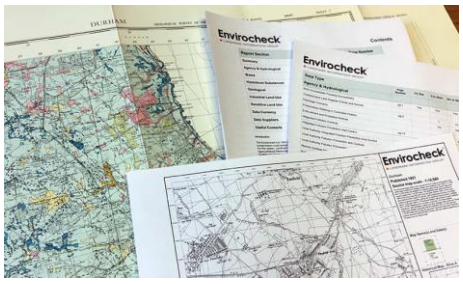



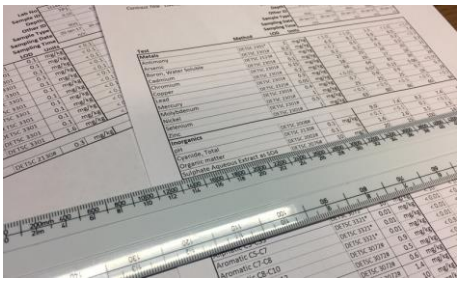

Phase 2: Site Investigation

BOC, North Tees

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ISO 45001 Occupational Health and Safety Management
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PHASE 2 SITE INVESTIGATION REPORT

BOC, NORTH TEES

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APPENDICES

Revision	Date	Prepared By	Signed
Final	June 2021	L Cassidy *Senior Environmental Engineer*	
		Checked By	
		R Woods *Principal Geotechnical Engineer*	
		Approved By	
		R Woods *Principal Geotechnical Engineer*	

1 EXECUTIVE SUMMARY

Site Address	BOC Hydrogen Plant
Proposed Development	The site is expected to be developed with a new CO2 Capture, Connection, Purification & Liquefaction Plant.
Fieldwork	• 4no cable percussive boreholes with rotary core follow-on (BH101 to BH104 inclusive) to a maximum depth of 25.50m below ground level (bgl). • 3no machine excavated trial pits (TP301 to TP303) were dug to a maximum depth of 2.70mbgl. • 2no Dynamic Cone Penetrometer Tests (DCP101 & DCP102) to a maximum depth of 10.00mbgl. • 2no concrete cores (CC401 and CC402) to a maximum depth of 0.70mbgl.
Ground Conditions	• Made ground was encountered to depths of between 5.20mbgl and 5.70mbgl. • Loose to medium dense silty sand encountered (7.40-7.80m thick). • Underlain by slightly sandy silty clay (0.60-4.40m thick) overlying further slightly sandy slightly gravelly clays. • Rockhead of mudstone encountered between 14.90 and 20.00mbgl. Cored to a maximum depth of 25.50mbgl, generally comprising weak to medium strong silty mudstone with thin bands of siltstone noted. • Groundwater was encountered between 2.60m and 3.20m.
Contamination Testing Results	• Eight made ground soil samples tested. • No exceedances of the relevant thresholds. • No asbestos fibres. • 4no leachate samples tested. • Elevated sulphate (1no sample), PAHs (2no samples) and TPH (2no samples). • Slightly alkaline pH.
Contamination Analysis	• Given the site's proposed commercial land use, the levels of contamination recorded on site are unlikely to pose a risk to the current and future users of the site. • If any zones of odorous, brightly coloured or suspected contaminated ground or groundwater are encountered then work should cease in that area until the material has been investigated. The results of the investigation will therefore determine whether or not remediation will be required. • Made ground classed as uncontaminated with respect to construction workers. PPE for workers. Damping down of site during dry windy conditions. • Controlled waters unlikely to be at risk. • With respect to utilities pH was elevated; as a minimum all services should be laid in clean trenches. • Sub surface concrete should be designed to DS-2 ACEC (Class AC-1). This assumes mobile groundwater conditions.
Geotechnical Testing Results	• Sands loose to medium dense based on SPT N values. • Clays medium to high strength based on SPT N values. • UCS results between 1.5 and 6.9MPa. • Point Load Test results between 0.08 and 1.76Is(50)MPa. • Moisture contents between 12 and 38%. • Cohesive deposits of medium volume change potential. • Sulphates between 31-300mg/l, pH slightly alkaline. • Angle of shearing resistance of 18-35 degrees based on shear box testing.
Geotechnical Analysis & Foundation Recommendations	• Recommended to adopt either piled or raft foundations. Consideration could also be given to ground improvement. • Normal earthworks plant for excavations, although very dense slag deposits, surface concrete and buried concrete obstructions are present.

2 INTRODUCTION

2.1 Authorisation

The site investigation described in this report was carried out by Solmek to the instructions of Tolent Construction and Linde GmbH, on land located at BOC Hydrogen Plant, North Tees.

2.2 Scope of Works

The site is expected to be developed with a new CO_2 Capture, Connection, Purification & Liquefaction Plant.

The following steps may be required in the investigation and remediation of potentially contaminated land:

Phase 1: Desk Study
Phase 2: Intrusive Investigation
Phase 3: Remediation Statement
Phase 4: Validation Reports

Phases 1 and 2 are generally required in the redevelopment of most sites. Phases 3 and 4 are subject to the findings of the initial stages.

A geotechnical and environmental (Phase 2) investigation including a ground gas risk assessment was requested. The fieldwork and testing was generally carried out according to;

- BS 5930:2015+A1:2020 Code of Practice for Ground Investigations
- BS 10175:2011+A1:2013 Investigation of Potentially Contaminated Sites – Code of Practice.
- CIRIA C665:2007 Assessing Risks Posed by Hazardous Ground Gas to Buildings
- BS 8485:2015+A1:2019 Code of Practice for the Characterization and Remediation from Ground Gas in Affected Developments
- Rock and soil descriptions shall be in accordance with BS EN ISO 14689-1:2003, BS EN ISO 14688-1:2002 and BS EN ISO 14688-2:2004

This report forms part of a Stage 1 Risk Assessment (Generic Quantitative Risk Assessment) with respect to the Environment Agency's guidance document Environment Agency *Land Contamination Risk Management*, which replaced the now-withdrawn *Contaminated Land Report 11 – Model Procedures for the Management of Land Contamination (2004)*.

The information provided in this report is based on the investigation fieldwork and is subject to the comments and approval of the various regulatory authorities. There may be other conditions prevailing on the site which have not been disclosed by this investigation and which have not been taken into account by this report. Solmek reserve the right to alter conclusions and recommendations should further information be available or provided. Any schematic representation or opinion of the possible configuration of ground conditions between exploratory holes is conjectural and given for guidance only and confirmation of intermediate ground conditions should be considered if deemed necessary.

3 SITE DESCRIPTION AND FIELDWORK

A site inspection, as recommended in BS 5930 and BS 10175, was undertaken on 5th May 2021. The site is centred at Ordnance Survey Co-ordinates 452348, 523385 and covers approximately 0.45Ha.

The site is a roughly rectangular shaped parcel of land of level topography located within a wider industrial area. The site generally consists of a concrete surfacing and is currently mostly used for materials/container storage with industrial plant/apparatus also present.

The wider area is industrialised.

3.1 Fieldwork

The fieldwork was commenced on 5th May 2021. The extent of the investigation was:

- 4no cable percussive boreholes with rotary core follow-on (BH101 to BH104 inclusive) to a maximum depth of 25.50m below ground level (bgl).
  - The borehole positions were specified by the client.
  - The boreholes were continued via coring to provide further geological information for pile design.
- Gas monitoring wells were installed in each borehole.
  - The wells were spaced at <25m centres evenly around the site in accordance with CIRIA C665.
- 3no machine excavated trial pits (TP301 to TP303) were dug to a maximum depth of 2.70mbgl.
  - The trial pit positions were specified by the client.
- 2no Dynamic Cone Penetrometer Tests (DCP101 & DCP102) to a maximum depth of 10.00mbgl.
- 2no concrete cores (CC401 and CC402) to a maximum depth of 0.70mbgl.
- Insitu testing in the exploratory positions as Standard Penetration Tests (SPTs) and hand shear vanes.
- Retrieval of samples for geotechnical and chemical testing.

The trial pits and boreholes were respectively backfilled with clean arisings and bentonite/installations upon completion. Selected plates of the trial pits and photographs of the concrete and rock cores are presented in Appendix A.

Descriptions of the strata encountered in the boreholes and trial pits together with details of sampling and groundwater are presented in Appendix B of this report. A plan showing the location of the boreholes and trial pits can be found in Appendix A (Figure 2).

4 GROUND CONDITIONS

A summary of the ground conditions encountered is given below.

4.1 Made Ground

Made ground was relatively uniform across the site and, where penetrated, was encountered to a minimum depth of 5.20mbgl (BH104) and a maximum depth of 5.70mbgl (BH102). The full extent of made ground was not penetrated within TP301 to TP303 inclusive.

Across the site, the made ground initially consisted of concrete with 5mm rebar, ranging in thickness from 0.10m (TP302, TP303, BH102, BH103 and BH104) to 0.70m (CC-401).

Underlying the concrete, the made ground broadly consisted of sandy gravel, locally of a high concrete and boulder content, with the gravel generally comprising slag, concrete, brick and ash. Locally, dolomite, polystyrene and timber (all TP302) and relic rebar (T303 were noted). Possible ACMs were noted within TP302 at 0.60-1.30mbgl.

The granular made ground at depth generally had a strong hydrocarbon odour and oily sheen, as noted below:

- TP301 – 2.50-2.70mbgl
- TP303 – 0.55-0.65mbgl
- BH101 – 2.50-5.60mbgl
- BH103 – 2.70-5.60mbgl
- BH104 – 2.50-5.20mbgl

4.2 Obstructions

A suspected concrete pad was encountered within TP303 at 0.65mbgl.

4.3 Natural Deposits

Proven to underlie the made ground deposits within the boreholes, natural ground generally comprised loose to medium dense silty sand (7.40-7.80m thick).

Underlying the sands, firm consistency thinly laminated slightly sandy medium to high strength silty clay was generally encountered (0.60-4.40m thick), in turn underlain by firm to stiff consistency locally thinly laminated slightly sandy slightly gravelly high strength clay, to a maximum depth of 20.00mbgl.

4.4 Solid Geology

Rockhead, comprising mudstone, was encountered within the boreholes between 14.90mbgl (BH101) and 20.00mbgl (BH102).

The four boreholes continued via coring, with the retrieved rock core generally logged as weak to medium strong silty mudstone with gypsum veins noted. Bands of weak siltstone were noted within BH101 (24.00-25.00mbgl), BH103 (23.20-23.45mbgl) and BH104 (17.30-17.50mbgl).

4.5 Groundwater

Groundwater strikes, where encountered, are presented on the exploratory logs (Appendix B) and are summarised below in Table 1:

TABLE 1: SUMMARY OF GROUNDWATER STRIKES

Exploratory Position	Depth Encountered (mbgl)	Depth after 20 minutes (mbgl)	Strata
BH101	3.20	-	Made Ground
BH102	2.60	2.50	Made Ground
BH103	3.20	-	Made Ground
BH104	3.20	-	Made Ground

It should be noted the rapid rate of advancement of the exploratory holes may mask minor seepages and it should be borne in mind that water levels fluctuate with a number of influences including season, rainfall, dewatering and pumping activities. Therefore, water levels significantly higher than those found during this investigation may be encountered.

5 CONTAMINATION TESTING RESULTS

The proposed development of the site is to involve the construction of residential homes with associated gardens, parking and access roads. The chemical samples were generally retrieved in line with BS ISO 18400-105:2017 *Soil Quality. Sampling*. The chemical results are presented in Appendix C.

5.1 Contamination Testing and Rationale

To provide information upon the possibility of ground contamination eight samples of made ground were selected for shallow contamination testing. Given the Commercial end-use of the site, eight samples are considered appropriate for testing. The samples selected are detailed below:

- TP301 – 2.60m (Made ground – granular fill)
- TP302 – 0.60m (Made ground – granular fill, possible ACMs noted)
- TP303 – 0.60m (Made ground – granular fill, hydrocarbon odour noted)
- BH101 – 4.00-4.45m (Made ground – granular fill, hydrocarbon odour noted)
- BH102 – 2.00-2.45m (Made ground – granular fill)
- BH102 – 4.00-4.45m (Made ground – granular fill)
- BH103 – 1.20m (Made ground – granular fill)

- BH104 – 4.00m (Made ground – granular fill, hydrocarbon odour noted)

The samples selected are considered to provide coverage of the made ground from across the site that would be most likely to be exposed during future site works. The samples were tested for the following contaminant suites:

- 8no Metals, semi-metals, non-metals, inorganic determinants
- 8no Asbestos identification screenings
- 8no Speciated Polyaromatic Hydrocarbons (PAHs)
- 8no Total Petroleum Hydrocarbon Criteria Working Group fractions (TPHCWG)

Leachate analysis was also undertaken on the below samples:

- TP301 – 2.60m (Made ground – granular fill)
- TP302 – 0.60m (Made ground – granular fill)
- BH101 – 4.00-4.45m (Made ground – granular fill, hydrocarbon odour noted)
- BH103 – 1.20m (Made ground – granular fill)

5.2 Test Results

Based on the proposed development at the site, the test results have been compared to a series of Land Quality Management (LQM) Suitable for Use Levels (S4UL) based on a Commercial land use. These are the most up to date thresholds published in December 2014.

The value for lead has been compared with the Category 4 Screening Level (March 2014) developed by Contaminated Land: Applications In Real Environments (CL:AIRE).

The test results are presented in Appendix C, and a summary is provided below in Tables 2 and 3.

TABLE 2: SUMMARY OF INORGANIC CONTAMINATION TESTING RESULTS

Determinand	Units	Number of Samples above Level of Detection	Minimum Recorded Level	Maximum Recorded Level	Commercial Threshold Value	Number of Results Exceeding Threshold Value
Metals						
Cadmium	mg/kg	6	<0.1	0.69	190	0
Chromium	mg/kg	8	7.1	25	8600	0
Copper	mg/kg	8	8.5	270	68000	0
Lead	mg/kg	8	8.5	94	2300*	0
Mercury	mg/kg	2	<0.1	0.13	1100	0
Nickel	mg/kg	8	14	33	980	0
Zinc	mg/kg	8	29	330	730000	0
Semi metals and non metals						
Arsenic	mg/kg	8	12	38	640**	0
Boron	mg/kg	5	<0.4	4.6	240000	0
Selenium	mg/kg	5	<0.2	1.3	12000	0
Inorganic chemicals						
Cyanide (Total)	mg/kg	0	<0.5	-	1580**	0
Sulphate (2:1 Water Soluble)	mg/l	8	120	950	2000^	0
Other						
pH	pH	-	9.3	11.9	5.5^	0

* Category 4 Screening Levels, March 2014
** CLEA Software Version 1.06 (pH7 and 1%SOM)
^ EA Threshold Values

5.3 Metals, Semi Metals and Non Metals

No samples indicated raised levels of contamination above the S4UL threshold values, based on the eight samples tested.

5.4 Inorganic Chemicals

Soluble sulphates (potentially aggressive to foundation concrete) were recorded between 120 and 950mg/l. None of the samples were elevated above levels affecting human health or the BRE Special Digest 1 500mg/l limit for the sulphate classification of concrete.

The results of the pH testing were between 9.3 and 11.9, which is consistent with slightly alkaline conditions.

5.5 Organic Chemicals

The organic thresholds vary depending on the levels of soil organic matter (SOM).

The average SOM recorded across the site was 1.02% therefore a SOM of 1% has been used to determine the S4UL thresholds. Table 2, below, summarises the results.

TABLE 3: SUMMARY OF ORGANIC CONTAMINATION TESTING RESULTS

Determinand	Units	Number of Samples above Level of Detection	Minimum Recorded Level	Maximum Recorded Level	Commercial Threshold Value at 1% SOM	Number of Results Exceeding Threshold Value
TPH Aliphatic Fractions						
Aliphatic (C5-C6)	mg/kg	0	<1	-	3200	0
Aliphatic (C6-C8)	mg/kg	2	<1	4.9	77800	0
Aliphatic (C8-C10)	mg/kg	0	<1	-	2000	0
Aliphatic (C10-C12)	mg/kg	1	<1	6.4	9700	0
Aliphatic (C12-C16)	mg/kg	0	<1	-	59000	0
Aliphatic (C16-C21)	mg/kg	0	<1	-	1600000	0
Aliphatic (C21-C35)	mg/kg	2	<1	4.5	1600000	0
Aliphatic (C35-C44)	mg/kg	0	<1	-	1600000	0
TPH Aromatic Fractions						
Aromatic (C5-C7)	mg/kg	0	<1	-	26000	0
Aromatic (C7-C8)	mg/kg	0	<1	-	56000	0
Aromatic (C8-C10)	mg/kg	5	<1	13	3500	0
Aromatic (C10-C12)	mg/kg	3	<1	110	16000	0
Aromatic (C12-C16)	mg/kg	3	<1	64	36000	0
Aromatic (C16-C21)	mg/kg	1	<1	170	28000	0
Aromatic (C21-C35)	mg/kg	5	<1	1400	28000	0
Aromatic (C35-C44)	mg/kg	0	<1	-	28000	0
Speciated PAH						
Naphthalene	mg/kg	0	<0.1	-	190	0
Acenaphthylene	mg/kg	0	<0.1	-	83000	0
Acenaphthene	mg/kg	0	<0.1	-	84000	0
Fluorene	mg/kg	0	<0.1	-	63000	0
Phenanthrene	mg/kg	0	<0.1	-	22000	0
Anthracene	mg/kg	0	<0.1	-	520000	0
Fluoranthene	mg/kg	0	<0.1	-	23000	0
Pyrene	mg/kg	0	<0.1	-	54000	0
Benzo[a]anthracene	mg/kg	0	<0.1	-	170	0
Chrysene	mg/kg	0	<0.1	-	350	0
Benzo[b]fluoranthene	mg/kg	0	<0.1	-	44	0
Benzo[k]fluoranthene	mg/kg	0	<0.1	-	1200	0
Benzo[a]pyrene	mg/kg	0	<0.1	-	35	0
Benzo[g,h,i]perylene	mg/kg	0	<0.1	-	3900	0
Dibenz(a,h)Anthracene	mg/kg	0	<0.1	-	3.5	0
Indeno(1,2,3-c,d)Pyrene	mg/kg	0	<0.1	-	500	0
Total PAH	mg/kg	0	<2	-	1000*	0
Total Phenol	mg/kg	1	<0.3	0.89	760	0
* EA Threshold Values						

No samples indicated raised levels of contamination above the S4UL threshold values, based on the eight

samples tested.

5.6 Asbestos

From the eight samples subject to asbestos screening, no asbestos fibres were recorded.

5.7 Leachates

Four samples have been subject to leachate testing. The results have been compared, where available, to UK Drinking Water Standards (DWS), otherwise EA Leachate Quality Thresholds and WHO Guidelines (2005) have been used. Results are summarised within Table 4 below.

TABLE 4: SUMMARY OF LEACHATE CONTAMINATION TESTING RESULTS

Determinand	Units	Number of Samples above Level of Detection	Minimum Recorded Level	Maximum Recorded Level	UK Drinking Water Standards	Number of Results Exceeding Threshold Value
Inorganic Contaminants						
Boron	µg/l	4	48	160	2000	0
Cadmium	µg/l	0	<0.11	-	5	0
Chromium	µg/l	1	<0.5	3.9	50	0
Copper	µg/l	2	<0.5	2.4	2000	0
Lead	µg/l	0	<0.5	-	25	0
Mercury	µg/l	0	<0.05	0.05	1	0
Nickel	µg/l	1	<0.5	2.4	20	0
Zinc	µg/l	0	<2.5	-	5000	0
Arsenic	µg/l	4	1.4	7	10	0
Selenium	µg/l	4	1.5	5.4	10	0
Cyanide	µg/l	0	<0.05	-	50	0
pH	pH	-	8.5	10	5.5	0
W.S. Sulphate	mg/l	4	1	1100	250	1
PAH						
Acenaphthene	µg/l	0	<0.1	-	0.1	0
Acenaphthylene	µg/l	0	<0.1	-	0.1	0
Anthracene	µg/l	0	<0.1	-	0.1	0
Benzo[a]anthracene	µg/l	0	<0.1	-	0.1	0
Benzo[a]pyrene	µg/l	0	<0.1	-	0.1	0
Benzo[b]fluoranthene	µg/l	0	<0.1	-	0.1	0
Benzo[k]fluoranthene	µg/l	0	<0.1	-	0.1	0
Benzo[g,h,i]perylene	µg/l	0	<0.1	-	0.1	0
Chrysene	µg/l	0	<0.1	-	0.1	0
Dibenz(a,h)Anthracene	µg/l	0	<0.1	-	0.1	0
Fluoranthene	µg/l	0	<0.1	-	0.1	0
Fluorene	µg/l	0	<0.1	-	0.1	0
Indeno(1,2,3-c,d)Pyrene	µg/l	0	<0.1	-	0.1	0
Naphthalene	µg/l	2	<0.1	8.3	0.1	2
Phenanthrene	µg/l	0	<0.1	-	0.1	0
Pyrene	µg/l	0	<0.1	-	0.1	0
Total PAH	µg/l	1	<2	8.3	0.2**	2
Total Phenol	µg/l	0	<0.03	-	0.5*	0
TPH Aliphatic Fractions						
Aliphatic (C5-C6)	µg/l	0	<0.1	-	15000*	0
Aliphatic (C6-C8)	µg/l	0	<0.1	-	15000*	0
Aliphatic (C8-C10)	µg/l	0	<0.1	-	300*	0
Aliphatic (C10-C12)	µg/l	0	<0.1	-	300*	0
Aliphatic (C12-C16)	µg/l	0	<0.1	-	300*	0
Aliphatic (C16-C35)	µg/l	0	<0.1	-	300*	0
Aliphatic (C16-C35)	µg/l	0	<0.1	-	300*	0
Aliphatic (C35-C44)	µg/l	0	<0.1	-	300*	0
TPH Aromatic Fractions						
Aromatic (C5-C7)	µg/l	0	<0.1	-	10*	0
Aromatic (C7-C8)	µg/l	0	<0.1	-	10*	0
Aromatic (C8-C10)	µg/l	2	<0.1	840	100*	2
Aromatic (C10-C12)	µg/l	2	<0.1	150	100*	1
Aromatic (C12-C16)	µg/l	1	<0.1	52	100*	0
Aromatic (C16-C21)	µg/l	0	<0.1	-	90*	0
Aromatic (C21-C35)	µg/l	0	<0.1	-	90*	0
Aromatic (C35-C44)	µg/l	0	<0.1	-	90*	0

* WHO Guidelines 2005
** EA leachate quality thresholds
*** EQS Freshwater

From the four samples subject to leachate analysis, exceedances were noted within three of the samples,

as summarised below:

- TP301 (2.60m) recorded elevated naphthalene, total PAH, Aromatic TPH C8-10 and C10-C12
- TP302 (0.60m) recorded elevated sulphate
- BH101 (4.00-4.45m) recorded elevated naphthalene, total PAH, Aromatic TPH C8-10 and C10-C12

5.8 Environmental Protection Act 1990: Part 2A Revised Statutory Guidance (April 2012)

This revised document explains how the Local Authority should decide if land, based on a legal interpretation, is contaminated. The document replaces the previous guidance given in Annex 3 of DEFRA Circular 01/2006, issued in accordance with section 78YA of the 1990 Environmental Protection Act.

The main objectives of the Part 2A regime are to *"identify and remove unacceptable risks to human health and the environment" and* to *"seek to ensure that contaminated land is made suitable for its current use".* Part 2A uses a risk based approach to defining contaminated land whereby the "risk" is interpreted as *"the likelihood that harm, or pollution of water, will occur as a result of contaminants in, on or under the land"* and by *"the scale and seriousness of such harm or pollution if it did occur".*

For a relevant risk to exist a contaminant, pathway and receptor linkage must be present before the land can be considered to be contaminated. The document explains that *"for a risk to exist there must be contaminants present in, on or under the land in a form and quantity that poses a hazard, and one or more pathways by which they might significantly harm people, the environment, or property; or significantly pollute controlled waters."*

A conceptual model is used to develop and communicate the risks associated with a particular site.

To determine if land is contaminated the local authority use various categories from 1 to 4. Categories 1 and 2 include *"land which is capable of being determined as contaminated land on grounds of significant possibility of significant harm to human health."* Categories 3 and 4 *"encompass land which is not capable of being determined on such grounds".*

See Appendix E for additional notes on contamination guidelines.

6 CONTAMINATION ANALYSIS

Mitigation measures to reduce the risks identified for each receptor are discussed in the following sections.

6.1 Users of the Site Once Development is Complete

The users of the site, particularly construction workers, are likely to be exposed to contaminants present in the soils beneath the site during redevelopment work. **Potential** exposure pathways include dermal absorption after contact with contaminated ground, inhalation of soil or dust, inhalation of volatised compounds, and inadvertent soil ingestion.

To establish if the levels of contaminants present on site may pose a risk to the health of the future users of the site the results of the contamination testing have been compared to a series of LQM/CIEH S4UL based on a Commercial land use.

The levels of contaminants across the site are generally low with no exceedances of the relevant thresholds.

The new development is expected to comprise new industrial/commercial buildings and apparatus. Based on the **shallow** soil contamination testing, it is considered that the levels of contamination are unlikely to pose a risk to future users of the site.

6.2 Construction Workers and Users of Surrounding Sites

Short term human exposure to contaminants present in soils can occur via several pathways during the construction and ground works phase of the development. These include dermal absorption after contact with contaminated ground, inhalation of soil or dust (including windblown dust), inhalation of volatised compounds, inadvertent soil ingestion and contact with contaminated groundwater.
It is considered that the encountered levels of contamination are unlikely to pose a risk to construction

workers and users of surrounding sites. As good practice, full PPE must be employed in accordance with Health and Safety Executive*: Protection of Workers and the General Public During the Development of Contaminated Land* and safeguards should be taken to limit dust during ground works, and access to the public should be restricted. Construction workers should use gloves as a precaution when handling any fill materials. Provision of suitable hygiene facilities are needed for site workers. Wheel washers should be provided and used for any vehicle entering or leaving site to prevent cross contamination.

Although asbestos was not detected from the soil samples subjected to testing within this investigation, the possibility still exists that asbestos containing materials may still be present on site and currently lie undetected, particularly as potential ACMs were observed during the fieldwork. It is therefore advised that a 'watching brief' is undertaken during the initial site strip and any excavation works and advice sought if asbestos is found or suspected.

During dry weather, any excavations may require clean water to be sprinkled at shallow depth to prevent excess dust escaping to off-site receptors. Monitoring of dust concentrations during construction should be given careful consideration to ensure occupational exposure levels are not exceeded. Works should be undertaken in line with BRE: *The Control of Dust and Emissions from Construction and Demolition, Best Practice Guidance*.

6.3 Vegetation

Plants can be affected by soil contamination in a number of ways resulting in growth inhibition, nutrient deficiencies and yellowing of leaves. Contaminants are taken up by plants through the roots and through foliage. Contaminants identified as being highly phytotoxic include boron, cadmium, copper, nickel, and zinc.

For this project, no vegetation is proposed therefore it is not considered to be a sensitive receptor.

6.4 Ground and Surface Water

The principal pathway by which soil contamination may reach the water environment is through a slow seepage or leaching to groundwater or surface water. The potential for contaminants to migrate along such pathways is dependent on the chemical and physical characteristics of the contaminants and the local hydrogeology.

From the site investigation undertaken, ground conditions broadly comprise deep (5.20-5.70mbgl) made ground over drift deposits of silty sand, with clay present at depth. The granular deposits can be considered to have a moderate permeability, with the underlying clays likely to have a low permeability.

Rockhead of mudstone was proven in the intrusive investigation between 14.90 and 20.00mbgl, comprising mudstone, which is likely to have a low permeability.

No surface water features are present in the immediate vicinity of the site. Groundwater was encountered between 2.60 and 3.20mbgl.

With respect to contamination, no exceedances were noted within the soil analysis, whilst the leachate analysis recorded exceedances within three of the four samples, generally for low mobility organic contaminants.

Given the heavily industrialised area surrounding the site, the low sensitivity aquifers at depth and the absence of nearby surface water features, the encountered contamination is not considered to pose a significant risk to groundwater or surface water receptors.

6.5 Construction Materials

Materials at risk from potential soil contamination include inorganic matrices such as cement and concrete and also organic material; e.g. plastics and rubbers. Acid ground conditions and elevated levels of sulphates can accelerate the corrosion of building materials. Plastics and rubbers are generally used for piping and service ducts and are potentially attacked by a range of chemicals, most of which are organic, particularly petroleum-based substances. Drinking water supplies can be tainted by substances that can penetrate piping and water companies enforce stringent threshold values.

6.5.1 Concrete Classification

BRE Special Digest One: *Concrete in Aggressive Ground*: 2005 3rd Edition has been used to assess the risks posed to underground concrete and to establish the design measures required to mitigate the risks. The results of the pH and water-soluble sulphate tests (when converted to total potential sulphate) fall into Class DS-2 ACEC (Class AC-1) requirements for concrete protection. This assumes mobile groundwater conditions.

6.5.2 Water Supply Pipes Material Selection

The levels of potential contaminants should be compared to thresholds supplied in the UK Water Industry Research (UKWIR) publication *Guidance for the selection of Water Supply Pipes to be used in Brownfield Sites* (January 2011). A Brownfield Site is defined in the document as "Land or premises that have previously been used or developed that may be vacant or derelict". It should be noted that Brownfield sites may not be contaminated. The guidance does not apply to Greenfield Sites however water companies may have their own assessment criteria which should be checked by the developer.

Level of acidic to alkaline pH (8.3 to 11.9) were recorded across the site at depths of between 0.60mbgl and 16.95mbgl within the made ground and natural samples.

The concentrations of the selected determinants should be compared to the pipe material selection table in Appendix E, and consultation with the appropriate utility supply company is required to identify the most suitable service fabric. However, the pH levels preclude the use of copper pipes whilst TPH levels locally preclude the use of polyethylene pipes.

6.6 Unexpected Contamination

If during the initial site strip or subsequent ongoing construction activities, any zones of odorous, brightly coloured or suspected contaminated ground are encountered, then the following procedure should be followed:

- Stop work in the affected area
- Contact Solmek and provide pictures of the affected area
- Solmek can visit site to investigate the material and provide guidance
- If required – Solmek can sample and test the material
- Once test results are returned, this will determine whether or not remediation will be required

6.7 Waste Classification and WAC Testing

During the site strip and construction activities, material may be required to be removed from site. Any such material would require classification, in line with Environment Agency Technical Guidance *Waste Classification: Guidance on the classification and assessment of waste* (2015). This would classify the material as either Non-Hazardous or Hazardous Waste.

Once the material has been classified, determining the suitable landfill for disposal is governed by landfill directive Waste Acceptance Criteria (WAC) testing, with landfills categorized as Inert Waste, Stable Non-Reactive Hazardous Waste and Hazardous Waste.

If waste classification and/or WAC testing are not undertaken, material taken off site may be subject to WAC testing by the appropriate waste disposal company. The decision on whether or not to accept waste, or whether further testing is required, is at the discretion of the waste disposal company.

For this project, Waste Classification has not been requested by the client, however Solmek note that TPH levels have been recorded which may impact the waste classification of the material. Waste classification, in line with the aforementioned EA guidance, would be needed to classify the material as Hazardous or Non-Hazardous Waste. WAC testing would then be required to determine the suitability of the material for the relevant landfill.

7 GROUND GAS ASSESSMENT

The proposed development includes the construction of industrial buildings and apparatus.

Ground gases such as carbon dioxide (CO_2), methane (CH_4), carbon monoxide (CO) and volatile organic compounds (VOCs) can be classed as a form of contamination where there is a potential risk to human health.

For this report, gas monitoring is via measuring emissions from four standpipes (BH101 to BH104) that were installed during the sitework. The gas monitoring will consist of four visits. The gas monitoring results will be presented as an addendum to this report.

Each monitoring well was designed to have the response zone within the deep granular made ground, which locally recorded hydrocarbon vapours.

8 GEOTECHNICAL TESTING AND ANALYSIS

Samples taken from the boreholes and trial pits underwent a series of geotechnical tests (BS 1377:1990) to aid foundation design and soil description. In addition, insitu Standard Penetration Tests (SPTs) were undertaken at regular intervals during drilling. The geotechnical results are presented in Appendix D.

8.1 Strength and Density

8.1.1 *SPT N Values*

Standard Penetration Tests undertaken within the granular made ground ranged from 7 to 50+, indicating loose to very dense conditions.

SPTs within the natural granular deposits ranged from 4 to 23, indicating loose to medium dense deposits.

Standard Penetration Tests undertaken within the natural cohesive deposits yielded N values of between 9 and 25. Using the Terzaghi and Peck (1967) correction, these N values can be multiplied by five to provide approximate shear strengths, with these results indicating medium to high strength deposits.

SPTs approaching/upon rockhead yielded N values between 26 and 50+.

8.1.2 *DCP Testing*

Two DCP tests were undertaken, to 2.00mbgl (DCP201) and 10.00mbgl (DCP202), respectively. Within DCP201, the blow count generally ranged from 7 to 50 blows per 100mm, generally increasing with depth.

Within DCP202, the blow count ranged from 1 to 19, with the peak (19) at 0.70-0.80mbgl. The results are shown in full in Appendix D.

8.2 Rock Uniaxial Compressive Strength (UCS) Tests

A series of thirteen rock core samples taken were subjected to UCS testing, ranging in depth from 15.10mbgl to 25.10mbgl.

All of the samples exhibited a ‘brittle’ failure mode and produced UCS results between 1.5 and 6.9MPa.

8.3 Point Load Testing

Sixteen samples of rock core were sent for Point Load Testing (both axial and diametral) to provide an indication of the strength of the rock. The corrected results ranged between 0.08 and 1.76Is(50)MPa.

8.4 Moisture Contents

Six samples recovered from the boreholes have been subject to moisture content tests to determine the moisture profile at depths of between 13.50 and 18.45mbgl. Moisture levels were between 14% and 38%.

Within the 17no samples sent for pH/sulphate testing, from depths between 6.00 and 16.95mbgl, moisture contents were between 12 and 33%.

8.5 Atterberg Limit Determinations

Six Atterberg Limit Determination tests were carried out on samples of cohesive material to classify the fine grained soils. The results were compared to the Casagrande Chart published in BS 5930 and showed the samples to generally be clay (locally silt) of intermediate to high plasticity.

The Plasticity Indices ranged from 14 to 29 with equivalent moisture contents recorded above and below the corresponding plastic limits. The cohesive material can be assessed as having a **medium** shrinkage potential in relation to NHBC Guidance Chapter 4.2.

8.6 Particle Size Distribution and Sedimentation Testing

19no samples from the boreholes at varying depths were subject to Particle Size Distribution (PSD) tests in accordance with BS1377 Part 2 to aid soil descriptions. In addition to the PSD tests, the samples were then subjected to sedimentation analysis using a hydrometer to further classify the fine grained soils (i.e. the quantities of clay and silt). The results have been used to prepare precise soil descriptions in accordance with BS5930:2015 Section 6 and are presented in Appendix C.

8.7 Shearbox Test

Shearbox testing was undertaken on nine samples from between 6.00 and 17.45mbgl. The angle of shearing resistance ranged from 18-35 degrees and the effective cohesion ranged from 6-22kPa. Full details are in Appendix D.

8.8 pH and Sulphate Results

Seventeen natural samples from the boreholes were tested for acidity and soluble sulphate content to assess whether the material may be potentially aggressive to building fabric. The results of the testing for pH ranged from 8.3 to 9.3 indicating slightly alkaline conditions. Soluble sulphates were recorded at levels ranging from 31mg/l to 300mg/l.

8.9 Preliminary Ground Model

The information gathered during the intrusive works has been collated and summarised in the below preliminary ground model.

TABLE 5: PRELIMINARY GROUND MODEL

Strata	Depth (mbgl)		Parameters Range (average)	Reference
	From	To		
Made Ground	0.00	5.20-5.70	pH = 9.3-11.9 (10.3)	Laboratory Testing
			SO^4 = 120-800 (538)	
			N = 7-50+ (35)	In-situ SPT
Loose to medium dense silty SAND	5.20-5.70	13.00-13.40	pH = 8.3-9.3 (9.1)	Laboratory Testing
			SO^4 = 31-300 (95)	
			MC = 19-33% (26%)	
			N = 5-26 (15.4)	In-situ SPT
			Angle of Shear Resistance = 30-35 (32.8)	Shearbox Testing
			Effective Cohesion kPa = 6-19 (11.7)	
Firm consistency thinly laminated slightly sandy silty CLAY	13.00-13.40	14.00-17.70	N = 25-29 (26.8)	In-situ SPT
			pH = 8.3-9.6 (8.5)	Laboratory Testing
			SO^4 = 300 (300)	
			IP = 13-17 (16)	Atterberg Limit Testing
			Angle of Shear Resistance = 18-19 (18.5)	Shearbox Testing
			Effective Cohesion kPa = 11-22 (16.5)	
Firm to stiff consistency slightly sandy slightly gravelly CLAY	14.00-17.70	14.90-20.00	N = 14-25 (19)	In-situ SPT
			pH = 8.7-8.9 (8.8)	Laboratory Testing
			SO^4 = 190-220 (205)	
			IP = 14-20 (17)	Atterberg Limit Testing
			Angle of Shear Resistance = 28 (28)	Shearbox Testing
			Effective Cohesion kPa = 8 (8)	
Redcar Mudstone Formation	14.90-20.00	25.00	N = 35-50+ (42.7)	In-situ SPT
			Is(50)MPa = 0.08-1.76 (0.41)	Point Load Testing
			MPa = 1.5-6.9 (3.72)	UCS Testing

8.10 Foundations

The deep made ground is likely to render conventional foundations unsuitable, therefore consideration has been given to the below foundation solutions:

- Piled Foundations
- Raft Foundations
- Ground Improvement

8.10.1 *Piled Foundations*

For the heavily loaded structures the shallow ground conditions are not suitable to support traditional foundations. Instead, piled foundations should be adopted. Information provided in this report should be made available to a competent piling contractor who can design appropriate foundations in accordance with Section 7: Pile foundations of BS EN 1997 – 1:2004 which applies to end-bearing piles, friction piles, tension piles and transversely loaded piles installed by driving, by jacking, and by screwing or boring. The piling contractor will need to take into consideration the possible effects of negative skin friction from made ground and loose granular deposits. Allowance should be made for breaking through known and unknown buried obstructions, in particular the very dense slag.

Given the close proximity of sensitive industrial land use in the area, a bored CFA pile may be required. Consultation with Navigator is recommended prior to installing any piled foundations to determine limits of ground vibration/disturbance when installing the piles. In addition, consideration should be given to the amount and type of waste produced from CFA piling operations on the site and the safe disposal of potentially contaminative arisings, in particular the hydrocarbon-impacted made ground noted at depth.

The precise method of pile installation and the applicability of proprietary systems, diameters and depths required would need to be determined by a specialist piling contractor.

The piled foundations are likely to penetrate the groundwater table in which isolated hydrocarbon contamination is present. The piling contractor should follow EA guidance and consult EA publications *Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination* (2001) and *Piling into Contaminated Sites* (2002) prior to commencing intrusive piling works. To achieve this, the piling contractor may need to adopt sleeved piles. It should also be noted that piled foundations can create preferential pathways for gas migration.

8.10.2 *Raft Foundations*

Given the depth of made ground encountered, conventional foundations may be unsuitable, therefore a raft could be considered. Detailed design loads and raft sizes have not been made available to Solmek. To accommodate raft foundations, it would be recommended to over-excavate into the made ground and replace the excavated made ground with 150mm layers of granular fill, compacted in accordance with *Specification for Highway Works Series 600*

8.10.3 *Ground Improvement*

For lightly loaded structures, the strength of the shallow alluvial silt and high compressibility means settlement of shallow foundations is likely to be high. Thus, it would appear ground improvement techniques such as vibro-replacement (i.e. stone columns) should be considered. This has the potential to firm up the shallow very soft to soft silt and hence reduce potential settlement. This would potentially allow the use of shallow foundations, such as pad footings, for tank apparatus etc. However, contact with a specialist ground improvement contractor is recommended who can advise on the suitability of possible techniques.

8.10.4 *General Foundation Comments*

Prior to placing foundation concrete, obvious soft or loose spots should be removed and replaced with suitably recompacted hardcore or lean mix concrete. In addition, all excavations should be inspected to ensure that they fully penetrate areas of disturbed ground.

Further advice should be sought from Solmek if unexpected ground conditions are encountered during redevelopment.

8.11 Excavation

Based on the nature of the ground conditions encountered, excavations should be within the capacity of normal earthworks plant although breaking out of relic foundations, surface concrete and slag deposits should be anticipated. Stability of excavations will be poor in the made ground and natural granular deposits. Excavation sides should be designed, constructed and supported in accordance with the recommendations given in CIRIA Report No. 97: *Trenching Practice*.

8.12 Groundwater

Groundwater was encountered within the boreholes, between 2.60 and 3.20mbgl. No groundwater was encountered within the trial pits.

It should be noted the rapid rate of advancement of the exploratory holes may mask minor seepages and it should be borne in mind that water levels fluctuate with a number of influences including season, rainfall, dewatering and pumping activities. Therefore, water levels significantly higher than those found during this investigation may be encountered.

