

Phase 2: Site Investigation

KMS Goldthorpe, Barnsley

Mallinson Properties Ltd

M23-024

Solmek Ltd

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

www.solmek.com

info@solmek.com



PHASE 2 SITE INVESTIGATION REPORT

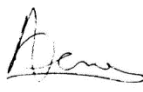
KMS GOLDTHORPE, BARNSELEY

TABLE OF CONTENTS

1	EXECUTIVE SUMMARY	2
2	INTRODUCTION	3
3	SITE DESCRIPTION AND FIELDWORK	3
4	GROUND CONDITIONS	4
5	CONTAMINATION TESTING RESULTS	5
6	CONCEPTUAL MODEL AND CONTAMINATION ANALYSIS	8
7	GROUND GAS ASSESSMENT	10
8	GEOTECHNICAL TESTING AND ANALYSIS.....	10
TABLE 1: SUMMARY OF GROUNDWATER STRIKES		6
TABLE 2: SUMMARY OF INORGANIC CONTAMINATION TESTING RESULTS.....		6
TABLE 3: SUMMARY OF ORGANIC CONTAMINATION TESTING RESULTS		7

APPENDICES

- Appendix A: Drawings
Appendix B: Borehole & Trial Pit Logs
Appendix C: Contamination Laboratory Results
Appendix D: Geotechnical Laboratory Results
Appendix E: Notes on Limitations & Contamination Guidelines

Revision	Date	Prepared by	Signed
Final	November 2023	A Crane <i>Engineering Geologist</i>	
		Checked by	
		L Richards <i>Regional Manager</i>	
		Approved by	
		R Woods <i>Managing Director</i>	

1 EXECUTIVE SUMMARY

Site Address	Morgan House, Commercial Rd, Goldthorpe, Rotherham S63 9BL.
Proposed Development	The site is expected to be developed with extensions to an existing industrial unit and associated redevelopment of hardstanding.
Fieldwork	3no rotary open-hole (BH01 to BH03) inclusive to a maximum depth of 30.00mbgl. - The boreholes were drilled to investigate the presence of shallow historic mine workings. - Gas monitoring well was installed in BH01. 5no machine excavated trial pits (TP01 to TP05) were dug to a maximum depth of 0.7mbgl. - The trial pits were spaced to locate potential deeper areas of made ground in the western portion of the site. - In-situ testing in the exploratory positions as California Bearing Ratio (CBR) and hand shear vanes.
Ground Conditions	- Made ground was encountered to a maximum depth of 0.70mbgl. - Natural ground generally comprised firm to stiff weathered mudstone and natural clay deposits. - Bedrock of interbedded mudstone and sandstone was encountered at depths of between 0.45mbgl and 1.70mbgl and was proven to 30.00mbgl. - Groundwater was recorded at depths of between 6.00mbgl and 15.10mbgl.
Contamination Testing Results	- No significantly raised contaminants detected. - No asbestos fibres. - Slightly to highly alkaline pH.
Contamination Analysis	- Given the site's proposed commercial land use the levels of contamination recorded on site are unlikely to pose a risk to the current and future users of the site. - If any zones of odorous, brightly coloured or suspected contaminated ground or groundwater are encountered then work should cease in that area until the material has been investigated. The results of the investigation will therefore determine whether or not remediation will be required. - Made ground classed as posing a low risk with respect to construction workers. PPE for workers. Damping down of site during dry windy conditions. - Controlled waters unlikely to be at significant risk. - With respect to utilities pH was elevated, precluding the use of copper pipes; as a minimum all services should be laid in clean trenches. - Sub surface concrete should be designed to DS-2 ACEC (Class AC-1s).
Geotechnical Analysis & Foundation Recommendations	- Bearing capacity of 125kN/m² at minimum depth of 0.45mbgl on 1m² pads upon mudstone bedrock - Settlements within 25mm. - Normal earthworks plant for excavations. - 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 Mallinson Properties Ltd, on land located within KMS Transport on the Goldthorpe site in Barnsley (Figure 1).

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

- *Haigh Huddlestone & Associates Coal Mining Risk Assessment (E23/8057/MD/L001) March 2023.*

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

2.2 Scope of Works

The site is expected to be developed with extensions to an existing industrial unit and associated redevelopment of hardstanding.

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

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

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

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

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

A site inspection, as recommended in BS 5930 and BS 10175, was undertaken on Monday 16th October 2023. The site is centred at Ordnance Survey Co-ordinates 445112E, 403682N and covers approximately

1.22Ha.

The site is a rectangular shaped parcel of land located on land comprising part of the KMS Transport compound in Goldthorpe, Barnsley. The area under investigation is located immediately south of Commercial Road and relatively flat in topography with an uneven surface in the most western border of the site comprising roughly laid and loosely compacted hardcore of brick, tile, concrete, and rebar as well as other construction materials. The rest of the site consist of evenly laid concrete and compacted hardcore of dark sandstone. Furthermore, the perimeter of the site consists of soft landscaping of shrubs and trees. However, no trees or shrubs have grown on the western border of the site.

Three large warehouse/office buildings occupy the western portion of the site alongside a visitor's car park. The eastern portion of the site consist of a large parking and loading space for lorries and a wire fence surrounds the site. There are two entry points to the site located along its northern border providing access from Commercial Road. To the immediate west of site there is a steep incline to a large carpark and a stream. To the immediate east of the site there is a road (Commercial Road) and to the immediate south there is more industrial buildings.

4 GEOLOGICAL SETTING

The site is shown on geological mapping to be underlain by bedrock geology of the Pennine Middle Coal Measures Formation. The Shafton Coal seam is noted to subcrop to the immediate south of the site, and appears to dip north underneath the site.

BGS Mapping sheet SE40SW notes that the seam is between 1.30 – 1.50m in thickness.

5 Fieldwork

The fieldwork was carried out on 16th October 2023. The extent of the investigation was:

- 3no rotary open-hole (BH01 to BH03) inclusive to a maximum depth of 30.00mbgl.
 - The boreholes were drilled to investigate the presence of shallow historic mine workings.
- Gas monitoring well was installed in BH01.
- 5no machine excavated trial pits (TP01 to TP05) were dug to a maximum depth of 0.7mbgl.
 - The trial pits were spaced to locate potential deeper areas of made ground in the western portion of the site.
- In-situ testing in the exploratory positions as California Bearing Ratio (CBR) and hand shear vanes.
- Retrieval of samples for geotechnical and chemical testing.

The boreholes were backfilled with bentonite and monitoring installations upon completion. Trial pits were backfilled in layers with clean arisings.

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).

6 GROUND CONDITIONS

A summary of the ground conditions encountered is given below. The borehole and trial pit logs are presented in Appendix B.

6.1 Made Ground

Made ground was relatively uniform across the site and was encountered to depths of up to 0.7mbgl (BH01). In the west of the site the made ground comprised brick, tile, and concrete with occasional rebar, cloth and wood to a maximum depth of 0.7mbgl (BH01). in the east of the site, granular hardcore comprising brick, core, tile, concrete and occasional rubber was present to a maximum depth of 0.5m .

Visually, blue streaks were locally noted in the made ground in TP03 in the west, although no olfactory evidence of contamination was noted within this stratum.

6.2 Relic Service Pipes & Obstructions

Within the trial pits inferred weathered mudstone bedrock caused refusal and therefore, they were terminated before targeted depth.

6.3 Natural Deposits

Proven to underlie the made ground deposits across the site, natural ground generally comprised firm to stiff clay (possibly completely weathered mudstone). The trial pits that encountered natural ground were terminated at a maximum depth of 0.7mbgl (TP03) due to refusal on more competent inferred mudstone bedrock.

6.4 Solid Geology

Rockhead, generally comprising interbedded mudstone and sandstone, was encountered within all of the exploratory positions at depths ranging from 0.45mbgl (TP02) to 1.7mbgl (BH03). The interbedded mudstone and sandstone was proven to the maximum termination depth of the boreholes (30.00mbgl).

6.5 Groundwater

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

TABLE 1: SUMMARY OF GROUNDWATER STRIKES

Exploratory Position	Depth Encountered (mbgl)	Strata
BH01	6.00	Interbedded mudstone and sandstone
BH03	15.10	Sandstone

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

7 CONTAMINATION TESTING RESULTS

The proposed development of the site is to involve the extension of an existing industrial unit. 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.

