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GROUND INVESTIGATION REPORT

**FOR
BROWNSIDE MILL,
BRUN TERRACE,
BURNLEY,
LANCASHIRE**

**PREPARED FOR
M. SMITHSON PROPERTIES
LTD**

**REPORT NO. 7416B
JUNE 2022**

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GROUND INVESTIGATION AT BROWNSIDE MILL, BRUN TERRACE, BURNLEY, LANCASHIRE, BB10 3JR

CLIENT: M. SMITHSON PROPERTIES LTD

ENGINEER: BLUEPRINT BUILDING CONSULTANTS LTD

1. INTRODUCTION

This report has been prepared in accordance with emailed instructions, dated 22nd February 2022 and 12th May 2022, from the Engineer on behalf of the Client.

The brief was set out in our estimates, ref. E5478A dated 21st February 2022 and E5738 dated 12th May 2022, with amendments as the investigation proceeded and includes:

- 3 No. cable percussive boreholes
- 3 No. rotary boreholes
- Insitu testing
- Geotechnical laboratory testing
- Contamination analysis
- Installation of standpipes followed by groundwater and ground gas monitoring
- Provision of an interpretative report on the above.

It should be noted that we have previously issued the following reports for this site which should be read in conjunction with this Phase II Ground Investigation Report:

- Phase I Desk Study Report, ref. 7416 and dated February 2022.
- Geological & Mining Appraisal, ref. 7416A and dated April 2022.

1.1 Site Location and Description

The site is located at Brownside Mill, Brun Terrace, Burnley, Lancashire, BB10 3JR, as indicated on Figure 1. The approximate National Grid Reference of the centre of the site is 386503 432526.

As shown on Figure 2, the site comprises a roughly rectangular shaped plot of land of 0.06ha located in the north west of Brownside Mill; a works premises comprising several industrial units presently occupied by Laserworld Engineering, SB Metals and Raw Feeding Lancashire To the south east the site is largely bound by a concrete surfaced yard area with an adjoining building in the north. Elsewhere the site is surrounded by open areas of rough ground generally with an grassed uneven surface. The River Brun is located approximately 16m to the south west.

The site comprises the partially derelict shell of a previous building that had been destroyed by fire, with the rear and side walls still remaining. An existing concrete floor slab is present across the site.

1.2 Proposed Development and Purpose of the Ground Investigation

We understand that it is proposed to erect six adjoining steel frame industrial units on the existing derelict building footprint, fronting to the southeast, as shown on Figure 3. With a refuse/recycling area and twelve parking spaces adjacent to the site.

The purpose of the investigation was to determine the ground conditions at the positions of the exploratory holes, to assess the likelihood of a general pattern of strata being present below the site and to establish the load bearing characteristics of the strata deriving, if possible, an assessment of the suitability of appropriate founding techniques.

It was also required to determine the presence of any shallow coal seams, and associated mine workings, in order to assess the risk to near surface ground stability.

In addition contamination analysis and assessment was required in order to determine necessary precautions and/or remedial measures required for the proposed development and to ascertain the need for any further sampling and analysis.

Ground gas monitoring and assessment was also required to determine necessary precautions and/or remedial measures.

2. INVESTIGATION

2.1 Investigation Details

Three 150mm diameter boreholes were put down by cable percussive boring techniques at the positions determined and set out by Sub Surface North West Ltd, as shown on Figure 4. The boreholes were put down to depths of between 8.45m and 12.45m, samples taken were logged in accordance with BS EN ISO 14688-1: 2018 and BS EN ISO 14689-1: 2018 and the resulting Borehole Records are appended.

Three rotary boreholes were put down to a depth of 35.00m using a Beretta T44 drill rig at the positions determined and set out by Sub Surface North West Ltd, as shown on Figure 4. Boreholes were advanced by rotary open holing techniques, with water flushing medium, using 100mm diameter rock roller bits and 150mm diameter temporary casing. The foreman driller logged chippings flushed to the surface during drilling and the resulting Rotary Borehole Records are appended.

2.2 Sub Surface Detail

Details of the strata encountered in the ground investigation are given on the appended Borehole Records. The exploratory holes found made ground overlying cohesive drift deposits and granular drift deposits underlain by Coal Measures strata bedrock. A general summary of the strata found is as follows:

2.2.1 Made Ground

Made ground was encountered in BH1, BH2 and BH3 to depths of 1.70m, 2.90m and 1.20m, respectively. An initial concrete slab was found to 0.30m underlain by brick to 1.00m in BH1. Below depths of 1.00m in BH1 and 0.30m in BH2 and BH3, was encountered granular made ground generally comprising dark brown locally clayey sandy fine to coarse gravel sized fragments of stone, and occasional brick and concrete. A chemical odour was noted in this material in BH3.

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R1, R2 and R3 encountered concrete to depths of 0.30m, 0.40m and 0.30m, underlain by locally ashy gravel sized fragments of stone and brick to depths of 0.60m, 0.80m and 1.00m, respectively.

Below 0.90m, BH2 encountered cohesive made ground comprising dark grey, light grey and brown mottled sandy silty clay with occasional stone gravel and pieces of string.

Below 1.20m, BH3 encountered probable made ground to 5.00m comprising dark greyish brown very clayey very sandy gravel sized fragments of stone with many stone cobbles and pockets of clay.

2.2.2 Drift Deposits

Underlying the made ground/ probable made ground, at respective depths of 1.70m, 2.90m and 5.00m, BH1, BH2 and BH3 encountered cohesive drift deposits generally comprising dark brownish grey slightly gravelly slightly sandy silty clay. This strata was found to be firm medium strength in BH1; soft low strength becoming stiff high strength at 4.10m and firm medium strength at 5.00m in BH2; and firm medium strength becoming high strength at 6.00m in BH3. Comparable cohesive soils were encountered in R1, R2 and R3 to depths of 8.60m, 8.00m and 8.20m, respectively.

Below depths of 4.50m and 6.00m, BH1 and BH2 encountered stiff high strength thinly laminated dark brownish grey slightly gravelly silty clay.

Below depths of 7.50m and 6.30m, BH1 and BH3 encountered very stiff very high strength greyish brown and occasional orangish brown and dark grey mottled slightly gravelly slightly sandy silty clay.

At depths of 8.70m and 8.00m, BH2 and BH3 were underlain by granular drift deposits comprising dense to very dense dark brown silty sandy gravel. Underlying the clays at 8.60m, 8.00m and 8.20m, R1, R2 and R3 encountered sand and gravel with occasional boulders to depths of 9.80m, 10.10m and 10.90m.

Gravel in drift deposits consisted of subangular to subrounded fine to coarse sandstone, siltstone, quartz and coal.

2.2.3 Bedrock

R1, R2 and R3 encountered bedrock at depths of 9.80m, 10.10m and 10.90m, initially comprising brown sandstone to depths of 10.60m, 10.80m and 10.90m. This was underlain by grey mudstone, locally interbedded with dark grey siltstone and, with increasing depth, occasional sandstone bands.

The boreholes encountered no coal seams, and no voids, broken ground, loss of flush or groundwater inflows that might be indicative of mineworkings.

2.2.4 Groundwater

A summary of groundwater entries and levels are tabulated below:

TABLE 1 GROUNDWATER

Expl. Hole No.	Water Entry Depth (m)	Rate of Inflow	Depth Sealed (m)	Depth to Standing Water Level* (m)
BH1	7.90	Slow	NS	7.00
BH2	8.70	Slow	NS	8.10
BH3	4.80 7.50	Slow Moderate	5.00 NS	4.40 5.90

* after 20 minutes, NS = Not Sealed

It should be noted that groundwater levels and rates of inflow may be subject to seasonal and/ or climatic variations.

Monitoring of standpipes installed to 6.00m in BH1, BH2 and BH3 found groundwater to be at minimum depths of 3.20m, 2.15m and 2.80m, respectively.

3. SAMPLING, TESTING AND MONITORING

3.1 Sampling

Samples were obtained from water entries and continuous core, small disturbed and bulk disturbed samples were obtained for the strata encountered and were subjected to careful examination.

In the cable percussive boreholes five 100mm diameter undisturbed samples were recovered from cohesive strata and submitted for testing in the laboratory.

The samples will be retained for a period of one month after the issue of this report, for reference purposes, and then disposed of unless otherwise instructed.

3.2 Field Testing

Twenty-two Standard Penetration Tests (SPTs) were performed in the boreholes, the results of which are recorded on the appended Standard Penetration Test Results Sheet with 'N' values and indicative relative density and shear strength, where appropriate, given on the appended Borehole Records.

3.3 Installations and Monitoring

On completion of BH1, BH2 and BH3, hdpe standpipes were installed to a depth of 6.00m. The standpipes are slotted from 1.00m depth, have an internal diameter of 50mm and have removable quick release gas valves to enable both ground gas and groundwater monitoring and sampling to be undertaken. Details of the installations are given on the appended Borehole Records.

Monitoring of the standpipes for ground gas and groundwater has been undertaken on six scheduled occasions using portable equipment. A Gas Data GFM 435 was used for monitoring methane, carbon dioxide, oxygen, gas flows and atmospheric pressure. The results of the monitoring is given on the appended Ground Gas and Groundwater Monitoring Results sheet.

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3.4 Laboratory Testing

The following laboratory tests were carried out in accordance with BS.1377: 1990, where applicable, and the results are appended.

- Moisture content, plastic limit and liquid limit tests
- Quick undrained triaxial tests
- Particle size distribution by wet sieve analysis
- Soluble sulphate content and pH value tests.

Contamination analyses have been performed on three soil samples to determine: pH and concentrations of sulphate, sulphide, cyanide, arsenic, boron (soluble), cadmium, chromium, hexavalent chromium, copper, lead, mercury, molybdenum, nickel, selenium, zinc, speciated total petroleum hydrocarbons (TPHs), the speciated polynuclear aromatic hydrocarbons (PAHs) suite, the benzene/ ethylbenzene/ toluene/ xylene (BTEX) suite and phenols. In addition three soil samples were subjected to an asbestos screen.

In addition two soil samples were also analysed for a suite of volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs) to identify chlorinated solvent contamination.

To investigate the potential risk of contamination associated with fire-fighting foams potentially used on site, two soil samples have been subjected to a suite of poly- and perfluoroalkyl substances (PFAS).

Contamination analyses have also been performed on three samples of groundwater taken on 20/04/2022 from the standpipes installed in BH1, BH2 and BH3 to determine: pH and concentrations of sulphate, sulphide, cyanide, arsenic, boron (soluble), cadmium, chromium, hexavalent chromium, copper, lead, mercury, molybdenum, nickel, selenium, zinc, speciated TPHs, the speciated PAHs suite, the BTEX suite and phenols.

In addition of the water samples were analysed for a suite of poly- and perfluoroalkyl substances (PFAS) to investigate contamination risk associated with fire-fighting foams.

The results of the above analyses are appended.

4. APPRAISAL AND RECOMMENDATIONS

4.1 Comments on the Profile

At the outset it should be appreciated that only a small proportion of the area to be developed has been investigated and consequently the recommendations made and opinions expressed in this report can only be applied to such conditions as were encountered in the exploratory holes.

The exploratory holes indicate a nature and degree of similarity to the extent that we consider them likely to be representative of the natural ground conditions. However, no guarantee can be given.

Due to the site having been previously developed, and the nature of made ground, localised variations in thickness and composition should be anticipated and hence interpolation or extrapolation from the exploratory holes to adjoining areas should only be undertaken with caution.

Details of the findings of the investigation are given on the appended Borehole Records and a summary of the ground conditions is given in Section 2.2.

4.2 Geology and Mining

4.2.1 Geological and Mining Appraisal

The geological appraisal indicated that the site would be underlain by drift deposits, largely comprising Glacial Boulder Clays, overlying Lower Coal Measures bedrock, comprising interbedded mudstones, siltstones and subordinate sandstones with occasional coal seams. An unnamed sandstone sequence was anticipated to outcrop in the area of the site.

The site was identified to be located on a downthrown block, bound approximately 24m to the north east and 185m to the south west, by roughly parallel north west to south east trending normal faults. Although it could be established that the intervening strata was younger than that either side of the faults, due to lack of detail on the map and the complexity of the outcropping geology in the wider area, it was not possible to determine an accurate stratigraphic age of the bedrock underlying the site at rockhead. Due to the limited outcropping and data associated with the fault-bound block it was also not possible to establish the dip of the strata.

In addition the geological map showed the fault planes identified above to be inclined away from the surface fault line and extending beneath the downthrown block. As a result the fault to the north east of the site was indicated to extend beneath the site and bisect a coal seam (Dandy Coal) at an unspecified depth. It was established that the stratigraphic sequence located to the north east of the fault zone, expected to underlie the site at depth, could be anticipated to be older than that encountered at rockhead. It was also indicated that additional sympathetic faults are likely to be present further complicating matters.

As a consequence of the above, it was not possible to accurately determine the stratigraphic sequence underlying the site including the presence and depth of potentially worked coal seams.

The Coal Mining Report indicated that the site was underlain at 20m and 48m below ground level by worked coal seams with an extraction thickness of 0.80m. These workings were both indicated to be in the Rushy Park coal seam, which was usually recorded as the Dandy Mine in the Burnley Area, and would indicate that they are separated by a fault with a throw of some 28m. Alternatively it was considered that one of the coal seams identified in the Coal Mining Report may be in within younger strata in the downthrown block to the south west of the fault. These were identified on the Generalized Vertical Section as the Lady Mine or China Mine coal seams.

The Coal Mining Report indicated that the Coal Authority are not aware of any recorded abandoned mine entries within the site or within 100m of the site. It should be noted that the Coal Authority records may be incomplete and hence mine entries may be present for which the Coal Authority has no knowledge

Given the findings of the geological and mining appraisal, which identified a worked coal seam at 20m beneath ground level according to the Coal Authority Report, it was recommended that three rotary boreholes were taken out to up to 30m depth followed by a ground stability assessment in order to determine whether remedial measures are required for the proposed development.

4.2.2 Findings of the Ground Investigation

The rotary borehole investigation found made ground overlying cohesive and granular drift deposits to rockhead at depths of between 9.80m and 10.90m, initially comprising brown sandstone. At depths of between 10.60m and 10.90m this was underlain by grey mudstone, locally interbedded with dark grey siltstone and, with increasing depth, occasional sandstone bands.

The boreholes encountered no coal seams, and no voids, broken ground, loss of flush or groundwater inflows that might be indicative of mineworkings.

4.2.3 Conclusions and Recommendations

The findings of the ground investigation indicated that no shallow coal seams or evidence of coal workings are present beneath the site, at depths of up to 35m below ground level. If coal workings are present at greater depths the investigation established that the thickness of overlying competent bedrock is at least of the order of approximately 15m.

Surface instability arises when the collapse of mineworkings migrates upwards through the roof strata and back to the surface or near surface level. There is considered to be a potential for this if there is less than ten times the unworked thickness of the coal seam in intact rock strata above the mined coal seam.

Given the above we consider that no ground stabilisation measures or precautions need be considered in relation to mineworkings.

Although we have traced no record of mine entries, observations should be kept throughout all site operations for signs attributable to an unrecorded mineshaft or adit. If a mineshaft or adit is suspected, appropriate action would need to be taken in the light of the established condition and location as determined by inspection and investigation.

4.3 Foundations

We understand that it is proposed to construct six adjoining steel frame industrial units on the site. However, at the time of writing this report no specific details regarding the proposed foundations and design loadings were available and consequently the recommendations given are in general terms only.

The ground investigation found made ground/ probable made ground to depths ranging from 1.70m to 5.00m underlain by medium locally low strength clays generally becoming high to very high strength with increasing depth and locally underlain by dense to very dense gravel.

We would not recommend founding in the made ground in its present condition because of its inherent variability in consistency and compaction, and in parts the nature of its constituents.

In view of the depth of made ground shallow foundations in natural ground are not feasible. For the ground conditions encountered on this site we would recommend a piled foundation solution.

With regard to the choice of pile type, consideration could be given to driven piles, continuous flight auger (CFA) piles or cast in-situ bored piles with the driven pile option probably being the most economical. However, in considering piles driven to a pre-determined set in the more competent strata at depth, it is essential to ensure that any vibrations set up during the driving process are not transmitted to adjacent/ nearby buildings, structures, services and/or slopes/ retaining walls as they may be detrimentally affected. Consequently, in respect of driven piles, we recommend that any tendering Specialist Piling Contractor confirm that vibrations will not detrimentally affect adjacent/ nearby buildings, structures, services and/or slopes/ retaining walls. If such confirmation cannot be given then we would recommend using either CFA or cast in-situ bored piles.

Care must be taken to space the piles in any group to ensure the adequate utilisation of skin friction where this has been assumed in the calculation of the load bearing capacity of an individual pile. Checks must also be undertaken to confirm that the underlying ground supporting the pile group is not overstressed.

In determining the final pile design it should be noted that up to 5.00m of the piles may be in made ground and due regard should be paid to the lack of lateral restraint over this length in cases where significant lateral forces are to be catered for.

To provide assistance for estimating purposes only, we have undertaken a preliminary pile design calculation for a 12.00m long pile taking into consideration the ground conditions at BH2, as follows:

Preliminary Pile Design based on strata in BH2 (water at 2.90m)

Bored Cast In-situ or CFA Pile Factor of Safety: 2.5 (shaft), 3.0 (end)
Dia. = 0.30m, Perimeter = 0.94m, Cross Section Area = 0.07m², Length = 12.00m

0.00 to 2.90m	MADE GROUND	ignore
2.90 to 6.00m	Low to medium strength CLAY	(c = 59kN/m ²)
	Allowable Shaft Friction	= 14.2kN/m ²
	Allowable Shaft Friction Load	= <u>41kN</u>
6.00 to 8.70m	High strength CLAY	(c = 116kN/m ²)
	Allowable Shaft Friction	= 28.0kN/m ²
	Allowable Shaft Friction Load	= <u>71kN</u>
8.70 to 12.00m	Very dense sandy GRAVEL	(N = 50/235mm)
	Allowable Shaft Friction	= 25.5kN/m ²
	Allowable Shaft Friction Load	= <u>79kN</u>
12.00m	Very dense sandy GRAVEL	(N = 50/245mm)
	Allowable End Bearing	= 695kN/m ²
	Allowable End Bearing Load	= <u>48kN</u>

Total Allowable Working Load = 41 + 71 + 79 + 48 = 239kN

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In order to use the load carrying capacity attributable to both shaft friction and end bearing, the final design figures should be checked to ensure that the ultimate shaft friction is greater than or equal to the allowable working load, otherwise end bearing only should be used.

In order to use the full load carrying capacity attributable to end bearing for bored cast in-situ piles either base ramming should be carried out or settled debris should be removed.

To formulate the most satisfactory and economic scheme we recommend that competitive tenders and designs from Specialist Piling Contractors should be sought using the exploratory hole information obtained.

4.4 Floor Slab Construction

With regard to the design and construction of normal ground bearing floor slabs, it should be noted that due to the thickness of Made Ground there will be a risk of significant total and differential settlements, the extent of which will be a matter of chance rather than being assessable by calculation.

To obviate any significant damaging settlements we would recommend using a suspended floor slab with intermediate support designed on the same basis as the main foundations where the spans are too large for economical single suspended slab design.

