REMEDIATION STRATEGY
FOR LAND AT
UNION STREET
HECKMONDWIKE

Prepared for: -

BAK Building (Contracts) Limited
Belmont House
2 Dalton Court
Commercial Road
Darwen
BB3 0DG

GeoCon Site Investigations Ltd
Suite 2 Marple House
39 Stockport Road,
Marple,
Stockport
SK6 6BD

March 2020
Ref: K0234 IW (GSI1143) RS RK BAK 1130320

Quality Assurance	
Project ID	GSI 1143
Project Name	Union Street, Heckmondwike
Report Type	Remediation Strategy
Report Reference	K0234 IW (GSI1143) RS 130320
Client	BAK Building (Contracts) Limited
Version	Version 1
Date of First Issue	March 2020
Revision Date	-
Written by	*Ian Walker* For and on behalf of GeoCon Site Investigations Ltd Ian Walker B.Sc. (Hons) F.G.S Director
Reviewed by	*Christopher Oates* For and on behalf of GeoCon Site Investigations Ltd Christopher Oates B.Sc. (Hons) FGS MIEnvSc Senior Engineer
Authorised by	*Ian Walker* For and on behalf of GeoCon Site Investigations Ltd Ian Walker B.Sc. (Hons) F.G.S Director

From herein after GeoCon Site Investigations Ltd will be referred to as GeoCon.

GeoCon Offices:

Manchester (Head Office)
Suite 2 Marple House
39 Stockport Rd
Marple
Stockport
SK6 6BD
Tel: 0844 504 3901

Birmingham
2nd Floor,
Quayside Tower,
Broad Street,
Birmingham.
B1 2HF
Tel: 0844 504 6901

London (East)
Fortis House
160 London Rd,
Barking
London
IG11 8BB
Tel: 0844 504 7901

Newcastle-Upon-Tyne:
The Axis Building,
Maingate, Kingsway North,
Team Valley,
Gateshead,
NE11 0NQ
Tel: 0844 504 7981

Bristol:
2430 / 2440
The Quadrant,
Almondsbury,
Bristol,
BS32 4AQ
Tel: 0844 504 9208

London (West)
Building 3 Chiswick Park,
566 Chiswick High Road,
Chiswick,
London,
W4 5YA
Tel: 0844 504 4901

Table of Contents

List of Tables

APPENDICES

Appendix	Information
A	Drawings
B	Chemical Testing Results
C	Chemical Screening Criteria
D	Probability/Consequence Matrix
E	Gas Monitoring Data

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
LQM	Land Quality Management
mbgl	Meters Below Ground Level
MP	Mackintosh Probe
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

1.0 INTRODUCTION

1.1 Instruction

1.1.1 GeoCon Site Investigations Ltd (GeoCon) have been commissioned by BAK Building (Contracts) Limited to develop a Remediation Strategy on Land at Union Street, Heckmondwike.

1.1.2 It is understood that development proposals comprise the redevelopment of the site for new residential properties.

1.2 Previous Surveys

1.2.1 Previous assessments conducted upon the site comprise the following, which should be read in conjunction with this strategy:

- Phase I Preliminary Risk Assessment carried out by ARP Geotechnical Ltd in September 2009.
- Phase II Site Investigation referenced K0234 TF (GSI1143) PII Report RK BAK 110719 dated March 2020.

1.3 Objectives

1.3.1 The objective of this remediation strategy is as follows:

- To outline the remedial strategy proposed at the site and the proposed verification strategy for agreement by the Local Planning Authority.

1.4 Limitations

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

1.4.2 This report presents the observations made during the geoenvironmental site investigations 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. GeoCon assumes all third party data to be true and correct. No responsibility can be accepted by GeoCon for inaccuracies in the information provided by any other party.

1.4.3 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. GeoCon 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.

1.4.4 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. 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. GeoCon cannot accept responsibility for any situations resulting from locally unforeseen ground conditions occurring between exploratory holes.

1.4.5 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.

2.0 SITE LOCATION AND DESCRIPTION

2.1 Site Location

2.1.1 The site is located at land off Union Street, Heckmondwike at approximate National Grid Reference NGR: 21139:23420 (centre of the site).

2.1.2 A site location plan is presented as Drawing No. GSI1143/01 in Appendix A.

2.2 Site Description

2.2.1 The site is a trapezoid shaped piece of land adjacent to the existing furniture vendors, and is currently unused land, vegetation has been removed prior to commencement of development.

2.2.2 The site is situated within an existing residential area and is bound by a timber yard to the west, the Spen River to the south (separated from the site by a wall), a cycle lane and car park to the North, and a small furniture factory to the East, with neighbouring residential and commercial properties beyond.

2.2.3 Site surface levels have been visibly altered during the duration of the ground investigation.

2.2.4 The topography of the site is gently sloping down towards the River Spen.

2.2.5 Access to the site is via Union Street from the West.

2.3 Future Site Usage

2.3.1 It is currently proposed to redevelop the site with residential housing.

2.4 Surrounding Area

2.4.1 The current surrounding land use to the site is generally commercial, residential and industrial properties in all directions.

2.4.2 The topography of the surrounding area is generally flat.

2.5 Statutory Services

2.5.1 GeoCon have not been provided with buried service location plans at this stage.

2.6 Site Reconnaissance

2.6.1 A site walkover was carried out on 9th July 2019. All details from the site walkover are included in the site description above.

2.6.2 There are no further relevant details above those which are already given in this report.

3.0 BACKGROUND

3.1 Published Geology

3.1.1 The British Geological Survey (BGS) Map Sheet 77 Huddersfield, Solid and Drift Edition, and the BGS Online Open Geoscience shows the site to be underlain by the following geological succession outlined below in Table 4.1: Geology.

Table 3.1: Geology

Geology	Description /strata
Artificial	None Recorded
Superficial	Alluvium
Bedrock	Pennine Lower Coal Measures Formation / Falhouse Rock

3.1.2 There are no artificial deposits indicated underlying the site.

3.1.3 The superficial deposits beneath the site are shown to be alluvium, which is generally described as *'the unconsolidated detrital material deposited by a river, stream or other body of running water as a sorted or semi-sorted sediment'* (BGS General Description).

3.1.4 The bedrock geology at the site is shown to be rocks of the Pennine Lower Coal Measures Formation and Falhouse Rock which are generally described as *'interbedded grey mudstone, siltstone and pale grey sandstone, commonly with mudstones containing marine fossils in the lower part, and more numerous and thicker coal seams in the upper part'* and '*fine-grained, thinly bedded sandstone that forms a number of leaves interbedded with mudstone*' respectively (BGS general description).

3.2 Hydrology and hydrogeology

3.2.1 The Phase I PRA carried out by ARP Geotechnical concluded that risks to groundwater are very low and no further assessment is required with respect to drinking water and groundwater.

3.2.2 The Phase I PRA carried out by ARP Geotechnical concluded the nearest surface watercourse to the site is the River Spen located adjacent to the southern site boundary. There are no licensed surface water abstraction points within 500m of the site.

3.3 Ground Investigation

3.3.1 The intrusive investigation was carried out over three phases between 9th and 10th July 2019, 30th July 2019, and 28th and 31st January 2020.

3.3.2 The actual ground investigation comprised the formation of:

- Nine windowless sample boreholes;
- Three cable percussion boreholes;
- Full supervision of all works by engineering geologist including sampling and detailed geotechnical descriptions to BS5930, EN ISO 14688-1 EN ISO 14688-2 and EN ISO 14689 of all strata types encountered within the exploratory holes;
- The installation of eight gas and groundwater monitoring wells;
- Subsequent gas and groundwater monitoring in accordance with CIRIA 665;
- A suite of chemical laboratory analysis; and,
- Production of an interpretative report.

3.4 Ground Conditions

General

3.4.1 It should be noted that the ground levels across the site appear to have been altered between the separate phases of ground investigation. This was observed and recorded via visual inspection, however GeoCon have not been provided with any documents relating to change is site level. Therefore, the ground condition section below refers to all deposits from ground level at the time of investigation.

3.4.2 The actual ground conditions encountered across the site were generally uniform and comprised of Made Ground over Alluvium and Pennine Lower Coal Measures Formation.

3.4.3 The general ground conditions encountered have been summarised below, and are in relation to sample locations shown on the exploratory hole location plan provided in Appendix A.

Made Ground

3.4.4 Made Ground was encountered in WS01, WS05, WS06, WS07, WS08, WS09, BH01a, BH02 and BH03 from ground level to depths of between 0.20 and 1.40mbgl.

3.4.5 The Made Ground generally comprised of hardstanding, granular and cohesive Made Ground materials.

Hardstanding:

3.4.6 Hardstanding was encountered in WS06 and BH02 from 0.10 to 0.35mbgl and comprised of concrete.

Granular Made Ground:

3.4.7 Granular Made Ground materials were encountered in WS01, WS05, WS06, WS07, WS08, WS09, BH01a from ground level to depths of 1.40mbgl, and generally comprised of clayey sandy gravel, silty gravel, gravel and gravelly sand with fragments of brick, fabric, ceramics, timber, ash, slag, clinker, plastic, glass, limestone and sandstone.

Cohesive Made Ground:

3.4.8 Cohesive Made Ground materials were encountered WS01, WS07, WS08, WS09, BH02, BH03 from ground level to depths of 1.40mbgl, and generally comprised of soft to firm gravelly clay and clay with fragments of brick and clinker.

Alluvium

3.4.9 Materials considered to represent Alluvium were encountered in all exploratory hole locations except WS06 from ground level to 4.80mbgl.

3.4.10 The Alluvium deposits generally comprised of clay, sandy clay, gravelly clay, sandy gravelly clay, clayey gravelly sand, silty gravel, clayey gravel and sandy gravel with fragments of mudstone, sandstone, coal and siltstone.

Pennine Lower Coal Measures Formation)

3.4.11 Deposits considered to represent weathered Pennine Lower Coal Measures Formation were encountered in all exploratory hole locations except for WS05, WS06 and WS09 and were proved to depths of between 1.90 to 5.69mbgl.

3.4.12 The Pennine Lower Coal Measures Formation generally comprised very weak thinly laminated sandstone, or stiff grey clay, containing gravels of thinly laminated green and grey sandstone, siltstone and mudstone.

Groundwater

3.4.13 Groundwater was encountered in all exploratory holes across the site. Further details are as follows: -

- WS01 – 2.00mbgl remaining steady after 20 minutes.

- WS02 – 1.00mbgl remaining steady after 20 minutes.
- WS03 – 2.00mbgl remaining steady after 20 minutes.
- WS04 – 2.00mbgl remaining steady after 20 minutes.
- WS05 – 2.00mbgl remaining steady after 20 minutes.
- WS07 – 3.40mbgl remaining steady after 20 minutes.
- WS08 – 3.00mbgl remaining steady after 20 minutes.
- WS09 – 2.00mbgl remaining steady after 20 minutes.
- BH01a – 3.00mbgl rising to 2.00mbgl after 20 minutes.
- BH03 – 2.00mbgl rising to 1.80mbgl after 20 minutes.

Contamination

3.4.14 A strong petrochemical odour was noted at 0.30mbgl in BH01a.

3.4.15 No further 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.

4.0 CHEMICAL TESTING AND RESULTS

4.1 General

4.1.1 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 4.1 Summary of Chemical Testing Suite below. Chemical results have been screened against current guideline values where applicable for a residential end use.

4.1.2 All chemical testing results are presented in Appendix B.

Table 4.1: Summary of Chemical Testing Suite

Testing	Comment	No. of soil samples analysed	No. of groundwater 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 Made Ground within the area previously not accessible to achieve general site coverage, and targeting former uses on site and off site within influencing distance	11	2
Speciated PAH	General analysis of Made Ground within the area previously not accessible to achieve general site coverage, and targeting former uses on site and off site within influencing distance	11	2
TPH CWG	General analysis of Made Ground within the area previously not accessible to achieve general site coverage, and targeting former uses on site and off site within influencing distance	11	2
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	10	-

4.2 Soils Test Results

4.2.1 All chemical results have initially been compared against screening criteria for a residential end use with plant uptake.

4.2.2 Only detectable concentrations of contaminants reported above the screening criteria are presented overleaf in Table 4.2 Summary of soil chemical testing results.

Table 4.2: Summary of Soil Chemical Testing Results

Determinand	No. Of samples analysed	Screening value (mg/kg) (where applicable)	Determinand concentration range (mg/kg)	No of Samples exceeding screening value
Summary of soil results				
Arsenic	11	37	<0.04 – 0.96	2
Lead	11	210	19 – 381	1
Benzo(a)pyrene	11	2.2	<0.04 – 6.51	2
Benzo(b)fluoranthene	11	2.6	<0.05 – 7.37	2
Dibenzo(ah)anthracene	11	0.24	<0.04 – 0.96	2
Benzene	11	0.087	<0.01 - 467	1

4.2.3 In addition, ten samples were analysed for asbestos screen. No fibres were detected in any of the samples.

4.2.4 A list of the screening criteria used for soils is presented in Appendix C.

4.3 Groundwater Test Results

4.3.1 Only detectable concentrations of contaminants reported above the screening criteria, or where no screening criteria is available are presented below in All groundwater chemical results have initially been compared to Environmental Quality Standards (EQS) to assess risk to controlled waters. Any compound concentrations which exceed the EQS screening value are underlined. All other chemicals analysed not listed in the table recoded levels below the limits of detection.

4.3.2 Table 4.3: Summary of Groundwater Chemical Testing Results.

4.3.3 All groundwater chemical results have initially been compared to Environmental Quality Standards (EQS) to assess risk to controlled waters. Any compound concentrations which exceed the EQS screening value are underlined. All other chemicals analysed not listed in the table recoded levels below the limits of detection.

