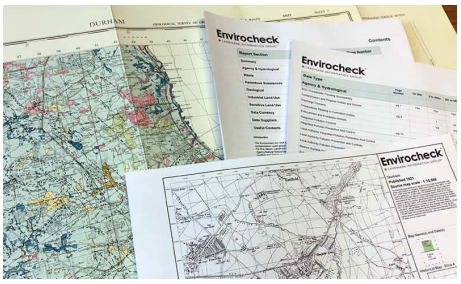

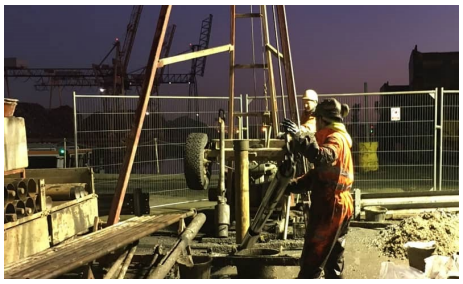

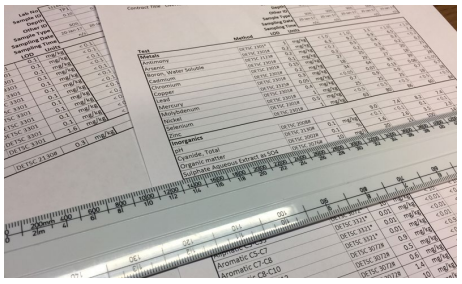

Phase 2: Site Investigation

25 Porter Street, Staveley, Chesterfield

David & Hilary Mateer

M23-006

Solmek Ltd

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info@solmek.com

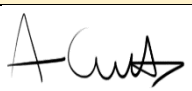
ISO 9001:2015 Quality Management
ISO 14001:2015 Environmental Management
ISO 45001 Occupational Health and Safety Management
CHAS Accredited Contractor CHAS.co.uk

PHASE 2 SITE INVESTIGATION REPORT

25 PORTER STREET, STAVELEY, CHESTERFIELD

TABLE OF CONTENTS

APPENDICES

Revision	Date	Prepared by	Signed
REV_1	September 2023	L Richards *Regional Manager*	
		Checked by	
		A Cutts *Senior Engineering Geologist*	
		Approved by	
		R Woods *Managing Director*	

1 EXECUTIVE SUMMARY

Site Address	• 25 Porter Street, Staveley, Chesterfield, S43 3UY.
Proposed Development	• A new residential development with associated parking and soft landscaping.
Fieldwork	• 3no water flush rotary open-hole boreholes (RBH01 to RBH03 inclusive) drilled to a depth of 25.00mbgl with 1no. monitoring pipe in RBH03.
Ground Conditions	• Topsoil was encountered within RBH01 to a depth of 0.10mbgl. • Made ground of decorative gravel and concrete were recorded to a depth of 0.10mbgl in RBH02 and RBH03 respectively. • Underlying the concrete in RBH03, made ground of sandy gravel subbase was proven to 0.50mbgl. • Natural drift deposits were noted to be thin, comprising firm sandy gravelly medium strength clay of intermediate plasticity in RBH01 and RBH02 to depths of 0.60 and 0.90mbgl. • RBH03 encountered sandy gravel to a depth of 0.90mbgl. As the gravel constituents comprised mainly of sandstone, it is possible that this gravel could represent completely weathered sandstone rockhead. • Rockhead, generally comprising sandstone was encountered within all of the boreholes, at depths of between 0.60mbgl (RBH01) and 0.90mbgl (RBH03). • The sandstone was noted to be underlain by mudstone at depths between 8.60mbgl (RBH01) and 8.80mbgl (RBH03), which was proven to the maximum termination depth of 25mbgl in RBH01. • Within RBH02 and RBH03, the driller noted broken ground and a loss of drilling flush between 15.20-16.10mbgl (RBH02) and 16.10-17.00mbgl (RBH03), which is indicative of possible collapsed coal workings. Beyond those depths, the driller noted solid drilling. • No groundwater was recorded during the fieldwork.
Geotechnical Analysis & Foundation Recommendations	• Bearing capacity of 250kN/m^2 at minimum depth of 0.60mbgl on 0.45m wide strips. • Locally, the foundations are to be stepped due to the variable depth of bedrock encountered. • Settlements within 25mm. • Normal earthworks plant for excavations, although breaking out weathered sandstone bedrock may be required. • Evidence of historic mining noted; however, the depth of the workings is likely to be too deep to influence proposed development. • Mining risk assessed to be low.

