

Report No	Date
22124/R1	August 2022
Project	GROUNDHOG, ABERDULAIS – GROUND INVESTIGATION REPORT
Client	Groundhog

Spectrum Geo Services
Foxglove Cottage,
Cwm Risca Lane,
Tondu,
BRIDGEND
CF32 0EH

Report No:	Date:
22124/R1	August 2022

Project:
GROUNDHOG, ABERDULAIS – GROUND INVESTIGATION REPORT

Issue Number	Status	Description of Amendments
1	Draft	
2	Final	Conclusion adjustments

Report prepared by:	
Signed 	August 2022

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1.0 INTRODUCTION

1.1 Introduction

Spectrum Geo Services (SGS) were requested by Groundhog to undertake a Ground Investigation Study, of a site at Groundhog, Aberdulais.

This report includes a review of the available geological and historical information and Phase 2 Ground Investigation operations.

1.2 Scope of Work

The objectives of this assessment are:

- *Purchase historic maps, envirocheck report, coal mining and radon report.*
- *Review desktop data and advise on any issues raised.*
- *1 days window sampling*
- *1 days trial pitting including hire of tracked digger.*
- *Allow sum of £750 (+VAT) for geotechnical and contamination testing.*
- *Allow for supervision of the site works by a geotechnical engineer.*
- *Allow for preparing a combined desktop, preliminary contamination assessment and interpretive report.*

1.3 Development Proposals

It is assumed that the intention is to develop the site by means infilling to provide a level area for commercial development.

1.4 Limitations

Subsoils are inherently variable and by their very nature are hidden from view such that no investigation can be exhaustive to the extent that all soil conditions are revealed. Conditions may therefore be present beneath the site that were not apparent from the data available for review.

Unless specifically noted to the contrary, it should be assumed that this report has not been submitted to any regulatory authorities for approval. Redevelopment sites may have planning conditions attached in respect of contaminated land assessment. Where we are made aware of such conditions in advance of scoping the works, we can tailor the report to the regulatory authority requirements. Where we are not made aware of any such requirements there can be no certainty that our investigation will meet any or all the regulatory authority requirements.

2.0 EXISTING SITE INFORMATION

2.1 Previous Investigations

A previous investigation had been carried out in close proximity to the site, by Ian Farmer Associates:

- *Report on Ground Investigation, Groundhog Limited, Ynysgerwn Avenue, Aberdulaish, SA10 8HH. February 2019.*

Data from that report has been employed within this report.

2.2 Site Location

The site is situated on the northern side of the B4242 Ynysgerwn Avenue, south east of the A4109, north east of Aberdulaish and may be located by Grid Reference SS 781 999. The existing site comprised an area of rough ground.

The area of the proposed extension was generally level and occupied by the northern end of the industrial unit and an access road around the site. The area to the north sloped down to the site road and was occupied by woodland.



Figure SGS/22124/01: Site Location Plan

2.3 Published Geology

Based on data available from the BGS webviewer, the following geological setting is anticipated.

The 1:50000 British Geological Map Sheet 247 indicates the site to be underlain by Glacial Sand and Gravel overlying Lower Pennant Coal Measures. Graig and Brithdir Coal Seams are indicated to the west of the site parallel with the Roman Road. The Lower Pennant Coal Measures generally consist of sandstone and mudstone.

The Coal Authority Report included in the Farmers Desk Study, indicated that the site is not within a surface area that could be affected by past underground mining and no mine entries were located within or within 20m of the site.

2.3 Hydrology

The OS Map shows the site to be north of the River Neath.

3.0 DESK STUDY

3.1 Introduction

To facilitate a Desk Study, Enviro Insight, and historical map information were procured, and are Appended.

A Preliminary Investigation in the form of a desk study and site reconnaissance was carried out in January 2019 in order to assess the potential hazards on and adjacent to the site and prepare a risk assessment for further consideration.

