SOLMEK

Phase 2: Site Investigation

Former ITEC Building, Goulton Street, Hull

William Birch & Sons Ltd

S210340

Solmek Ltd

12 Yarm Road
Stockton-on-Tees
TS18 3NA
Tel: 01642 607083

www.solmek.com

info@solmek.com

bsi. ISO 9001:2015 Quality Management
bsi. ISO 14001:2015 Environmental Management
bsi. ISO 45001 Occupational Health and Safety Management
CHAS Accredited Contractor CHAS.co.uk

PHASE 2 SITE INVESTIGATION REPORT

FORMER ITEC BUILDING, GOULTON STREET, HULL

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Revision	Date	Prepared By	Signed
Rev/1 to include landscaping comments	April 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	Goulton Street, Hull
Proposed Development	The site is expected to be developed with new commercial units with associated parking.
Fieldwork	• 2no cable percussive boreholes (BH01 & BH02) drilled to a maximum of 20.00mbgl with 2no. monitoring pipes. • 6no machine excavated trial pits (TP01 to TP06) to a maximum depth of 2.50mbgl.
Ground Conditions	• Made ground was encountered to depths of between 0.50mbgl and 1.50mbgl. • Soft to stiff consistency slightly sandy locally slightly gravelly clay initially encountered. • From ca. 2.00mbgl very soft to soft consistency very low to low strength silty clay was encountered and proven to depths of between 10.40-10.60mbgl • Stiff consistency thinly laminated clay encountered from ca. 17.40mbgl to termination depths. • Thin band of peat present in BH02 (6.40-6.60mbgl). • No groundwater was encountered within any of the exploratory positions.
Contamination Testing Results	• Four made ground samples and one natural sample tested. • Elevated PAHs in BH03 (0.30m). • Asbestos fibres within BH03 only (0.036%). • Alkaline pH.
Contamination Analysis	• Given the site's proposed Commercial land use, the levels of contamination recorded on site may 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 contaminated (asbestos and PAHs) with respect to construction workers. PPE for workers. Damping down of site during dry windy conditions. • Suitable growing medium required to 0.50m, formed from imported materials. • 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-1 ACEC (Class AC-1s). This assumes static groundwater conditions.
Geotechnical Testing Results	• Shallow cohesive deposits medium to high strength (55kPa-100kPa) based on in-situ hand vanes. • SPT N values ranged from 2 to 33, indicating very low to high strength conditions. • Triaxial results ranged from 22 to 77kPa. • Cohesive materials on site have a medium volume change potential. • Moisture contents between 17 and 55%. • Sulphates between <10-260mg/l, pH slightly alkaline. • CBRs between 2.71 and 6.51%.
Geotechnical Analysis & Foundation Recommendations	• Recommended to adopt piled foundations – this report should be made available to a competent piling contractor. • Suspended reinforced ground slab or precast concrete floor slab should be used, unless made ground is first excavated and replaced with compacted granular fill. • Normal earthworks plant for excavations.

2 INTRODUCTION

2.1 Authorisation

The site investigation described in this report was carried out by Solmek to the instructions of William Birch & Sons Ltd, on land located at Goulton Street, Hull.

Sources of information, including previous work undertaken at the site, are detailed below:

- *Sub Surface Phase 1 Desk Study (NE3914) March 2020.*

Reference should be made to the above report for details of the site's history and environmental setting.

2.2 Scope of Works

The site is expected to be developed with new commercial units with associated parking.

A geotechnical and environmental investigation including a ground gas risk assessment was requested. The fieldwork and testing was generally carried out according to the recommendations of BS5930: 2015 *Code of Practice for Ground Investigations* and where applicable BS EN 1997-2:2007 with soil descriptions to BS EN 14688-1:2013 where applicable.

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 by Sub Surface on 4th March 2020 with the site re-appraised by Solmek during the fieldworks. The site is centred at Ordnance Survey Co-ordinates 508144, 427490 and covers approximately 0.17Ha.

The site is a rectangular shaped parcel of land of level topography.

In the centre of the site is the former ITEC building, which is locked and secured. The building is of brick and stone construction, and is 2-4 storeys with a cellar noted. Vegetation is present to the west and north of the building, with hardstanding present to the east.

Access to the building was not possible during Solmeks intrusive works, however Solmek note that the Sub Surface desk study identified asbestos and a possible oil tank within the cellar.

The surrounding areas of the site are generally commercial/industrial.

3.1 Fieldwork

The fieldwork was commenced on 17th March 2021, with additional works undertaken on 26th March. The extent of the investigation was:

- 2no cable percussive boreholes (BH01 & BH02) to a maximum depth of 20.00m below ground level (bgl).
    - The boreholes were evenly spread around the site to achieve maximum site coverage.

- Gas monitoring wells were installed in BH's 01 & 02.
    - The wells were spaced at <25m centres evenly around the site in accordance with CIRIA C665.
- 6no machine excavated trial pits (TP01 to TP06) were dug to a maximum depth of 2.50mbgl.
    - The trial pits were spaced evenly across the site locate potential deeper areas of made ground from the former building footprints as well as relict footings and other potential obstructions.
    - Plate Bearing Tests undertaken within TP01, TP03 and TP06.
- 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 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 was encountered to a minimum depth of 0.50mbgl (TP04) and a maximum depth of 1.50mbgl (TP05). The made ground broadly consisted of a surface covering of either topsoil or concrete (0.10-0.20m thick), generally overlying granular fill, in turn generally underlain by clay fill.

TP05 and TP06 were excavated into a bund at the west of the site, which was shown to be formed of clay fill.

Within TP02 and TP03, hydrocarbon odours were noted within the clay fill.

4.2 Natural Deposits

Proven to underlie the made ground deposits across the site, natural ground generally comprised initially soft to stiff consistency slightly sandy locally slightly gravelly medium to high strength clays, however by ca. 2.00mbgl, very soft to soft consistency very low to low strength silty clay was encountered, to depths of between 10.40 and 10.60mbgl.

The natural deposits then encountered firm to stiff consistency slightly sandy slightly gravelly medium to high strength clay, which was proven to depths of between 17.40 and 17.90mbgl, at which point stiff consistency thinly laminated slightly sandy high strength silty clay was encountered and proven to termination depths of 20.00mbgl.