2 INTRODUCTION

2.1 Authorisation

The site investigation described in this report was carried out by Solmek to the instructions of Commonbond Studio on behalf of the clients, Mr and Mrs Mateer, on land located at 25 Porter Street, Staveley, Chesterfield, S43 3UY (Figure 1).

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

- *Coal Mining Risk Assessment – Midland Surveying & Engineering Ltd, March 2017.*

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 a new residential development with associated parking and soft landscaping.

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 (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
- CIRIA C758D Abandoned Mine Workings Manual

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

An initial site inspection, as recommended in BS 5930 and BS 10175, was undertaken on Wednesday 28th

June 2023.

The site is located at 25 Porter Street, Staveley, Chesterfield, S43 3UY, and is accessible via a shared driveway from Church Street to the north.

The site itself comprises a residential garden, with a grassed lawn area present in the west, a concreted driveway present in the south, and a decorative gravel parking area present in the east. A number of manholes, which are indicative of buried services, were noted within the concreted area of the site during the walkover.

The land use immediately surrounding the site is residential, with St John's Church present to the north of the site.

4 GEOLOGICAL SETTING

4.1 Geology

No drift deposits are shown on relevant geological mapping; therefore drift deposits are likely to be thin on site.

The site lies within the Pennine Middle Coal Measures Formation, with two coal seams (the Upper St John and the Lower St John seams) appearing to subcrop to the north and west of the site, and dip underneath the site. The Upper St John seam is anticipated to be the shallower of the two seams, and based on anticipated dip angle and direction, it is expected to lie at a depth of around 15mbgl underneath the site.

British Geological Survey mapping notes that the Upper St John and the Lower St John seams have a thickness of 0.40m.

5 FIELDWORK

The fieldwork was carried out on 7th August 2023. The extent of the investigation was:

- 3no rotary open-hole/cored boreholes (RBH01 to RBH03 inclusive) to a depth of 25.00mbgl.
  - The boreholes were drilled to investigate the presence of shallow historic mine workings.
- A gas monitoring well was installed in RBH03.
- In-situ testing in the exploratory positions as hand shear vanes.
- Retrieval of samples for geotechnical testing.

The boreholes were backfilled with bentonite/grout and/or monitoring installations upon completion.

A plan showing the location of the boreholes can be found in Appendix A (Figure 2).

6 GROUND CONDITIONS

A summary of the ground conditions encountered is given below. The exploratory hole logs are presented in Appendix B.

6.1 Topsoil and Made Ground

Topsoil was encountered within RBH01 to a depth of 0.10mbgl.

Made ground of decorative gravel and concrete were recorded to a depth of 0.10mbgl in RBH02 and RBH03 respectively. Underlying the concrete in RBH03, made ground of sandy gravel subbase was proven to 0.50mbgl.

6.2 Natural Deposits

Proven to underlie the made ground deposits across the site, natural drift deposits were noted to be thin, comprising firm sandy gravelly medium strength clay of intermediate plasticity in RBH01 and RBH02 to depths of 0.60 and 0.90mbgl in RBH01 and RBH02 respectively.

RBH03 differed slightly, with no cohesive material encountered, however drift deposits of sandy gravel were noted to a depth of 0.90mbgl. As the gravel constituents comprised mainly of sandstone, it is possible that this gravel could represent completely weathered sandstone rockhead.