The site appears to have been an open field up until between 1964 and 1973 when the industrial unit was constructed. The site became the car park/storage area for the industrial unit and remained so to the present.

There is the potential for the made ground on the site to pose a risk to site workers with a smaller risk to end users. On completion there is unlikely to be a significant pathway from contamination below the floor or hardstanding to end users there the risk is considered to be very low. However, the risk to site workers during construction of the extension is considered to be moderate.

The site is located close to a drainage channel to the north. Given the possible permeable nature of the geological conditions anticipated on site, there is considered to be a moderate risk to this water body

4.0 PRELIMINARY CONCEPTUAL MODEL AND QUALITATIVE RISK ASSESSMENT

Source Characterisation

All potential **on-site** and **off-site** sources of contamination identified by this desk study are detailed in Table 4.1.1 below. The table also details any which have been discounted.

Table 4.1. 1: Identified Potential Sources of Contamination

Source		Distance (m)	Compass Direction	Identified by:	Comments
Possible Made Ground	On-Site	0		Possible	Suite of contamination testing required to negate source.

It is not possible to discount all of the potential sources of contamination. Potential sources of contamination which cannot be discounted are carried forward to a preliminary qualitative risk assessment. The Contaminants of Concern (CoC) for the remaining potential sources of contamination are listed in Table 4.1.2.

Table 4.1. 2: Contaminants of Concern

CONTAMINANTS OF CONCERN								
Source	Metals	Cadmium	PAH	Soil Organic Matter	SO ₄ , SO ₃	pH	Asbestos	Chromium IV
ON-SITE								
Made Ground	X	X	X	X	X	X	X	X

5.0 SITE OPERATIONS

5.1 Site Works

Site works were undertaken on 09 August 2022 and comprised trial pitting, and Window Sampling. Conditions during the fieldwork were predominantly sunny and dry. The positions are shown on Drawings SGS/22124/Locs.

The Ian Farmer investigation comprised 4No window sample holes.

The exploratory hole locations were limited and dictated by site hardstanding, buildings and services.

The work was undertaken in accordance with BS5930.

Samples were recovered of strata encountered, to allow laboratory testing to be undertaken.

6.0 LABORATORY TESTING

6.1 Introduction

On completion of site operations, selected soil samples were scheduled for laboratory testing. The following laboratory testing was undertaken and is Appended.

- pH,
- Sulphate by aqueous extract,
- Metals soil suite,
- PAH,
- Organic Matter,
- Asbestos ID.
- Atterberg Limits

The results are presented within Appendix C.

7.0 SITE CONDITIONS ENCOUNTERED

7.1 Ground Conditions

The ground conditions encountered are summarised below. Conditions can vary in areas which are between exploratory hole positions and thus have not been investigated.

Stratum	Depth to base (m)	Remarks
Soft CLAY	0.30	Topsoil
MADE GROUND. Granular of slag.	0.70 – (1.85)	Made Ground
MADE GROUND. Granular of reworked strata	(2.00) – (3.00)	WS03 and 04 only
Stiff CLAY	(0.90) – (1.00)	Farmers holes only.

Table 7.1. Generalised Strata

The findings show that the area is covered in at least 3.00m of Made Ground. In fact the Made Ground was dense and thus it was not possible to break through that strata.

The Farmers window samples terminated in stiff CLAY.

7.2 Groundwater Conditions

During the field operations, water was not noted.

It should be noted that groundwater levels vary due to changes in climatic and other conditions and may at time differ from those recorded.

8.0 GEOTECHNICAL PARAMETERS

8.1 Introduction

This section presents geotechnical parameters, which will be taken forward into the foundation and geotechnics options appraisals, and assigns parameters to the strata encountered.

8.1.1 MADE GROUND

The Made Ground was noted to a maximum depth of 3.00m at WS03. The Made ground was of two differing lithologies.

The upper Made Ground (to depths of 0.70m to (1.85m) was formed of granular SLAG. There is a risk that this material may be expansive.