This is an expensive form of construction and we would recommend that careful consideration is given to the extent to which the maintenance of a very uniform level surface is essential. If some degree of tolerance is available in this respect, we would recommend consideration is given to a compromise solution, which, whilst not guaranteeing any specific limit to the degree of movement would nevertheless provide some reduction in the risks involved and at the same time be a cheaper option.

The compromise solution referred to above involves removing approximately 0.60 metres of Made Ground, placing a layer of geotextile material and then building up to the underside of the slab using a graded granular hardcore, placed and compacted in layers not exceeding 150mm followed by the construction of suitably reinforced concrete slab with shear reinforcement at all joints cast on a 50mm bed of compacted sand.

The design of the slab size and reinforcement will be controlled by the extent to which tilting of the slabs can be tolerated and the static and live loading to be supported.

Alternatively if consideration is being given to using the existing floor slab and provided there will not be a significant increase in the loads placed on it in the past, then the majority of settlement should already have taken place.

4.5 Excavations and Groundwater

There should be no particular difficulties in excavating the strata indicated in the exploratory holes utilising an appropriate and suitably sized mechanical excavator.

It is recommended that all excavations to greater than 1.20m depth, or for shallower excavations where groundwater is encountered above this level, are closely supported, especially where man entry is required. Alternatively, where space permits, the excavations might be battered back to an appropriate angle.

Groundwater inflows were encountered in BH1, BH2 and BH3, at depths of 7.90m, 8.70m and 4.80m, rising to 7.00m, 8.10m and 4.40m after 20 minutes, respectively. It should be noted that groundwater levels and rates of inflow may be subject to seasonal and/ or climatic variations.

Monitoring of standpipes installed to 6.00m in BH1, BH2 and BH3 found groundwater to be at minimum depths of 3.20m, 2.15m and 2.80m, respectively.

Given the limited information, groundwater seepages or inflows are not anticipated in shallow excavations. Should groundwater seepages occur and water accumulate in the excavation it should be able to be removed by pumping from a filtered sump.

4.6 Buried Concrete

For the design of buried concrete the recommendations given in Building Research Establishment (BRE) Special Digest 1 (February 2017 revision), "Concrete in Aggressive Ground", should be followed.

Determination of pH on the soil and groundwater samples gave values in the range of 7.5 to 11.3. Soluble sulphate concentrations were also determined for the soil and groundwater samples and the results ranged from 0.07g/l to 0.87g/l and 0.01g/l to 0.07g/l respectively. The results indicate that the Design Sulphate Class for the site should be DS-2.

Our knowledge of the site and ground conditions indicates that the site is "brownfield" with mobile groundwater. Consequently, in accordance with the Design Sulphate Class for the site together with the site and groundwater conditions an Aggressive Chemical Environment for Concrete (ACEC) classification of AC-2 should be used as detailed on the appended extract.

4.7 Contamination Considerations

We have previously undertaken a Phase I Report, ref. 7416 and dated February 2022 and this Phase II ground investigation has been undertaken to provide an initial contamination risk assessment in accordance with the Phase I Conceptual Ground Model. Based upon the findings of the above additional sampling, analysis and assessment may be required.

It should be appreciated that the suite of determinants analysed for consists of a range of contaminants identified in the Conceptual Ground Model. However, the absence of any other specific contaminants cannot be guaranteed.

4.7.1 Assessment (Soil)

In order to provide an assessment of the presence of contamination five soil samples have been analysed for a suite of determinants and the results are appended.

Levels of the determinants have been compared against the most recently published guideline values. Contaminated Land: Applications in Real Environments (CL:AIRE) published guideline values in December 2009 to supplement previous guideline values. The Department for Environment, Food and Rural Affairs (DEFRA) published in March 2014 Category 4 Screening Levels (C4SLs) for arsenic, cadmium, lead, hexavalent chromium, benzo(a)pyrene and benzene. Land Quality Management Limited (LQM)/ Chartered Institute of Environmental Health (CIEH) then published Suitable for Use Levels (S4ULs) in November 2014, which largely superseded the previous guideline values. Updated S4ULs values for cadmium and phenols were published in July 2015 and for nickel in August 2015. The guideline values (S4ULs and occasionally C4SLs and CL:AIRE) are derived using the Environment Agency's CLEA Model and vary dependent upon the land use; allotment and residential use being the most sensitive and commercial/ industrial use being the least sensitive.

For the purposes of assessment, as the proposed development is industrial units, contamination analyses have been compared with the guideline values for a standard land use of commercial and industrial.

The contamination analysis determined no elevated levels of the determinants analysed for when compared with the guideline values for a standard land use of commercial and industrial. Guideline values for the assessment can be supplied directly to the Regulator, if requested.

An asbestos screen was undertaken on three soil samples and asbestos was detected in made ground sampled from 0.30m in BH3. Analysis determined that chrysotile cement was present. Asbestos quantification by gravimetry determined that 0.53% total asbestos was present.

In addition to the above, an assessment of risk to personnel who will come into contact with on-site materials throughout the site has been undertaken.

4.7.2 Assessment (Water)

Three samples of groundwater taken from the standpipes installed in BH1, BH2 and BH3 on 20/04/2022 have been analysed for a suite of determinants in accordance with the Conceptual Ground Model and the results are appended.

To assess the risk to surface water bodies the results have been compared with the Environmental Quality Standards (EQS) for annual allowable concentrations, published in the Department of Environment Food and Rural Affairs (DEFRA) Water Framework Directive Directions 2015, or the best equivalent (e.g. the Dangerous Substance Directive List II Substances).

To assess the risk to groundwater resources the results have been compared with the United Kingdom Drinking Water Standards (UK DWS), published in the Water Supply (Water Quality) Regulations 2016. Where no UK DWS is available the World Health Organisation (WHO) Drinking Water Guidelines have been adopted.

The EQS values for copper, nickel, lead and zinc are based on the bioavailable component, however as the groundwater analyses report total concentrations of metal ions rather than bioavailable concentrations and consequently may indicate a false exceedance of the EQS. For the purposes of this assessment the bioavailability of copper, lead, nickel and zinc has been estimated using the Water Framework Directive UKTAG Pb Screening Tool spreadsheet and Metal Biodiversity Assessment Tools (M-BAT) spreadsheet, and the results are appended.

We have listed the samples where the levels of contamination have exceeded the EQS, UK DWS and/ or WHO, as follows:

TABLE 2 ASSESSMENT OF GROUNDWATER CONTAMINATION

Determinant	Expl. Hole No	Depth (m)	Recorded Level (µg/l)	EQS (µg/l)	UK DWS (µg/l)
Cadmium	M2	2.40	0.32	0.08	50
Copper	M2	2.40	1.3 [#]	1.0 _{bio}	2000
Nickel	M2	2.40	4.7 [#]	4.0 _{bio}	20
Lead	M2	2.40	3.0 [#]	1.2 _{bio}	10
	M3	3.80	3.0 [#]		
Selenium	M3	3.80	19.0	-	10
Zinc	M2	2.40	21.2 [#]	12.3* _{bio}	5000
	M3	3.80	37.2 [#]		

bio = bioavailable, # bioavailable concentration, *10.9 + ambient background concentration.

In addition, the results of the PFAS contamination analyses found several of the compounds to have elevated concentrations greater than the EQS standard of 0.65ng/l, with the largest detected concentration of 7.48ng/l. However the levels were significantly lower than the adopted UK DWS value of 100ng/l. It should be noted that the LOD for most of the compounds were for concentrations higher than the EQS value.

The previous Desk Study Report (ref. 7416) identified that the site was likely to be underlain by glacial drift deposits overlying Coal Measures bedrock, designated as Secondary Undifferentiated and Secondary A aquifers, respectively. The ground investigation encountered a significant thickness of low permeability cohesive strata in the glacial deposits underlying the made ground which would prevent any significant movement of contaminated groundwater perched within the made ground. In addition the Desk Study identified that the site is not within 500m of a Source Protection Zone, with no groundwater or surface water abstraction points within 1km. The nearest surface water course was identified as the River Brun located approximately 16m to the south west.

Given the above, we would consider the elevated concentration of selenium, which exceeded the UK DWS, encountered in perched groundwater taken from M3 to present a negligible risk of significant pollution to groundwater resources. It should be noted that the UK DWS is a post treatment standard and as such is very stringent.

In addition given the low permeability of the underlying drift strata, we would consider the risk of significant pollution of controlled surface waters from the relatively low concentrations of cadmium, copper, lead, nickel, zinc and several PFAS compounds detected in the perched groundwater samples taken from M2 and M3, which did not exceed the UK DWS, as being negligible.

4.7.3 Conclusions and Recommendations

Section 78a(2) of the Environmental Protection Act: 1990 as amended by the Contaminated Land (England) (Amendment) regulations 2012, and Section 86 of the Water Act 2003, defines CONTAMINATED LAND for the purposes of Part IIA as:

“any land which appears to the LOCAL AUTHORITY in whose area it is situated to be in such a condition, by reason of substances in, on or under the land, that:

- (a) SIGNIFICANT HARM is being caused or there is a SIGNIFICANT POSSIBILITY of such harm being caused; or
- (b) SIGNIFICANT POLLUTION OF CONTROLLED WATERS is being, or is likely to be, caused”

Before a LOCAL AUTHORITY can make the judgement that land appears to be CONTAMINATED LAND on the basis that SIGNIFICANT HARM is being caused, or that there is a SIGNIFICANT POSSIBILITY of such harm being caused, the LOCAL AUTHORITY must identify a SIGNIFICANT POLLUTANT LINKAGE. This means that each of the following has to be identified:

- (a) a CONTAMINANT;
- (b) a relevant RECEPTOR (defined as living organisms, ecological systems, controlled waters or property); and
- (c) a PATHWAY by means of which either:
 - (i) the CONTAMINANT is causing SIGNIFICANT HARM to that RECEPTOR, or
 - (ii) there is a SIGNIFICANT POSSIBILITY of such harm being caused by that CONTAMINANT to that RECEPTOR

It should be noted that the words in capitals have a legal definition within the legislation.

Without a clear identification of all three elements of the pollutant linkage, land cannot be identified as contaminated under the regime.

The National Planning Policy Framework states that, “after remediation, as a minimum, land should not be capable of being determined as contaminated land under Part IIA of the Environmental Protection Act 1990”. Therefore, the general principles detailed above apply to this assessment.

Our assessment, the results of the contamination analysis, indicates fragments and/ or fibres of chrysotile asbestos within cement and lagging is present in the near surface Made Ground (source). The pathway from the source to site operatives during earthworks and the end users of the development will need to be removed by precautions and/ or remedial measures.

As the contaminated ground will be covered by buildings and hardstanding for the proposed development we consider that no other surface protection will be necessary.

Waste Soil Management

Contaminated materials should, where possible, be retained on site. However, it should be appreciated that contaminated material left on site is the legal responsibility of the landowner, unless the person who created the contamination can be identified.

If waste materials are to be removed from the site, classification of the waste should be undertaken to determine the most appropriate tip to use and the associated costs. It should be noted that significant cost savings can sometimes be made on waste disposal by correct classification of the waste, a service that we can provide.

It should be noted that all vehicles carrying contaminated material should be securely sheeted and the wheels and undercarriages cleaned before leaving site to ensure that hazardous materials are not dropped onto public roads.

Health Risks to Site Personnel

S4ULs, C4SLs and CL:AIRE assume long term contact with contamination and assess chronic health risk. The risk of short term acute exposure to site personnel is dealt with in the remit of the Health and Safety Executive under the Health and Safety at Work Act: 1974 and Regulations made under the Act, including the Control of Substances Hazardous to Health (COSHH) Regulations. The levels of contamination and risk to site personnel should be considered under the Construction Design and Management (CDM) Regulations at the planning stage and in the development of the designers and contractors Health and Safety Plans and Method Statements. The risk of contact with on-site soils should be minimised and the following precautions should be taken as a minimum requirement.

Site personnel involved in earthworks and excavations should be made aware of the hazards of working with contaminated materials found on the site. Strict personal hygiene should be observed and suitable personal protective equipment (PPE) should be worn. The presence of asbestos in made ground sampled from BH3 should be noted and dealt with in accordance with current safety guidelines. In addition smoking should be prohibited to minimise the potential for transfer of contaminants from hand to mouth.

Earthworks undertaken during dry weather might generate dust and in this instance dust should be damped down and asbestos grade Respiratory Protective Equipment (RPE) made available to site operatives. In addition, stockpiled materials should be sheeted over to prevent excessive airborne dust being formed.

4.8 Ground Gas Considerations

Ground gas monitoring has been undertaken on six scheduled occasions and the results of the monitoring visits are appended.

Ground gases: methane, carbon dioxide and oxygen and flow rate have been monitored and the ranges of ground gases and flow rate during the monitoring period are as follows:

TABLE 3 GROUND GAS CONCENTRATIONS AND FLOW RATE

Methane (% vol. In air)	Carbon Dioxide (% vol. in air)	Oxygen (% vol. in air)	Gas Flow Rate (litres/ hour)
0.0	0.0 – 0.3	20.1 – 21.7	<0.1

It can be seen from the monitoring that no elevated levels of methane or carbon dioxide, or depleted levels of associated oxygen, have been detected. In addition no gas flow has been detected.

Methane gas when present between 5% volume in air (Lower Explosive Limit - L.E.L.) and 15% volume in air (Upper Explosive Limit - U.E.L.) is potentially explosive and inflammable whilst carbon dioxide in conjunction with depleted oxygen is an asphyxiant. Both methane and carbon dioxide are a by-product of the anaerobic and aerobic decomposition of biodegradable materials.

The levels of gas have been assessed in accordance with British Standard 8485, "Code of practice for the design of protective measures for methane and carbon dioxide gasses for new buildings", published in June 2015 and updated in January 2019 (BS.8485:2015+A1:2019).

The characteristic hazardous gas flow rate (Q_{hg}) is calculated by dividing the maximum gas (methane or carbon dioxide) concentration by 100 and multiplying by the maximum flow rate in litres per hour (minimum 0.1 l/hr for Sub Surface monitoring equipment). For this site $Q_{hg} = [0.3/ 100] \times 0.1 = 0.0003$ l/hr

Based on the monitoring to date, BS.8485:2015+A1:2019, Table 2, indicates that the site falls into Characteristic Situation 1 (CS1).

BS.8485:2015+A1:2019, Table 4, indicates that for a CS1 and the type of development proposed a score of zero gives no protection and remedial measures required.

All excavations of greater than 1.20m depth should be routinely checked for air quality prior to man entry and appropriate precautions taken.

4.9 General

We recommend that consultation should be undertaken with, and the written approval obtained from, the Local Authority Environmental Health Officer, the Local Authority Building Control Officer and the Coal Authority prior to commencing development.

We trust that this report fulfils your present requirements but if you have any queries or we can be of further assistance please contact the undersigned or Ms Anna Marsden at our Preston office.

SUB SURFACE CONSULTANTS LIMITED
REPORT No. 7416B
JUNE 2022



T. Plum B.Sc.(Hons.), M.Sc., F.G.S.
Senior Geoenvironmental Engineer
For and on behalf of
Sub Surface Consultants Limited



C. A. Marsden B.Sc.(Hons.), C.Eng., M.I.C.E.
Director
For and on behalf of
Sub Surface Consultants Limited.

INSITU TEST RESULTS



SUB SURFACE

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Standard Penetration Test Results

Site : BROWNSIDE MILL, BRUN TERRACE, BURNLEY, LANCASHIRE

Client : M SMITHSON PROPERTIES LTD

Engineer : BLUEPRINT BUILDING CONSULTANTS LTD

Job Number
7416B

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Borehole Number	Base of Borehole (m)	End of Seating Drive (m)	End of Test Drive (m)	Test Type	Seating Blows per 75mm		Blows for each 75mm penetration				Result	Comments
					1	2	1	2	3	4		
BH1	1.20	1.35	1.45	SPT	2	5	16	40			56/95mm	
BH1	3.00	3.15	3.45	SPT	2	3	3	4	4	6	N=17	
BH1	5.00	5.15	5.45	SPT	3	4	4	7	7	9	N=27	
BH1	6.00	6.15	6.45	SPT	4	5	5	8	9	9	N=31	
BH1	8.00	8.15	8.45	SPT	4	5	11	11	12	13	N=47	
BH1	9.00	9.15	9.45	SPT	7	9	10	12	12	13	N=47	
BH2	1.20	1.35	1.65	SPT	1	2	1	2	2	6	N=11	
BH2	2.00	2.15	2.45	SPT	2	2	2	2	3	3	N=10	
BH2	3.00	3.15	3.45	SPT	1	1	2	2	2	2	N=8	
BH2	4.00	4.15	4.45	SPT	2	4	5	5	6	8	N=24	
BH2	6.00	6.15	6.45	SPT	2	3	7	7	8	9	N=31	
BH2	7.50	7.65	7.95	SPT	2	4	5	6	7	9	N=27	
BH2	9.00	9.15	9.40	SPT	3	4	8	12	16	14	50/245mm	
BH2	10.50	10.65	10.88	SPT	4	8	12	16	14	8	50/225mm	
BH2	12.00	12.15	12.40	CPT	4	5	12	12	13	13	50/245mm	
BH3	1.20	1.20	1.20	CPT	25		50				25*/0mm	
BH3	2.00	2.15	2.45	SPT	1	2	4	4	5	6	50/0mm	
BH3	3.00	3.15	3.45	SPT	2	3	1	0	1	3	N=19	
BH3	4.00	4.15	4.45	CPT	2	4	5	5	5	6	N=5	
BH3	6.00	6.15	6.45	SPT	6	7	9	8	12	13	N=21	
BH3	7.50	7.65	7.95	SPT	10	11	11	12	12	13	N=42	
BH3	8.00	8.15	8.45	SPT	9	10	11	12	13	13	N=48	
BH3											N=49	

LABORATORY TEST RESULTS



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Laboratory Test Results

Site : BROWNSIDE MILL, BRUN TERRACE, BURNLEY, LANCASHIRE

Client : M SMITHSON PROPERTIES LTD

Engineer : BLUEPRINT BUILDING CONSULTANTS LTD

Job Number

7416B

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DETERMINATION OF MOISTURE CONTENT, LIQUID LIMIT AND PLASTIC LIMIT AND DERIVATION OF PLASTICITY AND LIQUIDITY INDEX

Borehole/ Trial Pit	Depth (m)	Sample	Natural Moisture Content %	Sample Passing 425µm Sieve		Liquid Limit %	Plastic Limit %	Plasticity Index %	Liquidity Index	Group Symbol	Laboratory Description
				Percentage %	Moisture Content %						
BH1	2.00	U	28	68	41	59	26	33	0.45	CH	Dark brownish grey slightly gravelly slightly sandy silty CLAY. Gravel is angular to subrounded fine to coarse sandstone and siltstone.
BH1	8.00	D	13	42	31	31	21	10	1.00	CL	Greyish brown and occasional orangish brown mottled slightly gravelly slightly sandy silty CLAY. Gravel is subangular to subrounded fine to coarse sandstone and siltstone.
BH2	3.00	D	31	78	40	26	19	7	3.00	CL	Dark brownish grey slightly gravelly slightly sandy silty CLAY. Gravel is angular to subrounded fine to coarse coal and sandstone.
BH2	5.00	U	15	60	25	32	17	15	0.53	CL	Dark brownish grey slightly gravelly slightly sandy silty CLAY. Gravel is angular to subrounded fine to coarse coal and sandstone.
BH3	5.00	U	29	72	40	56	25	31	0.48	CH	Dark brownish grey slightly gravelly slightly sandy silty CLAY. Gravel is angular to subrounded fine to coarse sandstone, siltstone and coal.