Table 4.3: Summary of Groundwater Chemical Testing Results

Determinand	No. Of samples analysed	Screening value (where applicable) (µg/l)	Determinant concentration range above detection (µg/l)	No of Samples exceeding screening value
Summary of Groundwater results		**EQS**		
Boron	2	2000	204 – 205	0
Copper	2	1	7 – 14	2
Nickel	2	34	6	0
Zinc	2	12.3	21 – 27	2
Aliphatic C6-8	2	NSV	1	0
Aliphatic C8-10	2	NSV	5	0
Total Aliphatics	2	NSV	6	0
Total Aromatics	2	NSV	12	0

NSV = No Screening Value Available

** = Hardness Dependent*

5.0 REFINED ENVIRONMENTAL RISK ASSESSMENT

5.1 General

5.1.1 The refined Environmental Risk Assessment has been evaluated using a probability/consequence matrix, which is provided in Appendix D.

5.2 Risk to Human Health

5.2.1 Most of the chemical determinants analysed recorded levels below the relevant screening criteria for a residential end use except for arsenic, lead, benzo(a)pyrene, benzo(a)fluoranthene, dibenzo(ah)anthracene and benzene.

5.2.2 An elevated concentration of arsenic was recorded in two samples from WS07 at 0.80mbgl at 86mg/kg and BH03 at 0.70mbgl at 38mg/kg, exceeding the screening criteria of 37mg/kg.

5.2.3 An elevated concentration of lead was recorded in one sample from BH03 at 0.70mbgl at 381mg/kg, exceeding the screening criteria of 210mg/kg.

5.2.4 Elevated concentrations of benzo(a)pyrene were recorded in two samples from BH03 at 0.70mbgl at 3.03 mg/kg and WS07 at 0.80mbgl at 6.51 mg/kg, exceeding the screening criteria for benzo(a)pyrene of 2.20mg/kg.

5.2.5 Elevated concentrations of benzo(a)fluoranthene were recorded in two samples from BH03 at 0.70mbgl at 3.63mg/kg, and WS07 at 0.80mbgl at 7.37mg/kg, exceeding the screening criteria of 2.60mg/kg.

5.2.6 Elevated concentrations of dibenzo(ah)anthracene were recorded in two samples from BH03 at 0.70mbgl at 0.48mg/kg, and WS07 at 0.80mbgl at 0.96mg/kg, exceeding the screening criteria of 0.24mg/kg.

5.2.7 Elevated concentrations of benzene were recorded in one sample from BH03 at 0.70mbgl at 467mg/kg, exceeding the screening criteria of 0.087mg/kg.

5.2.8 Based on the above, contamination is present beneath parts of the site within the Made Ground materials. The elevated levels of contamination may represent either localised hotspots of contamination or could be representative of the site as a whole.

5.2.9 It is understood that the development comprises two storey residential properties with private gardens and associated access road and driveways, which has already been constructed.

5.2.10 On this basis, the risk to end users and construction workers is considered to be low to moderate.

5.3 Risk to Controlled Waters

Groundwater

5.3.1 The Phase I PRA carried out by ARP Geotechnical concluded that risks to groundwater are very low and no further assessment is required with respect to drinking water and groundwater.

Surface Water

5.3.2 The nearest surface watercourse to the site is the River Spen located adjacent to the southern site boundary. There are no licensed surface water abstraction points within 500m of the site.

5.3.3 Chemical testing has been carried out on selected samples of groundwater taken from the adjacent River Spen, one upstream and one downstream (discussed in section 5.0). The risks have then been assessed by comparing the results of the groundwater analysis against EQS screening criteria and are discussed further below.

5.3.4 The majority of determinands recorded levels below the EQS, with the exception of copper and zinc.

5.3.5 Copper concentrations between 7 and 14µg/l were recorded in both water samples analysed, exceeding the lower EQS value of 1µg/l.

5.3.6 Zinc concentrations between 21 and 27µg/l were recorded in both water samples analysed, exceeding the lower EQS value of 12.3µg/l.

5.3.7 Considering the results of the soils analysis and the minor concentrations of copper and zinc within the soils across the site, it is considered unlikely that the site is the source contributing to these minor elevated concentrations.

5.3.8 Concentrations of TPH Aliphatic C6-8 (1-5µg/l), TPH Aliphatic C8-10 (5µg/l), Total Aliphatics (5µg/l), and Total Aromatics (12µg/l) were recorded in the samples of surface water, exceeding the detection limits of the analytical instrument, however there are currently no EQS values available for these determinands.

5.3.9 Considering the results of the soils analysis and that no TPH concentrations were recorded (all below detection) it is considered unlikely that the site is the source contributing to these minor elevated concentrations of THP.

5.3.10 Therefore, considering the above, the results of the soil and water testing, and considering that natural attenuation, dilution and dispersion will take place, and the generally impermeable geology at the site, the risks to surface water are considered to be **low**.

5.4 Plants and Native grasses

5.4.1 Any plants that may be grown at the site in areas of landscaping may potentially be at risk from phytotoxic elements in any artificial soils beneath the site. Given the above and the low potential for contamination the risks to plants and native grasses are considered to be **low**. These risks will be mitigated by the remedial measures set out in section 5.3 above.

5.5 Ground Gas Risk Assessment

5.5.1 There are no landfill sites or other waste associated sites within 250m of the site boundary.

5.5.2 Made Ground was also encountered beneath the site and was proven to depths of up to 1.40mbgl.

5.6 Buried Services and Utilities

5.6.1 Any organic contamination present in the soils or groundwater beneath the site would pose a risk of premature failure to below ground services via chemical reaction. Based on the chemical analysis carried out during this ground investigation, the risks to buried services and pipelines are considered to be **low**.

5.6.2 It is the responsibility of the utility providers to confirm the risk status and determine what materials should be used in the provision of any newly proposed buried services and utilities based on the results of the chemical analysis with this report. A copy of this report should therefore be provided to the utility contractors.

5.6.3 It is recommended that prior to the placement of any newly proposed buried services, that adequate testing of the soils of which the pipes/cables will be laid in is carried out to determine the suitability of those soils for the utility provider's equipment.

5.7 Updated Conceptual Site Model (CSM)

5.7.1 Following the results of the site investigation and above assessment, an updated Conceptual Site Model has been produced overleaf as Table 5.1: Updated Conceptual Site Model (CSM).

Table 5.1: Updated Conceptual Site Model (CSM)

Potential Sources	Potential Receptor	Potential Pathway	Likelihood	Severity	Pollutant Linkage	Risk Classification	Action / Mitigation
Heavy metals, sulphates and inorganics Leachable contamination Mobile and organic contamination PAH's, VOC's and SVOC's PCB's (off site and on-site sources)	Human health & animals: Including current site users, future site users, neighbouring residents and constructions workers	Ingestion Inhalation of dust Dermal Contact	Likely	High	Considered potentially active	**Moderate**	Results of the site investigation confirm that some levels of analytes analysed recorded levels above the relevant screening criteria for a residential end use. Therefore, remedial action is required.
	Local water courses and associated Flora and fauna.	Contaminants leaching, into water bodies, downward and lateral migration via permeable strata and features.	Unlikely	High	Considered inactive	**Low**	No further action.
	Aquifer (Drinking water)	Contaminants leaching, into water bodies, downward and lateral migration via permeable strata and features	Unlikely	High	Considered inactive	**Very low**	No further action.
Phytotoxic elements	Plants and vegetation	Plant uptake	Possible	High	Considered potentially active	**Low**	Results of the site investigation confirm that all levels of analytes analysed recorded levels above the relevant screening criteria. Therefore, remedial action is required.
Hazardous ground gases and vapours (off site and on-site sources)	Human health animals and plants: Including current site users, future site users,	Inhalation	Possible	High	TBC	**TBC**	Gas monitoring is currently ongoing at the site. Report will be updated on completion of the monitoring period.

	neighbouring residents and constructions workers						
Asbestos	Human health animals and plants: Including current site users, future site users, neighbouring residents and constructions workers	Inhalation	Unlikely	High	Considered inactive	**Very low**	Results of the site investigation confirm that no asbestos fibres were recorded in the samples analysed from the site. No further action.

6.0 REMEDIATION OUTLINE

6.1.1 The aim of this Remediation Strategy is to minimize the risk to identified receptors, in this case:

- Construction Workers, and
- Future residents of the proposed development

in a managed approach, and thus render the site as being unlikely to be identified as Contaminated Land as defined by Part 2A of the EPA by breaking any potential pollutant linkages identified as being potentially associated with this site.

6.1.2 Contamination on site is identified as:

- Impacts of arsenic, lead, benzo(a)pyrene, benzo(a)fluoranthene, dibenzo(ah)anthracene and benzene recorded at near surface depths in the Made Ground.
- Impacts of copper, zinc and TPH with respect to surface waters.

6.1.3 The identified soil contamination findings are all located in areas associated with proposed hardstanding.

6.1.4 The investigation to date has been point specific, therefore there is potential for further contamination to be present on site in those areas not previously tested.

6.1.5 Based on the contamination profile identified and the proposed end use of the site, in order to meet the needs of this Remediation Strategy the recommendations as set out in Section 7.0 below are considered the appropriate approach.

7.0 REMEDIATION STRATEGY

7.1 Aims

7.1.1 The aims of this remediation strategy are the following:

- Resolve any identified and potential contamination issues in order to protect environmental receptors and render the site suitable for the proposed development with respect to the National Planning Policy Framework (NPPF).
- Render the site as unlikely to be defined as Contaminated Land as defined under Part 2A of the EPA.

7.2 Construction Activities

7.2.1 During the construction works, all personnel on site will comply with guidance provided in the Health and Safety Executive (HSE) document "Protection of Workers and the general public during the redevelopment of potentially Contaminated Land". In summary, the following should be provided by the appointed contractor:

- All staff to be suitably trained and competent;
- Protective clothing, footwear, glasses, suitable dust masks and gloves. (Personnel should be instructed in why and how they are to be used);
- Hand-washing, eye-washing and boot-washing facilities;
- Damp down all exposed soils on site;
- Smoking shall be limited to designated areas.

7.3 Removal of Below Ground Obstructions

7.3.1 Obstructions in the form of relic foundations and infrastructure may be found on site during groundworks.

7.3.2 Where relict structures are found to retain fluid contaminants, they shall be drained and removed from site. The engineer should be notified to ensure that the appropriate action is taken and records made for final validation.

7.3.3 Deep excavations for the removal of structures etc. will be unstable in the short term and side support may be necessary.

7.3.4 Suitable materials derived from the grubbing-up shall be stored in a location on site, to be agreed with the engineer, prior to crushing. Any unsuitable materials shall be removed to a suitable licensed landfill site as stipulated within the Materials Management Plan.

7.4 Contaminated soils

7.4.1 It is understood that the proposed development comprises residential properties with private gardens and associated access roads and driveways.

7.4.2 Chemical sampling and analysis of site soils, to date, indicate that remedial measures are required with respect to landscaped areas of the site where contaminants have been identified to ensure that it is suitable for a residential end use.

7.4.3 The Made Ground materials should be removed from the site within soft landscaping areas / garden areas around the locations of the elevated hotspots (BH03 and WS07) and replaced with clean imported

materials. These should be removed up to the nearest clean sampling point. During removal, it is recommended that a watching brief is present on site and samples are taken from four sides and the base of each excavation and analysed to confirm the elevated contamination is no longer present.

7.4.4 Therefore, assuming that site levels will be as per final levels, it is recommended at this stage, as a minimum, the upper 600mm of Made Ground materials should be removed from site in accordance with BRE Cover systems for land regeneration 2004. This document recommends that based on the soil testing results, 600 mm of Made Ground below proposed formation level should be removed from site and replaced with clean inert materials comprising of clean inert imported topsoil / subsoil material in line with BS 3882: 2015 Specification for topsoil. Some of these materials may require removal anyway as part of the construction process.

7.4.5 It may be possible to reduce the thickness of the cover system by installing a capillary break layer, no dig layer, and / or geotextile.

7.4.6 Where the Made Ground materials are less than 600 mm thick, only the Made Ground materials will require removal.

7.4.7 In areas of the site where buildings and hardstanding are proposed the Made Ground can be left insitu as the buildings and hardstanding areas will break the 'pollutant linkage' and remove the pathway for contamination and come in to contact with the end users.

7.4.8 Excavations should not be left open for longer than necessary, should be safely battered back and should be securely cordoned-off using 2.00m high Herras type fencing, with appropriate warning signs whenever excavations works are suspended.

7.5 Export to Landfill

7.5.1 Any material exported from the site to landfill should be hauled by a registered waste carrier in accordance with the requirements of the Duty of Care Regulations, 1991 and the Landfill (England and Wales) Regulations 2005.

7.5.2 A transfer note should be completed, signed and retained by the parties involved.

7.5.3 All hazardous waste going for disposal at landfills must be classified according to the new European Waste Catalogue (EWC).

7.5.4 Assessment of chemical analysis data indicates that soils would likely be classified as Non-hazardous to Hazardous Waste across the site should off-site disposal to landfill be required. However, this would need to be confirmed with the landfill operator and may require appropriate classification testing prior to disposal. Isolated hotspots if encountered may need to be taken off as Non-Hazardous or Hazardous Waste, however this is considered to be very unlikely. Any off-site disposal of soil requires careful management and due consideration of appropriate legislation, guidance and Duty of Care responsibilities.

7.5.5 Waste Acceptance Criteria (WAC) has been carried out on four samples taken from the Made Ground beneath the site, and one additional samples, from a stockpile present on site. The results of the WAC testing results should be presented to the landfill operator for their confirmation.

7.6 Dust Control

7.6.1 At all times during the excavation works, Best Practicable Means shall be employed to minimise dust and odour generation and their emission off site.

7.7 Asbestos

7.7.1 No asbestos fibres were recorded at the site, therefore it is unlikely that asbestos is present within the Made Ground materials beneath the site.

7.7.2 If asbestos is identified at any stage during the construction the following additional PPE should be utilized:

- Personal asbestos monitors;
- Background asbestos monitors;
- Disposable coveralls should be provided where appropriate.

7.7.3 GeoCon does not offer professional advice on asbestos management and disposal. Specialist advise should be sought from a suitable asbestos consultant/contractor.

7.9 Previously Unidentified Contaminants

7.9.1 Should any suspected contaminated materials other than those detailed in this and previous reports be encountered during the re-development, then it should be excavated and stockpiled on an impermeable material and sampled and tested for an appropriate range of determinants.