6.3 Solid Geology

Rockhead, generally comprising sandstone was encountered within all of the boreholes, at depths of between 0.60mbgl (RBH01) and 0.90mbgl (RBH03). The sandstone was noted to be underlain by mudstone at depths between 8.60mbgl (RBH01) and 8.80mbgl (RBH03), which was proven to the maximum termination depth of 25mbgl in RBH01.

Within RBH02 and RBH03, the driller noted broken ground and a loss of drilling flush between 15.20-16.10mbgl (RBH02) and 16.10-17.00mbgl (RBH03), which is indicative of possible collapsed coal workings. Beyond those depths, the driller noted solid drilling, however the flush returns did not return, therefore the material was inferred to comprise mudstone to the base of the holes based on the anticipated geology transposed from RBH01.

6.4 Groundwater

No groundwater was encountered during the intrusive investigation.

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. Additionally, due to the water utilised as a flushing medium during the probing, groundwater strikes are likely to be masked.

7 GROUND GAS ASSESSMENT

The proposed development includes the construction of residential housing.

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 one standpipe (RBH03) that was installed during the sitework. The gas monitoring will consist of six visits over a period of three months. The gas monitoring results will be presented as an addendum to this report.

8 GEOTECHNICAL TESTING AND ANALYSIS

Samples taken from the boreholes underwent a series of geotechnical tests at a UKAS accredited laboratory to aid foundation design and soil description. In addition, hand shear vanes were undertaken within the hand dug trial pits. The geotechnical results are presented in Appendix C.

8.1 Strength and Density

8.1.1 *Hand Shear Vanes*

Hand shear vane testing within the natural cohesive deposits returned results of 56kPa and 60kPa in RBH01 and RBH02 respectively, which are indicative of medium strength conditions.

8.2 Moisture Contents

One sample recovered from RBH02 has been subject to a moisture content test to determine the moisture profile within the shallow clay deposits. The moisture level was recorded as 29%.

8.3 Atterberg Limit Determinations

One Atterberg Limit Determination test was carried out on a sample of cohesive material from RBH02 to classify the fine grained soils. The result was compared to the Casagrande Chart published in BS 5930 and showed the sample to be silt of intermediate plasticity.

The Plasticity Index was recorded as 17% with equivalent moisture contents recorded above the corresponding plastic limits. The cohesive material can be assessed as having a **low** shrinkage potential in relation to NHBC Guidance Chapter 4.2.

8.4 pH and Sulphate Results

Three samples of natural material 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 6.8 to 8.2 indicating slightly acidic to slightly alkaline conditions. Soluble sulphates were recorded at levels ranging from 18mg/l to 580mg/l.

8.5 Mining Assessment

The ten times seam thickness rule states that where competent rock exceeds ten times the extracted seam thickness, then no major crown holing should occur at the surface (Structural Foundations Manual; M. F. Atkinson, *Spon Press* 2003). If the competent rock cover is less than ten times the extracted seam thickness, then recommendations suggest the workings must be grouted using a mixture of pulverised fuel ash (PFA) and cement placed into the area under pressure.

Multiple situations may mean a ratio in excess of 10x seam thickness is required to prevent crown hole collapse, including but not exclusive to; steeply dipping strata, presence of groundwater, a high extraction ratio noted, and multiple seam extractions underlying the site (CIRIA C758D, Table 5.1). Additionally, weak basement rock underlying the workings has potential to cause a separate collapse mechanism via pillars sinking.

Conversely, there are scenarios where the acceptable cover criterion may be decreased from 10x seam thickness, these include where a rigid non-degradable roof strata is present to stop the upward void migration and where low residual voidage is proven either via infilling or extensive collapse (CIRIA C758D, Table 5.1).

For certain developments, a ratio of less than 10x may be addressed via bridging techniques i.e. utilising raft foundations, however this would be dependent on approval from the regulatory authorities.

Table 1 below, shows a summary of the ground conditions encountered within the rotary boreholes drilled to date highlighting possible mining related information.

