



Title:

REPORT ON A GROUND INVESTIGATION

FOR

NENTHEAD MINES PROPOSED MWTS, GI, NENTHEAD

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1.0 INTRODUCTION

In August 2019 Soil Engineering Geoservices Ltd were instructed by The Coal Authority (The Engineer and The Employer) to carry out a ground investigation at Nenthead and the adjacent scheduled ancient monument, a former metal mining site and museum. It is proposed to create a mine water treatment scheme at the site consisting of a pipeline, reedbeds and various treatment and pumping buildings. The investigation comprised the formation of cable percussion boreholes selectively extended by rotary drilling techniques together with trial pitting and dynamic sampling. An Archaeological watching brief was required throughout the works and PAS128 surveys were carried out at each location in advance of intrusive works.

This factual report presents the results of the fieldwork and laboratory testing undertaken together with information on the ground and groundwater conditions encountered. The fieldwork was carried out between 2nd and 20th September 2019.

2.0 PURPOSE, SCOPE AND REPORT FORMAT

2.1 Purpose

The purpose of this investigation was to determine the subsurface ground and groundwater conditions at the site of the proposed mine water treatment scheme. This information was obtained from a combination of intrusive investigation techniques and laboratory testing.

2.2 Scope of Work

The brief for this factual report comprised the following items:

- 1. To undertake a utilities scan at each exploratory hole position
- 2. To form exploratory holes on site.
- 3. To install gas and groundwater monitoring instruments.
- 4. To monitor on site installations.
- 5. To undertake laboratory tests on samples recovered from exploratory holes.

The sources of information used in the compilation of this report are detailed in the list of references on page 12.

2.3 Limitations

This report has been prepared in accordance with the project specification. Soil Engineering accepts no liability for any deficiencies in the report that arise from the specification's non-compliance with either European or British Standards. This particularly applies to exploratory hole spacings and depths and to the scope of laboratory testing.

It should be noted that the investigation data on which this report is based is only indicative of the actual ground, groundwater and ground gas conditions that exist at the locations of the exploratory holes and may not be representative of the conditions that exist on the site as a whole.

2.4 Report Format

This report is presented in the following format:

Factual information comprising: -



- Description of fieldwork
- Exploratory hole logs
- Laboratory test results
- Maps and plans
- Photographs
- Archaeological records

3.0 DESK STUDY INFORMATION

3.1 Scope of Study

A formal comprehensive (phase I) desk study was not requested by the Engineer for this investigation. The following sections however provide general details of site location and description, together with site geology as ascertained from published maps, papers, and memoirs together with details of any previous investigation carried out on the site.

3.2 Site Location and Description

The existing Mining Museum and scheduled ancient monument is located to the east north east of Nenthead in eastern Cumbria. The site is bounded to the north by the A689, to the south by the River Nent and to the east by Alston Moor. To the west of the site is the village of Nenthead

During the investigation, our engineer noted that the majority of the site comprised of hilly moorland terrain, comprising Alston Moor and the scheduled ancient monument of Nenthead Mine. The site rises from west to east. The terrain comprises of rough tracks and open moorland to the east and a carpark and mining museum with associated access to the west.

Site levels vary between approximately 577m AOD at the east end of the site and 437m AOD at the western end of the site.

The location of the site is indicated on Figure 1 in Section C of this report.

3.3 Geology

From the available information on the 1:50,000 scale Geological Survey map of the area¹ economic memoir² and detailed paper³ the site is shown to be underlain by the Stainmoore Member and the Alston Member of Carboniferous age with superficial deposits and peat being poorly mapped on the 1:50,000 scale mapping. All the beds are shown to be generally horizontal or shallowly dipping.

3.4 Previous Investigations

The Engineer has not made SEGL aware of any previous investigations on this site, however in April 2018 Soil Engineering carried out an investigation on this site consisting of four cable percussive boreholes. For further information reference should be made to the full report which is listed in the references of this report on page 13.



¹ Sheet 25: 1990, Solid and Drift edition for Alston

² North Pennine Orefield - Volume 1: Tyne to Stainmore. Memoire for sheets E19 and E25,

³ The Geology of NY74SE, Nenthead Cumbria S.M. Clarke

4.0 FIELDWORK

4.1 Scope of Fieldwork

The scope of the fieldwork was specified by the Engineer and was undertaken in general accordance with Eurocodes⁴ and, where there is no conflict, also with BS 5930⁵. Soil and rock logging has been undertaken in accordance with the relevant European Standards^{6,7,8} listed in the references for this report. In accordance with the specification and drawings provided by the Engineer, Soil Engineering were required to set out and survey the exploratory holes and to undertake the testing and sampling regime. Cable percussion boreholes selectively extended by rotary drilling were formed together with mechanically excavated trial pits and dynamically sampled boreholes. The exploratory hole locations are shown on the site plan presented in Section C of this report.

4.2 Ground Penetrating Radar Survey / Utility Detection

To allow the positive identification of any utilities or buried features on site prior to the formation of any exploratory hole, a category B PAS128 Survey was undertaken at each of the exploratory hole locations. These surveys were undertaken by Zetica Ltd, a specialist contractor. The survey comprised two types of non-intrusive geophysical mapping, Electromagnetic Ground conductivity (EM) and Ground Penetrating Radar (GPR). In addition, a desk top review, liaison with utility providers and site reconnaissance were also undertaken. The geophysical mapping covered a minimum 5m by 5m grid at each exploratory hole location.

A site sketch of each exploratory hole location was produced which indicated the location of any buried services encountered relative to the proposed exploratory hole location. Where buried services were located and found to obstruct the proposed exploratory hole, the position was relocated within the 5m by 5m grid.

4.3 Inspection Pits

In order to reduce the risk of damaging buried services, the location of each exploratory hole was scanned using a cable avoidance tool (CAT). As a further precaution, an inspection pit was hand excavated to a depth of 1.20m at each location, followed by a further scan of the base of each pit with the CAT.

4.4 Cable Percussion Boreholes

A total of five boreholes designated BH102R and BH103 to BH106 inclusive were formed to depths between 3.74m and 6.00m using conventional light cable percussion techniques together with 200mm and 150mm diameter temporary steel casings. The boreholes were all formed in order to obtain samples for laboratory testing and to provide geotechnical information for foundation design. Two of the boreholes were also used for the installation of gas monitoring wells and three for the installation of piezometers.

102mm nominal diameter open tube thin walled samples (UT100) were obtained at regular intervals throughout the boring operations where suitable cohesive materials were encountered. Where cohesive materials were found to be too stiff and / or had a high granular content, U100 sampling with an attendant reduction in sample quality was employed. All UT100 and U100 samples were sealed with wax to prevent moisture loss and were transported to the Leeds laboratory of Soil Engineering.

⁸ BS EN ISO 14689-1: 2003: Geotechnical Investigation and testing – Identification and Classification of Rock – Part 1: Identification and description.



⁴ Eurocode 7 Part 2 (BS EN 1997-2: 2007)

 $^{^{\}rm 5}$ BS 5930: 2015: Code of Practice for Site Investigation. British Standards Institution

⁶ BS EN ISO 14688-1: 2002: Geotechnical Investigation and testing – Identification and Classification of Soil – Part 1: Identification and Description.

⁷ BS EN ISO 14688-2: 2004 + A1: 2013: Geotechnical Investigation and testing – Identification and Classification of Soil – Part 2: Principles for a Classification

In granular materials or where the presence of coarse material prevented the taking of open tube samples, Standard Penetration Tests⁹ were carried out using either a split spoon sampler or a solid 60° cone. The results of these tests are given as a Standard Penetration "N" value or as a blow count for a given penetration at the appropriate position on the borehole logs, where the use of either the sampler or cone is also recorded.

Representative disturbed samples of all materials encountered were obtained and these were placed in sealed containers for transport to the laboratory.

Where required, environmental samples were obtained for chemical testing.

The samples recovered from the boreholes were described by an Engineering Geologist, in accordance with the terminology presented in Appendix 1 of this report. A detailed description of all strata encountered, groundwater conditions and the position and type of samples taken are included on the borehole logs presented in Section A of this report.

4.5 Rotary Drilling

In order to obtain information on the solid geology beneath the site boreholes BH105 and BH107 inclusive were extended using rotary drilling techniques. These boreholes were extended to depths between 10.00m and 14.80m, using a PWF core barrel together with a protective semi rigid plastic liner and a Polycrystalline Diamond (PCD) core bit with water flush to produce cores of 92mm nominal diameter.

Details of the strata encountered are given on the borehole logs along with the Engineering Geologist's assessment of Total Core Recovery (TCR), Solid Core Recovery (SCR), and Rock Quality Designation (RQD) each expressed as a percentage of the individual core runs. Where applicable a fracture spacing (I_f) has also been determined and this information is given on the logs.

The symbols and abbreviations used on the rotary borehole logs are explained on the exploratory hole log legend and notation sheet presented in Section A of this report.

The core samples recovered were transported to the Leeds laboratory of Soil Engineering where they were photographed, sampled and described by an Engineering Geologist in accordance with the terminology presented in Appendix 1 of this report. The borehole logs are presented in Section A of this report and photographic records are presented in Section D of this report.

4.6 Dynamic Sampling

Sixteen dynamic sampling holes designated WS101 to WS109 inclusive WSBH101R, WSTP101, WSTP102, WSTP103, WSTP105, WSTP106 and WSTP107 were formed to depths between 1.50m and 4.10m using conventional equipment, which comprised 1.00m long steel cylinders with an internal plastic liner. The steel cylinders were repeatedly driven into the ground to progressive depths using rods connected to a handheld motor driven percussion hammer.

WSBH and WSTP holes were carried out with dynamic sampling equipment due to access restrictions or requirements to remain access past the location. This prevented the holes being completed by cable percussive (WSBH) or a tracked excavator (WSTP).

Disturbed representative samples of the strata being penetrated were recovered from the window sampler for geotechnical description and laboratory testing. The depths of the samples recovered are shown on the relevant exploratory hole logs presented in Section A of this report.

⁹ BS EN ISO 22476-3:2005 + A1: 2011: Geotechnical Investigation and Testing - Field Testing - Part 3: Standard Penetration Test.



4.7 Trial Pits

Twenty-two trial pits designated TP104 and TP108 to TP128 Inclusive were excavated using a 9T tracked excavator to depths between 0.50m and 3.00m. These trial pits were located around the site to provide a reasonable indication of the presence of any made ground and in particular to assess the mass soil fabric of the near surface natural deposits.

The trial pits were not shored and were logged from the surface by an Engineering Geologist. The Engineering Geologist provided a detailed description of the ground conditions encountered in each pit and also obtained disturbed soil samples at regular intervals for geotechnical and chemical analysis. The strata encountered in the trial pits are described on the trial pit logs presented in Section A of this report and the location of each of the trial pits is indicated on the site plan presented in Section C of this report. Trial pit photographs are included in Section D of this report

4.8 Installations

A slotted 50mm diameter UPVC tube was installed in each of boreholes BH102R, BH107, WS103, WS104 and WSBH101R. This tubing was slotted from the base of each borehole up to a depth of 0.50m with the slotted section being surrounded by pea gravel and the upper 0.50m being surrounded by a bentonite seal. A metal stopcock cover was concreted into place on each of the installations and a plastic cap with a gas valve was placed onto each tube to facilitate long-term groundwater and gas monitoring. A schematic of each installation is shown on the relevant borehole log presented in Section A of this report.

Casagrande type piezometers were installed in boreholes BH103, BH104 and BH106. These comprised a porous tip set within a sand cell of predetermined length. The sand cell or response zone was sealed with bentonite pellets and the piezometer tip was connected to ground level by a 19mm diameter UPVC tube. A metal stopcock cover was concreted into place at ground level to facilitate long term groundwater monitoring. A schematic of each installation is shown on the relevant borehole log presented in Section A of this report.

4.9 Groundwater and Gas Monitoring

In accordance with the Engineer's instruction monitoring of gas in boreholes BH102R, BH107, WS103, WS104 and WSBH101R and groundwater in boreholes BH103, BH104 and BH106 was carried out at weekly intervals for four weeks after completion of the site works. Monitoring for groundwater was carried out using a standard electronic dip meter and monitoring for methane, carbon dioxide, carbon monoxide, hydrogen sulphide and oxygen gases was carried out using a Geotechnical Instruments GA5000 gas analyser. Where practical, visits to site were made on days of low or falling barometric pressure in order to try to record the more onerous gas conditions. The results are presented in Section A of this report.

4.10 Archaeologists Report

AOC Archaeology Group was engaged as a subcontractor to Soil Engineering to undertake the role of Archaeological Clerk Of works, to investigate and produce a report on any evidence of Archaeological importance encountered during the siteworks. This involved a survey by the Archaeologist for evidence of historical remains as a watching brief during the removal of topsoil and the upper sections of superficial deposits in the trial pits and windowless samples. The AOC Archaeological report is included in Appendix 2 of this report.

5.0 LABORATORY TESTING

5.1 Scope of Testing



Project No: TA8234 Document No. F01

All geotechnical (soils) and chemical (environmental) testing was specified and scheduled by the Engineer. The scope of the testing was required to assist the Engineer in any geotechnical design to be made and in establishing any potential site contamination levels.

5.2 Geotechnical Soils Testing

The programme of laboratory testing was carried out in accordance with BS 1377¹⁰. The testing was carried out at the Leeds laboratory of Soil Engineering, a UKAS accredited testing laboratory No 1265.

Results are given on the summary sheets with individual test plots presented in Section B of this report.

In addition, chemical (sulfate and pH) testing was undertaken by DETS, a UKAS accredited testing laboratory No. 2139 Testing was undertaken in order to assess concrete requirements from BRE Special Digest No 1¹¹. Samples were prepared in general accordance with BS 1377, although final analysis of total sulfate was performed using ICP and aqueous extract using Ion Chromatography.

5.3 Environmental Testing

A programme of environmental testing was scheduled by the Engineer. Testing was carried out by DETS, a UKAS accredited testing laboratory No. 2139

Testing was carried out in accordance with the methods identified in the test reports.

The results of the environmental testing are presented in Section B of this report.

6.0 RESULTS OF THE INVESTIGATION

6.1 Scope of Commentary

The results of this investigation appear to broadly concur with the published geology summarised in Section 3.3 of this report and also with the information presented in the previous investigation carried out on this site and referenced in Section 3.4 of this report. The following sections are only intended to provide a summary of the ground conditions encountered during this investigation whilst the logs presented in Section A of this report give a detailed account of all the strata observed.

6.2 Made Ground

Made Ground was encountered in boreholes BH102R, BH104, and BH105 to depths between 1.00m and 4.60m and was comprised of clayey to very clayey sand and gravel or slightly sandy slightly gravelly clay. The sand and gravel was noted in BH102R located in the Nenthead mines carpark. The clay was noted on the open fells at the eastern end of the site.

Trial pits TP104, TP108, TP109 TP126, TP127, and TP128 located either in the Nenthead mines carpark and adjacent to access tracks located within the former historic mine areas encountered made ground between 0.50m and 2.05m in overall thickness. TP104 had the most significant thickness of made ground which comprised grey and brown very gravelly fine to coarse sand with high cobble content. Both the cobbles and gravel were noted to comprise wood, sandstone, and siltstone. Trial pit TP108 was terminated at 0.50m due to a possible feature associated with the historic mining activities carried out on the site.

Trial pits TP109 and TP127 both encountered a slightly sandy slightly gravelly clay to 1.90m and 1.30m

¹¹ BRE Special Digest 1: 2005: Concrete in Aggressive Ground. BRE Construction Division.



