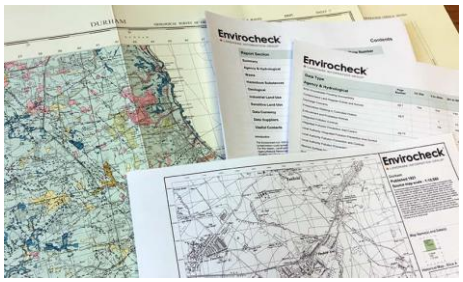
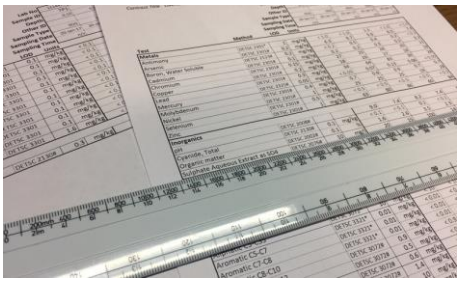
SOLMEK







Phase 2: Site Investigation

Rhostyllen, Wrexham

Thistlewood Properties

S200831/SI

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PHASE 2 SITE INVESTIGATION REPORT

RHOSTYLLEN, WREXHAM

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1 EXECUTIVE SUMMARY

Site Address	Rhostyllen, Wrexham
Proposed Development	The site is outlined for development of a convenience store along with hardstanding as car parking.
Fieldwork	• 5no small percussive boreholes (BH1 to BH5) drilled to a maximum of 5.45mbgl with 5no. monitoring pipes. • 2no machine excavated trial pits (TP1 & TP2) to a maximum depth of 1.80mbgl.
Ground Conditions	• Made ground was encountered to depths of between 0.30mbgl and 1.10mbgl. • Shallow deposits comprised loose sands within BH1, 2 and 5 or stiff consistency very sandy slightly gravelly high strength clay within BHs 3 and 4. • Medium dense sandy gravel was encountered within each borehole, proven to between 3.65 and 5.45mbgl. • No groundwater was encountered.
Contamination Testing Results	• Three made ground and five natural samples tested. • Elevated PAHs within two soil samples. • No exceedances for metals, TPHs or BTEX & MTBE within soils. • No asbestos fibres. • Three leachate samples analysed, with exceedances for PAHs (three samples) and TPH (one sample) • Slightly alkaline pH within both soils and leachates.
Contamination Analysis	• Given the site's proposed commercial land use, the levels of contamination recorded on site are unlikely to pose a risk to the current and future users of the site. • If any zones of odorous, brightly coloured or suspected contaminated ground or groundwater are encountered then work should cease in that area until the material has been investigated. The results of the investigation will therefore determine whether or not remediation will be required. • Made ground classed as uncontaminated locally slightly contaminated (PAHs) 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 peripheral landscaping, to 0.50m, utilising imported materials. • Controlled waters unlikely to be at risk. • With respect to utilities pH and locally TPH were elevated; as a minimum all services should be laid in clean trenches. • Sub surface concrete should be designed to DS-1 ACEC (Class AC-1). This assumes mobile groundwater conditions.
Geotechnical Testing Results	• Cohesive deposits high strength (110kPa-130kPa) based on in-situ hand vanes. • Cohesive materials on site have a medium volume change potential. • Moisture contents between 4.8 and 17%. • Sulphates between <10-15mg/l, pH slightly alkaline. • 2no. soakaway tests returned infiltration rates of 95.8 and 30.2 x 10^{-6} m/sec, respectively
Geotechnical Analysis & Foundation Recommendations	• Bearing capacity of 100kN/m^2 at minimum depth of 0.60mbgl on 0.60m wide strips. • Local deepening of foundations to 1.10mbgl due to depth of made ground. • Settlements within 25mm. • Consideration to be given to rafts or mini-piles if greater bearing capacities are required. • Normal earthworks plant for excavations.

2 INTRODUCTION

2.1 Authorisation

The site investigation described in this report was carried out by Solmek to the instructions of Waterman Group on behalf of Thistlewood Properties, on land located to the southeast of Wrexham Road, Rhostyllen, Wrexham (Figures 1 & 2).

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

- *Solmek Phase 1 Desk Study (S200831) September 2020.*

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

2.2 Scope of Works

The site is expected to be developed with a retail unit with associated parking and peripheral soft landscaping.

A geotechnical and environmental investigation including a ground gas risk assessment was requested. The fieldwork and testing was generally carried out according to the recommendations of BS5930: 2015 "Code of Practice for Ground Investigations" and where applicable BS EN 1997-2:2007 with soil descriptions to BS EN 14688-1:2013 where applicable. 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 27th August 2020. The site is centred at Ordnance Survey Co-ordinates 331750, 348740 and covers approximately 0.23Ha.

The area of investigation is located on a parcel of land located south of Wrexham Road. It is currently divided into two areas.

The north of the site consists of three structures associated with the former fuel station, the building to the north is the covered forecourt and is of steel portal frame construction, manholes from the buried fuel tank were noted in this area however the filling hoses had been removed. The building to the centre is the former shop and is of steel portal frame construction and has been converted into a car show room. The building to the south is used for storage and is steel portal frame construction which is clad in cement-based sheeting (Possible asbestos), the building is used for storing car parts and to the north of this is a hardstanding parking area, with a possible buried tank also noted within this area.

The south if the site consist of level tarmac storage area which is used to store scrap cars, also present in this area is a single storey garage.

Wrexham Road is present immediately north, with housing beyond this. Houses are present immediately east, with fields beyond this. Fields are present to the south and west of the site.

3.1 Fieldwork

The fieldwork was carried out on 27th August 2020. The extent of the investigation was:

- 5no small percussive boreholes (BH1 to BH5 inclusive) to a maximum depth of 5.45m below ground level (bgl).

    - The boreholes were evenly spread around the site to achieve maximum site coverage.
- Gas monitoring wells were installed in all five boreholes.
    - The wells were spaced at <25m centres evenly around the site in accordance with CIRIA C665.
- 2no machine excavated trial pits (TP1 and TP2) were dug to a maximum depth of 1.80mbgl.
    - In-situ soakaway testing carried out in both trial pits.
- Insitu testing in the exploratory positions as Standard Penetration Tests (SPTs) and hand shear vanes.
- Retrieval of samples for geotechnical and chemical testing.

The trial pits and boreholes were backfilled with clean arisings or installations upon completion.

Descriptions of the strata encountered in the boreholes and trial pits together with details of sampling and groundwater are presented in Appendix B of this report. A plan showing the location of the boreholes and trial pits can be found in Appendix A (Figure 3).

4 GROUND CONDITIONS

A summary of the ground conditions encountered is given below.

4.1 Made Ground

Made ground was relatively uniform across the site and was encountered to a minimum depth of 0.30mbgl (BH5) and a maximum depth of 1.10mbgl (TP1). The made ground broadly consisted of tarmac surfacing (except TP1) between 0.05m and 0.10m thick. This overlay sub-base comprising ash and brick granular fill. Within BH4 this had a hydrocarbon odour. In TP1 a 0.10m thick surface layer of limestone gravel overlay sandy, slightly clayey gravel fill comprising brick and sandstone to 1.10mbgl.

4.2 Obstructions

Within BH1 a sandstone boulder impeded progress at 4.10mbgl where drilling had to be terminated.

4.3 Natural Deposits

Underlying the made ground, the shallow natural deposits varied between the north and south of the site. Within BH's 1, 2 and 5, loose sand was proven to depths between 1.90mbgl (BH5) and 3.00mbgl (BH2). However in BH's 3 and 4, stiff consistency very sandy slightly gravelly high strength clay of intermediate plasticity was proven to depths of 2.90mbgl and 1.60mbgl respectively. In BH4 this was underlain with deposits of loose sand to 2.70mbgl.

Underlying the above strata, some uniformity was encountered with medium dense sandy gravel proven to the base of each borehole at depths between 3.65mbgl (BH5) and 5.45mbgl (BH4). In BH1 a boulder terminated progress in the gravel at 4.10mbgl.

Within the trial pits natural stratum comprised clayey, slightly gravelly sand to depths of 1.60mbgl and 1.80mbgl respectively.

4.4 Groundwater

No groundwater was encountered in either the boreholes or the trial pits during the 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.

5 CONTAMINATION TESTING RESULTS

The proposed development of the site is to involve the construction of a retail unit with associated parking and peripheral planting. The chemical samples were generally retrieved in line with BS ISO 18400-105:2017

"Soil Quality. Sampling". The chemical results are presented in Appendix C.

5.1 Site Characterisation

Within the 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 the site as being utilised as a garage and filling station.

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

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

5.2 Contamination Testing and Rationale

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

- TP2 – 0.30m (Made ground – clay fill)
- BH1 – 0.30m (Made ground – granular fill)
- BH2 – 0.50m (Natural clay)
- BH3 – 0.40m (Natural gravel)
- BH3 – 0.80m (Natural clay)
- BH4 – 0.30m (Made ground – granular fill, hydrocarbon odour noted)
- BH4 – 0.60m (Natural clay)
- BH5 – 1.00m (Natural sand)

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:

- 8no Metals, semi-metals, non-metals, inorganic determinants
- 8no Asbestos identification screenings
- 8no Speciated Polyaromatic Hydrocarbons (PAHs)
- 4no Total Petroleum Hydrocarbon Criteria Working Group fractions (TPHCWG)
- 4no Methyl Tert-Butyl Ether (MTBE)
- 4no Benzene, Toluene, Ethylbenzene & Xylenes (BTEX)
- 1no Waste Acceptance Criteria Testing (WAC)

In addition, three of the samples were sent for leachate analysis:

- BH1 – 0.30m (Made ground – granular fill)
- BH3 – 0.40m (Natural gravel)
- BH4 – 0.30m (Made ground – granular fill, hydrocarbon odour noted)

5.3 Test Results

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

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

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

TABLE 1: SUMMARY OF INORGANIC CONTAMINATION TESTING RESULTS

Determinand	Units	Number of Samples above Level of Detection	Minimum Recorded Level	Maximum Recorded Level	Commercial Threshold Value	Number of Results Exceeding Threshold Value
Metals						
Cadmium	mg/kg	6	<0.1	2.1	190	0
Chromium	mg/kg	8	5.2	24	8600	0
Copper	mg/kg	8	5.9	58	68000	0
Lead	mg/kg	8	19	210	2300*	0
Mercury	mg/kg	3	<0.1	0.12	1100	0
Nickel	mg/kg	8	4.3	34	980	0
Zinc	mg/kg	8	21	180	730000	0
Semi metals and non metals						
Arsenic	mg/kg	8	4.2	19	640**	0
Boron	mg/kg	0	<0.4	0.9	240000	0
Selenium	mg/kg	2	<0.2	0.36	12000	0
Inorganic chemicals						
Cyanide (Total)	mg/kg	0	<0.50	-	1580**	0
Sulphate (2:1 Water Soluble)	mg/l	0	<10	350	2000^	0
Other						
pH	pH	-	8.1	9.8	5.5^	0

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

5.4 Metals, Semi Metals and Non Metals

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

5.5 Inorganic Chemicals

Soluble sulphates (potentially aggressive to foundation concrete) were recorded between <10 and 350mg/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 8.1 and 9.8, which is consistent with slightly alkaline conditions.

5.6 Organic Chemicals

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

The average SOM recorded across the site was 2.89% therefore a SOM of 2.5% has been used to determine the S4UL thresholds. Table 2, below, summarises the results.

TABLE 2: SUMMARY OF ORGANIC CONTAMINATION TESTING RESULTS

Determinand	Units	Number of Samples above Level of Detection	Minimum Recorded Level	Maximum Recorded Level	Commercial Threshold Value at 2.5% SOM	Number of Results Exceeding Threshold Value
TPH Aliphatic Fractions						
Aliphatic (C5-C6)	mg/kg	0	<1	-	5900	0
Aliphatic (C6-C8)	mg/kg	0	<1	-	17000	0
Aliphatic (C8-C10)	mg/kg	0	<1	-	4800	0
Aliphatic (C10-C12)	mg/kg	0	<1	-	23000	0
Aliphatic (C12-C16)	mg/kg	0	<1	-	82000	0
Aliphatic (C16-C21)	mg/kg	0	<1	-	1700000	0
Aliphatic (C21-C35)	mg/kg	1	<1	260	1700000	0
Aliphatic (C35-C44)	mg/kg	0	<1	-	1700000	0
TPH Aromatic Fractions						
Aromatic (C5-C7)	mg/kg	0	<1	-	46000	0
Aromatic (C7-C8)	mg/kg	0	<1	-	110000	0
Aromatic (C8-C10)	mg/kg	0	<1	-	8100	0
Aromatic (C10-C12)	mg/kg	0	<1	-	28000	0
Aromatic (C12-C16)	mg/kg	1	<1	25	37000	0
Aromatic (C16-C21)	mg/kg	1	<1	34	28000	0
Aromatic (C21-C35)	mg/kg	1	<1	780	28000	0
Aromatic (C35-C44)	mg/kg	0	<1	-	28000	0
Speciated PAH						
Naphthalene	mg/kg	2	<0.1	11	460	0
Acenaphthylene	mg/kg	2	<0.1	4.7	97000	0
Acenaphthene	mg/kg	2	<0.1	47	97000	0
Fluorene	mg/kg	2	<0.1	37	68000	0
Phenanthrene	mg/kg	2	<0.1	240	22000	0
Anthracene	mg/kg	2	<0.1	54	540000	0
Fluoranthene	mg/kg	3	<0.1	230	23000	0
Pyrene	mg/kg	3	<0.1	210	54000	0
Benzo[a]anthracene	mg/kg	2	<0.1	45	170	0
Chrysene	mg/kg	2	<0.1	47	350	0
Benzo[b]fluoranthene	mg/kg	2	<0.1	52	44	1
Benzo[k]fluoranthene	mg/kg	2	<0.1	21	1200	0
Benzo[a]pyrene	mg/kg	2	<0.1	42	35	1
Benzo[g,h,i]perylene	mg/kg	2	<0.1	25	4000	0
Dibenz(a,h)Anthracene	mg/kg	2	<0.1	7.5	3.6	2
Indeno(1,2,3-c,d)Pyrene	mg/kg	2	<0.1	25	510	0
Total PAH	mg/kg	3	<2	1100	1000*	1
Total Phenol	mg/kg	1	<0.3	2.4	1500	0
Benzene	mg/kg	2	< 0.001	13	47	0
Toluene	mg/kg	0	< 0.001	-	110000	0
Ethylbenzene	mg/kg	1	< 0.001	4.1	13000	0
o-xylene	mg/kg	1	< 0.001	2.5	15000	0
m&p-xylene	mg/kg	1	< 0.001	5.3	14000	0
* EA Threshold Values						

Exceedances were noted within two of the samples, as summarised below:

- BH1 (0.30m) recorded elevated dibenzo(a,h)anthracene
- BH4 (0.30m) recorded elevated benzo(b)fluoranthene, benzo(a)pyrene, dibenzo(a,h)anthracene and total PAH

Both of these samples were retrieved from a stratum comprising ash fill, likely to be the source of the PAHs. This is further corroborated by double plot ratio analysis of the PAHs (Figure 4) which indicates the samples to generally have a coal/tar creosote and coal signature, within the combustion/coal derived segments of the plot.

