PROPOSED RESIDENTIAL BARN CONVERSION

LONG ACRES, REDFIELD HILL, BITTON

Phase 2 Intrusive Ground Investigation

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PROPOSED RESIDENTIAL BARN CONVERSIONS

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1. Introduction

1.1 Terms of Reference

Ground Investigation Limited (GI) has been commissioned by Mr. Matthew Woolley to carry out a Phase 2 intrusive ground investigation in connection with the proposed residential conversion of two former agricultural barns at the premises known as Long Acres at Redfield Hill in Bitton. The proposed site layout is presented as the base to Figure 1.

This report is intended to address Part B of Condition 2 of South Gloucestershire Council's planning permission reference PK17/4721/F. In this regard, the particular planning condition relates only to the building known as Barn B and its surroundings. This assessment also includes consideration of Barn A, however, as a prudent additional precaution, acknowledging the sensitive residential end use.

The report provides a generic quantitative assessment of potential chronic human health risks associated with the presence of contaminated soils in the context of the proposed development works. The previously issued preliminary qualitative assessments of potential risks associated with hazardous ground gas and potential risks to controlled waters are also updated in the context of the proposed development.

The findings of this report should be considered in the context of the previously issued Phase 1 Assessment of Land Quality ('Desk Study'), prepared by GI, and issued in July 2020 (Ref. 1).

1.2 Site Location

The property is located on the southern side of Redfield Hill, on the rural northern outskirts of the village Bitton, overlooking Oldland Common on the eastern fringes of Bristol. The postal address for the site is Long Acres, Redfield Hill, Bitton, Bristol, BS30 6NX and its approximate National Grid Reference is 368040, 171420.

A full description of the site was provided within the earlier Desk Study, and details are therefore not repeated here. However, an updated description of the site at the time of the Phase 2 fieldworks is provided in Section 2.2.1.

1.3 Proposed Development

The proposed development of the site is understood to involve the conversion of two former agricultural buildings into dwellings, with associated external alterations, landscaping and parking areas.

Based on the identified planning requirements, this report is concerned mainly with the building known as Barn B, which occupies the southern part of the proposed development footprint. However, the footprint and proposed garden area of Barn A have also been investigated as an additional precaution.

We understand that the proposed residential dwelling at Barn B will occupy the same footprint as the existing workshop building and will be provided with a grassed landscaped garden to its south and east, together with an adjoining hard surfaced terraced amenity space adjoining its southern elevation. A new parking and turning area will be constructed to the east, approached from the north by a newly constructed access road.

Barn A occupies adjoining land to the north and will be in an almost identical layout to Barn B.

The proposed development layout has been used as the base to Figure 1.

1.4 Objectives

The primary objectives of this Phase 2 intrusive ground investigation are summarised as follows.

(i) Examine the physical ground and groundwater conditions within the proposed development area.

(ii) Identify and investigate potentially significant geo-environmental and geotechnical hazards.

(iii) Consider ground contamination in relation to threats posed to human health and controlled waters.

(iv) Advise on the need for remedial actions, or further investigation, to address potentially unacceptable human health or environmental risks associated with identified ground contamination hazards.

1.5 Scope of Work

In order to achieve the objectives summarised in Section 1.4 above, the following general scope of work has been carried out.

(i) Fieldworks involving the inspection of six hand excavated trial pits, extending to depths ranging between 0.50 and 1.35 m below the existing ground level.

(ii) The collection of representative soil samples from each of the exploratory holes, and subsequent laboratory chemical analysis of selected samples.

(iii) Preparation of this report on the Intrusive Ground Investigation, addressing potential ground contamination issues in the context of the proposed development.

1.6 Report Structure

This report is presented in four sections, the contents of which are summarised below.

- **Section 1** provides an introduction to the report. It identifies the site location, summarises the proposed development, and outlines the objectives of the study and the general scope of work.
- **Section 2** describes the fieldwork and laboratory testing that has been carried out.
- **Section 3** provides a description of the physical ground and groundwater conditions revealed by the investigation.
- **Section 4** considers ground contamination hazards in respect of chronic human health risks, risks to controlled waters and risks arising from potentially hazardous ground gas. An assessment of the potential aggressive environment for concrete used below ground level is also provided.

2. Fieldworks & Laboratory Testing

2.1 General

The general scope of the Phase 2 intrusive works is summarised below:

- The inspection of six hand excavated trial pits.
- The extraction of representative disturbed samples of the strata revealed within the exploratory holes.
- The recording of general observations concerning the incidence and behaviour of groundwater seepages, together with any obvious visual or olfactory evidence of soil or groundwater contamination.
- Laboratory chemical analysis carried out on selected soil samples recovered from the exploratory holes.

This section of the report describes the fieldworks and provides details of the subsequent laboratory testing.

2.2 Intrusive Investigatory Works

The intrusive investigatory works were carried out on 23rd November 2020 under the supervision of Ground Investigation Limited.

The positions of investigation were determined on the basis of the proposed architectural layout, taking into consideration the findings of the previous Desk Study (Ref. 1) and site walkover.

2.2.1 Updated Walkover Survey

A supplementary site walkover was undertaken at commencement of the intrusive fieldworks by an experienced Chartered Geologist to verify the findings of the earlier preliminary assessment, and to help select suitable exploratory hole positions.

Essentially there were no significant changes to the situation described within the earlier desk study report, whereby Barn A was being used for the storage of lightweight construction tools and equipment, whereas Barn B was being used for storage and as a workshop in connection with the Client's hobby of restoring classic motor vehicles.

As previously, the premises were clean and tidy, with no evidence, for example, of hydrocarbon staining across any of the surfaces.

The external areas also remained unchanged, being given over largely to grassed landscaping.

2.2.2 Trial Pits

A total of six exploratory holes were excavated carefully by hand, extending to depths of between 0.50 and 1.35 m below ground level, terminating within the natural subsoils of the Mercia Mudstone Group.

Four of these trial pits targeted the footprints of the barns which are being converted and needed to be broken out initially through the concrete floor slabs. The other two pits targeted the proposed soft landscaped garden areas.

As the excavation progressed at each position, details of the strata succession were recorded, together with observations concerning the incidence and behaviour of any groundwater seepages, the stability of the trial pit sides, and any visual or olfactory evidence of ground contamination.

Environmental samples of the soils encountered were collected and sealed in amber glass jars and polythene containers, as appropriate, for laboratory inspection and testing.

Upon completion, the trial pits were backfilled with the excavated spoil, in the approximate reverse order in which it was removed.

The records of the trial pits are presented in Appendix A.

2.3 Laboratory Testing

Chemical tests have been completed on selected soil samples appropriate for the consideration of potentially harmful effects on human health and the environment, and potential aggressive effects towards buried concrete.

The types of tests undertaken on the selected samples are summarised below.