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APPENDIX A:
Figures and Drawings

Contains Maps® Imagery ©Google 2021

Title
Site Location Plan

Project
BOC North Tees

Client
Tolent Construction

Date
June 2021

Fig No.
Figure 1

Scale
Do Not Scale

Key

Approx. Site Boundary

N

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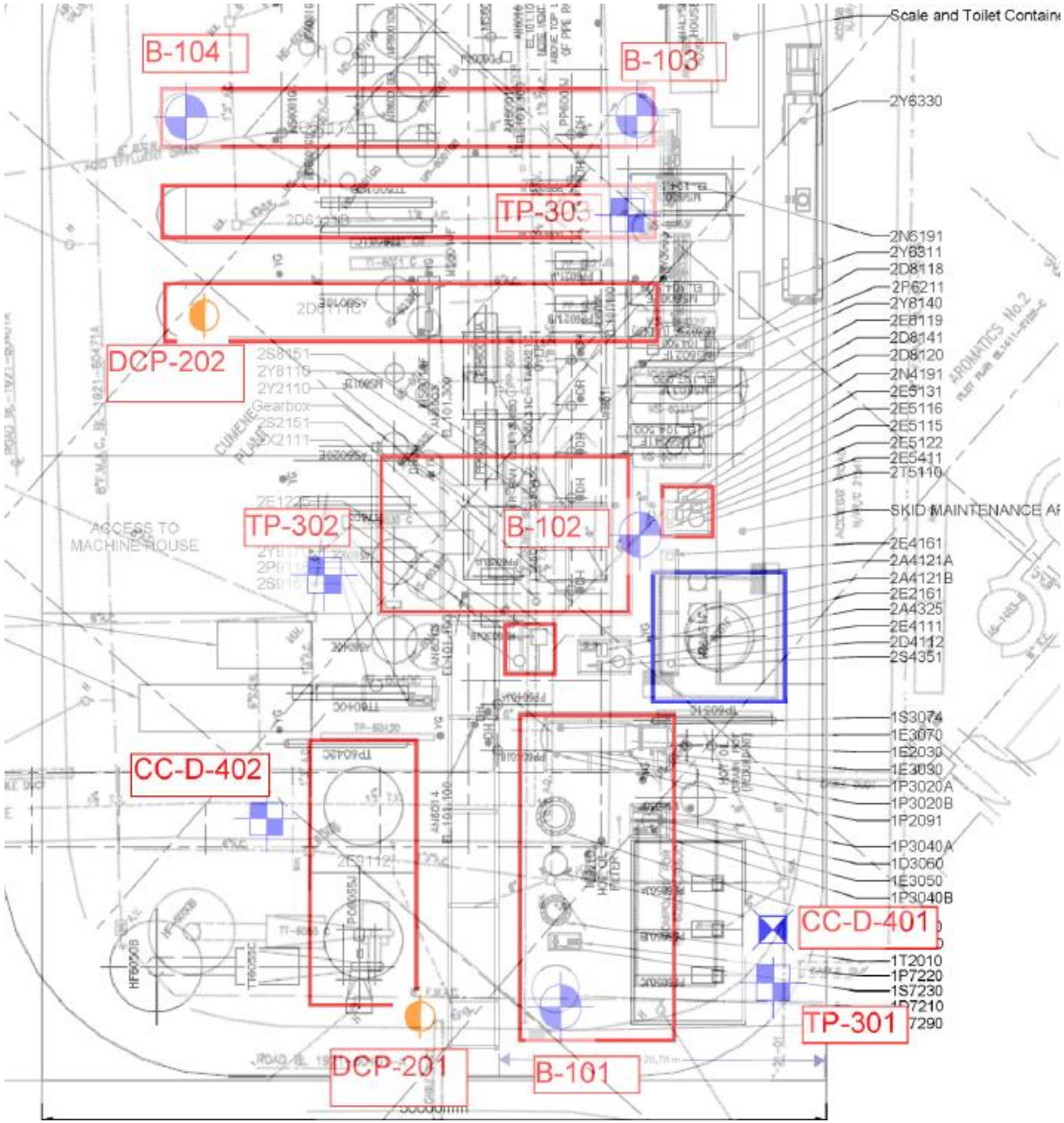

Title	Exploratory Hole Location Plan
Project	BOC North Tees
Client	Tolent Construction
Date	June 2021
Fig No.	Figure 2
Scale	Do Not Scale

Key

- Approx. Rotary Borehole Location
- Approx. DCP Location.
- Approx. TP Location
- Approx. Concrete Core Location

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Figure 3: CC-401

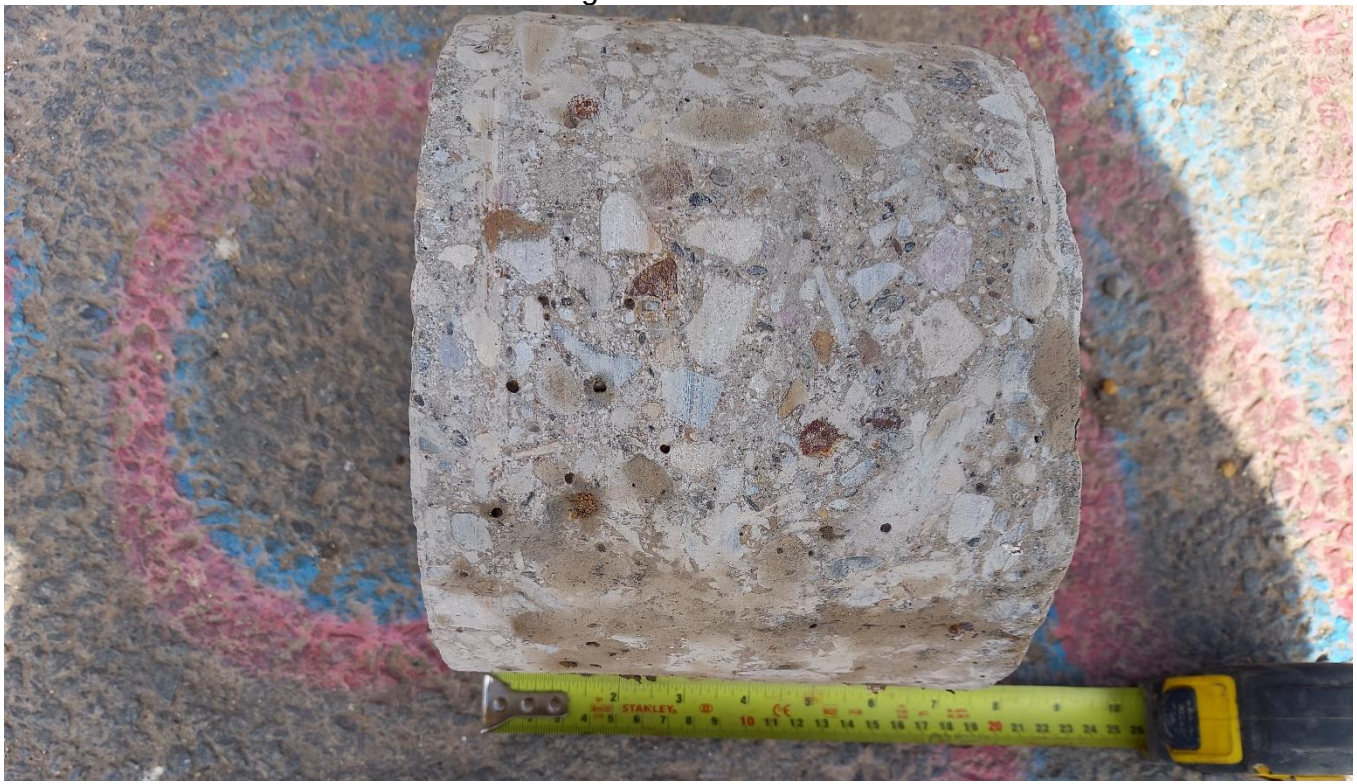

Figure 4: CC-402

Title
Concrete Core Photographs
Project
BOC North Tees
Client
Tolent Construction
Date
June 2021
Fig No.
Figures 3 & 4
Scale
N/A
Key

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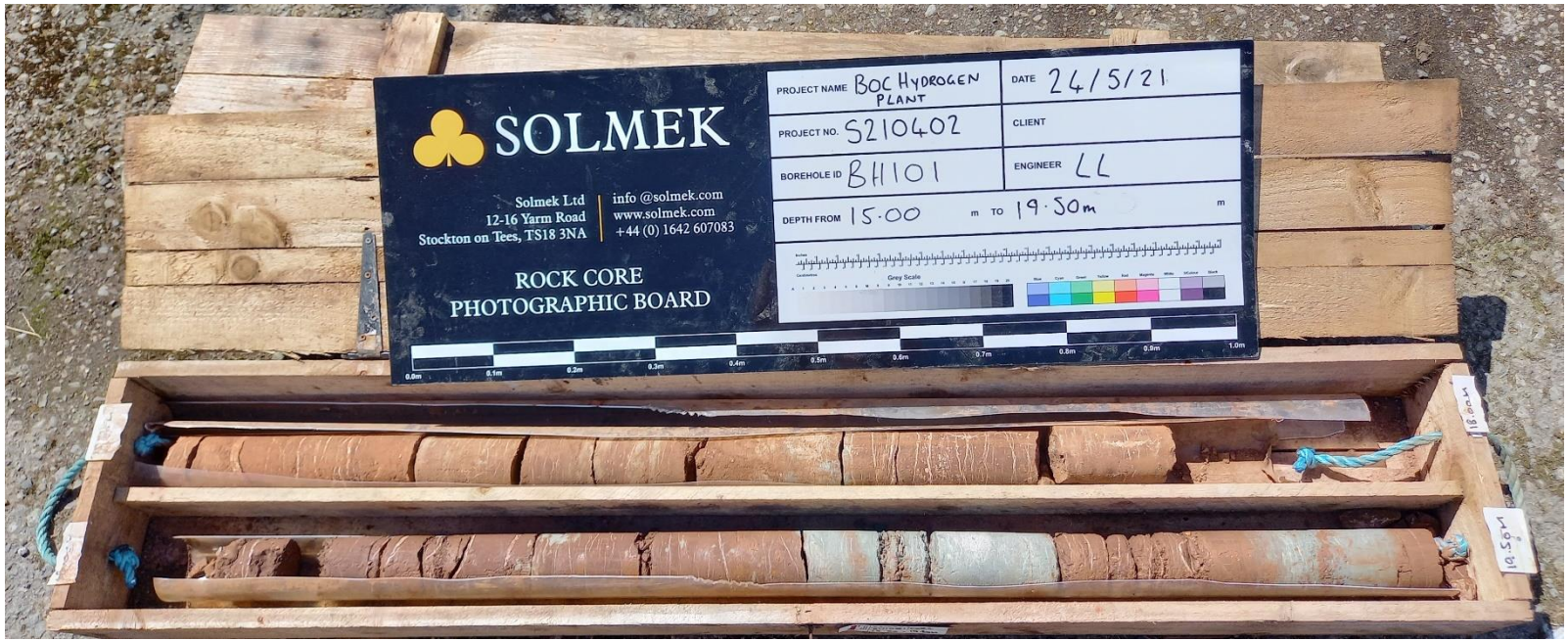

Figure 5: BH101 15.00-19.50m

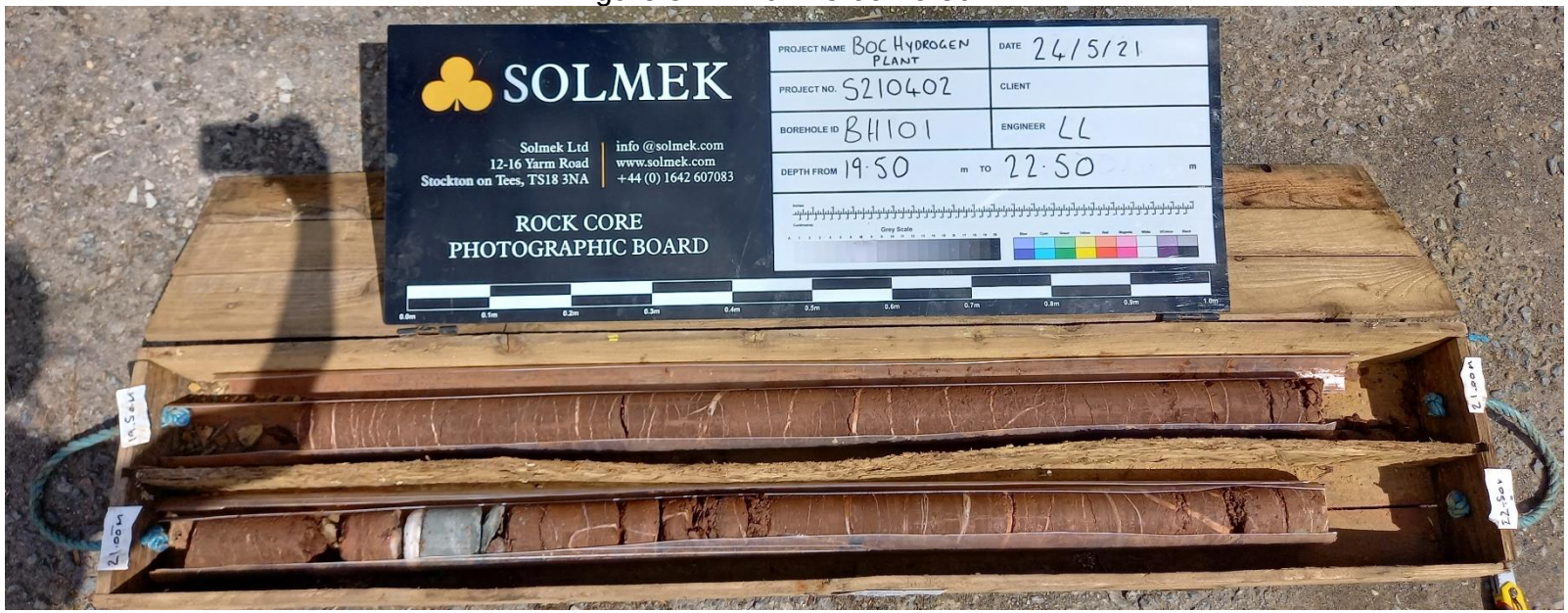

Figure 6: BH101 19.50-22.50m

Title
Rock Core Photographs
Project
BOC North Tees
Client
Tolent Construction
Date
June 2021
Fig No.
Figures 5 & 6
Scale
N/A
Key

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Figure 7: BH101 22.50-25.00m

Figure 8: BH102 20.00-23.00m

Title
Rock Core Photographs

Project
BOC North Tees

Client
Tolent Construction

Date
June 2021

Fig No.
Figures 7 & 8

Scale
N/A

Key

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Figure 9: BH102 23.00-25.50m

Figure 10: BH103 19.50-22.50m

Title
Rock Core Photographs
Project
BOC North Tees
Client
Tolent Construction
Date
June 2021
Fig No.
Figures 9 & 10
Scale
N/A
Key

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Figure 11: BH103 22.50-25.50m

Figure 12: BH104 17.50-20.00m

Title
Rock Core Photographs
Project
BOC North Tees
Client
Tolent Construction
Date
June 2021
Fig No.
Figures 11 & 12
Scale
N/A
Key

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Figure 13: TP301.

Figure 14: TP301.

Title	**Date**
Figures 13 & 14	June 2021
Project	
BOC North Tees	
Client	
Tolent Construction	

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Figure 15: TP302.

Figure 16: TP302 Spoil.

Title	**Date**
Figures 15 & 16	June 2021
Project	
BOC North Tees	
Client	
Tolent Construction	

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Figure 17: TP303.

Figure 18: TP303.

Title	**Date**
Figures 17 & 18	June 2021
Project	
BOC North Tees	
Client	
Tolent Construction	

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Figure 19: TP303 with possible duct.

Title	Date
Figures 19 & 20	June 2021
Project	
BOC North Tees	
Client	
Tolent Construction	

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APPENDIX B:
Borehole Logs & Trial Pit Logs

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Cable Percussive with Rotary Core Follow-on Log

Scale 1:75 Sheet 1 of 2

BH101

Contract no:	S210402	**Site:**	BOC Hydrogen Plant	**Driller:**	BBL
				Plant used:	Cable Percussive /Beretta T41
				Started:	12/05/2021
Client:	Linde GmbH			**Ended:**	12/05/2021
Method:	Cable Percussive with Rotary Core Follow On			**Backfilled:**	12/05/2021

GL (AOD):	
Easting:	
Northing:	
Logged:	EL
Status:	FINAL

Backfill / Installation	Legend	Depth (m)	Level (m AOD)	Stratum Description	Samples and Insitu Testing: Depth (m)	Type	Results
				MADE GROUND: Grey concrete with 5mm rebar.			
		0.50		MADE GROUND: Dark grey sandy gravel. High cobble and boulder content noted. Gravel is angular, fine to coarse of brick, concrete and slag like material. Cobbles and boulders are angular of concrete, brick and slag like material. Slightly hydrocarbon odour noted.			
		2.50		MADE GROUND: Dark grey slightly sandy gravel. Sand is ash. Gravel is angular of slag like material. Strong hydrocarbon odour and oily sheen noted.	3.00 - 3.45 3.00 - 3.45	SPT (S) B+D	N=35 (3,6/7,8,10,10)
					4.00 - 4.26 4.00 4.00 - 4.45	SPT (S) B+D ES	N=50+ (10,15 for 45mm/26,24 for 60mm)
G					5.00 - 5.45 5.00 5.00 - 5.45	SPT (S) B+D ES	N=23 (3,4/5,6,6,6)
		5.60		Medium dense brown silty SAND.	6.00 - 6.45 6.00 6.00 - 6.45	SPT (S) B+D ES	N=23 (2,3/4,6,6,7)
					7.50 - 7.95 7.50 - 7.95	SPT (S) B+D	N=17 (2,2/3,3,5,6)
					9.00 - 9.45 9.00 - 9.45	SPT (S) B+D	N=14 (2,2/2,3,4,5)
					10.50 - 10.95 10.50 - 10.95	SPT (S) B+D	N=14 (1,2/3,3,4,4)
					12.00 - 12.45 12.00 - 12.45	SPT (S) B+D	N=18 (2,2/3,4,5,6)
		13.40		Firm grey mottled brown thinly laminated slightly sandy silty CLAY. Silt dustings noted on some laminae.	13.50 - 13.95 13.50 - 13.95	SPT (S) B+D	N=10 (1,2/2,2,3,3)
		14.00		Firm to stiff reddish brown slightly sandy slightly gravelly CLAY of high plasticity. Gravel is subangular to rounded, fine to coarse of sandstone and mudstone.			
		14.90			15.00 - 15.24	SPT (S)	N=43 (7,12/18,25)

Hole Diameter		Casing Depths		General Remarks
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)	
15.50	150	15.00	150	1. Hand dug inspection pit pre-dug to 2.50m. 2. Groundwater encountered at 3.20m.

Chiselling		
From (m)	To (m)	Time (hr)

Ground Water				
Depth Strike (m)	Depth Casing (m)	Depth Sealed (m)	Time Elapsed (min)	Water Level (m)
3.20	6.00			

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Cable Percussive with Rotary Core Follow-on Log

Scale 1:75 Sheet 2 of 2

BH101

Contract no:	S210402	**Site:**	BOC Hydrogen Plant	**Driller:**	BBL
				Plant used:	Cable Percussive /Beretta T41
				Started:	12/05/2021
Client:	Linde GmbH			**Ended:**	12/05/2021
Method:	Cable Percussive with Rotary Core Follow On			**Backfilled:**	12/05/2021

GL (AOD):	
Easting:	
Northing:	
Logged:	EL
Status:	FINAL

Backfill / Installation	Legend	Depth (m)	Level (m AOD)	Stratum Description	Samples and Insitu Testing: Depth (m)	Type	Results			
				Reddish brown mottled grey weak to medium strong silty MUDSTONE. Very closely spaced planar to vertical gypsum veins up to 1.5cm. Closely spaced planar to sub-planar fractures.	15.00 - 15.45	C				
					15.00 - 18.00	D	53	41	29	NI 26 38
					18.00 - 21.00	C	90	90	21	3 8 25
					21.00 - 24.00	C	95	92	32	5 8 50
		24.00		Pale grey weak SILTSTONE. Very closely spaced planar to sub-planar gypsum veins up to 0.6cm. Closely spaced planar to sub-planar fractures.	24.00 - 25.00	C	100	50	10	3 8 18
		25.00		End of Borehole at 25.000m						

Hole Diameter		Casing Depths		General Remarks
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)	
15.50	150	15.00	150	1. Hand dug inspection pit pre-dug to 2.50m. 2. Groundwater encountered at 3.20m.

Chiselling		
From (m)	To (m)	Time (hr)

Ground Water				
Depth Strike (m)	Depth Casing (m)	Depth Sealed (m)	Time Elapsed (min)	Water Level (m)
3.20	6.00			

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Cable Percussive with Rotary Core Follow-on Log

Scale 1:75 Sheet 1 of 2

BH102

Contract no:	S210402	**Site:**	BOC Hydrogen Plant	**Driller:**	BBL
				Plant used:	Cable Percussive/Beretta T41
				Started:	05/05/2021
Client:	Linde GmbH			**Ended:**	07/05/2021
Method:	Cable Percussive with Rotary Core Follow On			**Backfilled:**	11/05/2021

GL (AOD):	
Easting:	
Northing:	
Logged:	EL
Status:	FINAL

Backfill / Installation	Legend	Depth (m)	Level (m AOD)	Stratum Description	Samples and Insitu Testing		
					Depth (m)	Type	Results
		0.10		MADE GROUND: Grey concrete with 5mm rebar.			
				MADE GROUND: Dark grey slightly sandy gravel. High concrete of cobbles and boulders noted. Gravel is angular to subangular fine to coarse of slag like material and concrete. Cobbles and boulders are angular of slag like material and concrete.	1.20 - 1.65 1.20 - 1.65	SPT (S) B+D	N=7 (2,2/3,2,1,1)
					2.00 - 2.45 2.00 2.00 - 2.45	SPT (S) B+D ES	N=14 (2,2/3,3,4,4)
					3.00 - 3.45 3.00 - 3.45	SPT (S) B+D	N=16 (2,3/3,4,4,5)
					4.00 - 4.27 4.00 4.00 - 4.45	SPT (S) B+D ES	N=50+ (4,6/28,22 for 45mm)
G					5.00 - 5.09 5.00 - 5.45	SPT (S) B+D	N=50+ (25 for 25mm/50 for 65mm)
		5.70		Loose to medium dense grey silty SAND.	6.00 - 6.45 6.00 - 6.45	SPT (S) B+D	N=5 (1,0/0,1,2,2)
					7.00	ES	
					7.50 - 7.95 7.50 - 7.95	SPT (S) B+D	N=4 (1,1/0,1,1,2)
					9.00 - 9.45 9.00 - 9.45	SPT (S) B+D	N=14 (2,2/3,3,4,4)
					10.50 - 10.95 10.50 - 10.95	SPT (S) B+D	N=19 (2,3/4,4,5,6)
					12.00 - 12.45 12.00 - 12.45	SPT (S) B+D	N=18 (2,2/3,4,5,6)
		13.10		Firm brown thinly laminated slightly sandy silty CLAY of high plasticity. Silt dustings noted on some laminae.	13.50 - 13.95 13.50 - 13.95	SPT (S) B+D	N=11 (0,1/2,2,3,4)
					15.00 - 15.45	SPT (S)	N=21 (2,3/4,5,6,6)

Hole Diameter		Casing Depths		General Remarks
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)	
20.50	150	19.50	150	1. Hand dug inspection pit pre-dug to 1.20m. 2. Groundwater encountered at 2.60m.

Chiselling		
From (m)	To (m)	Time (hr)

Ground Water				
Depth Strike (m)	Depth Casing (m)	Depth Sealed (m)	Time Elapsed (min)	Water Level (m)
2.60	2.00		20	2.50

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Cable Percussive with Rotary Core Follow-on Log

Scale 1:75 Sheet 2 of 2

BH102

Contract no:	S210402	**Site:**	BOC Hydrogen Plant	**Driller:**	BBL
				Plant used:	Cable Percussive/Beretta T41
				Started:	05/05/2021
Client:	Linde GmbH			**Ended:**	07/05/2021
Method:	Cable Percussive with Rotary Core Follow On			**Backfilled:**	11/05/2021

GL (AOD):	
Easting:	
Northing:	
Logged:	EL
Status:	FINAL

Backfill / Installation	Legend	Depth (m)	Level (m AOD)	Stratum Description	Samples and Insitu Testing: Depth (m)	Type	Results				
				Firm brown thinly laminated slightly sandy silty CLAY of high plasticity. Silt dustings noted on some laminae.	15.00 - 15.45	B+D					
		16.30		Firm to stiff reddish brown slightly sandy gravelly CLAY. Gravel is subangular to rounded, fine to coarse of mudstone.	16.50 - 16.95 16.50 - 16.95	SPT (S) B+D	N=18 (3,3/4,4,5,5)				
		17.30		Firm dark grey thinly laminated CLAY. Thinly widely spaced beds of mudstone gravel noted.							
		18.10		Firm to stiff reddish brown slightly sandy gravelly CLAY. Gravel is subangular to rounded, fine to coarse of mudstone.	18.00 - 18.45 18.00 - 18.45	SPT (S) B+D	N=18 (3,3/3,4,5,6)				
					19.50 - 19.95 19.50 - 19.95	SPT (S) B+D	N=20 (3,4/4,5,5,6)				
		20.00		Reddish brown mottled grey weak to medium strong silty MUDSTONE. Very closely spaced planar to vertical gypsum veins up to 1.5cm. Closely spaced planar to sub-planar fractures.	20.00 - 20.30 20.00 - 20.50 20.00 - 23.00	SPT (S) C D	N=50+ (15,10 for 45mm/18,21,11 for 35mm)				
				Mudstone becomes very friable.	23.00 - 25.50	C		100	83	26	NI 6 28
		23.10 23.30		Reddish brown gravelly SAND. Gravel is angular to sub-angular, fine to coarse of mudstone. Reddish brown mottled grey weak to medium strong silty MUDSTONE. Very closely spaced planar to vertical gypsum veins up to 1.5cm. Closely spaced planar to sub-planar fractures.				100	88	8	5 7 24
		25.50		End of Borehole at 25.500m							

Hole Diameter		Casing Depths		General Remarks
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)	
20.50	150	19.50	150	1. Hand dug inspection pit pre-dug to 1.20m. 2. Groundwater encountered at 2.60m.

Chiselling		
From (m)	To (m)	Time (hr)

Ground Water				
Depth Strike (m)	Depth Casing (m)	Depth Sealed (m)	Time Elapsed (min)	Water Level (m)
2.60	2.00		20	2.50

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Cable Percussive with Rotary Core Follow-on Log

Scale 1:75 Sheet 1 of 2

BH103

Contract no:	S210402	**Site:**	BOC Hydrogen Plant	**Driller:**	BBL
				Plant used:	Cable Percussive/Beretta T41
				Started:	12/05/2021
Client:	Linde GmbH			**Ended:**	13/05/2021
Method:	Cable Percussive with Rotary Core Follow On			**Backfilled:**	14/05/2021

GL (AOD):	
Easting:	
Northing:	
Logged:	EL
Status:	FINAL

Backfill / Installation	Legend	Depth (m)	Level (m AOD)	Stratum Description	Samples and Insitu Testing		
					Depth (m)	Type	Results
		0.10		MADE GROUND: Grey concrete with 5mm rebar.			
				MADE GROUND: Greyish brown gravelly sand. Gravel is angular to subangular fine to coarse of slag like material and concrete.	1.20	ES	
		2.70		MADE GROUND: Dark grey slightly sandy gravel. Gravel is angular to subangular, fine to coarse of slag like material. Sand is of ash. Strong hydrocarbon odour noted.	3.00 - 3.45 3.00 3.00 - 3.45	SPT (S) B+D ES	N=35 (3,6/7,8,10,10)
					4.00 - 4.26 4.00 - 4.45	SPT (S) B+D	N=50+ (10,15 for 45mm/26,24 for 60mm)
G					5.00 - 5.45 5.00 5.00 - 5.45	SPT (S) B+D ES	N=23 (3,4/5,6,6,6)
		5.60		Loose to medium dense brown silty SAND.	6.00 - 6.45 6.00 6.00 - 6.45	SPT (S) B+D ES	N=23 (2,3/4,6,6,7)
					7.00 - 7.45 7.00 - 7.45	SPT (S) B+D	N=9 (1,2/2,2,2,3)
					8.00 - 8.45 8.00 - 8.45	SPT (S) B+D	N=12 (2,2/3,2,3,4)
					9.00 - 9.45 9.00 - 9.45	SPT (S) B+D	N=20 (3,4/5,4,5,6)
					10.00 - 10.45 10.00 - 10.45	SPT (S) B+D	N=13 (1,2/2,3,4,4)
					11.00 - 11.45 11.00 - 11.45	SPT (S) B+D	N=20 (3,4/4,5,5,6)
					12.00 - 12.45 12.00 - 12.45	SPT (S) B+D	N=17 (2,3/3,4,5,5)
					13.00 - 13.45 13.00 - 13.45	SPT (S) B+D	N=8 (2,3/3,2,1,2)
		13.30		Firm brownish grey thinly laminated slightly sandy silty CLAY of high plasticity.	14.00 - 14.45 14.00 - 14.45	SPT (S) B+D	N=9 (1,1/2,2,2,3)
					15.00 - 15.45	SPT (S)	N=12 (2,2/2,3,3,4)

Hole Diameter		Casing Depths		General Remarks
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)	
19.50	150	19.00	150	1. Hand dug inspection pit pre-dug to 1.20m. 2. Groundwater encountered at 3.20m.

Chiselling		
From (m)	To (m)	Time (hr)

Ground Water				
Depth Strike (m)	Depth Casing (m)	Depth Sealed (m)	Time Elapsed (min)	Water Level (m)
3.20	6.00			

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Cable Percussive with Rotary Core Follow-on Log

Scale 1:75 Sheet 2 of 2

BH103

Contract no:	S210402	**Site:**	BOC Hydrogen Plant	**Driller:**	BBL
				Plant used:	Cable Percussive/Beretta T41
				Started:	12/05/2021
Client:	Linde GmbH			**Ended:**	13/05/2021
Method:	Cable Percussive with Rotary Core Follow On			**Backfilled:**	14/05/2021

GL (AOD):	
Easting:	
Northing:	
Logged:	EL
Status:	FINAL

Backfill / Installation	Legend	Depth (m)	Level (m AOD)	Stratum Description	Samples and Insitu Testing: Depth (m)	Type	Results			
				Firm brownish grey thinly laminated slightly sandy silty CLAY of high plasticity.	15.00 - 15.45	B+D				
					16.00 - 16.45	SPT (S)	N=14 (2,2/3,3,4,4)			
					16.00 - 16.45	B+D				
					17.00 - 17.45	SPT (S)	N=16 (1,2/3,4,4,5)			
					17.00 - 17.45	B+D				
		17.70		Firm to stiff reddish brown slightly sandy slightly gravelly silty CLAY of intermediate plasticity. Gravel is angular to subrounded fine to coarse of sandstone and mudstone.	18.00 - 18.45	SPT (S)	N=19 (3,3/4,4,5,6)			
					18.00 - 18.45	B+D				
					19.00 - 19.45	SPT (S)	N=26 (3,3/4,5,7,10)			
		19.20		Reddish brown mottled grey weak to medium strong silty MUDSTONE. Very closely spaced	19.00 - 19.45	D				
					19.50 - 22.00	C				
				planar to vertical gypsum veins up to 1.5cm. Closely spaced planar to sub-planar fractures.	19.50 - 22.00	C		67	25	7	NI 12 20
					22.00 - 25.00	C				
		23.20		Pale grey weak SILTSTONE. Very closely spaced planar to sub-planar gypsum veins up to 0.5cm. Closely spaced planar fractures.				100	93	60	2 7 40
		23.45		Reddish brown mottled grey weak to medium strong silty MUDSTONE. Very closely spaced planar to vertical gypsum veins up to 1.5cm. Closely spaced planar to sub-planar fractures.							
		25.50		End of Borehole at 25.500m							

Hole Diameter		Casing Depths		General Remarks
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)	
19.50	150	19.00	150	1. Hand dug inspection pit pre-dug to 1.20m. 2. Groundwater encountered at 3.20m.

Chiselling		
From (m)	To (m)	Time (hr)

Ground Water				
Depth Strike (m)	Depth Casing (m)	Depth Sealed (m)	Time Elapsed (min)	Water Level (m)
3.20	6.00			

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Cable Percussive with Rotary Core Follow-on Log

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BH104

Contract no:	S210402	**Site:**	BOC Hydrogen Plant	**Driller:**	BBL
				Plant used:	Cable Percussive/Beretta T41
				Started:	13/05/2021
Client:	Linde GmbH			**Ended:**	14/05/2021
Method:	Cable Percussive			**Backfilled:**	14/05/2021

GL (AOD):	
Easting:	
Northing:	
Logged:	EL
Status:	FINAL

Backfill / Installation	Legend	Depth (m)	Level (m AOD)	Stratum Description	Samples and Insitu Testing		
					Depth (m)	Type	Results
		0.10		MADE GROUND: Grey concrete with 5mm rebar.			
				MADE GROUND: Greyish brown gravelly sand. Gravel is angular to subangular fine to coarse of slag like material and concrete.			
		2.50		MADE GROUND; Dark grey slightly sandy gravel. Gravel is angular to subangular fine to coarse of slag like material. Sand is of ash. Strong hydrocarbon odour noted.	3.00 - 3.45	SPT (S)	N=37 (4,5/6,8,11,12)
					3.00 - 3.45	B+D	
					4.00 - 4.22	SPT (S)	N=50+ (25 for 45mm/18,21,11 for 20mm)
					4.00	B+D	
					4.00 - 4.45	ES	
G					5.00 - 5.40	SPT (S)	N=50+ (10,12/9,12,15,14 for 25mm)
		5.20		Loose to medium dense brown silty SAND.	5.00 - 5.45	B+D	
					6.00 - 6.45	SPT (S)	N=12 (1,2/2,3,3,4)
					6.00 - 6.45	B+D	
					7.00 - 7.45	SPT (S)	N=9 (2,2/2,2,2,3)
					7.00 - 7.45	B+D	
					8.00 - 8.45	SPT (S)	N=7 (1,2/1,2,2,2)
					8.00 - 8.45	B+D	
					9.00 - 9.45	SPT (S)	N=19 (2,3/4,4,5,6)
					9.00 - 9.45	B+D	
					10.00 - 10.45	SPT (S)	N=23 (3,4/4,5,6,8)
					10.00 - 10.45	B+D	
					11.00 - 11.45	SPT (S)	N=26 (4,5/6,6,7,7)
					11.00 - 11.45	B+D	
					12.00 - 12.38	SPT (S)	N=20 (3,4/4,4,5,7)
					12.00 - 12.45	B+D	
		13.00		Firm brownish grey thinly laminated slightly sandy silty CLAY of high plasticity.	13.00 - 13.45	SPT (S)	N=13 (1,2/3,3,3,4)
					13.00 - 13.45	B+D	
					14.00 - 14.45	SPT (S)	N=13 (2,2/3,3,3,4)
					14.00 - 14.45	B+D	
		14.90			15.00 - 15.45	SPT (S)	N=14 (2,2/3,3,4,4)

Hole Diameter		Casing Depths		General Remarks
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)	
17.50	150	17.00	150	1. Hand dug inspection pit pre-dug to 1.20m. 2. Groundwater encountered at 3.20m.

Chiselling		
From (m)	To (m)	Time (hr)

Ground Water				
Depth Strike (m)	Depth Casing (m)	Depth Sealed (m)	Time Elapsed (min)	Water Level (m)
3.20	6.00			

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Cable Percussive with Rotary Core Follow-on Log

Scale 1:75 Sheet 2 of 2

BH104

Contract no:	S210402	**Site:**	BOC Hydrogen Plant	**Driller:**	BBL
				Plant used:	Cable Percussive/Beretta T41
				Started:	13/05/2021
Client:	Linde GmbH			**Ended:**	14/05/2021
Method:	Cable Percussive			**Backfilled:**	14/05/2021

GL (AOD):	
Easting:	
Northing:	
Logged:	EL
Status:	FINAL

Backfill / Installation	Legend	Depth (m)	Level (m AOD)	Stratum Description	Samples and Insitu Testing: Depth (m)	Type	Results		
				Firm to stiff reddish brown slightly sandy slightly gravelly CLAY of low plasticity. Gravel is angular to subrounded fine to coarse of mudstone and sandstone.	15.00 - 15.45	B+D			
		16.00		Firm brown thinly laminated slightly sandy slightly gravelly CLAY. Gravel is subangular to rounded fine to coarse of mudstone and sandstone.	16.00 - 16.45	SPT (S)	N=25 (2,3/5,6,7,7)		
					16.00 - 16.45	B+D			
		17.10			17.00 - 17.45	SPT (S)	N=35 (3,3/4,7,10,14)		
		17.30		Firm to stiff reddish brown slightly sandy slightly gravelly CLAY. Gravel is angular to subrounded	17.00 - 17.45	B+D			
		17.50		fine to coarse of mudstone and sandstone.	17.50 - 20.00	C			
		17.90		Reddish brown mottled grey weak to medium strong silty MUDSTONE. Very closely spaced planar to vertical gypsum veins up to 1.5cm. Closely spaced planar to sub-planar fractures.					
				Pale grey weak SILTSTONE. Very closely spaced planar to sub-planar gypsum veins up to 0.5cm. Closely spaced planar to vertical fractures.			28	16	14
				Reddish brown mottled grey weak to medium strong silty MUDSTONE. Very closely spaced planar to vertical gypsum veins up to 1.5cm. Closely spaced planar to sub-planar fractures.					
		20.00		End of Borehole at 20.000m					

Hole Diameter		Casing Depths		General Remarks
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)	
17.50	150	17.00	150	1. Hand dug inspection pit pre-dug to 1.20m. 2. Groundwater encountered at 3.20m.

Chiselling		
From (m)	To (m)	Time (hr)

Ground Water				
Depth Strike (m)	Depth Casing (m)	Depth Sealed (m)	Time Elapsed (min)	Water Level (m)
3.20	6.00			

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Trial Pit Log

TrialPit No
TP301
Sheet 1 of 1

Project Name:	BOC Hydrogen Plant	Project No. S210402	Co-ords: E - N Level:	Date 07/05/2021
Plant Used:	JCB 3CX	Dimensions (m): Depth 2.70	2.10 / 2.10	Scale 1:26
Client:	Linde GmbH			Logged LL

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							MADE GROUND: Grey concrete with 5mm rebar.
				0.50			
	0.60 0.60	B ES					MADE GORUND: Dark grey slightly sandy gravel. High concrete of cobbles and boulders noted. Gravel is angular fine to coarse of slag like material, concrete and brick. Cobbles and boulders are angular of slag, concrete and brick.
	1.60 1.60	B ES					
				2.50			
	2.60 2.60	B ES					MADE GROUND: Grey slightly sandy gravel. Sand is of ash. Gravel is angular of slag like material. Strong hydrocarbon odour and oily sheen noted.
				2.70			End of Pit at 2.700m

Remarks: 1. No groundwater encountered.

Stability: Stable

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Trial Pit Log

TrialPit No
TP302
Sheet 1 of 1

Project Name:	BOC Hydrogen Plant	Project No. S210402	Co-ords: E - N Level:
Plant Used:	JCB 3CX	Dimensions (m): Depth 1.70	4.20 × 2.30
Client:	Linde GmbH		

Date: 11/05/2021
Scale: 1:26
Logged: LL

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.10			MADE GROUND: Grey concrete with 5mm rebar.
	0.20 0.20	B ES					MADE GROUND: Brown gravelly sand. Gravel is angular to subangular, fine to coarse of brick and concrete.
				0.60			MADE GROUND: Dark brown gravelly sand. Gravel is angular to subangular, fine to coarse of concrete, dolomite and slag-like-material. Occasional pieces of clothing, polystyrene and timber noted. Rare piece of suspected asbestos noted.
	0.80 0.80 0.90 - 1.00	B ES B					
				1.30			MADE GROUND: Dark grey sand. Sand is of fly ash.
	1.40 1.40	B ES		1.50			MADE GROUND: Yellowish brown slightly sandy gravel. Gravel is subangular, fine to coarse of dolomite.
	1.60	B		1.70			End of Pit at 1.700m

Remarks: 1. No groundwater encountered.

Stability: Stable down to 1.30m.

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Trial Pit Log

TrialPit No
TP303
Sheet 1 of 1

Project Name:	BOC Hydrogen Plant	Project No. S210402	Co-ords: E - N Level:	Date 07/05/2021
Plant Used:	JCB 3CX	Dimensions (m): Depth 0.65	5.10 / 2.10	Scale 1:26
Client:	Linde GmbH			Logged LL

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.10			MADE GROUND: Grey concrete with 5mm rebar.
	0.20 0.20	B ES					MADE GROUND: Light brownish grey slightly sandy gravel. Medium cobble and boulder content noted. Gravel is angular to subangular fine to coarse of slag and concrete. Cobbles and boulders are angular of concrete and slag. Occasional piece of scrap rebar noted.
	0.60 0.60	B ES		0.55 0.65 0.65			MADE GROUND: Black gravel. Gravel is angular of slag. Strong hydrocarbon odour and oily sheen noted. MADE GROUND: Concrete obstruction. (Suspected pad). End of Pit at 0.650m

Remarks: 1. No groundwater encountered.