TABLE 1: SOLID GEOLOGY SUMMARY

Borehole Reference	Depth of coal/possible workings (mbgl)	Thickness of coal/void (m)	Flush Returns (%)	Overlying Solid Geology Thickness (m)	Remarks
RBH01	None noted	N/A	100	N/A	No coal recorded.
RBH02	15.20-16.10	0.90	0	14.40	Loss of flush and broken ground – Inferred collapsed workings.
RBH03	16.10-17.00	0.90	0	15.20	Loss of flush and broken ground – Inferred collapsed workings.

Based on the geological plans, the site is expected to be underlain by the Top and Bottom St John seams. As only one coal seam has been encountered, this is likely to be the Top St John Seam. The depth of broken ground encountered correlates with the anticipated depth of the Top St John seam based on stratum dip (~15mbgl).

The three rotary boreholes drilled to scheduled 25.00mbgl depth recorded possible workings at depths between 15.20-16.10mbgl (RBH02) and 16.10-17.00mbgl (RBH03), with a working thickness of 0.90m in both boreholes. When assessing the cover ratio, a minimum worked thickness of 1.00m has been adopted for seams <1.00m thickness (CIRIA C758D).

In this case, mine working thicknesses of 1.00m, with respective overlying solid geology thicknesses of between 14.40m and 15.20m have been applied. This gives cover ratios of 14.4 and 15.2, both of which are in excess of the ten times seam thickness rule, therefore it is likely that there is sufficient overlying rock cover to prevent void migration. Based on the findings of the 3no boreholes drilled, no remediation measures are deemed necessary for the proposed development.

8.6 Foundations

8.6.1 *Foundations within Bedrock*

The site is underlain by sandstone with rockhead noted between 0.60mbgl and 0.90mbgl. It would be prudent to situate the foundations directly upon competent sandstone bedrock.

Strip footings, 0.45m wide, should be adopted placed directly onto the sandstone rockhead at depths of at least 0.60mbgl.

Locally, due to the variable depths of bedrock encountered, the foundations will need to be stepped in order to ensure they found upon the sandstone bedrock. Stepped foundations should be designed in line with NHBC Standards.

The shallow weathered sandstone can be considered weak. Table 2.4 in *Foundation Design & Construction, 6th Edition*, M.J. Tomlinson outlines a bearing capacity of 250kN/m^2 for sandstone to be assumed. Providing imposed loads do not exceed the bearing capacity then settlements have been calculated at less than 25mm.

The developer should also ensure the footings are placed at sufficient depth through the weathered zone to more competent bedrock to achieve the desired 250kN/m^2 allowable bearing capacity.

8.6.2 *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.

8.7 Excavation

Based on the nature of the ground conditions encountered, excavations should be within the capacity of normal earthworks plant although breaking out of rockhead and unknown obstructions should be anticipated. Stability of excavations will be poor in the granular made ground but should improve slightly in the natural clay and highly weathered sandstone. Excavation sides should be designed, constructed and supported in accordance with the recommendations given in CIRIA Report No. 97: “Trenching Practice”.

8.8 Groundwater

No groundwater was encountered during the intrusive investigation.

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. Additionally, due to the water utilised as a flushing medium during the

probing, groundwater strikes are likely to be masked.