7.1 Contamination Testing and Rationale

To provide information upon the possibility of ground contamination four samples of made ground and one sample of natural deposits were selected for shallow contamination testing. The samples selected are detailed below:

- TP01 – 0.15-0.30m (Made ground – topsoil)
- TP02 – 0.10-0.20m (Made ground – sandy gravel)
- TP03 – 0.50-0.70m (Natural weathered mudstone)
- TP04 – 0.40-0.50m (Made Ground - sandy gravelly clay)
- TP05 – 0.40-0.50m (Made ground – sandy gravelly clay)

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)

7.2 Test Results

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

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

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

TABLE 2: SUMMARY OF INORGANIC CONTAMINATION TESTING RESULTS

Determinand	Units	Number of Samples above Level of Detection	Minimum Recorded Level	Maximum Recorded Level	Commercial Threshold Value	Number of Results Exceeding Threshold Value
Metals						
Cadmium	mg/kg	5	0.2	0.5	190	0
Chromium	mg/kg	5	17	33	8600	0
Copper	mg/kg	5	17	38	68000	0
Lead	mg/kg	5	15	33	2300*	0
Mercury	mg/kg	1	<0.1	0.27	1100	0
Nickel	mg/kg	5	7.8	49	980	0
Zinc	mg/kg	5	62	130	730000	0
Semi metals and non metals						
Arsenic	mg/kg	5	5.2	12	640**	0
Boron	mg/kg	3	<0.4	1.1	240000	0
Selenium	mg/kg	0	<0.2	-	12000	0
Inorganic chemicals						
Cyanide (Total)	mg/kg	0	<0.5	-	1580**	0
Sulphate (2:1 Water Soluble)	mg/l	5	70	860	2000^	0
Other						
pH	pH	-	7.5	11.3	5.5^	0
* Category 4 Screening Levels, March 2014 ** CLEA Software Version 1.06 (pH7 and 1%SOM) ^ EA Threshold Values						

7.3 Metals, Semi Metals and Non Metals

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

7.4 Inorganic Chemicals

Soluble sulphates (potentially aggressive to foundation concrete) were recorded between 70 and 860mg/l. None of the samples were elevated above levels affecting human health, however the sample from TP02 (0.10-0.20m) was noted to be above the BRE Special Digest 1 500mg/l limit for the sulphate classification of concrete.

The results of the pH testing were between 7.5 and 11.3. These pH levels are consistent with slightly to highly alkaline conditions.

7.5 Organic Chemicals

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

The average SOM recorded across the site was 1.08% therefore a SOM of 1.00% has been used to determine the S4UL thresholds. Table 3, below, summarises the results.

TABLE 3: SUMMARY OF ORGANIC CONTAMINATION TESTING RESULTS

Determinand	Units	Number of Samples above Level of Detection	Minimum Recorded Level	Maximum Recorded Level	Commercial Threshold Value at 1% SOM	Number of Results Exceeding Threshold Value
TPH Aliphatic Fractions						
Aliphatic (C5-C6)	mg/kg	0	<1	-	12000	0
Aliphatic (C6-C8)	mg/kg	0	<1	-	40000	0
Aliphatic (C8-C10)	mg/kg	0	<1	-	11000	0
Aliphatic (C10-C12)	mg/kg	0	<1	-	47000	0
Aliphatic (C12-C16)	mg/kg	0	<1	-	90000	0
Aliphatic (C16-C21)	mg/kg	0	<1	-	1800000	0
Aliphatic (C21-C35)	mg/kg	0	<1	-	1800000	0
TPH Aromatic Fractions						
Aromatic (C5-C7)	mg/kg	0	<1	-	86000	0
Aromatic (C7-C8)	mg/kg	0	<1	-	180000	0
Aromatic (C8-C10)	mg/kg	0	<1	-	17000	0
Aromatic (C10-C12)	mg/kg	0	<1	-	34000	0
Aromatic (C12-C16)	mg/kg	0	<1	-	38000	0
Aromatic (C16-C21)	mg/kg	0	<1	-	28000	0
Aromatic (C21-C35)	mg/kg	0	<1	-	28000	0
Speciated PAH						
Naphthalene	mg/kg	0	<0.1	-	1100	0
Acenaphthylene	mg/kg	0	<0.1	-	100000	0
Acenaphthene	mg/kg	0	<0.1	-	100000	0
Fluorene	mg/kg	0	<0.1	-	71000	0
Phenanthrene	mg/kg	3	<0.1	0.6	23000	0
Anthracene	mg/kg	1	<0.1	0.2	540000	0
Fluoranthene	mg/kg	4	<0.1	1.5	23000	0
Pyrene	mg/kg	4	<0.1	1.5	54000	0
Benzo[a]anthracene	mg/kg	4	<0.1	0.8	180	0
Chrysene	mg/kg	4	<0.1	0.8	350	0
Benzo[b]fluoranthene	mg/kg	4	<0.1	0.6	45	0
Benzo[k]fluoranthene	mg/kg	4	<0.1	0.4	1200	0
Benzo[a]pyrene	mg/kg	4	<0.1	0.9	36	0
Benzo[g,h,i]perylene	mg/kg	4	<0.1	0.5	4000	0
Dibenz(a,h)Anthracene	mg/kg	0	<0.1	0.1	3.6	0
Indeno(1,2,3-c,d)Pyrene	mg/kg	4	<0.1	0.5	510	0
Total PAH	mg/kg	4	<2	8.4	1000*	0
Total Phenol	mg/kg	0	<0.3	-	3200	0
* EA Threshold Values						

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

7.6 Asbestos

From the five samples subject to asbestos screening, asbestos fibres were recorded in none.

7.7 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.

8 CONTAMINATION ANALYSIS

8.1 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 volatiles compounds, and inadvertent soil ingestion. Moreover, a risk to ground/surface water receptors exists through leaching of contaminants.

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 S4UL thresholds based on commercial end use (see Tables 2 & 3).

The levels of contaminants across the site are low with none of the samples exceeding any of the commercial contaminant thresholds.

The new development is expected to comprise an extension to an existing industrial unit. Based on the **shallow** soil contamination testing, it is considered that the levels of contamination may not pose a significant risk to future users of the site.

8.2 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 volatiles compounds, inadvertent soil ingestion and contact with contaminated groundwater.

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

Although asbestos was not detected from the soil samples subjected to testing within this investigation, the

possibility still exists that asbestos containing materials may still be present on site and currently lie undetected. It is therefore advised that a 'watching brief' is undertaken during the initial site strip and any excavation works and advice sought if asbestos is found or suspected.

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

8.3 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. No soft landscaping has been proposed and so is not considered a significant factor.

8.4 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 thin made ground of granular and cohesive material directly overlying mudstone bedrock, with local areas of natural clay noted. The published geology indicates the site is underlain by solid geology of the Pennine Middle Coal Measures Formation, which is designated as a Secondary Aquifer – A by the Environment Agency.

Groundwater was encountered between 6.00 and 15.10mbgl.

No contamination was recorded based on the five samples tested.

No significant risk is posed to groundwater receptors.

8.5 Construction Materials

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

6.5.1 Concrete Classification

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

Levels of slightly to highly alkaline pH (7.5 to 11.3) were recorded across the site.

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.

8.6 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

8.7 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.

9 GROUND GAS ASSESSMENT

The proposed development includes the extension of an existing industrial unit.

Ground gases such as carbon dioxide (CO₂), methane (CH₄), 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 (BH01) 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.

The rationale of the ground gas installations was to capture ground gas emissions from the site.

10 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, in-situ Standard Penetration Tests (SPTs) were undertaken at regular intervals during drilling. The geotechnical results are presented in Appendix D.

10.1 Strength and Density

10.1.1 Hand Shear Vanes

A single hand shear vane test within the natural cohesive deposits within TP03 at 0.70mbgl and returned a result of 48kPa, which is indicative of medium strength conditions.

10.2 Moisture Contents

Three samples recovered from the trial pits have been subject to moisture content tests to determine the moisture profile. Moisture levels were between 16% and 18%.

10.3 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 intermediate plasticity.

The Plasticity Indices ranged from 10 to 18 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 current relevant guidance.

10.4 pH and Sulphate Results

Four samples of 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 7.4 to 8.5 indicating slightly alkaline to alkaline conditions. Soluble sulphates were recorded at levels ranging from 18mg/l to 170mg/l.

10.5 CBR Tests

California Bearing Ratio testing was undertaken via plate load bearing test method within the trial pits. The results are presented within Appendix D.

