ENVIRONMENTAL
MANAGEMENT SOLUTIONS

Intrusive Ground Investigation Report

CCP

18 Iron Bridge Close
London
NW10 0UF

E7119a

Environmental
Management Solutions
24th July 2017

EXECUTIVE SUMMARY

SITE: 18 Iron Bridge Close, London, NW10 0UF

Client	CCP.
Proposed Development	Residential land use.
Purpose of Report	Ground investigation to obtain a characterisation of the site with respect to soil contamination issues.
Site History	Open land until 1914 when a railway siding is constructed adjacent to the east. A coal depot and works appear in the vicinity of the site in the 1970s. By 1991 the building at the site and surrounding business park is established.
Site Status	Two storey brick building with parking area to the west and landscaping to the north and east. A retaining wall is present in the east.
Anticipated Geology	London Clay Formation.
Agency and Hydrological	London Clay Formation is Unproductive Strata. No surface water features recorded within 250 m. No licensed water abstractions within 1000 m of the site. The site is not within a source protection zone.
Waste / Landfill	No landfill sites within 1000 m of the site. A waste transfer station is 76 m north-east of the site. A scrap metal yard is between 90 m and 93 m north-east of the site.
Site Work	Four hand excavated trial pits with contamination and sulphate testing.
Ground Conditions	Made Ground generally between 0.65 m and 0.80 m deep overlying clay of the London Clay Formation.
Groundwater	No groundwater encountered.
Contamination Summary	No elevated concentrations of contaminants recorded in any of the samples tested. No asbestos detected in any of the samples tested. No remedial measures considered necessary.
Ground Gas	No gas protection (methane and carbon dioxide) measures required. No radon gas protection measures required.

CCP

18 Iron Bridge Close, London, NW10 0UF

Intrusive Ground Investigation Report

Contents Amendment Record

This report has been issued and amended as follows:

Revision	Description	Date
0	Report E7119a	24/07/2017
	Shaun Armitage BSc FGS	[redacted]

Contents

1. Introduction

Environmental Management Solutions Limited (EMS) have been instructed by CCP, of 18 Iron Bridge Close, London, NW10 0UF to undertake an intrusive geo-environmental investigation for a site located at 18 Iron Bridge Close, London, NW10 0UF.

The site is located at National Grid Reference 521284 185249. A site location plan is included within Appendix A of this report.

A phase one desk study has previously been undertaken by Your Environment for the site and is discussed in Section 3.1.

This investigation has been undertaken to provide information on the contamination status of the site. It is understood that this report will be used in support of a planning application.

2. Objectives of the Investigation

2.1. Objectives of the Investigation

The objectives of this intrusive investigation were:

- to obtain further information in relation to potential sources of contamination, likely pathways, and features of immediate concern;
- to obtain data on the geology, geochemistry, soil, hydrogeology and hydrology of the site;
- to obtain data on the nature and extent of any contamination at the site;
- to provide data to review the conceptual model and to update the risk assessment;
- to establish whether or not there are potentially unacceptable risks associated with soil and groundwater contamination;
- to provide a phase two ground investigation report to be submitted to the relevant planning authorities in partial fulfilment of planning conditions / in support of a planning application.

2.2. Scope of Work

The scope of work was developed in accordance with the Environment Agency and Department for Environment Food and Rural Affairs (DEFRA) document 'Model Procedures for the Management of Land Contamination' Contaminated Land Report

(CLR) 11, dated 2004 and the British Standards Institution publication 'BS 10175:2011+A1:2013 – Investigation of Potentially Contaminated Sites – Code of Practice'.

2.3. Management Limitations

- This report has been prepared under the express instructions and solely for the use of the Client and the Client's agents.
- The findings of this report represent the professional opinion of experienced contaminated land consultants. EMS does not provide legal advice and the advice of legal professionals may also be required.
- All work carried out in preparing this report has utilised and is based upon EMS current professional knowledge and understanding of current relevant UK standards and codes, technology and legislation. Changes in this legislation and guidance may occur at any time in the future and cause any conclusions to become inappropriate or incorrect. EMS does not accept responsibility for advising the Client or other interested parties of the facts or implications of any such changes.
- The report is limited to the boundaries identified by the Client on this site and confirmed within this report.
- This report represents the conditions and findings on the dates of the investigation. Over time, site conditions may alter.
- It is recommended that this report is passed to statutory bodies for their comment as soon as is possible. Such statutory bodies may disagree with the conclusions/recommendations of EMS or provide further information useful to the proposed development.

3. Land Use and Setting

3.1. Previous Investigation Reports

A Desktop Study and Preliminary Risk Assessment Report (report reference YE3123 dated June 2017) has previously been produced for the site by Your Environment. The important findings of this investigation are summarised in the following section:

The desktop study investigation included a site walkover survey, study of historical maps, study of published geological data, and study of environmental database information.

Published geological information indicates the site is directly underlain by the London Clay Formation (clay, silt and sand). No superficial deposits are anticipated to be present at the site.

In terms of aquifer designation, the London Clay Formation is classified as Unproductive Strata. There are no surface water features recorded within 250 m of the site. There are no licensed water abstractions recorded within 1000 m of the site. The site is not within a source protection zone.

Historical maps indicate the site to have comprised open land set in surrounding farmland until 1914 when a railway siding was constructed 10 m east of the site. A pond was present 40 m west of the site until 1914. By 1975 the railway siding is removed and replaced by a road. A coal depot is located 20 m east of the site at this time and a works is present 100 m to the west. By 1991 the current building at the site is constructed and the east part of the site covered a road embankment.

No radon protective measures are necessary within new dwellings or extensions at the site.

No landfill sites have been identified within 1000 m of the site. Two waste sites are located within 100 m of the site. A waste transfer station is recorded 76 m north-east of the site. A scrap metal yard is located between 90 m and 93 m north-east of the site.

The report identified the former railway sidings and coal depot, as well as the current radar and telecommunications equipment suppliers to the south, as sources of contamination. A maximum moderate risk to receptors from these sources was identified.

EMS consider that the radar and telecommunications equipment suppliers is not a significant source of contamination as Audiolink, the company occupying the site to the south, only undertaken the sale and hire of two-way radios.

3.2. Site Description

The site comprises a two storey brick building with a flat roof and surrounding land. Macadam surfacing is present to the west of the building which provides car parking space. A concrete walkway is present along the northern and eastern elevations of the building. A retaining wall, approximately 1.00 m high, is present in the east of the site. This wall retains a raised level area which is surfaced in decorative gravel and concrete paving, both of which are slightly overgrown. An overgrown area with a number of piles of overgrown demolition rubble and earth is present in the north of the site. This area slopes gently downhill in a southerly direction.

The site is bound to the east by a high metal mesh fencing. The northern boundary is defined by the edge of the pavement. No boundary exists to the west. The southern boundary is formed by a connecting building.

A business park is present to the south and west of the site with an access road to the north. A road is present to the east with a concrete and macadam plant beyond.

3.3. Future Land Use

The conversion of the existing building into residential flats is proposed. It is assumed that the external areas of the site will form car parking and shared outdoor space.

4. Site Investigation and Observations

4.1. Investigation Strategy

The site was investigated by means of a series of hand excavated trial pits. The trial pits were put down to allow inspection and sampling of the soils for contamination purposes. The trial pits targeted the area of the site closest to the former railway sidings and coal yard.

The locations of the trial pits are indicated on the exploratory hole location plan included as Appendix B.

4.2. Investigation Methodology

Four hand excavated trial pits (HP1 to HP4) were excavated across the site on 4th July 2017. The trial pits were excavated to depths of between 0.80 m and 1.00 m.

