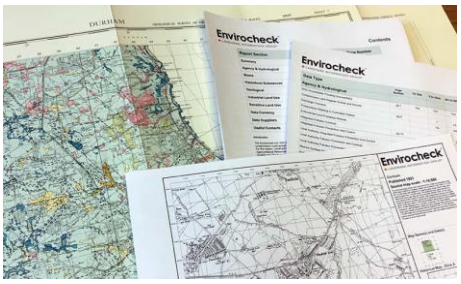



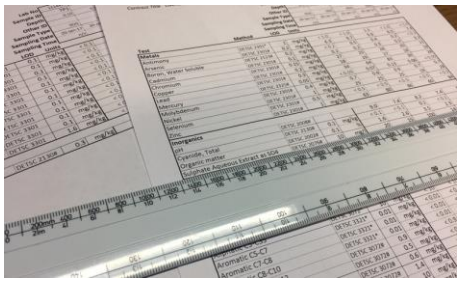

# Phase 2: Site Investigation

## Mill Lane, Batley

## Mandale Construction North Ltd

S240106/SI

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ISO 9001:2015 Quality Management
ISO 14001:2015 Environmental Management
ISO 45001 Occupational Health and Safety Management
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# PHASE 2 SITE INVESTIGATION REPORT

# MILL LANE, BATLEY

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## APPENDICES



| Revision | Date | Prepared by | Signed |
|---|---|---|---|
| Final | February 2024 | M Atkins<br>*Senior Geotechnical Engineer* |  |
| | | Checked by | |
| | | L Cassidy<br>*Principal Environmental Engineer* |  |
| | | Approved by | |
| | | R Woods<br>*Managing Director* |  |

# 1 EXECUTIVE SUMMARY

| | |
|---|---|
| **Site Address** | • Mill Lane, Batley, West Yorkshire, WF17 6EN. |
| **Proposed Development** | • The site is outlined for 19no residential properties with soft landscaped gardens and hardstanding in the form car parking and access road, along with Public Open Space to the north east, including a playground. |
| **Fieldwork** | • 6no small percussive boreholes (BH01 to BH06) drilled to a maximum of 2.00mbgl.<br>• 4no monitoring pipes in BH01, BH03, BH04 and BH06.<br>• 7no machine excavated trial pits (TP01 to TP07) to a maximum depth of 2.00mbgl.<br>• In-situ & laboratory testing. |
| **Ground Conditions** | • Made ground was encountered to depths of between 0.20mbgl and 2.00mbgl generally comprising topsoil and cohesive fill with localised gravel.<br>• Natural ground generally comprised firm to stiff slightly sandy gravelly medium to high strength clay of low to high plasticity to a maximum depth of 2.00mbgl.<br>• Inferred sandstone rockhead was encountered at depths between 0.60mbgl and 2.00mbgl within the exploratory positions.<br>• No groundwater was recorded during the fieldwork. |
| **Contamination Analysis** | • Given the site's proposed land use the levels of contamination recorded on site may pose a risk to the current and future users of the site, however this linkage will be severed.<br>• 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.<br>• PPE for workers. Damping down of site during dry windy conditions.<br>• Clean cover system required for all areas of soft landscaping, to a depth of 0.60m in proposed garden areas, and 0.45m in Public Open Space areas.<br>• Controlled waters unlikely to be at risk.<br>• With respect to utilities pH was elevated precluding use of wrapped-steel; as a minimum all services should be laid in clean trenches.<br>• Sub surface concrete should be designed to DS-1 ACEC (Class AC-1). |
| **Geotechnical Analysis & Foundation Recommendations** | • Bearing capacity of 140kN/m$^2$ at minimum depth of 0.90mbgl on 0.60m wide strips.<br>• Locally deepening of foundations due to made ground depths.<br>• Settlements within 25mm.<br>• 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 Mandale Construction North Ltd, on land located at Mill Lane, Batley, West Yorkshire, WF17 6EN (Appendix A, Figure 1).

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

- *Haigh Huddleston & Associates Ground Investigation Report (E20/7738/MD/003, November 2022)*
- *Solmek Phase 1 Desk Study (S240106, February 2024)*

Reference should be made to the above reports for details of the site's history and environmental setting, the ground conditions encountered, and the results of historical contamination analysis.

## 2.2 Scope of Works

The site is expected to be developed with 19no residential properties with soft landscaped gardens and hardstanding in the form car parking and access road, along with Public Open Space (POS) to the north east, including a playground. The proposed layout is shown as Figure 3.

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

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

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

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

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

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

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

## 3 SITE DESCRIPTION

The site is centred at Ordnance Survey Co-ordinates 425104E, 423448N and covers approximately 1.44Ha.

The site is located on a parcel of land north of Heaton Grange comprising an irregular shaped parcel of land and has a mostly gently sloped and uneven topography. The site is currently disused with no buildings present, however, there is a playground on the eastern side of the site.

The site perimeter is secure with temporary gated access to the south-west from the western portion of the site. To access the playground area, there is a second non-gated access point to the east.

The land use immediately to the north and west is industrial in nature, with a railway directly to the north. Land use to the south and east is entirely residential.

No obvious signs of surface contamination were noted at the time of the intrusive investigation, however, a number of services were located on and surrounding the site including drainage, manhole covers, streetlighting and overhead cables.

## 4 FIELDWORK

The fieldwork was carried out on 10th January 2024. The extent of the investigation was:

- 6no. small percussive boreholes (BH01 to BH06 inclusive) drilled to a maximum depth of 2.00m below ground level (bgl).
    - The boreholes were targeted to provide coverage in the area of the proposed footprint of the development to allow foundation design to take place and to provide samples for geotechnical and shallow contamination testing and analysis.

- Installation of ground-gas and groundwater monitoring pipes in three small percussive boreholes (BH01, BH03, BH04 and BH06).
    - Installations evenly spaced around the site (25-50m distance) to capture potential ground gas from made ground and underlying deposits.

- 7no. machine excavated trial pits (TP01 to TP07 inclusive) to a maximum depth of 2.00mbgl.
    - The trial pits were targeted to appraise the shallow ground conditions and retrieve, bulk and environmental samples for laboratory testing.
    - In-situ CBR testing undertaken in each trial pit at depths of 0.30mbgl and 0.60mbgl.

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

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

## 5 GROUND CONDITIONS

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

### 5.1 Made Ground

Made ground generally comprised slightly sandy gravelly clayey topsoil to a maximum depth of 0.90mbgl (TP04) with BH06 and TP06 underlain by firm slightly sandy gravelly clay to 1.00mbgl and 2.00mbgl respectively. Additionally, TP03 was underlain by slightly sandy gravel to a depth of 0.70mbgl.

The gravel fraction in the made ground was sandstone, brick and concrete with localised fabric noted.

### 5.2 Natural Deposits

Proven to underlie the made ground deposits across the site, natural ground generally comprised firm to stiff slightly sandy gravelly medium to high strength clay of low to high plasticity to a maximum depth of 2.00mbgl.

### 5.3 Solid Geology

Inferred sandstone rockhead was encountered at depths between 0.60mbgl and 2.00mbgl within the small percussive boreholes and trial pits, however bedrock was not proven via rotary drilling methods.

### 5.4 Groundwater

No groundwater was encountered within the exploratory positions 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.

## 6 CONTAMINATION TESTING RESULTS

The proposed development is expected to be the construction of 19no residential properties with soft landscaped gardens and hardstanding in the form car parking and access road, along with Public Open Space (POS) to the north east, including a playground. 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.

### 6.1 Site Characterisation

Within the Solmek Phase 1 Desk Study, a preliminary conceptual model was formed based on the information obtained, and the previous investigation. The initial risk was based on the site history which recorded generally open land throughout the site's history.

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

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

### 6.2 Contamination Testing and Rationale

To provide information upon the possibility of ground contamination five samples of made ground and one sample of natural clay were selected for shallow contamination testing. A Low overall contamination risk was highlighted in the Phase 1 Desk Study due to previous land uses. This coupled with the end use being Residential with Home Grown Produce and Public Open Space means that six further samples are considered appropriate for testing, for a total of 12no samples tested across the site. The samples selected for testing within this investigation are detailed below:

- BH01 – 0.10-0.30m (Made ground – topsoil)
- BH02 – 0.20-0.40m (Made ground – topsoil)
- BH03 – 0.40-0.60m (Made ground – topsoil)
- BH05 – 0.40-0.60m (Natural clay)
- TP06 – 0.80-1.00m (Made ground – clay)
- TP07 – 0.20-0.40m (Made ground – topsoil)

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

- 6no Metals, semi-metals, non-metals, inorganic determinants

- 6no Asbestos identification screenings
    - 1no Asbestos quantification analysis.
- 6no Speciated Polyaromatic Hydrocarbons (PAHs)
- 2no Total Petroleum Hydrocarbon Criteria Working Group fractions (TPH CWG)

## 6.3 Test Results

Based on the proposed development at the site, the test results have been compared to a series of Land Quality Management (LQM) Suitable for Use Levels (S4UL) based on a residential with home grown produce and Public Open Space (POS) land use. These are the most up to date thresholds published in December 2014.

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

The test results are presented in Appendix C, and a summary is provided below in Tables 1 & 2.

**TABLE 1: SUMMARY OF INORGANIC CONTAMINATION TESTING RESULTS**

| Determinand | Units | Number of Samples above Level of Detection | Minimum Recorded Level | Maximum Recorded Level | Residential with HGP Threshold Value | Number of Results Exceeding Res with HGP Threshold Value | POS Threshold Value | Number of Results Exceeding POS Threshold Value |
|---|---|---|---|---|---|---|---|---|
| **Metals** | | | | | | | | |
| Cadmium | mg/kg | 6 | 0.2 | 0.4 | 11 | 0 | 120 | 0 |
| Chromium | mg/kg | 6 | 15 | 29 | 910 | 0 | 1500 | 0 |
| Copper | mg/kg | 6 | 21 | 80 | 2400 | 0 | 12000 | 0 |
| Lead | mg/kg | 6 | 20 | 150 | 200* | 0 | 630* | 0 |
| Mercury | mg/kg | 5 | <0.05 | 0.33 | 40 | 0 | 120 | 0 |
| Nickel | mg/kg | 6 | 18 | 30 | 180 | 0 | 230 | 0 |
| Zinc | mg/kg | 6 | 110 | 210 | 3700 | 0 | 81000 | 0 |
| | | | | | | | | |
| Arsenic | mg/kg | 6 | 10 | 43 | 37** | 1 | 79 | 0 |
| Boron | mg/kg | 6 | 0.3 | 1.1 | 290 | 0 | 21000 | 0 |
| Selenium | mg/kg | 2 | <0.5 | 0.6 | 250 | 0 | 1100 | 0 |
| | | | | | | | | |
| Cyanide | mg/kg | 3 | <0.1 | 0.2 | 1.49** | 0 | 73.8** | 0 |
| W.S. Sulphate | mg/l | 6 | 12 | 100 | 2000^ | 0 | 2000^ | 0 |
| | | | | | | | | |
| pH | pH | - | 6.2 | 8.0 | 5.5^ | 0 | <5.5^ | 0 |

* Category 4 Screening Levels, March 2014
** CLEA Software Version 1.06 (pH7 and 1%SOM)
^ EA Threshold Values
HGP - Home Grown Produce
POS – Public Open Space

## 6.4 Metals, Semi Metals and Non Metals

None of the samples indicated raised levels of contamination above the S4UL threshold values, based on the six samples tested with the exception of Arsenic (43mg/kg) in BH02, 0.20-0.40m raised above the residential with homegrown produce threshold value, though below the public open space threshold.

With respect to the historic results, it is noted that one (WS11, 1.20m) of the six samples recorded elevated lead. No other exceedances were recorded.

## 6.5 Inorganic Chemicals

Soluble sulphates (potentially aggressive to foundation concrete) were recorded between 12 and 100mg/l. None of the samples were elevated above levels affecting human health, or the BRE Special Digest 1 500mg/l limit for the sulphate classification of concrete.

The results of the pH testing were between 6.2 and 8.0. These pH levels indicate slightly acidic to slightly alkaline conditions.

## 6.6 Organic Chemicals

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

The average SOM recorded across the site was 1.60% therefore a SOM of 1.00% has been used to determine the S4UL thresholds. Table 2, below, summarises the results.