7.9.2 Should any visual or olfactory evidence of contamination be identified during the removal of below ground obstructions and the turning over of Made Ground appropriate samples shall be taken by the Engineer for chemical analysis. The Engineer shall check the nature of materials excavated for visual and olfactory evidence of hydrocarbon contamination throughout the remedial works. Depending on the results, the excavated materials shall either be returned to the works beneath the proposed cover system or disposed of, off-site to a suitable licensed facility.

7.9.3 Any grossly 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 following crushing in line with the earthworks specification.

7.9.4 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.

7.9.5 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.

7.11 Drainage and Services Installations

7.11.1 It is recommended that statutory services are consulted at an early stage, with respect to the ground conditions within which they will lay services, in order to enable them to assess if any protection measures are required.

7.11.2 Underground services, comprising BT Lines, gas mains, combined and foul sewers, CCTV and possible fibre optic cables may all impact the site and the design team and Client should familiarise themselves with their presence.

All drainage installation will encounter Made Ground. Any suitable Made Ground arisings from drainage trenches etc., if not returned to the original excavation must be placed beneath proposed hard end-use areas of the site, placed beneath a cover of suitable thickness in garden and landscaped areas, or disposed off-site adhering to the guidelines outlined above.

7.12 Soakaway Drainage

7.12.1 Should soakaways be utilised at the site, these should not be placed within significantly contaminated Made Ground, thereby preventing the potential for leachate generation.

7.13 Materials Management Plan

7.13.1 A Materials Management Plan is advised to be undertaken if not already prepared and should allow for remediation of the site soils in the landscaped areas during the appropriate phase of the works.

7.13.2 The Materials Management Plan should also refer to this strategy in respect to:

- Materials arising from the encountering of previously unidentified contamination.
- Materials arising from the removal of below ground obstructions.
- Control of water.
- Contamination related Health and Safety issues, including dust control.

7.13.3 GeoCon does not provide advice on Materials Management Plans, expert advice should be sought.

8.0 VALIDATION

8.1.1 Validation chemical testing should be provided by the supplier of any capping material to be imported to confirm its suitability for use on site. All soil imported should be certified prior to import to be suitable for use chemically plus BS3883 compliant for topsoil.

8.1.2 Where pre-testing of any proposed imported material is not viable, for whatever reason, validation samples will need to be collected from said materials prior to placement.

8.1.3 Where any material is deemed to be unsuitable for use in the capping layer, either by GeoCon or the Local Authority/Environment Agency, the Contractor shall make provision for the costs of sampling, testing and removal of unacceptable materials from excavations and shall make provisions for delays associated with material testing and classification prior to disposal.

8.1.4 Soil samples destined for chemical analysis to be collected in appropriate sampling containers. All samples will subsequently be stored in cool boxes prior to submission to a suitably accredited laboratory for analysis. The minimum analysis to be undertaken on materials for use within the cover system is detailed in table 8.1 below.

Table 8.1: Proposed Testing frequency and analysis

Soil Source	Testing frequency	Analysis suite
Site sourced soils	1 sample per 50m^3	Heavy metals/metalloids, and inorganics, Speciated PAH, TPH CWG, asbestos screen.
Imported soils brownfield source	1 sample per 50m^3	Heavy metals/metalloids, and inorganics, Speciated PAH, TPH CWG, asbestos screen.
Imported soils greenfield source	1 sample per 250m^3	Heavy metals/metalloids, and inorganics, Speciated PAH, TPH CWG, asbestos screen.

Analysis suite subject to review of specific soil source.

8.1.5 Where less than the stated volumes are utilised a minimum of three samples will be taken from each material/soil source.

8.1.6 Depth validation of the capping system will be required within landscaped areas. The validation will comprise a hand dug pits, with photographic record and insitu testing of all soil will be undertaken as part of the verification. Samples should be taken from each validation pit for subsequent testing. All testing should be in line with Table 8.1 Above.

8.1.7 The Validation Report will include the following:

- Remediation Strategy (including copies of confirmation from regulatory authorities agreeing criteria).
- Photographic evidence of the removal of material from site.
- Detailed drawings of the excavated areas showing the extent of the material removal operation and the locations of where the validating samples were taken.
- Test results showing that the side walls of the excavation are free from contamination, indicating that all the contamination has been removed.
- Details of the provenance of the subsoil and topsoil (to be provided by contractor).

- Copy of Consignment Notes relating to the movement of wastes to a licensed waste management facility.
- Laboratory analysis of validation soil samples and assessment of suitability for use.
- Logs indicating the thickness of cover soils within each trial pit excavated.
- A drawing indicating the location of cover thickness validation trial pits.
- Detailed drawings showing all sampling locations for chemical testing.
- Details of any gas membrane installation, including confirmation of compliance with the installation specification by the installer and independent validator.
- Photographic evidence obtained during the installation process of the gas protection membrane.
- Details of any variation from the adopted strategy due to unforeseen circumstances.
- Details of any previously unidentified contamination encountered.
- Details of any potentially contaminative activity occurrences that took place.
- Production of a Validation Report.

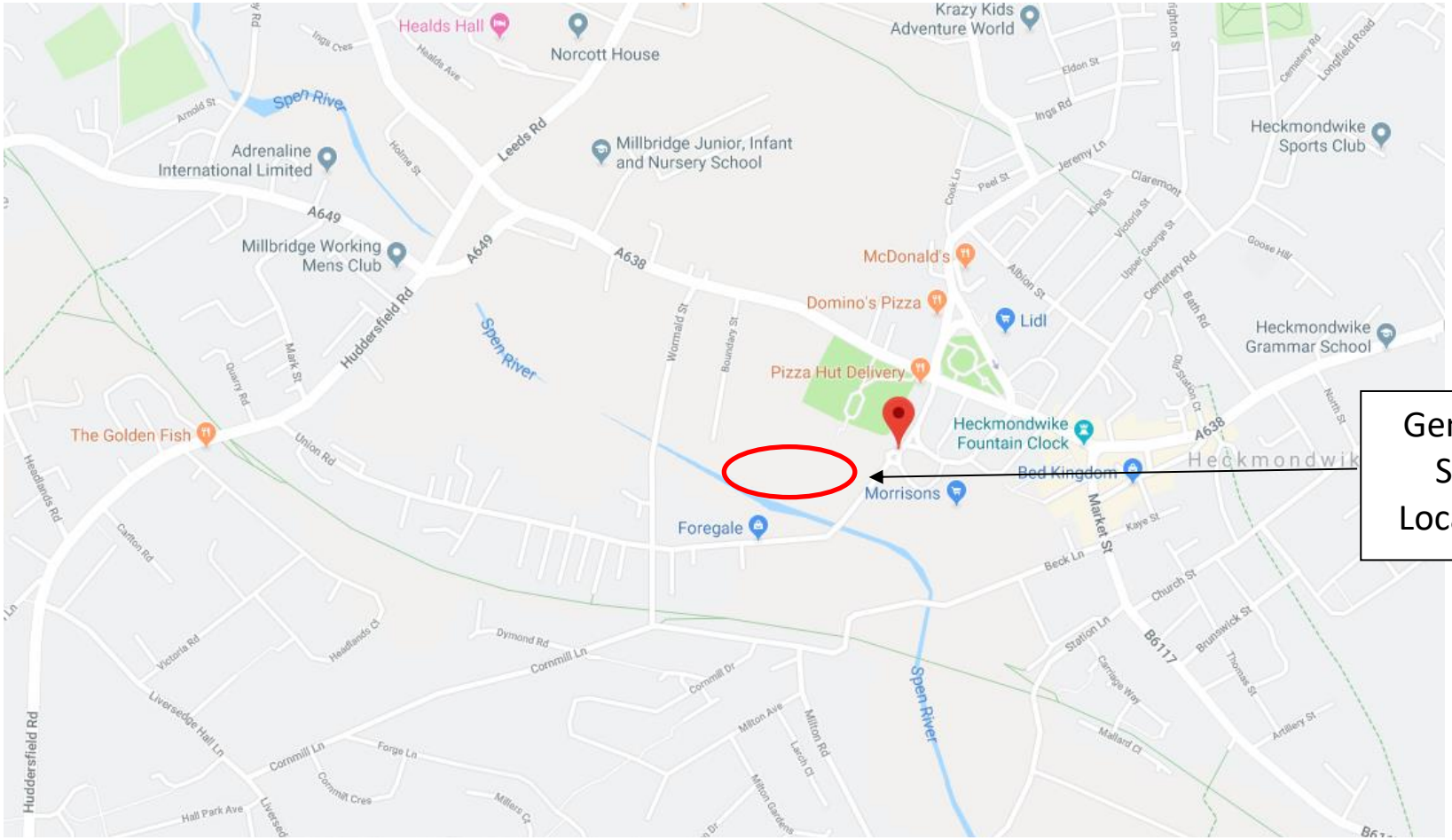
9.0 REFERENCES

- *AGS: A clients guides and tool kit*
- *Atkins: AtRisk Soil Screening Values and Water Screening Values*
- *Bowles, J. E. (1996): Foundation analysis and design, McGraw-Hill, New York.*
- *British Geological Survey (BGS): 1:50'000 geological maps of the area*
- *British Geological Survey (BGS): Open geoscience online mapping tool*
- *BS 5930: code of Practise for Site Investigation Amendment 2*
- *BS 10175: Code of Practise for the Investigation of Potentially Contaminated Sites*
- *BRE 410 (2004): Working platforms for tracked plant: Good practice guide to the design, installation, maintenance and repair of ground-supported working platforms, BRE Press, Garston.*
- *BRE 211 Radon: Guidance on protective measures for new buildings*
- *CIRIA 552: Contaminated Land Risk Assessment; A Guide to Good Practise 2001*
- *CIRIA 665: Assessing the Risks Posed by Hazardous Ground Gases for Buildings 2007*
- *Coal Authority: Coal authority mining report and Cheshire brine subsidence report*
- *Contaminated Land: Applications in Real Environments (CL:AIRE): 'The Soil Generic Assessment Criteria for Human Health Risk Assessment' GAC's.*
- *David Norbury: Soil and Rock Descriptions in Engineering Practise*
- *Department of the Environment: DOE industry profiles*
- *EN ISO 14688-1: Geotechnical investigation and testing -- Identification and classification of soil -- Part 1: Identification and description*
- *EN ISO 14688-2: Geotechnical investigation and testing -- Identification and classification of soil -- Part 2: Principles for a classification*
- *EN ISO 14689: Geotechnical investigation and testing -- Identification and classification of rock -- Part 1: Identification and description*
- *Environment Agency (EA): EA Online & What's in my back yard*
- *Environment Agency (EA): Soil Guideline Values (SGVs)*
- *International Society of Rock Mechanics (ISRM): Commission on Testing Methods (1985) Suggested Method for Determining Point Load Strength, Int. J. Rock Mech. Min. Sci. and Geomech. Abstr. 22, 1985, pp.51-60.*
- *Land Quality Management (LQM): Generic Screening Criteria (GACs)*
- *Landmark: Envirocheck report and Envirocheck analysis online historical mapping tool*
- *Ordnance survey: OS Landranger map for the area; OS open data online mapping tool*
- *Planning Policy 23: Planning and Pollution Control, Office of The Deputy Prime Minister 2004*
- *R&D Publication CLR 8: Assessment of risks to human health from land contamination*
- *R&D Publication CLR 10: The Contaminated Land Exposure Model (CLEA)*
- *R&D Publication CLR 11: Model Procedure for the Management of Contaminated Land DEFRA 2004*
- *Stroud M.A: The standard penetration test in insensitive clays, Proceedings of the European Symposium on Penetration Testing, Stockholm, 1975, Vol 2,pp 367 – 75.*
- *UK Specification for Ground Investigation Second Edition 2012*

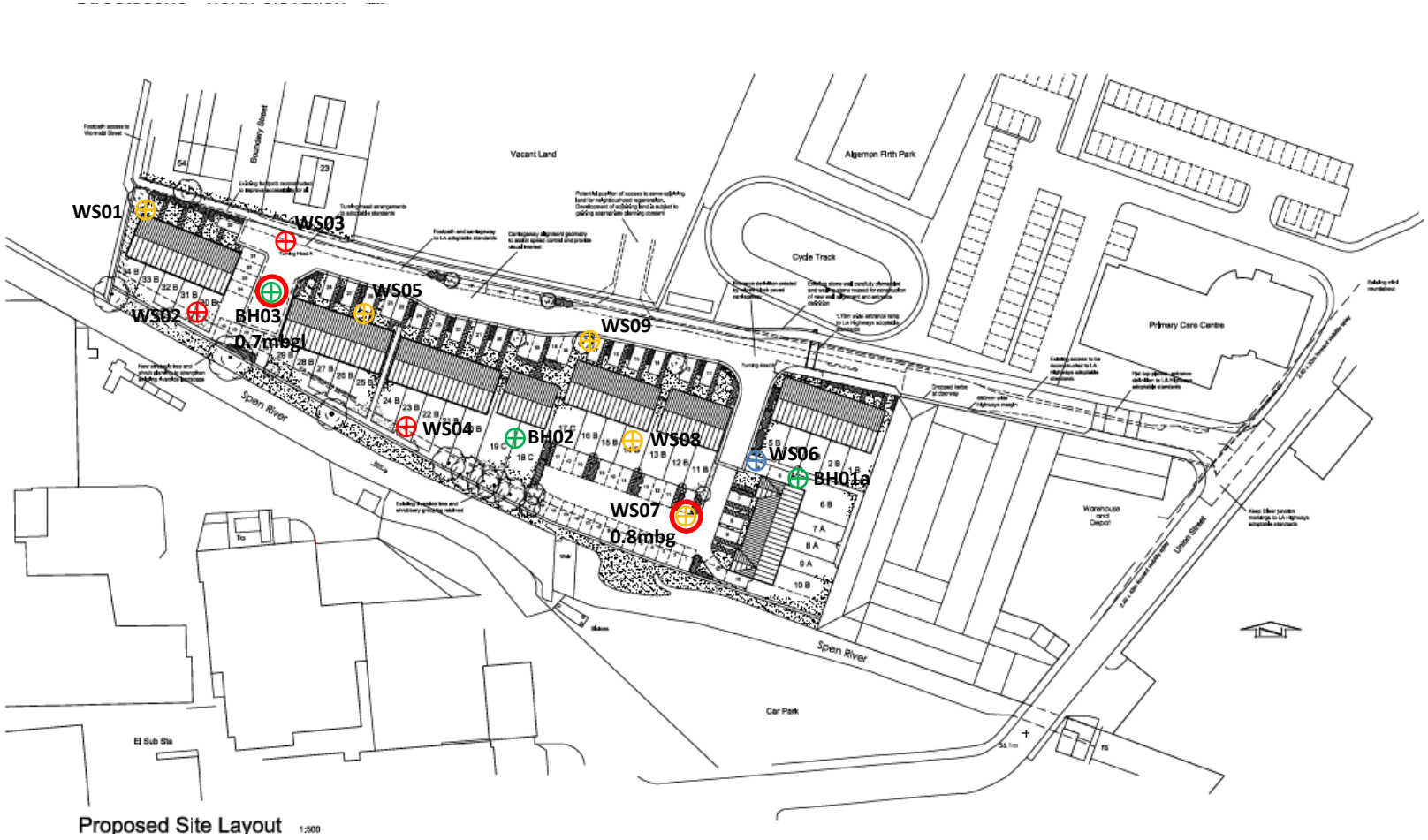
APPENDIX A

DRAWINGS

N



GEOCON	GeoCon Site Investigations Ltd Suite 2 Marple House, 39 Stockport Road, Marple, Stockport, SK6 6BD. Tel: 0844 504 3901, Fax: 0844 504 3902, Email: info@geoconsiteinvestigations.com Web: www.geoconsiteinvestigations.com	**SITE NAME/CONTRACT** Union Street, Heckmondwike	**DRAWING NO.** GSI 1143/01	**SCALE** N.T.S
		TITLE Site Location Plan	**DATE** June 2019	**DRAWN BY** SP