Method of Preparation : BS 1377:PART 1:1990:7.4 Preparation of samples for classification tests BS 1377:PART 2:1990:4.2 & 5.2 Sample preparations

Method of Test : BS 1377:PART 2:1990:3 Determination of moisture content 1990:4 Determination of the liquid limit BS 1377:PART 2:1990:5 Determination of the plastic limit and plasticity index

Remarks :



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Laboratory Test Results

Site : BROWNSIDE MILL, BRUN TERRACE, BURNLEY, LANCASHIRE

Client : M SMITHSON PROPERTIES LTD

Engineer : BLUEPRINT BUILDING CONSULTANTS LTD

Job Number
7416B

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DETERMINATION OF DENSITY, MOISTURE CONTENT AND UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT MEASUREMENT OF PORE PRESSURE

Borehole/ Trial Pit	Depth (m)	Sample	Moisture Content %	Bulk Density (Mg/m ³)	Dry Density (Mg/m ³)	Cell Pressure (kN/m ²)	Deviator Stress (kN/m ²)	Apparent Cohesion (kN/m ²)	Angle of Shearing Resistance (degrees)	Laboratory Description
BH1	2.00	U	28	2.14	1.66	50 100 150	128 128 0	64	0.0	Dark brownish grey slightly gravelly slightly sandy silty CLAY. Gravel is angular to subrounded fine to coarse sandstone and siltstone.
BH1	4.00	U	25	2.05	1.64	100 150 200	85 86 0	43	0.0	Dark brownish grey slightly gravelly slightly sandy silty CLAY. Gravel is angular to subrounded fine to coarse sandstone and siltstone.
BH1	7.50	U	13	2.21	1.95	150 200 250	288 299 311	150	0.0	Dark brownish grey slightly gravelly silty CLAY. Gravel is subangular to subrounded fine to coarse sandstone, siltstone and coal.
BH2	5.00	U	15	1.95	1.70	100 150 200	98 101 0	50	0.0	Dark brownish grey slightly gravelly slightly sandy silty CLAY. Gravel is angular to subrounded fine to coarse coal and sandstone.
BH3	5.00	U	29	2.00	1.55	100 150 200	130 0 0	65	0.0	Dark brownish grey slightly gravelly slightly sandy silty CLAY. Gravel is angular to subrounded fine to coarse sandstone, siltstone and coal.

Method of Preparation : BS 1377:PART 1:1990:7.4.2 Moisture content 1990: Preparation of undisturbed samples for testing BS 1377:PART 2:1990:7.2

Method of Test : BS 1377:PART 2:1990:3 Determination of moisture content 1990:7 Determination of density BS 1377:PART 7:1990:8 Undrained shear strength 1990:9 Multistage loading

Remarks :



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Laboratory Test Results

Site : BROWNSIDE MILL, BRUN TERRACE, BURNLEY, LANCASHIRE

Client : M SMITHSON PROPERTIES LTD

Engineer : BLUEPRINT BUILDING CONSULTANTS LTD

Job Number

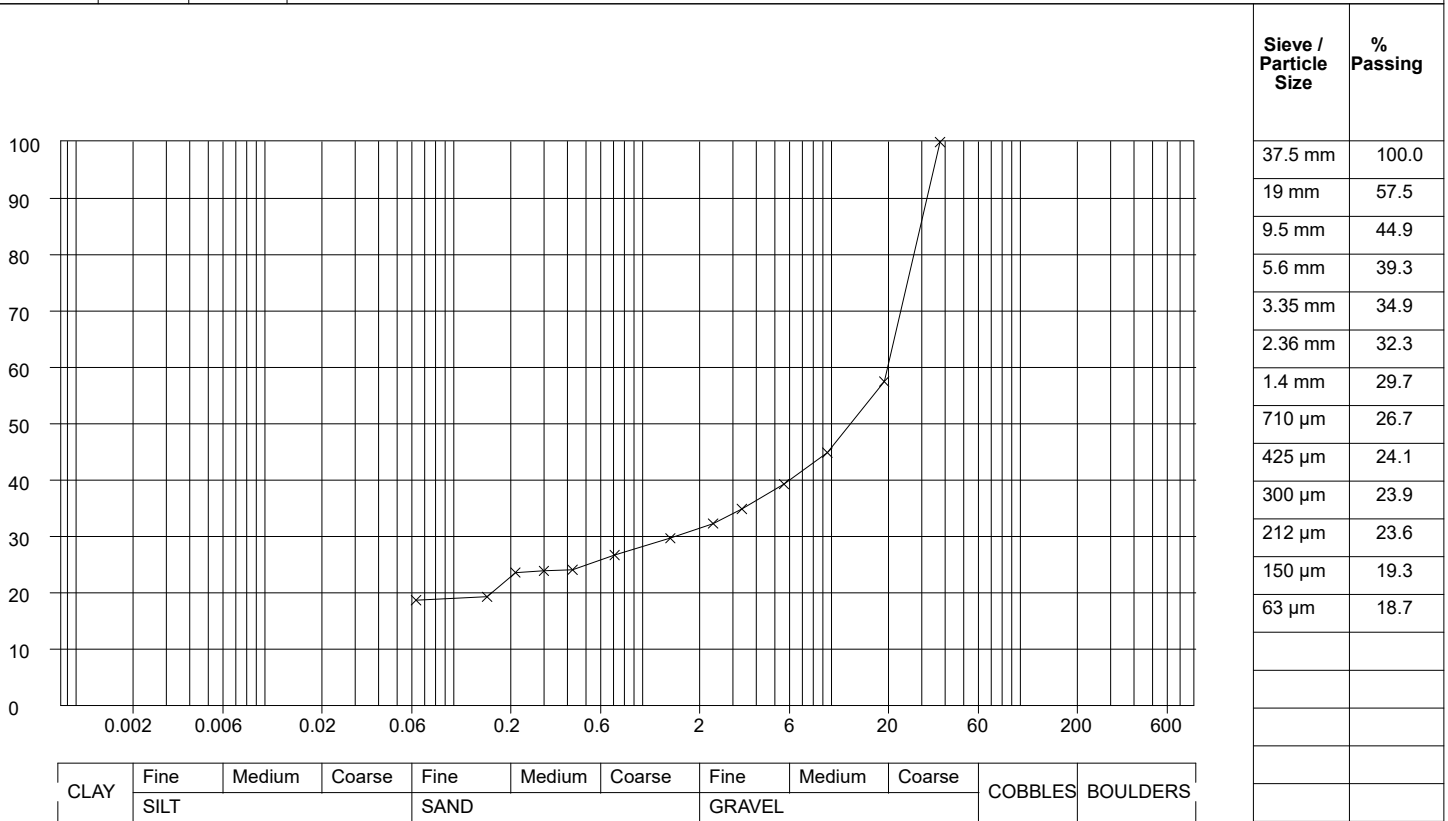
7416B

Sheet

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DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Laboratory Description
BH2	10.50 - 10.95	B	Dark brown silty sandy subangular to subrounded fine to coarse sandstone, siltstone and coal GRAVEL.



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

Grading Analysis	
D85	31.0 mm
D60	20.1 mm
D10	<63.0 µm
Uniformity Coefficient	-

Particle Proportions	
Cobbles + Boulders	-
Gravel	68.5%
Sand	12.8%
Silt	-
Clay	-

Method of Preparation : BS 1377:PART 1:1990:7.3 Initial preparation 1990:7.4.5 Particle size tests

Method of Test : BS 1377:PART 2:1990:9 Determination of particle size distribution

Remarks :



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Laboratory Test Results

Site : BROWNSIDE MILL, BRUN TERRACE, BURNLEY, LANCASHIRE

Client : M SMITHSON PROPERTIES LTD

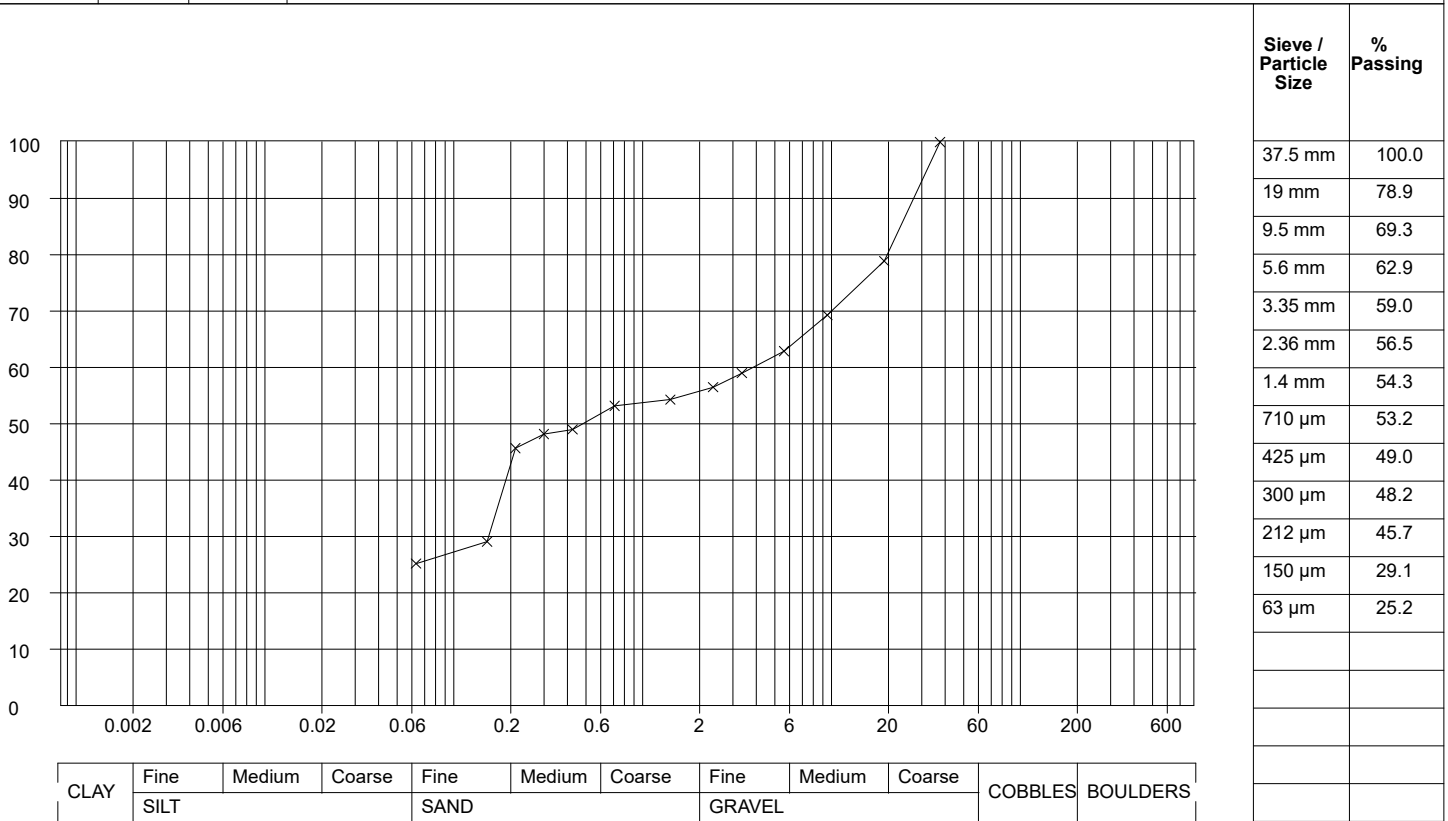
Engineer : BLUEPRINT BUILDING CONSULTANTS LTD

Job Number
7416B

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DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Laboratory Description
BH3	2.00 - 2.45	B	Probable MADE GROUND: dark greyish brown very clayey very sandy fine to coarse gravel sized fragments of stone.



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

Grading Analysis	
D85	24.3 mm
D60	3.9 mm
D10	<63.0 µm
Uniformity Coefficient	-

Particle Proportions	
Cobbles + Boulders	-
Gravel	44.2%
Sand	30.6%
Silt	-
Clay	-

Method of Preparation : BS 1377:PART 1:1990:7.3 Initial preparation 1990:7.4.5 Particle size tests

Method of Test : BS 1377:PART 2:1990:9 Determination of particle size distribution

Remarks :



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Laboratory Test Results

Site : BROWNSIDE MILL, BRUN TERRACE, BURNLEY, LANCASHIRE

Client : M SMITHSON PROPERTIES LTD

Engineer : BLUEPRINT BUILDING CONSULTANTS LTD

Job Number
7416B

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DETERMINATION OF pH, SULPHATE CONTENT AND TOTAL SULPHUR OF SOIL AND GROUNDWATER AND MAGNESIUM, CHLORIDE, AMMONIA AND NITRATE CONTENT

Borehole/ Trial Pit	Depth (m)	Sample	Concentration of Sulphate			Total Sulphur %	Magnesium mg/l	Ammonium NH4 mg/l	Water Soluble Chloride mg/l	Water Soluble Nitrate mg/l	pH	Design Class	Laboratory Description
			Soil		Ground Water g /l								
			Total S03 %	S04 in 2:1 water:soil g /l									
BH1	1.20	B		0.48						9.6	DS-1	MADE GROUND: dark brown orangey sandy fine to coarse gravel sized fragments of stone.	
BH1	2.50	D		0.19						9.6	DS-1	Dark brownish grey slightly gravelly slightly sandy silty CLAY. Gravel is angular to subrounded fine to coarse sandstone and siltstone.	
BH1	3.35	W			0.08					7.6	DS-1	GROUNDWATER	
BH2	1.20	B		0.17						9.5	DS-1	MADE GROUND: dark grey, light grey and brown mottled sandy slightly gravelly silty clay. Gravel sized fragments are fine to coarse stone.	
BH2	2.40	W			0.01					7.7	DS-1	GROUNDWATER	
BH2	3.00	D		0.42						10.7	DS-1	Dark brownish grey slightly gravelly slightly sandy silty CLAY. Gravel is angular to subrounded fine to coarse coal and sandstone.	
BH2	5.50	D		0.14						9.7	DS-1	Brownish grey slightly gravelly silty CLAY. Gravel is angular to subrounded fine to coarse sandstone, siltstone, coal and quartz.	
BH3	1.20	B		0.87						8.9	DS-2	Probable MADE GROUND: dark greyish brown very clayey very silty fine to coarse gravel sized fragments of stone.	
BH3	3.80	W			0.13					7.5	DS-1	GROUNDWATER	
BH3	6.00	D		0.20						11.3	DS-1	Dark brownish grey slightly gravelly slightly sandy silty CLAY. Gravel is angular to subrounded fine to coarse sandstone, siltstone and coal.	
BH3	7.50	D		0.07						10.9	DS-1	Dark brownish grey slightly gravelly slightly sandy silty CLAY. Gravel is angular to subrounded fine to coarse sandstone, siltstone and coal.	

Method of Preparation : BS 1377:PART 1:1990:7.5 Preparation of soil for chemical tests BS 1377:PART 3:1990:5.2, 5.3, 5.4 & 9.4

Method of Test : Lab in-house methods based on BS1377: Part 3 for contents of water sol sulphate, pH, chloride and magnesium. Lab in-house method based on MEWAM (EA, 2006) for total sulphur

Remarks : Classification relates to Design Sulphate Class of BRE Special Digest 1 (2005)



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BRE Special Digest 1

AGGRESSIVE CHEMICAL ENVIRONMENT FOR CONCRETE (ACEC) SITE CLASSIFICATION.

Table C1 Aggressive Chemical Environment for Concrete (ACEC) classification for natural ground locations^a							
Sulfate Design Sulfate Class for location	2:1 water/soil extract ^b		Groundwater		Groundwater		ACEC Class for location
	2	3	Total potential sulfate ^c	Static water	Mobile water		
1	(SO ₄ mg/l)	(SO ₄ mg/l)	4 (SO ₄ %)	5 (pH)	6 (pH)	7	
DS-1	< 500	< 400	< 0.24	≥ 2.5	> 5.5 ^d 2.5–5.5	AC-1s AC-1 ^d AC-2z	
DS-2	500–1500	400–1400	0.24–0.6	> 3.5 2.5–3.5	> 5.5 2.5–5.5	AC-1s AC-2 AC-2s AC-3z	
DS-3	1600–3000	1500–3000	0.7–1.2	> 3.5 2.5–3.5	> 5.5 2.5–5.5	AC-2s AC-3 AC-3s AC-4	
DS-4	3100–6000	3100–6000	1.3–2.4	> 3.5 2.5–3.5	> 5.5 2.5–5.5	AC-3s AC-4 AC-4s AC-5	
DS-5	> 6000	> 6000	> 2.4	> 3.5 2.5–3.5	≥ 2.5	AC-4s AC-5	

Notes

- a Applies to locations on sites that comprise either undisturbed ground that is in its natural state (ie is not brownfield – Table C2) or clean fill derived from such ground.
- b The limits of Design Sulfate Classes based on 2:1 water/soil extracts have been lowered relative to previous Digests (Box C7).
- c Applies only to locations where concrete will be exposed to sulfate ions (SO₄) which may result from the oxidation of sulfides (eg pyrite) following ground disturbance (Appendix A1 and Box C8).
- d For flowing water that is potentially aggressive to concrete owing to high purity or an aggressive carbon dioxide level greater than 15 mg/l (Section C2.2.3), increase the ACEC Class to AC-2z.

Explanation of suffix symbols to ACEC Class

- Suffix 's' indicates that the water has been classified as static.
- Concrete placed in ACEC Classes that include the suffix 'z' primarily have to resist acid conditions and may be made with any of the cements or combinations listed in Table D2 on page 42.