5.7 Asbestos

From the eight samples subject to asbestos screening, no asbestos fibres were recorded.

5.8 Waste Acceptance Criteria (WAC) Testing

One sample from BH4 (0.30m) was sent for WAC testing. The sample exceeded the Inert Waste thresholds for Total Organic Carbon, TPH and PAHs.

In addition, from the wider contamination testing undertaken, Solmek advise that the PAH level (170mg/kg) within BH1 (0.30m) would also exceed the Inert Waste thresholds.

It would be up to the discretion of the relevant Waste Disposal Company whether further testing would be necessary to determine whether the waste could be classified as hazardous, and whether or not to accept waste is at the discretion of the Waste Disposal Company.

5.9 BTEX and MTBE

Four samples were tested for BTEX and MTBE. MTBE was below detection limits within all four samples. With respect to BTEX, the results are shown in Table 2, with no exceedances recorded.

5.10 Leachates

Three samples were sent for leachate analysis. The results have been compared, where available, to UK Drinking Water Standards (DWS), otherwise EA Leachate Quality Thresholds and WHO Guidelines (2005) have been used. Results are summarised within Table 3 below.

TABLE 3: SUMMARY OF LEACHATE CONTAMINATION TESTING RESULTS

Determinand	Units	Number of Samples above Level of Detection	Minimum Recorded Level	Maximum Recorded Level	UK Drinking Water Standards	Number of Results Exceeding Threshold Value
Inorganic Contaminants						
Boron	µg/l	3	20	35	2000	0
Cadmium	µg/l	0	<0.08	0.08	5	0
Chromium	µg/l	2	<1	4.3	50	0
Copper	µg/l	1	<1	2.1	2000	0
Lead	µg/l	0	<1	-	25	0
Mercury	µg/l	0	<0.5	0.5	1	0
Nickel	µg/l	0	<1	-	20	0
Zinc	µg/l	2	<1	1.2	5000	0
Arsenic	µg/l	2	<1	2.9	10	0
Selenium	µg/l	1	<1	1.6	10	0
Cyanide	µg/l	0	<0.05	-	50	0
pH	pH	-	8.4	8.8	>5.5	0
W.S. Sulphate	mg/l	3	1	37	250	0
PAH						
Acenaphthene	µg/l	1	<0.1	42	0.1	1
Acenaphthylene	µg/l	1	<0.1	12	0.1	1
Anthracene	µg/l	2	<0.1	7.3	0.1	2
Benzo[a]anthracene	µg/l	1	<0.1	3.4	0.1	1
Benzo[a]pyrene	µg/l	1	<0.1	2.6	0.1	1
Benzo[b]fluoranthene	µg/l	1	<0.1	3.8	0.1	1
Benzo[k]fluoranthene	µg/l	1	<0.1	1.1	0.1	1
Benzo[g,h,i]perylene	µg/l	1	<0.1	1.7	0.1	1
Chrysene	µg/l	1	<0.1	2.9	0.1	1
Dibenz(a,h)Anthracene	µg/l	1	<0.1	0.22	0.1	1
Fluoranthene	µg/l	3	0.1	14	0.1	3
Fluorene	µg/l	1	<0.1	17	0.1	1
Indeno(1,2,3-c,d)Pyrene	µg/l	1	<0.1	1.9	0.1	1
Naphthalene	µg/l	1	<0.1	2.1	0.1	1
Phenanthrene	µg/l	2	<0.1	29	0.1	2
Pyrene	µg/l	3	0.1	10	0.1	3
Total PAH	µg/l	1	<2	150	0.2**	1
Total Phenol	µg/l	0	<0.03	0.03	0.5*	0
TPH Aliphatic Fractions						
Aliphatic (C5-C6)	µg/l	0	<0.1	-	15000*	0
Aliphatic (C6-C8)	µg/l	0	<0.1	-	15000*	0
Aliphatic (C8-C10)	µg/l	1	<0.1	51	300*	0
Aliphatic (C10-C12)	µg/l	1	<0.1	26	300*	0
Aliphatic (C12-C16)	µg/l	1	<0.1	22	300*	0
Aliphatic (C16-C35)	µg/l	1	<0.1	25	300*	0
Aliphatic (C16-C35)	µg/l	1	<0.1	200	300*	0
Aliphatic (C35-C44)	µg/l	1	<0.1	24	300*	0
TPH Aromatic Fractions						
Aromatic (C5-C7)	µg/l	0	<0.1	-	10*	0
Aromatic (C7-C8)	µg/l	0	<0.1	-	10*	0
Aromatic (C8-C10)	µg/l	1	<0.1	28	100*	0
Aromatic (C10-C12)	µg/l	1	<0.1	68	100*	0
Aromatic (C12-C16)	µg/l	1	<0.1	220	100*	1
Aromatic (C16-C21)	µg/l	1	<0.1	200	90*	1
Aromatic (C21-C35)	µg/l	1	<0.1	700	90*	1
Aromatic (C35-C44)	µg/l	1	<0.1	35	90*	0
* WHO Guidelines 2005 ** EA leachate quality thresholds *** EQS Freshwater						

All three samples recorded exceedances for at least one determinant, as summarised below:

- BH1 (0.30m) recorded elevated anthracene, fluoranthene, phenanthrene and pyrene
- BH3 (0.40m) recorded elevated fluoranthene and pyrene
- BH4 (0.30m) recorded elevated acenaphthene, acenaphthylene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(g,h,i)perylene, chrysene, dibenzo(a,h)anthracene, fluoranthene, fluorene, indeno(1,2,3-c,d)pyrene, naphthalene, phenanthrene, pyrene, total PAH and aromatic C12-C16, C16-C21 and C21-C35

5.11 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 4 identifies the potential pollution linkages present on site based on source – pathway – receptor relationships.

TABLE 4: CONCEPTUAL MODEL

Source	Pathway	Receptor	Risk Rating	Comments
Asphyxiating or explosive ground gases • Made ground • Deep coal mining • Historic fuel tanks	**Ground gas migration** • Migration through permeable soils • Inhalation	**Future site users** • Transient adult workers	Moderate /Low	Gas monitoring in progress, source risk rating subject to change.
		Users during development • Construction workers	Low	
Areas of contamination hazardous to human health (Commercial Thresholds) • No elevated inorganic determinants • No asbestos fibres • Elevated PAHs within BH1 and BH4	• Inhalation • Dust ingestion • Dermal contact	**Future site users** • Transient adult workers	Low	Mitigated by proposed structure hard standing.
		Users during development • Construction workers	Moderate	Mitigation measures required during construction. Consideration to be given to Health and Safety Executive: *Protection of Workers and the General Public During the Development of Contaminated Land.*
	• Inhalation • Dust ingestion	**Users of surrounding sites** • Transient adult workers	Moderate	Potential moderate risk during remediation/construction from dust generation. Consideration to be given to dust suppression, in line with BRE: *The Control of Dust and Emissions from Construction and Demolition, Best Practice Guidance.*
Areas of elevated Leachate contamination • Elevated PAHs within all three samples • Elevated TPH within BH4 only	• Leaching of mobilised contaminants	**Solid geology** • Secondary Aquifer – A	Moderate /Low	Localised, shallow, contamination overlying a medium sensitivity aquifer, however lower sensitivity drift deposits are present overlying the solid geology aquifer at depth.
		Drift geology • Secondary Aquifer – Undifferentiated	Low	The low sensitivity and variable permeability aquifer is not considered to be a sensitive receptor.
	• Drainage • Lateral migration • Accumulation of contaminated sediment	**Surface water features** • River 295m south	Low	Distant surface water is highly unlikely to be impacted by the localised contamination encountered.
Areas of phytotoxic contamination	• Uptake via roots and leaf surfaces	**Vegetation** • None on site or proposed	Low	Low potential for vegetation impact as only limited peripheral planting is proposed – use of imported materials required.
Areas of contamination above service fabric or BRE Special Digest 1 thresholds	• Direct contact	**Construction Materials** • Concrete	Low	Made ground and natural ground not aggressive to concrete.
		Construction Materials • Service Fabric	Moderate	Polyethylene and copper piping to be avoided and prudent to lay any service within a clean bedding.

In general terms, future users, 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, controlled waters and vegetation are considered to be at **potentially less** of a risk.

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

6.1 Users of the Site Once Development is Complete

The users of the site, particularly construction workers, are likely to be exposed to contaminants present in the soils beneath the site during redevelopment work. **Potential** exposure pathways include dermal absorption after contact with contaminated ground, inhalation of soil or dust, inhalation of volatised compounds, and inadvertent soil ingestion. 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/CIEH S4UL based on residential with home grown produce.

The levels of contaminants across the site are generally low, based on the samples tested to date, with exceedances noted within two of the eight samples, as summarised below:

- BH1 (0.30m) recorded elevated dibenzo(a,h)anthracene
- BH4 (0.30m) recorded elevated benzo(b)fluoranthene, benzo(a)pyrene, dibenzo(a,h)anthracene and total PAH

The new development is expected to comprise a new convenience store, with associated parking and access roads. Based on the **shallow** soil contamination testing, it is considered that the levels of contamination are unlikely to pose a risk to future users of the site, as the pollutant linkage will be severed, as long as all contaminated areas are covered either by buildings, hardstanding or a clean cover system. However, there is still the potential for currently undiscovered contamination (possibly hydrocarbons) to be present.

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 volatised compounds, inadvertent soil ingestion and contact with contaminated groundwater.

Locally elevated levels of PAHs were detected within BH1 (0.30m) and BH4 (0.30m). It is considered that such levels of contamination may pose 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.

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

During dry weather, any excavations may require clean water to be sprinkled at shallow depth to prevent

excess dust escaping to off-site receptors. Monitoring of dust concentrations during construction should be given careful consideration to ensure occupational exposure levels are not exceeded. Works should be undertaken in line with BRE: *The Control of Dust and Emissions from Construction and Demolition, Best Practice Guidance*.

6.3 Vegetation

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

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

Small areas of peripheral soft landscaping are proposed. During the initial site strip, proposed soft landscaped areas should be excavated to 0.50mbgl 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.

The cover system should include imported topsoil, to a depth of 200mm over either natural ground or clean imported subsoil at least 300mm in thickness. The topsoil and subsoil should be screened of any deleterious materials (i.e. ash, slag, brick rubble and concrete).

6.4 Ground and Surface Water

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

From the site investigation undertaken, ground conditions broadly comprise thin made ground (<1.10m) over variable drift deposits, of granular deposits in the north of the site, or cohesive deposits in the south of the site, both overlying sandy gravel at depth. The granular deposits can be considered to have a moderate to high permeability, with the localised cohesive deposits having a low permeability. The drift deposits are designated as a Secondary Aquifer – Undifferentiated by the Environment Agency.

The published geology indicates the site is underlain by solid geology of Etruria Formation of Mudstone, which is designated as a Secondary Aquifer – A by the Environment Agency, as well as being a Source Protection Zone. Rockhead was not proven in the intrusive investigation, however drift deposits have been proven to 5.45mbgl. BGS logs in the wider area show depth to the mudstone rockhead as ranging between 18 and 37mbgl.

The nearest surface water feature is Glanyrafon Brook, located 295m south of the site, which drains into the River Clywedog ca. 1km east of the site. No groundwater was encountered during the intrusive works, however the groundwater flow onsite is likely to be south eastwards, towards the Glanyrafon Brook.

With respect to contamination, two of the eight soil samples and all three of the leachate samples recorded contamination, generally comprising PAHs, although one of the three leachate samples also recorded elevated Aromatic C12-C16, C16-C21 and C21-C35.

Regarding the PAHs, double plot ratio indicates the PAHs are not of petroleum origin, and it is inferred they are a result of the use of ash as a shallow sub-base material on the site. Three samples of natural material underlying this stratum (BH2 – 0.50m, BH4 – 0.60m and BH5 – 1.00m) have been tested, with elevated PAHs not present within any of these samples, indicating little downward migration of contamination has occurred. This is likely a result of the limited mobility of PAHs in groundwater, due to their low solubility and high preference for sorption to organic carbon.

With respect to the localised TPH contamination, none of the eight soil samples and just one of the three leachate samples recorded elevated TPHs, indicating a localised point source. No hydrocarbon odours were

encountered in the underlying stratum, and the soil samples analysed both within and immediately below this stratum did not record elevated TPHs, indicating limited migration of TPHs has occurred. This can be expected, given the low concentrations of more mobile fractions (<C16) of TPH within the shallow soils and the presence of a substantial thickness of clay (1.20m) underlying the made ground, serving as a containment layer.

For both the PAHs and TPHs, given the distance to controlled waters (Secondary Aquifer – A >18mbgl, nearest watercourses >295m), it is highly likely that the leachates will attenuate naturally before they migrate to controlled waters, and therefore it is unlikely that a complete contaminant linkage will exist between the shallow contamination on-site and the controlled water receptors in the area.

Given the localised nature of the contamination, the aquifer designations beneath the site, and the distance to surface waters, the development is considered to represent a low risk to groundwater or surface water receptors.

6.5 Construction Materials

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

6.5.1 Concrete Classification

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

6.5.2 Water Supply Pipes Material Selection

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

Level of acidic to alkaline pH (8.1 to 9.8) were recorded across the site at depths of between 0.30mbgl and 2.00mbgl within the made ground and natural samples.

The concentrations of the selected determinants should be compared to the pipe material selection table in Appendix E, and consultation with the appropriate utility supply company is required to identify the most suitable service fabric. However, the pH levels preclude the use of copper pipes, whilst TPH levels locally preclude the use of polyethylene pipes.

6.6 Fuel Tanks

Fuel tanks were discussed within the Phase 1 Desk Study (Section 6.4). Two fuel tanks are understood to be present, both of which have been decommissioned and filled with liquid sand. The site investigation, based on data available to date, does not indicate significant leakages have occurred from the tanks. For completeness, the client may wish to undertake a tank inspection to ensure they have been adequately decommissioned. Alternatively, as part of the site strip the client may wish to excavate the tanks. Should the latter be the case, a methodology for the safe removal of tanks was provided in Section 6.4 of the Phase 1 Desk Study, and further information can be set out in a Phase 3 Remediation Statement.

7 GROUND GAS ASSESSMENT

The proposed development includes the construction of a convenience store.