SOLMEK

Appendix A

SOLMEK

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

Figure Title

Site Location Plan

Project Number

M23-006

Project Name

25 Porter Street, Staveley, Chesterfield

Client

David & Hilary Mateer

Date

September 2023

DRG Number

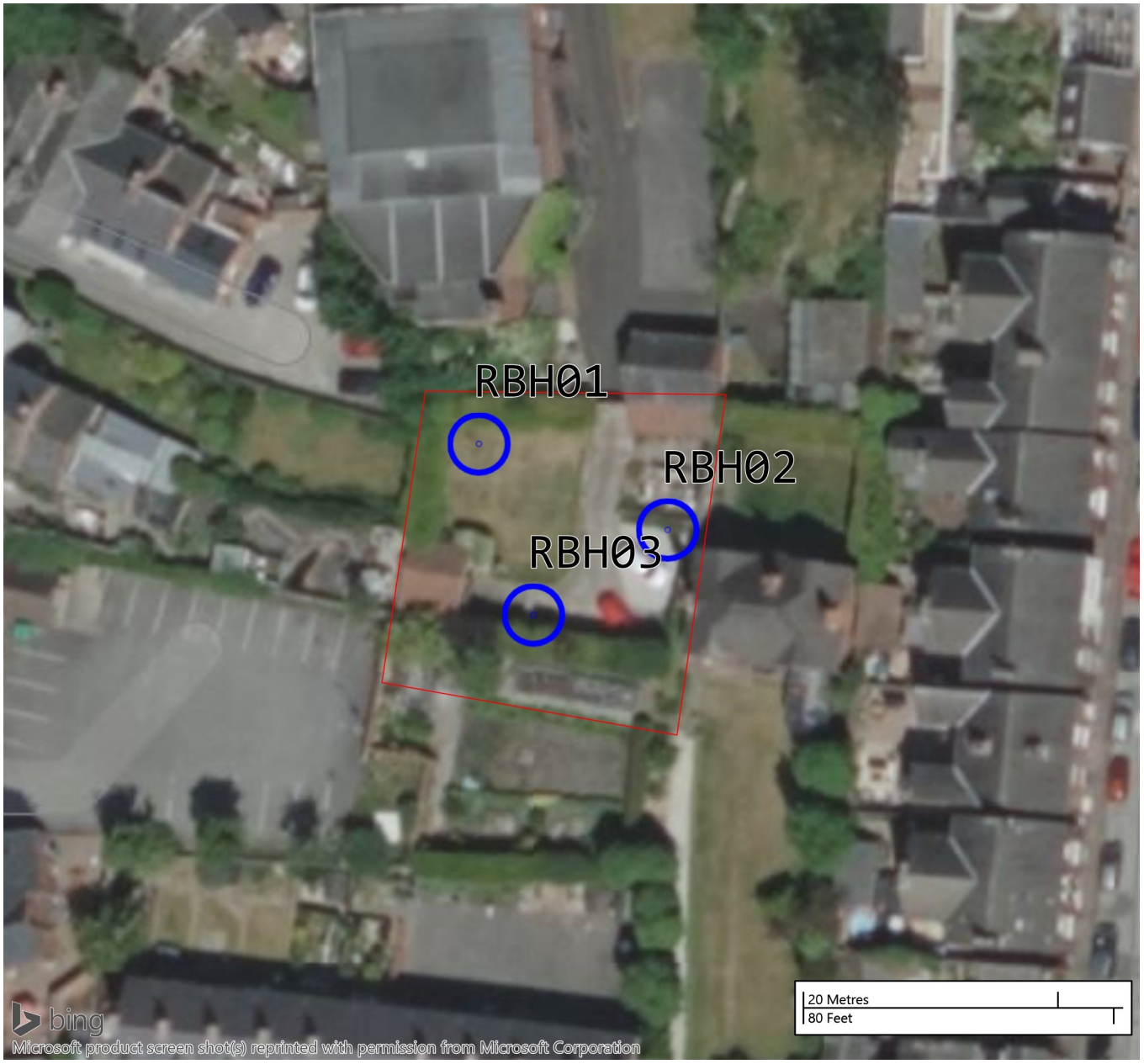
Figure 1

Scale

1:5000 @ A4 [DO NOT SCALE]

Legend Key

Project Bounds - Project Bounds



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

Figure Title

Exploratory Hole Location Plan

Project Number

M23-006

Project Name

25 Porter Street, Staveley, Chesterfield

Client

David & Hilary Mateer

Date

September 2023

DRG Number

Figure 2

Scale

1:500 @ A4 [DO NOT SCALE]

Legend Key

- Locations By Type - Empty
- Locations By Type - RO
- Project Bounds - Project Bounds