Table C2 Aggressive Chemical Environment for Concrete (ACEC) classification for brownfield locations^a								
Sulfate and magnesium Design Sulfate Class for location	2:1 water/soil extract ^b		Groundwater		Total potential sulfate ^c	Groundwater		ACEC Class for location
	2	3	4	5		Static water	Mobile water	
1	(SO ₄ mg/l)	(Mg mg/l)	(SO ₄ mg/l)	(Mg mg/l)	6 (SO ₄ %)	7 (pH) ^d	8 (pH) ^d	9
DS-1	< 500		< 400		< 0.24	≥ 2.5	> 6.5 ^d 5.5–6.5 4.5–5.5 2.5–4.5	AC-1s AC-1 AC-2z AC-3z AC-4z
DS-2	500–1500		400–1400		0.24–0.6	> 5.5 2.5–5.5	> 6.5 5.5–6.5 4.5–5.5 2.5–4.5	AC-1s AC-2 AC-2s AC-3z AC-4z AC-5z
DS-3	1600–3000		1500–3000		0.7–1.2	> 5.5 2.5–5.5	> 6.5 5.5–6.5 2.5–5.5	AC-2s AC-3 AC-3s AC-4 AC-5
DS-4	3100–6000	≤ 1200	3100–6000	≤ 1000	1.3–2.4	> 5.5 2.5–5.5	> 6.5 2.5–6.5	AC-3s AC-4 AC-4s AC-5
DS-4m	3100–6000	> 1200 ^e	3100–6000	> 1000 ^e	1.3–2.4	> 5.5 2.5–5.5	> 6.5 2.5–6.5	AC-3s AC-4m AC-4ms AC-5m
DS-5	> 6000	≤ 1200	> 6000	≤ 1000	> 2.4	> 5.5 2.5–5.5	≥ 2.5	AC-4s AC-5
DS-5m	> 6000	> 1200 ^e	> 6000	> 1000 ^e	> 2.4	> 5.5 2.5–5.5	≥ 2.5	AC-4ms AC-5m

Notes

- a Brownfield locations are those sites, or parts of sites, that might contain chemical residues produced by or associated with industrial production (Section C5.1.3).
- b The limits of Design Sulfate Classes based on 2:1 water/soil extracts have been lowered from previous Digests (Box C7).
- c Applies only to locations where concrete will be exposed to sulfate ions (SO₄), which may result from the oxidation of sulfides such as pyrite, following ground disturbance (Appendix A1 and Box C8).
- d An additional account is taken of hydrochloric and nitric acids by adjustment to sulfate content (Section C5.1.3).
- e The limit on water-soluble magnesium does not apply to brackish groundwater (chloride content between 12 000 mg/l and 17 000 mg/l). This allows 'm' to be omitted from the relevant ACEC classification. Seawater (chloride content about 18 000 mg/l) and stronger brines are not covered by this table.

Explanation of suffix symbols to ACEC Class

- Suffix 's' indicates that the water has been classified as static.
- Concrete placed in ACEC Classes that include the suffix 'z' have primarily to resist acid conditions and may be made with any of the cements in Table D2 on page 42.
- Suffix 'm' relates to the higher levels of magnesium in Design Sulfate Classes 4 and 5.

CONTAMINATION ANALYSIS RESULTS



Amended Report

Report No.: 22-08923-2

Initial Date of Issue: 30-Mar-2022 **Date of Re-Issue:** 30-Mar-2022

Client: Sub Surface

Client Address: 3 Peel Street
Preston
Lancashire
PR2 2QS

Contact(s): Simon Gabbatt

Project: 7416B Brownside Mill, Brun Terrace,
Burnley, Lancashire

Quotation No.: Q22-26627 **Date Received:** 10-Mar-2022

Order No.: **Date Instructed:** 10-Mar-2022

No. of Samples: 12

Turnaround (Wkdays): 7 **Results Due:** 18-Mar-2022

Date Approved: 30-Mar-2022

Approved By:

Details: Stuart Henderson, Technical Manager

Results - Soil

**Project: 7416B Brownsie Mill, Brun Terrace, Burnley,
Lancashire**

Client: Sub Surface	Chemtest Job No.:				22-08923	22-08923	22-08923	22-08923	22-08923
Quotation No.: Q22-26627	Chemtest Sample ID.:				1387950	1387951	1387953	1387957	1387958
Order No.:	Client Sample Ref.:				541	452	516	500	501
	Sample Location:				BH1	BH1	BH2	BH3	BH3
	Sample Type:				SOIL	SOIL	SOIL	SOIL	SOIL
	Top Depth (m):				1.20	1.20	0.30	0.30	0.30
	Bottom Depth (m):				1.65	1.65	0.90	1.20	1.20
	Date Sampled:				25-Feb-2022	25-Feb-2022	25-Feb-2022	25-Feb-2022	25-Feb-2022
	Asbestos Lab:				COVENTRY		COVENTRY	COVENTRY	
Determinand	Accred.	SOP	Units	LOD					
ACM Type	U	2192		N/A	-		-	Cement, lagging	
Asbestos Identification	U	2192		N/A	No Asbestos Detected		No Asbestos Detected	Chrysotile	
Asbestos by Gravimetry	U	2192	%	0.001				0.53	
Total Asbestos	U	2192	%	0.001				0.53	
Moisture	N	2030	%	0.020	13		4.8	8.1	
PFBS	SN		µg/kg	1.00		See Attached			See Attached
PFPS	SN		µg/kg	1.00		See Attached			See Attached
PFHxS	SN		µg/kg	1.00		See Attached			See Attached
PFHpS	SN		µg/kg	1.00		See Attached			See Attached
PFOS	SN		µg/kg	1.00		See Attached			See Attached
PFNS	SN		µg/kg	1.00		See Attached			See Attached
PFDS	SN		µg/kg	1.00		See Attached			See Attached
PFUdS	SN		µg/kg	1.00		See Attached			See Attached
PFDoS	SN		µg/kg	1.00		See Attached			See Attached
PFBA	SN		µg/kg	3.00		See Attached			See Attached
PFPeA	SN		µg/kg	1.00		See Attached			See Attached
PFHxA	SN		µg/kg	2.00		See Attached			See Attached
PFHpA	SN		µg/kg	1.00		See Attached			See Attached
PFOA	SN		µg/kg	1.00		See Attached			See Attached
PFNA	SN		µg/kg	1.00		See Attached			See Attached
PFDA	SN		µg/kg	1.00		See Attached			See Attached
PFUdA	SN		µg/kg	1.00		See Attached			See Attached
PFDoA	SN		µg/kg	1.00		See Attached			See Attached
pH	U	2010		4.0	9.6		10.4	11.6	
Boron (Hot Water Soluble)	U	2120	mg/kg	0.40	1.1		1.4	2.0	
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010	0.48				
Cyanide (Total)	U	2300	mg/kg	0.50	< 0.50		< 0.50	< 0.50	
Sulphide (Easily Liberatable)	N	2325	mg/kg	0.50	2.1		6.6	2.5	
Sulphate (Total)	U	2430	%	0.010	0.23		0.47	0.32	
Arsenic	U	2450	mg/kg	1.0	7.9		13	6.1	
Cadmium	U	2450	mg/kg	0.10	0.27		1.1	0.12	
Chromium	U	2450	mg/kg	1.0	21		20	16	

Results - Soil

Project: 7416B Brownside Mill, Brun Terrace, Burnley,

Lancashire

Client: Sub Surface	Chemtest Job No.:					22-08923	22-08923	22-08923	22-08923	22-08923
Quotation No.: Q22-26627	Chemtest Sample ID.:					1387950	1387951	1387953	1387957	1387958
Order No.:	Client Sample Ref.:					541	452	516	500	501
	Sample Location:					BH1	BH1	BH2	BH3	BH3
	Sample Type:					SOIL	SOIL	SOIL	SOIL	SOIL
	Top Depth (m):					1.20	1.20	0.30	0.30	0.30
	Bottom Depth (m):					1.65	1.65	0.90	1.20	1.20
	Date Sampled:					25-Feb-2022	25-Feb-2022	25-Feb-2022	25-Feb-2022	25-Feb-2022
	Asbestos Lab:					COVENTRY		COVENTRY	COVENTRY	
Determinand	Accred.	SOP	Units	LOD						
Molybdenum	U	2450	mg/kg	2.0	< 2.0		3.2	< 2.0		
Copper	U	2450	mg/kg	0.50	21		34	13		
Mercury	U	2450	mg/kg	0.10	< 0.10		< 0.10	< 0.10		
Nickel	U	2450	mg/kg	0.50	23		29	15		
Lead	U	2450	mg/kg	0.50	32		140	160		
Selenium	U	2450	mg/kg	0.20	0.35		0.21	< 0.20		
Zinc	U	2450	mg/kg	0.50	73		92	71		
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50		< 0.50	0.64		
TPH >C6-C10	N	2670	mg/kg	1.0	< 1.0		< 1.0	< 1.0		
TPH >C10-C21	N	2670	mg/kg	1.0	< 1.0		< 1.0	6.7		
TPH >C21-C40	N	2670	mg/kg	1.0	< 1.0		< 1.0	100		
Total TPH >C6-C40	U	2670	mg/kg	10	< 10		< 10	110		
Naphthalene	U	2700	mg/kg	0.10	< 0.10		< 0.10	< 0.10		
Acenaphthylene	U	2700	mg/kg	0.10	< 0.10		< 0.10	< 0.10		
Acenaphthene	U	2700	mg/kg	0.10	< 0.10		< 0.10	< 0.10		
Fluorene	U	2700	mg/kg	0.10	< 0.10		< 0.10	< 0.10		
Phenanthrene	U	2700	mg/kg	0.10	< 0.10		< 0.10	< 0.10		
Anthracene	U	2700	mg/kg	0.10	< 0.10		< 0.10	< 0.10		
Fluoranthene	U	2700	mg/kg	0.10	< 0.10		< 0.10	< 0.10		
Pyrene	U	2700	mg/kg	0.10	< 0.10		< 0.10	< 0.10		
Benzo[a]anthracene	U	2700	mg/kg	0.10	< 0.10		< 0.10	< 0.10		
Chrysene	U	2700	mg/kg	0.10	< 0.10		< 0.10	< 0.10		
Benzo[b]fluoranthene	U	2700	mg/kg	0.10	< 0.10		< 0.10	< 0.10		
Benzo[k]fluoranthene	U	2700	mg/kg	0.10	< 0.10		< 0.10	< 0.10		
Benzo[a]pyrene	U	2700	mg/kg	0.10	< 0.10		< 0.10	< 0.10		
Indeno(1,2,3-c,d)Pyrene	U	2700	mg/kg	0.10	< 0.10		< 0.10	< 0.10		
Dibenz(a,h)Anthracene	U	2700	mg/kg	0.10	< 0.10		< 0.10	< 0.10		
Benzo[g,h,i]perylene	U	2700	mg/kg	0.10	< 0.10		< 0.10	< 0.10		
Total Of 16 PAH's	U	2700	mg/kg	2.0	< 2.0		< 2.0	< 2.0		
Dichlorodifluoromethane	U	2760	µg/kg	1.0	< 1.0			< 1.0		
Chloromethane	U	2760	µg/kg	1.0	< 1.0			< 1.0		
Vinyl Chloride	U	2760	µg/kg	1.0	< 1.0			< 1.0		
Bromomethane	U	2760	µg/kg	20	< 20			< 20		
Chloroethane	U	2760	µg/kg	2.0	< 2.0			< 2.0		
Trichlorofluoromethane	U	2760	µg/kg	1.0	< 1.0			< 1.0		

Results - Soil

**Project: 7416B Brownside Mill, Brun Terrace, Burnley,
Lancashire**

Client: Sub Surface	Chemtest Job No.:				22-08923	22-08923	22-08923	22-08923	22-08923
Quotation No.: Q22-26627	Chemtest Sample ID.:				1387950	1387951	1387953	1387957	1387958
Order No.:	Client Sample Ref.:				541	452	516	500	501
	Sample Location:				BH1	BH1	BH2	BH3	BH3
	Sample Type:				SOIL	SOIL	SOIL	SOIL	SOIL
	Top Depth (m):				1.20	1.20	0.30	0.30	0.30
	Bottom Depth (m):				1.65	1.65	0.90	1.20	1.20
	Date Sampled:				25-Feb-2022	25-Feb-2022	25-Feb-2022	25-Feb-2022	25-Feb-2022
	Asbestos Lab:				COVENTRY		COVENTRY	COVENTRY	
Determinand	Accred.	SOP	Units	LOD					
1,1-Dichloroethene	U	2760	µg/kg	1.0	< 1.0			< 1.0	
Trans 1,2-Dichloroethene	U	2760	µg/kg	1.0	< 1.0			< 1.0	
1,1-Dichloroethane	U	2760	µg/kg	1.0	< 1.0			< 1.0	
cis 1,2-Dichloroethene	U	2760	µg/kg	1.0	< 1.0			< 1.0	
Bromochloromethane	U	2760	µg/kg	5.0	< 5.0			< 5.0	
Trichloromethane	U	2760	µg/kg	1.0	< 1.0			< 1.0	
1,1,1-Trichloroethane	U	2760	µg/kg	1.0	< 1.0			< 1.0	
Tetrachloromethane	U	2760	µg/kg	1.0	< 1.0			< 1.0	
1,1-Dichloropropene	U	2760	µg/kg	1.0	< 1.0			< 1.0	
Benzene	U	2760	µg/kg	1.0	< 1.0		< 1.0	< 1.0	
1,2-Dichloroethane	U	2760	µg/kg	2.0	< 2.0			< 2.0	
Trichloroethene	N	2760	µg/kg	1.0	< 1.0			< 1.0	
1,2-Dichloropropane	U	2760	µg/kg	1.0	< 1.0			< 1.0	
Dibromomethane	U	2760	µg/kg	1.0	< 1.0			< 1.0	
Bromodichloromethane	U	2760	µg/kg	5.0	< 5.0			< 5.0	
cis-1,3-Dichloropropene	N	2760	µg/kg	10	< 10			< 10	
Toluene	U	2760	µg/kg	1.0	< 1.0		< 1.0	< 1.0	
Trans-1,3-Dichloropropene	N	2760	µg/kg	10	< 10			< 10	
1,1,2-Trichloroethane	U	2760	µg/kg	10	< 10			< 10	
Tetrachloroethene	U	2760	µg/kg	1.0	< 1.0			< 1.0	
1,3-Dichloropropane	U	2760	µg/kg	2.0	< 2.0			< 2.0	
Dibromochloromethane	U	2760	µg/kg	10	< 10			< 10	
1,2-Dibromoethane	U	2760	µg/kg	5.0	< 5.0			< 5.0	
Chlorobenzene	U	2760	µg/kg	1.0	< 1.0			< 1.0	
1,1,1,2-Tetrachloroethane	U	2760	µg/kg	2.0	< 2.0			< 2.0	
Ethylbenzene	U	2760	µg/kg	1.0	< 1.0		< 1.0	< 1.0	
m & p-Xylene	U	2760	µg/kg	1.0	< 1.0		< 1.0	< 1.0	
o-Xylene	U	2760	µg/kg	1.0	< 1.0		< 1.0	< 1.0	
Styrene	U	2760	µg/kg	1.0	< 1.0			< 1.0	
Tribromomethane	U	2760	µg/kg	1.0	< 1.0			< 1.0	
Isopropylbenzene	U	2760	µg/kg	1.0	< 1.0			< 1.0	
Bromobenzene	U	2760	µg/kg	1.0	< 1.0			< 1.0	
1,2,3-Trichloropropane	N	2760	µg/kg	50	< 50			< 50	
N-Propylbenzene	U	2760	µg/kg	1.0	< 1.0			< 1.0	
2-Chlorotoluene	U	2760	µg/kg	1.0	< 1.0			< 1.0	

Results - Soil

Project: 7416B Brownsie Mill, Brun Terrace, Burnley,

Lancashire

Client: Sub Surface	Chemtest Job No.:				22-08923	22-08923	22-08923	22-08923	22-08923
Quotation No.: Q22-26627	Chemtest Sample ID.:				1387950	1387951	1387953	1387957	1387958
Order No.:	Client Sample Ref.:				541	452	516	500	501
	Sample Location:				BH1	BH1	BH2	BH3	BH3
	Sample Type:				SOIL	SOIL	SOIL	SOIL	SOIL
	Top Depth (m):				1.20	1.20	0.30	0.30	0.30
	Bottom Depth (m):				1.65	1.65	0.90	1.20	1.20
	Date Sampled:				25-Feb-2022	25-Feb-2022	25-Feb-2022	25-Feb-2022	25-Feb-2022
	Asbestos Lab:				COVENTRY		COVENTRY	COVENTRY	
Determinand	Accred.	SOP	Units	LOD					
1,3,5-Trimethylbenzene	U	2760	µg/kg	1.0	< 1.0			< 1.0	
4-Chlorotoluene	U	2760	µg/kg	1.0	< 1.0			< 1.0	
Tert-Butylbenzene	U	2760	µg/kg	1.0	< 1.0			< 1.0	
1,2,4-Trimethylbenzene	U	2760	µg/kg	1.0	< 1.0			< 1.0	
Sec-Butylbenzene	U	2760	µg/kg	1.0	< 1.0			< 1.0	
1,3-Dichlorobenzene	U	2760	µg/kg	1.0	< 1.0			< 1.0	
4-Isopropyltoluene	U	2760	µg/kg	1.0	< 1.0			< 1.0	
1,4-Dichlorobenzene	U	2760	µg/kg	1.0	< 1.0			< 1.0	
N-Butylbenzene	U	2760	µg/kg	1.0	< 1.0			< 1.0	
1,2-Dichlorobenzene	U	2760	µg/kg	1.0	< 1.0			< 1.0	
1,2-Dibromo-3-Chloropropane	U	2760	µg/kg	50	< 50			< 50	
1,2,4-Trichlorobenzene	U	2760	µg/kg	1.0	< 1.0			< 1.0	
Hexachlorobutadiene	U	2760	µg/kg	1.0	< 1.0			< 1.0	
1,2,3-Trichlorobenzene	U	2760	µg/kg	2.0	< 2.0			< 2.0	
Methyl Tert-Butyl Ether	U	2760	µg/kg	1.0	< 1.0		< 1.0	< 1.0	
N-Nitrosodimethylamine	U	2790	mg/kg	0.50	< 0.50			< 0.50	
Phenol	U	2790	mg/kg	0.50	< 0.50			< 0.50	
2-Chlorophenol	U	2790	mg/kg	0.50	< 0.50			< 0.50	
Bis-(2-Chloroethyl)Ether	U	2790	mg/kg	0.50	< 0.50			< 0.50	
1,3-Dichlorobenzene	U	2790	mg/kg	0.50	< 0.50			< 0.50	
1,4-Dichlorobenzene	N	2790	mg/kg	0.50	< 0.50			< 0.50	
1,2-Dichlorobenzene	U	2790	mg/kg	0.50	< 0.50			< 0.50	
2-Methylphenol	U	2790	mg/kg	0.50	< 0.50			< 0.50	
Bis(2-Chloroisopropyl)Ether	U	2790	mg/kg	0.50	< 0.50			< 0.50	
Hexachloroethane	N	2790	mg/kg	0.50	< 0.50			< 0.50	
N-Nitrosodi-n-propylamine	U	2790	mg/kg	0.50	< 0.50			< 0.50	
4-Methylphenol	U	2790	mg/kg	0.50	< 0.50			< 0.50	
Nitrobenzene	U	2790	mg/kg	0.50	< 0.50			< 0.50	
Isophorone	U	2790	mg/kg	0.50	< 0.50			< 0.50	
2-Nitrophenol	N	2790	mg/kg	0.50	< 0.50			< 0.50	
2,4-Dimethylphenol	N	2790	mg/kg	0.50	< 0.50			< 0.50	
Bis(2-Chloroethoxy)Methane	U	2790	mg/kg	0.50	< 0.50			< 0.50	
2,4-Dichlorophenol	U	2790	mg/kg	0.50	< 0.50			< 0.50	
1,2,4-Trichlorobenzene	U	2790	mg/kg	0.50	< 0.50			< 0.50	
Naphthalene	U	2790	mg/kg	0.50	< 0.50			< 0.50	