The soils were logged in general accordance with British Standard BS5930:2015 by an experienced Geo-Environmental Engineer.

Environmental samples (plastic tub, amber jar and small amber jar) were taken as appropriate by the EMS Geo-Environmental Engineer for subsequent laboratory contamination testing.

On completion of logging and sampling, the trial pits were backfilled with the soil arisings.

Details of the soils encountered, samples taken, and any groundwater entries are recorded on the trial pit logs (Appendix C). Photographs of the trial pits are included as Appendix D.

4.3. Collection, Preservation and Transport of Contamination Samples

EMS soil contamination sampling methodology determines that samples are taken from the trial pits and placed in glass jars and vials for storage. Jars and vials are stored within a cool box at the first possible opportunity to ensure sample preservation. Containers for volatile analysis were filled so that minimal air space remained prior to sealing. This, in combination with a low storage temperature, reduces the likelihood

for volatile compounds, which may have been present within the sample, to volatilise to the headspace prior to analysis.

After brief temporary storage within EMS's sample refrigeration unit, samples selected for laboratory analysis are transported in cool boxes via an overnight courier company. On-site inspection for below ground asbestos debris is undertaken as standard at the time of investigation, and soil/debris samples taken if deemed necessary.

Samples were chosen for laboratory analysis based upon visual observations. Disposable nitrile gloves were worn and changed between each sample taken to prevent cross contamination.

The samples were analysed by Envirolab, Units 7-8 Sandpits Business Park, Mottram Road, Hyde, Cheshire, SK14 3AR. Envirolab are a UKAS accredited laboratory (UKAS number 1247) and part of the Monitoring Certification Scheme (MCERTS). A suite of tests, as listed in the table below, were requested to be undertaken on the samples submitted for analysis.

Testing was undertaken in accordance with in-house test methods. The full list of determinands screened for during these tests is listed on the test certificates included within Appendix E of this report.

4.4. Analytical Strategy – Contamination Testing

Representative soil samples from the trial pits were collected and analysed for contaminants selected based on the findings of the desk study and on observations at the time of intrusive site investigation. Analysis for these contaminants will give an initial determination of the level and distribution of contamination within soil beneath the site. Samples were also tested to determine the concentrations of sulphates in the soil (both naturally occurring and anthropogenic) for assessment of the risk posed to buried concrete. The samples were submitted for analysis for the following compounds:

Location	Depth (m)	Testing suite
HP1	0.20	Heavy metals, pH, water soluble sulphate, total sulphate, total sulphur, total cyanide, phenols, organic matter, banded TPH, speciated PAH, asbestos, and PCBs.
HP2	0.30	Heavy metals, pH, water soluble sulphate, total sulphate, total sulphur, total cyanide, phenols, organic matter, banded TPH, speciated PAH, asbestos, and PCBs.
HP2	0.70	pH, water soluble sulphate, total sulphate, and total sulphur.
HP3	0.30	Heavy metals, pH, water soluble sulphate, total sulphate, total sulphur, total cyanide, phenols, organic matter, banded TPH, speciated PAH, and asbestos.
HP3	0.80	pH, water soluble sulphate, total sulphate, and total sulphur.
HP4	0.10	Heavy metals, pH, water soluble sulphate, total sulphate, total sulphur, total cyanide, phenols, organic matter, banded TPH, speciated PAH, and asbestos.
HP4	0.80	Heavy metals, pH, water soluble sulphate, total sulphate, total sulphur, total cyanide, phenols, organic matter, banded TPH, speciated PAH, asbestos, and PCBs.

An asbestos screen was included in the contamination testing suite for all locations where the presence of Made Ground was identified.

5. Investigation Findings

5.1. Ground Conditions

Made Ground

Made Ground was encountered in all the trial pits to depths between 0.65 m and in excess of 1.00 m. The Made Ground was generally sand-based at shallow depths and clay-based at greater depth. Sand-based material was encountered throughout the full depth of the Made Ground in HP1. All the Made Ground soils had low proportions of anthropogenic materials including brick, concrete and ash.

London Clay Formation

Strata considered to represent the London Clay Formation were encountered directly beneath the Made Ground and to the base of all trial pits except HP4 where the Made Ground was not fully penetrated.

This material comprised stiff clay in all instances.

5.2. Groundwater Occurrence

No groundwater entries occurred in any of the four trial pits.

5.3. Laboratory Analysis Results

The results of the laboratory soil contamination tests are presented in Appendix E.

6. Soil Contamination Assessment

6.1. Selection of Generic Assessment Criteria

Risk assessment of a site is undertaken via the source-pathway-receptor linkage concept. Thus, for a risk to exist, a source of contamination capable of causing harm to a receptor (such as groundwater or humans) has to be present on the site in association with a pathway which facilitates exposure. The Environment Agency has developed guidelines to risk assessment of human exposure to contaminated sites; this recommends the use of a tiered approach with an initial generic comparison against Soil Guideline Values (SGVs) being the first step to site human health risk assessment. The primary purpose of the SGVs is to provide 'intervention values' for the assessment of risk in relation to land contamination.

In recent years, as science and understanding has advanced, the Environment Agency have withdrawn the SGV for lead, and are understood to have no plans to publish further SGVs, preferring to let industry derive its own values, based on the most up to date science and understanding, and a similar methodology. EMS has chosen to use the 'S4UL' (Suitable for Use Levels), published in 2015 by Land Quality Management (LQM) and the Chartered Institute for Environmental Heath (CIEH) for human health risk assessment. The levels have been based on Health Criteria Values and Tolerable Daily Intakes that represent minimal or tolerable levels of risks to health as described in the Environment Agency's SR2 guidance. These S4ULs cover 89 substances.

Where S4ULs are not available (total cyanide and MTBE), the widely accepted Soil Screening Values (SSVs) developed as part of the Atkins ATRISK program have been used. These values have been developed utilising peer reviewed literature within the guidelines presented in the Environment Agency contaminated land guidance documentation CLR7 to CLR10. The values have been updated utilizing the 2008 new

guidance SC050021/SR3 (the CLEA report) and SC050021/SR2 (the TOX report). The ATRISK SSVs have been developed on a minimal risk basis.

In the case of lead, the Department for Environment, Food and Rural Affairs' Category 4 Screening Level (C4SL) has been used for comparison purposes.

The development of the site as a residential development is proposed. The generic screening values for a residential land use with the consumption of home grown produce have therefore been utilised for comparison purposes.

Further screening values have been obtained from the Building Research Establishment (BRE) to allow preliminary assessment of the risk to buildings and structures on the site.

The risk to contractors from acute (short term) exposure has been initially assessed on a qualitative basis. The risk to controlled waters from concentrations of contaminants in soil samples taken as part of this preliminary investigation has also been assessed on a qualitative basis.

6.2. Human Health

General Contaminants

A table comparing the soil contamination results with the relevant generic screening values has been included within Appendix E. No contaminants have been recorded above the relevant screening values.

PCBs

No PCB concentrations in excess of the laboratory test detection limits have been identified.

Asbestos

Asbestos was not identified in any of the samples of Made Ground.

Conclusions

The site is therefore considered to be suitable for the proposed use. No remedial measures are necessary.

6.3. Human Health – Construction Workers

As discussed above, no threats to human health have been identified by the contamination testing. The risk level presented to construction workers in contact with soils at the site is considered to be low. Standard good practice including wearing gloves when handling soil, washing hands before eating, drinking or smoking and suppression of dust is still recommended.

6.4. Buried Concrete

Total sulphur, total sulphate, water soluble sulphate and pH results for soil samples from the site have been compared with the recommendations outlined within BRE Special Digest 1: 2005 (concrete in aggressive ground).

