.00			19		0.0	73	0.00	
Bulk Disturbed Sample	E2		59.00			19		0.0	19	0.00	32.2
Large Bulk disturbed sample	E3		R/O					0.0	0	0.00	0.0
								0.0	0	0.00	0.0
Insitu Testing	**H**										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
								0.0	0	0.00	0.0
Geoenvironmental Laboratory Testing	**L**										0.0
Marine Scotland Sample	L2		121			11		0.0	45	0.00	37.2
								0.0	0	0.00	0.0
Additional Items											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
								0.0	0	0.00	0.0

Health & Safety Summary	Today	Actual To Date	Lost & Damaged
Hoc Cards	1	9	
Safety Drills	0	4	
Tool Box Talks	1	7	
HSE Meetings	0	1	
Incidents/Near Miss	0	0	
Environmental	0	0	
Hours Worked	120	600	

Fugro GeoServices Representative Comments

BH08 was continued below scheduled depth of -15mCD to confirm rockhead.
JUB was waiting on tide during this additional drilling time.
Additional data down to rockhead available,
Alternatively, this period may be charged at standing rate if information is not required.

Client Representative Comments

FGSL Rep: Theo Cleave

Signed:

Client Rep:

Signed:

NEARSHORE DAILY PROGRESS REPORT

Nigg Energy Park - Marine Ground Investigation

Daily Report No. 06

Job No	C1982	Vessel	Skate 3A	Date	Thursday 07-Mar-19

To	ANeillings@arch-henderson.co.uk	Attn.	Andy Neillings	No./email	0141 227 3060
cc	mshuttleworth@arch-henderson.co.uk	Attn.	Michael Shuttleworth	No./email	Redact
cc	stuart.innes@gegroup.com	Attn.	Stuart Innes	No./email	Redact
cc		Attn.		No./email	
cc	m.chappell@fugro.com	Attn.	Mathew Chappell - Nearshore Manager	No./email	
cc	n.armstrong@fugro.com	Attn.	Nicholas Armstrong - Reporting Mana	No./email	Redact
cc	g.crisp@fugro.com	Attn.	Glen Crisp - Project Manager	No./email	Redact

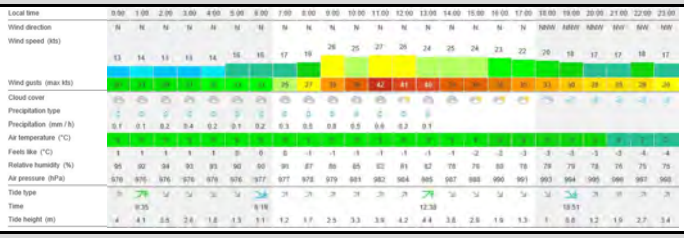
Observed Weather	Wind		Swell (Hs)	Sea State	Visibility	Weather Forecast
Time 00:00	Speed Knts	Dir				
00:00	21	NE	N/A	smooth/slight	good	See Below
06:00	24	E	N/A	slight	good	
12:00	28	NE	N/A	slight	good	
18:00	19	NNW	N/A	smooth	good	
00:00	16	NW	N/A	smooth	good	

Leg Penetration (m)					Operational Status
BH no.	1	2	3	4	
BH07	**3.2**	**4.4**	**4.4**	**3.4**	**Jacked up ~30m from BH07 after aborted move** **Awaiting suitable weather window to complete move.**

Summary of Operations / Borehole Drilling - last 24hrs:

From	To	Hrs (No.)	Code	Description
00:00	07:00	7.00	Standby (weather)	JUB jacked up ~30m from BH07 / await weather window to complete move
07:00	08:00	1.00	Crew Change / TBT	Nightshift transfer to shore / Handover at accomodation / Dayshift transfer to JUB / TBT on Moving & Jacking Ops
08:00	16:30	8.50	Standby (weather)	JUB jacked up ~30m from BH07 / Wind and swell in excess of operational limits / Dayshift continue to monitor conditions
16:30	17:30	1.00	Standby (weather)	Conditions settling as winds move from NE towards SW forecast / Crew prepare JUB for move
17:30	19:45	2.25	Moving & Jacking	Wind measured 19kts avg. / Jack down and pull legs / Complete move to BH07 / Preload and jack up to safe working height
19:45	20:15	0.50	Crew Change / TBT	Nightshift transfer to JUB / Handover onboard as BM finishes preloading / Dayshift transfer to shore / TBT as above
20:15	00:00	3.75	Cable Percussion	Run in casing to mudline / Commence CP drilling from **0.00m to 8.00m BML / Seabed below CD = 4.01m**

Weather forecast



Health Safety & the Environment

FGSL Rep: Theo Cleave	Client Rep:
Signed:	Signed:

NEARSHORE DAILY PROGRESS REPORT

Nigg Energy Park - Marine Ground Investigation

Daily Report No. 06

Activity Time Summary		Today	To Date	Day Shift	Night Shift	Company	Position
Mobilisation		0.00	3.50	Onboard JUB (mobilisation)			
Moving & Jacking		2.25	17.50	Jimmy Wilson	Joshua Sandy	Fugro GeoServices	Bargemaster
Rotary Drilling (Coring)		0.00	5.83	James Lawson	Adam Cook	Fugro GeoServices	Driller
Cable Percussion		3.75	47.58	Callum Allardyce	Ashley Lowthian	Fugro GeoServices	Assistant Driller
Standby (Fugro)		0.00	0.00	Stuart Nye		Fugro GeoServices	Assistant Driller
Standby (Tide)		0.00	11.50				
Standby (weather)		16.50	37.75	Richard Luker	Bart Kot	Fugro	Geotechnical Engineer
Single Shift Standby		0.00	5.75				
Other Operations		0.00	5.08	Theo Cleave		Fugro GeoServices	Project Engineer
Crew Change / TBT		1.50	9.50				
		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	24.00	24.00	**No. Personnel**	**10**	**Total Man Hours Worked**	120

Project Program / Progress		Programmed			Today			Actual To Date			% Program Completed
Activity	BoQ Item	m.	No.	Hours	m.	No.	Hours	m.	No.	Hours	
General Items, Provisional Services	**A**										0
Establish all plant, equipment, crew on site	A2		1.0					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			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
								0.0	0	0.00	0.0
Percussion Boring	**B**										0.0
Move boring plant to site of each exploratory hole	B1		8.00			1		0.0	4	0.00	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			R/O				0.0	0	0.00	0.0
Advance BH between groundlevel and 10m depth	B4	80.00			8.00			37.4	0	0.00	46.8
As B4 but between 10m and 20m	B5	36.50						16.4	0	0.00	44.8
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	0	0.00	0.0
Rotary Drilling	**C**										0.0
Move rotary plant to site of each exploratory hole	C15		6.00			1		0.0	2	0.00	33.3
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
								0.0	0	0.00	0.0
Sampling, Monitoring during investigation	**E**										0.0
Small Disturbed Sample	E1		59.00					0.0	73	0.00	
Bulk Disturbed Sample	E2		59.00					0.0	19	0.00	32.2
Large Bulk disturbed sample	E3		R/O					0.0	0	0.00	0.0
								0.0	0	0.00	0.0
Insitu Testing	**H**										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
								0.0	0	0.00	0.0
Geoenvironmental Laboratory Testing	**L**										0.0
Marine Scotland Sample	L2		121					0.0	45	0.00	37.2
								0.0	0	0.00	0.0
Additional Items											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
								0.0	0	0.00	0.0

Health & Safety Summary	Today	Actual To Date	Lost & Damaged
Hoc Cards	1	10	
Safety Drills	0	4	
Tool Box Talks	1	8	
HSE Meetings	0	1	
Incidents/Near Miss	0	0	
Environmental	0	0	
Hours Worked	120	720	

Fugro GeoServices Representative Comments

Client Representative Comments

FGSL Rep: Theo Cleave

Signed:

Client Rep:

Signed:

NEARSHORE DAILY PROGRESS REPORT

Nigg Energy Park - Marine Ground Investigation

Daily Report No. 07

Job No	C1982	Vessel	Skate 3A	Date	Friday 08-Mar-19

To	ANeillings@arch-henderson.co.uk	Attn.	Andy Neillings	No./email	0141 227 3060
cc	mshuttleworth@arch-henderson.co.uk	Attn.	Michael Shuttleworth	No./email	Redact
cc	stuart.innes@gegroup.com	Attn.	Stuart Innes	No./email	Redact
cc		Attn.		No./email	
cc	m.chappell@fugro.com	Attn.	Mathew Chappell - Nearshore Manager	No./email	
cc	n.armstrong@fugro.com	Attn.	Nicholas Armstrong - Reporting Mana	No./email	Redact
cc	g.crisp@fugro.com	Attn.	Glen Crisp - Project Manager	No./email	Redact

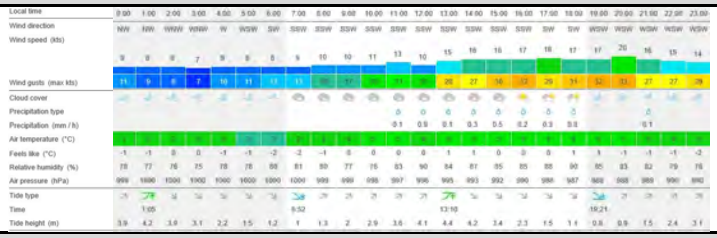
Observed Weather	Wind		Swell (Hs)	Sea State	Visibility	Weather Forecast
Time 00:00	Speed Knts	Dir				
00:00	16	NW	N/A	smooth	good	See Below
06:00	8	SW	N/A	smooth	good	
12:00	21	SSW	N/A	smooth	good	
18:00	25	SSW	N/A	smooth	good	
00:00	20	SSW	N/A	smooth	good	

Leg Penetration (m)					Operational Status
BH no.	1	2	3	4	
BH07	**3.2**	**4.4**	**4.4**	**3.4**	**Jacked up on BH07** **CP underway at approx. -12.00mCD**
BH03	**2.3**	**0.8**	**1.9**	**2.7**	

Summary of Operations / Borehole Drilling - last 24hrs:

From	To	Hrs (No.)	Code	Description
00:00	07:15	7.25	Cable Percussion	Continue CP drilling from 8.00m to 18.45m BML
07:15	08:00	0.75	Crew Change / TBT	Nightshift transfer to shore / Handover at CTV Quay / Dayshift transfer to JUB / TBT on Working at Height
08:00	09:30	1.50	Cable Percussion	Continue CP drilling from **18.45m to 19.50 BML** / E.O.H confirmed by client at **-23.51mCD** / SPT tested to **-23.62mCD**
09:30	10:10	0.67	Other Operations	Pull all casing / Wash down and clear deck / Prepare JUB for move
10:10	12:45	2.58	Moving & Jacking	Jack down and pull legs / Complete move to **BH03** / Preload and jack up to safe working height
12:45	19:00	6.25	Cable Percussion	Run in casing to mudline / Commence CP drilling from **0.00m to 8.00m BML** / **Seabed = -0.75mCD**
19:00	19:30	0.50	Other Operations	Wash down and clear deck for E.O.S / Fuel all plant nad RHIB
19:30	20:00	0.50	Crew Change / TBT	Dayshift transfer to shore / Handover on CTV Quay / Nightshift transfer to JUB / TBT on Working at Height
20:00	00:00	4.00	Cable Percussion	Continue CP drilling from **8.00m to 13.00 BML**

Weather forecast



Health Safety & the Environment

FGSL Rep: Theo Cleave	Client Rep:
Signed:	**Signed:**

NEARSHORE DAILY PROGRESS REPORT

Nigg Energy Park - Marine Ground Investigation

Daily Report No. 07

Activity Time Summary		Today	To Date	Day Shift	Night Shift	Company	Position
Mobilisation		0.00	3.50	Onboard JUB (mobilisation)			
Moving & Jacking		2.58	20.08	Jimmy Wilson	Joshua Sandy	Fugro GeoServices	Bargemaster
Rotary Drilling (Coring)		0.00	5.83	James Lawson	Adam Cook	Fugro GeoServices	Driller
Cable Percussion		19.00	66.58	Callum Allardyce	Ashley Lowthian	Fugro GeoServices	Assistant Driller
Standby (Fugro)		0.00	0.00	Stuart Nye		Fugro GeoServices	Assistant Driller
Standby (Tide)		0.00	11.50				
Standby (weather)		0.00	37.75	Richard Luker	Bart Kot	Fugro	Geotechnical Engineer
Single Shift Standby		0.00	5.75				
Other Operations		1.17	6.25	Theo Cleave		Fugro GeoServices	Project Engineer
Crew Change / TBT		1.25	10.75				
		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	24.00	24.00	**No. Personnel**	**10**	**Total Man Hours Worked**	120

Project Program / Progress		Programmed			Today			Actual To Date			% Program Completed
Activity	BoQ Item	m.	No.	Hours	m.	No.	Hours	m.	No.	Hours	
General Items, Provisional Services	**A**										0
Establish all plant, equipment, crew on site	A2		1.0					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				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
								0.0	0	0.00	0.0
Percussion Boring	**B**										0.0
Move boring plant to site of each exploratory hole	B1		8.00			1		0.0	5	0.00	62.5
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	B3			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	0	0.00	0.0
Rotary Drilling	**C**										0.0
Move rotary plant to site of each exploratory hole	C15		6.00			1		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						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	0	0.00	0.0
Sampling, Monitoring during investigation	**E**										0.0
Small Disturbed Sample	E1		59.00			21		0.0	94	0.00	
Bulk Disturbed Sample	E2		59.00			19		0.0	38	0.00	64.4
Large Bulk disturbed sample	E3		R/O					0.0	0	0.00	0.0
								0.0	0	0.00	0.0
Insitu Testing	**H**										0.0
Standard Penetration Test in Borehole	H1		40			11		0.0	11	0.00	27.5
Standard Penetration Test in Rotary Drill Hole	H2		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			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	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 Summary	Today	Actual To Date	Lost & Damaged
Hoc Cards	1	11	
Safety Drills	0	4	
Tool Box Talks	1	9	
HSE Meetings	0	1	
Incidents/Near Miss	0	0	
Environmental	0	0	
Hours Worked	120	840	

Fugro GeoServices Representative Comments

Client rep contacted at shift change to update on forecasted high winds and current stage of BH07. Agreement to continue BH07 to -24mCD and then pull casing to allow a move before conditions deteriorate.