Within BH02 only, a thin band of peat was encountered, from 6.40-6.60mbgl.

4.3 Groundwater

No groundwater was encountered within any of the exploratory positions.

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.

5 CONTAMINATION TESTING RESULTS

The proposed development of the site is to involve the construction of commercial units with associated 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 Site Characterisation

Within the Sub Surface Phase 1 Desk Study, a preliminary conceptual model was formed based on the information obtained. The initial risk was based on the site history which recorded housing as present from ca. 1906 which were all demolished by ca. 1977, whilst a hostel was noted from ca. 1963, which was the present-day building.

An overall low to moderate risk was provided for various receptors:

- Human Health – Low to Moderate
- Controlled Water – Low
- Current Site Users (on-site workers/visitors) – Low to Moderate
- Vegetation – Low
- Construction Materials – Low to Moderate

5.2 Contamination Testing and Rationale

To provide information upon the possibility of ground contamination four samples of made ground and one sample of natural clay were selected for shallow contamination testing. A Low to Moderate overall contamination risk was highlighted in the Phase 1 Desk Study due to previous land uses. This coupled with the end use being Commercial means that five samples are considered appropriate for testing. The samples selected are detailed below:

- BH01 – 0.30m (Made ground – clay fill)
- BH01 – 0.70m (Natural clay)
- BH02 – 0.30m (Made ground – granular fill)
- TP02 – 0.40-0.60m (Made ground – clay fill, hydrocarbon odour noted)
- TP04 – 0.10-0.30m (Made ground – topsoil)

The samples selected are considered to provide coverage of both the made ground and shallow natural strata 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:

- 5no Metals, semi-metals, non-metals, inorganic determinants
- 5no Asbestos identification screenings
- 5no Speciated Polyaromatic Hydrocarbons (PAHs)
- 3no Total Petroleum Hydrocarbon Criteria Working Group fractions (TPHCWG)

5.3 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 1 and 2.

TABLE 1: 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	5	0.15	0.67	190	0
Chromium	mg/kg	5	23	41	8600	0
Copper	mg/kg	5	31	680	68000	0
Lead	mg/kg	5	53	670	2300*	0
Mercury	mg/kg	5	0.15	1.2	1100	0
Nickel	mg/kg	5	27	47	980	0
Zinc	mg/kg	5	100	1000	730000	0
Semi metals and non metals						
Arsenic	mg/kg	5	20	38	640**	0
Boron	mg/kg	5	0.48	2.6	240000	0
Selenium	mg/kg	4	<0.2	0.31	12000	0
Inorganic chemicals						
Cyanide (Total)	mg/kg	3	<0.5	1.4	1580**	0
Sulphate (2:1 Water Soluble)	mg/l	3	<10	240	2000^	0
Other						
pH	pH	-	9.0	12.0	5.5^	0

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

5.4 Metals, Semi Metals and Non Metals

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

5.5 Inorganic Chemicals

Soluble sulphates (potentially aggressive to foundation concrete) were recorded between <10 and 240mg/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 9.0 and 12.0, which is consistent with alkaline conditions.

5.6 Organic Chemicals

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

The average SOM recorded across the site was 2.8% therefore a SOM of 2.5% has been used to determine the S4UL thresholds. Table 2, below, summarises the results.

TABLE 2: 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 2.5% SOM	Number of Results Exceeding Threshold Value
TPH Aliphatic Fractions						
Aliphatic (C5-C6)	mg/kg	0	<1	-	5900	0
Aliphatic (C6-C8)	mg/kg	0	<1	-	17000	0
Aliphatic (C8-C10)	mg/kg	0	<1	-	4800	0
Aliphatic (C10-C12)	mg/kg	0	<1	-	23000	0
Aliphatic (C12-C16)	mg/kg	0	<1	-	82000	0
Aliphatic (C16-C21)	mg/kg	0	<1	-	1700000	0
Aliphatic (C21-C35)	mg/kg	1	<1	73	1700000	0
Aliphatic (C35-C44)	mg/kg	0	<1	-	1700000	0
TPH Aromatic Fractions						
Aromatic (C5-C7)	mg/kg	0	<1	-	46000	0
Aromatic (C7-C8)	mg/kg	0	<1	-	110000	0
Aromatic (C8-C10)	mg/kg	0	<1	-	8100	0
Aromatic (C10-C12)	mg/kg	0	<1	-	28000	0
Aromatic (C12-C16)	mg/kg	0	<1	-	37000	0
Aromatic (C16-C21)	mg/kg	2	<1	39	28000	0
Aromatic (C21-C35)	mg/kg	2	<1	460	28000	0
Aromatic (C35-C44)	mg/kg	0	<1	-	28000	0
Speciated PAH						
Naphthalene	mg/kg	4	<0.1	5.7	460	0
Acenaphthylene	mg/kg	4	<0.1	4.4	97000	0
Acenaphthene	mg/kg	4	<0.1	23	97000	0
Fluorene	mg/kg	4	<0.1	29	68000	0
Phenanthrene	mg/kg	5	1	180	22000	0
Anthracene	mg/kg	5	0.29	62	540000	0
Fluoranthene	mg/kg	5	0.92	180	23000	0
Pyrene	mg/kg	5	0.98	160	54000	0
Benzo[a]anthracene	mg/kg	4	<0.1	78	170	0
Chrysene	mg/kg	4	<0.1	72	350	0
Benzo[b]fluoranthene	mg/kg	4	<0.1	83	44	1
Benzo[k]fluoranthene	mg/kg	4	<0.1	36	1200	0
Benzo[a]pyrene	mg/kg	4	<0.1	66	35	1
Benzo[g,h,i]perylene	mg/kg	4	<0.1	34	4000	0
Dibenz(a,h)Anthracene	mg/kg	4	<0.1	12	3.6	1
Indeno(1,2,3-c,d)Pyrene	mg/kg	4	<0.1	42	510	0
Total PAH	mg/kg	5	3.2	1100	1000*	1
Total Phenol	mg/kg	0	<0.3	-	1500	0
* EA Threshold Values						

Concentrations of Benzo(b)fluoranthene, Benzo(a)pyrene, Dibenz(ah)anthracene and total PAH were elevated within BH01 (0.30m), which was a sample of clay fill retrieved from the west of the site. No other exceedances were recorded.