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 five standpipes (BH2, BH3 & BH4) 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, insitu Standard Penetration Tests (SPTs) and Hand Shear Vane Tests were undertaken at regular intervals during drilling. The geotechnical results are presented in Appendix D.

8.1 Strength and Density

Standard Penetration Tests undertaken within the shallow locally clayey sands between 1.00 and 2.00mbgl yielded N values of between 7 and 9, indicative of loose deposits.

Hand shear vane testing within the natural cohesive deposits (BH3-BH5) returned results ranging 110kPa to 130kPa, which are indicative of high strength conditions.

Further Standard Penetration Tests undertaken within the sandy gravel present at depth across the site yielded N values generally between 11 and 23, indicative of medium dense deposits. SPT N values of 50+ were recorded at termination depth within BH1, BH3 and BH5, inferred to be the result of buried cobbles/boulders.

8.2 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 1.00 and 2.00mbgl. Moisture levels were between 4.8% and 17%.

8.3 Atterberg Limit Determinations

Two 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 intermediate plasticity.

The Plasticity Indices were 17 and 25 with equivalent moisture contents recorded above and above the corresponding plastic limits. The cohesive material can be assessed as having a **medium** shrinkage potential in relation to NHBC Guidance Chapter 4.2.

8.4 Particle Size Distribution and Sedimentation Testing

Six samples from the boreholes and trial pits were 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 BS5930:2015 Section 6 and are presented in Appendix D.

8.5 pH and Sulphate Results

Four natural samples from the boreholes were tested for acidity and soluble sulphate content to assess whether the material may be potentially aggressive to building fabric. The results of the testing for pH ranged from 8.2 to 8.6 indicating slightly alkaline conditions. Soluble sulphates were recorded at levels ranging from <10mg/l to 15 mg/l.

8.6 Percolation Tests

Two percolation tests were carried out within the bases of TP1 and TP2. The results returned infiltration rates of 95.8 and 30.2 x 10^{-6} m/sec, respectively.

Soakaway drainage, if incorporated, should be designed in accordance with BRE Special Digest 365 – Soakaway Design. The results are presented in Appendix D.

8.7 Preliminary Ground Model

The information gathered during the intrusive works has been collated and summarised in the below preliminary ground model.

8.8 Foundations

Detailed design loads have not been made available to Solmek. Variable ground conditions have been encountered across the site, however within BHs 1, 2 and 5 (located closest to the proposed building footprint, Figure 3), ground conditions generally comprised loose sands to between 1.90mbgl and 3.00mbgl, over medium dense to dense gravels. Within BH5 only, a band of clay was present between the sand and gravel bands (1.90-3.10mbgl)

Given this, and given the variable ground conditions encountered, consideration has been given to several foundation options, as summarised below:

- Strip Foundations upon shallow loose sands
- Raft Foundations upon shallow loose sands
- Mini-piled Foundations

8.8.1 *Strip Foundations*

SPT results within the shallow sands indicate loose deposits, with N values between 7 and 9.

It is recommended that foundations in sand be placed at a minimum depth of 0.60mbgl. Deeper made ground was encountered in the area of TP1 only (1.10mbgl) which may require deepened footings, with any deepened sections requiring adequate stepping and reinforcement.

Using an SPT N Value of 7, and for strip foundations 0.60m wide at a depth of 0.60mbgl, an allowable bearing pressure of 100kN/m^2 is recommended in order to achieve settlements of less than 25mm.

If the above bearing pressure is inadequate, consideration should be given to the options set out in Sections 8.8.2 & 8.8.3.

8.8.2 *Raft Foundations*

Given the N values encountered within the loose sands, the bearing pressure calculated in Section 8.8.1 may be inadequate. Alternatively, a raft could be considered. Detailed design loads and raft sizes have not been made available to Solmek.

8.8.3 *Mini-Piled Foundations*

Should the shallow loose sands be unsuitable for founding upon, consideration could be given to the deeper medium dense gravel stratum (encountered between 2.70 and 3.10mbgl across the site). Given the volume of concrete required to construct strip foundations at this depth, and the difficulty of excavating through loose sands to ca. 3.00mbgl, mini-piled foundations may be a more suitable foundation solution for founding within the medium dense gravels.

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 loose shallow deposits. Allowance should be made

for breaking through known and unknown buried obstructions.

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

8.8.4 *General Foundation Comments*

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

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

8.9 Excavation

Based on the nature of the ground conditions encountered, excavations should be within the capacity of normal earthworks plant although breaking out of relic foundations (beneath the existing buildings) and other obstructions should be anticipated. Stability of excavations will be poor in the made ground and shallow sands. Excavation sides should be designed, constructed and supported in accordance with the recommendations given in CIRIA Report No. 97: “Trenching Practice”.

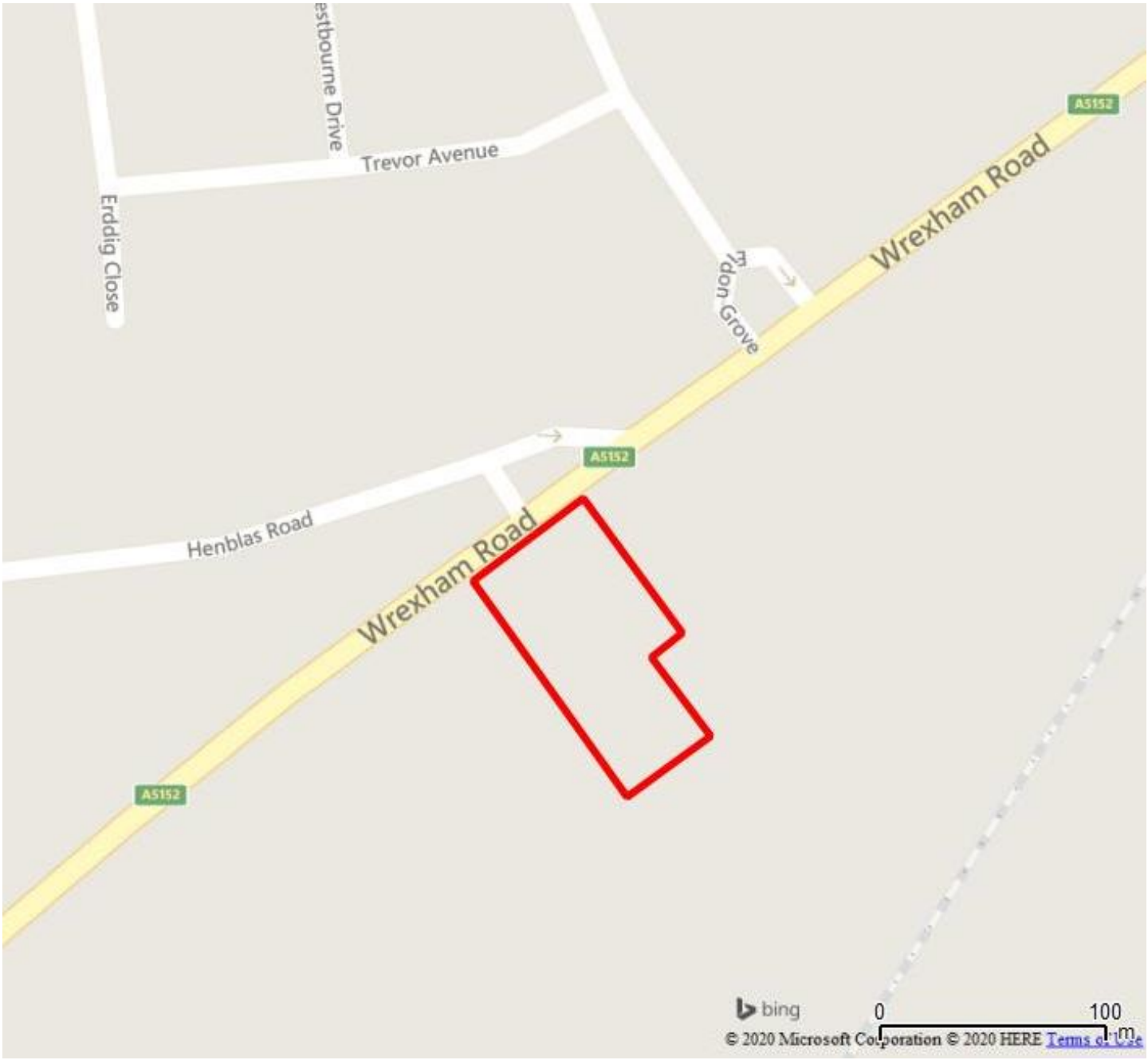
8.10 Groundwater

No groundwater was encountered in either the boreholes or the trial pits during the 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.

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APPENDIX A:
Figures and Drawings



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Title
Site Location Plan

Project
Rhostyllen, Wrexham

Client
Thistlewood Properties

Date
September 2020

Fig No.
Figure 1

Scale
On map

Key

Approx. Site Boundary

N

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SOLMEK



Contains Bing® Imagery ©Microsoft 2016

Title
Site Satellite Image

Project
Rhostyllen, Wrexham

Client
Thistlewood Properties

Date
September 2020

Fig No.
Figure 2

Scale
On map

Key

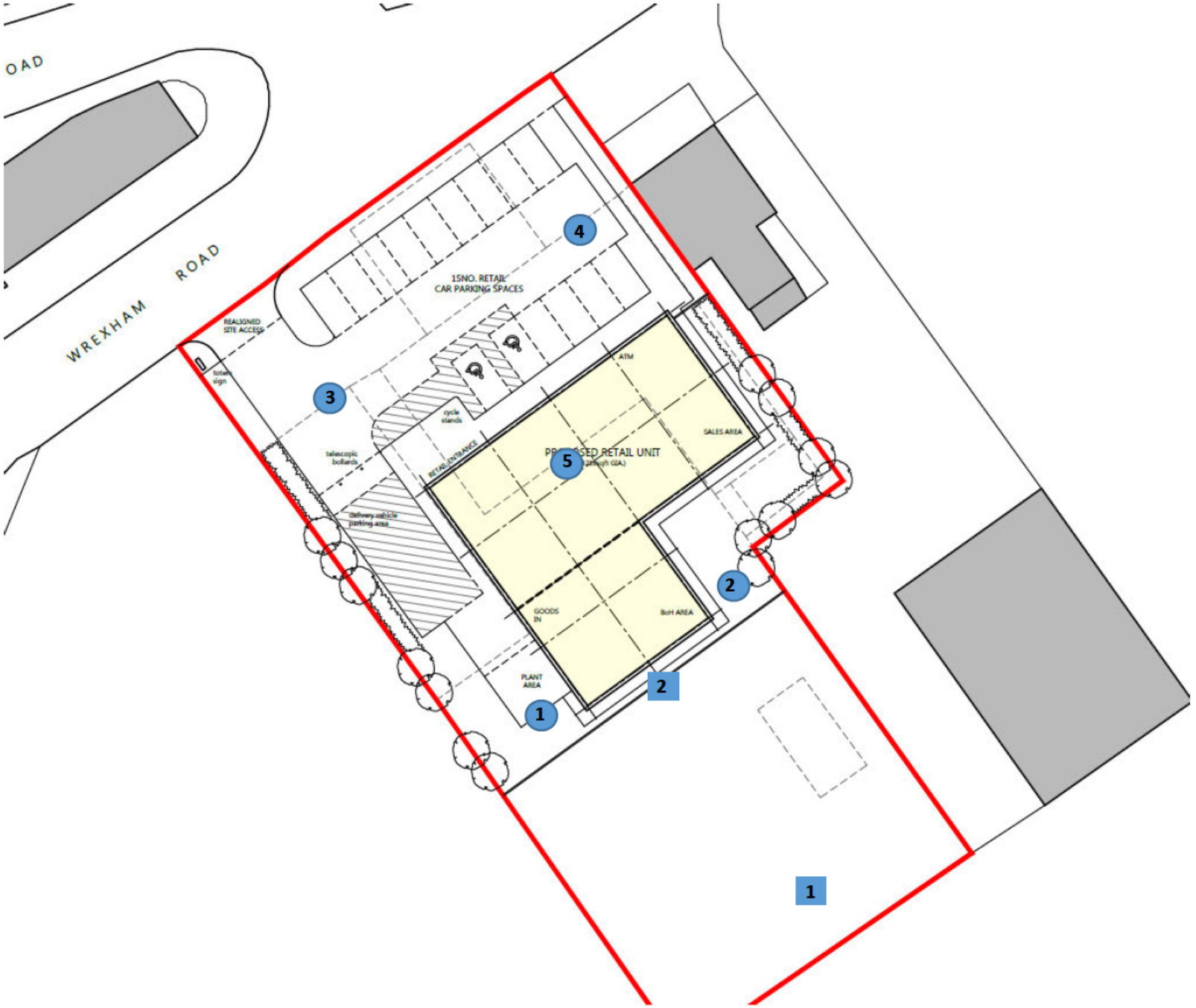
Approx. Site Boundary

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Title
Proposed Layout & Exploratory Hole Location Plan

