

Phase 2: Site Investigation

Plane Street, Huddersfield

Accent Housing

S190939/SI

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PHASE 2 SITE INVESTIGATION REPORT

PLANE STREET, HUDDERSFIELD

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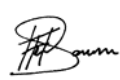


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Revision	Date	Prepared by	Signed
Final	April 2020	T Deo <i>Geotechnical Engineer</i>	
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1 EXECUTIVE SUMMARY

Site Address	<ul style="list-style-type: none"> Plane Street, Huddersfield, HD4 3DF.
Proposed Development	<ul style="list-style-type: none"> The proposed development is outlined to be residential comprising dwellings with associated parking, access roads and soft landscaping.
Fieldwork	<ul style="list-style-type: none"> 5no small percussive boreholes (BH1 to BH5) to a maximum depth of 3.20mbgl. 5no machine excavated trial pits (TP1 and TP5) were dug to a maximum depth of 3.00mbgl. 3no gas monitoring boreholes were installed in BH2, BH4 and BH3. In-situ testing undertaken as Standard Penetration Tests (SPTs) and hand shear vane tests.
Ground Conditions	<ul style="list-style-type: none"> Made ground was relatively uniform across the site was encountered between 0.20mbgl (TP2) and 0.70mbgl (BH3). Tarmac 0.10m thick was noted in BH1, BH2, BH5, TP1 and TP3. Sandstone road stone was noted in TP2, TP3 and BH3. Generally, a sandy fine to coarse gravel with medium cobble content. The gravel consisting of ash, flint, concrete and brick with cobbles of generally brick was noted to a maximum depth of 0.60mbgl (BH6). Natural ground generally comprised alternating bands of clay and silt underlain by a completely weathered mudstone. Rockhead, encountered as stiff to very stiff consistency very gravelly high to very high strength clay was noted was encountered in all boreholes and trial pits, except BH3 and TP5, at depths of between 0.30mgl and 3.00mbgl. Inferred perched groundwater was recorded within BH2 (0.40m), TP1 (0.40m) and TP2 (0.40m).
Contamination Testing Results	<ul style="list-style-type: none"> Four ground and one natural ground samples were selected for shallow contamination testing. One sample indicated raised levels of arsenic (TP2 0.40mbgl). In terms of TPHCWG, exceedances were noted within BH3 (C16-C21 & C21-C35). In terms of speciated PAH, elevated levels of speciated and total PAH were recorded within three of the four samples. No asbestos fibres. The pH levels are consistent with alkaline to strongly alkaline conditions.
Contamination Analysis	<ul style="list-style-type: none"> Given the site's proposed Residential land use the levels of contamination recorded on site are unlikely to pose a significant risk to the current and future users of the site. If any zones of odorous, brightly coloured or suspected contaminated ground or groundwater are encountered then work should cease in that area until the material has been investigated. The results of the investigation will therefore determine whether or not remediation will be required. Made ground classed as contaminated with respect to construction workers. PPE for workers. Damping down of site during dry windy conditions. Clean cover system required for all proposed areas of soft landscaping to 0.60mbgl, in line with YALPAG guidance. Controlled waters unlikely to be at risk. The elevated levels of TPH preclude the use of PE pipes and the pH levels >8 which precludes the use of copper pipes. Class DS-2 ACEC (Class AC-1s) requirements for concrete protection. This assumes static groundwater conditions.
Geotechnical Testing Results	<ul style="list-style-type: none"> Cohesive deposits returned results ranging from 45kPa to 75kPa indicated medium strength conditions based on laboratory testing. N values of between 16 and 50+. When using the rule of thumb that five times the N-Value roughly equates to the shear strength, this is equivalent to medium to very high strength. Cohesive materials on site have a high volume change potential. Moisture contents between 28% and 53%. pH ranged from 5.8 to 7.6 indicating acidic to alkaline conditions. Soluble sulphates were recorded at levels ranging from <10mg/l to 110mg/l.
Geotechnical Analysis & Foundation Recommendations	<ul style="list-style-type: none"> Based on a conservative shear strength of 45kN/m² a safe bearing capacity of 105kN/m² has been determined for strip foundations 0.60m wide founding on the natural cohesive deposits at minimum depths of 1.00mbgl. For foundations upon rockhead, a safe bearing capacity of 150kN/m² can be assumed on 0.60m wide strips at minimum depth of 0.60mbgl. Settlements within 25mm. Alternatively, consideration could be given to mini-piled foundations. Plant for excavations will need to be of sufficient size to adequately excavate through the mudstone to the appropriate formation levels.

2 INTRODUCTION

2.1 Authorisation

The site investigation described in this report was carried out by Solmek to the instructions of Watson Batty Architects on behalf of Accent Housing on a parcel of land at Plane Street, Huddersfield, HD4 3DF.

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

- Solmek Phase 1 Desk Study Report (S190939, November 2019)

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

2.2 Scope of Works

The proposed development is outlined to be residential comprising dwellings with associated parking, access roads and soft landscaping. A drawing showing the position of the site is included in Appendix A (Figure 1).

A geotechnical and environmental investigation including a ground gas risk assessment was requested. The fieldwork and testing were generally carried out according to the recommendations of BS5930: 2015 "Code of Practice for Site Investigations" and all stratum descriptions are as recommended in that publication. The information provided in this report is based on the investigation fieldwork and is subject to the comments and approval of the various regulatory authorities.

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

3 SITE DESCRIPTION AND FIELDWORK

A site inspection, as recommended in BS 5930 and BS 10175, was undertaken on 4th October 2019. The site is centred at OS Grid Ref 414580, 415390 and covers approximately 0.82Ha.

The site is irregularly shaped and is steeply sloping towards the north east. The site is currently disused and derelict and is covered in overgrown vegetation. Mature trees surround the site.

The site sits raised approximately 1.50m from Plane Street to the immediate north.

The site perimeter is secure and is surrounded by a stone retaining wall and metal fence which is a former school entrance to the north with multiple pedestrian access points via Plane Street.

The land use immediately to north, east and west is residential in nature. Immediately to the south of the site are vacant plots of land.

3.1 Fieldwork

The fieldwork was carried out on 13th March 2020. The extent of the investigation was:

- 5no small percussive boreholes (BH1 to BH5) to a maximum depth of 3.20mbgl.
- 5no machine excavated trial pits (TP1 and TP5) were dug to a maximum depth of 3.00mbgl.
- 3no of gas monitoring boreholes were installed in BH2, BH4 and BH3.
- In-situ testing in the exploratory positions as Standard Penetration Tests (SPTs) and hand shear vane tests.

Logging of the boreholes and trial pits was carried out by an experienced geotechnical engineer. Samples were taken for both geotechnical and contamination analysis. In-situ Standard Penetration Tests (SPT) were undertaken within the underlying deposits during the intrusive works.

The trial pits and boreholes were backfilled with clean arisings upon completion. Selected plates of the trial pits are presented in Appendix A.

