

Report No

22177/R2

Date

September 2023

Project

CWMAVON – SUPPLEMENTARY GROUND INVESTIGATION

Client

TRJ

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Report No:	Date:
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Project:
CWMAVON – SUPPLEMENTARY GROUND INVESTIGATION

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1.0 INTRODUCTION

1.1 Introduction

Spectrum Geo Services (SGS) were commissioned by TRJ Ltd. to complete a review of existing GI data at a site at 91 Waun Wen Road, Cwmafan, Port Talbot, SA12 9ED. This review recommended further ground investigation operations, due to the fact that the building plans had required a change in footprint, due to a coal shaft buffer zone.

The site is located approximately 2.85km north of Port Talbot. The site is approximately 0.168ha in area and is centred on National Grid Reference (NGR) 278512, 192486. The approximate postcode of the site being SA12 9ED.

SGS had completed a review of previous data (22177_R1) dated June 2023, which noted the requirement to undertake further window sampling, trial pitting and probe holes at the site to confirm the ground conditions and the potential presence of shallow coal seams/workings.

1.2 Scope of Works

The objectives of this assessment are to investigate the near surface deposits by window sampling and pitting, and to drill 2 No rotary probe holes with water flush, to determine/confirm the present of coals and the potential presence of broken ground or open workings which may influence the development.

1.3 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.

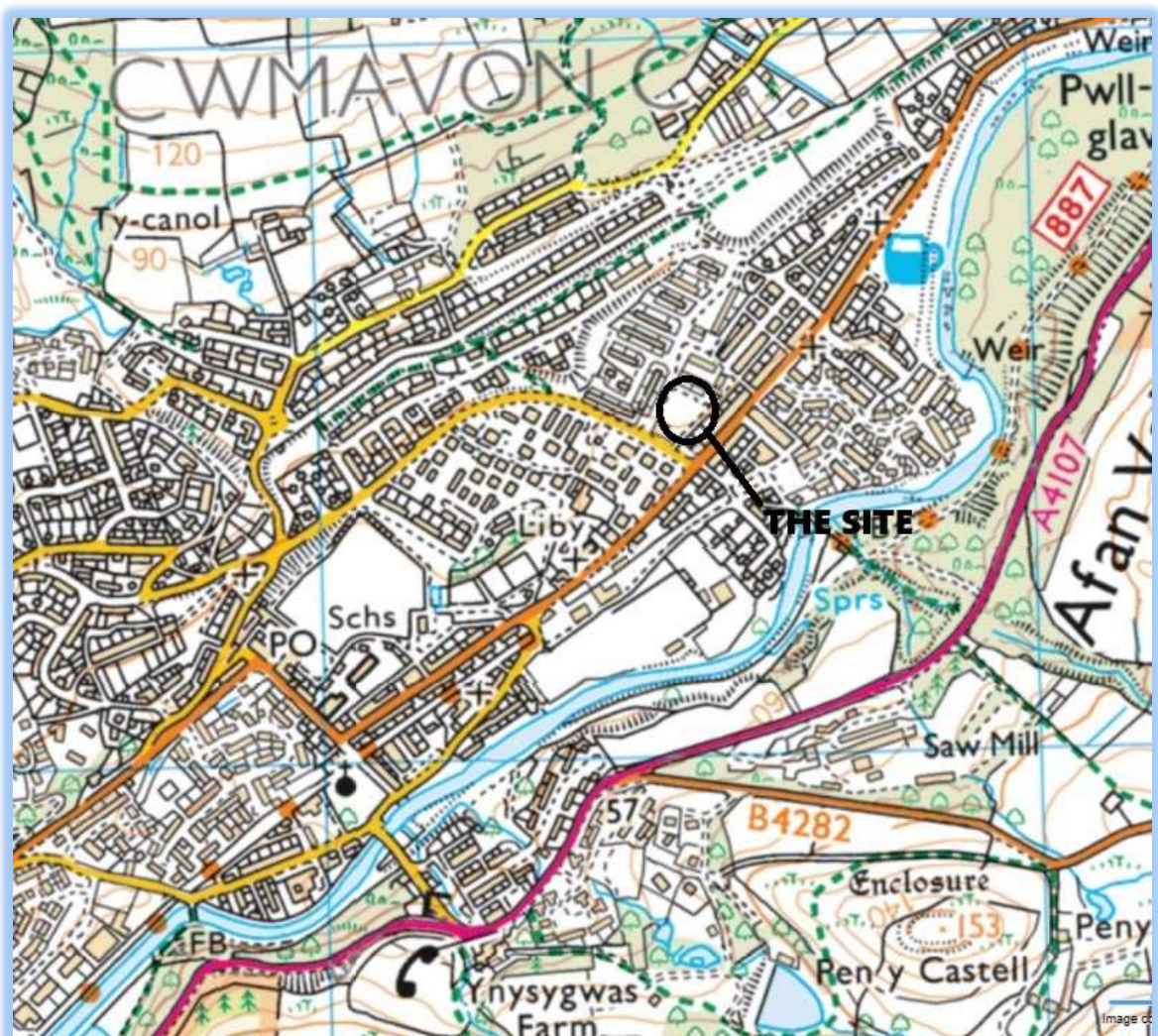
Unless specifically noted to the contrary, it should be assumed that this report has not been submitted to any regulatory authorities for approval. Redevelopment sites in particular may have planning conditions attached in respect of contaminated land assessment. Where we are made aware of such conditions 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 of the regulatory authority requirements.

2.0 EXISTING SITE INFORMATION

2.1 Site Location

The site is located at 91 Waun Wen Road, Cwmafan, SA12 9ED.

At the time of the investigation, the site comprised an open area of tarmacadamed car park as shown in Drawing 22177/01.



Drawing 22177/01.

2.2 Published Geology

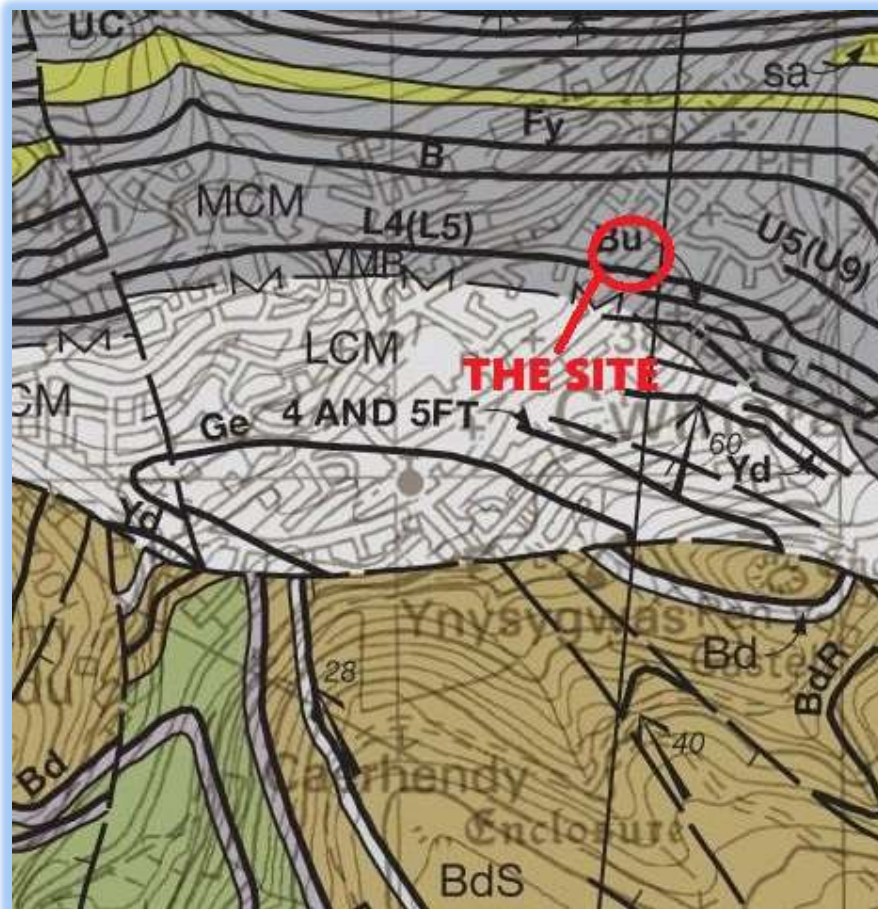
Information published by the British Geological Survey (BGS) suggests the site to be underlain by a sequence comprising;

Superficial Deposits

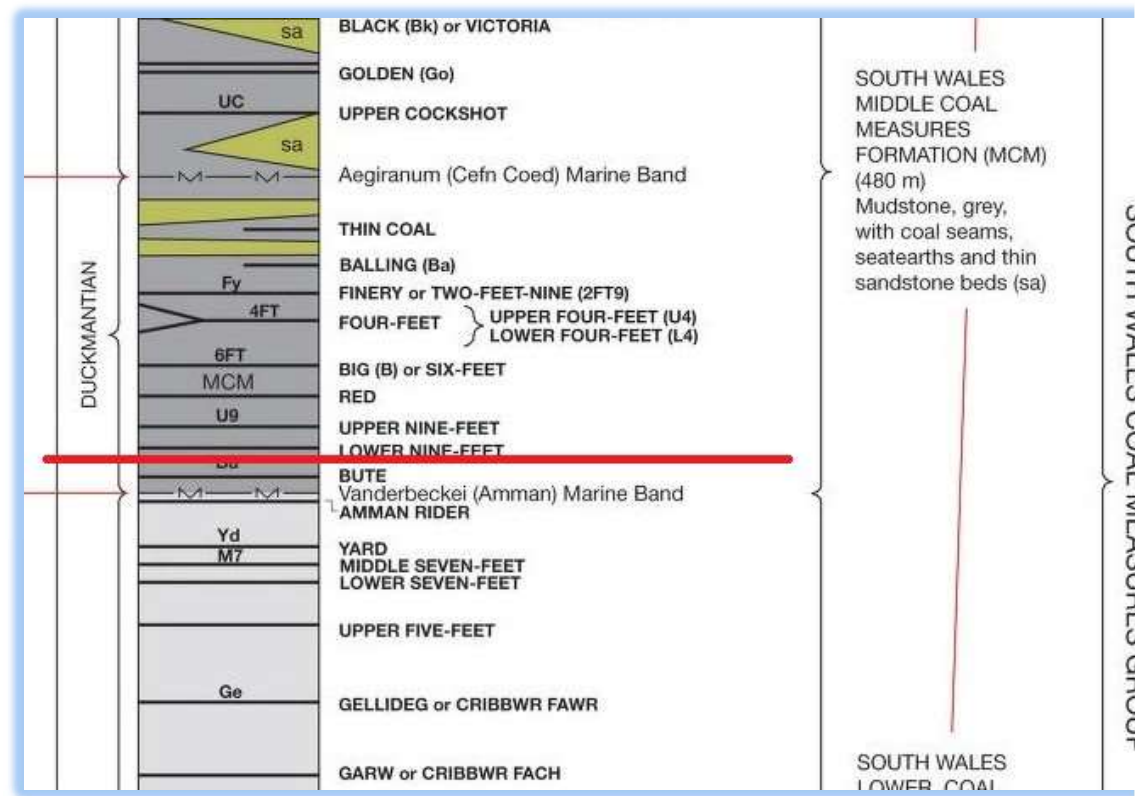
Alluvium - Clay, silt, sand and gravel. Sedimentary superficial deposit formed between 11.8 thousand years ago and the present during the Quaternary period.

