GEOENVIRO

SOLUTIONS LIMITED

PHASE II / GROUND INVESTIGATION AND UPDATED RISK ASSESSMENT REPORT

AT

LAND ADJACENT TO NO. 7, TOWN GATE, SCHOLES

FOR

MR D. BLACKBURN

Report Reference: GES 2371-22 PII

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APPENDICES

LIST OF ACRONYMS

Acronym	Meaning
BGS	British Geological Survey
BH	Borehole
CDM	Construction Design and Management
CL:AIRE	Contaminated Land: Applications In Real Environments
CLR	Contaminated Land Report
COSHH	Control Of Substances Hazardous to Health
CSM	Conceptual Site Model
DCP	Dynamic Cone Penetrometer
DEFRA	Department for Environment Foods and Rural Affairs
DoE	Department of Environment
DP	Dynamic Probe
DWS	Drinking Water Standard
EA	Environment Agency
EQS	Environmental Quality Standard
GAC	Generic Acceptance Criteria
HA	Hand Auger
HP	Hand Pit
LPA	Local Planning Authority
LQM	Land Quality Management
mbgl	Metres Below Ground Level
MP	Mackintosh Probe
NGR	National Grid Reference
NPPF	National Planning Policy Framework
OS	Ordnance Survey
SGV	Soil Guideline Value
SPOSH	Significant Possibility of Significant Harm
SPT	Standard Penetration Test
SPZ	Source Protection Zone
SSSI	Site of Special Scientific Interest
SSV	Soil Screening Value
TP	Trial Pit
TT	Trial Trench
WS	Windowless Sample / Window Sample
WSV	Water Screening Value

1. INTRODUCTION

1.1 BACKGROUND AND INSTRUCTION

GeoEnviro Solutions Limited (GES) was instructed by Mr. D. Blackburn (the Client) to produce a Phase II geoenvironmental ground investigation for a site located adjacent to Number 7, "Fieldhead", Town Gate, Scholes, BD19 6ET.

This report is written in accordance with the guidance set out in Land Contamination Risk Management (LCRM), Guiding Principles for Land Contamination (GPLC) 1 – 3, and the National Planning Policy Framework (NPPF).

A site location plan is presented as Drawing No. GES 2371-22 / 01 in **Appendix 1**.

1.2 PROPOSED DEVELOPMENT

It is currently proposed to construct a new two storey, three-bed residential property at the site, which comprises the garden of the adjoining residential property.

It is understood that planning has already been granted for the site by Kirklees Metropolitan District Council (KMDC), under application 2017/60/90589/E.

A proposed development plan, as provided to GES, drawn by Michael Denton Associates Ltd., referenced 16:10:6969:100 Rev. B, dated March 2020 is presented within **Appendix 1**.

This proposed development plan has been utilized in the preparation of this risk assessment, if an alternative development is subsequently proposed this assessment may need revising and should not be relied upon in its present outcome.

1.3 OBJECTIVES

The objectives of this Phase II report are to:

- Gain an understanding of any concerns of the regulatory authorities (Local Authority Planning, Building Control and Environmental Health departments and the Environment Agency) regarding local land filling, flooding, mining, quarrying and other concerns.
- Establish the environmental setting, including sensitivity in relation to human health, surface water, groundwater, and ecological receptors based on the findings of the preliminary CSM.
- Assess by quantitative means the potential nature and extent of contamination from those uses and the environmental risk and liabilities which may affect the site redevelopment.
- Refine the prevalent source-pathway-receptor linkages present on site by means of a Tier 2 contamination risk assessment which incorporates the formulation of an Updated Conceptual Site Model.
- To identify the ground conditions and provide details of their engineering properties in order to facilitate foundation design for the proposed development.

1.4 SCOPE

The scope of the ground investigation varies from that proposed within the Phase I report, as the client wished to expedite the works to meet planning deadlines. As such, prior to commencing the site works the proposed scope of investigation was as follows:

- Two rotary boreholes to a depth of 30.00 mbgl to assess the presence, condition and depth to any coal seams present beneath the site.
- One day's window sampling at two locations to a nominal depth of up to 5.00 mbgl or refusal, and in situ geotechnical testing (SPTs).
- Environmental and geotechnical sampling, and subsequent laboratory testing of samples.
- The installation of combined gas and groundwater monitoring standpipes within the window sampler boreholes to a nominal depth of 5.00mbgl.
- Subsequent gas and groundwater monitoring on six occasions over a three-month period, commencing approximately one week after the completion of the ground investigation.
- Interpretation and risk assessment of the data in respect of potential contamination and subsequent updating of the preliminary CSM.
- Interpretation of the geotechnical data to provide details of their engineering properties in order to facilitate foundation design for the proposed development

However, the proposed scope may be subject to change dependent upon site conditions, access, restrictions and obstructions.

1.5 PREVIOUS INVESTIGATIONS

GES have previously undertaken a Phase I Desktop Study and Preliminary Risk Assessment for the site, ref. GES 2371-22 PI, dated June 2022 which should be read in conjunction with this report.

The Phase I identified that the Linfit Lousey and Shertcliffe Coal seams may be present beneath the site, though are likely to be beyond the influencing distance of the site.

The preliminary conceptual site model (CSM) within the Phase I identified a low risk from on-site made ground, as well as the on-site / offsite migration of ground gas.

2. PHYSICAL SETTING

2.1 SITE INFORMATION

Location

The site is located adjacent to Number 7, “Fieldhead”, Town Gate, Scholes, at approximate National Grid Reference (NGR): 416865, 425910 (centre of the site).

A site location plan is presented as Drawing No. GES 2371-22/01 in **Appendix 1**.

Topography

The site slopes gently from north to south; the northern site boundary appears to be retaining approximately 0.5 m of the neighbouring garden and the southern boundary appears to be retaining approximately 0.5 to 1.0 m of the site. The surrounding area gently slopes to the southeast.

Site Description

A site walkover was carried out on the 7th June 2022; access to the site is via the driveway for No. 7, “Fieldhead”.

The site comprises a residential garden for No. 7, “Fieldhead” and currently comprises mature planting along the northern boundary, along with planting in the centre and east of the site, and mature trees are present along the southern boundary of the site. The remainder of the site is covered by grass.

A small (circa 1.8 m x 1.8 m) garden shed for the is present in the northwest of the site.

The surrounding land use generally comprises residential properties, with a plot of undeveloped land to the east.

Table 2.1: Site Surface Covering

Type of Surface Cover	Distribution (%)
Soft Ground (grassed and landscaped areas)	100
Hardstanding	0
Roadways	0
Buildings	0
Water (ponds, streams)	0

2.2 GEOLOGY

The British Geological Survey shows the site to be underlain by the geological succession outlined below in Table 2.2.

Table 2.2: Published Geology

Geology	Description /strata
Artificial	None Recorded
Superficial	None Recorded
Bedrock	Undifferentiated Pennine Lower Coal Measures (PLCM) Formation and Unnamed Sandstone of the (PLCM) Formation

There are no known artificial deposits recorded underlying the site, though Made Ground is anticipated, as the site was used to store building materials.

No superficial deposits are recorded to underlie the site.

The northern half and the southeast of the site is recorded to be underlain by an unnamed sandstone unit of the PLCM Formation. The east and southeast of the site is recorded to be underlain by undifferentiated strata of the PLCM Formation.

The PLCM Formation are generally described as *'interbedded grey mudstone, siltstone and pale grey sandstone, commonly with fossiliferous mudstone in the lower part, and more numerous and thicker coal seams in the upper part'* (BGS Lexicon Description).

A northwest-southeast trending inferred fault is recorded to pass through the south of the site, separating the sandstone in the southwest of the site from the remainder of the strata recorded to underlie the site.

The Groundsure Report records two inferred coal seams to be located 235 and 305 m north of the site, within the northern fault block. A review of these coal seams on the 1:50,000 scale geological map indicates them to be the Linfit Lousey Coal (LFT) seam, with a recorded thickness of between 0.0 and 1.3 m, and the Shertcliffe Coal (SH) seam, with a recorded thickness of between 0.0 and 0.8 m.

2.3 HYDROGEOLOGY

The Environment Agency designate aquifers in accordance with the Water Framework Directive. These designations reflect not only the importance of aquifers in terms of groundwater as a resource (drinking water supply) but also their role in supporting surface water flows and wetlands ecosystems. The aquifer designation data is based on geological mapping provided by the British Geological Survey.

Groundwater Vulnerability

The site is recorded to be located within an area where the EA considers the groundwater to have a medium vulnerability to mobile pollutants, as summarised in Table 2.3 below.

Table 2.3: Groundwater Vulnerability Definitions

Definition	Description
High Vulnerability	Areas able to easily transmit pollution to groundwater. They are likely to be characterised by high leaching soils and the absence of low permeability superficial deposits.
Medium Vulnerability	Intermediate between high and low vulnerability.
Low Vulnerability	Areas that provide the greatest protection from pollution. They are likely to be characterised by low leaching soils and/or the presence of superficial deposits characterised by a low permeability.

Superficial Deposits

There is no superficial aquifer designation for the site.

Bedrock

The Environment Agency aquifer classification scheme indicates that the bedrock aquifer designation for the site is classed as Secondary A aquifer which are generally described as *'permeable layers capable of supporting water supplies at a local rather than strategic scale, and*

in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers.'

2.4 HYDROLOGY

There are no major surface water courses within 250 m of the site.

2.5 CONTAMINANT SOURCES

On-Site Sources

The following possible on-site sources have been identified from the historical study and previous desktop:

- Made ground associated with recent construction activities.
- Ground gas associated with underground coal workings.

Offsite Sources

The following possible off-site sources have been identified from the historical study and previous desktop:

- Ground gas associated with underground coal workings.

3. FIELDWORKS

3.1 GROUND INVESTIGATION

All ground investigation works were completed from 30th June to 8th July 2022 under the supervision of a Geoenvironmental Engineer from GES.

The ground investigation has been carried out in accordance with BS5930: 2015+A1:2020 and the UK Specification for Ground Investigation Second Edition 2012.

All strata descriptions were undertaken in accordance with BS5930: 2015+A1:2020; EN ISO 14688-1&2:2018; and EN ISO 14689:2018.

The ground investigation undertaken was in line with the scope as described in Section 1.3, with the addition of a sonic borehole (SN01), drilled to allow the installation of a deeper gas / groundwater monitoring standpipe.

The positions of the exploratory holes in relation to the existing site layout can be reviewed on drawing number GES 2371-22/02 within **Appendix 1**.

3.2 RESTRICTIONS

No restrictions were encountered during this ground investigation.

4. GEOLOGY AND GROUND CONDITIONS

The following ground conditions were encountered during the ground investigation.

4.1 GENERAL

A generalised summary of the ground conditions encountered, depths to base, and thickness recorded from the exploratory hole records is presented below in Table 4.1, below.

Table 4.1: Summary of Ground Conditions

Geology / Strata	Depth (mbgl)				Thickness (m)		Locations encountered
	Top		Base		Min	Max	
	Min	Max	Min	Max			
Made Ground	0.00	-	0.30	0.40	0.30	0.40	List all locations encountered
Residual PLCM	0.30	0.40	1.20	2.00	0.80	1.60	List all locations encountered
PLCM	1.20	2.00	5.00	7.00	3.80	5.00	RO01 & RO02
Residual PLCM	5.00	7.00	7.80	8.00	1.00	2.80	RO01 & RO02
Coal	7.80	8.00	8.00	8.30	0.20	0.30	RO01 & RO02
PLCM	8.00	8.30	30.00	30.00	Not Proven		RO01 & RO02

Detailed strata descriptions are presented on the exploratory point logs presented in **Appendix 3**.

4.2 MADE GROUND

Reworked Natural Materials

Reworked Topsoil was encountered across the site, generally comprising a slightly sandy, slightly gravelly Clay, with common roots and rootlets, the gravel fraction was of brick, Sandstone and Mudstone.

4.3 BEDROCK (PENNINE LOWER COAL MEASURES)

Residual PLCM

Residual PLCM was encountered across the site and generally comprised a firm to stiff, slightly sandy gravelly clay, with gravel of sandstone and mudstone.

A second layer of residual PLCM was encountered at depth within the rotary boreholes and is likely to represent an extremely weak Mudstone.

PLCM Bedrock

Bedrock was encountered across the site, in RO01, RO02, WS01 and WS02 it comprised a very weak fine to medium grained Sandstone.

In SN01, it comprised a Mudstone, recovered as medium to coarse gravel, with rare thin beds (<10 cm thick) of Sandstone.

As such, it is possible that the inferred fault is present in the south of the site.

4.4 COAL SEAMS & MINE WORKINGS

Intact coal, considered to be representative of the Linfit Lousey Coal Seam, was encountered within the PLCM in both the rotary open hole boreholes, from depths of between 7.80 and 8.00 mbgl, with a thickness of between 0.20 and 0.30 m.

All coal encountered was noted as being intact and no potential voids, loss of flush or dropping of drilling rods was observed.

4.5 GROUNDWATER

Groundwater was generally not encountered during the ground investigation.

4.6 GROUNDWATER MONITORING

Groundwater monitoring is ongoing at the site to establish the ground water levels beneath the site, which included monitoring on three occasions to date. Table 4.2 below presents the details of the groundwater monitoring regime.

Table 4.2: Groundwater Monitoring Results

Exploratory Hole ID	09/07/22		15/07/22		20/07/22	
	Base of Hole (mbgl)	SWL* (mbgl)	Base of Hole (mbgl)	SWL* (mbgl)	Base of Hole (mbgl)	SWL* (mbgl)
SN01	3.75	3.09	3.75	2.92	2.70	3.75
WS01	0.93	Dry	0.93	Dry	0.93	Dry
WS02	0.86	Dry	0.86	Dry	0.86	Dry

**Standing Water Level*

4.7 OBSTRUCTIONS

No obstructions were encountered during this ground investigation.

4.8 CONTAMINATION

No visual or olfactory evidence of contamination was encountered or observed during this ground investigation, in particular no obvious visual or olfactory evidence of mobile contamination was observed during the ground investigation.

5. INSITU TESTING

5.1 STANDARD PENETRATION TESTS

Standard penetration testing was undertaken in some / all exploratory boreholes, and are summarised below:

- SPT 'N' values of between 51 and 52 were encountered within the upper surface of the PLCM.

6. LABORATORY TESTING – GEOTECHNICAL

The following programme of laboratory testing has been undertaken on samples obtained during this investigation:

- Moisture content determinations BS 1377: 1990: Pt2: 3.2
- Index properties (1 point) BS 1377: 1990: Pt2: 4.4, 5.3 & 5.4

The test results are summarised in Table 6.1, below:

Table 6.1: Summary of Geotechnical Test Results.

Test type	Number of tests	Results	Comments
Moisture content determinations	2	21%	
Index Properties (1 Point)	2	LL 32 – 37% PL 19 – 21% PI 11 – 18%	Clay of low to intermediate plasticity. NHBC Class – low

The test results are presented in **Appendix 4**.

7. LABORATORY TESTING – SULPHATES

The following programme of chemical laboratory testing has been undertaken on samples obtained during this investigation:

Three samples of the reworked topsoil and three samples of the underlying natural soils were submitted for assessment of water-soluble sulphate, total sulphate, pH value and total sulphur concentrations.

Within the reworked topsoil, water-soluble sulphate concentrations of 0.018 to 0.036 g/l were recorded, total sulphate concentrations ranged from 1300 to 1500 mg/kg, total sulphur concentrations ranged from <0.14% to 0.17% with pH values ranging from of 6.5 to 6.9.

Within the natural soils, water-soluble sulphate concentrations of 0.014 to 0.055 g/l were recorded, total (acid) sulphate concentrations ranged from 240 to 600 mg/kg, total sulphur concentrations ranged from <0.021% to 0057% with pH values ranging from of 5.7 to 6.9.

Reference to BRE Special Digest 1 and the test results indicates the results from the fall within Design Sulphate Class DS-1. Consequently, concrete may be designed to AC-1s concrete classification.

All chemical testing results are presented in **Appendix 5**.

8. LABORATORY TESTING – CONTAMINATION

8.1 SOIL AND GROUNDWATER TESTING

All samples were sent to a UKAS accredited chemical testing laboratory, and MCERTS were used where available. The analytical strategy focussed on a general suite of potential contaminants and the analytical suites are summarised in Table 8.1, below.

Table 8.1: Summary of Chemical Testing Suite

Testing	Comment	No. of soil samples analysed
General metals suite including Arsenic, cadmium, chromium, copper, cyanide, lead, mercury, nickel, phenol, selenium, zinc, pH, and water soluble sulphate	General analysis of soils beneath the site to achieve general site coverage, and targeting former uses on site and off site within influencing distance	6
Speciated PAH and TPH CWG	General analysis of soils beneath the site to achieve general site coverage, and targeting former uses on site and off site within influencing distance	6
Asbestos Screen	General analysis of soils beneath the site to achieve general site coverage, and targeting former uses on site and off site within influencing distance	6

All chemical testing results are presented in **Appendix 5**.

9. GEOTECHNICAL RECOMMENDATIONS

9.1 MINING RISK

The Groundsure Report records two inferred coal seams to be located 235 and 305 m north of the site, within the northern fault block. Review of these coal seams on the 1:50,000 scale geological map indicates them to be the Linfit Lousey Coal (LFT) seam, with a recorded thickness of between 0.0 and 1.3 m, and the Shertcliffe Coal (SH) seam, with a recorded thickness of between 0.0 and 0.8 m.

The ground investigation undertaken identified an intact coal seam at depths of between 7.80 and 8.00 mbgl, with a thickness of between 0.20 and 0.30 m, which is considered representative of the Linfit Lousey Coal seam.

Given the coal seam encountered was intact, it is considered sufficient rock cover exists and as such, the coal seam is considered to pose a very low to negligible risk to surface stability.

No mine entries are recorded to be present on-site, however, given the possibility of bell pits or unrecorded mine entries, it is considered prudent to strip back to natural strata within the footprint of the proposed plot / highways and examined for evidence of mine entries. If a mine entry / disturbed ground is encountered, advice regarding its treatment should be sought immediately from a suitably qualified engineer.

9.2 QUARRYING RISK

Inspection of historical OS plans has not revealed evidence of quarrying / pitting beneath the site. The possibility of encountering unrecorded quarries / pits cannot however be wholly discounted. It is recommended that excavations be examined for evidence of such features. If evidence of an infilled quarry / pit is suspected, works should cease, and the advice sought of a suitably qualified consultant.

