



PHASE II SITE INVESTIGATION AND UPDATED RISK ASSESSMENT REPORT FOR QUARMBY ROAD, HUDDERSFIELD.

For: Mr Stephen Peace

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Quality Assurance

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Update Status

Issue	Date	Description	Prepared	Reviewed	Approved

Contents

Introduction	1
Physical Setting	3
Proposed Development	6
Fieldworks	7
Geology and Ground Conditions	8
Insitu Testing	10
Laboratory Testing – Sulphates	11
Laboratory Testing – Contamination	12
Contamination	13
Updated Conceptual Site Model and Risk Assessment	16
Recommendations	19
Reliance and Limitations	20

Appendices

Appendix	Information
1	Drawings
2	Site Photographs
3	Exploratory Hole Logs
4	Exploratory Hole Photographs
5	Chemical Testing Results
6	Chemical Screening Criteria
7	Risk Assessment Matrix

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
DP	Dynamic Probe
DoE	Department of Environment
DWS	Drinking Water Standard
EA	Environment Agency
EQS	Environmental Quality Standard
GAC	Generic Acceptance Criteria
HP	Hand Pit
HA	Hand Auger
LPA	Local Planning Authority
LQM	Land Quality Management
mbgl	Metres Below Ground Level
MP	Mackintosh Probe
NPPF	National Planning Policy Framework
NGR	National Grid Reference
OS	Ordnance Survey
SGV	Soil Guideline Value
SSV	Soil Screening Value
WSV	Water Screening Value
SPOSH	Significant Possibility of Significant Harm
SPZ	Source Protection Zone
SSSI	Site of Special Scientific Interest
TP	Trial Pit
TT	Trial Trench
WS	Windowless Sample / Window Sample

1. Introduction

GeoEnviro Solutions Ltd (GES) was instructed by Mr Stephen Peace (the Client) to conduct a Phase II environmental site investigation at a site encompassing a newly developed property, located at 69a Quarmby Road, Huddersfield, HD3 4EA.

We are content that as a result of the actual site 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 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).

1.1 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, 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.

1.2 Background and Instruction

The site investigation undertaken was specified by ourselves as a result of recommendations made in our previously issued Phase I: Desktop Study & Risk Assessment Report for the site (Report Reference: 2112-21 PI Report, issued in February 2022), to which this report should be read in conjunction with. As such this report seeks to address the potential pollutant linkages identified within the Preliminary Conceptual Site Model contained within our Phase I: Desktop Study report.

The site investigation was undertaken as a whole, encompassing the landscaped area, concrete patio and land in front of the substation surrounding the property. This report provided the information collected as a whole but references that data specifically relating to the property on Quarmby Road.

1.3 Previous Investigations

GES conducted a Phase I: Desktop Study & Risk Assessment Report for the site in February 2022; this report identified the potential for on-site soils containing elevated concentrations of metals, PAHs, phenols, VOC and SVOCs, and the potential risk of ground gas migration under the site due to a historic landfill being located 41m northeast of the site.

It is recommended that this report is ready in entirety alongside this report.

1.4 Scope

Prior to commencing the site works the proposed scope of investigation was as follows:

- One day excavating trial pits by hand at a minimum of three locations to a nominal depth of up to 1.20 mbgl or refusal.
- One day's use of a hand auger advancing follow on exploratory holes at a minimum of three locations to a nominal depth of up to 2.50 mbgl or refusal.
- Environmental sampling and subsequent environmental laboratory testing of samples.
- The installation of three combined gas and groundwater monitoring standpipes to a nominal depth of 2.50mbgl.
- 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.

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

2. Physical Setting

2.1 Site Information

Location

The site is located at land adjacent to 69 Quarmby Road, Huddersfield, at approximate National Grid Reference (NGR): 411571:416928 (centre of the site).

A site location plan is presented as Drawing No. GES 2112-21/01 in [Appendix 1](#).

Topography

The site is generally flat.

Access

Access to the site is granted through a locked wooden gate. Permission to the site was granted by the property owner, Mr Stephen Peace.

Site Description

A site reconnaissance was carried out on the 7th March 2022. Site photographs collected during the site reconnaissance are included within [Appendix 2](#).

The site comprises an irregular shaped piece of land with an approximate area of 0.1 Ha, occupied by a new build property with an associated driveway. The land comprises a mix of hardstanding and landscaped areas.

An approximate distribution of the surface covering is given below in Table 2.1.

Table 2.1: Site Surface Covering

Type of Surface Cover	Distribution (%)
Soft Ground (grassed and landscaped areas)	10
Hardstanding	35
Roadways	-
Buildings	55
Water (ponds, streams)	-

2.2 Geology

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

Table 2.2: Published Geology

Geology	Description /strata
Artificial	None Recorded
Superficial	None Recorded
Bedrock	Rough Rock Sandstone

No artificial deposits are recorded to underlie the site.

No superficial geology deposits are recorded to underlie the site.

The bedrock geology beneath the site is shown to comprise the Rough Rock Sandstone Formation which is generally described as ‘*coarse grained, cross bedded felspathic sandstone*’ (BGS Leixcon description).

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.

Superficial Deposits

There is no superficial aquifer designation for the site.

Bedrock

The Environment Agency aquifer classification scheme indicates that the bedrock aquifer beneath 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.*’

The groundwater vulnerability in the vicinity of the site is classified as high.

Table 2.3 below presents the Environment Agency groundwater vulnerability definitions:

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.

2.4 Hydrology

The nearest surface watercourse to the site is an unnamed small to medium pond feature, located approximately 247 m to the southwest.

2.5 Contaminant Sources

On-Site Sources

The following possible on-site sources were identified by the Historical Mapping Study undertaken in the Phase I report:

- Chemical Works.
- Unspecified Mills.
- Unspecified Commercial/Industrial activities.

Offsite Sources

The following possible offsite sources were identified by the Historical Mapping Study undertaken in the Phase I report:

- Chemical Works.
- Unspecified Mills.
- Unspecified Commercial/Industrial activities.
- Historical landfill.