¹⁰ BS 1377: 1990: Parts 1 to 9: Methods of Test for Soils For Civil Engineering Purposes. British Standards Institution

respectively. Trial pits TP126 and TP128 encountered very gravelly and very clayey fine to coarse sand to depths between 0.45m and 0.55m respectively.

Window samples WS102, WS103, WS104, WS105, WSBH101R, WSTP102, WSTP103, WSTP105, WSTP106 and WSTP107 encountered made ground to depths between 0.50m and 3.10m, generally comprising a mixture of sands and gravels and clays associated with the historic activities on the site. In WSTP103, the remains of a wall were noted between 0.40m and 0.50m depth.

6.3 Superficial Deposits

Boreholes BH103 to BH106 inclusive encountered superficial deposits comprising soft to firm slightly sandy slightly gravelly clay to depths between 2.50m and 5.50m. BH103 encountered a layer of firm grey mottled brown slightly sandy slightly gravelly clay between ground level and 0.90m whilst from ground level in BH106 soft to firm slightly sandy slightly gravelly clay was found to 2.25m.

Below any made ground in the window samples, generally firm to stiff slightly sandy slightly gravelly clay was encountered. Where no made ground was present, soft to firm clay was noted. WS101 and WSTP101 both identified 0.50m and 0.85m respectively of clayey fine to coarse sand.

Trial pits TP110 to TP128 inclusive all encountered superficial deposits to depths between 0.90m and 3.00m and generally consisting of soft to firm becoming firm to stiff with depth slightly gravelly sandy clay. Trail pit TP125 found dark brownish grey very clayey very gravelly sand between ground level and 0.20m and trial pit TP126 found brown mottled orange very gravelly clayey fine to coarse sand between 0.45m and 1.25m.

6.4 Carboniferous Strata

Boreholes BH105 and BH107 were extended into rock. BH105 encountered medium strong thinly laminated light grey fine to coarse grained slightly sandy carbonaceous sandstone, underlain by a sequence of siltstones and mudstones to the base of each hole at depths of 14.80m and 10.00m respectively. In borehole BH105, a void was noted at depths between 11.20m and 13.30m.

6.5 Groundwater

Groundwater was encountered in WS101, WS106 and WS107 at various depths. A summary of exploratory hole groundwater inflows is given in Table 1 in Section A, whilst the logs presented in Section A of this report provide full details of all groundwater information.

6.6 Gas Monitoring

The results of the gas monitoring are presented in Section A of this report. The monitoring (which was carried out where possible during days of low or falling atmospheric pressure) produced no detectable methane, carbon dioxide levels were in the range 0.1% to 1.3% whilst oxygen levels were in the range 19.4% to 22.2%.

For and on behalf of

Soil Engineering Geoservices Ltd

M.P. Burton Project Engineering Geologist



REPORT REFERENCES

- 1. BGS Sheet 25: 1990: 1:50,000 scale Alston. British Geological Survey.
- 2. BS EN 1997-2: 2007: Eurocode 7 Geotechnical Design Part 2: Ground Investigation and Testing
- 3. BS 5930: 2015: Code of Practice for Site Investigation. British Standards Institution
- 4. BS EN ISO 14688-1: 2002: Geotechnical Investigation and testing Identification and Classification of Soil Part 1: Identification and Description.
- 5. BS EN ISO 14688-2: 2004 + A1: 2013: Geotechnical Investigation and testing Identification and Classification of Soil Part 2: Principles for a Classification
- 6. BS EN ISO 14689-1: 2003: Geotechnical Investigation and testing Identification and Classification of Rock Part 1: Identification and description.
- 7. BS EN ISO 22476-3: 2005: + A1: 2011 Geotechnical Investigation and Testing Field Testing Part 3: Standard Penetration Test.
- 8. BS 1377: 1990: Parts 1 to 9: Methods of Test for Soils For Civil Engineering Purposes. British Standards Institution.
- 9. BRE Special Digest 1: 2005: Concrete in Aggressive Ground. BRE Construction Division.
- 10. ISRM 2007 The complete ISRM Suggested Methods for Rock Characterization, Testing and Monitoring: 1974-2006. Ulusay, R. and Hudson, J.A. (Eds).

Where any documents referenced above are subject to any amendment, then the latest version incorporating such amendment shall be deemed to apply, unless specifically stated otherwise.

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SUPPORTING FACTUAL DATA

SECTION A

Exploratory Hole Records and Field Data

EXPLORATORY HOLE LOG LEGEND AND NOTATION SHEET

SECTION A: EXPLORATORY HOLE LOG LEGENDS

CODE	DESCRIPTION	LEGEND	CODE	DESCRIPTION	LEGEND
101	Topsoil		806	Coal	
102	Made Ground		807	Breccia	
104	Concrete		808	Conglomerate	00000
201	Clay		809	Fine Grained Igneous	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\
301	Silt	×××××	810	Medium Grained Igneous	++++
401	Sand		811	Coarse Grained Igneous	*****
501	Gravel		812	Fine Grained Metamorphic	
601	Peat	alle alle alle	813	Coarse / Medium Grained Metamorphic	
701	Cobbles	0 2 0 0	EVT	Evaporite	0000000
730	Boulders		MWS	Mine Workings	
801	Mudstone		904	Grout	
802	Siltstone	****** ******	905	Arisings	
803	Sandstone		BLK	Zone of No Recovery	
804	Limestone		WTR	Water	~~
805	Chalk	T T T	types are re	soils types comprise a mixture of particle presented graphically on the exploratory the legends shown on this sheet.	



SECTION A: EXPLORATORY HOLE LOG LEGENDS

SAMPLIN	IG NOTATION
u	Undisturbed U100 or U38 sample (size given on log)
ит	Thin wall open drive tube sampler (size given on log)
Р	Piston Sample
BLK	Block Sample
M	Mazier Sample
TW	Thin Walled Sample
L	Liner Sample obtained from windowless sampler
D	Small Disturbed Sample
В	Bulk Disturbed Sample
LB	Large Bulk Disturbed Sample
С	Core Sample
ES	Environmental Soil Sample
EW	Environmental Water Sample
W	Water Sample
UF	No Recovery in U Sample
UTF	No Recovery in UT Sample
PF	No Recovery in P Sample
TWF	No Recovery in TW Sample

IN SITU 1	TEST NOTATION
SPT	Standard Penetration Test with a Split Spoon
SPT(C)	Standard Penetration Test with a Cone
С	Cone Penetration Test
NP	No Penetration for SPT or SPT(C)
V	Vane Test
HV	Hand Vane
НР	Hand Penetrometer
CBR	California Bearing Ratio Test
К	Permeability Test (test type not differentiated)
Pr	Pressuremeter Test

OTHER IN	IOTATION
TCR	Total Core Recovery
SCR	Solid Core Recovery
RQD	Rock Quality Designation
FI	Fracture Index
If	Fracture Spacing
NI	Non Intact
NA	Data Not Applicable
NR	Data Not Recorded

GRAPHICS USED Standing water level Joining bar indicates level risen Waterstrike level



SUPPORTING FACTUAL DATA

SECTION A

Exploratory Hole Records and Field Data

CABLE PERCUSSION AND ROTARY DRILLING RECORDS

Project	Name	Ner	nthead	Mines	- Pr	oposed	MWTS	S, GI							_			_		H	lole ID			
Project	No	TA8	234												Exp	lorator	y Hole	Log		RF	1102F	5		
Engine		Aec																		٥.	11021	`		
Employ	er er			uthorit	У																et 1 of	1		
Ground L Date Star			7.97mO[)9/2019)					Coordii Date C				8120.33E, 543530.52N Grid OSGB (09/2019 Inclination 90° from hori:								m harizar	atal		
Top	Base			ime Sta	rt D	ate Tim	ne End R							nt Use	d Shorir	ng Used Pi	it Stability							
0.00 1.20	1.20 5.01	IP CP	03/09/	2019 13:00 2019 13:40		03/09/201	9 13:40	BJ BJ	MPB MPB	N	NA NA	NA NA		ed Hand 1		e used	Stable		0.50m	x 0.50m	x 1.20m			
								-,																
			D			GRESS									l Danah	Donath	WATER			1				
Date		Depth	Casiii	g Wat	er			Rema	irks				Date	Time	Depth Strike	Depth Casing	Depth Sealed	Water Rose To	Time Elapsed		Remark	KS		
03/09/20	19 17:30	5.01	4.50	Dry	, _E	nd of Hole																		
				 CABLE P	ERCL	JSSION	DETAILS					ł					SPT D	ETAILS						
Depth	Depth	Tim	ne Start	Durat	ion	Tool		Remarks						Test		Reporte	d Result	н	ammer Serial Number	Energy	Depth	Depth		
4.60 4.70	4.70		/2019 09:4 /2019 10:4			Chise Chise		Chiselling Chiselling				Top 1.50	Type	N=12 (2,3,2	2,3,4,3)			TS1	Ratio 50 50	Casing 1.50	Dry			
4.70	4.80	03/09/	2019 10:4	01:0		Chise	i Chis					2.50 3.50 4.50	S S S	N=15 (5,4,3 N=10 (1,2,3 50/140mm	3,3,4,5) 3,2,2,3) 1 (12,13/40,2	25.25/65)		TS1 TS1 TS1	50 50 50	2.50 3.00 4.50	Dry Dry Dry			
													4.80	s	50/140mm	(25/70,29,2	21/65)		TS1	50	4.50	Dry		
Depth	ROTARY FLUSH DETAILS Depth Flush Flush Flush Parada																							
Тор	Base	Flu	sh Type	Ret		Colour			Remark	(S														
							DYNAMIC SAMPLING																	
HOLE DI Depth		R CASING	.			Depth	1	1		Sample	e Rui	n												
Base	Diamete	Base		eter Dept	h Top	Base	Diameter	r Durat			ry Refere													
		1						<u> </u>																
D: .		ALLATIO		ILS Response	Pipe	e Pipe		PE CONS	1				Depth	Dept	h	DEF	PTH RELAT							
Distance 5.01	1D 01	Type '`	Top 1.00	Base 5.01	Ref		Top 0.00	Base 1.00	Diame 50	eter P	Pipe Typ	oe _	Тор	Base				Rer	narks					
		-				01	1.00	5.00	50	SLO	TTED													
																			_					
Depth	Depth	BACKFILL DETAILS Denth															LOCATIO		.S					
Top 0.00	p Base Description Remarks													Ren	narks									
0.50 1.00	1.00 5.01	Bentonit Gravel b	e																					
	NI I	00: 411 1	nth :	otro- "	- نام	notor- :	milli :	00													40-			
AGS		See he	eader sh	eet for d	etails	of boring	millimetro g, progres		ater.															
		For de	etails of a	bbreviat			47.0	/2027	0.2.					, ,	N ADS				SOII	en.	GINEE	BIUG		
FINAL Form No. 9	SIEXPHOL	EHDR		Prir		e and tin e.Revisior	ne 17/01 n No. 2.02	./2020 1	9:24	Issue D)ate 22/0		og check 16	ked by	INILR						hy Soletanch			

Project Name	Nenthead Mines - Proposed MW				Hole ID									
roject No.	TA8234						Explo	rato	ry Ho		BH102R			
ingineer	Aecom													
mployer	The Coal Authority										Sheet 1 of 1			
Ground Level		oordinate		378120.33E, 543530.5				Gr	id	09	SGB			
lole Type	IP+CP In	clination		90° from	horizonta	1 1								
	Description of Strata	Weathering	Legend	Depth (Thick- ness)	Datum Level	Waterstrike	Sampling Details	Dia.	TCR/Sample Recovery %	SCR/Blows	RQD	Ŧ	In Situ Test Instal Details ation	
	. (Driller's description)			0.15	437.82			10.0.					-° - d	
	light greyish brown clayey to very clayey fine to fragments and subangular to subrounded fine to			0.13	437.02		ES 1 0.20						0.0	
	d fragments of ash, sandstone, limestone, clinker,			-			ES 2 0.50						10.1	
muustone anu siid	storie.													
				(1.60)			ES 3 1.00							
													1.0	
													SPT(S) N=12	
				4.75	(20.22		D 4 1.50-1.95						(2,3,2,3,4,3)	
	Grey gravelly very clayey fine to coarse sand sized cangular to subrounded fine to coarse gravel sized			1.75	436.22		B 5 1.50-2.00						1.50	
fragments of ash,	sandstone, limestone, clinker, mudstone and			(0.75)			D 7 1.75 ES 6 2.00							
siltstone.														
MADE GROUND: 0	Grey gravelly very sandy clay with high cobble	\dashv		2.50 -	435.47		B 9 2.50						SPT(S) N=15	
content. Sand size	d fragments are fine to coarse. Gravel sized ular to subangular fine to coarse of sandstone.						D 8 2.50-2.95						(5,4,3,3,4,5)	
	nents are subangular of sandstone.			-			D 11 3.00							
				(1.50)			ES 10 3.00							
				` '									SPT(S) N=10	
							B 12 3.50-4.00						(1,2,3,2,2,3)	
													3.50	
	ight grey sandy slightly gravelly clay. Sand sized			4.00 -	433.97		D 13 4.00 ES 14 4.00							
	to coarse. Gravel sized fragments are subangular e to coarse of sandstone.			(0.60)]	
				4.60	433.37		D 15 4.50-4.75						SPT(S) 50/140mm-	
	weak grey SILTSTONE. Recovered as subangular to coarse gravel sized fragments.	0	× × × × × × × × × × × × × × × × × × ×	(0.41)									5)] .]	
Complete at	5.01m. Termination Reason: Rockhead		×××××	5.01 -	432.96		D 16 4.80-5.01						4.50 SPT(S) 50/140mm	
Complete at	1 3.0 mi. Termination Reason. Rockneau												(25/70,29,21/65)] 4.80	
				-									1 -	
													1	
]]	
					-									
]	
				-									-	
				-									1 -	
]	
													=	
													1 -	
]	
				-	-								-	
] :										
] -										
]	
				-				_					-	
Notes	s: All depth in metres, all diameters in millime	tres.	1	1	I	1			1	-	1			
AGS	See header sheet for details of boring, progr		water.											
	For details of abbreviations, see key.	04 (055)	1001				11 1400					50	IL engineering	
INAL	Print date and time 17/		19:24	1 0	Lo	•	ked by MPB						of the Pachy Seletanche Group	