Bedrock Geology

South Wales Middle Coal Measures Formation - Mudstone, siltstone and sandstone. Sedimentary bedrock formed between 318 and 309.5 million years ago during the Carboniferous period.



Drawing 22177/02: Geological Setting



Drawing 22177/03: Geological Column

2.3 Hydrology

The site lies to the west of the River Avan, with elevated ground to the west.

Thus, it is anticipated that the predominant groundwater flow is in an easterly westerly.

3.0 SITE OPERATIONS

3.1 Site Works

Site works comprised window sampling, machine dug trial pits and 2 rotary drilled probe holes, employing water flush and Klemm drill rig. These were drilled on 29 and 30 September 2023. The positions are shown on Drawing 22177/Locs.

100% water flush returns were noted by the driller during the rotary probing. On completion the holes were filled with bentonite grout, with no excessive take.

Borehole logs are shown in Appendix B.

4.0 DESK STUDY

4.1 Introduction

A desk study of the site was previously undertaken by Socotec, as noted in 22177_R1.

The SOCOTEC desk top study (DTS) and field reconnaissance report (Report No. H1060- 21) supplied by Neath Port Talbot County Borough Council outlined the following summary of the sites and its key risks.

The site is located adjacent to a former copper works and is shown on the historical mapping of the site (circa 1880) as well as a coal pit, coke ovens and gas works located to the west of the site. The eastern portion of the site historically consisted of gardens associated with the residential properties on Cunard Row. A number of tramways are also identified within the north west site boundary. By the 1920-1930s the tramway and an associated slag heap are labelled as disused and the residential properties of Cunard Row have been demolished. Re-profiling and restoration was undertaken in the 1970s and by the end of the decade the new residential properties of Waun Wen have been built and the area of the existing car park developed. These features persist today.

A mineshaft (7m north of the site boundary) and coal outcrop running through the site were identified during the DTS and represent two of the main risks associated with the redevelopment of the site and which the ground investigation has been commissioned to resolve. Due to the coal mining legacy issues there is a medium to high risk of geotechnical

hazards associated with the site and the historic industrial setting suggests a low to moderate risk of geo-environmental hazards.

The DTS also suggests that current and historic land uses will be sources of contamination including car parking, hard standing past mining, former tramways and former slag heaps.

4.2 Previous Ground Investigation

Tetra Tech undertook a Phase2 Ground Investigation. The works were undertaken on the same site, but in the eastern part of the car park, to accommodate an original development location.

The site investigation was undertaken between 16th and 19th May 2022. The scope of the investigation specified by Neath Port Talbot Council is based on the desk top study undertaken by SOCOTEC Report No. H1060-21 and included the following:

- Geophysical survey to locate mineshaft shown to be north of the site and outside the red line boundary.
- Clearance of buried services prior to excavation and the location and level of each exploratory hole location surveyed.
- Two combined dynamic sample, rotary core and rotary open hole boreholes to a depth of 30metres, with sampling and SPTs in the upper 10metres.
- Two days of windowless sampling to five metres, or refusal, with SPTs and samples.
- One day of soakaway testing in two trial pits not exceeding 1.5metres depth.
- Five TRL DCP test locations to obtain indicative CBR values around the site.
- Installation of gas/groundwater monitoring standpipes within the one borehole and two windowless samples and three return visits to measure gas/groundwater levels.
- On-site inspection and logging of recovered samples.
- Representative soil samples taken and submitted for geotechnical classification testing.

- Representative soil samples submitted and tested for a suite of potential contaminants.

4.3 Coal Mining Risk Assessment (CMRA)

Tetra Tech undertook a CMRA. The risk assessment indicates that there is a Low to Moderate Risk of ground instability as a result of a recorded mine entry (shaft) being present on the northern site boundary. The nature of the backfill and cap is defined in the consultant's coal mining report and the location confirmed by Tetra Tech by the use of geophysical methods. A development exclusion zone was recommended to be placed around the mineshaft location.

The risk assessment indicates that there is a Low Risk of ground instability as a result of deep or shallow recorded/unrecorded mining and mining geology beneath the site. Following the drilling of two rotary openhole boreholes no workings were encountered in the Lower Nine Foot Top Leaf seam, in the eastern portion of the site.

4.4 Ground Contamination

The results of the Tetra Tech laboratory testing have indicated elevated Arsenic in two samples (WS04 and TP01) in Made Ground at concentrations which pose a potential risk to human health. The results have also indicated elevated heavy metal and PAH concentrations in soil derived leachate testing at concentrations which pose a potential risk to underlying groundwater. Due to access constraints (parked cars during monitoring) groundwater sampling could not be undertaken and as such the potential impact to groundwater cannot be discounted.

Based on the significant thickness of Made Ground noted across the site associated with the substantial industrial historical land use on site, the potential for localised previously unidentified contamination cannot be discounted.

4.0 SITE CONDITIONS ENCOUNTERED

4.1 Ground Conditions

Boreholes 5 and 6 noted a generalised succession as indicated in Table 5.1.

Stratum	Depth to base (m)	Remarks
MADE GROUND	(0.70) to (2.00)	Tarmac over sub-base over colliery and copperworks waste.
Medium to very dense SANDS and GRAVELS	(1.70) to 14.30	Alluvial
MUDSTONE	(30.00) to (31.00)	BH02 and 03
BH03 Coals	14.50-15.90, 27.90 – 28.50, 29.10 – 29.90	
BH0 Coal	23.80 – 24.60	BH2 and 3

Table 4.1. Generalised Strata

4.2 Groundwater Conditions

Water strikes were noted at between 3m and 3.20m depth, being deeper in the north of the site.

Monitoring of window sample and BH02 (previous investigations) noted water at 1.90m and 2.10m depths, as shown in GW1.

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

5.0 LABORATORY TESTING

Chemical laboratory testing was conducted to determine the concentrations of the following;

- Metals
- Asbestos
- pH and SO₄
- PAH MS
- TPH CWG
- WAC E 1 stage

The results are appended.

6.0 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 6.1.1 below. The table also details any which have been discounted.

Table 6.1. 1: Identified Potential Sources of Contamination

Source		Distance (m)	Compass Direction	Identified by:	Comments
Probable 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 6.1.2.

Table 6.1. 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

7.0 GEOTECHNICAL PARAMETERS

7.1 Introduction

This section presents geotechnical parameters, which will be taken forward into the foundation options appraisals, and assigns parameters to the strata encountered. We have chosen not to assess geotechnical parameters of the Made Ground, as it is variable both laterally and vertically.

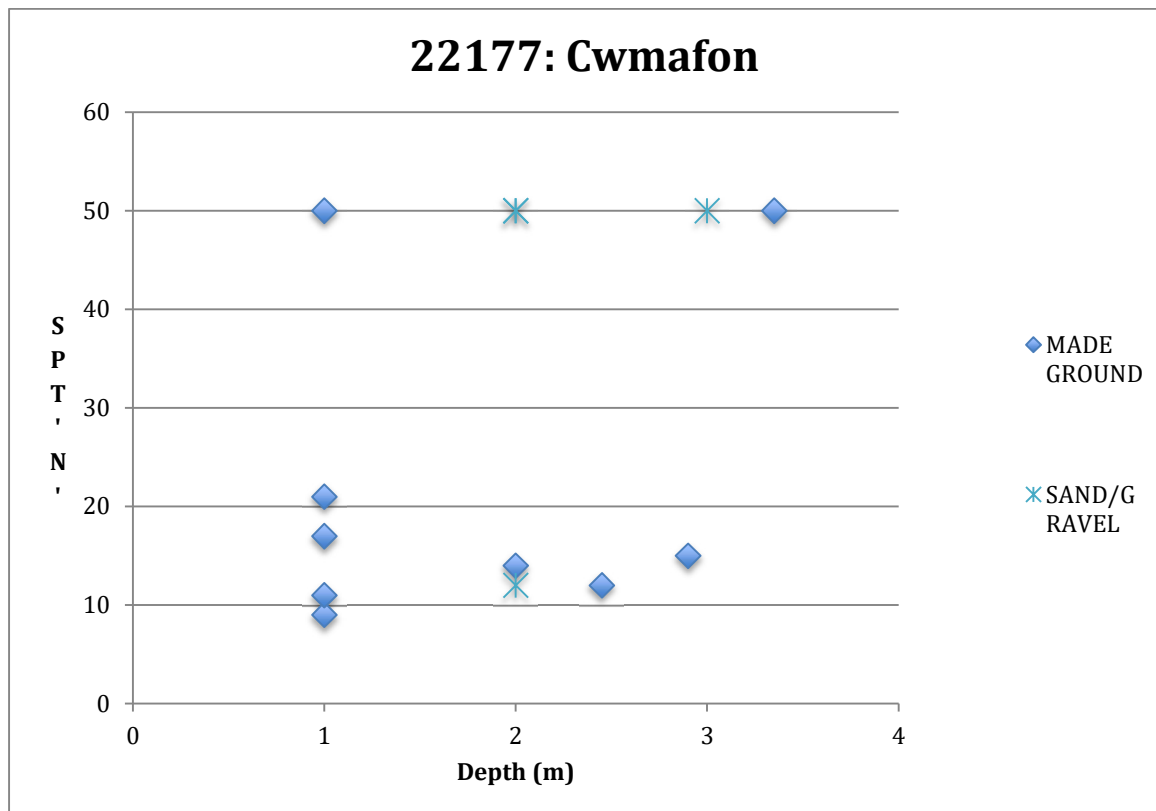


Figure 7.1. SPT N vs Depth

7.1.1 Alluvial SANDS and GRAVELS

What has been described as medium dense to very dense SAND/GRAVEL with cobbles, was noted beneath the Made Ground.