**TABLE 2: SUMMARY OF ORGANIC CONTAMINATION TESTING RESULTS**

| Determinand | Units | Number of Samples above Level of Detection | Minimum Recorded Level | Maximum Recorded Level | Residential with HGP Threshold Value at 1% SOM | Number of Results Exceeding Threshold Value | POS Threshold Value at 1% SOM | Number of Results Exceeding Threshold Value |
|---|---|---|---|---|---|---|---|---|
| **TPH Aliphatic Fractions** | | | | | | | | |
| Aliphatic (C5-C6) | mg/kg | 0 | <0.01 | - | 42 | 0 | 570000 | 0 |
| Aliphatic (C6-C8) | mg/kg | 0 | <0.01 | - | 100 | 0 | 600000 | 0 |
| Aliphatic (C8-C10) | mg/kg | 0 | <0.01 | - | 27 | 0 | 13000 | 0 |
| Aliphatic (C10-C12) | mg/kg | 0 | <1.5 | - | 130 | 0 | 13000 | 0 |
| Aliphatic (C12-C16) | mg/kg | 0 | <1.2 | - | 110 | 0 | 13000 | 0 |
| Aliphatic (C16-C35) | mg/kg | 0 | <1.5 | - | 65000 | 0 | 250000 | 0 |
| **TPH Aromatic Fractions** | | | | | | | | |
| Aromatic (C5-C7) | mg/kg | 0 | <0.1 | - | 70 | 0 | 56000 | 0 |
| Aromatic (C7-C8) | mg/kg | 0 | <0.1 | - | 130 | 0 | 56000 | 0 |
| Aromatic (C8-C10) | mg/kg | 0 | <0.1 | - | 34 | 0 | 5000 | 0 |
| Aromatic (C10-C12) | mg/kg | 0 | <0.9 | - | 74 | 0 | 5000 | 0 |
| Aromatic (C12-C16) | mg/kg | 0 | <0.5 | - | 140 | 0 | 5100 | 0 |
| Aromatic (C16-C21) | mg/kg | 0 | <0.6 | - | 260 | 0 | 3800 | 0 |
| Aromatic (C21-C35) | mg/kg | 0 | <1.4 | - | 1100 | 0 | 3800 | 0 |
| **Speciated PAH** | | | | | | | | |
| Naphthalene | mg/kg | 2 | <0.1 | - | 2.3 | 0 | 4900 | 0 |
| Acenaphthylene | mg/kg | 0 | <0.1 | - | 170 | 0 | 15000 | 0 |
| Acenaphthene | mg/kg | 2 | <0.1 | | 210 | 0 | 15000 | 0 |
| Fluorene | mg/kg | 2 | <0.1 | 0.6 | 170 | 0 | 9900 | 0 |
| Phenanthrene | mg/kg | 4 | <0.1 | 3.5 | 95 | 0 | 3100 | 0 |
| Anthracene | mg/kg | 3 | <0.1 | 0.6 | 2400 | 0 | 74000 | 0 |
| Fluoranthene | mg/kg | 4 | <0.1 | 3.9 | 280 | 0 | 3100 | 0 |
| Pyrene | mg/kg | 4 | <0.1 | 3.5 | 620 | 0 | 7400 | 0 |
| Benzo(a)anthracene | mg/kg | 4 | <0.1 | 1.6 | 7.2 | 0 | 29 | 0 |
| Chrysene | mg/kg | 4 | <0.1 | 1.9 | 15 | 0 | 57 | 0 |
| Benzo(b)fluoranthene | mg/kg | 3 | <0.1 | 1.0 | 2.6 | 0 | 7.1 | 0 |
| Benzo(k)fluoranthene | mg/kg | 2 | <0.1 | 0.6 | 77 | 0 | 190 | 0 |
| Benzo(a)pyrene | mg/kg | 3 | <0.1 | 1.5 | 2.2 | 0 | 5.7 | 0 |
| Indeno(123cd)pyrene | mg/kg | 2 | <0.1 | 1.0 | 320 | 0 | 640 | 0 |
| Dibenz(ah)anthracene | mg/kg | 2 | <0.1 | 0.2 | 0.24 | 0 | 0.57 | 0 |
| Benzo(ghi)perylene | mg/kg | 2 | <0.1 | 0.8 | 27 | 0 | 82 | 0 |
| PAH | mg/kg | 3 | <1.6 | 22 | 50* | 0 | 50* | 0 |
| Phenols | mg/kg | 3 | <0.3 | 0.7 | 280 | 0 | 760 | 0 |
| * EA Threshold Values | | | | | | | | |

From the six samples tested for organic determinants within this report, no exceedances were recorded.

With respect to the historic results, it is noted that one (WS11, 1.20m) of the six samples recorded elevated benzo(b)fluoranthene, benzo(a)pyrene, dibenzo(a,h)anthracene and total PAH. No other exceedances were recorded.

### 6.7 Asbestos

From the six samples subject to asbestos screening, asbestos fibres were recorded in one sample (TP06, 0.80-1.00m) (0.50m) comprising bundles of Chrysotile fibres. This sample was sent for quantification testing, with the results indicating 0.001% asbestos by mass.

With respect to the historic results, it is noted that two of the six samples recorded asbestos, with WS11 (1.20m) and WS12 (0.50m) both recording bundles of chrysotile fibres, quantified as 0.005% and 0.003%, respectively.

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

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

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

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

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

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

See Appendix E for additional notes on contamination guidelines.

## 7 CONCEPTUAL MODEL AND CONTAMINATION ANALYSIS

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

## TABLE 3: CONCEPTUAL MODEL

| Source | Pathway | Receptor | Risk Rating | Comments |
|---|---|---|---|---|
| **Asphyxiating or explosive ground gases**<br>• Made ground (<2.50m).<br>• Deep coal mining area<br>• Landfills within 100m.<br>• Intermediate Radon Affected Area. | **Ground gas migration**<br>• Migration through permeable soils<br>• Inhalation | **Future site users**<br>• Adult & infant residents | Moderate /Low | Gas monitoring in progress, source risk rating subject to change.<br><br>Historic gas monitoring by Haigh Huddleston & Associates recommended Amber 1/CS2 ground gas protection measures based on results to date.<br><br>**Basic radon protective measures are required.** |
| | | **Users during development**<br>• Construction workers | Low | |
| **Areas of contamination hazardous to human health (Residential Thresholds)**<br>• 6no samples tested.<br>• No significantly elevated organic determinants.<br>• Elevated arsenic local to BH02.<br>• Asbestos in TP06 (0.001%).<br>(Haigh Huddleston & Associates Site Investigation)<br>• Asbestos in WS11 & WS12 (0.005% and 0.003%).<br>• Elevated lead and PAHs local to WS11.<br>• Max. 9.0% Carbon Dioxide during gas monitoring. | • Inhalation<br>• Dust ingestion<br>• Dermal contact | **Future site users**<br>• Adult & infant residents | Low | Mitigated by proposed structures, hardstanding and clean cover system. |
| | | **Users during development**<br>• Construction workers | High | Mitigation measures required during construction. Consideration to be given to Health and Safety Executive: *Protection of Workers and the General Public During the Development of Contaminated Land.* |
| | • Inhalation<br>• Dust ingestion | **Users of surrounding sites**<br>• Transient adult workers and residents | Moderate | Potential moderate risk during remediation/construction from dust generation. Consideration to be given to dust suppression, in line with BRE: *The Control of Dust and Emissions from Construction and Demolition, Best Practice Guidance.* |
| | • Leaching of mobilised contaminants | **Drift geology**<br>• Not designated | Low | The thin, impermeability aquifer is not considered to be a sensitive receptor. |
| | | **Solid geology**<br>• Secondary Aquifer – A | Low | The low permeability and relatively low sensitivity aquifer is not considered to be a sensitive receptor, with respect to the generally low contaminant levels recorded. |
| | • Drainage<br>• Lateral migration<br>• Accumulation of contaminated sediment | **Surface water features**<br>• Batley Beck 102m west | Low | The surface water is unlikely to be impacted by the low contamination levels recorded. |
| **Areas of phytotoxic contamination**<br>• No raised phytotoxic leads | • Uptake via roots and leaf surfaces | **Vegetation**<br>• Present on site and proposed | Low/Moderate | Given localised contaminants, clean cover system of 300mm imported topsoil and 300mm site-won clean clay subsoil in garden areas (150mm topsoil and 300mm subsoil in Public Open Space) |
| **Areas of contamination above service fabric or BRE Special Digest 1 thresholds**<br>• Elevated pH | • Direct contact | **Construction Materials**<br>• Concrete | Low/Moderate | Mitigation through use of sulphate resistant concrete where in contact with made ground. Class DS-1 ACEC (Class AC-1s) |
| | | **Construction Materials**<br>• Service Fabric | Low/Moderate | Wrapped-steel piping to be avoided and prudent to lay any service within a clean bedding. |

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

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

## 7.1 Users of the Site Once Development is Complete

The users of the site, particularly construction workers, are likely to be exposed to contaminants present in the soils beneath the site during redevelopment work. **Potential** exposure pathways include dermal absorption after contact with contaminated ground, inhalation of soil or dust, inhalation of volatised compounds, and inadvertent soil ingestion. 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 Residential with Home Grown Produce and the less sensitive Public Open Space end use (see Tables 1 and 2).

The levels of contaminants across the site are generally low with exceedances limited to two of the six samples tested during this site investigation, as summarised below:

- BH02, 0.20-0.40m (made ground – topsoil) Arsenic – *above Res with HGP only*
- TP06, 0.80-1.00m (made ground – clay) Chrysotile Asbestos (0.001%)

Within the Haigh Huddleston & Associates Ground Investigation Report (E20/7738/MD/003) a series of contamination tests were conducted with Chrysotile Asbestos encountered in WS11, 1.20m and WS12, 0.50m.

It should also be noted that within the Haigh Huddleston & Associates Ground Investigation Report, the results were compared against the Public Open Space thresholds, however, for the purpose of this report, Solmek have compared these results against the Residential with Home Grown Produce levels which indicated the following determinants to be above the threshold value to cause harm to human health:

- WS11, 1.20m – Lead (310mg/kg), Benzo(b)fluoranthene (3.3mg/kg), Benzo(a)pyrene (4.0mg/kg), Dibenzo (a,h)anthracene (0.4mg/kg) and PAH Total (57mg/kg).

The location of the samples which recorded elevated contamination are shown below on Figure A, based on the 6no samples tested to date along with the approximate location of the historic contamination.


**FIGURE A: ELEVATED CONTAMINATION LOCATIONS**

The site is expected to be developed with 19no residential properties with soft landscaped gardens and hardstanding in the form car parking and access road, along with Public Open Space (POS) to the north east, including a playground.

Based on the **shallow** soil contamination testing, it is considered that the levels of contamination may pose a risk to future users of the site, as soft landscaping is proposed in the final development. This pollutant linkage however will be severed as long as all contaminated areas are encapsulated either by buildings, hardstanding, a clean cover system or safe or removed from site to an appropriate landfill site.

### 7.2 Construction Workers and Users of Surrounding Sites

Short term human exposure to contaminants present in soils can occur via several pathways during the construction and ground works phase of the development. These include dermal absorption after contact with contaminated ground, inhalation of soil or dust (including windblown dust), inhalation of volatised compounds, inadvertent soil ingestion and contact with contaminated groundwater.

Chrysotile asbestos fibres were detected in the sample from TP06 (0.80-1.00mbgl) along with WS11(1.20m) and WS12 (0.50m) from the historic site investigation. These samples were sent for further analysis asbestos quantification testing by Gravimetry. This indicated that there was between 0.001% and 0.005% by mass of asbestos within the sample.

Based on the guidance set forth in the Interdepartmental Committee for the Redevelopment of Contaminated Land (ICRCL), 1990, Guidance note 64/85 *Asbestos on Contaminated Sites* asbestos contaminated soil should be considered as a hazardous waste if the percentage by mass exceeds 0.1%. Should it have a mass of >0.001% it is considered as a risk to human health. Given that the samples showed up to 0.005% by mass it is possible that the soil may present a risk to human health.

Raised levels of Arsenic in BH02 (0.20-0.40m) and lead in historic WS11 (1.20m) were also detected. It is considered that such levels of contamination may pose a risk to construction workers and users of surrounding sites. As good practice, full PPE must be employed in accordance with Health and Safety Executive*: Protection of Workers and the General Public During the Development of Contaminated Land*

and safeguards should be taken to limit dust during ground works, and access to the public should be restricted. Construction workers should use gloves as a precaution when handling any fill materials. Provision of suitable hygiene facilities are needed for site workers. Wheel washers should be provided and used for any vehicle entering or leaving site to prevent cross contamination.

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

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

### 7.3 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 six samples tested. However, the elevated arsenic and asbestos recorded is not considered suitable in materials for re-use.

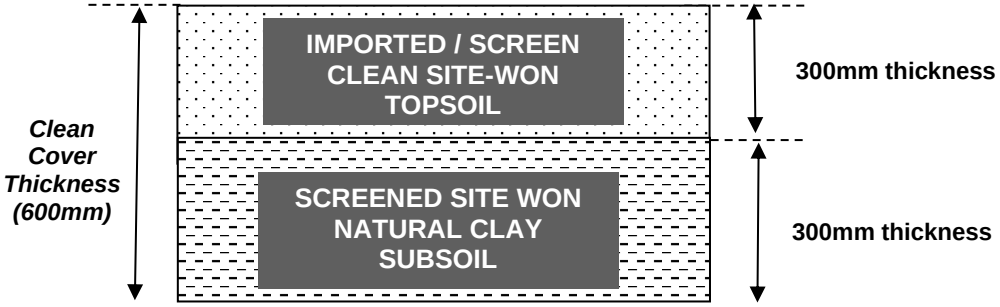
During the initial site strip, proposed soft landscaped areas should be excavated to 0.45mbgl (in Public Open Space) and 0.60mbgl (in garden areas) or natural ground (whichever is the shallowest). Any deleterious materials encountered (i.e. ash, slag, brick rubble and concrete) should be removed and placed beneath areas of permanent hardcover. Topsoil and subsoil from around BH02, TP06, WS11 and WS12, are deemed unsuitable for re-use given the elevated levels of arsenic, asbestos, lead and speciated PAH.

The cover system should include imported or clean screen site-won topsoil, to a depth of 300mm over screened site-won natural clay subsoil at least 300mm in thickness in soft landscaped gardens, however, within the public open space, a reduced cover system of 450mm (150mm imported or clean screen site-won topsoil over screened site-won natural clay subsoil at least 300mm) atop a geotextile membrane may be adopted.