Issue Date 02/03/2018

Part of the Bachy Soletanche Group

Form No. SIEXPHOLELOG

Project	Name	. Ne	nthead	d Mines	- Pr	oposed	d MWT	S, GI						_					H	łole ID			
Project			3234											ЕX	plorato	y Hole	Log		В	H103			
Engine Employ			com e Coal	Authori	tv														She	et 1 of 1	1		
Ground L			1.95mC		-)				Coordin	nates	37	8680.48	E, 54328	5.75N			Grid						
Date Star	ted	04/0	09/2019	9	Date Completed 04								9				Incli	Inclination 90° from horizontal					
Top 0.00	Base	Туре		Time Sta		04/09/201		Rig Crew	Logge	Barrel	Type Drill		lant Use		ing Used P	it Stability Stable	/		Remarl				
1.20	4.23	CP		9/2019 10:0		04/09/201		BJ	MPB	N/			Dando 2500		ine useu	Stable		0.301					
					PRC	GRESS										WATER	STRIKE	S					
Date ⁻	Гіте	Depth	n Dep Casi					Rema	arks			Date	e Time	Depth Strike		Depth Sealed	Water Rose To	Time Elapsed		Remark	ĸs		
04/09/20:	9 14:15	4.23	4.1	O Di	y E	nd of Hole																	
				CABLE	PERCI	USSION	DETAILS									SPT D	DETAILS						
Depth Top	Depth Base	Tin	ne Start	t Dura	tion	Too	ı		Rema	arks		Depth Top	Test Type		Reporte	d Result	ŀ	lammer Serial Number	Energy Ratio	Depth Casing	Depth Water		
4.10	4.20	04/09)/2019 11:	15 012	00	Chise	d Chi	Chiselling				2.50 3.50 4.10 4.20	\$ \$ \$ \$	N=20 (4,5 N=22 (4,7 50/20mn 50/20mn	5,4,5,5,6) 7,6,6,5,5) n (25/20,50/2 n (25/10,50/2	0) 0)		T.SI T.SI T.SI T.SI	50 50 50 50	2.50 3.00 4.10 4.10	Dry Dry Dry Dry		
Depth			ROTARY FLUSH DETAILS																				
Top	Depth Base	Flu	ush Typ∘		ush turn	Flush Colour			Remark	KS													
HOLE DI	AMETE	R CASIN	G DIAM	ETER			DYNAM	IIC SAM	PLING														
Depth	Diamete	Dept	h Dian	neter Dept	h Ton	Depth	Diamete	1	tion	Sample													
8ase 4.23	200	8ase 4.10	,	00		Base				Recovery	Referenc	<u>e</u>											
	TPINI	ALLATIC	N DET	AII S		1	DI	PE CON:	STDLICT	ION					DEI	PTH RELA	TED DEM	IVDKC					
Distance			esponse	Respons			Тор	Base	Diame		ре Туре	Depth				TITIKEEA		marks					
4.10	01	SPIE	Top 2.20	4.23	Ref 01		0.00	4.10	19	PLAII		Тор	Base										
				BA	CKFI	LL DETA	ILS			-			-	'		LOCATIO	n detaii	_S					
Depth Top 0.00 0.50 2.20	Depth Base 0.50 2.20 4.23	Concret Bentoni Sand ba	e te	cription				Rei	marks							Rer	narks						
AGS FINAL Form No. S		See h For d	eader s	metres, al heet for c abbrevia Pri	letails tions : nt dat	of borin see key. te and tir		ss and w	9:24	Issue Da	ate 22/06/2		cked by	MPB						GINEE hy Soletanche			

Project Name	Nenthead Mines - Proposed I	MWTS	, GI										\Box	Hole ID	
Project No.	TA8234							Explo	rato	ry Ho	le Lo	og		BH103	
Engineer	Aecom														
Employer	The Coal Authority													Sheet 1 of	1
Ground Level	+491.95mOD		dinate	S		48E, 5432		V	Gri	id	OS	GB .			
Hole Type	IP+CP	inclir	nation g			horizonta				e %	ñ				
	Description of Strata		Weathering	Legend	Depth (Thick-	Datum Level	Waterstrike	Sampling		TCR/Sample Recovery %	SCR/Blows	RQD	느	In Situ Test Details	Install- ation
Firm eroy mottle	brown slightly sandy slightly gravelly CLAY. S	and ic	We		ness)		Wa	Details	Dia.	TCF	SCI				0 d l =
fine to coarse. Grav	vel is subangular to subrounded fine to coars							ES 1 0.20							
sandstone, mudsto	one and sittstone.				(0.90)			ES 2 0.50							8.0
								B 4 0.00-1.20							
	sandy slightly gravelly CLAY. Sand is fine to co				0.90	491.05		ES 3 1.00							
Gravel is subangula mudstone and silts	lar to subrounded fine to coarse of sandstone stone.	·,													
								U 5 1.50-1.95	100	100	43				
					-			D 6 1.95-2.05							
					(2.60)	1		ES 7 2.00							
from 2 E0m for	sandy							D 8 2.25-2.50						SPT(S) N=20	
from 2.50m firm s	anuy					1		D 9 2.50-2.95						(4,5,4,5,5,6) 2.50	
					_			B 10 2.50-3.00 ES 11 3.00							
						1		D 12 3.25							
Eutropeah	MUDSTONE Passaged	or to			3.50 -	488.45								SPT(S) N=22	
	rey MUDSTONE. Recovered as grey subangula o coarse gravel sized fragments.	ar to			(0.60)			D 13 3.50-3.95						(4,7,6,6,5,5) 3.50	
					-			B 14 3.50-4.00 ES 15 4.00							
	IMESTONE. (Driller's description) t 4.23m. Termination Reason: Rockhe				4.10 4.23	487.85 487.72		D 16 4.10-4.20						SPT(S) 50/20mm (25/20,50/20)	
Complete at	4.23m. Termination Reason. Rockite	au												4.10 SPT(S) 50/20mm]
						1								(25/10,50/20) 4.20	-
					_]
															-
															_
						1									1
															1
]
															1
															1
					-]
															1
					-]
															-
					-]
															1
					-]
						1									1
					'	1]
															1
									1						
	s: All depth in metres, all diameters in mi						1	1	1						1
AGS	See header sheet for details of boring, For details of abbreviations, see key.	progress	s and v	vater.											
FINAL	Print date and time	17/01/	/2020	19:24		Ιο	a chec	ked by MPB					SOI	L engine	RING



Project	Name	Ner	thead N	/lines -	- Pro	posec	MWT	S, GI												H	łole ID	
Project	No.	TA8	234												Exp	olorator	y Hole	Log		В	H104	
Engine	er	Aec																				
Employ Ground L			Coal Au 2.77mOD	thority	/				Coord	linates		3787	788.32E	5,54326	1.72N			Grid		She OSGB	et 1 of 1	1
Date Star	rted		9/2019							Comple		05/0	9/2019						nation	90° fro	m horizor	ntal
Top 0.00	Base	Туре	Date Tir			ate Tim		Rig Crew	Logg		rel Type NA	Drill E		ant Use		ng Used Pi	t Stability Stable	<u>'</u>		Remarl		
1.20	3.74	CP	05/09/20			05/09/201		BJ	MPE		NA	NA		ando 2500			Stable		0.001		. 2.25	
			Depth	F Depth		GRESS									Depth	Depth	WATER Depth	STRIKES Water	Time			
Date 05/09/20		Depth 3.74	Casing 3.50	Water	r	nd of Hole		Rema	arks				Date	Time	Strike	Casing	Sealed	Rose To		ı	Remark	KS
			C	ABLE PE	ERCU	ISSION	DETAILS										SPT D	DETAILS				
Depth	Depth	Tim	e Start	Duratio	\neg	Tool			Ren	narks			Depth	Test		Reported		н	ammer Serial Number	Energy	Depth	Depth
3.20	3.50	05/09/	2019 11:00	01:00		Chise	I Ch	iselling					Top 2.50 3.20 3.50	Type S S S	50/130mn	8,10,10,12) n (10,15/45,2 n (15,10/15,2	0,30/55) 2,28/70)		T.SI T.SI T.SI	50 50 50 50	2.50 3.20 3.20	Water Dry Dry Dry
				DOTAB																		
Depth	Depth	Elii	sh Type	Flus		USH DE Flush	IAILS		Remai	rke												
HOLE DI	 AMETER	CASING	G DIAMETE	:R		ı	DYNAM	IIC SAM	IPLIN	G												
Depth Base	Diamete	Depth Base	Diamete	er Depth	Тор	Depth Base	Diamete	er Dura	ition	Samp		Run ference										
3.74	200	3.50	200																			
	INST	L ALLATIO	N DETAIL	S			PI	PE CON:	STRUC	TION						DEP	TH RELA	TED REM	ARKS			
Distance		iype		Base	Pipe Ref	Pipe Ref	Тор	Base	Diam		Pipe 1	Гуре	Depth Top	Dept Base				Rer	narks			
3.40	01	SPIE	1.50	3.74	01	01	0.00	3.40	19	9 PL	AIN											
Depth	Depth		,		KFIL	L DETA	ILS										LOCATIO		.S			
Top 0.00	Base 0.50	Concrete	Descrip	otion		+		Rei	marks								Ren	narks				
0.50 1.50	1.50 3.74	Bentonite Sand bac	e																			
AGS		See he	pth in me	et for det	tails (of boring			ater.			ı										
FINAL		For de	tails of ab			-	ne 17/0	1/2020 1	9:24			Le	og cher	ked by	MPB				SOI	L en	ginee	RING
	SIEXPHOL	EHDR					No. 2.02			Issue	Date 2	2/06/20	•	y					Part	of the Bac	hy Soletanch	e Group

Project Name	Nenthead Mines - Proposed MWTS,	, GI											Hole ID	
Project No.	TA8234						Explo	orato	ry Ho	le Lo	og		BH104	
Engineer	Aecom													
Employer Ground Level	The Coal Authority +502.77mOD Coord	dinate		378788.3	225 5/22	C1 72N	1	Gri	id		GB		Sheet 1 of 1	
Hole Type		nation	5		horizonta		ı	GII	iu	Us	GD			
		ering		Depth	Datum	trike	Sampling		mple ry %	ows			In Situ Test In	stall-
	Description of Strata	Weathering	Legend	(Thick- ness)	Level	Waterstrike	Details	Dia.	TCR/Sample Recovery %	SCR/Blows	RQD	Ψ.		ation
	rk grey mottled orangish brown slightly sandy Sand sized fragments are fine to coarse. Gravel					_	ES 1 0.20	10.0.					0.0	.0
	angular to subangular fine to coarse of sandstone			(1.00) -			D 3 0.50						0.0	0
				(1.00)			ES 2 0.50 B 4 0.50-1.00							
Firm to stiff aroy clip	htly sandy slightly gravelly CLAY. Sand is fine to			1.00 -	501.77		ES 5 1.00						1===	
	angular to subrounded fine to coarse of													
•				-										
				(1.50)			U 6 1.50-1.95 B 7 1.50-2.00	100	0	45				
				-			ES 8 2.00							
				2.50 -	500.27		D 9 2.25						SPT(S) N=40	
SILTSTONE. Recovere	ly laminated grey mottled light brownish grey ed as grey slightly sandy slightly gravelly clay.		× × × × × × × × × × × × × × × × × ×	2.30 -	300.21		D 10 2.50-2.95						(6,7,8,10,10,12) 2.50	
Sand sized fragment angular to subangula	s are fine to coarse. Gravel sized fragments are ar fine to coarse.		× × × × × × × × × × × × × × × × × × ×				B 11 2.50-3.00 ES 12 3.00							
			X X X X X X X X X X X X X X X X X X X	(1.24)			D 13 3.20-3.45						SPT(S) 50/130mm - (10,15/45,20,30/5	
			× × × × × × × × × × × × × × × × × × ×	-			D 14 3.50-3.74						5) 3.20	
Complete at 3	3.74m. Termination Reason: Rockhead		×××××	3.74	499.03		51. 6.66 6						SPT(S) 50/145mm (15,10/15,22,28/7	
				-									0) _ 3.50 -	
				-										
				-									-	
													-	
				-										
													_	
				-									-	
				-									-	
				-										
				:										
				-										
				-										
				-				+					-	
ACS	All depth in metres, all diameters in millimetres See header sheet for details of boring, progress		vater.	<u> </u>	1	1			<u> </u>	I	<u> </u>			
INAL	For details of abbreviations, see key. Print date and time 17/01/	19:24		Lo	g chec	ked by MPB					SOI	L engineeri	ING	
orm No. SIEXPHOLELO		· ·					Part o	f the Bachy Soletanche G	iroup					

Project	Name	Nen	thead	Mines	- Pr	oposed	:TWM	S, GI										_		H	Hole ID	
Project	No.	TA8	234												Exp	olorato	ry Hole	Log		В	H105	
Engine	er	Aec																				
Employ Ground I			Coal A		У				Coord	dinates		3788	R04 35F	, 54313	4 28N			Grid		She OSGB	eet 1 of 1	1
Date Sta			9/2019							Comple			9/2019						nation		om horizor	ntal
Top 0.00	Base	Туре	Date Ti	me Sta		ate Tim	ne End F	Rig Crew	Logo		rel Type D	Orill B		ant Use	- 1	ng Used P	it Stability Stable	/		Remarl	ks	
1.20 3.94	3.94 14.80	CP RC	06/09/2	2019 09:00 2019 12:30	- (06/09/201 06/09/201 16/09/201	9 12:45	BJ MW	MPI	В	NA PWF	NA PCD	D	ando 2500 acchio 20)	le useu	Stable					
D-4-	T:	D 41-	Depth			GRESS		D					Data	T:	Depth	Depth		STRIKE: Water	Time	1	Damand	1
Date 06/09/20	19 12:45	Depth 3.94	Casing 3.40		er E	nd of Shift		Rema	arks				Date	Time	Strike	Casing		Rose To	Elapsed	I	Remark	KS
12/09/20 12/09/20 13/09/20	19 17:30	3.94 7.00 7.00	4.00 4.00	Dry Dry	E	tart of Shift nd of Shift tart of Shiff																
13/09/20 16/09/20	19 16:30	11.20 11.20	4.00 4.00	Dry	E	nd of Shift tart of Shiff																
16/09/20	19 11:00	14.80	4.00	Dry	E	nd of Hole																
				CABLE P	ERCL	JSSION	DETAILS										SPT D	ETAILS				
Depth Top	Depth Base	Tim	e Start	Durat		Tool			Rer	marks			Depth Top	Test Type		Reporte	ed Result	ŀ	lammer Serial Number	Energy Ratio	Depth Casing	Depth Water
3.30	3.60	06/09/	2019 10:20	01:00		Chise	l Chi	selling					2.50 3.30	S S	N=14 (2,3, 50/150mn	3,4,4,3) n (11,14/65,	25,25,0/0)		T.SI T.SI	50 50	2.50 3.30	Dry Dry
													3.60	С	100/150m	m (25/40,50	0,50,0/0)		T.SI	50	3.40	Dry
				ROTAI	RY FL	.USH DE	TAILS															
Depth Top	Depth Base	Flu	sh Type	Flu Reti		Flush Colour			Rema	rks												
3.60	14.80	١	NATER	0		NA																
HOLE D	AMETER	Denth	. 1			Depth	DYNAM	1		G Samp	ole Ru	ın										
Base 3.94	Diamete 200	Base	Diame 200	ter Depth	Тор	Base	Diamete	r Dura	tion		ery Refer											
14.80	101	14.80	140																			
	INST	ALLATIO	n detai	LS			PI	PE CONS	STRUC	CTION						DE	PTH RELA	TED REM	IARKS			
Distance	ID .	Type Re	esponse F Top	Response Base	Pipe Ref		Тор	Base	Dian	neter	Pipe Ty	ре	Depth Top	Dept Base				Rei	marks			
Depth	Depth				CKFII	LL DETA	ILS										LOCATIO		_S			
Top 0.00	Base 14.80	Bentonite		iption				Rer	narks	-							Rer	narks				
	Note						millimeti															
AGS	8		eader she tails of a				g, progre	ss and w	ater.													
FINAL	elity (St. : -	ELIES.		Prin			ne 17/0:	1/2020 1	9:24		D /		•	ked by	МРВ						GINEE	
Form No.	SIEXPHOL	LHDR			Issu	e.Revisior	n No. 2.02			Issue	Date 22/	06/201	16						Part	of the Bac	hy Soletanch:	e Group