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

4 GROUND CONDITIONS

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

4.1 Made Ground

Made ground was relatively uniform across the site was encountered between 0.20mbgl (TP2) and 0.70mbgl (BH3). Tarmac 0.10m thick was noted in BH1, BH2, BH5, TP1 and TP3. Sandstone road stone was noted in TP2, TP3 and BH3. Generally, a sandy fine to coarse gravel with medium cobble content. The gravel consisting of ash, flint, concrete and brick with cobbles of generally brick was noted to a maximum depth of 0.60mbgl (BH6).

4.2 Natural Deposits

Proven to underlie the made ground deposits across the site, natural ground generally comprised alternating bands of clay and silt underlain by a completely weathered mudstone. Generally, a firm consistency very slightly very clayey medium strength silt of high to very high plasticity was noted in BH1, BH4, BH5, TP1 and TP4 to a maximum depth between 1.10mbgl to 1.80mbgl. Within BH4 and TP5 a firm consistency silty sandy medium strength clay of very high plasticity was encountered to a maximum depth of 3.00mbgl.

Rockhead of weathered mudstone, recovered as stiff to very stiff consistency very gravelly high to very high strength clay, was noted was encountered in all boreholes and trial pits except BH3 and TP5 to a maximum depth of 3.20mbgl. The gravel fraction comprised mudstone. Rockhead was proven between 0.30mgl and 3.00mbgl.

4.3 Groundwater

Inferred perched groundwater was recorded within BH2 (0.40m), TP1 (0.40m) and TP2 (0.40m). It should be noted the rapid rate of advancement of the exploratory holes may mask minor seepages and it should be borne in mind that water levels fluctuate with a number of influences including season, rainfall, dewatering and pumping activities.

5 CONTAMINATION TESTING RESULTS

The proposed development of the site is to involve the construction of a residential home with areas of soft landscaping and an area of hardstanding. The chemical results are presented in Appendix C.

5.1 Site Characterisation

Within the Solmek Phase 1 Desk Study, a preliminary conceptual model was formed based on the information obtained. The initial risk was based on the site history which recorded to have a school located on-site until 2019.

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

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

5.2 Contamination Testing and Rationale

To provide information upon the possibility of ground contamination four ground and one natural ground samples were selected for shallow contamination testing. A Low to Moderate overall contamination risk was highlighted in the Phase 1 Desk Study due to previous land uses. This coupled with the end use being Residential with Home Grown Produce means that three samples are considered appropriate for testing:

- TP1 – 0.30mbgl (Made Ground – Gravel Fill)
- TP2 – 0.40mbgl (Natural Mudstone)
- BH3 – 0.60mbgl (Made Ground – Gravel Fill)
- TP4 – 0.20mbgl (Made Ground – Gravel Fill)
- TP5 – 0.20mbgl (Made Ground – Gravel Fill)

The samples selected are considered to provide coverage of the made ground and natural ground deposits encountered during the site investigation which are likely to be encountered during the future site development by construction workers. The samples were selected for the following tests:

- 5no Metals, semi-metals, non-metals, inorganic determinands
- 5no Asbestos identification screenings
- 5no Speciated Polyaromatic Hydrocarbons (PAHs)
- 1no Total Petroleum Hydrocarbon Criteria Working Group fractions (TPH CWG)
- 5no Organic Matter Content

5.3 Test Results

Based on the proposed development at the site, the test results have been compared to a series of LQM/CIEH Suitable 4 Use Levels (S4UL) based on a residential with home grown produce. The latest LQM/CIEH S4UL were published in December 2014. In the absence of LQM/CIEH S4UL, Category 4 Screening Levels (March 2014), EA CLEA Thresholds (from Version 1.06, May 2011) and EA Lower Tier Threshold values have been adopted. 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, 3 & 4.

TABLE 1: SUMMARY OF INORGANIC CONTAMINATION TESTING RESULTS

Determinant	Units	Number of Samples above Level of Detection	Minimum Level	Maximum Level	Residential with HGP Value	Number of Results Exceeding Threshold Value
Metals						
Cadmium	mg/kg	4	<0.1	0.59	11	0
Chromium	mg/kg	5	4.5	25	910	0
Copper	mg/kg	5	13	51	2400	0
Lead	mg/kg	5	19	61	200*	0
Mercury	mg/kg	2	<0.1	0.15	40	0
Nickel	mg/kg	5	6.1	23	180	0
Zinc	mg/kg	5	22	170	3700	0
Semi metals and non-metals						
Arsenic	mg/kg	5	12	52	37**	1
Boron	mg/kg	2	<0.4	1.3	290	0
Selenium	mg/kg	3	<0.2	1.5	250	0
Inorganic chemicals						
Cyanide (Total)	mg/kg	0	<1	-	1.49**	0
Sulphate (2:1 Water Soluble)	mg/l	1	<10	890	2000^	0
Other						
pH	pH	-	8.3	9.0	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

5.4 Metals, Semi Metals and Non Metals

One sample indicated raised levels of arsenic (TP2 0.40mbgl) above the S4UL threshold values.

5.5 Inorganic Chemicals

Soluble sulphates (potentially aggressive to foundation concrete) were recorded between <10 and 890mg/l. None of the samples were elevated above levels affecting human health however one sample of gravel fill from BH3 was raised above the BRE Special Digest 1 500mg/l limit for the sulphate classification of concrete.

The results of the pH testing were between 8.3 and 9.0. These pH levels are consistent with alkaline to strongly alkaline conditions.

5.6 Organic Chemicals

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

The average SOM recorded across the site was 8.16% therefore a SOM of 6.00% has been used to determine the S4UL thresholds. Table 2, below, summarises the results.

TABLE 2: SUMMARY OF ORGANIC CONTAMINATION TESTING RESULTS

Determinant	Units	Number of Samples above Level of Detection	Minimum Level	Maximum Level	Residential with HGP Value at 6% SOM	Number of Results Exceeding Threshold Value
TPH Aliphatic Fractions						
Aliphatic (C5-C6)	mg/kg	0	<1	-	42	0
Aliphatic (C6-C8)	mg/kg	0	<1	-	100	0
Aliphatic (C8-C10)	mg/kg	0	<1	-	27	0
Aliphatic (C10-C12)	mg/kg	0	<1	-	130	0
Aliphatic (C12-C16)	mg/kg	0	<1	-	110	0
Aliphatic (C16-C21)	mg/kg	1	3.9	3.9	65000	0
Aliphatic (C21-C35)	mg/kg	1	64	64	65000	0
Aliphatic (C35-C44)	mg/kg	1	41	41	65000	0
TPH Aromatic Fractions						
Aromatic (C5-C7)	mg/kg	0	<1	-	70	0
Aromatic (C7-C8)	mg/kg	0	<1	-	130	0
Aromatic (C8-C10)	mg/kg	0	<1	-	34	0
Aromatic (C10-C12)	mg/kg	1	6.9	6.9	74	0
Aromatic (C12-C16)	mg/kg	1	93	93	140	0
Aromatic (C16-C21)	mg/kg	1	580	580	260	1
Aromatic (C21-C35)	mg/kg	1	2400	2400	1100	1
Aromatic (C35-C44)	mg/kg	1	120	120	1100	0
Speciated PAH						
Naphthalene	mg/kg	4	<0.1	3.1	2.3	2
Acenaphthylene	mg/kg	4	<0.1	40	170	0
Acenaphthene	mg/kg	4	<0.1	2.8	210	0
Fluorene	mg/kg	4	<0.1	5.9	170	0
Phenanthrene	mg/kg	5	1.1	43	95	0
Anthracene	mg/kg	4	0.1	27	2400	0
Fluoranthene	mg/kg	5	1.7	500	280	1
Pyrene	mg/kg	5	1.8	590	620	0
Benzo[a]anthracene	mg/kg	5	0.72	260	7.2	3
Chrysene	mg/kg	5	0.77	250	15	2