9.3 FOUNDATIONS

The made grounds is not considered suitable for the construction of shallow foundations due to the risk of unacceptable total and differential settlement occurring under moderately light surface loading.

The proposed development is likely to be capable of being constructed on conventional shallow spread/trench fill foundations within the residual PLCM strata, with at least a firm in-situ condition.

Based on the above, strip foundations placed within the residual PLCM could be designed assuming the allowable increase in load shown in Table 8.1, below.

Table 8.1: Summary of Geotechnical Test Results.

Foundation type	Strip Foundations (/m)			Spread Foundations (m^2)		
Foundation Width (m)	0.6	0.9	1.2	1.0	2.0	3.0
Foundation Depth (m)	1.0			1.0		
Allowable increase in Stress (kN/m^2)	110	105	110	150	140	130

The allowable increase in stress given above assumes a factor of safety of 3 against general shear failure, with cohesion of at least 50 kPa at the foundation depths.

If bedrock is encountered at a shallow depth within an area of the site, foundations should de deepened to bear onto a consistent stratum, to mitigate the potential for differential settlement.

Settlements at these loading intensities should remain within tolerable limits for the type of structure proposed provided that the underlying soils are carefully inspected immediately final trimming has taken place.

If the fault recorded to pass through the site is encountered once the site has been stripped, it is recommended that foundations be reinforced across the fault, to mitigate the potential for differential settlement.

Should any soft or loose material be encountered they should be locally removed and replaced with lean-mix concrete or compacted granular soil. In addition, if the excavations are required to stand open for any period of time, then a blinding layer of lean-mix concrete should be placed in the excavation bases. This expedient will reduce loosening of the sub-grade due to the ingress of surface water.

If the suggested bearing capacities are unsuitable for the desired construction method, foundations should be deepened so that they consistently sit on the PLCM bedrock, where an allowable increase in bearing capacity of 200 kN/m^2 may be assumed for strip foundations.

With respect to the volume change potential of the tested soils, careful consideration of the guidance provided in Chapter 4.2 of the NHBC standards[1] is recommended. It may be noted that where foundations lie outside of the zone of influence of the trees at the site, the minimum foundation depths given in Table 5[2] of the standards should be employed in conjunction with the recommendations above. Foundations lying inside the zone of influence of existing trees should be constructed at depths determined from the guidance in Chapter 4.2, although, this does require a survey of the existing trees to be undertaken. In addition, the recommendations given for voids below ground floor slabs and drainage services should be followed.

9.4 FLOOR SLABS

In accordance with current NHBC Standards and based on proven ground conditions it is considered that ground bearing floor slabs could be utilised across the majority of the site following a topsoil strip.

Locally suspended floor slabs may be required where soil swelling may occur (i.e., within the zone of influence of existing or proposed trees or hedges) or where the ground has insufficient bearing capacity.

At the time of writing ground gas monitoring has not been completed for the site. In view of this, it would be prudent to give consideration to any gas protection measures required to be incorporated into the floor slab design.

9.5 EXCAVATIONS

Groundwater was not encountered during the investigation. However, it should be appreciated that groundwater levels are subject to seasonal variation or changes on local drainage conditions.

[1] NHBC Standards, Chapter 4.2, *Building near trees*
[2] NHBC Standards, Chapter 4.2, *Building near trees,* Table 5 – *Minimum foundation depths outside zone of influence*

Groundwater is unlikely to represent a particular problem to the construction of the development; however, it should be recognized that slight seepages and minor water entries may combine in any long trench excavations to create a significant volume of water which may cause local problems during the construction phase. Any minor groundwater seepages or significant standing water within excavations made upon this site may be removed by using a simple form of de-watering. Such a system could include the excavation of sumps from which the water could be pumped. Advice on Groundwater Control is given in CIRIA Report No 515 – Groundwater Control Design and Practice.

The stability of the excavation faces cannot be guaranteed thus temporary support to the excavation faces may become necessary unless the foundations are constructed using trench-fill techniques. In this method the foundation trenches should be excavated, inspected and backfilled with concrete as a continuous operation. Under no circumstances should operatives be allowed to enter unsupported excavations.

Subject to space constraints, excavations could be battered back to a suitable angle of repose (typically 1:1 for a 1.00m deep excavation). Alternatively, if there is a requirement to protect nearby structures or services, appropriate supports may be required. Advice on excavation support is given in CIRIA Report No 97 – Trenching Practice.

Where trench support/shoring is utilised an appropriately qualified and experienced engineer should design the support system. The shoring/support will require regular inspection in accordance with published guidelines to ensure that the support/shoring is adequate for the ground conditions present.

9.6 PAVEMENTS / HIGHWAYS

At this stage the sub grade is likely to comprise natural residual clays. Using geotechnical data including Atterberg Limit results and Table 5.1 from IAN 73/06, a preliminary design CBR of 5 % could be assumed for the residual PLCM soils which form the sub grade. Notwithstanding the above, it is recommended that in-situ CBR testing be carried out along the alignment of proposed highways, following completion of the enabling works and when final site levels will be known.

All road design should be discussed with the relevant local authority if highways are to be subject to a Section 38 Agreement.

10. CONTAMINATION

10.1 SOIL TESTING

A total of six samples, three samples of the reworked topsoil and three samples of the underlying natural soils have been analysed by Chemtest Ltd in their UKAS and MCERTS accredited laboratory-testing facility in accordance with laboratory protocol.

The testing completed comprised of a focused suite of heavy metals, speciated Total Petroleum Hydrocarbons (TPH CWG Aromatic/aliphatic split) and speciated Polycyclic Aromatic Hydrocarbons (PAH) including the more carcinogenic benzo(a)pyrene (BaP) and naphthalene, asbestos, soil organic matter (SOM) content, MTBE & BTEX, cyanide, pH and sulphates.

The results of this laboratory testing have been compared to the Soil Guideline Values (SGVs) as well as the CIEH 'LQM' guideline values for inorganic and organic contaminants in soils. The proposed development of the site is intended to comprise a residential property and therefore screening has been made against a 'residential with homegrown produce' end-use.

A set of Screening Values are provided in **Appendix 6**.

10.2 SELECTION OF SCREENING CRITERIA

The on-site receptors for the study site are considered to be:

- Construction workers (during redevelopment of the site only).
- Future maintenance workers (following redevelopment).
- Future end users and site visitors (following redevelopment); and
- Trespassers (during redevelopment).

Risks to construction workers during the redevelopment process will be mitigated by adhering to appropriate health and safety legislation, and the wearing of appropriate personal protective equipment (PPE). During redevelopment, the site will be securely fenced to prevent trespassers from accessing the site, and good site management practices will be implemented to mitigate exposure to off-site receptors.

The potential pathways for contaminants within the soil to human health receptors following redevelopment are considered to be:

- Direct ingestion of soil and soil derived dust.
- Dermal contact with soil outside and soil derived dust inside.
- Inhalation of soil derived dust inside and outside; and
- Inhalation of soil derived vapours inside and outside.

The potential pathways for contaminants within the soil to off-site human health receptors following redevelopment are considered to be:

- Direct ingestion of soil and soil derived dust.
- Dermal contact with soil outside and soil derived dust inside.
- Inhalation of soil derived dust inside and outside; and
- Inhalation of soil derived vapours inside and outside if contamination within soil is able to migrate across the site boundary within.

In the first instance, the results of this laboratory testing have been compared to generic assessment criteria (GAC) for the residential with homegrown produce land use scenario. These incorporate the following pathways:

- Direct ingestion of soil and soil derived dust.
- Dermal contact with soil outside and soil derived dust inside.
- Inhalation of soil derived dust inside and outside; and
- Inhalation of soil derived vapours inside and outside.

Contaminants have been screened against revised LQM/CIEH S4UL criteria[3] where available. These GAC have been designed for use under planning, using Health Criteria Values based on minimal risk, and updated exposure parameters. The S4UL are intended to replace the previous LQM/CIEH GAC. The S4UL are based on the assumption of a sandy loam soil; the 1.0 % soil organic matter (SOM) criteria have been used, where available and appropriate, in the first instance. All soil samples were analysed for %SOM, the reworked topsoil has an SOM of 11 %, while the natural soils range from 1.7 to 2.8 %, and so this conservative approach is considered appropriate for initial screening.

Where no S4UL are available, the EIC/ AGS/ CL:AIRE/ GAC[4] have been used. The toxicological criteria within these are also based on minimal risk. It is recognised that these criteria have not recently been updated, and in particular, do not incorporate the slightly higher inhalation rates that have been used within the S4UL. However, given that they incorporate additional pathways, they are considered suitable for an initial screen. The EIC/ AGS/ CL:AIRE/ GAC are also based on a sandy loam soil and the 1% SOM criteria have been used in the first instance.

There is neither an S4UL nor a EIC/ AGS/ CL:AIRE/ GAC available for lead. In the absence of a GAC based on minimal risk, the C4SL for lead has been used. It is recognised that this is based on a “low level of toxicological concern” rather than on a minimal risk level. However, it is considered appropriate for use under planning, especially for a site where there will effectively be no pathways for inorganic metals following redevelopment.

All the GAC are based on a sandy loam soil. This is considered appropriate for use for initial screening. Although it is apparent from the laboratory soil descriptions, that the Made Ground, by its very nature is heterogeneous, and often has a significant sand/gravel component, especially at shallow depths, it is noted that the natural soil descriptions have a significant clay component.

All of the GAC assume unsaturated soils. However, the use of the GAC is considered to be conservative, because they assume a certain air-filled porosity and water-filled porosity.

The GAC also assume that no free phase product is present and are not intended for use in this instance. No free product was observed within soils during the ground investigation.

[3] Nathanail et al. (2015) The LQM/CIEH S4ULs for Human Health Risk Assessment. Land Quality Press, 2015. Copyright Land Quality Management Limited reproduced with permission; Publication Number S4UL3495

[4] CL:AIRE (2010) The EIC/AGS/CL:AIRE Generic Assessment Criteria for Human Health Risk Assessment

10.3 SOIL TESTING RESULTS AND SCREENING

All metals, PAHs, and TPH CWG analytes for the reworked topsoil are presented in the following tables with units in mg/kg unless otherwise stated. Other potential contaminants of concern are only shown where there is at least one result exceeding the limit of detection.

The results of the chemical laboratory testing are provided in **Appendix 6**.

Tables 10.1 – 10.3 below and overleaf summarize the soil testing results for the reworked topsoil.

Metalloids

Table 10.1: Metalloids Soil Exceedances

Determinant	Min	Max	GAC	Number of exceedances	Location of exceedances
Arsenic	22.00	30.00	37*	0	
Cadmium	0.18	0.29	11	0	
Chromium total	9.20	12.00	910*	0	
Chromium (VI)	0.50	0.50	6*	0	
Copper	30.00	45.00	2400*	0	
Lead	110.00	150.00	200*	0	
Mercury	0.28	0.38	120*[a]	0	
Nickel	12.00	16.00	180*[b]	0	
Selenium	0.53	0.79	250*	0	
Zinc	76.00	94.00	3700*	0	
Total Phenols	<0.1	<0.1	1500*	0	
Total Cyanide	<0.5	<0.5	34*	0	

**LQM/CIEH GAC for Public Open Space Near Residential' use scenario based on a sandy loam soil and 2.5% SOM.*

a) Based on the inorganic mercury GAC as the conceptual site model does not suggest that other forms of mercury are likely to be present on site.

b) LQM issued an update to the nickel S4ULs in August 2015, and this has been taken into account.

Organics

Table. 10.2: PAH Soil Exceedances

Determinant	Min	Max	GAC	Number of exceedances	Location of exceedances
Acenaphthylene	0.51	1.40	210	0	
Acenaphthene	0.49	1.10	170	0	
Anthracene	0.77	2.00	2400	0	
Benzo(a)anthracene	3.20	4.90	7.2	0	
Benzo(a)pyrene	3.20	4.70	2.2	3	WS01 0.0-0.3 mbgl WS02 0.0-0.3 mbgl SN01 0.0-0.3 mbgl

Determinant	Min	Max	GAC	Number of exceedances	Location of exceedances
Benzo(b)fluoranthene	3.60	5.30	2.6	3	WS01 0.0-0.3 mbgl WS02 0.0-0.3 mbgl SN01 0.0-0.3 mbgl
Benzo(k)fluoranthene	2.40	2.80	320	0	
Benzo(ghi)perylene	1.10	2.50	77	0	
Chrysene	4.10	6.20	15	0	
Dibenz(a,h)anthracene	0.27	1.30	0.24	3	WS01 0.0-0.3 mbgl WS02 0.0-0.3 mbgl SN01 0.0-0.3 mbgl
Fluoranthene	5.90	11.00	280	0	
Fluorene	0.49	1.10	170	0	
Indeno(1,2,3-cd)pyrene	1.80	2.40	27	0	
Naphthalene	1.20	3.40	2.3	1	SN01 0.0-0.3 mbgl
Phenanthrene	3.30	8.20	95	0	
Pyrene	6.40	11.00	620	0	

**LQM/CIEH GAC for Public Open Space Near Residential' use scenario based on a sandy loam soil and 2.5% SOM.*

Table 10.3: TPH CWG Aliphatic/Aromatic Soil Exceedances

Determinant	Min	Max	GAC*	Number of exceedances	Location of exceedances
Aliphatic >C5 - C7	1.00	1.00	42	0	
Aliphatic >C6 - C8	1.00	21.00	100	0	
Aliphatic >C8 - C10	35.00	100.00	27	3	WS01 0.0-0.3 mbgl WS02 0.0-0.3 mbgl SN01 0.0-0.3 mbgl
Aliphatic >C10 - C12	31.00	48.00	130	0	
Aliphatic >C12 - C16	22.00	39.00	1100	0	
Aliphatic >C16 – C35	228.00	411.00	65000	0	
Aromatic >C5 - C7	1.00	1.00	70	0	
Aromatic >C7 - C8	1.00	1.00	130	0	
Aromatic >C8 - C10	1.00	1.00	34	0	
Aromatic >C10 - C12	1.00	1.00	74	0	
Aromatic >C12 - C16	5.60	61.00	140	0	
Aromatic >C16 - C21	40.00	270.00	260	1	WS02 0.0-0.3 mbgl

Determinant	Min	Max	GAC*	Number of exceedances	Location of exceedances
Aromatic >C21 - C35	350.00	840.00	1100	0	

** LQM/CIEH GAC scenario based on a sandy loam soil and 2.50% SOM. It is noted that the LQM/CIEH S4UL guidance recommends an additive approach for the TPH fraction, so that a hazard index approach is used. Based on a preliminary conservative comparison of maximum concentrations to S4ULs, no forward modelling is necessary to prove that this would still result in no exceedances at the site.*

Others

No asbestos fibres were recorded in any of the samples tested.

All samples tested for BTEX/MTBE returned concentrations below the limit of detection.

Natural Soils

There were no exceedances for the metalloids, PAH congeners or TPH CWG bands screened for within the residual PLCM strata tested.

Additionally, no asbestos fibres were recorded in any of the samples tested and all samples tested for BTEX/MTBE returned concentrations below the limit of detection.

10.4 INTERIM GAS MONITORING RESULTS

The site has been classified as Type A, in accordance with Table 3 in BS8485:2015+A1:2019.

Ground gas and groundwater monitoring standpipes were installed in WS01 and WS02, as well as SN01.

Ground gas monitoring is ongoing and has been carried out on four occasions to date. It should be noted that the third visit was undertaken as an additional visit, to monitor during rapidly falling pressures following elevated temperatures on the 18th and 19th July.

The standpipes were tested for the presence of methane, oxygen, carbon dioxide and hydrogen sulphide using a GA5000. The flow rates of the gas and barometric pressure were also recorded.

Ambient conditions were dry to moist, with the wind recorded as being calm to light. The rounds of monitoring were completed during steady and falling pressure conditions.

Oxygen

Oxygen concentrations ranged from a minimum of 19.2% to a maximum of 21.2%.

Methane

Methane concentrations ranged from a minimum of 0.0% to a maximum of 0.1%.

The maximum peak concentration of Methane obtained was 0.1% from WS01 during the third monitoring visit on the 20th July 2022, and from SN01 during the fourth monitoring visit on the 26th July 2022.

Carbon Dioxide

Carbon Dioxide concentrations ranged from a minimum of 0.2% to a maximum of 2.5%.

The maximum peak concentration of Carbon Dioxide obtained was 2.5% from SN01 during the second monitoring visit on the 15th July.

Flows Rates

Flow rates ranged from a minimum of -0.2 l/hr to a maximum of <0.1 l/hr.

Barometric pressure ranged from a low of 1000 mB during the fourth monitoring visit on the 26th July to a high of 1018 mB attained during the second monitoring visit of the 15th July 2022. In the case of any negative flows, it should be assumed that any negative flows can become positive and therefore any negative flows should be taken as positive.

Gas Screening Values

The recorded concentrations of Methane and Carbon Dioxide have been used to calculate a Gas Screening Value (GSV) for the gassing regime at this site.

The GSV has subsequently been compared against Table 2 in BS8485:2015+A1:2019.

C665 recommends that a maximum worst case theoretical GSV is calculated by multiplying the maximum recorded gas concentration by the maximum recorded flow, irrespective of where the standpipe is, or the date of the visit. However, it is widely accepted that this is not considered representative of the actual site conditions, as too many variables are taken into consideration. As such two alternative approaches have been utilised, both of which are considered equal valid.

- Worst-possible: Multiply the highest recorded gas concentration by the highest recorded flow for any given standpipe, irrespective of the timing of the two data points.
- Worst-credible: Multiply each gas concentration against the flow rate at each individual monitoring event.

As such GES has adopted the worst-possible approach above.

The values used represent the worst-case CO_2 and CH_4 concentrations across all installations. The maximum flow rate was -0.2l/hr and this was taken from all locations and/or monitoring visits.

Table 10.4 below summarises the gas monitoring data calculations.

Table 10.4: Calculated GSV's

Peak Flow Rate (l/hr)	Worst Case CO_2	CO_2 GSV	Worst Case CH_4	CH_4 GSV
-0.2	2.5%	0.005 l/hr	0.1%	0.002 l/hr

(Worst case CO_2 and CH_4 concentration / 100) x worst case flow rate = GSV

This GSV is a conservative estimate based on the maximum concentrations and flow rate.

Based on the maximum calculated GSV of 0.005/hr as derived for Carbon Dioxide, along with the maximum concentrations for Methane of 0.1% and Carbon Dioxide of 2.5%, the site can be ***provisionally*** characterised as Characteristic Situation 1 (CS1) and as 'very low risk'. This assessment will be reviewed on completion of the ground gas monitoring programme.