Client Representative Comments

"As per our discussion, please continue the BH to a level of -24mCD. This should allow you to complete and move before 10AM."

FGSL Rep: Theo Cleave

Signed:

Client Rep:

Signed:

NEARSHORE DAILY PROGRESS REPORT

Nigg Energy Park - Marine Ground Investigation

Daily Report No. 08

Job No	C1982	Vessel	Skate 3A	Date	Saturday 09-Mar-19

To	ANeillings@arch-henderson.co.uk	Attn.	Andy Neillings	No./email	0141 227 3060
cc	mshuttleworth@arch-henderson.co.uk	Attn.	Michael Shuttleworth	No./email	Redact
cc	stuart.innes@gegroup.com	Attn.	Stuart Innes	No./email	Redact
cc		Attn.		No./email	
cc	m.chappell@fugro.com	Attn.	Mathew Chappell - Nearshore Manager	No./email	
cc	n.armstrong@fugro.com	Attn.	Nicholas Armstrong - Reporting Mana	No./email	Redact
cc	g.crisp@fugro.com	Attn.	Glen Crisp - Project Manager	No./email	Redact

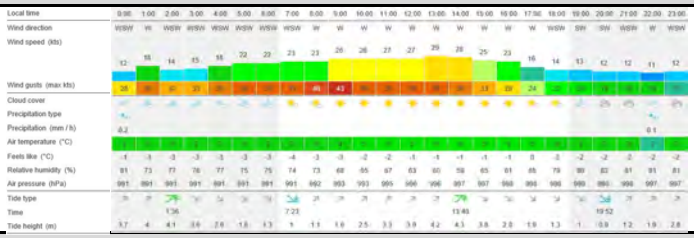
Observed Weather	Wind		Swell (Hs)	Sea State	Visibility	Weather Forecast
Time 00:00	Speed Knts	Dir				
00:00	20	SSW	N/A	smooth/slight	good	See Below
06:00	31	SSW	N/A	slight	good	
12:00	28	WSW	N/A	slight	good	
18:00	26	W	N/A	slight	good	
00:00	19	WSW	N/A	smooth/slight	good	

Leg Penetration (m)					Operational Status
BH no.	1	2	3	4	
BH03	**2.3**	**0.8**	**1.9**	**2.7**	**CP drilling operations underway on BH03**

Summary of Operations / Borehole Drilling - last 24hrs:

From	To	Hrs (No.)	Code	Description
00:00	06:30	6.50	Cable Percussion	Continue CP drilling from **13.00m to 17.00 BML** / Unable to advance casing further
06:30	07:00	0.50	Rotary Drilling (Coring)	Clear down deck and switch over to RC operations / Run in Geobor S and continue BH from 17.00m
07:00	08:00	1.00	Crew Change / TBT	Nightshift transfer to shore / Handover at CTV Quay / Dayshift transfer to JUB / TBT
08:00	09:00	1.00	Rotary Drilling (Coring)	Continue BH from **17.00m to 22.50m BML / E.O.H @ -23.25mCD** / begin to pull casing to deck
09:00	19:00	10.00	Standby (weather)	Very high winds in excess of 40kts / Wait for suitable weather window to move / Crew onboard monitoring conditions
19:00	20:00	1.00	Crew Change / TBT	Dayshift transfer to shore / Handover on CTV Quay / Nightshift transfer to JUB / TBT
20:00	00:00	4.00	Standby (weather)	Winds marginal with gusts in excecss of limits / Swell >1m on shelving beach / Wait for suitable weather window to move

Weather forecast



Health Safety & the Environment

Very steep seabed gradient in this area and formed of very loose material.
Moves require more time to adjust legs to the changing contours.
This additional time and the risk of moving into the deeper channel need to be considered when judging weather windows.

FGSL Rep: Theo Cleave	Client Rep:
Signed:	Signed:

NEARSHORE DAILY PROGRESS REPORT

Nigg Energy Park - Marine Ground Investigation

Daily Report No. 08

Activity Time Summary		Today	To Date	Day Shift	Night Shift	Company	Position
Mobilisation		0.00	3.50	Onboard JUB (mobilisation)			
Moving & Jacking		0.00	20.08	Jimmy Wilson	Joshua Sandy	Fugro GeoServices	Bargemaster
Rotary Drilling (Coring)		1.50	7.33	James Lawson	Adam Cook	Fugro GeoServices	Driller
Cable Percussion		6.50	73.08	Callum Allardyce	Ashley Lowthian	Fugro GeoServices	Assistant Driller
Standby (Fugro)		0.00	0.00	Stuart Nye		Fugro GeoServices	Assistant Driller
Standby (Tide)		0.00	11.50				
Standby (weather)		14.00	51.75	Richard Luker	Bart Kot	Fugro	Geotechnical Engineer
Single Shift Standby		0.00	5.75				
Other Operations		0.00	6.25	Theo Cleave		Fugro GeoServices	Project Engineer
Crew Change / TBT		2.00	12.75				
		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	24.00	24.00	**No. Personnel**	**10**	**Total Man Hours Worked**	120

Project Program / Progress		Programmed			Today			Actual To Date			% Program Completed
Activity	BoQ Item	m.	No.	Hours	m.	No.	Hours	m.	No.	Hours	
General Items, Provisional Services	**A**										0
Establish all plant, equipment, crew on site	A2		1.0					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			14.00	0.0	0	51.75	0.0
Standing Time for plant, crew, etc - TIDE	B11 C19			R/O				0.0	0	11.50	0.0
								0.0	0	0.00	0.0
Percussion Boring	**B**										0.0
Move boring plant to site of each exploratory hole	B1		8.00					0.0	5	0.00	62.5
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	B3			R/O				0.0	0	0.00	0.0
Advance BH between groundlevel and 10m depth	B4	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						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	0	0.00	0.0
Rotary Drilling	**C**										0.0
Move rotary plant to site of each exploratory hole	C15		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	C43	9.50			2.50			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	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	91.5
Large Bulk disturbed sample	E3		R/O					0.0	0	0.00	0.0
								0.0	0	0.00	0.0
Insitu Testing	**H**										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
								0.0	0	0.00	0.0
Geoenvironmental Laboratory Testing	**L**										0.0
Marine Scotland Sample	L2		121			22		0.0	83	0.00	68.6
								0.0	0	0.00	0.0
Additional Items											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
								0.0	0	0.00	0.0

Health & Safety Summary	Today	Actual To Date	Lost & Damaged
Hoc Cards	1	12	
Safety Drills	0	4	
Tool Box Talks	1	10	
HSE Meetings	0	1	
Incidents/Near Miss	0	0	
Environmental	0	0	
Hours Worked	120	960	

Fugro GeoServices Representative Comments

Wind speed recorded and monitored using forecasting systems (Met Office, WindFinder etc.) and anonometers; handheld and station mounted.

Client Representative Comments

FGSL Rep: Theo Cleave

Signed:

Client Rep:

Signed:

NEARSHORE DAILY PROGRESS REPORT

Nigg Energy Park - Marine Ground Investigation

Daily Report No. 09

Job No	C1982	Vessel	Skate 3A	Date	Sunday 10-Mar-19

To	ANeillings@arch-henderson.co.uk	Attn.	Andy Neillings	No./email	0141 227 3060
cc	mshuttleworth@arch-henderson.co.uk	Attn.	Michael Shuttleworth	No./email	Redact
cc	stuart.innes@gegroup.com	Attn.	Stuart Innes	No./email	Redact
cc		Attn.		No./email	
cc	m.chappell@fugro.com	Attn.	Mathew Chappell - Nearshore Manager	No./email	
cc	n.armstrong@fugro.com	Attn.	Nicholas Armstrong - Reporting Mana	No./email	Redact
cc	g.crisp@fugro.com	Attn.	Glen Crisp - Project Manager	No./email	Redact

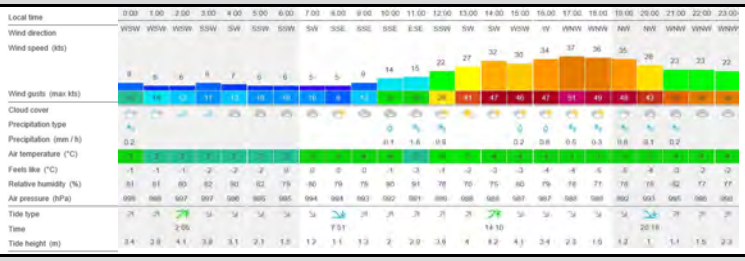
Observed Weather	Wind		Swell (Hs)	Sea State	Visibility	Weather Forecast
Time 00:00	Speed Knts	Dir				
00:00	19	WSW	N/A	smooth	good	See Below
06:00	20	W	N/A	smooth/slight	good	
12:00	25	W	N/A	slight	poor	
18:00	39	W	N/A	slight	poor	
00:00	28	W	N/A	smooth/slight	poor	

Leg Penetration (m)					Operational Status
BH no.	1	2	3	4	
BH03	**2.3**	**0.8**	**1.9**	**2.7**	**BH03 completed.**
BH04	**2.4**	**0.7**	**1.6**	**2.9**	**Awaiting suitable weather window for move to BH04.**

Summary of Operations / Borehole Drilling - last 24hrs:

From	To	Hrs (No.)	Code	Description
00:00	03:00	3.00	Standby (weather)	Winds marginal with gusts in excecss of limits / Swell ~1m on shelving beach / Wait for suitable weather window to move
03:00	03:30	0.50	Standby (weather)	Wait for suitable weather window to move / Nightshift continue to monitor conditions / General R&M
03:30	06:00	2.50	Moving & Jacking	Conditions marginal / BM jacks down and pulls legs / Spin JUB to BH04 / Preload and jack to sage working height
06:00	07:30	1.50	Cable Percussion	Run in casing to depth / Commence CP drilling from **0.00m to 1.00m BML**
07:30	08:00	0.50	Crew Change / TBT	Dayshift transfer to JUB / Handover onboard for drilling continuation / TBT with all crew - Crew Transfers
08:00	11:00	3.00	Cable Percussion	Continue CP drilling from **1.00m to 4.00m BML**
11:00	11:45	0.75	Other Operations	Prepare deck for forecast storm / jack up beyond forecast Hmax and secure all deck items
11:45	12:00	0.25	Crew Change / TBT	Transfer Dayshift to shore as a precaution / Forecast far in excess of deck operations and evacuation limits.
12:00	19:00	7.00	Standby (weather)	Continue to monitor storm from shore / Avg. 35-40kt winds, gusting >40kts
19:00	19:45	0.75	Crew Change / TBT	Handover with nightshift at accomodation / Nightshift transfer CTV Quay
19:45	00:00	4.25	Standby (weather)	Continue to monitor storm from shore / Avg. 25-30kt winds, gusting >30kts

Weather forecast



Health Safety & the Environment

Met Office - *"High for unsettled conditions for much of the period but Medium becoming Low on Monday for details due to complexity in movement and development of the synoptic pattern."*
Continue to monitor multiple complex lows over the next few days, forecasts up to and exceeding 50kts.