Benzo[b]fluoranthene	mg/kg	3	<0.1	410	2.6	3
Benzo[k]fluoranthene	mg/kg	3	<0.1	200	77	1
Benzo[a]pyrene	mg/kg	3	<0.1	430	2.2	3
Benzo[g,h,i]perylene	mg/kg	3	<0.1	280	27	1
Dibenz(a,h)Anthracene	mg/kg	3	<0.1	37	0.24	3
Indeno(1,2,3-c,d)Pyrene	mg/kg	3	<0.1	280	320	0
Total PAH	mg/kg	5	6.2	3300	50*	3
Total Phenol	mg/kg	2	<0.3	0.37	280	0
* EA Threshold Values						

In terms of TPHCWG two levels of species was recorded above the threshold values within the sample BH3 0.60mbgl, aromatic (C16-C21) (580mg/kg) an aromatic (C21-C35) (2400mg/kg). In terms of speciated PAH, ten levels of species and total PAH were recorded above threshold values. Benzo[a]anthracene, Benzo[b]fluoranthene, Benzo[a]pyrene, Dibenz(a,h)Anthracene and Total PAH were recorded as elevated in TP2 0.40mbgl, BH3 0.60mbgl and TP4 0.20mbgl. Elevated levels of Naphthalene and Chrysene were recorded in TP2 0.40mbgl and BH3 0.60mbgl. Fluoranthene, Benzo[k]fluoranthene and Benzo[g,h,i]perylene were recorded as elevated in BH3 0.60mbgl.

5.7 Asbestos

From the five samples subject to asbestos screening, no asbestos was detected. For further details see the results of the screening within Appendix C.

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

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

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

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

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

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

See Appendix E for additional notes on contamination guidelines.

6 CONCEPTUAL MODEL AND CONTAMINATION ANALYSIS

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

TABLE 3: CONCEPTUAL MODEL

Source	Pathway	Receptor	Risk Rating	Comments	
Asphyxiating or explosive ground gases <ul style="list-style-type: none"> Made ground Landfills within 250m 	Ground gas migration <ul style="list-style-type: none"> Migration through permeable soils Inhalation 	Future site users <ul style="list-style-type: none"> Adult and infant residents 	Moderate /Low	Gas monitoring in progress, source risk rating subject to change.	
		Users during development <ul style="list-style-type: none"> Construction workers 	Low		
Areas of contamination hazardous to human health (Residential with HGP) <ul style="list-style-type: none"> No asbestos fibres. Raised levels of arsenic (TP2 0.40mbgl) Elevated TPHCWG (BH3 0.60mbgl) Elevated speciated and total PAH (TP2, BH3 & TP4) 	<ul style="list-style-type: none"> Inhalation 	Future site users <ul style="list-style-type: none"> Adult and infant residents 	Moderate /Low	Localised areas of contamination can be mitigated by encapsulation with building footprints, hardstanding or clean cover systems. Clean cover system essential in areas of soft landscaping.	
		Users during development <ul style="list-style-type: none"> Construction workers 	Moderate	Raised levels of arsenic, PAHs and TPH encountered. 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.	
	<ul style="list-style-type: none"> Inhalation Dust ingestion 	Users of surrounding sites <ul style="list-style-type: none"> Neighbouring residents 	Moderate	Potential moderate risk during demolition/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.	
	<ul style="list-style-type: none"> Leaching mobilised contaminants 	of	Solid geology <ul style="list-style-type: none"> Secondary Aquifer – A 	Moderate /Low	Low sensitivity aquifer located beneath low permeability thin clay deposits.
			Drift geology <ul style="list-style-type: none"> Limited drift deposits 	Very Low	The low permeability and the relatively low sensitivity of the aquifer, drift deposits variable across the site and relatively thin deposits.
	<ul style="list-style-type: none"> Drainage Lateral migration Accumulation of contaminated sediment 	of	Surface water features <ul style="list-style-type: none"> River southeast 228m 	Low	Limited contamination unlikely to migrate to the nearest surface water feature and unlikely to pose a risk.
<ul style="list-style-type: none"> Uptake via roots and leaf surfaces 		Vegetation <ul style="list-style-type: none"> Garden areas proposed 	Moderate /Low	Exceedances of phytotoxic thresholds. Clean cover system of imported topsoil and subsoil recommended.	
Areas of water soluble sulphates elevated above BRE Special Digest 1 threshold (>500mg/l) <ul style="list-style-type: none"> BH3 0.60mbgl 	<ul style="list-style-type: none"> Direct contact 	Construction Materials <ul style="list-style-type: none"> Concrete 	High	Mitigation through use of sulphate resistant concrete where in contact with made ground.	
Areas of contamination above service fabric thresholds: <ul style="list-style-type: none"> pH and locally TPH 	<ul style="list-style-type: none"> Direct contact 	Construction Materials <ul style="list-style-type: none"> Service Fabric 	High	Elevated levels of TPH preclude the use of PE pipes. Copper 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, vegetation, and construction materials 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 each receptor are discussed in the following sections.

6.1 Users of the Site Once Development is Complete

The users of the site, particularly construction workers, are likely to be exposed to contaminants present in the soils beneath the site during redevelopment work. **Potential** exposure pathways include dermal absorption after contact with contaminated ground, inhalation of soil or dust, inhalation of volatilised 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 end use (see Tables 1 and 2).

Exceedances were noted within three of the five samples tested, as summarised below:

- TP2 0.40mbgl recorded elevated arsenic, benzo(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene, chrysene, dibenzo(a,h)anthracene and total PAH
- TP4 0.20mbgl recorded elevated arsenic, benzo(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene, dibenzo(a,h)anthracene, naphthalene and total PAH
- BH3 0.60mbgl recorded elevated aromatic C16-C21, aromatic C21-35, benzo(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene, benzo(k)fluoranthene, benzo(g,h,i)perylene, chrysene, dibenzo(a,h)anthracene, fluoranthene, naphthalene and total PAH

The new development is expected to comprise new residential properties with associated gardens/access roads. Based on the shallow soil contamination testing, it is considered that the levels of contamination may pose a risk to future users of the site, as soft landscaping is proposed in the final development. This pollutant linkage however will be severed as long as all contaminated areas are covered either by buildings, hardstanding, or a clean cover system.

During the initial site strip if any zones of odorous, brightly coloured or suspected contaminated ground are encountered then work should cease in that area until the material has been tested. The results of the tests will determine whether or not remediation will be required.

The current legislation on waste involves the categorization of materials into inert waste, non-reactive hazardous wastes and hazardous wastes. The determination of the category depends on DEFRA landfill directive waste acceptance criteria (WAC) testing. Material taken off site may be subject to WAC by the appropriate waste disposal company.