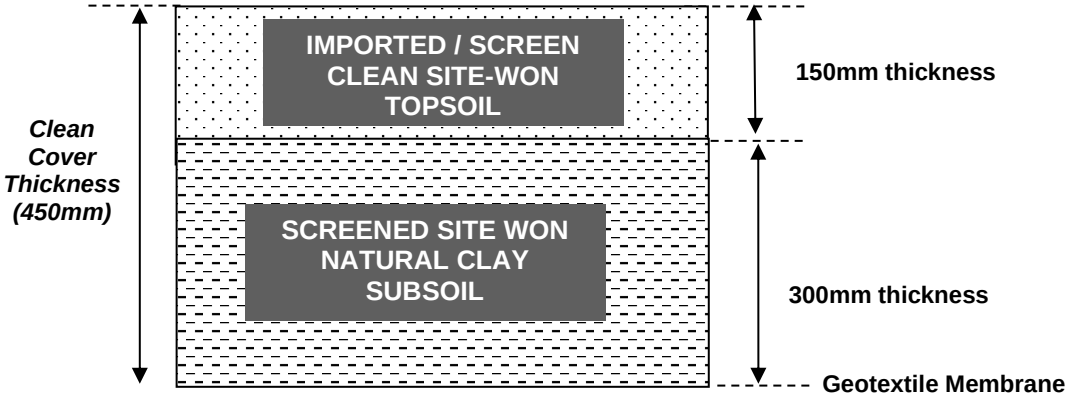
Appropriate certification will be required to ensure that the onsite or imported materials are clean and free from deleterious materials in accordance with the Local Authority Guidelines *Verification Requirements for Cover Systems, Technical Guidance for developers, Landowners and Consultants* (Yorkshire and Lincolnshire Pollution Advisory Group Version 4.1 – June 2021). Details of the clean cover system must be presented in a Phase 3 Remediation Statement.

The two diagrams below gives an overview of the minimum thicknesses of clean cover system that should be placed by the site operatives in soft landscaped areas.

### *Soft Landscaped Garden Areas*




### *Soft Landscaped Public Open Space*




## 7.4 Ground and Surface Water

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

From the site investigation undertaken, ground conditions broadly comprise made ground of topsoil and cohesive fill over firm to stiff clay underlain by inferred sandstone. The cohesive deposits can be considered to have a low permeability.

The published geology indicates the site is underlain by solid geology of Pennine Middle and Lower Coal Measures Formation (PCM), which is designated as a Secondary Aquifer – A by the Environment Agency and lies outside a Source Protection Zone. Inferred sandstone rockhead was proven in the intrusive investigation at depths of between 0.60mbgl and 2.00mbgl.

The nearest surface water feature is Batley Beck located 102m west of the site.

No contamination was recorded based on the five samples tested, other than arsenic (BH02) and asbestos (TP06).

The only groundwater encountered during the intrusive investigation is likely to be perched, sitting above the low permeability clays and silts. Due to the generally low contamination found across the site, the aquifer designations beneath the site, and the distance to surface waters, the development is considered to represent a low risk to groundwater or surface water receptors.

Given the generally low contamination levels encountered across the site and the cohesive deposits acting as an effective aquiclude and the distance to surface waters, the development is considered to represent a low risk to groundwater or surface water receptors.

## 7.5 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.

### 7.5.1 *Concrete Classification*

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

### 7.5.2 *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.

Based on the samples tested during the site investigation, levels of acidic to slightly alkaline pH (5.5 to 8.0) were recorded across the site at depths of between 0.00mbgl and 1.40mbgl within the made ground and natural samples.

The concentrations of the selected determinants should be compared to the pipe material selection table in Appendix E, and consultation with the appropriate utility supply company is required to identify the most suitable service fabric. However, the pH levels may preclude the use of wrapped-steel pipes depending on the depth of proposed service corridors.

## 7.6 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

## 7.7 Waste Classification

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.

# 8 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 four standpipes (BH01, BH03, BH04 & BH06) that were 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.

## 8.1 Historic Ground Gas Monitoring (*Haigh Huddleston & Associates Ground Investigation Report - E20/7738/MD/003, November 2022)*

In this report, it is noted gas monitoring was undertaken on the proposed residential development to the west, no methane was detected and carbon dioxide concentrations between 0.5 and 9.0% were recorded.

Additionally, two further gas monitoring stations had been installed in the proposed public open space area with no methane has been detected and carbon dioxide concentrations recorded between 3.9 and 8.2%.

No flow rates were detected over the period of testing on each side of the site.

Based on the monitoring results to date, ground gas protection measures in accordance with **NHBC Amber 1** or **CS2** (BS 8485:2015 Table 2) are required.

# 9 GEOTECHNICAL TESTING AND ANALYSIS

Samples taken from the boreholes and trial pits underwent a series of geotechnical tests at a UKAS accredited laboratory to aid foundation design and soil description. In addition, in-situ Hand Shear Vane and Standard Penetration Tests (SPTs) were undertaken at regular intervals during drilling. The geotechnical results are presented in Appendix D.

## 9.1 Strength and Density

### 9.1.1 *Hand Shear Vanes*

Hand shear vane testing within the natural cohesive deposits at depths of between 0.50mbgl and 1.90mbgl returned results ranging 54kPa to 144kPa, which are indicative of medium to high strength conditions.

### 9.1.2 *SPT N Values*

Standard Penetration Tests undertaken at the base of the boreholes between 1.00mbgl and 2.00mbgl recorded an N value of 50+ (refusal).

## 9.2 Moisture Contents

Seven samples recovered from the boreholes and trial pits have been subject to moisture content tests to determine the moisture profile at depths of between 0.40mbgl and 1.40mbgl. Moisture levels were between 13% and 22%.

## 9.3 Atterberg Limit Determinations

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

The Plasticity Indices ranged from 15 to 29 with the equivalent moisture contents recorded above and below

the corresponding plastic limits. The cohesive material can be assessed as having a **low** shrinkage potential in relation to NHBC Guidance Chapter 4.2.

### 9.4 Dry Density / Moisture Content Relationship

One sample (TP02, 0.40m) was subject to optimum moisture content (OMC) / dry density relationship testing using the 2.5kg rammer method. The OMC of the sample was 16% with maximum dry density of 1.80Mg/m$^3$.

### 9.5 pH and Sulphate Results

Three samples of natural soil 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 5.5 to 7.7 indicating acidic to slightly alkaline conditions. Soluble sulphates were recorded at levels ranging from <10mg/l to 89mg/l.

### 9.6 Percolation Tests

Three percolation tests were carried out within the bases of TP01, TP02 and TP04. The results returned an inferred infiltration rates of 0.00 x 10$^{-6}$ m/sec for each tests.

Given the results encountered and the significant thickness of low permeability cohesive deposits, soakaway drainage may not be suitable for the proposed development. Soakaway drainage, if incorporated, should be designed in accordance with BRE *Special Digest 365 – Soakaway Design*. The results are presented in Appendix D.

### 9.7 CBR Tests

CBR testing was undertaken within the trial pits at depths of 0.30mbgl and 0.60mbgl. The in-situ CBR results are detailed below in Table 4.

**TABLE 4: SUMMARY OF CBR TESTING RESULTS**

| Trial Pit | 0.30mbgl result (%) | 0.60mbgl result (%) |
|---|---|---|
| TP01 | 3.8 | +12 |
| TP02 | 5.3 | 5.5 |
| TP03 | 3.4 (M/G) | 3.7 (M/G) |
| TP04 | 2.5 (M/G) | 2.2 (M/G) |
| TP05 | - | - |
| TP06 | 1.5 (M/G) | 0.8 (M/G) |
| TP07 | 1.3 (M/G) | 1.8 (M/G) |
| *M/G notes tests was undertaken in made ground.* | | |

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

### 9.8 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.

For this site, the Phase 1 Desk Study indicated that the site was within a Coal Mining Reporting Area. Subsequent review of the Coal Mining Report and Geological Mapping did not indicate that the site was at risk of historic shallow mine workings, therefore further investigation was not considered necessary.

## 9.9 Foundations

Based on plasticity index results, all cohesive soils at the site should be regarded as being of medium volume change potential. Foundations should therefore be placed at a minimum depth of 0.90m below original or finished ground level, whichever is the lower.

Based on a conservative undrained shear strength of 54kN/m² a safe bearing capacity of 140kN/m² has been determined for strip foundations 0.60m wide founding on the natural medium to high strength clay at depths of around 0.90mbgl. Providing the safe bearing capacity is not exceeded settlements have been calculated to be less than 25mm.

Locally, foundations will require deepening due to made ground depths. All deepened sections should be adequately stepped and reinforced, in accordance with NHBC Standards Chapter 4.4.

Foundations near existing or proposed trees should be deepened and provided with appropriate heave precautions in accordance with NHBC Standards Chapter 4.2.

However, given the made ground depth shallow inferred rockhead and encountered at depths of between 0.60mbgl and 2.00mbgl, strip foundations may be placed on the underlying sandstone bedrock.

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/m² for sandstone 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 250kN/m² allowable bearing capacity.

It should be recognised that clay rich soils can deteriorate fairly rapidly on exposure, particularly in periods of wet weather and frost. It would be prudent to protect all exposed soils in foundation excavations with a concrete blinding layer, particularly if they are likely to remain open for extended period of time.

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.

### 9.9.1 *Roads/Parking/Hard Standing etc*

If imported granular material is laid down and compacted in accordance with the Specification for Highways Works (approximately 450mm total), this may yield an adequate CBR value. This should be verified with in-situ CBR testing.

## 9.10 Excavation

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

## 9.11 Groundwater

No groundwater was encountered within the exploratory positions 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.

**SOLMEK**

# Appendix A


SOLMEK
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**Figure Title**

Site Location Plan

**Project Number**

S240106

**Project Name**

Mill Lane, Batley

**Client**

Mandale

**Date**

January 2024

**DRG Number**

Figure 1

**Scale**

1:5000 @ A4 [DO NOT SCALE]

Legend Key

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


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**Figure Title**

Exploratory Location Plan

**Project Number**

S240106

**Project Name**

Mill Lane, Batley

**Client**

Mandale

**Date**

January 2024

**DRG Number**

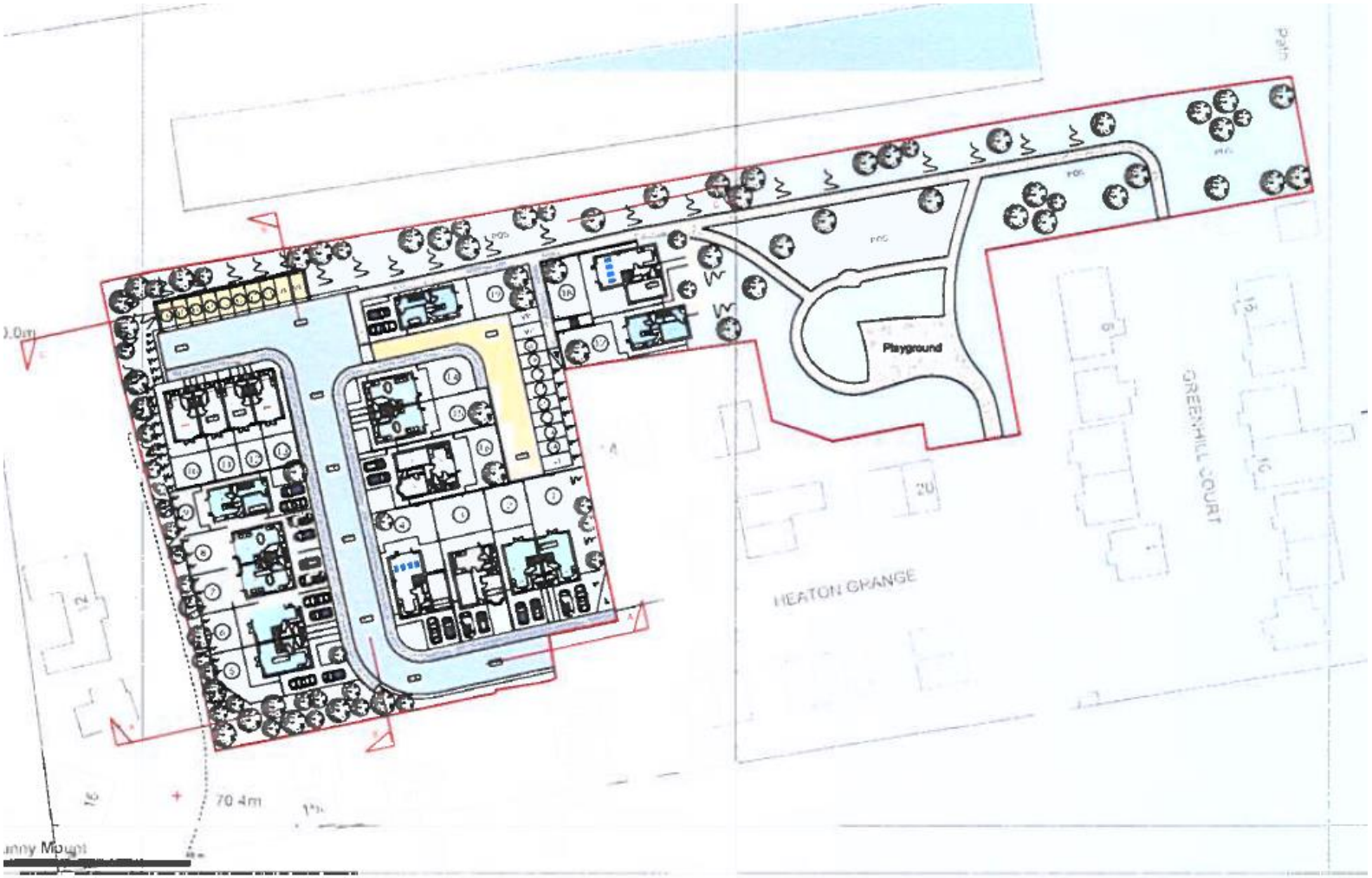
Figure 2

**Scale**

1:1200 @ A4 [DO NOT SCALE]