FGSL Rep: Theo Cleave	Client Rep:
Signed:	Signed:

NEARSHORE DAILY PROGRESS REPORT

Nigg Energy Park - Marine Ground Investigation

Daily Report No. 09

Activity Time Summary		Today	To Date	Day Shift	Night Shift	Company	Position
Mobilisation		0.00	3.50	Onboard JUB (mobilisation)			
Moving & Jacking		2.50	22.58	Jimmy Wilson	Joshua Sandy	Fugro GeoServices	Bargemaster
Rotary Drilling (Coring)		0.00	7.33	James Lawson	Adam Cook	Fugro GeoServices	Driller
Cable Percussion		4.50	77.58	Callum Allardyce	Ashley Lowthian	Fugro GeoServices	Assistant Driller
Standby (Fugro)		0.00	0.00	Stuart Nye		Fugro GeoServices	Assistant Driller
Standby (Tide)		0.00	11.50				
Standby (weather)		14.75	66.50	Richard Luker	Bart Kot	Fugro	Geotechnical Engineer
Single Shift Standby		0.00	5.75				
Other Operations		0.75	7.00	Theo Cleave		Fugro GeoServices	Project Engineer
Crew Change / TBT		1.50	14.25				
		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	24.00	24.00	**No. Personnel**	**10**	**Total Man Hours Worked**	120

Project Program / Progress		Programmed			Today			Actual To Date			% Program Completed
Activity	BoQ Item	m.	No.	Hours	m.	No.	Hours	m.	No.	Hours	
General Items, Provisional Services	**A**										0
Establish all plant, equipment, crew on site	A2		1.0					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			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
								0.0	0	0.00	0.0
Percussion Boring	**B**										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/O					0.0	0	0.00	0.0
Break out surface obstructions where present	B3			R/O				0.0	0	0.00	0.0
Advance BH between groundlevel and 10m depth	B4	80.00			4.00			53.4	0	0.00	66.8
As B4 but between 10m and 20m	B5	36.50						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						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	0	0.00	0.0
Rotary Drilling	**C**										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	R/O						0.0	0	0.00	0.0
As C41 but between 10m and 20m	C42	20.50						5.7	0	0.00	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	0	0.00	0.0
Sampling, Monitoring during investigation	**E**										0.0
Small Disturbed Sample	E1		59.00					0.0	116	0.00	
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
								0.0	0	0.00	0.0
Insitu Testing	**H**										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
								0.0	0	0.00	0.0
Geoenvironmental Laboratory Testing	**L**										0.0
Marine Scotland Sample	L2		121					0.0	83	0.00	68.6
								0.0	0	0.00	0.0
Additional Items											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
								0.0	0	0.00	0.0

Health & Safety Summary	Today	Actual To Date	Lost & Damaged
Hoc Cards	1	13	
Safety Drills	0	4	
Tool Box Talks	1	11	
HSE Meetings	0	1	
Incidents/Near Miss	0	0	
Environmental	0	0	
Hours Worked	120	1080	

Fugro GeoServices Representative Comments

First complex low passes over this 24hr period.
Second low currently tracking East towards North Sea, forecast to arrive on site in 48hrs.

Client Representative Comments

FGSL Rep: Theo Cleave

Signed:

Client Rep:

Signed:

NEARSHORE DAILY PROGRESS REPORT

Nigg Energy Park - Marine Ground Investigation

Daily Report No. 10

Job No	C1982	Vessel	Skate 3A	Date	Monday 11-Mar-19

To	ANeillings@arch-henderson.co.uk	Attn.	Andy Neillings	No./email	0141 227 3060
cc	mshuttleworth@arch-henderson.co.uk	Attn.	Michael Shuttleworth	No./email	Redact
cc	stuart.innes@gegroup.com	Attn.	Stuart Innes	No./email	Redact
cc		Attn.		No./email	
cc	m.chappell@fugro.com	Attn.	Mathew Chappell - Nearshore Manager	No./email	
cc	n.armstrong@fugro.com	Attn.	Nicholas Armstrong - Reporting Mana	No./email	Redact
cc	g.crisp@fugro.com	Attn.	Glen Crisp - Project Manager	No./email	Redact

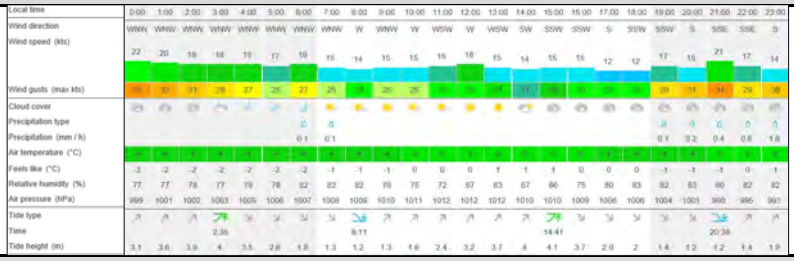
Observed Weather	Wind		Swell (Hs)	Sea State	Visibility	Weather Forecast
Time 00:00	Speed Knts	Dir				
00:00	28	W	N/A	smooth/slight	good	See Below
06:00	19	SW	N/A	smooth	good	
12:00	20	WSW	N/A	smooth	good	
18:00	8	SW	N/A	smooth	good	
00:00	29	SSW	N/A	slight	good	

Leg Penetration (m)					Operational Status
BH no.	1	2	3	4	
BH04	**2.4**	**0.7**	**1.6**	**2.9**	**CP drilling underway on BH04** **Rockhead expected at approx. -19mCD**

Summary of Operations / Borehole Drilling - last 24hrs:

From	To	Hrs (No.)	Code	Description
00:00	02:15	2.25	Standby (weather)	Winds marginal with gusts in excecss of limits / Swell ~1m on shelving beach / Wait for suitable weather window to move
02:15	02:45	0.50	Crew Change / TBT	Nightshift transfer to JUB from CTV Quay
02:45	07:00	4.25	Cable Percussion	Prepare deck for drilling operations / remove all extra scraps etc. / Continue CP from **4.00m to 7.50m BML**
07:00	07:15	0.25	Other Operations	Fuel all plant / Wash down and clear deck for E.O.S
07:15	08:00	0.75	Crew Change / TBT	Nightshift transfer to shore / Handover at CTV Quay / Dayshift transfer to JUB / TBT & Fire Drill
08:00	15:40	7.67	Cable Percussion	Continue CP drilling from **7.50m to 12.50m BML** / Chiselling through very course gravels
15:40	19:20	3.67	Cable Percussion	Run in 7" casing and continue CP drilling from **12.50m to 18m BML**
19:20	20:00	0.67	Crew Change / TBT	Dayshift transfer to shore / Handover on CTV Quay / Nightshift transfer to JUB / TBT & Fire Drill
20:00	22:35	2.58	Cable Percussion	Continue CP drilling from **18.00m to 22.10m BML** / E.O.H @ **-24.10mCD** / Seabed below Chart Datum = 2.00m
22:35	00:00	1.42	Other Operations	Pull all casing to deck / Wash down and clear deck for E.O.H / Fuel all plant / General R&M

Weather forecast



Health Safety & the Environment

Met Office - *"Complex low near Faeroes and into the northern North Sea tracks east or SE trough Mon while transient ridge builds over UK and drifts into the central and southern North Sea."*
Continue to monitor multiple complex lows over the next few days, forecasts up to and exceeding 40kts.

FGSL Rep: Theo Cleave	Client Rep:
Signed:	Signed:

NEARSHORE DAILY PROGRESS REPORT

Nigg Energy Park - Marine Ground Investigation

Daily Report No. 10

Activity Time Summary		Today	To Date	Day Shift	Night Shift	Company	Position
Mobilisation		0.00	3.50	Onboard JUB (mobilisation)			
Moving & Jacking		0.00	22.58	Jimmy Wilson	Joshua Sandy	Fugro GeoServices	Bargemaster
Rotary Drilling (Coring)		0.00	7.33	James Lawson	Adam Cook	Fugro GeoServices	Driller
Cable Percussion		18.17	95.75	Callum Allardyce	Ashley Lowthian	Fugro GeoServices	Assistant Driller
Standby (Fugro)		0.00	0.00	Stuart Nye		Fugro GeoServices	Assistant Driller
Standby (Tide)		0.00	11.50				
Standby (weather)		2.25	68.75	Richard Luker	Bart Kot	Fugro	Geotechnical Engineer
Single Shift Standby		0.00	5.75				
Other Operations		1.67	8.67	Theo Cleave		Fugro GeoServices	Project Engineer
Crew Change / TBT		1.92	16.17				
		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	24.00	24.00	**No. Personnel**	**10**	**Total Man Hours Worked**	120

Project Program / Progress		Programmed			Today			Actual To Date			% Program Completed
Activity	BoQ Item	m.	No.	Hours	m.	No.	Hours	m.	No.	Hours	
General Items, Provisional Services	**A**										0
Establish all plant, equipment, crew on site	A2		1.0					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				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
								0.0	0	0.00	0.0
Percussion Boring	**B**										0.0
Move boring plant to site of each exploratory hole	B1		8.00					0.0	6	0.00	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			R/O				0.0	0	0.00	0.0
Advance BH between groundlevel and 10m depth	B4	80.00			6.00			59.4	0	0.00	74.3
As B4 but between 10m and 20m	B5	36.50			10.00			42.9	0	0.00	
As B4 but between 20m and 30m	B6	R/O			2.10			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			6.08	0.0	0	9.08	0.0
								0.0	0	0.00	0.0
Rotary Drilling	**C**										0.0
Move rotary plant to site of each exploratory hole	C15		6.00					0.0	4	0.00	66.7
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						5.7	0	0.00	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	0	0.00	0.0
Sampling, Monitoring during investigation	**E**										0.0
Small Disturbed Sample	E1		59.00			25		0.0	141	0.00	
Bulk Disturbed Sample	E2		59.00			21		0.0	75	0.00	
Large Bulk disturbed sample	E3		R/O					0.0	0	0.00	0.0
								0.0	0	0.00	0.0
Insitu Testing	**H**										0.0
Standard Penetration Test in Borehole	H1		40			12		0.0	33	0.00	82.5
Standard Penetration Test in Rotary Drill Hole	H2		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			21		0.0	104	0.00	86.0
								0.0	0	0.00	0.0
Additional Items											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
								0.0	0	0.00	0.0

Health & Safety Summary	Today	Actual To Date	Lost & Damaged
Hoc Cards	1	14	
Safety Drills	1	5	
Tool Box Talks	1	12	
HSE Meetings	0	1	
Incidents/Near Miss	0	0	
Environmental	0	0	
Hours Worked	120	1200	

Fugro GeoServices Representative Comments	Client Representative Comments

FGSL Rep: Theo Cleave **Signed:**	**Client Rep:** **Signed:**

NEARSHORE DAILY PROGRESS REPORT

Nigg Energy Park - Marine Ground Investigation

Daily Report No. 11

Job No	C1982	Vessel	Skate 3A	Date	Tuesday 12-Mar-19

To	ANeillings@arch-henderson.co.uk	Attn.	Andy Neillings	No./email	0141 227 3060
cc	mshuttleworth@arch-henderson.co.uk	Attn.	Michael Shuttleworth	No./email	Redact
cc	stuart.innes@gegroup.com	Attn.	Stuart Innes	No./email	Redact
cc		Attn.		No./email	
cc	m.chappell@fugro.com	Attn.	Mathew Chappell - Nearshore Manager	No./email	
cc	n.armstrong@fugro.com	Attn.	Nicholas Armstrong - Reporting Mana	No./email	Redact
cc	g.crisp@fugro.com	Attn.	Glen Crisp - Project Manager	No./email	Redact

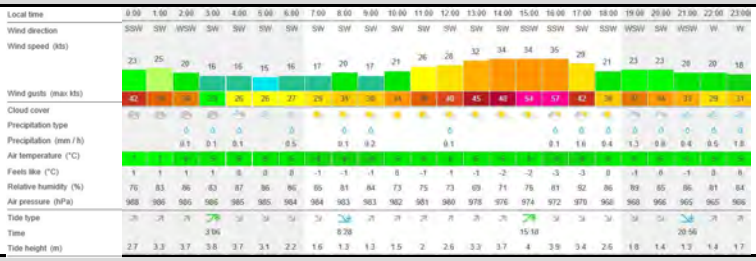
Observed Weather	Wind		Swell (Hs)	Sea State	Visibility	Weather Forecast
Time 00:00	Speed Knts	Dir				
00:00	28	W	N/A	slight	good	See Below
06:00	20	SW	N/A	smooth/slight	good	
12:00	31	SW	N/A	slight	good	
18:00	36	SSW	N/A	slight	good	
00:00	23	W	N/A	slight	good	

Leg Penetration (m)					Operational Status
BH no.	1	2	3	4	
BH04	**2.4**	**0.7**	**1.6**	**2.9**	**Pulling casing on BH04 Complete to -24.10mCD Monitor weather for suitable window to move.**

Summary of Operations / Borehole Drilling - last 24hrs:

From	To	Hrs (No.)	Code	Description
00:00	00:45	0.75	Other Operations	Pull all casing to deck / Wash down and clear deck for E.O.H / Fuel all plant / General R&M
00:45	07:00	6.25	Standby (weather)	Large weather system moving over site / Winds avg. ~25kts
07:00	08:00	1.00	Crew Change / TBT	Handover with dayshift / TBT with all crew / Dayshift transfer to quayside to monitor weather
08:00	19:00	11.00	Standby (weather)	Large weather system moving over site / Winds avg. ~30kts, gusts >50kts / Crew not onboard through v.high winds
19:00	20:00	1.00	Crew Change / TBT	Transit toCTV Quay / Handover with nightshift
20:00	00:00	4.00	Standby (weather)	Large weather system moving over site / Winds avg. ~22kts, gusts >30kts /

Weather forecast



Health Safety & the Environment

Met Office - *"Large and deep Atlantic low to the NW of Scotland moves ESE across the far north of Scotland through Tuesday and into southern Scandinavia on Wednesday."*
Continue to monitor multiple complex lows over the next few days, forecasts up to and exceeding 50kts.