On the basis of the test results obtained it is considered appropriate to adopt a Design Sulphate classification for the site of DS-1, together with an Aggressive Chemical Environment for Concrete (ACEC) classification of AC-1.

6.5. Underground Services

It is recommended that this report is passed to service providers to allow appropriate pipe/cable materials to be selected.

6.6. Undiscovered Contamination

Should any hitherto undiscovered contamination be encountered during construction works the Geo-Environmental Engineer should be informed immediately so that appropriate measures can be taken. The potential for the presence of significant undiscovered contamination at this site is considered to be low.

6.7. Ground Gas Assessment

No significant sources of ground gas (methane or carbon dioxide) have been identified at or close to the site. As a result no ground gas protection measures in relation to these gases are considered necessary.

The desk study indicates that no radon protective measures are necessary within new dwellings or extensions at the site.

6.8. Controlled Waters

In terms of aquifer designation, the London Clay Formation is classified as Unproductive Strata. There are no surface water features recorded with 250 m of the site. There are no licensed water abstractions recorded within 1000 m of the site. The site is not within a source protection zone.

Given the very low levels of soil contaminants recorded at the site, the level of risk posed by the site to controlled waters is considered to be very low.

6.9. Waste Recommendations

Soil contamination test results are included as Appendix E. This ground investigation report should be used to assist appropriate classification of soils for disposal at landfill. If materials are to be re-used on site, this should be undertaken in accordance with all current waste and re-use (WRAP) guidance.

6.10. Updated Conceptual Model

Contaminant	Pathway	Receptor	Risk
Heavy metals and inorganics within upper strata; principally Made Ground and topsoil.	Direct contact, dust inhalation and ingestion of soil	Future residents	**Low.** No elevated concentrations of soil contaminants have been identified by the intrusive investigation.
	Direct contact, inhalation and ingestion of soil	Construction workers	**Low.** No elevated concentrations of soil contaminants have been identified by the intrusive investigation. Standard 'good site practices' are still recommended (e.g. PPE, separate eating/drinking areas/provision of washing facilities and suppression of dust).
	Uptake of contaminants via home-grown plant produce.	Future residents	**Low.** No elevated concentrations of soil contaminants have been identified by the intrusive investigation.
	Plant uptake	Vegetation	**Low.** No elevated concentrations of soil contaminants have been identified by the intrusive investigation.
	Direct contact	Structures and services	**Low.** No elevated concentrations of soil contaminants have been identified by the intrusive investigation.
	Horizontal and vertical migration	Unproductive Strata	**Low.** No elevated concentrations of soil contaminants have been identified by the intrusive investigation.
	Horizontal and vertical migration	No surface water features within 250 m	**Low.** No elevated concentrations of soil contaminants have been identified by the intrusive investigation.
Polycyclic aromatic hydrocarbons, phenol, aromatic and aliphatic hydrocarbons within upper strata; principally Made Ground and topsoil.	Direct contact, dust inhalation and ingestion	Future residents	**Low.** No elevated concentrations of soil contaminants have been identified by the intrusive investigation.
	Direct contact, inhalation and ingestion	Construction workers	**Low.** No elevated concentrations of soil contaminants have been identified by the investigation. Standard 'good site practices' are still recommended (e.g. PPE, separate eating/drinking areas/provision of washing facilities and suppression of dust).

Contaminant	Pathway	Receptor	Risk
	Uptake of contaminants via home-grown plant produce.	Future residents	**Low.** No elevated concentrations of soil contaminants have been identified by the intrusive investigation.
	Plant uptake	Vegetation	**Low.** No elevated concentrations of soil contaminants have been identified by the intrusive investigation.
	Direct contact	Structures and services	**Low.** No elevated concentrations of soil contaminants have been identified by the intrusive investigation.
	Volatile inhalation	Future residents	**Low.** No elevated concentrations of volatile soil contaminants have been identified by the intrusive investigation.
	Horizontal and vertical migration	Unproductive Strata	**Low.** No elevated concentrations of soil contaminants have been identified by the intrusive investigation.
	Horizontal and vertical migration	No surface water features within 250 m	**Low.** No elevated concentrations of soil contaminants have been identified by the intrusive investigation.
Sulphates from Made Ground and natural soils beneath site	Direct contact	Concrete structures and water pipes	**Low.** DS-1 applicable.
Aggressive pH from Made Ground beneath site	Direct contact	Concrete structures and water pipes	**Low.** AC-1 applicable.
Asbestos if present within Made Ground beneath site	Inhalation of fibres	Future residents	**Low.** No asbestos detected in any of the samples tested.
	Inhalation of fibres	Construction workers	**Low.** No asbestos detected in any of the samples tested.