Stability: Stable

APPENDIX C:
Contamination Laboratory Results

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Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

Final Report

Report No.:	21-15431-1		
Initial Date of Issue:	17-May-2021		
Client	Solmek Ltd		
Client Address:	12 Yarm Road Stockton-on-Tees TS18 3NA		
Contact(s):	Leo Cassidy Office		
Project	S210402 BOC Hydrogen Plant		
Quotation No.:		**Date Received:**	11-May-2021
Order No.:	SOL-5020	**Date Instructed:**	11-May-2021
No. of Samples:	2		
Turnaround (Wkdays):	5	**Results Due:**	17-May-2021
Date Approved:	17-May-2021		
Approved By:			
Details:	Glynn Harvey, Technical Manager		

Results - Leachate

Project: S210402 BOC Hydrogen Plant

Client: Solmek Ltd				**Chemtest Job No.:**		21-15431
Quotation No.:				**Chemtest Sample ID.:**		1197537
				Sample Location:		TP301
				Sample Type:		SOIL
				Top Depth (m):		2.60
				Date Sampled:		07-May-2021
Determinand	**Accred.**	**SOP**	**Type**	**Units**	**LOD**	
pH	U	1010			N/A	8.5
Sulphate	U	1220		mg/l	1.0	130
Cyanide (Total)	U	1300		mg/l	0.050	< 0.050
Hardness	U	1415		mg/l	15	160
Arsenic (Dissolved)	U	1455		µg/l	0.20	1.4
Boron (Dissolved)	U	1455		µg/l	10.0	48
Cadmium (Dissolved)	U	1455		µg/l	0.11	< 0.11
Chromium (Dissolved)	U	1455		µg/l	0.50	3.9
Copper (Dissolved)	U	1455		µg/l	0.50	< 0.50
Mercury (Dissolved)	U	1455		µg/l	0.05	< 0.05
Nickel (Dissolved)	U	1455		µg/l	0.50	2.4
Lead (Dissolved)	U	1455		µg/l	0.50	< 0.50
Selenium (Dissolved)	U	1455		µg/l	0.50	1.5
Zinc (Dissolved)	U	1455		µg/l	3.0	< 3.0
Aliphatic TPH >C5-C6	N	1675		µg/l	0.10	< 0.10
Aliphatic TPH >C6-C8	N	1675		µg/l	0.10	< 0.10
Aliphatic TPH >C8-C10	N	1675		µg/l	0.10	< 0.10
Aliphatic TPH >C10-C12	N	1675		µg/l	0.10	< 0.10
Aliphatic TPH >C12-C16	N	1675		µg/l	0.10	< 0.10
Aliphatic TPH >C16-C21	N	1675		µg/l	0.10	< 0.10
Aliphatic TPH >C21-C35	N	1675		µg/l	0.10	< 0.10
Aliphatic TPH >C35-C44	N	1675		µg/l	0.10	< 0.10
Total Aliphatic Hydrocarbons	N	1675		µg/l	5.0	< 5.0
Aromatic TPH >C5-C7	N	1675		µg/l	0.10	< 0.10
Aromatic TPH >C7-C8	N	1675		µg/l	0.10	< 0.10
Aromatic TPH >C8-C10	N	1675		µg/l	0.10	840
Aromatic TPH >C10-C12	N	1675		µg/l	0.10	150
Aromatic TPH >C12-C16	N	1675		µg/l	0.10	52
Aromatic TPH >C16-C21	N	1675		µg/l	0.10	< 0.10
Aromatic TPH >C21-C35	N	1675		µg/l	0.10	< 0.10
Aromatic TPH >C35-C44	N	1675		µg/l	0.10	< 0.10
Total Aromatic Hydrocarbons	N	1675		µg/l	5.0	1000
Total Petroleum Hydrocarbons	N	1675		µg/l	10	1000
Naphthalene	U	1800		µg/l	0.10	8.3
Acenaphthylene	U	1800		µg/l	0.10	< 0.10
Acenaphthene	U	1800		µg/l	0.10	< 0.10
Fluorene	U	1800		µg/l	0.10	< 0.10
Phenanthrene	U	1800		µg/l	0.10	< 0.10
Anthracene	U	1800		µg/l	0.10	< 0.10
Fluoranthene	U	1800		µg/l	0.10	< 0.10

Results - Leachate

Project: S210402 BOC Hydrogen Plant

Client: Solmek Ltd				**Chemtest Job No.:**		21-15431
Quotation No.:				**Chemtest Sample ID.:**		1197537
				Sample Location:		TP301
				Sample Type:		SOIL
				Top Depth (m):		2.60
				Date Sampled:		07-May-2021
Determinand	**Accred.**	**SOP**	**Type**	**Units**	**LOD**	
Pyrene	U	1800		µg/l	0.10	< 0.10
Benzo[a]anthracene	U	1800		µg/l	0.10	< 0.10
Chrysene	U	1800		µg/l	0.10	< 0.10
Benzo[b]fluoranthene	U	1800		µg/l	0.10	< 0.10
Benzo[k]fluoranthene	U	1800		µg/l	0.10	< 0.10
Benzo[a]pyrene	U	1800		µg/l	0.10	< 0.10
Indeno(1,2,3-c,d)Pyrene	U	1800		µg/l	0.10	< 0.10
Dibenz(a,h)Anthracene	U	1800		µg/l	0.10	< 0.10
Benzo[g,h,i]perylene	U	1800		µg/l	0.10	< 0.10
Total Of 16 PAH's	U	1800		µg/l	2.0	8.3
Total Phenols	U	1920		mg/l	0.030	< 0.030

Results - Soil

Project: S210402 BOC Hydrogen Plant

Client: Solmek Ltd		**Chemtest Job No.:**			21-15431	21-15431
Quotation No.:		**Chemtest Sample ID.:**			1197537	1197538
			Sample Location:		TP301	TP303
			Sample Type:		SOIL	SOIL
			Top Depth (m):		2.60	0.60
			Date Sampled:		07-May-2021	07-May-2021
			Asbestos Lab:		DURHAM	DURHAM
Determinand	**Accred.**	**SOP**	**Units**	**LOD**		
ACM Type	U	2192		N/A	-	-
Asbestos Identification	U	2192		N/A	No Asbestos Detected	No Asbestos Detected
ACM Detection Stage	U	2192		N/A	-	-
Moisture	N	2030	%	0.020	26	12
Soil Colour	N	2040		N/A	Brown	Brown
Other Material	N	2040		N/A	Stones	Stones
Soil Texture	N	2040		N/A	Sand	Sand
pH	M	2010		4.0	9.3	9.7
Boron (Hot Water Soluble)	M	2120	mg/kg	0.40	< 0.40	< 0.40
Sulphate (2:1 Water Soluble) as SO4	M	2120	mg/l	10	150	650
Cyanide (Total)	M	2300	mg/kg	0.50	< 0.50	< 0.50
Arsenic	M	2450	mg/kg	1.0	12	13
Cadmium	M	2450	mg/kg	0.10	< 0.10	0.69
Chromium	M	2450	mg/kg	1.0	7.1	13
Copper	M	2450	mg/kg	0.50	8.5	12
Mercury	M	2450	mg/kg	0.10	< 0.10	< 0.10
Nickel	M	2450	mg/kg	0.50	14	14
Lead	M	2450	mg/kg	0.50	8.5	51
Selenium	M	2450	mg/kg	0.20	0.32	1.1
Zinc	M	2450	mg/kg	0.50	29	330
Organic Matter	M	2625	%	0.40	0.69	1.9
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	< 1.0	< 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0
Aliphatic TPH >C8-C10	M	2680	mg/kg	1.0	< 1.0	< 1.0
Aliphatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0	< 1.0
Aliphatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0	< 1.0
Aliphatic TPH >C16-C21	M	2680	mg/kg	1.0	< 1.0	< 1.0
Aliphatic TPH >C21-C35	M	2680	mg/kg	1.0	< 1.0	< 1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	< 5.0
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	< 1.0	< 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0
Aromatic TPH >C8-C10	M	2680	mg/kg	1.0	10	13
Aromatic TPH >C10-C12	M	2680	mg/kg	1.0	9.7	110
Aromatic TPH >C12-C16	M	2680	mg/kg	1.0	4.0	20
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0	< 1.0
Aromatic TPH >C21-C35	M	2680	mg/kg	1.0	45	280
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0

Results - Soil

Project: S210402 BOC Hydrogen Plant

Client: Solmek Ltd		**Chemtest Job No.:**			21-15431	21-15431
Quotation No.:		**Chemtest Sample ID.:**			1197537	1197538
		Sample Location:			TP301	TP303
		Sample Type:			SOIL	SOIL
		Top Depth (m):			2.60	0.60
		Date Sampled:			07-May-2021	07-May-2021
		Asbestos Lab:			DURHAM	DURHAM
Determinand	**Accred.**	**SOP**	**Units**	**LOD**		
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	69	420
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	69	420
Naphthalene	M	2700	mg/kg	0.10	< 0.10	< 0.10
Acenaphthylene	M	2700	mg/kg	0.10	< 0.10	< 0.10
Acenaphthene	M	2700	mg/kg	0.10	< 0.10	< 0.10
Fluorene	M	2700	mg/kg	0.10	< 0.10	< 0.10
Phenanthrene	M	2700	mg/kg	0.10	< 0.10	< 0.10
Anthracene	M	2700	mg/kg	0.10	< 0.10	< 0.10
Fluoranthene	M	2700	mg/kg	0.10	< 0.10	< 0.10
Pyrene	M	2700	mg/kg	0.10	< 0.10	< 0.10
Benzo[a]anthracene	M	2700	mg/kg	0.10	< 0.10	< 0.10
Chrysene	M	2700	mg/kg	0.10	< 0.10	< 0.10
Benzo[b]fluoranthene	M	2700	mg/kg	0.10	< 0.10	< 0.10
Benzo[k]fluoranthene	M	2700	mg/kg	0.10	< 0.10	< 0.10
Benzo[a]pyrene	M	2700	mg/kg	0.10	< 0.10	< 0.10
Indeno(1,2,3-c,d)Pyrene	M	2700	mg/kg	0.10	< 0.10	< 0.10
Dibenz(a,h)Anthracene	M	2700	mg/kg	0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene	M	2700	mg/kg	0.10	< 0.10	< 0.10
Total Of 16 PAH's	M	2700	mg/kg	2.0	< 2.0	< 2.0
Total Phenols	M	2920	mg/kg	0.10	0.89	< 0.10

Test Methods

SOP	Title	Parameters included	Method summary
1010	pH Value of Waters	pH	pH Meter
1220	Anions, Alkalinity & Ammonium in Waters	Fluoride; Chloride; Nitrite; Nitrate; Total; Oxidisable Nitrogen (TON); Sulfate; Phosphate; Alkalinity; Ammonium	Automated colorimetric analysis using 'Aquakem 600' Discrete Analyser.
1300	Cyanides & Thiocyanate in Waters	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Continuous Flow Analysis.
1415	Cations in Waters by ICP-MS	Sodium; Potassium; Calcium; Magnesium	Direct determination by inductively coupled plasma - mass spectrometry (ICP-MS).
1455	Metals in Waters by ICP-MS	Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc	Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS).
1675	TPH Aliphatic/Aromatic split in Waters by GC-FID(cf. Texas Method 1006 / TPH CWG)	Aliphatics: >C5–C6, >C6–C8, >C8– C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44	Pentane extraction / GCxGC FID detection
1800	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Waters by GC-MS	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Pentane extraction / GCMS detection
1920	Phenols in Waters by HPLC	Phenolic compounds including: Phenol, Cresols, Xylenols, Trimethylphenols Note: Chlorophenols are excluded.	Determination by High Performance Liquid Chromatography (HPLC) using electrochemical detection.
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2680	TPH A/A Split	Aliphatics: >C5–C6, >C6–C8,>C8–C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44	Dichloromethane extraction / GCxGC FID detection

Test Methods

SOP	Title	Parameters included	Method summary
2700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Dichloromethane extraction / GC-FID (GC-FID detection is non-selective and can be subject to interference from co-eluting compounds)
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"
SOP	Standard operating procedure
LOD	Limit of detection

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.com

Eurofins Chemtest Ltd
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

Final Report

Report No.:	21-17892-1
Initial Date of Issue:	04-Jun-2021
Client	Solmek Ltd
Client Address:	12 Yarm Road Stockton-on-Tees TS18 3NA
Contact(s):	Leo Cassidy Office
Project	S210402 BOC Hydrogen Plant

Quotation No.:		**Date Received:**	27-May-2021
Order No.:	SOL-5064	**Date Instructed:**	27-May-2021
No. of Samples:	6		
Turnaround (Wkdays):	5	**Results Due:**	03-Jun-2021
Date Approved:	04-Jun-2021		

Approved By:

Details: Glynn Harvey, Technical Manager

Results - Leachate

Project: S210402 BOC Hydrogen Plant

Client: Solmek Ltd				**Chemtest Job No.:**		21-17892	21-17892	21-17892
Quotation No.:				**Chemtest Sample ID.:**		1209371	1209372	1209375
				Sample Location:		TP302	BH101	BH103
				Sample Type:		SOIL	SOIL	SOIL
				Top Depth (m):		0.60	4.00	1.20
				Bottom Depth (m):			4.45	
				Date Sampled:		07-May-2021	12-May-2021	14-May-2021
Determinand	**Accred.**	**SOP**	**Type**	**Units**	**LOD**			
pH	U	1010			N/A	8.6	10.0	9.2
Sulphate	U	1220		mg/l	1.0	1100	140	230
Cyanide (Total)	U	1300		mg/l	0.050	< 0.050	< 0.050	< 0.050
Hardness	U	1415		mg/l	15	1300	160	260
Arsenic (Dissolved)	U	1455		µg/l	0.20	2.2	3.6	7.0
Boron (Dissolved)	U	1455		µg/l	10.0	96	160	72
Cadmium (Dissolved)	U	1455		µg/l	0.11	< 0.11	< 0.11	< 0.11
Chromium (Dissolved)	U	1455		µg/l	0.50	< 0.50	< 0.50	< 0.50
Copper (Dissolved)	U	1455		µg/l	0.50	1.2	< 0.50	2.4
Mercury (Dissolved)	U	1455		µg/l	0.05	< 0.05	< 0.05	< 0.05
Nickel (Dissolved)	U	1455		µg/l	0.50	< 0.50	< 0.50	< 0.50
Lead (Dissolved)	U	1455		µg/l	0.50	< 0.50	< 0.50	< 0.50
Selenium (Dissolved)	U	1455		µg/l	0.50	4.5	1.8	5.4
Zinc (Dissolved)	U	1455		µg/l	2.5	< 2.5	< 2.5	< 2.5
Aliphatic TPH >C5-C6	N	1675		µg/l	0.10	[B] < 0.10	[B] < 0.10	< 0.10
Aliphatic TPH >C6-C8	N	1675		µg/l	0.10	[B] < 0.10	[B] < 0.10	< 0.10
Aliphatic TPH >C8-C10	N	1675		µg/l	0.10	[B] < 0.10	[B] < 0.10	< 0.10
Aliphatic TPH >C10-C12	N	1675		µg/l	0.10	[B] < 0.10	[B] < 0.10	< 0.10
Aliphatic TPH >C12-C16	N	1675		µg/l	0.10	[B] < 0.10	[B] < 0.10	< 0.10
Aliphatic TPH >C16-C21	N	1675		µg/l	0.10	[B] < 0.10	[B] < 0.10	< 0.10
Aliphatic TPH >C21-C35	N	1675		µg/l	0.10	[B] < 0.10	[B] < 0.10	< 0.10
Aliphatic TPH >C35-C44	N	1675		µg/l	0.10	[B] < 0.10	[B] < 0.10	< 0.10
Total Aliphatic Hydrocarbons	N	1675		µg/l	5.0	[B] < 5.0	[B] < 5.0	< 5.0
Aromatic TPH >C5-C7	N	1675		µg/l	0.10	[B] < 0.10	[B] < 0.10	< 0.10
Aromatic TPH >C7-C8	N	1675		µg/l	0.10	[B] < 0.10	[B] < 0.10	< 0.10
Aromatic TPH >C8-C10	N	1675		µg/l	0.10	[B] < 0.10	[B] 320	< 0.10
Aromatic TPH >C10-C12	N	1675		µg/l	0.10	[B] < 0.10	[B] 67	< 0.10
Aromatic TPH >C12-C16	N	1675		µg/l	0.10	[B] < 0.10	[B] < 0.10	< 0.10
Aromatic TPH >C16-C21	N	1675		µg/l	0.10	[B] < 0.10	[B] < 0.10	< 0.10
Aromatic TPH >C21-C35	N	1675		µg/l	0.10	[B] < 0.10	[B] < 0.10	< 0.10
Aromatic TPH >C35-C44	N	1675		µg/l	0.10	[B] < 0.10	[B] < 0.10	< 0.10
Total Aromatic Hydrocarbons	N	1675		µg/l	5.0	[B] < 5.0	[B] 380	< 5.0
Total Petroleum Hydrocarbons	N	1675		µg/l	10	[B] < 10	[B] 380	< 10
Naphthalene	U	1800		µg/l	0.10	< 0.10	0.22	< 0.10
Acenaphthylene	U	1800		µg/l	0.10	< 0.10	< 0.10	< 0.10
Acenaphthene	U	1800		µg/l	0.10	< 0.10	< 0.10	< 0.10
Fluorene	U	1800		µg/l	0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	U	1800		µg/l	0.10	< 0.10	< 0.10	< 0.10
Anthracene	U	1800		µg/l	0.10	< 0.10	< 0.10	< 0.10

Results - Leachate

Project: S210402 BOC Hydrogen Plant

Client: Solmek Ltd				**Chemtest Job No.:**		21-17892	21-17892	21-17892
Quotation No.:				**Chemtest Sample ID.:**		1209371	1209372	1209375
				Sample Location:		TP302	BH101	BH103
				Sample Type:		SOIL	SOIL	SOIL
				Top Depth (m):		0.60	4.00	1.20
				Bottom Depth (m):			4.45	
				Date Sampled:		07-May-2021	12-May-2021	14-May-2021
Determinand	**Accred.**	**SOP**	**Type**	**Units**	**LOD**			
Fluoranthene	U	1800		µg/l	0.10	< 0.10	< 0.10	< 0.10
Pyrene	U	1800		µg/l	0.10	< 0.10	< 0.10	< 0.10
Benzo[a]anthracene	U	1800		µg/l	0.10	< 0.10	< 0.10	< 0.10
Chrysene	U	1800		µg/l	0.10	< 0.10	< 0.10	< 0.10
Benzo[b]fluoranthene	U	1800		µg/l	0.10	< 0.10	< 0.10	< 0.10
Benzo[k]fluoranthene	U	1800		µg/l	0.10	< 0.10	< 0.10	< 0.10
Benzo[a]pyrene	U	1800		µg/l	0.10	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-c,d)Pyrene	U	1800		µg/l	0.10	< 0.10	< 0.10	< 0.10
Dibenz(a,h)Anthracene	U	1800		µg/l	0.10	< 0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene	U	1800		µg/l	0.10	< 0.10	< 0.10	< 0.10
Total Of 16 PAH's	U	1800		µg/l	2.0	< 2.0	< 2.0	< 2.0
Total Phenols	U	1920		mg/l	0.030	< 0.030	< 0.030	< 0.030

Results - Soil

Project: S210402 BOC Hydrogen Plant

Client: Solmek Ltd			**Chemtest Job No.:**		21-17892	21-17892	21-17892	21-17892	21-17892	21-17892
Quotation No.:			**Chemtest Sample ID.:**		1209371	1209372	1209373	1209374	1209375	1209376
			Sample Location:		TP302	BH101	BH102	BH102	BH103	BH104
			Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Top Depth (m):		0.60	4.00	2.00	4.00	1.20	4.00
			Bottom Depth (m):			4.45	2.45	4.45		
			Date Sampled:		07-May-2021	12-May-2021	11-May-2021	11-May-2021	14-May-2021	14-May-2021
			Asbestos Lab:		COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**						
ACM Type	U	2192		N/A	-	-	-	-	-	-
Asbestos Identification	U	2192		N/A	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
ACM Detection Stage	U	2192		N/A	-	-	-	-	-	-
Moisture	N	2030	%	0.020	16	19	4.9	12	13	14
Soil Colour	N	2040		N/A	Grey	Black	Brown	Grey	Grey	Grey
Other Material	N	2040		N/A	Stones	Stones	Stones	Stones	Stones	Stones
Soil Texture	N	2040		N/A	Sand	Sand	Sand	Sand	Gravel	Sand
pH	M	2010		4.0	10.1	10.9	11.9	10.7	9.6	10.1
Boron (Hot Water Soluble)	M	2120	mg/kg	0.40	0.49	1.1	< 0.40	4.6	0.92	0.82
Sulphate (2:1 Water Soluble) as SO4	M	2120	mg/l	10	950	800	120	610	470	550
Cyanide (Total)	M	2300	mg/kg	0.50	[B] < 0.50	[B] < 0.50	[B] < 0.50	[B] < 0.50	< 0.50	< 0.50
Arsenic	M	2450	mg/kg	1.0	19	25	19	35	38	38
Cadmium	M	2450	mg/kg	0.10	0.26	0.22	0.32	0.13	0.52	0.10
Chromium	M	2450	mg/kg	1.0	15	16	8.5	16	25	17
Copper	M	2450	mg/kg	0.50	33	25	35	12	270	16
Mercury	M	2450	mg/kg	0.10	0.11	< 0.10	< 0.10	< 0.10	0.13	< 0.10
Nickel	M	2450	mg/kg	0.50	20	23	16	25	30	33
Lead	M	2450	mg/kg	0.50	34	63	15	20	94	14
Selenium	M	2450	mg/kg	0.20	1.3	0.90	< 0.20	< 0.20	0.69	< 0.20
Zinc	M	2450	mg/kg	0.50	120	87	44	36	130	40
Organic Matter	M	2625	%	0.40	3.5	0.57	< 0.40	0.55	0.98	< 0.40
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	< 1.0	< 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	[B] < 1.0	[B] 4.1	[B] < 1.0	[B] < 1.0	< 1.0	4.9
Aliphatic TPH >C8-C10	M	2680	mg/kg	1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	< 1.0	< 1.0
Aliphatic TPH >C10-C12	M	2680	mg/kg	1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	< 1.0	6.4
Aliphatic TPH >C12-C16	M	2680	mg/kg	1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	< 1.0	< 1.0
Aliphatic TPH >C16-C21	M	2680	mg/kg	1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	< 1.0	< 1.0
Aliphatic TPH >C21-C35	M	2680	mg/kg	1.0	[B] < 1.0	[B] < 1.0	[B] 4.5	[B] < 1.0	1.6	< 1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	< 1.0	< 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	[B] < 5.0	[B] < 5.0	[B] < 5.0	[B] < 5.0	< 5.0	11
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	< 1.0	< 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	< 1.0	< 1.0
Aromatic TPH >C8-C10	M	2680	mg/kg	1.0	[B] < 1.0	[B] 3.1	[B] 1.8	[B] < 1.0	< 1.0	3.7
Aromatic TPH >C10-C12	M	2680	mg/kg	1.0	[B] < 1.0	[B] < 1.0	[B] 1.4	[B] < 1.0	< 1.0	< 1.0
Aromatic TPH >C12-C16	M	2680	mg/kg	1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] 64	< 1.0	< 1.0
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] 170	< 1.0	< 1.0
Aromatic TPH >C21-C35	M	2680	mg/kg	1.0	[B] < 1.0	[B] < 1.0	[B] 14	[B] 1400	5.5	< 1.0

Results - Soil

Project: S210402 BOC Hydrogen Plant

Client: Solmek Ltd		**Chemtest Job No.:**			21-17892	21-17892	21-17892	21-17892	21-17892	21-17892
Quotation No.:		**Chemtest Sample ID.:**			1209371	1209372	1209373	1209374	1209375	1209376
		Sample Location:			TP302	BH101	BH102	BH102	BH103	BH104
		Sample Type:			SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
		Top Depth (m):			0.60	4.00	2.00	4.00	1.20	4.00
		Bottom Depth (m):				4.45	2.45	4.45		
		Date Sampled:			07-May-2021	12-May-2021	11-May-2021	11-May-2021	14-May-2021	14-May-2021
		Asbestos Lab:			COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**						
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	< 1.0	< 1.0
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	[B] < 5.0	[B] < 5.0	[B] 17	[B] 1600	6.3	< 5.0
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	[B] < 10	[B] < 10	[B] 21	[B] 1600	< 10	15
Naphthalene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthylene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluorene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Anthracene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluoranthene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Pyrene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[a]anthracene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Chrysene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[b]fluoranthene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[k]fluoranthene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[a]pyrene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-c,d)Pyrene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Dibenz(a,h)Anthracene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Of 16 PAH's	M	2700	mg/kg	2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Total Phenols	M	2920	mg/kg	0.10	< 0.10	0.17	< 0.10	< 0.10	< 0.10	< 0.10

Deviations

In accordance with UKAS Policy on Deviating Samples TPS 63. Chemtest have a procedure to ensure 'upon receipt of each sample a competent laboratory shall assess whether the sample is suitable with regard to the requested test(s)'. This policy and the respective holding times applied, can be supplied upon request.The reason a sample is declared as deviating is detailed below. Where applicable the analysis remains UKAS/MCERTs accredited but the results may be compromised.

Sample:	Sample Ref:	Sample ID:	Sample Location:	Sampled Date:	Deviation Code(s):	Containers Received:
1209371			TP302	07-May-2021	B	Amber Glass 250ml
1209371			TP302	07-May-2021	B	Amber Glass 60ml
1209371			TP302	07-May-2021	B	Plastic Tub 500g
1209372			BH101	12-May-2021	B	Amber Glass 250ml
1209372			BH101	12-May-2021	B	Amber Glass 60ml
1209372			BH101	12-May-2021	B	Plastic Tub 500g
1209373			BH102	11-May-2021	B	Amber Glass 250ml
1209373			BH102	11-May-2021	B	Amber Glass 60ml
1209373			BH102	11-May-2021	B	Plastic Tub 500g
1209374			BH102	11-May-2021	B	Amber Glass 250ml
1209374			BH102	11-May-2021	B	Amber Glass 60ml
1209374			BH102	11-May-2021	B	Plastic Tub 500g

Test Methods

SOP	Title	Parameters included	Method summary
1010	pH Value of Waters	pH	pH Meter
1220	Anions, Alkalinity & Ammonium in Waters	Fluoride; Chloride; Nitrite; Nitrate; Total; Oxidisable Nitrogen (TON); Sulfate; Phosphate; Alkalinity; Ammonium	Automated colorimetric analysis using 'Aquakem 600' Discrete Analyser.
1300	Cyanides & Thiocyanate in Waters	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Continuous Flow Analysis.
1415	Cations in Waters by ICP-MS	Sodium; Potassium; Calcium; Magnesium	Direct determination by inductively coupled plasma - mass spectrometry (ICP-MS).
1455	Metals in Waters by ICP-MS	Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc	Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS).
1675	TPH Aliphatic/Aromatic split in Waters by GC-FID(cf. Texas Method 1006 / TPH CWG)	Aliphatics: >C5–C6, >C6–C8, >C8– C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44	Pentane extraction / GCxGC FID detection
1800	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Waters by GC-MS	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Pentane extraction / GCMS detection
1920	Phenols in Waters by HPLC	Phenolic compounds including: Phenol, Cresols, Xylenols, Trimethylphenols Note: Chlorophenols are excluded.	Determination by High Performance Liquid Chromatography (HPLC) using electrochemical detection.
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2680	TPH A/A Split	Aliphatics: >C5–C6, >C6–C8,>C8–C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44	Dichloromethane extraction / GCxGC FID detection

Test Methods

SOP	Title	Parameters included	Method summary
2700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Dichloromethane extraction / GC-FID (GC-FID detection is non-selective and can be subject to interference from co-eluting compounds)
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"
SOP	Standard operating procedure
LOD	Limit of detection

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.com

APPENDIX D:
Geotechnical Laboratory Results

Laboratory Report Front Sheet

Site name	Job number
BOC Hydrogen Plant	S210402

Solmek
12-16 Yarm Road,
Stockton on Tees,
TS18 3NA
01642 607083
lab@solmek.com

UKAS TESTING
7607

Client details:

Reference: S210402
Name: Solmek
Address: 12 Yarm Road,
Stockton-on-tees,
TS18 3NA

Telephone: 01642 607083
Email: lcassidy@solmek.com

FAO: L Cassidy

Date commenced: 26/05/2021

Date reported: 07/06/2021

Observations and interpretations are outside of the UKAS Accreditiation

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced in full, without the prior written approval of the laboratory.

Samples will be held at the laboratory for a period of 4 weeks after the report date. After the all samples will be disposed of. Should further testing be required then the office should be informed before the above date.

Signature:	Approved Signitories:
T Finnimore	☐ K Watkin (Lab Manager) ☑ T Finnimore (Senior Technician) ☐ J Brischuk (Senior Technician)

Summary of Classification Tests

Solmek
12-16 Yarm Road,
Stockton on Tees,
TS18 3NA
01642 607083
lab@solmek.com

UKAS TESTING
7607

Site name	Job number
BOC Hydrogen Plant	S210402

Hole	Depth		Type	*w*	Oven temp.	wa	Pa	Pr	wL	wP	IP	IL	Plasticity class	Preparation method
	Top m	Base m		%	oc	%	%	%	%	%	%			
BH101	13.50	13.95	B	25	105	25	99	1	51-s	24	27	0.037	CH	Tested after >425µm removed by hand
BH102	15.00	15.45	B	31	105	31	100	0	54-s	28	26	0.115	CH	Tested in natural condition
BH103	16.00	16.45	B	38	105	38	100	0	64-s	35	29	0.103	MH	Tested after >425µm removed by hand
BH103	18.00	18.45	B	26	105	26	99	1	47-s	27	20	-0.050	CI	Tested after >425µm removed by hand
BH104	14.00	14.45	B	31	105	31	100	0	52-s	27	25	0.160	CH	Tested after >425µm removed by hand
BH104	15.00	15.45	B	14	105	16	89	11	31-s	17	14	-0.071	CL	Tested after >425µm removed by hand

All tests found in Solmek UKAS Schedule of Accreditation are tested to standard unless otherwise indicated

Key	Description		Category	BS Test Code
w	Moisture content			BS 1377:1990 Part 2 Clause 3.2
wa	Equivalent moisture content passing 425µm sieve			BS 1377:1990 Part 2 Clause 3.2
wL	Liquid limit	Single point	-s	BS 1377:1990 Part 2 Clause 4.4
		Four point	-f	BS 1377:1990 Part 2 Clause 4.3
wP	Plastic limit			BS 1377:1990 Part 2 Clause 5.2
Pa	Percentage passing 425um sieve			
Pr	Percentage retained 425um sieve			
IP	Plasticity index			BS 1377:1990 Part 2 Clause 5.4
IL	Liquidity index			BS 1377:1990 Part 2 Clause 5.4
	Suffix indicating test is "Not UKAS Accredited"		*	

Approved by	T. Finnimore
Approval date	27/05/2021 16:09
Date report generated	
Report Number	

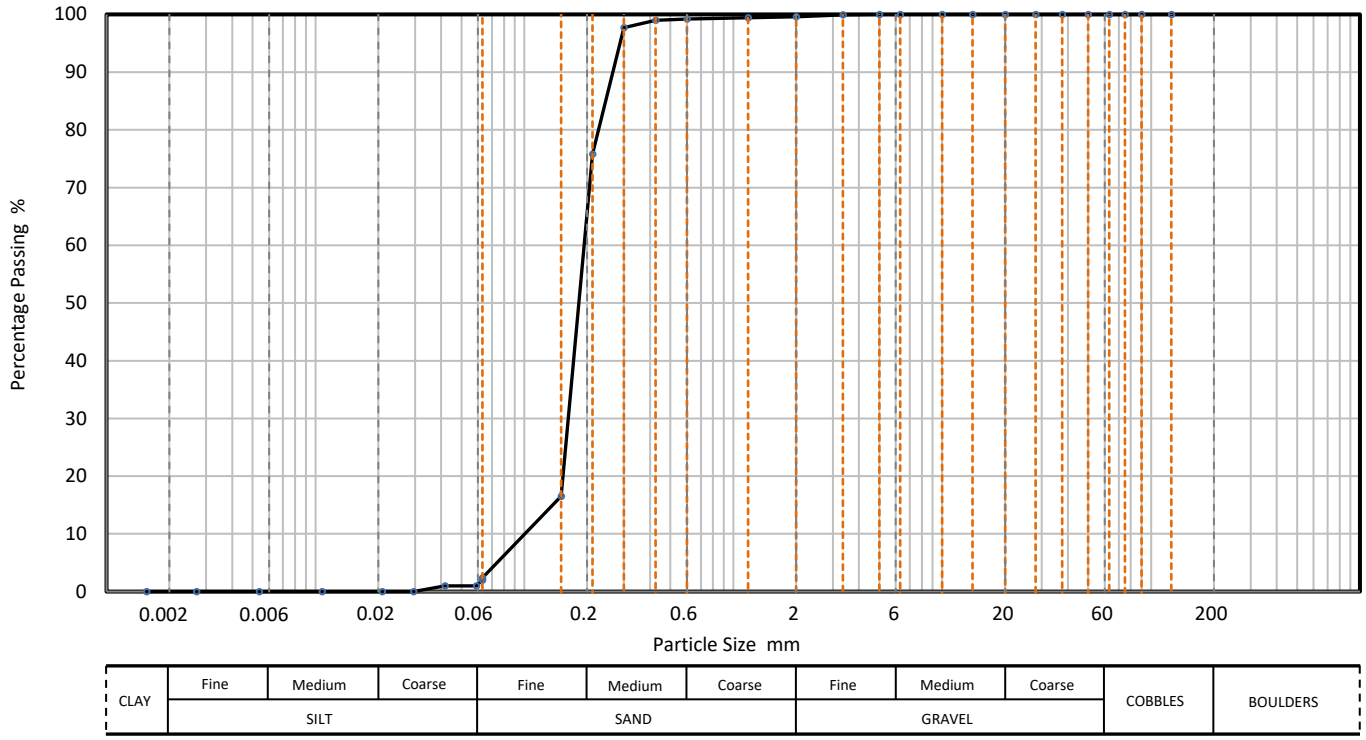
PARTICLE SIZE DISTRIBUTION

Site name	Job number
BOC Hydrogen Plant	S210402

Solmek
12-16 Yarm Road,
Stockton on Tees,
TS18 3NA
01642 607083
lab@solmek.com

UKAS TESTING 7607

Hole	BH101	Lab sample ID	SLMK202105250
Depth (Top) m	7.50	Test Method	BS 1377 - 2 : 1990 Clauses 9.2 and 9.5
Depth (Base) m	7.95	Soil Description	Brown, Slightly Silty, SAND.
Sample type	B		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0630	2
90	100	0.0588	1
75	100	0.0417	1
63	100	0.0295	0
50	100	0.0208	0
37.5	100	0.0108	0
28	100	0.0054	0
20	100	0.0027	0
14	100	0.0016	0
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	99		
0.6	99	Particle density	(assumed)
0.425	99	2.65	Mg/m3
0.3	98		
0.212	76		
0.15	17		
0.063	2		

Dry Mass of sample, g	600

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	0.4
Sand	97.2
Silt	2.4
Clay	0.0

Grading Analysis		
D100	mm	
D60	mm	0.193
D30	mm	0.162
D10	mm	0.1
Uniformity Coefficient		1.9
Curvature Coefficient		1.4

Remarks
Preparation and testing in accordance with test method unless noted below

Accreditation status
Hydrometer is the usual Sedimentation method carried out by Solmek and is part of the Solmek UKAS accreditation schedule.

Approved by	T. Finnimore
Approval date	03/06/2021 11:34

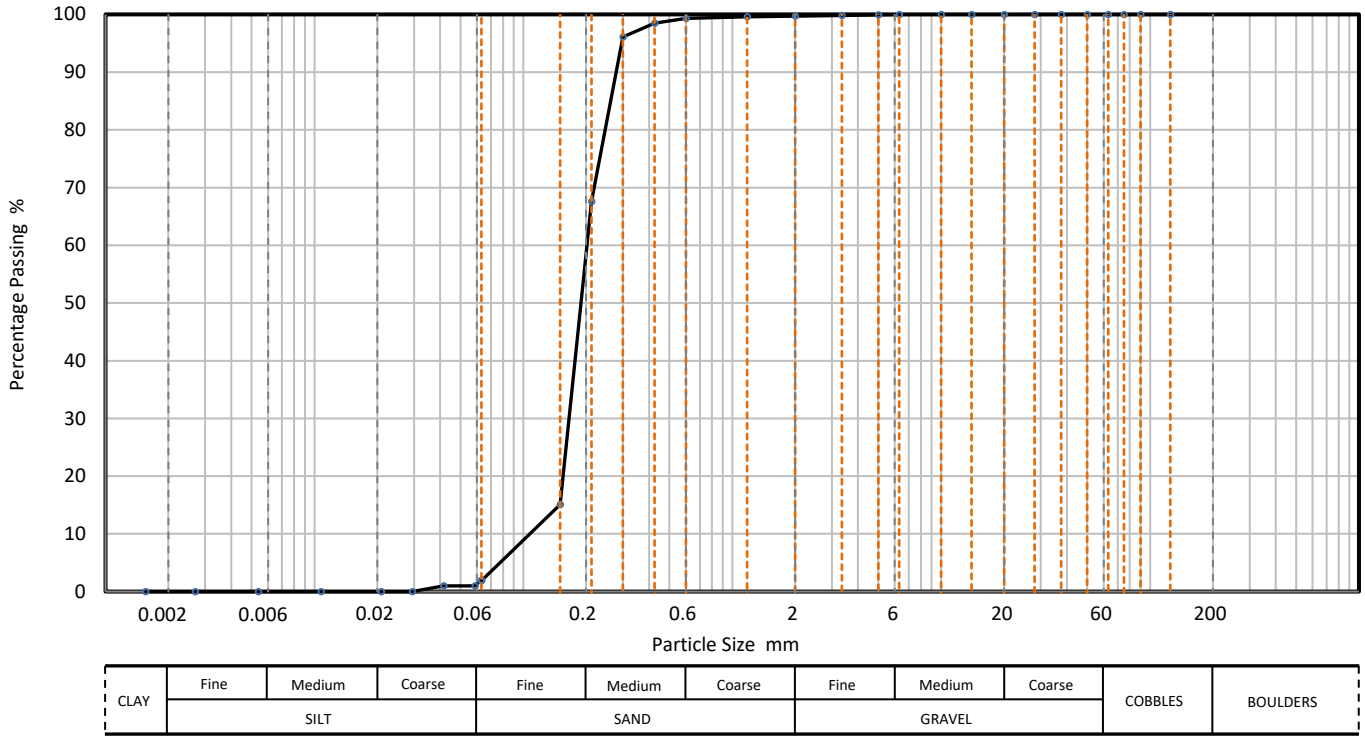
PARTICLE SIZE DISTRIBUTION

Site name	Job number
BOC Hydrogen Plant	S210402

Solmek
12-16 Yarm Road,
Stockton on Tees,
TS18 3NA
01642 607083
lab@solmek.com

UKAS TESTING 7607

Hole		BH101	Lab sample ID	SLMK202105251
Depth (Top)	m	9.00	Test Method	BS 1377 - 2 : 1990 Clauses 9.2 and 9.5
Depth (Base)	m	9.45	Soil Description	Brown, Slightly Silty, SAND.
Sample type		B		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0630	2
90	100	0.0588	1
75	100	0.0416	1
63	100	0.0294	0
50	100	0.0208	0
37.5	100	0.0108	0
28	100	0.0054	0
20	100	0.0027	0
14	100	0.0016	0
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.6	99	Particle density	(assumed)
0.425	99	2.65	Mg/m3
0.3	96		
0.212	68		
0.15	15		
0.063	2		

Dry Mass of sample, g	587

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	0.3
Sand	97.8
Silt	1.9
Clay	0.0

Grading Analysis		
D100	mm	
D60	mm	0.202
D30	mm	0.165
D10	mm	0.107
Uniformity Coefficient		1.9
Curvature Coefficient		1.3

Remarks
Preparation and testing in accordance with test method unless noted below

Accreditation status
Hydrometer is the usual Sedimentation method carried out by Solmek and is part of the Solmek UKAS accreditation schedule.

Approved by	T. Finnimore
Approval date	04/06/2021 15:33

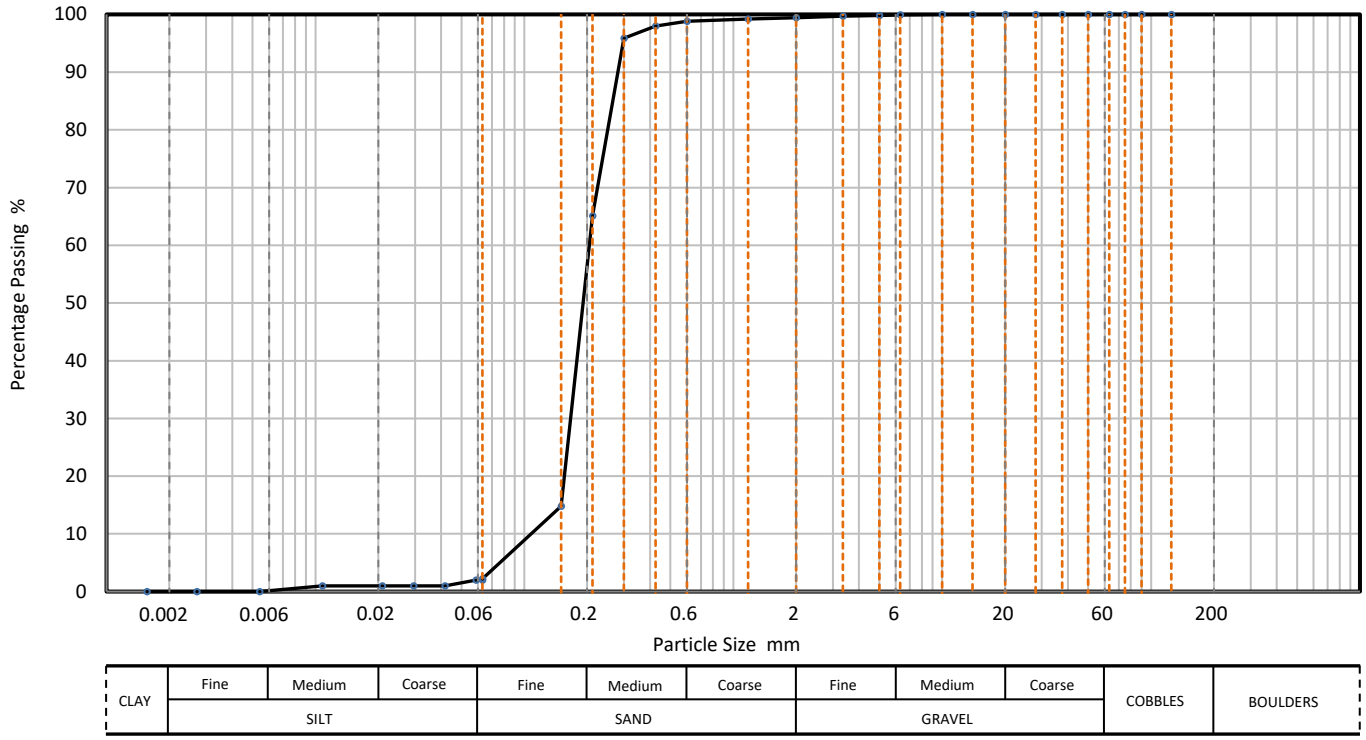
PARTICLE SIZE DISTRIBUTION

Site name	Job number
BOC Hydrogen Plant	S210402

Solmek
12-16 Yarm Road,
Stockton on Tees,
TS18 3NA
01642 607083
lab@solmek.com

UKAS TESTING 7607

Hole	BH101	Lab sample ID	SLMK202105252
Depth (Top) m	10.50	Test Method	BS 1377 - 2 : 1990 Clauses 9.2 and 9.5
Depth (Base) m	10.95	Soil Description	Brown, slightly silty, SAND
Sample type	B		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0630	2
90	100	0.0587	2
75	100	0.0417	1
63	100	0.0295	1
50	100	0.0208	1
37.5	100	0.0108	1
28	100	0.0054	0
20	100	0.0027	0
14	100	0.0016	0
10	100		
6.3	100		
5	100		
3.35	100		
2	99		
1.18	99		
0.6	99	Particle density	(assumed)
0.425	98	2.65	Mg/m3
0.3	96		
0.212	65		
0.15	15		
0.063	2		

Dry Mass of sample, g: 400

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	0.6
Sand	97.2
Silt	2.2
Clay	0.0

Grading Analysis		
D100	mm	
D60	mm	0.205
D30	mm	0.167
D10	mm	0.108
Uniformity Coefficient		1.9
Curvature Coefficient		1.3

Remarks
Preparation and testing in accordance with test method unless noted below

Accreditation status
Hydrometer is the usual Sedimentation method carried out by Solmek and is part of the Solmek UKAS accreditation schedule.

Approved by	KW
Approval date	03/06/2021 14:39

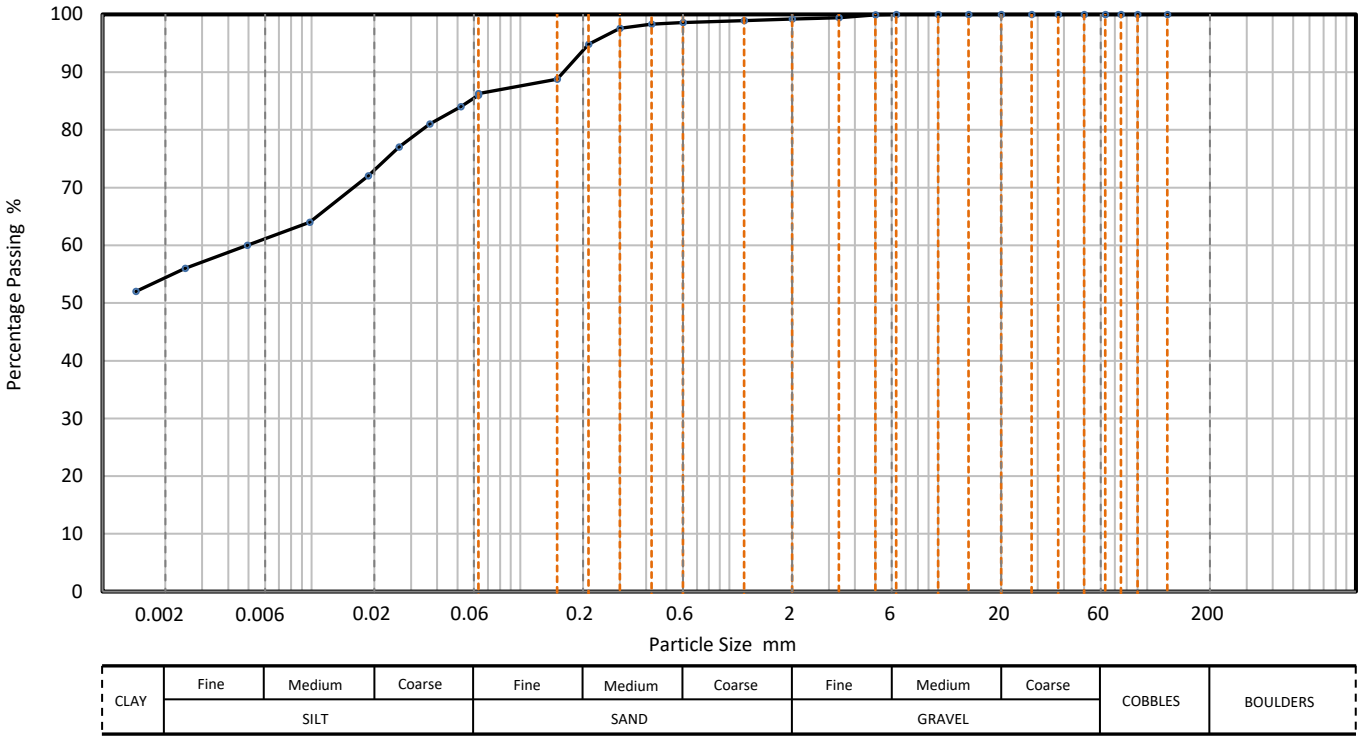
PARTICLE SIZE DISTRIBUTION

Site name	Job number
BOC Hydrogen Plant	S210402

Solmek
12-16 Yarm Road,
Stockton on Tees,
TS18 3NA
01642 607083
lab@solmek.com

UKAS TESTING 7607

Hole	BH101	Lab sample ID	SLMK202105253
Depth (Top) m	13.50	Test Method	BS 1377 - 2 : 1990 Clauses 9.2 and 9.5
Depth (Base) m	13.95	Soil Description	Brown, Slightly Sandy, Silty, CLAY.
Sample type	B		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0630	86
90	100	0.0518	84
75	100	0.0368	81
63	100	0.0262	77
50	100	0.0187	72
37.5	100	0.0098	64
28	100	0.0049	60
20	100	0.0025	56
14	100	0.0014	52
10	100		
6.3	100		
5	100		
3.35	99		
2	99		
1.18	99		
0.6	99	Particle density (assumed)	
0.425	98	2.65 Mg/m3	
0.3	98		
0.212	95		
0.15	89		
0.063	86		

Dry Mass of sample, g: 461

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	0.8
Sand	12.9
Silt	32.3
Clay	54.0

Grading Analysis		
D100	mm	
D60	mm	0.00506
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks
Preparation and testing in accordance with test method unless noted below

Accreditation status
Hydrometer is the usual Sedimentation method carried out by Solmek and is part of the Solmek UKAS accreditation schedule.