Project
Rhostyllen, Wrexham

Client
Thistlewood Properties

Date
September 2020

Fig No.
Figure 3

Scale
Do Not Scale

Key

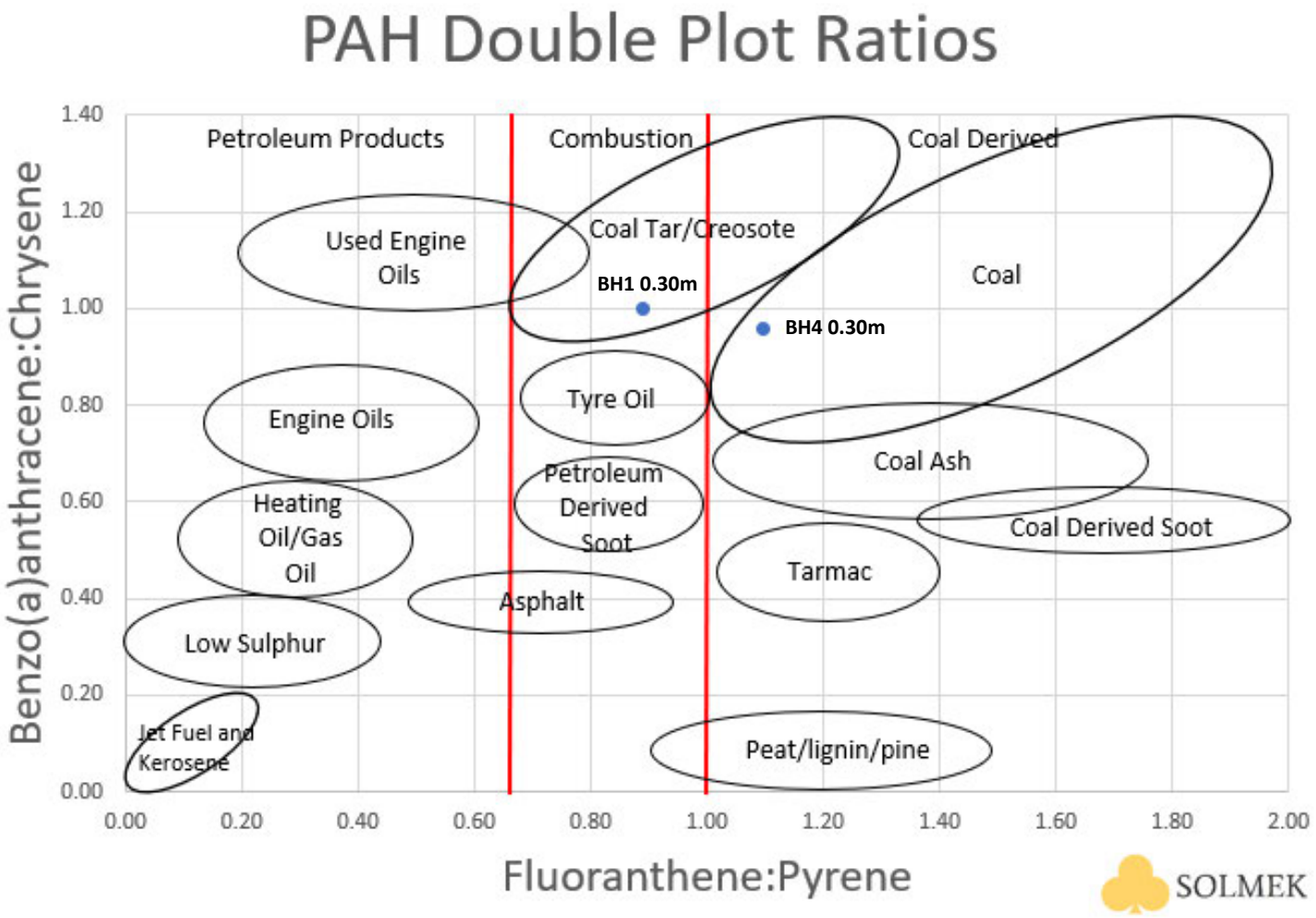
- Approx. Site Boundary
- Approx. BH Location
- Approx. TP Location

N

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Title	Double Plot Ratio Analysis
Project	Rhostyllen, Wrexham
Client	Thistlewood Properties
Date	September 2020
Fig No.	Figure 4
Scale	N/A
Key	

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APPENDIX B:
Borehole Logs & Trial Pit Logs

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Borehole Log

Scale 1:50 Sheet 1 of 1

BH1

Contract no:	S200831	**Site:**	Rhostyllen, Wrexham	**Driller:**	BBL
				Plant used:	Mini Percussive Rig
				Started:	27/08/2020
Client:	Thistlewood Properties.			**Ended:**	27/08/2020
Method:	Mini Percussive Rig			**Backfilled:**	27/08/2020

GL (AOD):
Easting:
Northing:
Logged: PF
Status: FINAL

Backfill / Installation	Legend	Depth (m)	Level (m AOD)	Stratum Description	Samples and Insitu Testing		
					Depth (m)	Type	Results
		0.05		MADE GROUND: Black tarmac.			
				MADE GROUND: Black sandy gravel. Gravel is fine to coarse angular to subangular of ash and brick.	0.30	B+ES	
		0.60		Brown slightly clayey slightly gravelly SAND. Gravel is fine to coarse rounded to subrounded of sandstone.	0.80	B+ES	
		0.90		Loose to medium dense light brown SAND.	1.00 - 1.45	SPT (S)	N=8 (1,2/2,2,2,2)
					1.00	B	
					1.50	B	
					2.00 - 2.45	SPT (S)	N=9 (1,2/2,2,2,3)
					2.50	B	
		2.90		Medium dense light brown to brown sandy GRAVEL. Gravel is fine to coarse rounded to subrounded of sandstone.	3.00 - 3.45	SPT (S)	N=11 (2,2/4,3,2,2)
					3.50	B	
G					4.00 - 4.15	SPT (S)	N=50+ (25/50)
		4.15		*4.10m: Sandstone boulder.*			
				End of Borehole at 4.150m			

Hole Diameter		Casing Depths		General Remarks	Chiselling			Ground Water				
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)	1. Hand dug inspection pit to 1.20m. 2, No groundwater encountered.	From (m)	To (m)	Time (hr)	Depth Strike (m)	Depth Casing (m)	Depth Sealed (m)	Time Elapsed (min)	Water Level (m)

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Borehole Log

Scale 1:50 Sheet 1 of 1

BH2

Contract no:	S200831	**Site:**	Rhostyllen, Wrexham	**Driller:**	BBL
				Plant used:	Mini Percussive Rig
				Started:	27/08/2020
Client:	Thistlewood Properties.			**Ended:**	27/08/2020
Method:	Mini Percussive Rig			**Backfilled:**	27/08/2020

GL (AOD):
Easting:
Northing:
Logged: PF
Status: FINAL

Backfill / Installation	Legend	Depth (m)	Level (m AOD)	Stratum Description	Samples and Insitu Testing		
					Depth (m)	Type	Results
		0.05		MADE GROUND: Black tarmac.			
				MADE GROUND: Black sandy gravel. Gravel is fine to coarse angular to subangular of ash and brick.	0.30	B+ES	
		0.40		Firm consistency brown sandy CLAY.	0.50	B+ES	
		0.70		Loose light brown slightly clayey slightly gravelly SAND. Gravel is fine to coarse rounded to subrounded of sandstone.	1.00 - 1.45	SPT (S)	N=8 (1,1/2,2,2,2)
					1.00	B	
					1.50	B	
					2.00 - 2.45	SPT (S)	N=9 (2,2/2,2,2,3)
					2.50	B	
		3.00		Medium dense brown clayey sandy GRAVEL. Gravel is fine to coarse rounded to subrounded of sandstone.	3.00 - 3.45	SPT (S)	N=11 (2,3/2,3,2,4)
					3.50	B	
G					4.00 - 4.45	SPT (S)	N=22 (4,4/5,6,5,6)
		4.45		End of Borehole at 4.450m			

Hole Diameter		Casing Depths		General Remarks	Chiselling			Ground Water				
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)	1. Hand dug inspection pit to 1.20m. 2, No groundwater encountered.	From (m)	To (m)	Time (hr)	Depth Strike (m)	Depth Casing (m)	Depth Sealed (m)	Time Elapsed (min)	Water Level (m)

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Borehole Log

Scale 1:50 Sheet 1 of 1

BH3

Contract no:	S200831	**Site:**	Rhostyllen, Wrexham	**Driller:**	BBL
				Plant used:	Mini Percussive Rig
				Started:	27/08/2020
Client:	Thistlewood Properties.			**Ended:**	27/08/2020
Method:	Mini Percussive Rig			**Backfilled:**	27/08/2020

GL (AOD):
Easting:
Northing:
Logged: PF
Status: FINAL

Backfill / Installation	Legend	Depth (m)	Level (m AOD)	Stratum Description	Samples and Insitu Testing		
					Depth (m)	Type	Results
		0.10		MADE GROUND: Black tarmac.			
				Light brown very sandy GRAVEL. Gravel is fine to coarse rounded to subrounded of sandstone.	0.40	B+ES	
		0.60		Stiff consistency brown mottled grey slightly sandy slightly gravelly high strength CLAY of intermediate plasticity. Gravel is fine to coarse angular to subangular of coal and sandstone.	0.80	B+ES	
					1.00	B	
					1.20	HV	120kPa
					1.50	B	
					2.00	HV	110kPa
					2.50	B	
		2.90		Medium dense brown clayey sandy GRAVEL. Gravel is fine to coarse rounded to subrounded of sandstone.	3.00 - 3.45	SPT (S)	N=17 (3,3/3,4,4,6)
					3.50	B	
G					4.00 - 4.15	SPT (S)	N=50+ (25/50)
		4.15		End of Borehole at 4.150m			

Hole Diameter		Casing Depths		General Remarks	Chiselling			Ground Water				
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)	1. Hand dug inspection pit to 1.20m. 2, No groundwater encountered.	From (m)	To (m)	Time (hr)	Depth Strike (m)	Depth Casing (m)	Depth Sealed (m)	Time Elapsed (min)	Water Level (m)

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Borehole Log

Scale 1:50 Sheet 1 of 1

BH4

Contract no:	S200831	**Site:**	Rhostyllen, Wrexham	**Driller:**	BBL
				Plant used:	Mini Percussive Rig
				Started:	27/08/2020
Client:	Thistlewood Properties.			**Ended:**	27/08/2020
Method:	Mini Percussive Rig			**Backfilled:**	27/08/2020

GL (AOD):
Easting:
Northing:
Logged: PF
Status: FINAL

Backfill / Installation	Legend	Depth (m)	Level (m AOD)	Stratum Description	Samples and Insitu Testing: Depth (m)	Type	Results
		0.05		MADE GROUND: Black tarmac.			
				MADE GROUND: Black ash. Hydrocarbon odour noted.	0.30	B+ES	
		0.40		Stiff consistency brown mottled grey slightly sandy slightly gravelly high strength CLAY of intermediate plasticity. Gravel is fine to coarse angular to subangular of coal and sandstone.	0.60	B+ES	
					1.00	HV	110kPa
					1.00	B	
		1.60			1.50	B	
				Loose light brown SAND.	2.00 - 2.45	SPT (S)	N=8 (2,2/2,2,2,2)
					2.50	B	
		2.70		Medium dense brown clayey sandy GRAVEL. Gravel is fine to coarse rounded to subangular of sandstone.	3.00 - 3.45	SPT (S)	N=17 (2,3/3,4,5,5)
					3.50	B	
					4.00 - 4.45	SPT (S)	N=22 (3,4/5,5,6,6)
					4.50	B	
G					5.00 - 5.45	SPT (S)	N=23 (4,4/4,5,7,7)
		5.45		End of Borehole at 5.450m			

Hole Diameter		Casing Depths		General Remarks	Chiselling			Ground Water				
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)	1. Hand dug inspection pit to 1.20m. 2, No groundwater encountered.	From (m)	To (m)	Time (hr)	Depth Strike (m)	Depth Casing (m)	Depth Sealed (m)	Time Elapsed (min)	Water Level (m)

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

Borehole Log

Scale 1:50 Sheet 1 of 1

BH5

Contract no:	S200831	**Site:**	Rhostyllen, Wrexham	**Driller:**	BBL
				Plant used:	Mini Percussive Rig
				Started:	27/08/2020
Client:	Thistlewood Properties.			**Ended:**	27/08/2020
Method:	Mini Percussive Rig			**Backfilled:**	27/08/2020

GL (AOD):
Easting:
Northing:
Logged: PF
Status: FINAL

Backfill / Installation	Legend	Depth (m)	Level (m AOD)	Stratum Description	Samples and Insitu Testing: Depth (m)	Type	Results
		0.05		MADE GROUND: Black tarmac.			
		0.30		MADE GROUND: Black ash.	0.20	B+ES	
		0.55		Firm consistency brown sandy CLAY.	0.50	B+ES	
				Loose light brown slightly clayey SAND.	1.00 - 1.45	SPT (S)	N=7 (2,2/1,2,2,2)
					1.00	B	
					1.50	B	
		1.90		Stiff consistency brown slightly sandy slightly gravelly high strength CLAY. Gravel is fine to coarse angular to subrounded of sandstone.	2.00	HV	120kPa
					2.50	B	
		3.10		Dense brown slightly clayey sandy GRAVEL. Gravel is fine to coarse rounded to subangular of sandstone.	3.00	HV	130kPa
	G				3.50 - 3.65	SPT (S)	N=50+ (25/50)
		3.65		End of Borehole at 3.650m	3.50	B	

Hole Diameter		Casing Depths		General Remarks	Chiselling			Ground Water				
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)	1. Hand dug inspection pit to 1.20m. 2, No groundwater encountered.	From (m)	To (m)	Time (hr)	Depth Strike (m)	Depth Casing (m)	Depth Sealed (m)	Time Elapsed (min)	Water Level (m)

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

Trial Pit Log

TrialPit No
TP1
Sheet 1 of 1

Project Name:	Rhostyllen, Wrexham	Project No. S200831	Co-ords: E - N Level:	Date 27/08/2020
Plant Used:	JCB 3CX	Dimensions (m): Depth 1.60	1.20 × 0.30	Scale 1:26
Client:	Thistlewood Properties.			Logged PF

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.50	B+ES		0.10			MADE GROUND: Grey slightly sandy gravel. Gravel is fine to coarse angular to subrounded of limestone.
	1.00	ES		1.10			MADE GROUND: Reddish brown to grey sandy slightly clayey gravel. Gravel is fine to coarse angular to subangular of brick and sandstone. Slight hydrocarbon odour noted at 0.70mbgl.
	1.40	B		1.60			Brown clayey slightly gravelly SAND. Gravel is fine to coarse rounded to subrounded of sandstone.
							End of Pit at 1.600m

Remarks: 1. No groundwater encountered,

Stability:

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

Trial Pit Log

TrialPit No
TP2
Sheet 1 of 1

Project Name:	Rhostyllen, Wrexham	Project No. S200831	Co-ords: E - N Level:	Date 27/08/2020
Plant Used:	JCB 3CX	Dimensions (m): Depth 1.80	1.20 × 0.30	Scale 1:26
Client:	Thistlewood Properties.			Logged PF

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.10			MADE GROUND: Black tarmac.
	0.30	B+ES					MADE GROUND: Stiff consistency grey slightly sandy slightly gravelly clay (reworked). Gravel is fine to coarse angular to subangular of brick.
	0.60	B+ES		0.50			Brown clayey slightly gravelly SAND.
	1.00	B		0.70			Light brown slightly clayey SAND.
				1.80			End of Pit at 1.800m

Remarks: 1.No groundwater encountered.