Chemical analysis has been undertaken as follows, based on the contaminants of concern identified within Section 4.2.3 of this report:

(i) inorganics suite comprising: metals/semi-metals, cyanides, total and water soluble sulphate, pH, asbestos screening; and

(ii) organics suite comprising: speciated polycyclic aromatic hydrocarbons (PAHs), speciated petroleum hydrocarbons (TPH) including BTEX, phenols and soil organic matter (SOM).

The chemical test results are presented in Appendix B.

3. Physical Ground & Groundwater Conditions

3.1 General

The exploratory holes have established that within the depth of investigation the site is underlain by the following general sequence of strata (from ground level down).

(i) Topsoil;
(ii) Made Ground; and
(iii) Mercia Mudstone Group.

The general characteristics of these strata, as inferred from field observations are discussed below, whilst detailed engineering records are provided in Appendix A.

3.2 Strata Descriptions

3.2.1 Topsoil

Visually clean Topsoil extended to 0.30 m depth within the two trial pits located in the grassed landscaped areas, which will comprise the proposed gardens of the converted barns. This consisted of a friable dark brown silty clay with fine fibrous roots.

3.2.2 Made Ground

The existing barns are set into the top of the hillside on the break of slope, such that the original ground surface had been made up to a varying degree, with dominantly granular materials, to level the floors of the buildings.

The concrete floor slabs were observed to range between approximately 0.10 and 0.20 m in thickness at the selected positions, with some reinforcement in the southernmost barn.

Granular sub-base materials were encountered beneath the floor slabs including a range of materials, albeit dominated by cobbles of brickwork and sandstone. These material extended to depths ranging between 0.35 and 0.95 m below ground level, where encountered, but were absent at the southern end of Barn A, with the floor slab founded directly off the natural subsoil at this position, reflecting the fact that the ground had been previously lowered in this area to accommodate the structure.

Some further reworked subsoil was encountered beneath the granular fill, for example within TP1 and TP2, comprising a soft dull reddish brown sandy, very silty clay, extending to 0.60 and 1.20 m depths at these positions, respectively. The clay subsoil at TP6 also appeared possibly to have been reworked.

No visual or olfactory evidence of potentially mobile contamination, including hydrocarbons, for example, was encountered and no obvious potential asbestos containing materials were observed in the soils.

3.2.3 Mercia Mudstone Group

Deposits of the Mercia Mudstone Group were recorded beneath the Topsoil or Made Ground, subsequently extending beyond the maximum depth of 1.35 m achieved by the trial pits.

These deposits typically comprised reddish brown, mottled greenish grey, silty clays, in places containing gravel sized lithorelicts of mudstone. Consistencies appeared to range between soft to firm and stiff.

3.3 Groundwater

Groundwater was not encountered within any of the exploratory holes during the investigation process, or would be expected at shallow depth, acknowledging the elevated setting of the site.

Notwithstanding the above, it should be noted that subsequent variations in groundwater and hydrological conditions could occur in response to future seasonal or climatic changes, and that the groundwater conditions encountered within the exploratory holes on the day of the investigation may not be entirely representative of conditions occurring within open excavations over the longer term.

4. Ground and Groundwater Contamination

4.1 Introduction

The chemical test results have been considered within a risk assessment framework, whereby a conceptual model of possible pollutant linkage has been developed for the site and is described in the context of the proposed development. This considers the relationship between potential contamination sources, pathways and receptors in the light of the available information concerning the site history, geology, hydrology, and environmental setting, together with details of the proposed development, as set out in the preceding sections of this report.

This section of the report considers the level of risk posed by potential contaminants to human health and controlled waters in the context of the proposed residential development.

A preliminary conceptual site model was presented within the earlier Desk Study (Ref. 1), in the context of a Phase 1 Assessment of Land Quality. This has been updated and expanded in the following sections in the light of the findings of the subsequent intrusive investigatory works.

4.2 Updated Conceptual Site Model

4.2.1 Ground and Groundwater Conditions

It is possible to summarise the general ground and groundwater conditions as follows, on the basis of the information contained within the preceding sections of this report.

- Visually clean Topsoil has been observed to directly overlie the natural subsoil in the grassed landscaped areas of the development site, whilst the ground levels in the footprints of the barns have been made up with variable, but generally modest, thicknesses of granular materials.

- No direct visual or olfactory evidence of potentially mobile contaminants, such as hydrocarbons, was encountered during this investigation.

- The deposits of Topsoil and Made Ground are directly underlain by naturally deposited fine-grained soils of the Mercia Mudstone Group, typically comprising reddish brown, mottled light greenish grey, silty clays, in places with mudstone lithorelicts.

- Groundwater was not encountered within any of the trial pits excavated at the site, which extended to a maximum depth of 1.35 m below the existing ground level. Subsequent variations in groundwater and hydrological conditions could occur, in response to future seasonal or climatic changes, however, a shallow groundwater table would not be envisaged, acknowledging the elevated setting of the site.

4.2.2 Possible Sources of Contamination

It is possible to make the following comments concerning potential contamination sources present at, and in the vicinity of the site, in light of the findings of the desk-based research (Ref. 1), site inspection, and intrusive investigatory works referred to herein.

- Based on our examination of historical mapping, the site comprised open agricultural land prior to construction of the existing dwelling between 1955 and 1965. It was subsequently

used as a poultry farm until, it is believed, sometime prior to around 1985. We understand that since this time the site has been used mainly for storage purposes associated with the Client's contracting business, however, Barn B has been subject to some automotive use in connection with the Client's hobby of refurbishing classic motor vehicles. The latter is considered the most significant driver for considering potential risks from ground contamination, although it should be acknowledged that the operations were undertaken at a domestic scale, as opposed to a large scale commercial enterprise.

- With regards to the small scale automotive land use identified, potential contamination could occur in the form of metals, semi-metals, fuels, oils, polycyclic aromatic hydrocarbons and acids/alkalis, due, for example to spills/leaks from vehicles or machinery and any small scale fuel/oil storage etc. In this regard, however, based on the site walkover, there was no visible evidence of significant oil spills in the form of hydrocarbon staining. Moreover, there do not appear to be any facilities for bulk storage of fuel or oil. The only fuel tanks identified during the site walkover, as discussed in Section 2.3 were empty and temporarily stored on pallets within a concrete surfaced area outside of the footprint of Barn B.

- Agricultural land usage as a poultry farm can result in contamination, for example, in the form of heavy metals, in addition to the normal range of commercial activities associated with vehicle movements and maintenance etc.

- It appears that the some of the roofing materials on the barn which it is proposed to demolish may contain asbestos, which could potentially contaminate the surface following uncontrolled demolition. However, in this regard, this barn lies outside of the footprint of the Barn B plot. Moreover, the Client has commissioned an asbestos survey for the site which identifies where any asbestos containing material (ACM) is present and will enable this to be carefully stripped out in accordance with contemporary protocols prior to demolition being undertaken. The uncontrolled demolition in the past of any earlier structures containing asbestos could also have contaminated the site surface, however. In this regard, it should be appreciated that some of the granular material beneath the building floor slabs may be derived from demolition works, but is encapsulated by the building floor slabs. No evidence of obvious asbestos containing materials was present, however, at the selected positions. It should be noted in the above regard that consideration of the presence of asbestos within above ground structures is not within the scope of this report.