Approved by	T. Finnimore
Approval date	03/06/2021 11:25

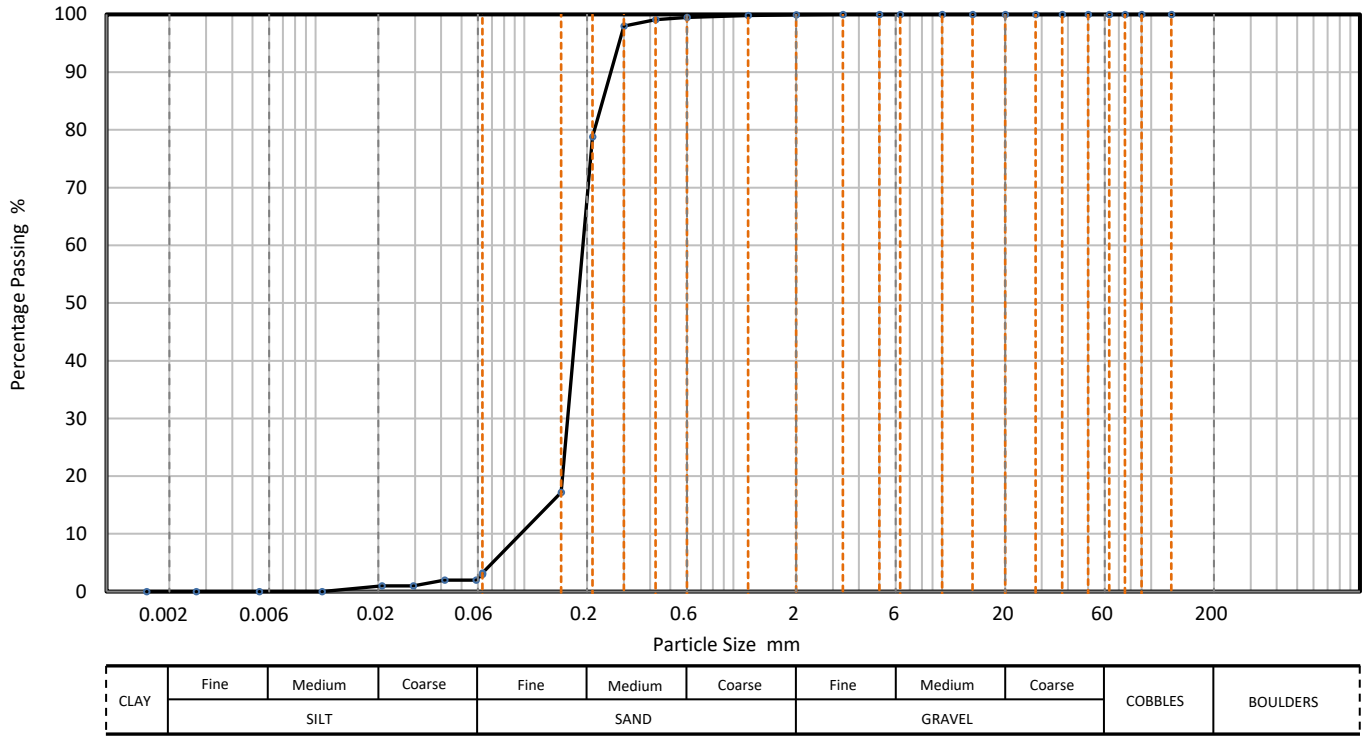
PARTICLE SIZE DISTRIBUTION

Site name	Job number
BOC Hydrogen Plant	S210402

Solmek
12-16 Yarm Road,
Stockton on Tees,
TS18 3NA
01642 607083
lab@solmek.com

UKAS TESTING 7607

Hole	BH102	Lab sample ID	SLMK202105254
Depth (Top) m	7.50	Test Method	BS 1377 - 2 : 1990 Clauses 9.2 and 9.5
Depth (Base) m	7.95	Soil Description	Brown, Slightly Silty, SAND.
Sample type	B		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0630	3
90	100	0.0587	2
75	100	0.0415	2
63	100	0.0294	1
50	100	0.0208	1
37.5	100	0.0108	0
28	100	0.0054	0
20	100	0.0027	0
14	100	0.0016	0
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.6	100	Particle density	(assumed)
0.425	99	2.65	Mg/m3
0.3	98		
0.212	79		
0.15	17		
0.063	3		

Dry Mass of sample, g	457

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	0.1
Sand	96.7
Silt	3.2
Clay	0.0

Grading Analysis		
D100	mm	
D60	mm	0.191
D30	mm	0.161
D10	mm	0.096
Uniformity Coefficient		2
Curvature Coefficient		1.4

Remarks
Preparation and testing in accordance with test method unless noted below

Accreditation status
Hydrometer is the usual Sedimentation method carried out by Solmek and is part of the Solmek UKAS accreditation schedule.

Approved by	T. Finnimore
Approval date	03/06/2021 11:35

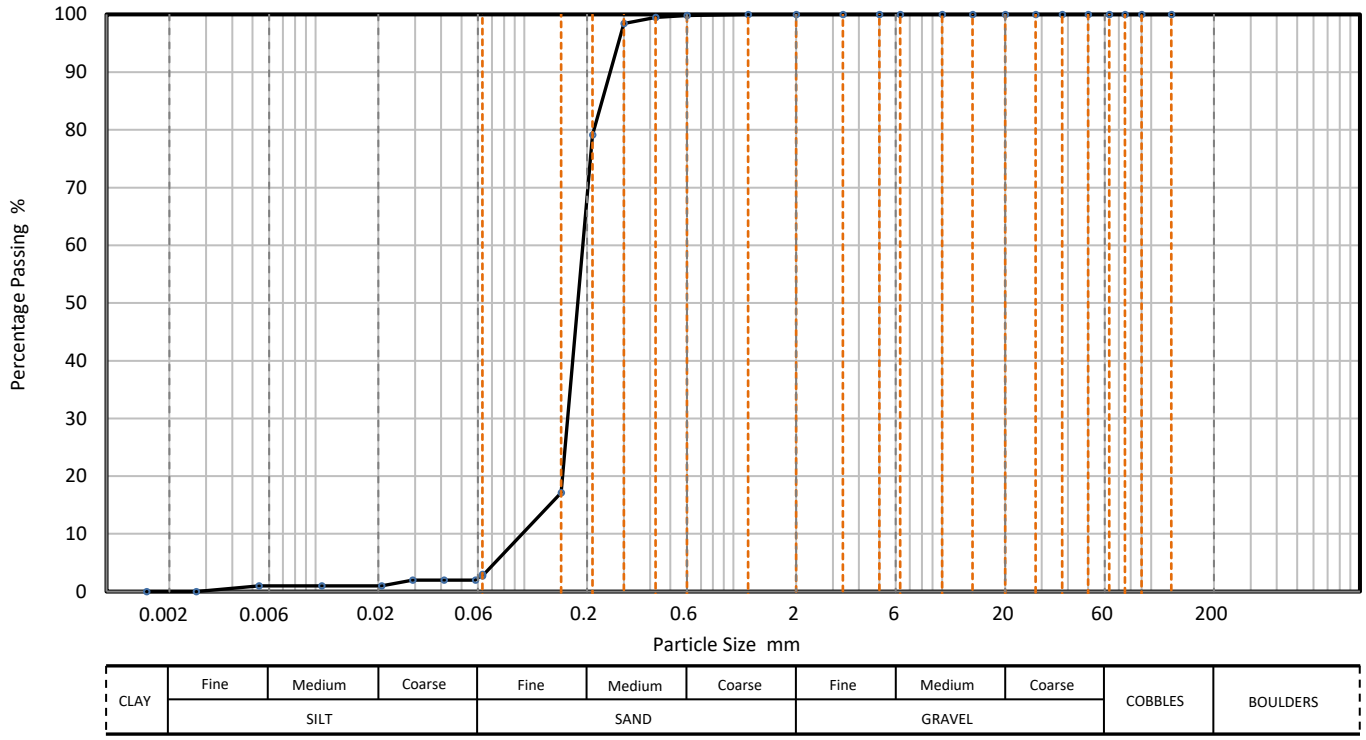
PARTICLE SIZE DISTRIBUTION

Site name	Job number
BOC Hydrogen Plant	S210402

Solmek
12-16 Yarm Road,
Stockton on Tees,
TS18 3NA
01642 607083
lab@solmek.com

UKAS TESTING 7607

Hole		BH102	Lab sample ID	SLMK202105255
Depth (Top)	m	9.00	Test Method	BS 1377 - 2 : 1990 Clauses 9.2 and 9.5
Depth (Base)	m	9.45	Soil Description	Brown, Slightly Silty, SAND.
Sample type		B		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0630	3
90	100	0.0582	2
75	100	0.0412	2
63	100	0.0292	2
50	100	0.0207	1
37.5	100	0.0107	1
28	100	0.0054	1
20	100	0.0027	0
14	100	0.0016	0
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.6	100	Particle density	(assumed)
0.425	100	2.65	Mg/m3
0.3	98		
0.212	79		
0.15	17		
0.063	3		

Dry Mass of sample, g	632

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	0.0
Sand	97.3
Silt	2.5
Clay	0.2

Grading Analysis		
D100	mm	
D60	mm	0.191
D30	mm	0.161
D10	mm	0.0979
Uniformity Coefficient		1.9
Curvature Coefficient		1.4

Remarks
Preparation and testing in accordance with test method unless noted below

Accreditation status
Hydrometer is the usual Sedimentation method carried out by Solmek and is part of the Solmek UKAS accreditation schedule.

Approved by	T. Finnimore
Approval date	03/06/2021 11:31

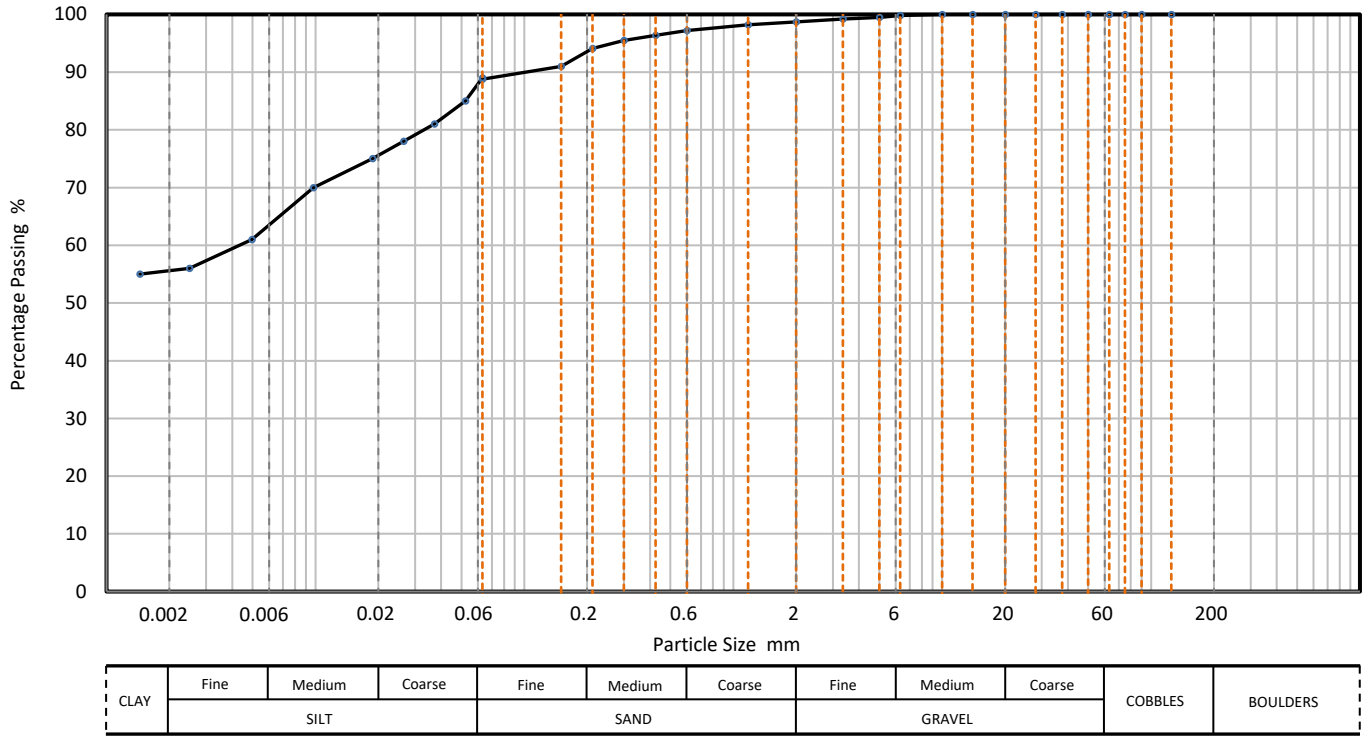
PARTICLE SIZE DISTRIBUTION

Site name	Job number
BOC Hydrogen Plant	S210402

Solmek
12-16 Yarm Road,
Stockton on Tees,
TS18 3NA
01642 607083
lab@solmek.com

UKAS TESTING
7607

Hole	BH102	Lab sample ID	SLMK202105256
Depth (Top) m	15.00	Test Method	BS 1377 - 2 : 1990 Clauses 9.2 and 9.5
Depth (Base) m	15.45	Soil Description	Brown Slightly Gravelly, Slightly Sandy, Silty, Clay.
Sample type	B		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0630	89
90	100	0.0522	85
75	100	0.0371	81
63	100	0.0264	78
50	100	0.0187	75
37.5	100	0.0098	70
28	100	0.0050	61
20	100	0.0025	56
14	100	0.0014	55
10	100		
6.3	100		
5	100		
3.35	99		
2	99		
1.18	98		
0.6	97	Particle density	(assumed)
0.425	96	2.65	Mg/m3
0.3	96		
0.212	94		
0.15	91		
0.063	89		

Dry Mass of sample, g	267

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	1.3
Sand	9.9
Silt	33.2
Clay	55.6

Grading Analysis		
D_{100}	mm	
D_{60}	mm	0.00446
D_{30}	mm	
D_{10}	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks
Preparation and testing in accordance with test method unless noted below

Accreditation status
Hydrometer is the usual Sedimentation method carried out by Solmek and is part of the Solmek UKAS accreditation schedule.

Approved by	JBrischuk
Approval date	07/06/2021 11:39

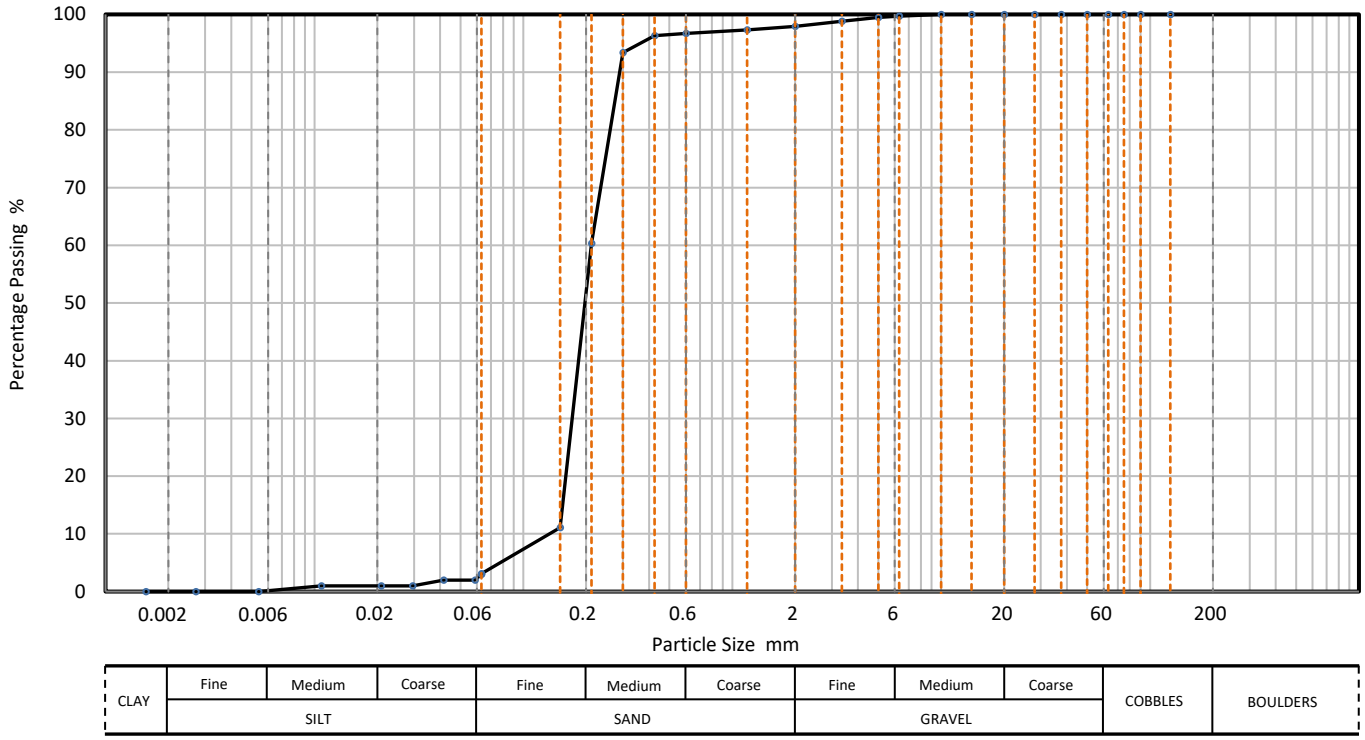
PARTICLE SIZE DISTRIBUTION

Site name	Job number
BOC Hydrogen Plant	S210402

Solmek
12-16 Yarm Road,
Stockton on Tees,
TS18 3NA
01642 607083
lab@solmek.com

UKAS TESTING 7607

Hole	BH103	Lab sample ID	SLMK202105258
Depth (Top) m	6.00	Test Method	BS 1377 - 2 : 1990 Clauses 9.2 and 9.5
Depth (Base) m	6.45	Soil Description	Brown, slightly gravelly, slightly silty SAND
Sample type	B		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0630	3
90	100	0.0587	2
75	100	0.0416	2
63	100	0.0294	1
50	100	0.0208	1
37.5	100	0.0108	1
28	100	0.0054	0
20	100	0.0027	0
14	100	0.0016	0
10	100		
6.3	100		
5	100		
3.35	99		
2	98		
1.18	97		
0.6	97	Particle density	(assumed)
0.425	96	2.65	Mg/m3
0.3	93		
0.212	60		
0.15	11		
0.063	3		

Dry Mass of sample, g: 468

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	2.1
Sand	94.8
Silt	3.1
Clay	0.0

Grading Analysis		
D100	mm	
D60	mm	0.212
D30	mm	0.171
D10	mm	0.133
Uniformity Coefficient		1.6
Curvature Coefficient		1

Remarks
Preparation and testing in accordance with test method unless noted below

Accreditation status
Hydrometer is the usual Sedimentation method carried out by Solmek and is part of the Solmek UKAS accreditation schedule.

Approved by	KW
Approval date	03/06/2021 14:36

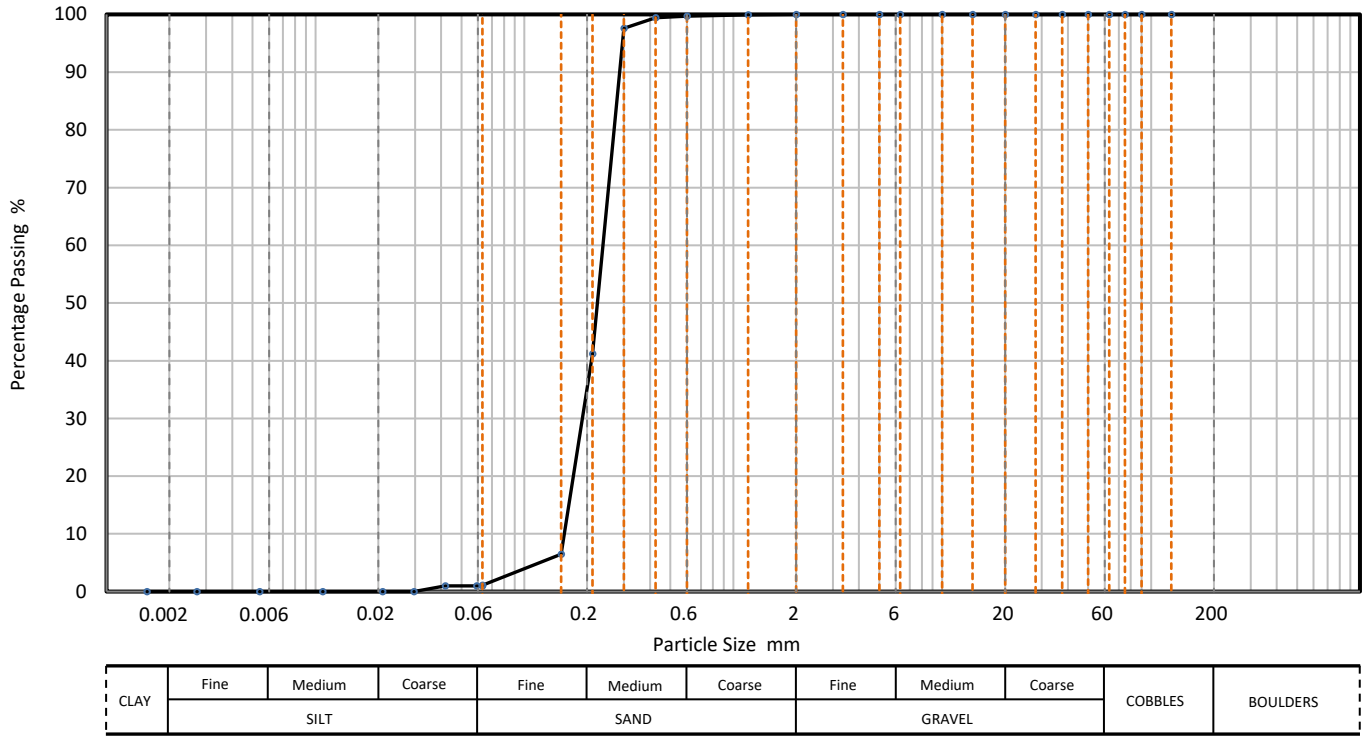
PARTICLE SIZE DISTRIBUTION

Site name	Job number
BOC Hydrogen Plant	S210402

Solmek
12-16 Yarm Road,
Stockton on Tees,
TS18 3NA
01642 607083
lab@solmek.com

UKAS TESTING 7607

Hole		BH103	Lab sample ID	SLMK202105259
Depth (Top)	m	7.00	Test Method	BS 1377 - 2 : 1990 Clauses 9.2 and 9.5
Depth (Base)	m	7.45	Soil Description	Brown, Slightly Silty, SAND.
Sample type		B		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0630	1
90	100	0.0591	1
75	100	0.0418	1
63	100	0.0296	0
50	100	0.0209	0
37.5	100	0.0108	0
28	100	0.0054	0
20	100	0.0027	0
14	100	0.0016	0
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.6	100	Particle density	(assumed)
0.425	99	2.65	Mg/m3
0.3	98		
0.212	41		
0.15	7		
0.063	1		

Dry Mass of sample, g	571

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	0.0
Sand	98.9
Silt	1.1
Clay	0.0

Grading Analysis		
D100	mm	
D60	mm	0.238
D30	mm	0.19
D10	mm	0.155
Uniformity Coefficient		1.5
Curvature Coefficient		0.97

Remarks
Preparation and testing in accordance with test method unless noted below

Accreditation status
Hydrometer is the usual Sedimentation method carried out by Solmek and is part of the Solmek UKAS accreditation schedule.

Approved by	T. Finnimore
Approval date	03/06/2021 11:32

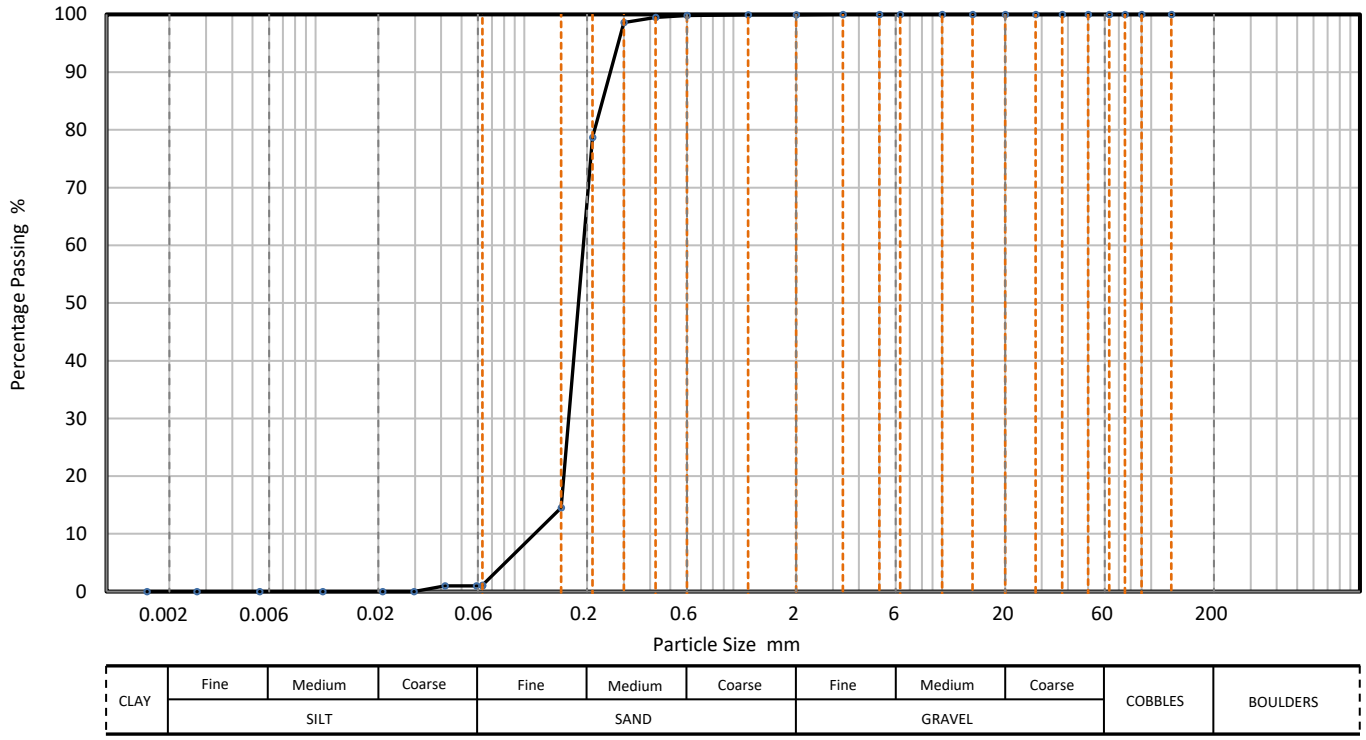
PARTICLE SIZE DISTRIBUTION

Site name	Job number
BOC Hydrogen Plant	S210402

Solmek
12-16 Yarm Road,
Stockton on Tees,
TS18 3NA
01642 607083
lab@solmek.com

UKAS TESTING 7607

Hole	BH103	Lab sample ID	SLMK2021052510
Depth (Top) m	9.00	Test Method	BS 1377 - 2 : 1990 Clauses 9.2 and 9.5
Depth (Base) m	9.45	Soil Description	Brown, Slightly Silty, SAND.
Sample type	B		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0630	1
90	100	0.0590	1
75	100	0.0417	1
63	100	0.0295	0
50	100	0.0209	0
37.5	100	0.0108	0
28	100	0.0054	0
20	100	0.0027	0
14	100	0.0016	0
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.6	100	Particle density	(assumed)
0.425	100	2.65	Mg/m3
0.3	99		
0.212	79		
0.15	15		
0.063	1		

Dry Mass of sample, g: 505

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	0.1
Sand	98.8
Silt	1.1
Clay	0.0

Grading Analysis		
D100	mm	
D60	mm	0.192
D30	mm	0.163
D10	mm	0.112
Uniformity Coefficient		1.7
Curvature Coefficient		1.2

Remarks
Preparation and testing in accordance with test method unless noted below

Accreditation status
Hydrometer is the usual Sedimentation method carried out by Solmek and is part of the Solmek UKAS accreditation schedule.

Approved by	T. Finnimore
Approval date	03/06/2021 11:26

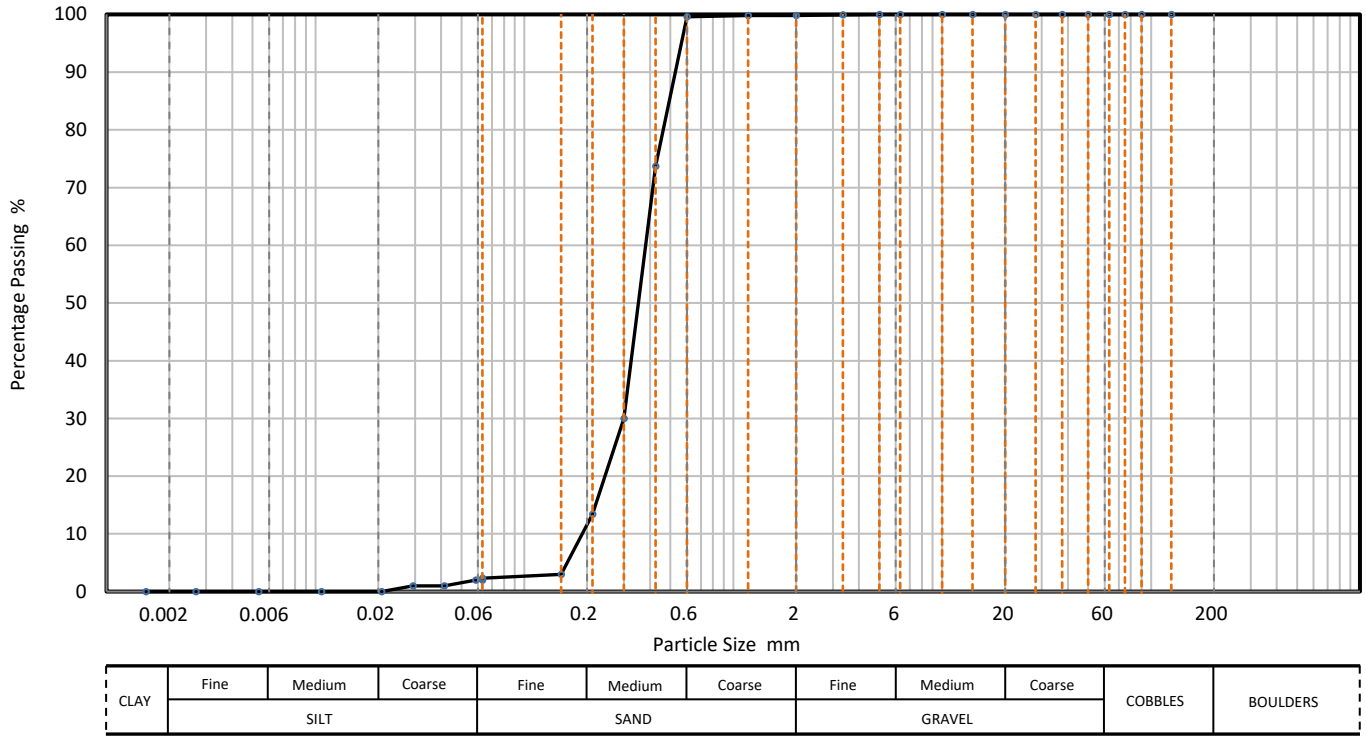
PARTICLE SIZE DISTRIBUTION

Site name	Job number
BOC Hydrogen Plant	S210402

Solmek
12-16 Yarm Road,
Stockton on Tees,
TS18 3NA
01642 607083
lab@solmek.com

UKAS TESTING 7607

Hole		BH103	Lab sample ID	SLMK2021052511
Depth (Top)	m	10.00	Test Method	BS 1377 - 2 : 1990 Clauses 9.2 and 9.5
Depth (Base)	m	10.45	Soil Description	Brown, Slightly Silty, SAND.
Sample type		B		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0630	2
90	100	0.0585	2
75	100	0.0414	1
63	100	0.0293	1
50	100	0.0207	0
37.5	100	0.0107	0
28	100	0.0053	0
20	100	0.0027	0
14	100	0.0015	0
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.6	100	Particle density	(assumed)
0.425	74	2.65	Mg/m3
0.3	30		
0.212	13		
0.15	3		
0.063	2		

Dry Mass of sample, g: 592

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	0.2
Sand	97.5
Silt	2.3
Clay	0.0

Grading Analysis		
D100	mm	
D60	mm	0.381
D30	mm	0.3
D10	mm	0.189
Uniformity Coefficient		2
Curvature Coefficient		1.2

Remarks
Preparation and testing in accordance with test method unless noted below

Accreditation status
Hydrometer is the usual Sedimentation method carried out by Solmek and is part of the Solmek UKAS accreditation schedule.

Approved by	T. Finnimore
Approval date	04/06/2021 16:16

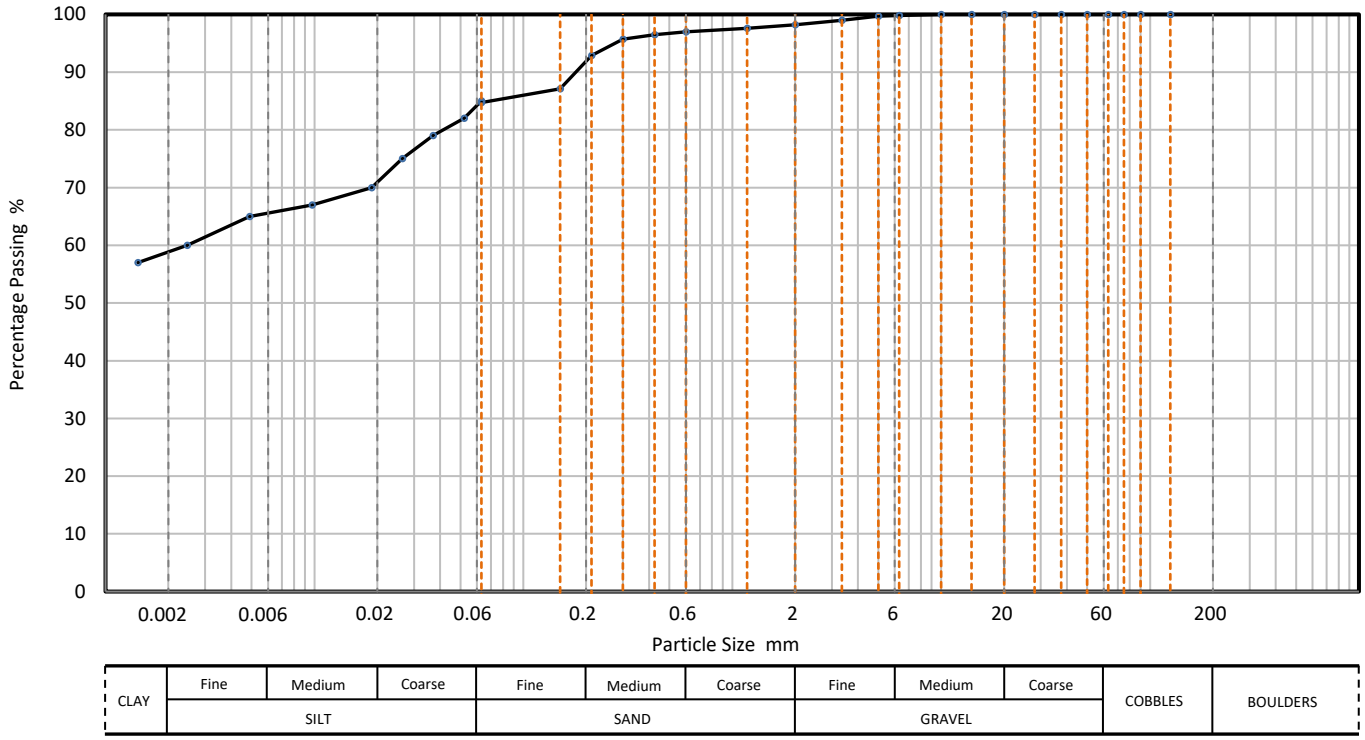
PARTICLE SIZE DISTRIBUTION

Site name	Job number
BOC Hydrogen Plant	S210402

Solmek
12-16 Yarm Road,
Stockton on Tees,
TS18 3NA
01642 607083
lab@solmek.com

UKAS TESTING 7607

Hole	BH103	Lab sample ID	SLMK2021052512
Depth (Top) m	14.00	Test Method	BS 1377 - 2 : 1990 Clauses 9.2 and 9.5
Depth (Base) m	14.45	Soil Description	Brown, Slightly Gravelly, Slightly Sandy, Silty, CLAY.
Sample type	B		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0630	85
90	100	0.0520	82
75	100	0.0369	79
63	100	0.0263	75
50	100	0.0187	70
37.5	100	0.0097	67
28	100	0.0049	65
20	100	0.0025	60
14	100	0.0014	57
10	100		
6.3	100		
5	100		
3.35	99		
2	98		
1.18	98		
0.6	97	Particle density	(assumed)
0.425	97	2.65	Mg/m3
0.3	96		
0.212	93		
0.15	87		
0.063	85		

Dry Mass of sample, g	361

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	1.8
Sand	13.5
Silt	25.8
Clay	58.9

Grading Analysis		
D100	mm	
D60	mm	0.00235
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks
Preparation and testing in accordance with test method unless noted below

Accreditation status
Hydrometer is the usual Sedimentation method carried out by Solmek and is part of the Solmek UKAS accreditation schedule.

Approved by	T. Finnimore
Approval date	03/06/2021 11:23

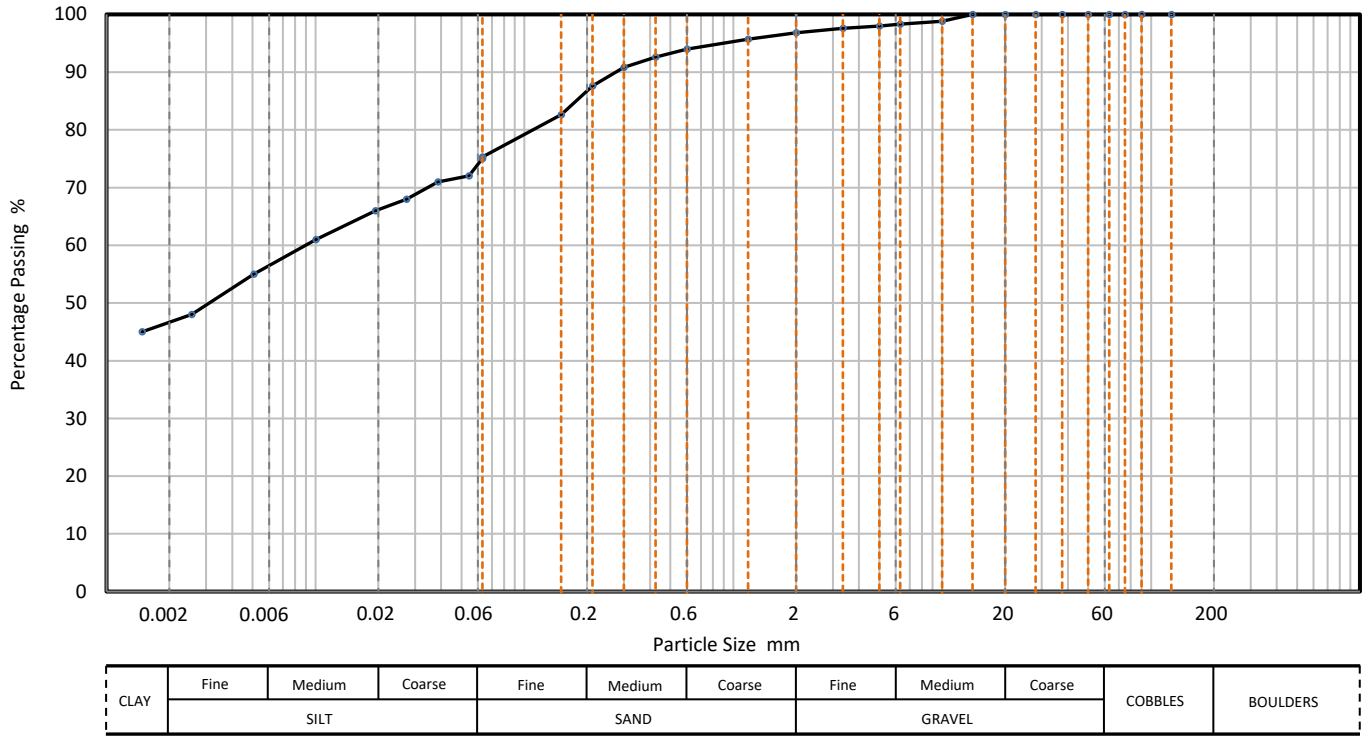
PARTICLE SIZE DISTRIBUTION

Site name	Job number
BOC Hydrogen Plant	S210402

Solmek
12-16 Yarm Road,
Stockton on Tees,
TS18 3NA
01642 607083
lab@solmek.com

UKAS TESTING 7607

Hole	BH103	Lab sample ID	SLMK2021052514
Depth (Top) m	18.00	Test Method	BS 1377 - 2 : 1990 Clauses 9.2 and 9.5
Depth (Base) m	18.45	Soil Description	Brown, Slightly Gravelly, Slightly Sandy, Silty, CLAY.
Sample type	B		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0630	75
90	100	0.0543	72
75	100	0.0385	71
63	100	0.0273	68
50	100	0.0194	66
37.5	100	0.0101	61
28	100	0.0051	55
20	100	0.0026	48
14	100	0.0015	45
10	99		
6.3	98		
5	98		
3.35	98		
2	97		
1.18	96		
0.6	94	Particle density	(assumed)
0.425	93	2.65	Mg/m3
0.3	91		
0.212	88		
0.15	83		
0.063	75		

Dry Mass of sample, g: 495

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	3.2
Sand	21.5
Silt	28.6
Clay	46.7

Grading Analysis		
D100	mm	
D60	mm	0.00889
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks
Preparation and testing in accordance with test method unless noted below

Accreditation status
Hydrometer is the usual Sedimentation method carried out by Solmek and is part of the Solmek UKAS accreditation schedule.