The lower MADE GROUND was of re-worked natural strata, and may be difficult to differentiate from the stiff CLAYs noted by Farmers.

Standard Penetration N values of between 31 and 50 were noted, averaging 43.

Employing correlations developed by Peck et al, the following is recommended.

- Angle of Internal Friction (ϕ') = 38°

9.0 GEOTECHNICAL ASSESSMENT

9.1 Introduction

The following sections provide an assessment of the options relating to foundation options at site, making suggestions relating to potential options/assessment for bearing capacity and foundations and attack to buried concrete.

9.2 Foundation Options

The granular SLAG Made Ground will not be suitable, and indeed it will be beneficial to ensure that ground slabs are suspended above this, or that the material is removed completely.

Within the stiff CLAY and lower re-worked natural materials (>1.85m) an allowable bearing capacity (q_a) in the order of 150kN/m^2 would be attainable, however care must be taken to inspect the stratum for loose or waterlogged zones.

Excavations will degrade in wet conditions, and thus close support should be considered. No water was noted within reasonable foundation excavation depths; however it would be prudent to allow for pumping from open sump.

All formations must be inspected by a professional Geotechnical Engineer to confirm that the materials will accommodate the allowable bearing capacity calculated, and so that soft spots are identified, and removed.

9.4 Attack to Buried Concrete

Laboratory testing during, noted neutral to slightly alkaline pH values, and a maximum water-soluble sulphate value of 0.15g/l , indicating Sulphate Class DS-1, in accordance with BRE Special Digest 1.

9.4 Groundwater

Groundwater was not noted.

It is prudent to assume that there may be perched tables or standing water during periods of rainfall. Thus, pumping from open sumps should be accommodated for.

It should be noted that groundwater levels vary due to changes in climatic and other conditions and may therefore at times vary from those recorded during these operations.

10.0 CONTAMINATION TESTING

Contamination testing was undertaken on four samples, as shown in the Appendices.

Sample ID		TP01	WS02	WS03	WS04	6% SOM
Depth to Top	Units	0.50	0.50	1.70	0.75	
		0.80	0.80	2.00	1.00	Commercial C4SL
% Stones >10mm	% w/w	40.3	36.7	4.6	29.2	
pH	pH	8.93	9.49	6.18	7.03	
Sulphate (water sol 2:1)	g/l	0.09	0.15	<0.01	<0.01	
Acid Sol Sulphate	mg/kg	1600	2100	<200	<200	
Organic Matter	% w/w	1.4	2.1	2.1	1.4	
Arsenic	mg/kg	28	810	5	3	640
Cadmium	mg/kg	1	10.3	1.8	1.1	190
Copper	mg/kg	97	2560	33	21	68000
Chromium	mg/kg	26	15	22	16	8600
Chromium (hexavalent)	mg/kg	<1	<1	<1	<1	33
Lead	mg/kg	192	6770	33	17	2700 P
Mercury	mg/kg	1	<0.17	<0.17	<0.17	1100
Nickel	mg/kg	7	58	38	25	980
Asbestos in Soil (inc. matrix)						
Asbestos in soil		NAD	NAD	NAD	NAD	
Asbestos ACM - Suitable for Water Absorption Test?		N/A	N/A	N/A	N/A	
PAH-16MS						5% SOM
Acenaphthene	mg/kg	<0.01	<0.01	<0.01	<0.01	100000
Acenaphthylene	mg/kg	<0.01	<0.01	<0.01	<0.01	100000
Anthracene	mg/kg	<0.02	<0.02	<0.02	<0.02	540000
Benzo(a)anthracene	mg/kg	<0.04	<0.04	<0.04	<0.04	98
Benzo(a)pyrene	mg/kg	<0.04	<0.04	<0.04	<0.04	15
Benzo(b)fluoranthene	mg/kg	<0.05	<0.05	<0.05	<0.05	100
Benzo(ghi)perylene	mg/kg	<0.05	<0.05	<0.05	<0.05	660
Benzo(k)fluoranthene	mg/kg	<0.07	<0.07	<0.07	<0.07	140
Chrysene	mg/kg	<0.06	<0.06	<0.06	<0.06	140
Dibenzo(ah)anthracene	mg/kg	<0.04	<0.04	<0.04	<0.04	13
Fluoranthene	mg/kg	<0.08	<0.08	<0.08	<0.08	23000
Fluorene	mg/kg	<0.01	<0.01	<0.01	<0.01	70000
Indeno(123-cd)pyrene	mg/kg	<0.03	<0.03	<0.03	<0.03	62
Naphthalene	mg/kg	<0.03	<0.03	<0.03	<0.03	540
Phenanthrene	mg/kg	<0.03	<0.03	<0.03	<0.03	23000
Pyrene	mg/kg	<0.07	<0.07	<0.07	<0.07	55000
Total PAH-16MS	mg/kg	<0.08	<0.08	<0.08	<0.08	912768