6.2 Construction Workers and Users of Surrounding Sites

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

Raised levels of Arsenic, PAHs and TPH were detected. It is considered that levels of contamination may pose a risk to construction workers and users of surrounding sites. As such special precautions are considered necessary. Any ground workers at the site should be briefed on the potentially moderate levels of contaminants in the shallow soils.

As good practice, full PPE must be employed in accordance with HSE guidance 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.

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

During dry weather, any excavations may require clean water to be sprinkled at shallow depth to prevent excess dust escaping to offsite receptors. Monitoring of dust concentrations during construction should be given careful consideration to ensure occupational exposure levels are not exceeded.

6.3 Vegetation

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

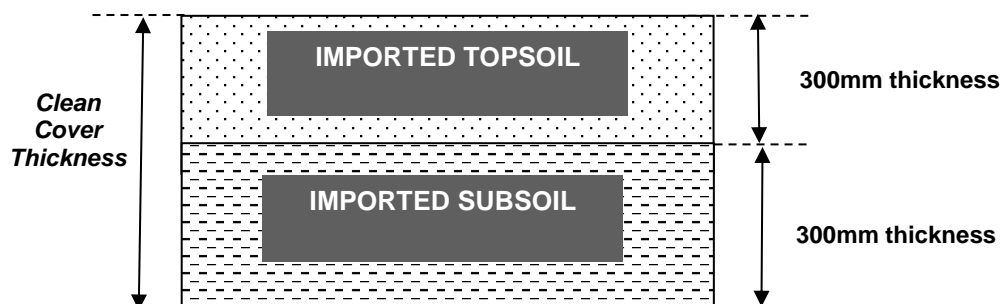
To establish if the levels of contaminants present on site may pose a risk to vegetation the results of the contamination testing have been compared to a series of threshold values published in "*Code of Good Agricultural Practice for the Protection of Soil*". Concentrations of the phytotoxic determinants arsenic are shown as elevated.

A clean cover is recommended to break pathways between the contamination source and future site users. During the initial site strip, proposed soft landscaped areas should be excavated to 0.60mbgl or natural ground (whichever is the shallowest). Any deleterious materials encountered (i.e. brick rubble, ash and concrete) should be placed beneath areas of permanent hardcover or removed from site.

The clean cover system should include clean imported topsoil to a depth of 300mm over clean imported subsoil to 300mm. No material from the site is considered suitable for re-use given its composition and contamination encountered. The thickness of capping was selected due to the proposed end use as residential gardens.

Any proposed gardens will require validation 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, YALPAG, Version 3.4 – November 2017).

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



6.4 Ground and Surface Water

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

From the site investigation undertaken, ground conditions broadly comprise made ground of gravel fill over mudstone. The drift deposits can be considered to have a low permeability, thin deposits of clay were noted in some of the trial pits and boreholes.

The published geology indicates the site is underlain by solid geology of the Pennine Lower Coal Measures

Formation (PLCM), which is designated as a Secondary Aquifer – A by the Environment Agency but does not lie in a Source Protection Zone.

The nearest surface water feature is River located 228m south-east of the site.

Groundwater was encountered during the intrusive investigation is sitting within the low permeability clay or just beneath the made ground. Due to the generally low contamination found across the site, the aquifer designations beneath the site, and the distance to surface waters, the development is considered to represent a low risk to groundwater or surface water receptors.

6.5 Construction Materials

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

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

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 Brownfields 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 concentrations of the selected determinants should be compared to the pipe material selection table in Appendix E and Consultation with the appropriate water supply company is required to identify the most suitable service fabric. However, the elevated levels of TPH preclude the use of PE pipes and the pH levels >8 which precludes the use of copper pipes.

7 GROUND GAS ASSESSMENT

The site is expected to be developed with residential dwellings with associated parking, access roads and soft landscaping.

Ground gases such as carbon dioxide (CO₂), methane (CH₄), carbon monoxide (CO) and volatile organic compounds (VOCs) can be classed as a form of contamination where there is a potential risk to human health.

For this report, gas monitoring is via measuring emissions from three standpipes (BH2, BH4 and BH5) 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 GEOTECHNICAL TESTING AND ANALYSIS

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

8.1 Strength and Density

Hand shear vanes undertaken within the trial pits cohesive deposits returned results ranging from 45kPa to

75kPa indicated medium strength conditions.

Standard Penetration Tests undertaken within the natural cohesive deposits yielded N values of between 16 and 50+. When using the rule of thumb that five times the N-Value roughly equates to the shear strength, this is equivalent to high to very high strength.

Standard Penetration Tests returned results 50+ (refusal) in all boreholes between the depths of 0.70mbgl and 3.20mbgl.

8.2 Moisture Contents

Six samples recovered from the boreholes and trial pits have been subject to moisture content tests to determine the moisture profile at depths of between 0.40 and 1.60mbgl. Moisture levels were between 28% and 53%.

8.3 Atterberg Limit Determinations

Six Atterberg Limit Determination tests were out carried 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 high to very high plasticity and silt of high to very high plasticity.

The Plasticity Indices ranged from 23 to 45 with moisture contents recorded above the corresponding plastic limits. The cohesive material can be assessed as having a **high** shrinkage potential in relation to NHBC Guidance Chapter 4.2.

8.4 Particle Size Distribution and Sedimentation Testing

One sample from the boreholes was subject to Particle Size Distribution (PSD) tests in accordance with BS1377 Part 2 to aid soil descriptions. The results have been used to prepare precise soil descriptions in accordance with BS5930:1999 Section 6 and are presented in Appendix C.

8.5 pH and Sulphate Results

Six samples of natural soil from the boreholes and trial pits 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 5.8 to 7.6 indicating acidic to alkaline conditions. Soluble sulphates were recorded at levels ranging from <10mg/l to 110mg/l.

8.6 Foundations

The site is underlain by mudstone with rockhead noted between 0.30mbgl and 3.00mbgl. Rockhead was not encountered within TP5 and BH3, which terminated at 3.00mbgl and 0.70mbgl respectively. As a result of this variation, Solmek have considered the utilisation of conventional foundations upon both cohesive deposits and rockhead, and also the use of mini-piles.

8.6.1 Conventional Foundations – Cohesive deposits

Based on plasticity index results, all cohesive soils at the site should be regarded as being of high volume change potential. Foundations should therefore be placed at a minimum depth of 1.00m below original or finished ground level, whichever is the lower.

Based on a conservative shear strength of 45kN/m² a safe bearing capacity of 105kN/m² has been determined for strip foundations 0.6m wide founding on the natural cohesive deposits at depths of around 1.00mbgl. Providing the safe bearing capacity is not exceed settlements have been calculated to be less than 25mm.

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

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.

8.6.2 Conventional Foundations upon Rockhead

Where shallow rockhead is present, it would be prudent to situate the foundations directly upon the mudstone bedrock. The foundations will be required to found at a minimum depth of 0.60mbgl to protect against damage from frost action.