Appendix B

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

Rotary Open Hole Log

Scale 1:150 Sheet 1 of 1

RBH01

Contract no:	M23-006	**Site:**	25 Porter Street, Staveley, Chesterfield	**Driller:**	ID Drilling Ltd
				Plant used:	Massenza MI3
				Started:	07/08/2023
Client:	David & Hilary Mateer			**Ended:**	07/08/2023
Method:	Rotary Open-Hole			**Backfilled:**	07/08/2023

GL (AOD):	
Easting:	443333.85
Northing:	374780.37
Logged:	AC
Status:	FINAL

Backfill / Installation	Legend	Depth (m)	Level (m AOD)	Stratum Description	Samples and Insitu Testing: Depth (m)	Type	Results	Coring / Fractures: TCR (%)	SCR (%)	RQD (%)	Fracture
		0.10		TOPSOIL	0.50	HV	56kPa				
		0.60		Firm brown sandy gravelly medium strength CLAY.							
				Highly weathered SANDSTONE (Driller's description).							
		8.60		Grey MUDSTONE (Driller's description).							
		25.00		End of Borehole at 25.000m							

Hole Diameter		Casing Depths		General Remarks
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)	1.2m Hand excavated inspection pit dug. No groundwater encountered.

Flush Returns			
From (m)	To (m)	Flush Type	Flush (%)
0.60	24.00	Water	100

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

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Stockton on Tees
TS18 3NA
01642 607083
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Rotary Open Hole Log

Scale 1:150 Sheet 1 of 1

RBH02

Contract no: M23-006
Site: 25 Porter Street, Staveley, Chesterfield
Client: David & Hilary Mateer
Method: Rotary Open-Hole

Driller: ID Drilling Ltd
Plant used: Massenza MI3
Started: 07/08/2023
Ended: 07/08/2023
Backfilled: 07/08/2023

GL (AOD):
Easting: 443348.80
Northing: 374773.73
Logged: AC
Status: FINAL

Backfill / Installation	Legend	Depth (m)	Level (m AOD)	Stratum Description
		0.10		MADE GROUND: Decorative gravel
		0.80		Firm brown sandy gravelly medium strength CLAY of intermediate plasticity.
				Highly weathered SANDSTONE (Driller's description).
		8.70		Grey MUDSTONE (Driller's description).
		15.20		Broken ground and loss of flush noted. Possible collapsed workings (Driller's description).
		16.10		Solid drilling, but no flush returns noted. Material inferred to be mudstone based on findings of RBH01 (Driller's description).
		25.00		End of Borehole at 25.000m

Samples and Insitu Testing

Depth (m)	Type	Results
0.70	HV	60kPa

Coring / Fractures

TCR (%)	SCR (%)	RQD (%)	Fracture

Hole Diameter

Depth Base (m)	Diameter (mm)

Casing Depths

Depth Base (m)	Diameter (mm)

General Remarks

1.2m Hand excavated inspection pit dug.
No groundwater encountered.

Flush Returns

From (m)	To (m)	Flush Type	Flush (%)
0.80	8.70	Water	100
8.70	15.20	Water	100
15.20	16.10	Water	0

Ground Water

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

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

Rotary Open Hole Log

Scale 1:150 Sheet 1 of 1

RBH03

Contract no:	M23-006	**Site:**	25 Porter Street, Staveley, Chesterfield	**Driller:**	ID Drilling Ltd
				Plant used:	Massenza MI3
				Started:	07/08/2023
Client:	David & Hilary Mateer			**Ended:**	07/08/2023
Method:	Rotary Open-Hole			**Backfilled:**	07/08/2023

GL (AOD):		
Easting:	443338.27	
Northing:	374766.92	
Logged:	AC	
Status:	FINAL	

Backfill / Installation	Legend	Depth (m)	Level (m AOD)	Stratum Description
		0.10		Concrete
		0.50		MADE GROUND: Brown sandy gravel.
		0.90		Brown sandy GRAVEL. Sand is fine to coarse. Gravel is fine to coarse angular of sandstone. Possible completely weathered sandstone rockhead.
				Highly weathered SANDSTONE (Driller's description).
		8.80		Grey MUDSTONE (Driller's description).
		16.10		Broken ground and loss of flush noted. Possible collapsed workings (Driller's description).
		17.00		Solid drilling, but no flush returns noted. Material inferred to be mudstone based on findings of RBH01 (Driller's description).
		25.00		End of Borehole at 25.000m