Project Name	Nenthead Mines - Proposed MWT	S, GI												Hole ID	
D. : N.	T4000/							Explor	ator	у Но	le Lo	g		DUIAOE	
Project No. Engineer	TA8234 Aecom													BH105	
Employer	The Coal Authority													Sheet 1 of	2
Ground Level		ordinate	!S	378804.3	35E, 5431	34.281	N		Gri	d	09	GB			
Hole Type	IP+CP+RC Inc	lination		90° from	horizonta	ıl									
	Description of Strata	Weathering	Legend	Depth (Thick- ness)	Datum Level	Waterstrike		ampling tails	Dia.	TCR/Sample Recovery %	SCR/Blows	RQD	<u>u</u>	In Situ Test Details	Install- ation
	Brown slightly gravelly very sandy clay. Sand sized								Dia.		0,				-
	to coarse. Gravel sized fragments are subangular to coarse of sandstone, limestone, siltstone and			- -			ES 2 0.50 B 4 0.00	0							
				(1.95) _			ES 3 1.00	0						-	-
l				1.95	503.53		u 5 1.50		100	100	56				
, , ,	fine to coarse SAND.			(0.55)	502.98		D 6 1.95 ES 7 2.00							SPT(S) N=14	
	y sandy slightly gravelly CLAY. Sand is fine to ibangular to subrounded fine to coarse of one and siltstone.			(0.80)			D 8 2.50 B 9 2.50 ES 10 3.0	-3.00						(2,3,3,4,4,3)	
Strong fine grained fine to coarse grave	pale grey SANDSTONE. Recovered as subangular el sized fragments.			3.30	502.18		D 11 3.3	0-3.59						SPT(S) 50/150mm (11,14/65,25,25,0/ 0) 3.30	
SANDSTONE with t Discontinuities: 1)	ne to coarse grained slightly sandy carbonaceous thin laminations of black mudstone. 0-10 degrees closely to medium spaced smooth			3.94 (0.42)	501.54		C1 3.60	-5.00	101	55	26	25	NI 140 220	SPT(C) 100/150mm (25/40,50,50,0/0) 3.60	
20mm.	angish brown surface staining penetrating up to ore loss. (Probable SANDSTONE).	1		(0.64)									NR		
SANDSTONE with t Discontinuities: 1) with orangish brow	ne to coarse grained slightly sandy carbonaceous thin laminations of black mudstone. 0-10 degrees closely spaced smooth undulating vn surface staining penetrating up to 20mm. ore loss. (Probable SANDSTONE).			(0.43)	500.48		C 2 5.00	-6.00	101	43	7	0	NI 130 NR	-	
Very weak thinly la	minated black MUDSTONE. Discontinuities: 1)	_		6.00	499.48									-	
	closely to closely spaced rough undulating. 5m extremely weak			(1.50)			C 3 6.00	-7.00	101	82	47	30	NI 70 130		
	0m assumed zone of core loss			` ′ -				_					NR] .	
gravel sized fragm			****	7.50 -	497.98		C 4 7.00	-8.00	101	100	28	0	NI		
laminations of blac	own fine to coarse grained SILTSTONE with thin ck carbonaceous mudstone. Recovered as non e sand, gravel and cobble sized fragments.		* * * * * * * * * * * * * * * * * * *	(0.75)									NI		
laminations of blac closely spaced roug staining. 2) 80-90 c orange surface stai	own fine to coarse grained SILTSTONE with thin it mudstone. Discontinuities: 1) 0-15 degrees gh undulating with orangish brown surface degrees closely spaced rough undulating with ining penetrating up to 50mm inly laminated dark grey MUDSTONE.		* * * * * * * * * * * * * * * * * * *	8.25 (0.40) _ 8.65 (0.35) _	497.23 496.83 496.48		C 5 8.00	-9.00	101	86	6	0	NI 120 120		
Discontinuities: 1) with brownish grey from 8.90m to 9.00 Strong thinly light laminations of blac closely to closely s	0-15 degrees very closely spaced rough undulating y staining penetrating up to 30mm Om assumed zone of core loss grey fine to coarse grained SILTSTONE with k.k mudstone. Discontinuities: 1) 0-15 degrees very paced smooth undulating with orangish brown degrees very closely to closely spaced smooth		* * * * * * * * * * * * * * * * * * *	(1.20)	-30.40		C 6 9.00	-10.20	101	97	73	73	NI 130 200		
AGS	s: All depth in metres, all diameters in millimetr See header sheet for details of boring, progre For details of abbreviations, see key.	ss and											501	iL enginee) DIDE
FINAL	Print date and time 17/0	1/2020	19:24		Lo	g chec	ked by M	ЬR					301		

Issue Date 02/03/2018

Part of the Bachy Soletanche Group

Form No. SIEXPHOLELOG

Project Name	Nenthead Mines - Proposed MV	NTS, 0	Gl												Hole ID	
Project No.	TA8234								Exploi	ator	у Но	le Lo	og		BH105	
Engineer	Aecom														Cl . 2 . 6	,
Employer Ground Level	The Coal Authority +505.48mOD	Coordi	nato		27990//3	35E, 5431	37.381	N.		Gri	d	00	GB		Sheet 2 of 2	<u>′</u>
Hole Type	IP+CP+RC	Inclina		5		horizonta		V		GII	u	0.3	GD			
- ,.	Description of Strata		Weathering	Legend	Depth (Thick- ness)	Datum Level	Waterstrike		Sampling Details	Dia.	TCR/Sample Recovery %	SCR/Blows	RQD	<u>u</u>	In Situ Test Details	Install- ation
	rey fine to coarse grained SILTSTONE with			××××× ×××××	40.00	(05.00					'					
closely to closely spa staining. 2) 70-85 de	mudstone. Discontinuities: 1) 0-15 degrees wa aced smooth undulating with orangish brown egrees very closely to closely spaced smooth ngish brown surface staining.	ery		× × × × × × × × × × × × × × × × × × ×	10.20 (0.30) 10.50 -	495.28 494.98								NI	-	
from 9.70m to 9.85r clay. Sand is fine to o Very weak dark grey	n recovered as soft orange to brown slightly sandy coarse (Highly weathered mudstone) fine to coarse grained SILTSTONE. Recovered arse sand, gravel and cobbles sized fragments				10.70 10.90 (0.30)	494.78 494.58		C 7	10.20-11.20	101	88	30	30 -	NI 110	-	
Extremely weak brow	win fine to coarse grained SANDSTONE. tact fine to coarse sand and gravel sized				11.20	494.28								110		
Extremely weak thin Discontinuities: 1) 0	Ily laminated brown to dark grey MUDSTONE. -10 degrees closely spaced rough undulating. re loss. (Probable MUDSTONE). e Workings)				-			C 8	11.20-12.70	101	0	0	0			
					(2.10)									NR		
					-										-	
degrees very closely	ninated black MUDSTONE. Discontinuities: 0-1 to closely spaced smooth planar. 51m very strong grey brown fine to coarse grained	10			13.30	492.18								NI 20	- - -	
	re loss. (Probable MUDSTONE).				14.00 -	491.48		C 9	13.30-14.80	101	43	15	0	60	- -	
from 14.05m to 14.8	30m assumed zone of core loss				(0.80)									NR	- -	
Complete at 1	4.80m. Termination Reason: Achieved Scheduled Depth				14.80	490.68										
					-										-	
					-										<u>-</u> - -	
					-										-	
					-										- - -	
					- - - -											
					-											
AGS	All depth in metres, all diameters in millin See header sheet for details of boring, pro For details of abbreviations, see key.		and v	vater.										SOU	L enginee	

Print date and time 17/01/2020 19:24 Log checked by MPB Form No. SIEXPHOLELOG Issue Date 02/03/2018 Issue.Revision No. 2.05



Project	Name	Ner	thead I	Mines	- Pro	oposed	MWT:	S, GI												H	łole ID	
Project	No.	TA8	234												Exp	olorator	y Hole	Log		В	H106	
Engine	er	Aec		نداد د باند																CL.	1	1
Employ Ground L			Coal Au i.18mOD	utnont	у				Coord	dinates	s	378	789.71E,	, 54307	7.10N			Grid		OSGB	et 1 of 1	1
Date Star			9/2019							Comp			9/2019						nation		m horizor	ntal
Top 0.00	Base 1.20	Туре	Date Ti 09/09/2	me Stai 019 09:45		ate Tim	ne End F	Rig Crew	Logg MPI		NA	Drill E		ant Use		ng Used P	t Stability Stable	'	0.50	Remarl m x 0.50m		
1.20	6.00	CP		019 10:00		09/09/201		BJ	MPI		NA	NA		ando 250								
					DDO	GRESS											WATER	CTDIVE	<u> </u>			
Date	Time	Depth	Depth	Dept	h	GKESS		Rema	arks				Date	Time	Depth	Depth	Depth	Water	Time		Remark	(S
09/09/20		6.00	Casing 5.50	Wate		nd of Hole									Strike	Casing	Sealed	Rose To	Elapsed	1		
				ABLE P	ERCL	ISSION	DETAILS	i								1	SPT D	ETAILS				
Depth Top	Depth Base		e Start	Durati		Tool			Ren	marks	i		Depth Top	Туре		-	d Result		Hammer Serial Number	Energy Ratio	Depth Casing	Depth Water
5.50	5.80	09/09/	2019 11:20	01:00)	Chise	I Chi	iselling					2.50 4.50 5.50	S S	N=15 (2,4, N=20 (4,5,	,4,4,4,3) ,4,4,5,7) n (11,14,23,2	7 0/0)		T.SI T.SI T.SI	50 50 50	2.50 4.50 5.50	Dry Dry
													5.80	Č	50/135mr	n (25/60,28,2	22/60)		T.SI	50	5.50	Dry Dry
D 11						USH DE	TAILS															
Depth Top	Depth Base	Flu	sh Type	Flu: Retu		Flush Colour			Rema	rks												
HOLE DI	 AMETER	CASING	DIAMET	ER			DYNAM	IIC SAM	1PLIN	G												
Depth Base	Diameter	Depth Base		ter Depth	Тор	Depth Base	Diamete	er Dura	ation	Sam	iple very Re	Run										
6.00	150	5.50	150			Dusc				INCCO	very ite	iciciicc										
						1																
Distance		R	N DETAIL		Pipe	Pipe		PE CON	T			Time	Depth	Dept	th	DEF	TH RELA					
Distance 5.70		SPIE	Top 3.50	Base 6.00	Ref 01	Ref 01	Top 0.00	Base 5.70	Diam 1		Pipe PLAIN	туре	Тор	Bas	е			ке	marks			
				BAG	CKFIL	LL DETA	ILS										LOCATIO	N DETAI	LS			
Depth Top	Depth Base		Descri	ption				Rei	marks								Ren	narks				
0.00 0.50	0.50 3.50	Concrete Bentonite	е																			
3.50	6.00	Sand bac	kfill																			
.	NI-2	νο. VII -	nth in	atros -II	dia	otoro :	millin	roc														
AGS	3	See he	pth in me eader she	et for de	tails	of borin			ater.													
FINAL		ror de	tails of al				ne 17/01	1/2020 1	19:24			1	og chec	ked hv	MPB				soi	L en	ginee	RING
	SIEXPHOL	EHDR					n No. 2.02			Issue	e Date 2	2/06/20		.54 Dy	2				Par	t of the Bac	hy Soletanch	e Group

Project Name	Nenthead Mines - Proposed M	WTS, GI											Hole ID	
Project No.	TA8234						Explo	rator	у Но	le Lo	g		BH106	
Engineer	Aecom												Cl 11 (1	ı
Employer Ground Level	The Coal Authority +504.18mOD	Coordinate	s	378789	71E, 5430	77 10N	1	Grie	4	OS	GB		Sheet 1 of 1	<u>L</u>
Hole Type	IP+CP	Inclination			horizonta		•	GII.		00	uв			
	Description of Strata	Weathering	Legend	Depth (Thick- ness)	Datum Level	Waterstrike	Sampling	Dia	TCR/Sample Recovery %	SCR/Blows	RQD	느	In Situ Test Details	Install- ation
Firm greyish brown to coarse. Gravel is sulfamily sandstone, mudstor Ground) Firm greyish brown to coarse. Gravel is: sandstone, mudstor from 2.50m with to subrounded of lime.	lightly sandy slightly gravelly CLAY. Sand is fin bangular to subrounded fine to coarse of le and limestone. (Possible Reworked/Made and limestone. (Possible Reworked/Made Slightly sandy slightly gravelly CLAY. Sand is fin subangular to subrounded fine to coarse of	ne as	Tegend To the control of the control	(3.25)		Water	Details ES 2 0.20 ES 3 0.50 B1 0.00-1.20 ES 4 1.00 U5 1.50-1.95 B6 1.50-2.00 ES 7 2.00 D8 2.25 D9 2.50-2.95 B10 2.50-3.00 ES 11 3.00 D12 3.25 U13 3.50-3.95 B14 3.50-4.00 ES 15 4.00 D16 4.25 D17 4.50-4.95 B18 4.50-5.00 ES 19 5.00 D 20 5.50-5.80	100	0 0 Recow	150	RC R			
AGS Notes:	All depth in metres, all diameters in millin See header sheet for details of boring, pr For details of abbreviations, see key.		water.											



Project	Name	Nen	thead N	∕lines - ¹	Proposed	d MWTS	s, GI						_					Н	lole ID	
Project		TA82											Exp	lorator	y Hole I	Log		ВІ	H107	
Engine		Aeco	om Coal Au	:thority														She	et 1 of 1	1
Employ Ground L			4.47mOD	LITOTICY				Coordin	ates	3	78788.57	<u> </u> =, 54311(0.99N			Grid		OSGB	EL T OI J	
Date Star			9/2019					Date Co			8/09/2019						nation		m horizon	ıtal
Top 0.00	Base 4.50	Type	Date Tin		Date Tim 17/09/2019		Rig Crew MW	Logge MO	r Barrel SW			ant Use		ng Used Pi	it Stability	<u> </u>		Remark	(S	
4.50	10.00	RC RC	17/09/20		18/09/2019		MW	MO	SWI			nacchio 205								
					ROGRESS											STRIKES				
Date ⁻		Depth	Casing				Rema	ırks			Date	Time	Depth Strike	Depth Casing	Depth Sealed	Water Rose To	Time Elapsed	1	Remark	ίs
17/09/20: 18/09/20: 25/09/20:	19 12:30	6.50 6.50 10.00	5.00 5.00 5.00	Dry Dry Dry	End of Shift Start of Shift End of Hole	t			_											
<u> </u>			C	ABLE PEF	RCUSSION	DETAILS					_				SPT D	DETAILS				
Depth Top	Depth Base	Tim	ie Start	Duration	1			Rema	 arks		Depth Top	Test Type	Τ	Reporte	d Result		lammer Serial Number	Energy Ratio	Depth Casing	Depth Water
Depth Top 4.50	Diamete	R CASING Depth Base		Flush Return 0	n Colour NA	DYNAMI Diameter	IC SAM	tion R	Sample Recovery	Run / Referen	ce			DEF	PTH RELAT	TED REM	IARKS			
Distance		Type Re	esponse Re	esponse P	Pipe Pipe	Тор	Base	Diamet		ре Туре	Depth			DL	TH NELFO		marks			
4.00	01		Top 1.00	4.00	Ref Ref 01 01 01	0.00 1.00	1.00 4.00	50 50	PLAIN SLOTT	N	Тор	Base	:							
Depth	Depth				KFILL DETAI	ILS					 				LOCATIO		.S			
Top 0.00	Base 1.00	Bentonite	Descrip	otion			Ren	narks							Rem	narks				
1.00	4.00 10.00	Gravel bar Bentonite	е	etres. all di	iameters in	millimetr	es.													
AGS		See he	eader shee	et for deta obreviation	ails of boring ns see key.	g, progres	ss and wa										SOL	I en	Ginee	יפוחפי
FINAL Form No. S	Tor details or abbreviations see key.											cked by	INILR						hy Soletanche	