Legend Key

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




**Title**
Proposed Development Plan

**Project**
Mill Lane, Batley

**Client**
Mandale Construction North Ltd

**Date**
February 2024

**Fig No.**
Figure 3

**Scale**
Do Not Scale

**Key**

**Solmek Ltd.**
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SOLMEK

# Appendix B

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# Borehole Log

Scale 1:50 Sheet 1 of 1

## BH01

| | | | | | |
|---|---|---|---|---|---|
| **Contract no:** | S240106 | **Site:** | Mill Lane, Batley | **Driller:** | SR Drilling Ltd |
| | | | | **Plant used:** | Mini Rig |
| | | | | **Started:** | 10/01/2024 |
| **Client:** | Mandale | | | **Ended:** | 10/01/2024 |
| **Method:** | Small Percussive | | | **Backfilled:** | 10/01/2024 |

**GL (AOD):**
**Easting:** 425020
**Northing:** 423437
**Logged:** RF
**Status:** FINAL

| Backfill / Installation | Legend | Depth (m) | Level (m AOD) | Stratum Description | Samples and Insitu Testing | | |
|---|---|---|---|---|---|---|---|
| | | | | | Depth (m) | Type | Results |
| | | | | MADE GROUND: Dark brown slightly sandy gravelly clayey topsoil. Sand is fine to coarse. Gravel is fine to coarse, angular to subangular of sandstone, brick and concrete. | 0.10 - 0.30 | B | |
| | | 0.30 | | Firm light brown locally dark brown, slightly sandy gravelly medium strength CLAY of low plasticity. Sand is fine to coarse. Gravel is fine to coarse, angular to subangular of sandstone. | 0.40 - 0.60 | D | |
| | | | | | 0.80 - 1.00 | D | |
| G | | | | | 1.20 | HV | 64kPa |
| | | 1.40 | | | 1.20 - 1.40 | D | N=50+ (25 for 50mm/50 for 50mm) |
| | | 1.50 | | Inferred light yellow locally light grey SANDSTONE. | 1.40 - 1.50 | SPT (S) | |
| | | | | End of Borehole at 1.500m | | | |

| Hole Diameter | | Casing Depths | | General Remarks | Chiselling | | | Ground Water | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth Base (m) | Diameter (mm) | Depth Base (m) | Diameter (mm) | | From (m) | To (m) | Time (hr) | Depth Strike (m) | Depth Casing (m) | Depth Sealed (m) | Time Elapsed (min) | Water Level (m) |
| | | | | 1.2m Hand excavated inspection pit dug.<br>No groundwater encountered. | | | | | | | | |

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# Borehole Log

Scale 1:50 Sheet 1 of 1

## BH02

| | | | | | |
|---|---|---|---|---|---|
| **Contract no:** | S240106 | **Site:** | Mill Lane, Batley | **Driller:** | SR Drilling Ltd |
| | | | | **Plant used:** | Mini Rig |
| | | | | **Started:** | 10/01/2024 |
| **Client:** | Mandale | | | **Ended:** | 10/01/2024 |
| **Method:** | Small Percussive | | | **Backfilled:** | 10/01/2024 |

| | | |
|---|---|---|
| **GL (AOD):** | | |
| **Easting:** | 425010 | |
| **Northing:** | 423487 | |
| **Logged:** | RF | |
| **Status:** | FINAL | |

| Backfill / Installation | Legend | Depth (m) | Level (m AOD) | Stratum Description | Samples and Insitu Testing | | |
|---|---|---|---|---|---|---|---|
| | | | | | Depth (m) | Type | Results |
| | | | | MADE GROUND: Dark brown slightly sandy gravelly clayey topsoil. Sand is fine to coarse. Gravel is fine to coarse, angular to subangular of sandstone, brick and concrete. | 0.20 - 0.40 | B | |
| | | 0.40 | | Firm light brown locally dark brown slightly sandy gravelly medium strength CLAY of high plasticity. Sand is fine to coarse. Gravel is fine to coarse, angular to subangular of sandstone. | 0.40 - 0.60 | D | |
| | | | | | 0.80 - 1.00 | D | |
| | | | | | 1.20 | HV | 55kPa |
| | | | | | 1.40 - 1.60 | D | |
| | | | | | 1.80 - 2.00 | D | |
| | | 2.00 | | Inferred light yellow, locally light grey SANDSTONE. | 2.00 - 2.00 | SPT (S) | N=50+ (25 for 0mm/50 for 0mm) |
| | | 2.00 | | End of Borehole at 2.000m | | | |

| Hole Diameter | | Casing Depths | | General Remarks | Chiselling | | | Ground Water | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth Base (m) | Diameter (mm) | Depth Base (m) | Diameter (mm) | | From (m) | To (m) | Time (hr) | Depth Strike (m) | Depth Casing (m) | Depth Sealed (m) | Time Elapsed (min) | Water Level (m) |
| | | | | 1.2m Hand excavated inspection pit dug.<br>No groundwater encountered. | | | | | | | | |

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# Borehole Log

Scale 1:50 Sheet 1 of 1

## BH03

| | | | | | |
|---|---|---|---|---|---|
| **Contract no:** | S240106 | **Site:** | Mill Lane, Batley | **Driller:** | SR Drilling Ltd |
| | | | | **Plant used:** | Mini Rig |
| | | | | **Started:** | 10/01/2024 |
| **Client:** | Mandale | | | **Ended:** | 10/01/2024 |
| **Method:** | Small Percussive | | | **Backfilled:** | 10/01/2024 |

| | | |
|---|---|---|
| **GL (AOD):** | | |
| **Easting:** | 425057 | |
| **Northing:** | 423495 | |
| **Logged:** | RF | |
| **Status:** | FINAL | |

| Backfill / Installation | Legend | Depth (m) | Level (m AOD) | Stratum Description | Samples and Insitu Testing | | |
|---|---|---|---|---|---|---|---|
| | | | | | Depth (m) | Type | Results |
| | | | | MADE GROUND: Dark brown slightly sandy gravelly clayey topsoil. Sand is fine to coarse. Gravel is fine to coarse, angular to subrounded of sandstone, brick and concrete. | 0.20 - 0.40 | B | |
| | | | | | 0.40 - 0.60 | B | |
| | | 0.60 | | Stiff light brown locally dark brown slightly sandy gravelly high strength CLAY of high plasticity. Sand is fine to coarse. Gravel is fine to coarse, angular to subangular of sandstone. | 0.80 - 1.00 | D | |
| | | | | | 1.20 | HV | 82kPa |
| | | | | | 1.40 - 1.60 | D | |
| | | | | | 1.80 - 2.00 | D | |
| | | 2.00 | | Inferred light yellow locally light grey SANDSTONE. | 2.00 - 2.00 | SPT (S) | N=50+ (25 for 0mm/50 for 0mm) |
| | | 2.00 | | End of Borehole at 2.000m | | | |

| Hole Diameter | | Casing Depths | | General Remarks | Chiselling | | | Ground Water | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth Base (m) | Diameter (mm) | Depth Base (m) | Diameter (mm) | | From (m) | To (m) | Time (hr) | Depth Strike (m) | Depth Casing (m) | Depth Sealed (m) | Time Elapsed (min) | Water Level (m) |
| | | | | 1.2m Hand excavated inspection pit dug.<br>No groundwater encountered. | | | | | | | | |

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# Borehole Log

Scale 1:50 Sheet 1 of 1

## BH04

| | | | | | |
|---|---|---|---|---|---|
| **Contract no:** | S240106 | **Site:** | Mill Lane, Batley | **Driller:** | SR Drilling Ltd |
| | | | | **Plant used:** | Mini Rig |
| | | | | **Started:** | 10/01/2024 |
| **Client:** | Mandale | | | **Ended:** | 10/01/2024 |
| **Method:** | Small Percussive | | | **Backfilled:** | 10/01/2024 |

| | | |
|---|---|---|
| **GL (AOD):** | | |
| **Easting:** | 425057 | |
| **Northing:** | 423451 | |
| **Logged:** | RF | |
| **Status:** | FINAL | |

| Backfill / Installation | Legend | Depth (m) | Level (m AOD) | Stratum Description | Samples and Insitu Testing | | |
|---|---|---|---|---|---|---|---|
| | | | | | Depth (m) | Type | Results |
| | | | | MADE GROUND: Dark brown slightly sandy, gravelly clayey topsoil. Sand is fine to coarse. Gravel is fine to coarse, angular to subangular of sandstone, brick and concrete. | 0.20 - 0.40 | B | |
| | | 0.40 | | Firm light brown locally dark brown, slightly sandy gravelly medium strength CLAY of intermediate plasticity. Sand is fine to coarse. Gravel is fine to coarse, angular to subrounded of sandstone, brick and concrete. | 0.40 - 0.60 | B | |
| | | | | | 0.80 - 1.00 | B | |
| | | | | | 1.20 | HV | 58kPa |
| G | | 1.40 | | | 1.20 - 1.40 | B | N=50+ (12,13 for 25mm/25,50) |
| | | 1.50 | | Inferred light yellow locally light grey SANDSTONE. | 1.40 - 1.50 | SPT (S) | |
| | | | | End of Borehole at 1.500m | | | |

| Hole Diameter | | Casing Depths | | General Remarks | Chiselling | | | Ground Water | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth Base (m) | Diameter (mm) | Depth Base (m) | Diameter (mm) | | From (m) | To (m) | Time (hr) | Depth Strike (m) | Depth Casing (m) | Depth Sealed (m) | Time Elapsed (min) | Water Level (m) |
| | | | | 1.2m Hand excavated inspection pit dug.<br>No groundwater encountered. | | | | | | | | |

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# Borehole Log

Scale 1:50 Sheet 1 of 1

## BH05

| | | | | | |
|---|---|---|---|---|---|
| **Contract no:** | S240106 | **Site:** | Mill Lane, Batley | **Driller:** | SR Drilling Ltd |
| | | | | **Plant used:** | Mini Rig |
| | | | | **Started:** | 10/01/2024 |
| **Client:** | Mandale | | | **Ended:** | 10/01/2024 |
| **Method:** | Small Percussive | | | **Backfilled:** | 10/01/2024 |

| | | |
|---|---|---|
| **GL (AOD):** | | |
| **Easting:** | 425087 | |
| **Northing:** | 423493 | |
| **Logged:** | RF | |
| **Status:** | FINAL | |

| Backfill / Installation | Legend | Depth (m) | Level (m AOD) | Stratum Description | Samples and Insitu Testing | | |
|---|---|---|---|---|---|---|---|
| | | | | | Depth (m) | Type | Results |
| | | | | MADE GROUND: Dark brown slightly sandy gravelly clayey topsoil. Sand is fine to coarse. Gravel is fine to coarse, angular to subangular of sandstone, brick and concrete. | 0.10 - 0.30 | B | |
| | | 0.30 | | Firm light brown locally dark brown, slightly sandy gravelly medium strength CLAY of intermediate plasticity. Sand is fine to coarse. Gravel is fine to coarse angular to subangular of sandstone. | 0.40 - 0.60 | D | |
| | | | | | 0.80 - 1.00 | D | |
| | | | | | 1.20 | HV | 59kPa |
| | | | | | 1.20 - 1.40 | D | N=50+ (25 for 0mm/50 for 0mm) |
| | | 1.40 | | Inferred light yellow, locally light grey SANDSTONE. | 1.40 - 1.40 | SPT (S) | |
| | | 1.40 | | End of Borehole at 1.400m | | | |

| Hole Diameter | | Casing Depths | | General Remarks | Chiselling | | | Ground Water | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth Base (m) | Diameter (mm) | Depth Base (m) | Diameter (mm) | | From (m) | To (m) | Time (hr) | Depth Strike (m) | Depth Casing (m) | Depth Sealed (m) | Time Elapsed (min) | Water Level (m) |
| | | | | 1.2m Hand excavated inspection pit dug.<br>No groundwater encountered. | | | | | | | | |