Appendices

a) Site Plan

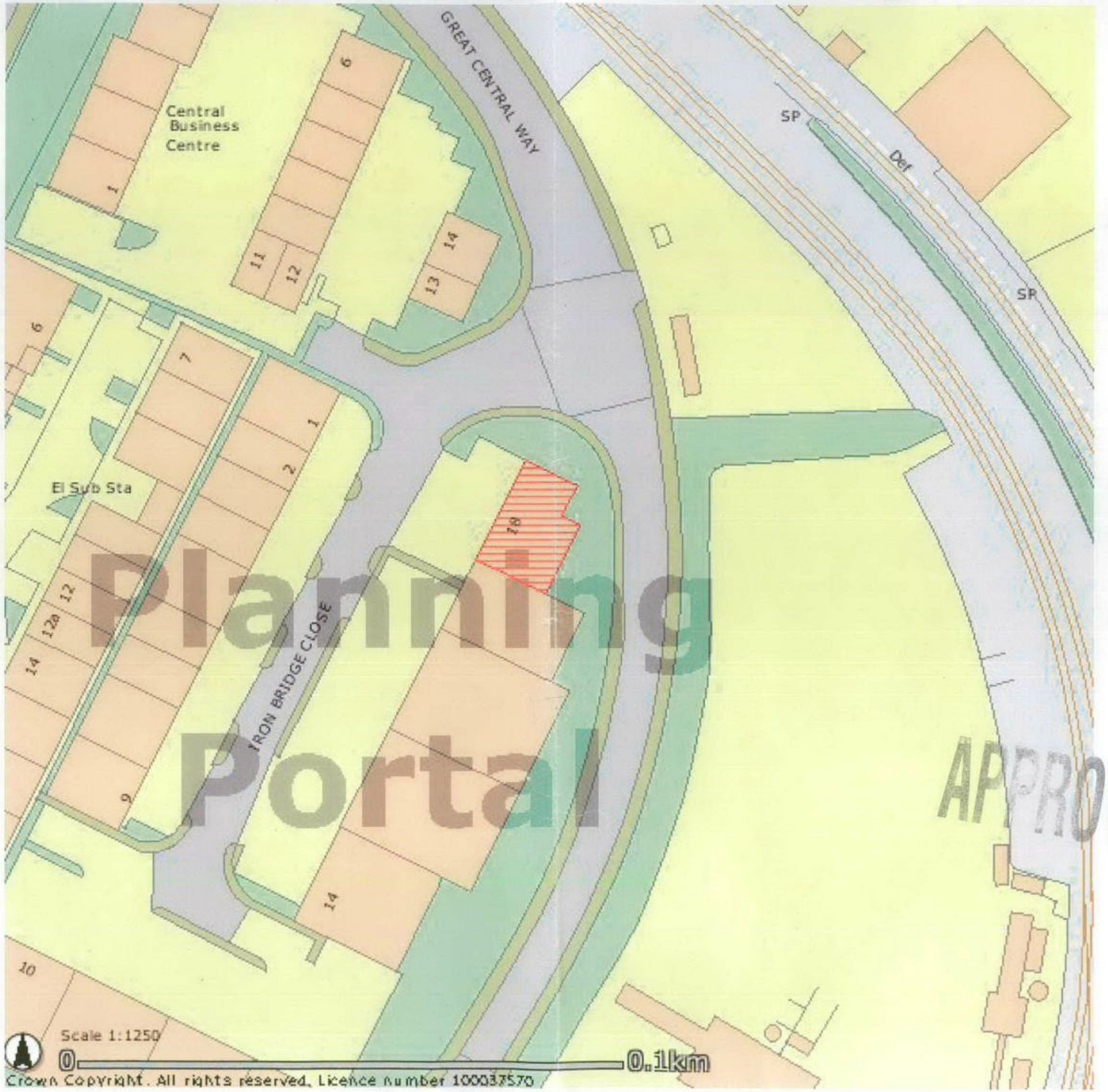
b) Exploratory Hole Location Plan

c) Trial Pit Logs

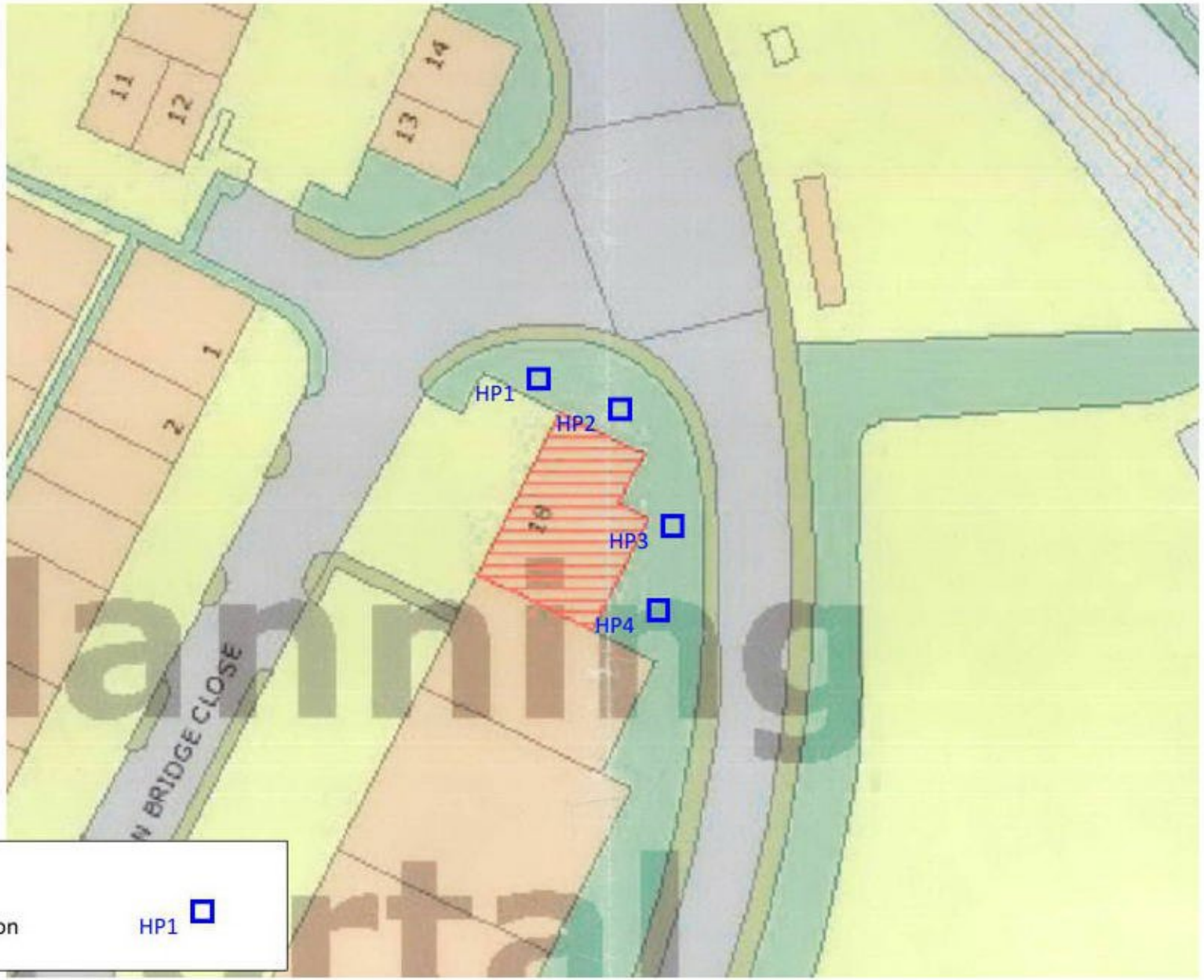
d) Photographic Record – Trial Pits

e) Laboratory Test Results – Contamination

Appendix A – Site Plan



Appendix B – Exploratory Hole Location Plan



KEY:

Trial pit location HP1

ENVIRONMENTAL MANAGEMENT SOLUTIONS	
Project Number:	E7119a
Site:	18 Iron Bridge Close, London, NW10 0UF
Drawing Title:	Exploratory Hole Location Plan

Appendix C – Trial Pit Logs

ENVIRONMENTAL MANAGEMENT SOLUTIONS

Environmental Management Solutions

EXPLORATORY HOLE LOG

Project				HOLE No
18 Iron Bridge Close, London, NW10 0UF				HP1
Job No	Date	Ground Level (m)	Co-Ordinates ()	
E7119	04-07-17			
Contractor				Sheet
				1 of 1

SAMPLES & TESTS		Water	STRATA				Geology	Instrument/ Backfill
Depth	Sample No.		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION		
0.20	ES				(0.50)	MADE GROUND: Brown and cream slightly gravelly fine sand with occasional gravel-size fragments of possible bitumen and cobble-size fragments of concrete. Gravel is fine and medium sub-angular flint.		
					0.50			
					(0.30)	MADE GROUND: Light brown very gravelly fine sand with occasional gravel and cobble-size concrete fragments. Gravel is medium sub-angular flint.		
					0.80			
0.80	D				(0.05)	Stiff grey and orange-brown CLAY. (London Clay Formation)		
					0.85			

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	1. No groundwater entered pit. 2. Backfilled with arisings.

All dimensions in metres Scale 1:6.25	Client CCP	Method/ Plant Used Hand Dug	Logged By SMA

EXPLORATORY HOLE LOG E7119 18 IRON BRIDGE CLOSE.GPJ GINT STD AGS 3_1.GDT 24/7/17

ENVIRONMENTAL MANAGEMENT SOLUTIONS

Environmental Management Solutions

EXPLORATORY HOLE LOG

Project				HOLE No
18 Iron Bridge Close, London, NW10 0UF				HP2
Job No	Date	Ground Level (m)	Co-Ordinates ()	
E7119	04-07-17			
Contractor				Sheet
				1 of 1

SAMPLES & TESTS		Water	STRATA					Geology	Instrument/ Backfill
Depth	Sample No.		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION			
					(0.15)	MADE GROUND: Brown silty gravelly fine sand occasional rootlets. Gravel is medium angular stone.			
					0.15				
					(0.25)	MADE GROUND: Light brown silty very gravelly fine sand. Occasional gravel-size concrete, fine gravel-size ash and cobble-size brick and concrete. Two pieces of thick plastic sheet.			
0.30	ES				0.40				
					(0.25)	MADE GROUND: Grey brown slightly gravelly clay with occasional gravel-size ash.			
					0.65				
					(0.15)	Stiff grey and orange-brown CLAY. (London Clay Formation)			
0.70	D				0.80				

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											1. No groundwater entered pit. 2. Backfilled with arisings.