Project Name	Nenthead Mines - Proposed MV	VTS, GI											Hole ID	
Project No.	TA8234						Explo	rato	ry Ho	le Lo	og		BH107	
Engineer	Aecom												DITOI	
Employer	The Coal Authority												Sheet 1 of	2
Ground Level		Coordina			57E, 5431			Gri	id	OS	SGB			
Hole Type	RO+RC	Inclinatio			horizonta				<u>a</u> ~	<u>«</u>				
	Description of Strata	Weathering	Legend	Depth (Thick-	Datum Level	Waterstrike	Sampling		TCR/Sample Recovery %	SCR/Blows	RQD	<u></u>	In Situ Test Details	Install- ation
		Wes		ness)	Level	Wat	Details	Dia.	TCR, Rec	SCF			Details	ation
Rotary openhole. Fo WS107.	or strata descriptions from 0.00m to 4.50m see				-									
					1									
					-									
				-	1									
]									
														‡: <u>H</u> ::
					1									
				-]									}: F:
				(4.50)										
					1									∤∴∏ ∴
]]. [] :
				_										
					1									
					1									
]:.H::
					1									
				-	1									
	bunded COBBLES of extremely strong light grey	-	4 .0 0	4.50	499.97									-
subangular fine to o	one and limestone. With much angular to coarse gravel sized fragments of sandstone and		0,000	(0.80)	1							NI		1
limestone with a lit	tle fine to coarse sand.		0 9 0 0	(0.80) -										
Accumed zone of co	ore loss. (Probable SANDSTONE).		0 0 0 0	5.30	499.17		C 1 4.50-6.00	101	81	29	25			
	nly laminated MUDSTONE. Recovered as very st	tiff	: : : : :	5.50	498.97							NR		
slightly sandy slight	ly gravelly clay. Sand is fine to coarse. Gravel siz lar to subangular fine to coarse.			5.70	498.77							NI		
Strong brown fine g	rained SANDSTONE. Recovered as non intact co			(0.30) - 6.00 -	498.47									-
sized fragments are	to coarse sand with high cobble content. Grave angular to subangular fine to coarse. Cobble			(0.50)	1							NR		
	angular to subangular. ore loss. (Probable SANDSTONE).	-/]	: : : : :	6.50	497.97									
Extremely weak fine fine to medium san	e to medium grained SANDSTONE. Recovered a	s					C 2 6.00-7.50	101	67	12	12	NI		
	_			(0.58)	-		C 2 0.00-7.30	101	0,	12	12			
Extremely weak dar	k grey MUDSTONE. Recovered as very stiff	-		7.08	497.39						-	NR	,	
gravelly sandy clay. angular to subangu	Sand is fine to coarse. Gravel sized fragments a lar fine to coarse.	re		(0.42)	-									
Extremely weak fine	e to medium grained SANDSTONE. Recovered a	s		7.50 (0.30)	496.97							NI		-
	u. k grey to black thinly laminated MUDSTONE.	_		7.80	496.67									
	tiff dark grey to black slightly gravelly clay. Sand el sized fragments are angular to subangular fin			(0.55)	-							NA		
to coarse.			××××	8.35	496.12		C 3 7.50-9.00	101	100	53	15			
extremely closely to	ey SILTSTONE. Discontinuities: 1) 0-10 degrees o very closely spaced planar rough. 2) 70-90		××××× ×××××		-									-
from 8.50m to 8.50	closely to closely spaced planar rough. m 1 No 75-90 degrees discontinuity planar clay infilled		××××× ×××××											
with soft to firm gre			×××× ×××××	(1.15)	1							NI		
stiff friable sandy g	m extremely weak grey mudstone. Recovered as very ravelly clay. Sand is fine to coarse,. Gravel sized		×××× ×××××]							70 170		1
from 9.06m to 9.24	ılar to subangular fine to coarse m assumed zone of core loss		×××××	9.50	494.97		C 4 9.00-10.00	101	75	27	20	170		
subrounded fine to	m recovered as non intact core (subangular to coarse gravel sized fragments)	_/		(0.30)										
	strong grey fine grained SANDSTONE. 1-10 degrees extremely closely to very closely		××××× ×××××	9.80 10.00	494.67 494.47									
				10.00	7.3 7.4 1							_		
1														
AGS Notes:	All depth in metres, all diameters in millim See header sheet for details of boring, pro For details of abbreviations, see key.		d water.											



Project Name	Nenthead Mines - Proposed M\	NTS,	Gl											Hole ID	
Project No.	TA8234							Explor	ator	у Но	le Lo	9		BH107	
Engineer	Aecom														
Employer	The Coal Authority +504.47mOD	C	l:		270700	75 5/24	10.001		C		00	CD		Sheet 2 of 2	2
Ground Level Hole Type		Coord Inclina				57E, 5431 horizonta		I	Gri	1	OS	GB			
	Description of Strata		Weathering	Legend	Depth (Thick- ness)	Datum Level	Waterstrike	Sampling Details	Dia.	TCR/Sample Recovery %	SCR/Blows	RQD	Ŧ	In Situ Test Details	Install- ation
Discontinuities: 1) 0 spaced planar smoo spaced planar smoo from 9.70m to 9.80m undstone Extremely weak thir Discontinuities: 1) 0 planar smooth. from 9.86m to 9.8% subrounded fine to Complete at 1	All depth in metres, all diameters in millin	netres.													
	See header sheet for details of boring, pro	gress	and v	vater.											

Log checked by MPB

Issue Date 02/03/2018

FINAL

Form No. SIEXPHOLELOG

Print date and time 17/01/2020 19:24

Issue.Revision No. 2.05

SOIL ENGINEERING

Part of the Bachy Soletanche Group



SUPPORTING FACTUAL DATA

SECTION A

Exploratory Hole Records and Field Data

DYNAMIC SAMPLING RECORDS

Project	Name	Ner	thead	Mines	- Pr	opose	d MWT	S, GI											H	łole ID	
Project	No.	TA8	234											Exp	olorator	y Hole	Log		V	/S101	
Engine	er	Aec																			
Employ Ground L			Coal A		ty				Coordin	ates	378	3109.61E	. 543496	5.52N			Grid		OSGB	et 1 of	1
Date Star			9/2019							mpleted		09/2019						nation		m horizoi	ntal
Top 0.00	Base 1.20	Туре	Date T	ime Sta 2019 13:30		ate Tin	ne End	Rig Crew	Loggei MPB	Barrel Typ	pe Drill NA		ant Use		ng Used Pi	t Stability Stable	/		Remarl		
1.20	2.35	WLS		2019 14:30 2019 14:30		09/09/201		GC	MPB	NA NA	NA NA		Terrier	oois Noi	ie useu	Stable		U.SUII	II X 0.50III	x 1.20111	
					PRO	GRESS	;									WATER	STRIKES	S			
Date '		Depth	Casini	g Wat	ter			Rema	arks				Time	Depth Strike	Depth Casing	Depth Sealed	Water Rose To	Time Elapsed		Remarl	ks
09/09/20	19 15:30	2.35	0.00	1.5	.O E	nd of Hole	•					16/09/20	019 14:30	1.50	0.00		1.30	20	Not sea	led	
				 CABLE F	PERCL	JSSION	DETAILS	<u> </u>								SPT D	ETAILS				
Depth Top	Depth Base	Tim	e Start	Dura	tion	Too	ol		Rema	rks		Depth Top	Test Type		Reporte	d Result	F	lammer Serial Number	Energy Ratio	Depth Casing	Depth Water
Depth Top	Depth Base	Flu	sh Type	Flu	ARY FL ush turn	USH DI Flush Colour	ETAILS		Remarks	5		2.00	S	50/210mn	n (7,11,13,19	.18/60)		TDP5	58	0.00	1.50
HOLE DI	AMETER	CASING	G DIAMET	ΓER			DYNAM	IIC SAM	PLING												
Depth Base	Diameter	Depth Base	Diame	eter Dept	th Top	Depth Base	Diamete	er Dura		Sample ecovery R	Run Reference										
					.20	2.00	90	00:10	0:00	20	1										
Distance			N DETAI	Response			PI Top	PE CONS	Diamet	1	е Туре	Depth			DEF	TH RELAT		narks			
Jistalice	טי	Ahe	Тор	Base	Ref	Ref	lioh	מממ	Signified	ripe	, iype	Тор	Base	:			Rei	i iui No			
Depth	Depth	I			ACKFII	LL DETA	AILS									LOCATIO		_S			
Top 0.00	Base 2.35	Bentonite		ription		+		Rer	narks							Ren	narks				
AGS		See he		eet for d Ibbreviat	letails tions s	of borin see key.	millimet ng, progre	ss and w										- 60:			ND:CC
FINAL Print date and time 17/01/2020 19:25 Log of Form No. SIEXPHOLEHDR Issue Revision No. 2.02 Issue Date 22/06/2016										Log chec	ked by	MPB						hy Soletanch			
					.500						- 5, 2							, art		,	

Project Name					Hole ID									
Project No.	TA8234		Explo	orato	ry Ho		WS101							
ingineer imployer	Aecom The Coal Authority												Sheet 1 of	1
iround Level		rdinate	es	378109.6	S1E, 5434	96.521	J	Gr	id	09	GB		Sileet 1 Oi	1
lole Type		ination		90° from										
	Description of Strata	Weathering	Legend	Depth (Thick- ness)	Datum Level	Waterstrike	Sampling Details	Dia.	TCR/Sample Recovery %	SCR/Blows	RQD	¥	In Situ Test Details	Install- ation
subangular to subro limestone. Firm to stiff brown: cobble content. Sar subrounded fine to Cobbles are subang and sandstone. Firm to stiff dark gr coarse. Gravel is su mudstone. Loose brown very c subrounded fine to	htly clayey fine to coarse SAND. Gravel is ounded fine to coarse of sandstone, mudstone and slightly sandy slightly gravelly CLAY with low nd is fine to coarse. Gravel is subangular to coarse of sandstone, mudstone and limestone gular to subrounded fine to coarse of limestone rey slightly sandy very gravelly CLAY. Sand is fine to ibangular to subrounded fine to coarse of clayey fine to coarse SAND and subangular to coarse GRAVEL of sandstone. 1. Sandstone. 2.35m. Termination Reason: Rockhead			(0.45) (0.40) (0.40) (0.30) (1.15) (1.15) 2.35	437.19 436.79 436.49 435.34		ES 2 0.20 B 3 0.20-0.50 D 5 0.50 ES 4 0.50 B 6 0.50-0.80 D 7 0.90 ES 8 1.00 D 10 1.20-1.65 B 9 1.00-2.20 L 11 1.20-2.00						SPT(S) N=7 (2,2,2,2,1,2) 1,20 SPT(S) 50/210mm (7,11,13,19,18/60) 2,00	
													-	
													-	
AGS Notes:	: All depth in metres, all diameters in millimetre See header sheet for details of boring, progres For details of abbreviations, see key. Print date and time 17/01	ss and v					ked by MPB					60	L enginee	DIO:

Part of the Bachy Soletanche Group

Project	Name	Ne	nthea	d Min	es -	Pro	posed	MWT	S, GI							_						H	Hole ID	
Project	No.	TAS	3234													Ex	plorato	ory Ho	oie l	_og		V	/S102	
Engine	er		com																					
Employ Ground L			2.79m0		ority					Coordin	nates	3.	78114.5	4E. 5	43531	L.27N				Grid		OSGB	eet 1 of 1	1
Date Star			09/201							Date Co			3/09/20								nation		om horizor	ntal
Top 0.00	Base	Туре	Date				te Tim		Rig Crew	Logge MO	r Barrel	Type Dri			t Use		ng Used ne used	Pit Stal				Remarl	KS	
1.20							/09/201:		GC	MO	N		NA IIIs		errier	oois No	ile useu	Stau	ile					
					PI	ROG	RESS						\top					WA	TER	STRIKES	5			
Date		Deptl	n Dep Cas		Depth Water				Rema	arks			Da	te Ti	ime	Depth Strike	Dept Casin		epth aled	Water Rose To	Time Elapsed	1	Remark	ks
13/09/20		4.10	0.0		3.00 E PEF		of Hole	DETAILS										s	PT D	ETAILS				
Depth Top						Rema	arks		Dep To		Test Type		Report				Hammer Serial Number TDP5 TDP5	Energy Ratio	Depth Casing	Depth Water				
												1.2 2.0 3.0 3.9	0	S S	N=5 (1,1,1 N=7 (1,1,1 N=34 (6,8 50/125mi	l,1,1,2) l,2,2,2) l,8,8,8,10) m (25,0/0,2	7,23/50)				58 58 58 58 58	0.00 0.00 0.00 0.00	Dry Dry Dry Dry	
Depth	ROTARY FLUSH DETAILS Depth Depth Flush Type Flush Flush Colour					Remarks																		
HOLE DI	AMETE	_		ETER				DYNAM	IC SAM															
Depth Base	Diamete	Dept Base		meter D	epth T		Depth Base	Diamete	r Dura		Sample Recover	Run Referen	ce											
					1.20 2.00		2.00 3.00	87 87	00:03 00:03		81 70	1 2												
	П	ALLATIC	ON DET		nse P	ipe	Pipe		PE CONS	1			Dep	th T	Depth	1	D	EPTH R	RELAT	ED REM				
Distance	ID	Туре	Тор	Bas		Ref	Ref	Тор	Base	Diamet	ter P	іре Туре	Top		Base					Rer	narks			
					BACK	/FII I	DETA	11.6										100/	ATION	I DETAIL	c			
BACKFILL DETAILS Depth Depth Page Description Remarks							+	LOCATION DETAILS Remarks																
0.00	8ase 4.10	Bentoni		3.1Pti0	••				Kei										.terril					
AGS	Not	See h		heet fo f abbre	r deta viatior	ils o ns se	f boring e key.	millimetr g, progres	ss and wa				Log ch	2001-	ad by	MDP					SOI	L en	GINEE	erine
FINAL Form No. 9	SIEXPHOL	EHDR						ne 1770. n No. 2.02	., 2020 1		Issue D	ate 22/06	-	.ccke	Ju Dy I	νII D							hy Soletanch	

Project Name	Nenthead Mines - Propose	d MWTS, C	àl												Hole ID	
roject No.	TA8234							Ex	plorat	tor	у Но	ole Lo	og		WS102	2
ngineer	Aecom															
mployer	The Coal Authority														Sheet 1 of	1
ound Level ble Type	+437.79mOD IP+WLS	Coordir Inclinat		S	378114.5 90° from			I	,	Grio	d	O:	SGB			
ле туре	11 +44E3				Depth	1101120116					e %	s,			1	
	Description of Strata		Weathering	Legend	(Thick-	Datum Level	Waterstrike	Samplii	ng		TCR/Sample Recovery %	SCR/Blows	RQD	<u>u</u>	In Situ Test Details	Insta atio
MADE GROUND: C	Compacted stone (hardcore). (Driller's desc		š	******	ness)	437.69	W	Details D1 0.10	D	ia.	TCF Re	SC				
лаde Ground: D	Park grey slightly clayey fine to coarse san ph cobble content. Gravel sized fragments	nd sized			0.10	437.03		ES 2 0.20								
ngular to subroun	ded fine to coarse of limestone. Cobble si				(0.05)			B 3 0.20-0.50 D 5 0.50								1
ragments are angu	ular to subrounded of limestone.				(0.95)			ES 4 0.50								
					1.05	436.74		ES 6 1.00								-
	ottled light grey slightly gravelly sandy CL oulder content. Sand is fine to coarse. Grav				1.03	430.74		D 7 1.05 B 8 1.05-1.20							SPT(S) N=5	1
ngular to subroun	ided fine to coarse of limestone and muds ers are angular to subangular of limestone	stone.			-			D 9 1.20-1.65							(1,1,1,1,1,2) 1.20	-
obbico ana boara	ore and angular to capanigular or immediate				(1 (5)			L 10 1.20-2.00								
					(1.45)										SPT(S) N=7	1
								D 11 2.00-2.45							(1,1,1,2,2,2)	
								D 11 2.00 2.40							2.00	1
	led orange and dark grey slightly clayey v rse SAND. Gravel is angular to subrounde				2.50 -	435.29		142 252 253]
coarse of limestone					-			L 12 2.50-3.00								
nom 2.30m sand is	s medium to coarse				-			D40 000 0/5							SPT(S) N=34 (6,8,8,8,8,10)	-
					(1.60)			D 13 3.00-3.45 L 14 3.00-3.90							3.00	-
					-			L 14 5.00-5.90								-
															SPT(S) 50/125mn	
subrounded	0m limestone and siltstone cobbles present - an			7	4.10 -	433.69		D 15 3.90-4.10)						(25,0/0,27,23/50	
Complete at	4.10m. Termination Reason: Rock	thead			-										3.30	1
					-											1
					-											1
					-											-
					-											1
					-											1
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					-											-
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Notes	s: All depth in metres, all diameters in	millimetres										<u> </u>				
AGS	See header sheet for details of boring	ng, progress a	nd w	vater.												
	For details of abbreviations, see key.		20.5	40.5-										SO	IL engine	PDIL
MA SIEVELOI E	Print date and til		J20 :	19:25	Iccus Data			ked by MPB							of the Pachy Soletan	