Results - Soil

Project: 7416B Brownside Mill, Brun Terrace, Burnley,

Lancashire

Client: Sub Surface	Chemtest Job No.:					22-08923	22-08923	22-08923	22-08923	22-08923
Quotation No.: Q22-26627	Chemtest Sample ID.:					1387950	1387951	1387953	1387957	1387958
Order No.:	Client Sample Ref.:					541	452	516	500	501
	Sample Location:					BH1	BH1	BH2	BH3	BH3
	Sample Type:					SOIL	SOIL	SOIL	SOIL	SOIL
	Top Depth (m):					1.20	1.20	0.30	0.30	0.30
	Bottom Depth (m):					1.65	1.65	0.90	1.20	1.20
	Date Sampled:					25-Feb-2022	25-Feb-2022	25-Feb-2022	25-Feb-2022	25-Feb-2022
	Asbestos Lab:					COVENTRY		COVENTRY	COVENTRY	
Determinand	Accred.	SOP	Units	LOD						
4-Chloroaniline	N	2790	mg/kg	0.50	< 0.50				< 0.50	
Hexachlorobutadiene	U	2790	mg/kg	0.50	< 0.50				< 0.50	
4-Chloro-3-Methylphenol	U	2790	mg/kg	0.50	< 0.50				< 0.50	
2-Methylnaphthalene	U	2790	mg/kg	0.50	< 0.50				< 0.50	
4-Nitrophenol	N	2790	mg/kg	0.50	< 0.50				< 0.50	
Hexachlorocyclopentadiene	N	2790	mg/kg	0.50	< 0.50				< 0.50	
2,4,6-Trichlorophenol	U	2790	mg/kg	0.50	< 0.50				< 0.50	
2,4,5-Trichlorophenol	U	2790	mg/kg	0.50	< 0.50				< 0.50	
2-Chloronaphthalene	U	2790	mg/kg	0.50	< 0.50				< 0.50	
2-Nitroaniline	U	2790	mg/kg	0.50	< 0.50				< 0.50	
Acenaphthylene	U	2790	mg/kg	0.50	< 0.50				< 0.50	
Dimethylphthalate	U	2790	mg/kg	0.50	< 0.50				< 0.50	
2,6-Dinitrotoluene	U	2790	mg/kg	0.50	< 0.50				< 0.50	
Acenaphthene	U	2790	mg/kg	0.50	< 0.50				< 0.50	
3-Nitroaniline	N	2790	mg/kg	0.50	< 0.50				< 0.50	
Dibenzofuran	U	2790	mg/kg	0.50	< 0.50				< 0.50	
4-Chlorophenylphenylether	U	2790	mg/kg	0.50	< 0.50				< 0.50	
2,4-Dinitrotoluene	U	2790	mg/kg	0.50	< 0.50				< 0.50	
Fluorene	U	2790	mg/kg	0.50	< 0.50				< 0.50	
Diethyl Phthalate	U	2790	mg/kg	0.50	< 0.50				< 0.50	
4-Nitroaniline	U	2790	mg/kg	0.50	< 0.50				< 0.50	
2-Methyl-4,6-Dinitrophenol	N	2790	mg/kg	0.50	< 0.50				< 0.50	
Azobenzene	U	2790	mg/kg	0.50	< 0.50				< 0.50	
4-Bromophenylphenyl Ether	U	2790	mg/kg	0.50	< 0.50				< 0.50	
Hexachlorobenzene	U	2790	mg/kg	0.50	< 0.50				< 0.50	
Pentachlorophenol	N	2790	mg/kg	0.50	< 0.50				< 0.50	
Phenanthrene	U	2790	mg/kg	0.50	< 0.50				< 0.50	
Anthracene	U	2790	mg/kg	0.50	< 0.50				< 0.50	
Carbazole	U	2790	mg/kg	0.50	< 0.50				< 0.50	
Di-N-Butyl Phthalate	U	2790	mg/kg	0.50	< 0.50				< 0.50	
Fluoranthene	U	2790	mg/kg	0.50	< 0.50				< 0.50	
Pyrene	U	2790	mg/kg	0.50	< 0.50				< 0.50	
Butylbenzyl Phthalate	U	2790	mg/kg	0.50	< 0.50				< 0.50	
Benzo[a]anthracene	U	2790	mg/kg	0.50	< 0.50				< 0.50	
Chrysene	U	2790	mg/kg	0.50	< 0.50				< 0.50	

Results - Soil

**Project: 7416B Brownside Mill, Brun Terrace, Burnley,
Lancashire**

Client: Sub Surface	Chemtest Job No.:							
Quotation No.: Q22-26627	Chemtest Sample ID.:	22-08923	22-08923	22-08923	22-08923	22-08923		
Order No.:	Client Sample Ref.:	1387950	1387951	1387953	1387957	1387958		
	Sample Location:	541	452	516	500	501		
	Sample Type:	BH1	BH1	BH2	BH3	BH3		
	Top Depth (m):	SOIL	SOIL	SOIL	SOIL	SOIL		
	Bottom Depth (m):	1.20	1.20	0.30	0.30	0.30		
	Date Sampled:	1.65	1.65	0.90	1.20	1.20		
	Asbestos Lab:	25-Feb-2022	25-Feb-2022	25-Feb-2022	25-Feb-2022	25-Feb-2022		
		COVENTRY		COVENTRY	COVENTRY			
Determinand	Accred.	SOP	Units	LOD				
Bis(2-Ethylhexyl)Phthalate	N	2790	mg/kg	0.50	< 0.50			< 0.50
Di-N-Octyl Phthalate	U	2790	mg/kg	0.50	< 0.50			< 0.50
Benzo[b]fluoranthene	U	2790	mg/kg	0.50	< 0.50			< 0.50
Benzo[k]fluoranthene	U	2790	mg/kg	0.50	< 0.50			< 0.50
Benzo[a]pyrene	U	2790	mg/kg	0.50	< 0.50			< 0.50
Indeno(1,2,3-c,d)Pyrene	U	2790	mg/kg	0.50	< 0.50			< 0.50
Dibenz(a,h)Anthracene	U	2790	mg/kg	0.50	< 0.50			< 0.50
Benzo[g,h,i]perylene	U	2790	mg/kg	0.50	< 0.50			< 0.50
Total Phenols	U	2920	mg/kg	0.10	< 0.10		< 0.10	< 0.10

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
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Alkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2325	Sulphide in Soils	Sulphide	Steam distillation with sulphuric acid / analysis by 'Aquakem 600' Discrete Analyser, using N,N-dimethyl-p-phenylenediamine.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.
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.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
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.
2790	Semi-Volatile Organic Compounds (SVOCs) in Soils by GC-MS	Semi-volatile organic compounds(cf. USEPA Method 8270)	Acetone/Hexane extraction / GC-MS
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"
SOP	Standard operating procedure
LOD	Limit of detection

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 30 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



Unit 7-8 Hawarden Business Park

Manor Road (off Manor Lane)

Hawarden

Deeside

CH5 3US

Tel: (01244) 528700

Fax: (01244) 528701

email: hawardencustomerservices@alsglobal.com

Website: www.alsenvironmental.co.uk

Chemtest
Willie Snaith Rd
Newmarket
Suffolk
CB8 7SQ

Attention: Subcontracting Lab

CERTIFICATE OF ANALYSIS

Date of report Generation:	28 March 2022
Customer:	Chemtest
Sample Delivery Group (SDG):	220311-96
Your Reference:	22067
Location:	Newmarket
Report No:	639739
Order Number:	UK0611500479

We received 2 samples on Friday March 11, 2022 and 2 of these samples were scheduled for analysis which was completed on Monday March 28, 2022. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

Chemical testing (unless subcontracted) performed at ALS Life Sciences Ltd Hawarden.

All sample data is provided by the customer. The reported results relate to the sample supplied, and on the basis that this data is correct.

Incorrect sampling dates and/or sample information will affect the validity of results.

The customer is not permitted to reproduce this report except in full without the approval of the laboratory.

Approved By:

Sonia McWhan

Operations Manager



CERTIFICATE OF ANALYSIS

Validated

SDG: 220311-96
Client Ref.: 22067

Report Number: 639739
Location: Newmarket

Superseded Report:

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
25954107	1387951	BH1	1.20	25/02/2022
25954108	1387958	BH3	0.30	25/02/2022

Only received samples which have had analysis scheduled will be shown on the following pages.



CERTIFICATE OF ANALYSIS

Validated

SDG: 220311-96
Client Ref.: 22067

Report Number: 639739
Location: Newmarket

Superseded Report:

<p>Results Legend</p> <p>X Test</p> <p>N No Determination Possible</p> <p>Sample Types -</p> <p>S - Soil/Solid UNS - Unspecified Solid GW - Ground Water SW - Surface Water LE - Land Leachate PL - Prepared Leachate PR - Process Water SA - Saline Water TE - Trade Effluent TS - Treated Sewage US - Untreated Sewage RE - Recreational Water DW - Drinking Water Non-regulatory UNL - Unspecified Liquid SL - Sludge G - Gas OTH - Other</p>	Lab Sample No(s)	25954107	25954108		
	Customer Sample Reference	1387951	1387958		
	AGS Reference				
	Depth (m)				
	Container	500gTUB	500gTUB		
	Sample Type	S	S		
	PFAS Solids	All	NDPs: 0 Tests: 2	X	X
Sample description	All	NDPs: 0 Tests: 2	X	X	



CERTIFICATE OF ANALYSIS

Validated

SDG: 220311-96
Client Ref.: 22067

Report Number: 639739
Location: Newmarket

Superseded Report:

Sample Descriptions

Grain Sizes

very fine	<0.063mm	fine	0.063mm - 0.1mm	medium	0.1mm - 2mm	coarse	2mm - 10mm	very coarse	>10mm
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Lab Sample No(s)	Customer Sample Ref.	Depth (m)	Colour	Description	Inclusions	Inclusions 2
25954107	1387951	BH1 1.20-1.65	Dark Brown	Sandy Loam	None	Stones
25954108	1387958	BH3 0.30-1.20	Dark Brown	Sand	Vegetation	Stones

These descriptions are only intended to act as a cross check if sample identities are questioned, and to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions.

We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample.

Other coarse granular materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.



CERTIFICATE OF ANALYSIS

Validated

SDG: 220311-96
Client Ref.: 22067

Report Number: 639739
Location: Newmarket

Superseded Report:

Table of Results - Appendix

Method No	Reference	Description
PM024	Modified BS 1377	Soil preparation including homogenisation, moisture screens of soils for Asbestos Containing Material
TM338	PFAS In Solids	Analysis of perfluoroalkylsulfonates and perfluorocarboxylic acids in Solids

NA = not applicable.

Chemical testing (unless subcontracted) performed at ALS Life Sciences Ltd Hawarden.



CERTIFICATE OF ANALYSIS

SDG: 220311-96	Client Reference: 22067	Report Number: 639739
Location: Newmarket	Order Number: UK0611500479	Superseded Report:

Appendix

General

1. Results are expressed on a dry weight basis (dried at 35°C) for all soil analyses except for the following: NRA and CEN Leach tests, flash point LOI, pH, ammonium as NH4 by the BRE method, VOC TICs and SVOC TICs.

2. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for all sample types unless the sample is destroyed on testing. The prepared soil sub sample that is analysed for asbestos will be retained for a period of 6 months after the analysis date. All bulk samples will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALS reserve the right to charge for samples received and stored but not analysed.

3. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.

4. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.

5. If no separate volatile sample is supplied by the client, or if a headspace or sediment is present in the volatile sample, the integrity of the data may be compromised. This will be flagged up as an invalid VOC on the test schedule and the result marked as deviating on the test certificate.

6. NDP - No determination possible due to insufficient/unsuitable sample.

7. Results relate only to the items tested.

8. LoDs (Limit of Detection) for wet tests reported on a dry weight basis are not corrected for moisture content.

9. **Surrogate recoveries** - Surrogates are added to your sample to monitor recovery of the test requested. A % recovery is reported, results are not corrected for the recovery measured. Typical recoveries for organics tests are 70-130%. Recoveries in soils are affected by organic rich or clay rich matrices. Waters can be affected by remediation fluids or high amounts of sediment. Test results are only ever reported if all of the associated quality checks pass; it is assumed that all recoveries outside of the values above are due to matrix affect.

10. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.

11. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.

12. For dried and crushed preparations of soils volatile loss may occur e.g volatile mercury.

13. For leachate preparations other than Zero Headspace Extraction (ZHE) volatile loss may occur.

14. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.

15. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C5-C12 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

16. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

17 Data retention. All records, communications and reports pertaining to the analysis are archived for seven years from the date of issue of the final report.

18. **Tentatively Identified Compounds (TICs)** are non-target peaks in VOC and SVOC analysis. All non-target peaks detected with a concentration above the LoD are subjected to a mass spectral library search. Non-target peaks with a library search confidence of >75% are reported based on the best mass spectral library match. When a non-target peak with a library search confidence of <75% is detected it is reported as "mixed hydrocarbons". Non-target compounds identified from the scan data are semi-quantified relative to one of the deuterated internal standards, under the same chromatographic conditions as the target compounds. This result is reported as a semi-quantitative value and reported as Tentatively Identified Compounds (TICs). TICs are outside the scope of UKAS accreditation and are not moisture corrected.

19. Sample Deviations

If a sample is classed as deviated then the associated results may be compromised.

1	Container with Headspace provided for volatiles analysis
2	Incorrect container received
3	Deviation from method
4	Matrix interference
◆	Sample holding time exceeded in laboratory
@	Sample holding time exceeded due to late arrival of instructions or samples
§	Sampled on date not provided

20. Asbestos

When requested, the individual sub sample scheduled will be analysed in house for the presence of asbestos fibres and asbestos containing material by our documented in house method TM048 based on HSG 248 (2021), which is accredited to ISO17025. If a specific asbestos fibre type is not found this will be reported as "Not detected". If no asbestos fibre types are found all will be reported as "Not detected" and the sub sample analysed deemed to be clear of asbestos. If an asbestos fibre type is found it will be reported as detected (for each fibre type found). Testing can be carried out on asbestos positive samples, but, due to Health and Safety considerations, may be replaced by alternative tests or reported as No Determination Possible (NDP). The quantity of asbestos present is not determined unless specifically requested.

Identification of Asbestos in Bulk Materials & Soils

The results for identification of asbestos in bulk materials and soils are obtained from supplied bulk materials and soils which have been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2021).

The results for identification of asbestos in soils are obtained from a homogenised sub sample which has been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

Visual Estimation Of Fibre Content

Estimation of fibre content is not permitted as part of our UKAS accredited test other than: - Trace - Where only one or two asbestos fibres were identified.

Respirable Fibres

Respirable fibres are defined as fibres of <3 µm diameter, longer than 5 µm and with aspect ratios of at least 3:1 that can be inhaled into the lower regions of the lung and are generally acknowledged to be most important predictor of hazard and risk for cancers of the lung.

Further guidance on typical asbestos fibre content of manufactured products can be found in HSG 264.

The identification of asbestos containing materials and soils falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.

**SUB SURFACE**SITE INVESTIGATION AND SPECIALIST GEOTECHNICAL CONSULTANTS
3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907

Groundwater Analyses

Site:	BROWNSIDE MILL, BRUN TERRACE, BURNLEY, LANCASHIRE	Job Number:	7416B
Client:	M SMITHSON PROPERTIES	Sheet:	1/1
Engineer:	BLUEPRINT BUILDING CONSULTANTS LTD		

Pb Screening Tool and Metal Biodiversity Assessment Tools (M-BAT) Output.**Pb Screening Tool Output.**

INPUT DATA						RESULTS (Pb)			
ID	Location	Waterbody	Date	Measured Pb Concentration (dissolved) ($\mu\text{g l}^{-1}$)	DOC	Site Specific PNEC Dissolved Pb ($\mu\text{g l}^{-1}$)	BioF	Available Pb ($\mu\text{g l}^{-1}$)	Risk Characterisation Ratio
1	Brownside Mill, Brun Terrace, Burnley	Groundwater	20/04/2022	6.60	2.18	2.62	0.46	3.03	2.52
2	Brownside Mill, Brun Terrace, Burnley	Groundwater	20/04/2022	6.50	2.18	2.62	0.46	2.98	2.48

Metal Biodiversity Assessment Tools (M-BAT) Output

INPUT DATA											
ID	Location	Waterbody	Date	Measured Cu Concentration (dissolved) ($\mu\text{g l}^{-1}$)	Measured Zn Concentration (dissolved) ($\mu\text{g l}^{-1}$)	Measured Ni Concentration (dissolved) ($\mu\text{g l}^{-1}$)	pH	DOC	Ca		
1	Brownside Mill, Brun Terrace, Burnley	Groundwater	20/04/2022	2.2	2.5	3	7.6	2.19	53.6		
2	Brownside Mill, Brun Terrace, Burnley	Groundwater	20/04/2022	10	36	12	7.7	2.19	53.6		
3	Brownside Mill, Brun Terrace, Burnley	Groundwater	20/04/2022	7.7	63	3.3	7.5	2.19	53.6		

RESULTS (Copper)				RESULTS (Zinc)				RESULTS (Ni)			
Site-specific PNEC Dissolved Copper ($\mu\text{g l}^{-1}$)	BioF	Bioavailable Copper Concentration ($\mu\text{g l}^{-1}$)	Risk Characterisation Ratio	Site-specific PNEC Dissolved Zinc ($\mu\text{g l}^{-1}$)	BioF	Bioavailable Zinc Concentration ($\mu\text{g l}^{-1}$)	Risk Characterisation Ratio	Site-specific PNEC Dissolved Nickel ($\mu\text{g l}^{-1}$)	BioF	Bioavailable Nickel Concentration ($\mu\text{g l}^{-1}$)	Risk Characterisation Ratio
8.26	0.12	0.27	0.27	18.47	0.59	1.48	0.14	11.00	0.36	1.09	0.27
7.76	0.13	1.29	1.29	18.48	0.59	21.24	1.95	10.21	0.39	4.70	1.18
8.63	0.12	0.89	0.89	18.46	0.59	37.19	3.41	11.80	0.34	1.12	0.28



Final Report

Report No.: 22-14971-1
Initial Date of Issue: 12-May-2022
Client: Sub Surface
Client Address: 3 Peel Street
Preston
Lancashire
PR2 2QS
Contact(s): Simon Gabbatt
Project: 7416B Brownside Mill, Brun Terrace,
Burnley, Lancashire
Quotation No.: Q22-26627
Date Received: 22-Apr-2022
Order No.:
Date Instructed: 22-Apr-2022
No. of Samples: 3
Turnaround (Wkdays): 7
Results Due: 03-May-2022
Date Approved: 11-May-2022
Subcon Results Due: 16-May-2022

Approved By:

Details: Stuart Henderson, Technical Manager

Results - Water

**Project: 7416B Brownsie Mill, Brun Terrace, Burnley,
Lancashire**

Client: Sub Surface	Chemtest Job No.:					22-14971	22-14971	22-14971
Quotation No.: Q22-26627	Chemtest Sample ID.:					1415664	1415665	1415666
	Client Sample ID.:					648-651	652-655	656-659
	Sample Location:					BH1	BH2	BH3
	Sample Type:					WATER	WATER	WATER
	Top Depth (m):					3.35	2.40	3.80
	Date Sampled:					20-Apr-2022	20-Apr-2022	20-Apr-2022
Determinand	Accred.	SOP	Units	LOD				
PFBS	SN		ng/l	1.00	See Attached		See Attached	
PFPS	SN		ng/l	1.00	See Attached		See Attached	
PFHxS	SN		ng/l	1.00	See Attached		See Attached	
PFHpS	SN		ng/l	1.00	See Attached		See Attached	
PFOS	SN		ng/l	1.00	See Attached		See Attached	
PFNS	SN		ng/l	1.00	See Attached		See Attached	
PFDS	SN		ng/l	1.00	See Attached		See Attached	
PFUdS	SN		ng/l	1.00	See Attached		See Attached	
PFDoS	SN		ng/l	1.00	See Attached		See Attached	
PFBA	SN		ng/l	1.00	See Attached		See Attached	
PFPeA	SN		ng/l	1.00	See Attached		See Attached	
PFHxA	SN		ng/l	1.00	See Attached		See Attached	
PFHpA	SN		ng/l	1.00	See Attached		See Attached	
PFOA	SN		ng/l	0.65	See Attached		See Attached	
PFNA	SN		ng/l	1.00	See Attached		See Attached	
PFDA	SN		ng/l	1.00	See Attached		See Attached	
PFUdA	SN		ng/l	1.00	See Attached		See Attached	
PFDoA	SN		ng/l	1.00	See Attached		See Attached	
pH	U	1010		N/A	7.6	7.7	7.5	
Sulphate	U	1220	mg/l	1.0	71	9.2	110	
Cyanide (Total)	U	1300	mg/l	0.050	< 0.050	< 0.050	< 0.050	
Sulphide	U	1325	mg/l	0.050	< 0.050	< 0.050	< 0.050	
Arsenic (Dissolved)	U	1455	µg/l	0.20	0.47	1.1	1.3	
Boron (Dissolved)	U	1455	µg/l	10.0	20	40	18	
Cadmium (Dissolved)	U	1455	µg/l	0.11	< 0.11	0.32	< 0.11	
Chromium (Dissolved)	U	1455	µg/l	0.50	3.9	< 0.50	< 0.50	
Copper (Dissolved)	U	1455	µg/l	0.50	2.2	10	7.7	
Mercury (Dissolved)	U	1455	µg/l	0.05	< 0.05	< 0.05	< 0.05	
Molybdenum (Dissolved)	U	1455	µg/l	0.20	1.7	1.5	4.7	
Nickel (Dissolved)	U	1455	µg/l	0.50	3.0	12	3.3	
Lead (Dissolved)	U	1455	µg/l	0.50	< 0.50	6.6	6.5	
Selenium (Dissolved)	U	1455	µg/l	0.50	1.9	3.4	19	
Zinc (Dissolved)	U	1455	µg/l	2.5	< 2.5	36	63	
Chromium (Hexavalent)	U	1490	µg/l	20	< 20	< 20	< 20	
TPH >C6-C10	N	1670	µg/l	0.10	< 0.10	< 0.10	< 0.10	
TPH >C10-C21	N	1670	µg/l	0.10	< 0.10	< 0.10	< 0.10	
TPH >C21-C40	N	1670	µg/l	0.10	< 0.10	< 0.10	< 0.10	
Total TPH >C6-C40	U	1670	µg/l	10	< 10	< 10	< 10	

Results - Water

**Project: 7416B Brownside Mill, Brun Terrace, Burnley,
Lancashire**

Client: Sub Surface		Chemtest Job No.:			22-14971	22-14971	22-14971
Quotation No.: Q22-26627		Chemtest Sample ID.:			1415664	1415665	1415666
		Client Sample ID.:			648-651	652-655	656-659
		Sample Location:			BH1	BH2	BH3
		Sample Type:			WATER	WATER	WATER
		Top Depth (m):			3.35	2.40	3.80
		Date Sampled:			20-Apr-2022	20-Apr-2022	20-Apr-2022
Determinand	Accred.	SOP	Units	LOD			
Naphthalene	U	1700	µg/l	0.10	< 0.10	< 0.10	< 0.10
Acenaphthylene	U	1700	µg/l	0.10	< 0.10	< 0.10	< 0.10
Acenaphthene	U	1700	µg/l	0.10	< 0.10	< 0.10	< 0.10
Fluorene	U	1700	µg/l	0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	U	1700	µg/l	0.10	< 0.10	< 0.10	< 0.10
Anthracene	U	1700	µg/l	0.10	< 0.10	< 0.10	< 0.10
Fluoranthene	U	1700	µg/l	0.10	< 0.10	< 0.10	< 0.10
Pyrene	U	1700	µg/l	0.10	< 0.10	< 0.10	< 0.10
Benzo[a]anthracene	U	1700	µg/l	0.10	< 0.10	< 0.10	< 0.10
Chrysene	N	1700	µg/l	0.10	< 0.10	< 0.10	< 0.10
Benzo[b]fluoranthene	U	1700	µg/l	0.10	< 0.10	< 0.10	< 0.10
Benzo[k]fluoranthene	U	1700	µg/l	0.10	< 0.10	< 0.10	< 0.10
Benzo[a]pyrene	U	1700	µg/l	0.10	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-c,d)Pyrene	U	1700	µg/l	0.10	< 0.10	< 0.10	< 0.10
Dibenz(a,h)Anthracene	U	1700	µg/l	0.10	< 0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene	U	1700	µg/l	0.10	< 0.10	< 0.10	< 0.10
Total Of 16 PAH's	N	1700	µg/l	2.0	< 2.0	< 2.0	< 2.0
Benzene	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
Toluene	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
m & p-Xylene	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
o-Xylene	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
Methyl Tert-Butyl Ether	N	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
Total Phenols	U	1920	mg/l	0.030	< 0.030	< 0.030	< 0.030

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.
1325	Sulphide in Waters	Sulphides	Automated colorimetric analysis by 'Aquakem 600' Discrete Analyser using N,N-dimethyl-pphenylenediamine.
1455	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).
1490	Hexavalent Chromium in Waters	Chromium [VI]	Automated colorimetric analysis by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
1670	Total Petroleum Hydrocarbons (TPH) in Waters by GC-FID	TPH (C6–C40); optional carbon banding, e.g. 3-band – GRO, DRO & LRO	Pentane extraction / GC FID detection
1700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Waters 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)
1760	Volatile Organic Compounds (VOCs) in Waters by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics. (cf. USEPA Method 8260)	Automated headspace gas chromatographic (GC) analysis of water samples with mass spectrometric (MS) detection of volatile organic compounds.
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.

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"
SOP	Standard operating procedure
LOD	Limit of detection

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 30 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



Unit 7-8 Hawarden Business Park
Manor Road (off Manor Lane)
Hawarden
Deeside
CH5 3US

Tel: (01244) 528700

Fax: (01244) 528701

email: hawardencustomerservices@alsglobal.com

Website: www.alsenvironmental.co.uk

Chemtest
Willie Snaith Rd
Newmarket
Suffolk
CB8 7SQ

Attention: Subcontracting Lab

CERTIFICATE OF ANALYSIS

Date of report Generation: 11 May 2022
Customer: Chemtest
Sample Delivery Group (SDG): 220425-24
Your Reference: 22-14971
Location: Newmarket
Report No: 645698
Order Number: 22199

We received 2 samples on Monday April 25, 2022 and 2 of these samples were scheduled for analysis which was completed on Wednesday May 11, 2022. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

Chemical testing (unless subcontracted) performed at ALS Life Sciences Ltd Hawarden.

All sample data is provided by the customer. The reported results relate to the sample supplied, and on the basis that this data is correct.

Incorrect sampling dates and/or sample information will affect the validity of results.

The customer is not permitted to reproduce this report except in full without the approval of the laboratory.

Approved By:

Sonia McWhan

Operations Manager



CERTIFICATE OF ANALYSIS

Validated

SDG: 220425-24
Client Ref.: 22-14971

Report Number: 645698
Location: Newmarket

Superseded Report:

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
26179929	1415664			20/04/2022
26179931	1415666			20/04/2022

Only received samples which have had analysis scheduled will be shown on the following pages.



CERTIFICATE OF ANALYSIS

Validated

SDG: 220425-24
Client Ref.: 22-14971

Report Number: 645698
Location: Newmarket

Superseded Report:

Results Legend <div style="display: flex; gap: 10px;"> <div style="border: 1px solid black; width: 20px; height: 20px; background-color: yellow; display: flex; align-items: center; justify-content: center; font-weight: bold;">X</div> Test </div> <div style="display: flex; gap: 10px; margin-top: 5px;"> <div style="border: 1px solid black; width: 20px; height: 20px; background-color: red; display: flex; align-items: center; justify-content: center; font-weight: bold;">N</div> No Determination Possible </div>	Lab Sample No(s)	26179929	26179931	
	Customer Sample Reference	1415664	1415666	
	AGS Reference			
	Depth (m)			
	Container	0.5l glass bottle (ALE227)	0.5l glass bottle (ALE227)	
	Sample Type	UNL	UNL	
	PFAS Liquids	All	NDPs: 0 Tests: 2	X X

- Sample Types -
- S - Soil/Solid
 - UNS - Unspecified Solid
 - GW - Ground Water
 - SW - Surface Water
 - LE - Land Leachate
 - PL - Prepared Leachate
 - PR - Process Water
 - SA - Saline Water
 - TE - Trade Effluent
 - TS - Treated Sewage
 - US - Untreated Sewage
 - RE - Recreational Water
 - DW - Drinking Water Non-regulatory
 - UNL - Unspecified Liquid
 - SL - Sludge
 - G - Gas
 - OTH - Other



CERTIFICATE OF ANALYSIS

Validated

SDG: 220425-24
Client Ref.: 22-14971

Report Number: 645698
Location: Newmarket

Superseded Report:

Table of Results - Appendix

Method No	Reference	Description
TM337	PFAS in Environmental Water Matrices	Analysis of PFAS

NA = not applicable.

Chemical testing (unless subcontracted) performed at ALS Life Sciences Ltd Hawarden.



CERTIFICATE OF ANALYSIS

Validated

SDG: 220425-24
Client Ref.: 22-14971

Report Number: 645698
Location: Newmarket

Superseded Report:

Test Completion Dates

Lab Sample No(s)	26179929	26179931
Customer Sample Ref.	1415664	1415666
AGS Ref.		
Depth		
Type	Water	Water
PFAS Liquids	11-May-2022	11-May-2022



CERTIFICATE OF ANALYSIS

SDG: 220425-24
Client Ref: 22-14971

Report Number: 645698
Location: Newmarket

Superseded Report:

Appendix

General

1. Results are expressed on a dry weight basis (dried at 35°C) for all soil analyses except for the following: NRA and CEN Leach tests, flash point LOI, pH, ammonium as NH4 by the BRE method, VOC TICs and SVOC TICs.

2. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for all sample types unless the sample is destroyed on testing. The prepared soil sub sample that is analysed for asbestos will be retained for a period of 6 months after the analysis date. All bulk samples will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALS reserve the right to charge for samples received and stored but not analysed.

3. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.

4. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.

5. If no separate volatile sample is supplied by the client, or if a headspace or sediment is present in the volatile sample, the integrity of the data may be compromised. This will be flagged up as an invalid VOC on the test schedule and the result marked as deviating on the test certificate.

6. NDP - No determination possible due to insufficient/unsuitable sample.

7. Results relate only to the items tested.

8. LoDs (Limit of Detection) for wet tests reported on a dry weight basis are not corrected for moisture content.

9. **Surrogate recoveries** - Surrogates are added to your sample to monitor recovery of the test requested. A % recovery is reported, results are not corrected for the recovery measured. Typical recoveries for organics tests are 70-130%. Recoveries in soils are affected by organic rich or clay rich matrices. Waters can be affected by remediation fluids or high amounts of sediment. Test results are only ever reported if all of the associated quality checks pass; it is assumed that all recoveries outside of the values above are due to matrix affect.

10. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.

11. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.

12. For dried and crushed preparations of soils volatile loss may occur e.g volatile mercury.

13. For leachate preparations other than Zero Headspace Extraction (ZHE) volatile loss may occur.

14. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.

15. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C5-C12 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

16. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

17 Data retention. All records, communications and reports pertaining to the analysis are archived for seven years from the date of issue of the final report.

18. **Tentatively Identified Compounds (TICs)** are non-target peaks in VOC and SVOC analysis. All non-target peaks detected with a concentration above the LoD are subjected to a mass spectral library search. Non-target peaks with a library search confidence of >75% are reported based on the best mass spectral library match. When a non-target peak with a library search confidence of <75% is detected it is reported as "mixed hydrocarbons". Non-target compounds identified from the scan data are semi-quantified relative to one of the deuterated internal standards, under the same chromatographic conditions as the target compounds. This result is reported as a semi-quantitative value and reported as Tentatively Identified Compounds (TICs). TICs are outside the scope of UKAS accreditation and are not moisture corrected.

19. Sample Deviations

If a sample is classed as deviated then the associated results may be compromised.

1	Container with Headspace provided for volatiles analysis
2	Incorrect container received
3	Deviation from method
4	Matrix interference
♦	Sample holding time exceeded in laboratory
@	Sample holding time exceeded due to late arrival of instructions or samples
§	Sampled on date not provided

20. Asbestos

When requested, the individual sub sample scheduled will be analysed in house for the presence of asbestos fibres and asbestos containing material by our documented in house method TM048 based on HSG 248 (2021), which is accredited to ISO17025. If a specific asbestos fibre type is not found this will be reported as "Not detected". If no asbestos fibre types are found all will be reported as "Not detected" and the sub sample analysed deemed to be clear of asbestos. If an asbestos fibre type is found it will be reported as detected (for each fibre type found). Testing can be carried out on asbestos positive samples, but, due to Health and Safety considerations, may be replaced by alternative tests or reported as No Determination Possible (NDP). The quantity of asbestos present is not determined unless specifically requested.

Identification of Asbestos in Bulk Materials & Soils

The results for identification of asbestos in bulk materials and soils are obtained from supplied bulk materials and soils which have been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2021).

The results for identification of asbestos in soils are obtained from a homogenised sub sample which has been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central

Aste stos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anorthophyllite	-
Fibrous Tremolite	-

Visual Estimation Of Fibre Content

Estimation of fibre content is not permitted as part of our UKAS accredited test other than: - Trace - Where only one or two asbestos fibres were identified.

Respirable Fibres

Respirable fibres are defined as fibres of <3 µm diameter, longer than 5 µm and with aspect ratios of at least 3:1 that can be inhaled into the lower regions of the lung and are generally acknowledged to be most important predictor of hazard and risk for cancers of the lung.

Further guidance on typical asbestos fibre content of manufactured products can be found in HSG 264.




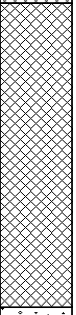
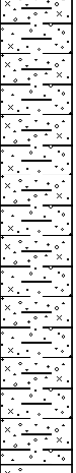
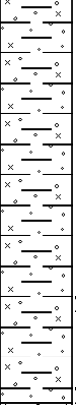
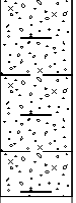
The identification of asbestos containing materials and soils falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.

BOREHOLE RECORD SHEETS

Boring Method LIGHT CABLE PERCUSSIVE	Casing Diameter 150mm to 10.00m	Ground Level (mOD)	Client M SMITHSON PROPERTIES LTD	Job Number 7416B
	Location AS PLAN	Dates 25/02/2022	Engineer BLUEPRINT BUILDING CONSULTANTS LTD	Sheet 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.30-1.00	B					(0.30)	MADE GROUND: concrete.	[Cross-hatch pattern]		
0.30-1.00	D					0.30	MADE GROUND: brick (recovered as fine to coarse gravel sized fragments).	[Cross-hatch pattern]		
						(0.70)				
1.20-1.45	SPT 56/95			2,5/16,40		1.00	MADE GROUND: dark brown clayey sandy fine to coarse gravel sized fragments of stone	[Cross-hatch pattern]		
1.20-1.45	D					(0.70)				
1.20-1.65	B					1.70	Firm medium strength dark brownish grey slightly gravelly slightly sandy silty CLAY. Gravel is angular to subrounded fine to coarse sandstone and siltstone	[Stippled pattern]		
2.00-2.45	U c=64kPa									
2.50	D									
3.00-3.45	SPT N=17			2,3/3,4,4,6		(2.80)				
3.00-3.45	B									
3.00-3.45	D									
4.00-4.45	U c=43kPa									
4.45	D					4.50	Stiff high strength thinly laminated dark brownish grey slightly gravelly silty CLAY. Gravel is subangular to subrounded fine to coarse sandstone, siltstone and coal	[Stippled pattern]		
5.00-5.45	SPT N=27			3,4/4,7,7,9						
5.00-5.45	B									
5.00-5.45	D									
6.00-6.45	SPT N=31			4,5/5,8,9,9		(3.00)				
6.00-6.45	B									
6.00-6.45	D									
7.00	D								▼1	
7.50-7.95	U c=150kPa					7.50	Very stiff very high strength greyish brown and occasional orangish brown mottled slightly gravelly slightly sandy silty CLAY. Gravel is subangular to subrounded fine to coarse sandstone and siltstone	[Stippled pattern]		
8.00-8.45	D			Water Inflow(1) at 7.90m, rose to 7.00m in 20 mins, not sealed.					▽1	
8.00-8.45	SPT N=47			4,5/11,11,12,13		(1.95)				
9.00-9.45	SPT N=47			7,9/10,12,12,13						
9.00-9.45	D									
				25/02/2022:7.00m		9.45	Complete at 9.45m			

Remarks Hand dug inspection pit from GL to 1.20m to check for services - 1 hour. On completion backfilled with arisings and installed a 50mm dia hdpe gas monitoring standpipe with a gas valve and a gravel surround to 6.00m, a Bentonite seal from 1.00m to 0.20m and a concreted in lockable steel protective cover from 0.20m to GL.	Scale (approx)	Logged By
	1:50	PM/VW
	Figure No. 7416.BH1	




 SUB SURFACE SITE INVESTIGATION SPECIALISTS, GEOTECHNICAL & ENVIRONMENTAL CONSULTANTS 3 Peel Street, Preston, Lancashire, PR2 2QS. Tel: (01772) 561135 Fax: (01772) 204907							Site BROWNSIDE MILL, BRUN TERRACE, BURNLEY, LANCASHIRE			Borehole Number BH2	
Boring Method LIGHT CABLE PERCUSSIVE		Casing Diameter 150mm to 10.50m		Ground Level (mOD)		Client M SMITHSON PROPERTIES LTD			Job Number 7416B		
		Location AS PLAN		Dates 24/02/2022		Engineer BLUEPRINT BUILDING CONSULTANTS LTD			Sheet 1/2		
Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr	
0.30-0.90	B					(0.30)	MADE GROUND: concrete.				
0.30-0.90	D					0.30	MADE GROUND: dark brown silty sandy fine to coarse gravel sized fragments of stone and concrete.				
						(0.60)					
						0.90	MADE GROUND: soft to firm dark grey, light grey and brown mottled sandy slightly gravelly silty clay with occasional pieces of string. Gravel sized fragments are fine to coarse stone.				
1.20-1.65	SPT N=11			1,2/1,2,2,6							
1.20-1.65	B										
1.20-1.65	D										
						(2.00)					
2.00-2.45	SPT N=10			2,2/2,2,3,3							
2.00-2.45	B										
2.00-2.45	D										
						2.90	Soft low strength becoming firm to stiff medium to high strength dark brownish grey slightly gravelly slightly sandy silty CLAY. Gravel is angular to subrounded fine to coarse coal and sandstone.				
3.00-3.45	SPT N=8			1,1/2,2,2,2							
3.00-3.45	B										
3.00-3.45	D										
						(3.10)	...below 4.10m: stiff high strength.				
4.00-4.45	SPT N=24			2,4/5,5,6,8							
4.00-4.45	B										
4.00-4.45	D										
						(5.00)	...below 5.00m: firm medium strength.				
5.00-5.45	U _c =50kPa										
5.50	D										
						6.00	Stiff high strength thinly laminated brownish grey slightly gravelly silty CLAY. Gravel is angular to subrounded fine to coarse sandstone, siltstone, coal and quartz.				
6.00-6.45	SPT N=31			2,3/7,7,8,9							
6.00-6.45	B										
6.00-6.45	D										
						(2.70)					
7.00	D										
						8.70	Very dense dark brown silty sandy subangular to subrounded fine to coarse sandstone, siltstone and coal GRAVEL with low cobble content.				
7.50-7.95	SPT N=27			2,4/5,6,7,9							
7.50-7.95	B										
7.50-7.95	D										
8.50	D										
9.00-9.45	B			Water Inflow(1) at 8.70m, rose to 8.10m in 20 mins, not sealed.							
9.00-9.45	D			3,4/8,12,16,14							
9.00-9.45	SPT 50/245										

Remarks
 Hand dug inspection pit from GL to 1.20m to check for services - 1 hour.
 On completion backfilled with arisings and installed a 50mm dia hdpe slotted standpipe with a gas valve and a gravel surround to 6.00m, a Bentonite seal from 1.00m to 0.20m and a concreted in lockable steel protective cover from 0.20m to GL.