FGSL Rep: Theo Cleave	Client Rep:
Signed:	Signed:

NEARSHORE DAILY PROGRESS REPORT

Nigg Energy Park - Marine Ground Investigation

Daily Report No. 11

Activity Time Summary		Today	To Date	Day Shift	Night Shift	Company	Position
Mobilisation		0.00	3.50	Onboard JUB (mobilisation)			
Moving & Jacking		0.00	22.58	Jimmy Wilson	Joshua Sandy	Fugro GeoServices	Bargemaster
Rotary Drilling (Coring)		0.00	7.33	James Lawson	Adam Cook	Fugro GeoServices	Driller
Cable Percussion		0.00	95.75	Callum Allardyce	Ashley Lowthian	Fugro GeoServices	Assistant Driller
Standby (Fugro)		0.00	0.00	Stuart Nye		Fugro GeoServices	Assistant Driller
Standby (Tide)		0.00	11.50				
Standby (weather)		21.25	90.00	Richard Luker	Bart Kot	Fugro	Geotechnical Engineer
Single Shift Standby		0.00	5.75				
Other Operations		0.75	9.42	Theo Cleave		Fugro GeoServices	Project Engineer
Crew Change / TBT		2.00	18.17				
		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	24.00	24.00	**No. Personnel**	**10**	**Total Man Hours Worked**	120

Project Program / Progress		Programmed			Today			Actual To Date			% Program Completed
Activity	BoQ Item	m.	No.	Hours	m.	No.	Hours	m.	No.	Hours	
General Items, Provisional Services	**A**										0
Establish all plant, equipment, crew on site	A2		1.0					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			21.25	0.0	0	87.75	0.0
Standing Time for plant, crew, etc - TIDE	B11 C19			R/O				0.0	0	11.50	0.0
								0.0	0	0.00	0.0
Percussion Boring	**B**										0.0
Move boring plant to site of each exploratory hole	B1		8.00					0.0	6	0.00	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			R/O				0.0	0	0.00	0.0
Advance BH between groundlevel and 10m depth	B4	80.00						59.4	0	0.00	74.3
As B4 but between 10m and 20m	B5	36.50						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	R/O						0.0	0	0.00	0.0
Advance BH through hard stratum or obstruction	B9			R/O				0.0	0	9.08	0.0
								0.0	0	0.00	0.0
Rotary Drilling	**C**										0.0
Move rotary plant to site of each exploratory hole	C15		6.00					0.0	4	0.00	66.7
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						5.7	0	0.00	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	0	0.00	0.0
Sampling, Monitoring during investigation	**E**										0.0
Small Disturbed Sample	E1		59.00					0.0	141	0.00	
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	0	0.00	0.0
Insitu Testing	**H**										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					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	104	0.00	86.0
								0.0	0	0.00	0.0
Additional Items											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
								0.0	0	0.00	0.0

Health & Safety Summary	Today	Actual To Date	Lost & Damaged
Hoc Cards	1	15	
Safety Drills	0	5	
Tool Box Talks	1	13	
HSE Meetings	0	1	
Incidents/Near Miss	0	0	
Environmental	0	0	
Hours Worked	120	1320	

Fugro GeoServices Representative Comments

Gap between weather systems developing over the next 24 hrs.
Monitor development for possible move window.

Client Representative Comments

FGSL Rep: Theo Cleave

Signed:

Client Rep:

Signed:

NEARSHORE DAILY PROGRESS REPORT

Nigg Energy Park - Marine Ground Investigation

Daily Report No. 12

Job No	C1982	Vessel	Skate 3A	Date	Wednesday 13-Mar-19

To	ANeillings@arch-henderson.co.uk	Attn.	Andy Neillings	No./email	0141 227 3060
cc	mshuttleworth@arch-henderson.co.uk	Attn.	Michael Shuttleworth	No./email	Redact
cc	stuart.innes@gegroup.com	Attn.	Stuart Innes	No./email	Redact
cc		Attn.		No./email	
cc	m.chappell@fugro.com	Attn.	Mathew Chappell - Nearshore Manager	No./email	
cc	n.armstrong@fugro.com	Attn.	Nicholas Armstrong - Reporting Mana	No./email	Redact
cc	g.crisp@fugro.com	Attn.	Glen Crisp - Project Manager	No./email	Redact

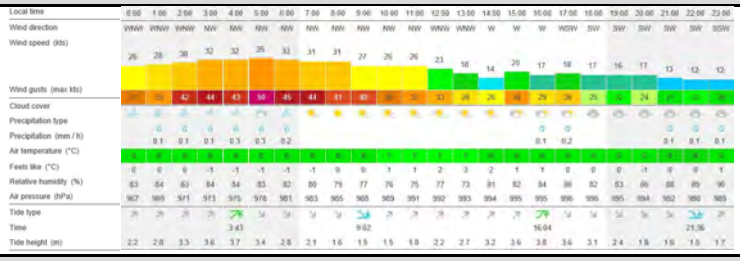
Observed Weather	Wind		Swell (Hs)	Sea State	Visibility	Weather Forecast
Time 00:00	Speed Knts	Dir				
00:00	28	W	N/A	slight	good	See Below
06:00	37	WNW	N/A	smooth	good	
12:00	21	W	N/A	smooth	good	
18:00	34	WSW	N/A	slight	good	
00:00	23	SSW	N/A	smooth/slight	good	

Leg Penetration (m)					Operational Status
BH no.	1	2	3	4	
BH04	**2.4**	**0.7**	**1.6**	**2.9**	**BH04 complete** **Awaiting weather window to move to BH05**

Summary of Operations / Borehole Drilling - last 24hrs:

From	To	Hrs (No.)	Code	Description
00:00	00:45	0.75	Standby (weather)	Await weather window for move to BH05 / Nightshift continue to monitor
00:45	07:00	6.25	Standby (weather)	Await weather window for move to BH05 / Wind average <30kts
07:00	08:00	1.00	Crew Change / TBT	Nightshift transfer to shore / Handover at CTV Quay / Dayshift transfer to JUB / TBT & Abandonment Drill
08:00	13:00	5.00	Standby (weather)	Await weather window for move to BH05 / Wind dropping to within operational limits / Monitor closely
13:00	15:15	2.25	Moving & Jacking	Jack down and pull legs / Move ~53m directly S from BH04 / Cannot pull JUB West against wind / Abort move
15:15	16:45	1.50	Standby (weather)	Jack up and await window / Client contacted / **Client Instruction to commence drilling 17m from BH05**
16:45	19:00	2.25	Cable Percussion	Run in 8" casing to mudline / Commence CP drilling from **0.00m to 2.00m BML**
19:00	19:20	0.33	Other Operations	Fuel all plant and RHIB / Wash down for E.O.S
19:20	20:00	0.67	Crew Change / TBT	Dayshift transfer to shore / Handover on CTV Quay / Nightshift transfer to JUB / TBT & Abandonment Drill
20:00	00:00	4.00	Cable Percussion	Continue CP drilling from **2.00m to 7.00m BML**

Weather forecast



Health Safety & the Environment

Met Office - *"Deep low in central North Sea moves east to reach northern Denmark by this evening then to Sweden by Thur. Another low moves from near Iceland on a similar track on Thur with ridge briefly moving east over central and southern North Sea overnight into Fri."*

Continue to monitor onditions closely, forecasts up to and exceeding 40kts.

FGSL Rep: Theo Cleave	**Client Rep:**
Signed:	**Signed:**

NEARSHORE DAILY PROGRESS REPORT

Nigg Energy Park - Marine Ground Investigation

Daily Report No. 12

Activity Time Summary		Today	To Date	Day Shift	Night Shift	Company	Position
Mobilisation		0.00	3.50	Onboard JUB (mobilisation)			
Moving & Jacking		2.25	24.83	Jimmy Wilson	Mark Bray	Fugro GeoServices	Bargemaster
Rotary Drilling (Coring)		0.00	7.33	Callum Allardyce	Adam Cook	Fugro GeoServices	Driller
Cable Percussion		6.25	102.00	Stuart Nye	Ashley Lowthian	Fugro GeoServices	Assistant Driller
Standby (Fugro)		0.00	0.00			Fugro GeoServices	Assistant Driller
Standby (Tide)		0.00	11.50				
Standby (weather)		13.50	103.50	Richard Luker	Bart Kot	Fugro	Geotechnical Engineer
Single Shift Standby		0.00	5.75				
Other Operations		0.33	9.75	Theo Cleave		Fugro GeoServices	Project Engineer
Crew Change / TBT		1.67	19.83				
		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	24.00	24.00	No. Personnel	9	Total Man Hours Worked	108

Project Program / Progress		Programmed			Today			Actual To Date			% Program Completed
Activity	BoQ Item	m.	No.	Hours	m.	No.	Hours	m.	No.	Hours	
General Items, Provisional Services	**A**										0
Establish all plant, equipment, crew on site	A2		1.0					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				0.0	0	87.75	0.0
Standing Time for plant, crew, etc - TIDE	B11 C19			R/O				0.0	0	11.50	0.0
								0.0	0	0.00	0.0
Percussion Boring	**B**										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		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
Advance BH between groundlevel and 10m depth	B4	80.00			7.00			66.4	0	0.00	83.0
As B4 but between 10m and 20m	B5	36.50						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	R/O						0.0	0	0.00	0.0
Advance BH through hard stratum or obstruction	B9			R/O				0.0	0	9.08	0.0
								0.0	0	0.00	0.0
Rotary Drilling	**C**										0.0
Move rotary plant to site of each exploratory hole	C15		6.00			1		0.0	5	0.00	83.3
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						5.7	0	0.00	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	0	0.00	0.0
Sampling, Monitoring during investigation	**E**										0.0
Small Disturbed Sample	E1		59.00					0.0	142	0.00	
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	0	0.00	0.0
Insitu Testing	**H**										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					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	104	0.00	86.0
								0.0	0	0.00	0.0
Additional Items											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
								0.0	0	0.00	0.0

Health & Safety Summary	Today	Actual To Date	Lost & Damaged
Hoc Cards	1	16	
Safety Drills	1	6	
Tool Box Talks	1	14	
HSE Meetings	0	1	
Incidents/Near Miss	0	0	
Environmental	0	0	
Hours Worked	108	1428	

Fugro GeoServices Representative Comments

Client Representative Comments

FGSL Rep: Theo Cleave

Signed:

Client Rep:

Signed:

NEARSHORE DAILY PROGRESS REPORT

Nigg Energy Park - Marine Ground Investigation

Daily Report No. 13

Job No	C1982	Vessel	Skate 3A	Date	Thursday 14-Mar-19

To	ANeillings@arch-henderson.co.uk	Attn.	Andy Neillings	No./email	0141 227 3060
cc	mshuttleworth@arch-henderson.co.uk	Attn.	Michael Shuttleworth	No./email	Redact
cc	stuart.innes@gegroup.com	Attn.	Stuart Innes	No./email	Redact
cc		Attn.		No./email	
cc	m.chappell@fugro.com	Attn.	Mathew Chappell - Nearshore Manager	No./email	
cc	n.armstrong@fugro.com	Attn.	Nicholas Armstrong - Reporting Mana	No./email	Redact
cc	g.crisp@fugro.com	Attn.	Glen Crisp - Project Manager	No./email	Redact

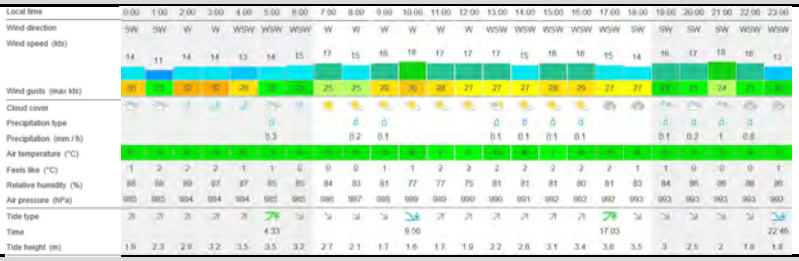
Observed Weather	Wind		Swell (Hs)	Sea State	Visibility	Weather Forecast
Time 00:00	Speed Knts	Dir				
00:00	23	SSW	N/A	smooth	good	See Below
06:00	25	WSW	N/A	smooth	good	
12:00	22	WSW	N/A	smooth	good	
18:00	22	SW	N/A	smooth	good	
00:00	22	WSW	N/A	smooth	good	

Leg Penetration (m)					Operational Status
BH no.	1	2	3	4	
BH05	**1.8**	**1.7**	**2.5**	**2.6**	**CP drilling underway on BH05**

Summary of Operations / Borehole Drilling - last 24hrs:

From	To	Hrs (No.)	Code	Description
00:00	07:00	7.00	Cable Percussion	Continue CP drilling from **7.00m to 12.00m BML** / Break down and swap over bailer
07:00	07:15	0.25	Other Operations	Wash down clear down for E.O.S / Fuel all plant
07:15	08:00	0.75	Crew Change / TBT	Nightshift transfer to shore / Handover at CTV Quay / Dayshift transfer to JUB / TBT & Man Overboard Drill
08:00	12:15	4.25	Cable Percussion	Continue CP drilling from **12.00m to 14.50m BML** / Chisel between 12.20 - 12.50m, large gravels
12:15	16:00	3.75	Rotary Drilling (Coring)	Run in Geobor S / Continue from **14.50m to 17.50m BML / E.O.H @ -24.25mCD** / Pull all casing to deck
16:00	19:30	3.50	Standby (weather)	Await weather window for move to BH05 / Wind over operational limits for moving & jacking
19:30	20:15	0.75	Crew Change / TBT	Dayshift transfer to shore / Handover on CTV Quay / Nightshift transfer to JUB / TBT & Man Overboard Drill
20:15	00:00	3.75	Standby (weather)	Await weather window for move to BH05 / Nightshift continue to monitor

Weather forecast



Health Safety & the Environment

Met Office: *"A low moves east near Shetland on Friday morning then fills near Norway on Saturday morning. Another low is expected over Ireland deepening as it pushes northeast through the UK. This low continues to deepen as as it moves into the central North Sea early on Sunday."*

FGSL Rep: Theo Cleave	Client Rep:
Signed:	Signed:

NEARSHORE DAILY PROGRESS REPORT

Nigg Energy Park - Marine Ground Investigation

Daily Report No. 13

Activity Time Summary		Today	To Date	Day Shift	Night Shift	Company	Position
Mobilisation		0.00	3.50	Onboard JUB (mobilisation)			
Moving & Jacking		0.00	24.83	Jimmy Wilson	Mark Bray	Fugro GeoServices	Bargemaster
Rotary Drilling (Coring)		3.75	11.08	Callum Allardyce	Adam Cook	Fugro GeoServices	Driller
Cable Percussion		11.25	113.25	Justin Smith	Ashley Lowthian	Fugro GeoServices	Assistant Driller
Standby (Fugro)		0.00	0.00			Fugro GeoServices	Assistant Driller
Standby (Tide)		0.00	11.50				
Standby (weather)		7.25	110.75	Richard Luker	Bart Kot	Fugro	Geotechnical Engineer
Single Shift Standby		0.00	5.75				
Other Operations		0.25	10.00	Theo Cleave		Fugro GeoServices	Project Engineer
Crew Change / TBT		1.50	21.33				
		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	24.00	24.00	**No. Personnel**	**9**	**Total Man Hours Worked**	108

Project Program / Progress		Programmed			Today			Actual To Date			% Program Completed
Activity	BoQ Item	m.	No.	Hours	m.	No.	Hours	m.	No.	Hours	
General Items, Provisional Services	**A**										0
Establish all plant, equipment, crew on site	A2		1.0					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				0.0	0	87.75	0.0
Standing Time for plant, crew, etc - TIDE	B11 C19			R/O				0.0	0	11.50	0.0
								0.0	0	0.00	0.0
Percussion Boring	**B**										0.0
Move boring plant to site of each exploratory hole	B1		8.00					0.0	7	0.00	87.5
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	B3			R/O				0.0	0	0.00	0.0
Advance BH between groundlevel and 10m depth	B4	80.00			3.00			69.4	0	0.00	86.8
As B4 but between 10m and 20m	B5	36.50			4.50			47.4	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	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	0.0
								0.0	0	0.00	0.0
Rotary Drilling	**C**										0.0
Move rotary plant to site of each exploratory hole	C15		6.00					0.0	5	0.00	83.3
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			8.7	0	0.00	42.2
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	0	0.00	0.0
Sampling, Monitoring during investigation	**E**										0.0
Small Disturbed Sample	E1		59.00			16		0.0	158	0.00	
Bulk Disturbed Sample	E2		59.00			14		0.0	89	0.00	
Large Bulk disturbed sample	E3		R/O					0.0	0	0.00	0.0
								0.0	0	0.00	0.0
Insitu Testing	**H**										0.0
Standard Penetration Test in Borehole	H1		40			8		0.0	41	0.00	
Standard Penetration Test in Rotary Drill Hole	H2		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			10		0.0	114	0.00	94.2
								0.0	0	0.00	0.0
Additional Items											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
								0.0	0	0.00	0.0

Health & Safety Summary	Today	Actual To Date	Lost & Damaged
Hoc Cards	1	17	
Safety Drills	1	7	
Tool Box Talks	1	15	
HSE Meetings	0	1	
Incidents/Near Miss	0	0	
Environmental	0	0	
Hours Worked	108	1536	

Fugro GeoServices Representative Comments

Client Representative Comments

FGSL Rep: Theo Cleave

Signed:

Client Rep:

Signed:

NEARSHORE DAILY PROGRESS REPORT

Nigg Energy Park - Marine Ground Investigation

Daily Report No. 14

Job No	C1982	Vessel	Skate 3A	Date	Friday 15-Mar-19

To	ANeillings@arch-henderson.co.uk	Attn.	Andy Neillings	No./email	0141 227 3060
cc	mshuttleworth@arch-henderson.co.uk	Attn.	Michael Shuttleworth	No./email	Redact
cc	stuart.innes@gegroup.com	Attn.	Stuart Innes	No./email	Redact
cc		Attn.		No./email	
cc	m.chappell@fugro.com	Attn.	Mathew Chappell - Nearshore Manager	No./email	
cc	n.armstrong@fugro.com	Attn.	Nicholas Armstrong - Reporting Manage	No./email	Redact
cc	g.crisp@fugro.com	Attn.	Glen Crisp - Project Manager	No./email	Redact

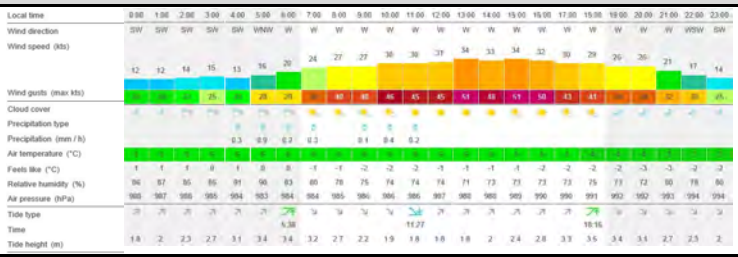
Observed Weather	Wind		Swell (Hs)	Sea State	Visibility	Weather Forecast
Time 00:00	Speed Knts	Dir				
00:00	22	WSW	N/A	smooth	good	See Below
06:00	25	W	N/A	smooth/slight	good	
12:00	38	W	N/A	slight	good	
18:00	29	W	N/A	slight	good	
00:00	23	SW	N/A	smooth	good	

Leg Penetration (m)					Operational Status
BH no.	1	2	3	4	
BH05	**1.8**	**1.7**	**2.5**	**2.6**	**Awaiting weather window to move to BH06**

Summary of Operations / Borehole Drilling - last 24hrs:

From	To	Hrs (No.)	Code	Description
00:00	07:00	7.00	Standby (weather)	Await weather window for move to BH05 / Nightshift continue to monitor
07:00	08:00	1.00	Crew Change / TBT	Nightshift transfer to shore / Handover at CTV Quay / Dayshift transfer to JUB to continue to monitor weather
08:00	11:00	3.00	Standby (weather)	Dayshift onboard to monitor weather and perform general R&M to JUB plant.
11:00	14:00	3.00	Standby (weather)	Dayshift transfer to shore ahead of forecast gales / Shoreside storage area prepared for demobilisation
14:00	19:00	5.00	Standby (weather)	Dayshift continue to monitor weather for opportunity to move to BH06
19:00	20:00	1.00	Crew Change / TBT	Dayshift transfer to shore / Handover at accomodation / Nightshift transfer to Quay to continue monitoring conditions
20:00	00:00	4.00	Standby (weather)	Nightshift continue to monitor weather for opportunity to move to BH06

Weather forecast



Health Safety & the Environment

Met Office: *"A low moves east near Shetland on Friday morning then fills near Norway on Saturday morning. Another low is expected over Ireland deepening as it pushes northeast through the UK. This low continues to deepen as as it moves into the central North Sea early on Sunday."*

FGSL Rep: Theo Cleave	**Client Rep:**
Signed:	**Signed:**

NEARSHORE DAILY PROGRESS REPORT

Nigg Energy Park - Marine Ground Investigation

Daily Report No. 14

Activity Time Summary		Today	To Date	Day Shift	Night Shift	Company	Position
Mobilisation		0.00	3.50	Onboard JUB (mobilisation)			
Moving & Jacking		0.00	24.83	Jimmy Wilson	Mark Bray	Fugro GeoServices	Bargemaster
Rotary Drilling (Coring)		0.00	11.08	Callum Allardyce	Adam Cook	Fugro GeoServices	Driller
Cable Percussion		0.00	113.25	Justin Smith	Ashley Lowthian	Fugro GeoServices	Assistant Driller
Standby (Fugro)		0.00	0.00			Fugro GeoServices	Assistant Driller
Standby (Tide)		0.00	11.50				
Standby (weather)		22.00	132.75	Richard Luker	Bart Kot	Fugro	Geotechnical Engineer
Single Shift Standby		0.00	5.75				
Other Operations		0.00	10.00	Theo Cleave		Fugro GeoServices	Project Engineer
Crew Change / TBT		2.00	23.33				
		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	24.00	24.00	**No. Personnel**	**9**	**Total Man Hours Worked**	108

Project Program / Progress		Programmed			Today			Actual To Date			% Program Completed
Activity	BoQ Item	m.	No.	Hours	m.	No.	Hours	m.	No.	Hours	
General Items, Provisional Services	**A**										0
Establish all plant, equipment, crew on site	A2		1.0					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			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	0.0
								0.0	0	0.00	0.0
Percussion Boring	**B**										0.0
Move boring plant to site of each exploratory hole	B1		8.00					0.0	7	0.00	87.5
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	B3			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	B5	36.50						47.4	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	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	0.0
								0.0	0	0.00	0.0
Rotary Drilling	**C**										0.0
Move rotary plant to site of each exploratory hole	C15		6.00					0.0	5	0.00	83.3
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						8.7	0	0.00	42.2
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	0	0.00	0.0
Sampling, Monitoring during investigation	**E**										0.0
Small Disturbed Sample	E1		59.00					0.0	158	0.00	
Bulk Disturbed Sample	E2		59.00					0.0	89	0.00	
Large Bulk disturbed sample	E3		R/O					0.0	0	0.00	0.0
								0.0	0	0.00	0.0
Insitu Testing	**H**										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	0	0.00	0.0
Geoenvironmental Laboratory Testing	**L**										0.0
Marine Scotland Sample	L2		121					0.0	114	0.00	94.2
								0.0	0	0.00	0.0
Additional Items											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
								0.0	0	0.00	0.0

Health & Safety Summary	Today	Actual To Date	Lost & Damaged
Hoc Cards	1	18	
Safety Drills	0	7	
Tool Box Talks	1	16	
HSE Meetings	0	1	
Incidents/Near Miss	0	0	
Environmental	0	0	
Hours Worked	108	1644	

Fugro GeoServices Representative Comments

Client Representative Comments

FGSL Rep: Theo Cleave

Signed:

Client Rep:

Signed:

NEARSHORE DAILY PROGRESS REPORT

Nigg Energy Park - Marine Ground Investigation

Daily Report No. 15

Job No	C1982	Vessel	Skate 3A	Date	Saturday 16-Mar-19

To	ANeillings@arch-henderson.co.uk	Attn.	Andy Neillings	No./email	0141 227 3060
cc	mshuttleworth@arch-henderson.co.uk	Attn.	Michael Shuttleworth	No./email	Redact
cc	stuart.innes@gegroup.com	Attn.	Stuart Innes	No./email	Redact
cc		Attn.		No./email	
cc	m.chappell@fugro.com	Attn.	Mathew Chappell - Nearshore Manager	No./email	
cc	n.armstrong@fugro.com	Attn.	Nicholas Armstrong - Reporting Manage	No./email	Redact
cc	g.crisp@fugro.com	Attn.	Glen Crisp - Project Manager	No./email	Redact

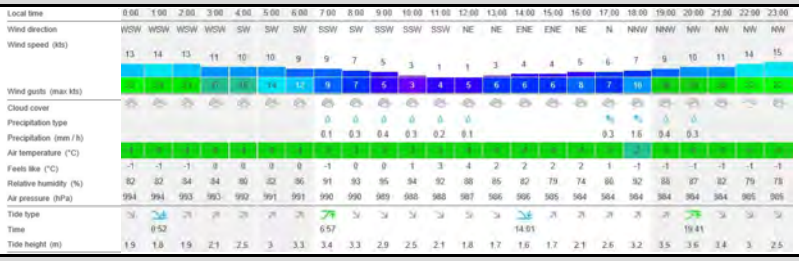
Observed Weather	Wind		Swell (Hs)	Sea State	Visibility	Weather Forecast
Time 00:00	Speed Knts	Dir				
00:00	23	SW	N/A	smooth	good	See Below
06:00	11	SW	N/A	smooth	good	
12:00	3	NE	N/A	smooth	good	
18:00	8	NNW	N/A	smooth	good	
00:00	22	NW	N/A	smooth	good	

Leg Penetration (m)					Operational Status
BH no.	1	2	3	4	
BH05	**1.8**	**1.7**	**2.5**	**2.6**	
BH06	**3.2**	**5.2**	**3.4**	**2.9**	**Awaiting weather window to move to BH06**