Stability:

APPENDIX C:
Contamination Laboratory Results

eurofins | Chemtest
Eurofins Chemtest Ltd
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

Final Report

Report No.:	20-23666-1
Initial Date of Issue:	14-Sep-2020
Client	Solmek Ltd
Client Address:	12 Yarm Road Stockton-on-Tees TS18 3NA
Contact(s):	Leo Cassidy Office
Project	S200831 Rhostyllen, Wrexham

Quotation No.:		**Date Received:**	07-Sep-2020
Order No.:	SOL-4263	**Date Instructed:**	07-Sep-2020
No. of Samples:	8		
Turnaround (Wkdays):	5	**Results Due:**	11-Sep-2020
Date Approved:	14-Sep-2020		

Approved By:

[redacted]

Details: Glynn Harvey, Technical Manager

Results - Leachate

Project: S200831 Rhostyllen, Wrexham

Client: Solmek Ltd				**Chemtest Job No.:**		20-23666	20-23666	20-23666
Quotation No.:				**Chemtest Sample ID.:**		1059596	1059598	1059600
				Sample Location:		BH1	BH3	BH4
				Sample Type:		SOIL	SOIL	SOIL
				Top Depth (m):		0.30	0.40	0.30
				Date Sampled:		27-Aug-2020	27-Aug-2020	27-Aug-2020
Determinand	**Accred.**	**SOP**	**Type**	**Units**	**LOD**			
pH	U	1010			N/A	8.6	8.8	8.4
Sulphate	U	1220		mg/l	1.0	31	3.0	37
Cyanide (Total)	U	1300		mg/l	0.050	< 0.050	< 0.050	< 0.050
Hardness	U	1415		mg/l	15	120	450	190
Arsenic (Dissolved)	U	1450		µg/l	1.0	2.9	1.6	< 1.0
Boron (Dissolved)	U	1450		µg/l	20	27	35	23
Cadmium (Dissolved)	U	1450		µg/l	0.080	< 0.080	< 0.080	< 0.080
Chromium (Dissolved)	U	1450		µg/l	1.0	4.3	1.7	< 1.0
Copper (Dissolved)	U	1450		µg/l	1.0	< 1.0	2.1	< 1.0
Mercury (Dissolved)	U	1450		µg/l	0.50	< 0.50	< 0.50	< 0.50
Nickel (Dissolved)	U	1450		µg/l	1.0	< 1.0	< 1.0	< 1.0
Lead (Dissolved)	U	1450		µg/l	1.0	< 1.0	< 1.0	< 1.0
Selenium (Dissolved)	U	1450		µg/l	1.0	< 1.0	1.6	< 1.0
Zinc (Dissolved)	U	1450		µg/l	1.0	1.2	< 1.0	1.0
Aliphatic TPH >C5-C6	N	1675		µg/l	0.10		< 0.10	< 0.10
Aliphatic TPH >C6-C8	N	1675		µg/l	0.10		< 0.10	< 0.10
Aliphatic TPH >C8-C10	N	1675		µg/l	0.10		< 0.10	51
Aliphatic TPH >C10-C12	N	1675		µg/l	0.10		< 0.10	26
Aliphatic TPH >C12-C16	N	1675		µg/l	0.10		< 0.10	22
Aliphatic TPH >C16-C21	N	1675		µg/l	0.10		< 0.10	25
Aliphatic TPH >C21-C35	N	1675		µg/l	0.10		< 0.10	200
Aliphatic TPH >C35-C44	N	1675		µg/l	0.10		< 0.10	24
Total Aliphatic Hydrocarbons	N	1675		µg/l	5.0		< 5.0	350
Aromatic TPH >C5-C7	N	1675		µg/l	0.10		< 0.10	< 0.10
Aromatic TPH >C7-C8	N	1675		µg/l	0.10		< 0.10	< 0.10
Aromatic TPH >C8-C10	N	1675		µg/l	0.10		< 0.10	28
Aromatic TPH >C10-C12	N	1675		µg/l	0.10		< 0.10	68
Aromatic TPH >C12-C16	N	1675		µg/l	0.10		< 0.10	220
Aromatic TPH >C16-C21	N	1675		µg/l	0.10		< 0.10	200
Aromatic TPH >C21-C35	N	1675		µg/l	0.10		< 0.10	700
Aromatic TPH >C35-C44	N	1675		µg/l	0.10		< 0.10	35
Total Aromatic Hydrocarbons	N	1675		µg/l	5.0		< 5.0	1300
Total Petroleum Hydrocarbons	N	1675		µg/l	10		< 10	1600
Naphthalene	U	1800		µg/l	0.10	< 0.10	< 0.10	2.1
Acenaphthylene	U	1800		µg/l	0.10	< 0.10	< 0.10	12
Acenaphthene	U	1800		µg/l	0.10	< 0.10	< 0.10	42
Fluorene	U	1800		µg/l	0.10	< 0.10	< 0.10	17
Phenanthrene	U	1800		µg/l	0.10	0.49	< 0.10	29
Anthracene	U	1800		µg/l	0.10	0.22	< 0.10	7.3
Fluoranthene	U	1800		µg/l	0.10	0.63	0.60	14

Results - Leachate

Project: S200831 Rhostyllen, Wrexham

Client: Solmek Ltd				**Chemtest Job No.:**		20-23666	20-23666	20-23666
Quotation No.:				**Chemtest Sample ID.:**		1059596	1059598	1059600
				Sample Location:		BH1	BH3	BH4
				Sample Type:		SOIL	SOIL	SOIL
				Top Depth (m):		0.30	0.40	0.30
				Date Sampled:		27-Aug-2020	27-Aug-2020	27-Aug-2020
Determinand	**Accred.**	**SOP**	**Type**	**Units**	**LOD**			
Pyrene	U	1800		µg/l	0.10	0.67	0.57	10
Benzo[a]anthracene	U	1800		µg/l	0.10	< 0.10	< 0.10	3.4
Chrysene	U	1800		µg/l	0.10	< 0.10	< 0.10	2.9
Benzo[b]fluoranthene	U	1800		µg/l	0.10	< 0.10	< 0.10	3.8
Benzo[k]fluoranthene	U	1800		µg/l	0.10	< 0.10	< 0.10	1.1
Benzo[a]pyrene	U	1800		µg/l	0.10	< 0.10	< 0.10	2.6
Indeno(1,2,3-c,d)Pyrene	U	1800		µg/l	0.10	< 0.10	< 0.10	1.9
Dibenz(a,h)Anthracene	U	1800		µg/l	0.10	< 0.10	< 0.10	0.22
Benzo[g,h,i]perylene	U	1800		µg/l	0.10	< 0.10	< 0.10	1.7
Total Of 16 PAH's	U	1800		µg/l	2.0	2.0	< 2.0	150
Total Phenols	U	1920		mg/l	0.030	< 0.030	< 0.030	< 0.030

Results - Soil

Project: S200831 Rhostyllen, Wrexham

Client: Solmek Ltd		**Chemtest Job No.:**			20-23666	20-23666	20-23666	20-23666	20-23666	20-23666	20-23666	20-23666
Quotation No.:		**Chemtest Sample ID.:**			1059595	1059596	1059597	1059598	1059599	1059600	1059601	1059602
		Sample Location:			TP2	BH1	BH2	BH3	BH3	BH4	BH4	BH5
		Sample Type:			SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
		Top Depth (m):			0.30	0.30	0.50	0.40	0.80	0.30	0.60	1.00
		Date Sampled:			27-Aug-2020	27-Aug-2020	27-Aug-2020	27-Aug-2020	27-Aug-2020	27-Aug-2020	27-Aug-2020	27-Aug-2020
		Asbestos Lab:			COVENTRY	COVENTRY	COVENTRY	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	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
ACM Detection Stage	U	2192		N/A	-	-	-	-	-	-	-	-
Moisture	N	2030	%	0.020	5.8	5.5	10	6.0	13	5.8	10	6.6
Soil Colour	N	2040		N/A	Brown	Brown	Brown	Brown	Brown	Brown	Brown	Brown
Other Material	N	2040		N/A	Stones	Stones	Stones	Stones	Stones	Stones	Stones	Stones
Soil Texture	N	2040		N/A	Sand	Sand	Loam	Sand	Clay	Sand	Clay	Sand
pH	M	2010		4.0	8.6	9.8	8.3	9.5	8.1	8.5	8.1	8.1
Boron (Hot Water Soluble)	M	2120	mg/kg	0.40	[B] 0.90	[B] 0.44	[B] 0.90	[B] < 0.40	[B] < 0.40	[B] 0.66	[B] 0.74	[B] < 0.40
Sulphate (2:1 Water Soluble) as SO4	M	2120	mg/l	10	[B] 120	[B] 93	[B] 62	[B] 20	[B] < 10	[B] 350	[B] < 10	[B] < 10
Cyanide (Total)	M	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Arsenic	M	2450	mg/kg	1.0	8.8	13	14	12	11	19	8.2	4.2
Cadmium	M	2450	mg/kg	0.10	0.51	2.1	2.1	0.34	0.14	1.6	< 0.10	< 0.10
Chromium	M	2450	mg/kg	1.0	5.5	24	15	11	24	14	18	5.2
Copper	M	2450	mg/kg	0.50	27	36	58	5.9	25	40	17	8.5
Mercury	M	2450	mg/kg	0.10	< 0.10	0.12	0.12	< 0.10	< 0.10	0.11	< 0.10	< 0.10
Nickel	M	2450	mg/kg	0.50	4.3	30	17	15	34	31	18	8.3
Lead	M	2450	mg/kg	0.50	40	110	210	19	48	45	24	20
Selenium	M	2450	mg/kg	0.20	< 0.20	< 0.20	< 0.20	< 0.20	0.27	0.36	< 0.20	< 0.20
Zinc	M	2450	mg/kg	0.50	28	180	180	32	53	150	33	21
Organic Matter	M	2625	%	0.40	1.6	5.9	4.1	< 0.40	< 0.40	11	0.52	< 0.40
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0				< 1.0		< 1.0	< 1.0	< 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0				< 1.0		< 1.0	< 1.0	< 1.0
Aliphatic TPH >C8-C10	M	2680	mg/kg	1.0				< 1.0		< 1.0	< 1.0	< 1.0
Aliphatic TPH >C10-C12	M	2680	mg/kg	1.0				< 1.0		< 1.0	< 1.0	< 1.0
Aliphatic TPH >C12-C16	M	2680	mg/kg	1.0				< 1.0		< 1.0	< 1.0	< 1.0
Aliphatic TPH >C16-C21	M	2680	mg/kg	1.0				< 1.0		< 1.0	< 1.0	< 1.0
Aliphatic TPH >C21-C35	M	2680	mg/kg	1.0				< 1.0		260	< 1.0	< 1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0				< 1.0		< 1.0	< 1.0	< 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0				< 5.0		260	< 5.0	< 5.0
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0				< 1.0		< 1.0	< 1.0	< 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0				< 1.0		< 1.0	< 1.0	< 1.0
Aromatic TPH >C8-C10	M	2680	mg/kg	1.0				< 1.0		< 1.0	< 1.0	< 1.0
Aromatic TPH >C10-C12	M	2680	mg/kg	1.0				< 1.0		< 1.0	< 1.0	< 1.0
Aromatic TPH >C12-C16	M	2680	mg/kg	1.0				< 1.0		25	< 1.0	< 1.0
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0				< 1.0		34	< 1.0	< 1.0
Aromatic TPH >C21-C35	M	2680	mg/kg	1.0				< 1.0		780	< 1.0	< 1.0
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0				< 1.0		< 1.0	< 1.0	< 1.0

Results - Soil

Project: S200831 Rhostyllen, Wrexham

Client: Solmek Ltd		**Chemtest Job No.:**			20-23666	20-23666	20-23666	20-23666	20-23666	20-23666	20-23666	20-23666
Quotation No.:		**Chemtest Sample ID.:**			1059595	1059596	1059597	1059598	1059599	1059600	1059601	1059602
			Sample Location:		TP2	BH1	BH2	BH3	BH3	BH4	BH4	BH5
			Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Top Depth (m):		0.30	0.30	0.50	0.40	0.80	0.30	0.60	1.00
			Date Sampled:		27-Aug-2020	27-Aug-2020	27-Aug-2020	27-Aug-2020	27-Aug-2020	27-Aug-2020	27-Aug-2020	27-Aug-2020
			Asbestos Lab:		COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**								
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0				< 5.0		840	< 5.0	< 5.0
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0				< 10		1100	< 10	< 10
Naphthalene	M	2700	mg/kg	0.10	< 0.10	3.0	< 0.10	< 0.10	< 0.10	11	< 0.10	< 0.10
Acenaphthylene	M	2700	mg/kg	0.10	< 0.10	0.88	< 0.10	< 0.10	< 0.10	4.7	< 0.10	< 0.10
Acenaphthene	M	2700	mg/kg	0.10	< 0.10	1.1	< 0.10	< 0.10	< 0.10	47	< 0.10	< 0.10
Fluorene	M	2700	mg/kg	0.10	< 0.10	1.4	< 0.10	< 0.10	< 0.10	37	< 0.10	< 0.10
Phenanthrene	M	2700	mg/kg	0.10	< 0.10	7.3	< 0.10	< 0.10	< 0.10	240	< 0.10	< 0.10
Anthracene	M	2700	mg/kg	0.10	< 0.10	3.0	< 0.10	< 0.10	< 0.10	54	< 0.10	< 0.10
Fluoranthene	M	2700	mg/kg	0.10	6.7	16	< 0.10	< 0.10	< 0.10	230	< 0.10	< 0.10
Pyrene	M	2700	mg/kg	0.10	6.6	18	< 0.10	< 0.10	< 0.10	210	< 0.10	< 0.10
Benzo[a]anthracene	M	2700	mg/kg	0.10	< 0.10	10	< 0.10	< 0.10	< 0.10	45	< 0.10	< 0.10
Chrysene	M	2700	mg/kg	0.10	< 0.10	10	< 0.10	< 0.10	< 0.10	47	< 0.10	< 0.10
Benzo[b]fluoranthene	M	2700	mg/kg	0.10	< 0.10	27	< 0.10	< 0.10	< 0.10	52	< 0.10	< 0.10
Benzo[k]fluoranthene	M	2700	mg/kg	0.10	< 0.10	9.1	< 0.10	< 0.10	< 0.10	21	< 0.10	< 0.10
Benzo[a]pyrene	M	2700	mg/kg	0.10	< 0.10	19	< 0.10	< 0.10	< 0.10	42	< 0.10	< 0.10
Indeno(1,2,3-c,d)Pyrene	M	2700	mg/kg	0.10	< 0.10	18	< 0.10	< 0.10	< 0.10	25	< 0.10	< 0.10
Dibenz(a,h)Anthracene	M	2700	mg/kg	0.10	< 0.10	6.1	< 0.10	< 0.10	< 0.10	7.5	< 0.10	< 0.10
Benzo[g,h,i]perylene	M	2700	mg/kg	0.10	< 0.10	20	< 0.10	< 0.10	< 0.10	25	< 0.10	< 0.10
Total Of 16 PAH's	M	2700	mg/kg	2.0	13	170	< 2.0	< 2.0	< 2.0	1100	< 2.0	< 2.0
Benzene	M	2760	µg/kg	1.0				< 1.0		4.6	13	< 1.0
Toluene	M	2760	µg/kg	1.0				< 1.0		< 1.0	< 1.0	< 1.0
Ethylbenzene	M	2760	µg/kg	1.0				< 1.0		< 1.0	4.1	< 1.0
m & p-Xylene	M	2760	µg/kg	1.0				< 1.0		< 1.0	5.3	< 1.0
o-Xylene	M	2760	µg/kg	1.0				< 1.0		2.5	< 1.0	< 1.0
Methyl Tert-Butyl Ether	M	2760	µg/kg	1.0				< 1.0		< 1.0	< 1.0	< 1.0
Total Phenols	M	2920	mg/kg	0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	2.4	< 0.30	< 0.30