Where made ground was present, a conservative equilibrium CBR of 2% should be adopted for design purposes.

10.6 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. Should the overlying rock be weak and/or faulting, a ratio in excess of 10x may be required, whilst weak basement rock underlying the works could cause a separate collapse mechanism via pillars sinking. For certain developments, a ratio of less than 10x may be addressed via using rafts, however this would be dependent on approval from the regulatory authorities. This may not be appropriate for steeply dipping seams and where strong flowing water is encountered.

Based on the Coal Mining Risk Assessment carried out by Haigh Huddleston and Associates noting that the site may be at risk due to shallow unrecorded coal workings, possibly associated with the Shafton Coal seam, three rotary open-hole boreholes were drilled to a depth of 30.00mbgl.

No coal, voids, areas of soft ground, loss of flush, or other evidence of historic coal workings were noted by the lead driller during the intrusive investigation. Therefore, based on the findings of the three boreholes drilled, coal mining is deemed to pose a low risk to development.

10.7 Foundations

10.7.1 Foundations atop Rockhead

The site is underlain by mudstone with rockhead noted between 0.45mbgl (TP02) to 1.7mbgl (BH03). It would be prudent to situate the foundations directly upon the mudstone bedrock.

The foundations will be required to found at a minimum depth of 0.45mbgl to protect against damage from frost action.

Pad footings of dimensions 1m x 1m, should be adopted placed directly onto the weathered limestone rockhead at depths of at least 0.45mbgl.

The shallow weathered mudstone can be considered very weak to weak. Table 2.4 in *Foundation Design & Construction, 6th Edition*, M.J. Tomlinson outlines a bearing capacity of 125kN/m² for weathered mudstone be assumed. Providing imposed loads do not exceed the bearing capacity then settlement 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 125kN/m² allowable bearing capacity.

10.8 Excavation

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

10.9 Groundwater

Groundwater was encountered between 6.00mbgl and 15.10mbgl, as referenced in Table 1.

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

SOLMEK

Appendix A



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

Figure Title

Site Location Plan

Project Number

M23-024

Project Name

KMS Goldthorpe, Barnsley

Client

Mallinson Properties Ltd

Date

November 2023

DRG Number

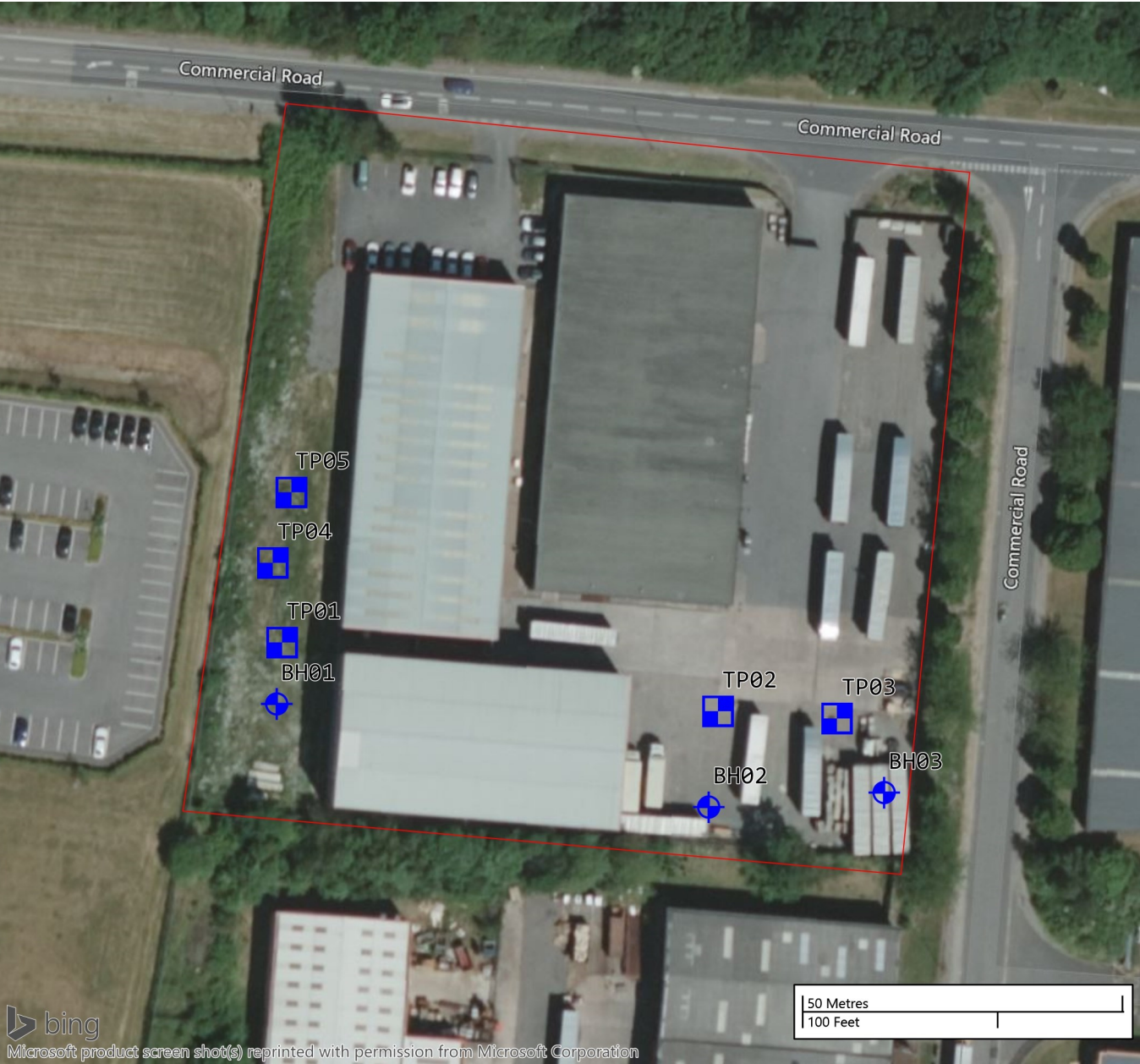
Figure 1

Scale

1:5000 @ A4 [DO NOT SCALE]

Legend Key

 Project Bounds - Project Bounds



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

Figure Title

Exploratory Hole Location Plan

Project Number

M23-024

Project Name

KMS Goldthorpe, Barnsley

Client

Mallinson Properties Ltd

Date

November 2023

DRG Number

Figure 2

Scale

1:1000 @ A4 [DO NOT SCALE]

Legend Key

- Locations By Type - Empty
- ⛶ Locations By Type - BH
- ▣ Locations By Type - TP
- ▭ Project Bounds - Project Bounds

Appendix B



TrialPit No
TP01
Sheet 1 of 1

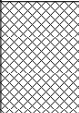
Date
16/10/2023

Scale
1:26

Logged
ARC

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.15			MADE GROUND: Dark brown sandy slightly gravelly slightly clayey topsoil. Sand is fine to coarse. Gravel is fine to coarse angular to subangular of bricks, tiles and concrete. Occasional rebar and rootlets.
				0.30			MADE GROUND: Soft to firm, orangey light brown sandy slightly gravelly clay. Sand is fine to coarse. Gravel is fine to coarse, subangular to angular of bricks and concrete.
				0.40			Weathered MUDSTONE. End of Pit at 0.400m

Stability: Pit wall 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: KMS Goldthorpe, Barnsley				Project No. M23-024		Co-ords: 445040E - 403791N Level:		Date 16/10/2023	
Plant Used: JCB				Dimensions (m): Depth 0.50		Scale 1:26		Logged ARC	
Client: Mallinson Properties Ltd									
Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
	Depth	Type	Results						
				0.40 0.45 0.50 0.50		  	MADE GROUND: Greyish dark brown sandy gravel. Sand is fine to coarse. Gravel is fine to coarse, subangular to angular of bricks and concrete. Occasional plastic. MADE GROUND: Unknown black uniform spherical plastic pellets. Stiff orangish light brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to medium, subangular to angular of brick, core and mudstone. Weathered MUDSTONE. End of Pit at 0.500m		
							1 2 3 4 5		
Remarks: No groundwater encountered. Pit terminated due to refusal of JCB on Mudstone.									
Stability: Pit wall stable.									



TrialPit No
TP03
Sheet 1 of 1

Date
16/10/2023

Scale
1:26

Logged
ARC

- 1
- 2
- 3
- 4
- 5

Stability: Pit wall stable.