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

The shallow weathered mudstone can be considered as weak. Table 2.4 in 'Foundation Design & Construction, 6th Edition, M.J. Tomlinson' outlines a bearing capacity of 150kN/m² for mudstone be assumed. Providing imposed loads do not exceed the bearing capacity then settlement have been calculated at less than 25mm. The developer should also ensure the footings are placed at sufficient depth through the weathered zone to more competent bedrock to achieve the desired 150kN/m² allowable bearing capacity.

8.6.3 Mini-Piled Foundations

Locally, where rockhead was not encountered at shallow depths, it may be prudent to consider the use of mini-piles. Information provided in this report should be made available to a competent piling contractor who can design appropriate foundations in accordance with Section 7: Pile foundations of BS EN 1997 – 1:2004 which applies to end-bearing piles, friction piles, tension piles and transversely loaded piles installed by driving, by jacking, and by screwing or boring. The piling contractor will need to take into consideration the possible effects of negative skin friction from made ground and alluvial silt deposits. Allowance should be made for breaking through known and unknown buried obstructions.

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

Solmek advise that further drilling may be required to adequately facilitate pile design.

8.6.4 Foundations – General Comments

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

Sub-surface concrete should be Design Sulphate Class DS-1, with the site allocated an ACEC Classification of AC-1s within natural deposits assuming static groundwater conditions.

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

8.7 Excavation

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

8.8 Groundwater

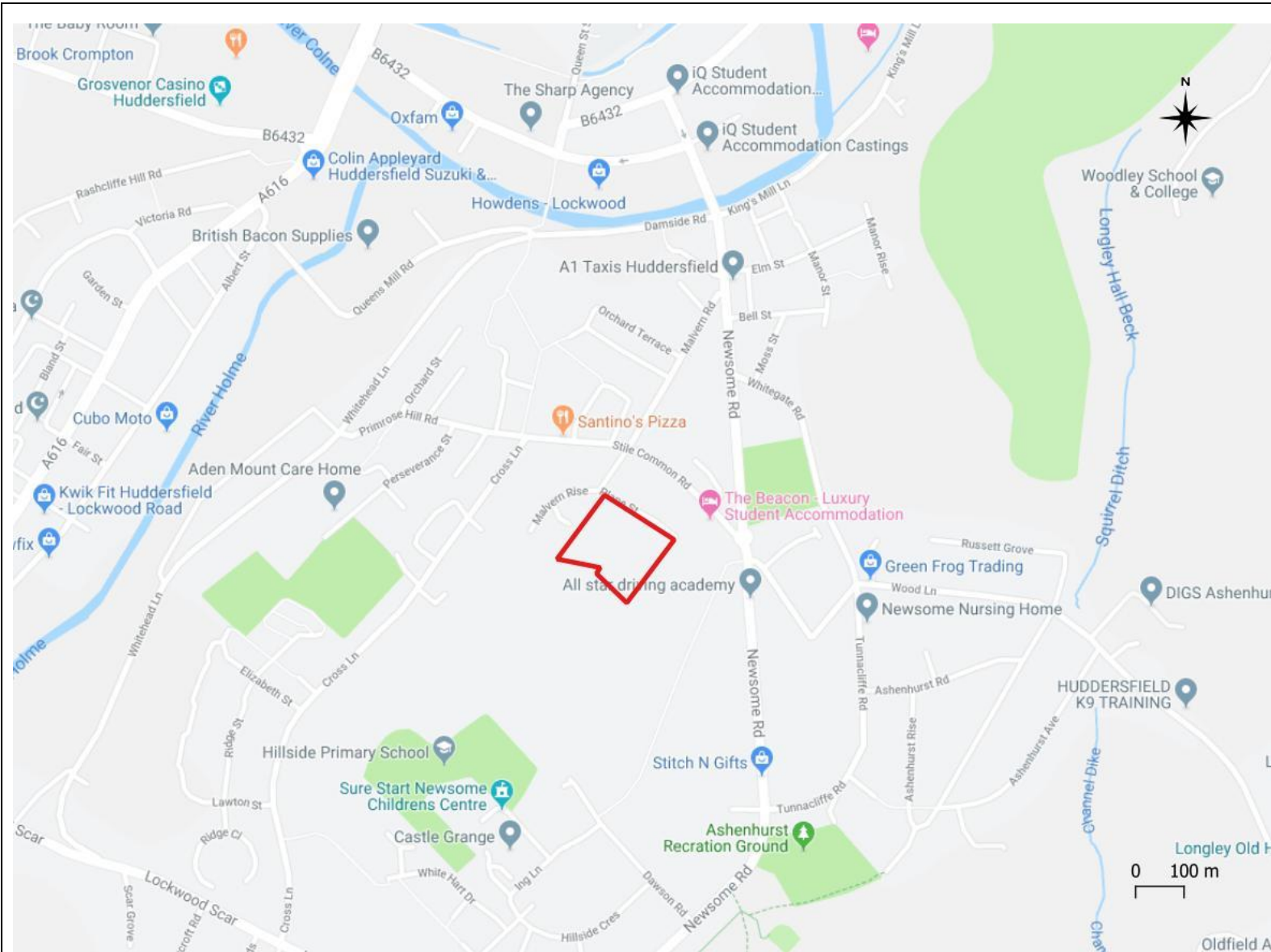
Inferred perched groundwater was recorded within BH2 (0.40m), TP1 (0.40m) and TP2 (0.40m).

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.

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**APPENDIX A:
Figures and Drawings**




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Title	Site Location Map
Project	Plane Street, Huddersfield
Client	Accent Housing
Date	April 2020
Fig No.	Figure 1
Scale	Scale on map
Key	 Site Boundary




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Title	Approximate Borehole and Trial Pit Location Plan
Project	Plane Street, Huddersfield
Client	Accent Housing
Date	April 2020
Fig No.	Figure 2
Scale	Scale on map
Key	<ul style="list-style-type: none">  Site Boundary  Trial Pit  Small Percussive Borehole (G) Gas monitoring pipe installed

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Photo 1: TP1 at a maximum depth of 3.00mbgl.



Photo 2: TP2 at a maximum depth of 3.00mbgl.


Title	Date	<p style="text-align: right;">Solmek Ltd. 12 Yarm Road Stockton-on-Tees TS18 3NA</p> <p style="text-align: right;">Tel: +44 (0) 1642 607083 Fax: +44 (0) 1642 612355 e-mail: south@solmek.com www.solmek.com</p> 
Trial Pit Photographs	March 2020	
Project	Photo No	
Plane Street, Huddersfield	1 & 2	
Client		
Unity Housing Association		



Photo 3: TP3 at a maximum depth of 3.00mbgl



Photo 4: TP4 at a maximum depth of 3.00mbgl.


Title	Date	<p>Solmek Ltd. 12 Yarm Road Stockton-on-Tees TS18 3NA</p> <p>Tel: +44 (0) 1642 607083 Fax: +44 (0) 1642 612355 e-mail: south@solmek.com www.solmek.com</p> 
Trial Pit Photographs	March 2020	
Project	Photo No	
Plane street, Huddersfield	3 & 4	
Client		
Unity Housing Association		



Photo 5: TP5 at a maximum depth of 3.00mbgl.