Summary of Operations / Borehole Drilling - last 24hrs:

From	To	Hrs (No.)	Code	Description
00:00	04:30	4.50	Standby (weather)	Nightshift continue to monitor weather for opportunity to move to BH06
04:20	06:25	2.08	Moving & Jacking	Wind below operational limits / Jack down and pull legs / **Move to BH06** / Preload and jack up to safe working height
06:25	07:15	0.83	Other Operations	Prepare drill deck for operations / remove all weather lashings etc. / Fuel all plant
07:15	07:45	0.50	Crew Change / TBT	Nightshift transfer to shore / Handover at CTV Quay / Dayshift transfer to JUB / TBT on CP Operations
07:45	18:45	11.00	Cable Percussion	Run in casing to **-9.60mCD**/ Commence CP drilling from **0.00m to 10.50m BML**
18:45	19:15	0.50	Other Operations	Clear and wash down deck for E.O.S / Fuel all plant
19:15	20:00	0.75	Crew Change / TBT	Dayshift transfer to shore / Handover on CTV Quay / Nightshift transfer to JUB / TBT on CP Operations
20:00	00:00	4.00	Cable Percussion	Continue CP drilling from **10.50m to 15.00m BML / E.O.H @ -24.6mCD**

Weather forecast



Health Safety & the Environment

Met Office: *"A deepening low moves NE across Ireland the central UK and into the North Sea today and then into southern Scandinavia on Sunday. A ridge of high pressure then topples across the UK and surrounding waters from the west on Monday"*

FGSL Rep: Theo Cleave	**Client Rep:**
Signed:	**Signed:**

NEARSHORE DAILY PROGRESS REPORT

Nigg Energy Park - Marine Ground Investigation

Daily Report No. 15

Activity Time Summary		Today	To Date	Day Shift	Night Shift	Company	Position
Mobilisation		0.00	3.50	Onboard JUB (mobilisation)			
Moving & Jacking		1.92	26.75	Jimmy Wilson	Mark Bray	Fugro GeoServices	Bargemaster
Rotary Drilling (Coring)		0.00	11.08	Callum Allardyce	Adam Cook	Fugro GeoServices	Driller
Cable Percussion		15.00	128.25	Justin Smith	Ashley Lowthian	Fugro GeoServices	Assistant Driller
Standby (Fugro)		0.00	0.00			Fugro GeoServices	Assistant Driller
Standby (Tide)		0.00	11.50				
Standby (weather)		4.50	137.25	Richard Luker	Bart Kot	Fugro	Geotechnical Engineer
Single Shift Standby		0.00	5.75				
Other Operations		1.33	11.33	Theo Cleave		Fugro GeoServices	Project Engineer
Crew Change / TBT		1.25	24.58				
		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	24.00	24.00	**No. Personnel**	**9**	**Total Man Hours Worked**	108

Project Program / Progress		Programmed			Today			Actual To Date			% Program Completed
Activity	BoQ Item	m.	No.	Hours	m.	No.	Hours	m.	No.	Hours	
General Items, Provisional Services	**A**										0
Establish all plant, equipment, crew on site	A2		1.0					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			4.50	0.0	0	137.25	0.0
Standing Time for plant, crew, etc - TIDE	B11 C19			R/O				0.0	0	11.50	0.0
								0.0	0	0.00	0.0
Percussion Boring	**B**										0.0
Move boring plant to site of each exploratory hole	B1		8.00			1		0.0	8	0.00	100.0
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
Advance BH between groundlevel and 10m depth	B4	80.00			10.00			79.4	0	0.00	99.3
As B4 but between 10m and 20m	B5	36.50			5.00			52.4	0	0.00	
As B4 but between 20m and 40m	B6	R/O						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			1.50	0.0	0	10.58	0.0
								0.0	0	0.00	0.0
Rotary Drilling	**C**										0.0
Move rotary plant to site of each exploratory hole	C15		6.00			1		0.0	6	0.00	100.0
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						8.7	0	0.00	42.2
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	0	0.00	0.0
Sampling, Monitoring during investigation	**E**										0.0
Small Disturbed Sample	E1		59.00			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	0	0.00	0.0
Insitu Testing	**H**										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
								0.0	0	0.00	0.0
Geoenvironmental Laboratory Testing	**L**										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	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
								0.0	0	0.00	0.0

Health & Safety Summary	Today	Actual To Date	Lost & Damaged
Hoc Cards	1	19	
Safety Drills	0	7	
Tool Box Talks	1	17	
HSE Meetings	0	1	
Incidents/Near Miss	0	0	
Environmental	0	0	
Hours Worked	108	1752	

Fugro GeoServices Representative Comments

Client Representative Comments

FGSL Rep: Theo Cleave

Signed:

Client Rep:

Signed:

NEARSHORE DAILY PROGRESS REPORT

Nigg Energy Park - Marine Ground Investigation

Daily Report No. 16

Job No	C1982	Vessel	Skate 3A	Date	Sunday 17-Mar-19

To	ANeillings@arch-henderson.co.uk	Attn.	Andy Neillings	No./email	0141 227 3060
cc	mshuttleworth@arch-henderson.co.uk	Attn.	Michael Shuttleworth	No./email	Redacted
cc					
cc		Attn.		No./email	
cc	m.chappell@fugro.com	Attn.	Mathew Chappell - Nearshore Manager	No./email	
cc	n.armstrong@fugro.com	Attn.	Nicholas Armstrong - Reporting Mana	No./email	Redacted
cc	g.crisp@fugro.com	Attn.	Glen Crisp - Project Manager	No./email	

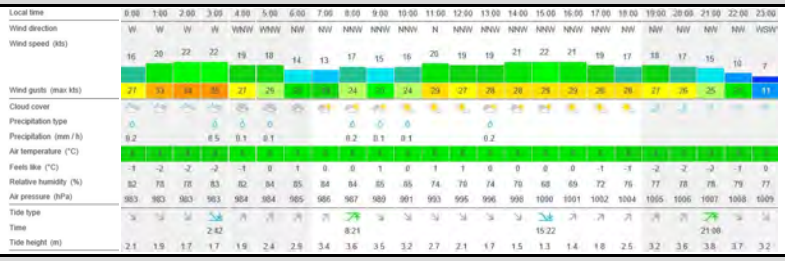
Observed Weather	Wind		Swell (Hs)	Sea State	Visibility	Weather Forecast
Time 00:00	Speed Knts	Dir				
00:00	25	NW	N/A	smooth	good	See Below
06:00	21	NW	N/A	smooth	good	
12:00	26	NNW	N/A	smooth/slight	good	
18:00	27	NW	N/A	smooth/slight	good	
00:00	16	WSW	N/A	smooth	good	

Leg Penetration (m)					Operational Status
BH no.	1	2	3	4	
BH06	**3.2**	**5.2**	**3.4**	**2.9**	**Finishing BH06 and pulling casing. Awaiting weather window to move to park up location**

Summary of Operations / Borehole Drilling - last 24hrs:

From	To	Hrs (No.)	Code	Description
00:00	03:00	3.00	Other Operations	Pull all casing to deck / Break casing down onto stillages / Clear down and fuel all plant
03:00	07:30	4.50	Standby (weather)	Await weather window for move to park up location / Nightshift continue to monitor
07:30	08:00	0.50	Crew Change / TBT	Nightshift transfer to shore / Handover at CTV Quay / Dayshift transfer to JUB / TBT
08:00	19:00	11.00	Standby (weather)	Await weather window for move to park up location / Dayshift continue to monitor
19:00	19:30	0.50	Crew Change / TBT	Dayshift transfer to shore for end of shift
19:30	00:00	4.50	Single Shift Standby	No Nightshift as crew prepares for demobilisation / Nightshift resting to change shift pattern

Weather forecast



Health Safety & the Environment

No nightshift as crew adjust to shift change.
Single Shift Standby from 19:30 to 07:30 to allow move to coincide with benine forecast on Monday.

FGSL Rep: Theo Cleave	Client Rep:
Signed:	Signed:

NEARSHORE DAILY PROGRESS REPORT

Nigg Energy Park - Marine Ground Investigation

Daily Report No. 16

Activity Time Summary		Today	To Date	Day Shift	Night Shift	Company	Position
Mobilisation		0.00	3.50	Onboard JUB (mobilisation)			
Moving & Jacking		0.00	26.75	Jimmy Wilson	Mark Bray	Fugro GeoServices	Bargemaster
Rotary Drilling (Coring)		0.00	11.08	Callum Allardyce	Adam Cook	Fugro GeoServices	Driller
Cable Percussion		0.00	128.25	Justin Smith	Ashley Lowthian	Fugro GeoServices	Assistant Driller
Standby (Fugro)		0.00	0.00			Fugro GeoServices	Assistant Driller
Standby (Tide)		0.00	11.50				
Standby (weather)		15.50	152.75	Richard Luker	Bart Kot	Fugro	Geotechnical Engineer
Single Shift Standby		4.50	10.25				
Other Operations		3.00	14.33	Theo Cleave		Fugro GeoServices	Project Engineer
Crew Change / TBT		1.00	25.58				
		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	24.00	24.00	**No. Personnel**	**9**	**Total Man Hours Worked**	108

Project Program / Progress		Programmed			Today			Actual To Date			% Program Completed
Activity	BoQ Item	m.	No.	Hours	m.	No.	Hours	m.	No.	Hours	
General Items, Provisional Services	**A**										0
Establish all plant, equipment, crew on site	A2		1.0					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			15.50	0.0	0	152.75	0.0
Standing Time for plant, crew, etc - TIDE	B11 C19			R/O				0.0	0	11.50	0.0
								0.0	0	0.00	0.0
Percussion Boring	**B**										0.0
Move boring plant to site of each exploratory hole	B1		8.00					0.0	8	0.00	100.0
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
Advance BH between groundlevel and 10m depth	B4	80.00						79.4	0	0.00	99.3
As B4 but between 10m and 20m	B5	36.50						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	B7	R/O						0.0	0	0.00	0.0
Advance BH through hard stratum or obstruction	B9			R/O				0.0	0	10.58	0.0
								0.0	0	0.00	0.0
Rotary Drilling	**C**										0.0
Move rotary plant to site of each exploratory hole	C15		6.00					0.0	6	0.00	100.0
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						8.7	0	0.00	42.2
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	0	0.00	0.0
Sampling, Monitoring during investigation	**E**										0.0
Small Disturbed Sample	E1		59.00					0.0	173	0.00	
Bulk Disturbed Sample	E2		59.00					0.0	104	0.00	
Large Bulk disturbed sample	E3		R/O					0.0	0	0.00	0.0
								0.0	0	0.00	0.0
Insitu Testing	**H**										0.0
Standard Penetration Test in Borehole	H1		40					0.0	49	0.00	
Standard Penetration Test in Rotary Drill Hole	H2		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	119	0.00	98.3
								0.0	0	0.00	0.0
Additional Items											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
								0.0	0	0.00	0.0

Health & Safety Summary	Today	Actual To Date	Lost & Damaged
Hoc Cards	1	20	
Safety Drills	0	7	
Tool Box Talks	1	18	
HSE Meetings	0	1	
Incidents/Near Miss	0	0	
Environmental	0	0	
Hours Worked	108	1860	

Fugro GeoServices Representative Comments

Client Representative Comments

FGSL Rep: Theo Cleave

Signed:

Client Rep:

Signed:

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	
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	
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	

STARFIX

MEAN POSITION REPORT

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	DML=14.6m DWL=4.2m Height above CD=5.5m		

Session Name: 20190303-160430 Records Used: 301 of 301

Start Time: 03 Mar 2019, 16:05:44+00:00 End Time: 03 Mar 2019, 16:10:45+00:00 Session Length: 00:05:01

Mean Position for Skate 3A CommonReferencePoint		
	OSGB 1936 / British National Grid [OSGB-UK Gbr02 NT]	**ETRS89(2D)**
Latitude	57°41'39.38423"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	
Waypoint	BH2
Easting	279,344.000m E
Northing	868,935.000m N
Range	1.12m Geodetic
Bearing TO	75.28°True
Bearing FROM	255.28°True