Carbon Monoxide

Carbon Monoxide concentrations ranged from a minimum of 0.0ppm to a maximum of 20.0ppm.

The maximum peak concentration of Carbon Dioxide obtained was 20.0ppm from WS01 during the first monitoring visit on the 9th July 2022. No values above 1.0ppm have been recorded in any of the subsequent monitoring visits.

Information provided by the World Health Organisation (WHO) provides air quality guidelines for Europe 2000, which provides time weighted average exposures that have been determined in such a way that the carboxyhaemoglobin (COHb) level of 2.5% is not exceeded. These are as follows:

- 87ppm for 15 minutes

- 52ppm for 30 minutes
- 26ppm for one hour
- 9ppm for eight hours

In addition, recommended WHO European guidelines for indoor air quality is as follow:

- 6ppm for twenty four hours so as not to exceed 2% COHb for chronic exposure.

Based on the above, the risk from carbon monoxide is ***provisionally*** considered to be moderate and will be reviewed on completion of the ground gas monitoring programme.

Therefore, based on the above results, protection is considered necessary against Carbon Monoxide.

Hydrogen Sulphide

There was no Hydrogen Sulphide detected during any of the rounds of monitoring.

Information taken directly from the HSE (Health & Safety Executive) Online provides the following:

- 0.0047 ppm is the recognition threshold of human smell, the concentration at which 50% of humans can detect the characteristic odour of hydrogen sulphide.
- 10-20 ppm is the borderline concentration for eye irritation.
- 50-100 ppm leads to eye damage.
- At 150-250 ppm the olfactory nerve is paralyzed after a few inhalations, and the sense of smell disappears, often together with awareness of danger.
- 320-530 ppm leads to pulmonary edema with the possibility of death.
- 530-1000 ppm causes strong stimulation of the central nervous system and rapid breathing, leading to loss of breathing.
- Concentrations over 1000 ppm cause immediate collapse with loss of breathing, even after inhalation of a single breath.

Based on the above, the risk from hydrogen sulphide is ***provisionally*** considered to be very low.

Therefore, based on the above results, protection is not considered necessary against Hydrogen Sulphide.

11. UPDATED CONCEPTUAL SITE MODEL AND RISK ASSESSMENT

The Conceptual Site Model has been re-formulated based upon the results from the ground investigation in accordance with BS10175:2015. It aims to provide information regarding the sources of contamination and the pathways in which contamination can migrate to a vulnerable receptor, all of which need to be present for there to be a risk. This is in relation to the proposed end use being classified as 'residential with homegrown produce'. The following linkages have been identified and are presented in Table 11.1, below.

Table 11.1: Updated Conceptual Site Model.

Contaminant Source	Pathways	Receptor	Pollutant Linkage	Classification of Probability	Classification of Consequence	Level of Risk	Justification
On Site: Made Ground soils on site possibly containing elevated metals, other organics such as TPH, PAH or phenols.	Ingestion, dermal contact, inhalation of dusts/vapours	Future end users and site visitors	Considered inactive	-	-	Very Low Risk	Because no pollutant linkage has been identified, the risk is considered to be very low.
		Construction Workers	Considered potentially active	Likely	Mild	Moderate / Low Risk	Elevated concentrations of PAH congeners and TPH bands have been encountered within the reworked topsoil across the site. Construction workers are more likely to encountered potentially impacted soils that future users and visitors. The risk to construction workers can be mitigated through the use of appropriate PPE.
	Leaching through soils and migration via groundwater or soil pore moisture	Controlled Waters	Considered potentially active	Low Likelihood	Mild	Low Risk	A low-risk rating has been assessed due to the possible presence of potentially contaminative sources on site, the presence of a Secondary (A) Aquifer within the bedrock underlying the site and an inferred fault being recorded in the southwest of the site.

Contaminant Source	Pathways	Receptor	Pollutant Linkage	Classification of Probability	Classification of Consequence	Level of Risk	Justification
	Permeation of water pipes	Construction materials, future end users and site visitors	Considered potentially active	Likely	Mild	Moderate / Low Risk	Hydrocarbons, especially aromatics are known to permeate plastic pipes. Provision of water supply pipes and connectors formed from proprietary "barrier pipe" materials (e.g. polyethylene-aluminium-polyethylene) may be required by the water supply company.
	Uptake	Plant and Wildlife	Considered inactive	-	-	Very Low Risk	Because no pollutant linkage has been identified, the risk is considered to be very low.
On Site: Asbestos at/near ground surface in Made Ground soils.	Inhalation of fibres in airborne dust	Future end users and site visitors	Considered inactive	-	-	Very Low Risk	Because no pollutant linkage has been identified, the risk is considered to be very low.
		Construction Workers	Considered potentially active	Unlikely	Mild	Very Low Risk	A low-risk rating has been assessed due to the previous construction / demolition works undertaken adjacent to the site and the site likely being used as a site compound. Construction workers are more likely to encountered potentially impacted soils that future users and visitors. The risk to construction workers can be mitigated through the use of appropriate PPE.
On-site / Offsite: Ground Gases (CH_4, CO_2, CO, H_2S) from underground coal workings.	Gas migration and build up within buildings (explosion/ asphyxiation risk)	Future end users and building structures.	Considered potentially active	-	-	-	Risk to be assessed on completion of ground gas monitoring programme.

12. RECOMMENDATIONS

The results of the testing undertake indicates that PAH and TPH contamination is present within the reworked topsoil, which is present across the site.

Given this, it is recommended that a Remediation Strategy be written to detail the works required to mitigate the risks detailed in Table 11.1 above.

12.1 WATCHING BRIEF AND DISCOVERY STRATEGY

A watching brief should be maintained by the Main Contractor at all times during the groundworks stage. Should any unforeseen contamination, such as oils or soils/groundwater with an unusual colour or odour, be encountered during groundworks then the following procedure should be implemented:

- Work to cease in that area to prevent exposure to ground workers and potential contaminants being spread around.
- Notify GES, to attend site and sample material.
- Notify the Environmental Health Department / Contaminated Land Officer(s) of the Local Planning Authority.

If the nature and extent of the contamination is unmanageable under the procedure set out above, then a suitable management, mitigation or remediation procedure will be agreed with the CLO. However, this is considered unlikely at this particular site.

12.2 PREVIOUSLY UNIDENTIFIED CONTAMINANTS

Any suspected contaminated soil/fill found during construction works shall be placed in temporary stockpiles on hardstanding or high density Visqueen and be suitability covered to minimize the potential for dust/odour nuisance and prevent surface water runoff. Samples of arisings material will be taken to determine whether this material is suitable for re-use on site.

Once the laboratory analysis of the material is available an assessment should be undertaken to determine whether it can be retained on-site as part of the Material Management Plan or whether it should be disposed off-site.

Depending on the nature of any such impact it may be necessary to undertake validation testing of the excavation faces in order to demonstrate that no such materials are left in-situ.

12.3 DISPOSAL OF ARISINGS

If any soils are to be removed offsite, it may be prudent to undertake Waste Acceptance Criteria (WAC) analyses on the soils to be removed and undertake discussion with landfill operators at an early stage.

Any materials removed from site should be undertaken in accordance with current Duty of Care requirements and the Environment Agency Technical Guidance Document WM3, dated 2015.

All materials must be transported in compliance with the Duty of Care Regulations by authorising movements with Carrier's individually numbered Duty of Care conveyance notes, complete with the appropriate EWC Codes. All relevant dockets will need to be kept; to provide evidence of the removal as these may be required as part of a Validation Report.

Site preparatory works associated with this project are likely to involve the re-use of both natural and made ground soils on-site. Therefore, the Contractor should prepare a Materials Management Plan (MMP) in accordance with the CL:AIRE Code of Practice (v2, March 2011).

The MMP will document how all of the materials to be excavated during the proposed site preparatory and remediation earthworks are to be dealt with.

12.4 GROUND GAS PROTECTION MEASURES

Gas monitoring is ongoing, provisional assessment indicates that the site will be classified Characteristic Situation 1, though this will be re-assessed on completion of the monitoring programme.

12.5 ASBESTOS

Although screening has revealed no asbestos to be present within the samples analysed from exploratory holes undertaken, it cannot be guaranteed that asbestos is not present within the soils across the remainder of the site.

Consequently, GES would recommend that a watching brief be adopted with regards to the site for the potential of finding any Asbestos Containing Materials (ACMs). If any ACMs are identified these need to be dealt with accordingly in relation to the Hazardous Waste Regulations 2005.

12.6 SERVICES

If new services will be installed as part of the redevelopment of the site, we would recommend the local water board be contacted to determine their specification for the type of pipework which should be used on this site.

All services and in particular potable water supply pipework should comprise of material that is resistant to attack and degradation to chemical attack.

Further information can be found within the published guidance for the '*Selection of Water Supply Pipes to be used in Brownfield Sites'*, issued in January 2011 by the UK Water Industry Research (UKWIR), this supersedes the Water Regulations Advisory Scheme (WRAS) Information and Guidance Note – '*Laying Pipes in Contaminated Land'* which has been withdrawn.

12.7 SURFACE WATER

It should be noted that the Environment Agency does not recommend that soakaways be placed within Made Ground, potentially contaminative land or in ground previously identified as contaminated.

12.8 CONSULTEES

It is highly recommended that this report be forwarded to the relevant Local Authority Environmental Health and Planning Departments to seek their comments and subsequent approval, otherwise further works may be required.

13. RELIANCE AND LIMITATIONS

This report has been prepared using published information and information provided by the Client and their professional advisers which has been made available to GES at the time of writing only. GES accepts no liability for any changes resulting from new information which has become available since this time.

This report is provided for the sole use of the client and their professional advisors and is confidential to them unless agreed otherwise in writing. This report may only be used and relied on once the work has been paid for in full. GES owes no duty of care and has no liability to any third party who is not authorised by GES to use this report. Any unauthorised third parties using information contained in this report do so at their own risk.

We are content that as a result of the ground investigation works and subsequent soil testing undertaken, as outlined within this report, we have characterised the ground conditions and consequently the potential for contamination to exist on site. These works and ensuing assessment have been detailed in this report.

This assessment has been carried out to determine the potential risks posed to future end users, along with other key receptors, resulting from potential contamination at the site, based on the proposed development. Should any revisions in the development proposals result in a change any assessment parameters detailed in this report, a re-assessment of the risk should be carried out.

Whilst this report may reference observations made regarding the presence of features/ issues such as invasive species, ACM, site drainage and evidence of structural abnormalities, this report does not constitute specialist surveys on these matters. Should further specialist surveys be carried out in this regard, the findings of these should be reported to GES so that we may determine if this has any impact on the findings of this report.

The assessment and interpretation of the factual data obtained as part of this ground investigation has been undertaken in accordance with standard consulting practise and with current national and international guidance.

This report presents the observations made during the ground investigation and the factual data obtained. The conclusions and recommendations in this report are limited to those which can be made based on the findings of the survey and information provided by third parties. GES assumes all third party data to be true and correct. No responsibility can be accepted by GES for inaccuracies in the information provided by any other party.

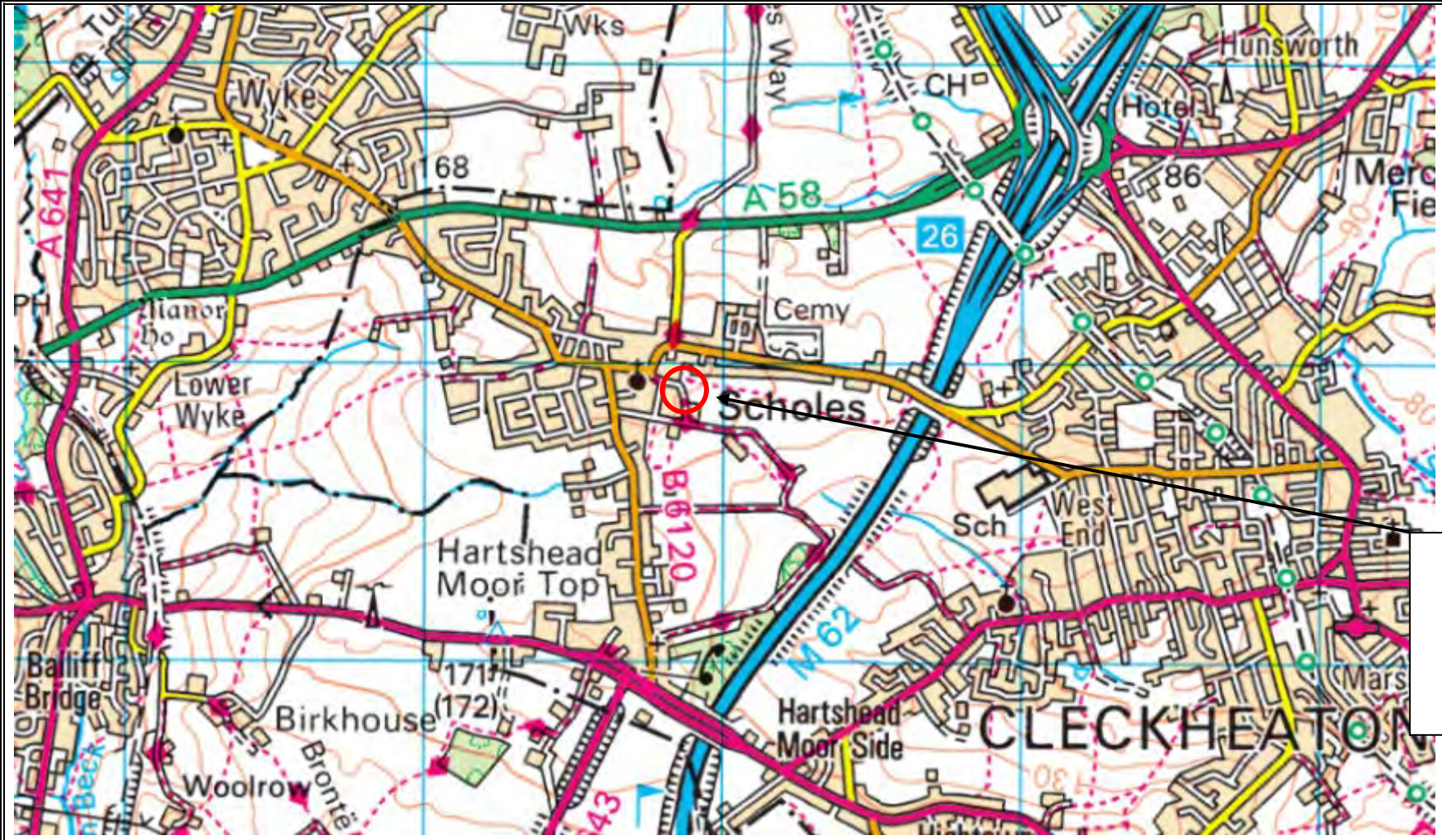
This report is written in the context of an agreed scope of works and should not be used in a different context. Furthermore, new information, improved practises, and changes in legislation may require the reinterpretation of the report in whole or in part after its original issue. GES reserve the right to alter their conclusions and recommendations in the light of further information that may become available.

Ground conditions can be variable and change rapidly, especially in areas of Made Ground, however it is assumed that the ground conditions encountered and observed are typical and representative of the site as a whole. Most specifically with regard to this limited investigation, the ground conditions have been determined from a limited number of exploratory holes formed across the site, therefore only a small percentage of the total area of the site has been investigated. Interpolation between exploratory holes has enabled a general picture of the subsurface conditions to be produced. Conclusions drawn from the ground investigation should be read in this context. GES cannot accept responsibility for any situations resulting from locally unforeseen ground conditions occurring between exploratory holes.

In addition, subsurface conditions including contaminant concentrations and groundwater levels may vary spatially with time. This factor should be given due consideration in the event that the information contained within this report is used after any significant period of time has elapsed.