Table 10.1: Contamination Results

The results have been compared with current Environment Agency limits for Commercial Uses. Table 10.1 shows the recorded values, related to current Soil Guideline Values (SGVs)/S4UL, or other published values.

Thus, it is evident that all positions were within guidelines with the exception of a spike of lead at WS02.

Thus, it is recommended that an assessment is undertaken into the implications of this, related to the proposed layout. Remediation in the form of a hotspot removal may be justified, or should hardstanding be proposed, this may provide sufficient pathway break to satisfy.

11.0 CONCLUSIONS

Allowable bearing capacities have been provided for the strata encountered. Formations, will need to be inspected for soft/loose spots and where those are found, treated accordingly. The strata will require care regarding trench stability.

Groundwater was not noted.

Contamination testing has shown there to be a single elevated value of Lead when related to Commercial Guidelines. SGS recommend that a Remediation Strategy is developed, to ensure that the lead spike is accommodated in the overall design. This may require (we suggest) hotspot removal or a cover system design.

This, would then be augmented by a Verification Report, confirming that such Remediation has been undertaken in accordance with the Remediation Strategy.

Neutral to slightly alkaline soil results were noted, and Sulphate Class DS-1, in accordance with BRE Special Digest 1 is recommended for buried concrete.

APPENDIX A

Phase 1 Data

Small Scale Historical Maps

Large Scale Historical Maps

APPENDIX B

Exploratory Hole Logs

TP 01 and 2.

WS01 to 04

APPENDIX C

Laboratory Testing

APPENDIX D

Photographic Plates

APPENDIX E

Drawings

Exploratory Hole Locations

SGS/22124/Locs

Window Sampling Hole Journal

[illegible]

Window Sampling Hole Journal

Inspection Pit Dimensions						Hand Vane: Raw Data						
Equipment or Rig Type Dart						Type	Geonor	Pilcon	Impact			
						16	19	19				
						Size (mm)	20	33	33			
						25	Tick one box					
Window Sampling: Tube Driving Data												
Tube dia (mm)	Depth		Recovery (m)	Time (min:sec)	Casing depth (windowless)	Depth	Peak			Remoulded		
	From	To					1	2	3	1	2	3
97	GL	1.00	0.60									
87	1.00	2.00	1.00									
77	2.00	3.00	1.00									
						Pocket Penetrometer: Raw Data						
						Depth	1	2	3	4	5	6
All depths are m below ground level						Use GDMS data entry to input raw data to HoleBASE						
Samples			Strata				Installation Details					
Type	No.	Depth	Depth	Description								
ES	Jars	1.70	2.00	GL - 0.30: Very soft dark brown slightly sandy slightly gravelly CLAY with many roots and rootlets. Gravel is subangular to subrounded fine to coarse of sanstone. TOPSOIL, Flower beds								
ES		2.00	2.50									
		1.00	N = 38	0.30 - 1.20: MADE GROUND: Dense multicoloured clayey SAND AND GRAVEL. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of vesicular slag, sandstone and brick. Fill.								
		2.00	N = 41	1.20 - 3.00: MADE GROUND: Dense becoming very dense with depth, brown and grey mottled orange slightly sandy clayey sub - angular to subrounded fine to coarse GRAVEL of sandstone with low cobble content of subrounded sandstone. Fill of natural material.								
		3.00	N = 50/10									
						Backfill Details (if no installation)						
Key to soil samples: B = bulk D = tub L = liner ES = environmental soil												
Groundwater Strike		If Yes		Project		Project No						
No		Depth of strike	After 20 mins	Depth sealed	Groundhog, Aberdulais	22124						
Remarks				Operator		Hole No.						
				SWGT		Date						
				Logger PL		Date						
						WS03						