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:
1059595			TP2	27-Aug-2020	B	Amber Glass 250ml
1059595			TP2	27-Aug-2020	B	Plastic Bag
1059595			TP2	27-Aug-2020	B	Plastic Tub 500g
1059596			BH1	27-Aug-2020	B	Amber Glass 250ml
1059596			BH1	27-Aug-2020	B	Plastic Tub 500g
1059597			BH2	27-Aug-2020	B	Amber Glass 250ml
1059597			BH2	27-Aug-2020	B	Plastic Tub 500g
1059598			BH3	27-Aug-2020	B	Amber Glass 250ml
1059598			BH3	27-Aug-2020	B	Plastic Tub 500g
1059599			BH3	27-Aug-2020	B	Amber Glass 250ml
1059599			BH3	27-Aug-2020	B	Plastic Tub 500g
1059600			BH4	27-Aug-2020	B	Amber Glass 250ml
1059600			BH4	27-Aug-2020	B	Plastic Tub 500g
1059601			BH4	27-Aug-2020	B	Amber Glass 250ml
1059601			BH4	27-Aug-2020	B	Plastic Tub 500g
1059602			BH5	27-Aug-2020	B	Amber Glass 250ml
1059602			BH5	27-Aug-2020	B	Plastic Bag

Test Methods

SOP	Title	Parameters included	Method summary
1010	pH Value of Waters	pH	pH Meter
1220	Anions, Alkalinity & Ammonium in Waters	Fluoride; Chloride; Nitrite; Nitrate; Total; Oxidisable Nitrogen (TON); Sulfate; Phosphate; Alkalinity; Ammonium	Automated colorimetric analysis using 'Aquakem 600' Discrete Analyser.
1300	Cyanides & Thiocyanate in Waters	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Continuous Flow Analysis.
1415	Cations in Waters by ICP-MS	Sodium; Potassium; Calcium; Magnesium	Direct determination by inductively coupled plasma - mass spectrometry (ICP-MS).
1450	Metals in Waters by ICP-MS	Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc	Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS).
1675	TPH Aliphatic/Aromatic split in Waters by GC-FID(cf. Texas Method 1006 / TPH CWG)	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	Pentane extraction / GCxGC FID detection
1800	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Waters by GC-MS	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	Pentane extraction / GCMS detection
1920	Phenols in Waters by HPLC	Phenolic compounds including: Phenol, Cresols, Xylenols, Trimethylphenols Note: Chlorophenols are excluded.	Determination by High Performance Liquid Chromatography (HPLC) using electrochemical detection.
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	Allkaline 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

Test Methods

SOP	Title	Parameters included	Method summary
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)
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic 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

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
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

eurofins | Chemtest
Eurofins Chemtest Ltd
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

Final Report

Report No.:	20-23667-1
Initial Date of Issue:	14-Sep-2020
Client	Solmek Ltd
Client Address:	12 Yarm Road Stockton-on-Tees TS18 3NA
Contact(s):	Leo Cassidy Office
Project	S200831 Rhostyllen, Wrexham

Quotation No.:		**Date Received:**	07-Sep-2020
Order No.:	SOL-4263	**Date Instructed:**	07-Sep-2020
No. of Samples:	1		
Turnaround (Wkdays):	7	**Results Due:**	15-Sep-2020
Date Approved:	14-Sep-2020		

Approved By:

[redacted]

Details: Glynn Harvey, Technical Manager

Results - Soil

Project: S200831 Rhostyllen, Wrexham

Client: Solmek Ltd			**Chemtest Job No.:**		20-23667
Quotation No.:			**Chemtest Sample ID.:**		1059603
			Sample Location:		BH4
			Sample Type:		SOIL
			Top Depth (m):		0.30
			Date Sampled:		27-Aug-2020
			Asbestos Lab:		COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**	
Naphthalene	M	2700	mg/kg	0.10	6.9
Acenaphthylene	M	2700	mg/kg	0.10	2.9
Acenaphthene	M	2700	mg/kg	0.10	46
Fluorene	M	2700	mg/kg	0.10	34
Phenanthrene	M	2700	mg/kg	0.10	130
Anthracene	M	2700	mg/kg	0.10	47
Fluoranthene	M	2700	mg/kg	0.10	150
Pyrene	M	2700	mg/kg	0.10	140
Benzo[a]anthracene	M	2700	mg/kg	0.10	38
Chrysene	M	2700	mg/kg	0.10	40
Benzo[b]fluoranthene	M	2700	mg/kg	0.10	38
Benzo[k]fluoranthene	M	2700	mg/kg	0.10	17
Benzo[a]pyrene	M	2700	mg/kg	0.10	34
Indeno(1,2,3-c,d)Pyrene	M	2700	mg/kg	0.10	23
Dibenz(a,h)Anthracene	M	2700	mg/kg	0.10	6.6
Benzo[g,h,i]perylene	M	2700	mg/kg	0.10	23

Results - 2 Stage WAC

Project: S200831 Rhostyllen, Wrexham

							Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	20-23667						**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Chemtest Sample ID:	1059603								
Sample Ref:									
Sample ID:									
Sample Location:	BH4								
Top Depth(m):	0.30								
Bottom Depth(m):									
Sampling Date:	27-Aug-2020								
Determinand	**SOP**	**Accred.**	**Units**						
Total Organic Carbon	2625	M	%			4.5	3	5	6
Loss On Ignition	2610	M	%			6.1	--	--	10
Total BTEX	2760	M	mg/kg			< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg			< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	M	mg/kg			11000	500	--	--
Total (Of 17) PAH's	2700	N	mg/kg			770	100	--	--
pH	2010	M				8.2	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg			0.031	--	To evaluate	To evaluate
Eluate Analysis			**2:1 mg/l**	**8:1 mg/l**	**2:1 mg/kg**	**Cumulative mg/kg 10:1**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	0.012	0.0023	< 0.050	< 0.050	0.5	2	25
Barium	1450	U	0.021	0.0065	< 0.50	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.00010	< 0.010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.0010	< 0.050	< 0.050	0.5	10	70
Copper	1450	U	0.0052	< 0.0010	< 0.050	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.00050	< 0.0010	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	< 0.0010	< 0.0010	< 0.050	< 0.050	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.0010	< 0.050	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.0010	< 0.010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.0010	< 0.010	< 0.010	0.06	0.7	5
Selenium	1450	U	0.0035	< 0.0010	< 0.010	< 0.010	0.1	0.5	7
Zinc	1450	U	0.0064	0.0012	< 0.50	< 0.50	4	50	200
Chloride	1220	U	24	1.3	45	24	800	15000	25000
Fluoride	1220	U	0.18	0.17	< 1.0	1.7	10	150	500
Sulphate	1220	U	23	11	43	120	1000	20000	50000
Total Dissolved Solids	1020	N	1600	120	2900	2000	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.030	< 0.30	< 0.50	1	-	-
Dissolved Organic Carbon	1610	U	26	7.6	< 50	84	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.175
Moisture (%)	29

Leachate Test Information	
Leachant volume 1st extract/l	0.280
Leachant volume 2nd extract/l	1.400
Eluant recovered from 1st extract/l	0.089

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Test Methods

SOP	Title	Parameters included	Method summary
1020	Electrical Conductivity and Total Dissolved Solids (TDS) in Waters	Electrical Conductivity and Total Dissolved Solids (TDS) in Waters	Conductivity Meter
1220	Anions, Alkalinity & Ammonium in Waters	Fluoride; Chloride; Nitrite; Nitrate; Total; Oxidisable Nitrogen (TON); Sulfate; Phosphate; Alkalinity; Ammonium	Automated colorimetric analysis using 'Aquakem 600' Discrete Analyser.
1450	Metals in Waters by ICP-MS	Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc	Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS).
1610	Total/Dissolved Organic Carbon in Waters	Organic Carbon	TOC Analyser using Catalytic Oxidation
1920	Phenols in Waters by HPLC	Phenolic compounds including: Phenol, Cresols, Xylenols, Trimethylphenols Note: Chlorophenols are excluded.	Determination by High Performance Liquid Chromatography (HPLC) using electrochemical detection.
2010	pH Value of Soils	pH	pH Meter
2015	Acid Neutralisation Capacity	Acid Reserve	Titration
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
2610	Loss on Ignition	loss on ignition (LOI)	Determination of the proportion by mass that is lost from a soil by ignition at 550°C.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2670	Total Petroleum Hydrocarbons (TPH) in Soils by GC-FID	TPH (C6–C40); optional carbon banding, e.g. 3-band – GRO, DRO & LRO*TPH C8–C40	Dichloromethane extraction / GC-FID
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)
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.
2815	Polychlorinated Biphenyls (PCB) ICES7Congeners in Soils by GC-MS	ICES7 PCB congeners	Acetone/Hexane extraction / GC-MS
640	Characterisation of Waste (Leaching C10)	Waste material including soil, sludges and granular waste	ComplianceTest for Leaching of Granular Waste Material and Sludge
650	Characterisation of Waste (Leaching WAC)	Waste material including soil, sludges and granular waste	ComplianceTest for Leaching of Granular Waste Material and Sludge

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
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I/S	Insufficient Sample
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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

Site name	Job number
Rhostyllen, Wrexham	S200831

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

UKAS TESTING
7607

Client details:

Reference: S200831
Name: Solmek
Address: 12 Yarm Road,
Stockton-on-tees,
TS18 3NA

Telephone: [redacted]
Email: [redacted]

FAO: L Cassidy

Date commenced: 04/09/2020

Date reported: 08/09/2020

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.

Solmek are not UKAS Accedited 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 Signitories:
[redacted]	☑ K Watkin (Lab Manager) ☐ U Mazhar (Assistant Lab Manager) ☐

Summary of Classification Tests

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

UKAS TESTING
7607

Site name	Job number
Rhostyllen, Wrexham	S200831

Hole	Depth Top m	Depth Base m	Type	w %	Oven temp. oc	wa %	Pa %	Pr %	wL %	wP %	IP %	IL	Plasticity class	Preparation method
BH1	1.00		B	7.6	105									
BH2	2.00		B	6.6	105									
BH3	1.00		B	17	105	17	98	2	41-s	16	25	0.040	CI	Tested after >425µm removed by hand
BH4	1.00		B	17	105	18	97	3	35-s	18	17	0.000	CI	Tested after >425µm removed by hand
BH5	1.00		B	5.8	105									
TP1	1.40		B	15	105									
TP2	1.00		B	4.8	105									

All tests found in Solmek 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	KW
Approval date	04/09/2020 08:15
Date report generated	
Report Number	

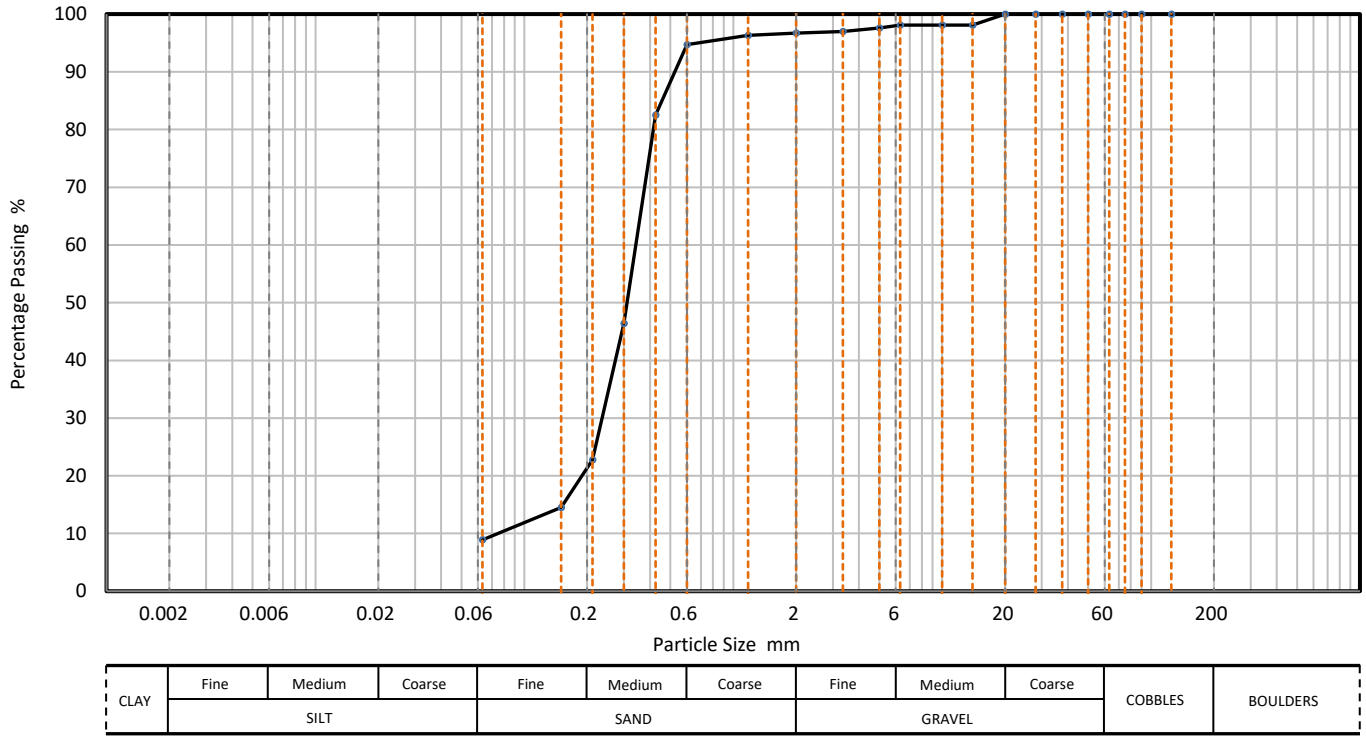
PARTICLE SIZE DISTRIBUTION

Site name	Job number
Rhostyllen, Wrexham	S200831

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

UKAS TESTING
7607

Hole	BH1	Lab sample ID	SLMK202009046
Depth (Top) m	1.00	Test Method	BS 1377 - 2 : 1990 Clause 9.2
Depth (Base) m		Soil Description	Brown, slightly gravelly, slightly clayey, SAND
Sample type	B		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	98		
10	98		
6.3	98		
5	98		
3.35	97		
2	97		
1.18	96		
0.6	95		
0.425	83		
0.3	46		
0.212	23		
0.15	15		
0.063	9		