3. Proposed Development

An outline development drawing for the site, comprising one residential property, as drawn by the client and referenced REV:28/8/2019-91038, dated august 2019 is provided within **Appendix 1**.

It should be noted that prior to the Phase II report being undertaken, the proposed development was constructed on-site.

The risk assessment undertaken in this report is therefore based a residential end-use. Any variation from this may require a re-assessment and the Conceptual Site Model updating accordingly.

4. Fieldworks

4.1 Site Investigation

All site investigation works were completed on 16th March 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.

In summary the investigation included:

- Four hand excavated trial pits were completed to a maximum depth of 0.80 mbgl, by a GES Geoenvironmental Engineer. The hand pits were logged with any groundwater conditions noted and representative soil samples removed in accordance with current guidelines.
- Two handheld TRL probes were undertaken through the base of TP01a and TP02, to a maximum depth of 1.05 mbgl.
- Soil samples were removed from shallow sub surface locations, with further samples taken at observed changes in strata. Samples were subsequently placed in suitable containers including 1 kg tubs and 250 ml glass jars and placed in cool boxes with cool packs prior to storage within our in-house laboratory fridges and then subsequent forwarding to our designated laboratory for analysis.
- The trial pits were backfilled immediately after excavation and completion of soakaway testing.

The positions of the exploratory holes in relation to the existing site layout can be reviewed on drawing number GES 2112-21 / 02 within [Appendix 1](#).

5. Geology and Ground Conditions

The following ground conditions were encountered during the site investigation.

5.1 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 5.1.

Table 5.1: Summary of Ground Conditions

Geology / Strata	Depth (mbgl)				Locations encountered
	Top		Base		
	Min	Max	Min	Max	
Concrete	0.00	-	-	0.15	TP02
Macadam	0.05	0.69	0.07	Not proven	TP03
Granular Made Ground	0.00	0.07	0.15	0.70	All exploratory hole locations
Residual Rough Rock	0.15	0.65	0.39	0.79	TP01a, TP02 & TP03
Rough Rock	0.39	0.79	Not proven		TP01a, TP02 & TP03

Detailed strata descriptions are presented on the exploratory point logs presented in [Appendix 3](#) and photographs of the exploratory points in [Appendix 4](#).

5.2 Made Ground

Made Ground was encountered in all exploratory hole locations from ground level to depths of between, 0.15 and 0.70 mbgl, comprising hardstanding and granular made ground.

Hardstanding

Concrete hardstanding was encountered in TP02 from ground level to a depth of 0.15 mbgl.

Bound macadam hardstanding was encountered in TP03 from 0.05 to 0.07 mbgl.

Granular Made Ground

Granular made ground, comprising a gravelly clayey sand with ash and a low cobble content (of brick and sandstone), was encountered in all exploratory hole locations from ground level to depths of up to 0.70 mbgl, and locally beneath hardstanding.

5.3 Superficial Deposits

No superficial deposits were encountered during the investigation.

5.4 Bedrock (Rough Rock Sandstone)

Residual Rough Rock Sandstone

Residual Rough Rock Sandstone strata were encountered beneath the made ground in TP01a, TP02 and TP03 and generally comprised a gravelly clayey sand, with gravel of sandstone.

Rough Rock Sandstone

Rough Rock Sandstone was encountered in TP01a, TP02 and TP03 and generally comprised a medium strong to strong, medium to coarse grained sandstone.

5.5 Groundwater

Groundwater was generally not encountered during the site investigation.

5.6 Restrictions

No restrictions were encountered during this ground investigation.

5.7 Obstructions

In 0.70 mbgl in TP01, black bound macadam material was encountered in the base of the pit. Scanning with a cable avoidance tool returned a strong signal, indicative of a live service, so the decision was made to terminate the pit.

Due to the presence of shallow bedrock across the site, no groundwater and ground gas monitoring standpipes were installed as part of this investigation.

5.8 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.

6. Insitu Testing

6.1 TRL Probes

TRL probes were conducted through the base of TP01a and TP02. The results of this testing show a progression through the weathered profile of the Rough Rock Sandstone.

The results from the TRL probes are provided in [Appendix 3](#).

7. Laboratory Testing – Sulphates

Three samples of the underlying naturally occurring deposits in were submitted for assessment of water-soluble sulphate, total sulphate, pH value and total sulphur concentrations.

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

Water-soluble sulphate concentrations of 0.014 g/l to 0.030 g/l, total sulphur concentrations of 0.041% to 0.110% and pH values of 8.1 were recorded in the granular made ground and residual Rough Rock sandstone strata. Based on the above results, Total Potential Sulphates range between 0.123% and 0.330%.

8. Laboratory Testing – Contamination

8.1 Soil 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	3
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	3
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	3

All chemical testing results are presented in [Appendix 5](#).

9. Contamination

9.1 Soil Testing

A total of three samples, comprising two samples of granular made ground and one of residual Rough Rock sandstone, 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 of a domestic property and therefore screening has been made against a land use of 'Residential with homegrown produce'.

A set of chemical screening values are provided in [Appendix 6](#).

9.2 Selection of Screening Criteria

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

- Maintenance workers; and
- End users and site visitors.

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 offsite human health receptors 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 criteria¹ 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 2.5% soil organic matter (SOM) criteria have been used, where available and appropriate, in the first instance. All soil samples were analysed for %SOM, the range was from 1.20 to 4.30%, and so this conservative approach is considered appropriate for initial screening.

Where no S4UL are available, the EIC/ AGS/ CL:AIRE/ GAC² 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 that the Made Ground, by its very nature is heterogeneous, and often has a significant sand/gravel component, especially at shallow depths.

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 site investigation.

9.3 Soil Testing Results and Screening

Any exceedances in contaminant concentrations when compared to the associated soil guidance values are discussed below:

Metalloids

Table 9.1, below, summarizes the soil testing results exceeding SGV's for residential with homegrown produce end use.