APPENDIX 1

DRAWINGS AND PLANS



GEOENVIRO SOLUTIONS LIMITED	GeoEnviro Solutions Ltd Unit 7 Springvale Works Brighouse West Yorkshire HD6 2RA Tel: 01484 986010 Email: info@geoenvirosolutions.com Web: www.geoenvirosoltions.com N	**PROJECT NAME** Land Adjacent to No. 7, Town Gate, Scholes **PROJECT NUMBER** 2371-22	**DRAWING NO.** 2371-22/01	**SCALE** N.T.S
		TITLE Site Location Plan	**DATE** June 2022	**DRAWN BY** RC

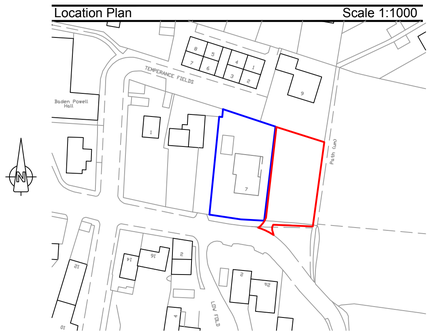
Window Sampler Location

Sonic Borehole Location

Rotary Borehole Location

GeoEnviro Solutions Ltd
Unit 7 Springvale Works
Brighouse
West Yorkshire
HD6 2RA
Tel: 01484 986010
Email: info@geoenvirosolutions.com
Web: www.geoenvirosoltions.com

PROJECT NAME Field Head, Scholes **PROJECT NUMBER** 2371-22		**DRAWING NO.** 2371-22/02	**SCALE** N.T.S
TITLE Proposed Exploratory Hole Location Plan		**DATE** July 2022	**DRAWN BY** RC



KEY TO PLAN

New Trees Mixed Groups

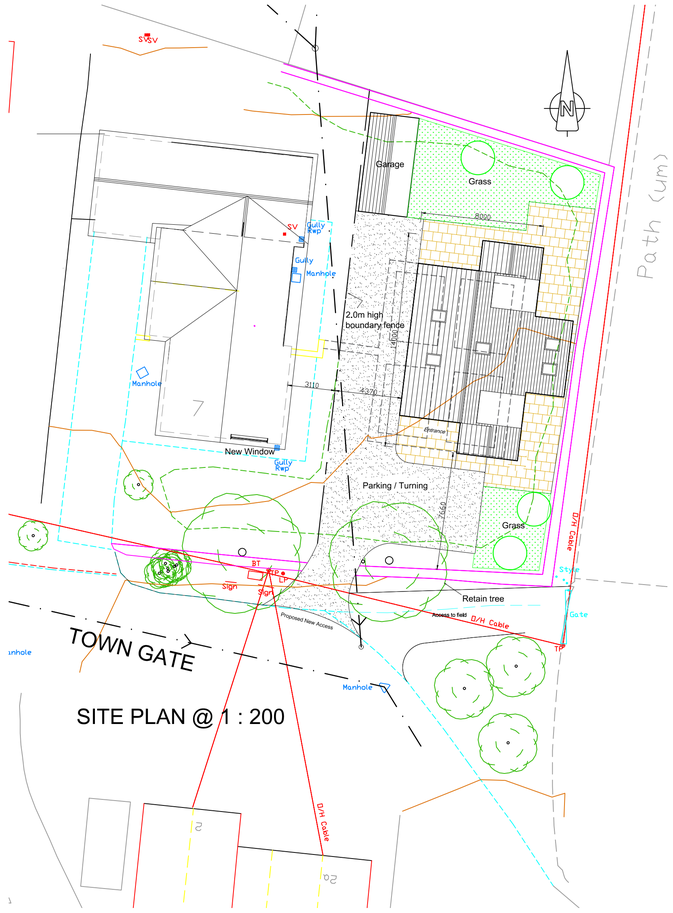
Tree planting to comprise heavy standards as per BS 3936 nursery stock with 120 - 140mm dia girths - To The following species

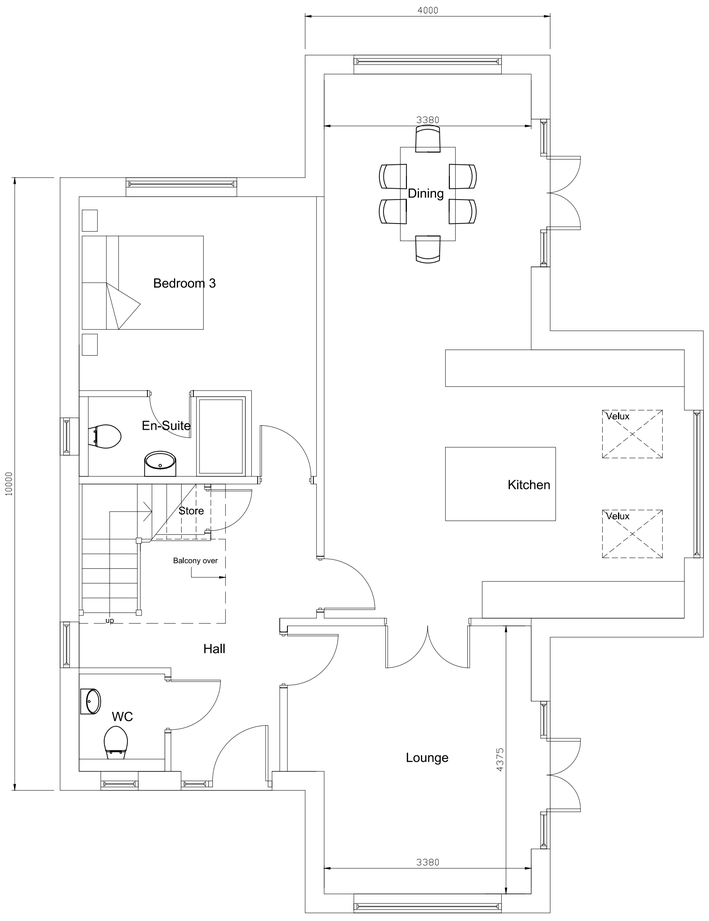
Trees

Grass

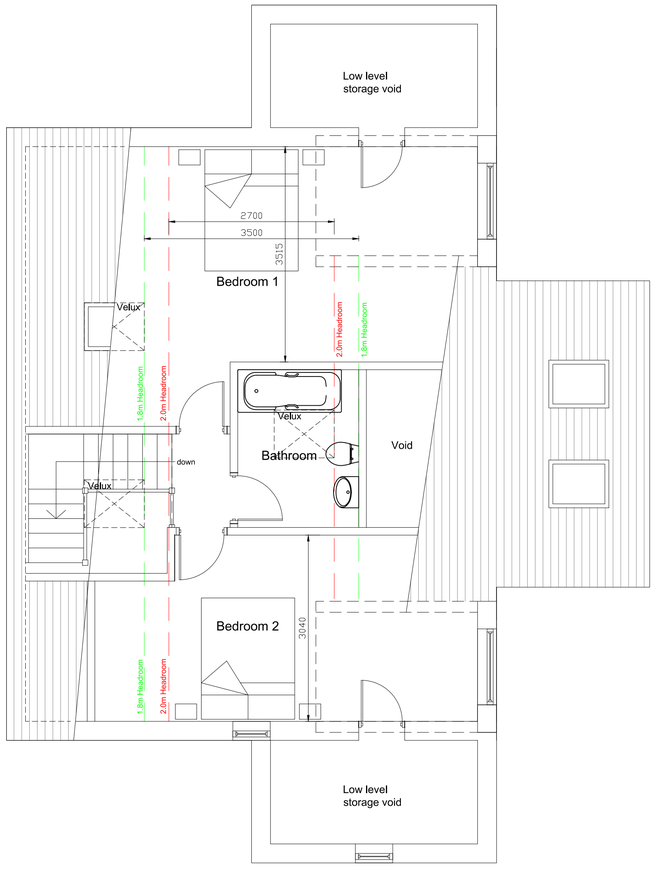
Tarmac

Marshalls Saxon Paving





GROUND FLOOR PLAN



FIRST FLOOR PLAN

B WINDOW ADDED TO FF STORAGE VOID 03/09/20

A PLANNING REVISIONS 29/07/20

Revisions

MICHAEL DENTON ASSOCIATES

Chartered Building Surveyors

Architectural Consultants, Civil & Structural Engineers
Project Managers & Town Planning Consultants

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tel 01422 364983

e-mail: mda@md-associates.co.uk

PROJECT	PROPOSED DETATCHED DWELLING
LOCATION	LAND ADJACENT TO FIELDHEAD 7 TOWN GATE SCHOLES BD19 6ET
CLIENT	Mr D. BLACKBURN
TITLE	SCHEME PROPOSAL - (Reserved Matters) Floor Plans

SCALE	DATE	DRAWN
1 : 50@A1 1 : 100@A3	March 2020	GR

DRAWING No.	Revision
16:10:6969:100	B

APPENDIX 22

SITE PHOTOGRAPHS

Site: Land Adjacent to No. 7, Towngate, Scholes
Client: Mr. D. Blackburn
Job Reference: GES 2371-22, Dated: June 2022

GEOENVIRO
SOLUTIONS LIMITED

A.

B.

C.

D.

A. **Facing north, view of site access.**

B. **Facing northeast, view of central site area.**

C. **Facing south, view of eastern site boundary.**

D. **Facing north, view of southern site boundary from Town Gate.**

APPENDIX 33

EXPLORATORY HOLE LOGS

Rotary Core Log

Project Name: Fieldhead	Client: Whitegate Garage	Date: 08/07/2022
Location: Fieldhead, Town Gate, Scholes, BD19 6ET	Contractor: GES	
Project No. : 2371-22	Crew Name: BHSN	Drilling Equipment: Sonic Rig (Rotary Head)

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
RO01	RO		Driller	1:50	Sheet 1 of 3

Well	Water	Depth (m)	Type /FI	Coring TCR	Coring SCR	Coring RQD	Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description
		0.00 - 0.30	ES					0.40			MADE GROUND: Grass over dark brown slightly sandy slightly gravelly CLAY with rootlets. Gravel is fine to coarse, sub-angular of brick, sandstone and mudstone. [REWORKED TOPSOIL]
											Firm orangish brown slightly sandy gravelly CLAY. Gravel is fine to coarse, sub-angular of sandstone. [RESIDUAL PENNINE LOWER COAL MEASURES FORMATION]
								2.00			Yellowish brown SANDSTONE. [PENNINE LOWER COAL MEASURES FORMATION]
								7.00			Light brown CLAY. [PENNINE LOWER COAL MEASURES FORMATION]
								8.00			Black COAL. [LINFIT LOUSEY COAL?]
								8.30			Grey MUDSTONE. [PENNINE LOWER COAL MEASURES FORMATION]
			Type/FI	TCR	SCR	RQD	D/R/(SPT)				

1 2 3 4 5 6 7 8 9 10

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)

Remarks

1. Hand pit (HP01) dug to 1.2 mbgl. 2. No visual or olfactory evidence of contamination noted. 3. Drilled with water flush, no loss of flush recorded. 4. No groundwater strikes recorded due to drilling method. 5. Logged by driller from arisings. 6. Backfilled on completion with bentonite and arisings.

Rotary Core Log

Project Name: Fieldhead	Client: Whitegate Garage	Date: 08/07/2022
Location: Fieldhead, Town Gate, Scholes, BD19 6ET	Contractor: GES	
Project No. : 2371-22	Crew Name: BHSN	Drilling Equipment: Sonic Rig (Rotary Head)

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
RO01	RO		Driller	1:50	Sheet 2 of 3

Well	Water	Depth (m)	Type /FI	Coring TCR	Coring SCR	Coring RQD	Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description
											Grey MUDSTONE. [PENNINE LOWER COAL MEASURES FORMATION]
			Type/FI	TCR	SCR	RQD	D/R/(SPT)				

11 12 13 14 15 16 17 18 19 20

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)

Remarks

1. Hand pit (HP01) dug to 1.2 mbgl. 2. No visual or olfactory evidence of contamination noted. 3. Drilled with water flush, no loss of flush recorded. 4. No groundwater strikes recorded due to drilling method. 5. Logged by driller from arisings. 6. Backfilled on completion with bentonite and arisings.

Rotary Core Log

Project Name: Fieldhead	Client: Whitegate Garage	Date: 08/07/2022
Location: Fieldhead, Town Gate, Scholes, BD19 6ET	Contractor: GES	
Project No. : 2371-22	Crew Name: BHSN	Drilling Equipment: Sonic Rig (Rotary Head)

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
RO01	RO		Driller	1:50	Sheet 3 of 3

Well	Water	Depth (m)	Type /FI	Coring TCR	Coring SCR	Coring RQD	Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description
											Grey MUDSTONE. [PENNINE LOWER COAL MEASURES FORMATION]
			Type/FI	TCR	SCR	RQD	D/R/(SPT)	30.00			End of Borehole at 30.000m

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)

Remarks

1. Hand pit (HP01) dug to 1.2 mbgl. 2. No visual or olfactory evidence of contamination noted. 3. Drilled with water flush, no loss of flush recorded. 4. No groundwater strikes recorded due to drilling method. 5. Logged by driller from arisings. 6. Backfilled on completion with bentonite and arisings.

Rotary Core Log

Project Name: Fieldhead	Client: Whitegate Garage	Date: 08/07/2022
Location: Fieldhead, Town Gate, Scholes, BD19 6ET	Contractor: GES	
Project No. : 2371-22	Crew Name: BHSN	Drilling Equipment: Sonic Rig (Rotary Head)

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
RO02	RO		Driller	1:50	Sheet 1 of 3

Well	Water	Depth (m)	Type /FI	Coring TCR	Coring SCR	Coring RQD	Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description
								0.40			MADE GROUND: Grass over dark brown slightly sandy slightly gravelly CLAY with rootlets. Gravel is fine to coarse, sub-angular of brick, sandstone and mudstone. [REWORKED TOPSOIL]
								1.20			Firm orangish brown slightly sandy gravelly CLAY. Gravel is fine to coarse, sub-angular of sandstone. [RESIDUAL PENNINE LOWER COAL MEASURES FORMATION]
											Yellowish brown SANDSTONE. [PENNINE LOWER COAL MEASURES FORMATION]
								5.00			Light brown CLAY. [PENNINE LOWER COAL MEASURES FORMATION]
								7.80			Black COAL. [LINFIT LOUSEY COAL?]
								8.00			Grey MUDSTONE. [PENNINE LOWER COAL MEASURES FORMATION]
			Type/FI	TCR	SCR	RQD	D/R/(SPT)				

1 2 3 4 5 6 7 8 9 10

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)

Remarks

1. Hand pit (HP02) dug to 1.2 mbgl. 2. No visual or olfactory evidence of contamination noted. 3. Drilled with water flush, no loss of flush recorded. 4. No groundwater strikes recorded due to drilling method. 5. Logged by driller from arisings. 6. Backfilled on completion with bentonite and arisings.

Rotary Core Log

Project Name: Fieldhead	Client: Whitegate Garage	Date: 08/07/2022
Location: Fieldhead, Town Gate, Scholes, BD19 6ET	Contractor: GES	
Project No. : 2371-22	Crew Name: BHSN	Drilling Equipment: Sonic Rig (Rotary Head)

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
RO02	RO		Driller	1:50	Sheet 2 of 3

Well	Water	Depth (m)	Type /FI	Coring TCR	Coring SCR	Coring RQD	Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description
											Grey MUDSTONE. [PENNINE LOWER COAL MEASURES FORMATION]
			Type/FI	TCR	SCR	RQD	D/R/(SPT)				

11 12 13 14 15 16 17 18 19 20

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)

Remarks

1. Hand pit (HP02) dug to 1.2 mbgl. 2. No visual or olfactory evidence of contamination noted. 3. Drilled with water flush, no loss of flush recorded. 4. No groundwater strikes recorded due to drilling method. 5. Logged by driller from arisings. 6. Backfilled on completion with bentonite and arisings.

Rotary Core Log

Project Name: Fieldhead	Client: Whitegate Garage	Date: 08/07/2022
Location: Fieldhead, Town Gate, Scholes, BD19 6ET	Contractor: GES	
Project No. : 2371-22	Crew Name: BHSN	Drilling Equipment: Sonic Rig (Rotary Head)

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
RO02	RO		Driller	1:50	Sheet 3 of 3

Well	Water	Depth (m)	Type /FI	Coring TCR	Coring SCR	Coring RQD	Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description
											Grey MUDSTONE. [PENNINE LOWER COAL MEASURES FORMATION]
			Type/FI	TCR	SCR	RQD	D/R/(SPT)	30.00			End of Borehole at 30.000m

21 22 23 24 25 26 27 28 29 30

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)

Remarks

1. Hand pit (HP02) dug to 1.2 mbgl. 2. No visual or olfactory evidence of contamination noted. 3. Drilled with water flush, no loss of flush recorded. 4. No groundwater strikes recorded due to drilling method. 5. Logged by driller from arisings. 6. Backfilled on completion with bentonite and arisings.

Percussion Drilling Log

Project Name: Fieldhead	Client: Whitegate Garage	Date: 08/07/2022
Location: Fieldhead, Town Gate, Scholes, BD19 6ET	Contractor: GES	
Project No. : 2371-22	Crew Name: BHSN	Drilling Equipment: Sonic Rig (Sonic Head)

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
SN01	CP		RC	1:50	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.00 - 0.30	ES		0.30			MADE GROUND: Grass over dark brown slightly sandy slightly gravelly CLAY with rootlets. Gravel is fine to coarse, sub-angular of brick, sandstone and mudstone. [REWORKED TOPSOIL]
		1.00 - 1.20	ES		1.60			POSSIBLE MADE GROUND: Stiff dark brown slightly sandy gravely CLAY. Gravel is fine to coarse, rounded to sub-rounded of mudstone, sandstone and possible brick.
					5.00			Extremely weak pale brown mottled brown, and mottled reddish brown on fractures MUDSTONE, recovered as medium to coarse gravel. Rare thin beds of sandstone (<10 cm). [DISTINCTLY WEATHERED PENNINE LOWER COAL MEASURES FORMATION]
								End of Borehole at 5.000m

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks

1. Hand pit (HP03) dug to 1.2 mbgl. 2. No visual or olfactory evidence of contamination noted. 3. No groundwater encountered. 4. 63mm diameter gas and groundwater monitoring standpipe installed as detailed above.

Percussion Drilling Log

Project Name: Fieldhead	Client: Whitegate Garage	Date: 30/06/2022
Location: Fieldhead, Town Gate, Scholes, BD19 6ET	Contractor: GES	
Project No. : 2371-22	Crew Name: BHSN	Drilling Equipment: Windowless Sampler Rig

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
WS01	WS		RC	1:50	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.30 - 0.60	ES		0.30			MADE GROUND: Grass over dark brown slightly sandy slightly gravelly CLAY with rootlets. Gravel is fine to coarse, sub-angular of brick, sandstone and mudstone. [REWORKED TOPSOIL]
		0.60 - 1.00	D					Firm orangish brown slightly sandy gravelly CLAY. Low plasticity (laboratory description). Gravel is fine to coarse, sub-angular of sandstone. [RESIDUAL PENNINE LOWER COAL MEASURES FORMATION]
		1.20	SPT	N=52 (6,6/9,14,14,15)	1.20			Very weak yellowish brown mottled orangish brown fine to medium grained SANDSTONE. [HIGHLY WEATHERED PENNINE LOWER COAL MEASURES FORMATION]
					1.55			End of Borehole at 1.550m

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks

1. Hand pit dug to 1.2 mbgl. 2. No visual or olfactory evidence of contamination noted. 3. No groundwater encountered. 4. Terminated on SPT 'N' refusal. 5. 63mm diameter gas and groundwater monitoring standpipe installed as detailed above.

Percussion Drilling Log

Project Name: Fieldhead	Client: Whitegate Garage	Date: 30/06/2022
Location: Fieldhead, Town Gate, Scholes, BD19 6ET	Contractor: GES	
Project No. : 2371-22	Crew Name: BHSN	Drilling Equipment: Windowless Sampler Rig

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
WS02	WS		RC	1:50	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.00 - 0.30	ES		0.35			MADE GROUND: Grass over dark brown slightly sandy slightly gravelly CLAY with rootlets. Gravel is fine to coarse, sub-angular of brick, sandstone and mudstone. [REWORKED TOPSOIL]
		0.60 - 0.80 0.60 - 0.90	ES D					Firm orangish brown slightly sandy gravelly CLAY with rare rootlets. Intermediate plasticity (laboratory description). Gravel is fine to coarse, sub-angular of sandstone. [RESIDUAL PENNINE LOWER COAL MEASURES FORMATION]
		1.20	SPT	N=51 (5,5/7,12,15,17)	1.20 1.55			Very weak yellowish brown mottled orangish brown fine to medium grained SANDSTONE. [HIGHLY WEATHERED PENNINE LOWER COAL MEASURES FORMATION]
								End of Borehole at 1.550m

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks

1. Hand pit dug to 1.2 mbgl. 2. No visual or olfactory evidence of contamination noted. 3. No groundwater encountered. 4. Terminated on SPT 'N' refusal. 5. 63mm diameter gas and groundwater monitoring standpipe installed as detailed above.