The upper surface of the SAND/GRAVEL was noted at depths of between 1.50m and 1.80m (where it was possible to break through the Made Ground. The rotary holes noted deeper Made Ground, but the visual descriptions in the pits and window samples are considered more reliable.

The sand and gravels recorded SPT N values of between 12 and refusal. Allowing for the effects of overburden and correcting accordingly suggests the strata to be predominantly very dense.

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

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

8.0 GEOTECHNICAL ASSESSMENT

8.1 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.

8.2 Foundation Options

At a depth of 1.50m to 2.00 the SAND and GRAVEL would provide an allowable bearing capacity (q_a) in the order of 150kN/m^2 , however care must be taken to inspect the stratum for loose or waterlogged zones.

Excavations in the Made Ground will degrade in wet conditions, and thus close support should be considered. Water was monitored as shallow as 1.90m depth, thus this may affect excavation depths. It is recommended that pumping from open sump is allowed for.

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.

8.3 Attack to Buried Concrete

Laboratory testing during, noted slightly alkaline pH values, and a maximum water soluble sulphate value of 0.11g/l, indicating Sulphate Class DS-1, in accordance with BRE Special Digest 1.

8.4 Groundwater

Groundwater was monitored at around 1.90m depth as described.

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.

9.0 CONTAMINATION TESTING

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

Client Sample ID	Units	TP02	TP03	TP05	WS13			
Depth to Top		1.20	0.60	1.40	1.60			
Sample Type		Soil - ES	Soil - ES	Soil - ES	Soil - ES	S4UL/ C4SL Resi With	S4UL/ C4SL Resi Without	POS Resi
% Stones >10mm	% w/w	4.2	11.7	<0.1	3.3			
pH	pH	7.79	7.88	9.18	8.12			
Sulphate (water sol 2:1)	g/l	0.11	0.04	0.03	0.05			
Organic matter	% w/w	54	50.5	7.1	62			
Arsenic	mg/kg	69	31	2	35	37	40	79
Boron (water soluble)	mg/kg	<1.0	<1.0	<1.0	<1.0	290	11000	21000
Cadmium	mg/kg	1	<0.5	<0.5	<0.5	11	65	120
Copper	mg/kg	378	91	4	80	2400	7100	12000
Chromium	mg/kg	22	15	5	15	910	910	1500
Chromium Hex	mg/kg	<1	<1	<1	<1	6	6	7.7
Lead	mg/kg	327	334	4	63	190	310	630
Mercury	mg/kg	0.33	<0.17	<0.17	0.24	40	56	120
Nickel	mg/kg	49	35	2	41	180	180	230
Selenium	mg/kg	2	<1	<1	<1	250	430	1100
Zinc	mg/kg	285	121	9	166	3700	40000	8100
TPH total (>C6-C40)	mg/kg	119	58	117	76	48000	64000	
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	Non detected		
PAH-16MS								
Acenaphthene	mg/kg	0.01	<0.01	<0.01	<0.01	1100	6000	
Acenaphthylene	mg/kg	0.07	0.05	<0.01	<0.01	920	6000	
Anthracene	mg/kg	0.12	0.04	<0.02	<0.02	11000	37000	
Benzo(a)anthracene	mg/kg	0.94	0.65	<0.04	<0.04	13	15	
Benzo(a)pyrene	mg/kg	0.88	2.03	<0.04	<0.04	3	3.2	
Benzo(b)fluoranthene	mg/kg	0.99	2.78	<0.05	0.08	3.7	4	
Benzo(ghi)perylene	mg/kg	0.53	1.68	<0.05	<0.05	350	360	
Benzo(k)fluoranthene	mg/kg	0.4	0.84	<0.07	<0.07	100	110	
Chrysene	mg/kg	0.81	1.32	<0.06	0.17	27	32	
Dibenzo(ah)anthracene	mg/kg	0.12	0.31	<0.04	<0.04	0.3	0.32	
Fluoranthene	mg/kg	1.48	0.56	<0.08	<0.08	890	1600	
Fluorene	mg/kg	0.02	0.01	<0.01	<0.01	860	4500	
Indeno(123-cd)pyrene	mg/kg	0.69	1.97	<0.03	0.05	41	46	
Naphthalene	mg/kg	<0.03	0.04	<0.03	<0.03	13	13	
Phenanthrene	mg/kg	0.43	0.17	<0.03	0.13	440	1500	
Pyrene	mg/kg	1.07	0.39	<0.07	<0.07	2000	3800	
Total PAH-16MS	mg/kg	8.56	12.8	<0.08	0.43	17761	60984	

6% SOM

Table 9.1: Soil Contamination Results

The results have been compared with current Environment Agency limits for Residential with and without homegrown produce and POS Resi Uses. Table 9.1 shows the recorded values, related to current Soil Guideline Values (SGVs)/S4UL, or other published values.

Thus, it is evident that most positions were within guidelines for Residential with and without plant uptake. However, values of arsenic at TP02 and lead at TP02 and 03, exceeded guidelines for residential end use. Both these locations are beneath areas of hardstanding or the buildings themselves and thus it is considered that no linkage will exist. Thus, no remediation strategy is required. However, these elevated values must be considered within the context of the site works and materials management plan.

As required within the Tetra Tech report, as water sample was retrieved from BH02, as subjected to a suite of chemical testing. The results are shown within Table 9.2.

Client Sample ID	Units	BH02	
Date Sampled		31-Aug-23	
Sample Type		Water - GW	
pH (w)	pH	6.78	
Arsenic (dissolved)	µg/l	<1	10
Boron (dissolved)	µg/l	135	1000
Beryllium (dissolved)	µg/l	<1	4
Cadmium (dissolved)	µg/l	<0.2	5
Copper (dissolved)	µg/l	5	2000
Chromium (dissolved)	µg/l	<1	50
Lead (dissolved)	µg/l	<1	25
Mercury (dissolved)	µg/l	<0.1	1
Nickel (dissolved)	µg/l	5	20
Selenium (dissolved)	µg/l	<1	10
Vanadium (dissolved)	µg/l	<1	
Zinc (dissolved)	µg/l	17	3000

PAH 16MS (w)			
Acenaphthene (w)	µg/l	<0.01	0.1
Acenaphthylene (w)	µg/l	<0.01	0.1
Anthracene (w)	µg/l	<0.01	
Benzo(a)anthracene (w)	µg/l	0.02	
Benzo(a)pyrene (w)	µg/l	0.03	0.01
Benzo(b)fluoranthene (w)	µg/l	0.05	
Benzo(ghi)perylene (w)	µg/l	0.03	
Benzo(k)fluoranthene (w)	µg/l	0.03	
Chrysene (w)	µg/l	0.04	
Dibenzo(ah)anthracene (w)	µg/l	<0.01	
Fluoranthene (w)	µg/l	0.05	
Fluorene (w)	µg/l	<0.01	0.1
Indeno(123-cd)pyrene (w)	µg/l	0.03	
Naphthalene (w)	µg/l	<0.01	10
Phenanthrene (w)	µg/l	0.02	0.1
Pyrene (w)	µg/l	0.04	0.1
Total PAH 16MS (w)	µg/l	0.34	0.1

TPH CWG (w) with Clean Up			
Ali >C5-C6 (w)	µg/l	<1	
Ali >C6-C8 (w)	µg/l	<1	
Ali >C8-C10 (w)	µg/l	<5	10
Ali >C10-C12 (w)	µg/l	<5	10
Ali >C12-C16 (w)	µg/l	<5	10
Ali >C16-C21 (w)	µg/l	<5	
Ali >C21-C35 (w)	µg/l	<5	
Total Aliphatics (w)	µg/l	<5	10
Aro >C5-C7 (w)	µg/l	<1	10
Aro >C7-C8 (w)	µg/l	<1	10
Aro >C8-C10 (w)	µg/l	<5	10
Aro >C10-C12 (w)	µg/l	<5	10
Aro >C12-C16 (w)	µg/l	<5	10
Aro >C16-C21 (w)	µg/l	<5	10
Aro >C21-C35 (w)	µg/l	<10	10
Total Aromatics (w)	µg/l	<10	10
TPH (Ali & Aro >C5-C35) (w)	µg/l	<10	10
BTEX - Benzene (w)	µg/l	<1	1
BTEX - Toluene (w)	µg/l	<1	700
BTEX - Ethyl Benzene (w)	µg/l	<1	300
BTEX - m & p Xylene (w)	µg/l	<1	
BTEX - o Xylene (w)	µg/l	<1	500
MTBE (w)	µg/l	<1	

Table 9.2: BH02 Water Contamination Results

When compared to available current groundwater standards, it is evident that all values fall well below acceptable levels (often below detection), with the exception of Benzo(a)pyrene.

The position of BH02, is to be covered in hardstanding and thus it is not considered that remediation is required.

10.0 COAL INVESTIGATION ASSESSMENT

The drilling operations noted in both this and the original phase of investigations, several relatively thin seams, which may be the Lower 9ft top leaf or the Bute. No workings were noted and no loss of flush recorded in any of the holes.



Fig 10: Geoindex Extract

Cross sections show the depth of the seams and assume a 60 degree dip to the north.

This, combined with the knowledge that there was no flush take during the drilling, indicates that there are no workings within these seams, which in most would by their dimensions appear to be non-economic for deep mining.

Thus, it is considered that no further investigation is required, and that no ground stabilisation is required for the development.

11.0 ADDITIONAL COMMENTS

Reference should also be made to the Tetra Tech Desk Top Study and Geotechnical Interpretive reports. The recommendations given in these reports regarding foundation type, gas protection, made ground and potential hazardous materials should be considered.

Foundations are to be coordinated with any new or existing services.

Any excavated material is to be WAC tested and WM3 assessed. Material that cannot be re-used for landscaping is to be removed off site for disposal at a suitable licenced facility.