Table 9.1: Metalloids Soil Exceedances

Determinant	Min	Max	GAC	Number of exceedances	Location of exceedances
Lead	51	390	200	1	TP03

¹ 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

² CL:AIRE (2010) The EIC/AGS/CL:AIRE Generic Assessment Criteria for Human Health Risk Assessment

Organics

There were no exceedances from the screening undertaken on PAH congeners.

There are no exceedances from the screening undertaken on the respective TPH CWG bands.

There were no exceedances from the screening undertaken on BTEX/MTBE congeners.

Others

The asbestos screening returned a negative result from all samples analysed.

10. Updated Conceptual Site Model and Risk Assessment

The Conceptual Site Model has been re-formulated based upon the results from the site 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'. A summary of the risk assessment protocols, and subsequent risk assessment matrix is provided in [Appendix 7](#). The following linkages have been identified and are presented in Table 10.1, below.

Table 10.1: Updated Conceptual Site Model.

Contaminant Source	Contaminant of Concern	Pathways	Receptor	Pollutant Linkage	Probability of Risk	Classification of Consequence	Level of Risk	Justification
On Site: Made Ground soils	Lead	Ingestion, dermal contact, inhalation of dusts	End users and site visitors	Considered potentially active	Likely	Mild	Moderate / Low ●	A moderate to low-risk rating has been assessed due to the Lead recorded above the SGV's in TP03. However, this location is under a layer of macadam, therefore is inaccessible, thus eliminating the potential pollutant linkage by removing the pathway.
			Construction / maintenance Workers	Considered potentially active	Likely	Medium	Moderate ●	A moderate risk rating has been assessed due to the Lead recorded above the SGV's in TP03. Elevated concentrations of lead found at this location may come into contact with any future construction / maintenance workers who disturb the overlying layer of macadam.
		Leaching through soils and migration via groundwater or soil pore moisture	Controlled Waters	Considered potentially active	Unlikely	Mild	Very low ●	A very low risk rating has been assessed as lead is bound in the recipient matrix and so is immobile.

Contaminant Source	Contaminant of Concern	Pathways	Receptor	Pollutant Linkage	Probability of Risk	Classification of Consequence	Level of Risk	Justification
		Permeation of water pipes	Construction materials, end users and site visitors	Considered inactive	-	-	Very low ●	Returned samples indicate no hydrocarbon concentrations from tested soils.
		Uptake	Plant and Wildlife	Considered inactive	-	-	Very low ●	Returned samples indicate no phytotoxic contaminants above elevated concentrations.
On Site: Made Ground soils.	Asbestos	Inhalation of fibres in airborne dust	End users and site visitors	Considered inactive	-	-	Very low ●	Returned samples indicate no fibrous material from all samples analysed.
			Construction / maintenance Workers	Considered inactive	-	-	Very low ●	Returned samples indicate a negative result for the presence of fibrous material from all samples analysed.
On Site: Ground Gases from Made Ground.	Ground gases, CO, CO ₂ , H ₂ S and CH ₄ .	Gas migration and build up within buildings (explosion/asphyxiation risk)	End users and building structures.	Considered inactive	-	-	Very Low ●	Given the limited thickness (<1m), composition and likely age of the made ground encountered during the site investigation, the gas generation potential has been classified as very low in accordance with Table 1, CL:AIRE RB17. This is considered appropriate, as while the one of the TOC concentrations within the made ground is >1%, it was recorded to contain ash, indicating the TOC is not representative of degradability.
Offsite: Ground Gases from historical landfilling activities.			Future end users and building structures.	Considered inactive	-	-	Very low ●	On further review of the information provided within the Phase I report, the historical mapping shows no evidence of the historical landfill (EA/NRW record) located 41m northeast of the site. Likewise, there are no BritPits or areas of made or infilled ground

Contaminant Source	Contaminant of Concern	Pathways	Receptor	Pollutant Linkage	Probability of Risk	Classification of Consequence	Level of Risk	Justification
								associated with the outline of the historic landfill. The only evidence of workings within the outline of the historic landfill comprise of localised earthworks circa 100m northeast of the site, associated with a residential property ('Royd House') and circa 260m northeast of the site, associated with the backfilling of a pond in the 1950s. Given the above, and that the site and the outline of the historic landfill are situated on the Rough Rock sandstone, which will allow the vertical migration and limit the lateral migration of ground gas, it is considered that the risk to the site from offsite sources of ground gas is very low.

11. Recommendations

11.1 Contaminated Soils

The results of the general testing undertaken across the site indicates that contamination is not likely across the site.

A single elevated concentration of Lead was recorded under a layer of hardstanding. As such there is no pathway present and no pollutant linkage exists.

However, should the site be re-developed at any stage, the issue of Lead contamination within the site soils should be re-evaluated in respect to any new development profile.

11.2 Gas Protection Measures

Based on the ground investigation works concluding that less than 1.00 metre of Made Ground material underlies the site and on further review of the desktop information, under the guidance of CL:AIRE RB17, there is insufficient thickness of Made Ground underlying the site to either produce or transmit sufficient volumes of ground gases to represent a risk to receptors.

It is further understood that the Client has installed a Radon Membrane as part of the development despite the site was shown to be in an area where Radon protection measures are not required. However, referring to RB17, the guidance suggests that the presence of a Radon membrane will provide sufficient protection against other ground gases, should any be present.

GES therefore considers that no gas protection measures are required at the site.

12. 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.

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 site investigation has been undertaken in accordance with standard consulting practise and with current national and international guidance.