Title	Date
Trial Pit Photographs	March 2020
Project	Photo No
Plane street, Huddersfield	5
Client	
Unity Housing Association	

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**APPENDIX B:
Borehole Logs & Trial Pit Logs**

Borehole Log

BH2

Contract no: S190939	Site: Plane Street, Huddersfield	Driller: SR Drilling Ltd	GL (AOD):
Client: Accent Housing		Plant used: Mini Rig	Easting:
Method: Small Percussive		Started: 13/03/2020	Northing:
		Ended: 13/03/2020	Logged: TD
		Backfilled: 13/03/2020	Status: FINAL

Backfill / Installation	Legend	Depth (m)	Level (m AOD)	Stratum Description	Samples and Insitu Testing		
					Depth (m)	Type	Results
		0.10		MADE GROUND: Tarmac.			
		0.40	▼	MADE GROUND: Blackish brown sandy fine to coarse gravel with medium cobble content. Gravel is subangular to subrounded including ash, flint and brick. Cobbles subangular of brick.	0.20 - 0.40	D	
				Stiff becoming very stiff consistency greyish brown very gravelly high to very high strength CLAY. Gravel is angular to subangular fine to coarse consisting of mudstone. (Completely weathered MUDSTONE)	0.40 - 0.60	D	
					0.80 - 1.00	D	
					1.20 - 1.65	SPT (S)	N=16 (4,3/3,3,4,6)
					1.40 - 1.60	D	
					1.60 - 1.80	D	
		1.80		End of Borehole at 1.800m	1.80 - 2.38	SPT (S)	N=50+ (25/50)

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. Groundwater encountered at 0.40m.				0.40				

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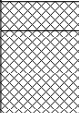




Trial Pit Log

TrialPit No
TP1
 Sheet 1 of 1

Project Name: Plane Street, Huddersfield Project No. S190939 Co-ords: E - N Date 12/03/2020
 Level:

Plant Used: JCB 3CX Dimensions (m): Scale 1:26

Client: Accent Housing Depth 3.00 Logged TD

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.10			MADE GROUND: Tarmac.
	0.30	ES		0.40			MADE GROUND: Blackish brown sandy fine to coarse gravel with medium cobble content. Gravel is subangular to subrounded including ash and brick. Cobbles subangular of brick and concrete.
	0.50 0.50	B HV	45kPa				Firm consistency sandy very clayey medium strength SILT of high plasticity. Sand is fine to medium.
				1.10			Stiff consistency greyish brown very gravelly CLAY. Gravel is angular to subangular fine to coarse consisting of mudstone. (Completely weathered MUDSTONE)
	2.00	B		3.00			End of Pit at 3.000m

Remarks: Groundwater encountered at 0.50m.

Stability:



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Trial Pit Log

TrialPit No
TP2
Sheet 1 of 1

Project Name: Plane Street, Huddersfield Project No. S190939 Co-ords: E - N Date 12/03/2020
Level:

Plant Used: JCB 3CX Dimensions (m): Scale 1:26

Client: Accent Housing Depth 3.00 Logged TD

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.20			MADE GROUND: Sandstone road stone.
	0.40	ES					Stiff consistency greyish brown very gravelly CLAY. Gravel is angular to subangular fine to coarse consisting of mudstone. (Completely weathered MUDSTONE)
	1.00	B					
				3.00			End of Pit at 3.000m

Remarks: Groundwater encountered at 0.40m.

Stability:



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Trial Pit Log

Trial Pit No
TP3
Sheet 1 of 1

Project Name: Plane Street, Huddersfield	Project No. S190939	Co-ords: E - N Level:	Date 12/03/2020
--	---------------------	--------------------------	--------------------

Plant Used: JCB 3CX	Dimensions (m): <input type="text"/>	Scale 1:26
---------------------	--------------------------------------	---------------

Client: Accent Housing	Depth 3.00	Logged TD
------------------------	---------------	--------------

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.10			MADE GROUND: Tarmac
	0.30	B		0.30			MADE GROUND: Sandstone road stone.
							Stiff consistency greyish brown very gravelly CLAY. Gravel is angular to subangular fine to coarse consisting of mudstone. (Completely weathered MUDSTONE)
	2.50	B		3.00			End of Pit at 3.000m

Remarks: No groundwater encountered.

Stability:



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Trial Pit Log

TrialPit No
TP4
Sheet 1 of 1

Project Name: Plane Street, Huddersfield Project No. S190939 Co-ords: E - N Date: 12/03/2020

Plant Used: JCB 3CX Dimensions (m): Scale: 1:26

Client: Accent Housing Depth: 3.00 Logged TD

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.05			MADE GROUND: Fine to medium sand (sub-base).
	0.20	ES		0.30			MADE GROUND: Blackish brown sandy fine to coarse gravel with medium cobble content. Gravel is subangular to subrounded including ash, dolomite and brick. Cobbles subangular of brick and concrete.
	0.50	HV	50kPa				Firm consistency grey sandy clayey medium strength SILT of high plasticity. Sand is fine to medium.
	1.00	B					
				1.80			Stiff consistency greyish brown very gravelly CLAY. Gravel is angular to subangular fine to coarse consisting of mudstone. (Completely weathered MUDSTONE)
	3.00	B		3.00			End of Pit at 3.000m

Remarks: No groundwater encountered.

Stability:



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Trial Pit Log

TrialPit No
TP5
Sheet 1 of 1

Project Name: Plane Street, Huddersfield	Project No. S190939	Co-ords: E - N Level:	Date 12/03/2020
--	---------------------	--------------------------	--------------------

Plant Used: JCB 3CX	Dimensions (m):	Scale 1:26
---------------------	-----------------	---------------

Client: Accent Housing	Depth 3.00	Logged TD
------------------------	---------------	--------------

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.20	ES		0.30			MADE GROUND: Slightly clayey sandy gravel with cobbles of brick.
	0.50	HV	49kPa				Firm consistency grey silty sandy medium strength CLAY of very high plasticity. Sand is fine to medium.
	1.00 1.00	B HV	75kPa				
				3.00			End of Pit at 3.000m

Remarks: No groundwater encountered.

Stability:

**APPENDIX C:
Contamination Laboratory Results**



Final Report

Report No.: 20-08680-1

Initial Date of Issue: 24-Mar-2020

Client: Solmek Ltd

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

Contact(s): Office
Thasonum Deo

Project: S190939 Plane Street, Huddersfield

Quotation No.: **Date Received:** 19-Mar-2020

Order No.: SOL3928 **Date Instructed:** 19-Mar-2020

No. of Samples: 5

Turnaround (Wkdays): 5 **Results Due:** 25-Mar-2020

Date Approved: 24-Mar-2020

Approved By:

Details: Glynn Harvey, Technical Manager

Results - Soil

Client: Solmek Ltd	Chemtest Job No.:					20-08680	20-08680	20-08680	20-08680	20-08680
Quotation No.:	Chemtest Sample ID.:					988137	988138	988139	988140	988141
	Sample Location:					TP1	TP2	BH3	TP4	TP5
	Sample Type:					SOIL	SOIL	SOIL	SOIL	SOIL
	Top Depth (m):					0.30	0.40	0.60	0.20	0.20
	Date Sampled:					16-Mar-2020	16-Mar-2020	16-Mar-2020	16-Mar-2020	16-Mar-2020
	Asbestos Lab:					COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY
Determinand	Accred.	SOP	Units	LOD						
ACM Type	U	2192		N/A	-	-	-	-	-	
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	
ACM Detection Stage	U	2192		N/A	-	-	-	-	-	
Moisture	N	2030	%	0.020	8.4	12	11	4.6	8.4	
Soil Colour	N	2040		N/A	Brown,	Brown,	Brown,	Brown,	Brown,	
Other Material	N	2040		N/A	Stones,	Stones,	Stones,	Stones,	Stones,	
Soil Texture	N	2040		N/A	Sand,	Sand,	Sand,	Sand,	Sand,	
pH	M	2010		4.0	8.5	8.5	8.3	9.0	8.3	
Boron (Hot Water Soluble)	U	2120	mg/kg	0.40	0.40	0.42	1.3	< 0.40	< 0.40	
Sulphate (2:1 Water Soluble) as SO4	M	2120	mg/l	10	< 10	< 10	890	< 10	< 10	
Cyanide (Total)	M	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	
Arsenic	M	2450	mg/kg	1.0	32	52	12	13	15	
Cadmium	M	2450	mg/kg	0.10	0.59	< 0.10	0.17	0.48	0.30	
Chromium	M	2450	mg/kg	1.0	16	25	22	4.5	15	
Copper	U	2450	mg/kg	0.50	51	42	20	13	29	
Mercury	M	2450	mg/kg	0.10	0.13	< 0.10	0.10	< 0.10	0.15	
Nickel	M	2450	mg/kg	0.50	19	14	19	6.1	23	
Lead	M	2450	mg/kg	0.50	61	20	47	19	31	
Selenium	M	2450	mg/kg	0.20	0.21	1.5	0.20	< 0.20	0.26	
Zinc	U	2450	mg/kg	0.50	84	22	170	40	54	
Organic Matter	M	2625	%	0.40	21	2.6	2.9	13	1.3	
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0			< 1.0			
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0			< 1.0			
Aliphatic TPH >C8-C10	M	2680	mg/kg	1.0			< 1.0			
Aliphatic TPH >C10-C12	M	2680	mg/kg	1.0			< 1.0			
Aliphatic TPH >C12-C16	M	2680	mg/kg	1.0			< 1.0			
Aliphatic TPH >C16-C21	M	2680	mg/kg	1.0			3.9			
Aliphatic TPH >C21-C35	M	2680	mg/kg	1.0			64			
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0			41			
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0			110			
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0			< 1.0			
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0			< 1.0			
Aromatic TPH >C8-C10	M	2680	mg/kg	1.0			< 1.0			
Aromatic TPH >C10-C12	M	2680	mg/kg	1.0			6.9			
Aromatic TPH >C12-C16	M	2680	mg/kg	1.0			93			
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0			580			
Aromatic TPH >C21-C35	M	2680	mg/kg	1.0			2400			
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0			120			

Results - Soil

Client: Solmek Ltd	Chemtest Job No.:		20-08680	20-08680	20-08680	20-08680	20-08680	
Quotation No.:	Chemtest Sample ID.:		988137	988138	988139	988140	988141	
	Sample Location:		TP1	TP2	BH3	TP4	TP5	
	Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	
	Top Depth (m):		0.30	0.40	0.60	0.20	0.20	
	Date Sampled:		16-Mar-2020	16-Mar-2020	16-Mar-2020	16-Mar-2020	16-Mar-2020	
	Asbestos Lab:		COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	
Determinand	Accred.	SOP	Units	LOD				
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0			3200	
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0			3300	
Naphthalene	M	2700	mg/kg	0.10	0.66	3.0	3.1	0.48
Acenaphthylene	M	2700	mg/kg	0.10	1.0	4.9	40	1.3
Acenaphthene	M	2700	mg/kg	0.10	1.1	2.8	2.2	0.25
Fluorene	M	2700	mg/kg	0.10	1.5	5.9	4.9	0.51
Phenanthrene	M	2700	mg/kg	0.10	8.9	39	43	6.7
Anthracene	M	2700	mg/kg	0.10	3.3	14	27	3.4
Fluoranthene	M	2700	mg/kg	0.10	12	63	500	18
Pyrene	M	2700	mg/kg	0.10	11	55	590	18
Benzo[a]anthracene	M	2700	mg/kg	0.10	4.8	31	260	9.7
Chrysene	M	2700	mg/kg	0.10	5.3	31	250	8.7
Benzo[b]fluoranthene	M	2700	mg/kg	0.10	< 0.10	35	410	13
Benzo[k]fluoranthene	M	2700	mg/kg	0.10	< 0.10	15	200	6.0
Benzo[a]pyrene	M	2700	mg/kg	0.10	< 0.10	26	430	12
Indeno(1,2,3-c,d)Pyrene	M	2700	mg/kg	0.10	< 0.10	16	280	6.4
Dibenz(a,h)Anthracene	M	2700	mg/kg	0.10	< 0.10	7.9	37	2.7
Benzo[g,h,i]perylene	M	2700	mg/kg	0.10	< 0.10	14	280	9.0
Total Of 16 PAH's	M	2700	mg/kg	2.0	50	360	3300	120
Total Phenols	M	2920	mg/kg	0.30	< 0.30	< 0.30	< 0.30	0.37

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Alkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2680	TPH A/A Split	Aliphatics: >C5–C6, >C6–C8,>C8–C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44	Dichloromethane extraction / GCxGC FID detection
2700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Dichloromethane extraction / GC-FID (GC-FID detection is non-selective and can be subject to interference from co-eluting compounds)
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.

Report Information

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- I/S Insufficient Sample
- U/S Unsuitable Sample
- N/E not evaluated
- < "less than"
- > "greater than"

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

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

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at the indicated laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

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

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:

customerservices@chemtest.com

**APPENDIX D:
Geotechnical Laboratory Results**

Laboratory Report Front Sheet

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



Site name	Job number
Plane Street, Huddersfield	S190939

Client details:

Reference: S190939
Name: Solmek
Address: 12 Yarm Road,
Stockton-on-tees,
TS18 3NA

Telephone: 01642 607083
Email: tdeo@solmek.com

FAO: T Deo

Date commenced: 17/03/2020


Date reported: 25/03/2020

Observations and interpretations are outside of the UKAS Accreditation

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

Solmek are not UKAS Accredited for the following tests; Density by Linear Measurement, Particle Density by Gas Jar, Point Load, Triaxial UU Multi Specimen, Triaxial UU Multistage and California Bearing Ratio.