APPENDIX A

Drawings

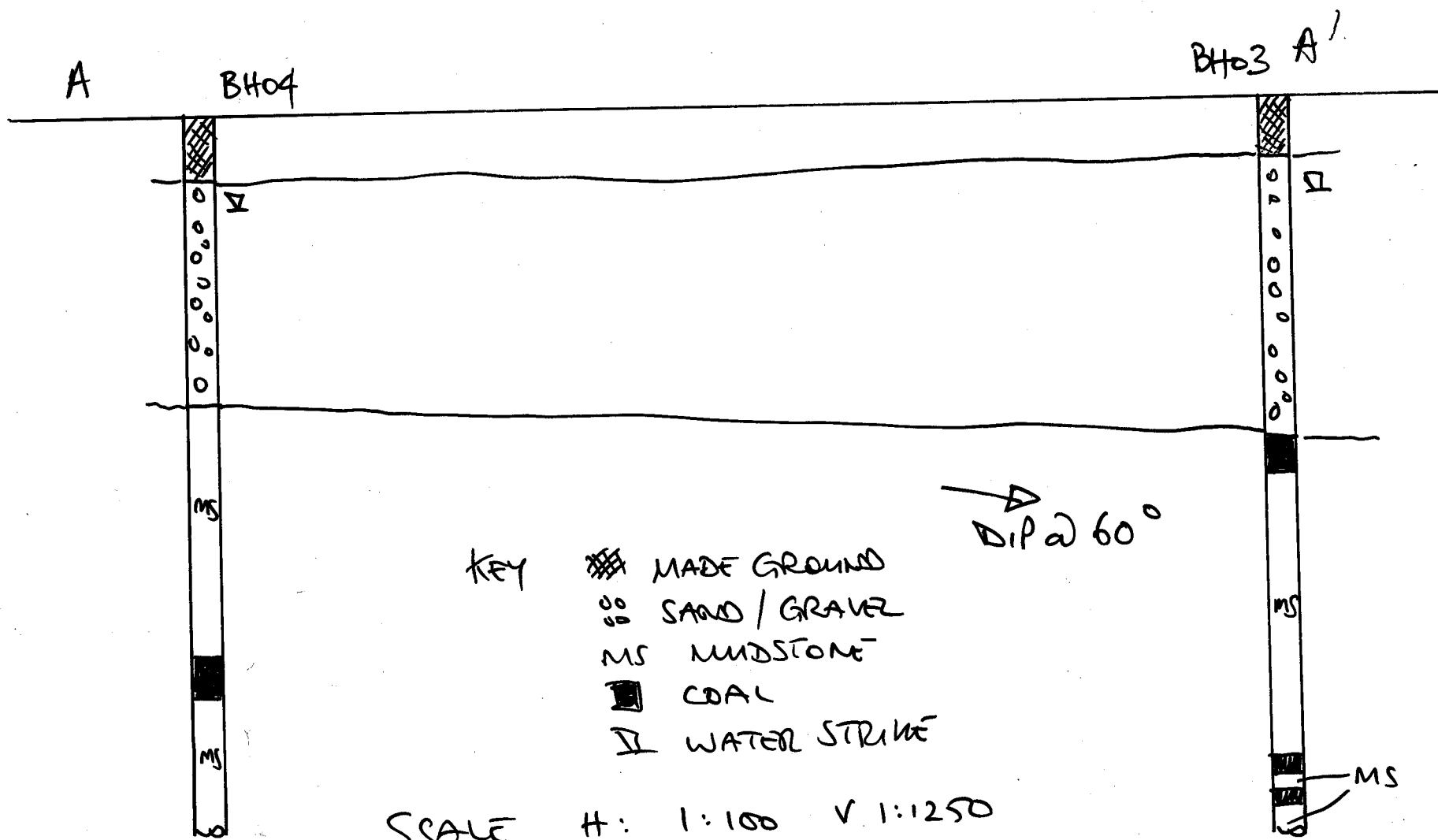
Borehole Location Plan

Drawing 22177_Locs

Geological Section Sketches

Drawing 22177_Sections





KEY



MADE GROUND



SAND / GRAVEL

MS

MUDSTONE



COAL



WATER STRIKE

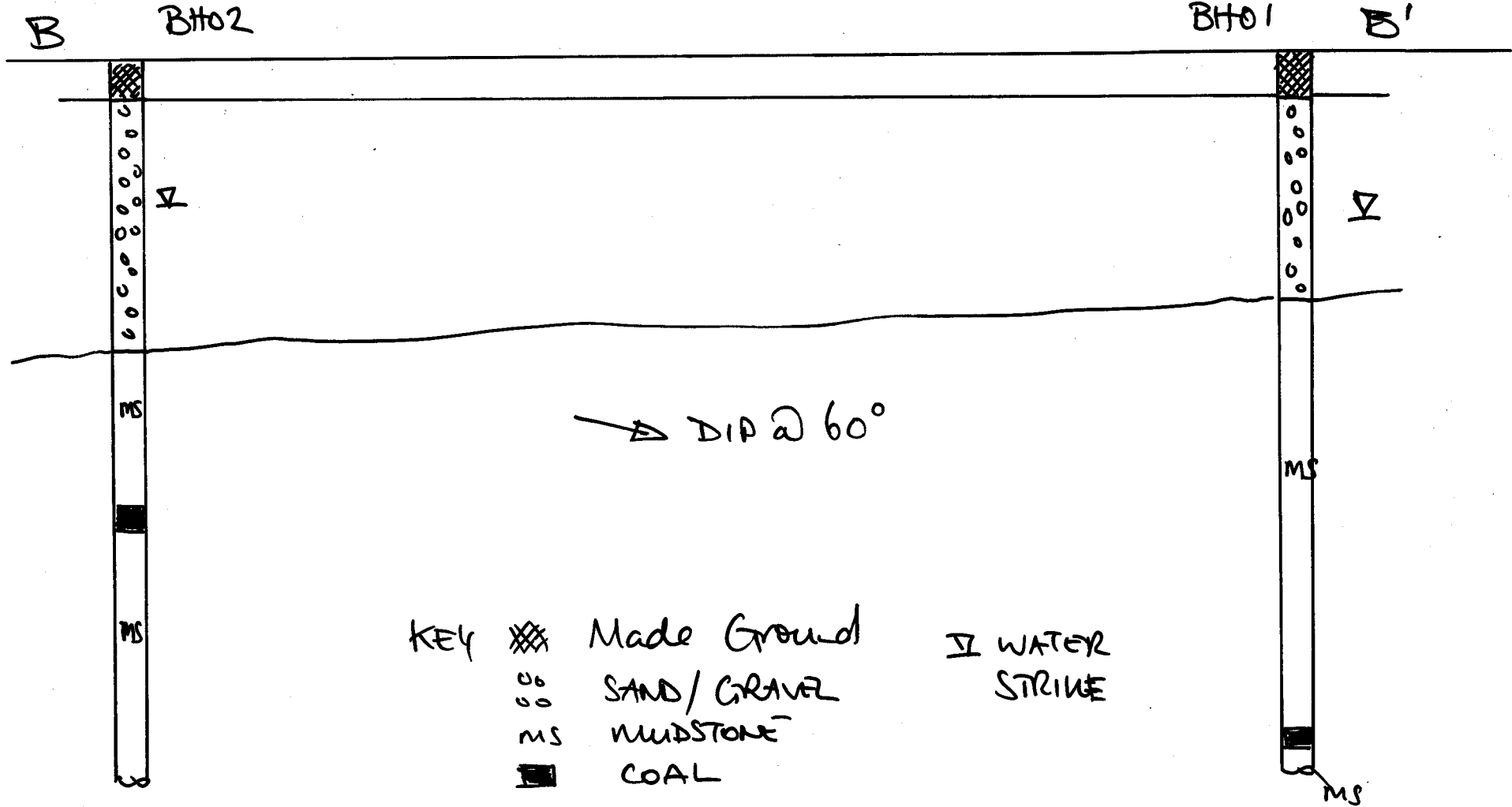
SCALE

H:

1:100

V

1:1250



SCALE

H 1:100

V 1:1250

APPENDIX B

Borehole Logs



Rotary Core Log

Project Name: Cwmavon				Client: TRJ				Date: 29/08/2023 - 30/08/2023			
Location: Cwmavon				Contractor: Apex Drilling Services							
Project No. : 22177				Crew Name: TD/JB				Drilling Equipment: Fraste PLG			
Borehole Number BH03		Hole Type RO		Level		Logged By TD		Scale 1:50		Page Number Sheet 1 of 4	

Well	Water	Depth (m)	Type /FI	Coring			Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description	
				TCR	SCR	RQD						
							0.30			MADE GROUND. Tarmac and Subbase.**	1	
							2.60			MADE GROUND. Backfill.**	2	
											3	
											4	
											5	
											6	
											7	
											8	
											9	
											10	

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

Remarks Rotary Open Hole																	
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Rotary Core Log

Project Name: Cwmavon				Client: TRJ				Date: 29/08/2023 - 30/08/2023			
Location: Cwmavon				Contractor: Apex Drilling Services							
Project No. : 22177				Crew Name: TD/JB				Drilling Equipment: Fraste PLG			
Borehole Number BH03		Hole Type RO		Level		Logged By TD		Scale 1:50		Page Number Sheet 2 of 4	

Well	Water	Depth (m)	Type /FI	Coring			Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description	
				TCR	SCR	RQD						
											Sand and Gravel.**	11
												12
												13
												14
												15
												16
												17
												18
												19
												20
											Mudstone.**	11
												12
												13
												14
												15
												16
												17
												18
												19
												20
											Coal.**	11
												12
												13
												14
												15
												16
												17
												18
												19
												20
											Mudstone.**	11
												12
												13
												14
												15
												16
												17
												18
												19
												20

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

[illegible][illegible]



Rotary Core Log

Project Name: Cwmavon				Client: TRJ				Date: 29/08/2023 - 30/08/2023			
Location: Cwmavon				Contractor: Apex Drilling Services							
Project No. : 22177				Crew Name: TD/JB				Drilling Equipment: Fraste PLG			
Borehole Number BH03		Hole Type RO		Level		Logged By TD		Scale 1:50		Page Number Sheet 4 of 4	

Well	Water	Depth (m)	Type /FI	Coring			Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description	
				TCR	SCR	RQD						
								31.00			Mudstone	
											End of Borehole at 31.000m	31
												32
												33
												34
												35
												36
												37
												38
												39
												40