Approved by	T. Finnimore
Approval date	03/06/2021 11:19

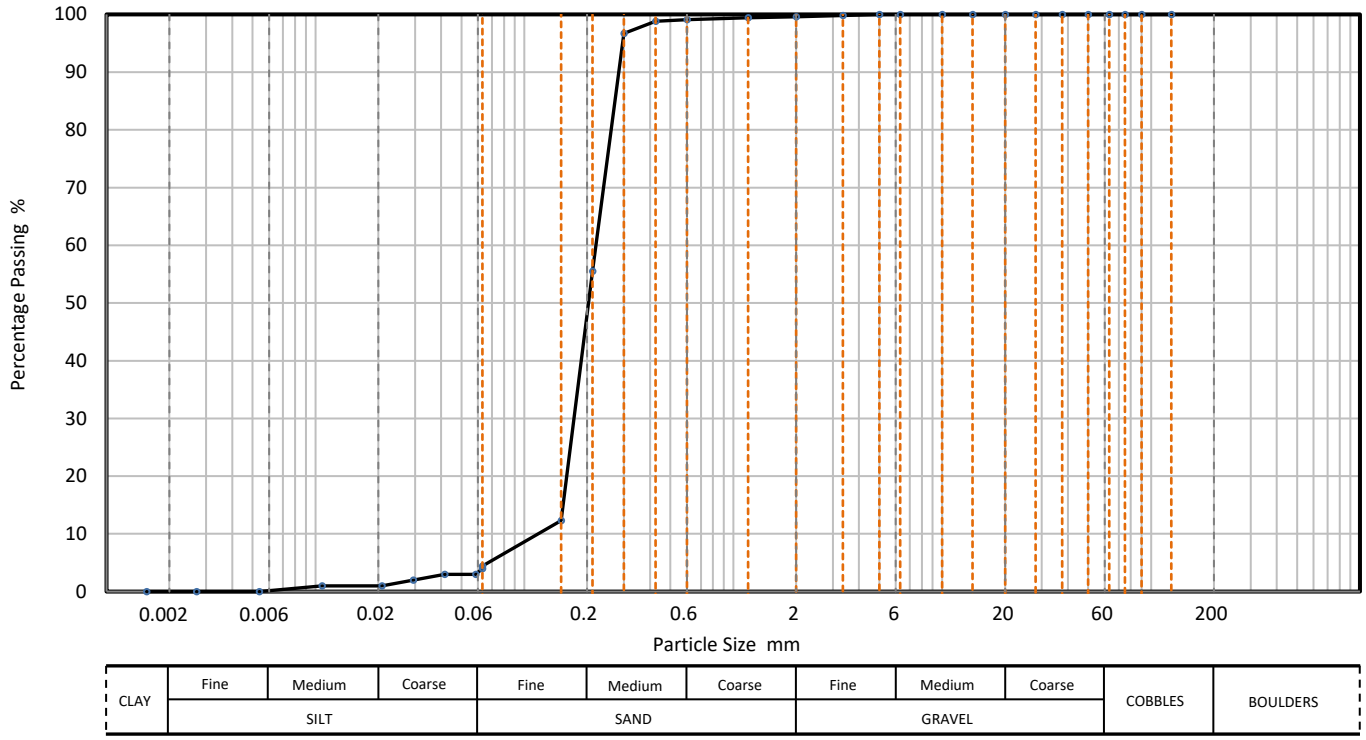
PARTICLE SIZE DISTRIBUTION

Site name	Job number
BOC Hydrogen Plant	S210402

Solmek
12-16 Yarm Road,
Stockton on Tees,
TS18 3NA
01642 607083
lab@solmek.com

UKAS TESTING 7607

Hole		BH104	Lab sample ID	SLMK2021052515
Depth (Top)	m	7.00	Test Method	BS 1377 - 2 : 1990 Clauses 9.2 and 9.5
Depth (Base)	m	7.45	Soil Description	Brown, slightly silty SAND
Sample type		B		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0630	4
90	100	0.0586	3
75	100	0.0415	3
63	100	0.0294	2
50	100	0.0208	1
37.5	100	0.0107	1
28	100	0.0054	0
20	100	0.0027	0
14	100	0.0016	0
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	99		
0.6	99	Particle density	(assumed)
0.425	99	2.65	Mg/m3
0.3	97		
0.212	56		
0.15	12		
0.063	4		

Dry Mass of sample, g	459

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	0.4
Sand	95.1
Silt	4.5
Clay	0.0

Grading Analysis		
D100	mm	
D60	mm	0.22
D30	mm	0.173
D10	mm	0.116
Uniformity Coefficient		1.9
Curvature Coefficient		1.2

Remarks
Preparation and testing in accordance with test method unless noted below

Accreditation status
Hydrometer is the usual Sedimentation method carried out by Solmek and is part of the Solmek UKAS accreditation schedule.

Approved by	KW
Approval date	03/06/2021 14:37

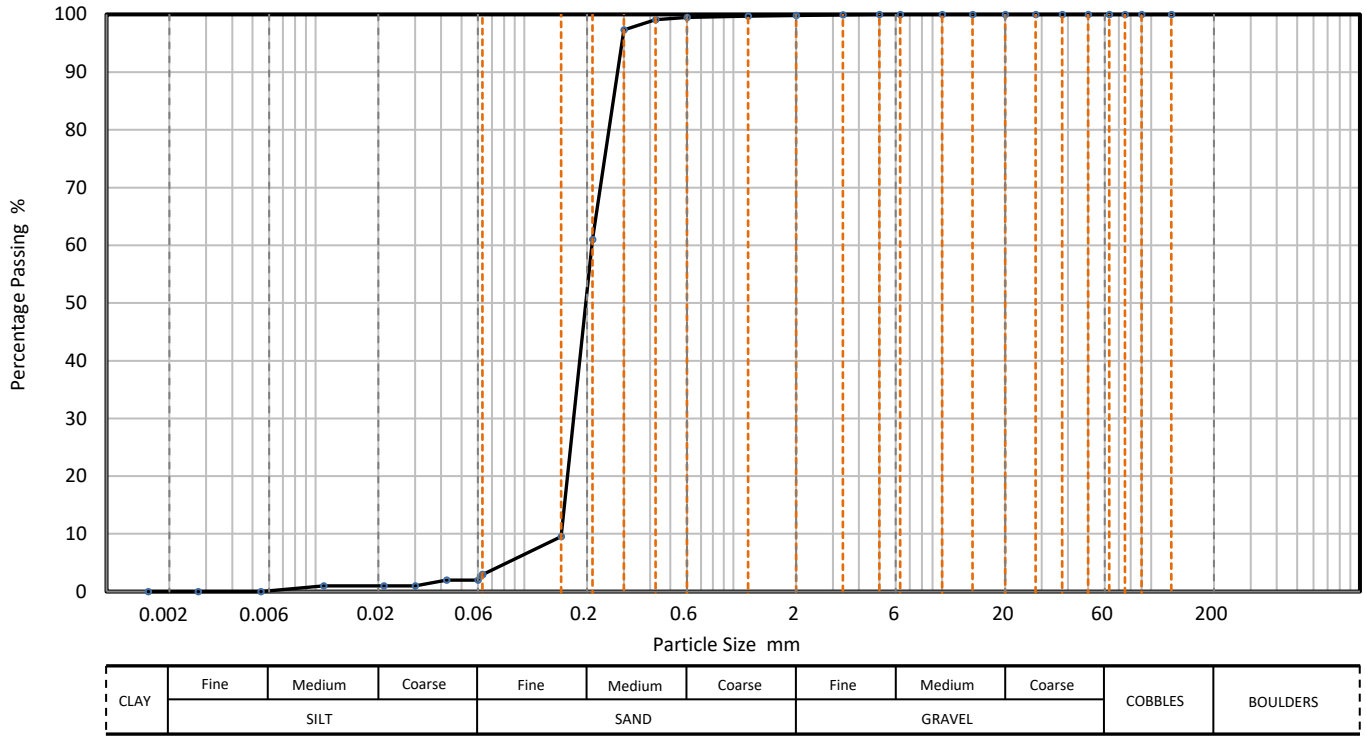
PARTICLE SIZE DISTRIBUTION

Site name	Job number
BOC Hydrogen Plant	S210402

Solmek
12-16 Yarm Road,
Stockton on Tees,
TS18 3NA
01642 607083
lab@solmek.com

UKAS TESTING 7607

Hole		BH104	Lab sample ID	SLMK2021052516
Depth (Top)	m	8.00	Test Method	BS 1377 - 2 : 1990 Clauses 9.2 and 9.5
Depth (Base)	m	8.45	Soil Description	SBrown, Slightly Clayey, Slightly Silty, SAND.
Sample type		B		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0630	3
90	100	0.0599	2
75	100	0.0424	2
63	100	0.0300	1
50	100	0.0212	1
37.5	100	0.0110	1
28	100	0.0055	0
20	100	0.0027	0
14	100	0.0016	0
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.6	100	Particle density	(assumed)
0.425	99	2.65	Mg/m3
0.3	97		
0.212	61		
0.15	10		
0.063	3		

Dry Mass of sample, g	505

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	0.2
Sand	96.9
Silt	2.9
Clay	0.0

Grading Analysis		
D100	mm	
D60	mm	0.211
D30	mm	0.172
D10	mm	0.151
Uniformity Coefficient		1.4
Curvature Coefficient		0.94

Remarks
Preparation and testing in accordance with test method unless noted below

Accreditation status
Hydrometer is the usual Sedimentation method carried out by Solmek and is part of the Solmek UKAS accreditation schedule.

Approved by	T. Finnimore
Approval date	03/06/2021 11:13

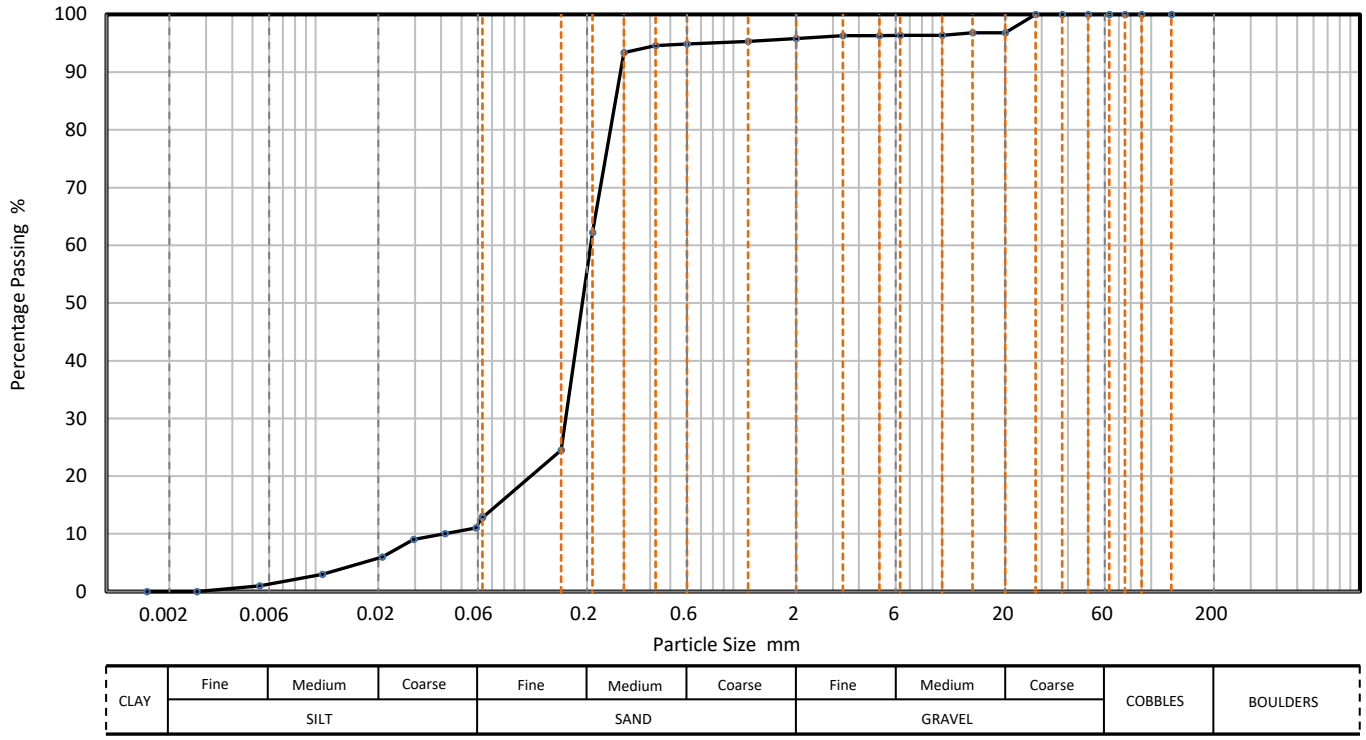
PARTICLE SIZE DISTRIBUTION

Site name	Job number
BOC Hydrogen Plant	S210402

Solmek
12-16 Yarm Road,
Stockton on Tees,
TS18 3NA
01642 607083
lab@solmek.com

UKAS TESTING 7607

Hole	BH104	Lab sample ID	SLMK2021052517
Depth (Top) m	10.00	Test Method	BS 1377 - 2 : 1990 Clauses 9.2 and 9.5
Depth (Base) m	10.45	Soil Description	Brown, slightly gravelly, slightly silty, SAND
Sample type	B		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0630	13
90	100	0.0588	11
75	100	0.0416	10
63	100	0.0294	9
50	100	0.0209	6
37.5	100	0.0108	3
28	100	0.0054	1
20	97	0.0027	0
14	97	0.0016	0
10	96		
6.3	96		
5	96		
3.35	96		
2	96		
1.18	95		
0.6	95	Particle density	(assumed)
0.425	95	2.65	Mg/m3
0.3	93		
0.212	62		
0.15	25		
0.063	13		

Dry Mass of sample, g	581

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	4.2
Sand	83.1
Silt	12.7
Clay	0.0

Grading Analysis		
D100	mm	
D60	mm	0.208
D30	mm	0.158
D10	mm	0.0421
Uniformity Coefficient		4.9
Curvature Coefficient		2.8

Remarks
Preparation and testing in accordance with test method unless noted below

Accreditation status
Hydrometer is the usual Sedimentation method carried out by Solmek and is part of the Solmek UKAS accreditation schedule.

Approved by	KW
Approval date	03/06/2021 14:34

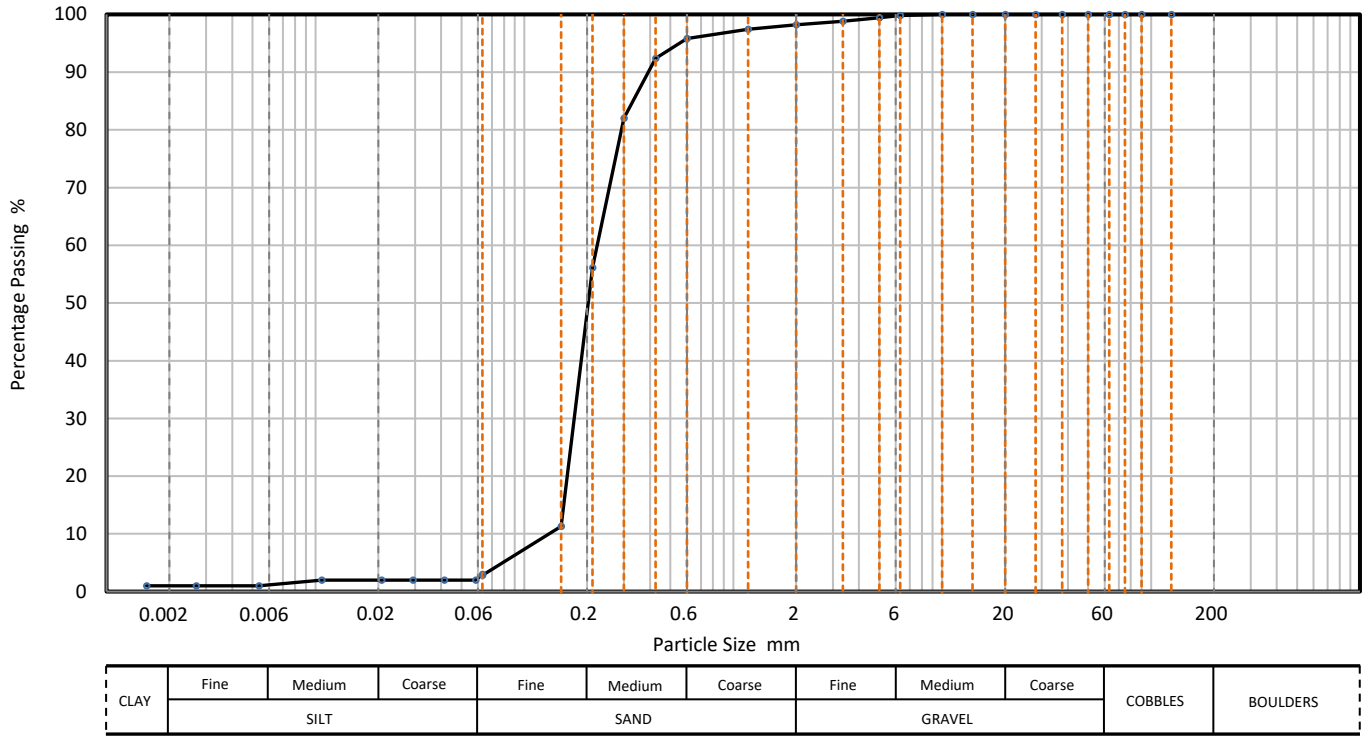
PARTICLE SIZE DISTRIBUTION

Site name	Job number
BOC Hydrogen Plant	S210402

Solmek
12-16 Yarm Road,
Stockton on Tees,
TS18 3NA
01642 607083
lab@solmek.com

UKAS TESTING 7607

Hole		BH104	Lab sample ID	SLMK2021052518
Depth (Top)	m	12.00	Test Method	BS 1377 - 2 : 1990 Clauses 9.2 and 9.5
Depth (Base)	m	12.45	Soil Description	Brown, Slightly Gravelly, Slightly Silty, SAND.
Sample type		B		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0630	3
90	100	0.0584	2
75	100	0.0414	2
63	100	0.0293	2
50	100	0.0207	2
37.5	100	0.0107	2
28	100	0.0054	1
20	100	0.0027	1
14	100	0.0016	1
10	100		
6.3	100		
5	99		
3.35	99		
2	98		
1.18	97		
0.6	96	Particle density	(assumed)
0.425	92	2.65	Mg/m3
0.3	82		
0.212	56		
0.15	11		
0.063	3		

Dry Mass of sample, g	424

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	1.8
Sand	95.4
Silt	2.0
Clay	0.8

Grading Analysis		
D100	mm	
D60	mm	0.223
D30	mm	0.173
D10	mm	0.131
Uniformity Coefficient		1.7
Curvature Coefficient		1

Remarks
Preparation and testing in accordance with test method unless noted below

Accreditation status
Hydrometer is the usual Sedimentation method carried out by Solmek and is part of the Solmek UKAS accreditation schedule.

Approved by	T. Finnimore
Approval date	03/06/2021 11:37

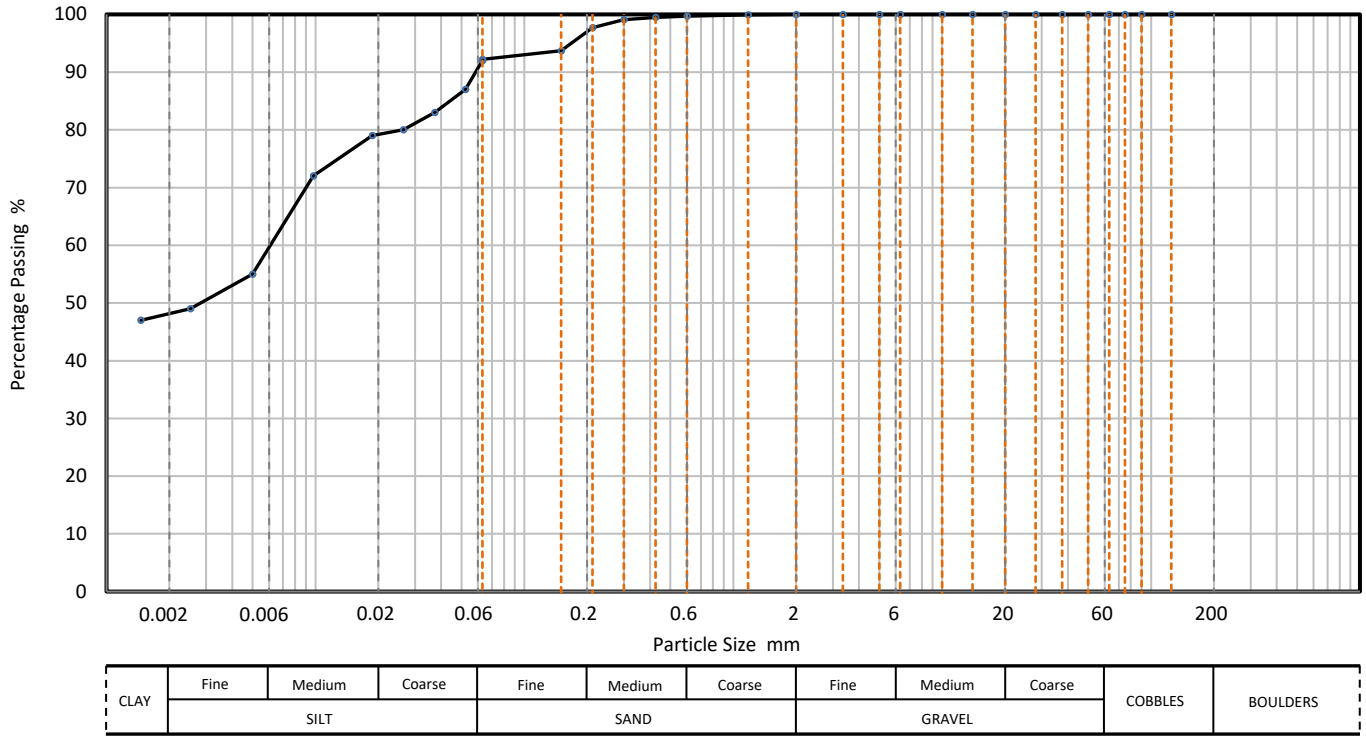
PARTICLE SIZE DISTRIBUTION

Site name	Job number
BOC Hydrogen Plant	S210402

Solmek
12-16 Yarm Road,
Stockton on Tees,
TS18 3NA
01642 607083
lab@solmek.com

UKAS TESTING
7607

Hole	BH104	Lab sample ID	SLMK2021052519
Depth (Top) m	14.00	Test Method	BS 1377 - 2 : 1990 Clauses 9.2 and 9.5
Depth (Base) m	14.45	Soil Description	Brown, Slightly Sandy, Silty, CLAY.
Sample type	B		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0630	92
90	100	0.0522	87
75	100	0.0372	83
63	100	0.0264	80
50	100	0.0187	79
37.5	100	0.0098	72
28	100	0.0050	55
20	100	0.0025	49
14	100	0.0015	47
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.6	100	Particle density	(assumed)
0.425	100	2.65	Mg/m3
0.3	99		
0.212	98		
0.15	94		
0.063	92		

Dry Mass of sample, g	405

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	0.0
Sand	7.7
Silt	44.1
Clay	48.2

Grading Analysis		
D_{100}	mm	
D_{60}	mm	0.00608
D_{30}	mm	
D_{10}	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks
Preparation and testing in accordance with test method unless noted below

Accreditation status
Hydrometer is the usual Sedimentation method carried out by Solmek and is part of the Solmek UKAS accreditation schedule.

Approved by	JBrischuk
Approval date	07/06/2021 11:39

LABORATORY REPORT

4043

Contract Number: PSL21/4340

Report Date: 17 June 2021

Client's Reference: S210402

Client Name: Solmek
12 Yarm Road
Stockton-on-Tees
TS18 3NA

For the attention of: Leo Cassidy

Contract Title: BOC North Tees

Date Received: 27/5/2021
Date Commenced: 27/5/2021
Date Completed: 17/6/2021

Notes: Opinions and Interpretations are outside the UKAS Accreditation

Checked and Approved Signatories:

A Watkins (Director)	R Berriman (Quality Manager)	S Royle (Laboratory Manager)
L Knight (Assistant Laboratory Manager)	S Eyre (Senior Technician)	T Watkins (Senior Technician)

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DETERMINATION OF UNCONFINED COMPRESSIVE STRENGTH

ISRM Suggested Methods, pp 111 –116, 1981.

Hole Number	Sample Number	Sample Type	Top Depth (m)	Base Depth (m)	Sample Diameter (mm)	Sample Length (mm)	Height Ratio	Initial Mass (g)	Bulk Density (Mg/m)	Moisture Content (%)	Dry Density (Mg/m)	Load Failure (kN)	UCS (MPa)	Failure Mode	Date Tested	Remarks
BH01		C	15.10	15.40	73	146	2.0	1394	2.28	6.5	2.14	13.1	3.1	Brittle	16/06/21	
BH01		C	19.20	19.50	72	122	1.7	1180	2.38	10.7	2.15	10.7	2.6	Brittle	16/06/21	
BH01		C	19.60	20.00	73	145	2.0	1384	2.28	6.4	2.14	6.4	1.5	Brittle	16/06/21	
BH01		C	23.10	23.50	73	146	2.0	1422	2.33	7.0	2.17	7.0	1.7	Brittle	16/06/21	
BH02		C	20.50	20.90	73	146	2.0	1406	2.30	6.9	2.15	16.1	3.8	Brittle	16/06/21	
BH02		C	21.80	22.10	73	135	1.8	1392	2.46	7.4	2.29	13.7	3.3	Brittle	16/06/21	
BH02		C	24.00	24.30	73	147	2.0	1469	2.39	5.6	2.26	22.1	5.3	Brittle	16/06/21	
BH02		C	24.80	25.10	73	146	2.0	1421	2.33	9.1	2.13	19.8	4.7	Brittle	16/06/21	
BH03		C	20.60	20.90	73	147	2.0	1400	2.28	12.3	2.03	14.7	3.5	Brittle	16/06/21	
BH03		C	22.20	22.40	73	143	2.0	1401	2.34	6.7	2.19	28.9	6.9	Brittle	16/06/21	
BH03		C	23.50	23.80	73	126	1.7	1262	2.39	5.7	2.26	10.3	2.5	Brittle	16/06/21	
BH03		C	24.80	25.10	73	138	1.9	1312	2.27	8.2	2.10	12.5	3.0	Brittle	16/06/21	
BH04		C	19.10	19.30	73	146	2.0	1464	2.40	7.9	2.22	27.4	6.5	Brittle	16/06/21	

PSL Professional Soils Laboratory

BOC North Tees

Contract No:
PSL21/4340
Client Ref:
S210402

SUMMARY OF POINT LOAD TEST RESULTS

ISRM Suggested Methods : 2007

Borehole Number	Depth (m)	Sample Ref	Test Type	Orientation	Dimensions (mm)		Area	D_e^2	D_e	Failure Load (P)		I_s	Corr Fac	I_{s50}	Failure Type	Remarks
				Par / Perp	W	D	(mm2)		(mm)	(Mpa)	(kN)	(MPa)	F	(MPa)		
BH01	15.00		A	Perp	73	40	2920	3717.86	60.97	-	0.77	0.21	1.093	0.23	Valid	
BH01	15.40		A	Perp	73	42	3066	3903.75	62.48	-	1.08	0.28	1.105	0.31	Valid	
BH01	17.00		A	Perp	73	31	2263	2881.34	53.68	-	0.92	0.32	1.032	0.33	Valid	
BH01	19.80		A	Perp	73	47	3431	4368.48	66.09	-	0.38	0.09	1.134	0.10	Valid	
BH01	21.00		A	Perp	73	35	2555	3253.13	57.04	-	0.61	0.19	1.061	0.20	Valid	
BH01	21.30		A	Perp	73	41	2993	3810.81	61.73	-	8.15	2.14	1.099	2.35	Valid	
BH01	22.50		A	Perp	72	39	2808	3575.26	59.79	-	0.89	0.25	1.084	0.27	Valid	
BH01	23.50		A	Perp	71	33	2343	2983.20	54.62	-	0.41	0.14	1.041	0.14	Valid	
BH01	24.00		A	Perp	70	27	1890	2406.42	49.06	-	0.91	0.38	0.991	0.37	Valid	
BH02	20.10		A	Perp	73	34	2482	3160.18	56.22	-	0.24	0.08	1.054	0.08	Valid	
BH02	20.30		A	Perp	73	33	2409	3067.23	55.38	-	5.16	1.68	1.047	1.76	Valid	
BH02	21.50		A	Perp	70	33	2310	2941.18	54.23	-	0.55	0.19	1.037	0.19	Valid	
BH02	22.50		A	Perp	72	44	3168	4033.62	63.51	-	0.50	0.12	1.114	0.14	Valid	
BH02	22.70		A	Perp	73	40	2920	3717.86	60.97	-	0.71	0.19	1.093	0.21	Valid	
BH02	23.20		A	Perp	70	33	2310	2941.18	54.23	-	0.88	0.30	1.037	0.31	Valid	
BH02	23.90		A	Perp	73	37	2701	3439.02	58.64	-	0.73	0.21	1.074	0.23	Valid	
BH02	24.50		A	Perp	73	41	2993	3810.81	61.73	-	0.32	0.08	1.099	0.09	Valid	
BH02	25.40		A	Perp	73	36	2628	3346.07	57.85	-	0.42	0.13	1.068	0.13	Valid	

Note All testing carried out on samples at as received water content

Par = parallel, Perp = perpendicular, U = Random

A = Axial, D = Diametral, I = Irregular

UKAS TESTING 4043

PSL Professional Soils Laboratory

BOC North Tees

Contract No:

PSL21/4340

Client Ref:

S210402

SUMMARY OF POINT LOAD TEST RESULTS

ISRM Suggested Methods : 2007

Borehole Number	Depth (m)	Sample Ref	Test Type	Orientation	Dimensions (mm)		D_e^2	D_e	Failure Load		I_s	Corr Fac	I_{s50}	Failure Type	Remarks
				Par / Perp	L	D		(mm)	(Mpa)	(kN)	(MPa)	F	(MPa)		
BH01	15.00		D	Par	-	73	5329	73.00	-	0.30	0.056	1.186	0.07	Valid	
BH01	15.40		D	Par	-	73	5329	73.00	-	0.63	0.118	1.186	0.14	Valid	
BH01	17.00		D	Par	-	73	5329	73.00	-	0.18	0.034	1.186	0.04	Valid	
BH01	19.80		D	Par	-	73	5329	73.00	-	0.15	0.028	1.186	0.03	Valid	
BH01	21.00		D	Par	-	73	5329	73.00	-	0.77	0.144	1.186	0.17	Valid	
BH01	21.30		D	Par	-	73	5329	73.00	-	2.20	0.413	1.186	0.49	Valid	
BH01	22.50		D	Par	-	72	5184	72.00	-	0.78	0.150	1.178	0.18	Valid	
BH01	23.50		D	Par	-	71	5041	71.00	-	0.27	0.054	1.171	0.06	Valid	
BH01	24.00		D	Par	-	70	4900	70.00	-	0.13	0.027	1.163	0.03	Valid	
BH02	20.10		D	Par	-	73	5329	73.00	-	0.51	0.096	1.186	0.11	Valid	
BH02	20.30		D	Par	-	73	5329	73.00	-	0.84	0.158	1.186	0.19	Valid	
BH02	21.50		D	Par	-	70	4900	70.00	-	0.21	0.043	1.163	0.05	Valid	
BH02	22.50		D	Par	-	72	5184	72.00	-	0.13	0.025	1.178	0.03	Valid	
BH02	22.70		D	Par	-	73	5329	73.00	-	0.55	0.103	1.186	0.12	Valid	
BH02	23.20		D	Par	-	70	4900	70.00	-	0.68	0.139	1.163	0.16	Valid	
BH02	23.90		D	Par	-	73	5329	73.00	-	0.22	0.041	1.186	0.05	Valid	
BH02	24.50		D	Par	-	73	5329	73.00	-	0.56	0.105	1.186	0.12	Valid	
BH02	25.40		D	Par	-	73	5329	73.00	-	0.18	0.034	1.186	0.04	Valid	

Note All testing carried out on samples at as received water content

Par = parallel, Perp = perpendicular, U = Random

UKAS TESTING 4043

PSL Professional Soils Laboratory

BOC North Tees

Contract No:

PSL21/4340

Client Ref:

S210402

SUMMARY OF POINT LOAD TEST RESULTS

ISRM Suggested Methods : 2007

Borehole Number	Depth (m)	Sample Ref	Test Type	Orientation	Dimensions (mm)		Area	D_e^2	D_e	Failure Load (P)		I_s	Corr Fac	I_{s50}	Failure Type	Remarks
				Par / Perp	W	D	(mm2)		(mm)	(Mpa)	(kN)	(MPa)	F	(MPa)		
BH03	21.20		A	Perp	72	35	2520	3208.56	56.64	-	1.32	0.41	1.058	0.44	Valid	
BH03	21.30		A	Perp	73	36	2628	3346.07	57.85	-	0.66	0.20	1.068	0.21	Valid	
BH03	21.50		A	Perp	73	41	2993	3810.81	61.73	-	0.27	0.07	1.099	0.08	Valid	
BH03	22.00		A	Perp	73	36	2628	3346.07	57.85	-	0.95	0.28	1.068	0.30	Valid	
BH03	22.40		A	Perp	73	34	2482	3160.18	56.22	-	0.93	0.29	1.054	0.31	Valid	
BH03	22.50		A	Perp	73	33	2409	3067.23	55.38	-	0.41	0.13	1.047	0.14	Valid	
BH03	22.90		A	Perp	73	31	2263	2881.34	53.68	-	0.28	0.10	1.032	0.10	Valid	
BH03	23.20		A	Perp	73	40	2920	3717.86	60.97	-	5.36	1.44	1.093	1.58	Valid	
BH03	25.40		A	Perp	73	45	3285	4182.59	64.67	-	0.85	0.20	1.123	0.23	Valid	
BH04	19.30		A	Perp	72	36	2592	3300.24	57.45	-	0.34	0.10	1.064	0.11	Valid	
BH04	19.90		A	Perp	73	25	1825	2323.66	48.20	-	0.09	0.04	0.984	0.04	Valid	

Note All testing carried out on samples at as received water content

Par = parallel, Perp = perpendicular, U = Random

A = Axial, D = Diametral, I = Irregular

UKAS TESTING 4043

PSL Professional Soils Laboratory

BOC North Tees

Contract No:

PSL21/4340

Client Ref:

S210402

SUMMARY OF POINT LOAD TEST RESULTS

ISRM Suggested Methods : 2007

Borehole Number	Depth (m)	Sample Ref	Test Type	Orientation	Dimensions (mm)		D_e^2	D_e	Failure Load		I_s	Corr Fac	I_{s50}	Failure Type	Remarks
				Par / Perp	L	D		(mm)	(Mpa)	(kN)	(MPa)	F	(MPa)		
BH03	21.20		D	Par	-	72	5184	72.00	-	0.46	0.089	1.178	0.10	Valid	
BH03	21.30		D	Par	-	73	5329	73.00	-	0.21	0.039	1.186	0.05	Valid	
BH03	21.50		D	Par	-	73	5329	73.00	-	0.10	0.019	1.186	0.02	Valid	
BH03	22.00		D	Par	-	73	5329	73.00	-	0.26	0.049	1.186	0.06	Valid	
BH03	22.40		D	Par	-	73	5329	73.00	-	1.33	0.250	1.186	0.30	Valid	
BH03	22.50		D	Par	-	73	5329	73.00	-	0.56	0.105	1.186	0.12	Valid	
BH03	22.90		D	Par	-	73	5329	73.00	-	1.52	0.285	1.186	0.34	Valid	
BH03	23.20		D	Par	-	73	5329	73.00	-	1.79	0.336	1.186	0.40	Valid	
BH03	25.40		D	Par	-	73	5329	73.00	-	0.47	0.088	1.186	0.10	Valid	
BH04	19.30		D	Par	-	72	5184	72.00	-	0.12	0.023	1.178	0.03	Valid	
BH04	19.90		D	Par	-	73	5329	73.00	-	0.13	0.024	1.186	0.03	Valid	

Note All testing carried out on samples at as received water content

Par = parallel, Perp = perpendicular, U = Random

UKAS TESTING 4043

Professional Soils Laboratory

BOC North Tees

Contract No:

PSL21/4340

Client Ref:

S210402

LABORATORY REPORT

4043

Contract Number: PSL21/4278

Report Date: 18 June 2021

Client's Reference: S210402

Client Name: Solmek
12 Yarm Road
Stockton-on-Tees
TS18 3NA

For the attention of: Leo Cassidy

Contract Title: BOC Hydrogen Plant

Date Received: 26/5/2021
Date Commenced: 26/5/2021
Date Completed: 18/6/2021

Notes: Opinions and Interpretations are outside the UKAS Accreditation

Checked and Approved Signatories:

A Watkins (Director)
R Berriman (Quality Manager)
S Royle (Laboratory Manager)
L Knight (Assistant Laboratory Manager)
S Eyre (Senior Technician)
T Watkins (Senior Technician)

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SUMMARY OF LABORATORY SOIL DESCRIPTIONS

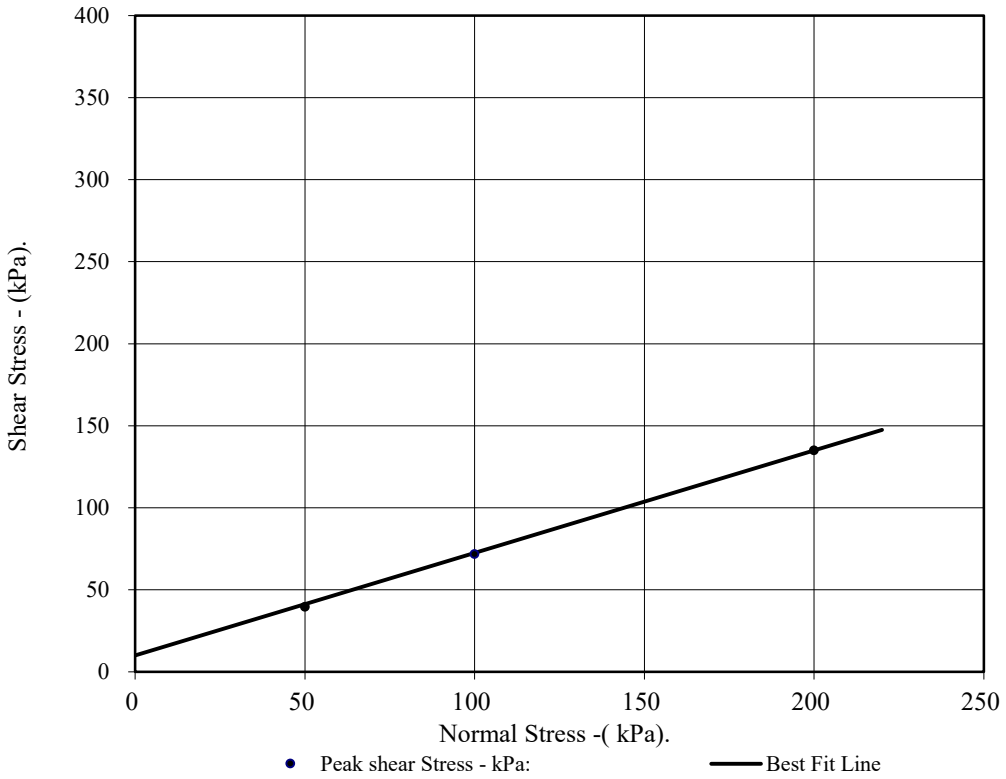
Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Description of Sample
BH101		B	6.00	6.45	Greyish brown SAND.
BH101		B	12.00	12.40	Greyish brown slightly gravelly SAND.
BH102		B	6.00	6.45	Dark brown SAND.
BH102		B	13.50	13.95	Brown slightly sandy CLAY.
BH103		B	12.00	12.45	Brown slightly gravelly SAND.
BH103		B	17.00	17.45	Brown slightly sandy CLAY.
BH104		B	6.00	6.45	Greyish brown slighlty gravelly SAND
BH104		B	11.00	11.45	Brown SAND
BH104		B	17.00	17.45	Brown slightly gravelly very sandy CLAY

CONSOLIDATED DRAINED SHEARBOX TEST

BS1377:Part 7:1990 Clause 4

Hole Number:	**BH101**		Top Depth:	**6.00**	
Sample Number:			Base Depth:	**6.45**	
Sample Conditions:	Dry		Sample Type	**B**	
Particle Density - Mg/m3:	2.65	Assumed	**Remarks:**		
Sample Preparation:	Material tested passing 2mm sieve Remoulded using hand tamped effort				
Sample Description:	**See summary of soil descriptions**				

STAGE	**1**	**2**	**3**
Initial Conditions			
Height - mm:	20.05	20.05	20.05
Length - mm:	59.97	59.97	59.97
Moisture Content - %:	24	24	24
Bulk Density - Mg/m3:	1.84	1.84	1.84
Dry Density - Mg/m3:	1.49	1.48	1.48
Voids Ratio:	0.782	0.791	0.792
Normal Pressure- kPa	50	100	200
Consolidation Stage			
Consolidated Height - mm:	19.69	19.64	19.60
Shearing Stage			
Rate of Strain (mm/min)	0.600	0.600	0.600
Displacement at peak shear stress (mm)	2.50	3.00	3.00
Peak shear Stress - kPa:	40	72	135
Final Consolidated Conditions			
Moisture Content - %:	23	23	22
Bulk Density - Mg/m3:	1.88	1.88	1.88
Dry Density - Mg/m3:	1.53	1.52	1.55
Peak			
Angle of Shearing Resistance:(~~θ~~)	**32**		
Effective Cohesion - kPa:	**10**		