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# Borehole Log

Scale 1:50 Sheet 1 of 1

## BH06

| | | | | | |
|---|---|---|---|---|---|
| **Contract no:** | S240106 | **Site:** | Mill Lane, Batley | **Driller:** | SR Drilling Ltd |
| | | | | **Plant used:** | Mini Rig |
| | | | | **Started:** | 10/01/2024 |
| **Client:** | Mandale | | | **Ended:** | 10/01/2024 |
| **Method:** | Small Percussive | | | **Backfilled:** | 10/01/2024 |

| | | |
|---|---|---|
| **GL (AOD):** | | |
| **Easting:** | 425117 | |
| **Northing:** | 423486 | |
| **Logged:** | RF | |
| **Status:** | FINAL | |

| Backfill / Installation | Legend | Depth (m) | Level (m AOD) | Stratum Description | Samples and Insitu Testing | | |
|---|---|---|---|---|---|---|---|
| | | | | | Depth (m) | Type | Results |
| | | | | MADE GROUND: Dark brown slightly sandy gravelly, clayey topsoil. Sand is fine to coarse. Gravel is fine to coarse angular to subrounded of sandstone, brick and concrete. Also includes fabric liners. | 0.20 - 0.40 | B | |
| | | | | | 0.40 - 0.60 | D | |
| | | 0.60 | | MADE GROUND: Firm dark brown locally light orangish brown slightly sandy gravelly clay. Sand is fine to coarse. Gravel is fine to coarse, angular to subangular of sandstone, brick and concrete. | 0.80 - 1.00 | D | |
| G | | 1.00 | | | 1.00 - 1.00 | SPT (S) | N=50+ (25 for 0mm/50 for 0mm) |
| | | 1.00 | | Inferred light yellow locally grey, SANDSTONE. | | | |
| | | | | End of Borehole at 1.000m | | | |

| Hole Diameter | | Casing Depths | | General Remarks | Chiselling | | | Ground Water | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth Base (m) | Diameter (mm) | Depth Base (m) | Diameter (mm) | | From (m) | To (m) | Time (hr) | Depth Strike (m) | Depth Casing (m) | Depth Sealed (m) | Time Elapsed (min) | Water Level (m) |
| | | | | 1.2m Hand excavated inspection pit dug.<br>No groundwater encountered. | | | | | | | | |

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# Trial Pit Log

TrialPit No
TP01
Sheet 1 of 1

| | | | |
|---|---|---|---|
| Project Name: | Mill Lane, Batley | Project No. S240106 | Co-ords: 425035E - 423492N<br>Level: |
| Plant Used: | 360 Excavator | Dimensions (m): Depth 0.80 | 1.80 × 0.50 |
| Client: | Mandale | | |

Date: 10/01/2024
Scale: 1:26
Logged: RF

| Water Strike | Samples & In Situ Testing: Depth | Type | Results | Depth (m) | Level (m) | Legend | Stratum Description |
|---|---|---|---|---|---|---|---|
| | 0.20 - 0.40 | B+ES | | 0.20 | | | MADE GROUND: Dark brown slightly sandy gravelly clayey topsoil. Sand is fine to coarse. Gravel is fine to coarse, angular to subangular of sandstone, brick and concrete. |
| | 0.30 | CBR | 3.8% | | | | Stiff light brown locally dark brown slightly sandy gravelly high strength CLAY. Sand is fine to coarse. Gravel is fine to coarse angular to subangular of sandstone. |
| | 0.50 | HV | 91kPa | | | | |
| | 0.60 - 0.80 | B | | 0.60 | | | Inferred light yellow, locally light grey SANDSTONE. |
| | | | | 0.80 | | | End of Pit at 0.800m |

Remarks: No groundwater encountered.

Stability: Pit wall stable.

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# Trial Pit Log

TrialPit No
TP02
Sheet 1 of 1

| | | | |
|---|---|---|---|
| Project Name: | Mill Lane, Batley | Project No. S240106 | Co-ords: 425021E - 423467N<br>Level: |
| Plant Used: | 360 Excavator | Dimensions (m): Depth 0.90 | 1.90 × 0.50 |
| Client: | Mandale | | |

Date: 10/01/2024
Scale: 1:26
Logged: RF

| Water Strike | Samples & In Situ Testing: Depth | Type | Results | Depth (m) | Level (m) | Legend | Stratum Description |
|---|---|---|---|---|---|---|---|
| | 0.00 - 0.20 | B+ES | | 0.20 | | | MADE GROUND: Dark brown slightly sandy gravelly clayey topsoil. Sand is fine to coarse. Gravel is fine to coarse, angular to subangular of sandstone, brick and concrete. |
| | 0.30 | CBR | 5.3% | | | | Stiff light brown locally dark brown slightly sandy gravelly high strength CLAY. Sand is fine to coarse. Gravel is fine to coarse angular to subrounded of sandstone. |
| | 0.40 - 0.60 | B+ES | | | | | |
| | 0.50 | HV | 134kPa | | | | |
| | 0.60 | CBR | 5.5% | | | | |
| | 0.80 - 0.90 | B | | 0.80 | | | Inferred light yellow, locally light grey SANDSTONE. |
| | | | | 0.90 | | | End of Pit at 0.900m |

Remarks: No groundwater encountered.

Stability: Pit wall stable.

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# Trial Pit Log

TrialPit No
TP03
Sheet 1 of 1

| | | | |
|---|---|---|---|
| Project Name: | Mill Lane, Batley | Project No. S240106 | Co-ords: 425053E - 423470N<br>Level: |
| Plant Used: | 360 Excavator | Dimensions (m): Depth 1.80 | 1.90 × 0.50 |
| Client: | Mandale | | |

Date
10/01/2024

Scale
1:26

Logged
RF

| Water Strike | Samples & In Situ Testing: Depth | Type | Results | Depth (m) | Level (m) | Legend | Stratum Description |
|---|---|---|---|---|---|---|---|
| | 0.20 - 0.40 | B+ES | | | | | MADE GROUND: Dark brown slightly sandy gravelly clayey topsoil. Sand is fine to coarse. Gravel is fine to coarse, angular to subangular of sandstone, brick and concrete. |
| | 0.30 | CBR | 3.1% | 0.40 | | | |
| | 0.50 - 0.70 | B+ES | | | | | MADE GROUND: Light yellow slightly sandy gravel. Sand is fine to coarse. Gravel is fine to coarse, angular of sandstone. |
| | 0.60 | CBR | 3.7% | 0.70 | | | |
| | 1.00 - 1.20 | B | | | | | Stiff light brown locally dark brown slightly sandy gravelly, high strength CLAY. Sand is fine to coarse. Gravel is fine to coarse, angular to subrounded of sandstone. |
| | 1.00 | HV | 144kPa | | | | |
| | 1.50 | HV | 131kPa | | | | |
| | 1.60 - 1.80 | B | | | | | |
| | | | | 1.80 | | | Inferred light yellow, locally light grey SANDSTONE. |
| | | | | 1.80 | | | End of Pit at 1.800m |

Remarks: No groundwater encountered.

Stability: Pit wall stable.

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# Trial Pit Log

TrialPit No
TP04
Sheet 1 of 1

| | | | |
|---|---|---|---|
| Project Name: | Mill Lane, Batley | Project No. S240106 | Co-ords: 425043E - 423436N<br>Level: |
| Plant Used: | 360 Excavator | Dimensions (m): Depth 2.00 | 1.80 × 0.50 |
| Client: | Mandale | | |

Date: 10/01/2024
Scale: 1:26
Logged: RF

| Water Strike | Samples & In Situ Testing: Depth | Type | Results | Depth (m) | Level (m) | Legend | Stratum Description |
|---|---|---|---|---|---|---|---|
| | 0.30 | CBR | 2.5% | | | | MADE GROUND: Dark brown slightly sandy gravelly clayey topsoil. Sand is fine to coarse. Gravel is fine to coarse, angular to subangular of sandstone, brick and concrete. |
| | 0.40 - 0.60 | B+ES | | | | | |
| | 0.60 | CBR | 2.2% | | | | |
| | 0.70 - 0.90 | B+ES | | | | | |
| | | | | 0.90 | | | |
| | 1.00 | HV | 67kPa | | | | Stiff light brown locally dark brown slightly sandy gravelly, medium to high strength CLAY. Sand is fine to coarse. Gravel is fine to coarse, angular to subrounded of sandstone. |
| | 1.70 - 1.90 | B | | | | | |
| | 1.90 | HV | 79kPa | 1.90 | | | Inferred light yellow, locally light grey SANDSTONE. |
| | | | | 2.00 | | | End of Pit at 2.000m |

Remarks: No groundwater encountered.

Stability: Pit wall stable.

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# Trial Pit Log

TrialPit No
TP05
Sheet 1 of 1

| | | | |
|---|---|---|---|
| Project Name: | Mill Lane, Batley | Project No. S240106 | Co-ords: 425108E - 423504N<br>Level: |
| Plant Used: | 360 Excavator | Dimensions (m): Depth 0.85 | 1.50 × 0.50 |
| Client: | Mandale | | |

Date: 10/01/2024
Scale: 1:26
Logged: RF

| Water Strike | Samples & In Situ Testing: Depth | Type | Results | Depth (m) | Level (m) | Legend | Stratum Description |
|---|---|---|---|---|---|---|---|
| | 0.20 - 0.40 | B | | 0.80<br>0.85 | | | MADE GROUND: Dark brown slightly sandy gravelly clayey topsoil. Sand is fine to coarse. Gravel is fine to coarse, angular to subangular of sandstone, brick and concrete.<br>Inferred light yellow, locally light grey SANDSTONE.<br>End of Pit at 0.850m |

Remarks: No groundwater encountered.

Stability: Pit wall stable.

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# Trial Pit Log

TrialPit No
TP06
Sheet 1 of 1

| | | | |
|---|---|---|---|
| Project Name: | Mill Lane, Batley | Project No. S240106 | Co-ords: 425148E - 423514N<br>Level: |
| Plant Used: | 360 Excavator | Dimensions (m): Depth 2.00 | 1.80 × 0.50 |
| Client: | Mandale | | |

Date: 10/01/2024
Scale: 1:26
Logged: RF

| Water Strike | Samples & In Situ Testing: Depth | Type | Results | Depth (m) | Level (m) | Legend | Stratum Description |
|---|---|---|---|---|---|---|---|
| | 0.20 - 0.40 | B+ES | | | | | MADE GROUND: Dark brown slightly sandy gravelly clayey topsoil. Sand is fine to coarse. Gravel is fine to coarse, angular to subangular of sandstone, brick and concrete. |
| | 0.30 | CBR | 1.5% | | | | |
| | 0.60 | CBR | 0.8% | 0.60 | | | MADE GROUND: Firm dark brown locally yellowish brown, slightly sandy gravelly clay. Sand is fine to coarse. Gravel is fine to coarse, angular to subangular of sandstone, brick and concrete. Also contains fabric rags. |
| | 0.80 - 1.00 | B+ES | | | | | |
| | 1.00 | HV | 54kPa | | | | |
| | 1.80 - 2.00 | B+ES | | | | | |
| | | | | 2.00 | | | Inferred light yellow, locally light grey SANDSTONE. |
| | | | | 2.00 | | | End of Pit at 2.000m |

Remarks: No groundwater encountered.

Stability: Pit wall stable.

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# Trial Pit Log

TrialPit No
TP07
Sheet 1 of 1

| | | | |
|---|---|---|---|
| Project Name: | Mill Lane, Batley | Project No. S240106 | Co-ords: 425182E - 423518N<br>Level: |
| Plant Used: | 360 Excavator | Dimensions (m): Depth 1.00 | 1.80 × 0.50 |
| Client: | Mandale | | |

Date: 10/01/2024
Scale: 1:26
Logged: RF

| Water Strike | Samples & In Situ Testing: Depth | Type | Results | Depth (m) | Level (m) | Legend | Stratum Description |
|---|---|---|---|---|---|---|---|
| | 0.20 - 0.40 | B+ES | | | | | MADE GROUND: Dark brown slightly sandy gravelly clayey topsoil. Sand is fine to coarse. Gravel is fine to coarse, angular to subangular of sandstone, brick and concrete. |
| | 0.30 | CBR | 1.3% | | | | |
| | 0.50 - 0.70 | B+ES | | 0.50 | | | MADE GROUND: Firm dark brown locally yellowish brown, slightly sandy gravelly clay. Sand is fine to coarse. Gravel is fine to coarse, angular to subangular of sandstone, brick and concrete. Also contains fabric rags. Also contains loose dead wires and carpets. |
| | 0.60 | CBR | 1.8% | | | | |
| | 0.70 | HV | 69kPa | | | | |
| | 0.80 - 1.00 | B | | | | | |
| | | | | 1.00 | | | Inferred light yellow, locally light grey SANDSTONE. |
| | | | | 1.00 | | | End of Pit at 1.000m |

1
2
3
4
5

Remarks: No groundwater encountered.

Stability: Pit wall stable.