Legend:

⊕ : Windowless sample location

⊕ : Windowless sample location with install

⊕ : Windowless sample location, abandoned due to repeated obstruction

⊕ : Cable Percussion location

○ : Location with elevated concentrations of contaminants with respect to GAC value

GeoCon Site Investigations Ltd
Suite 2 Marple House,
39 Stockport Road,
Marple,
Stockport,
SK6 6BD.
Tel: 0844 504 3901, Fax: 0844 504 3902,
Email: info@geoconsiteinvestigations.com
Web: www.geoconsiteinvestigations.com

SITE NAME/CONTRACT	DRAWING NO.	SCALE
Union Street, Heckmondwike	GSI 1143/05	N.T.S
TITLE	**DATE**	**DRAWN BY**
Borehole location plan showing raised contamination locations	March 2020	CO

APPENDIX B

CHEMICAL TESTING RESULTS

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 19/06810
Issue Number: 1 **Date:** 23 July, 2019

Client:
Geocon Site Investigations Ltd
Suite 2 Marple House,
39 Stockport Road,
Marple
Stockport
UK
SK6 6BD

Project Manager: I Walker; A Dickinson, F Scutt; N Giles
Project Name: Union Street, Heckmondwike
Project Ref: GSI 1143
Order No: PO 19/0314
Date Samples Received: 10/07/19
Date Instructions Received: 17/07/19
Date Analysis Completed: 23/07/19

Prepared by:

Sophie France
Admin Assistant

Approved by:

John Gustafson
Managing Director

UKAS TESTING
1247

Envirolab Job Number: 19/06810

Client Project Name: Union Street, Heckmondwike

Client Project Ref: GSI 1143

Lab Sample ID	19/06810/1	19/06810/2						Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	Up	Down								
Depth to Top										
Depth To Bottom										
Date Sampled	10-Jul-19	10-Jul-19								
Sample Type	Water - EW	Water - EW								
Sample Matrix Code	N/A	N/A								
pH (w)$_{A}^{\#}$	8.53	8.50						pH	0.01	A-T-031w
Hardness Total$_{A}^{\#}$	293	296						mg/l Ca CO3	2	A-T-049w
Sulphate (w)$_{A}^{\#}$	165	164						mg/l	1	A-T-026w
Cyanide (total) (w)$_{A}^{\#}$	<0.005	<0.005						mg/l	0.005	A-T-042wTCN
Phenols - Total by HPLC (w)$_{A}$	<0.01	<0.01						mg/l	0.01	A-T-050w
Arsenic (dissolved)$_{A}^{\#}$	<1	<1						µg/l	1	A-T-025w
Boron (dissolved)$_{A}^{\#}$	204	205						µg/l	10	A-T-025w
Cadmium (dissolved)$_{A}^{\#}$	<0.2	<0.2						µg/l	0.2	A-T-025w
Copper (dissolved)$_{A}^{\#}$	14	7						µg/l	1	A-T-025w
Chromium (dissolved)$_{A}^{\#}$	<1	<1						µg/l	1	A-T-025w
Lead (dissolved)$_{A}^{\#}$	<1	<1						µg/l	1	A-T-025w
Mercury (dissolved)$_{A}^{\#}$	<0.1	0.1						µg/l	0.1	A-T-025w
Nickel (dissolved)$_{A}^{\#}$	6	6						µg/l	1	A-T-025w
Selenium (dissolved)$_{A}^{\#}$	<1	<1						µg/l	1	A-T-025w
Zinc (dissolved)$_{A}^{\#}$	21	27						µg/l	1	A-T-025w

Envirolab Job Number: 19/06810

Client Project Name: Union Street, Heckmondwike

Client Project Ref: GSI 1143

Lab Sample ID	19/06810/1	19/06810/2						Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	Up	Down								
Depth to Top										
Depth To Bottom										
Date Sampled	10-Jul-19	10-Jul-19								
Sample Type	Water - EW	Water - EW								
Sample Matrix Code	N/A	N/A								
PAH 16MS (w)										
Acenaphthene (w)$_A^{\#}$	<0.01	<0.01						µg/l	0.01	A-T-019w
Acenaphthylene (w)$_A^{\#}$	<0.01	<0.01						µg/l	0.01	A-T-019w
Anthracene (w)$_A^{\#}$	<0.01	<0.01						µg/l	0.01	A-T-019w
Benzo(a)anthracene (w)$_A^{\#}$	<0.01	<0.01						µg/l	0.01	A-T-019w
Benzo(a)pyrene (w)$_A^{\#}$	<0.01	<0.01						µg/l	0.01	A-T-019w
Benzo(b)fluoranthene (w)$_A^{\#}$	<0.01	<0.01						µg/l	0.01	A-T-019w
Benzo(ghi)perylene (w)$_A^{\#}$	<0.01	<0.01						µg/l	0.01	A-T-019w
Benzo(k)fluoranthene (w)$_A^{\#}$	<0.01	<0.01						µg/l	0.01	A-T-019w
Chrysene (w)$_A^{\#}$	<0.01	<0.01						µg/l	0.01	A-T-019w
Dibenzo(ah)anthracene (w)$_A^{\#}$	<0.01	<0.01						µg/l	0.01	A-T-019w
Fluoranthene (w)$_A^{\#}$	<0.01	<0.01						µg/l	0.01	A-T-019w
Fluorene (w)$_A^{\#}$	<0.01	<0.01						µg/l	0.01	A-T-019w
Indeno(123-cd)pyrene (w)$_A^{\#}$	<0.01	<0.01						µg/l	0.01	A-T-019w
Naphthalene (w)$_A^{\#}$	<0.01	<0.01						µg/l	0.01	A-T-019w
Phenanthrene (w)$_A^{\#}$	<0.01	<0.01						µg/l	0.01	A-T-019w
Pyrene (w)$_A^{\#}$	<0.01	<0.01						µg/l	0.01	A-T-019w
Total PAH 16MS (w)$_A^{\#}$	<0.01	<0.01						µg/l	0.01	A-T-019w

Envirolab Job Number: 19/06810

Client Project Name: Union Street, Heckmondwike

Client Project Ref: GSI 1143

Lab Sample ID	19/06810/1	19/06810/2						Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	Up	Down								
Depth to Top										
Depth To Bottom										
Date Sampled	10-Jul-19	10-Jul-19								
Sample Type	Water - EW	Water - EW								
Sample Matrix Code	N/A	N/A								
TPH CWG (w)										
Ali >C5-C6 $(w)_A^{\#}$	<1	<1						µg/l	1	A-T-022w
Ali >C6-C8 $(w)_A^{\#}$	<1	1						µg/l	1	A-T-022w
Ali >C8-C10 $(w)_A^{\#}$	<5	5						µg/l	5	A-T-055w
Ali >C10-C12 $(w)_A^{\#}$	<5	<5						µg/l	5	A-T-055w
Ali >C12-C16 $(w)_A^{\#}$	<5	<5						µg/l	5	A-T-055w
Ali >C16-C21 $(w)_A^{\#}$	<5	<5						µg/l	5	A-T-055w
Ali >C21-C35 $(w)_A^{\#}$	<5	<5						µg/l	5	A-T-055w
Total Aliphatics $(w)_A^{\#}$	<5	6						µg/l	5	A-T-055w
Aro >C5-C7 $(w)_A^{\#}$	<1	<1						µg/l	1	A-T-022w
Aro >C7-C8 $(w)_A^{\#}$	<1	<1						µg/l	1	A-T-022w
Aro >C8-C10 $(w)_A$	<5	<5						µg/l	5	A-T-055w
Aro >C10-C12 $(w)_A^{\#}$	<5	<5						µg/l	5	A-T-055w
Aro >C12-C16 $(w)_A^{\#}$	<5	<5						µg/l	5	A-T-055w
Aro >C16-C21 $(w)_A^{\#}$	<5	<5						µg/l	5	A-T-055w
Aro >C21-C35 $(w)_A^{\#}$	<10	<10						µg/l	10	A-T-055w
Total Aromatics $(w)_A$	<10	<10						µg/l	10	A-T-055w
TPH (Ali & Aro >C5-C35) $(w)_A$	<10	12						µg/l	10	A-T-055w
BTEX - Benzene $(w)_A^{\#}$	<1	<1						µg/l	1	A-T-022w
BTEX - Toluene $(w)_A^{\#}$	<1	<1						µg/l	1	A-T-022w
BTEX - Ethyl Benzene $(w)_A^{\#}$	<1	<1						µg/l	1	A-T-022w
BTEX - m & p Xylene $(w)_A^{\#}$	<1	<1						µg/l	1	A-T-022w
BTEX - o Xylene $(w)_A^{\#}$	<1	<1						µg/l	1	A-T-022w
MTBE $(w)_A^{\#}$	<1	<1						µg/l	1	A-T-022w

REPORT NOTES

General
This report shall not be reproduced, except in full, without written approval from Envirolab.
The results reported herein relate only to the material supplied to the laboratory.
The residue of any samples contained within this report, and any received with the same delivery, will be disposed of six weeks after initial scheduling. For samples tested for Asbestos we will retain a portion of the dried sample for a minimum of six months after the initial Asbestos testing is completed.
Analytical results reflect the quality of the sample at the time of analysis only.
Opinions and interpretations expressed are outside the scope of our accreditation.
If results are in italic font they are associated with an AQC failure, these are not accredited and are unreliable.
A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.

Soil chemical analysis:
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any “A” subscripts
All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:
Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:
Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
Stones etc. are not removed from the sample prior to analysis.
Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed.
Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:
1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample.
Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.
Secondary Matrix Codes:
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal, E = contains roots/twigs.

Key:
IS indicates Insufficient Sample for analysis.
US indicates Unsuitable Sample for analysis.
NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
N/A indicates Not Applicable.
Superscript # indicates method accredited to ISO 17025.
Superscript "M" indicates method accredited to MCERTS.
Subscript "A" indicates analysis performed on the sample as received.
Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve

Please contact us if you need any further information.

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: Geocon Site Investigations Ltd, Suite 2 Marple House, 39 Stockport Road, Marple, Stockport, UK, SK6 6BD

Project: Union Street, Heckmondwike

Clients Project No: GSI 1143

Project No: 19/06810

Date Received: 17/07/2019 (am)

Cool Box Temperatures (°C): 17.6

NO DEVIATIONS IDENTIFIED

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 19/07406
Issue Number: 1 **Date:** 13 August, 2019

Client:
Geocon Site Investigations Ltd
Suite 2 Marple House,
39 Stockport Road,
Marple
Stockport
UK
SK6 6BD

Project Manager: I Walker; A Dickinson, F Scutt; N Giles
Project Name: Union Street, Heckmondwicke
Project Ref: GSI 1143
Order No: PO 19/0339
Date Samples Received: 01/08/19
Date Instructions Received: 05/08/19
Date Analysis Completed: 13/08/19

Prepared by:

Melanie Marshall
Laboratory Coordinator

Approved by:

Richard Wong
Client Manager

Envirolab Job Number: 19/07406

Client Project Name: Union Street, Heckmondwicke

Client Project Ref: GSI 1143

Lab Sample ID	19/07406/1	19/07406/2	19/07406/3	19/07406/4	19/07406/5	19/07406/6	19/07406/10	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS01	WS02	WS02	WS03	WS04	WS05	WS07			
Depth to Top	0.10	0.20	0.60	0.30	0.10	0.10	0.80			
Depth To Bottom										
Date Sampled	30-Jul-19	30-Jul-19	30-Jul-19	30-Jul-19	30-Jul-19	30-Jul-19	30-Jul-19			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	4AE	4A	4A	5A	5A	4AE	5A			
% Stones >10mm$_A$	6.8	-	<0.1	<0.1	<0.1	<0.1	5.9	% w/w	0.1	A-T-044
pH$_D$$^{M\#}$	7.99	-	7.83	7.30	8.00	7.80	7.49	pH	0.01	A-T-031s
Sulphate (water sol 2:1)$_D$$^{M\#}$	0.07	-	0.03	0.06	0.06	0.13	0.10	g/l	0.01	A-T-026s
Cyanide (total)$_A$$^{M\#}$	1	-	<1	<1	<1	<1	<1	mg/kg	1	A-T-042sTCN
Phenols - Total by HPLC$_A$	<0.2	-	<0.2	<0.2	<0.2	<0.2	<0.2	mg/kg	0.2	A-T-050s
Arsenic$_D$$^{M\#}$	38	-	7	3	12	22	86	mg/kg	1	A-T-024s
Cadmium$_D$$^{M\#}$	1.7	-	1.0	1.4	0.9	1.1	1.2	mg/kg	0.5	A-T-024s
Copper$_D$$^{M\#}$	484	-	22	14	30	58	143	mg/kg	1	A-T-024s
Chromium$_D$$^{M\#}$	48	-	24	28	24	32	36	mg/kg	1	A-T-024s
Chromium (hexavalent)$_D$	<1	-	<1	<1	<1	<1	<1	mg/kg	1	A-T-040s
Lead$_D$$^{M\#}$	381	-	33	24	61	101	206	mg/kg	1	A-T-024s
Mercury$_D$	<0.17	-	<0.17	<0.17	<0.17	<0.17	0.58	mg/kg	0.17	A-T-024s
Nickel$_D$$^{M\#}$	36	-	32	27	25	29	44	mg/kg	1	A-T-024s
Selenium$_D$$^{M\#}$	2	-	<1	1	1	<1	<1	mg/kg	1	A-T-024s
Zinc$_D$$^{M\#}$	484	-	94	115	95	153	159	mg/kg	5	A-T-024s

Envirolab Job Number: 19/07406

Client Project Name: Union Street, Heckmondwicke

Client Project Ref: GSI 1143

Lab Sample ID	19/07406/1	19/07406/2	19/07406/3	19/07406/4	19/07406/5	19/07406/6	19/07406/10	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS01	WS02	WS02	WS03	WS04	WS05	WS07			
Depth to Top	0.10	0.20	0.60	0.30	0.10	0.10	0.80			
Depth To Bottom										
Date Sampled	30-Jul-19	30-Jul-19	30-Jul-19	30-Jul-19	30-Jul-19	30-Jul-19	30-Jul-19			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	4AE	4A	4A	5A	5A	4AE	5A			
Asbestos in Soil (inc. matrix) ^										
Asbestos in soil$_D$#	NAD	NAD	-	NAD	NAD	NAD	NAD			A-T-045
Asbestos ACM - Suitable for Water Absorption Test?	N/A	N/A	-	N/A	N/A	N/A	N/A			

Envirolab Job Number: 19/07406

Client Project Name: Union Street, Heckmondwicke

Client Project Ref: GSI 1143

Lab Sample ID	19/07406/1	19/07406/2	19/07406/3	19/07406/4	19/07406/5	19/07406/6	19/07406/10	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS01	WS02	WS02	WS03	WS04	WS05	WS07			
Depth to Top	0.10	0.20	0.60	0.30	0.10	0.10	0.80			
Depth To Bottom										
Date Sampled	30-Jul-19	30-Jul-19	30-Jul-19	30-Jul-19	30-Jul-19	30-Jul-19	30-Jul-19			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	4AE	4A	4A	5A	5A	4AE	5A			
PAH-16MS										
Acenaphthene$_A^{M\#}$	0.35	-	<0.01	<0.01	0.07	0.15	1.03	mg/kg	0.01	A-T-019s
Acenaphthylene$_A^{M\#}$	0.09	-	<0.01	<0.01	<0.01	0.04	0.18	mg/kg	0.01	A-T-019s
Anthracene$_A^{M\#}$	0.66	-	<0.02	<0.02	0.08	0.24	1.77	mg/kg	0.02	A-T-019s
Benzo(a)anthracene$_A^{M\#}$	2.90	-	<0.04	<0.04	0.29	0.92	6.69	mg/kg	0.04	A-T-019s
Benzo(a)pyrene$_A^{M\#}$	3.03	-	<0.04	<0.04	0.24	0.83	6.51	mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene$_A^{M\#}$	3.63	-	<0.05	<0.05	0.30	1.06	7.37	mg/kg	0.05	A-T-019s
Benzo(ghi)perylene$_A^{M\#}$	1.77	-	<0.05	<0.05	0.13	0.50	3.15	mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene$_A^{M\#}$	1.34	-	<0.07	<0.07	0.10	0.37	2.77	mg/kg	0.07	A-T-019s
Chrysene$_A^{M\#}$	3.03	-	<0.06	<0.06	0.30	0.98	6.39	mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene$_A^{M\#}$	0.48	-	<0.04	<0.04	<0.04	0.14	0.96	mg/kg	0.04	A-T-019s
Fluoranthene$_A^{M\#}$	5.93	-	<0.08	<0.08	0.54	1.83	14.4	mg/kg	0.08	A-T-019s
Fluorene$_A^{M\#}$	0.22	-	<0.01	<0.01	0.04	0.10	0.87	mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene$_A^{M\#}$	2.19	-	<0.03	<0.03	0.16	0.58	4.01	mg/kg	0.03	A-T-019s
Naphthalene $_A^{M\#}$	0.34	-	<0.03	<0.03	0.10	0.06	0.64	mg/kg	0.03	A-T-019s
Phenanthrene$_A^{M\#}$	3.19	-	<0.03	<0.03	0.41	1.09	7.61	mg/kg	0.03	A-T-019s
Pyrene$_A^{M\#}$	5.14	-	<0.07	<0.07	0.46	1.59	12.8	mg/kg	0.07	A-T-019s
Total PAH-16MS$_A^{M\#}$	34.3	-	<0.08	<0.08	3.22	10.5	77.2	mg/kg	0.01	A-T-019s

Envirolab Job Number: 19/07406

Client Project Name: Union Street, Heckmondwicke

Client Project Ref: GSI 1143

Lab Sample ID	19/07406/1	19/07406/2	19/07406/3	19/07406/4	19/07406/5	19/07406/6	19/07406/10	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS01	WS02	WS02	WS03	WS04	WS05	WS07			
Depth to Top	0.10	0.20	0.60	0.30	0.10	0.10	0.80			
Depth To Bottom										
Date Sampled	30-Jul-19	30-Jul-19	30-Jul-19	30-Jul-19	30-Jul-19	30-Jul-19	30-Jul-19			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	4AE	4A	4A	5A	5A	4AE	5A			
TPH CWG										
Ali >C5-C6$_A^{\#}$	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
Ali >C6-C8$_A^{\#}$	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
Ali >C8-C10$_A$	2	-	<1	<1	<1	1	4	mg/kg	1	A-T-055s
Ali >C10-C12$_A^{M\#}$	1	-	<1	<1	<1	<1	2	mg/kg	1	A-T-055s
Ali >C12-C16$_A^{M\#}$	4	-	<1	<1	1	2	5	mg/kg	1	A-T-055s
Ali >C16-C21$_A^{M\#}$	4	-	<1	<1	1	4	6	mg/kg	1	A-T-055s
Ali >C21-C35$_A$	60	-	3	<1	7	17	39	mg/kg	1	A-T-055s
Total Aliphatics$_A$	71	-	3	<1	9	26	55	mg/kg	1	A-T-055s
Aro >C5-C7$_A^{\#}$	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
Aro >C7-C8$_A^{\#}$	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
Aro >C8-C10$_A$	5	-	<1	<1	1	2	6	mg/kg	1	A-T-055s
Aro >C10-C12$_A^{M\#}$	6	-	<1	<1	1	2	11	mg/kg	1	A-T-055s
Aro >C12-C16$_A$	24	-	1	<1	4	7	48	mg/kg	1	A-T-055s
Aro >C16-C21$_A^{M\#}$	95	-	<1	<1	9	22	130	mg/kg	1	A-T-055s
Aro >C21-C35$_A^{M\#}$	267	-	3	<1	21	71	264	mg/kg	1	A-T-055s
Total Aromatics$_A$	396	-	4	<1	38	107	460	mg/kg	1	A-T-055s
TPH (Ali & Aro >C5-C35)$_A$	467	-	7	<1	47	133	514	mg/kg	1	A-T-055s
BTEX - Benzene$_A^{\#}$	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
BTEX - Toluene$_A^{\#}$	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
BTEX - Ethyl Benzene$_A^{\#}$	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
BTEX - m & p Xylene$_A^{\#}$	0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
BTEX - o Xylene$_A^{\#}$	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
MTBE$_A^{\#}$	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s

Envirolab Job Number: 19/07406

Client Project Name: Union Street, Heckmondwicke

Client Project Ref: GSI 1143

Lab Sample ID	19/07406/13	19/07406/16	19/07406/17					Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS08	WS09	WS09							
Depth to Top	0.60	0.40	0.90							
Depth To Bottom										
Date Sampled	30-Jul-19	30-Jul-19	30-Jul-19							
Sample Type	Soil - ES	Soil - ES	Soil - ES							
Sample Matrix Code	4ABE	5A	5A							
% Stones >10mm$_A$	19.0	-	<0.1					% w/w	0.1	A-T-044
pH$_D$$^{M\#}$	7.76	-	6.75					pH	0.01	A-T-031s
Sulphate (water sol 2:1)$_D$$^{M\#}$	0.12	-	0.24					g/l	0.01	A-T-026s
Cyanide (total)$_A$$^{M\#}$	<1	-	<1					mg/kg	1	A-T-042sTCN
Phenols - Total by HPLC$_A$	<0.2	-	<0.2					mg/kg	0.2	A-T-050s
Arsenic$_D$$^{M\#}$	31	-	3					mg/kg	1	A-T-024s
Cadmium$_D$$^{M\#}$	1.2	-	1.3					mg/kg	0.5	A-T-024s
Copper$_D$$^{M\#}$	66	-	16					mg/kg	1	A-T-024s
Chromium$_D$$^{M\#}$	60	-	27					mg/kg	1	A-T-024s
Chromium (hexavalent)$_D$	<1	-	<1					mg/kg	1	A-T-040s
Lead$_D$$^{M\#}$	90	-	19					mg/kg	1	A-T-024s
Mercury$_D$	<0.17	-	<0.17					mg/kg	0.17	A-T-024s
Nickel$_D$$^{M\#}$	28	-	45					mg/kg	1	A-T-024s
Selenium$_D$$^{M\#}$	<1	-	1					mg/kg	1	A-T-024s
Zinc$_D$$^{M\#}$	184	-	158					mg/kg	5	A-T-024s

Envirolab Job Number: 19/07406

Client Project Name: Union Street, Heckmondwicke

Client Project Ref: GSI 1143

Lab Sample ID	19/07406/13	19/07406/16	19/07406/17					Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS08	WS09	WS09							
Depth to Top	0.60	0.40	0.90							
Depth To Bottom										
Date Sampled	30-Jul-19	30-Jul-19	30-Jul-19							
Sample Type	Soil - ES	Soil - ES	Soil - ES							
Sample Matrix Code	4ABE	5A	5A							
Asbestos in Soil (inc. matrix) ^										
Asbestos in soil$_D$#	NAD	NAD	-							A-T-045
Asbestos ACM - Suitable for Water Absorption Test?	N/A	N/A	-							

Envirolab Job Number: 19/07406

Client Project Name: Union Street, Heckmondwicke

Client Project Ref: GSI 1143

Lab Sample ID	19/07406/13	19/07406/16	19/07406/17					Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS08	WS09	WS09							
Depth to Top	0.60	0.40	0.90							
Depth To Bottom										
Date Sampled	30-Jul-19	30-Jul-19	30-Jul-19							
Sample Type	Soil - ES	Soil - ES	Soil - ES							
Sample Matrix Code	4ABE	5A	5A							
PAH-16MS										
Acenaphthene$_A^{M\#}$	0.29	-	<0.01					mg/kg	0.01	A-T-019s
Acenaphthylene$_A^{M\#}$	0.03	-	<0.01					mg/kg	0.01	A-T-019s
Anthracene$_A^{M\#}$	0.46	-	<0.02					mg/kg	0.02	A-T-019s
Benzo(a)anthracene$_A^{M\#}$	1.01	-	<0.04					mg/kg	0.04	A-T-019s
Benzo(a)pyrene$_A^{M\#}$	0.81	-	<0.04					mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene$_A^{M\#}$	0.98	-	<0.05					mg/kg	0.05	A-T-019s
Benzo(ghi)perylene$_A^{M\#}$	0.40	-	<0.05					mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene$_A^{M\#}$	0.36	-	<0.07					mg/kg	0.07	A-T-019s
Chrysene$_A^{M\#}$	0.98	-	<0.06					mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene$_A^{M\#}$	0.13	-	<0.04					mg/kg	0.04	A-T-019s
Fluoranthene$_A^{M\#}$	2.52	-	<0.08					mg/kg	0.08	A-T-019s
Fluorene$_A^{M\#}$	0.19	-	<0.01					mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene$_A^{M\#}$	0.51	-	<0.03					mg/kg	0.03	A-T-019s
Naphthalene $_A^{M\#}$	<0.03	-	<0.03					mg/kg	0.03	A-T-019s
Phenanthrene$_A^{M\#}$	1.98	-	<0.03					mg/kg	0.03	A-T-019s
Pyrene$_A^{M\#}$	2.06	-	<0.07					mg/kg	0.07	A-T-019s
Total PAH-16MS$_A^{M\#}$	12.7	-	<0.08					mg/kg	0.01	A-T-019s