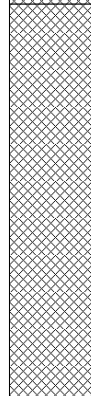
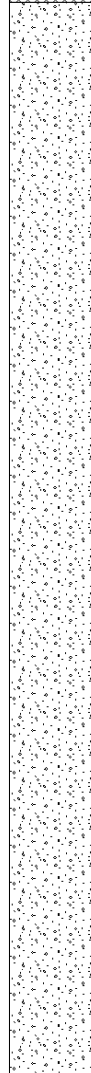
Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)

Remarks Rotary Open Hole																	
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Rotary Core Log

Project Name: Cwmavon				Client: TRJ				Date: 29/08/2023			
Location: Cwmavon				Contractor: Apex Drilling Services							
Project No. : 22177				Crew Name: TD/JP				Drilling Equipment: Fraste PLG			
Borehole Number BH04		Hole Type RO		Level		Logged By TD		Scale 1:50		Page Number Sheet 1 of 3	

Well	Water	Depth (m)	Type /FI	Coring			Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description								
				TCR	SCR	RQD													
								0.30			MADE GROUND. Tarmac and Subbase.**	1							
								2.90			MADE GROUND. Backfill.**	2							
												3							
																		Sand and Gravel.**	4
																			5
																			6
																			7
																			8
																			9
																			10

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

Remarks Rotary Open Hole																	
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Rotary Core Log

Project Name: Cwmavon				Client: TRJ				Date: 29/08/2023			
Location: Cwmavon				Contractor: Apex Drilling Services							
Project No. : 22177				Crew Name: TD/JB				Drilling Equipment: Fraste PLG			
Borehole Number BH04		Hole Type RO		Level		Logged By TD		Scale 1:50		Page Number Sheet 2 of 3	

Well	Water	Depth (m)	Type /FI	Coring			Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description	
				TCR	SCR	RQD						
								12.10			Sand and Gravel.**	11
												12
											Mudstone.**	13
												14
												15
												16
												17
												18
												19
												20

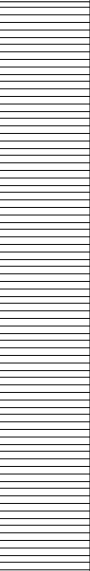
Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)

Remarks Rotary Open Hole																	
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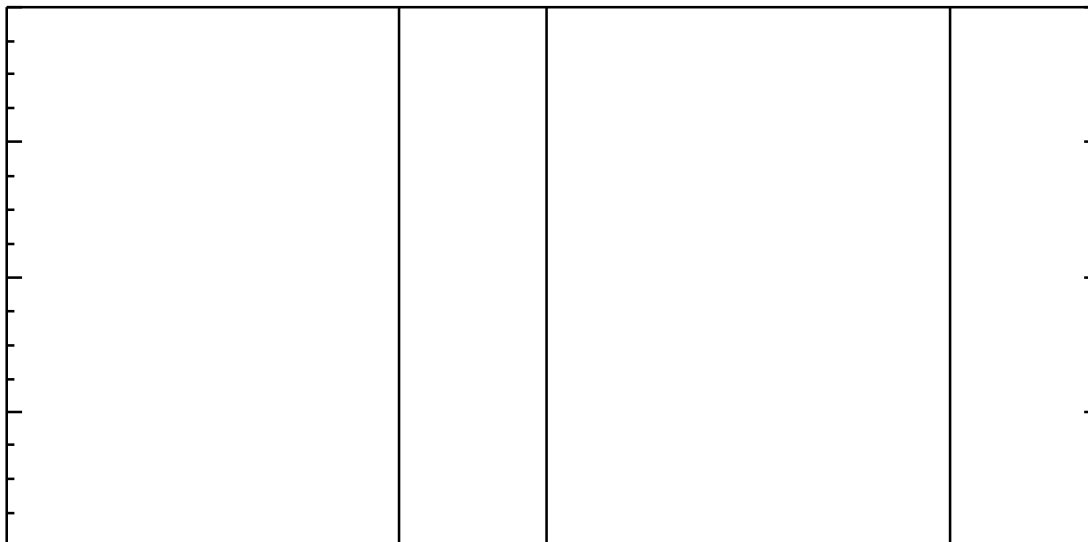
Rotary Core Log

Project Name: Cwmavon				Client: TRJ				Date: 29/08/2023			
Location: Cwmavon				Contractor: Apex Drilling Services							
Project No. : 22177				Crew Name: TD/JB				Drilling Equipment: Fraste PLG			
Borehole Number BH04		Hole Type RO		Level		Logged By TD		Scale 1:50		Page Number Sheet 3 of 3	

Well	Water	Depth (m)	Type /FI	Coring			Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description		
				TCR	SCR	RQD							
								23.80			Mudstone.**	21	

Project	Cwmavon	Project No	22177
Described by	PL	Trial Pit No	TP02
Date	29.08.2023	Sheet No	1 of 1

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

[illegible]

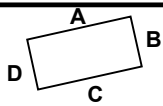
Groundwater Observations None	Strike of Face A		deg	
	Length of Face A	1.2	m	
	Width of Face B	0.3	m	
	Remarks			
Method/plant	2.5 ton excavator			
Stability	Stable			
Shoring	None			
Weather	Raining			
Sample Type:				
U Undisturbed, P Piston, D Disturbed, B Bulk, W Water				
ES Environmental Soil Sample				
EW Environmental Water Sample				
	Logger's Signature			
	PL			

Project	Cwmavon	Project No	22177
Described by	PL	Trial Pit No	TP03
Date	29.08.2023	Sheet No	1 of 1

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

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Samples and Tests			Strata		
Depth, m	Type & No	Results	Depth, m	Code	Description
0.60-0.80	ES		GL - 0.05	1	MADE GROUND: Macadam
			0.05 - 0.50	2	MADE GROUND: Light grey sandy subangular fine to coarse GRAVEL of limestone. Sub-base
			0.50 - 1.00	3	MADE GROUND: Grey and red subrounded COBBLES of fused slag with a little sand and gravel. Gravel is subrounded to rounded fine to coarse of slag, coke and coal. Burnt Furnace Material.
			1.00 - 1.80	4	MADE GROUND: Black silty SAND AND GRAVEL with low cobble content of subangular to subrounded slag and fire brick. Gravel is subrounded to rounded fine to coarse of slag, coke and coal. Many fragments of glass and ceramics. Burnt and unburnt foundry material.

Groundwater Observations None	Strike of Face A Length of Face A Width of Face B Remarks	deg 1.3 m 0.3 m	
Method/plant 2.5 ton excavator Stability Stable Shoring None Weather Raining 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	Cwmavon	Project No	22177
Described by	PL	Trial Pit No	TP04
Date	29.08.2023	Sheet No	1 of 1

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

[illegible][illegible]

Groundwater Observations None	Strike of Face A		deg	
	Length of Face A	1.3	m	
	Width of Face B	0.3	m	
	Remarks			
Method/plant	2.5 ton excavator			
Stability	Stable			
Shoring	None			
Weather	Raining			
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	Cwmavon	Project No	22177
Described by	PL	Trial Pit No	TP05
Date	29.08.2023	Sheet No	1 of 1

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

[illegible][illegible]

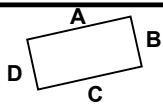
Groundwater Observations None	Strike of Face A		deg	
	Length of Face A	1.2	m	
	Width of Face B	0.3	m	
	Remarks			
Method/plant	2.5 ton excavator			
Stability	Stable			
Shoring	None			
Weather	Raining			
Sample Type:				
U Undisturbed, P Piston, D Disturbed, B Bulk, W Water				
ES Environmental Soil Sample				
EW Environmental Water Sample				
	Logger's Signature			
	PL			

Project	Cwmavon	Project No	22177
Described by	PL	Trial Pit No	TP06
Date	29.08.2023	Sheet No	1 of 1

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

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Samples and Tests			Strata		
Depth, m	Type & No	Results	Depth, m	Code	Description
0.40-0.60	ES		GL - 0.05	1	MADE GROUND: Macadam
1.10-1.40	ES		0.05 - 0.30	2	MADE GROUND: Light grey sandy subangular fine to coarse GRAVEL of limestone. Sub-base
			0.30 - 1.50	3	MADE GROUND: Black and grey ashy silty SAND AND GRAVEL with low cobble content of subangular to subrounded slag and fire brick. Gravel is subrounded to rounded fine to coarse of slag, coke and coal. Many fragments of glass and ceramics. Burnt and unburnt foundry material.
			1.50 - 1.70	4	Brown and grey slightly clayey to clayey SAND AND GRAVEL. Sand is fine to coarse. GRAVEL is subrounded fine to coarse of sandstone and mudstone. ALLUVIUM.

Groundwater Observations None	Strike of Face A Length of Face A Width of Face B Remarks	deg 1.3 m 0.3 m	
Method/plant 2.5 ton excavator Stability Stable Shoring None Weather Raining 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	Cwmavon	Project No	22177
Described by	PL	Trial Pit No	TP07
Date	29.08.2023	Sheet No	1 of 1

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

[illegible][illegible]

Groundwater Observations None	Strike of Face A		deg	
	Length of Face A	1.3	m	
	Width of Face B	0.3	m	
	Remarks			
Method/plant	2.5 ton excavator			
Stability	Stable			
Shoring	None			
Weather	Raining			
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	Cwmavon	Project No	22177
Described by	PL	Trial Pit No	TP08
Date	29.08.2023	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	1.2	m	
	Width of Face B	0.3	m	
Remarks				
Method/plant	2.5 ton excavator		Unable to continue due to boulders in pit.	
Stability	Stable			
Shoring	None			
Weather	Raining			
Sample Type:				
U Undisturbed, P Piston, D Disturbed, B Bulk, W Water			Logger's Signature PL	
ES Environmental Soil Sample				
EW Environmental Water Sample				

Window Sampling Hole Journal

Inspection Pit Dimensions						Hand Vane: Raw Data						
Equipment or Rig Type						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
87	GL	1.00	0.80									
						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		0.30 1.00	0.60 50/265	GL - 0.05: MADE GROUND: Macadam								
				0.05 - 0.25: MADE GROUND: Light grey sandy subangular fine to coarse GRAVEL of limestone. Sub-base								
				0.25 - 1.00: MADE GROUND: Red brown and grey sandy subangular to subrounded fine to coarse GRAVEL of slag with low to medium cobble content of subangular slag. Burnt foundry material.								
						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				
None		Depth of strike	After 20 mins	Depth sealed	Cwmavon				22177			
Remarks				Operator		Date		Hole No.				
Very dense at 1.00m				SWGT		29.08.2023		WS14				
				Logger		PL						