# Appendix C

# Certificate of Analysis

| | | | |
|---|---|---|---|
| *Certificate Number* | 24-01228 | *Issued:* | 29-Jan-24 |

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

| | |
|---|---|
| *Our Reference* | 24-01228 |
| *Client Reference* | S240106 |
| *Order No* | SOL 8012 |
| *Contract Title* | Mill Lane, Batley |
| *Description* | 6 Soil samples. |
| *Date Received* | 22-Jan-24 |
| *Date Started* | 22-Jan-24 |
| *Date Completed* | 29-Jan-24 |
| *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

MCERTS
THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME

ilac-MRA

UKAS TESTING
2139

# Summary of Chemical Analysis
# Matrix Descriptions

*Our Ref* 24-01228
*Client Ref* S240106
*Contract Title* Mill Lane, Batley

| Sample ID | Depth | Lab No | Completed | Matrix Description |
|---|---|---|---|---|
| BH01 | 0.10-0.30 | 2289164 | 29/01/2024 | Dark brown gravelly, sandy CLAY including odd rootlets |
| BH02 | 0.20-0.40 | 2289165 | 29/01/2024 | Dark brown/black gravelly, sandy CLAY including odd rootlets |
| BH03 | 0.40-0.60 | 2289166 | 29/01/2024 | Brown slightly gravelly, sandy CLAY |
| BH05 | 0.40-0.60 | 2289167 | 29/01/2024 | Brown slightly gravelly, sandy CLAY |
| TP06 | 0.80-1.00 | 2289168 | 29/01/2024 | Dark brown slightly gravelly, sandy CLAY including odd rootlets |
| TP07 | 0.20-0.40 | 2289169 | 29/01/2024 | Dark brown slightly gravelly, sandy CLAY including odd rootlets |

# Summary of Chemical Analysis
# Soil Samples

*Our Ref* 24-01228
*Client Ref* S240106
*Contract Title* Mill Lane, Batley

| | | | | Lab No | 2289164 | 2289165 | 2289166 | 2289167 | 2289168 | 2289169 |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | .Sample ID | BH01 | BH02 | BH03 | BH05 | TP06 | TP07 |
| | | | | Depth | 0.10-0.30 | 0.20-0.40 | 0.40-0.60 | 0.40-0.60 | 0.80-1.00 | 0.20-0.40 |
| | | | | Other ID | | | | | | |
| | | | | Sample Type | ES | ES | ES | ES | ES | ES |
| | | | | Sampling Date | 16/01/2024 | 16/01/2024 | 16/01/2024 | 16/01/2024 | 16/01/2024 | 16/01/2024 |
| | | | | Sampling Time | n/s | n/s | n/s | n/s | n/s | n/s |
| **Test** | **Method** | **LOD** | **Units** | | | | | | | |
| Asbestos Quantification | DETSC 1102 | 0.001 | % | | | | | | 0.001 | |
| **Metals** | | | | | | | | | | |
| Arsenic | DETSC 2301# | 0.2 | mg/kg | 12 | 43 | 10 | 10 | 26 | 20 |
| Boron, Water Soluble (2.5:1) | DETSC 2311# | 0.2 | mg/kg | 0.2 | 1.1 | 0.3 | 0.3 | 0.5 | 0.9 |
| Cadmium | DETSC 2301# | 0.1 | mg/kg | 0.3 | 0.3 | 0.2 | 0.2 | 0.4 | 0.4 |
| Chromium | DETSC 2301# | 0.15 | mg/kg | 15 | 28 | 15 | 20 | 29 | 28 |
| Copper | DETSC 2301# | 0.2 | mg/kg | 28 | 80 | 21 | 34 | 80 | 57 |
| Lead | DETSC 2301# | 0.3 | mg/kg | 34 | 150 | 20 | 35 | 97 | 81 |
| Mercury | DETSC 2325# | 0.05 | mg/kg | 0.07 | 0.33 | < 0.05 | 0.06 | 0.19 | 0.14 |
| Nickel | DETSC 2301# | 1 | mg/kg | 19 | 26 | 18 | 30 | 24 | 22 |
| Selenium | DETSC 2301# | 0.5 | mg/kg | < 0.5 | < 0.5 | 0.6 | < 0.5 | 0.5 | < 0.5 |
| Zinc | DETSC 2301# | 1 | mg/kg | 110 | 150 | 120 | 130 | 210 | 130 |
| **Inorganics** | | | | | | | | | | |
| pH | DETSC 2008# | | pH | 8.0 | 6.8 | 6.3 | 6.2 | 7.3 | 8.0 |
| Cyanide, Free | DETSC 2130# | 0.1 | mg/kg | < 0.1 | 0.1 | 0.2 | < 0.1 | 0.1 | < 0.1 |
| Organic matter | DETSC 2002# | 0.1 | % | 0.5 | 3.7 | 0.9 | 0.4 | 1.6 | 2.5 |
| Sulphate Aqueous Extract as SO4 (2:1) | DETSC 2076# | 10 | mg/l | 12 | 100 | 85 | 31 | 29 | 78 |
| **Petroleum Hydrocarbons** | | | | | | | | | | |
| Aliphatic C5-C6: HS_1D_AL | DETSC 3321* | 0.01 | mg/kg | < 0.01 | | < 0.01 | | | |
| Aliphatic C6-C8: HS_1D_AL | DETSC 3321* | 0.01 | mg/kg | < 0.01 | | < 0.01 | | | |
| Aliphatic C8-C10: HS_1D_AL | DETSC 3321* | 0.01 | mg/kg | < 0.01 | | < 0.01 | | | |
| Aliphatic C10-C12: EH_CU_1D_AL | DETSC 3072# | 1.5 | mg/kg | < 1.5 | | < 1.5 | | | |
| Aliphatic C12-C16: EH_CU_1D_AL | DETSC 3072# | 1.2 | mg/kg | < 1.2 | | < 1.2 | | | |
| Aliphatic C16-C21: EH_CU_1D_AL | DETSC 3072# | 1.5 | mg/kg | < 1.5 | | < 1.5 | | | |
| Aliphatic C21-C35: EH_CU_1D_AL | DETSC 3072# | 3.4 | mg/kg | < 3.4 | | < 3.4 | | | |
| Aliphatic C5-C35: EH_CU+HS_1D_AL | DETSC 3072* | 10 | mg/kg | < 10 | | < 10 | | | |
| Aromatic C5-C7: HS_1D_AR | DETSC 3321* | 0.01 | mg/kg | < 0.01 | | < 0.01 | | | |
| Aromatic C7-C8: HS_1D_AR | DETSC 3321* | 0.01 | mg/kg | < 0.01 | | < 0.01 | | | |
| Aromatic C8-C10: HS_1D_AR | DETSC 3321* | 0.01 | mg/kg | < 0.01 | | < 0.01 | | | |
| Aromatic C10-C12: EH_CU_1D_AR | DETSC 3072# | 0.9 | mg/kg | < 0.9 | | < 0.9 | | | |
| Aromatic C12-C16: EH_CU_1D_AR | DETSC 3072# | 0.5 | mg/kg | < 0.5 | | < 0.5 | | | |
| Aromatic C16-C21: EH_CU_1D_AR | DETSC 3072# | 0.6 | mg/kg | < 0.6 | | < 0.6 | | | |
| Aromatic C21-C35: EH_CU_1D_AR | DETSC 3072# | 1.4 | mg/kg | < 1.4 | | < 1.4 | | | |
| Aromatic C5-C35: EH_CU+HS_1D_AR | DETSC 3072* | 10 | mg/kg | < 10 | | < 10 | | | |
| TPH Ali/Aro Total C5-C35: EH_CU+HS_1D_Total | DETSC 3072* | 10 | mg/kg | < 10 | | < 10 | | | |
| **PAHs** | | | | | | | | | | |
| Naphthalene | DETSC 3301 | 0.1 | mg/kg | < 0.1 | 0.6 | < 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 | < 0.1 |
| Acenaphthene | DETSC 3301 | 0.1 | mg/kg | < 0.1 | 0.8 | < 0.1 | < 0.1 | 0.1 | < 0.1 |
| Fluorene | DETSC 3301 | 0.1 | mg/kg | < 0.1 | 0.6 | < 0.1 | < 0.1 | 0.1 | < 0.1 |
| Phenanthrene | DETSC 3301 | 0.1 | mg/kg | 0.3 | 3.5 | < 0.1 | < 0.1 | 1.1 | 0.4 |

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

# Summary of Chemical Analysis
# Soil Samples

*Our Ref* 24-01228
*Client Ref* S240106
*Contract Title* Mill Lane, Batley

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | **Lab No** | 2289164 | 2289165 | 2289166 | 2289167 | 2289168 | 2289169 |
| | | | **.Sample ID** | BH01 | BH02 | BH03 | BH05 | TP06 | TP07 |
| | | | **Depth** | 0.10-0.30 | 0.20-0.40 | 0.40-0.60 | 0.40-0.60 | 0.80-1.00 | 0.20-0.40 |
| | | | **Other ID** | | | | | | |
| | | | **Sample Type** | ES | ES | ES | ES | ES | ES |
| | | | **Sampling Date** | 16/01/2024 | 16/01/2024 | 16/01/2024 | 16/01/2024 | 16/01/2024 | 16/01/2024 |
| | | | **Sampling Time** | n/s | n/s | n/s | n/s | n/s | n/s |
| **Test** | **Method** | **LOD** | **Units** | | | | | | |
| Anthracene | DETSC 3301 | 0.1 | mg/kg | < 0.1 | 0.6 | < 0.1 | < 0.1 | 0.2 | 0.1 |
| Fluoranthene | DETSC 3301 | 0.1 | mg/kg | 0.5 | 3.9 | < 0.1 | < 0.1 | 1.6 | 0.7 |
| Pyrene | DETSC 3301 | 0.1 | mg/kg | 0.4 | 3.5 | < 0.1 | < 0.1 | 1.4 | 0.7 |
| Benzo(a)anthracene | DETSC 3301 | 0.1 | mg/kg | 0.1 | 1.6 | < 0.1 | < 0.1 | 0.8 | 0.3 |
| Chrysene | DETSC 3301 | 0.1 | mg/kg | 0.1 | 1.9 | < 0.1 | < 0.1 | 0.8 | 0.3 |
| Benzo(b)fluoranthene | DETSC 3301 | 0.1 | mg/kg | < 0.1 | 1.0 | < 0.1 | < 0.1 | 0.4 | 0.1 |
| Benzo(k)fluoranthene | DETSC 3301 | 0.1 | mg/kg | < 0.1 | 0.6 | < 0.1 | < 0.1 | 0.3 | < 0.1 |
| Benzo(a)pyrene | DETSC 3301 | 0.1 | mg/kg | < 0.1 | 1.5 | < 0.1 | < 0.1 | 0.7 | 0.3 |
| Indeno(1,2,3-c,d)pyrene | DETSC 3301 | 0.1 | mg/kg | < 0.1 | 1.0 | < 0.1 | < 0.1 | 0.4 | < 0.1 |
| Dibenzo(a,h)anthracene | DETSC 3301 | 0.1 | mg/kg | < 0.1 | 0.1 | < 0.1 | < 0.1 | 0.2 | < 0.1 |
| Benzo(g,h,i)perylene | DETSC 3301 | 0.1 | mg/kg | < 0.1 | 0.8 | < 0.1 | < 0.1 | 0.4 | < 0.1 |
| PAH 16 Total | DETSC 3301 | 1.6 | mg/kg | < 1.6 | 22 | < 1.6 | < 1.6 | 8.6 | 3.0 |
| **Phenols** | | | | | | | | | |
| Phenol - Monohydric | DETSC 2130# | 0.3 | mg/kg | < 0.3 | < 0.3 | 0.4 | < 0.3 | 0.7 | 0.4 |

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

# Summary of Asbestos Analysis
# Soil Samples

*Our Ref* 24-01228
*Client Ref* S240106
*Contract Title* Mill Lane, Batley

| Lab No | Sample ID | Material Type | Result | Comment* | Analyst |
|---|---|---|---|---|---|
| 2289164 | BH01 0.10-0.30 | SOIL | NAD | none | Darryl Fletcher |
| 2289165 | BH02 0.20-0.40 | SOIL | NAD | none | Darryl Fletcher |
| 2289166 | BH03 0.40-0.60 | SOIL | NAD | none | Darryl Fletcher |
| 2289167 | BH05 0.40-0.60 | SOIL | NAD | none | Darryl Fletcher |
| 2289168 | TP06 0.80-1.00 | SOIL | Chrysotile | Bundles of Chrysotile fibres | Darryl Fletcher |
| 2289169 | TP07 0.20-0.40 | SOIL | NAD | none | Darryl Fletcher |

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.

# Summary of Asbestos Quantification Analysis
# Soil Samples

*Our Ref* 24-01228
*Client Ref* S240106
*Contract Title* Mill Lane, Batley

| | |
|---|---|
| **Lab No** | 2289168 |
| **.Sample ID** | TP06 |
| **Depth** | 0.80-1.00 |
| **Other ID** | |
| **Sample Type** | ES |
| **Sampling Date** | 16/01/2024 |
| **Sampling Time** | |

| **Test** | **Method** | **Units** | |
|---|---|---|---|
| Total Mass% Asbestos (a+b+c) | DETSC 1102 | Mass % | **0.001** |
| Gravimetric Quantification (a) | DETSC 1102 | Mass % | na |
| Detailed Gravimetric Quantification (b) | DETSC 1102 | Mass % | 0.001 |
| Quantification by PCOM (c) | DETSC 1102 | Mass % | na |
| Potentially Respirable Fibres (d) | DETSC 1102 | Fibres/g | na |
| Breakdown of Gravimetric Analysis (a) | | | |
| Mass of Sample | | g | 882.32 |
| ACMs present* | | type | |
| Mass of ACM in sample | | g | |
| % ACM by mass | | % | |
| % asbestos in ACM | | % | |
| % asbestos in sample | | % | |
| Breakdown of Detailed Gravimetric Analysis (b) | | | |
| % Amphibole bundles in sample | | Mass % | na |
| % Chrysotile bundles in sample | | Mass % | 0.001 |
| Breakdown of PCOM Analysis (c) | | | |
| % Amphibole fibres in sample | | Mass % | na |
| % Chrysotile fibres in sample | | Mass % | na |
| Breakdown of Potentially Respirable Fibre Analysis (d) | | | |
| Amphibole fibres | | Fibres/g | na |
| Chrysotile fibres | | Fibres/g | na |

* Denotes test or material description outside of UKAS accreditation.
% asbestos in Asbestos Containing Materials (ACMs) is determined by
by reference to HSG 264.
Recommended sample size for quantification is approximately 1kg
# denotes deviating sample