PAH double ratio plot analysis has been undertaken on the sample from BH01 as well as on the three other samples which recorded the relevant PAH species above detection limits (Figure 3). The graph illustrates that the PAH source is generally coal tar/creosote.

5.7 Asbestos

From the five samples subject to asbestos screening, asbestos fibres were only recorded within one sample, BH01 (0.30m), where a bitumen-type material containing chrysotile was noted. The sample underwent quantification testing, with the results indicating that the sample comprised 0.039% asbestos by mass.

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 CONCEPTUAL MODEL AND CONTAMINATION ANALYSIS

The contamination conceptual model in Table 3 identifies the potential pollution linkages present on site based on source – pathway – receptor relationships.

TABLE 3: CONCEPTUAL MODEL

Source	Pathway	Receptor	Risk Rating	Comments
Asphyxiating or explosive ground gases • Made ground (1.50m) • No mining in vicinity of site • No landfills within 250m	**Ground gas migration** • Migration through permeable soils • Inhalation	**Future site users** • Transient adult workers	Moderate /Low	Gas monitoring in progress, source risk rating subject to change.
		Users during development • Construction workers	Low	
Areas of contamination hazardous to human health (Commercial Thresholds) • Five samples tested • No elevated inorganic determinants • Elevated PAHs within 1no sample (BH01 0.30m) • Asbestos (0.039%) present within 1no sample (BH01 0.30m)	• Inhalation • Dust ingestion • Dermal contact	**Future site users** • Transient adult workers	Moderate /Low	Mitigated by proposed structure hard standing – small areas of soft landscaping to be formed from a suitable growing medium comprising imported materials.
		Users during development • Construction workers	High	Mitigation measures required during construction. Consideration to be given to Health and Safety Executive: *Protection of Workers and the General Public During the Development of Contaminated Land.*
	• Inhalation • Dust ingestion	**Users of surrounding sites** • Transient adult workers	Moderate	Potential moderate risk during remediation/construction from dust generation. Consideration to be given to dust suppression, in line with BRE: *The Control of Dust and Emissions from Construction and Demolition, Best Practice Guidance.*
	• Leaching of mobilised contaminants	**Solid geology** • Principal Aquifer	Low	Limited localised low-solubility organic contamination is highly unlikely to impact the principal aquifer at depths >20.00mbgl.
		Drift geology • Unproductive Strata	Very Low	The low permeability and low sensitivity drift deposit aquifer is not considered to be at risk.
	• Drainage • Lateral migration • Accumulation of contaminated sediment	**Surface water features** • Humber Estuary located 273m southeast	Low	Distant surface waters highly unlikely to be impacted by the recorded contamination levels.
Areas of phytotoxic contamination	• Uptake via roots and leaf surfaces	**Vegetation** • None on site or proposed	Very Low	Small areas of soft landscaping to be formed from a suitable growing medium comprising imported materials.
Areas of contamination above service fabric or BRE Special Digest 1 thresholds	• Direct contact	**Construction Materials** • Concrete	Low	Made ground and natural ground not considered aggressive to concrete.
		Construction Materials • Service Fabric	Moderate /Low	Polyethylene and copper piping to be avoided and prudent to lay any service within a clean bedding.

In general terms, future users, construction workers, users of surrounding sites and construction materials are **potentially most** at risk as pollution linkages may be present for each of these receptors. Controlled waters and vegetation are considered to be at **potentially less** of a risk.

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 exceedances only noted within one of the five samples, as summarised below:

- BH01 (0.30m) recorded elevated Benzo(b)fluoranthene, Benzo(a)pyrene, Dibenzo(ah)anthracene and total PAH, as well as asbestos (0.039%).

The new development is expected to comprise new industrial units with associated access roads. Based on the **shallow** soil contamination testing, it is considered that the levels of contamination may pose a risk to future users of the site, however this pollutant linkage will be severed as all contaminated areas will be encapsulated either by buildings or hardstanding.

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.

Chrysotile asbestos fibres were detected in the sample from BH01 (0.30mbgl). This sample was sent for further analysis asbestos quantification testing by Gravimetry. The results of the screening and further testing are presented in Appendix C. This indicated that there was 0.039% by mass of asbestos within the sample.

Based on the guidance set forth in the Interdepartmental Committee for the Redevelopment of Contaminated Land (ICRCL), 1990, Guidance note 64/85 *Asbestos on Contaminated Sites,* as well as *The Hazardous Waste (England & Wales)* Regulations 2005, asbestos contaminated soil should be considered as a hazardous waste if the percentage by mass exceeds 0.1%. Should it have a mass of >0.001% it is considered as a risk to human health. Given that the sample showed 0.039% by mass it is possible that the soil may present a risk to human health.

In addition to the asbestos, locally elevated levels of PAHs were detected. It is considered that such levels of contamination may 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.

Further asbestos may be present elsewhere on the site that has not been sampled or tested during this investigation. It is therefore advised that having a qualified asbestos surveyor present during the initial site strip and any excavation works is given careful consideration. All works should be undertaken in accordance with the *Control of Asbestos Regulations* (2012) and CIRIA C733 *Asbestos in soil and made ground: a guide to understanding and managing risks*.

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.

To establish if the levels of contaminants present on site may pose a risk to vegetation the results of the contamination testing have been compared to a series of threshold values published in *Code of Good Agricultural Practice for the Protection of Soil*. No concentrations of the phytotoxic determinants are shown as elevated from the five samples tested.

For this site, small areas of soft landscaping are proposed. Given the existing nature of the site, and the size of the proposed areas of soft landscaping, it is considered adequate to implement a suitable growing medium. In these areas, it will be necessary to excavate these areas to 0.50mbgl or natural ground, whichever is shallower, and replace the excavated made ground with 0.50m of clean imported material, comprising 200mm topsoil over 300mm subsoil. The material should be imported from a reputable source. The topsoil and subsoil should be screened of any deleterious materials (i.e. ash, slag, brick rubble and concrete).

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 made ground (<1.50m) over drift deposits of locally slightly sandy locally silty clay. The drift deposits can be considered to have a low permeability, and are designated as an Unproductive Strata by the Environment Agency.

The published geology indicates the site is underlain by solid geology of Burnham Chalk Formation, which is designated as a Principal Aquifer by the Environment Agency but is not a Source Protection Zone. Rockhead was not proven in the intrusive investigation however drift deposits have been proven to 20.00mbgl.