Window Sampling Hole Journal

Inspection Pit Dimensions						Hand Vane: Raw Data						
Equipment or Rig Type						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
87	GL	1.00	0.70									
77	1.00	2.00	0.80									
						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								
		1.00 2.00 2.45 2.90 3.35	9 14 12 15 50/30	GL - 0.05: MADE GROUND: Macadam								
				0.05 - 0.50: MADE GROUND: Light grey sandy subangular fine to coarse GRAVEL of limestone. Sub-base								
				0.50 - 1.00: MADE GROUND: Medium dense grey angular to subangular COBBLES of slag. Burnt Furnace Material								
				1.00 - 2.00: MADE GROUND: Black silty SAND AND GRAVEL with low cobble content of subangular to subrounded slag and fire brick. Gravel is subrounded to rounded fine to coarse of slag, coke and coal. Fragments of glass and ceramics. Burnt and unburnt foundry material.								
						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					
None		Depth of strike	After 20 mins	Depth sealed	Cwmavon			22177				
Remarks				Operator		Date		Hole No.				
				SWGT		29.08.2023		WS15				
				Logger PL		Date						

Window Sampling Hole Journal

Inspection Pit Dimensions						Hand Vane: Raw Data						
Equipment or Rig Type						Type	Geonor		Pilcon	Impact		
						Size (mm)	16		19		19	
							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
87	GL	1.00	0.50									
77	1.00	2.00	0.10									
67	2.00	3.00	0.10									
						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	SPT N	Description								
		1.00	21	GL - 0.05: MADE GROUND: Macadam								
				0.05 - 0.30: MADE GROUND: Light grey sandy subangular fine to coarse GRAVEL of limestone. Sub-base								
				0.03 - 1.00: MADE GROUND: Red brown and black sandy subangular to subrounded fine to coarse GRAVEL of slag. Burnt foundry material.								
				1.00 - 1.50: MADE GROUND: Medium dense grey angular to subangular COBBLES of slag. Burnt Furnace Material								
		2.00	12	1.50 - 3.00: No Recovery. Probably pushing a cobble								
		3.00	50/125									
						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					
		Depth of strike	After 20 mins						Depth sealed			
None					Cwmavon	22177						
Remarks				Operator		Date		Hole No.				
				SWGT		29.08.2023						
				Logger		PL		WS12				

Appendix C

Laboratory Testing

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 23/08797
Issue Number: 1

Date: 13 September, 2023

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

Project Manager: Rob Griffiths
Project Name: Cwmavon
Project Ref: 22177
Order No: 22177/01
Date Samples Received: 04/09/23
Date Instructions Received: 04/09/23
Date Analysis Completed: 13/09/23

Approved by:



Richard Wong
Client Manager

Envirolab Job Number: 23/08797

Client Project Name: Cwmavon

Client Project Ref: 22177

Lab Sample ID	23/08797/1							Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	BH02									
Depth to Top										
Depth To Bottom										
Date Sampled	31-Aug-23									
Sample Type	WATER - GW									
Sample Matrix Code	N/A									
pH (w) [#]	6.78							pH	0.01	A-T-031w
Arsenic (dissolved) _A [#]	<1							µg/l	1	A-T-025w
Boron (dissolved) _A [#]	135							µg/l	10	A-T-025w
Beryllium (dissolved) _A [#]	<1							µg/l	1	A-T-025w
Cadmium (dissolved) _A [#]	<0.2							µg/l	0.2	A-T-025w
Copper (dissolved) _A	5							µg/l	4	A-T-025w
Chromium (dissolved) _A [#]	<1							µg/l	1	A-T-025w
Lead (dissolved) _A [#]	<1							µg/l	1	A-T-025w
Mercury (dissolved) _A [#]	<0.1							µg/l	0.1	A-T-025w
Nickel (dissolved) _A [#]	5							µg/l	2	A-T-025w
Selenium (dissolved) _A [#]	<1							µg/l	1	A-T-025w
Vanadium (dissolved) _A [#]	<1							µg/l	1	A-T-025w
Zinc (dissolved) _A [#]	17							µg/l	2	A-T-025w

Envirolab Job Number: 23/08797

Client Project Name: Cwmavon

Client Project Ref: 22177

Lab Sample ID	23/08797/1							Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	BH02									
Depth to Top										
Depth To Bottom										
Date Sampled	31-Aug-23									
Sample Type	WATER - GW									
Sample Matrix Code	N/A									
PAH 16MS (w)										
Acenaphthene (w) _A [#]	<0.01							µg/l	0.01	A-T-019w
Acenaphthylene (w) _A [#]	<0.01							µg/l	0.01	A-T-019w
Anthracene (w) _A [#]	<0.01							µg/l	0.01	A-T-019w
Benzo(a)anthracene (w) _A [#]	0.02							µg/l	0.01	A-T-019w
Benzo(a)pyrene (w) _A [#]	0.03							µg/l	0.01	A-T-019w
Benzo(b)fluoranthene (w) _A [#]	0.05							µg/l	0.01	A-T-019w
Benzo(ghi)perylene (w) _A [#]	0.03							µg/l	0.01	A-T-019w
Benzo(k)fluoranthene (w) _A [#]	0.03							µg/l	0.01	A-T-019w
Chrysene (w) _A [#]	0.04							µg/l	0.01	A-T-019w
Dibenzo(ah)anthracene (w) _A [#]	<0.01							µg/l	0.01	A-T-019w
Fluoranthene (w) _A [#]	0.05							µg/l	0.01	A-T-019w
Fluorene (w) _A [#]	<0.01							µg/l	0.01	A-T-019w
Indeno(123-cd)pyrene (w) _A [#]	0.03							µg/l	0.01	A-T-019w
Naphthalene (w) _A [#]	<0.01							µg/l	0.01	A-T-019w
Phenanthrene (w) _A [#]	0.02							µg/l	0.01	A-T-019w
Pyrene (w) _A [#]	0.04							µg/l	0.01	A-T-019w
Total PAH 16MS (w) _A [#]	0.34							µg/l	0.01	A-T-019w

Envirolab Job Number: 23/08797

Client Project Name: Cwmavon

Client Project Ref: 22177

Lab Sample ID	23/08797/1									
Client Sample No										
Client Sample ID	BH02									
Depth to Top										
Depth To Bottom										
Date Sampled	31-Aug-23									
Sample Type	WATER - GW									
Sample Matrix Code	N/A									
TPH CWG (w) with Clean Up										
Ali >C5-C6 (w) _A [#]	<1							µg/l	1	A-T-022w
Ali >C6-C8 (w) _A [#]	<1							µg/l	1	A-T-022w
Ali >C8-C10 (w) _A [#]	<5							µg/l	5	A-T-055w
Ali >C10-C12 (w) _A [#]	<5							µg/l	5	A-T-055w
Ali >C12-C16 (w) _A [#]	<5							µg/l	5	A-T-055w
Ali >C16-C21 (w) _A [#]	<5							µg/l	5	A-T-055w
Ali >C21-C35 (w) _A [#]	<5							µg/l	5	A-T-055w
Total Aliphatics (w) _A [#]	<5							µg/l	5	Calc-As Recd
Aro >C5-C7 (w) _A [#]	<1							µg/l	1	A-T-022w
Aro >C7-C8 (w) _A [#]	<1							µg/l	1	A-T-022w
Aro >C8-C10 (w) _A	<5							µg/l	5	A-T-055w
Aro >C10-C12 (w) _A [#]	<5							µg/l	5	A-T-055w
Aro >C12-C16 (w) _A [#]	<5							µg/l	5	A-T-055w
Aro >C16-C21 (w) _A [#]	<5							µg/l	5	A-T-055w
Aro >C21-C35 (w) _A	<10							µg/l	10	A-T-055w
Total Aromatics (w) _A	<10							µg/l	10	Calc-As Recd
TPH (Ali & Aro >C5-C35) (w) _A	<10							µg/l	10	Calc-As Recd
BTEX - Benzene (w) _A [#]	<1							µg/l	1	A-T-022w
BTEX - Toluene (w) _A [#]	<1							µg/l	1	A-T-022w
BTEX - Ethyl Benzene (w) _A [#]	<1							µg/l	1	A-T-022w
BTEX - m & p Xylene (w) _A [#]	<1							µg/l	1	A-T-022w
BTEX - o Xylene (w) _A [#]	<1							µg/l	1	A-T-022w
MTBE (w) _A [#]	<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 within the same delivery, will be disposed of **six weeks** after the 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 our scope of accreditation.
 The client Sample No, Client Sample ID, Depth to top, Depth to Bottom and Date Sampled are all provided by the client.
 A deviating sample 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.

Key

Superscript "#"	Accredited to ISO 17025
Superscript "M"	Accredited to MCertS
Superscript "U"	Individual result not accredited
None of the above symbols	Analysis unaccredited
Subscript "A"	Analysis performed on as-received Sample
Subscript "D"	Analysis performed on the dried sample, crushed to pass 2mm sieve.
Subscript "A"	Analysis has dependant options against results. Details appear in the comments of your Sample receipt
IS	Insufficient Sample for analysis
US	Unsuitable Sample for analysis
NDP	No Determination Possible
NAD	No Asbestos Detected
N/A	Not applicable

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.

Assigned Matrix Codes

1	SAND	6	CLAY/LOAM	A	Contains Stones
2	LOAM	7	OTHER	B	Contains Construction Rubble
3	CLAY	8	Asbestos Bulk (Only Asbestos ID accredited)	C	Contains visible hydrocarbons
4	LOAM/SAND	9	Incinerator Ash (some Metals accredited)	D	Contains glass / metal
5	SAND/CLAY			E	Contains roots / twigs

Note: 7,8,9 matrices are not covered by our ISO 17025 or MCertS accreditation, unless stated above.

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 by method A-T-007:

For waters, free and visible oils are excluded from the sample used for analysis, so the reported result represents the dissolved phase only.
 Results "with Clean up" indicates samples cleaned up with Silica during extraction.