Samples and Insitu Testing

Depth (m)	Type	Results

Coring / Fractures

TCR (%)	SCR (%)	RQD (%)	Fracture

Hole Diameter

Depth Base (m)	Diameter (mm)

Casing Depths

Depth Base (m)	Diameter (mm)

General Remarks

1.2m Hand excavated inspection pit dug.
No groundwater encountered.

Flush Returns

From (m)	To (m)	Flush Type	Flush (%)
0.90	8.80	Water	100
8.80	16.10	Water	100
16.10	17.00	Water	0

Ground Water

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

Appendix C

Laboratory Report Front Sheet

Site name	Job number
25 Porter Street, Staveley	M23-006

G2M Testing (Stockton)
12-16 Yarm Road,
Stockton on Tees,
TS18 3NA
01642 033318
info@g2mtesting.co.uk

UKAS TESTING
10258

Client details:

Reference:	M23-006
Name:	Solmek
Address:	12 Yarm Road, Stockton-on-tees, TS18 3NA
Telephone:	01642 607083
Email:	lrichards@solmek.com
FAO:	Luke Richards

Samples received:

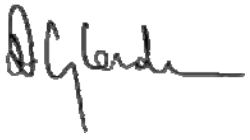
Date commenced: 16/08/2023

Date reported: 23/08/2023

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 above reporting date the samples will be disposed of. Should further testing be required then the office should be informed before the above date.

Signature:	Approved Signitories:
	☑ D.Anderson (Managing Director) ☐ J. Brischuk (Laboratory Manager) ☐

Summary of Classification Tests

G2M Testing (Stockton)
12-16 Yarm Road,
Stockton on Tees,
TS18 3NA
01642 033318
info@g2mtesting.co.uk

UKAS TESTING

10258

Site name	Job number
25 Porter Street, Staveley	M23-006

Hole	Depth Top m	Depth Base m	Type	*w* %	Oven temp. oc	wa %	Pa %	Pr %	wL %	wP %	IP %	IL	Plasticity class	Preparation method
BH02	0.50		B	29	105	36	80	20	47-s	30	17	0.353	MI	Tested after >425µm removed by hand

All tests found in G2M Testing 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
	Liquid limit 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	D Anderson
Approval date	22/08/2023 12:06
Date report generated	
Report Number	

Certificate of Analysis

Certificate Number	23-19603	*Issued:*	23-Aug-23

Client G2M Testing Ltd
12 Yarm Road
Stockton On Tees
Cleveland
TS18 3NA

Our Reference	23-19603
Client Reference	M23-006
Order No	LAB1953
Contract Title	25 Porter Street
Description	3 Soil samples.
Date Received	17-Aug-23
Date Started	17-Aug-23
Date Completed	23-Aug-23
Test Procedures	Identified by prefix DETSn (details on request).

Notes Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. 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 except in full, without the prior written approval of the laboratory.

Approved By

Kirk Bridgewood
General Manager

2139

Summary of Chemical Analysis
Soil Samples

Our Ref 23-19603
Client Ref M23-006
Contract Title 25 Porter Street

			Lab No	2219728	2219729	2219730
			.Sample ID	BH01	BH02	BH02
			Depth	0.10	0.20	0.50
			Other ID			
			Sample Type	SOIL	SOIL	SOIL
			Sampling Date	16/08/2023	16/08/2023	16/08/2023
			Sampling Time	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**			
Inorganics						
pH	DETSC 2008#		pH	6.8	7.5	8.2
Sulphate Aqueous Extract as SO4 (2:1)	DETSC 2076#	10	mg/l	18	490	580

Information in Support of the Analytical Results

Our Ref 23-19603
Client Ref M23-006
Contract 25 Porter Street

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
2219728	BH01 0.10 SOIL	16/08/23	PT 1L		
2219729	BH02 0.20 SOIL	16/08/23	PT 1L		
2219730	BH02 0.50 SOIL	16/08/23	PT 1L		

Key: P-Plastic T-Tub

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

End of Report

Appendix D

SOLMEK NOTES ON CONTAMINATION GUIDANCE (REF: VERSION 1/2023)

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.