The nearest surface water feature is the Humber Estuary located 273m southeast of the site.

The only recorded contamination was within one of five samples, localised to BH01 consisting of low-mobility PAH contamination.

Due to the generally low contamination found across the site, the aquifer designations beneath the site, and the distance to surface waters, the development is considered to represent a low 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-1 ACEC (Class AC-1s) requirements for concrete protection. This assumes static 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 (8.6 to 12.00) were recorded across the site at depths of between 0.10mbgl and 12.45mbgl 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 may 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 above 500mg/kg and PAH levels above 100mg/kg have been recorded locally (BH01). These levels are likely to mean the material cannot be considered as Inert Waste. 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 Commercial units.

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 two standpipes (BH01 & BH02) that were installed during the sitework. The gas monitoring will consist of four visits over a minimum period of one month. The gas monitoring results will be presented as an addendum to this report.

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, California Bearing Ratio Tests, insitu Standard Penetration Tests (SPTs) and Hand Shear Vane Tests were undertaken at regular intervals during drilling. The geotechnical results are presented in Appendix D.

8.1 Strength and Density

Four samples were subjected to remoulded quick, undrained triaxial testing from BH01 (1.50m, 12.00m & 18.00m) and BH02 (13.50m). The results ranged from 22 to 77kPa, indicating low to high strength conditions.

Hand shear vane testing within the shallow natural cohesive deposits returned results ranging 55kPa to 100kPa, which are indicative of medium to high strength conditions, with the results generally decreasing with depth.

Standard Penetration Tests undertaken within the shallow natural cohesive deposits (<10.50mbgl) yielded N values of between 2 and 8. Using the Terzaghi and Peck (1967) correction, these N values can be multiplied by five to provide approximate shear strengths, with these results indicating very low to medium strength deposits.

N values within the deeper natural cohesive deposits (>10.50mbgl) ranged from 13 to 33, indicating medium to high strength deposits.

8.2 Moisture Contents

Three samples recovered from the boreholes have been subject to moisture content tests to determine the moisture profile at depths of between 1.50 and 12.00mbgl. Moisture levels were between 17% and 55%.

8.3 Atterberg Limit Determinations

Three 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 of low to high plasticity.

The Plasticity Indices ranged from 12 to 28 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.

8.4 Particle Size Distribution and Sedimentation Testing

One sample from the boreholes (BH02 7.50mbgl) was subject to Particle Size Distribution (PSD) testing in accordance with BS1377 Part 2 to aid soil description. The results have been used to prepare precise soil descriptions in accordance with BS5930:2015 Section 6 and are presented in Appendix D.

8.5 pH and Sulphate Results

Three 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 8.6 to 8.9 indicating slightly alkaline conditions. Soluble sulphates were recorded at levels ranging from <10mg/l to 260mg/l.

8.6 Percolation Tests

The client initially requested soakaway testing, however given the anticipated ground conditions, Solmek advised that soakaways would be unlikely to work. The site investigation works corroborated this, as a significant thickness of low permeability cohesive deposits was encountered and proven to 20.00mbgl, with no granular bands or groundwater encountered. Therefore, soakaway drainage is unlikely to be suitable for the proposed development. Soakaway drainage, if incorporated, should be designed in accordance with BRE *Special Digest 365 – Soakaway Design*.

8.7 CBR Tests

CBR testing was undertaken within TPs 01, 03 and 06. The in-situ CBR results are detailed below in Table 4.

TABLE 4: SUMMARY OF CBR TESTING RESULTS

Test Number	Ground Conditions	Depth (mbgl)	Maximum Applied Load (kPa)	Measured Plate Penetration (mm)	CBR (%)
TP01	MADE GROUND: Clay fill	0.30	336	4.38	6.51
TP03		0.40		9.15	2.71
TP06		0.30		7.54	2.87

Given the variability of the results and the inherent heterogeneity of made ground, it may be prudent to adopt an equilibrium CBR of 2% for design works within the made ground.

8.8 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	0.50-1.50	pH = 9.0-12.0 (9.9)	Laboratory Testing
			SO^4 = <10-240 (117)	
			CBR = 2.71-6.51%	Plate Bearing Tests
Firm to stiff (locally soft) consistency slightly sandy locally slightly gravelly CLAY	0.50-1.50	2.00-3.50	kPa = 55-100 (77)	In-Situ Hand Vane
			pH = 8.9-9.0 (9.0)	Laboratory Testing
			SO^4 = <10 (<10)	
			N = 8 (8)	In-situ SPT
			IP = 28 (28)	Atterberg Limit Testing
			C_U = 39Pa (39)	Undrained Triaxial Testing
Very soft to soft consistency slightly sandy very low to low strength silty CLAY	2.00-3.50	10.40-10.60	N = 2-8 (4.33)	In-situ SPT
			pH = 8.6 (8.6)	Laboratory Testing
			SO^4 = 260 (260)	
Firm to stiff consistency slightly sandy slightly gravelly medium to high strength CLAY	10.40-10.60	17.40-17.90	N = 13-25 (19.83)	In-situ SPT
			C_U = 40-77kPa (58.5)	Undrained Triaxial Testing
			pH = 8.8 (8.8)	Laboratory Testing
			SO^4 = 61 (61)	
			IP = 12 (12)	Atterberg Limit Testing
Stiff consistency thinly laminated slightly sandy high strength silty CLAY	17.40-17.90	20.00	N = 27-33 (30)	In-situ SPT
			C_U = 22kPa (22)	Undrained Triaxial Testing
Burnham Chalk Formation	*Not Proven*			

8.9 Foundations

The ground conditions generally consisted of a thin crust of firm to stiff consistency clay, proven to depths of between 2.00 and 3.50mbgl, underlain by very soft to soft deposits (N values of between 2 and 8). These low strength deposits mean shallow foundations are unlikely to be viable, therefore a piled solution is recommended.

8.9.1 *Piled Foundations*

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 very soft to soft alluvial deposits. Allowance should be made for breaking through known and unknown buried obstructions.

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.

8.9.2 *Ground Slabs*

Made ground is in excess of 600mm and a suspended reinforced ground slab or precast concrete floor should therefore be used. However, if the made ground was removed from beneath the footprint of the building and a blanket of compacted inert granular fill was placed in accordance with an engineering specification, ground bearing slabs may be possible, if applicable.