APPENDIX 4

GEOTECHNICAL TESTING RESULTS

GEOENVIRO
SOLUTIONS LIMITED

Chilgrove Business Centre
Chilgrove Park Road
Chichester
PO18 9HU

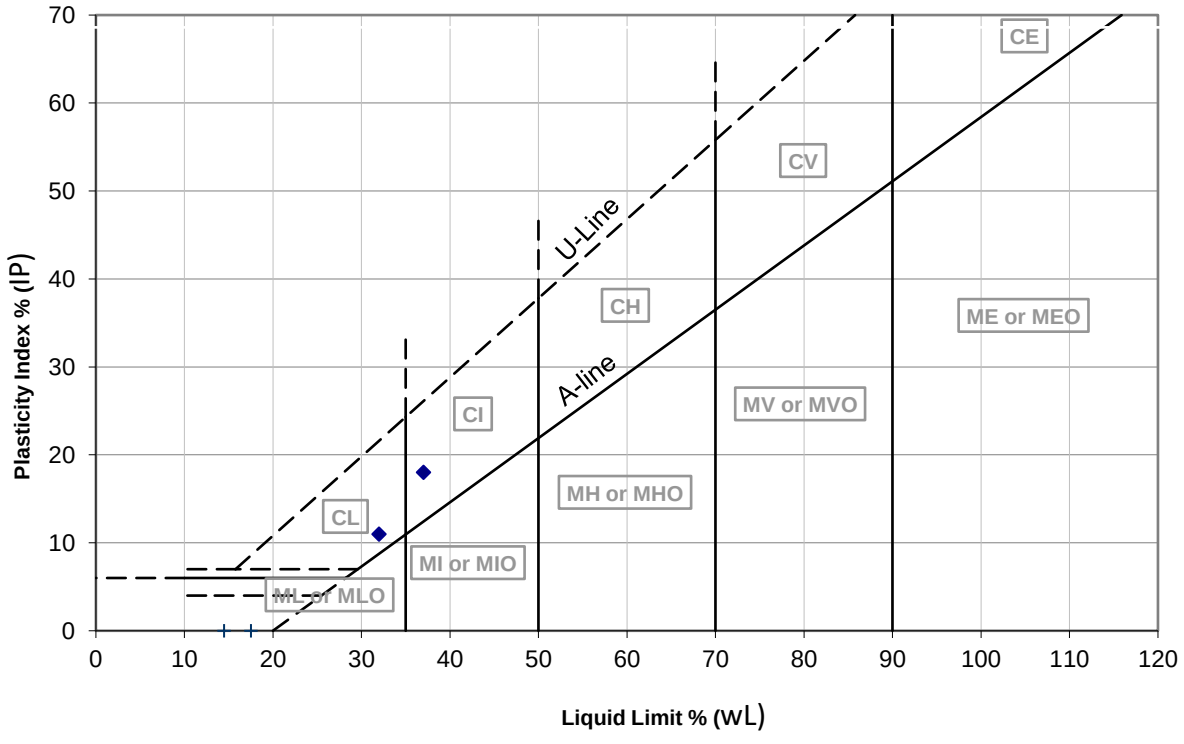
Client: Dean

Job No:	Site:	Date:	Sheet:
2371-22	Fieldhead	06/07/2022	1

Interpretation of Moisture Content, Liquid and Plastic Limits

Location	Depth	Moisture Content	Liquid Limit	Plastic Limit	Plasticity Index	Retained by 425mm	Modified	Modified	Liquidity/ Consistency		Casagrande Class	N.H.B.C Class
		(w)	(w_L)	(w_P)	(I_P)		(w')	(I_P')	(I_L)	(I_C)		
	(m)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)		(%)
WS01	0.6-1	21	32	21	11	99	21	0	0.0	1.0	C L	*
WS02	0.6-0.9	21	37	19	18	5	22	17	0.1	0.9	C I	LOW

*Clause 4.2 - D5 (b) of the NHBC Standards states that 'shrinkable soils are those...having a modified plasticity index of 10% or greater'



APPENDIX 5

CHEMCIAL TESTING RESULTS

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

Amended Report

Report No.:	22-24846-3		
Initial Date of Issue:	07-Jul-2022	**Date of Re-Issue:**	07-Jul-2022
Client	Geoenviro Solutions Ltd		
Client Address:	Unit 7 Springvale Works Brookfoot Lane Brighouse HD6 2RA		
Contact(s):	Richard Caine Sue Ellis		
Project	2371-22 "Fieldhead", Scholes		
Quotation No.:		**Date Received:**	01-Jul-2022
Order No.:		**Date Instructed:**	01-Jul-2022
No. of Samples:	6		
Turnaround (Wkdays):	5	**Results Due:**	07-Jul-2022
Date Approved:	07-Jul-2022		
Approved By:			
Details:	Stuart Henderson, Technical Manager		

Results - Soil

Project: 2371-22 "Fieldhead", Scholes

Client: Geoenviro Solutions Ltd			**Chemtest Job No.:**		22-24846	22-24846	22-24846	22-24846	22-24846	22-24846
Quotation No.:			**Chemtest Sample ID.:**		1459680	1459681	1459682	1459683	1459684	1459685
			Sample Location:		WS01	WS02	WS02	SN01	SN01	HP01
			Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Top Depth (m):		0.3	0.0	0.6	0.0	1.0	0.0
			Bottom Depth (m):		0.6	0.3	0.8	0.3	1.2	0.3
			Date Sampled:		30-Jun-2022	30-Jun-2022	30-Jun-2022	30-Jun-2022	30-Jun-2022	30-Jun-2022
			Asbestos Lab:		COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**						
ACM Type	U	2192		N/A	-	-	-	-	-	-
Asbestos Identification	U	2192		N/A	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
Moisture	N	2030	%	0.020	12	14	15	11	8.6	15
pH	U	2010		4.0	6.8	6.7	5.7	6.9	6.9	6.5
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010	0.027	0.018	0.014	0.031	0.055	0.036
Total Sulphur	U	2175	%	0.010	0.021	0.15	0.055	0.17	0.057	0.14
Cyanide (Total)	U	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Sulphate (Total)	U	2430	mg/kg	100	240	1300	600	1400	580	1500
Arsenic	U	2455	mg/kg	0.5	4.5	23	7.5	30	5.3	22
Cadmium	U	2455	mg/kg	0.10	< 0.10	0.19	< 0.10	0.29	0.23	0.18
Chromium	U	2455	mg/kg	0.5	6.1	9.6	11	12	17	9.2
Copper	U	2455	mg/kg	0.50	8.6	30	15	45	39	31
Mercury	U	2455	mg/kg	0.05	< 0.05	0.28	0.07	0.38	< 0.05	0.29
Nickel	U	2455	mg/kg	0.50	7.8	12	13	16	21	12
Lead	U	2455	mg/kg	0.50	9.9	120	23	150	6.2	110
Selenium	U	2455	mg/kg	0.25	< 0.25	0.64	0.50	0.79	1.1	0.53
Zinc	U	2455	mg/kg	0.50	29	76	44	94	39	83
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Organic Matter	U	2625	%	0.40	1.9	11	1.7	11	2.8	11
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	23	20	< 1.0	< 1.0	< 1.0	21
Aliphatic TPH >C8-C10	U	2680	mg/kg	1.0	90	100	< 1.0	35	< 1.0	87
Aliphatic TPH >C10-C12	U	2680	mg/kg	1.0	49	48	< 1.0	31	< 1.0	41
Aliphatic TPH >C12-C16	U	2680	mg/kg	1.0	23	27	< 1.0	22	< 1.0	39
Aliphatic TPH >C16-C21	U	2680	mg/kg	1.0	34	38	< 1.0	41	< 1.0	39
Aliphatic TPH >C21-C35	U	2680	mg/kg	1.0	340	190	< 1.0	370	< 1.0	190
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	560	420	< 5.0	500	< 5.0	410
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C8-C10	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C10-C12	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C12-C16	U	2680	mg/kg	1.0	< 1.0	61	< 1.0	7.2	< 1.0	5.6
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0	270	< 1.0	40	< 1.0	42
Aromatic TPH >C21-C35	U	2680	mg/kg	1.0	40	840	< 1.0	350	< 1.0	370
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	40	1200	< 5.0	400	< 5.0	420

Results - Soil

Project: 2371-22 "Fieldhead", Scholes

Client: Geoenviro Solutions Ltd			**Chemtest Job No.:**		22-24846	22-24846	22-24846	22-24846	22-24846	22-24846
Quotation No.:			**Chemtest Sample ID.:**		1459680	1459681	1459682	1459683	1459684	1459685
			Sample Location:		WS01	WS02	WS02	SN01	SN01	HP01
			Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Top Depth (m):		0.3	0.0	0.6	0.0	1.0	0.0
			Bottom Depth (m):		0.6	0.3	0.8	0.3	1.2	0.3
			Date Sampled:		30-Jun-2022	30-Jun-2022	30-Jun-2022	30-Jun-2022	30-Jun-2022	30-Jun-2022
			Asbestos Lab:		COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**						
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	600	1600	< 10	900	< 10	830
Naphthalene	U	2700	mg/kg	0.10	< 0.10	1.4	< 0.10	3.4	< 0.10	1.2
Acenaphthylene	U	2700	mg/kg	0.10	< 0.10	0.86	< 0.10	0.47	< 0.10	0.42
Acenaphthene	U	2700	mg/kg	0.10	< 0.10	0.60	< 0.10	1.4	< 0.10	0.51
Fluorene	U	2700	mg/kg	0.10	< 0.10	0.64	< 0.10	1.1	< 0.10	0.49
Phenanthrene	U	2700	mg/kg	0.10	< 0.10	4.3	< 0.10	8.2	< 0.10	3.3
Anthracene	U	2700	mg/kg	0.10	< 0.10	1.1	< 0.10	2.0	< 0.10	0.77
Fluoranthene	U	2700	mg/kg	0.10	0.55	7.4	< 0.10	11	< 0.10	5.9
Pyrene	U	2700	mg/kg	0.10	0.67	7.0	< 0.10	11	< 0.10	6.4
Benzo[a]anthracene	U	2700	mg/kg	0.10	< 0.10	3.5	< 0.10	4.9	< 0.10	3.2
Chrysene	U	2700	mg/kg	0.10	< 0.10	5.8	< 0.10	6.2	< 0.10	4.1
Benzo[b]fluoranthene	U	2700	mg/kg	0.10	< 0.10	4.0	< 0.10	5.3	< 0.10	3.6
Benzo[k]fluoranthene	U	2700	mg/kg	0.10	< 0.10	1.6	< 0.10	2.5	< 0.10	1.1
Benzo[a]pyrene	U	2700	mg/kg	0.10	< 0.10	3.5	< 0.10	4.7	< 0.10	3.2
Indeno(1,2,3-c,d)Pyrene	U	2700	mg/kg	0.10	< 0.10	2.3	< 0.10	2.4	< 0.10	1.8
Dibenz(a,h)Anthracene	U	2700	mg/kg	0.10	< 0.10	0.27	< 0.10	1.3	< 0.10	0.32
Benzo[g,h,i]perylene	U	2700	mg/kg	0.10	< 0.10	2.8	< 0.10	2.4	< 0.10	2.6
Total Of 16 PAH's	U	2700	mg/kg	2.0	< 2.0	47	< 2.0	68	< 2.0	39
Benzene	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
m & p-Xylene	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-Xylene	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Methyl Tert-Butyl Ether	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Phenols	U	2920	mg/kg	0.10	< 0.10	< 0.10	< 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
2175	Total Sulphur in Soils	Total Sulphur	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.
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.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2680	TPH A/A Split	Aliphatics: >C5–C6, >C6–C8,>C8–C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44	Dichloromethane extraction / GCxGC FID detection
2700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Dichloromethane extraction / GC-FID (GC-FID detection is non-selective and can be subject to interference from co-eluting compounds)
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"
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

APPENDIX 6

CHEMICAL

SCREENING CRITERIA

Parameter	Residential with homegrown produce (mg/kg, unless otherwise stated)			Residential without homegrown produce (mg/kg, unless otherwise stated)			Allotment (mg/kg, unless otherwise stated)			Commercial / Industrial (mg/kg, unless otherwise stated)			Public Open Space near Residential (mg/kg, unless otherwise stated)			Public Open Space - Park (mg/kg, unless otherwise stated)			Source
SOM	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	
Metals/metalloids																			
Arsenic	37			40			43			640			79			170			LQM (2014)
Beryllium	1.7			1.7			35			12			2.2			63			LQM (2014)
Boron	290			11000			45			240000			21000			46000			LQM (2014)
Cadmium	11			85			1.9			190			120			532			LQM (2014)
Chromium III	910			910			18000			8600			1500			33000			LQM (2014)
Chromium VI	6			6			1.8			33			7.7			220			LQM (2014)
Copper	2400			7100			520			68000			12000			44000			LQM (2014)
Lead	200			310			80			2330			630			1300			C4SL
Mercury (elemental)	1.2			1.2			21			58 (25.8)			16			30 (25.8)			LQM (2014)
Mercury (Inorganic)	40			56			19			1100			120			240			LQM (2014)
Methylmercury	11			15			6			320			40			68			LQM (2014)
Nickel	180			180			230			980			230			3400			LQM (2014)
Selenium	250			430			88			12000			1100			1800			LQM (2014)
Vanadium	410			1200			91			9000			2000			5000			LQM (2014)
Zinc	3700			40000			620			730000			81000			170000			LQM (2014)
Other																			
Total Sulphate	2,400			2,400			2,400			2,400			2,400			2,400			BRE (2005)
Water Soluble Sulphate (g/l)	0.5			0.5			0.5			0.5			0.5			0.5			BRE (2005)

Parameter	Residential with homegrown produce (mg/kg, unless otherwise stated)			Residential without homegrown produce (mg/kg, unless otherwise stated)			Allotment (mg/kg, unless otherwise stated)			Commercial / Industrial (mg/kg, unless otherwise stated)			Public Open Space near Residential (mg/kg, unless otherwise stated)			Public Open Space - Park (mg/kg, unless otherwise stated)			Source
SOM	1%	2.50%	6%	1%	2.50%	6%	1%	2.50%	6%	1%	2.50%	6%	1%	2.50%	6%	1%	2.50%	6%	
PAHs																			
Acenaphthene	210	510	1100	3000 (57)	4700(141)	6000 (336)	34	85	200	84000 (57)	97000 (141)	100000	15000	15000	15000	29000	30000	30000	LQM (2014)
Acenaphthylene	170	420	920	2900 (86.1)	4600 (212)	6000 (506)	28	69	160	8300 (86.1)	97000 (212)	100000	15000	15000	15000	29000	30000	30000	LQM (2014)
Anthracene	2400	5400	11000	31000 (1.17)	35000	37000	380	950	2200	520000	540000	540000	74000	74000	74000	150000	150000	150000	LQM (2014)
Benzo(a)anthracene	7.2	11	13	11	14	15	2.9	6.5	13	170	170	180	29	29	29	49	56	62	LQM (2014)
Benzo(a)pyrene	2.2	2.7	3	3.2	3.2	3.2	0.97	2	3.5	35	35	36	5.7	5.7	5.7	11	12	13	LQM (2014)
Benzo(b)fluoranthene	2.6	3.3	3.7	3.9	4	4	0.99	2.1	3.9	44	44	45	7.1	7.1	7.1	13	15	16	LQM (2014)
Benzo(g,h,i)perylene	320	340	350	360	360	360	290	470	640	3900	4000	4000	640	640	640	1400	1500	1600	LQM (2014)
Benzo(k)fluoranthene	77	93	100	110	110	110	37	75	130	1200	1200	1200	190	190	190	370	410	440	LQM (2014)
Chrysene	15	22	27	30	31	32	4.1	9.4	19	350	350	350	57	57	57	93	110	120	LQM (2014)
Dibenz(a,h)anthracene	0.24	0.28	0.3	0.31	0.32	0.32	0.14	0.27	0.61	3.5	3.6	3.6	0.57	0.57	0.58	1.1	1.3	1.4	LQM (2014)
Fluoranthene	280	560	890	1500	1600	1600	52	130	290	23000	23000	23000	3100	3100	3100	63	6300	6400	LQM (2014)
Fluorene	170	400	860	2800 (30.9)	3800 (76.5)	4500 (183)	27	67	160	63000 (30.9)	68000	71000	9900	9900	9900	20000	20000	20000	LQM (2014)
Indeno(1,2,3-cd)pyrene	27	36	41	45	46	46	9.5	21	39	500	510	510	82	82	82	150	170	180	LQM (2014)

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SOM	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	
Naphthalene	2.3	5.6	13	2.3	5.6	13	4.1	10	24	190 (76.4)	460 (183)	1100 (432)	4900	4900	4900	1200 (76.4)	1900 (183)	3000	LQM (2014)
Phenanthrene	95	220	440	1300 (36)	1500	1500	15	38	90	22000	22000	23000	3100	3100	3100	6200	6200	6300	LQM (2014)
Pyrene	620	1200	2000	3700	3800	3800	110	270	620	54000	54000	54000	7400	7400	7400	15000	15000	15000	LQM (2014)
Coal Tar (BaP as surrogate marker)	0.79	0.98	1.1	1.2	1.2	1.2	0.32	0.67	1.2	15	15	15	2.2	2.2	2.2	4.4	4.7	4.8	LQM (2014)
BTEX and TPH																			
Benzene	0.087	0.17	0.37	0.38	0.7	1.4	0.017	0.034	0.075	27	47	90	72	72	73	90	100	110	LQM (2014)
Toluene	130	290	660	880 vap (869)	1900	3900	22	51	120	56000 vap (869)	110000 vap (1920)	180000 vap (4360)	56000	56000	56000	87000 vap (869)	95000 vap (1920)	100000 vap (4360)	LQM (2014)
Ethylbenzene	47	110	260	83	190	440	16	39	91	5700 vap (518)	13000 vap (1220)	27000 vap (2840)	24000	24000	25000	17000 vap (518)	22000 vap (1220)	27000 vap (2840)	LQM (2014)
Xylene - o	60	140	330	88	210	480	28	67	160	6600 (478)	15000 (1120)	33000 (2620)	41000	42000	43000	17000 (478)	24000 (1120)	33000 (2620)	LQM (2014)
Xylene - m	59	140	320	82	190	450	31	74	170	6200 (625)	14000 (1470)	31000 (3460)	41000	42000	43000	17000 (625)	24000 (1470)	32000 (3460)	LQM (2014)
Xylene - p	56	130	310	79	180	430	29	69	160	5900 (576)	14000 (1350)	30000 (3170)	41000	42000	43000	17000 (576)	23000 (1350)	31000 (3170)	LQM (2014)
Aliphatic EC 5-6	42	78	160	42	78	160	730	1700	3900	3200 (304)	5900 (558)	12000 (1150)	570000 (304)	590000	600000	95000 (304)	130000 (558)	180000 (1150)	LQM (2014)
Aliphatic EC >6-8	100	230	530	100	230	530	2300	5600	13000	7800 (144)	17000 (322)	40000 (736)	600000	610000	620000	150000 (144)	220000 (322)	320000 (736)	LQM (2014)