Dry Mass of sample, g: 643

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	3.3
Sand	87.9
Fines <0.063mm	9.0

Grading Analysis		
D100	mm	
D60	mm	0.342
D30	mm	0.236
D10	mm	0.075
Uniformity Coefficient		4.6
Curvature Coefficient		2.2

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	08/09/2020 10:18

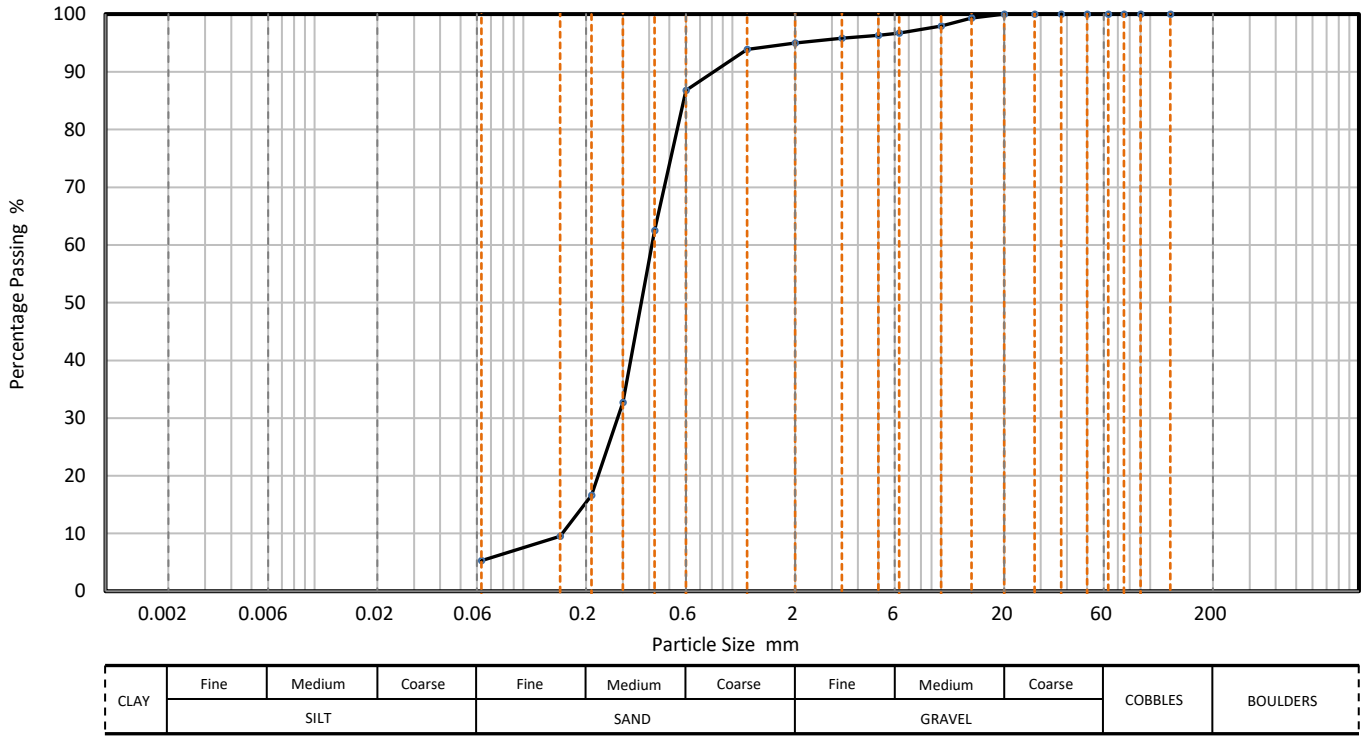
PARTICLE SIZE DISTRIBUTION

Site name	Job number
Rhostyllen, Wrexham	S200831

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

UKAS TESTING
7607

Hole	BH2	Lab sample ID	SLMK202009047
Depth (Top) m	2.00	Test Method	BS 1377 - 2 : 1990 Clause 9.2
Depth (Base) m		Soil Description	Brown, slightly gravelly, slightly clayey SAND
Sample type	B		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	99		
10	98		
6.3	97		
5	96		
3.35	96		
2	95		
1.18	94		
0.6	87		
0.425	63		
0.3	33		
0.212	17		
0.15	10		
0.063	5		

Dry Mass of sample, g	838

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	5.0
Sand	89.7
Fines <0.063mm	5.0

Grading Analysis		
D100	mm	
D60	mm	0.413
D30	mm	0.283
D10	mm	0.154
Uniformity Coefficient		2.7
Curvature Coefficient		1.3

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	08/09/2020 10:19

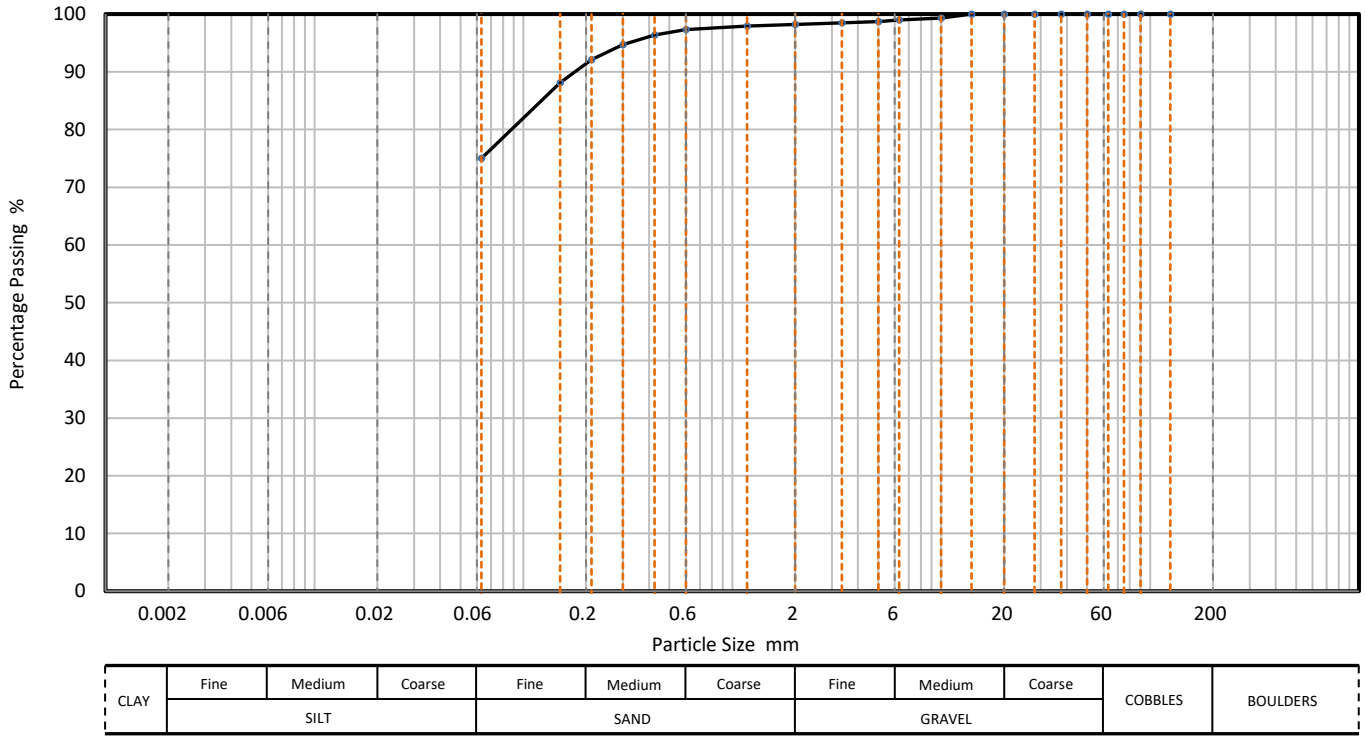
PARTICLE SIZE DISTRIBUTION

Site name	Job number
Rhostyllen, Wrexham	S200831

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

UKAS TESTING
7607

Hole	BH3	Lab sample ID	SLMK202009048
Depth (Top) m	1.00	Test Method	BS 1377 - 2 : 1990 Clause 9.2
Depth (Base) m		Soil Description	Brown, slightly gravelly, slightly sandy CLAY
Sample type	B		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	99		
6.3	99		
5	99		
3.35	99		
2	98		
1.18	98		
0.6	97		
0.425	96		
0.3	95		
0.212	92		
0.15	88		
0.063	75		

Dry Mass of sample, g: 512

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	1.8
Sand	23.2
Fines <0.063mm	75.0

Grading Analysis		
D100	mm	
D60	mm	
D30	mm	
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.

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Approval date	08/09/2020 10:20

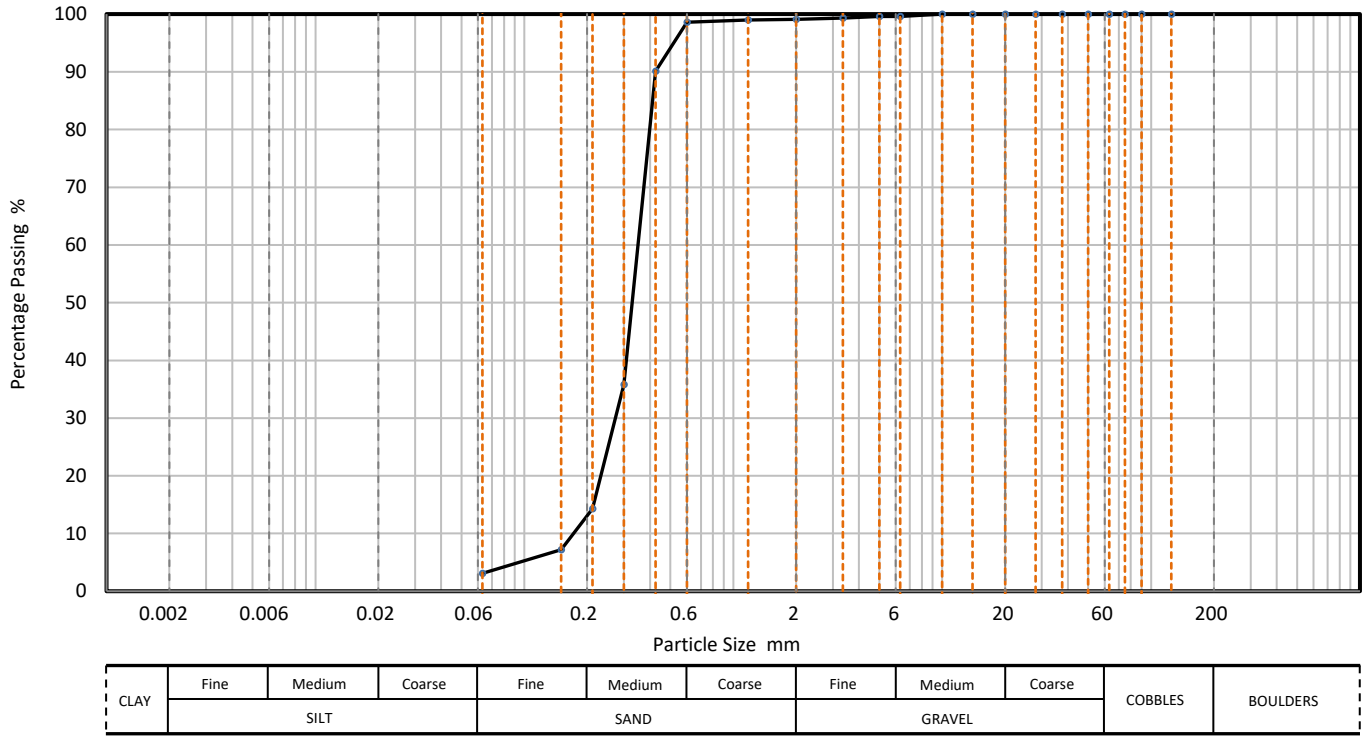
PARTICLE SIZE DISTRIBUTION

Site name	Job number
Rhostyllen, Wrexham	S200831

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

UKAS TESTING
7607

Hole	BH5	Lab sample ID	SLMK2020090410
Depth (Top) m	1.00	Test Method	BS 1377 - 2 : 1990 Clause 9.2
Depth (Base) m		Soil Description	Brown, slightly clayey SAND
Sample type	B		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	99		
2	99		
1.18	99		
0.6	99		
0.425	90		
0.3	36		
0.212	14		
0.15	7		
0.063	3		

Dry Mass of sample, g: 864

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	0.9
Sand	96.0
Fines <0.063mm	3.0

Grading Analysis		
D100	mm	
D60	mm	0.35
D30	mm	0.273
D10	mm	0.172
Uniformity Coefficient		2
Curvature Coefficient		1.2

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	08/09/2020 10:21

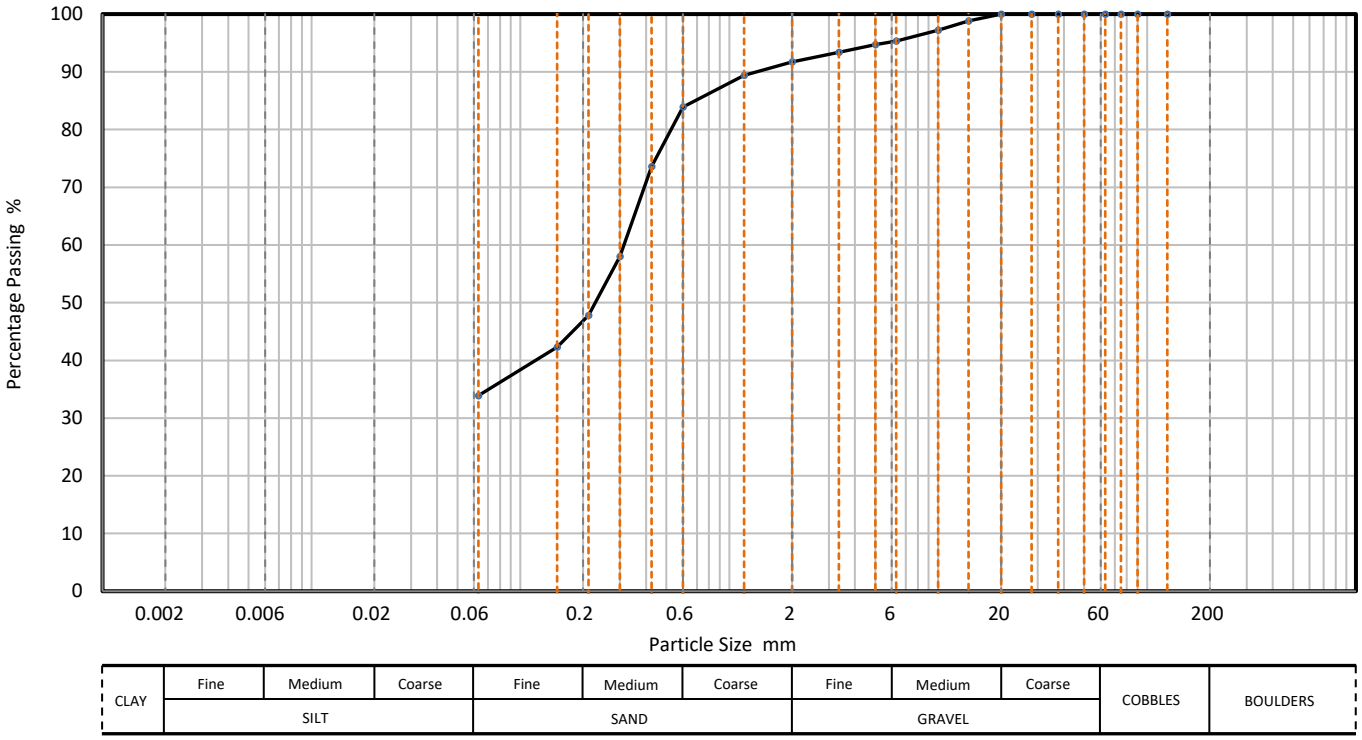
PARTICLE SIZE DISTRIBUTION

Site name	Job number
Rhostyllen, Wrexham	S200831

Solmek
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Stockton on Tees,
TS18 3NA
01642 607083
lab@solmek.com