8.9.3 *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.

8.10 Excavation

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

8.11 Groundwater

No groundwater was encountered within any of the exploratory positions.

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.

APPENDIX A:
Figures and Drawings

SOLMEK
12-16 Yarm Road, Stockton on Tees, TS18 3NA
Tel: 01642 607083 Email: info@solmek.com

Figure Title

Site Location Plan

Project Number

S210340

Project Name

Goulton Street, Hull

Client

William Birch & Sons Ltd

Date

April 2021

DRG Number

Figure 1

Scale

1:750 @ A4 [DO NOT SCALE]

Legend Key

Project Bounds - Project Bounds

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Tel: 01642 607083 Email: info@solmek.com

Figure Title

Exploratory Hole Location Plan

Project Number

S210340

Project Name

Goulton Street, Hull

Client

William Birch & Sons Ltd

Date

April 2021

DRG Number

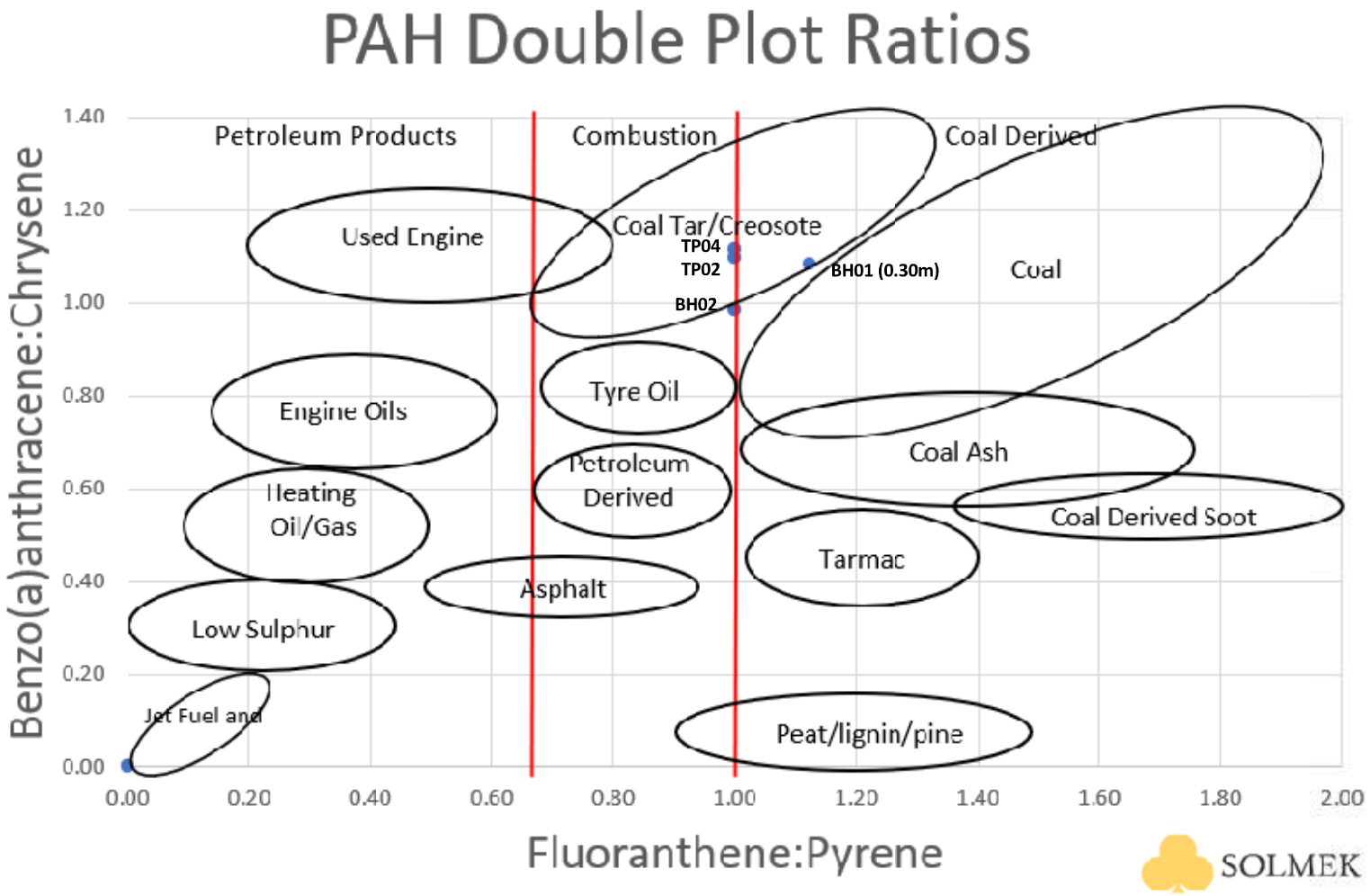
Figure 2

Scale

1:750 @ A4 [DO NOT SCALE]

Legend Key

- Locations By Type - Empty
- Locations By Type - BH
- Locations By Type - TP
- Project Bounds - Project Bounds



Title	PAH Double Ratio Plot Analysis
Project	Goulton Street, Hull
Client	William Birch & Sons Ltd
Date	April 2021
Fig No.	Figure 3
Scale	N/A
Key	

N

Solmek Ltd.
12 Yarm Road
Stockton-on-Tees
TS18 3NA

Tel: +44 (0) 1642 607083
Fax: +44 (0) 1642 612355
e-mail: south@solmek.com
www.solmek.com

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Figure 4: TP01.

Figure 5: TP01 Spoil.

Title	**Date**
Figures 4 & 5	April 2021
Project	
Goulton Street, Hull	
Client	
William Birch & Sons Ltd	

Solmek Ltd.
12 Yarm Road
Stockton-on-Tees
TS18 3NA

Tel: +44 (0) 1642 607083
Fax: +44 (0) 1642 612355
e-mail: south@solmek.com
www.solmek.com

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Figure 6: TP02.

Figure 7: TP02 Spoil.

Title	Date
Figures 6 & 7	April 2021
Project	
Goulton Street, Hull	
Client	
William Birch & Sons Ltd	

Solmek Ltd.
12 Yarm Road
Stockton-on-Tees
TS18 3NA

Tel: +44 (0) 1642 607083
Fax: +44 (0) 1642 612355
e-mail: south@solmek.com
www.solmek.com

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Figure 8: TP03.