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

Signature: 	Approved Signatories: <input checked="" type="checkbox"/> K Watkin (Lab Manager) <input type="checkbox"/> U Mazhar (Assistant Lab Manager) <input type="checkbox"/>
--	---

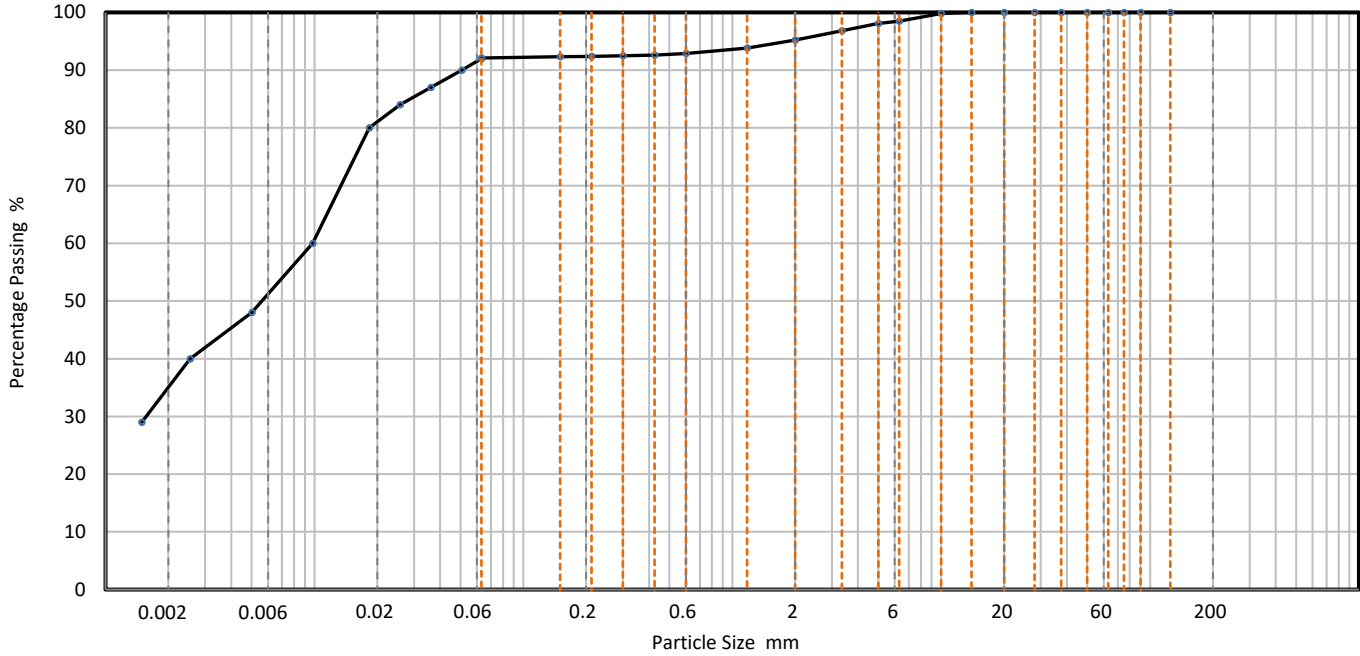
PARTICLE SIZE DISTRIBUTION

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



Site name	Job number
Plane Street, Huddersfield	S190939

Hole	BH1	Lab sample ID	SLMK2020031710	
Depth (Top)	m	0.40	Test Method	BS 1377 - 2 : 1990 Clauses 9.2 and 9.5
Depth (Base)	m	1	Soil Description	Brown, slightly sandy, slightly gravelly, Very Clayey SILT
Sample type	B			



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES	BOULDERS
	SILT			SAND			GRAVEL				

Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0630	92
90	100	0.0508	90
75	100	0.0361	87
63	100	0.0257	84
50	100	0.0183	80
37.5	100	0.0098	60
28	100	0.0050	48
20	100	0.0025	40
14	100	0.0015	29
10	100		
6.3	99		
5	98		
3.35	97		
2	95		
1.18	94		
0.6	93	Particle density (assumed)	
0.425	93	2.65	Mg/m ³
0.3	93		
0.212	92		
0.15	92		
0.063	92		

Dry Mass of sample, g

485

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	4.8
Sand	3.1
Silt	57.1
Clay	35.0

Grading Analysis		
D100	mm	
D60	mm	0.00993
D30	mm	0.00156
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

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

Accreditation status

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

Approved by	KW
Approval date	25/03/2020 14:07



Final Report

Report No.: 20-08693-1

Initial Date of Issue: 23-Mar-2020

Client: Solmek Ltd


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

Contact(s): Kathryn Watkin
Office
Thasonum Deo

Project: S190939 Plane Street, Huddersfield

Quotation No.:		Date Received:	19-Mar-2020
Order No.:	LAB337	Date Instructed:	19-Mar-2020
No. of Samples:	6		
Turnaround (Wkdays):	5	Results Due:	25-Mar-2020

Date Approved: 23-Mar-2020

Approved By:


Details: Glynn Harvey, Technical Manager

Results - Soil

Client: Solmek Ltd	Chemtest Job No.:		20-08693	20-08693	20-08693	20-08693	20-08693	20-08693	20-08693	
Quotation No.:	Chemtest Sample ID.:		988188	988189	988190	988191	988192	988193	988193	
	Sample Location:		BH1	TP1	TP2	BH4	BH5	BH2		
	Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL		
	Top Depth (m):		0.40	0.50	1.00	1.40	0.80	0.40		
	Bottom Depth (m):		1.00			1.60	1.00	0.60		
Determinand	Accred.	SOP	Units	LOD						
Moisture	N	2030	%	0.020	18	18	9.3	21	21	21
pH	U	2010		4.0	[A] 7.6	[A] 7.4	[A] 5.8	[A] 6.7	[A] 6.3	[A] 6.2
Sulphate (2:1 Water Soluble) as SO ₄	U	2120	mg/l	10	21	12	110	< 10	< 10	< 10

Deviations

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

Sample:	Sample Ref:	Sample ID:	Sample Location:	Sampled Date:	Deviation Code(s):	Containers Received:
988188			BH1		A	Plastic Tub 500g
988189			TP1		A	Plastic Tub 500g
988190			TP2		A	Plastic Tub 500g
988191			BH4		A	Plastic Tub 500g
988192			BH5		A	Plastic Tub 500g
988193			BH2		A	Plastic Tub 500g

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
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APPENDIX E:
Notes on Limitations & Contamination Guidance

UK BACKGROUND

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

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

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

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

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

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

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

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

PRELIMINARY CONCEPTUAL MODEL

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

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

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

PROBABILITY OF RISK BEING REALISED (C552 CIRIA, 2001)

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

RISK CLASSIFICATION MATRIX (C552 CIRIA, 2001)

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

HUMAN RECEPTORS

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

VEGETATION

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

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

GROUNDWATER AND SURFACE WATER RECEPTORS

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

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

Should a surface water receptor, such as a fresh water environment (river, canal, stream, lake etc), or marine environment be considered sensitive in relation to a site, then test results are compared with DEFRA & SEPA Environmental Quality Standards (2004). Many of the Environmental Quality Standards are hardness (CaCO₃) 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 CLR 11- Model Procedures, 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 ACCEPTANCE CRITERIA

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 WAC test categorises materials as either inert waste, non-reactive hazardous waste, and hazardous waste.

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.

CONSTRUCTION MATERIALS

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

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

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

REQUIREMENTS OF PARTIES WITHIN THE DEVELOPMENT PROCESS

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

RISKS & LIABILITIES FROM CONTAMINATION

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

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

♣Solmek conditions of offer, notes on limitations & basis for contract (ref: version1/2020)

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.