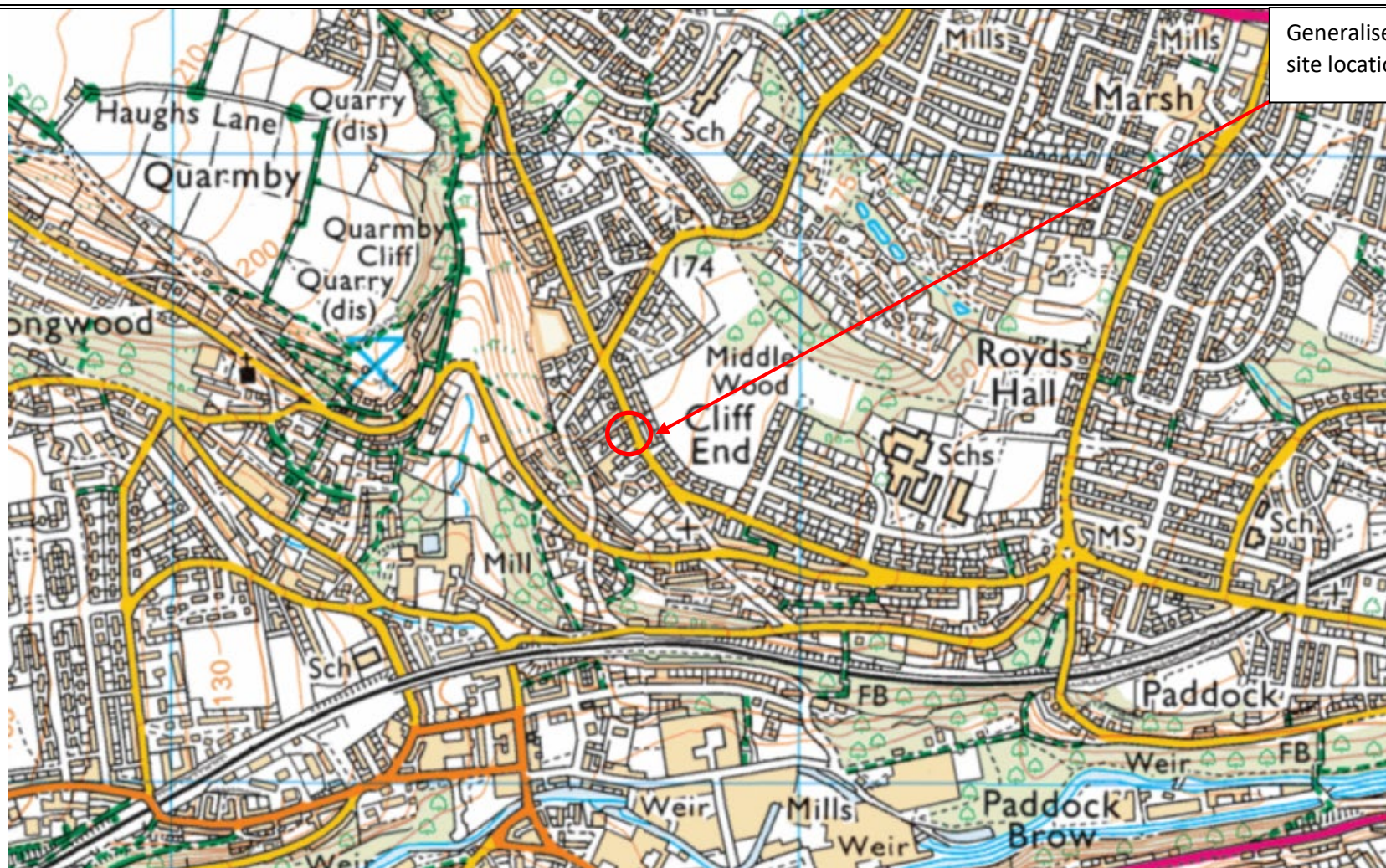
This report presents the observations made during the site investigation and the factual data obtained. The conclusions and recommendations in this report are limited to those which can be made based on the findings of the survey and information provided by third parties. GES assumes all third party 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. This report is provided for the sole use of the client and their professional advisers and is confidential to them unless agreed otherwise in writing.

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



Generalised
site location



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PROJECT NAME

Quarmby Road, Huddersfield

PROJECT NUMBER

2112-21

TITLE

Site location Plan

DRAWING NO.