Issue Date 02/03/2018

Part of the Bachy Soletanche Group

Form No. SIEXPHOLELOG

Project	Name	Nen	thead N	∕lines -	- Pro	oposec	I MWTS	5, GI												H	Hole ID	
Project	No.	TA8	234												Exp	olorator	y Hole	Log		V	/S103	
Engine	er	Aec		ol se																CI	. 1 .	1
Employ Ground L			Coal Au .58mOD	ithority	/				Coord	linates	5	3786	63.61E	, 54328	3.00N			Grid		OSGB	eet 1 of :	1
Date Star	rted		9/2019							Compl		12/09	9/2019						nation	90° fro	om horizor	ntal
Top 0.00	Base	Туре	Date Tir 12/09/20			ate Tim		Rig Crew	Logg MO		rrel Type D	Drill Bi		ant Use		ng Used Pi	t Stability Stable	<u>'</u>		Remar		
1.20	3.10	WLS	12/09/20			12/09/201		GC	MO		NA	NA	modia	Terrier	30.0	lo dosa	Stable		0.001	x 0,.00	A 1.20	
			I B			GRESS												STRIKE				
Date 12/09/20		Depth 3.10	Depth Casing 0.00	Depti Wate Dry	r	nd of Hole		Rema	arks				Date	Time	Depth Strike	Depth Casing	Depth Sealed	Water Rose To	Time Elapsed	ı	Remark	ks
Depth	Depth			1	\neg		DETAILS						Depth	Test				ETAILS	lammer Serial	Energy	Depth	Depth
Тор	Base	lim	e Start	Durati	on	Tool			Ren	narks			Top 1.20	Type S	N=11 (2,2,	Reported 2,3,3,3)	d Result		Number TDP5	Ratio 58	Casing 0.00	Water
													2.00 2.80	S S	N=25 (2,3,	8,6,4,7) n (7,8,16,34,0	/0)		TDP5 TDP5	58 58	0.00 0.00	Dry Dry
				DOTAR)/ FI	LICH DE	TAUC															
Depth	Depth		sh Type	Flus		.USH DE Flush	IAILS		Remar													
Тор	Base	110	зі турс	Retu	ırn	Colour																
HOLE DI	 AMETER	CASING	DIAMETE	ER .		ı	DYNAM	IC SAM	PLING	G												
Depth Base	Diameter	Denth		er Depth	Тор	Depth Base	Diamete	r Dura	tion	Samp	ple Ru very Refer											
Dase		Dase		1.20		2.00 2.80	87 77	00:02		69 75) 1	1										
				2.00	0	2.00	,,,	00.10	0.00	"	'											
	INSTA		N DETAIL				PII	PE CON	STRUC	TION						DEP	TH RELA	TED REN	IARKS			
Distance		iype		Base	Pipe Ref	Ref	Тор	Base	Diam		Pipe Ty	ре	Depth Top	Dept Base				Rei	marks			
2.80	01	SP	1.00	2.80	01	01 01	0.00 1.00	1.00 2.80	50 50	0 P 0 S	LAIN											
																			_			
Depth	Depth		Danami		ZKFII	LL DETA	ILS	D									LOCATIO		LS			
Top 0.00	Base 0.50	Concrete		otion				кег	marks								Ken	narks				
0.50 1.00	1.00 3.10	Bentonite Gravel ba																				
			oth in me						ote::													
AGS	5		ader shee tails of ab				y, progres	s and W	ater.													
FINAL				Print			ne 17/01	1/2020 1	9:25				-	ked by	MPB						GINEE	
Form No. 5	SIEXPHOLI	HDR			Issu	e.Revisior	No. 2.02			Issue	e Date 22/	06/201	.6						Part	of the Bac	hy Soletanch:	e Group

Description of Strata E Legend (Thick- E		S, GI					Fxnlo	rato	γ Ηο	le I d	oa -		Hole ID	
The Coal Authority round Level +490.58mOD Coordinates 37866361E,543288.00N Grid OSGB ole Type IP+WLS Inclination 90° from horizontal Description of Strata De							Explo	. 4 .01	, , 10	.5	9		WS103	3
Town Level +490.58mOD Coordinates 37866361E, 543288.00N Grid OSGB Description of Strata Depth (Thick-Level													Sheet 1 of	: 1
Description of Strata Depth (Thick-ness) Datum (Level	<u> </u>	ordinate	es	378663.6	51E, 5432	88.00N		Gri	d	09	GB		511000 1 01	
TOPSOIL MADE GROUND: Dark brown mottled orange and dark grey slightly gravelly sandy clay with high cobble content. Sand sized fragments are fine to coarse. Gravel sized fragments are angular to subrounded of limestone. Subrounded of limestone. Cobble sized fragments are angular to subrounded of limestone. Sand sized fragments are angular to subrounded of limestone. Sand sized fragments are angular to subrounded of limestone. Sand sized fragments are angular to subangular fine to coarse. Gravel sized fragments are angular to subangular fine to coarse. Gravel sized fragments are angular to subangular of limestone. Sand sized fragments are angular to subangular of limestone. In the coarse of limestone of limestone of limestone. Sand sized fragments are angular to subangular of limestone. The coarse of limestone of	ole Type IP+WLS Inc			90° from	horizonta								1	
TOPSOIL MADE GROUND: Dark brown mottled orange and dark grey slightly gravelly sandy clay with high cobble content. Sand sized fragments are fine to coarse. Gravel sized fragments are angular to subrounded for limestone. Subrounded of limestone of limestone. Subrounded of limestone of limestone of limestone of limestone of limestone. Subrounded of limestone of limest	Description of Strata	Weathering	Legend	(Thick-		Waterstrike		Dia.	TCR/Sample Recovery %	SCR/Blows	RQD	느		Instal atio
	MADE GROUND: Dark brown mottled orange and dark grey slightly pravelly sandy clay with high cobble content. Sand sized fragments re fine to coarse. Gravel sized fragments are angular to subrounded ine to coarse of limestone. Cobble sized fragments are angular to ubrounded of limestone. In the coarse of limestone of more coarsely with the coarse of limestone. In the coarse of limestone of more coarsely with high cobble content. Sand sized fragments are fine to coarse. Gravel sized fragments are angular to subangular to coarse of limestone. Cobble sized fragments are angular to ubangular of limestone. In the coarse of limestone of limestone of limestone. In the coarse of limestone of limestone of limestone of limestone of limestone. In the coarse of limestone of limestone. In the coarse of limestone of			0.15 (0.30) - 0.45	490.13		D1 0.15 ES 2 0.20 B 3 0.20-0.45 D 4 0.50 ES 5 0.50 B 6 0.50-0.80 D 7 1.00 ES 8 1.00 D 9 1.20-1.65 L 10 1.20-2.00 D 11 2.00-2.45 L 12 2.00-2.80	DIA	TT R				(2,2,2,3,3,3) 1.20 SPT(S) N=25 (2,3,8,6,4,7) 2.00 SPT(S) 50/150mm (7,8,16,34,0/0)	



Project	Name	Ner	nthead	Mines	- Pr	oposed	MWT:	S, GI						_					H	Hole ID	
Project	No.	TA8	234											Ex	piorato	ry Hole	Log		V	/S104	
Engine	er	Aec																	CI	. 1 .	1
Employ Ground L			Coal A 4.67mO[ty				Coordin	ates	37	8717.59E	543270	6.30N			Grid		OSGB	eet 1 of 1	1
Date Star	ted	12/0	9/2019						Date Co	mplete	ed 12	/09/2019	9				Incli	nation	90° fro	om horizor	ntal
Top 0.00	Base	Туре	Date T	ime Sta 2019 09:30		ate Tin 20/09/201		Rig Crew	Logge MO	r Barrel	Type Drill		ant Use		ing Used F	Pit Stability Stable	/		Remarl		
1.20	3.25	WLS		2019 10:30 2019 10:30		12/09/201		GC	MO	N/			Terrier	OUIS NO	ne useu	Stable		0.501	II x 0.50III	x 1.20m	
					PRO	GRESS										WATER	STRIKE	 S			
Date ⁻	Time	Depth	Depti		th			Rema	arks			Date	Time	Depth Strike		Depth	Water Rose To	Time	,	Remark	ks
12/09/20	19 12:00	3.25	0.00	Dr		nd of Hole								Game	Submig	334.54	1000 10	Ziapoos			
Donth	Donth			CABLE F	PERCL	JSSION	DETAILS					Donth	Tost				DETAILS		Engrav	Donth	Donth
Depth Top	Depth Base	Tim	ne Start	Dura	tion	Too	· .		Rema	ırks		Depth Top 1.20	Test Type S	N=18 (5,4	-	ed Result		Number	Energy Ratio	Depth Casing 0.00	Depth Water Dry
												1.70 2.40 3.20	S S S	N=15 (1,2 N=22 (3,5	,2,3,4,6)	10)		TDP5 TDP5 TDP5	58 58 58	0.00 0.00 0.00	Dry Dry Dry
				ROTA	RY FL	USH DE	TAILS														
Depth Top	Depth Base	Flu	sh Type		ush turn	Flush Colour			Remark	s											
HOLE DI	AMETE	R CASING	G DIAME	TER			DYNAM	IC SAM	PLING												
Depth	Diamete	Depth	Diame	eter Dept	h Top	Depth	Diamete		tion	Sample											
Base		Base		1.	20 70 40	1.70 2.40 3.20	87 87 77	00:07 00:07 00:10	7:00 7:00	100 93 63	Reference 1 2 3	e									
	INST	ALLATIO	N DETA	ILS		Τ	PI	PE CONS	STRUCT	ION					DE	PTH RELA	TED REM	IARKS			
Distance	ID	Туре	esponse Top	Response Base	e Pipe Ref		Тор	Base	Diamet	ter Pi	ре Туре	Depth Top	Dept Base				Rei	marks			
3.20	01	SP	1.00	3.20	01	01 01	0.00 1.00	1.00 3.20	50 50	PLAII SLOT	N TED	.sp	Jase								
				BA	 CKFII	LL DETA	ILS									LOCATIO	N DETAII	_S			
Depth Top 0.00 0.50 1.00	Depth Base 0.50 1.00 3.25	Concrete Bentonit Gravel b	e e	ription				Rer	marks							Rer	marks				
AGS FINAL Form No. S	S	See he		eet for d abbrevia	etails tions s nt dat	of borin see key. e and tir	millimetr g, progres me 17/02	ss and wa	9:25	Issue Da	ate 22/06/2	Log chec	cked by	MPB						GINEE chy Soletancho	

Project Name	Nenthead Mines - Proposed MWTS	S, GI											Hole ID	
Project No.	TA8234						Explo	rator	у Но	le Lo	g		WS104	
Engineer	Aecom The Cool Authority												Sheet 1 of	1
Employer Ground Level	The Coal Authority +494.67mOD Coo	rdinate	!S	378717.5	59E, 5432	76.301	J	Gri	d	OS	GB		Sileet 1 0i	1
Hole Type	IP+WLS Incl	ination		90° from	horizonta				-				T	
	Description of Strata	Weathering	Legend	Depth (Thick- ness)	Datum Level	Waterstrike	Sampling Details	Dia.	TCR/Sample Recovery %	SCR/Blows	RQD	ш	In Situ Test Details	Install- ation
gravelly sandy clay are fine to coarse. Gine to coarse of lin are angular to subn MADE GROUND: D sandy clay with me fine to coarse of limestra angular to subangu Firm dark grey mot CLAY with medium coarse. Gravel is an and sandstone. Cot sandstone and lime from 2.40m less or				0.10 (0.40) 0.50 (0.50) 1.00 (2.25) 3.25	494.57 494.17 493.67		Details D1 0.10 ES 2 0.20 B 3 0.20-0.50 D 4 0.50 ES 5 0.50 B 6 0.50-0.80 D 7 1.00 ES 8 1.00 D 9 1.20-1.65 L 10 1.20-1.70 D 11 1.20-2.15 L 12 1.70-2.40 D 13 2.40-2.85 L 14 2.40-3.20 D 15 3.20-3.25	Dia.	7.7 R9				SPT(S) N=18 (5,4,8,3,4,3) 1,20 SPT(S) N=15 (1,2,2,3,4,6) 1,70 SPT(S) N=22 (3,5,5,5,7) 2,40 SPT(S) 50/10mm (25/40,50/10) 3,20	
Notes Notes FINAL Form No. SIEXPHOLE	s: All depth in metres, all diameters in millimetre. See header sheet for details of boring, progres. For details of abbreviations, see key. Print date and time 17/01 ISOG Issue Revision No. 2.05	ss and 1			Lo 202/03/20	-	ked by MPB						L enginee	