Trial Pit Log

TrialPit No
TP04
Sheet 1 of 1

Project Name: KMS Goldthorpe, Barnsley

Project No.
M23-024

Co-ords: 444969E - 403813N
Level:

Date
16/10/2023

Plant Used:	JCB
-------------	-----

Dimensions
(m):

150

Scale
1:26

Client: Mallinson Properties Ltd

Depth
0.60

0.30

Logged
ARC

[illegible]

Remarks:	No groundwater encountered. Pit terminated due to refusal of JCB on Mudstone.
----------	--

Stability: Pit wall 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: KMS Goldthorpe, Barnsley				Project No. M23-024		Co-ords: 444972E - 403824N Level:		Date 16/10/2023	
Plant Used: JCB				Dimensions (m): 0.30		Scale 1:26		Logged ARC	
Client: Mallinson Properties Ltd				Depth 0.60					
Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
	Depth	Type	Results						
				0.15			MADE GROUND: Dark brown sandy slightly gravelly slightly clayey topsoil. Sand is fine to coarse. Gravel is fine to coarse angular to subangular of bricks, tiles and concrete. Occasional rebar and rootlets. MADE GROUND: Soft to firm, orangish light brown sandy slightly gravelly clay. Sand is fine to coarse. Gravel is fine to coarse, subangular to angular of bricks and concrete. Weathered MUDSTONE- refusal.		
				0.50					
				0.60					
	End of Pit at 0.600m								
1 2 3 4 5									
Remarks: No groundwater encountered. Pit terminated due to refusal of JCB on Mudstone.									
Stability: Pit wall stable.									



Rotary Open Hole Log

BH01

Site: KMS Goldthorpe, Barnsley

GL (AOD):	
Easting:	444970.13
Northing:	403791.07
Logged:	JR
Status:	FINAL

Method:	Rotary Openhole
----------------	-----------------

Backfill / Installation	Legend	Depth (m)	Level (m AOD)	Stratum Description	Samples and Insitu Testing			Coring / Fractures			
					Depth (m)	Type	Results	TCR (%)	SCR (%)	RQD (%)	Fracture
		0.70		MADE GROUND (Driller's description).							
		CLAY (Driller's description).									
		1.70		MUDSTONE with sandstone bands. (Driller's description).							
		30.00		End of Borehole at 30.000m							

Hole Diameter		Casing Depths		General Remarks	Flush Returns				Ground Water				
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)		From (m)	To (m)	Flush Type	Flush (%)	Depth Strike (m)	Depth Casing (m)	Depth Sealed (m)	Time Elapsed (min)	Water Level (m)
					1.2m Hand excavated inspection pit dug. Groundwater encountered at 6.00m.	0.00	30.00	Water	100	6.00			

 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		BH02	
Contract no: M23-024		Site: KMS Goldthorpe, Barnsley				Driller: ID Drilling Ltd Plant used: MI3 Started: 15/10/2023 Ended: 15/10/2023 Backfilled: 15/10/2023			GL (AOD): Easting: 445038.28 Northing: 403775.54 Logged: JR Status: FINAL				
Client: Mallinson Properties Ltd													
Method: Rotary Openhole													
Backfill / Installation	Legend	Depth (m)	Level (m AOD)	Stratum Description	Samples and Insitu Testing			Coring / Fractures					
					Depth (m)	Type	Results	TCR (%)	SCR (%)	RQD (%)	Fracture		
		0.30		MADE GROUND (Driller's description).									
		0.80		SAND (Driller's description).									
				MUDSTONE (Driller's description).									
		16.40		SANDSTONE with mudstone bands. (Driller's description).									
		30.00		End of Borehole at 30.000m									
Hole Diameter		Casing Depths		General Remarks	Flush Returns				Ground Water				
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)		From (m)	To (m)	Flush Type	Flush (%)	Depth Strike (m)	Depth Casing (m)	Depth Sealed (m)	Time Elapsed (min)	Water Level (m)
				1.2m Hand excavated inspection pit dug. No groundwater encountered.	0.00	30.00	Water	100					



Rotary Open Hole Log

BH03

Site: KMS Goldthorpe, Barnsley

GL (AOD):	
Easting:	445065.85
Northing:	403778.08
Logged:	JR
Status:	FINAL

Method:	Rotary Openhole
----------------	-----------------

[illegible]

Appendix C



Certificate of Analysis

Certificate Number 23-26027

Issued: 15-Nov-23

Client SOLMEK
12 Yarm Road
Stockton On Tees
Cleveland
TS18 3NA

Our Reference 23-26027

Client Reference M23024

Order No MID-0105/LR

Contract Title KMS Goldthorpe, Barnsley

Description 5 Soil samples.

Date Received 03-Nov-23

Date Started 03-Nov-23

Date Completed 15-Nov-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

A handwritten signature in black ink, appearing to read "K. Bridgewood".

Kirk Bridgewood
General Manager



Summary of Chemical Analysis

Matrix Descriptions

Our Ref 23-26027

Client Ref M23024

Contract Title KMS Goldthorpe, Barnsley

Sample ID	Depth	Lab No	Completed	Matrix Description
TP01	0.15-0.30	2257951	15/11/2023	Brown gravelly, sandy CLAY
TP02	0.10-0.20	2257952	15/11/2023	Brown gravelly, sandy CLAY (Possible made ground - brick)
TP03	0.50-0.70	2257953	15/11/2023	Brown gravelly, clayey SAND
TP04	0.40-0.50	2257954	15/11/2023	Brown gravelly, sandy CLAY
TP05	0.40-0.50	2257955	15/11/2023	Brown gravelly, sandy CLAY

Summary of Chemical Analysis

Soil Samples

Our Ref 23-26027

Client Ref M23024

Contract Title KMS Goldthorpe, Barnsley

Lab No	2257951	2257952	2257953	2257954	2257955
Sample ID	TP01	TP02	TP03	TP04	TP05
Depth	0.15-0.30	0.10-0.20	0.50-0.70	0.40-0.50	0.40-0.50
Other ID					
Sample Type	ES	ES	ES	ES	ES
Sampling Date	16/10/2023	16/10/2023	16/10/2023	16/10/2023	16/10/2023
Sampling Time	n/s	n/s	n/s	n/s	n/s

Test	Method	LOD	Units					
Metals								
Arsenic	DETSC 2301#	0.2	mg/kg	7.4	5.2	12	12	10
Boron, Water Soluble (2.5:1)	DETSC 2311#	0.2	mg/kg	0.4	1.1	0.6	0.5	0.3
Cadmium	DETSC 2301#	0.1	mg/kg	0.5	0.3	0.2	0.3	0.2
Chromium	DETSC 2301#	0.15	mg/kg	17	18	19	31	33
Copper	DETSC 2301#	0.2	mg/kg	21	17	26	34	38
Lead	DETSC 2301#	0.3	mg/kg	28	33	15	23	21
Mercury	DETSC 2325#	0.05	mg/kg	0.07	0.27	0.09	0.08	0.07
Nickel	DETSC 2301#	1	mg/kg	24	7.8	25	39	49
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Zinc	DETSC 2301#	1	mg/kg	92	130	62	110	130
Inorganics								
pH	DETSC 2008#		pH	8.7	11.3	7.6	7.9	7.5
Cyanide, Free	DETSC 2130#	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Organic matter	DETSC 2002#	0.1	%	0.9	2.2	0.8	0.6	0.9
Sulphate Aqueous Extract as SO4 (2:1)	DETSC 2076#	10	mg/l	70	860	110	110	110
Petroleum Hydrocarbons								
Aliphatic C5-C6: HS_1D_AL	DETSC 3321*	0.01	mg/kg	< 0.01		< 0.01		< 0.01
Aliphatic C6-C8: HS_1D_AL	DETSC 3321*	0.01	mg/kg	< 0.01		< 0.01		< 0.01
Aliphatic C8-C10: HS_1D_AL	DETSC 3321*	0.01	mg/kg	< 0.01		0.75		0.21
Aliphatic C10-C12: EH_CU_1D_AL	DETSC 3072#	1.5	mg/kg	< 1.5		< 1.5		< 1.5
Aliphatic C12-C16: EH_CU_1D_AL	DETSC 3072#	1.2	mg/kg	< 1.2		< 1.2		< 1.2
Aliphatic C16-C21: EH_CU_1D_AL	DETSC 3072#	1.5	mg/kg	< 1.5		< 1.5		< 1.5
Aliphatic C21-C35: EH_CU_1D_AL	DETSC 3072#	3.4	mg/kg	< 3.4		< 3.4		< 3.4
Aliphatic C5-C35: EH_CU+HS_1D_AL	DETSC 3072*	10	mg/kg	< 10		< 10		< 10
Aromatic C5-C7: HS_1D_AR	DETSC 3321*	0.01	mg/kg	< 0.01		< 0.01		< 0.01
Aromatic C7-C8: HS_1D_AR	DETSC 3321*	0.01	mg/kg	< 0.01		< 0.01		< 0.01
Aromatic C8-C10: HS_1D_AR	DETSC 3321*	0.01	mg/kg	< 0.01		< 0.01		< 0.01
Aromatic C10-C12: EH_CU_1D_AR	DETSC 3072#	0.9	mg/kg	< 0.9		< 0.9		< 0.9
Aromatic C12-C16: EH_CU_1D_AR	DETSC 3072#	0.5	mg/kg	< 0.5		< 0.5		< 0.5
Aromatic C16-C21: EH_CU_1D_AR	DETSC 3072#	0.6	mg/kg	< 0.6		< 0.6		< 0.6
Aromatic C21-C35: EH_CU_1D_AR	DETSC 3072#	1.4	mg/kg	< 1.4		< 1.4		< 1.4
Aromatic C5-C35: EH_CU+HS_1D_AR	DETSC 3072*	10	mg/kg	< 10		< 10		< 10
TPH Ali/Aro Total C5-C35: EH_CU+HS_1D_Total	DETSC 3072*	10	mg/kg	< 10		< 10		< 10
PAHs								
Naphthalene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthylene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluorene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Phenanthrene	DETSC 3301	0.1	mg/kg	0.6	0.5	< 0.1	< 0.1	0.3
Anthracene	DETSC 3301	0.1	mg/kg	0.2	0.1	< 0.1	< 0.1	< 0.1