2112-21/01

SCALE

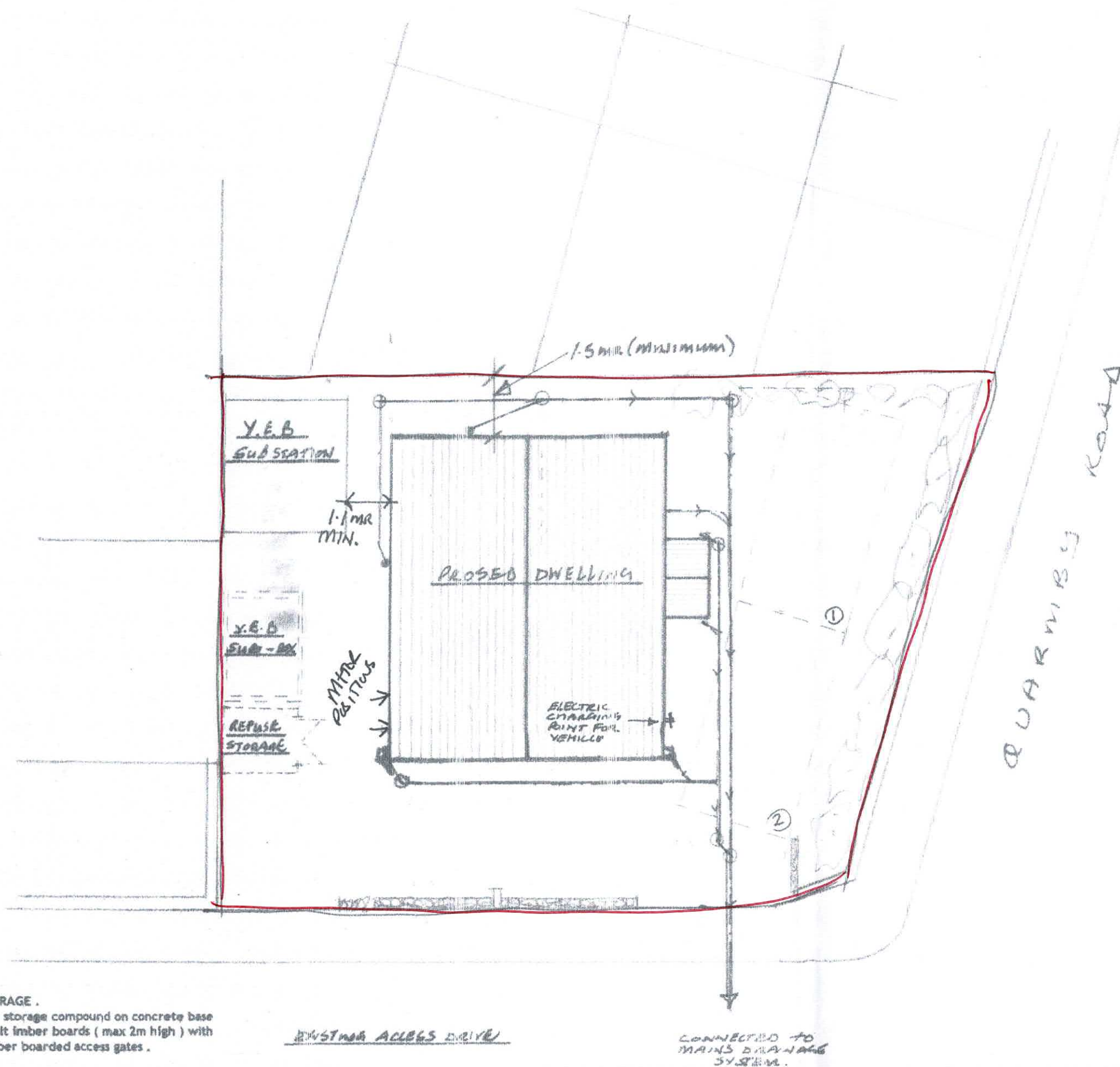
N.T.S

DATE

March 2022

DRAWN BY

JF



Form parking area as shown with sandstone chippings .
Drives access to be in tarmac finish .
Paths to be formed in art . stone flagging and gardens
to be top soiled with grass / flower beds as clients
requirements .

GROUND WORKS .
Remove existing garages , concrete bases , top soil ,
vegetation and excavate to reduced level for new
house and drive .

Full structural details of retaining walls and foundations
to be submitted and agreed on site with building inspector
after/during excavation for new houses.

ACCESS / DROP CROSSING.
Utilise existing drop crossing to form access for new parking area.

PROPOSED DETACHED DWELLING .

AT

LAND OFF QUARMBY ROAD .
QUARMBY .
HUDDERSFIELD .

REV 28/8/2019

PROPOSED SITE PLAN 1:100 .

EXISTING ACCESS DRIVE

CONNECTED TO
MAINS DRAINAGE
SYSTEM .

REFUSE STORAGE .
Form refuse storage compound on concrete base
with vertical timber boards (max 2m high) with
vertical timber boarded access gates .

 Trial Pit Location



GeoEnviro Solutions Ltd
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West Yorkshire
HD6 2RA
Tel: 01484 986010
Email: info@geoenvirosolutions.com
Web: www.geoenvirosolutions.com

PROJECT NAME Quarmby Road, Huddersfield

PROJECT NUMBER 2112-21

TITLE
Trial Pit Location Plan

DRAWING NO.

2112-21/02

SCALE

N.T.S

DATE
March 2022

DRAWN BY
JF

A solid green rounded rectangle with a thin black border, centered on the page.

APPENDIX 2
SITE PHOTOGRAPHS

Site: Quarmby Road, Huddersfield
Client: Mr S. Peace
Job Reference: 2112-21, Dated: March 2022

A.



B.



C.



D.



A. Access to TP01

B. Area to excavate TP01

C. Area to excavate TP02

D. Area to excavate TP03

APPENDIX 3
EXPLORATORY HOLE LOGS

Trial Pit Log

Project Name: 69a Quarmby Road		Client: Stephen Peace		Date: 16/03/2022	
Location: Quarmby Road, Huddersfield, HD3 4EA		Contractor: BHSN			
Project No. : 2112-21		Crew Name:		Equipment: Insulated Hand Digging Tools.	
Location Number TP01	Location Type TP	Level	Logged By JF	Scale 1:25	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.69 0.70			MADE GROUND: Dark brown gravelly clayey fine to coarse SAND, with ash, low cobble content and fragments of porcelain. Gravel is sub-angular to sub-rounded fine to coarse sandstone and brick. Cobbles are sub-rounded brick and sandstone.	
								BITUMENOUS MATERIAL / MACADAM End of Borehole at 0.700m	1
									2
									3
									4
									5

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks
0.30	0.30	No	No				

Remarks Suspected cable underlaying bitumen. C.A.T detected strong signal below layer - pit terminated due to suspected cable.							
--	--	--	--	--	--	--	---

Trial Pit Log

Project Name: 69a Quarmby Road		Client: Stephen Peace		Date: 16/03/2022	
Location: Quarmby Road, Huddersfield, HD3 4EA		Contractor: BHSN			
Project No. : 2112-21		Crew Name:		Equipment: Insulated Hand Digging Tools.	
Location Number TP01a	Location Type TP	Level	Logged By JF	Scale 1:25	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.70	D		0.65 0.79 0.80			MADE GROUND: Dark brown gravelly clayey fine to coarse SAND, with ash, low cobble content and fragments of porcelain. Gravel is sub-angular to sub-rounded fine to coarse sandstone and brick. Cobbles are sub-rounded brick and sandstone. Brown gravelly clayey fine to coarse SAND. Gravel is sub-angular to sub-rounded fine to coarse sandstone. [RESIDUAL ROUGH ROCK SANDSTONE] Strong yellowish brown medium to coarse grained SANDSTONE. [ROUGH ROCK SANDSTONE] End of Borehole at 0.800m	1
									2
									3
									4
									5

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks
0.30	0.30	No	No				

Remarks Pit terminated due to Rough Rock Sandstone encountered. Samples taken for contamination testing.							
--	--	--	--	--	--	--	---