Project	Name	Ne	nthead	d Min	es - l	Propose	ed MWT	S, GI						-					H	łole ID	
Project	No.	TA8	3234											EX	plorato	ry Hole	Log		V	/S105	
Engine			com	Λιι+h	ritu														Cha	et 1 of	1
Employ Ground L			Coal 4.32m0		ority				Coordin	ates	37	8796.06E	54319	1.49N			Grid		OSGB		1
Date Star	ted		09/201						Date Co			/09/2019						nation	90° fro	m horizoi	ntal
Top 0.00	Base 1.20	Туре	Date 11/0	Time 9/2019 1		Date Ti 11/09/20	me End	Rig Crew GC	Loggei MO	P Barrel T			ant Use		ng Used F	Pit Stability Stable	у		Remar n x 0.50m		
1.20	3.40	WLS		9/2019 0			019 09:15	GC	MO	NA NA			Terrier			Gubio				A 2.2011	
					PF	OGRES	S					T				WATER	STRIKE	S			
Date	Time	Depth	Dep Casi		epth Vater			Rema	arks			Date	Time	Depth Strike	Depth Casing		Water Rose To	Time Elapsed	i	Remark	ks
12/09/20	19 09:15	3.40	0.0	00	0.10	End of Ho	le														
				CABL	E PER	CUSSION	N DETAILS	S								SPT [DETAILS				
Depth Top	Depth Base	Tin	ne Star	t Du	ration	То	ol		Rema	rks		Depth Top	Test Type	N=4 (1,1,1		ed Result	ŀ	Hammer Serial Number	Energy Ratio	Depth Casing	Depth Water
				RC		FLUSH C						2.00	SS	N=12 (2,1, 48/275mr	,2,2,3,5) n (8,10,12,1:	2,14,10/50)		TDP5	58 58	0.00	0.10 0.10
Depth Top	Depth Base	Flu	ısh Typ	ne	Flush Return	Flush Colou			Remarks	S		_									
HOLE DI	AMETE	R CASIN	G DIAM	IETER			DYNAN	/IIC SAM	IPLING												
Depth Base	Diamete	Dept Base		neter D	epth To	p Depth Base		er Dura		Sample	Run Reference	a									
					1.20 2.00	2.00	87 77	00:0 00:0	2:00	60	1 2										
	П	ALLATIC	N DET		nse Pi	pe Pipe		IPE CON	1			Depth	Dept	h I	DE	PTH RELA					
Distance	ID	Туре	Top	Bas		ef Ref		Base	Diamet	er Pip	ре Туре	Тор	Base				Rei	marks			
					BACK	FILL DET	All C									LOCATIO	NI DETAIL	10			
Depth	Depth	Τ	Des	criptio		ILL DEI	LILO	Rei	marks			+					marks	LJ			
Top 0.00	3.40	Bentoni		Сприо	<u>'</u>											, ici					
AGS	Not	See h	eader s	heet fo	r detai ⁄iation	ls of bori s see key	n millimet ng, progre '. ime 17/0	ess and w				Log chec	cked by	MPB				SOI	L en	GINE	ering
Form No. S	SIEXPHOL	EHDR		-	ls	sue.Revisi	on No. 2.02)		ssue Dat	te 22/06/2	2016						Par	t of the Bac	hy Soletanch	e Group

roject Name	Nenthead Mines - Proposed MV	VIS, GI					Explo	orato	rv Ho	ا ما	20		Hole ID	
oject No.	TA8234						Lypic		. y 110	IO L	79		WS105	
ngineer	Aecom													
mployer round Level	The Coal Authority +504.32mOD	Coordinate	ec .	3797967	D6E, 5431	Q1 //QN	.1	Gr	id	0	SGB		Sheet 1 of 1	1
ole Type		nclination			horizonta		v	Gi	iu	0.	зав			
	Description of Strata	Weathering	Legend	Depth (Thick- ness)	Datum Level	Waterstrike	Sampling	1	TCR/Sample Recovery %	SCR/Blows	RQD	4	In Situ Test Details	Insta atio
TOPSOIL			X//XX//	0.10	504.22	3	Details D1 0.10	Dia.	5 %	Š				
cobble content. Sar fragments are angu	Oark brown slightly gravelly sandy clay with low nd sized fragments are fine to coarse. Gravel size ular to subrounded fine to coarse of limestone. nents are angular to subrounded of limestone.	d		(1.10)			ES 2 0.20 B 3 0.20-0.50 ES 4 0.50							
Sand is fine to coars	tled orangish brown slightly gravelly sandy CLAY. se. Gravel is angular to subangular fine to coarse			1.20	503.12		ES 6 1.00 D 7 1.20-1.65						SPT(S) N=4 (1,1,1,1,1,1) 1.20	
of limestone. from 1.65m less m	nottled			(0.90)			L8 1.20-2.00							
Firm dark grey mot	ttled brown slightly gravelly sandy CLAY. Sand is rel is angular to subangular fine to coarse of			2.10	502.22		D 9 2.00-2.45						SPT(S) N=12 - (2,1,2,2,3,5) 2.00	
limestone.	rer is angular to subangular line to coarse of			-			B 10 2.00-3.00							
from 3.00m to 3.40	Om very stiff			(1.30)									SPT(S) 48/275mm-	
				3.40	500.92		D 11 3.00-3.40						(8,10,12,12,14,10/ 50) 3.00	
													-	
				-									-	
				-									-	
AGS	s: All depth in metres, all diameters in millim See header sheet for details of boring, pro For details of abbreviations, see key.		water.									60	iL enginee	



Project	Name	Ner	thead	Mines	- Pr	oposed	d MWT	S, GI											H	łole ID	
Project	No.	TA8	234											Exp	olorator	y Hole	Log		W	/S106	
Engine	er	Aec		ناده ما در	+														Cha	+ 1 .f ′	1
Employ Ground L			Coal A		ty				Coordin	ates	378	8797.19E	, 54312	7.83N			Grid		OSGB	et 1 of 1	L
Date Star	ted		9/2019						Date Co			/09/2019						nation		m horizor	ntal
Top 0.00	Base 1.20	Туре	Date T	ime Sta 2019 13:30		ate Tin	ne End	Rig Crew	Logge MO	r Barrel T			ant Use		ng Used Pi ne used	t Stability Stable	,		Remarl		
1.20	3.05	WLS		2019 14:30		11/09/201		GC	MO	NA NA			Terrier	0013	le useu	Stable		0.301		X 1.2011	
					PRO	GRESS										WATER	STRIKES	5			
Date '		Depth	Casiii	g Wat	ter			Rema	arks				Time	Depth Strike	Depth Casing	Depth Sealed	Water Rose To		ı	Remark	(S
11/09/20	19 15:45	3.05	0.00	1.0	IO E	nd of Hole						11/09/2	019 14:30	1.20	0.00		1.00	20			
			1	CABLE F	PERCL	ISSION	DETAILS	i								SPT C	ETAILS				
Depth Top	Depth Base	Tim	e Start	Dura	tion	Тоо	ı		Rema	ırks		Depth Top	Test Type	N=18 (2,2,	Reporte	d Result	н	ammer Serial Number TDP5	Energy Ratio 58	Depth Casing	Depth Water
				DOTA	DV EI	USH DI	TAUC					1.70 2.70	SS	N=18 (8,5, 50/200mm	3,4,5,6) n (8,8,12,17,2	1/50)		TDP5 TDP5	58 58	0.00	1.00
Depth Top	Depth Base	Flu	sh Type	Flu	ush turn	Flush Colour	LIAILS		Remark	s		-									
HOLE DI	AMETER	CASINO	DIAME	ΓER			DYNAN	IIC SAM													
Depth Base	Diameter	Depth Base	Diame		th Top .20 .70	Depth Base 1.70 2.70	Diamete 89 79	00:10 00:10	D:00	Sample decovery 50 80	Run Reference 1 2	2									
Distance			N DETA	Response			PI Top	PE CONS	Diamet	1	ре Туре	Depth			DEP	TH RELA		ARKS narks			
Distance	וט	туре	Тор	Base	Ref	Ref	юр	Dase	Diamet	lei Pip	је туре	Тор	Base	:			Kei	IIdIKS			
Depth	Depth		Docci	ription	ACKFII	LL DETA	ILS	Por	marks							LOCATIO	N DETAIL narks	.S			
Top 0.00	Base 3.05	Bentonit		триоп				Kei	IIdIKS							Ren	IIdiks				
AGS		See he		eet for d Ibbreviat	letails tions s	of borin see key.	millimet g, progre	ss and w						MDS				SOI	Len	Ginee	BIDG
FINAL Form No. 9	SIEXPHOLI	EHDR		Prii			me 17/0 n No. 2.02			Issue Dat	te 22/06/2	Log chec 1016	кеа ру	INILR						hy Soletanche	

roject Name	Nenthead Mines - Proposed MW	15, GI					Explo	rato	ry Ho	le Lo	pq		Hole ID	
oject No. ngineer	TA8234 Aecom						'		,		5		WS106	
nployer	The Coal Authority												Sheet 1 of	1
ound Level		oordinate	!S	378797.1	L9E, 5431	27.83N	l	Gr	id	09	SGB			
ole Type	IP+WLS In	clination		90° from	horizonta				0		1			1
	Description of Strata	Weathering	Legend	Depth (Thick-	Datum Level	Waterstrike	Sampling		TCR/Sample Recovery %	SCR/Blows	RQD	<u> </u>	In Situ Test Details	Insta
TOPSOIL		š	X///X///	ness)	504.81	W	Details D 1 0.10	Dia.	R TC	SC				
Soft dark brown sli	ghtly gravelly sandy CLAY with low cobble content	: 1		0.10	304.61		ES 2 0.20							-
	se. Gravel is angular to subangular fine to coarse les are angular to subangular of limestone.			(0.70)			B 3 0.20-0.50 ES 4 0.50							
Soft to firm dark or	rey mottled orange slightly gravelly sandy CLAY		a .00	0.80	504.11		D 5 0.80							
with high cobble co subangular fine to	ontent. Sand is fine to coarse. Gravel is angular to coarse of limestone. Cobbles are angular to			(0.40) – 1.20	503.71		B 6 0.80-1.20 ES 7 1.00						SPT(S) N=18	
subangular of lime: Firm brown slightly	stone. y gravelly sandy CLAY with medium cobble content	t.					D 8 1.20-1.65						(2,2,2,4,6,6)	
of limestone. Cobb	rse. Gravel is angular to subangular fine to coarse les are angular to subangular of limestone. 5m dark brown mottled black						L 9 1.20-1.70						1.20 SPT(S) N=18	
from 1.70m to 2.70	0m dark brown			(1.85)			D 10 1.70-2.15						(8,5,3,4,5,6) 1.70	
				(1.03)			L 11 1.70-2.70							
				-									SPT(S) 50/200mm	
	5m dark grey to dark brown mottled orange			3.05	501.86		D 12 2.70-3.05						(8,8,12,17,21/50) 2.70	
Complete at	t 3.05m. Termination Reason: Achieved Scheduled Depth													-
				-									-	1
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Mata	s: All depth in metres, all diameters in millimet	tros												
AGS	See header sheet for details of boring, progr		water.											
ΙΔΙ	For details of abbreviations, see key.	01/2020	10·2E		l a	a chas	kad by MPR					so	L enginee	RIN



Project	Name	Ner	thead	Mines	- Pr	oposed	d MWT	S, GI											H	łole ID	
Project	No.	TA8	234											Exp	olorator	y Hole	Log		W	/S107	
Engine	er	Aec																			
Employ Ground L			Coal A		ty				Coordin	ates	378	8788.57E	543110) 99N			Grid		She OSGB	et 1 of 1	1
Date Star			9/2019							mpleted		/09/2019						nation		m horizor	ntal
Top 0.00	Base	Туре	Date T	ime Sta		ate Tin	ne End	Rig Crew	Logge MO				ant Use		ng Used Pi	-	,		Remarl		
1.20	3.40	WLS		2019 10:45 2019 11:15		11/09/201 11/09/201		GC GC	MO	NA NA	NA NA		Terrier	ools Non	ne used	Stable		U.SUr	n x 0.50m	x 1.20m	
						GRESS											STRIKES				
Date 11/09/20		Depth 3.40	Depti Casin		ter	nd of Hole		Rema	arks				Time	Depth Strike	Depth Casing 0.00	Depth Sealed	Water Rose To	Time Elapsed	ı	Remark	(S
				CABLE F	PERCL	ISSION	DETAILS									SPT D	ETAILS				
Depth	Depth Base	Tim	e Start	Dura		Too			Rema	ırks		Depth			Reporte			ammer Serial Number	Energy	Depth Casing	Depth Water
Тор	Dase											1.20 2.00 3.00	Type S S S	N=10 (2,2, N=31 (6,7, 58/290mm	2,2,3,3) 7,7,8,9) n (6,7,8,15,17	7,18/65)		TDP5 TDP5 TDP5	Ratio 58 58 58 58	0.00 0.00 0.00	0.80 0.80 0.80
				ROTA	RY FL	.USH DI	ETAILS														
Depth Top	Depth Base	Flu	sh Type		ush turn	Flush Colour			Remark	s											
HOLE DI	AMETER	-		ΓER			DYNAM	IIC SAM													
Depth Base	Diameter	Depth Base	Diame		th Top 20 00	Depth Base 2.00 3.00	Diamete 89 79	00:10 00:10	0:00	Sample Secovery 75 15	Run Reference 1 2	€									
Distance		ALLATIO Type Re	esponse	Response			PI Top	PE CONS	Diamet		е Туре	Depth			DEF	TH RELA		ARKS narks			
		71	Тор	Base	Ref	Ref						Тор	Base	!							
Depth	Depth			BA	CKFII	LL DETA	ILS									LOCATIO	n detail	.S			
Top 0.00	Base 3.40	Bentonite		ription				Rer	marks							Ren	narks				
AGS		See he		eet for d Ibbreviat	etails tions s	of borin see key.	millimet g, progre	ss and w										SOL	I en	Ginee	BIDG
FINAL Form No. 9	SIEXPHOLI	EHDR		Prii			me 17/0 n No. 2.02			Issue Dat	e 22/06/2	Log ched 1016	ked by	INILR						hy Soletanche	

Project Name	Nenthead Mines - Proposed M	WTS, GI											Hole ID	
Project No.	TA8234						Exploi	rator	у Но	le Lo	g		WS107	
Engineer Employer	Aecom The Coal Authority												Sheet 1 of 1	
Ground Level	+504.47mOD	Coordinate	es	378788.5	57E, 5431	10.991	 V	Grid	<u> </u>	OS	GB		21166(1 01 1	-
Hole Type	IP+WLS	Inclination			horizonta									
	Description of Strata	Weathering	Legend	Depth (Thick- ness)	Datum Level	Waterstrike	Sampling Details	Dia.	TCR/Sample Recovery %	SCR/Blows	RQD	4	In Situ Test Details	Install- ation
TOPSOIL				0.10	504.37		D1 0.10	D.a.					-	
CLAY with low cobbl	nottled orange and black slightly gravelly sand the content. Sand is fine to coarse. Gravel is	ıy					ES 2 0.20 B 3 0.20-0.50]	
angular to subangular	ar fine to coarse of limestone. Cobbles are ar of limestone.			-	-		ES 4 0.50						-	
				(1.40)										
				-	-		D 5 1.00 ES 6 1.00						SPT(S) N=10	
							D 7 1.20-1.65						(2,2,2,2,3,3) 1.20	
	wn sandy gravelly CLAY. Sand is fine to coarse subangular fine to coarse of limestone.	2.	4 0 0	1.50 -	502.97		L8 1.20-2.00						1.20	
Graver is angular to	subangular line to coarse of linestone.]	
				-	-								SPT(S) N=31 - (6,7,7,7,8,9)	
				(1.65)			D 9 2.00-2.45						(6,7,7,7,8,9) 2.00	
				-	-		L 10 2.00-3.00						-	
	n very gravelly and mottled orange light grey			3.15	501.32		D44 000 0 40						SPT(S) 58/290mm- (6,7,8,15,17,18/65)	
	ONE. (Driller's description)			3.40	501.07		D 11 3.00-3.40						3.00	
Complete at a	3.40m. Termination Reason: Rockhead	1		-	-								-	
				-	-								-	
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	All dende in many and the second second													
ACS	All depth in metres, all diameters in millir See header sheet for details of boring, pro		water.											
	For details of abbreviations, see key.											SO	L enginee	DIDG
INAI	Print date and time 1	7/01/2020	19.25		I٥	n chac	ked by MPB					1 301		KILIG