Parameter	Residential with homegrown produce (mg/kg, unless otherwise stated)			Residential without homegrown produce (mg/kg, unless otherwise stated)			Allotment (mg/kg, unless otherwise stated)			Commercial / Industrial (mg/kg, unless otherwise stated)			Public Open Space near Residential (mg/kg, unless otherwise stated)			Public Open Space - Park (mg/kg, unless otherwise stated)			Source
SOM	1%	2.50%	6%	1%	2.50%	6%	1%	2.50%	6%	1%	2.50%	6%	1%	2.50%	6%	1%	2.50%	6%	
Aliphatic EC >8-10	27	65	150	27	65	150	320	770	1700	2000 (78)	4800 (190)	11000 (451)	13000	13000	13000	14000 (78)	18000 (190)	21000 (451)	LQM (2014)
Aliphatic EC >10-12	130 (48)	330 (118)	760 (283)	130 (48)	330 (118)	760 (283)	2200	4400	7300	9700 (48)	23000 (118)	47000 (283)	13000	13000	13000	21000 (48)	23000 (118)	24000(283)	LQM (2014)
Aliphatic EC >12-16	1100 (24)	2400 (59)	4300 (142)	1100 (24)	2400 (59)	4300 (142)	11000	13000	13000	59000 (24)	82000 (59)	90000 (142)	13000	13000	13000	25000 (24)	25000 (59)	26000 (142)	LQM (2014)
Aliphatic EC >16-35	65000 (8.48)	92000 (21)	110000	65000 (8.48)	92000 (21)	110000	260000	270000	270000	1600000	1700000	1800000	250000	250000	250000	450000	480000	490000	LQM (2014)
Aliphatic EC >35-44	65000 (8.48)	92000 (21)	110000	65000 (8.48)	92000 (21)	110000	260000	270000	270000	1600000	1700000	1800000	250000	250000	250000	450000	480000	490000	LQM (2014)
Aromatic EC 5-7	70	140	300	370	690	1400	13	27	57	26000 (1220)	46000 (2260)	86000 (4710)	56000	56000	56000	76000 (1220)	84000 (2260)	92000 (4710)	LQM (2014)
Aromatic EC >7-8	130	290	660	860	1800	3900	22	51	120	56000 (869)	110000 (1920)	180000 (4360)	56000	56000	56000	87000 (869)	95000 (1920)	100000 (4360)	LQM (2014)
Aromatic EC >8-10	34	83	190	47	110	270	8.6	21	51	3500 (613)	8100 (1500)	17000 (3580)	5000	5000	5000	7200 (613)	8500 (1500)	9300 (3580)	LQM (2014)
Aromatic EC >10-12	74	180	380	250	590	1200	13	31	74	16000 (364)	28000 (899)	34000 (2150)	5000	5000	5000	9200 (364)	9700 (899)	10000	LQM (2014)
Aromatic EC >12-16	140	330	660	1800	2300 (419)	2500	23	27	130	36000 (169)	37000	38000	5100	5100	5000	10000	10000	10000	LQM (2014)
Aromatic EC >16-21	260	540	930	1900	1900	1900	46	110	260	28000	28000	28000	3800	3800	3800	7600	7700	7800	LQM (2014)
Aromatic EC >21-35	1100	1500	1700	1900	1900	1900	370	820	1600	28000	28000	28000	3800	3800	3800	7800	7800	7900	LQM (2014)

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SOM	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	
Aromatic EC >35-44	1100	1500	1700	1900	1900	1900	370	820	1600	28000	28000	28000	3800	3800	3800	7800	7800	7900	LQM (2014)
Aromatic EC >44-75	1600	1800	1900	1900	1900	1900	1200	2100	3000	28000	28000	28000	3800	3800	3800	7800	7800	7900	LQM (2014)
VOCs																			
1,2-dichloroethane (1,2-DCA)	0.0071	0.011	0.019	0.0092	0.013	0.023	0.0046	0.0083	0.016	0.67	0.97	1.7	29	29	29	21	24	28	LQM (2014)
1,1,1-trichloroethane	8.8	18	39	9	18	40	48	110	240	660	1300	3000	140000	140000	140000	57000 (1425)	76000 (2915)	100000 (6392)	LQM (2014)
1,1,2,2,tetrachloroethane	1.6	3.4	7.5	3.9	8	17	0.41	0.89	2	270	550	1100	1400	1400	1400	1800	2100	2300	LQM (2014)
tetrachloroethene	0.18	0.39	0.9	0.18	0.4	0.92	0.65	1.5	3.6	19	45	95	1400	1400	1400	810 (424)	1100 (951)	1500	LQM (2014)
tetrachloromethane (Carbon tetrachloride)	0.026	0.056	0.13	0.026	0.056	0.13	0.45	1	2.4	2.9	6.3	14	890	920	950	190	270	400	LQM (2014)
Trichloroethene	0.016	0.034	0.075	0.017	0.036	0.08	0.041	0.091	0.21	1.2	2.6	5.7	120	120	120	70	91	120	LQM (2014)
Trichloromethane (chloroform)	0.91	1.7	3.4	1.2	2.1	4.2	0.42	0.83	1.7	99	170	350	2500	2500	2500	2600	2800	3100	LQM (2014)
Chloroethene (Vinyl chloride)	0.00064	0.00087	0.0014	0.00077	0.001	0.0015	0.00055	0.001	0.0018	0.059	0.077	0.12	3.5	3.5	3.5	4.8	5	5.4	LQM (2014)
2,4,6 Trinitrotoluene (TNT)	1.6	3.7	8.1	65	66	66	0.24	0.58	1.4	1000	1000	1000	130	130	130	260	270	270	LQM (2014)

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SOM	1%	2.50%	6%	1%	2.50%	6%	1%	2.50%	6%	1%	2.50%	6%	1%	2.50%	6%	1%	2.50%	6%	
RDX	120	250	540	13000	13000	13000	17	38	85	210000	210000	210000	26000	26000	27000	49000 (18.7)	51000	53000	LQM (2014)
HMX	5.7	13	26	6700	6700	6700	0.86	1.9	3.9	110000	110000	110000	13000	13000	13000	23000 (0.35)	23000 (0.39)	24000 (0.48)	LQM (2014)
Aldrin	5.7	6.6	7.1	7.3	7.4	7.5	3.2	6.1	9.6	170	170	170	18	18	18	30	31	31	LQM (2014)
Dieldrin	0.97	2	3.5	7	7.3	7.4	0.17	0.41	0.96	170	170	170	18	18	18	30	30	31	LQM (2014)
Atrazine	3.3	7.6	17.4	610	620	620	0.5	1.2	2.7	9300	9400	9400	1200	1200	1200	2300	2400	2400	LQM (2014)
Dichlovos	0.032	0.066	0.014	6.4	6.5	6.6	0.0049	0.01	0.022	140	140	140	16	16	16	26	26	27	LQM (2014)
Alpha-Endosulfan	7.4	18	41	160 (0.003)	280 (0.007)	410 (0.016)	1.2	2.9	6.8	5600 (0.003)	7400 (0.007)	8400 (0.016)	1200	1200	1200	2400	2400	2500	LQM (2014)
alpha-Hexachlorocyclohexane	0.23	0.55	1.2	6.9	9.2	11	0.035	0.087	0.21	170	180	180	24	24	24	47	48	48	LQM (2014)
beta-hexachlorocyclohexanes	0.085	0.2	0.46	3.7	3.8	3.8	0.013	0.032	0.077	65	65	65	8.1	8.1	8.1	15	15	16	LQM (2014)
gamma-hexachlorocyclohexanes	0.06	0.14	0.33	2.9	3.3	3.5	0.0092	0.023	0.054	67	69	70	8.2	8.2	8.2	14	15	15	LQM (2014)
Chlorobenzene	0.46	1	2.4	0.46	1	2.4	5.9	14	32	56	130	290	11000	13000	14000	1300 (675)	2000 (1520)	2900	LQM (2014)
1,2-Dichlorobenzene	23	55	130	24	57	130	94	230	540	2000 (571)	4800 (1370)	11000 (3240)	90000	95000	98000	24000 (571)	36000 (1370)	51000 (3240)	LQM (2014)
1,3-Dichlorobenzene	0.4	1	2.3	0.44	1.1	2.5	0.25	0.6	1.5	30	73	170	300	300	300	390	440	470	LQM (2014)

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SOM	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	
1,4-Dichlorobenzene	61	150	350	61	150	350	15	37	88	4400 (224)	10000 (540)	25000 (1280)	17000	17000	17000	36000 (224)	36000 (540)	36000 (1280)	LQM (2014)
VOCs Continued																			
1,2,3-Trichlorobenzene	1.5	3.6	8.6	1.5	3.7	8.8	4.7	12	28	102	250	590	1800	1800	1800	770 (134)	1100 (330)	1600 (789)	LQM (2014)
1,2,4-Trichlorobenzene	2.6	6.4	15	2.6	6.4	15	55	140	320	220	530	1300	15000	17000	19000	1700 (318)	2600 (786)	4000 (1880)	LQM (2014)
1,3,5-Trichlorobenzene	0.33	0.81	1.9	0.33	0.81	1.9	4.7	12	28	23	55	130	1700	1700	1800	380 (36.7)	580 (90.8)	860 (217)	LQM (2014)
1,2,3,4-Tetrachlorobenzene	15	36	78	24	56	120	4.4	11	26	1700 (122)	3080 (304)	4400 (728)	830	830	830	1500 (122)	1600	1600	LQM (2014)
1,2,3,5-Tetrachlorobenzene	0.66	1.6	3.7	0.75	1.9	4.3	0.38	0.9	2.2	49 (39.4)	120 (98.1)	240 (235)	78	79	79	110 (39)	120	130	LQM (2014)
1,2,4,5-Tetrachlorobenzene	0.33	0.77	1.6	0.73	1.7	3.5	0.06	0.16	0.37	42 (19.7)	72 (49.1)	96	13	13	13	25	26	26	LQM (2014)
Pentachlorobenzene	5.8	12	22	19	30	38	1.2	3.1	7	640 (43)	770 (107)	830	100	100	100	190	190	190	LQM (2014)
Hexachlorobenzene	1.8 (0.2)	3.3 (0.5)	4.9	4.1 (0.2)	5.7 (0.5)	6.7 (1.2)	0.47	1.1	2.5	110 (0.2)	120	120	16	16	16	30	30	30	LQM (2014)
Phenol	280	550	1100	750	1300	2300	66	140	280	760 $_{dir}$ (31000)	1500 $_{dir}$ (35000)	3200 $_{dir}$ (37000)	760 $_{dir}$ (31000)	1500 $_{dir}$ (35000)	3200 $_{dir}$ (37000)	760 $_{dir}$ (31000)	1500 $_{dir}$ (35000)	3200 $_{dir}$ (37000)	LQM (2014)

Parameter	Residential with homegrown produce (mg/kg, unless otherwise stated)			Residential without homegrown produce (mg/kg, unless otherwise stated)			Allotment (mg/kg, unless otherwise stated)			Commercial / Industrial (mg/kg, unless otherwise stated)			Public Open Space near Residential (mg/kg, unless otherwise stated)			Public Open Space - Park (mg/kg, unless otherwise stated)			Source
SOM	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	
Chlorophenols (excluding pentachlorophenol)	0.87 (g)	2	4.5	94	150	210	0.13 (g)	0.3	0.7	3500	4000	4300	620	620	620	1100	1100	1100	LQM (2014)
Pentachlorophenol	0.22	0.52	1.2	27 (16.4)	29	31	0.03	0.08	0.19	400	400	400	60	60	60	110	120	120	LQM (2014)
Carbon Disulphide	0.14	0.29	0.62	0.14	0.29	0.62	4.8	10	23	11	22	47	11000	11000	12000	1300	1900	2700	LQM (2014)
Hexachlorobutadiene	0.29	0.7	1.6	0.32	0.78	1.8	0.25	0.61	1.4	31	66	120	25	25	25	48	50	51	LQM (2014)

(g) derived based on 2,3,4,6-tetrachlorophenol; dir - based on a threshold protective of direct skin contact with phenol (guideline in brackets based on health effects following long term exposure provided for illustration only); (vap) calculated for vapour phase only. SOM – Soil Organic Matter; (4.5) solubility.

Parameter	Residential with homegrown produce (mg/kg, unless otherwise stated)			Residential without homegrown produce (mg/kg, unless otherwise stated)			Allotment (mg/kg, unless otherwise stated)			Commercial / Industrial (mg/kg, unless otherwise stated)			Public Open Space near Residential (mg/kg, unless otherwise stated)			Public Open Space - Park (mg/kg, unless otherwise stated)			Source
SOM	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	
Metals/metalloids																			
Arsenic	37			40			43			640			79			170			LQM (2014)
Beryllium	1.7			1.7			35			12			2.2			63			LQM (2014)
Boron	290			11000			45			240000			21000			46000			LQM (2014)
Cadmium	11			85			1.9			190			120			532			LQM (2014)
Chromium III	910			910			18000			8600			1500			33000			LQM (2014)
Chromium VI	6			6			1.8			33			7.7			220			LQM (2014)
Copper	2400			7100			520			68000			12000			44000			LQM (2014)
Lead	200			310			80			2330			630			1300			C4SL
Mercury (elemental)	1.2			1.2			21			58 (25.8)			16			30 (25.8)			LQM (2014)
Mercury (Inorganic)	40			56			19			1100			120			240			LQM (2014)
Methylmercury	11			15			6			320			40			68			LQM (2014)
Nickel	180			180			230			980			230			3400			LQM (2014)
Selenium	250			430			88			12000			1100			1800			LQM (2014)
Vanadium	410			1200			91			9000			2000			5000			LQM (2014)
Zinc	3700			40000			620			730000			81000			170000			LQM (2014)
Other																			
Total Sulphate	2,400			2,400			2,400			2,400			2,400			2,400			BRE (2005)
Water Soluble Sulphate (g/l)	0.5			0.5			0.5			0.5			0.5			0.5			BRE (2005)

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SOM	1%	2.50%	6%	1%	2.50%	6%	1%	2.50%	6%	1%	2.50%	6%	1%	2.50%	6%	1%	2.50%	6%	
PAHs																			
Acenaphthene	210	510	1100	3000 (57)	4700(141)	6000 (336)	34	85	200	84000 (57)	97000 (141)	100000	15000	15000	15000	29000	30000	30000	LQM (2014)
Acenaphthylene	170	420	920	2900 (86.1)	4600 (212)	6000 (506)	28	69	160	8300 (86.1)	97000 (212)	100000	15000	15000	15000	29000	30000	30000	LQM (2014)
Anthracene	2400	5400	11000	31000 (1.17)	35000	37000	380	950	2200	520000	540000	540000	74000	74000	74000	150000	150000	150000	LQM (2014)
Benzo(a)anthracene	7.2	11	13	11	14	15	2.9	6.5	13	170	170	180	29	29	29	49	56	62	LQM (2014)
Benzo(a)pyrene	2.2	2.7	3	3.2	3.2	3.2	0.97	2	3.5	35	35	36	5.7	5.7	5.7	11	12	13	LQM (2014)
Benzo(b)fluoranthene	2.6	3.3	3.7	3.9	4	4	0.99	2.1	3.9	44	44	45	7.1	7.1	7.1	13	15	16	LQM (2014)
Benzo(g,h,i)perylene	320	340	350	360	360	360	290	470	640	3900	4000	4000	640	640	640	1400	1500	1600	LQM (2014)
Benzo(k)fluoranthene	77	93	100	110	110	110	37	75	130	1200	1200	1200	190	190	190	370	410	440	LQM (2014)
Chrysene	15	22	27	30	31	32	4.1	9.4	19	350	350	350	57	57	57	93	110	120	LQM (2014)
Dibenz(a,h)anthracene	0.24	0.28	0.3	0.31	0.32	0.32	0.14	0.27	0.61	3.5	3.6	3.6	0.57	0.57	0.58	1.1	1.3	1.4	LQM (2014)
Fluoranthene	280	560	890	1500	1600	1600	52	130	290	23000	23000	23000	3100	3100	3100	63	6300	6400	LQM (2014)
Fluorene	170	400	860	2800 (30.9)	3800 (76.5)	4500 (183)	27	67	160	63000 (30.9)	68000	71000	9900	9900	9900	20000	20000	20000	LQM (2014)
Indeno(1,2,3-cd)pyrene	27	36	41	45	46	46	9.5	21	39	500	510	510	82	82	82	150	170	180	LQM (2014)

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SOM	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	
Naphthalene	2.3	5.6	13	2.3	5.6	13	4.1	10	24	190 (76.4)	460 (183)	1100 (432)	4900	4900	4900	1200 (76.4)	1900 (183)	3000	LQM (2014)
Phenanthrene	95	220	440	1300 (36)	1500	1500	15	38	90	22000	22000	23000	3100	3100	3100	6200	6200	6300	LQM (2014)
Pyrene	620	1200	2000	3700	3800	3800	110	270	620	54000	54000	54000	7400	7400	7400	15000	15000	15000	LQM (2014)
Coal Tar (BaP as surrogate marker)	0.79	0.98	1.1	1.2	1.2	1.2	0.32	0.67	1.2	15	15	15	2.2	2.2	2.2	4.4	4.7	4.8	LQM (2014)
BTEX and TPH																			
Benzene	0.087	0.17	0.37	0.38	0.7	1.4	0.017	0.034	0.075	27	47	90	72	72	73	90	100	110	LQM (2014)
Toluene	130	290	660	880 vap (869)	1900	3900	22	51	120	56000 vap (869)	110000 vap (1920)	180000 vap (4360)	56000	56000	56000	87000 vap (869)	95000 vap (1920)	100000 vap (4360)	LQM (2014)
Ethylbenzene	47	110	260	83	190	440	16	39	91	5700 vap (518)	13000 vap (1220)	27000 vap (2840)	24000	24000	25000	17000 vap (518)	22000 vap (1220)	27000 vap (2840)	LQM (2014)
Xylene - o	60	140	330	88	210	480	28	67	160	6600 (478)	15000 (1120)	33000 (2620)	41000	42000	43000	17000 (478)	24000 (1120)	33000 (2620)	LQM (2014)
Xylene - m	59	140	320	82	190	450	31	74	170	6200 (625)	14000 (1470)	31000 (3460)	41000	42000	43000	17000 (625)	24000 (1470)	32000 (3460)	LQM (2014)
Xylene - p	56	130	310	79	180	430	29	69	160	5900 (576)	14000 (1350)	30000 (3170)	41000	42000	43000	17000 (576)	23000 (1350)	31000 (3170)	LQM (2014)
Aliphatic EC 5-6	42	78	160	42	78	160	730	1700	3900	3200 (304)	5900 (558)	12000 (1150)	570000 (304)	590000	600000	95000 (304)	130000 (558)	180000 (1150)	LQM (2014)
Aliphatic EC >6-8	100	230	530	100	230	530	2300	5600	13000	7800 (144)	17000 (322)	40000 (736)	600000	610000	620000	150000 (144)	220000 (322)	320000 (736)	LQM (2014)