Figure 9: TP03 Spoil.

Title	**Date**
Figures 8 & 9	April 2021
Project	
Goulton Street, Hull	
Client	
William Birch & Sons Ltd	

Solmek Ltd.
12 Yarm Road
Stockton-on-Tees
TS18 3NA

Tel: +44 (0) 1642 607083
Fax: +44 (0) 1642 612355
e-mail: south@solmek.com
www.solmek.com

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Figure 10: TP04.

Figure 11: TP04 Spoil.

Title	Date
Figures 10 & 11	April 2021
Project	
Goulton Street, Hull	
Client	
William Birch & Sons Ltd	

Solmek Ltd.
12 Yarm Road
Stockton-on-Tees
TS18 3NA

Tel: +44 (0) 1642 607083
Fax: +44 (0) 1642 612355
e-mail: south@solmek.com
www.solmek.com

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Figure 12: TP05.

Figure 13: TP05 Spoil.

Title	Date
Figures 12 & 13	April 2021
Project	
Goulton Street, Hull	
Client	
William Birch & Sons Ltd	

Solmek Ltd.
12 Yarm Road
Stockton-on-Tees
TS18 3NA

Tel: +44 (0) 1642 607083
Fax: +44 (0) 1642 612355
e-mail: south@solmek.com
www.solmek.com

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Figure 14: TP06.

Figure 15: TP06 Spoil.

Title	Date
Figures 14 & 15	April 2021
Project	
Goulton Street, Hull	
Client	
William Birch & Sons Ltd	

Solmek Ltd.
12 Yarm Road
Stockton-on-Tees
TS18 3NA

Tel: +44 (0) 1642 607083
Fax: +44 (0) 1642 612355
e-mail: south@solmek.com
www.solmek.com

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APPENDIX B:
Borehole Logs & Trial Pit Logs

SOLMEK
12-16 Yarm Road
Stockton on Tees
TS18 3NA
01642 607083
info@solmek.com

Borehole Log

Scale 1:100 Sheet 1 of 1

BH01

Contract no:	S210340	**Site:**	Goulton Street, Hull	**Driller:**	RD Drilling Ltd
				Plant used:	Dando 2000
				Started:	17/03/2021
Client:	William Birch & Sons Ltd			**Ended:**	17/03/2021
Method:	Cable Percussive			**Backfilled:**	17/03/2021

GL (AOD):
Easting: 508113
Northing: 427478
Logged: TD
Status: FINAL

Backfill / Installation	Legend	Depth (m)	Level (m AOD)	Stratum Description	Samples and Insitu Testing		
					Depth (m)	Type	Results
		0.15		MADE GROUND: Dark brown sandy clayey topsoil. Sand is fine to medium.	0.10	ES	
		0.40		MADE GROUND: Dark brown sandy gravelly clay fill of low cobble content. Sand is fine to medium. Gravel is fine to medium angular to subangular of concrete and brick. Cobbles of concrete and brick.	0.30	ES	
		0.60			0.50	ES	
					0.70	B	
				MADE GROUND: Greyish black clayey gravelly fine to coarse sand fill. Gravel is fine to medium angular to subangular of ash, brick and concrete.	0.70 - 1.50	ES	40 blows [450mm]
					1.50 - 1.95	U	
		2.00		Soft to firm consistency mottled brown and grey slightly sandy slightly gravelly low strength CLAY of high plasticity. Sand is fine to medium. Gravel is fine to medium subangular to subrounded of sandstone and limestone.	2.00	D	
					2.50 - 2.95	SPT (S)	N=4 (1,0/1,1,1,1)
				Very soft to soft consistency brown slightly sandy low strength CLAY. Sand is fine to medium.	2.50 - 2.95	B	
					2.50 - 3.00	D	
		3.60			3.50 - 3.95	U	20 blows [450mm]
				Very soft to soft consistency grey slightly sandy very low to low strength silty CLAY.	4.00	D	
					4.50 - 4.95	SPT (S)	N=5 (1,0/1,1,1,2)
G					4.50 - 4.90	B	
					4.50 - 5.00	D	
					5.50 - 5.95	SPT (S)	N=3 (1,0/0,1,1,1)
					5.50 - 5.95	B	
					5.50 - 6.00	D	
					6.30	D	N=3 (1,0/1,0,1,1)
					6.50 - 6.95	SPT (S)	
					6.50 - 6.95	B	
					6.50 - 7.00	D	
					7.30	D	N=3 (1,0/1,1,0,1)
					7.50 - 7.95	SPT (S)	
					7.50 - 7.95	B	
					7.50 - 8.00	D	
					8.50	D	
					9.00 - 9.45	SPT (S)	N=7 (1,1/2,1,2,2)
					9.00 - 9.45	B	
					9.00 - 9.50	D	
					10.00	D	
		10.40		Firm to stiff consistency brown slightly sandy slightly gravelly medium to high strength CLAY of low plasticity. Sand is fine to medium. Gravel is fine to medium subangular to subrounded of sandstone and limestone.	10.50 - 10.95	SPT (S)	N=13 (1,2/2,3,3,5)
					10.50 - 10.95	B	
					10.50 - 11.00	D	
					11.50	D	
					12.00 - 12.45	U	70 blows [350mm]
					13.50 - 13.95	SPT (S)	N=22 (4,4/5,5,6,6)
					13.50 - 14.00	B	
					15.00 - 15.45	U	80 blows [450mm]
					15.50	D	
					16.50 - 16.95	SPT (S)	N=25 (3,4/5,6,7,7)
					16.50 - 16.95	B	
					16.50 - 17.00	D	
		17.90		Stiff consistency greyish brown thinly laminated sandy low to high strength silty CLAY.	18.00 - 18.45	U	90 blows [400mm]
					18.50	D	
					19.50 - 19.95	SPT (S)	N=33 (4,5/8,8,8,9)
					19.50 - 19.95	B	
		20.00		End of Borehole at 20.000m	19.50 - 20.00	D	

Hole Diameter		Casing Depths		General Remarks	Chiselling			Ground Water				
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)		From (m)	To (m)	Time (hr)	Depth Strike (m)	Depth Casing (m)	Depth Sealed (m)	Time Elapsed (min)	Water Level (m)
20.00	150	3.00	150	1. Hand dug inspection pit to 1.20m. 2. No groundwater encountered, but noted as damp at 3.50 and 10.60mbgl.								