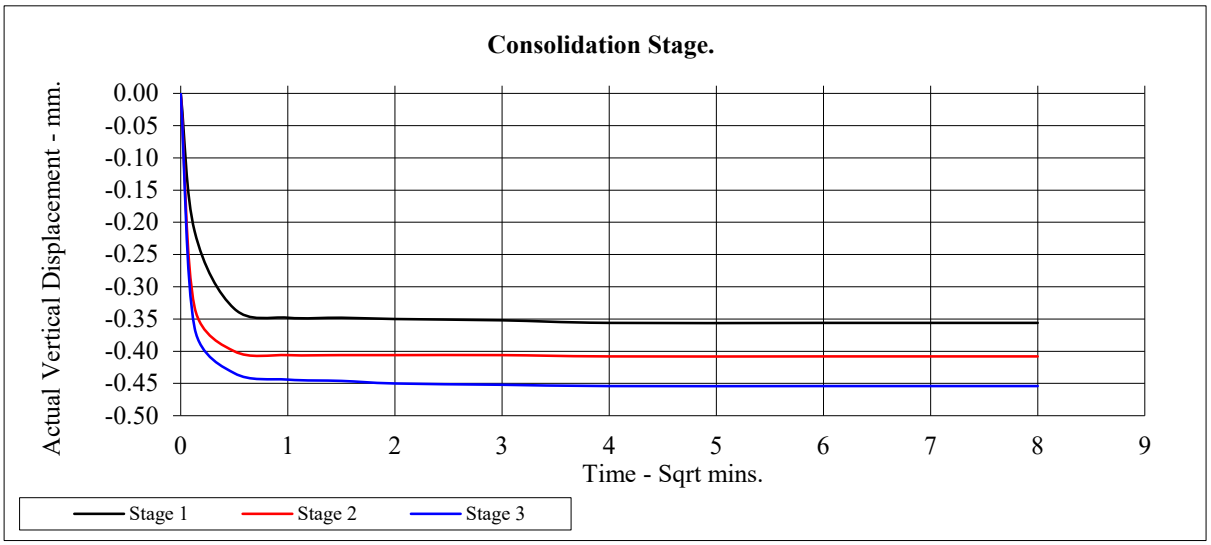


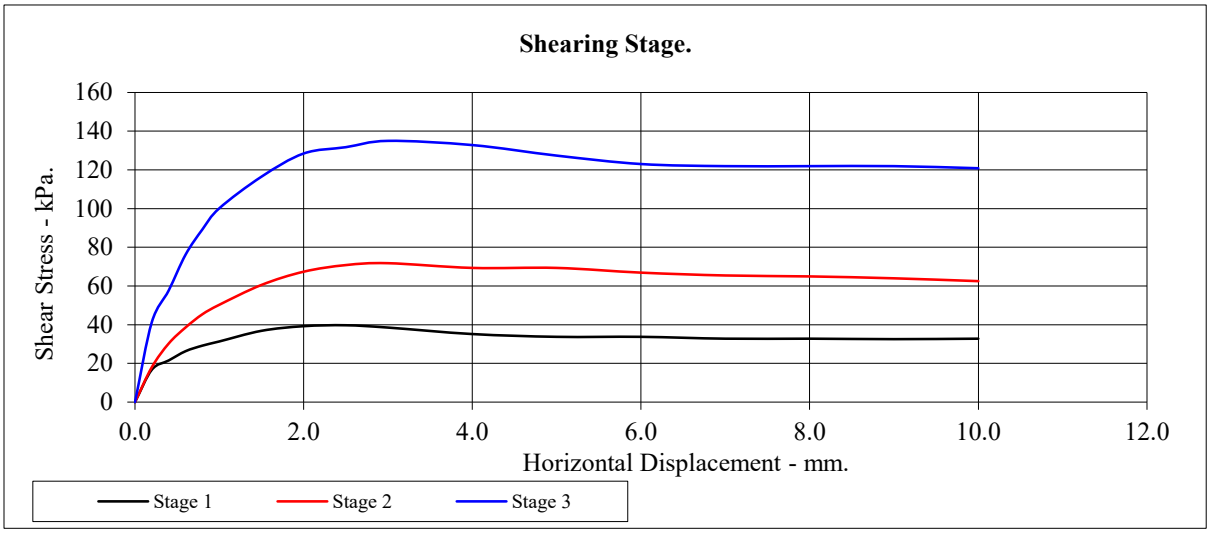
UKAS TESTING 4043	PSL Professional Soils Laboratory	**BOC Hydrogen Plant**	**Contract No:** PSL21/4278 **Client Ref:** S210402

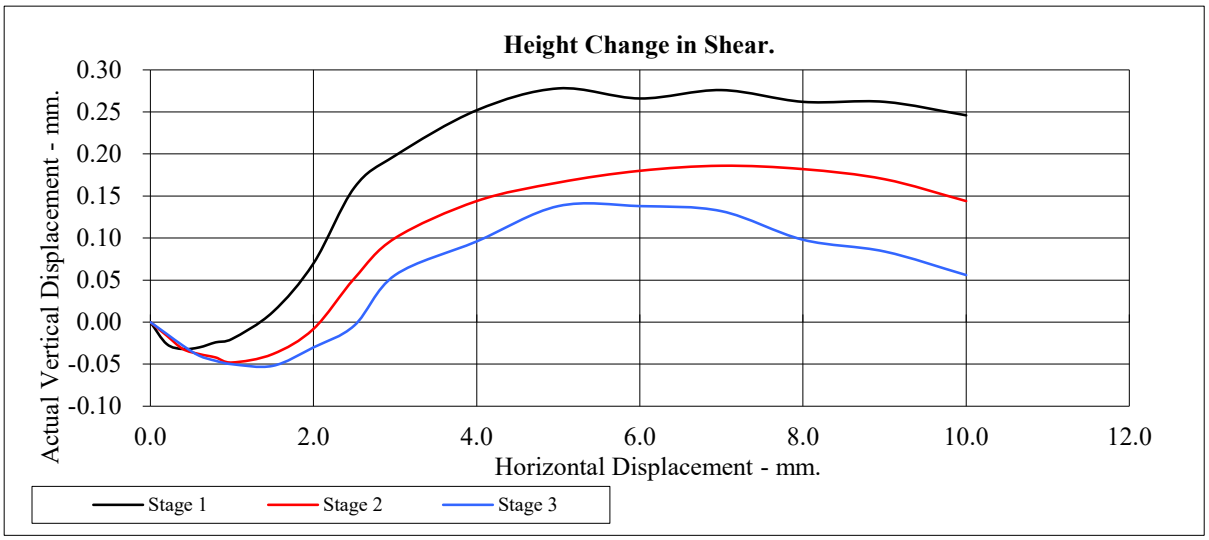
CONSOLIDATED DRAINED SHEARBOX TEST

BS1377:Part 7:1990 Clause 4

Hole Number:	**BH101**	Top Depth:	**6.00**
Sample Number:		Base Depth:	**6.45**





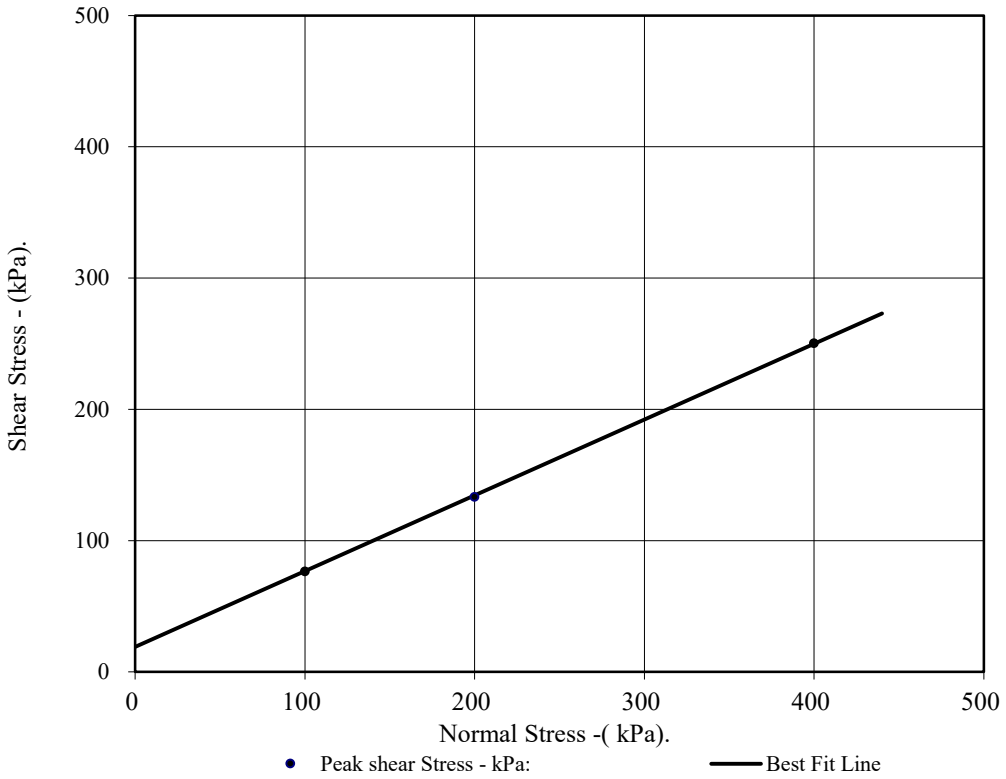


CONSOLIDATED DRAINED SHEARBOX TEST

BS1377:Part 7:1990 Clause 4

Hole Number:	**BH101**		Top Depth:	**12.00**
Sample Number:			Base Depth:	**12.45**
Sample Conditions:	Dry		Sample Type	**B**
Particle Density - Mg/m3:	2.65	Assumed	**Remarks:**	
Sample Preparation:	Material tested passing 2mm sieve Remoulded using hand tamped effort			
Sample Description:	**See summary of soil descriptions**			

STAGE	**1**	**2**	**3**
Initial Conditions			
Height - mm:	20.05	20.05	20.05
Length - mm:	59.97	59.97	59.97
Moisture Content - %:	23	23	23
Bulk Density - Mg/m3:	1.86	1.87	1.87
Dry Density - Mg/m3:	1.52	1.52	1.52
Voids Ratio:	0.748	0.741	0.744
Normal Pressure- kPa	100	200	400
Consolidation Stage			
Consolidated Height - mm:	19.71	19.52	19.48
Shearing Stage			
Rate of Strain (mm/min)	0.600	0.600	0.600
Displacement at peak shear stress (mm)	3.00	4.00	5.00
Peak shear Stress - kPa:	77	133	250
Final Consolidated Conditions			
Moisture Content - %:	23	23	22
Bulk Density - Mg/m3:	1.90	1.92	1.92
Dry Density - Mg/m3:	1.55	1.56	1.57
Peak			
Angle of Shearing Resistance:(~~θ~~)	**30**		
Effective Cohesion - kPa:	**19**		

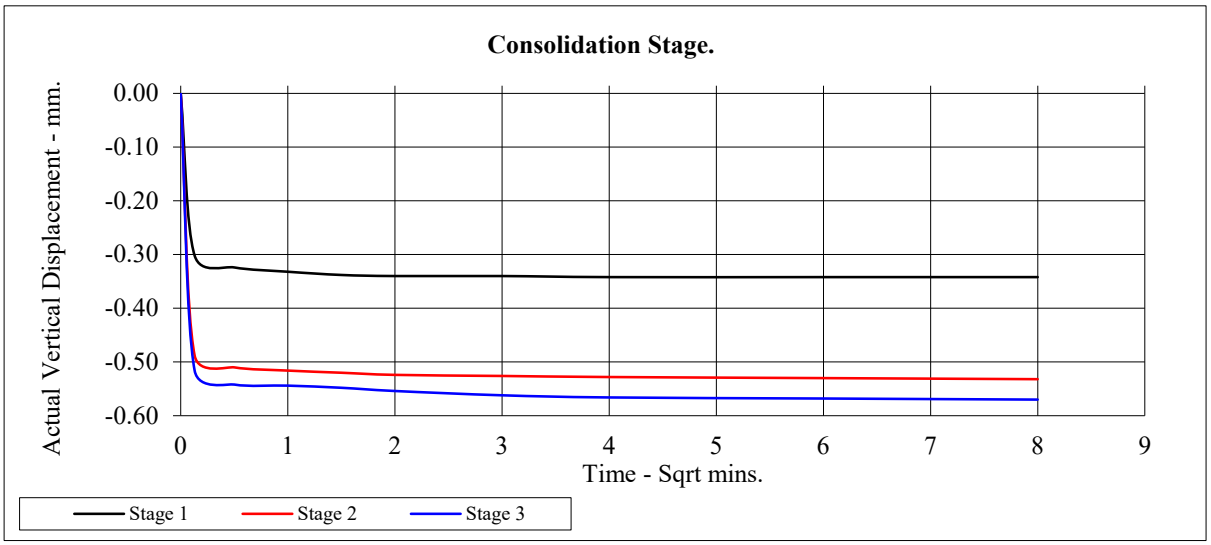


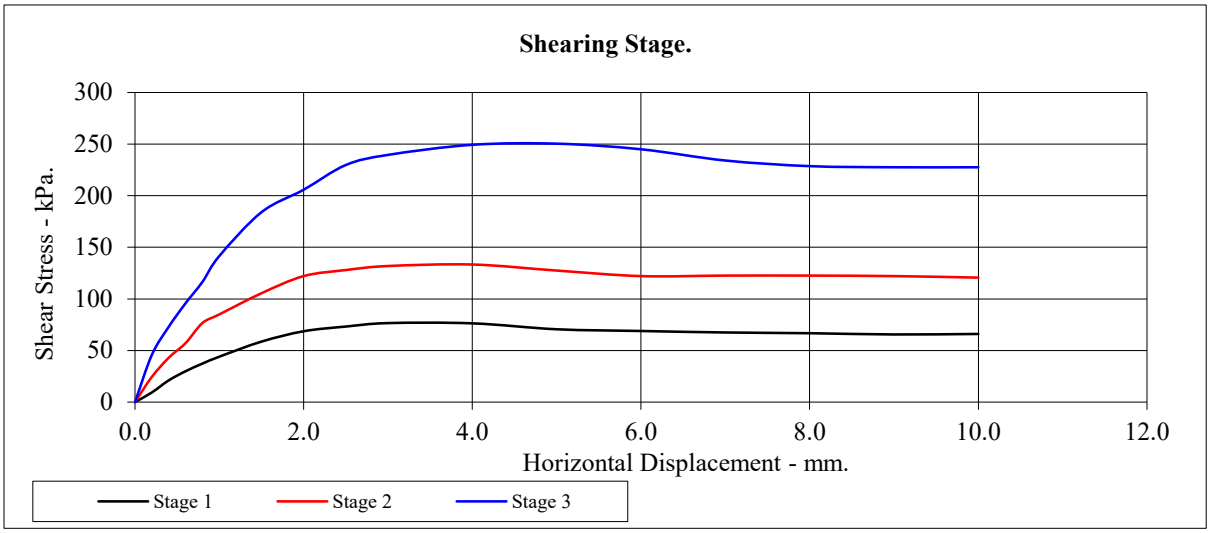
UKAS TESTING 4043	PSL Professional Soils Laboratory	**BOC Hydrogen Plant**	**Contract No:** PSL21/4278 **Client Ref:** S210402

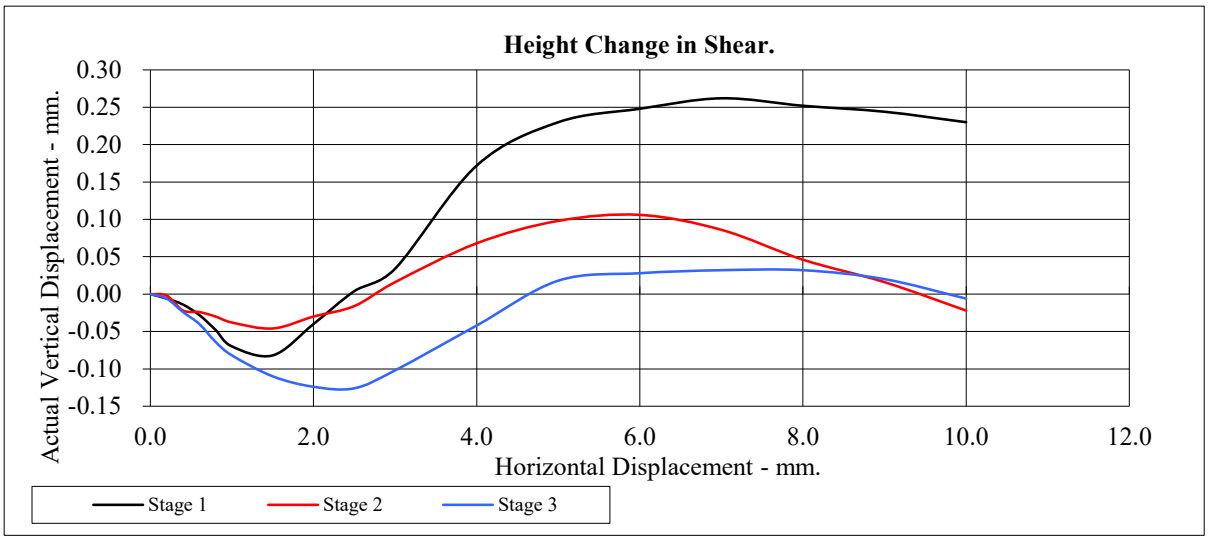
CONSOLIDATED DRAINED SHEARBOX TEST

BS1377:Part 7:1990 Clause 4

Hole Number:	**BH101**	Top Depth:	**12.00**
Sample Number:		Base Depth:	**12.45**





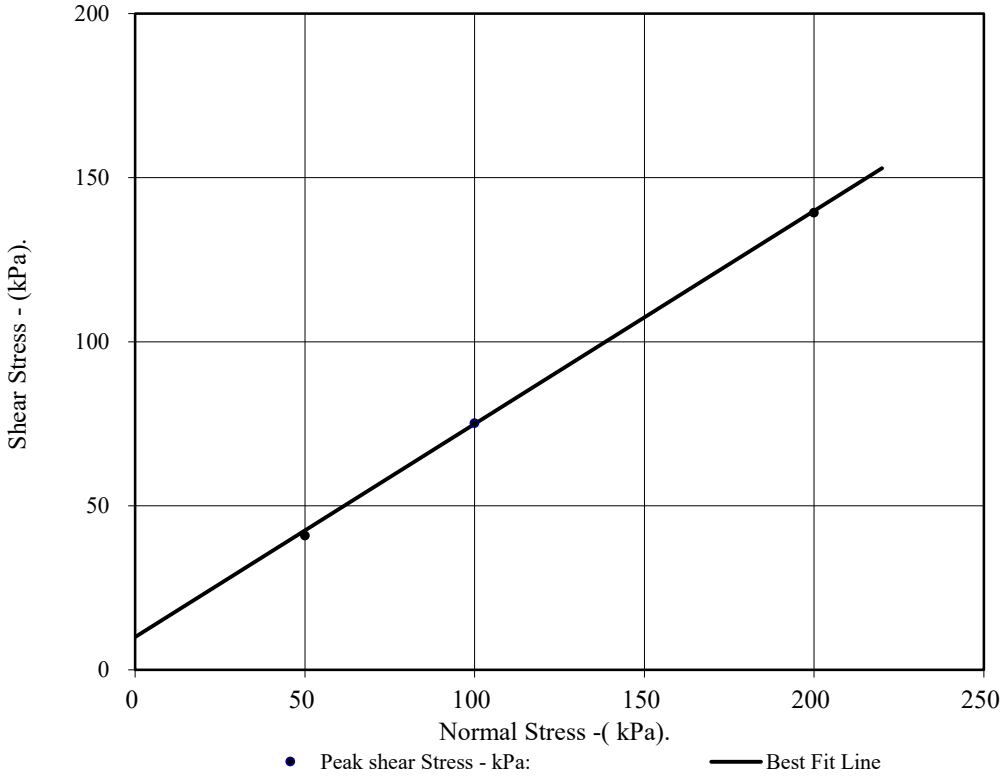


CONSOLIDATED DRAINED SHEARBOX TEST

BS1377:Part 7:1990 Clause 4

Hole Number:	**BH102**		Top Depth:	**6.00**	
Sample Number:			Base Depth:	**6.45**	
Sample Conditions:	Dry		Sample Type	**B**	
Particle Density - Mg/m3:	2.65	Assumed	**Remarks:**		
Sample Preparation:	Material tested passing 2mm sieve Remoulded using hand tamped effort				
Sample Description:	**See summary of soil descriptions**				

STAGE	**1**	**2**	**3**
Initial Conditions			
Height - mm:	20.05	20.05	20.05
Length - mm:	59.97	59.97	59.97
Moisture Content - %:	26	26	26
Bulk Density - Mg/m3:	1.89	1.90	1.89
Dry Density - Mg/m3:	1.50	1.50	1.50
Voids Ratio:	0.765	0.766	0.770
Normal Pressure- kPa	50	100	200
Consolidation Stage			
Consolidated Height - mm:	19.68	19.52	18.86
Shearing Stage			
Rate of Strain (mm/min)	0.600	0.600	0.600
Displacement at peak shear stress (mm)	2.50	3.00	4.00
Peak shear Stress - kPa:	41	75	139
Final Consolidated Conditions			
Moisture Content - %:	24	24	24
Bulk Density - Mg/m3:	1.93	1.95	2.01
Dry Density - Mg/m3:	1.55	1.57	1.62
Peak			
Angle of Shearing Resistance:(~~θ~~)	**33**		
Effective Cohesion - kPa:	**10**		

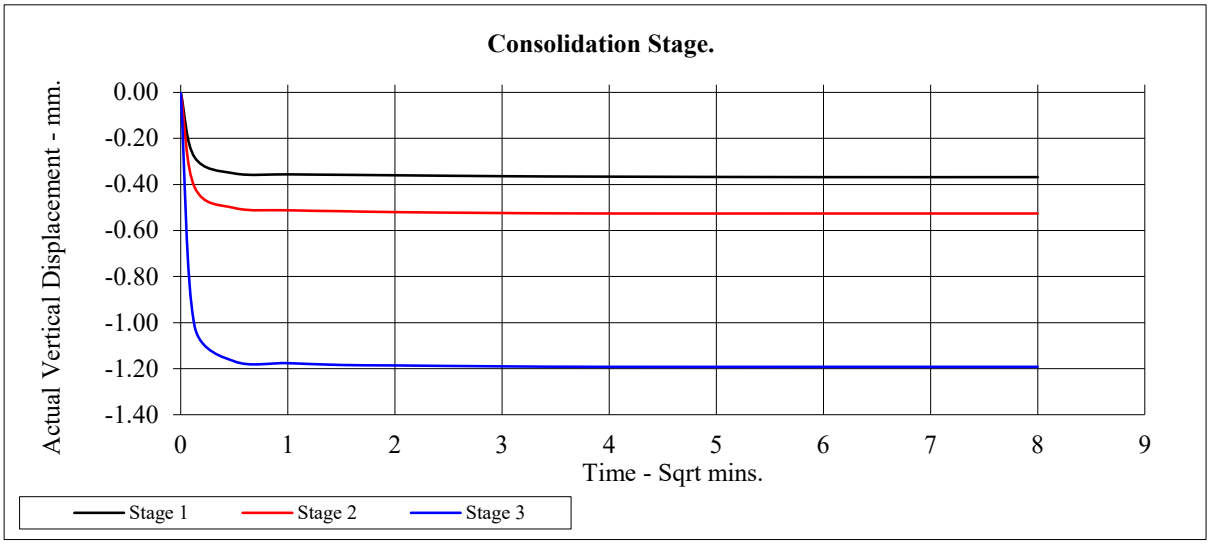


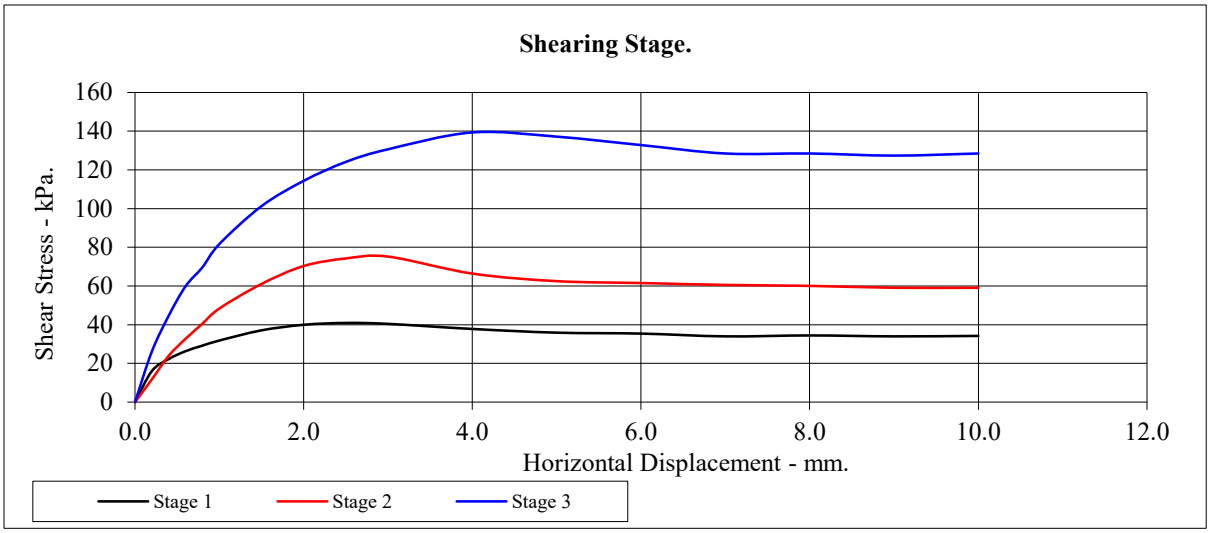
UKAS TESTING 4043	PSL Professional Soils Laboratory	**BOC Hydrogen Plant**	**Contract No:** PSL21/4278 **Client Ref:** S210402

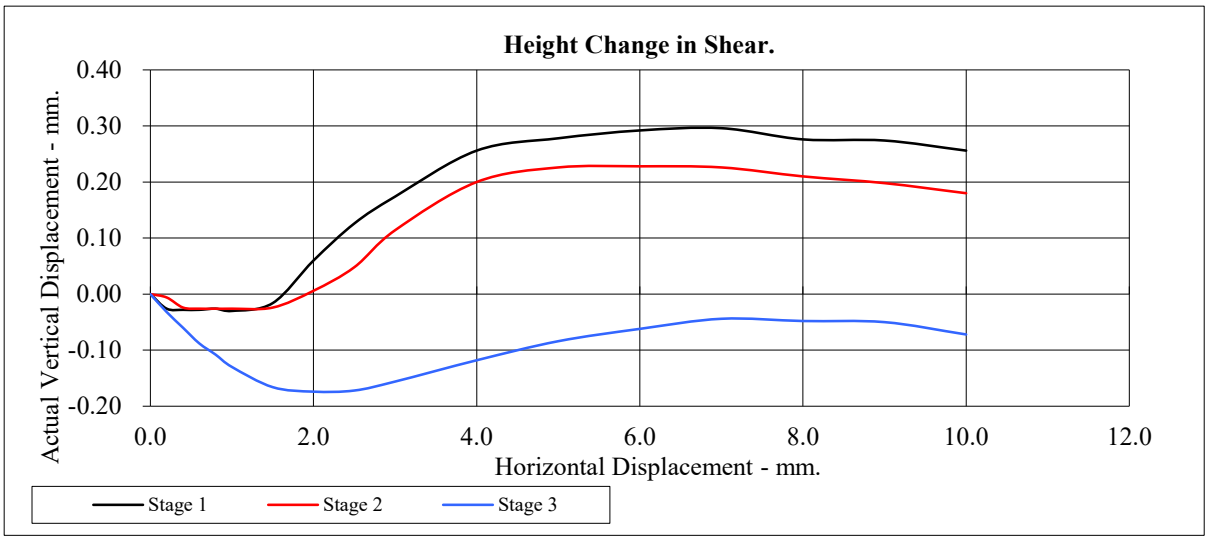
CONSOLIDATED DRAINED SHEARBOX TEST

BS1377:Part 7:1990 Clause 4

Hole Number:	**BH102**	Top Depth:	**6.00**
Sample Number:		Base Depth:	**6.45**







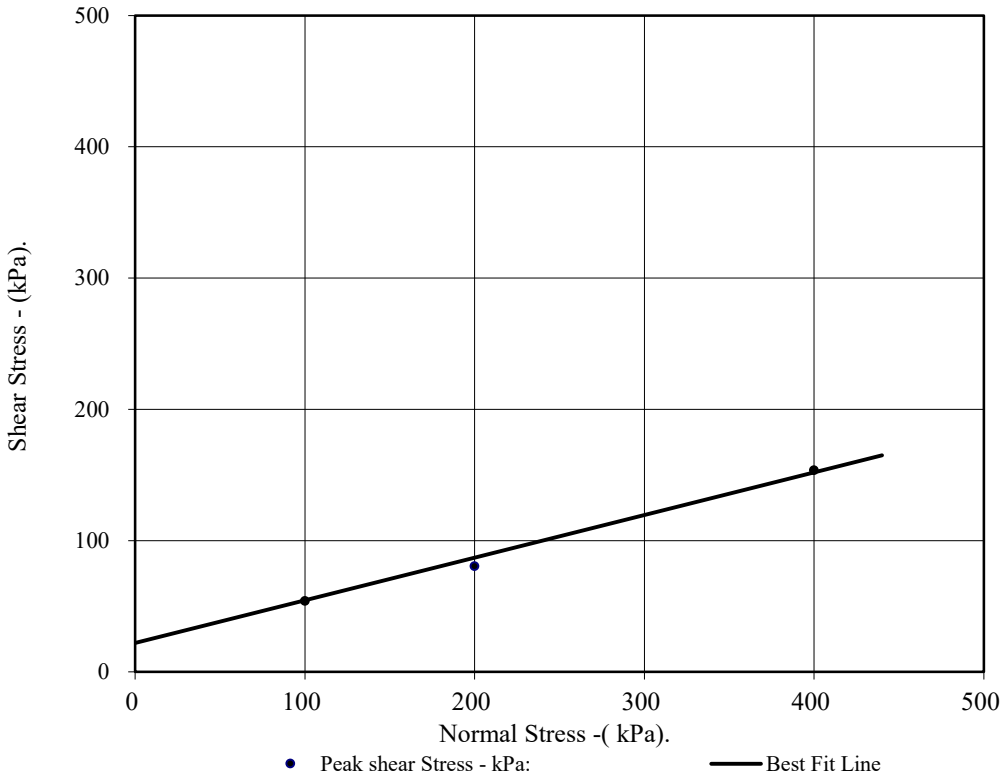
UKAS TESTING 4043	PSL Professional Soils Laboratory	**BOC Hydrogen Plant**	**Contract No:** PSL21/4278 **Client Ref:** S210402

CONSOLIDATED DRAINED SHEARBOX TEST

BS1377:Part 7:1990 Clause 4

Hole Number:	**BH102**		Top Depth:	**13.50**	
Sample Number:			Base Depth:	**13.95**	
Sample Conditions:	Submerged		Sample Type	**B**	
Particle Density - Mg/m3:	2.65	Assumed	**Remarks:**		
Sample Preparation:	Material tested passing 2mm sieve Remoulded using 2.5kg effort				
Sample Description:	**See summary of soil descriptions**				

STAGE	**1**	**2**	**3**
Initial Conditions			
Height - mm:	20.05	20.05	20.05
Length - mm:	59.97	59.97	59.97
Moisture Content - %:	27	27	27
Bulk Density - Mg/m3:	1.93	1.93	1.93
Dry Density - Mg/m3:	1.52	1.51	1.52
Voids Ratio:	0.747	0.750	0.747
Normal Pressure- kPa	100	200	400
Consolidation Stage			
Consolidated Height - mm:	18.82	18.19	17.85
Shearing Stage			
Rate of Strain (mm/min)	0.036	0.036	0.036
Displacement at peak shear stress (mm)	3.00	3.00	4.00
Peak shear Stress - kPa:	54	80	154
Final Consolidated Conditions			
Moisture Content - %:	26	25	23
Bulk Density - Mg/m3:	2.05	2.12	2.17
Dry Density - Mg/m3:	1.63	1.69	1.76
Peak			
Angle of Shearing Resistance:(~~θ~~)	**18**		
Effective Cohesion - kPa:	**22**		

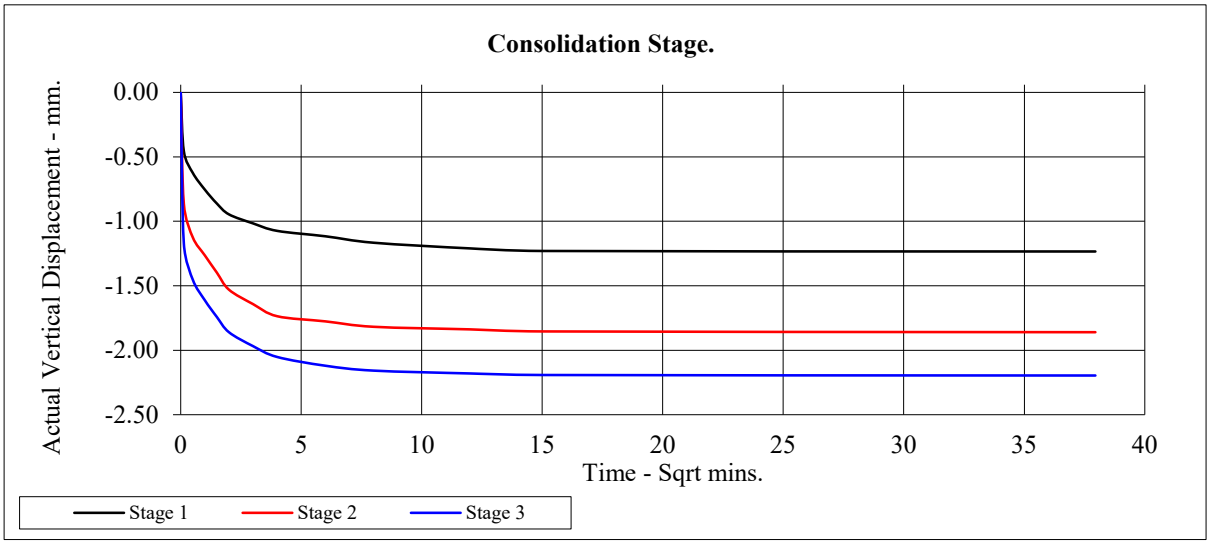


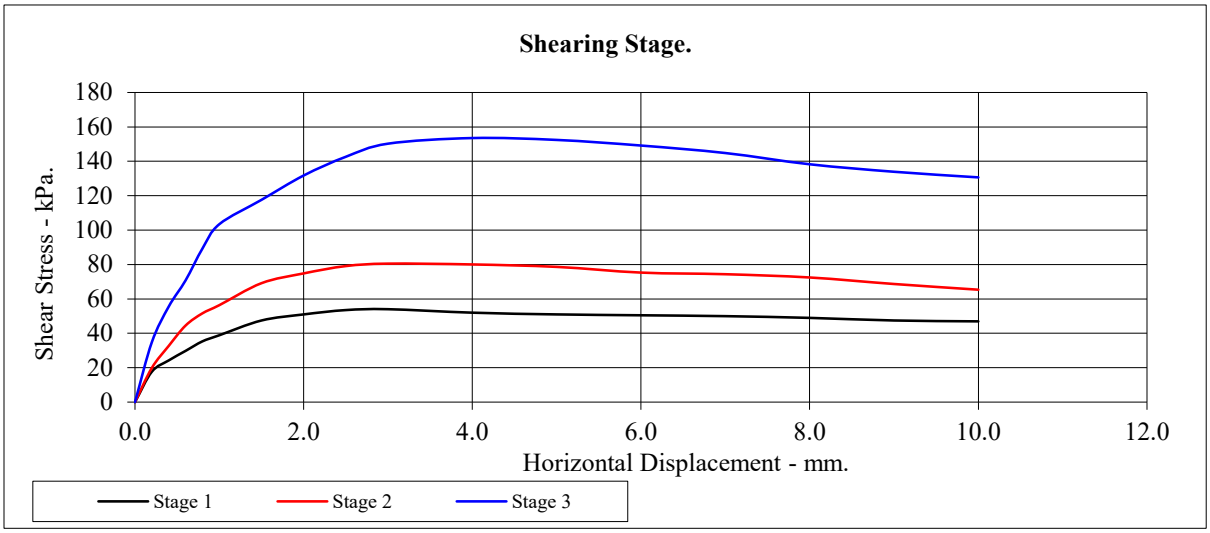
UKAS TESTING 4043	PSL Professional Soils Laboratory	**BOC Hydrogen Plant**	**Contract No:** PSL21/4278 **Client Ref:** S210402

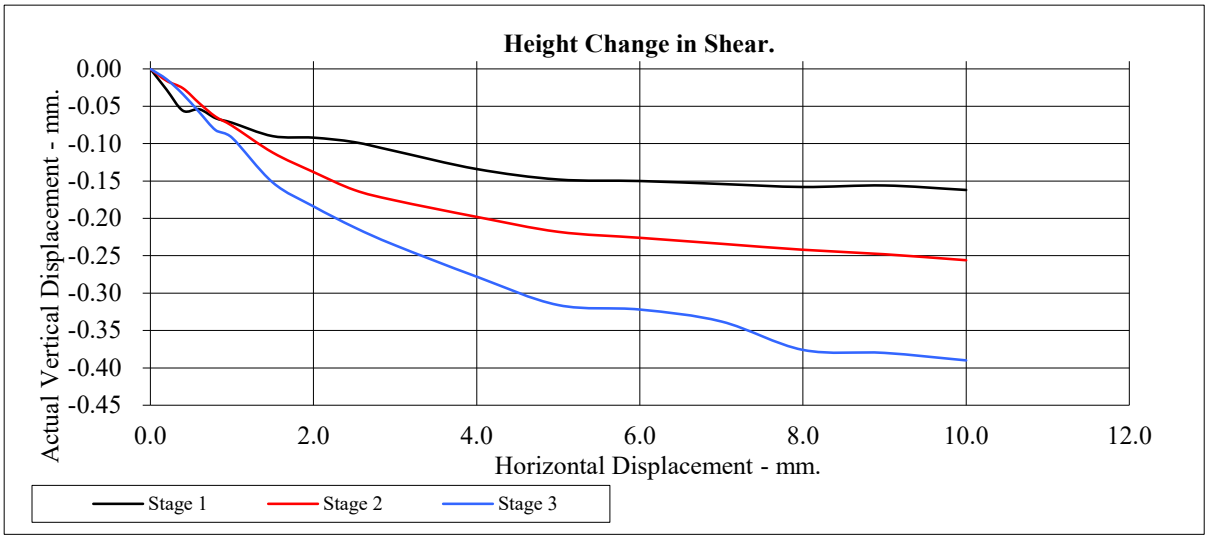
CONSOLIDATED DRAINED SHEARBOX TEST

BS1377:Part 7:1990 Clause 4

Hole Number:	**BH102**	Top Depth:	**13.50**
Sample Number:		Base Depth:	**13.95**





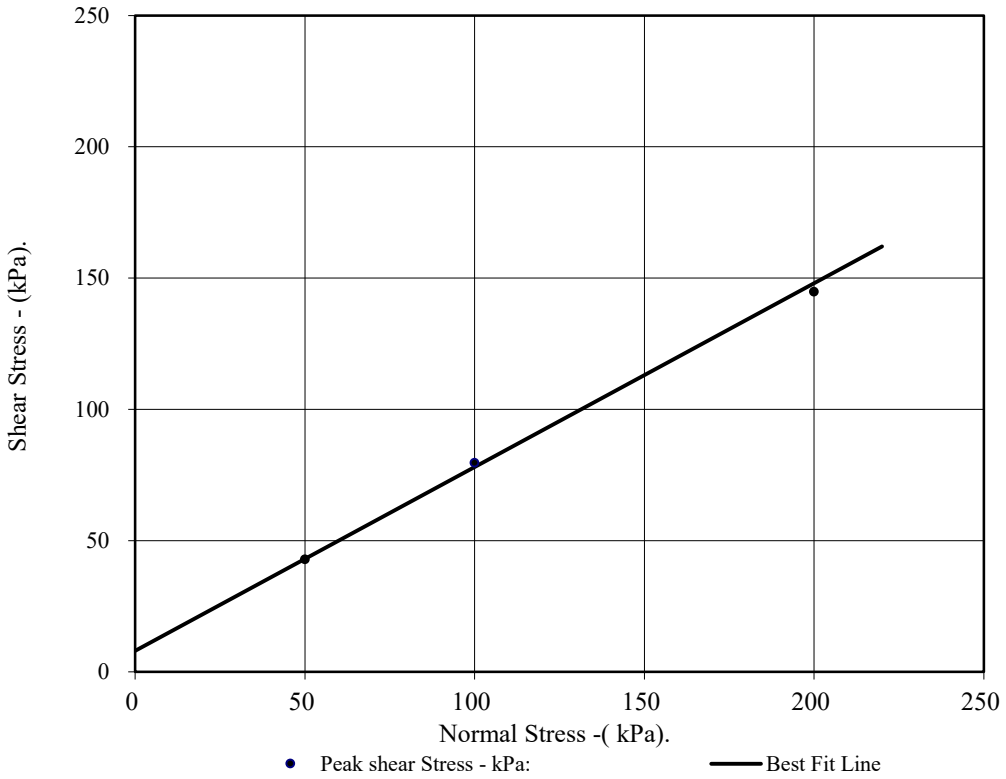


CONSOLIDATED DRAINED SHEARBOX TEST

BS1377:Part 7:1990 Clause 4

Hole Number:	**BH103**		Top Depth:	**12.00**	
Sample Number:			Base Depth:	**12.45**	
Sample Conditions:	Dry		Sample Type	**B**	
Particle Density - Mg/m3:	2.65	Assumed	**Remarks:**		
Sample Preparation:	Material tested passing 2mm sieve Remoulded using hand tamped effort				
Sample Description:	**See summary of soil descriptions**				

STAGE	**1**	**2**	**3**
Initial Conditions			
Height - mm:	20.05	20.05	20.05
Length - mm:	59.97	59.97	59.97
Moisture Content - %:	25	25	25
Bulk Density - Mg/m3:	1.87	1.87	1.87
Dry Density - Mg/m3:	1.50	1.49	1.49
Voids Ratio:	0.770	0.773	0.776
Normal Pressure- kPa	50	100	200
Consolidation Stage			
Consolidated Height - mm:	19.82	19.61	19.48
Shearing Stage			
Rate of Strain (mm/min)	0.600	0.600	0.600
Displacement at peak shear stress (mm)	3.00	4.00	3.00
Peak shear Stress - kPa:	43	80	145
Final Consolidated Conditions			
Moisture Content - %:	24	23	23
Bulk Density - Mg/m3:	1.89	1.91	1.92
Dry Density - Mg/m3:	1.53	1.55	1.56
Peak			
Angle of Shearing Resistance:(~~θ~~)	**35**		
Effective Cohesion - kPa:	**8**		

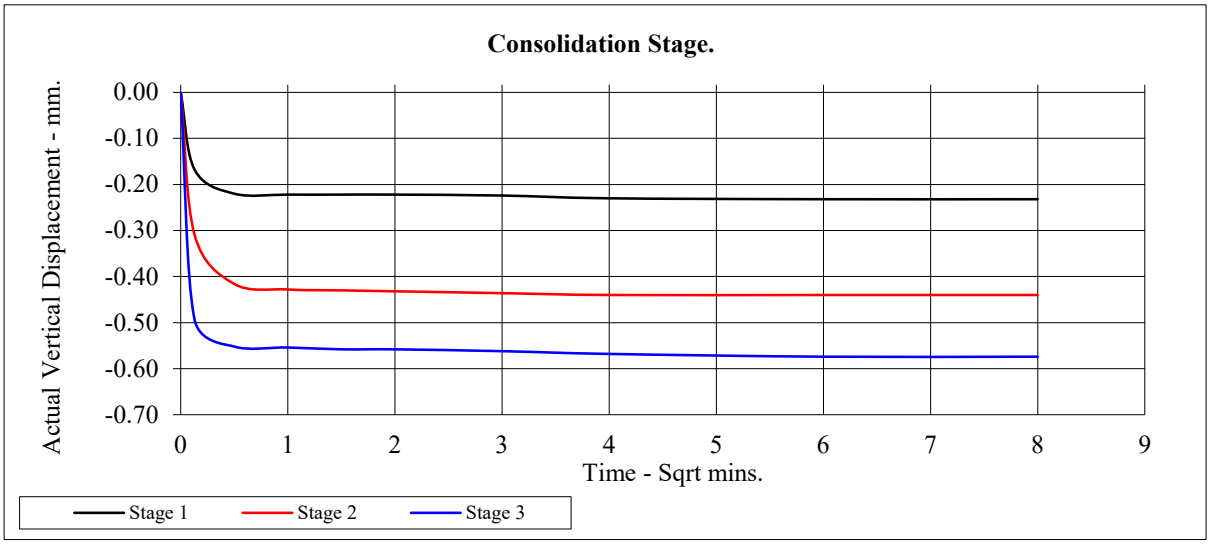


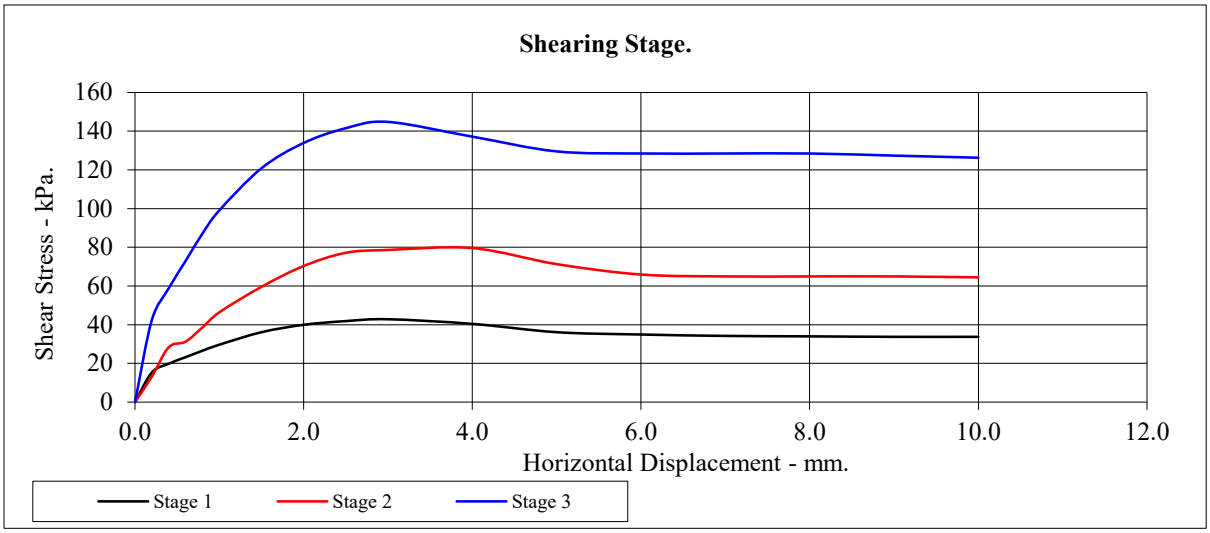
UKAS TESTING 4043	PSL Professional Soils Laboratory	**BOC Hydrogen Plant**	**Contract No:** PSL21/4278 **Client Ref:** S210402