# Information in Support of the Analytical Results

*Our Ref* 24-01228
*Client Ref* S240106
*Contract* Mill Lane, Batley

## Containers Received & Deviating Samples

| Lab No | Sample ID | Date Sampled | Containers Received | Holding time exceeded for tests | Inappropriate container for tests |
|---|---|---|---|---|---|
| 2289164 | BH01 0.10-0.30 SOIL | 16/01/24 | GJ 250ml, PT 1L | | |
| 2289165 | BH02 0.20-0.40 SOIL | 16/01/24 | GJ 250ml, PT 1L | | |
| 2289166 | BH03 0.40-0.60 SOIL | 16/01/24 | GJ 250ml, PT 1L | | |
| 2289167 | BH05 0.40-0.60 SOIL | 16/01/24 | GJ 250ml, PT 1L | | |
| 2289168 | TP06 0.80-1.00 SOIL | 16/01/24 | GJ 250ml, PT 1L x2 | | |
| 2289169 | TP07 0.20-0.40 SOIL | 16/01/24 | GJ 250ml, PT 1L | | |

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 | Acronym |
|---|---|
| Aliphatic C5-C6 | 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 SO4 | 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 SO4 | % | 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 |
|---|---|
| Mill Lane, Batley | S240106 |

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

UKAS TESTING
10258

**Client details:**

| | |
|---|---|
| Reference: | S240106 |
| Name: | Solmek |
| Address: | 12 Yarm Road,<br>Stockton-on-tees,<br>TS18 3NA |
| Telephone: | 01642 607083 |
| Email: | matkins@solmek.com |
| FAO: | Mark Atkins |

**Samples received:**

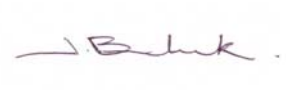
**Date commenced:** 22/01/2024

**Date reported:** 06/02/2024

**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)<br>☑ J. Brischuk (Laboratory Manager)<br>☐ |

# 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 |
|---|---|
| Mill Lane, Batley | S240106 |

| Hole | Depth Top m | Depth Base m | Type | *w* % | Oven temp. oc | wa % | Pa % | Pr % | wL % | wP % | IP % | IL | Plasticity class | Preparation method |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BH01 | 0.80 | | B | 16 | 105 | 17 | 93 | 7 | 34-s | 19 | 15 | -0.133 | CL | Tested after >425µm removed by hand |
| BH02 | 0.80 | | B | 22 | 105 | 24 | 93 | 7 | 52-s | 23 | 29 | 0.034 | CH | Tested after >425µm removed by hand |
| BH03 | 1.40 | | B | 17 | 105 | 17 | 100 | 0 | 52-s | 24 | 28 | -0.250 | CH | Tested in natural condition |
| BH04 | 0.80 | | B | 16 | 105 | 18 | 90 | 10 | 39-s | 19 | 20 | -0.050 | CI | Tested after >425µm removed by hand |
| BH05 | 0.80 | | B | 14 | 105 | 18 | 77 | 23 | 35-s | 19 | 16 | -0.063 | CI | Tested after >425µm removed by hand |
| BH05 | 1.20 | | B | 13 | 105 | | | | | | | | | |
| TP02 | 0.40 | | B | 18 | 105 | | | | | | | | | |
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All tests found in G2M Testing UKAS Schedule of Accreditation are tested to standard unless otherwise indicated

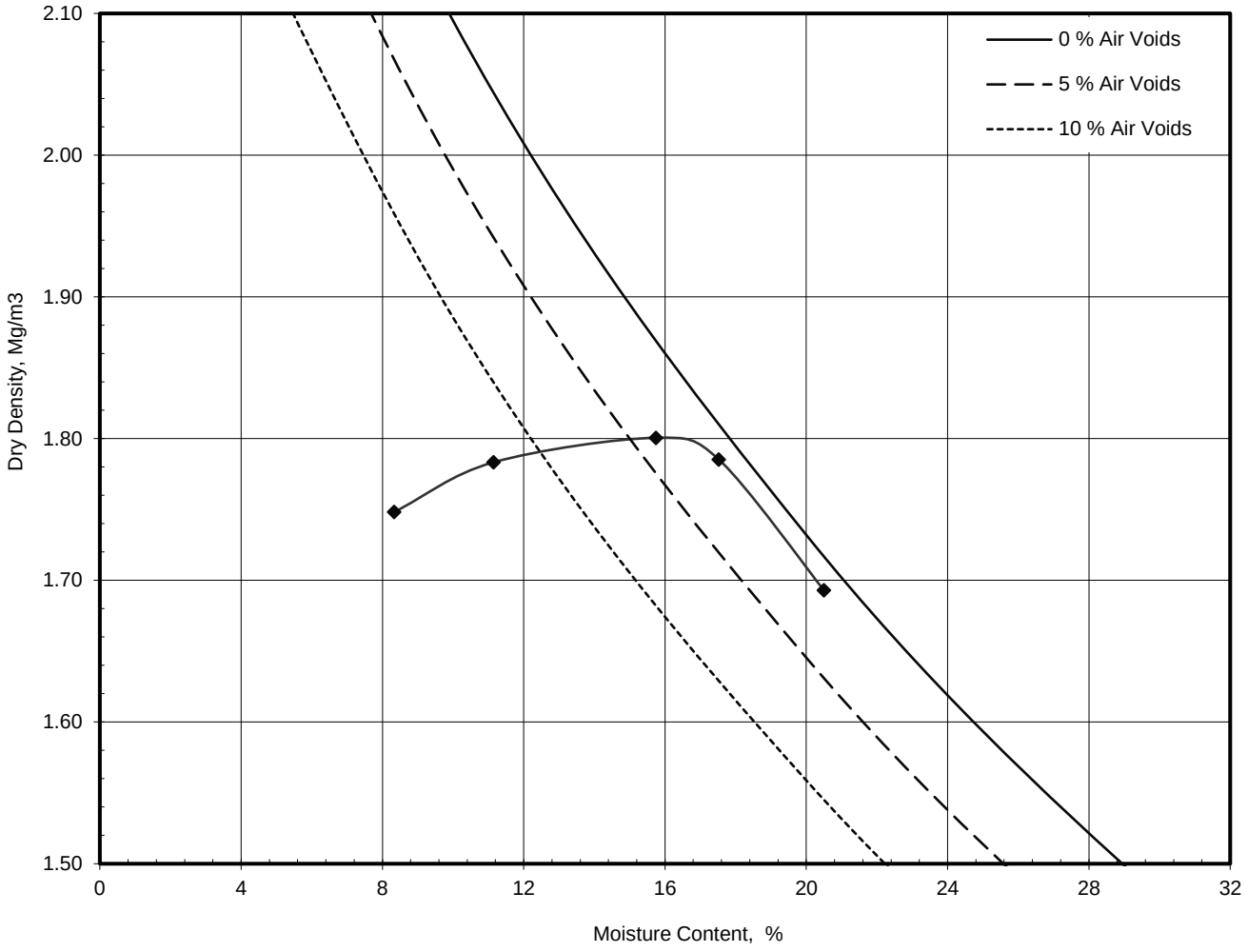
| Key | Description | | Category | BS Test Code |
|---|---|---|---|---|
| *w* | Moisture content | | | BS 1377:1990 Part 2 Clause 3.2 |
| wa | Equivalent moisture content passing 425µm sieve | | | BS 1377:1990 Part 2 Clause 3.2 |
| wL | Liquid limit | Single point | -s | BS 1377:1990 Part 2 Clause 4.4 |
| | | 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 | 06/02/2024 09:01 |
| Date report generated | |
| Report Number | |

UKAS TESTING
10258

# Dry Density / Moisture Content Relationship
## Light Compaction

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | Job Ref | **S240106** |
| | | | | | Borehole / Pit No | TP02 |
| Site Name | **Mill Lane, Batley** | | | | Sample No | |
| Soil Description | Brown Sandy Clay | | | | Depth | 0.40 m |
| Specimen Ref. | TP02 | Specimen Depth | 0.4 | m | Sample Type | B |
| Test Method | BS1377:Part 4:1990, clause 3.3, 2.5kg rammer | | | | Keylab ID | G2MT2024012252 |
| | | | | | Compaction Test Reference/No. | 1 |




| | | |
|---|---|---|
| Mould Type | | 1 LITRE |
| Samples Used | | Single sample tested |
| Material Retained on 37.5 mm Sieve | % | 0 |
| Material Retained on 20.0 mm Sieve | % | 2 |
| Particle Density - Assumed | Mg/m³ | 2.65 |
| Natural Moisture Content | % | |
| **Maximum Dry Density** | Mg/m³ | **1.80** |

| | | |
|---|---|---|
| **Optimum Moisture Content** | % | **16** |

| Operator | Checked | Approved | Remarks | Fig |
|---|---|---|---|---|
| Durham Lab | D Anderson | D Anderson | | Sheet 1 of 1 |

# Certificate of Analysis

| | | | |
|---|---|---|---|
| *Certificate Number* | 24-01238 | *Issued:* | 26-Jan-24 |

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

| | |
|---|---|
| *Our Reference* | 24-01238 |
| *Client Reference* | S240106 |
| *Order No* | SOL-8013 |
| *Contract Title* | Mill Lane, Batley |
| *Description* | 4 Soil samples. |
| *Date Received* | 22-Jan-24 |
| *Date Started* | 22-Jan-24 |
| *Date Completed* | 26-Jan-24 |
| *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* 24-01238
*Client Ref* S240106
*Contract Title* Mill Lane, Batley

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | **Lab No** | 2289209 | 2289210 | 2289211 | 2289212 |
| | | | **.Sample ID** | BH01 | BH02 | BH04 | BH05 |
| | | | **Depth** | 0.80-1.00 | 0.80-1.00 | 0.80-1.00 | 1.20-1.40 |
| | | | **Other ID** | | | | |
| | | | **Sample Type** | B | B | B | B |
| | | | **Sampling Date** | n/s | n/s | n/s | n/s |
| | | | **Sampling Time** | n/s | n/s | n/s | n/s |
| **Test** | **Method** | **LOD** | **Units** | | | | |
| **Inorganics** | | | | | | | |
| pH | DETSC 2008# | | pH | 7.7 | 7.4 | 5.6 | 5.5 |
| Sulphate Aqueous Extract as SO4 (2:1) | DETSC 2076# | 10 | mg/l | < 10 | 89 | 16 | < 10 |

Key: # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

# Information in Support of the Analytical Results

*Our Ref* 24-01238
*Client Ref* S240106
*Contract* Mill Lane, Batley

## Containers Received & Deviating Samples

| Lab No | Sample ID | Date Sampled | Containers Received | Holding time exceeded for tests | Inappropriate container for tests |
|---|---|---|---|---|---|
| 2289209 | BH01 0.80-1.00 SOIL | | PT 1L | | |
| 2289210 | BH02 0.80-1.00 SOIL | | PT 1L | | |
| 2289211 | BH04 0.80-1.00 SOIL | | PT 1L | | |
| 2289212 | BH05 1.20-1.40 SOIL | | 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

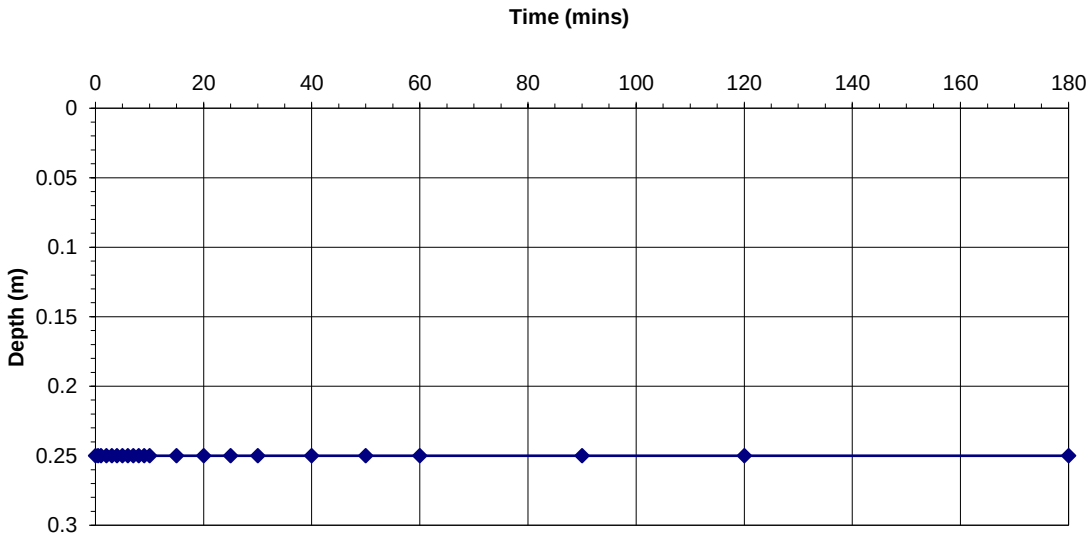
**SOAKAWAY DESIGN IN ACCORDANCE WITH BRE DIGEST 365: 1991**
**BRE Digest 365, Figure 2, Page 5**

| | | | | | |
|---|---|---|---|---|---|
| **Client:** | **Mandale** | | | | |
| **Site:** | **Mill Lane, Batley** | | **Notes:** | | |
| **Job No:** | **S240106** | | | | |
| **Pit No:** | **TP01** | | **Test No:** | **1** | |