EPH CWG (method A-T-055) from TPH CWG:

EPH CWG results have humics mathematically subtracted through instrument calculation.
 Where these humic substances have been identified in any IDs from "TPH CWG with clean up" please note that the concentration is **NOT** included in the quantified results but present in the ID for information.

Electrical Conductivity of water by method A-T-037:

Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the accreditation range and as such are unaccredited.

Please contact your client manager if you require 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: Spectrum Geo Services, Foxglove Cottage, Cwm Risca Lane, Tondy, Wales,
CF32 0EH

Project: Cwmavon

Clients Project No: 22177

Project No: 23/08797

Date Received: 04/09/2023 (am)

Cool Box Temperatures (°C): 18.1

Lab Sample ID	23/08797/1
Client Sample No	
Client Sample ID/Depth	BH02
Date Sampled	31/08/23
Deviation Code	
A7 (no HNO3)	✓

Key
A7 (no HNO3) No HNO3 preserved bottle provided (dissolved metals will be deviating)

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 Analysis Dates

Lab Sample ID	23/08797/1
Client Sample No	
Client Sample ID/Depth	BH02
Date Sampled	31/08/23
A-T-019w	08/09/2023
A-T-022w	07/09/2023
A-T-025w	13/09/2023
A-T-031w	07/09/2023
A-T-055w	07/09/2023
Calc-As Recd	07/09/2023

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

Final Test Report

Envirolab Job Number: 23/08798
Issue Number: 1

Date: 15-Sep-23

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

Project Manager: Rob Griffiths
Project Name: Cwmavon
Project Ref: 22177
Order No: 22177/01

Date Samples Received: 4-Sep-23
Date Instructions Received: 4-Sep-23
Date Analysis Completed: 15-Sep-23

Notes - Soil analysis

All results are reported as dry weight (<40°C).

For samples with Matrix Codes 1 - 6 natural stones >10mm are removed or excluded from the sample prior to analysis and reported results corrected to a whole sample basis.

For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis.

Notes - General

This report shall not be reproduced, except in full, without written approval from Envirolab.

Subscript "A" indicates analysis performed on the sample as received. "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve, unless asbestos is found to be present in which case all analysis is performed on the sample as received.

All analysis is performed on the dried and crushed sample for samples with Matrix Code 7 and this supercedes any "A" subscripts.

All analysis is performed on the sample as received for soil samples from outside the European Union and this supercedes any "D" subscripts

For complex, multi-compound analysis, quality control results do not always fall within chart limits for every compound and we have criteria for reporting in these situations.

If results are in italic font they are associated with such quality control failures and may be 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

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

Secondary Matrix Codes: A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal, E = contains roots/twigs.

IS indicates Insufficient sample for analysis, NDP indicates No Determination Possible and NAD indicates No Asbestos Detected.

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.

Please contact us if you need any further information.

HWOL TPH Code: EH_CU_1D_AL: Extractable hydrocarbons - i.e. everything extracted by the solvent(s), Clean-up - e.g. by florisil, silica gel, GC - Single coil gas chromatography, Aliphatics only

Approved by:



Richard Wong
Client Manager

Sample Details					Landfill Waste Acceptance Criteria Limits			
Lab Sample ID	Method	ISO17025	MCERTS	23/08798/5	Inert Waste Landfill	Stable Non-reactive Hazardous Waste in Non-Hazardous Landfill	Hazardous Waste Landfill	
Client Sample Number								
Client Sample ID				WS14				
Depth to Top				0.4				
Depth to Bottom				0.60				
Date Sampled				31/08/2023				
Sample Type				Solid				
Sample Matrix Code				7				
Solid Waste Analysis								
pH (pH Units) _D	A-T-031	N	N	7.61	-	>6	-	
ANC to pH 4 (mol/kg) _D	A-T-ANC	N	N	0.03	-	to be evaluated	to be evaluated	
ANC to pH 6 (mol/kg) _D	A-T-ANC	N	N	0.02	-	to be evaluated	to be evaluated	
Loss on Ignition (%) _D	A-T-030	N	N	3.2	-	-	10	
Total Organic Carbon (%) _D	A-T-032	N	N	0.42	3	5	6	
PAH Sum of 17 (mg/kg) _A	A-T-019	N	N	<0.08	100	-	-	
Mineral Oil (mg/kg) _{A EH, CU, 1D, AL}	A-T-007	N	N	<10	500	-	-	
Sum of 7 PCBs (mg/kg) _A	A-T-004	N	N	<0.007	1	-	-	
Sum of BTEX (mg/kg) _A	A-T-022	N	N	<0.01	6	-	-	
Eluate Analysis				10:1 mg/l	10:1 mg/kg	Limit values for compliance leaching test using BS EN 12457-2 at L/S 10 l/kg (mg/kg)		
Arsenic	A-T-025	N	N	<0.001	<0.01	0.5	2	25
Barium	A-T-025	N	N	0.030	0.300	20	100	300
Cadmium	A-T-025	N	N	<0.001	<0.01	0.04	1	5
Chromium	A-T-025	N	N	<0.001	<0.01	0.5	10	70
Copper	A-T-025	N	N	0.005	0.050	2	50	100
Mercury	A-T-025	N	N	<0.0005	<0.005	0.01	0.2	2
Molybdenum	A-T-025	N	N	0.001	0.010	0.5	10	30
Nickel	A-T-025	N	N	<0.002	<0.02	0.4	10	40
Lead	A-T-025	N	N	0.002	0.020	0.5	10	50
Antimony	A-T-025	N	N	<0.001	<0.01	0.06	0.7	5
Selenium	A-T-025	N	N	<0.001	<0.01	0.1	0.5	7
Zinc	A-T-025	N	N	0.006	0.060	4	50	200
Chloride	A-T-026	N	N	1	13	800	15000	25000
Fluoride	A-T-026	N	N	1.4	14.0	10	150	500
Sulphate as SO ₄	A-T-026	N	N	6	58	1000	20000	50000
Total Dissolved Solids	A-T-035	N	N	<20	<200	4000	60000	100000
Phenol Index	A-T-050	N	N	<0.01	<0.1	1	-	-
Dissolved Organic Carbon	A-T-032	N	N	<2.0	<200	500	800	1000
Leach Test Information								
pH (pH Units)	A-T-031	N	N	6.7				
Conductivity (µS/cm)	A-T-037	N	N	37				
Mass Sample (kg)				0.216				
Dry Matter (%)	A-T-044	N	N	81				
Stated acceptance limits are for guidance only and Envirolab cannot be held responsible for any discrepancies with current legislation								

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 23/08798
Issue Number: 1

Date: 15 September, 2023

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

Project Manager: Rob Griffiths
Project Name: Cwmavon
Project Ref: 22177
Order No: 22177/01
Date Samples Received: 04/09/23
Date Instructions Received: 04/09/23
Date Analysis Completed: 15/09/23

Approved by:



Richard Wong
Client Manager

Envirolab Job Number: 23/08798

Client Project Name: Cwmavon

Client Project Ref: 22177

Lab Sample ID	23/08798/1	23/08798/2	23/08798/3	23/08798/4	23/08798/5			Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	TP02	TP03	TP05	WS13	WS14					
Depth to Top	1.20	0.60	1.40	1.60	0.40					
Depth To Bottom	1.40	0.80	1.80	1.80	0.60					
Date Sampled	31-Aug-23	31-Aug-23	31-Aug-23	31-Aug-23	31-Aug-23					
Sample Type	SOIL - ES	SOIL - ES	SOLID	SOIL - ES	SOLID					
Sample Matrix Code	4A	4A	7	4A	7					
% Stones >10mm _A	4.2	11.7	<0.1	3.3	<0.1			% w/w	0.1	A-T-044
pH _D ^{M#}	7.79	7.88	9.18 ^U	8.12	7.61 ^U			pH	0.01	A-T-031s
Sulphate (water sol 2:1) _D ^{M#}	0.11	0.04	0.03 ^U	0.05	- ^U			g/l	0.01	A-T-026s
Organic Matter _D ^{M#}	54.0	50.5	7.1 ^U	62.0	- ^U			% w/w	0.1	A-T-032s
Arsenic _D ^{M#}	69	31	2 ^U	35	- ^U			mg/kg	1	A-T-024s
Boron (water soluble) _D ^{M#}	<1.0	<1.0	<1.0 ^U	<1.0	- ^U			mg/kg	1	A-T-027s
Cadmium _D ^{M#}	1.0	<0.5	<0.5 ^U	<0.5	- ^U			mg/kg	0.5	A-T-024s
Copper _D ^{M#}	378	91	4 ^U	80	- ^U			mg/kg	1	A-T-024s
Chromium _D [#]	22	15	5 ^U	-	- ^U			mg/kg	1	A-T-024s
Chromium _D ^{M#}	-	-	- ^U	15	- ^U			mg/kg	1	A-T-024s
Chromium (hexavalent) _D	<1	<1	<1	<1	-			mg/kg	1	A-T-040s
Lead _D ^{M#}	327	334	4 ^U	63	- ^U			mg/kg	1	A-T-024s
Mercury _D	0.33	<0.17	<0.17	0.24	-			mg/kg	0.17	A-T-024s
Nickel _D ^{M#}	49	35	2 ^U	41	- ^U			mg/kg	1	A-T-024s
Selenium _D ^{M#}	2	<1	<1 ^U	<1	- ^U			mg/kg	1	A-T-024s
Zinc _D ^{M#}	285	121	9 ^U	166	- ^U			mg/kg	5	A-T-024s
TPH total (>C6-C40) _A ^{M#}	119	58	117 ^U	76	- ^U			mg/kg	10	A-T-007s

Envirolab Job Number: 23/08798

Client Project Name: Cwmavon

Client Project Ref: 22177

Lab Sample ID	23/08798/1	23/08798/2	23/08798/3	23/08798/4	23/08798/5			Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	TP02	TP03	TP05	WS13	WS14					
Depth to Top	1.20	0.60	1.40	1.60	0.40					
Depth To Bottom	1.40	0.80	1.80	1.80	0.60					
Date Sampled	31-Aug-23	31-Aug-23	31-Aug-23	31-Aug-23	31-Aug-23					
Sample Type	SOIL - ES	SOIL - ES	SOLID	SOIL - ES	SOLID					
Sample Matrix Code	4A	4A	7	4A	7					
Asbestos in Soil (inc. matrix)										
Asbestos in soil _D [#]	NAD	NAD	NAD ^U	NAD	- ^U					A-T-045
Asbestos Matrix (visual) _D	-	-	-	-	-					A-T-045
Asbestos Matrix (microscope) _D	-	-	-	-	-					A-T-045
Asbestos ACM - Suitable for Water Absorption Test? _D	N/A	N/A	N/A	N/A	-					A-T-045