Window Sampling Hole Journal

Inspection Pit Dimensions						Hand Vane: Raw Data							
Equipment or Rig Type						Type		Geonor		Pilcon		Impact	
Dart						16		19		19			
						Size (mm)		20		33		33	
						25				Tick one box			
Window Sampling: Tube Driving Data													
Tube dia (mm)	Depth		Recovery (m)	Time (min:sec)	Casing depth (windowless)	Depth	Peak			Remoulded			
	From	To					1	2	3	1	2	3	
97	GL	1.00	0.90										
87	1.00	2.00	1.00										
						Pocket Penetrometer: Raw Data							
						Depth	1	2	3	4	5	6	
All depths are m below ground level						Use GDMS data entry to input raw data to HoleBASE							
Samples			Strata					Installation Details					
Type	No.	Depth	Depth	Description									
ES	Jars	0.75	1.00	GL - 0.30: Very soft dark brown slightly sandy slightly gravelly CLAY with many roots and rootlets. Gravel is subangular to subrounded fine to coarse of sanstone. TOPSOIL, Flower beds 0.30 - 0.75: MADE GROUND: Multicoloured sandy subangular to subrounded fine to coarse GRAVEL of vesicular slag and brick with high cobble content of subrounded to rounded vesicular slag. Fill. 0.75 - 2.00: MADE GROUND: Dense becoming very dense, brown and grey mottled orange subangular to subrounded fine to coarse GRAVEL of sandstone and quartz with low cobble content of sub - angular to subrounded sandstone. Probable fill of re-worked natural material.									
ES		1.00	1.30										
		1.00	N = 31										
		2.00	N = 50/100										
								Backfill Details (if no installation)					
Key to soil samples:						B = bulk		D = tub		L = liner		ES = environmental soil	
Groundwater Strike		If Yes			Project				Project No				
No		Depth of strike	After 20 mins	Depth sealed	Groundhog, Aberdulais				22124				
Remarks					Operator		Date		Hole No.				
Unable to proceed below 2.00m due to high density of made ground.					SWGT		09.08.2022		WS04				
					Logger		PL		Date				

Project	Groundhog, Aberdulais	Project No	22124
Described by	PL	Trial Pit No	TP01
Date	09.08.2022	Sheet No	1 of 1

Face Sketch (Indicate stratum boundaries, codes and Face(s) sketched, use additional sheets as required)

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[illegible]

Groundwater Observations None	Strike of Face A		deg	
	Length of Face A	1.5	m	
	Width of Face B	0.3	m	
	Remarks			
Method/plant	2.50 ton tracked excavator			
Stability	Stable			
Shoring	None			
Weather	Sunny			
Sample Type: U Undisturbed, P Piston, D Disturbed, B Bulk, W Water ES Environmental Soil Sample EW Environmental Water Sample				
Logger's Signature PL				

Project	Groundhog, Aberdulais	Project No	22124
Described by	PL	Trial Pit No	TP02
Date	09.08.2022	Sheet No	1 of 1