Scale (approx)
1:50

Logged By
PM/VW

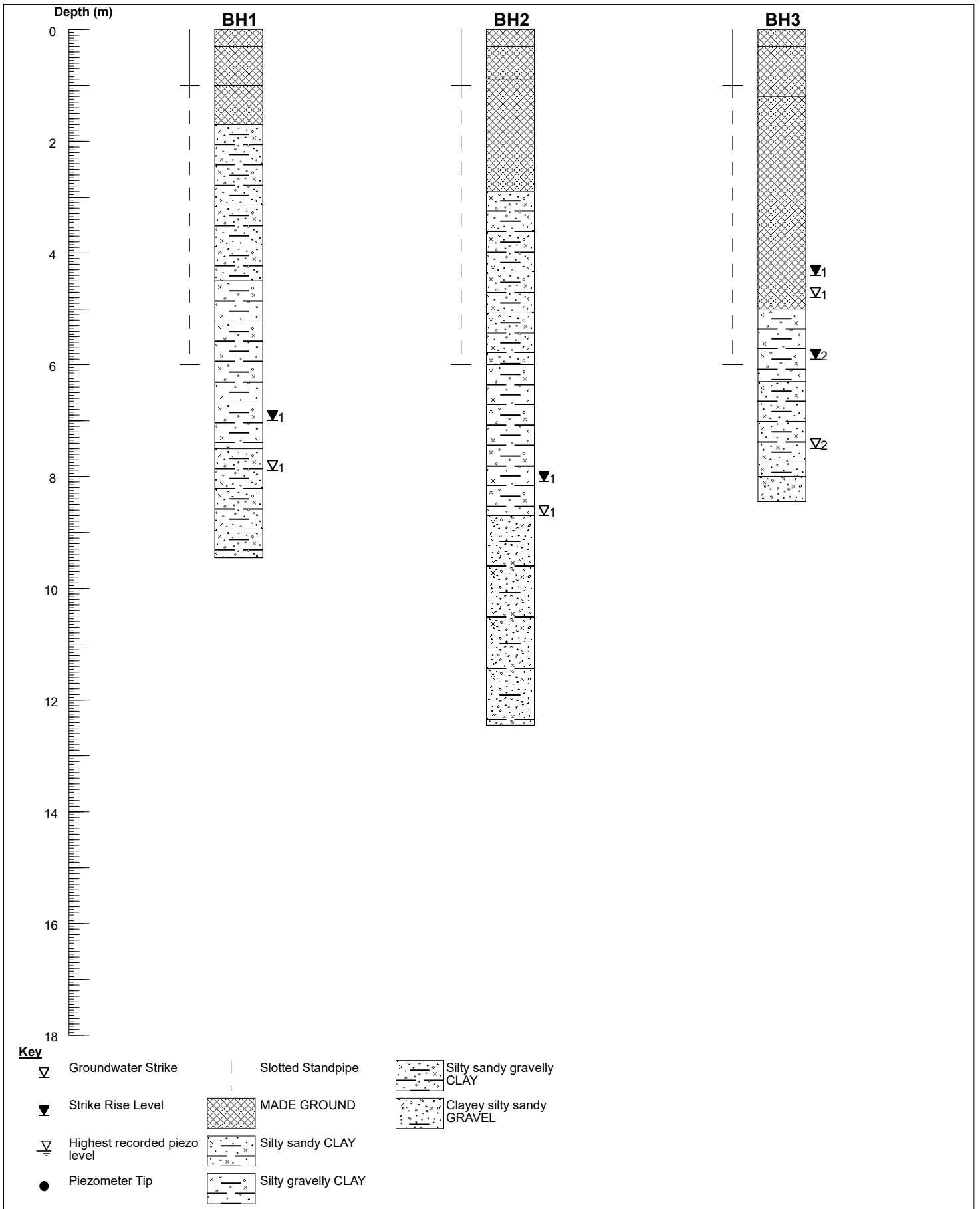
Figure No.
7416.BH2

 SUB SURFACE SITE INVESTIGATION SPECIALISTS, GEOTECHNICAL & ENVIRONMENTAL CONSULTANTS 3 Peel Street, Preston, Lancashire, PR2 2QS. Tel: (01772) 561135 Fax: (01772) 204907							Site BROWNSIDE MILL, BRUN TERRACE, BURNLEY, LANCASHIRE			Borehole Number BH2	
Boring Method LIGHT CABLE PERCUSSIVE		Casing Diameter 150mm to 10.50m		Ground Level (mOD)		Client M SMITHSON PROPERTIES LTD			Job Number 7416B		
		Location AS PLAN		Dates 24/02/2022		Engineer BLUEPRINT BUILDING CONSULTANTS LTD			Sheet 2/2		
Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr	
10.50-10.88 10.50-10.88 10.50-10.95	SPT 50/225 D B			4,8/12,16,14,8		(3.75)	Very dense dark brown silty sandy subangular to subrounded fine to coarse sandstone, siltstone and coal GRAVEL with low cobble content.				
12.00-12.40	SPT(C) 50/245			4,5/12,12,13,13 25/02/2022:9.10m		12.45					Complete at 12.45m
Remarks								Scale (approx) 1:50	Logged By PM/VW	Figure No. 7416.BH2	

Boring Method LIGHT CABLE PERCUSSIVE	Casing Diameter 150mm to 4.50m	Ground Level (mOD)	Client M SMITHSON PROPERTIES LTD	Job Number 7416B
	Location AS PLAN	Dates 24/02/2022	Engineer BLUEPRINT BUILDING CONSULTANTS LTD	Sheet 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.30-1.20	B					(0.30)	MADE GROUND: concrete.			
0.30-1.20	D					0.30	MADE GROUND: brownish grey clayey sandy fine to coarse gravel and cobble sized fragments of brick and stone (chemical odour).			
1.20-1.20	SPT(C) 25*/0			25/50		1.20	Probable MADE GROUND: dark greyish brown very clayey very sandy gravel sized fragments of stone with many stone cobbles and pockets of clay.			
1.20-1.65	B									
1.20-1.65	D									
2.00-2.45	SPT N=19			1,2/4,4,5,6						
2.00-2.45	B									
2.00-2.45	D									
3.00-3.45	SPT N=5			2,3/1,0,1,3		(3.80)				
3.00-3.45	B									
3.00-3.45	D									
4.00-4.45	SPT(C) N=21			2,4/5,5,5,6						
4.00-4.45	B									
4.00-4.45	D									
5.00-5.45	U c=65kPa			Water Inflow(1) at 4.80m, rose to 4.40m in 20 mins, sealed at 5.00m.		5.00	Firm medium to high strength thinly laminated dark brownish grey slightly gravelly slightly sandy silty CLAY. Gravel is angular to subrounded fine to coarse sandstone, siltstone and coal.		▼1	
5.50	D					(1.30)	...below 6.00m: high strength.		▼2	
6.00-6.45	SPT N=42			6,7/9,8,12,13		6.30	Very stiff very high strength greyish brown and occasional orangish brown and dark grey mottled slightly gravelly slightly sandy silty CLAY. Gravel is subangular to subrounded fine to coarse sandstone, siltstone and coal.		▼2	
6.00-6.45	B									
6.00-6.45	D									
7.50-7.95	D			Water Inflow(2) at 7.50m, rose to 5.90m in 20 mins, not sealed.		8.00	Dense dark brown silty sandy subangular to subrounded fine coarse sandstone GRAVEL.		▼2	
7.50-7.95	SPT N=48			10,11/11,12,12,13		(0.45)				
8.00-8.45	SPT N=49			9,10/11,12,13,13		8.45	Complete at 8.45m			
8.00-8.45	D									
				25/02/2022:6.20m						

Remarks Hand dug inspection pit from GL to 1.20m to check for services - 1 hour. On completion backfilled with arisings and installed a 50mm dia hdpe slotted standpipe with a gas valve and a gravel surround to 6.00m, a Bentonite seal from 1.00m to 0.20m and a concreted in lockable steel protective cover from 0.20m to GL.	Scale (approx)	Logged By
	1:50	PM/VW
	Figure No. 7416.BH3	



SS SUB SURFACE SITE INVESTIGATION SPECIALISTS, GEOTECHNICAL & ENVIRONMENTAL CONSULTANTS 3 Peel Street, Preston, Lancashire, PR2 2QS. Tel: (01772) 561135 Fax: (01772) 204907		Nominal Section			
Site BROWNSIDE MILL, BRUN TERRACE, BURNLEY, LANCASHIRE	Date Drawn 21/06/2022	Date Checked	Sheet 1/1	Job Number 7416B	
Client M SMITHSON PROPERTIES LTD	Drawn By	Checked By	Scale 1:90[V]	Figure No. M3614.1	

ROTARY BOREHOLE RECORD SHEETS



SUB SURFACE

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Site
BROWNSIDE MILL, BRUN TERRACE, BURNLEY,
LANCASHIRE

Borehole Number
R1

Machine : BERETTA T44 Flush : WATER Core Dia: NONE mm Method : ROTARY OPEN HOLE	Casing Diameter 150mm cased to 10.00m	Ground Level (mOD)	Client M SMITHSON PROPERTIES LTD	Job Number 7416B
	Location AS PLAN	Dates 31/05/2022	Engineer BLUEPRINT BUILDING CONSULTANTS LTD	Sheet 1/4

Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water		
							(0.30)	MADE GROUND: concrete				
							0.30	MADE GROUND: ashy gravel sized fragments of stone and brick.				
							(0.30)					
							0.60	Dark brownish grey slightly gravelly slightly sandy silty CLAY.				
							(8.00)					
							8.60	Dark brown SAND and GRAVEL with occasional boulders.				
							(1.20)					
							9.80	Brown SANDSTONE.				

Remarks
 Hand dug inspection pit from GL to 1.20m to check for services.
 Description based upon foreman drillers records of water flush returns.
 Foreman driller recorded no voids, broken ground or loss of flush returns.
 On completion backfilled with grout.

Scale (approx)
 1:50
Logged By
 VW
Figure No.
 7416C.R1



SUB SURFACE

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Site
BROWNSIDE MILL, BRUN TERRACE, BURNLEY,
LANCASHIRE

Borehole Number
R1

Machine : BERETTA T44
Flush : WATER
Core Dia: NONE mm
Method : ROTARY OPEN HOLE

Casing Diameter
150mm cased to 10.00m

Ground Level (mOD)

Client
M SMITHSON PROPERTIES LTD

Job Number
7416B

Location
AS PLAN

Dates
31/05/2022

Engineer
BLUEPRINT BUILDING CONSULTANTS LTD

Sheet
2/4

Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
							(0.80)	Brown SANDSTONE.		
							10.60	Grey MUDSTONE.		
							(7.90)			
							18.50	Light grey MUDSTONE with dark grey siltstone bands.		
							(2.20)			

Remarks

Scale (approx)
1:50
Logged By
VW
Figure No.
7416C.R1



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Site
BROWNSIDE MILL, BRUN TERRACE, BURNLEY,
LANCASHIRE

**Borehole
Number**
R1

Machine : BERETTA T44 Flush : WATER Core Dia: NONE mm Method : ROTARY OPEN HOLE	Casing Diameter 150mm cased to 10.00m	Ground Level (mOD)	Client M SMITHSON PROPERTIES LTD	Job Number 7416B
	Location AS PLAN	Dates 31/05/2022	Engineer BLUEPRINT BUILDING CONSULTANTS LTD	Sheet 3/4

Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
								Light grey MUDSTONE with dark grey siltstone bands.		
							20.70	Grey MUDSTONE with occasional sandstone bands.		
							(14.30)			

Remarks	Scale (approx) 1:50	Logged By VW
	Figure No. 7416C.R1	



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Site
BROWNSIDE MILL, BRUN TERRACE, BURNLEY,
LANCASHIRE

Borehole Number
R2

Machine : BERETTA T44 Flush : WATER Core Dia: NONE mm Method : ROTARY OPEN HOLE	Casing Diameter 150mm cased to 10.50m	Ground Level (mOD)	Client M SMITHSON PROPERTIES LTD	Job Number 7416B
	Location AS PLAN	Dates 01/06/2022	Engineer BLUEPRINT BUILDING CONSULTANTS LTD	Sheet 1/4

Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
							(0.40)	MADE GROUND: concrete		
							0.40 (0.40)	MADE GROUND: ashy gravel sized fragments of stone and brick.		
							0.80	Dark brownish grey slightly gravelly slightly sandy silty CLAY.		
							(7.20)			
							8.00	Dark brown SAND and GRAVEL with occasional boulders.		
							(2.10)			

Remarks Hand dug inspection pit from GL to 1.20m to check for services. Description based upon foreman drillers records of water flush returns. Foreman driller recorded no voids, broken ground or loss of flush returns. On completion backfilled with arisings and grout.	Scale (approx) 1:50	Logged By VW
	Figure No. 7416C.R2	



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Site
BROWNSIDE MILL, BRUN TERRACE, BURNLEY,
LANCASHIRE

Borehole Number
R2

Machine : BERETTA T44 Flush : WATER Core Dia: NONE mm Method : ROTARY OPEN HOLE	Casing Diameter 150mm cased to 10.50m	Ground Level (mOD)	Client M SMITHSON PROPERTIES LTD	Job Number 7416B
	Location AS PLAN	Dates 01/06/2022	Engineer BLUEPRINT BUILDING CONSULTANTS LTD	Sheet 2/4

Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
							10.10	Brown SANDSTONE.		
							(0.70)			
							10.80	Grey MUDSTONE with siltstone bands.		
							(6.40)			
							17.20	Grey MUDSTONE with dark grey siltstone bands.		
							(1.70)			
							18.90	Grey MUDSTONE with siltstone and sandstone bands.		

Remarks	Scale (approx) 1:50	Logged By VW
	Figure No. 7416C.R2	



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Site
BROWNSIDE MILL, BRUN TERRACE, BURNLEY,
LANCASHIRE

**Borehole
Number**
R2

Machine : BERETTA T44 Flush : WATER Core Dia: NONE mm Method : ROTARY OPEN HOLE	Casing Diameter 150mm cased to 10.50m	Ground Level (mOD)	Client M SMITHSON PROPERTIES LTD	Job Number 7416B
	Location AS PLAN	Dates 01/06/2022	Engineer BLUEPRINT BUILDING CONSULTANTS LTD	Sheet 3/4

Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
							(16.10)	Grey MUDSTONE with siltstone and sandstone bands.		

Remarks	Scale (approx) 1:50	Logged By VW
	Figure No. 7416C.R2	



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Site
BROWNSIDE MILL, BRUN TERRACE, BURNLEY,
LANCASHIRE

**Borehole
Number**
R2

Machine : BERETTA T44 Flush : WATER Core Dia: NONE mm Method : ROTARY OPEN HOLE	Casing Diameter 150mm cased to 10.50m	Ground Level (mOD)	Client M SMITHSON PROPERTIES LTD	Job Number 7416B
	Location AS PLAN	Dates 01/06/2022	Engineer BLUEPRINT BUILDING CONSULTANTS LTD	Sheet 4/4

Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
								Grey MUDSTONE with siltstone and sandstone bands.		
					01/06/2022:		35.00	Complete at 35.00m		

Remarks	Scale (approx) 1:50	Logged By VW
	Figure No. 7416C.R2	



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Site
BROWNSIDE MILL, BRUN TERRACE, BURNLEY,
LANCASHIRE

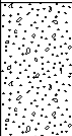

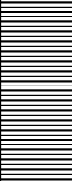
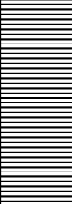


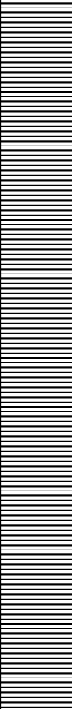
Borehole Number
R3

Machine : BERETTA T44 Flush : WATER Core Dia : NONE mm Method : ROTARY OPEN HOLE	Casing Diameter 150mm cased to 12.00m	Ground Level (mOD)	Client M SMITHSON PROPERTIES LTD	Job Number 7416B
	Location AS PLAN	Dates 30/05/2022	Engineer BLUEPRINT BUILDING CONSULTANTS LTD	Sheet 1/4

Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
							(0.30)	MADE GROUND: concrete.		
							0.30	MADE GROUND: gravel sized fragments of concrete and brick.		
							(0.70)			
							1.00	Dark brownish grey slightly sandy silty CLAY.		
							(2.90)			
							3.90	Dark brownish grey gravelly slightly sandy silty CLAY.		
							(4.30)			
							8.20	Dark brown clayey SAND and GRAVEL with some boulders.		
							(1.00)			
							9.20	Dark brown SAND and GRAVEL.		

Remarks Hand dug inspection pit from GL to 1.20m to check for services. Description based upon foreman drillers records of water flush returns. Foreman driller recorded no voids, broken ground or loss of flush returns. On completion backfilled with arisings and grout.	Scale (approx) 1:50	Logged By VW
	Figure No. 7416C.R3	

Machine : BERETTA T44 Flush : WATER Core Dia: NONE mm Method : ROTARY OPEN HOLE	Casing Diameter 150mm cased to 12.00m	Ground Level (mOD)	Client M SMITHSON PROPERTIES LTD	Job Number 7416B
	Location AS PLAN	Dates 30/05/2022	Engineer BLUEPRINT BUILDING CONSULTANTS LTD	Sheet 2/4

Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
							(1.70)	Dark brown SAND and GRAVEL.		
							10.90 (0.40)	Brown SANDSTONE.		
							11.30	Grey MUDSTONE.		
							(2.60)			
							13.90 (0.90)	Weak grey MUDSTONE.		
							14.80 (0.50)	Grey SILTSTONE.		
							15.30	Strong grey MUDSTONE with occasional sandstone bands.		