- There are no nearby sources of gas generation potential within the likely zone of influence of the site. Moreover, the underlying geology of the Mercia Mudstone Group would not be expected to give rise to any appreciable organic or putrescible horizons. In this regard, potential risks from hazardous landfill gasses such as methane and carbon dioxide would be expected to be very low. However, according to the Envirocheck report, the site lies within an intermediate probability radon area, with a consequent requirement for basic radon protective measures.

- Surrounding land uses are residential or agricultural and do not present a significant potential risk from inward migration of mobile contamination.

- The subsequent intrusive investigation works have not generally encountered soils which would be expected to give rise to potential soil contamination.

- The proposed residential development does not itself constitute a potentially contaminative land use.

4.2.3 Contaminants of Concern

Based on the summary presented in Section 4.2.2 above, as a precautionary measure, the following broad range of potential contaminants typical of those found on UK brownfield sites has been considered in quantifiable terms by this assessment.

- Metals and semi-metals: arsenic, boron, cadmium, chromium, hexavalent chromium, copper, lead, mercury, nickel, selenium and zinc.
- Organic compounds: phenols, polycyclic aromatic hydrocarbons (PAHs), speciated petroleum hydrocarbons (TPH) and BTEX.
- Inorganic compounds: cyanides and sulphates.
- Asbestos.

In addition to the above, careful vigilance has been exercised throughout the intrusive investigatory works for visual or olfactory evidence of hydrocarbon contamination and/or likely asbestos containing materials.

4.2.4 Receptors and Pathways

4.2.4.1 Chronic Human Health Risks

In respect of chronic human health risks arising from the presence of potentially contaminated soils at the site following completion of the proposed residential development, the eventual occupiers of the converted barns are considered to represent the most vulnerable receptors.

The most significant pathways for the purposes of assessing the risk posed to the identified receptors, from the aforementioned list of contaminants, would ordinarily be considered to be the ingestion of, and dermal contact with soil and fugitive soil dust within soft landscaped garden areas, uptake from edible plants, and indoor inhalation of soil vapours/gasses.

With regards to the above, the standard land use considered appropriate for this assessment is considered to be 'Residential' (with plant uptake)'.

4.2.4.2 Acute Human Health Risks

During construction, site workers, members of the public accessing adjacent land and the occupiers of nearby housing and businesses could potentially be exposed to any contaminants present in the ground via a number of pathways, including dermal contact with contaminated soils or ingestion of airborne particulate matter during bulk earthmoving operations. Such risks will would ordinarily be addressed in the context of the pre-construction health and safety plan prepared by the building/groundworks contractor.

The normal precautions anticipated on any construction site in this regard, would be expected to include the provision of appropriate personal protective equipment and hygiene facilities, together with the suppression of airborne particulate matter during bulk earthmoving activities.

4.2.4.3 Controlled Waters

The Desk Study (Ref. 1) indicates that the site is underlain by a Secondary 'B' Aquifer of high vulnerability, however, it does not lie within a source protection zone. Moreover, there are no nearby

surface watercourses. In this regard, controlled waters receptors are considered to be of relatively low sensitivity.

It should be acknowledged in the above context that the site does not have a history of large scale industrial or potentially contaminative land use, and has been shown to be underlain by fine-grained soils of likely low permeability, which would form a barrier against contaminant migration. Moreover, the proposed change of use will not involve significant groundworks or disturbance to the existing subsoils, such that there can be no significant impact on the identified receptors from these works.

Acknowledging the aforementioned considerations, subject to the approval of the regulatory authorities, the potential risk to controlled waters associated with the proposed conversion works is considered to be negligible. This is consistent with the conclusions of the earlier desk study.

4.3 Assessment of Chronic Human Health Risks

4.3.1 Methodology

Chronic human health risks associated with possible land contamination at the site have been assessed using the generic quantitative risk assessment (GQRA) methods published by DEFRA and the Environment Agency in CLR 11 (Ref. 2).

At the time of writing, Generic Assessment Criteria (GAC) have been issued from several different sources for the use in generic quantitative risk assessments for contaminated land, currently including the following:

(i) Category 4 Screening Levels (C4SLs) issued by Defra in 2013 for 6 contaminants (Ref. 3);

(ii) Soil Guideline Values (SGVs) issued by the Environment Agency in 2009 for some 11 contaminants (Ref. 4); and

(iii) Suitable 4 Use Levels (S4ULs) issued by the Chartered Institute of Environmental Health (CIEH)/Land Quality Management in 2014 for some 80+ contaminants (Ref. 5).

As an initial first stage risk assessment process, acknowledging the fact that almost all potential contaminants of concern are covered, and that the methodology is the most contemporary, the S4ULs have been used in this GQRA. However, in the case of lead (Pb), only one GAC is presently published, which is the Defra C4SL, such that this value has been used in the GQRA.

The GQRA presented herein is based on the generic residential land use as described in the Environment Agency publication SR3 (Ref. 6).

4.3.2 Sampling and Laboratory Testing

The investigation has established that the proposed development footprint is underlain by shallow Topsoil / Made Ground, with the naturally deposited Mercia Mudstone Group beneath.

In order to address potential chronic human health risks, six selected soil samples taken from the near surface soils in the proposed garden areas and from beneath the converted building footprints were scheduled for analysis. Whilst the soils beneath the building footprints will continue to remain encapsulated by the building floor slabs, it was considered important to target these materials acknowledging the potential for mobile hydrocarbon contaminants, if present, to permeate the floors of the workshops.

Laboratory test certificates presenting the results of the chemical analyses conducted on the selected soil samples are presented in Appendix B.

4.3.3 Risk Assessment

Table 1 summarises the laboratory test data and compares measured contaminant concentrations in the selected soil samples with their respective GAC. The results show that concentrations of the assessed contaminants of concern are all below their respective GAC. Indeed, many are below laboratory detection limits, including all of the TPH fractions and BTEX compounds, moreover no asbestos was identified.

In the above regard, it is our opinion that based on the desk study, intrusive investigation and generic quantitative risk assessment, potential risks to future users of the converted barns from contaminants in the underlying soils are very low. Subject to the approval of the regulatory authorities and warranty providers, therefore, specific remedial measures are considered unnecessary.

As with any previously developed site, it is possible that areas of differing soils and potential contamination could exist between the selected positions of investigation, which could be associated with a requirement for further analysis and/or assessment. Vigilance will need to be exercised in this respect, throughout the groundworks phase of construction and it should be appreciated that the reporting of any unexpected contamination is a requirement of the Local Authority regulators through the planning system.

4.4 Hazardous Ground Gas

Considering potential risks from sources of hazardous ground gas within the vicinity of the proposed new buildings, a thin veneer of Made Ground was encountered beneath the proposed development area, dominantly composed of inert granular materials. These deposits would not be considered to represent a significant potential source of hazardous ground gas.