Envirolab Job Number: 19/07406

Client Project Name: Union Street, Heckmondwicke

Client Project Ref: GSI 1143

Lab Sample ID	19/07406/13	19/07406/16	19/07406/17					Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS08	WS09	WS09							
Depth to Top	0.60	0.40	0.90							
Depth To Bottom										
Date Sampled	30-Jul-19	30-Jul-19	30-Jul-19							
Sample Type	Soil - ES	Soil - ES	Soil - ES							
Sample Matrix Code	4ABE	5A	5A							
TPH CWG										
Ali >C5-C6$_A^{\#}$	<0.01	-	<0.01					mg/kg	0.01	A-T-022s
Ali >C6-C8$_A^{\#}$	<0.01	-	<0.01					mg/kg	0.01	A-T-022s
Ali >C8-C10$_A$	<1	-	<1					mg/kg	1	A-T-055s
Ali >C10-C12$_A^{M\#}$	<1	-	<1					mg/kg	1	A-T-055s
Ali >C12-C16$_A^{M\#}$	<1	-	<1					mg/kg	1	A-T-055s
Ali >C16-C21$_A^{M\#}$	2	-	<1					mg/kg	1	A-T-055s
Ali >C21-C35$_A$	18	-	<1					mg/kg	1	A-T-055s
Total Aliphatics$_A$	19	-	<1					mg/kg	1	A-T-055s
Aro >C5-C7$_A^{\#}$	<0.01	-	<0.01					mg/kg	0.01	A-T-022s
Aro >C7-C8$_A^{\#}$	<0.01	-	<0.01					mg/kg	0.01	A-T-022s
Aro >C8-C10$_A$	<1	-	<1					mg/kg	1	A-T-055s
Aro >C10-C12$_A^{M\#}$	<1	-	<1					mg/kg	1	A-T-055s
Aro >C12-C16$_A$	5	-	<1					mg/kg	1	A-T-055s
Aro >C16-C21$_A^{M\#}$	16	-	<1					mg/kg	1	A-T-055s
Aro >C21-C35$_A^{M\#}$	46	-	<1					mg/kg	1	A-T-055s
Total Aromatics$_A$	68	-	<1					mg/kg	1	A-T-055s
TPH (Ali & Aro >C5-C35)$_A$	88	-	<1					mg/kg	1	A-T-055s
BTEX - Benzene$_A^{\#}$	<0.01	-	<0.01					mg/kg	0.01	A-T-022s
BTEX - Toluene$_A^{\#}$	<0.01	-	<0.01					mg/kg	0.01	A-T-022s
BTEX - Ethyl Benzene$_A^{\#}$	<0.01	-	<0.01					mg/kg	0.01	A-T-022s
BTEX - m & p Xylene$_A^{\#}$	<0.01	-	<0.01					mg/kg	0.01	A-T-022s
BTEX - o Xylene$_A^{\#}$	<0.01	-	<0.01					mg/kg	0.01	A-T-022s
MTBE$_A^{\#}$	<0.01	-	<0.01					mg/kg	0.01	A-T-022s

REPORT NOTES

General
This report shall not be reproduced, except in full, without written approval from Envirolab.
The results reported herein relate only to the material supplied to the laboratory.
The residue of any samples contained within this report, and any received with the same delivery, will be disposed of six weeks after initial scheduling. For samples tested for Asbestos we will retain a portion of the dried sample for a minimum of six months after the initial Asbestos testing is completed.
Analytical results reflect the quality of the sample at the time of analysis only.
Opinions and interpretations expressed are outside the scope of our accreditation.
If results are in italic font they are associated with an AQC failure, these are not accredited and are unreliable.
A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.
The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any “A” subscripts
All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:
Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:
Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
Stones etc. are not removed from the sample prior to analysis.
Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:
1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample.
Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.
Secondary Matrix Codes:
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal, E = contains roots/twigs.

Key:
IS indicates Insufficient Sample for analysis.
US indicates Unsuitable Sample for analysis.
NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
N/A indicates Not Applicable.
Superscript # indicates method accredited to ISO 17025.
Superscript "M" indicates method accredited to MCERTS.
Subscript "A" indicates analysis performed on the sample as received.
Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve

Please contact us if you need any further information.

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: Geocon Site Investigations Ltd, Suite 2 Marple House, 39 Stockport Road, Marple, Stockport, UK, SK6 6BD

Project: Union Street, Heckmondwicke

Clients Project No: GSI 1143

Project No: 19/07406

Date Received: 05/08/2019 (am)

Cool Box Temperatures (°C): 20.2

NO DEVIATIONS IDENTIFIED

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 20/01292
Issue Number: 1 **Date:** 18 February, 2020

Client:
Geocon Site Investigations Ltd
Suite 2 Marple House,
39 Stockport Road,
Marple
Stockport
UK
SK6 6BD

Project Manager: I Walker; A Dickinson,F Scutt;N Giles,A Hodgkinson
Project Name: Union Street, Heckmondwicke
Project Ref: GSI 1143
Order No: PO20/0054
Date Samples Received: 03/02/20
Date Instructions Received: 10/02/20
Date Analysis Completed: 18/02/20

Prepared by:

Melanie Marshall
Laboratory Coordinator

Approved by:

Danielle Brierley
Client Manager

Envirolab Job Number: 20/01292

Client Project Name: Union Street, Heckmondwicke

Client Project Ref: GSI 1143

Lab Sample ID	20/01292/1	20/01292/2	20/01292/4	20/01292/5	20/01292/6			Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	BH01a	BH01a	BH02	BH02	BH03					
Depth to Top	0.20	0.50	0.10	0.70	0.70					
Depth To Bottom										
Date Sampled	28-Jan-20	28-Jan-20	29-Jan-20	29-Jan-20	31-Jan-20					
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES					
Sample Matrix Code	4ABE	4ABE	6AE	4ABE	4AE					
% Stones >10mm$_A$	-	33.8	-	18.8	16.2			% w/w	0.1	A-T-044
pH$_D$$^{M\#}$	-	8.50	-	8.28	10.42			pH	0.01	A-T-031s
Sulphate (water sol 2:1)$_D$$^{M\#}$	-	0.19	-	0.16	0.40			g/l	0.01	A-T-026s
Cyanide (total)$_A$$^{M\#}$	-	<1	-	<1	<1			mg/kg	1	A-T-042sTCN
Phenols - Total by HPLC$_A$	-	<0.2	-	<0.2	<0.2			mg/kg	0.2	A-T-050s
Arsenic$_D$$^{M\#}$	-	15	-	20	5			mg/kg	1	A-T-024s
Cadmium$_D$$^{M\#}$	-	0.7	-	1.3	0.6			mg/kg	0.5	A-T-024s
Copper$_D$$^{M\#}$	-	52	-	119	26			mg/kg	1	A-T-024s
Chromium$_D$$^{M\#}$	-	38	-	63	19			mg/kg	1	A-T-024s
Chromium (hexavalent)$_D$	-	<1	-	<1	<1			mg/kg	1	A-T-040s
Lead$_D$$^{M\#}$	-	99	-	112	49			mg/kg	1	A-T-024s
Mercury$_D$	-	0.89	-	0.18	0.23			mg/kg	0.17	A-T-024s
Nickel$_D$$^{M\#}$	-	33	-	35	15			mg/kg	1	A-T-024s
Selenium$_D$$^{M\#}$	-	<1	-	2	<1			mg/kg	1	A-T-024s
Zinc$_D$$^{M\#}$	-	107	-	103	78			mg/kg	5	A-T-024s

Envirolab Job Number: 20/01292

Client Project Name: Union Street, Heckmondwicke

Client Project Ref: GSI 1143

Lab Sample ID	20/01292/1	20/01292/2	20/01292/4	20/01292/5	20/01292/6			Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	BH01a	BH01a	BH02	BH02	BH03					
Depth to Top	0.20	0.50	0.10	0.70	0.70					
Depth To Bottom										
Date Sampled	28-Jan-20	28-Jan-20	29-Jan-20	29-Jan-20	31-Jan-20					
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES					
Sample Matrix Code	4ABE	4ABE	6AE	4ABE	4AE					
Asbestos in Soil (inc. matrix) ^										
Asbestos in soil$_D^{\#}$	NAD	-	NAD	-	NAD					A-T-045
Asbestos ACM - Suitable for Water Absorption Test?$_D$	N/A	-	N/A	-	N/A					A-T-045

Envirolab Job Number: 20/01292

Client Project Name: Union Street, Heckmondwicke

Client Project Ref: GSI 1143

Lab Sample ID	20/01292/1	20/01292/2	20/01292/4	20/01292/5	20/01292/6			Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	BH01a	BH01a	BH02	BH02	BH03					
Depth to Top	0.20	0.50	0.10	0.70	0.70					
Depth To Bottom										
Date Sampled	28-Jan-20	28-Jan-20	29-Jan-20	29-Jan-20	31-Jan-20					
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES					
Sample Matrix Code	4ABE	4ABE	6AE	4ABE	4AE					
PAH-16MS										
Acenaphthene$_A^{M\#}$	-	0.36	-	<0.01	0.39			mg/kg	0.01	A-T-019s
Acenaphthylene$_A^{M\#}$	-	0.02	-	<0.01	0.06			mg/kg	0.01	A-T-019s
Anthracene$_A^{M\#}$	-	0.47	-	<0.02	0.52			mg/kg	0.02	A-T-019s
Benzo(a)anthracene$_A^{M\#}$	-	1.03	-	<0.04	0.99			mg/kg	0.04	A-T-019s
Benzo(a)pyrene$_A^{M\#}$	-	0.85	-	<0.04	0.88			mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene$_A^{M\#}$	-	0.94	-	<0.05	0.87			mg/kg	0.05	A-T-019s
Benzo(ghi)perylene$_A^{M\#}$	-	0.43	-	<0.05	0.54			mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene$_A^{M\#}$	-	0.32	-	<0.07	0.32			mg/kg	0.07	A-T-019s
Chrysene$_A^{M\#}$	-	1.12	-	<0.06	1.03			mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene$_A^{M\#}$	-	0.11	-	<0.04	0.12			mg/kg	0.04	A-T-019s
Fluoranthene$_A^{M\#}$	-	2.79	-	<0.08	2.41			mg/kg	0.08	A-T-019s
Fluorene$_A^{M\#}$	-	0.23	-	<0.01	0.37			mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene$_A^{M\#}$	-	0.52	-	<0.03	0.62			mg/kg	0.03	A-T-019s
Naphthalene $_A^{M\#}$	-	0.14	-	<0.03	0.32			mg/kg	0.03	A-T-019s
Phenanthrene$_A^{M\#}$	-	2.15	-	<0.03	2.24			mg/kg	0.03	A-T-019s
Pyrene$_A^{M\#}$	-	2.46	-	<0.07	2.18			mg/kg	0.07	A-T-019s
Total PAH-16MS$_A^{M\#}$	-	13.9	-	<0.08	13.9			mg/kg	0.01	A-T-019s

Envirolab Job Number: 20/01292

Client Project Name: Union Street, Heckmondwicke

Client Project Ref: GSI 1143

Lab Sample ID	20/01292/1	20/01292/2	20/01292/4	20/01292/5	20/01292/6			Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	BH01a	BH01a	BH02	BH02	BH03					
Depth to Top	0.20	0.50	0.10	0.70	0.70					
Depth To Bottom										
Date Sampled	28-Jan-20	28-Jan-20	29-Jan-20	29-Jan-20	31-Jan-20					
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES					
Sample Matrix Code	4ABE	4ABE	6AE	4ABE	4AE					
TPH CWG										
Ali >C5-C6$_A^{\#}$	-	<0.01	-	<0.01	<0.01			mg/kg	0.01	A-T-022s
Ali >C6-C8$_A^{\#}$	-	<0.01	-	<0.01	<0.01			mg/kg	0.01	A-T-022s
Ali >C8-C10$_A$	-	<1	-	<1	<1			mg/kg	1	A-T-055s
Ali >C10-C12$_A^{M\#}$	-	<1	-	<1	<1			mg/kg	1	A-T-055s
Ali >C12-C16$_A^{M\#}$	-	3	-	5	2			mg/kg	1	A-T-055s
Ali >C16-C21$_A^{M\#}$	-	6	-	13	4			mg/kg	1	A-T-055s
Ali >C21-C35$_A$	-	83	-	93	68			mg/kg	1	A-T-055s
Total Aliphatics$_A$	-	93	-	110	73			mg/kg	1	A-T-055s
Aro >C5-C7$_A^{\#}$	-	<0.01	-	<0.01	<0.01			mg/kg	0.01	A-T-022s
Aro >C7-C8$_A^{\#}$	-	<0.01	-	<0.01	<0.01			mg/kg	0.01	A-T-022s
Aro >C8-C10$_A$	-	2	-	3	8			mg/kg	1	A-T-055s
Aro >C10-C12$_A^{M\#}$	-	2	-	2	4			mg/kg	1	A-T-055s
Aro >C12-C16$_A$	-	9	-	11	13			mg/kg	1	A-T-055s
Aro >C16-C21$_A^{M\#}$	-	36	-	46	33			mg/kg	1	A-T-055s
Aro >C21-C35$_A^{M\#}$	-	98	-	81	95			mg/kg	1	A-T-055s
Total Aromatics$_A$	-	148	-	143	154			mg/kg	1	A-T-055s
TPH (Ali & Aro >C5-C35)$_A$	-	241	-	253	227			mg/kg	1	A-T-055s
BTEX - Benzene$_A^{\#}$	-	<0.01	-	<0.01	<0.01			mg/kg	0.01	A-T-022s
BTEX - Toluene$_A^{\#}$	-	<0.01	-	<0.01	<0.01			mg/kg	0.01	A-T-022s
BTEX - Ethyl Benzene$_A^{\#}$	-	<0.01	-	<0.01	<0.01			mg/kg	0.01	A-T-022s
BTEX - m & p Xylene$_A^{\#}$	-	<0.01	-	<0.01	<0.01			mg/kg	0.01	A-T-022s
BTEX - o Xylene$_A^{\#}$	-	<0.01	-	<0.01	<0.01			mg/kg	0.01	A-T-022s
MTBE$_A^{\#}$	-	<0.01	-	<0.01	<0.01			mg/kg	0.01	A-T-022s

REPORT NOTES

General
This report shall not be reproduced, except in full, without written approval from Envirolab.
The results reported herein relate only to the material supplied to the laboratory.
The residue of any samples contained within this report, and any received with the same delivery, will be disposed of six weeks after initial scheduling. For samples tested for Asbestos we will retain a portion of the dried sample for a minimum of six months after the initial Asbestos testing is completed.
Analytical results reflect the quality of the sample at the time of analysis only.
Opinions and interpretations expressed are outside the scope of our accreditation.
If results are in italic font they are associated with an AQC failure, these are not accredited and are unreliable.
A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.
The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any “A” subscripts
All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:
Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:
Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
Stones etc. are not removed from the sample prior to analysis.
Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:
1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample.
Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.
Secondary Matrix Codes:
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal, E = contains roots/twigs.