Remarks	Scale (approx) 1:50	Logged By VW
Figure No. 7416C.R3		



SUB SURFACE

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Site
BROWNSIDE MILL, BRUN TERRACE, BURNLEY,
LANCASHIRE

Borehole Number
R3

Machine : BERETTA T44 Flush : WATER Core Dia: NONE mm Method : ROTARY OPEN HOLE	Casing Diameter 150mm cased to 12.00m	Ground Level (mOD)	Client M SMITHSON PROPERTIES LTD	Job Number 7416B
	Location AS PLAN	Dates 30/05/2022	Engineer BLUEPRINT BUILDING CONSULTANTS LTD	Sheet 3/4

Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
							(19.70)	Strong grey MUDSTONE with occasional sandstone bands.		

Remarks	Scale (approx) 1:50	Logged By VW
	Figure No. 7416C.R3	



SUB SURFACE

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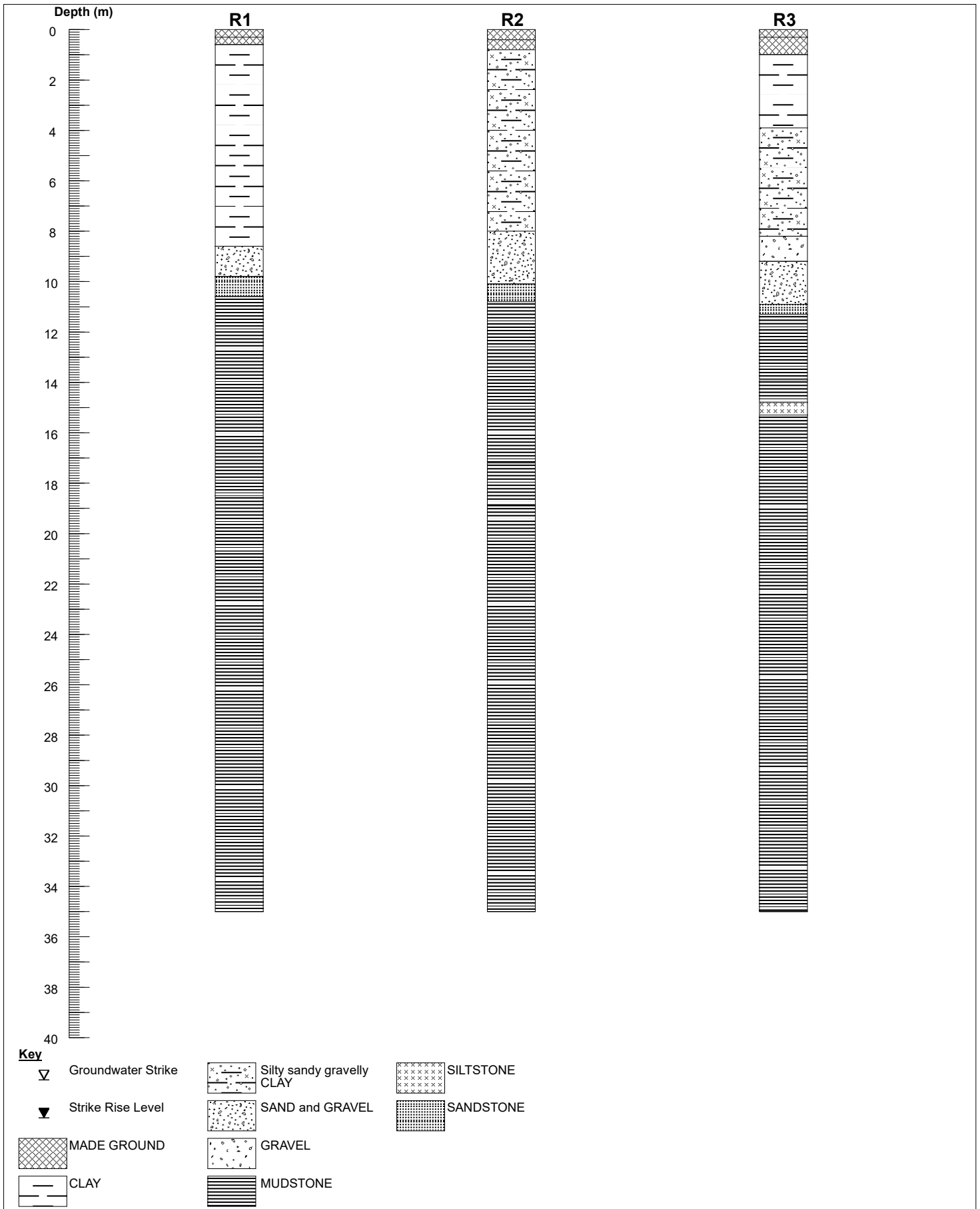
Site
BROWNSIDE MILL, BRUN TERRACE, BURNLEY,
LANCASHIRE

Borehole Number
R3

Machine : BERETTA T44 Flush : WATER Core Dia: NONE mm Method : ROTARY OPEN HOLE	Casing Diameter 150mm cased to 12.00m	Ground Level (mOD)	Client M SMITHSON PROPERTIES LTD	Job Number 7416B
	Location AS PLAN	Dates 30/05/2022	Engineer BLUEPRINT BUILDING CONSULTANTS LTD	Sheet 4/4

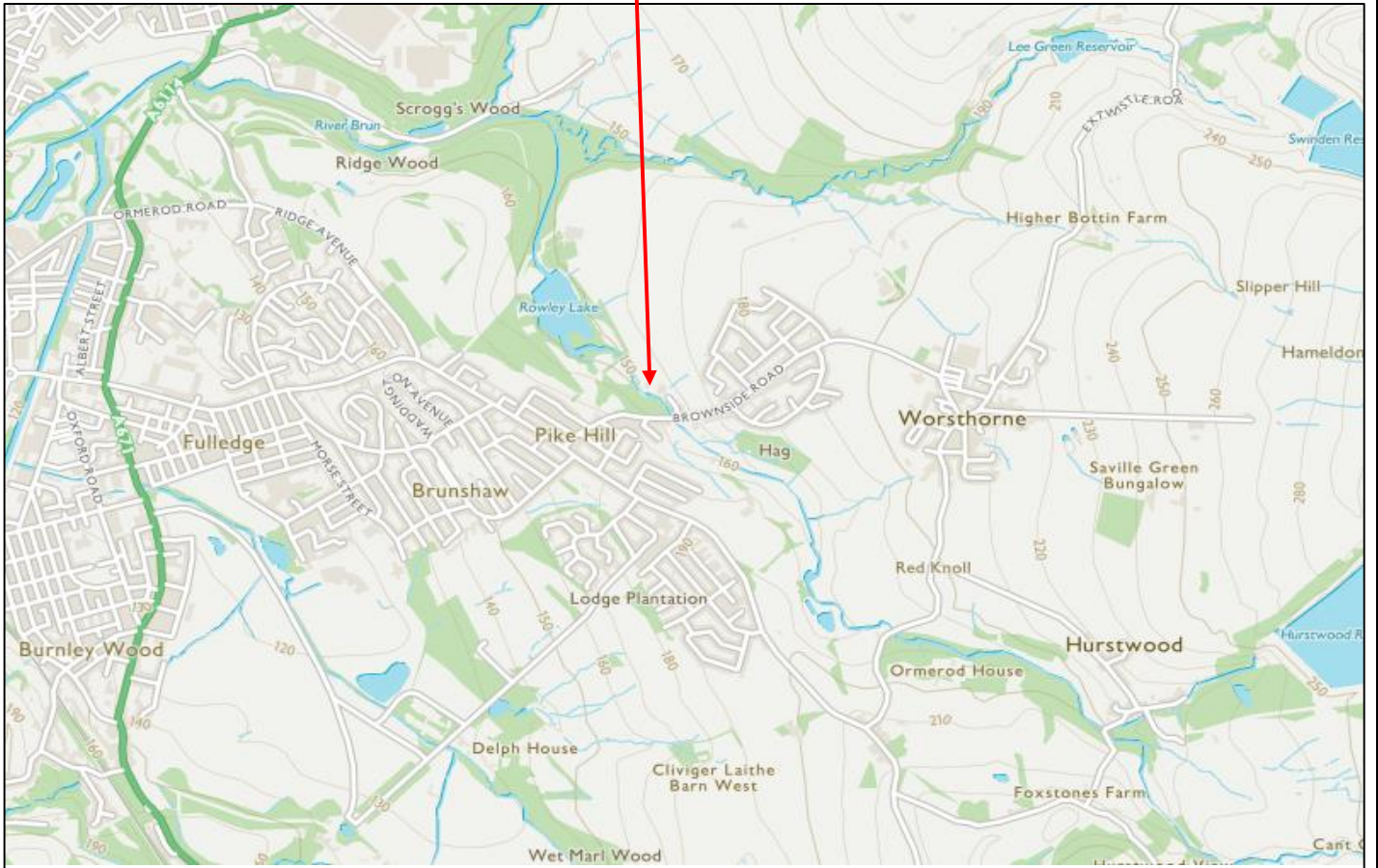
Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
								Strong grey MUDSTONE with occasional sandstone bands.		
					30/05/2022: DRY		35.00	Complete at 35.00m		

Remarks	Scale (approx) 1:50	Logged By VW
	Figure No. 7416C.R3	



SUB SURFACE SITE INVESTIGATION SPECIALISTS, GEOTECHNICAL & ENVIRONMENTAL CONSULTANTS 3 Peel Street, Preston, Lancashire, PR2 2QS. Tel: (01772) 561135 Fax: (01772) 204907	Nominal Section			
	Site BROWNSIDE MILL, BRUN TERRACE, BURNLEY, LANCASHIRE	Date Drawn 21/06/2022	Date Checked	Sheet 1/1
Client M SMITHSON PROPERTIES LTD	Drawn By	Checked By	Scale 1:200[V]	Figure No. M3614.1


FIGURES





SUB SURFACE

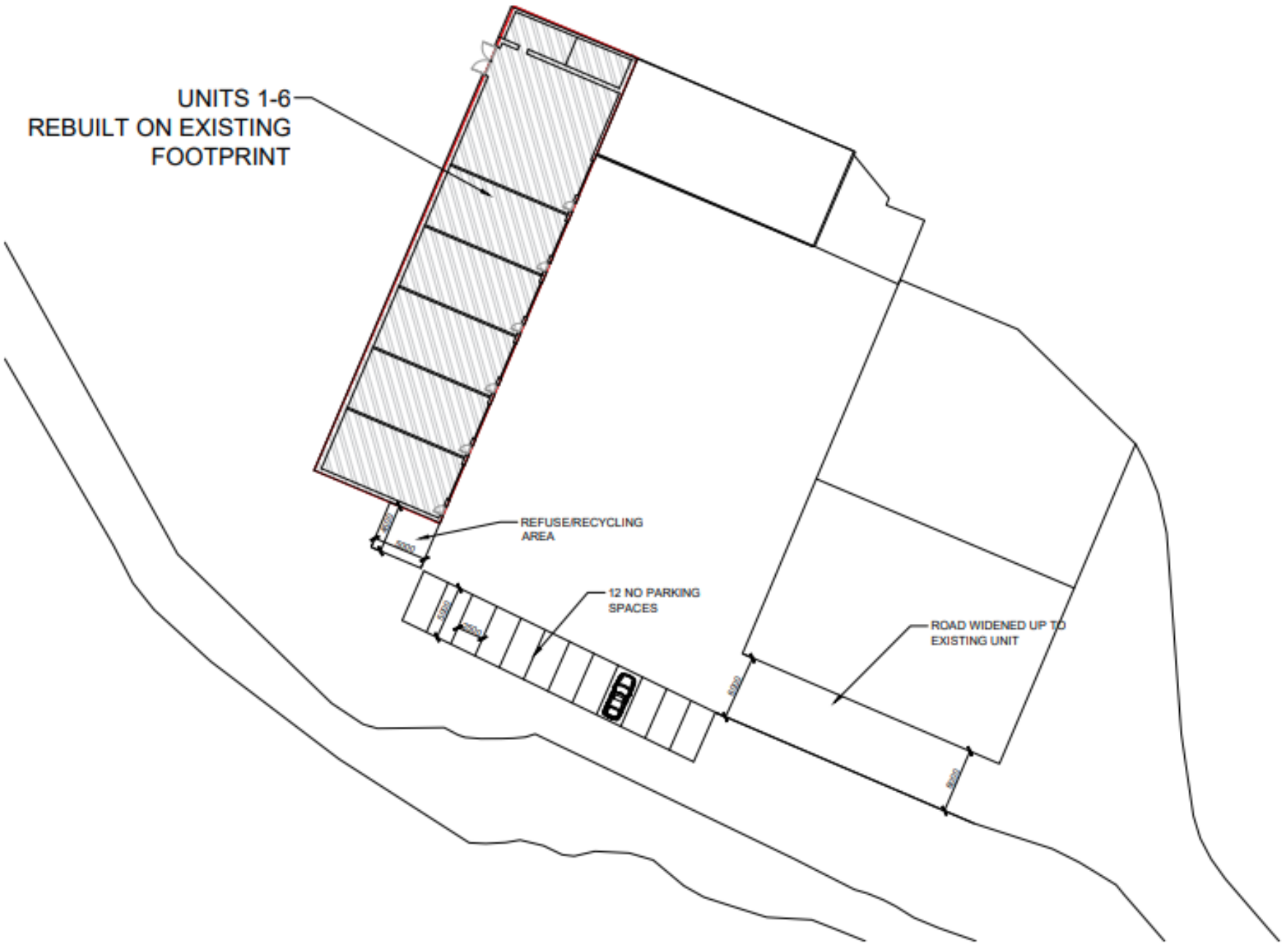
SITE INVESTIGATION AND SPECIALIST GEOTECHNICAL CONSULTANTS
 3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907

General Site Location

Site BROWNSIDE MILL, BRUN TERRACE, BURNLEY, LANCASHIRE	Date Drawn 10-May-22	Date Checked	Orientation 	Job No. 7416B
Client M. SMITHSON PROPERTIES LTD	Drawn By TP	Checked By	Scale -	Figure No. 1



 SUB SURFACE SITE INVESTIGATION AND SPECIALIST GEOTECHNICAL CONSULTANTS 3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907	Site Location			
	Site BROWNSIDE MILL, BRUN TERRACE, BURNLEY, LANCASHIRE	Date Drawn 10-May-22	Date Checked	Orientation 
Client M. SMITHSON PROPERTIES LTD	Drawn By TP	Checked By	Scale -	Figure No. 2

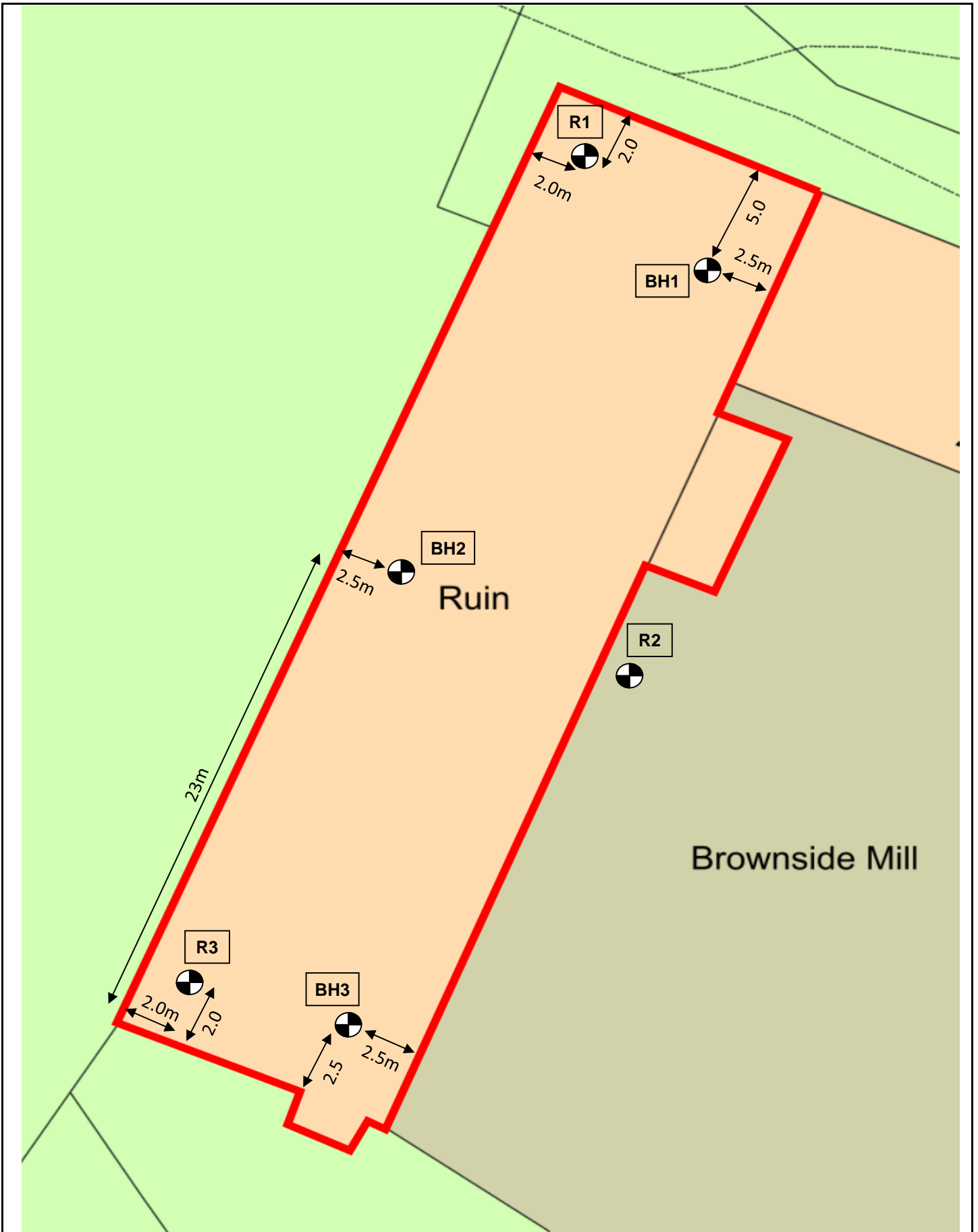



SUB SURFACE

SITE INVESTIGATION AND SPECIALIST GEOTECHNICAL CONSULTANTS
 3 Peel Street, Preston, PR2 2QS, Tel. (01772) 561135 Fax (01772) 204907

Proposed Development Plan

Site	BROWNSIDE MILL, BRUN TERRACE, BURNLEY, LANCASHIRE		Date Drawn	10-May-22	Date Checked		Orientation		Job No.	7416B
Client	M. SMITHSON PROPERTIES LTD		Drawn By	TP	Checked By		Scale	—	Figure No.	3



 SUB SURFACE SITE INVESTIGATION AND SPECIALIST GEOTECHNICAL CONSULTANTS 3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907	Borehole Location Plan			
	Date Drawn 16-Jun-22	Date Checked	Orientation 	Job No. 7416B
Site BROWNSIDE MILL, BRUN TERRACE, BURNLEY, LANCASHIRE	Drawn By TP	Checked By	Scale -	Figure No. 4
Client M. SMITHSON PROPERTIES LTD				