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SOM	1%	2.50%	6%	1%	2.50%	6%	1%	2.50%	6%	1%	2.50%	6%	1%	2.50%	6%	1%	2.50%	6%	
Aliphatic EC >8-10	27	65	150	27	65	150	320	770	1700	2000 (78)	4800 (190)	11000 (451)	13000	13000	13000	14000 (78)	18000 (190)	21000 (451)	LQM (2014)
Aliphatic EC >10-12	130 (48)	330 (118)	760 (283)	130 (48)	330 (118)	760 (283)	2200	4400	7300	9700 (48)	23000 (118)	47000 (283)	13000	13000	13000	21000 (48)	23000 (118)	24000(283)	LQM (2014)
Aliphatic EC >12-16	1100 (24)	2400 (59)	4300 (142)	1100 (24)	2400 (59)	4300 (142)	11000	13000	13000	59000 (24)	82000 (59)	90000 (142)	13000	13000	13000	25000 (24)	25000 (59)	26000 (142)	LQM (2014)
Aliphatic EC >16-35	65000 (8.48)	92000 (21)	110000	65000 (8.48)	92000 (21)	110000	260000	270000	270000	1600000	1700000	1800000	250000	250000	250000	450000	480000	490000	LQM (2014)
Aliphatic EC >35-44	65000 (8.48)	92000 (21)	110000	65000 (8.48)	92000 (21)	110000	260000	270000	270000	1600000	1700000	1800000	250000	250000	250000	450000	480000	490000	LQM (2014)
Aromatic EC 5-7	70	140	300	370	690	1400	13	27	57	26000 (1220)	46000 (2260)	86000 (4710)	56000	56000	56000	76000 (1220)	84000 (2260)	92000 (4710)	LQM (2014)
Aromatic EC >7-8	130	290	660	860	1800	3900	22	51	120	56000 (869)	110000 (1920)	180000 (4360)	56000	56000	56000	87000 (869)	95000 (1920)	100000 (4360)	LQM (2014)
Aromatic EC >8-10	34	83	190	47	110	270	8.6	21	51	3500 (613)	8100 (1500)	17000 (3580)	5000	5000	5000	7200 (613)	8500 (1500)	9300 (3580)	LQM (2014)
Aromatic EC >10-12	74	180	380	250	590	1200	13	31	74	16000 (364)	28000 (899)	34000 (2150)	5000	5000	5000	9200 (364)	9700 (899)	10000	LQM (2014)
Aromatic EC >12-16	140	330	660	1800	2300 (419)	2500	23	27	130	36000 (169)	37000	38000	5100	5100	5000	10000	10000	10000	LQM (2014)
Aromatic EC >16-21	260	540	930	1900	1900	1900	46	110	260	28000	28000	28000	3800	3800	3800	7600	7700	7800	LQM (2014)
Aromatic EC >21-35	1100	1500	1700	1900	1900	1900	370	820	1600	28000	28000	28000	3800	3800	3800	7800	7800	7900	LQM (2014)

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SOM	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	
Aromatic EC >35-44	1100	1500	1700	1900	1900	1900	370	820	1600	28000	28000	28000	3800	3800	3800	7800	7800	7900	LQM (2014)
Aromatic EC >44-75	1600	1800	1900	1900	1900	1900	1200	2100	3000	28000	28000	28000	3800	3800	3800	7800	7800	7900	LQM (2014)
VOCs																			
1,2-dichloroethane (1,2-DCA)	0.0071	0.011	0.019	0.0092	0.013	0.023	0.0046	0.0083	0.016	0.67	0.97	1.7	29	29	29	21	24	28	LQM (2014)
1,1,1-trichloroethane	8.8	18	39	9	18	40	48	110	240	660	1300	3000	140000	140000	140000	57000 (1425)	76000 (2915)	100000 (6392)	LQM (2014)
1,1,2,2,tetrachloroethane	1.6	3.4	7.5	3.9	8	17	0.41	0.89	2	270	550	1100	1400	1400	1400	1800	2100	2300	LQM (2014)
tetrachloroethene	0.18	0.39	0.9	0.18	0.4	0.92	0.65	1.5	3.6	19	45	95	1400	1400	1400	810 (424)	1100 (951)	1500	LQM (2014)
tetrachloromethane (Carbon tetrachloride)	0.026	0.056	0.13	0.026	0.056	0.13	0.45	1	2.4	2.9	6.3	14	890	920	950	190	270	400	LQM (2014)
Trichloroethene	0.016	0.034	0.075	0.017	0.036	0.08	0.041	0.091	0.21	1.2	2.6	5.7	120	120	120	70	91	120	LQM (2014)
Trichloromethane (chloroform)	0.91	1.7	3.4	1.2	2.1	4.2	0.42	0.83	1.7	99	170	350	2500	2500	2500	2600	2800	3100	LQM (2014)
Chloroethene (Vinyl chloride)	0.00064	0.00087	0.0014	0.00077	0.001	0.0015	0.00055	0.001	0.0018	0.059	0.077	0.12	3.5	3.5	3.5	4.8	5	5.4	LQM (2014)
2,4,6 Trinitrotoluene (TNT)	1.6	3.7	8.1	65	66	66	0.24	0.58	1.4	1000	1000	1000	130	130	130	260	270	270	LQM (2014)

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SOM	1%	2.50%	6%	1%	2.50%	6%	1%	2.50%	6%	1%	2.50%	6%	1%	2.50%	6%	1%	2.50%	6%	
RDX	120	250	540	13000	13000	13000	17	38	85	210000	210000	210000	26000	26000	27000	49000 (18.7)	51000	53000	LQM (2014)
HMX	5.7	13	26	6700	6700	6700	0.86	1.9	3.9	110000	110000	110000	13000	13000	13000	23000 (0.35)	23000 (0.39)	24000 (0.48)	LQM (2014)
Aldrin	5.7	6.6	7.1	7.3	7.4	7.5	3.2	6.1	9.6	170	170	170	18	18	18	30	31	31	LQM (2014)
Dieldrin	0.97	2	3.5	7	7.3	7.4	0.17	0.41	0.96	170	170	170	18	18	18	30	30	31	LQM (2014)
Atrazine	3.3	7.6	17.4	610	620	620	0.5	1.2	2.7	9300	9400	9400	1200	1200	1200	2300	2400	2400	LQM (2014)
Dichlovos	0.032	0.066	0.014	6.4	6.5	6.6	0.0049	0.01	0.022	140	140	140	16	16	16	26	26	27	LQM (2014)
Alpha-Endosulfan	7.4	18	41	160 (0.003)	280 (0.007)	410 (0.016)	1.2	2.9	6.8	5600 (0.003)	7400 (0.007)	8400 (0.016)	1200	1200	1200	2400	2400	2500	LQM (2014)
alpha-Hexachlorocyclohexane	0.23	0.55	1.2	6.9	9.2	11	0.035	0.087	0.21	170	180	180	24	24	24	47	48	48	LQM (2014)
beta-hexachlorocyclohexanes	0.085	0.2	0.46	3.7	3.8	3.8	0.013	0.032	0.077	65	65	65	8.1	8.1	8.1	15	15	16	LQM (2014)
gamma-hexachlorocyclohexanes	0.06	0.14	0.33	2.9	3.3	3.5	0.0092	0.023	0.054	67	69	70	8.2	8.2	8.2	14	15	15	LQM (2014)
Chlorobenzene	0.46	1	2.4	0.46	1	2.4	5.9	14	32	56	130	290	11000	13000	14000	1300 (675)	2000 (1520)	2900	LQM (2014)
1,2-Dichlorobenzene	23	55	130	24	57	130	94	230	540	2000 (571)	4800 (1370)	11000 (3240)	90000	95000	98000	24000 (571)	36000 (1370)	51000 (3240)	LQM (2014)
1,3-Dichlorobenzene	0.4	1	2.3	0.44	1.1	2.5	0.25	0.6	1.5	30	73	170	300	300	300	390	440	470	LQM (2014)

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SOM	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	
1,4-Dichlorobenzene	61	150	350	61	150	350	15	37	88	4400 (224)	10000 (540)	25000 (1280)	17000	17000	17000	36000 (224)	36000 (540)	36000 (1280)	LQM (2014)
VOCs Continued																			
1,2,3-Trichlorobenzene	1.5	3.6	8.6	1.5	3.7	8.8	4.7	12	28	102	250	590	1800	1800	1800	770 (134)	1100 (330)	1600 (789)	LQM (2014)
1,2,4-Trichlorobenzene	2.6	6.4	15	2.6	6.4	15	55	140	320	220	530	1300	15000	17000	19000	1700 (318)	2600 (786)	4000 (1880)	LQM (2014)
1,3,5-Trichlorobenzene	0.33	0.81	1.9	0.33	0.81	1.9	4.7	12	28	23	55	130	1700	1700	1800	380 (36.7)	580 (90.8)	860 (217)	LQM (2014)
1,2,3,4-Tetrachlorobenzene	15	36	78	24	56	120	4.4	11	26	1700 (122)	3080 (304)	4400 (728)	830	830	830	1500 (122)	1600	1600	LQM (2014)
1,2,3,5-Tetrachlorobenzene	0.66	1.6	3.7	0.75	1.9	4.3	0.38	0.9	2.2	49 (39.4)	120 (98.1)	240 (235)	78	79	79	110 (39)	120	130	LQM (2014)
1,2,4,5-Tetrachlorobenzene	0.33	0.77	1.6	0.73	1.7	3.5	0.06	0.16	0.37	42 (19.7)	72 (49.1)	96	13	13	13	25	26	26	LQM (2014)
Pentachlorobenzene	5.8	12	22	19	30	38	1.2	3.1	7	640 (43)	770 (107)	830	100	100	100	190	190	190	LQM (2014)
Hexachlorobenzene	1.8 (0.2)	3.3 (0.5)	4.9	4.1 (0.2)	5.7 (0.5)	6.7 (1.2)	0.47	1.1	2.5	110 (0.2)	120	120	16	16	16	30	30	30	LQM (2014)
Phenol	280	550	1100	750	1300	2300	66	140	280	760 $_{dir}$ (31000)	1500 $_{dir}$ (35000)	3200 $_{dir}$ (37000)	760 $_{dir}$ (31000)	1500 $_{dir}$ (35000)	3200 $_{dir}$ (37000)	760 $_{dir}$ (31000)	1500 $_{dir}$ (35000)	3200 $_{dir}$ (37000)	LQM (2014)

Parameter	Residential with homegrown produce (mg/kg, unless otherwise stated)			Residential without homegrown produce (mg/kg, unless otherwise stated)			Allotment (mg/kg, unless otherwise stated)			Commercial / Industrial (mg/kg, unless otherwise stated)			Public Open Space near Residential (mg/kg, unless otherwise stated)			Public Open Space - Park (mg/kg, unless otherwise stated)			Source
SOM	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	
Chlorophenols (excluding pentachlorophenol)	0.87 (g)	2	4.5	94	150	210	0.13 (g)	0.3	0.7	3500	4000	4300	620	620	620	1100	1100	1100	LQM (2014)
Pentachlorophenol	0.22	0.52	1.2	27 (16.4)	29	31	0.03	0.08	0.19	400	400	400	60	60	60	110	120	120	LQM (2014)
Carbon Disulphide	0.14	0.29	0.62	0.14	0.29	0.62	4.8	10	23	11	22	47	11000	11000	12000	1300	1900	2700	LQM (2014)
Hexachlorobutadiene	0.29	0.7	1.6	0.32	0.78	1.8	0.25	0.61	1.4	31	66	120	25	25	25	48	50	51	LQM (2014)

(g) derived based on 2,3,4,6-tetrachlorophenol; dir - based on a threshold protective of direct skin contact with phenol (guideline in brackets based on health effects following long term exposure provided for illustration only); (vap) calculated for vapour phase only. SOM – Soil Organic Matter; (4.5) solubility.

APPENDIX 7

GAS AND GROUNDWATER MONITORING RESULTS

Ground Gas and Groundwater Monitoring Record Sheet

JOB DETAILS

Client: Mr D. Blackburn
Site: "Fieldhead", Towngate, Scholes
Date: 09/07/2022
Job No: 2371-22
Visit No: 1 **of** 6
Operator: RC
Project Manager: RC

GEOENVIRO SOLUTIONS LIMITED

Monitoring Point	GAS CONCENTRATIONS: Methane (%v/v) Peak	Methane (%v/v) Steady	%LEL Peak	%LEL Steady	Carbon dioxide (%v/v) Peak	Carbon dioxide (%v/v) Steady	Carbon monoxide (ppmv) Peak	Carbon monoxide (ppmv) Steady	Hydrogen sulphide (ppmv) Peak	Hydrogen sulphide (ppmv) Steady	Oxygen (%v/v) Min.	Oxygen (%v/v) Steady	VOLATILES: PID Peak (ppm)	Product thickness (mm)	FLOW DATA: Flow rate (l/hr) Peak	Flow rate (l/hr) Steady	Differential borehole Pressure (mb)	Time for flow to equalise (secs)	Worst-credible GSVs: Methane (l/hr)	CO2 (l/hr)	WELL AND WATER DATA: Water level (mbgl)	Depth of well (m)	Reduced level (mAOD)	Water level (mAOD)	Response Zone	Comments
WS01	ND	ND	NR	NR	1.0	1.0	20	ND	ND	ND	20.6	20.6	NR	NR	0.0	0.0	-0.05	NR	0.0000	0.0000	Dry	0.93			0.5-1.0	
WS02	ND	ND	NR	NR	1.3	1.3	ND	ND	ND	ND	20.3	20.3	NR	NR	0.0	0.0	0.09	NR	0.0000	0.0000	Dry	0.86			0.5-1.0	
SN01	ND	ND	NR	NR	1.5	1.5	ND	ND	ND	ND	20.1	20.1	NR	NR	-0.2	-0.2	0.17	NR	0.0002	0.0030	3.09	3.75			1.0-3.75	
Max	ND	ND	ND	ND	1.5	1.5	20	ND	ND	ND	20.6	20.6	ND	ND	0.0	0.0	0.2	NA	0.0002	0.0030	3.09	3.75	NR	NR		
Min	ND	ND	0.0	0.0	1.0	1.0	ND	ND	ND	ND	20.1	20.1	0.0	0.0	-0.2	-0.2	-0.1	0	0.0000	0.0000	DRY	0.86	0.00	0.00		
																			Worst-possible GSVs							
																			0	0						

ND - Not detected
NR - Not recorded
NA - Non applicable

MG - Made ground
NAT - Natural
C - Cohesive
G - Granular

NB: Where no flow (ND) recorded, GSVs are calculated using equiment limit of detection (0.1l/hr). Where negative flows recorded, these are converted to positive values for calculation of GSVs.

METEOROLOGICAL AND SITE INFORMATION:

(Select correct box with X or enter data, as applicable)

State of ground:	x	Dry		Moist		Wet		Snow		Frozen
Wind:		Calm	x	Light		Moderate		Strong		
Cloud cover:		None		Slight	x	Cloudy		Overcast		
Precipitation:	x	None		Slight		Moderate		Heavy		
Time monitoring performed:			08:50	Start			09:15	End		
Barometric pressure (mbar):			1009	Start			1009	End		
Pressure trend (Daily):				Falling	x	Steady		Rising		
Source:	https://www.timeanddate.com/weather/@12265719/historic									
Air Temperature (Deg. C):			15	Before			16	After		

INSTRUMENTATION TECHNICAL SPECIFICATIONS:

Ground gas meter: GA5000
Gas Range: **CH_4** 0 - 100% **CO_2** 0 - 100% **O_2** 0 - 25%
Gas Flow range: +/-
Differential Pressure: +/- 500mbar
Date of last calibration: 31/10/2021
Date of next calibration: 01/11/2022

Ground Gas and Groundwater Monitoring Record Sheet

JOB DETAILS

Client: Mr D. Blackburn
Site: "Fieldhead", Towngate, Scholes
Date: 15/07/2022
Job No: 2371-22
Visit No: 2 **of** 6
Operator: LW
Project Manager: RC

GEOENVIRO SOLUTIONS LIMITED

Monitoring Point	GAS CONCENTRATIONS: Methane (%v/v) Peak	Methane (%v/v) Steady	%LEL Peak	%LEL Steady	Carbon dioxide (%v/v) Peak	Carbon dioxide (%v/v) Steady	Carbon monoxide (ppmv) Peak	Carbon monoxide (ppmv) Steady	Hydrogen sulphide (ppmv) Peak	Hydrogen sulphide (ppmv) Steady	Oxygen (%v/v) Min.	Oxygen (%v/v) Steady	VOLATILES: PID Peak (ppm)	Product thickness (mm)	FLOW DATA: Flow rate (l/hr) Peak	Flow rate (l/hr) Steady	Differential borehole Pressure (Pa)	Time for flow to equalise (secs)	Worst-credible GSVs: Methane (l/hr)	CO2 (l/hr)	WELL AND WATER DATA: Water level (mbgl)	Depth of well (m)	Reduced level (mAOD)	Water level (mAOD)	Response Zone	Comments
WS01	ND	ND	NR	NR	1.0	1.0	ND	ND	ND	ND	20.3	20.3	NR	NR	0.0	0.0	NR	60	0	0	Dry	0.93			0.5-1.0	
WS02	ND	ND	NR	NR	0.7	0.7	ND	ND	ND	ND	20.6	20.6	NR	NR	-0.1	-0.1	NR	60	0.0001	0.0007	Dry	0.86			0.5-1.0	
SN01	ND	ND	NR	NR	2.5	2.5	ND	ND	ND	ND	19.2	19.2	NR	NR	-0.1	-0.1	NR	60	0.0001	0.0025	2.92	3.81			1.0-3.75	
Max	**ND**	**ND**	**ND**	**ND**	**2.5**	**2.5**	**ND**	**ND**	**ND**	**ND**	**20.6**	**20.6**	**ND**	**ND**	**0.0**	**0.0**	**ND**	**60**	**0.0001**	**0.0025**	**2.92**	**3.81**	**NR**	**NR**		
Min	**ND**	**ND**	**0.0**	**0.0**	**0.7**	**0.7**	**ND**	**ND**	**ND**	**ND**	**19.2**	**19.2**	**0.0**	**0.0**	**-0.1**	**-0.1**	**0.0**	**60**	**0.0000**	**0.0000**	**DRY**	**0.86**	**0.00**	**0.00**		
																			Worst-possible GSVs							
																			0	**0**						

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NB: Where no flow (ND) recorded, GSVs are calculated using equiment limit of detection (0.1l/hr). Where negative flows recorded, these are converted to positive values for calculation of GSVs.