SOLMEK
12-16 Yarm Road
Stockton on Tees
TS18 3NA
01642 607083
info@solmek.com

Borehole Log

Scale 1:100 Sheet 1 of 1

BH02

Contract no:	S210340	**Site:**	Goulton Street, Hull	**Driller:**	RD Drilling Ltd
				Plant used:	Dando 2000
				Started:	18/03/2021
Client:	William Birch & Sons Ltd			**Ended:**	18/03/2021
Method:	Cable Percussive			**Backfilled:**	18/03/2021

GL (AOD):
Easting: 508156
Northing: 427499
Logged: TD
Status: FINAL

Backfill / Installation	Legend	Depth (m)	Level (m AOD)	Stratum Description	Samples and Insitu Testing: Depth (m)	Type	Results
		0.20		MADE GROUND: Concrete.	0.30	ES	
		0.40		MADE GROUND: Reddish grey sandy fine to coarse gravel fill of low cobble content. Sand is fine to coarse. Gravel is fine to coarse angular to subangular of brick and concrete.			
				MADE GROUND: Grey and black slightly sandy slightly gravelly clay fill. Sand is fine to medium.	1.00	B	
		1.30		Gravel is fine to coarse angular to subangular of brick and ash.	1.00 - 1.50	ES	
				Soft to firm consistency mottled brown and grey slightly sandy slightly gravelly CLAY of high plasticity. Sand is fine to medium. Gravel is fine to medium subangular to subrounded of sandstone and limestone.	1.50 - 1.95	SPT (S)	N=8 (1,2/2,2,2,2)
					1.50 - 1.95	D	
					2.50	D	10 blows [NR]
					2.50 - 3.00	U	
		3.50		Very soft to soft consistency grey slightly sandy very low to medium strength CLAY.	3.50 - 3.95	SPT (S)	N=2 (1,0/0,0,1,1)
					3.50	B	
					3.50 - 4.00	D	
G					4.50 - 4.95	SPT (S)	N=3 (1,0/1,1,1,0)
					4.50	D	
					5.50 - 5.95	SPT (S)	N=3 (1,0/1,0,1,1)
					5.50	B	
					5.50 - 6.00	D	N=8 (1,2/2,2,2,2)
		6.40			6.00 - 6.45	SPT (S)	
		6.60		Dark brown slightly clayey amorphous PEAT.	6.00 - 6.45	B	
				Very soft to soft consistency grey sandy very low to medium strength silty CLAY.	6.00 - 6.50	D	
					7.00	D	
					7.50 - 7.95	SPT (S)	N=3 (1,1/0,1,1,1)
					7.50	B	
					7.50 - 8.00	D	
					8.50	D	
					9.00 - 9.45	SPT (S)	N=8 (2,1/2,2,2,2)
					9.00 - 9.45	B	
					9.00 - 9.50	D	
		10.60		Firm to stiff consistency brown slightly sandy slightly gravelly medium to high strength CLAY. Sand is fine to medium. Gravel is fine to medium subangular to subrounded of sandstone and limestone.	10.50 - 10.95	SPT (S)	N=16 (3,4/4,4,4,4)
					10.50 - 10.95	B	
					10.50 - 11.00	D	
					11.50	D	
					12.50 - 12.95	SPT (S)	N=20 (3,4/5,5,5,5)
					12.50 - 12.65	B	
					12.50 - 13.50	D	
					13.50	D	60 blows [450mm]
					13.50 - 13.95	U	
					14.00	D	
					15.00 - 15.45	SPT (S)	N=23 (3,4/5,6,6,6)
					15.00	B	
					15.00 - 15.45	D	
					16.50 - 16.95	U	70 blows [450mm]
		17.40		Stiff consistency greyish brown thinly laminated slightly sandy high strength silty CLAY.	17.50	D	
					18.00 - 18.45	SPT (S)	N=27 (4,5/6,7,7,7)
					18.00 - 18.45	B	
					18.00 - 18.50	D	
					19.00	D	
					19.50 - 19.95	U	70 blows [450mm]
		20.00		End of Borehole at 20.000m	20.00	D	

Hole Diameter

Depth Base (m)	Diameter (mm)
20.00	150

Casing Depths

Depth Base (m)	Diameter (mm)
3.00	150

General Remarks

1. Hand dug inspection pit to 1.20m.
2. No groundwater encountered.

Chiselling

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

Ground Water

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

SOLMEK
Solmek Ltd
12-16 Yarm Road
Stockton on Tees
TS18 3NA
Tel: 01642 607083
Email: info@solmek.com

Trial Pit Log

TrialPit No
TP01
Sheet 1 of 1

Project Name:	Goulton Street, Hull	Project No. S210340	Co-ords: 508174E - 427494N Level:
Plant Used:	JCB 3CX	Dimensions (m): Depth 2.50	1.80 × 0.60
Client:	William Birch & Sons Ltd		

Date 26/03/2021
Scale 1:26
Logged CG

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.10 - 0.30	B+ES		0.10			MADE GROUND: Concrete.
				0.30			MADE GROUND: Reddish brown sandy gravel. Gravel is fine to coarse angular to subangular of brick and ash.
	0.40 - 0.60	B+ES					MADE GROUND: Dark brown sandy gravelly clay. Gravel is fine to coarse angular to subangular of brick, chalk and ash. Common roots.
	1.00 - 1.20	B		1.00			Firm consistency brown grey mottled slightly sandy medium strength CLAY. Occasional roots.
	1.20	HV	65kPa				
	1.50 - 1.70	B		1.40			Stiff consistency brown grey mottled high strength CLAY.
	1.50	HV	100kPa				
	2.00 - 2.20	B					
	2.00	HV	90kPa				
	2.50	HV	75kPa	2.50			End of Pit at 2.500m

1
2
3
4
5

Remarks: 1. No groundwater encountered.