All dimensions in metres Scale 1:6.25	Client CCP	Method/ Plant Used Hand Dug	Logged By SMA

EXPLORATORY HOLE LOG E7119 18 IRON BRIDGE CLOSE.GPJ GINT STD AGS 3_1.GDT 24/7/17

ENVIRONMENTAL MANAGEMENT SOLUTIONS

Environmental Management Solutions

EXPLORATORY HOLE LOG

Project				HOLE No
18 Iron Bridge Close, London, NW10 0UF				HP3
Job No	Date	Ground Level (m)	Co-Ordinates ()	
E7119	04-07-17			
Contractor				Sheet
				1 of 1

SAMPLES & TESTS		Water	STRATA					Geology	Instrument/ Backfill
Depth	Sample No.		Reduced Level	Legend	Depth (Thick-ness)		DESCRIPTION		
					(0.05)	0.05	Concrete paving slab.		
					(0.05)	0.10	MADE GROUND: Yellow slightly gravelly medium sand. Gravel is fine sub-angular flint.		
0.30	ES				(0.30)	0.40	MADE GROUND: Brown silty slightly gravelly fine sand with occasional gravel-size ash, brick and concrete. Gravel is fine to medium sub-angular flint.		
					(0.35)	0.75	MADE GROUND: Dessicated brown very sandy slightly gravelly clay with rare gravel-size brick. Gravel is fine and medium sub-angular flint and rounded stone.		
0.80	D				(0.10)	0.85	Stiff yellow-brown slightly sandy slightly gravelly CLAY. Gravel is medium sub-angular flint and rounded stone.		

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	1. No groundwater entered pit. 2. Backfilled with arisings.

All dimensions in metres Scale 1:6.25	Client CCP	Method/ Plant Used Hand Dug	Logged By SMA

EXPLORATORY HOLE LOG E7119 18 IRON BRIDGE CLOSE.GPJ GINT STD AGS 3_1.GDT 24/7/17

ENVIRONMENTAL MANAGEMENT SOLUTIONS

Environmental Management Solutions

EXPLORATORY HOLE LOG

Project				HOLE No
18 Iron Bridge Close, London, NW10 0UF				HP4
Job No	Date	Ground Level (m)	Co-Ordinates ()	
E7119	04-07-17			
Contractor				Sheet
				1 of 1

SAMPLES & TESTS		Water	STRATA					Geology	Instrument/ Backfill
Depth	Sample No.		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION			
					(0.05) 0.05	Decorative medium sub-rounded and sub-angular flint gravel on plastic membrane.			
0.10	ES				(0.25) 0.30	MADE GROUND: Brown slightly silty gravelly fine sand with rare gravel-size brick. One plastic shopping bag and one gravel-size piece of polystyrene.			
					(0.40) 0.70	MADE GROUND: Friable brown slightly sandy slightly gravelly clay with occasional gravel-size brick. One metal packing strip. Gravel is medium sub-angular flint and rounded stone. 0.65 - 0.70 One brick			
0.80	ES				(0.30) 1.00	MADE GROUND: Brown to dark brown slightly gravelly clay with some gravel-size ash fragments and occasional gravel-size brick.			

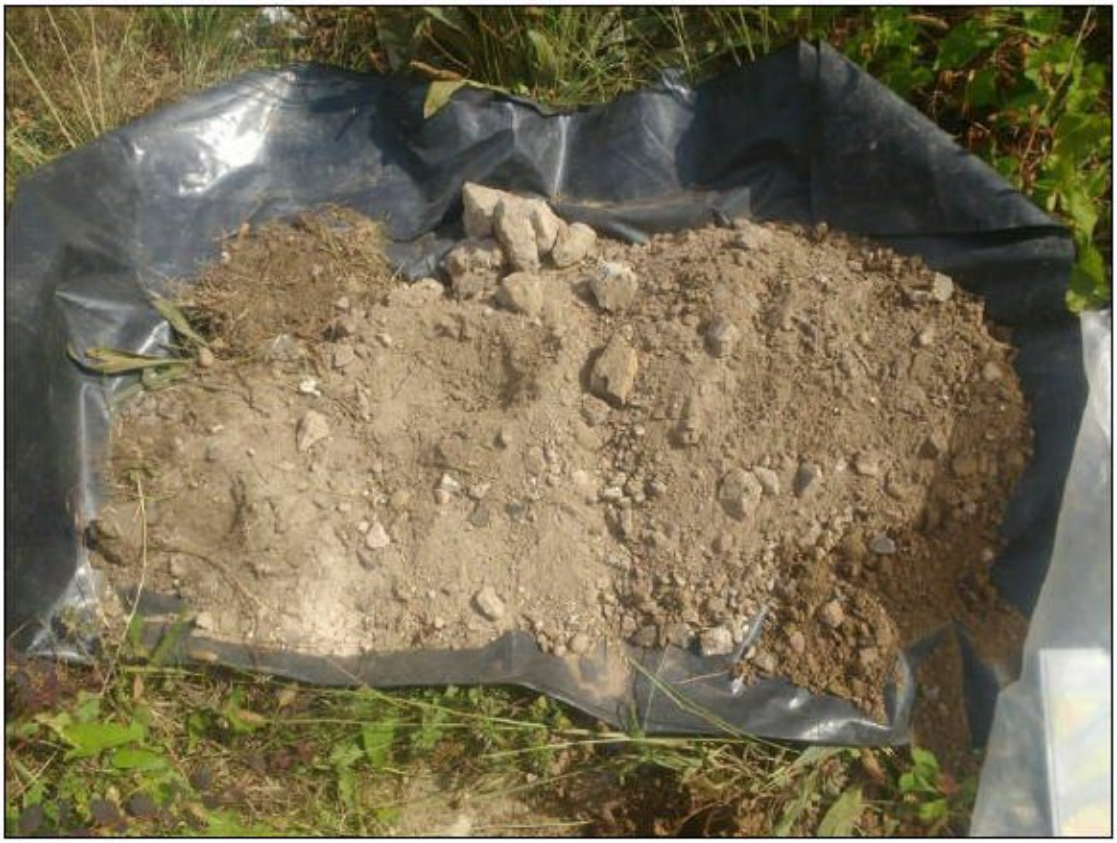
Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	1. No groundwater entered pit. 2. Backfilled with arisings.

All dimensions in metres Scale 1:6.25	Client CCP	Method/ Plant Used Hand Dug	Logged By SMA