Considering potential off-site gas sources, it is noted that the Desk Study (Ref. 1) does not identify any off-site sources, such as landfills, for example, within a radius of at least 250 m of the site. In this regard, it should also be appreciated that the site has been shown to be underlain by fine-grained subsoils of likely low gas-permeability, thus further mitigating the risk of gas migration from any unrecorded off site source.

The Envirocheck report commissioned as part of the Desk Study (Ref. 1), however, indicates that the site is located within an intermediate probability radon area, with a consequent requirement for basic radon protection measures.

Based on the above, it is our opinion that potential risks from hazardous ground gas are very low, and that further consideration of such matters is not warranted, other than the provision of basic radon protection to meet the statutory requirement for such measures in the site area.

4.5 Aggressive Chemical Environment for Concrete

The aggressive chemical environment for concrete (ACEC) for the site has been estimated using the methodology described in BRE Special Digest 1 (Ref. 7).

Concentrations of total potential sulphate, acid soluble sulphate and total sulphur, together with pH values have been measured in six samples of the encountered soils, the results of which are presented within Appendix B.

Comparison between the TPS and acid soluble sulphate concentrations indicates that pyrite is unlikely be present, as none of the results returned oxidisable sulphate concentrations above 0.3 %.

With reference to the published guidance, assuming static groundwater conditions (acknowledging the elevated setting and fine-grained nature of the soils), concrete conforming to ACEC Class AC-1s with a design sulphate class of DS-1 should be suitable for use.

TABLES

Long Acres, Bitton

Table 1 - Estimation of Chronic Human Health Risks for

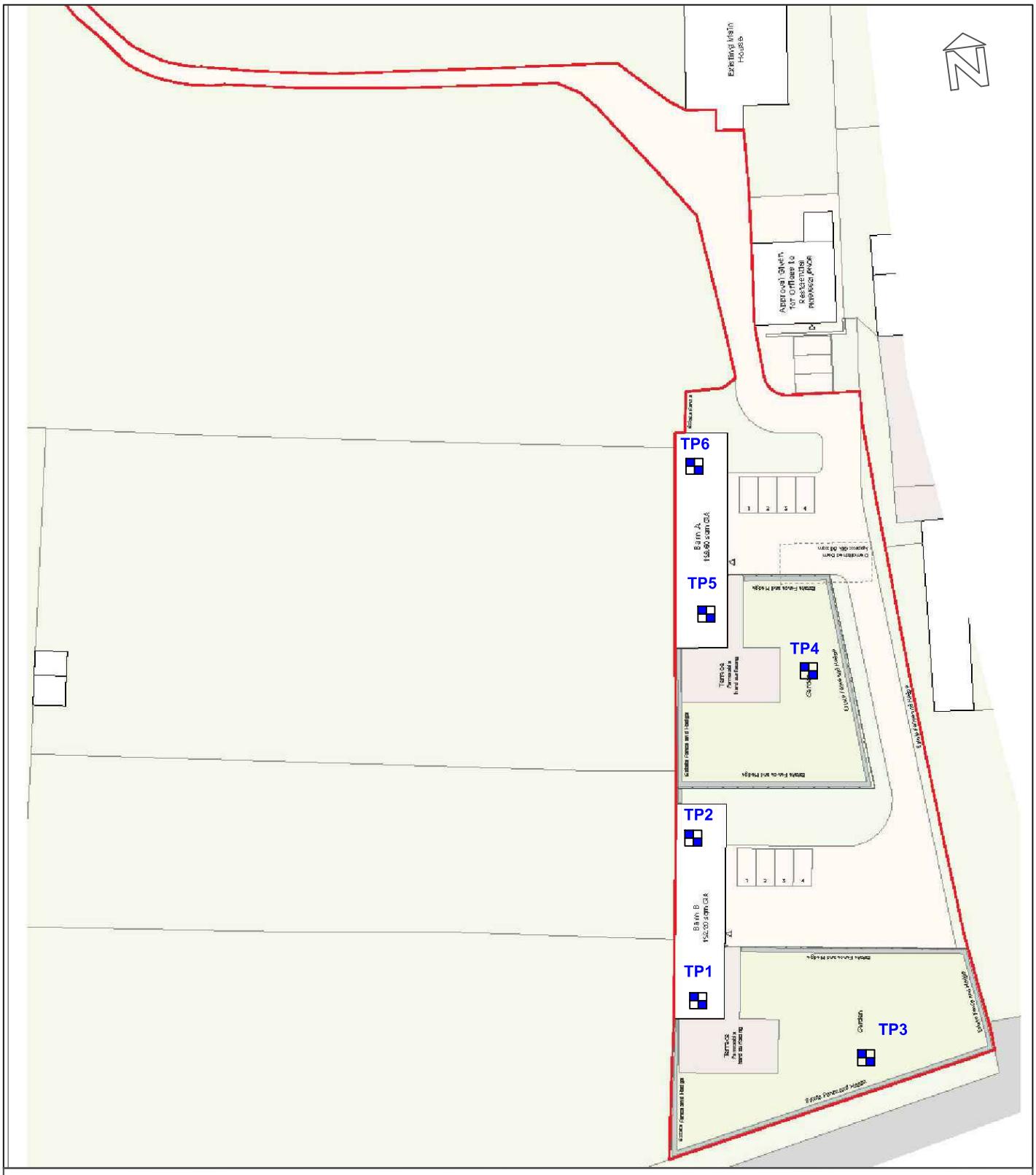
Standard Residential Land Use with Plant Uptake (1 % SOM)