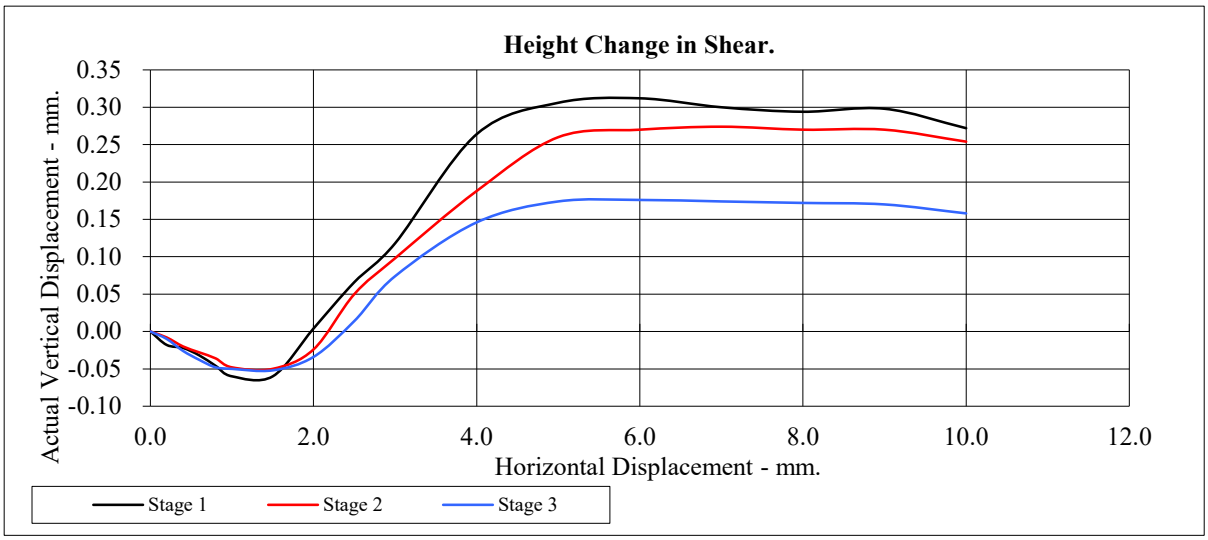
CONSOLIDATED DRAINED SHEARBOX TEST

BS1377:Part 7:1990 Clause 4

Hole Number:	**BH103**	Top Depth:	**12.00**
Sample Number:		Base Depth:	**12.45**





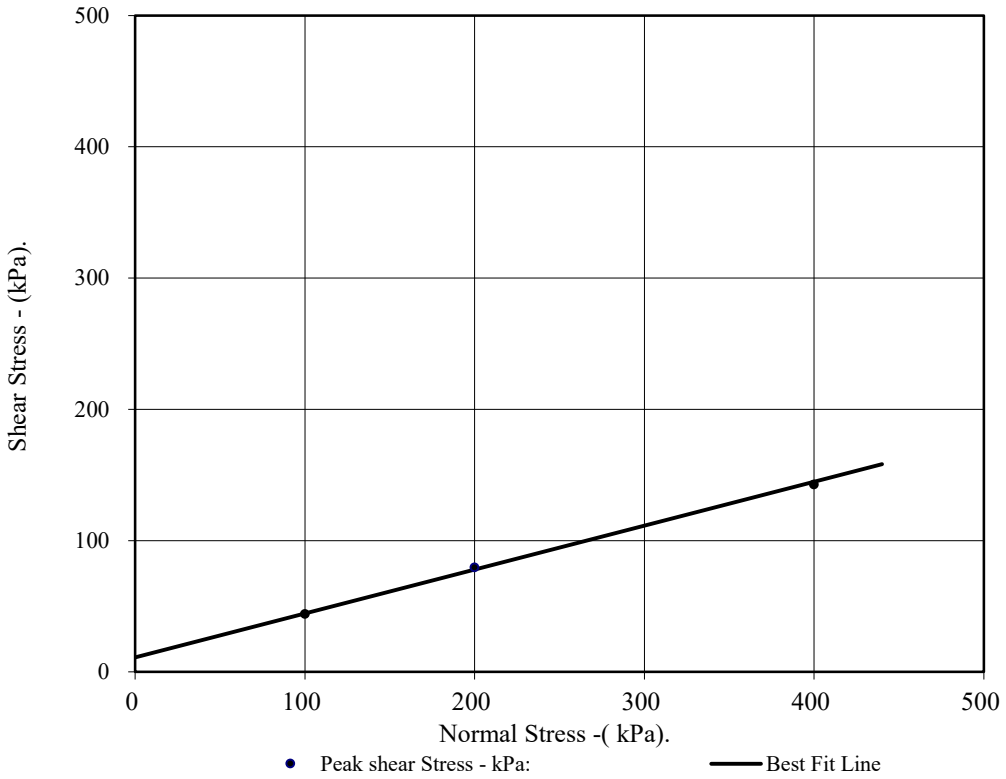


CONSOLIDATED DRAINED SHEARBOX TEST

BS1377:Part 7:1990 Clause 4

Hole Number:	**BH103**		Top Depth:	**17.00**	
Sample Number:			Base Depth:	**17.45**	
Sample Conditions:	Submerged		Sample Type	**B**	
Particle Density - Mg/m3:	2.65	Assumed	**Remarks:**		
Sample Preparation:	Material tested passing 2mm sieve Remoulded using 2.5kg effort				
Sample Description:	**See summary of soil descriptions**				

STAGE	**1**	**2**	**3**
Initial Conditions			
Height - mm:	20.05	20.05	20.05
Length - mm:	59.97	59.97	59.97
Moisture Content - %:	30	30	30
Bulk Density - Mg/m3:	1.92	1.92	1.92
Dry Density - Mg/m3:	1.48	1.48	1.48
Voids Ratio:	0.794	0.791	0.794
Normal Pressure- kPa	100	200	400
Consolidation Stage			
Consolidated Height - mm:	18.56	17.69	17.17
Shearing Stage			
Rate of Strain (mm/min)	0.039	0.039	0.039
Displacement at peak shear stress (mm)	4.00	4.00	4.00
Peak shear Stress - kPa:	44	80	143
Final Consolidated Conditions			
Moisture Content - %:	29	27	26
Bulk Density - Mg/m3:	2.08	2.18	2.24
Dry Density - Mg/m3:	1.61	1.72	1.79
Peak			
Angle of Shearing Resistance:(~~θ~~)	**19**		
Effective Cohesion - kPa:	**11**		

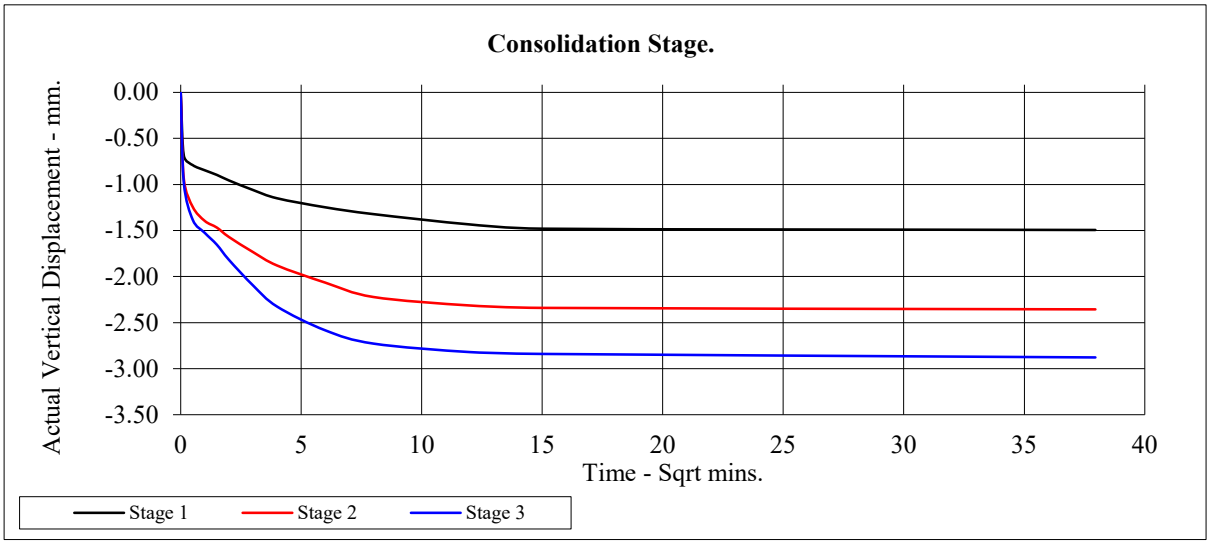


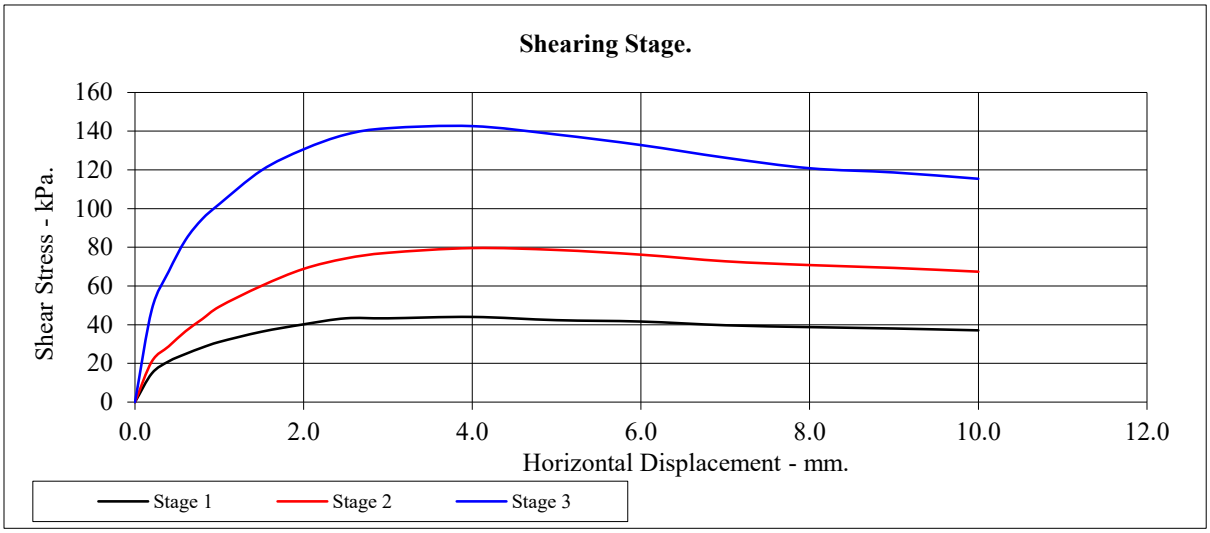
UKAS TESTING 4043	PSL Professional Soils Laboratory	**BOC Hydrogen Plant**	**Contract No:** PSL21/4278 **Client Ref:** S210402

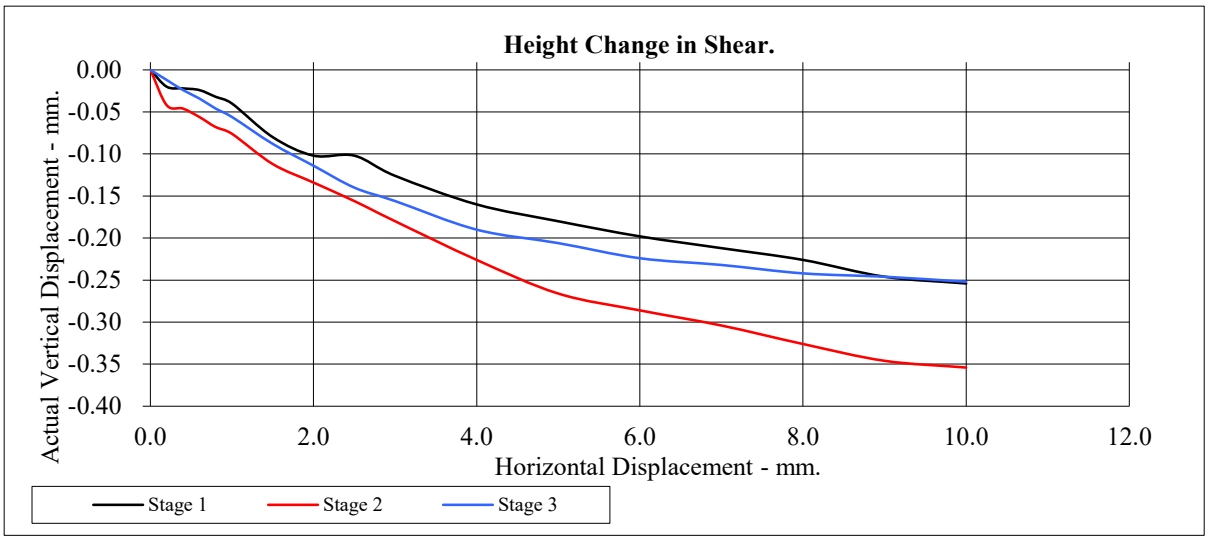
CONSOLIDATED DRAINED SHEARBOX TEST

BS1377:Part 7:1990 Clause 4

Hole Number:	**BH103**	Top Depth:	**17.00**
Sample Number:		Base Depth:	**17.45**







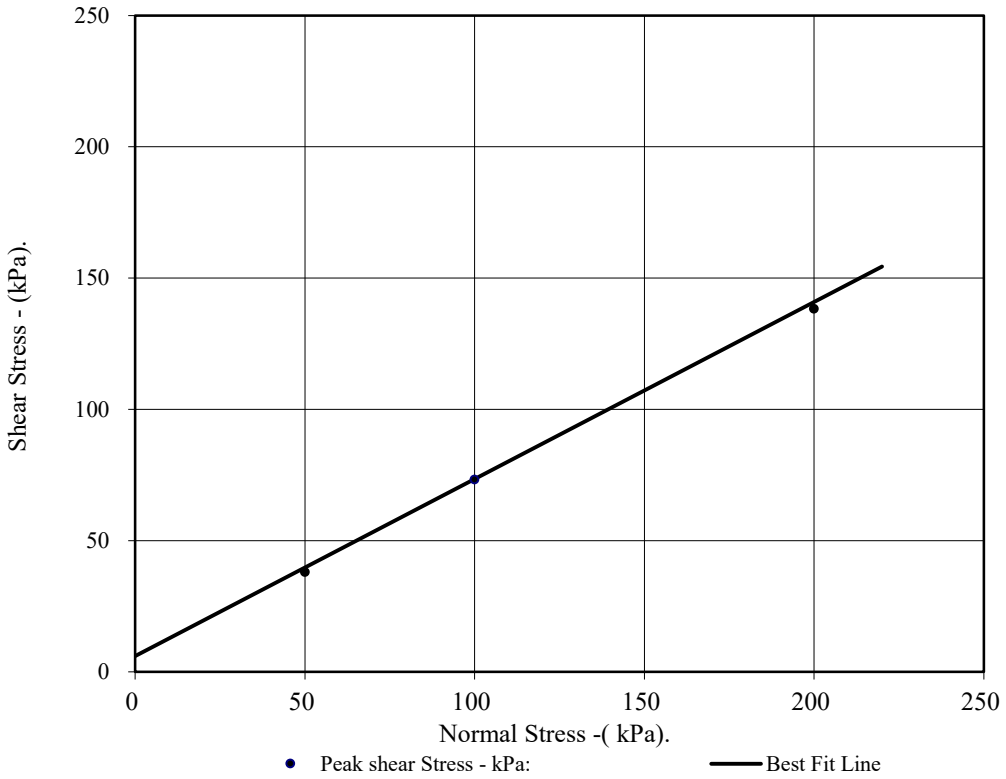
UKAS TESTING 4043	PSL Professional Soils Laboratory	**BOC Hydrogen Plant**	**Contract No: PSL21/4278** **Client Ref: S210402**

CONSOLIDATED DRAINED SHEARBOX TEST

BS1377:Part 7:1990 Clause 4

Hole Number:	**BH104**		Top Depth:	**6.00**	
Sample Number:			Base Depth:	**6.45**	
Sample Conditions:	Dry		Sample Type	**B**	
Particle Density - Mg/m3:	2.65	Assumed	**Remarks:**		
Sample Preparation:	Material tested passing 2mm sieve Remoulded using hand tamped effort				
Sample Description:	**See summary of soil descriptions**				

STAGE	**1**	**2**	**3**
Initial Conditions			
Height - mm:	20.05	20.05	20.05
Length - mm:	59.97	59.97	59.97
Moisture Content - %:	25	25	25
Bulk Density - Mg/m3:	1.87	1.88	1.87
Dry Density - Mg/m3:	1.50	1.50	1.49
Voids Ratio:	0.770	0.766	0.773
Normal Pressure- kPa	50	100	200
Consolidation Stage			
Consolidated Height - mm:	19.85	19.64	19.54
Shearing Stage			
Rate of Strain (mm/min)	0.600	0.600	0.600
Displacement at peak shear stress (mm)	3.00	4.00	4.00
Peak shear Stress - kPa:	38	73	138
Final Consolidated Conditions			
Moisture Content - %:	23	23	23
Bulk Density - Mg/m3:	1.89	1.92	1.92
Dry Density - Mg/m3:	1.53	1.56	1.56
Peak			
Angle of Shearing Resistance:(~~θ~~)	**34**		
Effective Cohesion - kPa:	**6**		

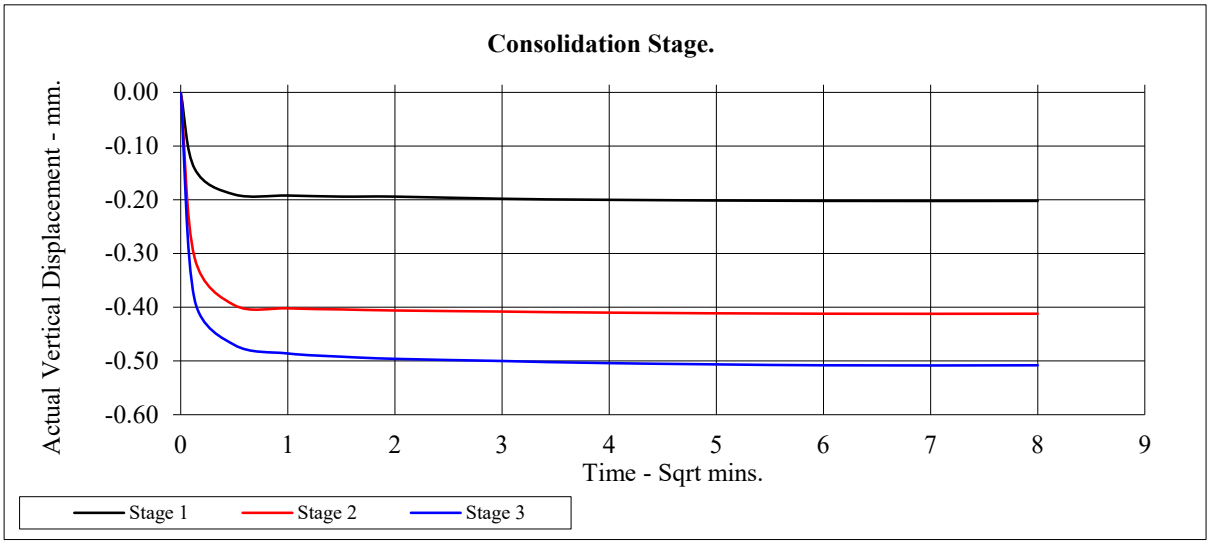


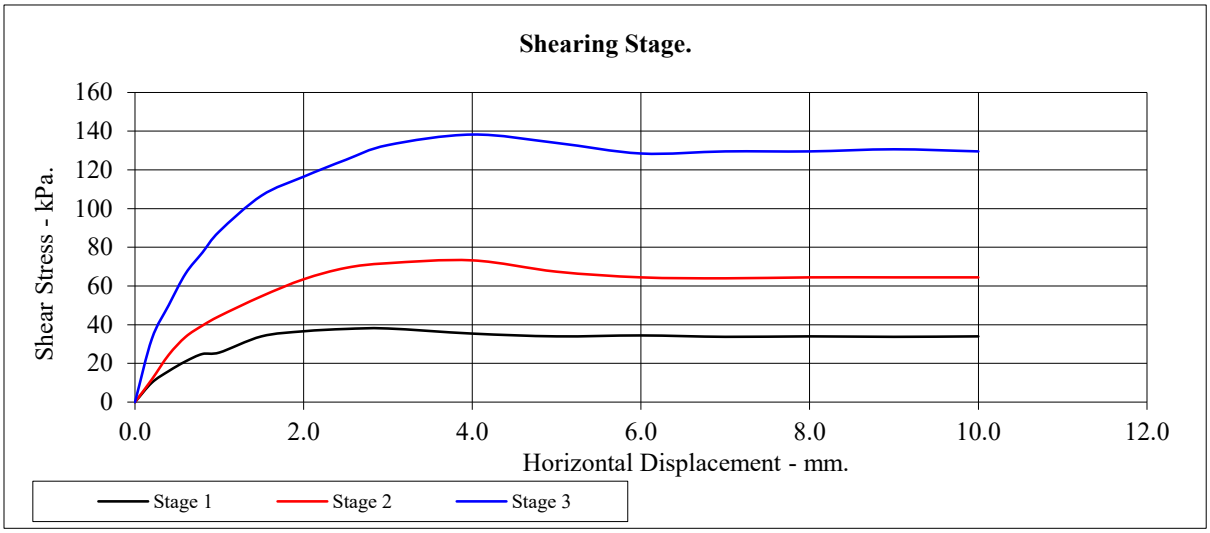
UKAS TESTING 4043	PSL Professional Soils Laboratory	**BOC Hydrogen Plant**	**Contract No:** PSL21/4278 **Client Ref:** S210402

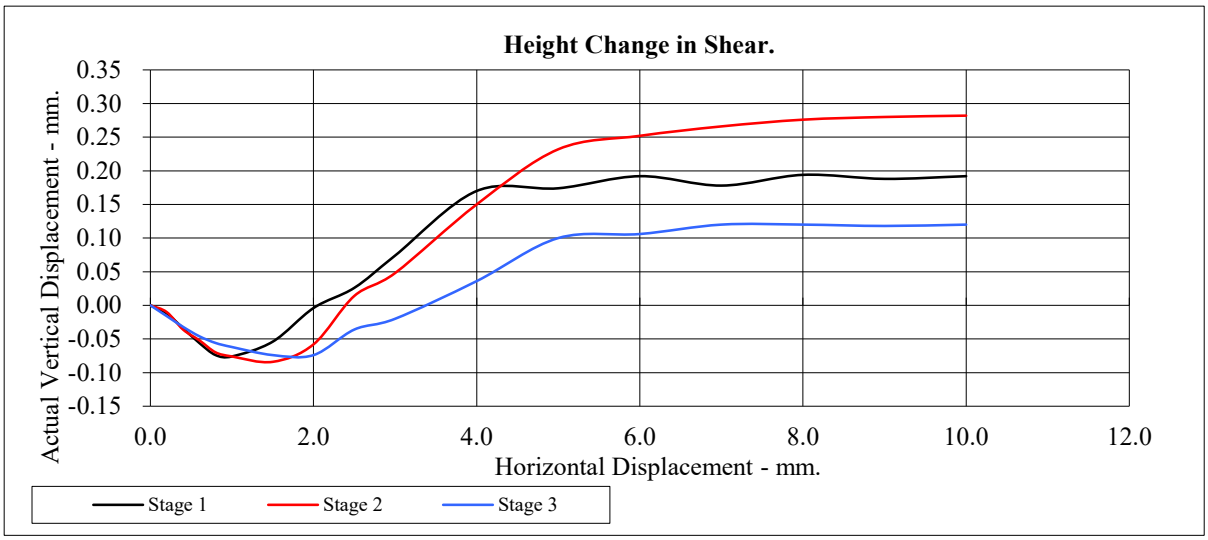
CONSOLIDATED DRAINED SHEARBOX TEST

BS1377:Part 7:1990 Clause 4

Hole Number:	**BH104**	Top Depth:	**6.00**
Sample Number:		Base Depth:	**6.45**





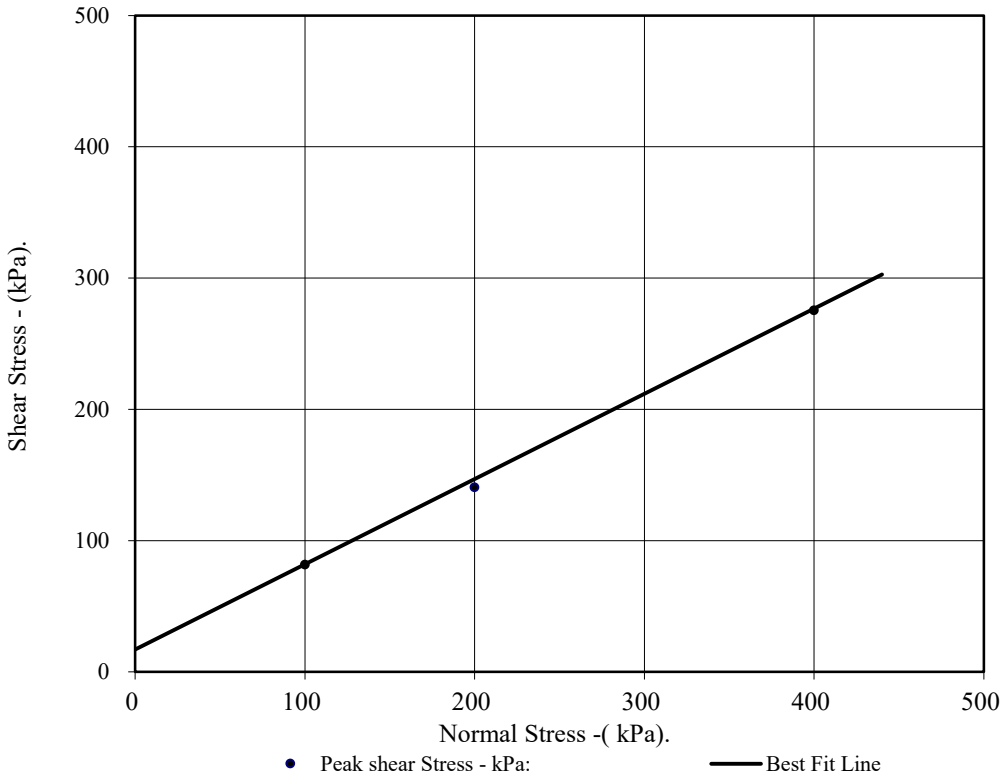


CONSOLIDATED DRAINED SHEARBOX TEST

BS1377:Part 7:1990 Clause 4

Hole Number:	**BH104**		Top Depth:	**11.00**	
Sample Number:			Base Depth:	**11.45**	
Sample Conditions:	Dry		Sample Type	**B**	
Particle Density - Mg/m3:	2.65	Assumed	**Remarks:**		
Sample Preparation:	Material tested passing 2mm sieve Remoulded using hand tamped effort				
Sample Description:	**See summary of soil descriptions**				

STAGE	**1**	**2**	**3**
Initial Conditions			
Height - mm:	20.05	20.05	20.05
Length - mm:	59.97	59.97	59.97
Moisture Content - %:	25	25	25
Bulk Density - Mg/m3:	1.91	1.91	1.92
Dry Density - Mg/m3:	1.53	1.53	1.53
Voids Ratio:	0.730	0.732	0.727
Normal Pressure- kPa	100	200	400
Consolidation Stage			
Consolidated Height - mm:	19.55	19.49	19.33
Shearing Stage			
Rate of Strain (mm/min)	0.600	0.600	0.600
Displacement at peak shear stress (mm)	3.00	3.00	4.00
Peak shear Stress - kPa:	82	141	275
Final Consolidated Conditions			
Moisture Content - %:	23	23	23
Bulk Density - Mg/m3:	1.96	1.97	1.99
Dry Density - Mg/m3:	1.60	1.60	1.62
Peak			
Angle of Shearing Resistance:(~~θ~~)	**33**		
Effective Cohesion - kPa:	**17**		

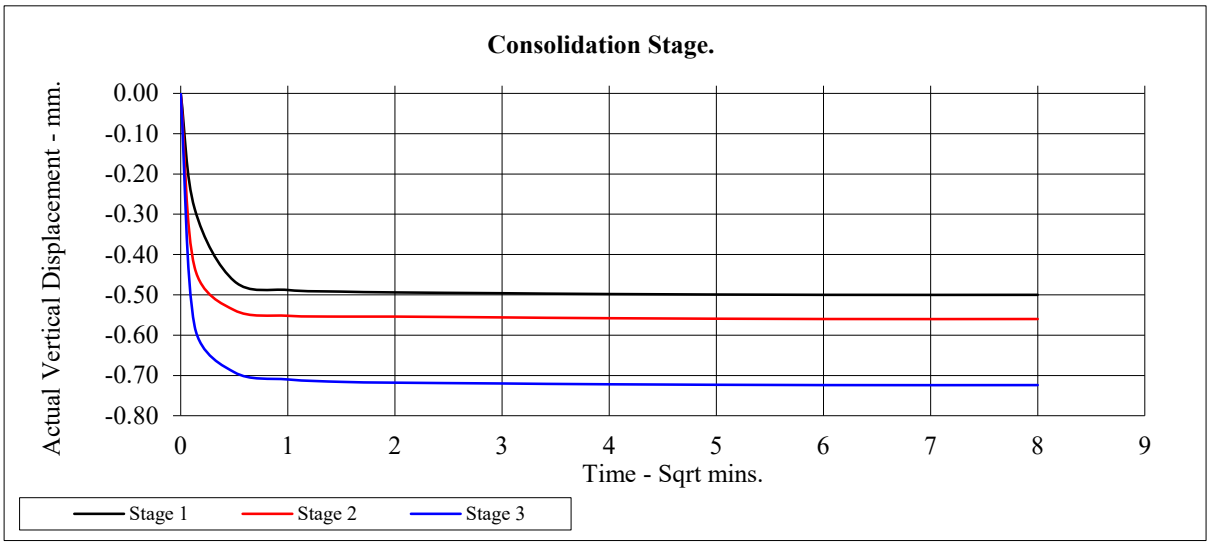


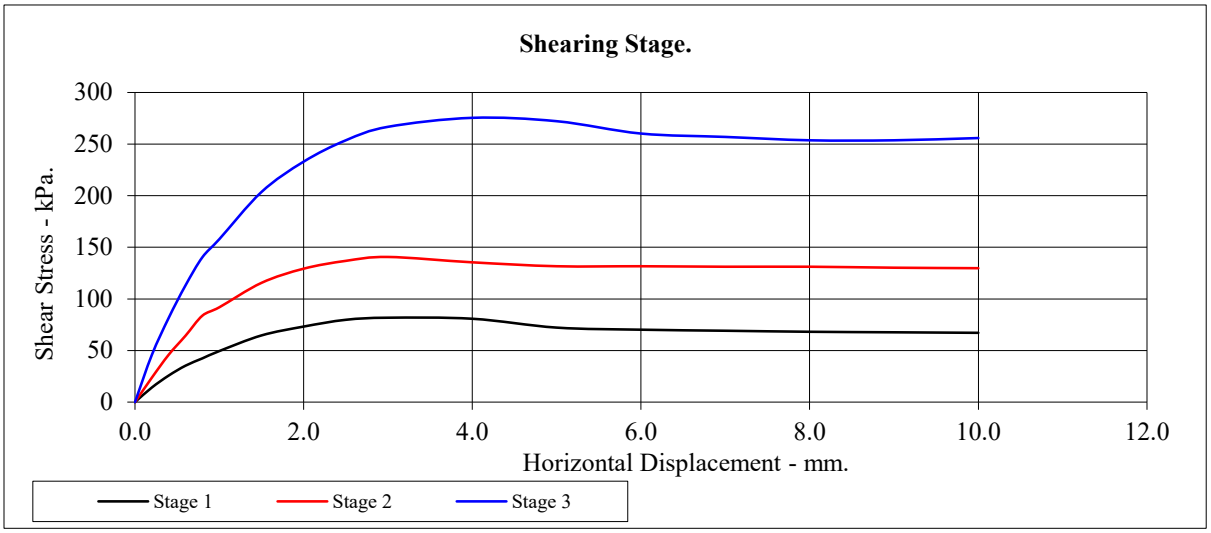
UKAS TESTING 4043	PSL Professional Soils Laboratory	**BOC Hydrogen Plant**	**Contract No:** PSL21/4278 **Client Ref:** S210402

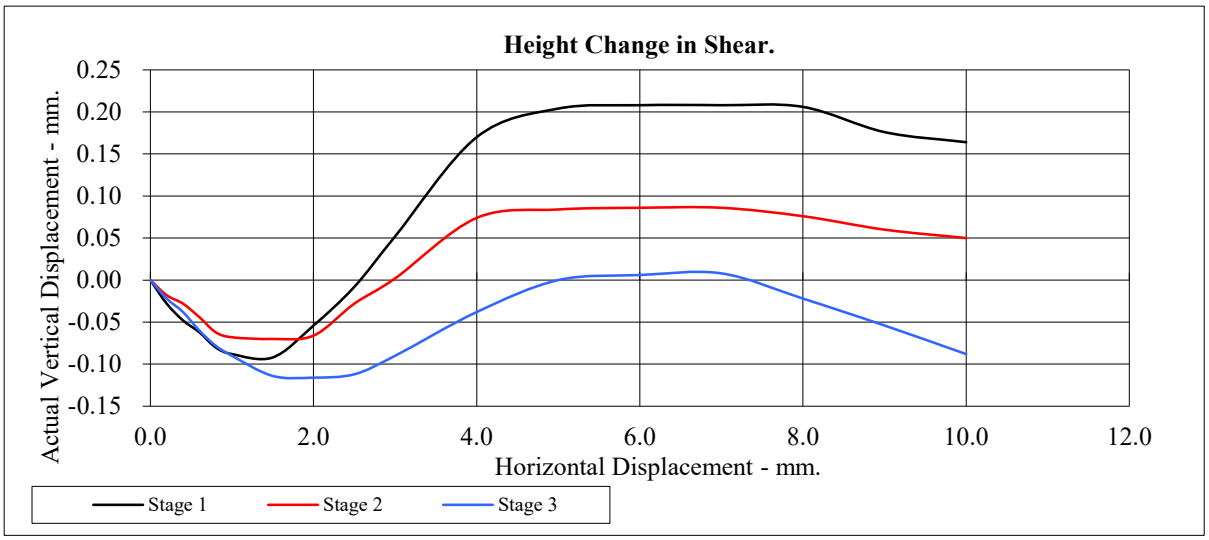
CONSOLIDATED DRAINED SHEARBOX TEST

BS1377:Part 7:1990 Clause 4

Hole Number:	**BH104**	Top Depth:	**11.00**
Sample Number:		Base Depth:	**11.45**





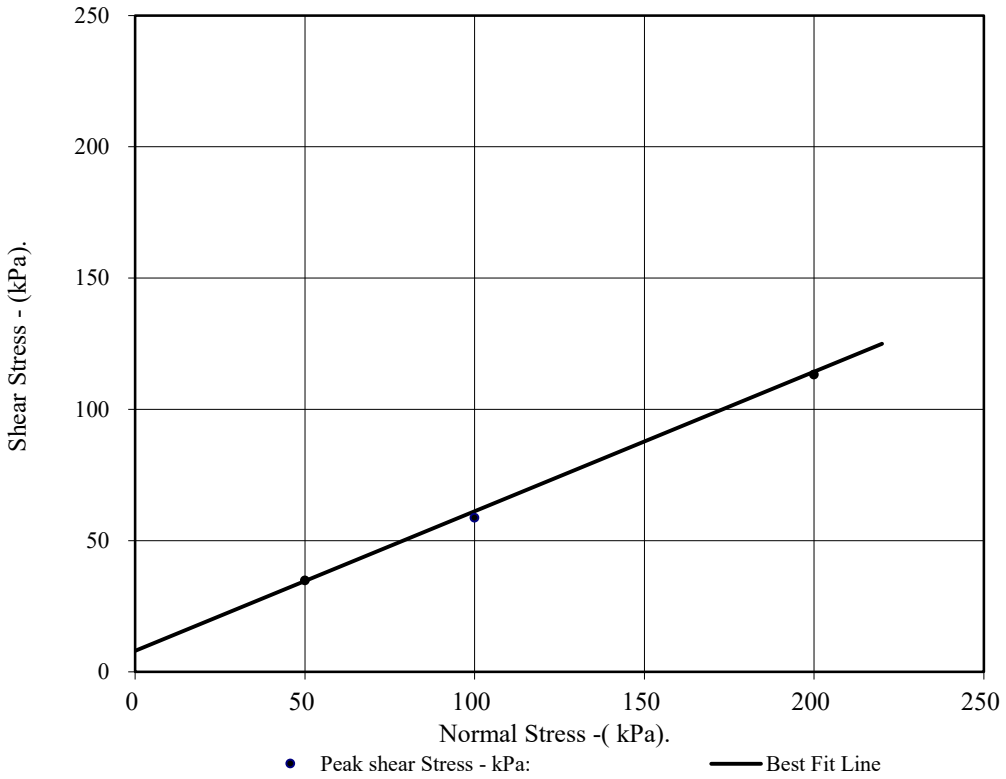


CONSOLIDATED DRAINED SHEARBOX TEST

BS1377:Part 7:1990 Clause 4

Hole Number:	**BH104**		Top Depth:	**17.00**	
Sample Number:			Base Depth:	**17.45**	
Sample Conditions:	Submerged		Sample Type	**B**	
Particle Density - Mg/m3:	2.65	Assumed	**Remarks:**		
Sample Preparation:	Material tested passing 2mm sieve Remoulded using 2.5kg effort				
Sample Description:	**See summary of soil descriptions**				

STAGE	**1**	**2**	**3**
Initial Conditions			
Height - mm:	20.05	20.05	20.05
Length - mm:	59.97	59.97	59.97
Moisture Content - %:	19	19	19
Bulk Density - Mg/m3:	2.09	2.09	2.09
Dry Density - Mg/m3:	1.75	1.76	1.76
Voids Ratio:	0.510	0.506	0.506
Normal Pressure- kPa	50	100	200
Consolidation Stage			
Consolidated Height - mm:	18.89	18.65	17.83
Shearing Stage			
Rate of Strain (mm/min)	0.049	0.049	0.049
Displacement at peak shear stress (mm)	5.00	6.00	10.00
Peak shear Stress - kPa:	35	59	113
Final Consolidated Conditions			
Moisture Content - %:	17	16	15
Bulk Density - Mg/m3:	2.22	2.25	2.35
Dry Density - Mg/m3:	1.90	1.94	2.03
Peak			
Angle of Shearing Resistance:(~~θ~~)	**28**		
Effective Cohesion - kPa:	**8**		

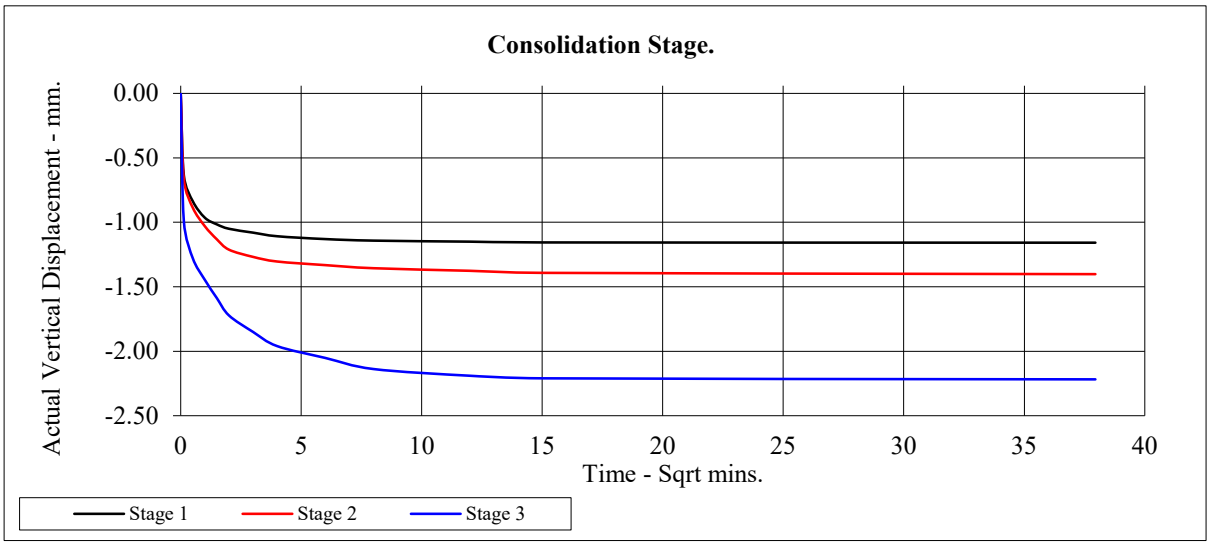


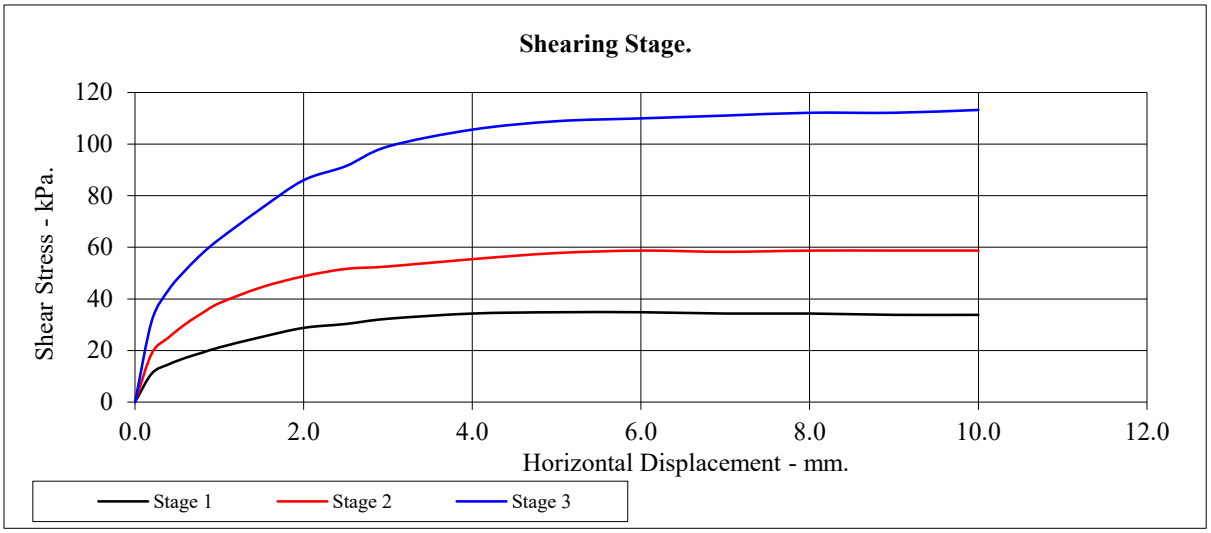
UKAS TESTING 4043	PSL Professional Soils Laboratory	**BOC Hydrogen Plant**	**Contract No:** PSL21/4278 **Client Ref:** S210402