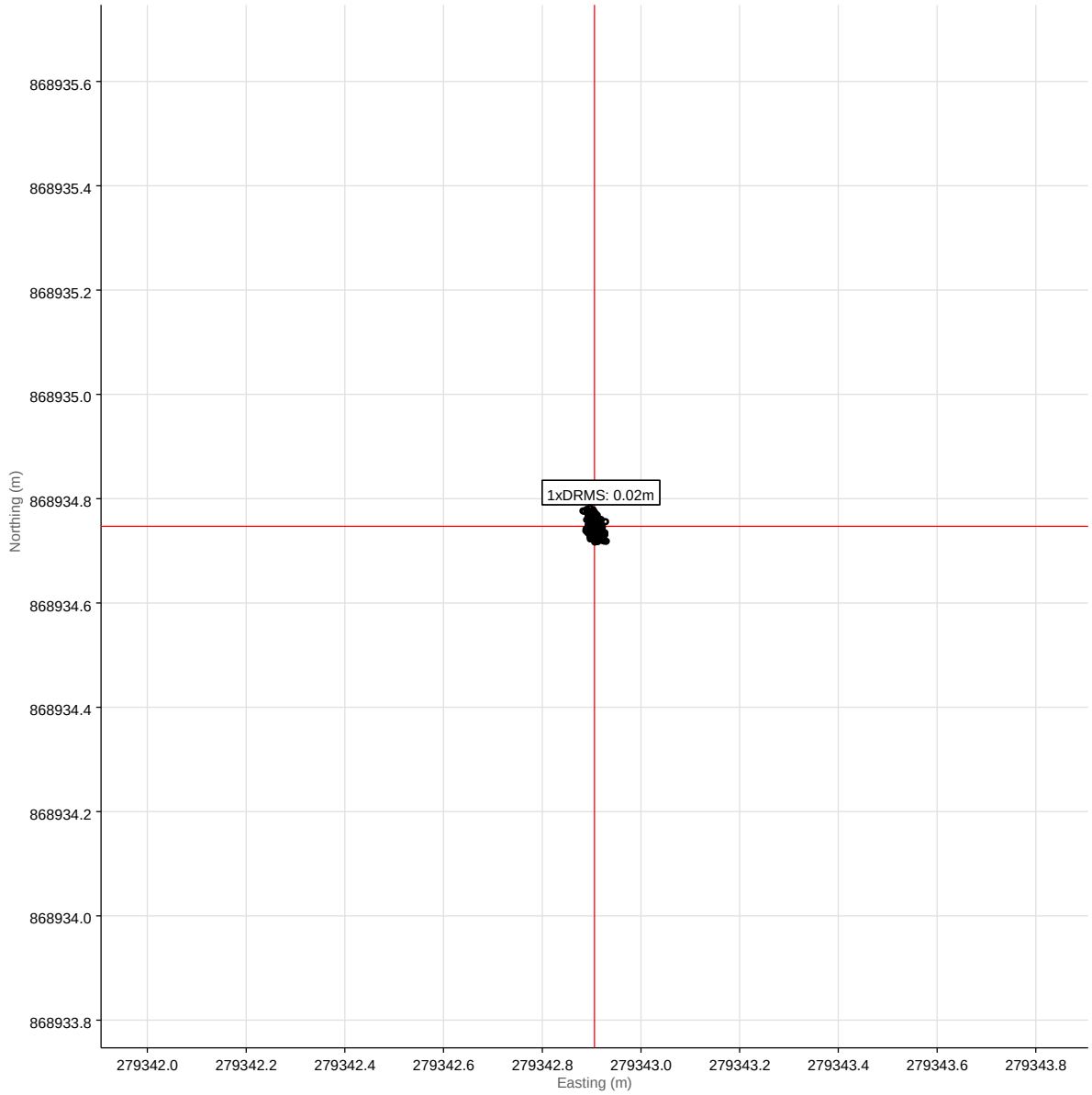
Jimmy Wilson
Barge/Rig Superintendent
FGSL (Fugro GeoServices Ltd UK)

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	
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	
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	

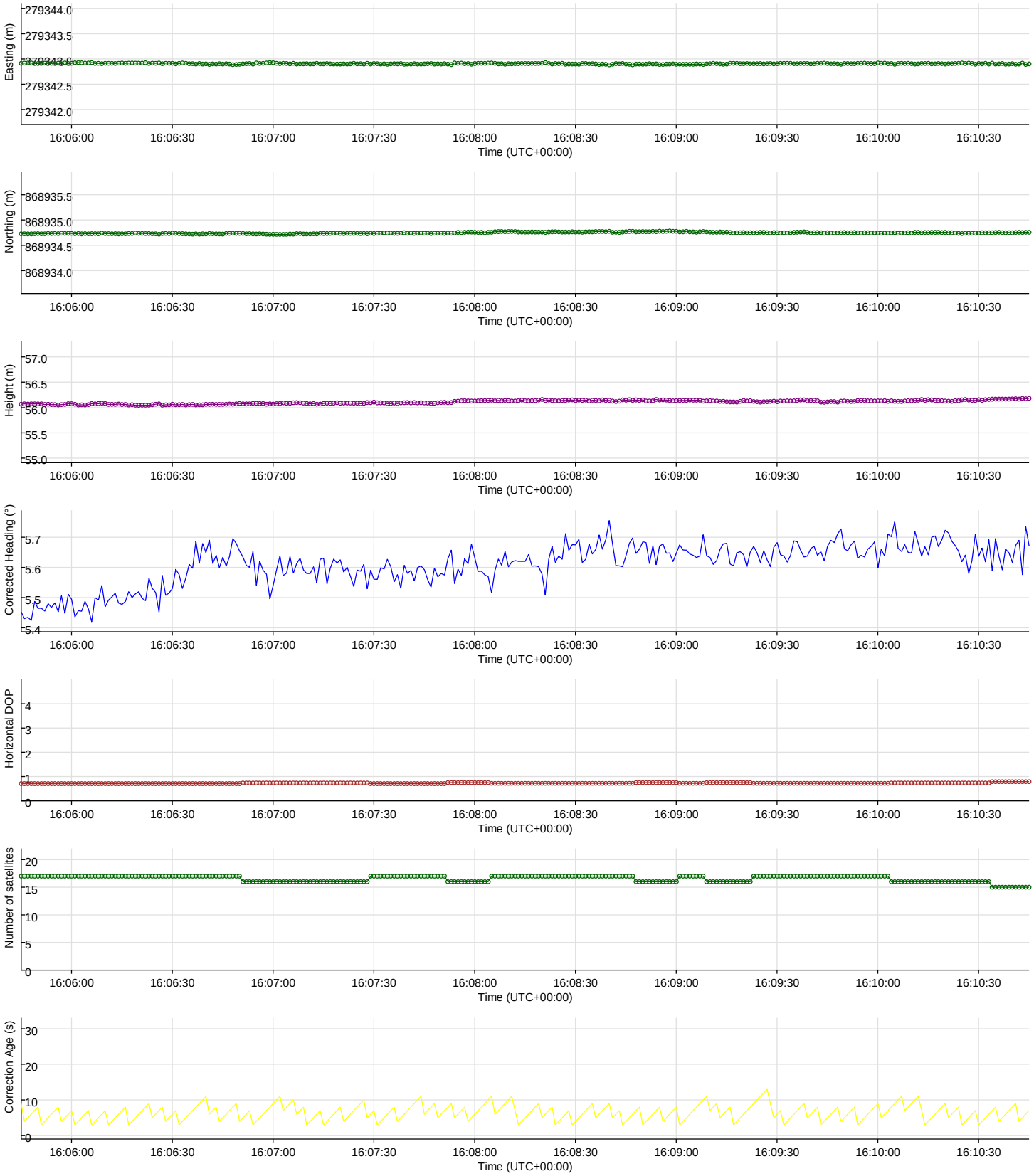
Scatter Plot



Mean Position

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

Time Series Plots for Skate 3A



STARFIX

MEAN POSITION REPORT

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		

Session Name: MorganMap 20190308-131604 Records Used: 291 of 301

Start Time: 08 Mar 2019, 13:16:04+00:00 End Time: 08 Mar 2019, 13:21:05+00:00 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

Jimmy Wilson
Party Chief
FGSL (Fugro GeoServices Ltd UK)

Theo Cleave
Party Chief
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	
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	
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	

STARFIX

MEAN POSITION REPORT

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

Start Time: 11 Mar 2019, 02:39:04+00:00 End Time: 11 Mar 2019, 02:44:05+00:00 Session Length: 00:05:01

Mean Position for Skate 3A CommonReferencePoint		
	OSGB 1936 / British National Grid [OSGB-UK Gbr02 NT]	**ETRS89(2D)**
Latitude	57°41'37.36438"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	
Waypoint	BH4
Easting	279,382.000m E
Northing	868,872.000m N
Range	1.51m Geodetic
Bearing TO	52.68°True
Bearing FROM	232.68°True

Jimmy Wilson
Party Chief
FGSL (Fugro GeoServices Ltd UK)

Theo Cleave
Party Chief
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	
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	
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	

STARFIX

MEAN POSITION REPORT

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		

Session Name: MorganMap 20190313-174839 Records Used: 296 of 301

Start Time: 13 Mar 2019, 17:48:39+00:00 End Time: 13 Mar 2019, 17:53:39+00:00 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

Jimmy Wilson
Party Chief
FGSL (Fugro GeoServices Ltd UK)

Theo Cleave
Party Chief
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	
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	
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	

STARFIX

MEAN POSITION REPORT

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 = 13.80m, DTW = 2.30m Deck Height Above CD = 4.20m		

Session Name: MorganMap 20190316-100855 Records Used: 301 of 301

Start Time: 16 Mar 2019, 10:08:56+00:00 End Time: 16 Mar 2019, 10:13:56+00:00 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	152.56°True
Bearing FROM	332.56°True

Jimmy Wilson
Party Chief
FGSL (Fugro GeoServices Ltd UK)

Theo Cleave
Party Chief
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	
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	
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	

STARFIX

MEAN POSITION REPORT

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 = 11.20m, DTW = 6.40m Deck Height Above CD = 7.19m		

Session Name: MorganMap 20190307-201214 Records Used: 299 of 301

Start Time: 07 Mar 2019, 20:12:14+00:00 End Time: 07 Mar 2019, 20:17:14+00:00 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

Jimmy Wilson
Party Chief
FGSL (Fugro GeoServices Ltd UK)

Theo Cleave
Party Chief
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	
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	
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	

STARFIX

MEAN POSITION REPORT

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 Height Above CD = 5.18m		

Session Name: MorganMap 20190305-114536 Records Used: 300 of 301

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

Mean Position for Skate 3A CommonReferencePoint		
	OSGB 1936 / British National Grid [OSGB-UK Gbr02 NT]	**ETRS89(2D)**
Latitude	57°41'35.22782"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

Jimmy Wilson
Party Chief
FGSL (Fugro GeoServices Ltd UK)

Theo Cleave
Party Chief
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	
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	
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^2 to 238.1 m^2 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.

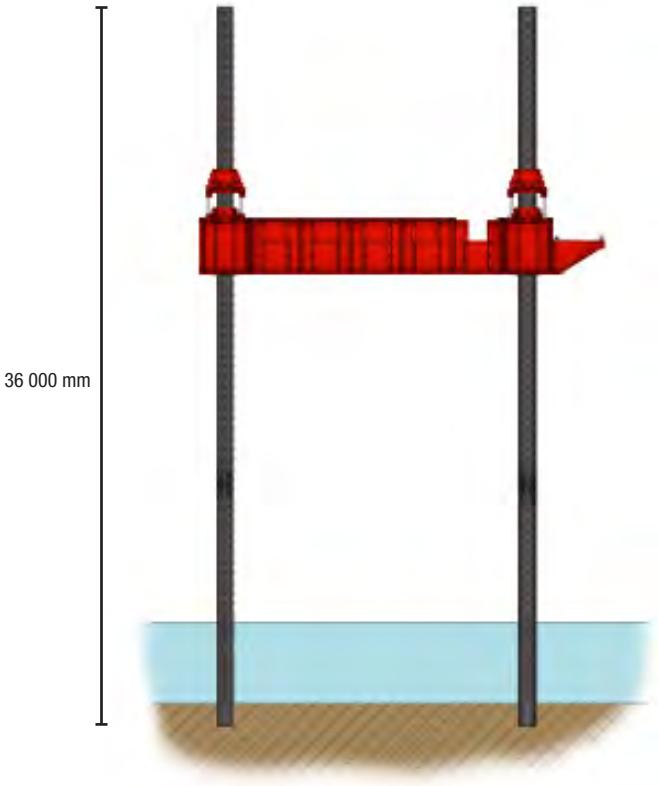
Operated and maintained exclusively by Fugro's trained and experienced marine engineers, the Skate 3 jack-up is a versatile, stable, self-elevating platform for overwater work.

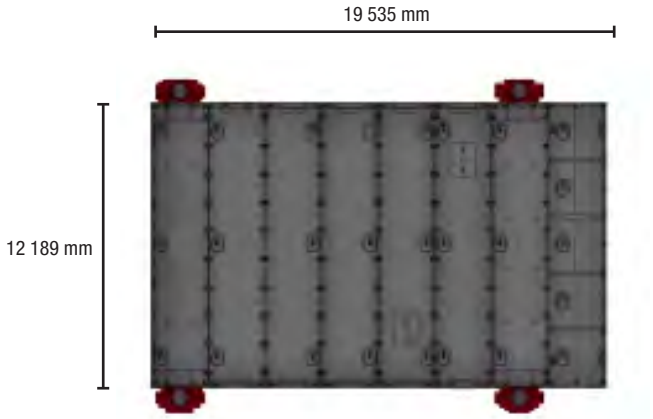
Skate 3 on site in Uruguay.