Trial Pit Log

Project Name: 69a Quarmby Road		Client: Stephen Peace		Date: 16/03/2022	
Location: Quarmby Road, Huddersfield, HD3 4EA		Contractor: BHSN			
Project No. : 2112-21		Crew Name:		Equipment: Insulated Hand Digging Tools.	
Location Number TP02	Location Type TP	Level	Logged By JF	Scale 1:25	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.15			MADE GROUND: Creamish light brown CONCRETE with 70% aggregate of sub-angular to sub-rounded fine to coarse sandstone, limestone, quartz, flint and chert.	
					0.50			MADE GROUND: Dark brown gravelly clayey fine to coarse SAND, with ash, low cobble content and fragments of porcelain. Gravel is sub-angular to sub-rounded fine to coarse sandstone and brick. Cobbles are sub-rounded brick and sandstone.	
		0.60	D		0.69			Yellowish brown gravelly clayey fine to coarse SAND. Gravel is sub-angular to sub-rounded fine to coarse sandstone.	
					0.70			[RESIDUAL ROUGH ROCK SANDSTONE] Medium strong to strong yellowish brown medium to coarse grained SANDSTONE. [ROUGH ROCK SANDSTONE]	1
								End of Borehole at 0.600m	
									2
									3
									4
									5

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks
0.30	0.30	No	No				

Remarks Pit terminated due to Rough Rock Sandstone encountered. Samples taken for contamination testing.							
--	--	--	--	--	--	--	---



Unit 7, Springvale Works,
Brookfoot Lane,
Brighouse,
HD6 2RA

Location:

TP01a

Client:

MR S Peace

Job No:

2112-21

Site:

69a Quarmby Road

Test Date:

16/03/2022

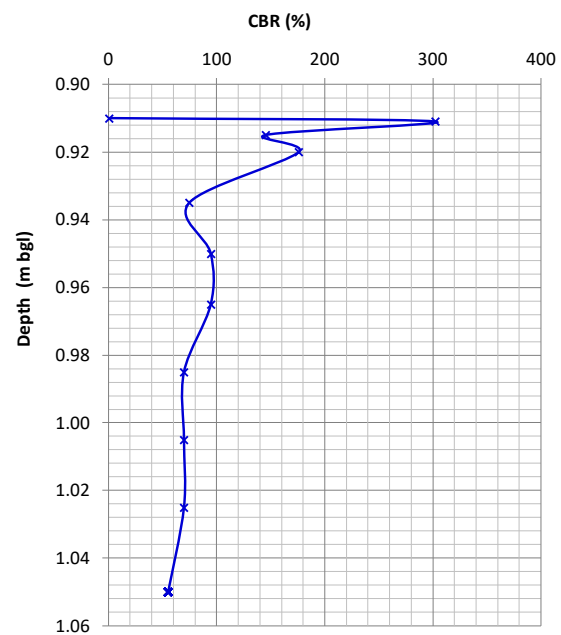
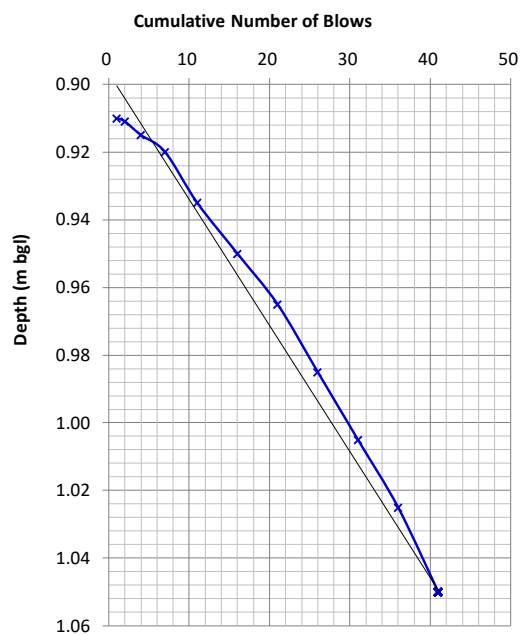
Tested by:

JF

IMPACT (TRL) Dynamic Cone Penetrometer

SL970, TRL Road Note 8, 60° cone.

Blow Count	Total Blows	Depth (mm)	CBR (%)	Blow Count	Total Blows	Depth (mm)	CBR (%)	Blow Count	Total Blows	Depth (mm)	CBR (%)
1	1	910	0								
1	2	911	302								
2	4	915	145								
3	7	920	176								
4	11	935	75								
5	16	950	95								
5	21	965	95								
5	26	985	70								
5	31	1005	70								
5	36	1025	70								
5	41	1050	55								





Unit 7, Springvale Works,
Brookfoot Lane,
Brighouse,
HD6 2RA

Location:

TP02

Client:

MR S Peace

Job No:

2112-21

Site:

69a Quarmby Road

Test Date:

16/03/2022

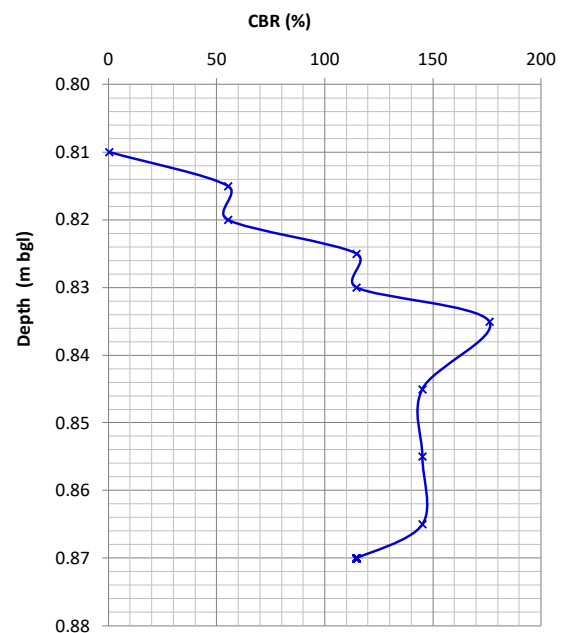
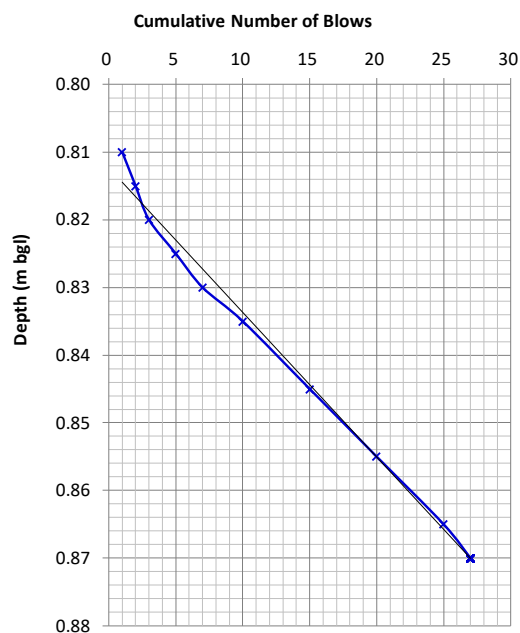
Tested by:

JF

IMPACT (TRL) Dynamic Cone Penetrometer

SL970, TRL Road Note 8, 60° cone.

Blow Count	Total Blows	Depth (mm)	CBR (%)	Blow Count	Total Blows	Depth (mm)	CBR (%)	Blow Count	Total Blows	Depth (mm)	CBR (%)
1	1	810	0								
1	2	815	55								
1	3	820	55								
2	5	825	115								
2	7	830	115								
3	10	835	176								
5	15	845	145								
5	20	855	145								
5	25	865	145								
2	27	870	115								



APPENDIX 4
EXPLORATORY HOLE
PHOTOGRAPHS

Site: Quarmby Road, Huddersfield
Client: Mr S. Peace
Job Reference: 2112-21, Dated: March 2022

A.



B.



A. TP01

B. TP01, Orange bar indicates
direction of cable.

A.



B.



C.



A. TP02

B. TP02

C. TP02 Spoil

A.



B.



A. TP03

B. TP03

APPENDIX 5
CHEMICAL TESTING RESULTS



2183

Final Report

Report No.:	22-10319-1		
Initial Date of Issue:	23-Mar-2022		
Client	Geoenviro Solutions Ltd		
Client Address:	Unit 7 , Springvale Works Brookfoot lane Brighthouse HD62RA		
Contact(s):	Andrew Dickinson Joe Frost		
Project	2112-21		
Quotation No.:		Date Received:	18-Mar-2022
Order No.:		Date Instructed:	18-Mar-2022
No. of Samples:	3		
Turnaround (Wkdays):	5	Results Due:	24-Mar-2022
Date Approved:	23-Mar-2022		
Approved By:			
Details:	Stuart Henderson, Technical Manager		

Results - Soil

Project: 2112-21

Client: Geoenviron Solutions Ltd	Chemtest Job No.:				22-10319	22-10319	22-10319
Quotation No.:	Chemtest Sample ID.:				1394311	1394312	1394313
	Sample Location:				TP01	TP02	TP03
	Sample Type:				SOIL	SOIL	SOIL
	Top Depth (m):				0.7	0.6	0.3
	Date Sampled:				16-Mar-2022	16-Mar-2022	16-Mar-2022
	Asbestos Lab:				DURHAM	DURHAM	DURHAM
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
Moisture	N	2030	%	0.020	11	11	9.5
pH	U	2010		4.0	8.1	8.1	8.1
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010	0.030	0.018	0.014
Total Sulphur	U	2175	%	0.010	0.11	0.041	0.089
Cyanide (Total)	U	2300	mg/kg	0.50	< 0.50	< 0.50	0.50
Sulphate (Total)	U	2430	mg/kg	100	420	250	810
Arsenic	U	2450	mg/kg	1.0	8.6	7.2	17
Cadmium	U	2450	mg/kg	0.10	< 0.10	< 0.10	0.76
Chromium	U	2450	mg/kg	1.0	140	16	39
Copper	U	2450	mg/kg	0.50	24	17	75
Mercury	U	2450	mg/kg	0.10	0.50	1.1	0.92
Nickel	U	2450	mg/kg	0.50	58	9.0	25
Lead	U	2450	mg/kg	0.50	51	66	390
Selenium	U	2450	mg/kg	0.20	< 0.20	< 0.20	0.29
Zinc	U	2450	mg/kg	0.50	56	37	170
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50
Organic Matter	U	2625	%	0.40	2.2	1.2	4.3
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	[C] < 1.0	[C] < 1.0	[C] < 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	[C] < 1.0	[C] < 1.0	[C] < 1.0
Aliphatic TPH >C8-C10	U	2680	mg/kg	1.0	[C] < 1.0	[C] < 1.0	[C] < 1.0
Aliphatic TPH >C10-C12	U	2680	mg/kg	1.0	[C] < 1.0	[C] < 1.0	[C] < 1.0
Aliphatic TPH >C12-C16	U	2680	mg/kg	1.0	[C] 16	[C] < 1.0	[C] < 1.0
Aliphatic TPH >C16-C21	U	2680	mg/kg	1.0	[C] < 1.0	[C] < 1.0	[C] < 1.0
Aliphatic TPH >C21-C35	U	2680	mg/kg	1.0	[C] 120	[C] < 1.0	[C] < 1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	[C] < 1.0	[C] < 1.0	[C] < 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	[C] 130	[C] < 5.0	[C] < 5.0
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	[C] < 1.0	[C] < 1.0	[C] < 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	[C] < 1.0	[C] < 1.0	[C] < 1.0
Aromatic TPH >C8-C10	U	2680	mg/kg	1.0	[C] < 1.0	[C] < 1.0	[C] < 1.0
Aromatic TPH >C10-C12	U	2680	mg/kg	1.0	[C] < 1.0	[C] < 1.0	[C] < 1.0
Aromatic TPH >C12-C16	U	2680	mg/kg	1.0	[C] < 1.0	[C] < 1.0	[C] < 1.0
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	[C] 7.6	[C] < 1.0	[C] < 1.0
Aromatic TPH >C21-C35	U	2680	mg/kg	1.0	[C] 61	[C] < 1.0	[C] < 1.0
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	[C] < 1.0	[C] < 1.0	[C] < 1.0
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	[C] 69	[C] < 5.0	[C] < 5.0
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	[C] 200	[C] < 10	[C] < 10