Key:
IS indicates Insufficient Sample for analysis.
US indicates Unsuitable Sample for analysis.
NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
N/A indicates Not Applicable.
Superscript # indicates method accredited to ISO 17025.
Superscript "M" indicates method accredited to MCERTS.
Subscript "A" indicates analysis performed on the sample as received.
Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve

Please contact us if you need any further information.

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: Geocon Site Investigations Ltd, Suite 2 Marple House, 39 Stockport Road, Marple, Stockport, UK, SK6 6BD

Project: Union Street, Heckmondwicke

Clients Project No: GSI 1143

Project No: 20/01292

Date Received: 10/02/2020 (am)

Cool Box Temperatures (°C): 7.4

NO DEVIATIONS IDENTIFIED

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

APPENDIX C

CHEMICAL SCREENING CRITERIA

GeoCon Site Investigations Ltd

GENERIC SCREENING CRITERIA
FOR
GENERIC QUANTITATIVE RISK ASSESSMENT

Atkins ATRISK SSV's Screening Criteria - SOILS **June 2018**

Compound	Residential WITH consumption of home-grown vegetables				Residential WITHOUT consumption of home-grown vegetables				Commercial				Allotments		Public Open Space - Residential				Public Open Space - Parks			
	1 % SOM SAND		6 % SOM SAND		1 % SOM SAND		6 % SOM SAND		1 % SOM SAND		6 % SOM SAND		6 % SOM SAND		1 % SOM SAND		6 % SOM SAND		1 % SOM SAND		6 % SOM SAND	
	mg/kg	Ref	mg/kg	Ref	mg/kg	Ref	mg/kg	Ref	mg/kg	Ref	mg/kg	Ref	mg/kg	Ref	mg/kg	Ref	mg/kg	Ref	mg/kg	Ref	mg/kg	Ref
Metals																						
Antimony	141	J	222	J	473	J	473	J	4650	J	4650	J	58.3	J	749	J	749	J	3090	J	3090	J
Arsenic	37	J	37	J	39.9	J	39.9	J	635	J	635	J	49	J	79.1	J	79.1	J	168	J	168	J
Barium	56.8	J	110	J	1340	J	1340	J	22000	J	22000	J	18.1	J	2680	J	2680	J	5770	J	5770	J
Beryllium	1.71	J	1.71	J	1.72	J	1.72	J	14	J	14	J	17.8	J	2.19	J	2.19	J	2.19	J	2.19	J
Boron	290	B	290	B	11000	B	11000	B	240000	B	240000	B	45	B	21000	B	21000	B	46000	B	46000	B
Cadmium (pH 6, 7, 8)	22.1	J	22.1	J	149	J	149	J	410	J	410	J	3.9	J	219	J	219	J	882	J	882	J
Chromium III	910	B	14300	J	910	B	16700	J	8600	B	208000	J	12600	J	30600	J	30600	J	83500	J	83500	J
Chromium VI	6	B	3.63	J	6	B	3.62	J	33	B	19.7	J	73.9	J	4.62	J	4.62	J	132	J	132	J
Copper	4730	J	4790	J	9060	J	9060	J	106000	J	106000	J	1450	J	16400	J	16400	J	45200	J	45200	J
Lead	200	H	200	J	310	H	313	J	1100	H	2310	J	19.1	J	625	J	625	J	1340	J	1340	J
Mercury (elemental)	0.0863	J	1.44	J	0.0863	J	1.44	J	7.95	J	102	J	316	J	1020	J	2590	J	61.2	J	282	J
Mercury (Inorganic)	180	J	180	J	244	J	244	J	3600	J	3600	J	94.1	J	474	J	474	J	1110	J	1110	J
Mercury (methyl)	8.81	J	15.8	J	10	J	20.3	J	350	J	405	J	9.27	J	53.1	J	53.1	J	94.3	J	96.9	J
Molybdenum	95.2	J	97.4	J	673	J	673	J	17000	D	17600	J	17	J	1360	J	1360	J	2880	J	2880	J
Nickel	136	J	136	J	188	J	188	J	1770	J	1770	J	67.3	J	347	J	347	J	804	J	804	J
Selenium	375	J	375	J	595	J	595	J	13000	J	13000	J	143	J	1370	J	170	J	2550	J	2550	J
Vanadium	136	J	138	J	357	J	357	J	7490	J	7490	J	33.2	J	818	J	818	J	1550	J	1550	J
Zinc	20000	J	20300	J	47000	J	47000	J	730000	B	1100000	J	5230	J	93700	J	93700	J	201000	J	201000	J
Non-Metals																						
Free-Cyanide (Total)	34	J	34	J	34	J	34	J	373	J	373	J	34	J	34	J	34	J	34	J	34	J
Phenol and Chlorophenols																						
Phenol	267	J	1200	J	570	J	2330	J	685	J	3170	J	331	J	685	J	3170	J	685	J	3170	J
Chlorophenols	0.87	B	4.5	B	94	B	150	B	3500	B	4300	B	0.7	B	620	B	620	B	1100	B	1100	B
Pentachlorophenol	0.22	B	1.2	B	27	B	31	B	400	B	400	B	0.19	B	60	B	60	B	110	B	120	B
Poly Aromatic Hydrocarbons (PAH) (1.0% SOM)																						
Acenaphthene	608	J	2760	J	2680	J	6730	J	83600	J	83600	J	680	J	14700	J	14800	J	28600	J	30100	J
Acenaphthylene	170	B	920	B	2900	B	5000	B	83000	B	83000	B	160	B	15000	B	15000	B	29000	B	30000	B
Anthracene	10200	J	26200	J	34300	J	37700	J	535000	J	535000	J	11300	J	74100	J	74100	J	150000	J	152000	J
Benzo(a)anthracene	4.52	E	8.54	E	4.52	E	9.04	E	131	E	131	E	15.1	E	28.7	E	37.7	E	28.7	E	12.2	E
Benzo(a)pyrene	1.51	J	2.05	J	2.17	J	2.21	J	26.1	J	26.1	J	2.4	J	4.04	J	4.04	J	8.6	J	8.99	J
Benzo(b)fluoranthene	7.72	E	9.86	E	7.72	E	10.3	E	142	E	142	E	18.6	E	35.5	E	40.7	E	35.5	E	13	E
Benzo(ghi)perylene	96.2	E	103	E	96.2	E	104	E	1440	E	1440	E	342	E	451	E	490	E	451	E	154	E
Benzo(k)fluoranthene	84.4	E	100	E	84.4	E	104	E	1430	E	1430	E	227	E	381	E	430	E	381	E	137	E
Chrysene	585	E	927	E	585	E	1010	E	140010	E	140010	E	1170	E	3010	E	3570	E	3010	E	1160	E
Dibenzo(ah)anthracene	0.838	E	1	E	0.838	E	1.03	E	14.3	E	14.3	E	2.57	E	3.96	E	4.48	E	3.96	E	1.42	E
Fluoranthene	983	J	2980	J	4880	J	5050	J	72200	J	72200	J	1010	J	9870	J	9870	J	20200	J	20300	J

GeoCon Site Investigations Ltd

GENERIC SCREENING CRITERIA
FOR
GENERIC QUANTITATIVE RISK ASSESSMENT

Compound	Residential WITH consumption of home-grown vegetables				Residential WITHOUT consumption of home-grown vegetables				Commercial				Allotments		Public Open Space - Residential				Public Open Space - Parks			
	1 % SOM SAND		6 % SOM SAND		1 % SOM SAND		6 % SOM SAND		1 % SOM SAND		6 % SOM SAND		6 % SOM SAND		1 % SOM SAND		6 % SOM SAND		1 % SOM SAND		6 % SOM SAND	
	mg/kg	Ref	mg/kg	Ref	mg/kg	Ref	mg/kg	Ref	mg/kg	Ref	mg/kg	Ref	mg/kg	Ref	mg/kg	Ref	mg/kg	Ref	mg/kg	Ref	mg/kg	Ref
Fluorene	735	J	2610	J	3260	J	4860	J	66500	J	66500	J	796	J	9870	J	9870	J	19600	J	20200	J
Indeno(123-cd)pyrene	7.31	E	9.75	E	7.31	E	10.3	E	142	E	142	E	16.6	E	34.4	E	39.6	E	34.4	E	12.7	E
Naphthalene	0.829	J	12.2	J	0.851	J	13.1	J	90.1	J	90.1	J	27.4	J	3490	J	4230	J	623	J	2280	J
Phenanthrene	95	B	440	B	1300	B	1500	B	22000	B	22000	B	90	B	3100	B	3100	B	6200	B	6300	B
Pyrene	668	J	2120	J	3650	J	3780	J	54100	J	54100	J	679	J	7400	J	7400	J	15100	J	15200	J
PAH (Total 16)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Petroleum Hydrocarbons (TPH CWG)																						
MTBE	27.6	J	220	J	33.3	J	318	J	3140	J	22400	J	108	J	73600	J	75000	J	70800	J	117000	J
Benzene	0.137	J	0.871	J	0.31	J	3.32	J	12.5	J	98	J	0.176	J	140	J	142	J	139	J	231	J
Toluene	113	J	780	J	312	J	3860	J	27900	J	183000	J	146	J	55300	J	55900	J	69900	J	101000	J
Ethylbenzene	50.7	J	453	J	85	J	1200	J	7660	J	63100	J	109	J	24300	J	24900	J	21400	J	39700	J
o-Xylene	26.4	J	336	J	30	J	456	J	3030	J	32700	J	191	J	37800	J	43100	J	9560	J	31700	J
m-Xylene	25	J	328	J	28	J	429	J	2830	J	30900	J	208	J	37500	J	43100	J	9270	J	31000	J
p-Xylene	24	J	312	J	26.8	J	410	J	2720	J	29700	J	196	J	37400	J	43100	J	9100	J	30600	J
TPH Aliphatic EC5-6	42.7	J	369	J	42.9	J	371	J	4490	J	29400	J	6110	J	682000	J	847000	J	109000	J	340000	J
TPH Aliphatic EC6-8	99.3	J	1240	J	99.6	J	1240	J	10400	J	98200	J	18300	J	753000	J	886000	J	163000	J	542000	J
TPH Aliphatic EC8-10	13.9	J	204	J	13.6	J	205	J	1370	J	14800	J	2390	J	18000	J	18600	J	9720	J	22700	J
TPH Aliphatic EC10-12	81.7	J	1180	J	81.8	J	1190	J	7900	J	69500	J	8960	J	18500	J	18700	J	17700	J	27800	J
TPH Aliphatic EC12-16	385	J	4130	J	385	J	2710	J	34000	J	139000	J	16300	J	18600	J	18700	J	23800	J	30000	J
TPH Aliphatic EC16-35	210000	J	210100	J	212000	J	212000	J	3620000	J	3620000	J	477000	J	445000	J	445000	J	864000	J	864000	J
TPH Aliphatic EC35-44	65000	B	110000	B	65000	B	110000	B	1600000	B	1800000	B	270000	B	250000	B	250000	B	450000	B	490000	B
TPH Aromatic EC5-7	0.137	J	0.871	J	0.31	J	3.32	J	12.5	J	98	J	0.176	J	140	J	142	J	139	J	231	J
TPH Aromatic EC7-8	113	J	780	J	312	J	3860	J	27900	J	183000	J	146	J	55300	J	55900	J	69900	J	101000	J
TPH Aromatic EC8-10	20.5	J	232	J	22.7	J	332	J	2210	J	20800	J	73.9	J	7300	J	7460	J	5140	J	10094	J
TPH Aromatic EC10-12	70	J	468	J	139	J	1550	J	12300	J	53800	J	95.9	J	7420	J	7490	J	8260	J	11600	J
TPH Aromatic EC12-16	165	J	830	J	703	J	2710	J	36000	B	65400	J	176	J	7470	J	7500	J	10600	J	12200	J
TPH Aromatic EC16 – 21	319	J	1040	J	1930	J	1930	J	28000	B	28400	J	321	J	3770	J	3770	J	7870	J	7870	J
TPH Aromatic EC21-35	1120	J	1710	J	1930	J	1930	J	28000	B	28400	J	1570	J	3770	J	3770	J	7870	J	7870	J
VOC and SVOC																						
1,1,1-Trichloroethane	3.19	J	40.2	J	3.2	J	40.4	J	306	J	2950	J	965	J	304000	J	431000	J	34900	J	129000	J
1,1,1,2-Tetrachloroethane	1.73	J	23.5	J	1.88	J	28.7	J	204	J	1930	J	18.7	J	4800	J	4960	J	3490	J	7230	J
1,1,2,2-Tetrachloroethane	3.29	J	29.2	J	4.73	J	60.2	J	426	J	3910	J	8.45	J	4870	J	4980	J	4640	J	7990	J
1,2-Dichloroethane	0.00819	J	0.594	J	0.00894	J	0.0701	J	0.851	J	5.09	J	0.0581	J	85.2	J	90.5	J	37.9	J	85.8	J
1,1,2 Trichloroethane	0.358	J	3.69	J	0.43	J	5.52	J	40.1	J	382	J	1.67	J	967	J	995	J	766	J	1470	J
1,1-Dichloroethane	1.17	J	10.5	J	1.19	J	10.9	J	115	J	803	J	41.9	J	42200	J	47500	J	11200	J	31100	J
1,1-Dichloroethene	0.121	J	1.15	J	0.122	J	1.17	J	11.9	J	86.6	J	14.3	J	9190	J	10700	J	1950	J	5850	J
1,2,4-Trimethylbenzene	1.17	J	10.2	J	2.02	J	26.8	J	42	D	1030	J	2.49	J	244	J	250	J	225	J	407	J
1,2-Dichloropropane	0.0111	J	0.12	J	0.0111	J	0.12	J	1.34	J	11.1	J	3.07	J	1190	J	2160	J	79.6	J	292	J
2-Chloronaphthalene	2.01	J	31	J	2.02	J	31.6	J	176	J	2090	J	272	J	6050	J	9010	J	659	J	2750	J