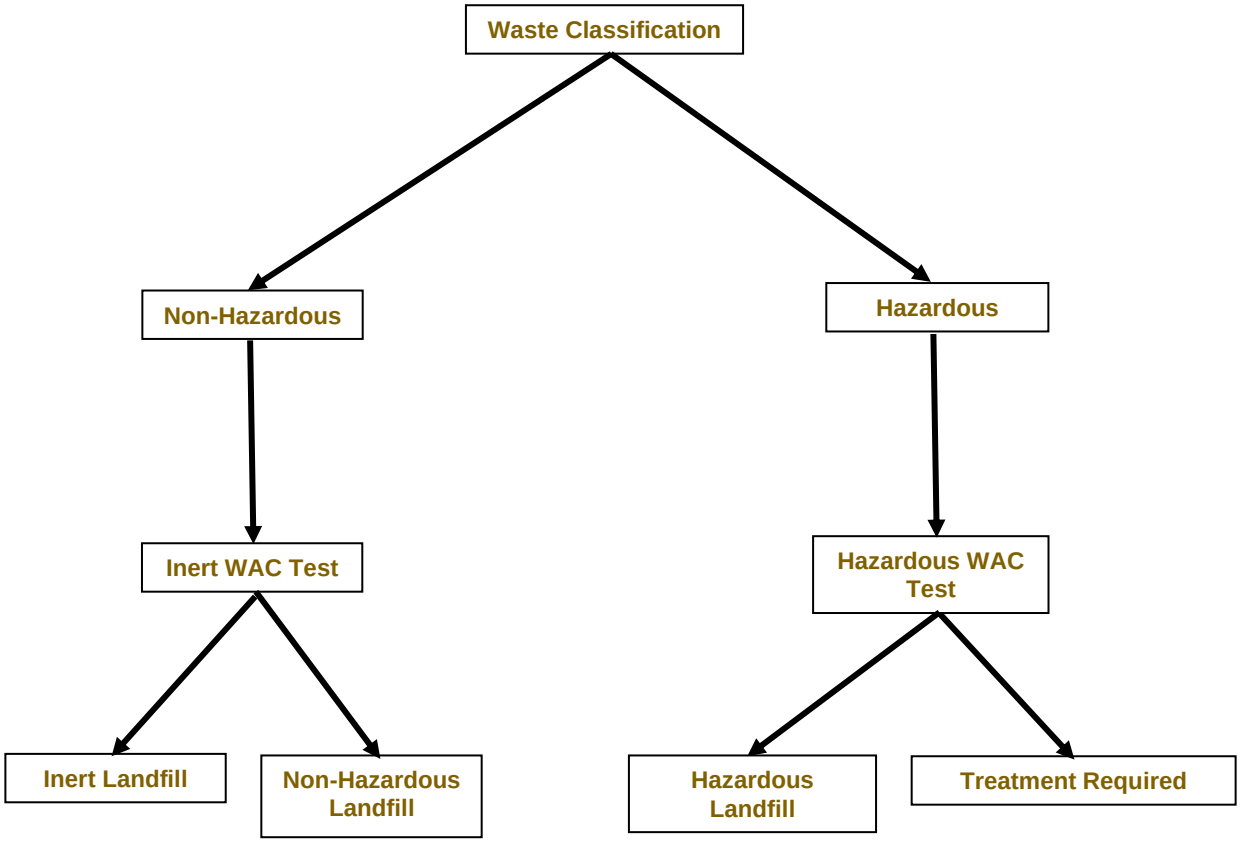
WASTE CLASSIFICATION AND WASTE ACCEPTANCE CRITERIA

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: version1/2023)

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.