Face Sketch (Indicate stratum boundaries, codes and Face(s) sketched, use additional sheets as required)

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[illegible]

Groundwater Observations None	Strike of Face A		deg	
	Length of Face A	1.4	m	
	Width of Face B	0.3	m	
	Remarks			
Method/plant	2.50 ton tracked excavator		Cast iron pipe running length of pit., approximately 0.40mbgl.	
Stability	Stable		White plastic conduit pipe directly below paving slabs.	
Shoring	None		Plastic membrane at 0.30mbgl	
Weather	Sunny			
Sample Type: U Undisturbed, P Piston, D Disturbed, B Bulk, W Water ES Environmental Soil Sample EW Environmental Water Sample			Logger's Signature PL	

Window Sampling Hole Journal

Inspection Pit Dimensions						Hand Vane: Raw Data						
Equipment or Rig Type Dart						Type	Geonor		Pilcon		Impact	
							16		19		19	
						Size (mm)	20		33		33	
Window Sampling: Tube Driving Data							25		Tick one box			
Tube dia (mm)	Depth		Recovery (m)	Time (min:sec)	Casing depth (windowless)	Depth	Peak			Remoulded		
	From	To					1	2	3	1	2	3
97	GL	1.00	0.60									
						Pocket Penetrometer: Raw Data						
						Depth	1	2	3	4	5	6
All depths are m below ground level						Use GDMS data entry to input raw data to HoleBASE						
Samples			Strata						Installation Details			
Type	No.	Depth	Depth	Description								
ES		0.50	0.80	GL - 0.30: Very soft dark brown slightly sandy slightly gravelly CLAY with many roots and rootlets. Gravel is subangular to subrounded fine to coarse of sanstone. TOPSOIL, Flower beds								
		1.00	N = 50/80	0.30 - 1.00: MADE GROUND: Very dense at 1.00m, Greenish blue and grey sandy subangular to subrounded fine to coarse GRAVEL of vesicular slag with high cobble content of subrounded to rounded vesicular slag. Fill.								
									Backfill Details (if no installation)			
Key to soil samples: B = bulk D = tub L = liner ES = environmental soil												
Groundwater Strike		If Yes			Project						Project No	
No		Depth of strike	After 20 mins	Depth sealed	Groundhog, Aberdulais						22124	
Remarks					Operator			Date			Hole No.	
Unable to proceed below 1.00m due to high density of made ground.					SWGT			09.08.2022			WS01	
					Logger PL			Date				

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 22/07767
Issue Number: 1

Date: 17 August, 2022

Client: Spectrum Geo Services
Foxglove Cottage
Cwm Risca Lane
Tondur
Wales
CF32 0EH

Project Manager: Rob Griffiths
Project Name: Groundhog Aberdulaio
Project Ref: 22124
Order No: 22124/01
Date Samples Received: 10/08/22
Date Instructions Received: 10/08/22
Date Analysis Completed: 17/08/22

Approved by:



Richard Wong
Client Manager

Envirolab Job Number: 22/07767

Client Project Name: Groundhog Aberdulaeos

Client Project Ref: 22124

Lab Sample ID	22/07767/1	22/07767/2	22/07767/3	22/07767/4				Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	TP01	WS02	WS03	WS04						
Depth to Top	0.50	0.50	1.70	0.75						
Depth To Bottom	0.80	0.80	2.00	1.00						
Date Sampled	09-Aug-22	09-Aug-22	09-Aug-22	09-Aug-22						
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES						
Sample Matrix Code	4AE	4AB	6AE	6A						
% Stones >10mm _A	40.3	36.7	4.6	29.2				% w/w	0.1	A-T-044
pH _D ^{M#}	8.93	9.49	6.18	7.03				pH	0.01	A-T-031s
Sulphate (water sol 2:1) _D ^{M#}	0.09	0.15	<0.01	<0.01				g/l	0.01	A-T-026s
Sulphate (acid soluble) _D ^{M#}	1600	2100	<200	<200				mg/kg	200	A-T-028s
Organic Matter _D ^{M#}	1.4	2.1	2.1	1.4				% w/w	0.1	A-T-032 OM
Arsenic _D ^{M#}	28	810	5	3				mg/kg	1	A-T-024s
Cadmium _D ^{M#}	1.0	10.3	1.8	1.1				mg/kg	0.5	A-T-024s
Copper _D ^{M#}	97	2560	33	21				mg/kg	1	A-T-024s
Chromium _D ^{M#}	26	15	22	16				mg/kg	1	A-T-024s
Chromium (hexavalent) _D	<1	<1	<1	<1				mg/kg	1	A-T-040s
Lead _D ^{M#}	192	6770	33	17				mg/kg	1	A-T-024s
Mercury _D	1.00	<0.17	<0.17	<0.17				mg/kg	0.17	A-T-024s
Nickel _D ^{M#}	7	58	38	25				mg/kg	1	A-T-024s

Envirolab Job Number: 22/07767

Client Project Name: Groundhog Aberdulaiois

Client Project Ref: 22124

Lab Sample ID	22/07767/1	22/07767/2	22/07767/3	22/07767/4				Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	TP01	WS02	WS03	WS04						
Depth to Top	0.50	0.50	1.70	0.75						
Depth To Bottom	0.80	0.80	2.00	1.00						
Date Sampled	09-Aug-22	09-Aug-22	09-Aug-22	09-Aug-22						
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES						
Sample Matrix Code	4AE	4AB	6AE	6A						
Asbestos in Soil (inc. matrix)										
Asbestos in soil ^o	NAD	NAD	NAD	NAD						A-T-045
Asbestos Matrix (visual) ^o	-	-	-	-						A-T-045
Asbestos Matrix (microscope) ^o	-	-	-	-						A-T-045
Asbestos ACM - Suitable for Water Absorption Test? ^o	N/A	N/A	N/A	N/A						A-T-045

Envirolab Job Number: 22/07767

Client Project Name: Groundhog Aberdulaiois

Client Project Ref: 22124

Lab Sample ID	22/07767/1	22/07767/2	22/07767/3	22/07767/4				Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	TP01	WS02	WS03	WS04						
Depth to Top	0.50	0.50	1.70	0.75						
Depth To Bottom	0.80	0.80	2.00	1.00						
Date Sampled	09-Aug-22	09-Aug-22	09-Aug-22	09-Aug-22						
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES						
Sample Matrix Code	4AE	4AB	6AE	6A						
PAH-16MS										
Acenaphthene _A ^{M#}	<0.01	<0.01	<0.01	<0.01				mg/kg	0.01	A-T-019s
Acenaphthylene _A ^{M#}	<0.01	<0.01	<0.01	<0.01				mg/kg	0.01	A-T-019s
Anthracene _A ^{M#}	<0.02	<0.02	<0.02	<0.02				mg/kg	0.02	A-T-019s
Benzo(a)anthracene _A ^{M#}	<0.04	<0.04	<0.04	<0.04				mg/kg	0.04	A-T-019s
Benzo(a)pyrene _A ^{M#}	<0.04	<0.04	<0.04	<0.04				mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene _A ^{M#}	<0.05	<0.05	<0.05	<0.05				mg/kg	0.05	A-T-019s
Benzo(ghi)perylene _A ^{M#}	<0.05	<0.05	<0.05	<0.05				mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene _A ^{M#}	<0.07	<0.07	<0.07	<0.07				mg/kg	0.07	A-T-019s
Chrysene _A ^{M#}	<0.06	<0.06	<0.06	<0.06				mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene _A ^{M#}	<0.04	<0.04	<0.04	<0.04				mg/kg	0.04	A-T-019s
Fluoranthene _A ^{M#}	<0.08	<0.08	<0.08	<0.08				mg/kg	0.08	A-T-019s
Fluorene _A ^{M#}	<0.01	<0.01	<0.01	<0.01				mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene _A ^{M#}	<0.03	<0.03	<0.03	<0.03				mg/kg	0.03	A-T-019s
Naphthalene _A ^{M#}	<0.03	<0.03	<0.03	<0.03				mg/kg	0.03	A-T-019s
Phenanthrene _A ^{M#}	<0.03	<0.03	<0.03	<0.03				mg/kg	0.03	A-T-019s
Pyrene _A ^{M#}	<0.07	<0.07	<0.07	<0.07				mg/kg	0.07	A-T-019s
Total PAH-16MS _A ^{M#}	<0.08	<0.08	<0.08	<0.08				mg/kg	0.01	A-T-019s