METEOROLOGICAL AND SITE INFORMATION:

(Select correct box with X or enter data, as applicable)

State of ground:		Dry	x	Moist		Wet		Snow		Frozen
Wind:		Calm	x	Light		Moderate		Strong		
Cloud cover:		None		Slight		Cloudy	x	Overcast		
Precipitation:		None		Slight	x	Moderate		Heavy		
Time monitoring performed:			14:00				15:00	End		
Barometric pressure (mbar):			1018	Start			1018	End		
Pressure trend (Daily):				Falling	x	Steady		Rising		
Source:	https://www.timeanddate.com/weather/@12265719/historic									
Air Temperature (Deg. C):			16	Before			16	After		

INSTRUMENTATION TECHNICAL SPECIFICATIONS:

Ground gas meter: GA5000
Gas Range: **CH_4** 0 - 100% **CO_2** 0 - 100% **O_2** 0 - 25%
Gas Flow range: +/-
Differential Pressure: +/- 500mbar
Date of last calibration: 31/10/2021
Date of next calibration: 01/11/2022

Ground Gas and Groundwater Monitoring Record Sheet

JOB DETAILS

Client: Mr D. Blackburn
Site: "Fieldhead", Towngate, Scholes
Date: 20/07/2022

Job No: 2371-22
Visit No: 3 **of** 6
Operator: JF
Project Manager: RC

GEOENVIRO SOLUTIONS LIMITED

Monitoring Point	GAS CONCENTRATIONS: Methane (%v/v) Peak	Methane (%v/v) Steady	%LEL Peak	%LEL Steady	Carbon dioxide (%v/v) Peak	Carbon dioxide (%v/v) Steady	Carbon monoxide (ppmv) Peak	Carbon monoxide (ppmv) Steady	Hydrogen sulphide (ppmv) Peak	Hydrogen sulphide (ppmv) Steady	Oxygen (%v/v) Min.	Oxygen (%v/v) Steady	VOLATILES: PID Peak (ppm)	Product thickness (mm)	FLOW DATA: Flow rate (l/hr) Peak	Flow rate (l/hr) Steady	Differential borehole Pressure (Pa)	Time for flow to equalise (secs)	Worst-credible GSVs: Methane (l/hr)	CO2 (l/hr)	WELL AND WATER DATA: Water level (mbgl)	Depth of well (m)	Reduced level (mAOD)	Water level (mAOD)	Response Zone	Comments
WS01	ND	ND	NR	NR	0.4	0.2	1	ND	ND	ND	21.2	21.2	NR	NR	-0.1	0.0	0.170	60	0.0001	0	DRY	0.93			0.5-1.0	
WS02	ND	ND	NR	NR	1.6	0.2	ND	ND	ND	ND	20.6	21.3	NR	NR	-0.2	0.0	0.120	60	0.0002	0	DRY	0.86			0.5-1.0	
SN01	0.1	0.1	NR	NR	1.7	1.7	ND	ND	ND	ND	20.6	20.6	NR	NR	-0.1	0.0	0.100	60	0.01	0	DRY	3.75			1.0-3.75	
Max	**0.1**	**0.1**	**ND**	**ND**	**1.7**	**1.7**	**1**	**ND**	**ND**	**ND**	**21.2**	**21.3**	**ND**	**ND**	**-0.1**	**0.0**	**0.2**	**60**	**0.0100**	**0.0000**	**DRY**	**3.75**	**NR**	**NR**		
Min	**ND**	**ND**	**0.0**	**0.0**	**0.4**	**0.2**	**ND**	**ND**	**ND**	**ND**	**20.6**	**20.6**	**0.0**	**0.0**	**-0.2**	**0.0**	**0.1**	**60**	**0.0001**	**0.0000**	**DRY**	**0.86**	**0.00**	**0.00**		
																			Worst-possible GSVs							
																			0.0001	**0.0017**						

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G - Granular

NB: Where no flow (ND) recorded, GSVs are calculated using equiment limit of detection (0.1l/hr). Where negative flows recorded, these are converted to positive values for calculation of GSVs.

METEOROLOGICAL AND SITE INFORMATION:

(Select correct box with X or enter data, as applicable)

State of ground:		Dry	x	Moist		Wet		Snow		Frozen
Wind:		Calm	x	Light		Moderate		Strong		
Cloud cover:		None		Slight	x	Cloudy		Overcast		
Precipitation:		None	x	Slight		Moderate		Heavy		
Time monitoring performed:			09:00	Start			09:15	End		
Barometric pressure (mbar):			1000	Start			1000	End		
Pressure trend (Daily):			x	Falling		Steady		Rising		
Source:	https://www.timeanddate.com/weather/@12265719/historic									
Air Temperature (Deg. C):			14	Before			14	After		

INSTRUMENTATION TECHNICAL SPECIFICATIONS:

Ground gas meter: GA5000
Gas Range: **CH_4** 0 - 100% **CO_2** 0 - 100% **O_2** 0 - 25%
Gas Flow range: +/-
Differential Pressure: +/- 500mbar
Date of last calibration: 31/10/2021
Date of next calibration: 01/11/2022

Ground Gas and Groundwater Monitoring Record Sheet

JOB DETAILS

Client: Mr D. Blackburn
Site: "Fieldhead", Towngate, Scholes
Date: 26/07/2022
Job No: 2371-22
Visit No: 4 **of** 6
Operator: JF
Project Manager: RC

GEOENVIRO SOLUTIONS LIMITED

Monitoring Point	GAS CONCENTRATIONS: Methane (%v/v) Peak	Methane (%v/v) Steady	%LEL Peak	%LEL Steady	Carbon dioxide (%v/v) Peak	Carbon dioxide (%v/v) Steady	Carbon monoxide (ppmv) Peak	Carbon monoxide (ppmv) Steady	Hydrogen sulphide (ppmv) Peak	Hydrogen sulphide (ppmv) Steady	Oxygen (%v/v) Min.	Oxygen (%v/v) Steady	VOLATILES: PID Peak (ppm)	Product thickness (mm)	FLOW DATA: Flow rate (l/hr) Peak	Flow rate (l/hr) Steady	Differential borehole Pressure (Pa)	Time for flow to equalise (secs)	Worst-credible GSVs: Methane (l/hr)	CO2 (l/hr)	WELL AND WATER DATA: Water level (mbgl)	Depth of well (m)	Reduced level (mAOD)	Water level (mAOD)	Response Zone	Comments
WS01	ND	ND	NR	NR	0.4	0.4	ND	ND	ND	ND	21.2	21.2	NR	NR	-0.1	-0.1	0	NR	0.0001	0.0004	Dry	0.93			0.5-1.0	
WS02	ND	ND	NR	NR	0.2	0.2	ND	ND	ND	ND	21.3	21.3	NR	NR	-0.2	0.0	0	NR	0.0002	0	Dry	0.86			0.5-1.0	
SN01	0.1	ND	NR	NR	1.7	1.7	ND	ND	ND	ND	20.6	20.6	NR	NR	-0.1	0.0	0	NR	0.0001	0	Dry	3.75			1.0-3.75	
Max	**0.1**	**ND**	**ND**	**ND**	**1.7**	**1.7**	**ND**	**ND**	**ND**	**ND**	**21.3**	**21.3**	**ND**	**ND**	**-0.1**	**0.0**	**0.2**	**NA**	**0.0002**	**0.0004**	**DRY**	**3.75**	**NR**	**NR**		
Min	**ND**	**ND**	**0.0**	**0.0**	**0.2**	**0.2**	**ND**	**ND**	**ND**	**ND**	**20.6**	**20.6**	**0.0**	**0.0**	**-0.2**	**-0.1**	**0.1**	**0**	**0.0001**	**0.0000**	**DRY**	**0.86**	**0.00**	**0.00**		
																			Worst-possible GSVs							
																			0.0001	**0.0017**						

ND - Not detected
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MG - Made ground
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NB: Where no flow (ND) recorded, GSVs are calculated using equiment limit of detection (0.1l/hr). Where negative flows recorded, these are converted to positive values for calculation of GSVs.

METEOROLOGICAL AND SITE INFORMATION:

(Select correct box with X or enter data, as applicable)

State of ground:	x	Dry		Moist		Wet		Snow		Frozen
Wind:	x	Calm		Light		Moderate		Strong		
Cloud cover:		None	x	Slight		Cloudy		Overcast		
Precipitation:		None	x	Slight		Moderate		Heavy		
Time monitoring performed:			09:30	Start			09:50	End		
Barometric pressure (mbar):			1000	Start			1000	End		
Pressure trend (Daily):				Falling		Steady	x	Rising		
Source:	https://www.timeanddate.com/weather/@12265719/historic									
Air Temperature (Deg. C):			13	Before			13	After		

INSTRUMENTATION TECHNICAL SPECIFICATIONS:

Ground gas meter: GA5000
Gas Range: **CH_4** 0 - 100% **CO_2** 0 - 100% **O_2** 0 - 25%
Gas Flow range: +/-
Differential Pressure: +/- 500mbar
Date of last calibration: 31/10/2021
Date of next calibration: 01/11/2022

APPENDIX 8

RISK ASSESSMENT MATRIX

Preliminary Risk Assessment Methodology (After NHBC Guidance for the Safe Development of Housing on Land Affected by Contamination (2008))

NHBC Guidance for the Safe Development of Housing on Land Affected by Contamination (2008) sets out a methodology for the estimation of risk.

At Phase I the risk estimation will take the form of a qualitative risk assessment, which will be entirely based on the conceptual model for each potential end-use of the site. Comments on level of uncertainty will also need to be included for each source-pathway-target linkage to allow the confidence in the assessed risks to be understood. The results of the qualitative risk assessment will allow the risk evaluation to be concisely described in the following chapters.

The methodology for risk evaluation is a qualitative method for interpreting the output for the risk estimation stage of the assessment. It involves the classification of the:

The magnitude of probability (i.e. likelihood).
[takes into account both the presence of the hazard and receptor and the integrity of the pathway]

The magnitude of the potential consequence (i.e. severity).
[takes into account both the potential severity of the hazard and the sensitivity of the receptor]

Classification of Probability

Classification	Definition	Examples
High likelihood (Hi)	There is a pollutant linkage and an event that either appears very likely in the short term and almost inevitable in the long term, or there is evidence at the receptor of harm or pollution.	*A) Elevated concentrations of toxic contaminants are present in soils in the top 0.5m in a residential garden.* *B) Ground/groundwater contamination could be present from chemical works, containing a number of USTs, having been in operation on the same site for over 50 years*
Likely (Li)	There is a pollutant linkage, and all the elements are present and in the right place, which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short term and likely over the long term.	*A) Elevated concentrations of toxic contaminants are present in soils at depths of 0.5-1.0m in a residential garden, or the top 0.5m in public open space.* *B) Ground/groundwater contamination could be present from an industrial site containing a UST present between 1970 and 1990. The tank is known to be single skin. There is no evidence of leakage although there are no records of integrity tests.*
Low likelihood (Lw)	There is a pollutant linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such event would take place and is less likely in the short term.	*A) Elevated concentrations of toxic contaminants are present in soils at depths >1m in a residential garden, or 0.5-1.0m in public open space.* *B) Ground/groundwater contamination could be present on a light industrial unit constructed in the 1990s containing a UST in operation over the last 10 years – the tank is double skinned but there is no integrity testing or evidence of leakage.*
Unlikely (Ul)	There is a pollutant linkage but circumstances are such that it is improbable that an event would occur even in the very long term.	*A) Elevated concentrations of toxic contaminants are present below hardstanding.* *B) Light industrial unit <10 yrs old containing a double skinned UST with annual integrity testing results available.*

Preliminary Risk Assessment Methodology (After NHBC Guidance for the Safe Development of Housing on Land Affected by Contamination (2008))

Classification of Consequence

	Definition	Examples
Severe (Sv)	Highly elevated concentrations likely to result in "significant harm" to human health as defined by the EPA 1990, Part 2A, if exposure occurs. A Category 1: Human Health risk is present. Equivalent to EA Category 1 pollution incident including persistent and/or extensive effects on water quality; leading to closure of a potable abstraction point major impact on amenity value or major damage to agriculture or commerce. Major damage to aquatic or other ecosystems, which is likely to result in a substantial adverse change in its functioning or harm to a species of special interest that endangers the long - term maintenance of the population. Catastrophic damage to crops, buildings or property.	*Significant harm to humans is defined in circular 01/2006 as death, disease*, serious injury, genetic mutation, birth defects or the impairment of reproductive functions.* *Major fish kill in surface water from large spillage of contaminants from site.* *Highly elevated concentrations of List I and substances present in groundwater close to small potable abstraction (high sensitivity).* *Explosion, causing building collapse (can also equate to immediate human health risk if buildings are occupied).*
Medium (Md)	Elevated concentrations which could result in "significant harm" to human health as defined by the EPA 1990, Part 2A if exposure occurs. A Category 2: Human Health risk is present. Equivalent to EA Category 2 pollution incident including significant effect on water quality; notification required to abstractors; reduction in amenity value or significant damage to agriculture or commerce. Significant damage to aquatic or other ecosystems, which may result in a substantial adverse change in its functioning or harm to a species of special interest that may endanger the long-term maintenance of the population. Significant damage to crops, buildings or property.	*Significant harm to humans is defined in circular 01/2006 as death, disease* serious injury, genetic mutation, birth defects or the impairment of reproductive functions.* *Damage to building rendering it unsafe to occupy e.g. foundation damage resulting in instability.* *Ingress of contaminants through plastic potable water pipes.*
Mild (Ml)	Exposure to human health unlikely to lead to "significant harm". A Category 3 Human Health risk is present. Equivalent to EA Category 3 pollution incident including minimal or short lived effect on water quality; marginal effect on amenity value, agriculture or commerce Minor or short lived damage to aquatic or other ecosystems, which is unlikely to result in a substantial adverse change in its functioning or harm to a species of special interest that would endanger the long-term maintenance of the population Minor damage to crops, buildings or property.	*Exposure could lead to slight short - term effects (e.g. mild skin rash).* *Surface spalling of concrete.*
Minor (Mr)	No measurable effect on humans.A Category 4: Human Health risk is present. Equivalent to insubstantial pollution incident with no observed effect on water quality or ecosystems. Repairable effects of damage to buildings, structures and services.	*The presence of contaminants at such concentrations that protective equipment is required during site works.* *The loss of plants in a landscaping scheme.* *Discoloration of concrete.*

* For these purposes, disease is to be taken to mean an unhealthy condition of the body or a part of it and can include, for example, cancer, liver dysfunction or extensive skin ailments. Mental dysfunction is included only insofar as it is attributable to the effects of a pollutant on the body of the person concerned.

The classification of consequence does not take into account the probability of the consequence being realized. Therefore, there may be more than one consequence for a particular pollutant linkage. Both a severe and medium classification can result in death. Severe relates to short term (acute) risk while medium relates to long

term (chronic) risk. Mild relates to significant harm but to less sensitive receptors. Minor classification relates to harm which is not significant but could have a financial cost.

The classification gives a guide as to the severity and consequence of identified risk when compared with other risk presented on the site. It should be noted that if a risk is identified it cannot be classified as "no risk" but as "very low risk". Differing stakeholders may have a different view on the acceptability of a risk.

Risk Evaluation Matrix

		Consequence			
		Severe (Sv)	Medium (Md)	Mild (Mi)	Minor (Mr)
Probability	High likelihood (Hi)	Very high risk (VH)	High Risk (H)	Moderate Risk (M)	Mod/low risk (M/L)
	Likely (Li)	High risk (H)	Moderate risk (M)	Mod/low risk (M/L)	Low risk (L)
	Low likelihood (Lw)	Moderate risk (M)	Mod/low risk (M/L)	Low risk (L)	Very low risk (VL)
	Unlikely (Ul)	Mod/low risk (M/L)	Low risk (L)	Very low risk (VL)	Very low risk (VL)

Risk Categorizations

Very high risk (VH)	There is a high probability that severe harm could arise to a designated receptor from an identified hazard, OR, there is evidence that severe harm to a designated receptor is currently happening. This risk, if realized, is likely to result in a substantial liability. Urgent investigation (if not undertaken already) and remediation are likely to be required.
High risk (H)	Harm is likely to arise to a designated receptor from an identified hazard. Realization of the risk is likely to present a substantial liability. Urgent investigation (if not undertaken already) is required and remedial works may be necessary in the short-term and are likely over the longer-term.
Moderate risk (M)	It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, or if any harm were to occur it is more likely that the harm would be relatively mild. Investigation (if not already undertaken) is normally required to clarify the risk and to determine the potential liability. Some remedial works may be required in the longer-term.
Low risk (L)	It is possible that harm could arise to a designated receptor from an identified hazard, but it is likely that this harm, if realized, would at worst normally be mild.
Very low risk (VL)	There is a low possibility that harm could arise to a receptor. In the event of such harm being realized it is not likely to be severe.

Reference

Rudland, D J, Lancefield, R M, Mayell, P N; 2001; Contaminated land Risk Assessment. A guide to Good Practice; CIRIA Report C552.

The NHBC (National House-Building Council) the Environment Agency and the Chartered Institute of Environmental Health, 2008, Guidance for the Safe Development of Housing on Land Affected by Contamination R&D66.