Stability: Stable

SOLMEK
Solmek Ltd
12-16 Yarm Road
Stockton on Tees
TS18 3NA
Tel: 01642 607083
Email: info@solmek.com

Trial Pit Log

TrialPit No
TP02
Sheet 1 of 1

Project Name:	Goulton Street, Hull	Project No. S210340	Co-ords: 508167E - 427514N Level:
Plant Used:	JCB 3CX	Dimensions (m): Depth 2.50	1.80 × 0.60
Client:	William Birch & Sons Ltd		

Date 26/03/2021
Scale 1:26
Logged CG

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.10			MADE GROUND: Concrete.
				0.30			MADE GROUND: Reddish brown sandy gravel. Gravel is fine to coarse angular to subangular of brick and ash.
	0.40 - 0.60	B+ES					MADE GROUND: Dark brown stained sandy gravelly clay. Gravel is fine to coarse angular to subangular of brick, ash, plastic and chalk. Hydrocarbon odour noted.
	1.00 - 1.20 1.00	B+ES HV	95kPa	1.00			Firm consistency light brown grey mottled slightly sandy high strength CLAY.
	1.50	HV	90kPa				
	1.80 - 2.00	B					
	2.00	HV	65kPa	2.00			Firm consistency light brown grey mottled medium strength CLAY.
	2.50	HV	60kPa	2.50			End of Pit at 2.500m

Remarks: 1. No groundwater encountered.

Stability: Stable

SOLMEK
Solmek Ltd
12-16 Yarm Road
Stockton on Tees
TS18 3NA
Tel: 01642 607083
Email: info@solmek.com

Trial Pit Log

TrialPit No
TP03
Sheet 1 of 1

Project Name:	Goulton Street, Hull	Project No. S210340	Co-ords: 508152E - 427508N Level:
Plant Used:	JCB 3CX	Dimensions (m): Depth 2.50	1.80 × 0.60
Client:	William Birch & Sons Ltd		

Date 26/03/2021
Scale 1:26
Logged CG

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.10 - 0.30	B+ES		0.10			MADE GROUND: Concrete.
				0.40			MADE GROUND: Dark brown clayey sandy gravel. Gravel is fine to coarse angular to subangular of concrete, brick, ash, clinker and plastic.
	0.60 - 0.80	B+ES					MADE GROUND: Dark brown stained sandy gravelly clay. Gravel is fine to coarse angular to subangular of brick, ash and plastic. Hydrocarbon odour noted.
	1.20 - 1.40	B		1.20			Firm consistency light brown grey mottled slightly sandy high strength CLAY.
	1.50	HV	80kPa				
	2.00 - 2.20	B					
	2.00	HV	85kPa				
	2.50	HV	75kPa	2.50			End of Pit at 2.500m

Remarks: 1. No groundwater encountered.

Stability: Stable

SOLMEK
Solmek Ltd
12-16 Yarm Road
Stockton on Tees
TS18 3NA
Tel: 01642 607083
Email: info@solmek.com

Trial Pit Log

TrialPit No
TP04
Sheet 1 of 1

Project Name:	Goulton Street, Hull	Project No. S210340	Co-ords: 508113E - 427466N Level:
Plant Used:	JCB 3CX	Dimensions (m): Depth 2.50	1.80 × 0.60
Client:	William Birch & Sons Ltd		

Date 26/03/2021
Scale 1:26
Logged CG

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.10 - 0.30	B+ES					MADE GROUND: Dark brown clayey sandy gravelly topsoil. Gravel is fine to coarse angular to subangular of concrete, brick, dolomite and ash.
	0.30 - 0.50	B+ES		0.30			MADE GROUND: Dark brown sandy gravel. Gravel is fine to coarse angular to subangular of brick and ash.
	0.60	HV	80kPa	0.50			Firm consistency light brown grey mottled slightly sandy high strength CLAY.
	1.00 - 1.20 1.00	B HV	85kPa				
	1.50	HV	75kPa				
	2.00 - 2.20 2.00	B HV	75kPa				
				2.50			End of Pit at 2.500m

1
2
3
4
5

Remarks: 1. No groundwater encountered.

Stability: Stable

SOLMEK
Solmek Ltd
12-16 Yarm Road
Stockton on Tees
TS18 3NA
Tel: 01642 607083
Email: info@solmek.com

Trial Pit Log

TrialPit No
TP05
Sheet 1 of 1

Project Name:	Goulton Street, Hull	Project No. S210340	Co-ords: 508106E - 427475N Level:
Plant Used:	JCB 3CX	Dimensions (m): Depth 2.50	1.80 × 0.60
Client:	William Birch & Sons Ltd		

Date: 26/03/2021
Scale: 1:26
Logged: CG

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.10 - 0.30	B+ES					MADE GROUND: Dark brown clayey sandy gravelly topsoil. Gravel is fine to coarse angular to subangular of brick, concrete, dolomite and ash.
	0.60 - 0.80	B+ES		0.50			MADE GROUND: Dark brown sandy gravelly clay. Gravel is fine to coarse angular to subangular of brick and chalk.
	1.50	HV	70kPa	1.50			Firm consistency light brown grey mottled slightly sandy medium strength CLAY.
	1.80 - 2.00	B					
	2.00	HV	55kPa				
				2.50			End of Pit at 2.500m

Remarks: 1. No groundwater encountered.

Stability: Stable

SOLMEK
Solmek Ltd
12-16 Yarm Road
Stockton on Tees
TS18 3NA
Tel: 01642 607083
Email: info@solmek.com

Trial Pit Log

TrialPit No
TP06
Sheet 1 of 1

Project Name:	Goulton Street, Hull	Project No. S210340	Co-ords: 508104E - 427487N Level:
Plant Used:	JCB 3CX	Dimensions (m): Depth 2.50	1.80 × 0.60
Client:	William Birch & Sons Ltd		

Date: 26/03/2021
Scale: 1:26
Logged: CG

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.10 - 0.30	B+ES		0.30			MADE GROUND: Dark brown clayey sandy gravelly topsoil. Gravel is fine to coarse angular to subangular of brick, concrete, dolomite and ash.
	0.60 - 0.80	B+ES		1.20			MADE GROUND: Dark brown sandy gravelly clay. Gravel is fine to coarse angular to subangular of brick and chalk.
	1.40 - 1.60	B					Firm consistency light brown grey mottled slightly sandy medium to high strength CLAY.
	1.50	HV	75kPa				
	2.00	HV	70kPa				
	2.50	HV	75kPa	2.50			End of Pit at 2.500m

Remarks: 1. No groundwater encountered.

Stability: Stable