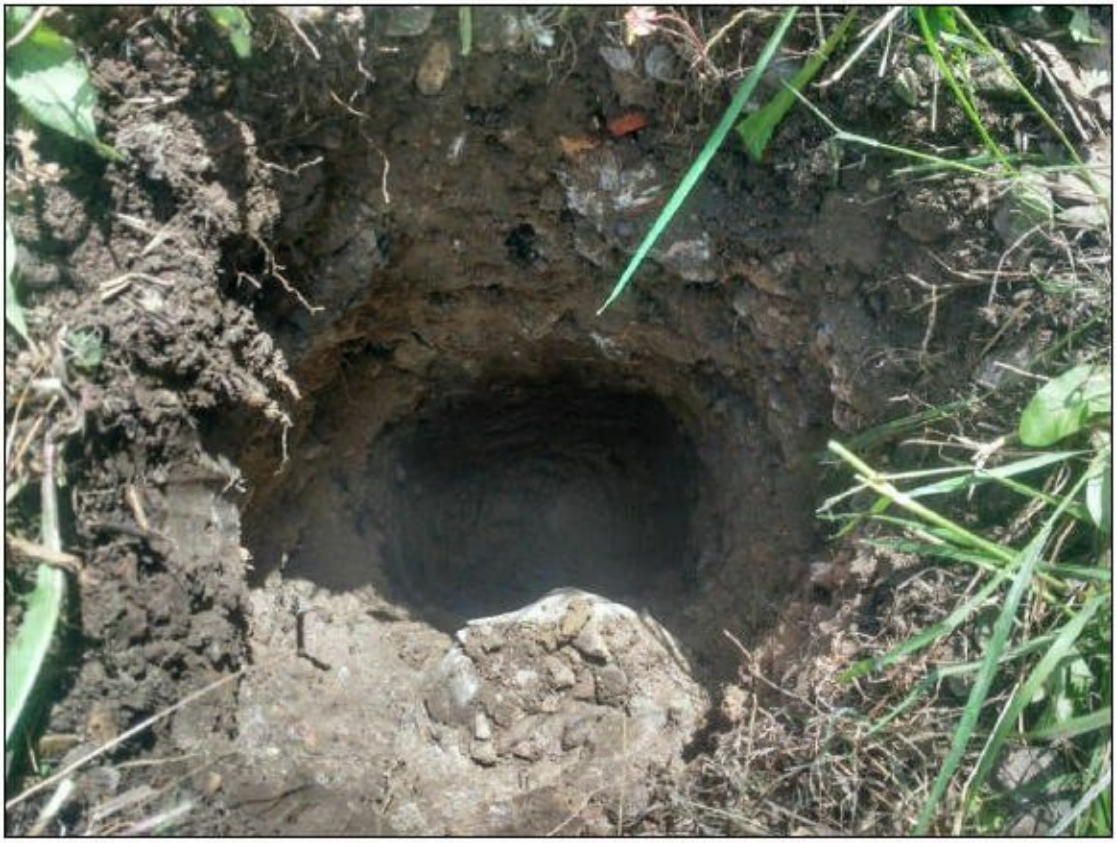
EXPLORATORY HOLE LOG E7119 18 IRON BRIDGE CLOSE.GPJ GINT STD AGS 3_1.GDT 24/7/17