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, 9 = INCINERATOR ASH.
 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
 Subscript "A" indicates analysis has dependant options against results. Testing dependant on results appear in the comments area of your sample receipt.
 EPH CWG results have humics mathematically subtracted through instrument calculation
 TPH results "with Cleanup" indicates results cleaned up with Silica during extraction

EPH CWG GCxGC ID from TPH CWG

Where we have identified humic substances in any ID's from TPH CWG with Clean Up please note that the concentration of these humic substances is not included in the quantified results and are included in the ID for information.

Please contact us if you need any further information.

v2

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: Spectrum Geo Services, Foxglove Cottage, Cwm Risca Lane, Tondy, Wales,
CF32 0EH

Project: Groundhog Aberdulaio
Clients Project No: 22124

Project No: 22/07767
Date Received: 10/08/2022 (am)
Cool Box Temperatures (°C): 21.1

NO DEVIATIONS IDENTIFIED with respect to sampling dates or containers received.

Note: 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 (for water samples $5 \pm 3^{\circ}\text{C}$), ISO 18400-105:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

Envirolab Analysis Dates

Lab Sample ID	22/07767/1	22/07767/2	22/07767/3	22/07767/4
Client Sample No				
Client Sample ID/Depth	TP01 0.50-0.80m	WS02 0.50-0.80m	WS03 1.70-2.00m	WS04 0.75-1.00m
Date Sampled	09/08/22	09/08/22	09/08/22	09/08/22
A-T-019s	15/08/2022	15/08/2022	15/08/2022	15/08/2022
A-T-024s	17/08/2022	17/08/2022	17/08/2022	17/08/2022
A-T-026s	17/08/2022	17/08/2022	17/08/2022	17/08/2022
A-T-028s	17/08/2022	17/08/2022	17/08/2022	17/08/2022
A-T-031s	17/08/2022	17/08/2022	17/08/2022	17/08/2022
A-T-032 OM	16/08/2022	16/08/2022	16/08/2022	16/08/2022
A-T-040s	17/08/2022	17/08/2022	17/08/2022	17/08/2022
A-T-044	16/08/2022	16/08/2022	16/08/2022	16/08/2022
A-T-045	11/08/2022	11/08/2022	11/08/2022	11/08/2022

The above dates are the analysis completion dates, please note that these are not necessarily the date that the analysis was weighed/extracted.

End of Report

9/8/22

PROJECT

GROUNDHOG

PROJECT NO

22124

TP

WS02

DEPTH (M)

GL-1.00

FACE



9/18/22

PROJECT

GROUNDHOG

PROJECT NO

22124

TP

W503

DEPTH (M)

GL 3.00

FACE



9/8/22

PROJECT

GROUNDHOG

PROJECT NO

22124

TP

WS04

DEPTH (M)

GL - 2.00

FACE







9.18.22

PROJECT

GROUNDHOG

PROJECT NO

22124

TP

TPO2

DEPTH (M)

6L @ 0.85

FACE



9/8/22

PROJECT

PROJECT NO

TP

DEPTH (M)

FACE

GROUNDHOG

22124

W501

GL 1.00



100

200

300

400

500

600