## CALCULATION OF SOIL INFILTRATION RATE

| Time (min) | Depth (m) |
|---|---|
| 0 | 0.25 |
| 0.5 | 0.25 |
| 1 | 0.25 |
| 2 | 0.25 |
| 3 | 0.25 |
| 4 | 0.25 |
| 5 | 0.25 |
| 6 | 0.25 |
| 7 | 0.25 |
| 8 | 0.25 |
| 9 | 0.25 |
| 10 | 0.25 |
| 15 | 0.25 |
| 20 | 0.25 |
| 25 | 0.25 |
| 30 | 0.25 |
| 40 | 0.25 |
| 50 | 0.25 |
| 60 | 0.25 |
| 90 | 0.25 |
| 120 | 0.25 |
| 180 | 0.25 |

| | | | |
|---|---|---|---|
| **Pit Dimensions** | Length (m) = | 1.80 | |
| | Width (m) = | 0.50 | |
| | Depth (m) = | 0.80 | |
| | **Depth at start of test (m) =** | 0.250 | |
| | **Depth at end of test (m)=** | 0.250 | |
| | **75% level (m)=** | 0.250 | |
| | **50% Effective Depth** | 0.550 | |
| | **25% level (m)=** | 0.250 | |
| | **Base area of pit ($m^2$) =** | 0.900 | |
| | **$Vp_{75-25}$ ($m^3$) =** | 0.000 | |
| | **$a_{p50}$ ($m^2$) =** | 3.430 | |
| **From the graph:** | | | |
| **tp 75 (min) =** | 0 | | |
| **tp 25 (min) =** | 180 | | |
| **Soil infiltration rate, f, (m/s) =** | **0.00E+00** | **normal test** | |
| **Input by:** | **RF** | **Date:** | **15/01/2024** |
| **Checked by:** | **MA** | **Date:** | **15/01/2024** |

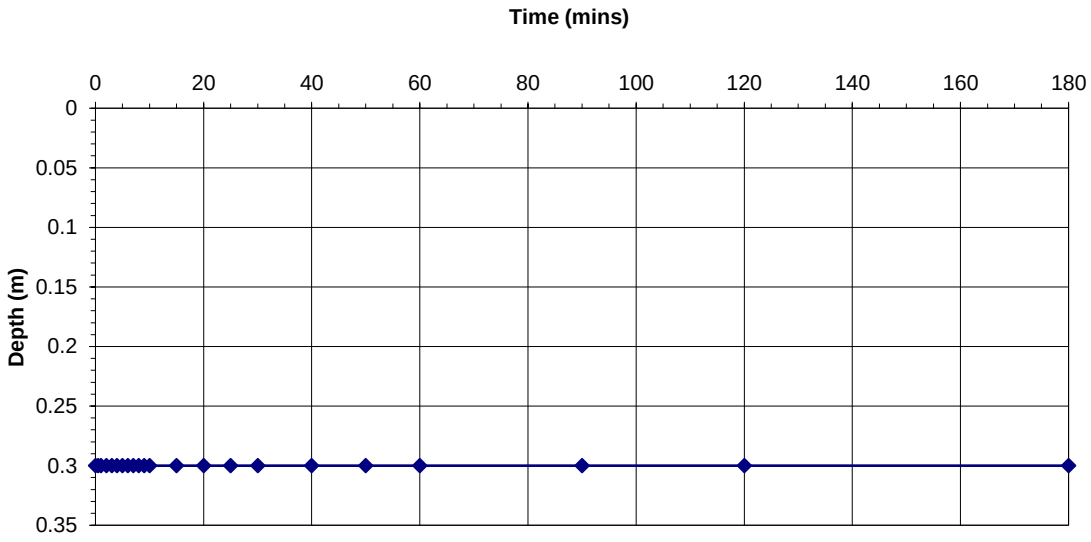


## SOAKAWAY DESIGN IN ACCORDANCE WITH BRE DIGEST 365: 1991
BRE Digest 365, Figure 2, Page 5

| | | | | | |
|---|---|---|---|---|---|
| **Client:** | **Mandale** | | | | |
| **Site:** | **Mill Lane, Batley** | | **Notes:** | | |
| **Job No:** | **S240106** | | | | |
| **Pit No:** | **TP02** | | **Test No:** | **1** | |

## CALCULATION OF SOIL INFILTRATION RATE

| Time (min) | Depth (m) | | | | |
|---|---|---|---|---|---|
| 0 | 0.3 | | **Pit Dimensions** | Length (m) = | 1.90 |
| 0.5 | 0.3 | | | Width (m) = | 0.50 |
| 1 | 0.3 | | | Depth (m) = | 0.90 |
| 2 | 0.3 | **Depth at start of test (m) =** | | | 0.300 |
| 3 | 0.3 | **Depth at end of test (m)=** | | | 0.300 |
| 4 | 0.3 | **75% level (m)=** | | | 0.300 |
| 5 | 0.3 | **50% Effective Depth** | | | 0.600 |
| 6 | 0.3 | **25% level (m)=** | | | 0.300 |
| 7 | 0.3 | | | | |
| 8 | 0.3 | **Base area of pit ($m^2$) =** | | | 0.950 |
| 9 | 0.3 | **$Vp_{75-25}$ ($m^3$) =** | | | 0.000 |
| 10 | 0.3 | **$a_{p50}$ ($m^2$) =** | | | 3.830 |
| 15 | 0.3 | | | | |
| 20 | 0.3 | | **From the graph:** | | |
| 25 | 0.3 | | **tp 75 (min) =** | | 0 |
| 30 | 0.3 | | **tp 25 (min) =** | | 180 |
| 40 | 0.3 | | | | |
| 50 | 0.3 | **Soil infiltration rate, f, (m/s) =** | | **0.00E+00** | **normal test** |
| 60 | 0.3 | | | | |
| 90 | 0.3 | | | | |
| 120 | 0.3 | **Input by:** | **RF** | **Date:** | **15/01/2024** |
| 180 | 0.3 | **Checked by:** | **MA** | **Date:** | **15/01/2024** |



## SOAKAWAY DESIGN IN ACCORDANCE WITH BRE DIGEST 365: 1991
BRE Digest 365, Figure 2, Page 5

| | | | | | |
|---|---|---|---|---|---|
| **Client:** | **Mandale** | | | | |
| **Site:** | **Mill Lane, Batley** | | **Notes:** | | |
| **Job No:** | **S240106** | | | | |
| **Pit No:** | **TP04** | | **Test No:** | **1** | |

## CALCULATION OF SOIL INFILTRATION RATE

| Time (min) | Depth (m) |
|---|---|
| 0 | 1.1 |
| 0.5 | 1.1 |
| 1 | 1.1 |
| 2 | 1.1 |
| 3 | 1.1 |
| 4 | 1.1 |
| 5 | 1.1 |
| 6 | 1.1 |
| 7 | 1.1 |
| 8 | 1.1 |
| 9 | 1.1 |
| 10 | 1.1 |
| 15 | 1.1 |
| 20 | 1.1 |
| 25 | 1.1 |
| 30 | 1.1 |
| 40 | 1.1 |
| 50 | 1.1 |
| 60 | 1.1 |
| 90 | 1.1 |
| 120 | 1.1 |
| 180 | 1.1 |

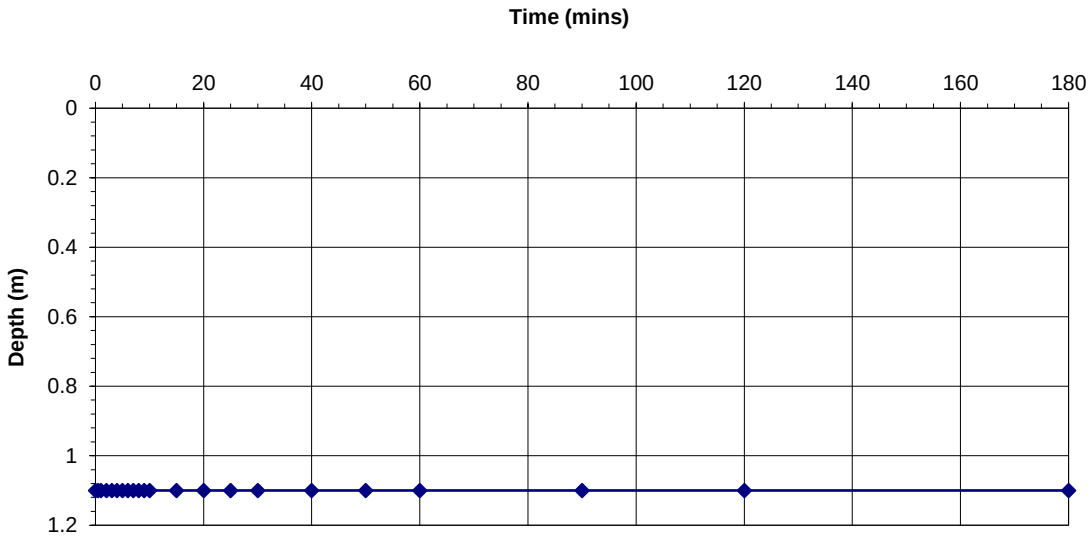
| | | |
|---|---|---|
| **Pit Dimensions** | Length (m) = | 1.80 |
| | Width (m) = | 0.50 |
| | Depth (m) = | 2.00 |

| | |
|---|---|
| **Depth at start of test (m) =** | 1.100 |
| **Depth at end of test (m)=** | 1.100 |
| **75% level (m)=** | 1.100 |
| **50% Effective Depth** | 0.900 |
| **25% level (m)=** | 1.100 |
| **Base area of pit ($m^2$) =** | 0.900 |
| **$Vp_{75-25}$ ($m^3$) =** | 0.000 |
| **$a_{p50}$ ($m^2$) =** | 5.040 |

| **From the graph:** | |
|---|---|
| **tp 75 (min) =** | 0 |
| **tp 25 (min) =** | 180 |

| | | |
|---|---|---|
| **Soil infiltration rate, f, (m/s) =** | **0.00E+00** | **normal test** |

| | | | |
|---|---|---|---|
| **Input by:** | **RF** | **Date:** | **15/01/2024** |
| **Checked by:** | **MA** | **Date:** | **15/01/2024** |



# Appendix E

**♣Solmek conditions of offer, notes on limitations & basis for contract (ref: version1/2024)**

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.

## 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.

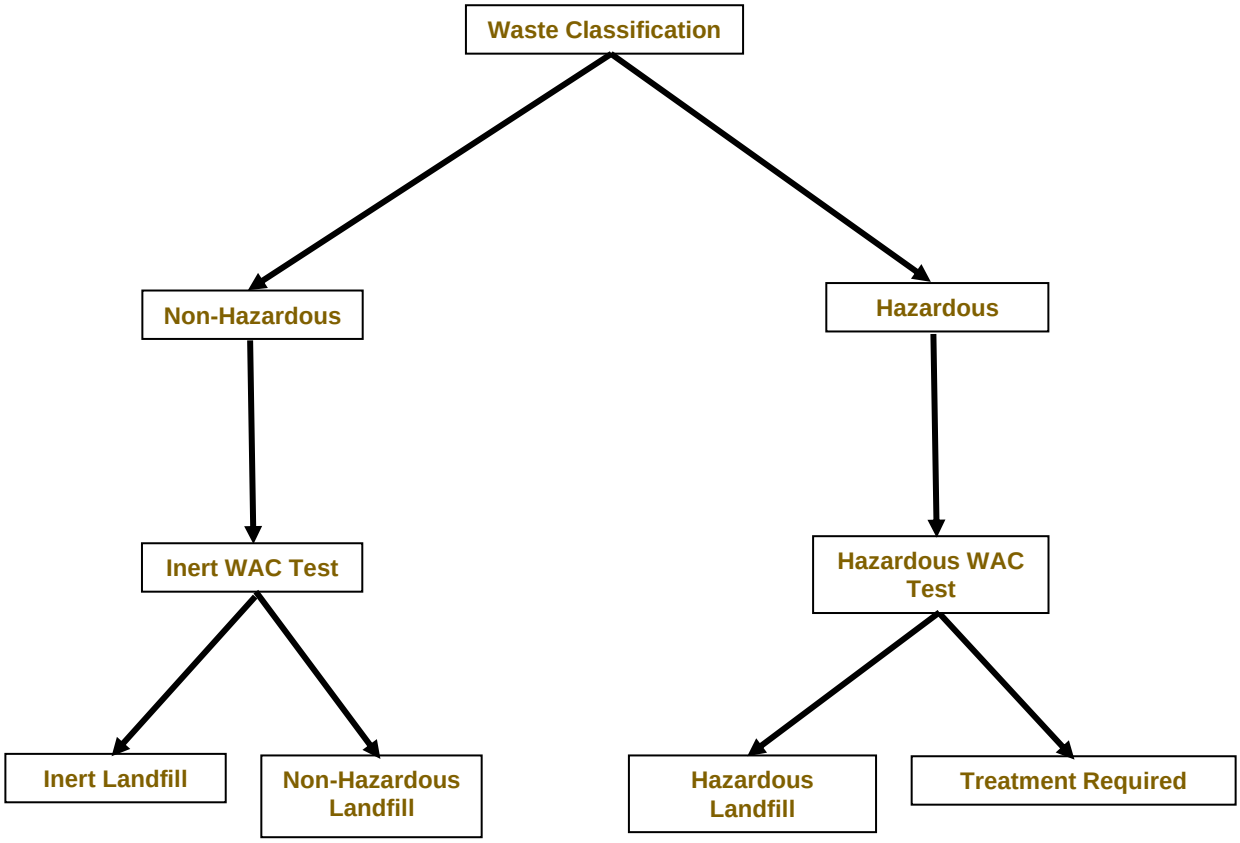
## WASTE CLASSIFICATION AND WASTE ACCEPTANCE CRITERIA

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.