Results - Soil

Project: 2112-21

Client: Geoenviron Solutions Ltd	Chemtest Job No.:				22-10319	22-10319	22-10319
Quotation No.:	Chemtest Sample ID.:				1394311	1394312	1394313
	Sample Location:				TP01	TP02	TP03
	Sample Type:				SOIL	SOIL	SOIL
	Top Depth (m):				0.7	0.6	0.3
	Date Sampled:				16-Mar-2022	16-Mar-2022	16-Mar-2022
	Asbestos Lab:				DURHAM	DURHAM	DURHAM
Determinand	Accred.	SOP	Units	LOD			
Naphthalene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Acenaphthylene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Acenaphthene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Fluorene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	U	2700	mg/kg	0.10	2.2	< 0.10	2.3
Anthracene	U	2700	mg/kg	0.10	0.48	< 0.10	1.1
Fluoranthene	U	2700	mg/kg	0.10	3.6	< 0.10	3.5
Pyrene	U	2700	mg/kg	0.10	3.4	< 0.10	< 0.10
Benzo[a]anthracene	U	2700	mg/kg	0.10	2.1	< 0.10	2.0
Chrysene	U	2700	mg/kg	0.10	2.8	< 0.10	2.7
Benzo[b]fluoranthene	U	2700	mg/kg	0.10	1.7	< 0.10	2.1
Benzo[k]fluoranthene	U	2700	mg/kg	0.10	0.53	< 0.10	1.5
Benzo[a]pyrene	U	2700	mg/kg	0.10	1.9	< 0.10	1.9
Indeno(1,2,3-c,d)Pyrene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Dibenz(a,h)Anthracene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Total Of 16 PAH's	U	2700	mg/kg	2.0	19	< 2.0	17
Benzene	U	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0	[C] < 1.0
Toluene	U	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0	[C] < 1.0
Ethylbenzene	U	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0	[C] < 1.0
m & p-Xylene	U	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0	[C] < 1.0
o-Xylene	U	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0	[C] < 1.0
Methyl Tert-Butyl Ether	U	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0	[C] < 1.0
Total Phenols	U	2920	mg/kg	0.10	< 0.10	< 0.10	< 0.10

Deviations

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

Sample:	Sample Ref:	Sample ID:	Sample Location:	Sampled Date:	Deviation Code(s):	Containers Received:
1394311			TP01	16-Mar-2022	C	Plastic Tub 1000g
1394312			TP02	16-Mar-2022	C	Plastic Tub 1000g
1394313			TP03	16-Mar-2022	C	Plastic Tub 1000g

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	Alkaline 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.
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
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; Dibenzo[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

[illegible]

Parameter	Residential <u>with</u> homegrown produce			Residential <u>without</u> homegrown produce			Allotment			Commercial / Industrial			Public Open Space near Residential			Public Open Space - Park			Source
	(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)						
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)anthracen e	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)fluoranth ene	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)peryle ne	320	340	350	360	360	360	290	470	640	3900	4000	4000	640	640	640	1400	1500	1600	LQM (2014)
Benzo(k)fluoranth ene	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)anthra cene	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)

Parameter	Residential <u>with</u> homegrown produce			Residential <u>without</u> homegrown produce			Allotment			Commercial / Industrial			Public Open Space near Residential			Public Open Space - Park			Source
	(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			
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 <u>with</u> homegrown produce			Residential <u>without</u> homegrown produce			Allotment			Commercial / Industrial			Public Open Space near Residential			Public Open Space - Park			Source
	(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)						
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(2 83)	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)

Parameter	Residential <u>with</u> homegrown produce			Residential <u>without</u> homegrown produce			Allotment			Commercial / Industrial			Public Open Space near Residential			Public Open Space - Park			Source
	(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			
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)

Parameter	Residential <u>with</u> homegrown produce			Residential <u>without</u> homegrown produce			Allotment			Commercial / Industrial			Public Open Space near Residential			Public Open Space - Park			Source
	(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)						
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- Hexachlorocyclohe xane	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- hexachlorocyclohe xanes	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- hexachlorocyclohe xanes	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)

Parameter	Residential <u>with</u> homegrown produce			Residential <u>without</u> homegrown produce			Allotment			Commercial / Industrial			Public Open Space near Residential			Public Open Space - Park			Source
	(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			
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-Tetrachlorobenzen e	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-Tetrachlorobenzen e	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-Tetrachlorobenzen e	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)
Pentachlorobenzen e	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)
Hexachlorobenzen e	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 <u>with</u> homegrown produce			Residential <u>without</u> homegrown produce			Allotment			Commercial / Industrial			Public Open Space near Residential			Public Open Space - Park			Source
	(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)						
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)
Hexachlorobutadie ne	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

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 (UI)	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.	<i>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.</i> <i>Major fish kill in surface water from large spillage of contaminants from site.</i> <i>Highly elevated concentrations of List 1 and substances present in groundwater close to small potable abstraction (high sensitivity).</i> <i>Explosion, causing building collapse (can also equate to immediate human health risk if buildings are occupied).</i>
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.	<i>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.</i> <i>Damage to building rendering it unsafe to occupy e.g. foundation damage resulting in instability.</i> <i>Ingress of contaminants through plastic potable water pipes.</i>
Mild (MI)	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.	<i>Exposure could lead to slight short - term effects (e.g. mild skin rash).</i> <i>Surface spalling of concrete.</i>
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.	<i>The presence of contaminants at such concentrations that protective equipment is required during site works.</i> <i>The loss of plants in a landscaping scheme.</i> <i>Discoloration of concrete.</i>

* 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

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

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 (UI)	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.