Contaminant		Units	GAC	Pass criteria?	TP1	TP2	TP3	TP4	TP5	TP6
					0.40 - 0.60m	1.00 - 1.20m	0.10 - 0.30m	0.10 - 0.30m	0.20 - 0.40m	0.35 - 0.55m
pH value		-	-	-	7.9	8.2	7.3	7.6	8.5	8.2
Soil Organic Matter		%	-	-	5.9	2.5	7.3	7.9	0.4	0.9
Asbestos Fibres Screen		-	-	-	NAI	NAI	NAI	NAI	NAI	NAI
Metals and inorganics	Arsenic	mg/kg	37	✓	19.1	13.1	11.5	17.9	7.2	6.5
	Boron	mg/kg	290	✓	4.5	1.3	1.9	2.3	< 0.5	1.1
	Cadmium	mg/kg	11	✓	0.9	< 0.5	< 0.5	0.9	< 0.5	< 0.5
	Chromium	mg/kg	910	✓	35.4	29.6	23.6	32.2	34.9	29.1
	Chromium (VI)	mg/kg	6	✓	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
	Copper	mg/kg	2400	✓	46.0	34.4	39.2	52.8	24.0	29.0
	Lead	mg/kg	200[C4SL]	✓	156	86.3	94.8	165	20.1	20.1
	Inorganic Mercury	mg/kg	40	✓	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
	Nickel	mg/kg	130	✓	29.5	27.9	22.2	27.2	31.3	25.8
	Selenium	mg/kg	250	✓	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
	Zinc	mg/kg	3700	✓	292	211	175	417	179	139
	Cyanide	mg/kg	41[GI]	✓	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Organics	Phenols	mg/kg	120	✓	< 6	< 6	< 6	< 6	< 6	< 6
PAHs	Naphthalene	mg/kg	2.3	✓	0.01	0.01	0.09	0.04	< 0.01	< 0.01
	Acenaphthylene	mg/kg	170	✓	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
	Acenaphthene	mg/kg	210	✓	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
	Fluorene	mg/kg	170	✓	< 0.01	0.01	0.02	0.03	< 0.01	< 0.01
	Phenanthrene	mg/kg	95	✓	0.09	0.13	0.21	0.35	< 0.01	0.04
	Anthracene	mg/kg	2400	✓	0.01	0.01	0.02	0.03	< 0.01	< 0.01
	Fluoranthene	mg/kg	280	✓	0.05	0.03	0.09	0.13	< 0.01	0.02
	Pyrene	mg/kg	620	✓	0.04	0.03	0.08	0.13	< 0.01	0.02
	Benzo(a)anthracene	mg/kg	7.2	✓	0.02	0.02	0.04	0.06	< 0.01	< 0.01
	Chrysene	mg/kg	15	✓	0.05	0.05	0.10	0.17	< 0.01	0.01
	Benzo(b)fluoranthene	mg/kg	2.6	✓	0.03	0.02	0.06	0.08	< 0.01	0.01
	Benzo(k)fluoranthene	mg/kg	77	✓	0.02	0.01	0.04	0.07	< 0.01	< 0.01
	Benzo(a)pyrene	mg/kg	2.2	✓	0.03	0.02	0.05	0.06	< 0.01	< 0.01
	Indeno(1,2,3-c,d)pyrene	mg/kg	27	✓	0.01	< 0.01	0.02	0.03	< 0.01	< 0.01
	Dibenzo(ah)anthracene	mg/kg	0.24	✓	< 0.01	< 0.01	0.01	0.02	< 0.01	< 0.01
	Benzo(g,h,i)perylene	mg/kg	320	✓	0.02	< 0.01	0.04	0.05	< 0.01	< 0.01
BTEX	Benzene	mg/kg	0.087	✓	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	Toluene	mg/kg	130	✓	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	Ethyl Benzene	mg/kg	47	✓	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	Xylenes	mg/kg	56	✓	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
TPHs (Aromatics)	>nC_5-nC_7	mg/kg	70	✓	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
	>nC_7-nC_8	mg/kg	130	✓	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
	>nC_8-nC_{10}	mg/kg	34	✓	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
	>nC_{10}-nC_{12}	mg/kg	74	✓	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
	>nC_{12}-nC_{16}	mg/kg	140	✓	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
	>nC_{16}-nC_{21}	mg/kg	260	✓	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
	>nC_{21}-nC_{35}	mg/kg	1100	✓	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
	>nC_{35}-nC_{44}	mg/kg	1100	✓	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPHs (Aliphatics)	>nC_5-nC_6	mg/kg	42	✓	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
	>nC_6-nC_8	mg/kg	100	✓	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
	>nC_8-nC_{10}	mg/kg	27	✓	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
	>nC_{10}-nC_{12}	mg/kg	130	✓	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
	>nC_{12}-nC_{16}	mg/kg	1100	✓	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
	>nC_{16}-nC_{21}	mg/kg	65000	✓	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
	>nC_{21}-nC_{35}	mg/kg	65000	✓	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH	TPH Screen	mg/kg	-	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

Notes

GAC	Generic Assessment Criteria. All GAC are S4ULs published by CIEH/LQM in 2014, unless otherwise stated.
C4SL	Catergory 4 Screening Level published by DEFRA in 2013.
GI	GAC derived in-house by GI.
NAI	No asbestos identified
Value	Shaded cells indicate samples in which GAC is exceeded.

FIGURES



KEY:

Trial Pit Location

Ground Investigation

Unit 3, Westfield Court, Barns Ground, Kenn, Clevedon, BS21 6FQ
Tel: 01275 876903
Email: mail@ground-investigation.com

SITE: Redfield Hill, Bitton

CLIENT: Mr. Matthew Woolley

PROJECT ID: P1374 | **SCALE:** NTS

FILENAME: P1374Figure1.dwg

FIGURE 1

Exploratory Hole Location Plan - Proposed Site Layout

APPENDIX A

Trial Pit Records

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Ground Investigation

Trial Pit Record

Hole ID
TP1
Sheet 1 of 1 (0.00m-2.00m)
All dimensions in metres
Scale 1:10

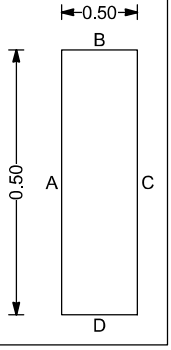
Site: Redfield Hill, Bitton	**Method/Plant Used:** Hand tools		
Client: Mr. Matthew Woolley	**Start date:** 23/11/20	**End Date:** 23/11/20	**Logged By:** TJG
Job No: P1374	**Easting:**	**Northing:**	**Elevation:**

SAMPLES & IN-SITU TESTS			WATER	STRATA		
Depth	Type / No	Results / Remarks		Legend	Depth	Description
					(0.15) 0.15	Floor slab broken out through unreinforced CONCRETE, in two layers with blue polythene membrane at base. **MADE GROUND (Concrete Surface)**
					(0.20) 0.35	Compact, slightly sandy, angular GRAVEL and COBBLES of predominantly sandstone and limestone, with some carbonaceous traces. **MADE GROUND (Sub-base Materials)**
0.40-0.60	ES-1	tub and amber jar			(0.25) 0.60	Soft dull reddish brown, sandy, very silty CLAY with occasional carbonaceous traces. **MADE GROUND (Reworked Mercia Mudstone Group)**
0.65-0.75	ES-2	tub and amber jar			(0.15) 0.75	Stiff reddish brown, mottled light greenish grey, silty CLAY. **MERCIA MUDSTONE GROUP**

Groundwater Observations

Strike Depth	Flow Rate Remarks

Shoring/Support: None.
Side Stability: Stable.



General Remarks
1) No groundwater encountered.
2) No obvious visual or olfactory evidence of hydrocarbon contamination.