Envirolab Job Number: 23/08798

Client Project Name: Cwmavon

Client Project Ref: 22177

Lab Sample ID	23/08798/1	23/08798/2	23/08798/3	23/08798/4	23/08798/5			Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	TP02	TP03	TP05	WS13	WS14					
Depth to Top	1.20	0.60	1.40	1.60	0.40					
Depth To Bottom	1.40	0.80	1.80	1.80	0.60					
Date Sampled	31-Aug-23	31-Aug-23	31-Aug-23	31-Aug-23	31-Aug-23					
Sample Type	SOIL - ES	SOIL - ES	SOLID	SOIL - ES	SOLID					
Sample Matrix Code	4A	4A	7	4A	7					
PAH-16MS										
Acenaphthene _A ^{M#}	0.01	<0.01	<0.01 ^U	<0.01	- ^U			mg/kg	0.01	A-T-019s
Acenaphthylene _A ^{M#}	0.07	0.05	<0.01 ^U	<0.01	- ^U			mg/kg	0.01	A-T-019s
Anthracene _A ^{M#}	0.12	0.04	<0.02 ^U	<0.02	- ^U			mg/kg	0.02	A-T-019s
Benzo(a)anthracene _A ^{M#}	0.94	0.65	<0.04 ^U	<0.04	- ^U			mg/kg	0.04	A-T-019s
Benzo(a)pyrene _A ^{M#}	0.88	2.03	<0.04 ^U	<0.04	- ^U			mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene _A ^{M#}	0.99	2.78	<0.05 ^U	0.08	- ^U			mg/kg	0.05	A-T-019s
Benzo(ghi)perylene _A ^{M#}	0.53	1.68	<0.05 ^U	<0.05	- ^U			mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene _A ^{M#}	0.40	0.84	<0.07 ^U	<0.07	- ^U			mg/kg	0.07	A-T-019s
Chrysene _A ^{M#}	0.81	1.32	<0.06 ^U	0.17	- ^U			mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene _A	0.12	0.31	<0.04	<0.04	-			mg/kg	0.04	A-T-019s
Fluoranthene _A ^{M#}	1.48	0.56	<0.08 ^U	<0.08	- ^U			mg/kg	0.08	A-T-019s
Fluorene _A ^{M#}	0.02	0.01	<0.01 ^U	<0.01	- ^U			mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene _A ^{M#}	0.69	1.97	<0.03 ^U	0.05	- ^U			mg/kg	0.03	A-T-019s
Naphthalene _A ^{M#}	<0.03	0.04	<0.03 ^U	<0.03	- ^U			mg/kg	0.03	A-T-019s
Phenanthrene _A ^{M#}	0.43 ^U	0.17 ^U	<0.03 ^U	0.13 ^U	- ^U			mg/kg	0.03	A-T-019s
Pyrene _A ^{M#}	1.07	0.39	<0.07 ^U	<0.07	- ^U			mg/kg	0.07	A-T-019s
Total PAH-16MS _A	8.56	12.8	<0.08 ^U	0.43	- ^U			mg/kg	0.01	A-T-019s

Report Notes

General

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 Analytical results reflect the quality of the sample at the time of analysis only.
 Opinions and Interpretations expressed are outside our scope of accreditation.
 The client Sample No, Client Sample ID, Depth to top, Depth to Bottom and Date Sampled are all provided by the client.
 A deviating sample 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.

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Subscript "A"	Analysis has dependant options against results. Details appear in the comments of your Sample receipt
IS	Insufficient Sample for analysis
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NDP	No Determination Possible
NAD	No Asbestos Detected
N/A	Not applicable

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.

Assigned Matrix Codes

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2	LOAM	7	OTHER	B	Contains Construction Rubble
3	CLAY	8	Asbestos Bulk (Only Asbestos ID accredited)	C	Contains visible hydrocarbons
4	LOAM/SAND	9	Incinerator Ash (some Metals accredited)	D	Contains glass / metal
5	SAND/CLAY			E	Contains roots / twigs

Note: 7,8,9 matrices are not covered by our ISO 17025 or MCertS accreditation, unless stated above.

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 by method A-T-007:

For waters, free and visible oils are excluded from the sample used for analysis, so the reported result represents the dissolved phase only.
 Results "with Clean up" indicates samples cleaned up with Silica during extraction.

EPH CWG (method A-T-055) from TPH CWG:

EPH CWG results have humics mathematically subtracted through instrument calculation.
 Where these humic substances have been identified in any IDs from "TPH CWG with clean up" please note that the concentration is **NOT** included in the quantified results but present in the ID for information.

Electrical Conductivity of water by method A-T-037:

Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the accreditation range and as such are unaccredited.

Please contact your client manager if you require 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: Spectrum Geo Services, Foxglove Cottage, Cwm Risca Lane, Tondy, Wales,
CF32 0EH

Project: Cwmavon

Clients Project No: 22177

Project No: 23/08798

Date Received: 04/09/2023 (am)

Cool Box Temperatures (°C): 16.0

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 Analysis Dates

Lab Sample ID	23/08798/1	23/08798/2	23/08798/3	23/08798/4	23/08798/5
Client Sample No					
Client Sample ID/Depth	TP02 1.20-1.40m	TP03 0.60-0.80m	TP05 1.40-1.80m	WS13 1.60-1.80m	WS14 0.40-0.60m
Date Sampled	31/08/23	31/08/23	31/08/23	31/08/23	31/08/23
A-T-004s					08/09/2023
A-T-007s	12/09/2023	12/09/2023	12/09/2023	12/09/2023	08/09/2023
A-T-019s	08/09/2023	08/09/2023	08/09/2023	08/09/2023	11/09/2023
A-T-022s					08/09/2023
A-T-024s	15/09/2023	15/09/2023	15/09/2023	15/09/2023	
A-T-025w					15/09/2023
A-T-026s	14/09/2023	14/09/2023	14/09/2023	14/09/2023	
A-T-026w					15/09/2023
A-T-026w (F)					15/09/2023
A-T-027s	14/09/2023	14/09/2023	14/09/2023	14/09/2023	
A-T-030s					14/09/2023
A-T-031s	14/09/2023	14/09/2023	14/09/2023	14/09/2023	14/09/2023
A-T-031w					15/09/2023
A-T-032s	14/09/2023	14/09/2023	14/09/2023	14/09/2023	14/09/2023
A-T-032w					15/09/2023
A-T-037w					15/09/2023
A-T-040s	14/09/2023	14/09/2023	14/09/2023	14/09/2023	
A-T-044	15/09/2023	15/09/2023	15/09/2023	15/09/2023	15/09/2023
A-T-045	11/09/2023	11/09/2023	11/09/2023	11/09/2023	
A-T-050w					15/09/2023
A-T-ANCs					14/09/2023
Calc-no stones					15/09/2023
Probe (w)					15/09/2023

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

APPENDIX D

Groundwater Monitoring

[illegible]

APPENDIX E

Photographic Plates

29/8/23

PROJECT	
PROJECT NO	CWMAVON
TP	23177
DEPTH (M)	TP 02
FACE	GL 1.80



100 200 300 400 500 600



29/8/23

PROJECT	CWMAYON
PROJECT NO	23177
TP	TP 0.3
DEPTH (M)	GL 1.80
FACE	

100 200 300 400 500 600



29/8/23

PROJECT	CWMAYON
PROJECT NO	23177
TP	TP04
DEPTH (M)	GL 1.80
FACE	



29/8/23

PROJECT

PROJECT NO

TP

DEPTH (M)

FACE

CWMAYON

23177

TP 05

GL 1.80





29/8/23

PROJECT	
PROJECT NO	CWMAVON
TP	23177
DEPTH (M)	TP 07
FACE	GL 1.80

100 200 300 400 500 600

29/8/23

PROJECT

CWMAVON

PROJECT NO

23177

TP

TP08

DEPTH (M)

GL 0.70

FACE



29/8/23

PROJECT
PROJECT NO
TP
DEPTH (M)
FACE

CWMAVON

23177

WS 12

GL 3.00



29/8/23

PROJECT

CWMAVON

PROJECT NO

23177

TP

WS 13

DEPTH (M)

GL 2.00

FACE



29/8/23

PROJECT

CWMAVON

PROJECT NO

23177

TP

WS14

DEPTH (M)

GL 1.00

FACE



29/8/23

PROJECT

CWMAVON

PROJECT NO

23177

TP

WS 15

DEPTH (M)

GL 2.00

FACE



29/8/23

PROJECT
PROJECT NO
TP
DEPTH (M)
FACE

CWMAVON

23177

WS 1.6

GL 2.00



APPENDIX F

Permit Closure Summary Form



Permit Ref.	27085	Project / Site Location	Childcare Unit, Waun Wen, Cwmavon, Neath Port Talbot, SA12 9ED
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Please supply all relevant documents, including this completed form within 3 months of the permitted works being completed.

Where relevant the report should include; borehole logs and details of mine or mine entry treatment works carried out (incl. engineering drawings, grout takes etc.) and a scaled site layout plan (correlated to O.S N' Grid) showing all relevant mine entry positions, coal seams, voids and broken ground proved by the works.

Summary of worksStart date **29/08/23**Finish date **30/08/23**Have any variations occurred? ☒ No ☐ Yes If so was the Authority notified? ☐ No ☐ Yes

Please describe;

Did if any of the following incidents occur?

- ☐ Spontaneous combustion ☐ Water emission ☐ Gas emission (elevated or above action levels)
☐ Geotechnical instability ☐ Legal issues incl. damage or potential claims ☒ None

If yes, please detail each item;

Were any of the following encountered? Please give a brief summary of the works undertaken.

- ☒ Intact coal only ☐ Broken ground ☐ Backfilled ground ☐ Voids

Description;

Several coal seams noted with no workings or loss of water flush. Tally with expectations

Will further works be necessary that require a Permit? ☒ No ☐ Yes

If yes, please describe, including any recommendations;

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Company: SPECTRUM GEO SERVICES LTD	Tel: 01656 723666