Summary of Chemical Analysis Soil Samples

Our Ref 23-26027

Client Ref M23024

Contract Title KMS Goldthorpe, Barnsley

Lab No	2257951	2257952	2257953	2257954	2257955
Sample ID	TP01	TP02	TP03	TP04	TP05
Depth	0.15-0.30	0.10-0.20	0.50-0.70	0.40-0.50	0.40-0.50
Other ID					
Sample Type	ES	ES	ES	ES	ES
Sampling Date	16/10/2023	16/10/2023	16/10/2023	16/10/2023	16/10/2023
Sampling Time	n/s	n/s	n/s	n/s	n/s

Test	Method	LOD	Units					
Fluoranthene	DETSC 3301	0.1	mg/kg	1.5	1.0	< 0.1	0.4	0.9
Pyrene	DETSC 3301	0.1	mg/kg	1.5	1.0	< 0.1	0.4	0.8
Benzo(a)anthracene	DETSC 3301	0.1	mg/kg	0.8	0.5	< 0.1	0.2	0.5
Chrysene	DETSC 3301	0.1	mg/kg	0.8	0.4	< 0.1	0.2	0.5
Benzo(b)fluoranthene	DETSC 3301	0.1	mg/kg	0.6	0.3	< 0.1	0.2	0.3
Benzo(k)fluoranthene	DETSC 3301	0.1	mg/kg	0.4	0.2	< 0.1	0.2	0.2
Benzo(a)pyrene	DETSC 3301	0.1	mg/kg	0.9	0.5	< 0.1	0.3	0.6
Indeno(1,2,3-c,d)pyrene	DETSC 3301	0.1	mg/kg	0.5	0.4	< 0.1	0.4	0.4
Dibenzo(a,h)anthracene	DETSC 3301	0.1	mg/kg	0.1	< 0.1	< 0.1	< 0.1	0.1
Benzo(g,h,i)perylene	DETSC 3301	0.1	mg/kg	0.5	0.2	< 0.1	0.2	0.3
PAH 16 Total	DETSC 3301	1.6	mg/kg	8.4	5.0	< 1.6	2.5	4.9
Phenols								
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3

Summary of Asbestos Analysis Soil Samples

Our Ref 23-26027

Client Ref M23024

Contract Title KMS Goldthorpe, Barnsley

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
2257951	TP01 0.15-0.30	SOIL	NAD	none	Shannon Hope
2257952	TP02 0.10-0.20	SOIL	NAD	none	Shannon Hope
2257953	TP03 0.50-0.70	SOIL	NAD	none	Shannon Hope
2257954	TP04 0.40-0.50	SOIL	NAD	none	Shannon Hope
2257955	TP05 0.40-0.50	SOIL	NAD	none	Shannon Hope

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: * - not included in laboratory scope of accreditation.

Information in Support of the Analytical Results

Our Ref 23-26027
 Client Ref M23024
 Contract KMS Goldthorpe, Barnsley

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
2257951	TP01 0.15-0.30 SOIL	16/10/23	GJ 250ml, PT 1L	Aliphatics/Aromatics (14 days), BTEX / C5-C10 (14 days), Naphthalene (14 days), PAH FID (14 days), pH + Conductivity (7 days), Cyanide/Mono pHoh (14 days)	BTEX / C5-C10
2257952	TP02 0.10-0.20 SOIL	16/10/23	GJ 250ml, PT 1L	Naphthalene (14 days), PAH FID (14 days), pH + Conductivity (7 days), Cyanide/Mono pHoh (14 days)	
2257953	TP03 0.50-0.70 SOIL	16/10/23	GJ 250ml, PT 1L	Aliphatics/Aromatics (14 days), BTEX / C5-C10 (14 days), Naphthalene (14 days), PAH FID (14 days), pH + Conductivity (7 days), Cyanide/Mono pHoh (14 days)	BTEX / C5-C10
2257954	TP04 0.40-0.50 SOIL	16/10/23	GJ 250ml, PT 1L	Naphthalene (14 days), PAH FID (14 days), pH + Conductivity (7 days), Cyanide/Mono pHoh (14 days)	
2257955	TP05 0.40-0.50 SOIL	16/10/23	GJ 250ml, PT 1L	Aliphatics/Aromatics (14 days), BTEX / C5-C10 (14 days), Naphthalene (14 days), PAH FID (14 days), pH + Conductivity (7 days), Cyanide/Mono pHoh (14 days)	BTEX / C5-C10

Key: G-Glass P-Plastic J-Jar 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

Information in Support of the Analytical Results

List of HWOL Acronyms and Operators

Acronym	Description
HS	Headspace analysis
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent
CU	Clean-up - e.g. by florisil, silica gel
1D	GC - Single coil gas chromatography
2D	GC-GC - Double coil gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics only
AR	Aromatics only
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +)
+	Operator to indicate cumulative eg. EH+HS_Total or EH_CU+HS_Total

Det

Aliphatic C5-C6

Acronym

HS_1D_AL

Appendix A - Details of Analysis

Method	Parameter	Units	Limit of Detection	Sample Preparation	Sub-Contracted	UKAS	MCERTS
DETSC 2002	Organic matter	%	0.1	Air Dried	No	Yes	Yes
DETSC 2003	Loss on ignition	%	0.01	Air Dried	No	Yes	Yes
DETSC 2008	pH	pH Units	1	Air Dried	No	Yes	Yes
DETSC 2076	Sulphate Aqueous Extract as SO ₄	mg/l	10	Air Dried	No	Yes	Yes
DETSC 2084	Total Organic Carbon	%	0.5	Air Dried	No	Yes	Yes
DETSC 2119	Ammoniacal Nitrogen as N	mg/kg	0.5	Air Dried	No	Yes	Yes
DETSC 2130	Cyanide free	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC 2130	Cyanide total	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC 2130	Phenol - Monohydric	mg/kg	0.3	Air Dried	No	Yes	Yes
DETSC 2130	Thiocyanate	mg/kg	0.6	Air Dried	No	Yes	Yes
DETSC 2301	Arsenic	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC 2301	Barium	mg/kg	1.5	Air Dried	No	Yes	Yes
DETSC 2301	Beryllium	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC 2301	Cadmium Available	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC 2301	Cadmium	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC 2301	Cobalt	mg/kg	0.7	Air Dried	No	Yes	Yes
DETSC 2301	Chromium	mg/kg	0.15	Air Dried	No	Yes	Yes
DETSC 2301	Copper	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC 2301	Manganese	mg/kg	20	Air Dried	No	Yes	Yes
DETSC 2301	Molybdenum	mg/kg	0.4	Air Dried	No	Yes	Yes
DETSC 2301	Nickel	mg/kg	1	Air Dried	No	Yes	Yes
DETSC 2301	Lead	mg/kg	0.3	Air Dried	No	Yes	Yes
DETSC 2301	Selenium	mg/kg	0.5	Air Dried	No	Yes	Yes
DETSC 2301	Zinc	mg/kg	1	Air Dried	No	Yes	Yes
DETSC 2311	Boron (water soluble)	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC 2321	Total Sulphate as SO ₄	%	0.01	Air Dried	No	Yes	Yes
DETSC 2325	Mercury	mg/kg	0.05	Air Dried	No	Yes	Yes
DETSC 3049	Sulphur (free)	mg/kg	0.75	As Received	No	Yes	Yes
DETSC 3072	Ali/Aro C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C12	mg/kg	1.5	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C12-C16	mg/kg	1.2	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C16-C21	mg/kg	1.5	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C21-C35	mg/kg	3.4	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C12	mg/kg	0.9	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C12-C16	mg/kg	0.5	As Received	No	Yes	Yes
DETSC 3072	Aromatic C16-C21	mg/kg	0.6	As Received	No	Yes	Yes
DETSC 3072	Aromatic C21-C35	mg/kg	1.4	As Received	No	Yes	Yes
DETSC 3303	Acenaphthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Acenaphthylene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(a)pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(a)anthracene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(b)fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(k)fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(g,h,i)perylene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Dibenzo(a,h)anthracene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes

Appendix A - Details of Analysis

Method	Parameter	Units	Limit of Detection	Sample Preparation	Sub-Contracted	UKAS	MCERTS
DETSC 3303	Indeno(1,2,3-c,d)pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Naphthalene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Phenanthrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3311	C10-C24 Diesel Range Organics (DRO)	mg/kg	10	As Received	No	Yes	Yes
DETSC 3311	C24-C40 Lube Oil Range Organics (LORO)	mg/kg	10	As Received	No	Yes	Yes
DETSC 3311	EPH (C10-C40)	mg/kg	10	As Received	No	Yes	Yes
DETSC 3321	Benzene	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3321	Ethylbenzene	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3321	Toluene	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3321	Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3321	m+p Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3321	o Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 28 + PCB 31	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 52	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 101	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 118	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 153	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 138	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 180	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB Total	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3521	Ali/Aro C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3521	Aliphatic C10-C12	mg/kg	1.5	As Received	No	Yes	Yes
DETSC 3521	Aliphatic C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3521	Aliphatic C12-C16	mg/kg	1.2	As Received	No	Yes	Yes
DETSC 3521	Aliphatic C16-C21	mg/kg	1.5	As Received	No	Yes	Yes
DETSC 3521	Aliphatic C21-C35	mg/kg	3.4	As Received	No	Yes	Yes
DETSC 3521	Aromatic C10-C12	mg/kg	0.9	As Received	No	Yes	Yes
DETSC 3521	Aromatic C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3521	Aromatic C12-C16	mg/kg	0.5	As Received	No	Yes	Yes
DETSC 3521	Aromatic C16-C21	mg/kg	0.6	As Received	No	Yes	Yes
DETSC 3521	Aromatic C21-C35	mg/kg	1.4	As Received	No	Yes	Yes

Method details are shown only for those determinands listed in Annex A of the MCERTS standard. Anything not included on this list falls outside the scope of MCERTS. No Recovery Factors are used in the determination of results. Results reported assume 100% recovery. Full method statements are available on request.

End of Report

Appendix D

Laboratory Report Front Sheet

Site name	Job number	G2M Testing (Stockton) 12-16 Yarm Road, Stockton on Tees, TS18 3NA 01642 033318 info@g2mtesting.co.uk	 10258
KMS Barnsley	M23-024		

Client details:

Reference: M23-024
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: 08/11/2023

Date reported: 14/11/2023

Observations and interpretations are outside of the UKAS Accreditation

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 Signatories:
	☐ 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



10258

Site name	Job number
KMS Barnsley	M23-024

[illegible]

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 Four point	-s	BS 1377:1990 Part 2 Clause 4.4
		-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	14/11/2023 10:21
Date report generated	
Report Number	



Certificate of Analysis

Certificate Number 23-26361

Issued: 15-Nov-23

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

Our Reference 23-26361

Client Reference M23-024

Order No LAB2038

Contract Title KMS BARNSELEY

Description 4 Soil samples.

Date Received 09-Nov-23

Date Started 09-Nov-23

Date Completed 15-Nov-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 23-26361

Client Ref M23-024

Contract Title KMS BARNSELY

Lab No	2259777	2259778	2259779	2259780
Sample ID	TP01	TP02	TP03	TP04
Depth	0.35	0.45	0.60	0.55
Other ID				
Sample Type	D	D	D	D
Sampling Date	08/11/2023	08/11/2023	08/11/2023	08/11/2023
Sampling Time	n/s	n/s	n/s	n/s

Test	Method	LOD	Units				
Inorganics							
pH	DETSC 2008#		pH	8.5	7.7	7.4	8.1
Sulphate Aqueous Extract as SO ₄ (2:1)	DETSC 2076#	10	mg/l	59	18	150	170

Information in Support of the Analytical Results

Our Ref 23-26361
 Client Ref M23-024
 Contract KMS BARNSELEY

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
2259777	TP01 0.35 SOIL	08/11/23	PT 1L		
2259778	TP02 0.45 SOIL	08/11/23	PT 1L		
2259779	TP03 0.60 SOIL	08/11/23	PT 1L		
2259780	TP04 0.55 SOIL	08/11/23	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

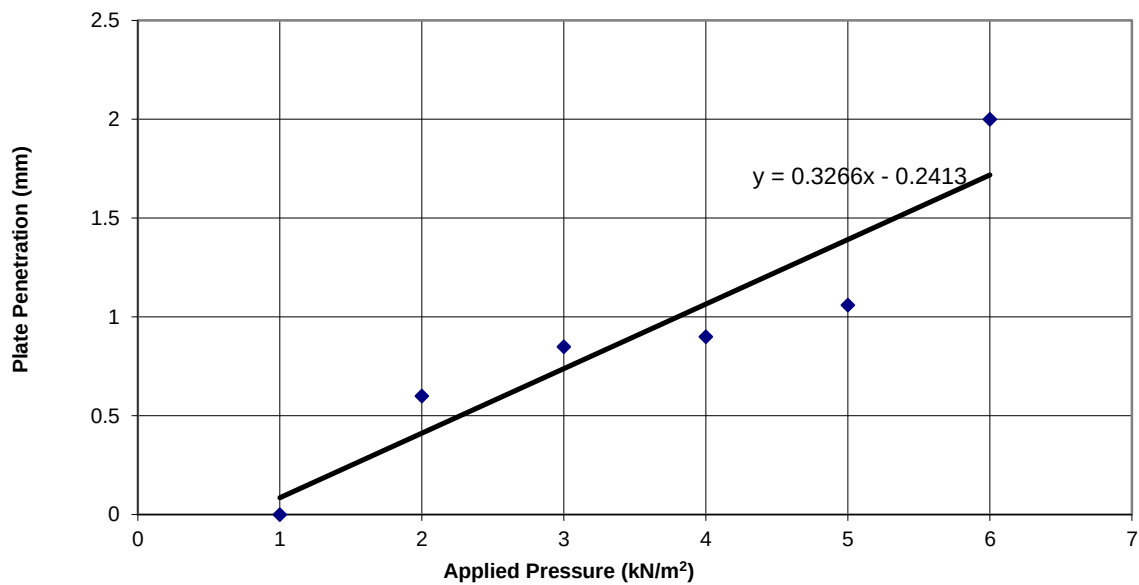
From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

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

End of Report

SOLMEK
GEOTECHNICAL TESTING LABORATORY

PLATE BEARING TEST			Date:	16/10/2023
Project Number:	M23-024		Test No:	TP01
Project Name:	KMS Goldthorpe, Barnsley		Test Level:	0.25
Test Method: BS 1377 : Part 9 : 1990 (Incremental Method)			Weather:	Cold/sunny
Plate Diameter:	0.305 m		Load Applied:	140 kPa
Kentledge Type:	JCB		Remarks:	Cohesive made ground