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Ground Investigation

Trial Pit Record

Hole ID
TP2
Sheet 1 of 1 (0.00m-2.00m)
All dimensions in metres
Scale 1:10

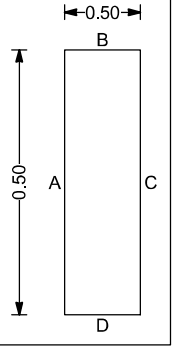
Site: Redfield Hill, Bitton	**Method/Plant Used:** Hand tools		
Client: Mr. Matthew Woolley	**Start date:** 23/11/20	**End Date:** 23/11/20	**Logged By:** TJG
Job No: P1374	**Easting:**	**Northing:**	**Elevation:**

SAMPLES & IN-SITU TESTS			WATER	STRATA		
Depth	**Type / No**	**Results / Remarks**		**Legend**	**Depth**	**Description**
					(0.10) 0.10	Floor slab broken out through unreinforced CONCRETE, with clear polythene membrane at base. **MADE GROUND (Concrete Surface)**
					(0.85) 0.95	Compact, slightly sandy, gravelly COBBLES of predominantly brick and sandstone, with some cemented brickwork and whole bricks. **MADE GROUND (Sub-base Materials)**
1.00-1.20	ES-1	tub and amber jar			(0.25) 1.20	Soft dull reddish brown, sandy, very silty CLAY with occasional carbonaceous traces. **MADE GROUND (Reworked Mercia Mudstone Group)**
1.25-1.35	ES-2	tub and amber jar			(0.15) 1.35	Soft to firm reddish brown, mottled light greenish grey, slightly gravelly, silty CLAY. Gravel is angular of mudstone. **MERCIA MUDSTONE GROUP**

Groundwater Observations

Strike Depth	Flow Rate Remarks

Shoring/Support: None.
Side Stability: Stable.



General Remarks
1) No groundwater encountered.
2) No obvious visual or olfactory evidence of hydrocarbon contamination.

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Ground Investigation

Trial Pit Record

Hole ID
TP3
Sheet 1 of 1 (0.00m-2.00m)
All dimensions in metres
Scale 1:10

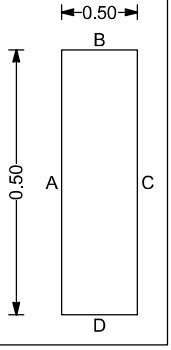
Site: Redfield Hill, Bitton	**Method/Plant Used:** Hand tools		
Client: Mr. Matthew Woolley	**Start date:** 23/11/20	**End Date:** 23/11/20	**Logged By:** TJG
Job No: P1374	**Easting:**	**Northing:**	**Elevation:**

SAMPLES & IN-SITU TESTS			WATER	STRATA		
Depth	**Type / No**	**Results / Remarks**		**Legend**	**Depth**	**Description**
0.10-0.30	ES-1	tub and amber jar			(0.30) 0.30	Turf over soft to firm, friable, dark brown silty clay TOPSOIL with fine fibrous roots. **TOPSOIL**
					(0.20) 0.50	Stiff reddish brown, mottled light greenish grey, slightly gravelly, silty CLAY. Gravel is angular of mudstone. **MERCIA MUDSTONE GROUP**

Groundwater Observations

Strike Depth	Flow Rate Remarks

Shoring/Support: None.
Side Stability: Stable.



General Remarks
1) No groundwater encountered.
2) No obvious visual or olfactory evidence of hydrocarbon contamination.

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Ground Investigation

Trial Pit Record

Hole ID
TP4
Sheet 1 of 1 (0.00m-2.00m)
All dimensions in metres
Scale 1:10

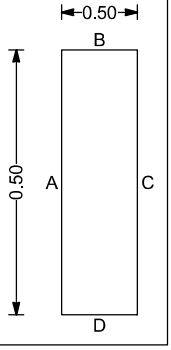
Site: Redfield Hill, Bitton	**Method/Plant Used:** Hand tools		
Client: Mr. Matthew Woolley	**Start date:** 23/11/20	**End Date:** 23/11/20	**Logged By:** TJG
Job No: P1374	**Easting:**	**Northing:**	**Elevation:**

SAMPLES & IN-SITU TESTS			WATER	STRATA		
Depth	**Type / No**	**Results / Remarks**		**Legend**	**Depth**	**Description**
0.10-0.30	ES-1	tub and amber jar			(0.30) 0.30	Turf over soft to firm, friable, dark brown silty clay TOPSOIL with fine fibrous roots. **TOPSOIL**
					(0.20) 0.50	Firm reddish brown, mottled light greenish grey, slightly gravelly, silty CLAY. Gravel is angular of mudstone. **MERCIA MUDSTONE GROUP**

Groundwater Observations

Strike Depth	Flow Rate Remarks

Shoring/Support: None.
Side Stability: Stable.



General Remarks
1) No groundwater encountered.
2) No obvious visual or olfactory evidence of hydrocarbon contamination.

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Ground Investigation

Trial Pit Record

Hole ID
TP5
Sheet 1 of 1 (0.00m-2.00m)
All dimensions in metres
Scale 1:10

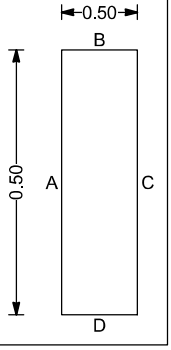
Site: Redfield Hill, Bitton	**Method/Plant Used:** Hand tools		
Client: Mr. Matthew Woolley	**Start date:** 23/11/20	**End Date:** 23/11/20	**Logged By:** TJG
Job No: P1374	**Easting:**	**Northing:**	**Elevation:**

SAMPLES & IN-SITU TESTS			WATER	STRATA		
Depth	**Type / No**	**Results / Remarks**		**Legend**	**Depth**	**Description**
					(0.10) 0.10	Floor slab broken out through unreinforced CONCRETE, with clear polythene membrane at base. **MADE GROUND (Concrete Surface)**
0.20-0.40	ES-1	tub and amber jar			(0.40) 0.50	Stiff reddish brown, mottled light greenish grey, slightly gravelly, silty CLAY. Gravel is angular of mudstone. **MERCIA MUDSTONE GROUP**

Groundwater Observations

Strike Depth	Flow Rate Remarks

Shoring/Support: None.
Side Stability: Stable.



General Remarks
1) No groundwater encountered.
2) No obvious visual or olfactory evidence of hydrocarbon contamination.

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Ground Investigation

Trial Pit Record

Hole ID
TP6
Sheet 1 of 1 (0.00m-2.00m)
All dimensions in metres
Scale 1:10

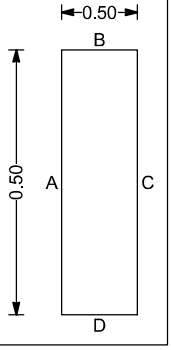
Site: Redfield Hill, Bitton	**Method/Plant Used:** Hand tools		
Client: Mr. Matthew Woolley	**Start date:** 23/11/20	**End Date:** 23/11/20	**Logged By:** TJG
Job No: P1374	**Easting:**	**Northing:**	**Elevation:**

SAMPLES & IN-SITU TESTS			WATER	STRATA		
Depth	Type / No	Results / Remarks		Legend	Depth	Description
					(0.20) 0.20	Floor slab broken out through reinforced CONCRETE. **MADE GROUND (Concrete Surface)**
					(0.15) 0.35	Compact, slightly sandy, gravelly COBBLES of predominantly brick and sandstone, with some cemented brickwork and whole bricks. **MADE GROUND (Sub-base Materials)**
0.35-0.55	ES-1	tub and amber jar			(0.35) 0.70	Firm to stiff reddish brown, slightly sandy, silty CLAY with occasional carbonaceous traces. **MERCIA MUDSTONE GROUP (Possibly Reworked)**

Groundwater Observations

Strike Depth	Flow Rate Remarks

Shoring/Support: None.
Side Stability: Stable.