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





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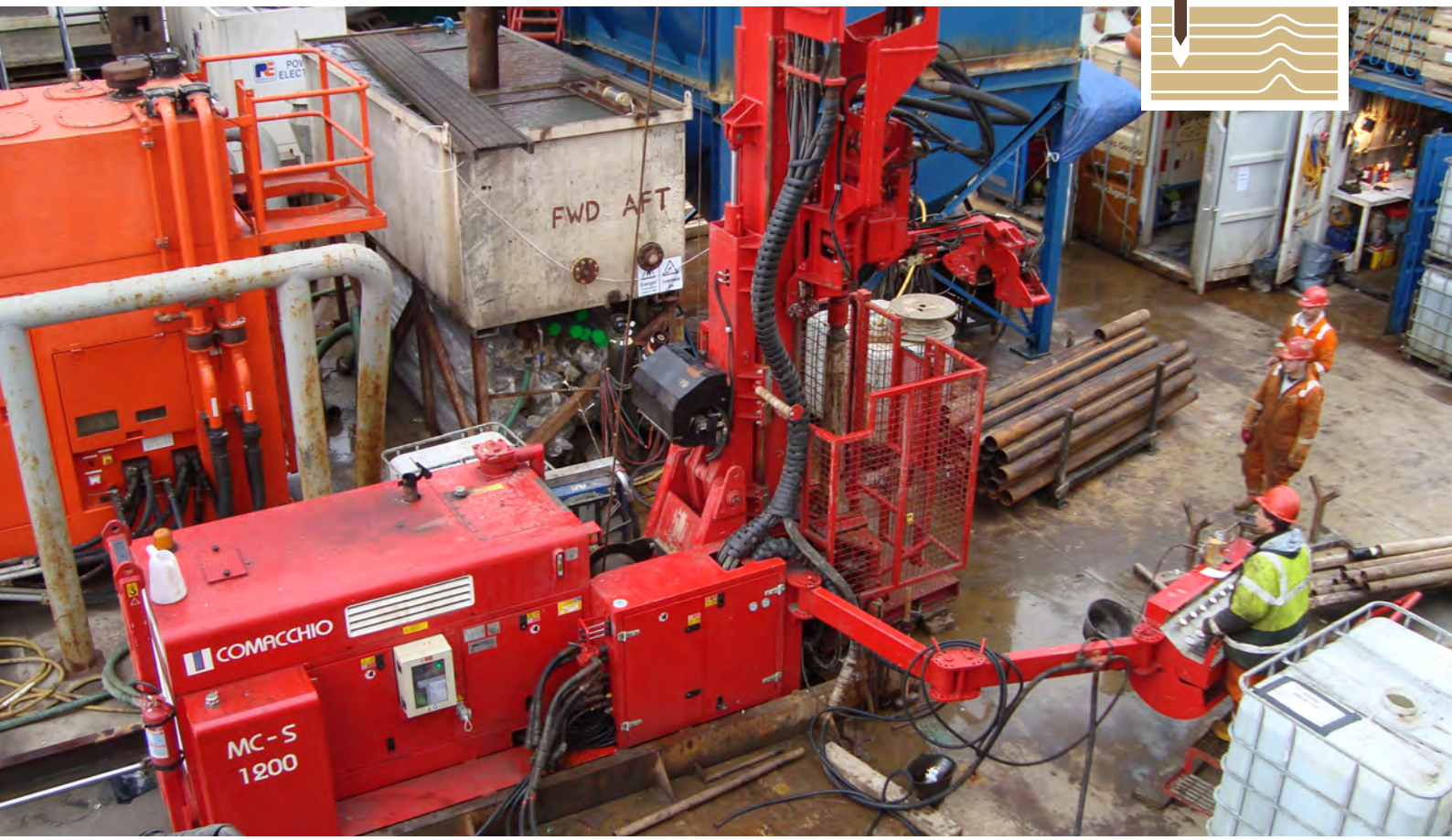


FUGRO
COMACCHIO MC1200

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

Feed stroke:	4750/7200/10 200 mm
Total length:	7100/9550/12 550 mm/ 23,3/31,3/41,2 ft
Feed force:	7000 daN/ 15 736 lbs
Retract force:	7000 daN/ 15 736 lbs

Clamps

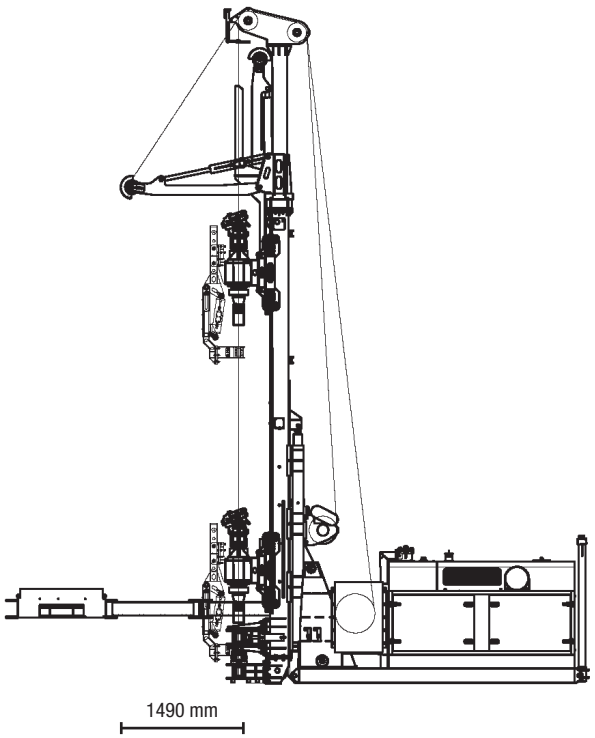
Min. handling:	45 mm / 1,8”
Max. handling:	360 mm /14.1”
Clamping force:	280 kN / 62 946 lbs
Breaking torque:	3500 daNm / 25 814 lb ft

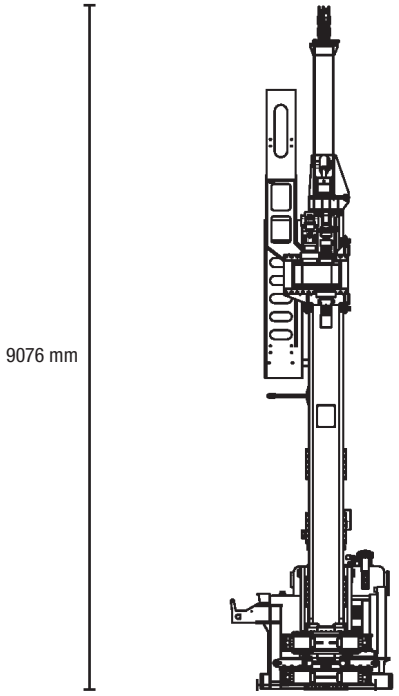
Rotary Head

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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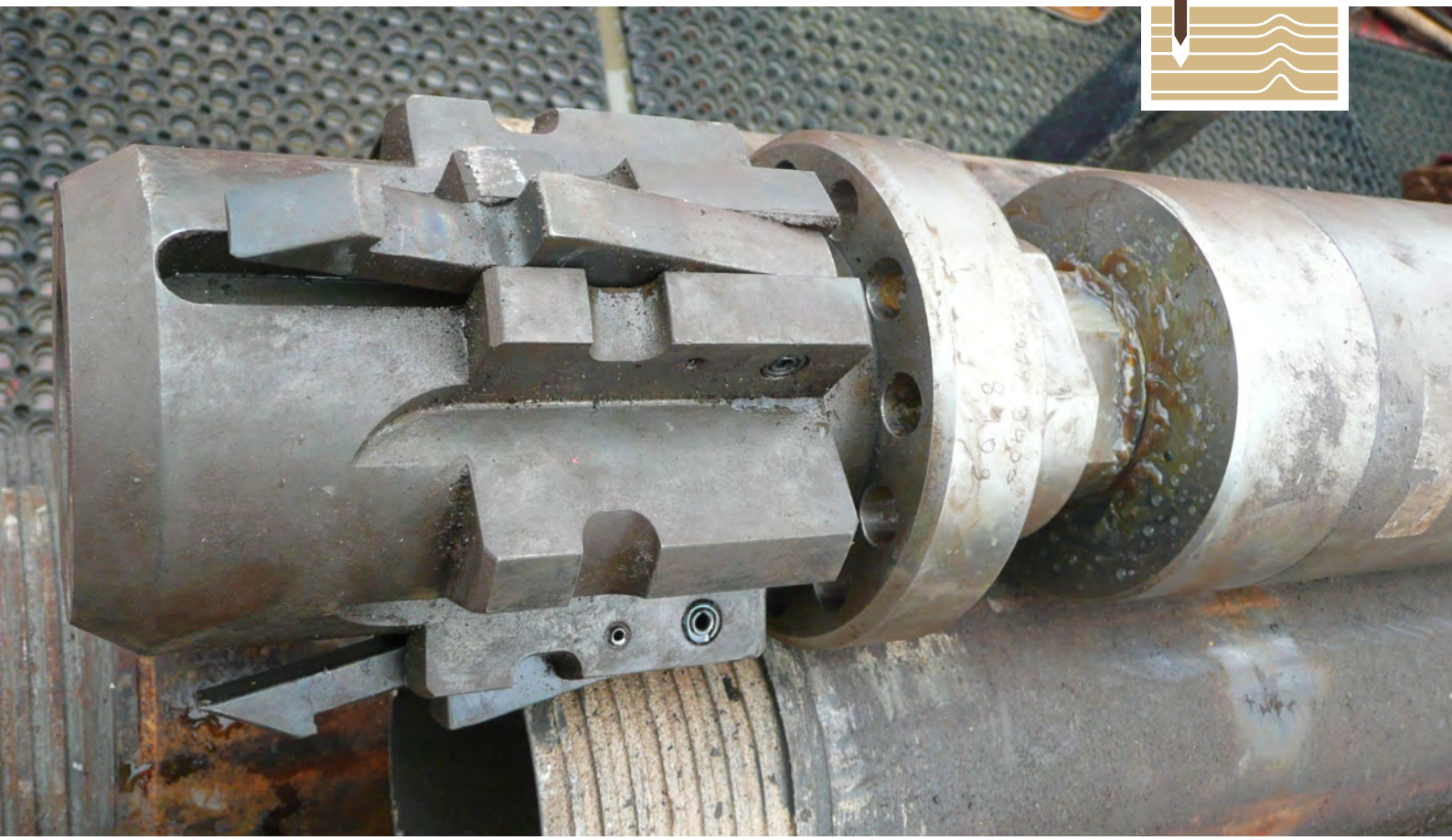


FUGRO
GEOBOR-S

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,
- 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:

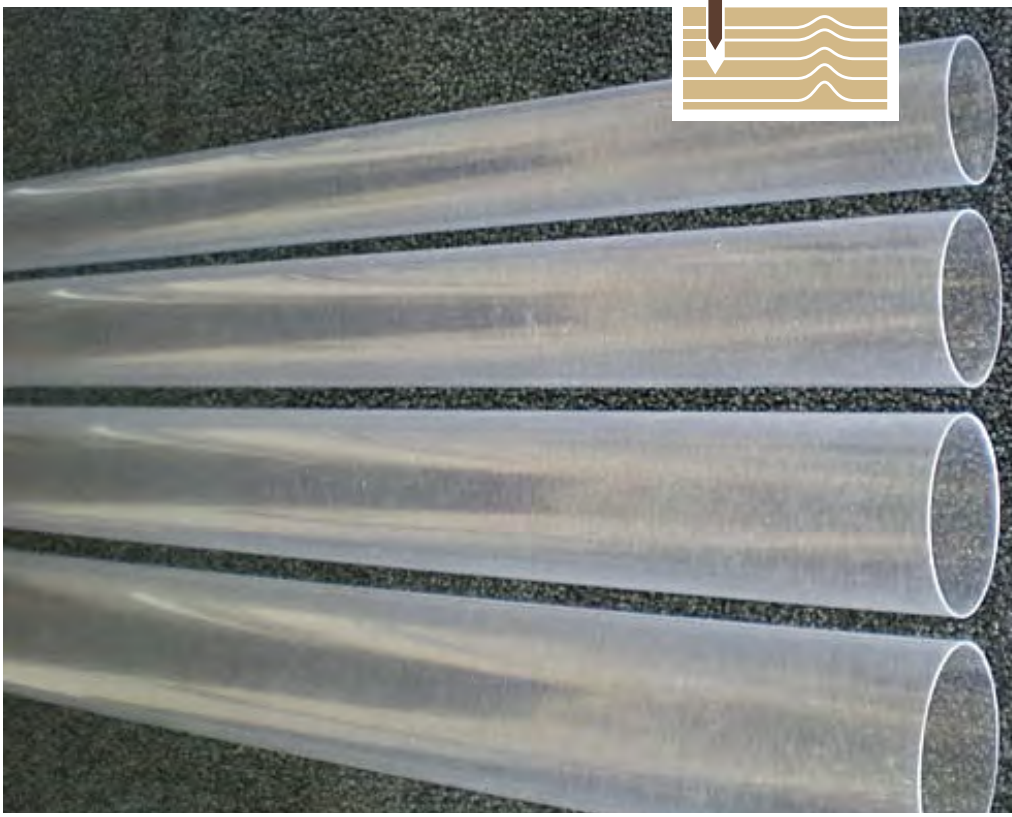
- reduces coring and transport induced disturbance,
- maintains sample quality,
- significantly enhances recovery especially in mixed formations.

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:

1. In medium to hard formations, many types of core bits can be used depending on the formation.

2. 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 %

3. 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.

4. 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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