Appendix D – Photographic Record – Trial Pits

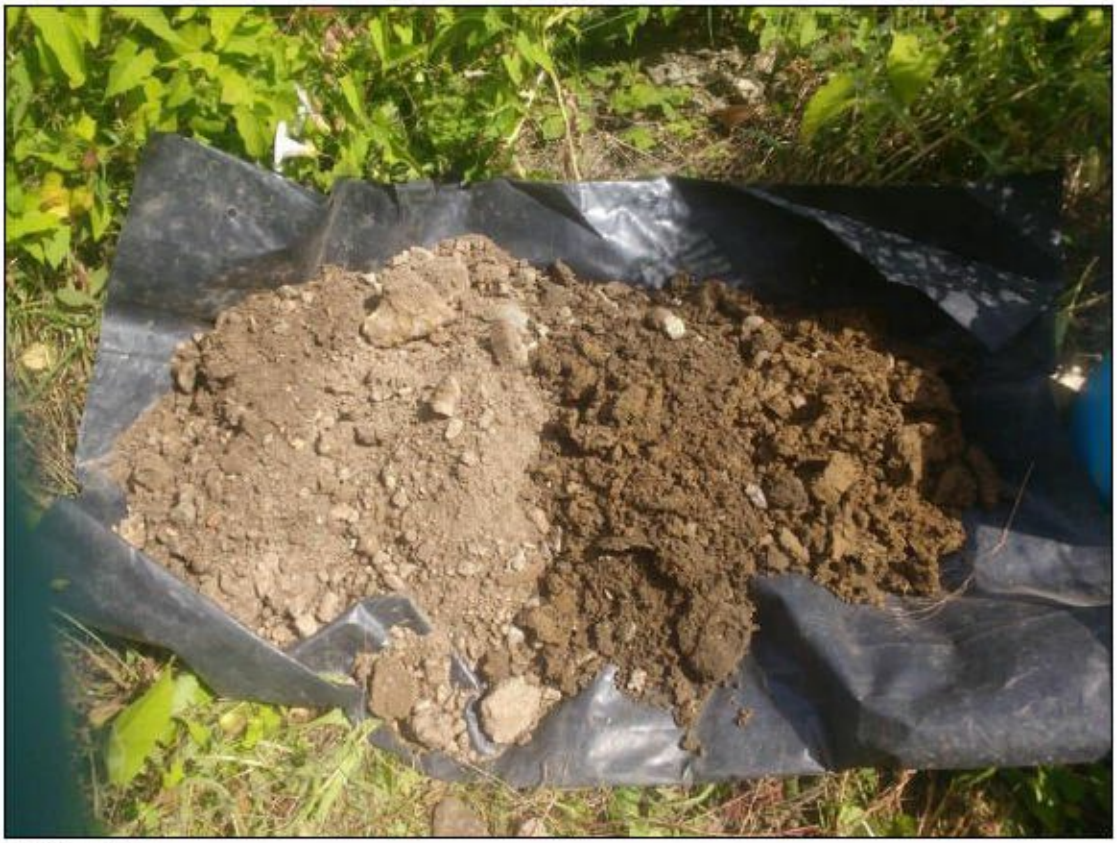
HP01 excavation



HP01 arisings



HP02 excavation



HP02 arisings

HP03 excavation

HP03 arisings

HP04 excavation

HP04 arisings

Appendix E – Laboratory Test Results – Contamination

ENVIRONMENTAL
MANAGEMENT SOLUTIONS

Project Name: 18 Iron Bridge Close, London, NW10 0UF

Project Ref: E7119

Sample location		HP1	HP2	HP3	HP4	HP4							
Depth of sample		0.20	0.30	0.30	0.10	0.80							
Date sampled		04-Jul-17	04-Jul-17	04-Jul-17	04-Jul-17	04-Jul-17	S4UL residential land use with home grown produce				C4SL residential land use with home grown produce	ATRISK SSV residental with plant uptake	ATRISK SSV residental with plant uptake
Sample type		Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES							
							1% SOM	2.5% SOM	6% SOM	6% SOM		1% SOM	6% SOM
pH	pH	8.12	8.17	7.4	7.58	8							
Cyanide (total)	mg/kg	<1	<1	<1	<1	<1						34	34
Phenols - Total by HPLC	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	120	200	380	1300			
Organic matter	% w/w	1.9	3.3	10.3	6.1	8.9							
Arsenic	mg/kg	6	10	7	7	7			37	170	37		
Cadmium	mg/kg	<0.5	1	1.2	1.4	1.1			11	532	26		
Copper	mg/kg	16	39	49	63	72			2400	44000			
Chromium III	mg/kg	14	30	29	42	29			910	33000			
Chromium VI	mg/kg	<1	<1	<1	<1	<1			6	220	21		
Lead	mg/kg	58	134	138	164	149					200		
Mercury (inorganic)	mg/kg	<0.17	0.66	0.27	0.42	0.2			40	240			
Nickel	mg/kg	16	24	19	27	31			130	800			
Selenium	mg/kg	<1	<1	2	2	<1			250	1800			
Zinc	mg/kg	60	110	213	331	136			3700	170000			
PAH 16													
Acenaphthene	mg/kg	<0.01	0.02	0.07	0.04	0.02	210	510	1100	30000			
Acenaphthylene	mg/kg	<0.01	0.02	0.06	<0.01	<0.01	170	420	920	30000			
Anthracene	mg/kg	0.03	0.11	0.21	0.1	0.07	2400	5400	11000	150000			
Benzo(a)anthracene	mg/kg	0.18	0.48	0.66	0.62	0.26	7.2	11	13	62			
Benzo(a)pyrene	mg/kg	0.21	0.59	0.64	0.66	0.27	2.2	2.7	3	13	5		
Benzo(b)fluoranthene	mg/kg	0.2	0.61	0.68	0.74	0.28	2.6	3.3	3.7	16			
Benzo(ghi)perylene	mg/kg	0.12	0.3	0.36	0.32	0.16	320	340	350	1600			
Benzo(k)fluoranthene	mg/kg	0.09	0.25	0.26	0.27	0.12	77	93	100	440			
Chrysene	mg/kg	0.2	0.58	0.79	0.68	0.3	15	22	27	120			
Dibenzo(ah)anthracene	mg/kg	<0.04	0.06	0.07	0.08	<0.04	0.24	0.28	0.3	1.4			
Fluoranthene	mg/kg	0.22	0.66	1.16	0.74	0.38	280	560	890	6400			
Fluorene	mg/kg	<0.01	0.02	0.15	0.03	0.02	170	400	860	20000			
Indeno(123-cd)pyrene	mg/kg	0.12	0.33	0.39	0.37	0.18	27	36	41	180			
Naphthalene	mg/kg	<0.03	<0.03	0.09	<0.03	<0.03	2.3	5.6	13	3000			
Phenanthrene	mg/kg	0.11	0.41	1.09	0.37	0.28	95	220	440	6300			
Pyrene	mg/kg	0.19	0.6	0.98	0.63	0.34	620	1200	2000	15000			
Total PAH	mg/kg	1.67	5.03	7.67	5.63	2.69							
TPH Banded 1													
>C6-C8	mg/kg	<10	<10	<10	<10	<10	70	140	300	92000 [4710]			
>C8-C10	mg/kg	<10	<10	<10	<10	<10	27	65	150	9300 (3580)			
>C10-C12	mg/kg	<10	<10	<10	<10	<10	74	180	380	10000			
>C12-C16	mg/kg	<10	<10	<10	<10	<10	140	330	660	10000			
>C16-C21	mg/kg	<10	<10	15	<10	<10	260	540	930	7800			
>C21-C40	mg/kg	39	63	102	90	91	1100	1500	1700	7900			
Total TPH	mg/kg	39	63	117	90	91							

Based on lowest value SSV (ali or aro):
Aromatic C5-C7
Aliphatic C8-C10
Aromatic C10-C12
Aromatic C12-C16
Aromatic C16-21
Aromatic C21-C35

Highlighted values exceed the relevant SSV.

Notes:

1. S4ULs for metals are not listed for varying SOM% but are based on 6 % SOM. The variability of the S4ULs for metals with SOM% is not considered significant.
2. Value shown exceeds solubility saturation limits if followed by square brackets [] or vapour saturation limits if followed by round brackets (). Brackets contain the saturation limit value.
3. Lowest value of m/p xylene used.
4. For Banded TPH the lowest value of either aliphatic or aromatic band has been used.

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Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 17/04639
Issue Number: 1 **Date:** 19 July, 2017

Client:
Environmental Management Solutions Ltd
Sigeric Business Park
Holme Lacy Road
Rotherwas
Hereford
UK
HR2 6BQ

Project Manager: Shaun Armitage
Project Name: 18 Iron Bridge Close, London, NW10 0UF
Project Ref: E7119
Order No: 373
Date Samples Received: 06/07/17
Date Instructions Received: 06/07/17
Date Analysis Completed: 19/07/17

Prepared by:

[redacted]

Violet McLoughlin
Administrative Assistant

Approved by:

[redacted]

Richard Wong
Client Manager

Envirolab Job Number: 17/04639

Client Project Name: 18 Iron Bridge Close, London, NW10 0UF

Client Project Ref: E7119

Lab Sample ID	17/04639/1	17/04639/3	17/04639/4	17/04639/5	17/04639/6	17/04639/7	17/04639/8		Units	Method ref
Client Sample No										
Client Sample ID	HP1	HP2	HP2	HP3	HP3	HP4	HP4			
Depth to Top	0.20	0.30	0.70	0.30	0.80	0.10	0.80			
Depth To Bottom										
Date Sampled	04-Jul-17	04-Jul-17	04-Jul-17	04-Jul-17	04-Jul-17	04-Jul-17	04-Jul-17			
Sample Type	Soil - ES	Soil - ES	Soil - D	Soil - ES	Soil - D	Soil - ES	Soil - ES			
Sample Matrix Code	1AE	4AE	5A	4AE	5A	4AE	5A			
% Stones >10mm$_A$	8.5	7.9	15.3	9.6	21.1	6.9	11.4		% w/w	A-T-044
pH$_D$	8.12	8.17	-	7.40	-	7.58	8.00		pH	A-T-031s
pH BRE$_D$	-	-	7.86	-	7.13	-	-		pH	A-T-031s
Sulphate BRE (water sol 2:1)$_D$	<10	48	19	<10	<10	<10	21		mg/l	A-T-026s
Sulphate BRE (acid sol)$_D$	0.07	0.17	<0.02	0.05	0.02	0.07	0.04		% w/w	A-T-028s
Sulphur BRE (total)$_D$	0.04	0.07	<0.01	0.04	0.02	0.06	0.03		% w/w	A-T-024s
Cyanide (total)$_A$	<1	<1	-	<1	-	<1	<1		mg/kg	A-T-042xTCN
Phenols - Total by HPLC$_A$	<0.2	<0.2	-	<0.2	-	<0.2	<0.2		mg/kg	A-T-050s
Organic matter$_D$	1.9	3.3	-	10.3	-	6.1	8.9		% w/w	A-T-032 OM
Arsenic$_D$	6	10	-	7	-	7	7		mg/kg	A-T-024s
Cadmium$_D$	<0.5	1.0	-	1.2	-	1.4	1.1		mg/kg	A-T-024s
Copper$_D$	16	39	-	49	-	63	72		mg/kg	A-T-024s
Chromium$_D$	14	30	-	29	-	42	29		mg/kg	A-T-024s
Chromium (hexavalent)$_D$	<1	<1	-	<1	-	<1	<1		mg/kg	A-T-040s
Lead$_D$	58	134	-	138	-	164	149		mg/kg	A-T-024s
Mercury$_D$	<0.17	0.66	-	0.27	-	0.42	0.20		mg/kg	A-T-024s
Nickel$_D$	16	24	-	19	-	27	31		mg/kg	A-T-024s
Selenium$_D$	<1	<1	-	2	-	2	<1		mg/kg	A-T-024s
Zinc$_D$	60	110	-	213	-	331	136		mg/kg	A-T-024s

Envirolab Job Number: 17/04639

Client Project Name: 18 Iron Bridge Close, London, NW10 0UF

Client Project Ref: E7119

Lab Sample ID	17/04639/1	17/04639/3	17/04639/4	17/04639/5	17/04639/6	17/04639/7	17/04639/8		Units	Method ref
Client Sample No										
Client Sample ID	HP1	HP2	HP2	HP3	HP3	HP4	HP4			
Depth to Top	0.20	0.30	0.70	0.30	0.80	0.10	0.80			
Depth To Bottom										
Date Sampled	04-Jul-17	04-Jul-17	04-Jul-17	04-Jul-17	04-Jul-17	04-Jul-17	04-Jul-17			
Sample Type	Soil - ES	Soil - ES	Soil - D	Soil - ES	Soil - D	Soil - ES	Soil - ES			
Sample Matrix Code	1AE	4AE	5A	4AE	5A	4AE	5A			
Asbestos in Soil (inc. matrix)										
Asbestos in soil$_A^{\#}$	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			