General Remarks
1) No groundwater encountered.
2) No obvious visual or olfactory evidence of hydrocarbon contamination.

APPENDIX B

Laboratory Test Results

Unit A2
Windmill Road
Ponswood Industrial Estate
St Leonards on Sea
East Sussex
TN38 9BY
Telephone: (01424) 718618

cs@elab-uk.co.uk
info@elab-uk.co.uk

THE ENVIRONMENTAL LABORATORY LTD

Analytical Report Number:	20-31015
Issue:	1
Date of Issue:	01/12/2020
Contact:	Tim Gillbanks
Customer Details:	Ground Investigation Limited Unit 3, Westfield Court Barns Ground Clevedon BristolBS21 6FQ
Quotation No:	Q19-01634
Order No:	Not Supplied
Customer Reference:	P1374
Date Received:	25/11/2020
Date Approved:	01/12/2020
Details:	Greenacres, Bitton
Approved by:	[redacted]

Mike Varley, Technical Manager

Sample Summary

Report No.: 20-31015, issue number 1

Elab No.	Client's Ref.	Date Sampled	Date Scheduled	Description	Deviations
221059	TP1 0.40 - 0.60	23/11/2020	25/11/2020	Silty loam	
221060	TP2 1.00 - 1.20	23/11/2020	25/11/2020	Silty clayey loam	
221061	TP3 0.10 - 0.30	23/11/2020	25/11/2020	Silty loam	
221062	TP4 0.10 - 0.30	23/11/2020	25/11/2020	Silty loam	
221063	TP5 0.20 - 0.40	23/11/2020	25/11/2020	Clayey loam	
221064	TP6 0.35 - 0.55	23/11/2020	25/11/2020	Silty clayey loam	

Results Summary

Report No.: 20-31015, issue number 1

				ELAB Reference	221059	221060	221061	221062	221063	221064
				Customer Reference						
				Sample ID						
				Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Sample Location	TP1	TP2	TP3	TP4	TP5	TP6
				Sample Depth (m)	0.40 - 0.60	1.00 - 1.20	0.10 - 0.30	0.10 - 0.30	0.20 - 0.40	0.35 - 0.55
				Sampling Date	23/11/2020	23/11/2020	23/11/2020	23/11/2020	23/11/2020	23/11/2020
Determinand	**Codes**	**Units**	**LOD**							
Soil sample preparation parameters										
Material removed	N	%	0.1		< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Description of Inert material removed	N		0		None	None	None	None	None	None
Metals										
Arsenic	M	mg/kg	1		19.1	13.1	11.5	17.9	7.2	6.5
Cadmium	M	mg/kg	0.5		0.9	< 0.5	< 0.5	0.9	< 0.5	< 0.5
Chromium	M	mg/kg	5		35.4	29.6	23.6	32.2	34.9	29.1
Copper	M	mg/kg	5		46.0	34.4	39.2	52.8	24.0	29.0
Lead	M	mg/kg	5		156	86.3	94.8	165	20.1	20.1
Mercury	M	mg/kg	0.5		< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Nickel	M	mg/kg	5		29.5	27.9	22.2	27.2	31.3	25.8
Selenium	M	mg/kg	1		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Zinc	M	mg/kg	5		292	211	175	417	179	139
Anions										
Water Soluble Sulphate	M	g/l	0.02		0.11	0.11	< 0.02	< 0.02	< 0.02	0.14
Inorganics										
Hexavalent Chromium	N	mg/kg	0.8		< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
Total Cyanide	M	mg/kg	1		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Sulphur	N	%	0.01		0.09	0.20	0.06	0.12	0.02	0.08
Total Potential Sulphate	N	%	0.01		0.27	0.61	0.18	0.37	0.06	0.23
Acid Soluble Sulphate (SO4)	U	%	0.02		0.15	0.53	0.09	0.18	0.04	0.19
Water Soluble Boron	N	mg/kg	0.5		4.5	1.3	1.9	2.3	< 0.5	1.1
Miscellaneous										
pH	M	pH units	0.1		7.9	8.2	7.3	7.6	8.5	8.2
Soil Organic Matter	U	%	0.1		5.9	2.5	7.3	7.9	0.4	0.9
Phenols										
Total Phenols	N	mg/kg	6		< 6	< 6	< 6	< 6	< 6	< 6
Polyaromatic hydrocarbons										
Naphthalene GCMS	N	mg/kg	0.01		0.01	0.01	0.09	0.04	< 0.01	< 0.01
Acenaphthylene GCMS	N	mg/kg	0.01		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene GCMS	N	mg/kg	0.01		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluorene GCMS	N	mg/kg	0.01		< 0.01	0.01	0.02	0.03	< 0.01	< 0.01
Phenanthrene GCMS	N	mg/kg	0.01		0.09	0.13	0.21	0.35	< 0.01	0.04
Anthracene GCMS	N	mg/kg	0.01		0.01	0.01	0.02	0.03	< 0.01	< 0.01
Fluoranthene GCMS	N	mg/kg	0.01		0.05	0.03	0.09	0.13	< 0.01	0.02
Pyrene GCMS	N	mg/kg	0.01		0.04	0.03	0.08	0.13	< 0.01	0.02
Benzo(a)anthracene GCMS	N	mg/kg	0.01		0.02	0.02	0.04	0.06	< 0.01	< 0.01
Chrysene GCMS	N	mg/kg	0.01		0.05	0.05	0.10	0.17	< 0.01	0.01
Benzo(b)fluoranthene GCMS	N	mg/kg	0.01		0.03	0.02	0.06	0.08	< 0.01	0.01
Benzo(k)fluoranthene GCMS	N	mg/kg	0.01		0.02	0.01	0.04	0.07	< 0.01	< 0.01
Benzo(a)pyrene GCMS	N	mg/kg	0.01		0.03	0.02	0.05	0.06	< 0.01	< 0.01
Indeno(1,2,3-cd)pyrene GCMS	N	mg/kg	0.01		0.01	< 0.01	0.02	0.03	< 0.01	< 0.01
Dibenzo(a,h)anthracene GCMS	N	mg/kg	0.01		< 0.01	< 0.01	0.01	0.02	< 0.01	< 0.01
Benzo(g,h,i)perylene GCMS	N	mg/kg	0.01		0.02	< 0.01	0.04	0.05	< 0.01	< 0.01
Total PAH(16) GCMS	N	mg/kg	0.04		0.41	0.36	0.89	1.27	< 0.04	0.15