UKAS TESTING
7607

Hole	TP1	Lab sample ID	SLMK2020090411
Depth (Top) m	1.40	Test Method	BS 1377 - 2 : 1990 Clause 9.2
Depth (Base) m		Soil Description	Brown, slightly gravelly, Very Clayey SAND
Sample type	B		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	99		
10	97		
6.3	95		
5	95		
3.35	93		
2	92		
1.18	89		
0.6	84		
0.425	74		
0.3	58		
0.212	48		
0.15	42		
0.063	34		

Dry Mass of sample, g	835

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	8.3
Sand	57.8
Fines <0.063mm	34.0

Grading Analysis		
D100	mm	
D60	mm	0.314
D30	mm	
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	08/09/2020 10:22

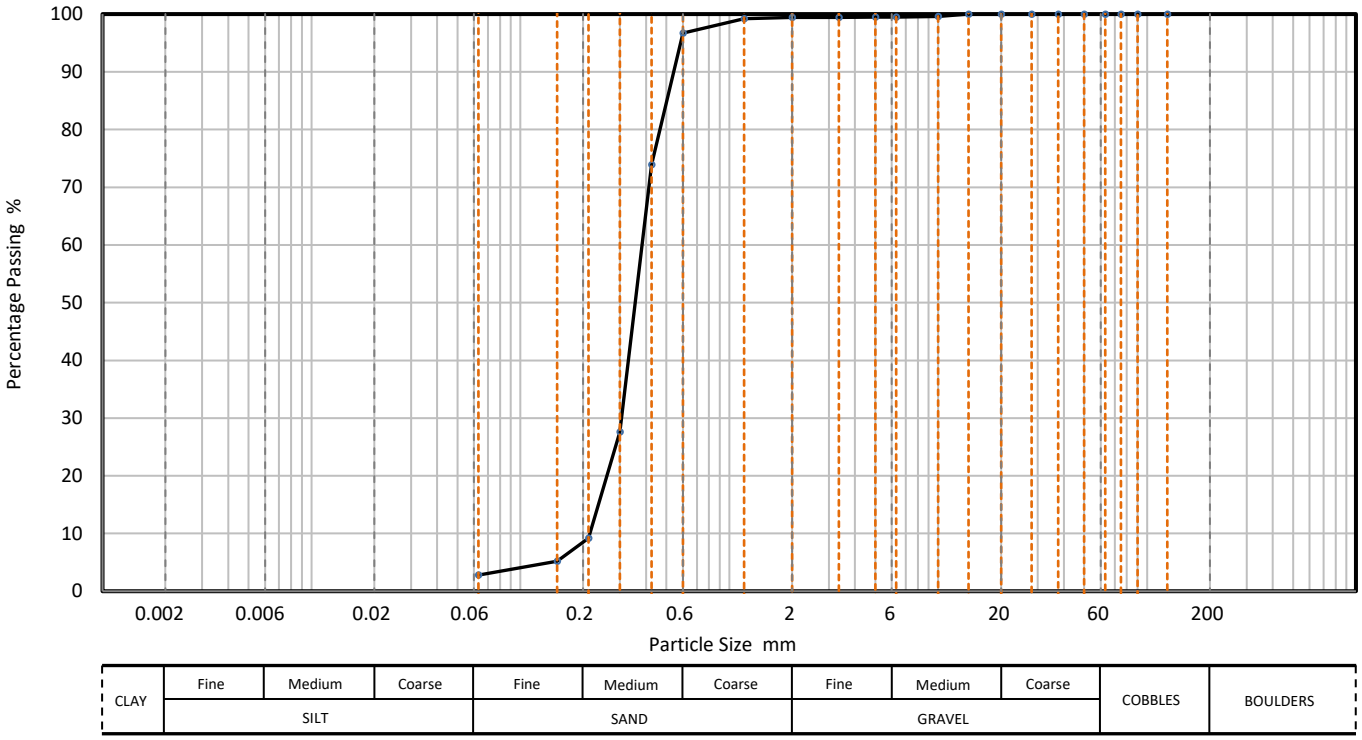
PARTICLE SIZE DISTRIBUTION

Site name	Job number
Rhostyllen, Wrexham	S200831

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

UKAS TESTING
7607

Hole		TP2	Lab sample ID	SLMK2020090412
Depth (Top)	m	1.00	Test Method	BS 1377 - 2 : 1990 Clause 9.2
Depth (Base)	m		Soil Description	Brown, slightly clayey SAND
Sample type		B		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	99		
2	99		
1.18	99		
0.6	97		
0.425	74		
0.3	28		
0.212	9		
0.15	5		
0.063	3		

Dry Mass of sample, g	672

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	0.6
Sand	96.6
Fines <0.063mm	3.0

Grading Analysis		
D100	mm	
D60	mm	0.383
D30	mm	0.305
D10	mm	0.215
Uniformity Coefficient		1.8
Curvature Coefficient		1.1

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	08/09/2020 10:23

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

Client:	Thistlewood Properties				
Site:	Rhostyllen, Wrexham				
Job No:	S200831				
Pit No:	TP1		Test No:	1	

CALCULATION OF SOIL INFILTRATION RATE

Time (min)	Depth (m)
0	1.2
0.5	1.23
1	1.25
2	1.27
3	1.29
4	1.31
5	1.33
6	1.35
7	1.36
8	1.38
9	1.4
10	1.41
15	1.48
20	1.54
25	1.6
30	
40	
50	
60	
90	
120	
180	

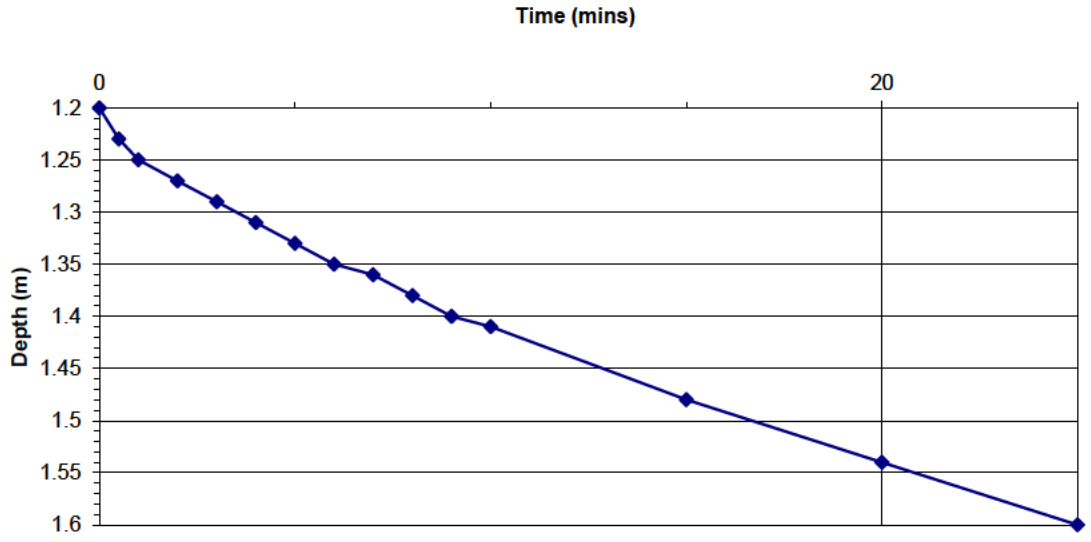
Pit Dimensions	Length (m) =	1.20
	Width (m) =	0.30
	Depth (m) =	1.60

Depth at start of test (m) =	1.200
Depth at end of test (m)=	1.600
75% level (m)=	1.300
50% Effective Depth	0.200
25% level (m)=	1.500
Base area of pit (m^2) =	0.360
Vp_{75-25} (m^3) =	0.072
a_{p50} (m^2) =	0.960

From the graph:	
tp 75 (min) =	3.5
tp 25 (min) =	16.55

Soil infiltration rate, f, (m/s) =	9.58E-05	normal test

Input by:	PF	Date:	02/09/2020
Checked by:	LC	Date:	09/09/2020



eurofins | Chemtest
Eurofins Chemtest Ltd
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

UKAS TESTING
2183

Final Report

Report No.:	20-23660-1
Initial Date of Issue:	10-Sep-2020
Client	Solmek Ltd
Client Address:	12 Yarm Road Stockton-on-Tees TS18 3NA
Contact(s):	Kathryn Watkin Office
Project	S200831 Rhostyllen, Wrexham

Quotation No.:		**Date Received:**	07-Sep-2020
Order No.:	LAB522	**Date Instructed:**	07-Sep-2020
No. of Samples:	4		
Turnaround (Wkdays):	5	**Results Due:**	11-Sep-2020
Date Approved:	10-Sep-2020		

Approved By:

[redacted]

Details: Glynn Harvey, Technical Manager

Results - Soil

Project: S200831 Rhostyllen, Wrexham

Client: Solmek Ltd		**Chemtest Job No.:**			20-23660	20-23660	20-23660	20-23660
Quotation No.:		**Chemtest Sample ID.:**			1059550	1059551	1059552	1059553
			Sample Location:		BH1	BH2	BH3	BH4
			Sample Type:		SOIL	SOIL	SOIL	SOIL
			Top Depth (m):		1.00	2.00	1.00	1.00
Determinand	**Accred.**	**SOP**	**Units**	**LOD**				
Moisture	N	2030	%	0.020	7.9	4.8	3.7	13
pH	U	2010		4.0	[A] 8.6	[A] 8.8	[A] 8.4	[A] 8.2
Sulphate (2:1 Water Soluble) as SO4	U	2120	mg/l	10	[A] < 10	[A] < 10	[A] < 10	[A] 15

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:
1059550			BH1		A	Plastic Tub 500g
1059551			BH2		A	Plastic Tub 500g
1059552			BH3		A	Plastic Tub 500g
1059553			BH4		A	Plastic Tub 500g

Test Methods

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

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
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

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

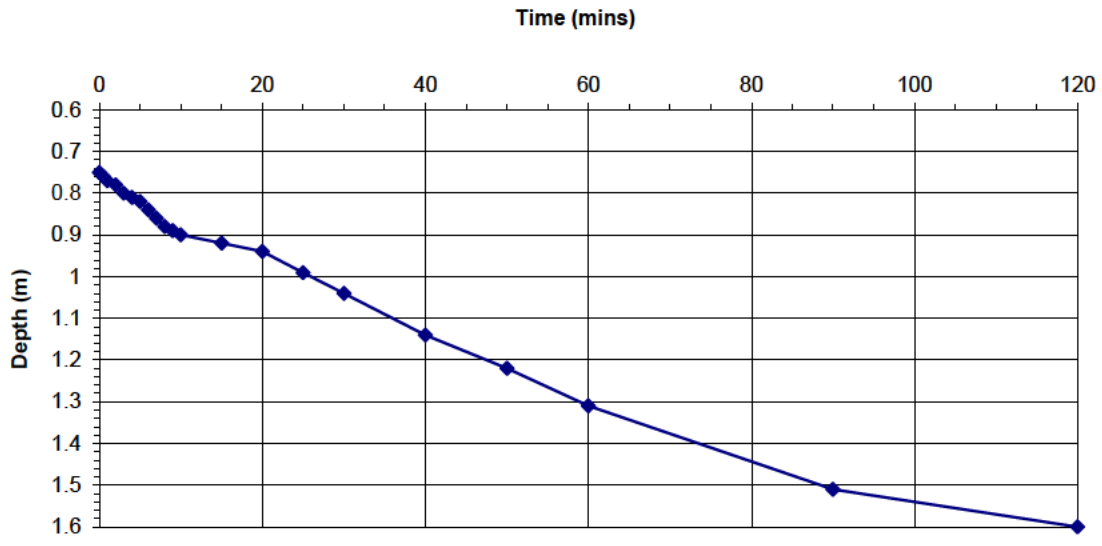
Client:	Thistlewood Properties				
Site:	Rhostyllen, Wrexham				
Job No:	S200831				
Pit No:	TP2		Test No:	1	

CALCULATION OF SOIL INFILTRATION RATE

Time (min)	Depth (m)
0	0.75
0.5	0.76
1	0.77
2	0.78
3	0.8
4	0.81
5	0.82
6	0.84
7	0.86
8	0.88
9	0.89
10	0.9
15	0.92
20	0.94
25	0.99
30	1.04
40	1.14
50	1.22
60	1.31
90	1.51
120	1.6
180	

Pit Dimensions	
Length (m) =	1.20
Width (m) =	0.30
Depth (m) =	1.60
Depth at start of test (m) =	0.750
Depth at end of test (m)=	1.600
75% level (m)=	0.963
50% Effective Depth	0.425
25% level (m)=	1.388
Base area of pit (m^2) =	0.360
Vp_{75-25} (m^3) =	0.153
a_{p50} (m^2) =	1.635
From the graph:	
tp 75 (min) =	22.3
tp 25 (min) =	74
Soil infiltration rate, f, (m/s) =	3.02E-05 normal test

Input by:	PF	Date:	02/09/2020
Checked by:	LC	Date:	09/09/2020



APPENDIX E:
Notes on Limitations & Contamination Guidance

SOLMEK NOTES ON CONTAMINATION GUIDANCE (REF: VERSION 1/2020)

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 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.

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

REQUIREMENTS OF PARTIES WITHIN THE DEVELOPMENT PROCESS

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

RISKS & LIABILITIES FROM CONTAMINATION

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

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

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

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.