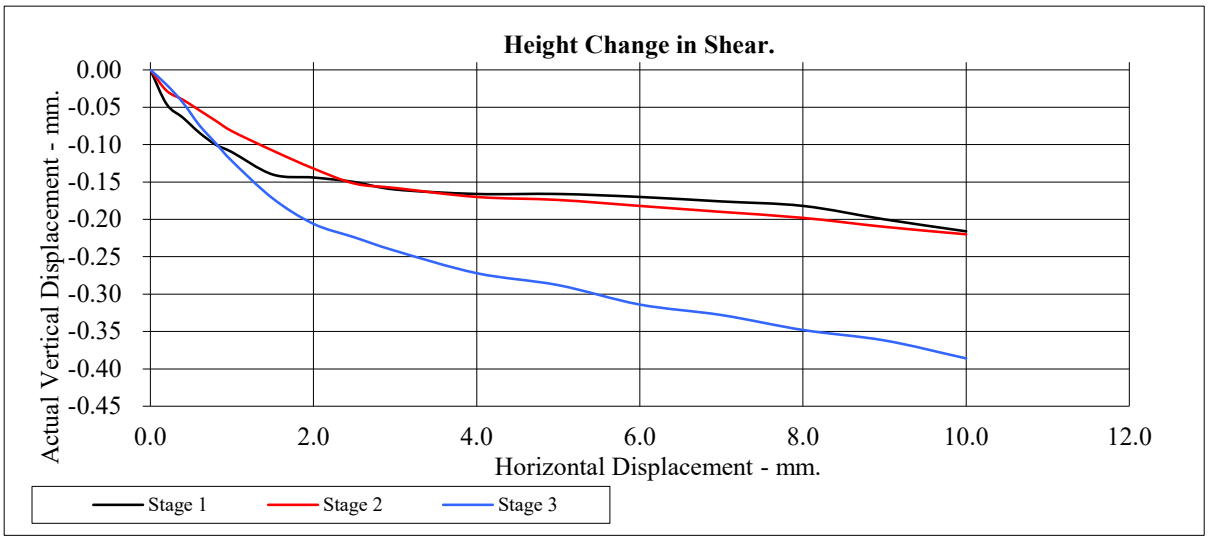
CONSOLIDATED DRAINED SHEARBOX TEST

BS1377:Part 7:1990 Clause 4

Hole Number:	**BH104**	Top Depth:	**17.00**
Sample Number:		Base Depth:	**17.45**







Eurofins Chemtest Ltd
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

Final Report

Report No.:	21-17882-1
Initial Date of Issue:	02-Jun-2021
Client	Solmek Ltd
Client Address:	12 Yarm Road Stockton-on-Tees TS18 3NA
Contact(s):	Leo Cassidy Office Joe Brischuk Tanya Finnimore
Project	S210402 BOC Hydrogen Plant

Quotation No.:		**Date Received:**	27-May-2021
Order No.:	LAB925	**Date Instructed:**	27-May-2021
No. of Samples:	17		
Turnaround (Wkdays):	5	**Results Due:**	03-Jun-2021
Date Approved:	02-Jun-2021		

Approved By:

Details: Glynn Harvey, Technical Manager

Results - Soil

Project: S210402 BOC Hydrogen Plant

Client: Solmek Ltd				**Chemtest Job No.:**	21-17882	21-17882	21-17882	21-17882	21-17882	21-17882	21-17882	21-17882
Quotation No.:				**Chemtest Sample ID.:**	1209314	1209315	1209316	1209317	1209318	1209319	1209320	1209321
				Sample Location:	BH101	BH101	BH101	BH102	BH102	BH102	BH103	BH103
				Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Top Depth (m):	7.50	9.00	10.50	7.50	9.00	16.50	6.00	7.00
				Bottom Depth (m):	7.95	9.45	10.95	7.95	9.45	16.95	6.45	7.45
				Date Sampled:	12-May-2021	12-May-2021	12-May-2021	11-May-2021	11-May-2021	11-May-2021	14-May-2021	14-May-2021
Determinand	**Accred.**	**SOP**	**Units**	**LOD**								
Moisture	N	2030	%	0.020	22	25	28	27	33	14	19	20
pH	U	2010		4.0	8.8	9.1	9.1	9.2	9.3	8.7	9.2	9.2
Sulphate (2:1 Water Soluble) as SO4	U	2120	mg/l	10	71	73	120	54	95	220	88	49

Results - Soil

Project: S210402 BOC Hydrogen Plant

Client: Solmek Ltd				**Chemtest Job No.:**	21-17882	21-17882	21-17882	21-17882	21-17882	21-17882	21-17882	21-17882
Quotation No.:				**Chemtest Sample ID.:**	1209322	1209323	1209324	1209325	1209326	1209327	1209328	1209329
				Sample Location:	BH103	BH103	BH103	BH103	BH104	BH104	BH104	BH104
				Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Top Depth (m):	9.00	10.00	14.00	16.00	7.00	8.00	10.00	12.00
				Bottom Depth (m):	9.45	10.45	14.45	16.45	7.45	8.45	10.45	12.45
				Date Sampled:	14-May-2021	14-May-2021	14-May-2021	14-May-2021	14-May-2021	14-May-2021	14-May-2021	14-May-2021
Determinand	**Accred.**	**SOP**	**Units**	**LOD**								
Moisture	N	2030	%	0.020	33	31	23	27	22	25	25	31
pH	U	2010		4.0	9.2	9.2	8.6	8.3	9.1	9.3	9.3	9.2
Sulphate (2:1 Water Soluble) as SO4	U	2120	mg/l	10	31	52	300	300	130	68	93	110

Results - Soil

Project: S210402 BOC Hydrogen Plant

Client: Solmek Ltd			**Chemtest Job No.:**		21-17882
Quotation No.:			**Chemtest Sample ID.:**		1209330
			Sample Location:		BH104
			Sample Type:		SOIL
			Top Depth (m):		15.00
			Bottom Depth (m):		15.45
			Date Sampled:		14-May-2021
Determinand	**Accred.**	**SOP**	**Units**	**LOD**	
Moisture	N	2030	%	0.020	12
pH	U	2010		4.0	8.9
Sulphate (2:1 Water Soluble) as SO4	U	2120	mg/l	10	190

Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"
SOP	Standard operating procedure
LOD	Limit of detection

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.com

Dynamic Probing - Super Heavy

Job Number	S210402	**Type of Test**	DPSH-B	**Mass of hammer (kg)**	63.5
Job Name	BOC North Tees			**Drop height (mm)**	750
Test Number	DCP201	**Date**	11/05/2021	**Test Start Level**	0.3
Weather	Damp, intermittent rain	**Dip of hole**	0.0	**Type of cone**	Sacrificial

Depth (From) (m)	Depth (To) (m)	Number of Blows
0.30	0.40	8
0.40	0.50	10
0.50	0.60	10
0.60	0.70	12
0.70	0.80	7
0.80	0.90	8
0.90	1.00	12
1.00	1.10	12
1.10	1.20	15
1.20	1.30	15
1.30	1.40	16
1.40	1.50	17
1.50	1.60	20
1.60	1.70	35
1.70	1.80	49
1.80	1.90	50
1.90	2.00	50

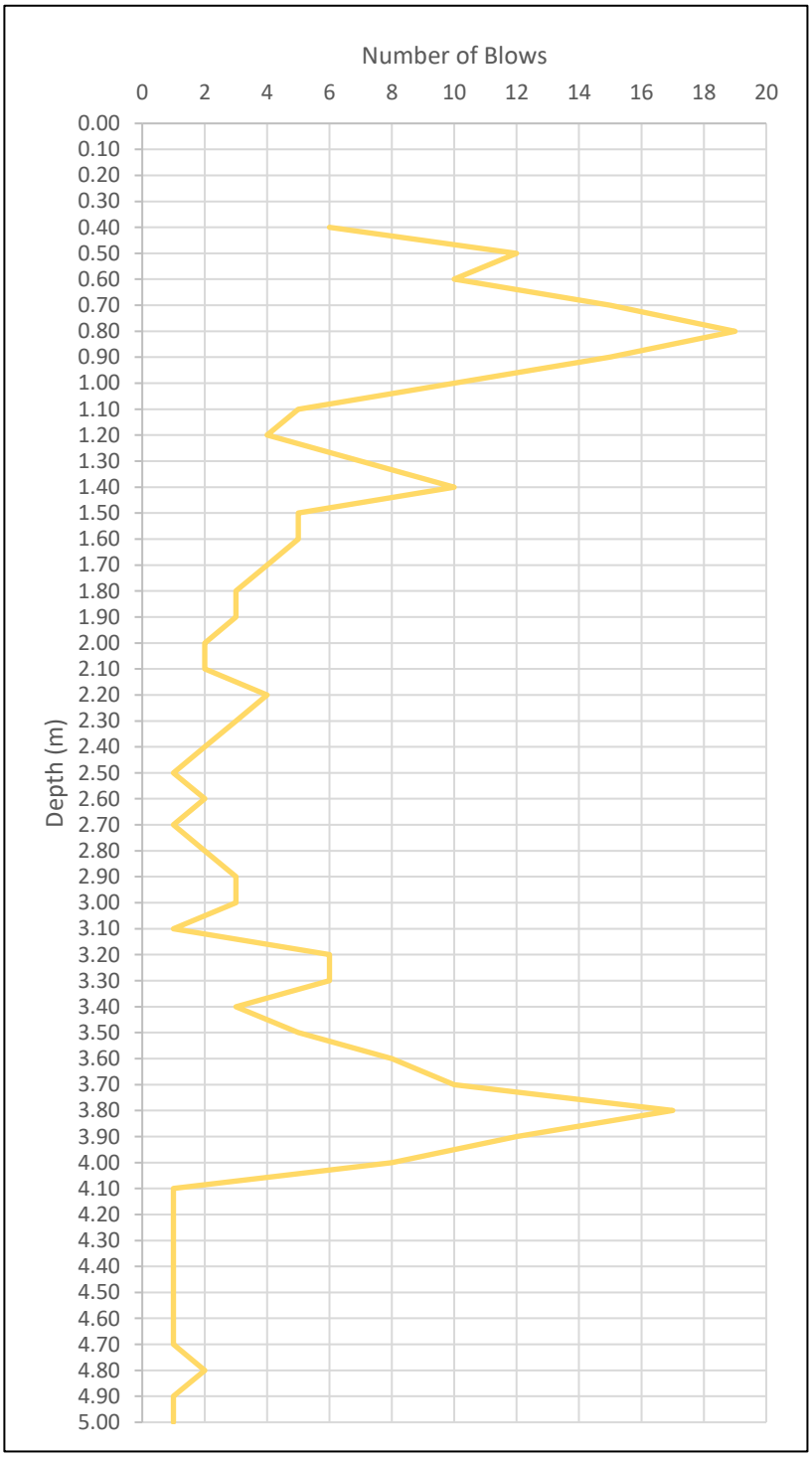
Comments: Concrete surface, test commenced from 0.30mbgl.

SOLMEK

Dynamic Probing - Super Heavy

Job Number	S210402	**Type of Test**	DPSH-B	**Mass of hammer (kg)**	63.5
Job Name	BOC North Tees			**Drop height (mm)**	750
Test Number	DCP202 (Page 1)	**Date**	11/05/2021	**Test Start Level**	0.3
Weather	Damp, intermittent rain	**Dip of hole**	0.0	**Type of cone**	Sacrificial

Depth (From) (m)	Depth (To) (m)	Number of Blows
0.30	0.40	6
0.40	0.50	12
0.50	0.60	10
0.60	0.70	15
0.70	0.80	19
0.80	0.90	15
0.90	1.00	10
1.00	1.10	5
1.10	1.20	4
1.20	1.30	7
1.30	1.40	10
1.40	1.50	5
1.50	1.60	5
1.60	1.70	4
1.70	1.80	3
1.80	1.90	3
1.90	2.00	2
2.00	2.10	2
2.10	2.20	4
2.20	2.30	3
2.30	2.40	2
2.40	2.50	1
2.50	2.60	2
2.60	2.70	1
2.70	2.80	2
2.80	2.90	3
2.90	3.00	3
3.00	3.10	1
3.10	3.20	6
3.20	3.30	6
3.30	3.40	3
3.40	3.50	5
3.50	3.60	8
3.60	3.70	10
3.70	3.80	17
3.80	3.90	12
3.90	4.00	8
4.00	4.10	1
4.10	4.20	1
4.20	4.30	1
4.30	4.40	1
4.40	4.50	1
4.50	4.60	1
4.60	4.70	1
4.70	4.80	2
4.80	4.90	1
4.90	5.00	1



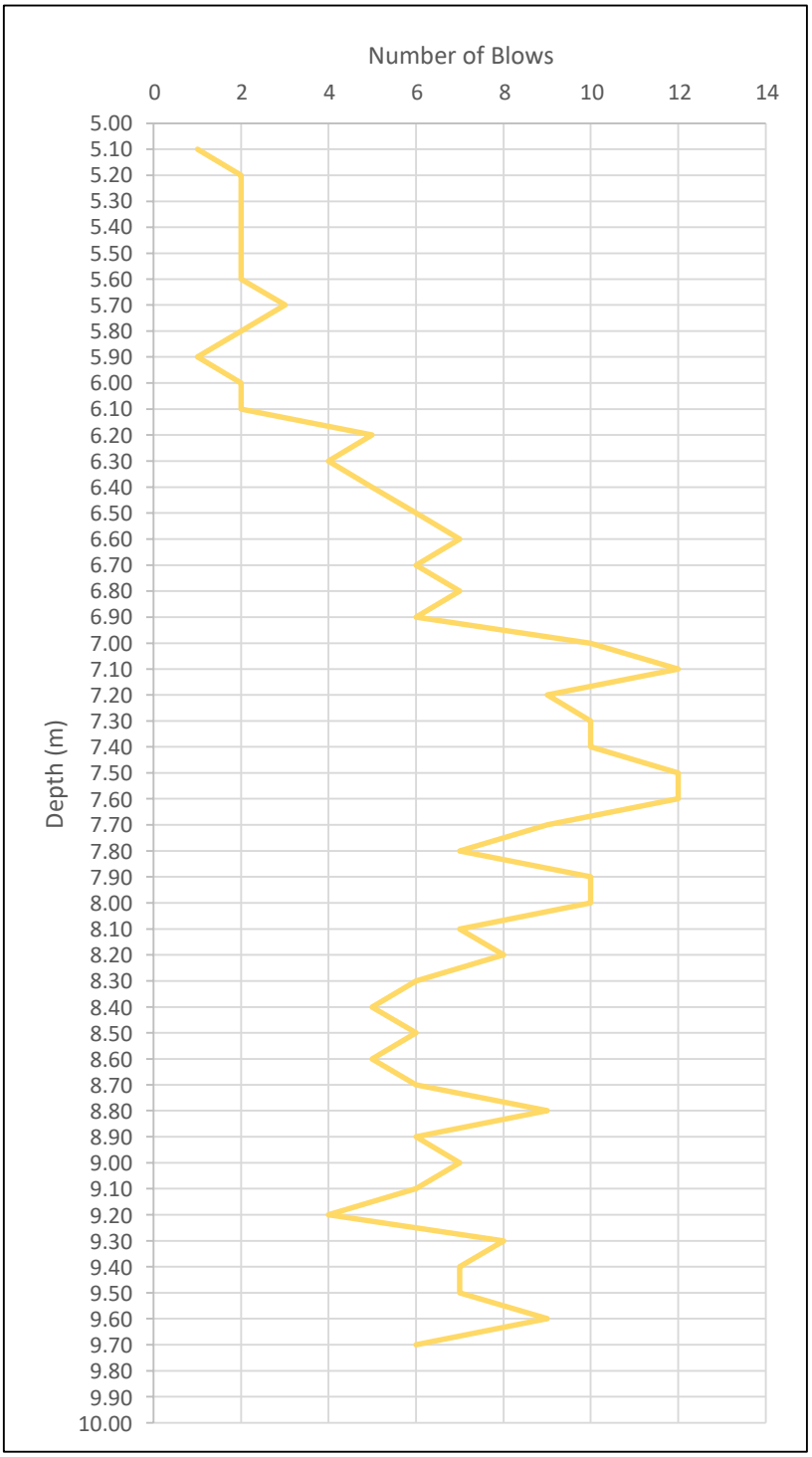
Comments: Concrete surface, test commenced from 0.30mbgl.

SOLMEK

Dynamic Probing - Super Heavy

Job Number	S210402	**Type of Test**	DPSH-B	**Mass of hammer (kg)**	63.5
Job Name	BOC North Tees			**Drop height (mm)**	750
Test Number	DCP202 (Page 2)	**Date**	11/05/2021	**Test Start Level**	0.3
Weather	Damp, intermittent rain	**Dip of hole**	0.0	**Type of cone**	Sacrificial

Depth (From) (m)	Depth (To) (m)	Number of Blows
5.00	5.10	1
5.10	5.20	2
5.20	5.30	2
5.30	5.40	2
5.40	5.50	2
5.50	5.60	2
5.60	5.70	3
5.70	5.80	2
5.80	5.90	1
5.90	6.00	2
6.00	6.10	2
6.10	6.20	5
6.20	6.30	4
6.30	6.40	5
6.40	6.50	6
6.50	6.60	7
6.60	6.70	6
6.70	6.80	7
6.80	6.90	6
6.90	7.00	10
7.00	7.10	12
7.10	7.20	9
7.20	7.30	10
7.30	7.40	10
7.40	7.50	12
7.50	7.60	12
7.60	7.70	9
7.70	7.80	7
7.80	7.90	10
7.90	8.00	10
8.00	8.10	7
8.10	8.20	8
8.20	8.30	6
8.30	8.40	5
8.40	8.50	6
8.50	8.60	5
8.60	8.70	6
8.70	8.80	9
8.80	8.90	6
8.90	9.00	7
9.00	9.10	6
9.10	9.20	4
9.20	9.30	8
9.30	9.40	7
9.40	9.50	7
9.50	9.60	9
9.60	9.70	6



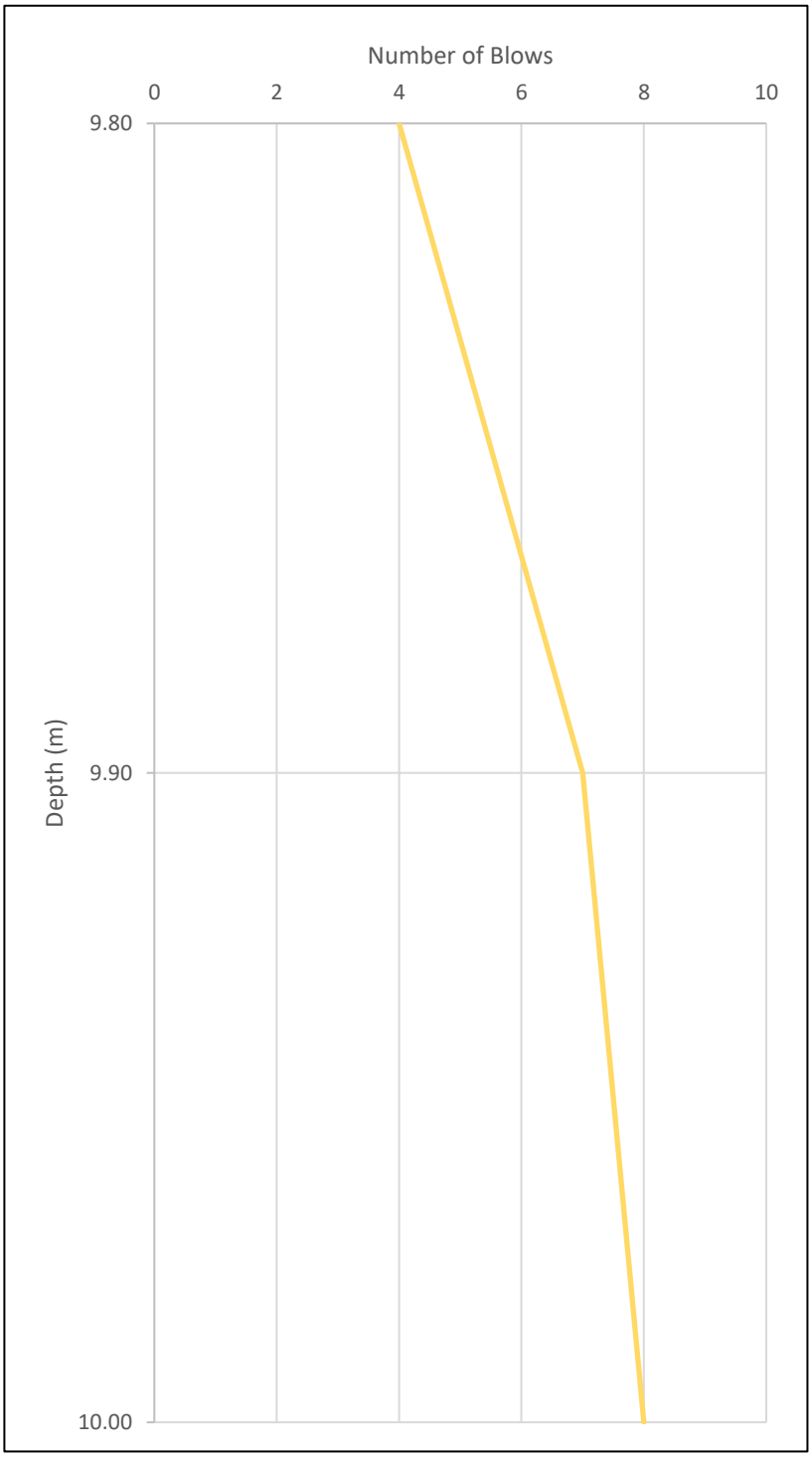
Comments: Concrete surface, test commenced from 0.30mbgl.

SOLMEK

Dynamic Probing - Super Heavy

Job Number	S210402	**Type of Test**	DPSH-B	**Mass of hammer (kg)**	63.5
Job Name	BOC North Tees			**Drop height (mm)**	750
Test Number	DCP202 (Page 3)	**Date**	11/05/2021	**Test Start Level**	0.3
Weather	Damp, intermittent rain	**Dip of hole**	0.0	**Type of cone**	Sacrificial

Depth (From) (m)	Depth (To) (m)	Number of Blows
9.70	9.80	4
9.80	9.90	7
9.90	10.00	8



Comments: Concrete surface, test commenced from 0.30mbgl.

SOLMEK

APPENDIX E:
Notes on Limitations & Contamination Guidance

UK BACKGROUND

Environmental Protection Act 1990: Part 2A Revised Statutory Guidance (April 2012)

This revised document explains how the Local Authority should decide if land, based on a legal interpretation, is contaminated. The document replaces the previous guidance given in Annex 3 of DEFRA Circular 01/2006, issued in accordance with section 78YA of the 1990 Environmental Protection Act.

The main objectives of the Part 2A regime are to *"identify and remove unacceptable risks to human health and the environment" and* to *"seek to ensure that contaminated land is made suitable for its current use".*

Part 2A uses a risk based approach to defining contaminated land whereby the "risk" is interpreted as *"the likelihood that harm, or pollution of water, will occur as a result of contaminants in, on or under the land"* and by *"the scale and seriousness of such harm or pollution if it did occur".*

For a relevant risk to exist a contaminant, pathway and receptor linkage must be present before the land can be considered to be contaminated. The document explains that *"for a risk to exist there must be contaminants present in, on or under the land in a form and quantity that poses a hazard, and one or more pathways by which they might significantly harm people, the environment, or property; or significantly pollute controlled waters."*

A conceptual model is used to develop and communicate the risks associated with a particular site.

To determine if land is contaminated the local authority use various categories from 1 to 4. Categories 1 and 2 include *"land which is capable of being determined as contaminated land on grounds of significant possibility of significant harm to human health."*

Categories 3 and 4 *"encompass land which is not capable of being determined on such grounds".*

PRELIMINARY CONCEPTUAL MODEL

Preliminary Conceptual Models are undertaken in accordance with CIRIA C552. The Preliminary Conceptual Model assesses the consequence and the likelihood of a risk being realised to provide a risk classification, using the tables detailed below.

CONSEQUENCE OF RISK BEING REALISED (Based on C552 CIRIA, 2001)

Classification	Definition	Example
Severe	Short-term (acute) risk to human health, the environment, an element of the development or other aspect with is likely to result in *significant harm*, damage or both.	High concentrations of cyanide on the surface of an informal recreational area. Major spills of contaminants from site into controlled water. High concentrations of explosive gas in the subsurface environment that have a clear unobstructed pathway into buildings.
Moderate	Chronic damage to human health, a plausible chance that an event will occur, although the timeline is not immediate to be in the short-term.	Appreciable concentration of contamination that over the longer-term will cause significant harm i.e. high lead concentration in topsoil. Shallow mine workings that are potentially unstable but may remain in a satisfactory or stable conditions for a number of years.
Mild	Low level pollution of non-sensitive water, a feasible hazardous scenario although the timeline of such occurring can probably be considered in 10's of years.	The effect of high sulphate concentrations on structural concrete. Pollution of non-classified groundwater.
Minor	Harm, although not necessarily significant to human health, or with respect to other aspects of the development, which are considered implausible in terms of occurrence, or will have little consequential impact.	The presence of contaminants at such low concentrations that protective equipment is required during site works. Any damage to structures is minimal and will not be structural in characteristics.

PROBABILITY OF RISK BEING REALISED (C552 CIRIA, 2001)

Classification	Definition
High Likelihood	There is a viable pollutant linkage and an event that either appears very likely in the short term and almost inevitable over the long term, or there is evidence that the receptor has been harmed or polluted.
Likely	There is a viable pollutant linkage and all elements are present and in the right place, which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short term and likely over the long term.
Low Likelihood	There is a viable pollutant linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such event would take place, and is less likely in the shorter term.
Unlikely	There is a viable pollutant linkage but circumstances are such that it is improbable that an event would occur even in the very long term.

RISK CLASSIFICATION MATRIX (C552 CIRIA, 2001)

Risk = Probability x Consequence		Consequence			
		Severe	**Moderate**	**Mild**	**Minor**
Probability	**High likelihood**	Very high risk	High risk	Moderate risk	Moderate/low risk
	Likely	High risk	Moderate risk	Moderate/low risk	Low risk
	Low likelihood	Moderate risk	Moderate/low risk	Low risk	Very low risk
	Unlikely	Moderate/low risk	Low risk	Very low risk	Very low risk

HUMAN RECEPTORS

Human exposure to contaminants present in soils can occur via several pathways. Direct exposure pathways include dermal absorption after contact with contaminated ground, inhalation of soil or dust, inhalation of volatised compounds, and inadvertent soil ingestion (or deliberate soil ingestion in the case of some children). Other indirect pathways include human ingestion of plants grown in contaminated soil or contaminated ground or surface water. Contaminants associated with wind blown dust can affect humans on surrounding sites.

VEGETATION

Plants can be affected by soil contamination in a number of ways resulting in growth inhibition, nutrient deficiencies and yellowing of leaves. Contaminants are taken up by plants through the roots and through foliage. Contaminants identified as being highly phytotoxic include boron, cadmium, copper, lead, nickel, and zinc.

To establish if the levels of contaminants present on a site may pose a risk to vegetation the results of the contamination testing are compared to a series of threshold values published in 'Code of Good Agricultural Practice for the Protection of Soil'.

GROUNDWATER AND SURFACE WATER RECEPTORS

The principal pathway by which soil contamination may reach the water environment is through a slow seepage or leaching to groundwater or surface water. The potential for contaminants to migrate along such pathways is dependent on the chemical and physical characteristics of the contaminants and the local hydrogeology. Surface watercourses may also accumulate contamination as contaminated sediments are deposited within the water body.

Where the site investigated overlies major/principal aquifers (and in some cases minor/secondary aquifers depending on certain conditions), groundwater Source Protection Zones and areas in close proximity to groundwater abstractions, contamination test results have been compared with the Water Supply (Water Quality) Regulations 1989 and The Water Supply (Water Quality) Regulations 2000.

Should a surface water receptor, such as a fresh water environment (river, canal, stream, lake etc), or marine environment be considered sensitive in relation to a site, then test results are compared with DEFRA & SEPA Environmental Quality Standards (2004). Many of the Environmental Quality Standards are hardness ($CaCO_3$) depended. Where no hardness values are available, Solmek assume conservative values (of between 0 and 50mg/l).

In the absence of vulnerable ground and surface water environments, Solmek may compare any test results with the Environment Agency Leachate Quality Threshold Values.

DETAILED QUANTITATIVE RISK ASSESSMENT (DQRA)

In line with Environment Agency's guidance document Environment Agency *Land Contamination Risk Management*, which replaced the now-withdrawn *Contaminated Land Report 11 – Model Procedures for the Management of Land Contamination (2004)*, a DQRA for groundwater/human health may be required following a Phase 2 investigation and before the preparation of a Phase 3 Remediation Strategy. For human health DQRA, a site specific assessment criteria is undertaken using CLEA Software Version 1.06. For groundwater DQRA, the Environment Agency Remedial Targets Worksheet Version 3.1 is used.

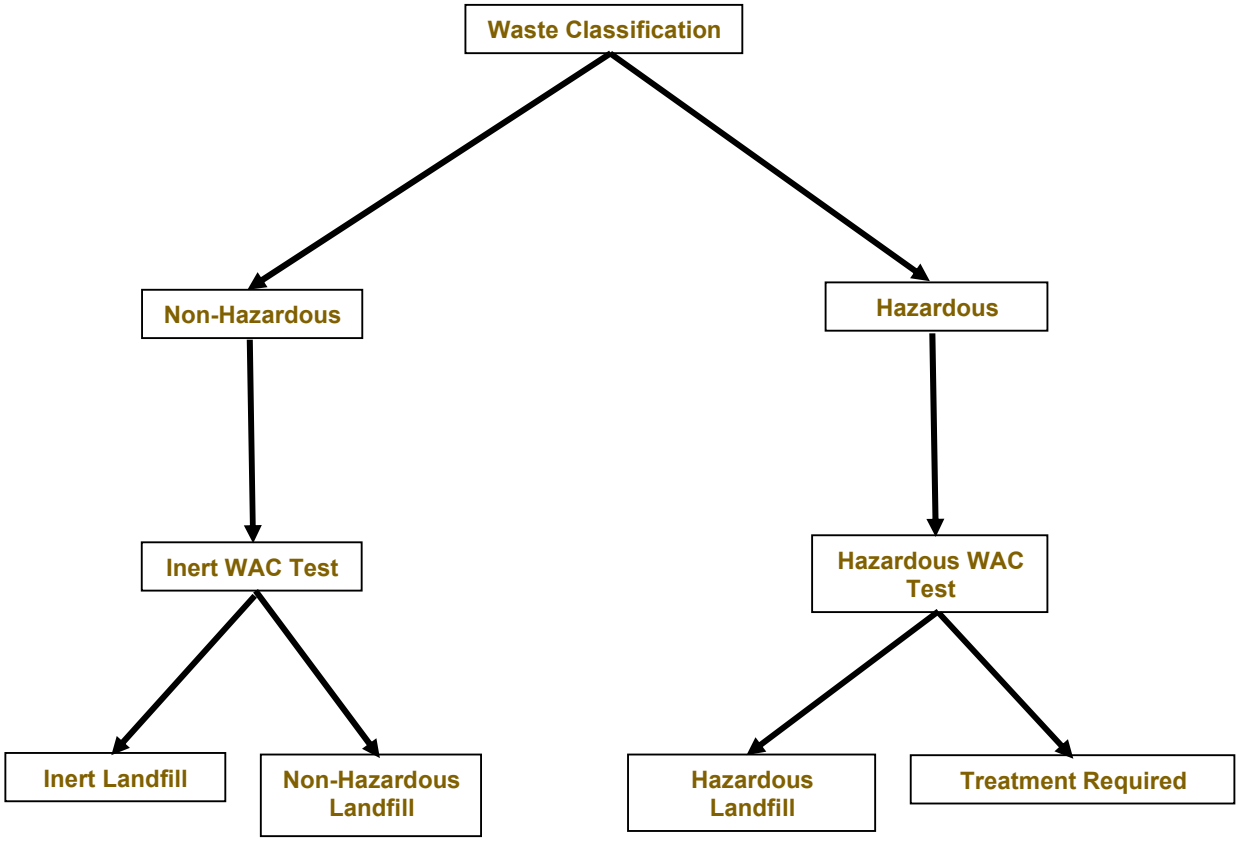
WASTE CLASSIFICATION AND WASTE ACCEPTANCE CRITERIA

During the site strip and construction activities, material may be required to be removed from site. Any such material would require classification, in line with Environment Agency Technical Guidance *Waste Classification: Guidance on the classification and assessment of waste (2015)*. This would classify the material as either Non-Hazardous or Hazardous Waste.

Once the material has been classified, determining the suitable landfill for disposal is governed by landfill directive Waste Acceptance Criteria (WAC) testing, with landfills categorized as Inert Waste, Stable Non-Reactive Hazardous Waste and Hazardous Waste. The WAC testing relates to materials that are to be exported from a site/development to landfill, and do not directly relate to human health specifically. The testing results are generally presented as certificates which can be used by site owners/contractors etc, which should be presented to the accepting waste facility or waste contractor.

If waste classification and/or WAC testing are not undertaken, material taken off site may be subject to WAC testing by the appropriate waste disposal company. The decision on whether or not to accept waste, or whether further testing is required, is at the discretion of the waste disposal company.

The below flow chart provides further information on the waste classification process.



CONSTRUCTION MATERIALS

Materials at risk from possible soil contaminants include inorganic matrices such as cement and concrete and also organic material such as plastics and rubbers. Acid ground conditions and high levels of sulphates can accelerate the corrosion of building materials. Where pH and soluble sulphate analysis has been undertaken, Solmek compare the test results with the guidelines presented within BRE Special Digest 1, 2005 (3rd Edition) 'Concrete in Aggressive Ground'. Plastics and rubbers are generally used for piping and service ducts and are potentially attacked by a range of chemicals, most of which are organic, particularly petroleum based substances. Drinking water supplies can be tainted by substances that can penetrate piping and water companies enforce stringent threshold values.

The levels of potential contaminants should be compared to thresholds supplied in the UK Water Industry Research (UKWIR) publication "Guidance for the selection of Water Supply Pipes to be used in Brownfield Sites" (January 2011). A Brownfield Site is defined in the document as "Land or premises that have not previously been used or developed that may be vacant or derelict". It should be noted that Brownfield sites may not be contaminated. The guidance does not apply to Greenfield Sites however water companies may have their own assessment criteria which should be checked by the developer. The table below outlines the pipe material selection threshold concentrations.

	Pipe Material (Threshold concentrations in mg/kg)					
Parameter group	**PE**	**PVC**	**Barrier pipe (PE-AL-PE)**	**Wrapped Steel**	**Wrapped Ductile Iron**	**Copper**
Extended VOC suite by purge and trap or head space and GC-MS with TIC	0.5	0.125	Pass	Pass	Pass	Pass
+ BTEX + MTBE	0.1	0.03	Pass	Pass	Pass	Pass
SVOCs TIC by purge and trap or head space and GC-MS with TIC (aliphatic and aromatic C5-C10)	2	1.4	Pass	Pass	Pass	Pass
+ Phenols	2	0.4	Pass	Pass	Pass	Pass
+ Cresols and chlorinated phenols	2	0.04	Pass	Pass	Pass	Pass
Mineral oil C11-C20	10	Pass	Pass	Pass	Pass	Pass
Mineral oil C21-C40	500	Pass	Pass	Pass	Pass	Pass
Corrosive (Conductivity, Redox and pH)	Pass	Pass	Pass	Corrosive if pH <7 and conductivity >400µS/cm	Corrosive if pH <5, Eh not neutral and conductivity >400µS/cm	Corrosive if pH <5 or >8 and Eh positive
Specific suite identified as relevant following site investigation						
Ethers	0.5	1	Pass	Pass	Pass	Pass
Nitrobenzene	0.5	0.4	Pass	Pass	Pass	Pass
Ketones	0.5	0.02	Pass	Pass	Pass	Pass
Aldehydes	0.5	0.02	Pass	Pass	Pass	Pass
Amines	Fail	Pass	Pass	Pass	Pass	Pass

REQUIREMENTS OF PARTIES WITHIN THE DEVELOPMENT PROCESS

Interested parties involved in the development process may use the data in different ways and there may be varying views and interpretation of the factual data. Local Authority staff may have a view on contamination and human health and the wider environment. The Environment Agency are concerned principally with the protection of Controlled waters. Building insurers, funders and purchasers may be primarily concerned with issues of potential commercial blight. Purchasers are also not always fully informed, and perceptions on issues associated with risk can affect the decision to purchase. Developers and construction organisations will focus on financial aspects of dealing with the contamination in the context of the development and construction programme.

RISKS & LIABILITIES FROM CONTAMINATION

In simple terms, risks associated with contamination may be considered in terms of 1) statutory risks and 2) development related risks. If contamination is severe or forms a potential hazard based on its potential to affect groundwater, surface water or human health, a statutory risk may be present, and as such, if the risk is not reduced, criminal proceedings may be instigated by a government body or local authority.

If the contamination is less severe or not considered to be mobile, it may be considered a commercial liability which could, in theory remain untreated, but which may at a later date affect the value of the property, or, with changing legislation, become a statutory risk. Commercial liabilities could give rise to civil proceedings by third parties if there are grounds for action.

♣Solmek conditions of offer, notes on limitations & basis for contract (ref: version1/2021)

These conditions accompany our tender and supercede any previous conditions issued. Solmek will prepare a report solely for the use of the Client (the party invoiced) and its agent(s). No reliance should be placed on the contents of this report, in whole or in part by 3rd parties. The report, its content and format and associated data are copyright, and the property of Solmek. Photocopying of part or all of the contents, transfer or reproduction of any kind is forbidden without written permission from Solmek. A charge may be levied against such approval, the same to be made at the discretion of Solmek.

Solmek cannot be held liable and do not warrant, or otherwise guarantee the validity of information provided by third parties and subsequently used in our reports. Solmek are not responsible for the action negligent of otherwise of subcontractors or third parties.

Site investigation is a process of sampling. The scope and size of an investigation may be considered proportional to levels of confidence regarding the ground and groundwater conditions. The exploratory holes undertaken investigate only a small volume of the ground in relation to the overall size of the site, and can only provide a general indication of site conditions. The opinions provided and recommendations given in this report are based on the ground conditions as encountered within each of the exploratory holes. There may be different ground conditions elsewhere on the site which have not been identified by this investigation and which therefore have not been taken into account in this report. Reports are generally subject to the comments of the local authority and Environment Agency. The comments made on groundwater conditions are based on observations made at the time that site work was carried out. It should be noted that mobile contamination, ground gas levels and groundwater levels may vary owing to seasonal, tidal and/or weather related effects. Solmek cannot be held liable for any unrecorded or unforeseen obstructions between exploratory boreholes and trial pits. This includes instances where previous structures on the site (buried man made structures) or the presence of boulder clay (cobbles and/or boulder obstructions) have been anticipated. All types of piling operations should make allowance for obstructions within the construction budget to accommodate this. Unrecorded ancient mining may occur anywhere where seams that have been worked and influence the rock and soil above. Dissolution cavities can occur where gypsum or chalk is present. Rotary drilling is the recommended technique to prove the integrity of the rock.

Where the scope of the investigation is limited via access to information, time constraints, equipment limitations, testing, interpretation or by the client or his agents budgetary constraints, elements not set out in the proposal and excluded from the report are deemed to be omitted from the scope of the investigation.

Desk studies are generally prepared in accordance with RICS guidelines. Environmental site investigations are generally undertaken as 'exploratory investigations' in accordance with the definitions provided in paragraph 5.4 of BS 10175:2011 in order to confirm the conceptual assumptions. You are advised to familiarize yourself with the typical scope of such an investigation. No pumping of water will be undertaken unless a licence or facilities/equipment have been arranged by others.

Where the type, number or/and depth of exploratory hole is specified by others, Solmek cannot and will not be responsible for any subsequent shortfall or inadequacy in data, and any consequent shortfall in interpretation of environmental and geotechnical aspects which may be required at a later date in order to facilitate the design of permanent or temporary works.

All information acquired by Solmek in the course of investigation is the property of Solmek, and, only also becomes the joint property of the Client only on the complete settlement of all invoices relating to the project. Solmek reserve the right to use the information in commercial tendering and marketing, unless the Client expressly wishes otherwise in writing. The quoted rates do not include VAT, and payment terms are 30 days from dispatch of invoice from our offices. Quotes are subject to a site visit.

We have allowed for 1 mobilisation and normal working hours unless otherwise stated. The scope of the investigation may be reviewed following the desk study and/or fieldwork. The presence or otherwise of Japanese Knotweed or other invasive plants can be difficult to identify especially during winter months. If Japanese Knotweed or other invasive species are suspect, it should be confirmed by an ecologist. We have not allowed for acquiring services information, and cannot be responsible for damage to underground services or pipes not shown to us or not clearly shown on plans. Costs incurred will be passed on to you, and in commissioning Solmek you understand and accept that you/your agent have a contractual relationship with Solmek & you accept this. Our rates assume unobstructed, reasonably level and firm access to the exploratory positions and adequate clear working areas and headroom. We have priced on the basis that you or your client have the necessary permissions, wayleaves and approvals to access land. All boreholes and pits are backfilled with arisings except where gas monitoring pipes are installed with stopcock covers. Solmek are not responsible for any uneven surfaces as a result of siteworks and rutting and backfilled excavations may require re-levelling and/or making good by others after fieldwork is complete, and Solmek has not allowed for this. No price has been provided or requested for a return visit to remove pipework and covers. Hourly rates apply to consultancy only and do not include expenses unless otherwise shown. If warranties are required, legal costs incurred will be passed on to you assuming Solmek agree to complete such warranties, modified or otherwise and you understand and agree to pay all costs.

We reserve the right to pursue full payment of the invoice prior to release of any information including reports. We advise you/your client that we may elect to pursue our statutory rights under late payment legislation, and will apply 8% to the base rate for unreasonably late payments. Solmek are exempt from the CIS Scheme. Solmek offer to undertake work only in strict accordance with conditions covered by our current insurances, which are available for inspection. Solmek are not responsible for acts, negligent or otherwise of subcontractors and as a matter of policy cannot indemnify any other parties. Professional indemnity Insurance is limited to ten times the invoice net total except where stated otherwise by Solmek. Solmek give notice that consequential loss as a direct or indirect result of Solmek's activities or omission of the same are excluded.