GeoCon Site Investigations Ltd

GENERIC SCREENING CRITERIA
FOR
GENERIC QUANTITATIVE RISK ASSESSMENT

Compound	Residential WITH consumption of home-grown vegetables				Residential WITHOUT consumption of home-grown vegetables				Commercial				Allotments		Public Open Space - Residential				Public Open Space - Parks			
	1 % SOM SAND		6 % SOM SAND		1 % SOM SAND		6 % SOM SAND		1 % SOM SAND		6 % SOM SAND		6 % SOM SAND		1 % SOM SAND		6 % SOM SAND		1 % SOM SAND		6 % SOM SAND	
	mg/kg	Ref	mg/kg	Ref	mg/kg	Ref	mg/kg	Ref	mg/kg	Ref	mg/kg	Ref	mg/kg	Ref	mg/kg	Ref	mg/kg	Ref	mg/kg	Ref	mg/kg	Ref
2-Methylphenol	93.7	J	490	J	4740	J	9930	J	155000	J	182000	J	76.8	J	25100	J	25100	J	47800	J	49400	J
2,4-Dichloro-o-cresol	36.4	J	202	J	2140	J	3530	J	54700	J	58600	J	32.2	J	8030	J	8030	J	14200	J	14400	J
2,4-Dimethylphenol	21.1	J	119	J	175	J	1040	J	11800	J	29800	J	20.2	J	5010	J	5020	J	8740	J	9880	J
2,4-Dinitrotoluene	1.68	J	8.72	J	243	J	253	J	3700	D	3760	J	1.35	J	501	J	502	J	973	J	989	J
2,4,6-Trinitrotoluene	1.6	B	8.1	B	65	B	66	B	1000	B	1000	B	1.4	B	130	B	130	B	260	B	270	B
2,6-Dinitrotoluene	0.902	J	4.73	J	107	J	125	J	1840	J	1880	J	0.734	J	251	J	251	J	489	J	498	J
2,6-bis(1,1-dimethyl)-4-(1-methylpropyl)-phenol	26.4	J	85.8	J	120	J	150	J	2160	J	2240	J	27.2	J	311	J	311	J	576	J	584	J
3-Methylphenol	92.8	J	484	J	6050	J	10800	J	166000	J	184000	J	75.5	J	25100	J	25100	J	48100	J	49300	J
4-Methylphenol	92.2	J	480	J	4870	J	10000	J	156000	J	182000	J	75.1	J	25100	J	25100	J	47800	J	49300	J
Biphenyl	95.5	J	540	J	979	J	3890	J	18000	D	67900	J	93.9	J	9440	J	9500	J	14900	J	18400	J
Bis (2-ethylhexyl) phthalate	317	J	1370	J	3860	J	4090	J	85000	D	86000	J	303	J	9680	J	9690	J	16600	J	16700	J
Bromobenzene	0.452	J	6.64	J	0.46	J	6.95	J	42.1	J	485	J	21.7	J	4700	J	5590	J	986	J	3450	J
Bromodichloromethane	0.00841	J	0.0842	J	0.00906	J	0.0996	J	0.854	J	7.12	J	0.0812	J	69.7	J	73.9	J	33.9	J	80.8	J
Bromoform	1.9	J	17.3	J	2.59	J	32.4	J	327	J	2970	J	5.6	J	3870	J	3960	J	2910	J	5220	J
Butyl benzyl phthalate	1540	J	8230	J	60900	J	63800	J	940000	J	945000	J	1410	J	125000	J	125000	J	257000	J	258000	J
Carbon disulphide	0.105	J	1.19	J	0.105	J	1.19	J	10.9	J	94.5	J	27.3	J	9950	J	11900	J	1290	J	4810	J
Carbon tetrachloride	0.141	J	1.82	J	0.146	J	1.99	J	14.8	J	152	J	3.01	J	981	J	1000	J	915	J	1600	J
Chlorobenzene	4.92	J	63.4	J	5.27	J	76.6	J	502	J	5460	J	39.6	J	15500	J	15900	J	13200	J	21300	J
Chloroethane	4.33	J	25.7	J	4.36	J	26	J	46	J	1970	J	453	J	518000	J	634000	J	82400	J	217000	J
Chloroform / Trichloro methane	0.429	J	3.94	J	0.472	J	4.93	J	45.2	J	357	J	1.77	J	1700	J	1720	J	2090	J	3120	J
Chloromethane	0.00428	J	0.0186	J	0.00432	J	0.0188	J	0.452	J	1.49	J	0.273	J	465	J	5650	J	73.8	J	173	J
Cis 1,2 Dichloroethene	0.0556	J	0.523	J	0.0573	J	0.558	J	6	J	44.4	J	1.23	J	1240	J	1360	J	389	J	1040	J
DDD	29.3	J	44.9	J	49.6	J	50.6	J	953	J	988	J	44.8	J	111	J	111	J	212	J	213	J
Dibromochloromethane	0.0878	J	1.05	J	0.0935	J	1.24	J	9.27	J	92.1	J	0.595	J	227	J	230	J	231	J	391	J
Dichloromethane	0.479	J	2.15	J	0.976	J	6.36	J	109	J	526	J	0.404	J	755	J	756	J	1430	J	1530	J
Diethyl Phthalate	131	J	702	J	1630	J	8970	J	108000	J	280000	J	114	J	49300	J	49500	J	85800	J	96000	J
Di-n-butyl phthalate	14.2	J	76.1	J	645	J	645	J	15000	D	15400	J	12.9	J	1300	J	1300	J	2620	J	2620	J
Di-n-octyl phthalate	2810	J	4340	J	4910	J	4910	J	89000	J	89000	J	3910	J	10600	J	10600	J	20000	J	20000	J
Dinoseb	0.645	J	0.704	J	0.0872	J	1.36	J	7.1	J	68.7	J	0.217	J	38.3	J	38.7	J	45.4	J	64.3	J
Formaldehyde	2.48	J	9.71	J	3.4	J	12.3	J	436	J	1350	J	2.8	J	1700	J	1720	J	218	J	229	J
Hexachlorobutadiene	0.29	B	1.6	B	0.32	B	1.8	B	31	B	120	B	1.4	B	25	B	25	B	48	B	51	B
Hexachloroethane	0.103	J	1.56	J	0.109	J	1.8	J	9.41	J	110	J	1.76	J	122	J	125	J	115	J	206	J
HMX	5.7	B	26	B	6700	B	6700	B	110000	B	110000	B	3.9	B	13000	B	13000	B	23000	B	24000	B
Isopropyl benzene	46.9	J	548	J	58.4	J	894	J	1400	D	53500	J	212	J	23900	J	24900	J	14800	J	33800	J
Methyl tert-butyl ether	27.6	J	160	D	20	E	220	D	7900	D	24000	D	90	D	7360	J	85500	E	7360	J	24800	E
Nicotine	0.1	J	0.4	J	47.1	J	49.8	J	855	J	860	J	0.0598	J	120	J	120	J	173	J	171	J
Prochloraz	9.47	J	52	J	606	J	611	J	12400	J	12500	J	8.52	J	1480	J	1480	J	2300	J	2310	J
Propyl benzene	110	J	952	J	197	J	2630	J	4100	D	103000	J	223	J	24700	J	25000	J	27500	J	43800	J

GeoCon Site Investigations Ltd

GENERIC SCREENING CRITERIA
FOR
GENERIC QUANTITATIVE RISK ASSESSMENT

Compound	Residential WITH consumption of home-grown vegetables				Residential WITHOUT consumption of home-grown vegetables				Commercial				Allotments		Public Open Space - Residential				Public Open Space - Parks			
	1 % SOM SAND		6 % SOM SAND		1 % SOM SAND		6 % SOM SAND		1 % SOM SAND		6 % SOM SAND		6 % SOM SAND		1 % SOM SAND		6 % SOM SAND		1 % SOM SAND		6 % SOM SAND	
	mg/kg	Ref	mg/kg	Ref	mg/kg	Ref	mg/kg	Ref	mg/kg	Ref	mg/kg	Ref	mg/kg	Ref	mg/kg	Ref	mg/kg	Ref	mg/kg	Ref	mg/kg	Ref
RDX	120	B	540	B	13000	B	13000	B	210000	B	210000	B	85	B	26000	B	27000	B	49000	B	53000	B
Styrene	9.42	E	43	D	9.42	E	170	D	3300	D	11000	D	8.7	D	4220	E	4220	E	4220	E	1260	E
Tetrachloroethene	0.455	E	6.15	E	0.455	E	6.89	E	75.8	E	823	E	8.7	E	4340	E	4240	E	4340	E	1150	E
Total Cresols (2-, 3- and 4-methylphenol)	80	D	400	D	80	D	6900	D	160000	D	180000	D	63	D	-	-	-	-	-	-	-	-
Trans 1,2 Dichloroethene	0.0952	J	0.986	J	0.0965	J	1.01	J	9.51	J	76.1	J	4.8	J	3550	J	4030	J	918	J	2700	J
Tributyl tin oxide	0.28	J	1.52	J	2.16	J	8.2	J	119	J	199	J	0.271	J	30.1	J	30.3	J	46.2	J	54.8	J
Trichloroethene	0.00156	J	0.0201	J	0.00159	J	0.0209	J	0.149	J	1.49	J	0.076	J	33.1	J	36.5	J	11	J	32	J
Trichloro methane	0.91	B	3.4	B	1.2	B	4.2	B	99	B	350	B	1.7	B	2500	B	2500	B	2600	B	3100	B
Trichloromethyl benzene	0.000214	J	0.00222	J	0.000294	J	0.00434	J	0.025	J	0.247	J	0.00068	J	0.18	J	0.183	J	0.199	J	0.309	J
Vinyl chloride	0.000284	J	0.00138	J	0.000305	J	0.00152	J	0.0309	J	0.117	J	0.00217	J	3.45	J	3.5	J	3.68	J	5.36	J
Pesticides																						
Aldrin	5.7	B	7.1	B	7.3	B	7.5	B	170	B	170	B	9.6	B	18	B	18	B	30	B	31	B
Dieldrin	0.97	B	3.5	B	7	B	7.4	B	170	B	170	B	0.96	B	18	B	18	B	30	B	31	B
Atrazine	3.3	B	17.4	B	610	B	620	B	9300	B	9400	B	2.7	B	1200	B	1200	B	2300	B	2400	B
Dichlorvos	0.032	B	0.14	B	6.4	B	6.6	B	140	B	140	B	0.022	B	16	B	16	B	26	B	27	B
Alpha-Endosulfans	7.4	B	41	B	160	B	410	B	5600	B	8400	B	6.8	B	1200	B	1200	B	2400	B	2500	B
Beta-Endosulfans	7	B	39	B	190	B	440	B	6300	B	8700	B	6.4	B	1200	B	1200	B	2400	B	2500	B
Alpha-Hexachlorocyclohexane	0.23	B	1.2	B	6.9	B	11	B	170	B	180	B	0.21	B	24	B	24	B	47	B	48	B
Beta-Hexachlorocyclohexane	0.085	B	0.46	B	3.7	B	3.8	B	65	B	65	B	0.077	B	8.1	B	8.1	B	15	B	16	B
Gamma-Hexachlorocyclohexane	0.06	B	0.33	B	2.9	B	3.5	B	67	B	70	B	0.054	B	8.2	B	8.2	B	14	B	15	B
Polychlorinated Biphenols (PCB)																						
Sum of PCDDs, PCDFs and dioxin-like PCBs	0.008	A	-	-	0.008	A	-	-	0.24	A	-	-	-	-	-	-	-	-	-	-	-	-
Chlorobenzenes																						
Chlorobenzene	0.46	B	2.4	B	0.46	B	2.4	B	56	B	290	B	32	B	11000	B	14000	B	1300	B	2900	B
1,2-Dichlorobenzene	23	B	130	B	24	B	130	B	2000	B	11000	B	540	B	90000	B	98000	B	24000	B	51000	B
1,3-Dichlorobenzene	0.4	B	2.3	B	0.44	B	2.5	B	30	B	170	B	1.5	B	300	B	300	B	390	B	470	B
1,4-Dichlorobenzene	61	B	350	B	61	B	350	B	4400	B	25000	B	88	B	17000	B	17000	B	36000	B	36000	B
Hexachlorobenzene	1.8	B	4.9	B	4.1	B	6.7	B	110	B	120	B	2.5	B	16	B	16	B	30	B	30	B
Pentachloro benzene	5.8	B	22	B	19	B	38	B	640	B	830	B	7	B	100	B	100	B	190	B	190	B
1,2,3-Trichlorobenzene	1.5	B	8.6	B	1.5	B	8.8	B	102	B	590	B	28	B	1800	B	1800	B	770	B	1600	B
1,2,4-Trichlorobenzene	2.6	B	15	B	2.6	B	15	B	220	B	1300	B	320	B	15000	B	19000	B	1700	B	4000	B
1,3,5-Trichlorobenzene	0.33	B	1.9	B	0.33	B	1.9	B	2.3	B	130	B	28	B	1700	B	1800	B	380	B	860	B
1,2,3,4-Tetrachlorobenzene	15	B	78	B	24	B	120	B	1700	B	4400	B	26	B	830	B	830	B	1500	B	1600	B
1,2,3,5-Tetrachlorobenzene	0.66	B	3.7	B	0.75	B	4.3	B	49	B	240	B	2.2	B	78	B	79	B	110	B	130	B
1,2,4,5-Tetrachlorobenzene	0.33	B	1.6	B	0.73	B	3.5	B	42	B	96	B	0.37	B	13	B	13	B	25	B	26	B

APPENDIX D

PROBABILITY / CONSEQUENCE 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 or harm or pollution.	*Elevated concentrations of toxic contaminants are present in soils in the top 0.5m in a residential garden.* *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.	*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.* *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 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.	*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.* *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.	*Elevated concentrations of toxic contaminants are present below hardstanding.* *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.* *Discolouration 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.

APPENDIX E

GAS MONITORING DATA

TBC