Results Summary

Report No.: 20-31015, issue number 1

ELAB Reference				221059	221060	221061	221062	221063	221064
Customer Reference									
Sample ID									
Sample Type				SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Location				TP1	TP2	TP3	TP4	TP5	TP6
Sample Depth (m)				0.40 - 0.60	1.00 - 1.20	0.10 - 0.30	0.10 - 0.30	0.20 - 0.40	0.35 - 0.55
Sampling Date				23/11/2020	23/11/2020	23/11/2020	23/11/2020	23/11/2020	23/11/2020
Determinand	**Codes**	**Units**	**LOD**						
BTEX									
Benzene	M	ug/kg	10	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0
Toluene	M	ug/kg	10	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0
Ethylbenzene	M	ug/kg	10	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0
Xylenes	M	ug/kg	10	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0
MTBE	N	ug/kg	10	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0
TPH CWG									
>C5-C6 Aliphatic	N	mg/kg	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
>C6-C8 Aliphatic	N	mg/kg	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
>C8-C10 Aliphatic	N	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
>C10-C12 Aliphatic	M	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
>C12-C16 Aliphatic	M	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
>C16-C21 Aliphatic	M	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
>C21-C35 Aliphatic	M	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
>C35-C40 Aliphatic	M	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total aliphatic hydrocarbons (>C5 - C40)	N	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
>C5-C7 Aromatic	N	mg/kg	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
>C7-C8 Aromatic	N	mg/kg	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
>C8-C10 Aromatic	N	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
>C10-C12 Aromatic	M	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
>C12-C16 Aromatic	M	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
>C16-C21 Aromatic	M	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
>C21-C35 Aromatic	M	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
>C35-C40 Aromatic	M	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total aromatic hydrocarbons (>C5 - C40)	N	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total petroleum hydrocarbons (>C5 - C40)	N	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

Unit A2, Windmill Road, Ponswood Industrial Estate, St Leonards on Sea, East Sussex, TN38 9BY
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Results Summary

Report No.: 20-31015, issue number 1

Asbestos Results

Analytical result only applies to the sample as submitted by the client. Any comments, opinions or interpretations (marked #) in this report are outside UKAS accreditation (Accreditation No2683). They are subjective comments only which must be verified by the client.

Elab No	Depth (m)	Clients Reference	Description of Sample Matrix #	Asbestos Identification	Gravimetric Analysis Total (%)	Gravimetric Analysis by ACM Type (%)	Free Fibre Analysis (%)	Total Asbestos (%)
221059	0.40 - 0.60	TP1	Brown Soil	No asbestos detected	n/t	n/t	n/t	n/t
221060	1.00 - 1.20	TP2	Brown Soil	No asbestos detected	n/t	n/t	n/t	n/t
221061	0.10 - 0.30	TP3	Brown Soil	No asbestos detected	n/t	n/t	n/t	n/t
221062	0.10 - 0.30	TP4	Brown Soil	No asbestos detected	n/t	n/t	n/t	n/t
221063	0.20 - 0.40	TP5	Brown Soil	No asbestos detected	n/t	n/t	n/t	n/t
221064	0.35 - 0.55	TP6	Brown Soil,Stones	No asbestos detected	n/t	n/t	n/t	n/t

Method Summary

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Parameter	Codes	Analysis Undertaken On	Date Tested	Method Number	Technique
Soil					
PAH (GC-MS)	N	As submitted sample	26/11/2020		GC-MS
Hexavalent chromium	N	As submitted sample	26/11/2020	110	Colorimetry
pH	M	Air dried sample	27/11/2020	113	Electromeric
Acid Soluble Sulphate	U	Air dried sample	27/11/2020	115	Ion Chromatography
Phenols in solids	N	As submitted sample	26/11/2020	121	HPLC
Water soluble anions	M	Air dried sample	26/11/2020	172	Ion Chromatography
Low range Aliphatic hydrocarbons soil	N	As submitted sample	27/11/2020	181	GC-MS
Low range Aromatic hydrocarbons soil	N	As submitted sample	27/11/2020	181	GC-MS
BTEX in solids	M	As submitted sample	27/11/2020	181A	GC-MS
Water soluble boron	N	Air dried sample	26/11/2020	202	Colorimetry
Total cyanide	M	As submitted sample	26/11/2020	204	Colorimetry
Total organic carbon/Total sulphur	N	Air dried sample	26/11/2020	216	IR
TPH CWG soil by gc-gc	M	As submitted sample	26/11/2020	271	
Asbestos identification	U	Air dried sample	27/11/2020	280	Microscopy
Aqua regia extractable metals	M	Air dried sample	26/11/2020	300	ICPMS
Soil organic matter	U	Air dried sample	30/11/2020	BS1377:P3	Titrimetry

Tests marked N are not UKAS accredited

Report Information

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Key

U	hold UKAS accreditation
M	hold MCERTS and UKAS accreditation
N	do not currently hold UKAS accreditation
^	MCERTS accreditation not applicable for sample matrix
*	UKAS accreditation not applicable for sample matrix
S	Subcontracted to approved laboratory UKAS Accredited for the test
SM	Subcontracted to approved laboratory MCERTS/UKAS Accredited for the test
NS	Subcontracted to approved laboratory. UKAS accreditation is not applicable.
I/S	Insufficient Sample
U/S	Unsuitable sample
n/t	Not tested
<	means "less than"
>	means "greater than"
LOD	LOD refers to limit of detection, except in the case of pH soils and pH waters where it means limit of discrimination.

Soil sample results are expressed on an air dried basis (dried at < 30°C), and are uncorrected for inert material removed.

ELAB are unable to provide an interpretation or opinion on the content of this report.

The results relate only to the sample received.

PCB congener results may include any coeluting PCBs

Uncertainty of measurement for the determinands tested are available upon request

Unless otherwise stated, sample information has been provided by the client. This may affect the validity of the results.

Deviation Codes

a	No date of sampling supplied
b	No time of sampling supplied (Waters Only)
c	Sample not received in appropriate containers
d	Sample not received in cooled condition
e	The container has been incorrectly filled
f	Sample age exceeds stability time (sampling to receipt)
g	Sample age exceeds stability time (sampling to analysis)

Where a sample has a deviation code, the applicable test result may be invalid.

Sample Retention and Disposal

All soil samples will be retained for a period of one month

All water samples will be retained for 7 days following the date of the test report

Charges may apply to extended sample storage

APPENDIX C

References

References

1. **Ground Investigation Limited.** *Proposed Residential Barn Conversion, Long Acres, Redfield Hill, Bitton – Phase 1 Assessment of Land Quality,* July 2020.

2. **Environment Agency & DEFRA.** *Model procedures for the management of land contamination*. Contaminated Land Report 11, September 2004.

3. **DEFRA**. *SP1010: Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination*. December 2013.

4. **Environment Agency**, *Soil Guideline Values for 'various substances' in soil*, 2009.

5. **LQM/CIEH**. *The LQM/CIEH S4ULs for Human Health Risk Assessment*, 2015.

6. **Environment Agency**, *SR3 Updated Technical Background to the CLEA model: Science Report Final SC050021/SR3*, 2009.

7. **BRE**. *Concrete in aggressive ground, Part 1: assessing the aggressive chemical environment.* Special Digest 1, 2005.