Envirolab Job Number: 17/04639

Client Project Name: 18 Iron Bridge Close, London, NW10 0UF

Client Project Ref: E7119

Lab Sample ID	17/04639/1	17/04639/3	17/04639/4	17/04639/5	17/04639/6	17/04639/7	17/04639/8		Units	Method ref
Client Sample No										
Client Sample ID	HP1	HP2	HP2	HP3	HP3	HP4	HP4			
Depth to Top	0.20	0.30	0.70	0.30	0.80	0.10	0.80			
Depth To Bottom										
Date Sampled	04-Jul-17	04-Jul-17	04-Jul-17	04-Jul-17	04-Jul-17	04-Jul-17	04-Jul-17			
Sample Type	Soil - ES	Soil - ES	Soil - D	Soil - ES	Soil - D	Soil - ES	Soil - ES			
Sample Matrix Code	1AE	4AE	5A	4AE	5A	4AE	5A			
PAH 16										
Acenaphthene$_A^{M\#}$	<0.01	0.02	-	0.07	-	0.04	0.02		mg/kg	A-T-019s
Acenaphthylene$_A^{M\#}$	<0.01	0.02	-	0.06	-	<0.01	<0.01		mg/kg	A-T-019s
Anthracene$_A^{M\#}$	0.03	0.11	-	0.21	-	0.10	0.07		mg/kg	A-T-019s
Benzo(a)anthracene$_A^{M\#}$	0.18	0.48	-	0.66	-	0.62	0.26		mg/kg	A-T-019s
Benzo(a)pyrene$_A^{M\#}$	0.21	0.59	-	0.64	-	0.66	0.27		mg/kg	A-T-019s
Benzo(b)fluoranthene$_A^{M\#}$	0.20	0.61	-	0.68	-	0.74	0.28		mg/kg	A-T-019s
Benzo(ghi)perylene$_A^{M\#}$	0.12	0.30	-	0.36	-	0.32	0.16		mg/kg	A-T-019s
Benzo(k)fluoranthene$_A^{M\#}$	0.09	0.25	-	0.26	-	0.27	0.12		mg/kg	A-T-019s
Chrysene$_A^{M\#}$	0.20	0.58	-	0.79	-	0.68	0.30		mg/kg	A-T-019s
Dibenzo(ah)anthracene$_A^{M\#}$	<0.04	0.06	-	0.07	-	0.08	<0.04		mg/kg	A-T-019s
Fluoranthene$_A^{M\#}$	0.22	0.66	-	1.16	-	0.74	0.38		mg/kg	A-T-019s
Fluorene$_A^{M\#}$	<0.01	0.02	-	0.15	-	0.03	0.02		mg/kg	A-T-019s
Indeno(123-cd)pyrene$_A^{M\#}$	0.12	0.33	-	0.39	-	0.37	0.18		mg/kg	A-T-019s
Naphthalene$_A^{M\#}$	<0.03	<0.03	-	0.09	-	<0.03	<0.03		mg/kg	A-T-019s
Phenanthrene$_A^{M\#}$	0.11	0.41	-	1.09	-	0.37	0.28		mg/kg	A-T-019s
Pyrene$_A^{M\#}$	0.19	0.60	-	0.98	-	0.63	0.34		mg/kg	A-T-019s
PAH (total 16)$_A^{M\#}$	1.67	5.03	-	7.67	-	5.63	2.69		mg/kg	A-T-019s

Envirolab Job Number: 17/04639

Client Project Name: 18 Iron Bridge Close, London, NW10 0UF

Client Project Ref: E7119

Lab Sample ID	17/04639/1	17/04639/3	17/04639/4	17/04639/5	17/04639/6	17/04639/7	17/04639/8		Units	Method ref
Client Sample No										
Client Sample ID	HP1	HP2	HP2	HP3	HP3	HP4	HP4			
Depth to Top	0.20	0.30	0.70	0.30	0.80	0.10	0.80			
Depth To Bottom										
Date Sampled	04-Jul-17	04-Jul-17	04-Jul-17	04-Jul-17	04-Jul-17	04-Jul-17	04-Jul-17			
Sample Type	Soil - ES	Soil - ES	Soil - D	Soil - ES	Soil - D	Soil - ES	Soil - ES			
Sample Matrix Code	1AE	4AE	5A	4AE	5A	4AE	5A			
Speciated PCB-EC7 & WHO12										
PCB BZ 28$_{A}^{MF}$	<0.002	<0.002	-	-	-	-	<0.002		mg/kg	A-T-004s
PCB BZ 52$_{A}^{MF}$	<0.002	<0.002	-	-	-	-	<0.002		mg/kg	A-T-004s
PCB BZ 81$_{A}$	<0.005	<0.005	-	-	-	-	<0.005		mg/kg	A-T-004s
PCB BZ 101$_{A}^{MF}$	<0.004	<0.004	-	-	-	-	<0.004		mg/kg	A-T-004s
PCB BZ 105$_{A}$	<0.005	<0.005	-	-	-	-	<0.005		mg/kg	A-T-004s
PCB BZ 114$_{A}$	<0.005	<0.005	-	-	-	-	<0.005		mg/kg	A-T-004s
PCB BZ 118$_{A}^{MF}$	<0.007	<0.007	-	-	-	-	<0.007		mg/kg	A-T-004s
PCB BZ 123$_{A}$	<0.005	<0.005	-	-	-	-	<0.005		mg/kg	A-T-004s
PCB BZ 126$_{A}$	<0.005	<0.005	-	-	-	-	<0.005		mg/kg	A-T-004s
PCB BZ 138$_{A}^{MF}$	<0.006	<0.006	-	-	-	-	<0.006		mg/kg	A-T-004s
PCB BZ 153$_{A}^{MF}$	<0.004	<0.004	-	-	-	-	<0.004		mg/kg	A-T-004s
PCB BZ 156$_{A}$	<0.005	<0.005	-	-	-	-	<0.005		mg/kg	A-T-004s
PCB BZ 157$_{A}$	<0.005	<0.005	-	-	-	-	<0.005		mg/kg	A-T-004s
PCB BZ 167$_{A}$	<0.005	<0.005	-	-	-	-	<0.005		mg/kg	A-T-004s
PCB BZ 169$_{A}$	<0.005	<0.005	-	-	-	-	<0.005		mg/kg	A-T-004s
PCB BZ 180$_{A}^{MF}$	<0.004	<0.004	-	-	-	-	<0.004		mg/kg	A-T-004s
PCB BZ 189$_{A}$	<0.005	<0.005	-	-	-	-	<0.005		mg/kg	A-T-004s
PCB BZ 77$_{A}$	<0.005	<0.005	-	-	-	-	<0.005		mg/kg	A-T-004s
TPH Banded 1										
>C6-C8$_{A}^{\#}$	<10	<10	-	<10	-	<10	<10		mg/kg	A-T-007s
>C8-C10$_{A}^{\#}$	<10	<10	-	<10	-	<10	<10		mg/kg	A-T-007s
>C10-C12$_{A}^{\#}$	<10	<10	-	<10	-	<10	<10		mg/kg	A-T-007s
>C12-C16$_{A}^{\#}$	<10	<10	-	<10	-	<10	<10		mg/kg	A-T-007s
>C16-C21$_{A}^{\#}$	<10	<10	-	15	-	<10	<10		mg/kg	A-T-007s
>C21-C40$_{A}$	39	63	-	102	-	90	91		mg/kg	A-T-007s
Total TPH Banded 1$_{A}$	39	63	-	117	-	90	91		mg/kg	A-T-007s

REPORT NOTES

General:
This report shall not be reproduced, except in full, without written approval from Envirolab.
All samples contained within this report, and any received with the same delivery, will be disposed of one month after the date of this report.
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 and there is insufficient sample to repeat the analysis. 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.

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