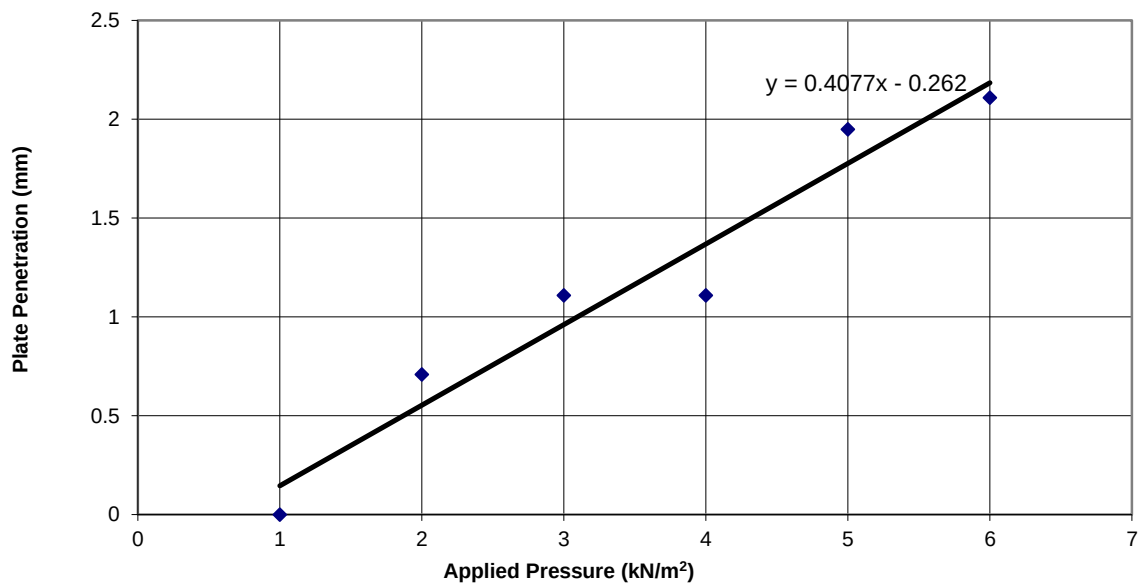


	Pressure (kN/m ²)	Plate Penetration (mm)
Initial	0	0
Stage 1	28	0.60
Stage 2	56	0.85
Stage 3	84	0.90
Stage 4	112	1.06
Stage 5	140	2.00
Stage 6		
Stage 7		
Stage 8		

Conversion Factor	0.45	Produced by: A Crane
Stress Applied @ 1.25mm	99.87 kN/m ²	
Total Plate Deflection	2.00 mm	Checked by: 
Plate Diameter	305 mm	
k305	79893	 SOLMEK
k762	35772	
CBR	4.75 %	

SOLMEK
GEOTECHNICAL TESTING LABORATORY

PLATE BEARING TEST			Date:	16/10/2023
Project Number:	M23-024		Test No:	TP02
Project Name:	KMS Goldthorpe, Barnsley		Test Level:	0.25
Test Method: BS 1377 : Part 9 : 1990 (Incremental Method)			Weather:	Cold/sunny
Plate Diameter:	0.305 m		Load Applied:	140 kPa
Kentledge Type:	JCB		Remarks:	Granular made ground

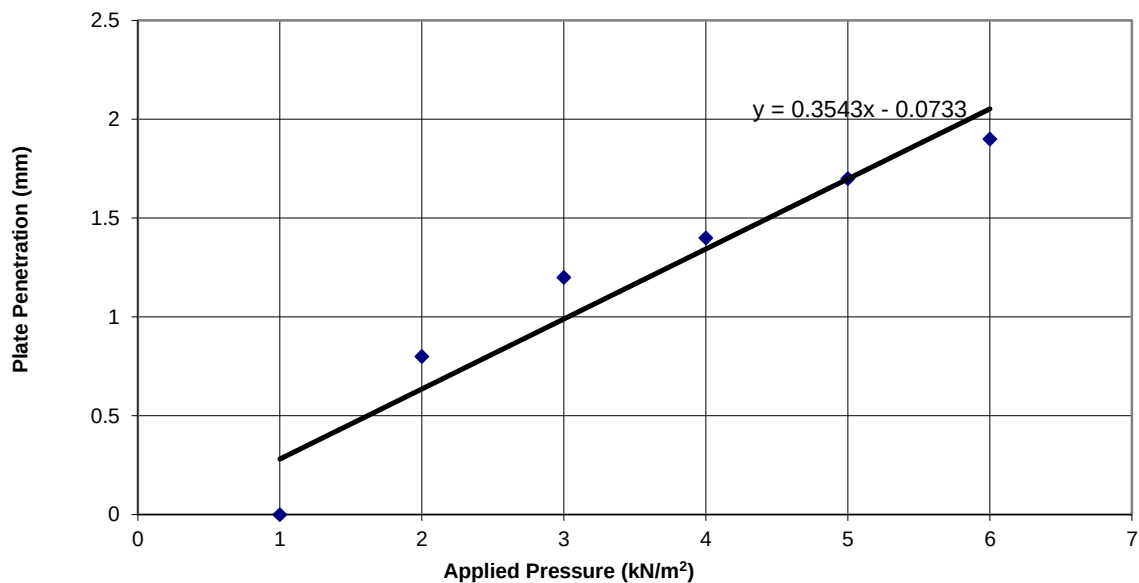


	Pressure (kN/m ²)	Plate Penetration (mm)
Initial	0	0
Stage 1	28	0.71
Stage 2	56	1.11
Stage 3	84	1.11
Stage 4	112	1.95
Stage 5	140	2.11
Stage 6		
Stage 7		
Stage 8		

Conversion Factor	0.45	Produced by: A Crane
Stress Applied @ 1.25mm	75.84 kN/m ²	
Total Plate Deflection	2.11 mm	Checked by: 
Plate Diameter	305 mm	
k305	60670	 SOLMEK
k762	27165	
CBR	2.95 %	

SOLMEK
GEOTECHNICAL TESTING LABORATORY

PLATE BEARING TEST			Date:	16/10/2023
Project Number:	M23-024		Test No:	TP03
Project Name:	KMS Goldthorpe, Barnsley		Test Level:	0.3
Test Method: BS 1377 : Part 9 : 1990 (Incremental Method)			Weather:	Cold/sunny
Plate Diameter:	0.305 m		Load Applied:	140 kPa
Kentledge Type:	JCB		Remarks:	Granular made ground

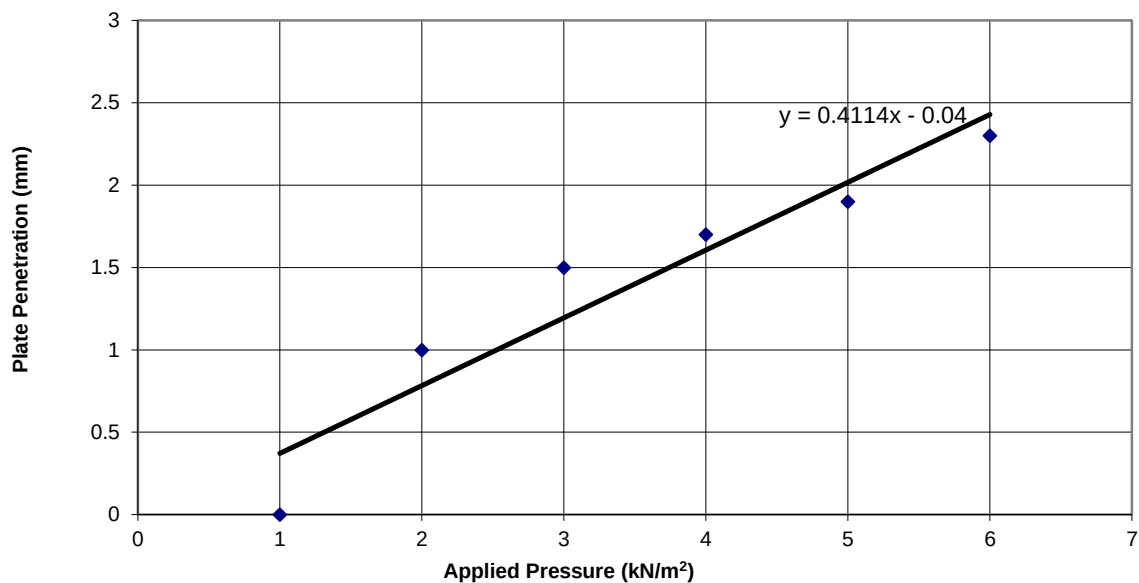


	Pressure (kN/m ²)	Plate Penetration (mm)
Initial	0	0
Stage 1	28	0.80
Stage 2	56	1.20
Stage 3	84	1.40
Stage 4	112	1.70
Stage 5	140	1.90
Stage 6		
Stage 7		
Stage 8		

Conversion Factor	0.45	Produced by: A Crane
Stress Applied @ 1.25mm	76.59 kN/m ²	
Total Plate Deflection	1.90 mm	Checked by: 
Plate Diameter	305 mm	
k305	61269	 SOLMEK
k762	27433	
CBR	3 %	

SOLMEK
GEOTECHNICAL TESTING LABORATORY

PLATE BEARING TEST			Date:	16/10/2023
Project Number:	M23-024		Test No:	TP04
Project Name:	KMS Goldthorpe, Barnsley		Test Level:	0.3
Test Method: BS 1377 : Part 9 : 1990 (Incremental Method)			Weather:	Cold/sunny
Plate Diameter:	0.305 m		Load Applied:	140 kPa
Kentledge Type:	JCB		Remarks:	Cohesive made ground

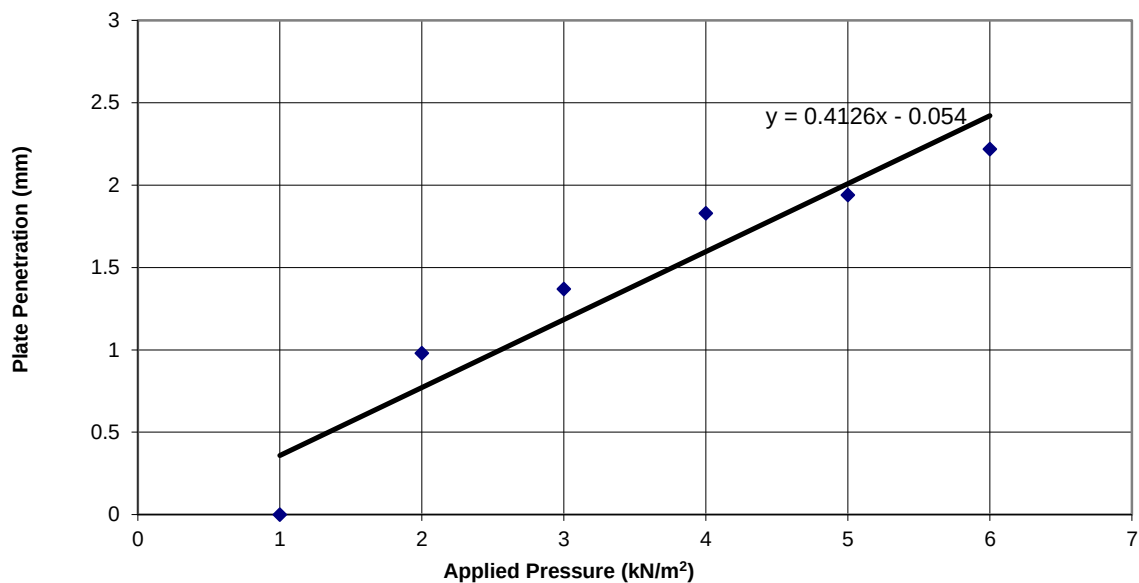


	Pressure (kN/m ²)	Plate Penetration (mm)
Initial	0	0
Stage 1	28	1.00
Stage 2	56	1.50
Stage 3	84	1.70
Stage 4	112	1.90
Stage 5	140	2.30
Stage 6		
Stage 7		
Stage 8		

Conversion Factor	0.45	Produced by: A Crane
Stress Applied @ 1.25mm	59.79 kN/m ²	
Total Plate Deflection	2.30 mm	Checked by: 
Plate Diameter	305 mm	
k305	47833	 SOLMEK
k762	21417	
CBR	1.95 %	

**SOLMEK
GEOTECHNICAL TESTING LABORATORY**

PLATE BEARING TEST			Date:	16/10/2023
Project Number:	M23-024		Test No:	TP05
Project Name:	KMS Goldthorpe, Barnsley		Test Level:	0.3
Test Method: BS 1377 : Part 9 : 1990 (Incremental Method)			Weather:	Cold/sunny
Plate Diameter:	0.305 m		Load Applied:	140 kPa
Kentledge Type:	JCB		Remarks:	Cohesive made ground



	Pressure (kN/m ²)	Plate Penetration (mm)
Initial	0	0
Stage 1	28	0.98
Stage 2	56	1.37
Stage 3	84	1.83
Stage 4	112	1.94
Stage 5	140	2.22
Stage 6		
Stage 7		
Stage 8		

Conversion Factor	0.45	Produced by: A Crane
Stress Applied @ 1.25mm	60.50 kN/m ²	
Total Plate Deflection	2.22 mm	Checked by: 
Plate Diameter	305 mm	
k305	48399	 SOLMEK
k762	21670	
CBR	1.99 %	

Appendix E

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 <i>significant harm</i> , 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 volatilised 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.

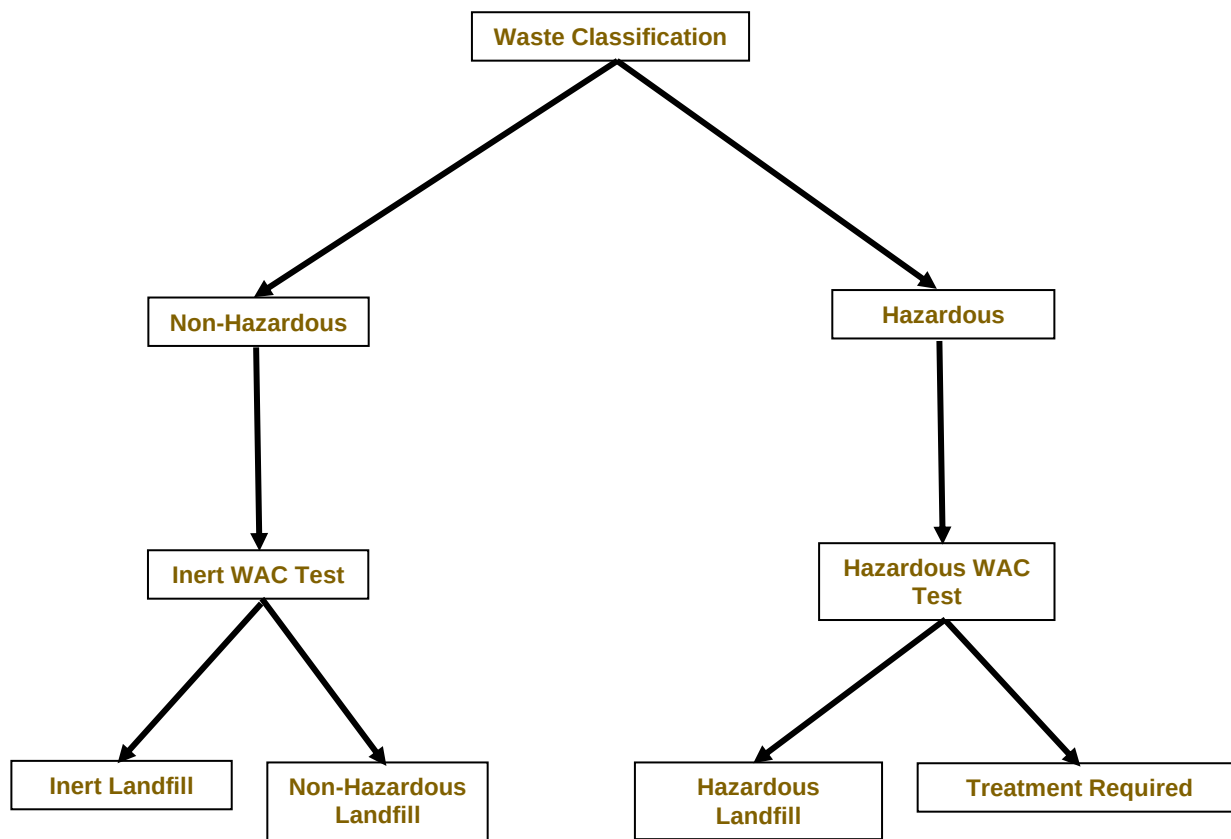
WASTE CLASSIFICATION AND WASTE ACCEPTANCE CRITERIA

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.

Parameter group	Pipe Material (Threshold concentrations in mg/kg)					
	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.