Issue Date 02/03/2018

Part of the Bachy Soletanche Group

FINAL

Form No. SIEXPHOLELOG

Print date and time 17/01/2020 19:25

Issue.Revision No. 2.05

Project	Name	Nen	thead N	Vines	- Pr	oposec	MWT	S, GI												H	łole ID	
Project	No.	TA8	234												Exp	olorator	y Hole	Log		V	/S108	
Engine	er	Aec		.1																CI.	. 4 . 6 .	
Employ Ground I			Coal Au	uthority	У				Coord	linates		37878	85.17E	, 54308	9.31N			Grid		OSGB	et 1 of :	1
Date Sta			9/2019							Comple			9/2019						nation		m horizor	ntal
Top 0.00	Base	Туре	Date Ti	me Stai		ate Tim	ne End F	Rig Crew GC	Logg MO		rel Type D NA	rill Bi		ant Use		ng Used Pi	t Stability Stable	/		Remarl		
1.20	3.10	WLS		019 16:30		11/09/201		GC	MO		NA NA	NA NA	Insula	Terrier	loois Non	ie used	Stable		0.50	m x 0.50m	x 1.20m	
					PRO	GRESS											WATER	STRIKES	S			
Date		Depth	Depth Casing	Dept Wate				Rema	arks				Date	Time	Depth Strike	Depth Casing	Depth Sealed	Water Rose To	Time Elapsed	i	Remark	K S
10/09/20 11/09/20 11/09/20		1.20 1.20 3.10	0.00 0.00 0.00	0.00 0.00 0.00	St	nd of Shift tart of Shift nd of Hole	:															
11/03/20	13 10.30	3.10	0.00	0.00		in of Fiore																
			C	ABLE P	ERCL	JSSION	DETAILS										SPT D	DETAILS				
Depth Top	Depth Base	Tim	e Start	Durati	on	Tool			Ren	narks			Depth Top	Test Type		Reporte	d Result	F	lammer Serial Number	Energy Ratio	Depth Casing	Depth Water
iop	2000												1.20 2.00	S S	N=6 (2,2,1 N=26 (4,5,	5,6,8,7)			TDP5 TDP5	58 58	0.00 0.00	0.00 0.00
													2.70	S	50/265mn	n (8,10,12,14,	16,8/40)		TDP5	58	0.00	0.00
				ROTAF	RY FL	USH DE	TAILS															
Depth Top	Depth Base	Flu	sh Type	Flus		Flush Colour		ı	Remar	rks												
	IAMETER	-	DIAMET	ER			DYNAM	IC SAM	PLING		1- P.:											
Depth Base	Diamete	Depth Base	Diamet	er Depth	- 1	Depth Base	Diamete	r Dura		1	ery Refer	ence										
				2.0		2.70	89 79	00:02		45 70	1 2											
	INIST	ALLATIO	N DETAIL	ς			DII	PE CONS	STRIIC	TION						DEP	TH RELA	TED BEN	IABKS			
Distance			esponse R	esponse			Тор	Base	Diam		Pipe Typ	ре	Depth	Dept					marks			
			Тор	Base	Ref	Ref					1 71		Тор	Base	2							
				BAG	CKFII	LL DETA	ILS										LOCATIO	N DETAII	_S			
Depth Top	Depth Base		Descri	ption				Ren	narks								Ren	narks				
0.00	3.10	Bentonite	e																			
			pth in me						ater													
AGS	5		tails of al				y, progres	oo aliu Wa	atel.													
FINAL	CIEVANIA	FLIDS		Prin			ne 17/01	1/2020 1	9:25		D-+ 00		-	ked by	MPB						GINEE	
rorm No.	SIEXPHOL	EHDK			ISSU	e.kevisior	No. 2.02			Issue	Date 22/0	J6/201	b						Part	t of the Bac	hy Soletanch	e Group

Project Name	Nenthead Mines - Proposed N	ЛWTS, GI											Hole ID	
: - + NI-	TA022/						Explo	orato	ry Ho	ole Lo	og		WS108)
roject No. ngineer	TA8234 Aecom												VV2100)
mployer	The Coal Authority												Sheet 1 of	: 1
round Level	+503.95mOD	Coordina	tes	378785	17E, 5430	18931N	1	Gr	id	OS	GB		311661 1 01	<u>+</u>
ole Type	IP+WLS	Inclinatio			horizonta		•	۵.			, 0.5			
		bu bu		Depth		š	6 1:		ele %	NS				
	Description of Strata	Weathering	Legend	(Thick-	Datum Level	Waterstrike	Sampling		TCR/Sample Recovery %	SCR/Blows	RQD	<u></u>	In Situ Test Details	Instal atio
		Wes		ness)	Level	Wat	Details	Dia.	TCR.	SCF			Details	atio
TOPSOIL	ettled evenciels brown elichthy evencelly condu	CLAV		0.10	503.85		D 1 0.10							
	ottled orangish brown slightly gravelly sandy ontent. Sand is fine to coarse. Gravel is angular		a 000		1		ES 2 0.20 B 3 0.20-0.50							
subangular fine to subangular of lime	coarse of sandstone. Cobbles are angular to			(0.65)	1		ES 4 0.50							1
				0.75	503.20									
	very clayey very gravelly fine to coarse SAND. subangular fine to coarse of limestone.			5	1 555.25									
aravor io ariganar ta	s capangalar line to coaree or innectione.			-	1		D 5 1.00 ES 6 1.00							7
				(0.95)	1		B 7 1.00-1.20						SPT(S) N=6 (2,2,1,1,2,2)	1
					1		D 8 1.20-1.65						1.20	-
			-	1.70	502.25		L 9 1.20-2.00							
	ottled grey slightly gravelly sandy CLAY. Sand angular to subrounded fine to coarse of limes													
				1 -	1								SPT(S) N=26	-
					1		D 10 2.00-2.45						(4,5,5,6,8,7) 2.00	1
				(1.40)	1		L 11 2.00-2.70							}::::::
				1	1								SPT(S) 50/265mm	
					1		D 12 2.70-3.10						(8,10,12,14,16,8/4	
				3.10	500.85		D 12 2.70-3.10						0) 2.70	-
Complete at	3.10m. Termination Reason: Rockhea	ad		3.10	300.83								2.70	-
					1									-
				-	1									7
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				-	1									4
				:	1									1
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				-	1									1
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				-	1									7
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			+		-								+	+
N	v All donth in material all all and all all all all all all all all all al	limant				1			1	1	l	\top		
	s: All depth in metres, all diameters in mill See header sheet for details of boring, p		water											
AGS	For details of abbreviations, see key.	ogicos aill	. rvatol.											
		17/01/202	0.10.25		1.	1	led by MDD					SO	IL engine	erin

Issue Date 02/03/2018

Print date and time 17/01/2020 19:25

Issue.Revision No. 2.05

FINAL

Form No. SIEXPHOLELOG

SOIL ENGINEERING

Part of the Bachy Soletanche Group

Project	Name	Nen	thead N	Vines	- Pr	oposec	I MWTS	S, GI												H	Hole ID	
Project	No.	TA8	234												Exp	olorator	y Hole	Log		V	/S109	
Engine	er	Aec		.1																CI.	. 4 . 6 .	4
Employ Ground I			Coal Au	uthority	<u>y</u>				Coord	linates		3787	77.40E	, 54306	0.48N			Grid		OSGB	eet 1 of :	1
Date Sta	rted	_	9/2019							Comple		11/09	9/2019						nation	90° fro	om horizor	ntal
Top 0.00	Base	Туре	Date Til	me Stai		ate Tim	ne End R	Rig Crew	Logg MO		rel Type D	Drill B		ant Use		ng Used Pi	t Stability Stable	<u>'</u>		Remarl		
1.20	3.30	WLS		019 07:30		11/09/201		GC	МО		NA	NA		Terrier								
					PP∩	GRESS											\M\ATED	STRIKES				
Date	Time	Depth	Depth Casing	Dept	h	MILESS		Rema	ırks				Date	Time	Depth Strike	Depth Casing	Depth Sealed	Water Rose To	Time		Remark	ks
10/09/20 11/09/20	19 07:30	1.20 1.20	0.00 0.00	0.65 0.65	Ei Si	nd of Shift tart of Shift	 :								Stilke	Casing	Sealed	Rose 10	Liapsec	1		
11/09/20	019 09:10	3.30	0.00	1.50	E	nd of Hole																
				ADLED	FDCI	ICCION	DETAILC										CDT C	TTALL C				
Depth	Depth	Tim	e Start	Durati		Tool	DETAILS		Ren	narks			Depth	Test		Reporte		ETAILS	lammer Serial	Energy	Depth	Depth
Тор	Base		- Columb										1.20 2.00	Type S S	N=6 (1,0,1, N=20 (2,2,	,1,2,2)			Number TDP5 TDP5	Ratio 58 58	0.00 0.00	0.65 0.70
													3.00	S	50/140mn	n (13,12/60,2	6,24/65)		TDP5	58	0.00	1.30
				ROTAF	RY FL	USH DE	TAILS															
Depth Top	Depth Base	Flu	sh Type	Flu: Retu		Flush Colour		ı	Remar	rks												
HOLE D	 AMETER	CASING	G DIAMET	ER		ı	DYNAM	IC SAM	PLING	G												
Depth Base	Diamete	Depth Base	Diamet	er Depth	Тор	Depth Base	Diamete	r Dura	tion	Samp	ole Ru ery Refer	un rence										
				1.2 2.0		2.00 3.00	89 79	00:05 00:07		60 55		1										
	INST	ALLATIO	N DETAIL	.S		Τ	PII	PE CONS	STRUC	CTION						DEF	TH RELA	TED REM	IARKS			
Distance	ID .	Туре Ре	esponse R	esponse Base	Pipe Ref		Тор	Base	Diam	neter	Pipe Ty	ре	Depth Top	Dept Base				Rer	marks			
Depth	Depth	T	Descri		CKFII	LL DETA	ILS	Don	narks								LOCATIO	N DETAII narks	_S			
Top 0.00	3.30	Bentonite		ption				Kei	ilai KS								Rei	iiai KS				
AGS		See he	pth in me eader she	et for de	tails	of boring			ater.													
FINAL		For de	tails of al				ne 17/01	/2020 1	9:25			I o	og chec	ked by	MPR				SOI	L en	GINE	RING
	SIEXPHOL	EHDR		. 11111		e and tin ie.Revisior		., 2020 1	J.EJ	Issue	Date 22/		-	ca by							hy Soletanch	

TA8234 Aecom The Coal Authority						Explo	· a co	.,		79		WS109	
												VV3103	
												Cl + 1 - f :	1
	dinate	c	378777.4	NE 5430	60.481		Gri	id		SGB		Sheet 1 of 2	L
	nation		90° from			•	Gii	iu	0.	JGB			
	ring		Depth	Datum	ri ke	Sampling		nple y %	3WS			In City Toot	Inetal
Description of Strata	eathe	Legend	(Thick-	Level	aterst		1	:R/Sar	CR/Blc	RQD	≝	Details	Instal atior
	3	\\/\!\\/\!		502.42	3	Details D1 0.10	Dia.	5 %	Š				
orangish brown slightly gravelly sandy CLAY nt. Sand is fine to coarse. Gravel is angular to			0.10			ES 2 0.20							
arse of sandstone and limestone. Cobbles are			(1.00)			D 4 0.50						-	
or surfacemental infections.			(1.00)			ES 5 0.50							
		ه څه و څه خو	-	/-		D 7 1.00						-	
n slightly gravelly sandy CLAY. Sand is fine to			1.10	501.42		ES 6 1.00						SPT(S) N=6	
ar to subangular line to coarse or linestone.			-			D 8 1.20-1.65						(1,0,1,1,2,2)	
			(1.20)			L 9 1.20-2.00							
			_									SPT/S) NI=20 =	
			-			D 10 200-245						(2,2,3,2,8,7)	
elly very clayey fine to coarse SAND. Gravel is			2.30 -	500.22								2.00	
fine to coarse of limestone.			-			L 11 2.00-3.00							
			(1.00)										
range and light grey			-			D 12 3.00-3.30						SPT(S) 50/140mm- (13,12/60,26,24/6	
30m. Termination Reason: Achieved		· · · · · · · · · · · · · · · · · · ·	3.30	499.22								5) 3.00	
Scheduled Depth			-									-	
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		vater											
	orangish brown slightly gravelly sandy CLAY int. Sand is fine to coarse. Gravel is angular to arse of sandstone and limestone. Cobbles are of sandstone and limestone. In slightly gravelly sandy CLAY. Sand is fine to ar to subangular fine to coarse of limestone. Illy very clayey fine to coarse SAND. Gravel is fine to coarse of limestone. In slightly gravelly sandy CLAY. Sand is fine to are to subangular fine to coarse SAND. Gravel is fine to coarse of limestone. In slightly rery clayey fine to coarse SAND. Gravel is fine to coarse of limestone. In slightly very clayey fine to coarse SAND. Gravel is fine to coarse of limestone.	orangish brown slightly gravelly sandy CLAY nt. Sand is fine to coarse. Gravel is angular to arse of sandstone and limestone. Cobbles are of sandstone and limestone. In slightly gravelly sandy CLAY. Sand is fine to ar to subangular fine to coarse of limestone. Illy very clayey fine to coarse SAND. Gravel is fine to coarse of limestone. Transpe and light grey 30m. Termination Reason: Achieved Scheduled Depth	orangish brown slightly gravelly sandy CLAY nt. Sand is fine to coarse. Gravel is angular to are of sandstone and limestone. Cobbles are of sandstone and limestone. Is lightly gravelly sandy CLAY. Sand is fine to ar to subangular fine to coarse of limestone. Illy very clayey fine to coarse SAND. Gravel is fine to coarse of limestone. Tange and light grey 30m. Termination Reason: Achieved Scheduled Depth	orangish brown slightly gravelly sandy CLAY Int. Sand is fine to coarse. Gravel is angular to tarse of sandstone and limestone. Cobbles are of sandstone and limestone. Cobbles are of sandstone and limestone. (100) In slightly gravelly sandy CLAY. Sand is fine to ar to subangular fine to coarse of limestone. (120) If yery clayey fine to coarse SAND. Gravel is fine to coarse of limestone. (100) If yery clayey fine to coarse SAND. Gravel is fine to coarse of limestone. (100) 330 If depth in metres, all diameters in millimetres. Scheduled Depth	orangish brown slightly gravelly sandy CLAY Int. Sand is fine to coarse. Gravel is angular to inse of sandstone and limestone. Cobbles are of sandstone and limestone. (1.00) 1 slightly gravelly sandy CLAY. Sand is fine to art to subangular fine to coarse of limestone. (1.20) 1 lily very clayey fine to coarse SAND. Gravel is fine to coarse of limestone. (1.00) 2.30 500.22 (1.00) 499.22 I depth in metres, all diameters in millimetres. se header sheet for details of boring, progress and water.	conagish brown slightly gravelly sandy CLAY It. Sand is fine to coarse. Gravel is angular to issee of sandstone and limestone. Cobbles are of sandstone and limestone. Cobbles are of sandstone and limestone. It is slightly gravelly sandy CLAY. Sand is fine to ar to subangular fine to coarse of limestone. It is subangular fine to coarse SAND. Gravel is fine to coarse of limestone. It is to coarse of limestone. It is	orangish brown slightly gravelly sandy CLAY It. Sand is fine to coarse. Gravel is angular to rare of sandstone and limestone. Cobbles are of sandstone and limestone. Cobbles are of sandstone and limestone. 110 50142 11	orangish brown slightly gravelly sandy CLW in: Sand is fine to coarse. Gravel is angular to race of anothers and limestone. Cobbles are of sandstone and limestone. Cobbles are of sandstone and limestone. 110	orampish brown slightly gravelly sandy CLAY It. Sam is fine to coarse Gravel is angular to or of sandstone and limestone. Cobbles are of sandstone and limestone. 110 501.42 ES 2 200 B3 0.20-0.50 D4 0.50 ES 5 0.50 D7 1.00 ES 6 1.00 D7 1.00 ES 6 1	orangish brown slightly gravelly sandy CLAY nt. Sand is the to coarse. Gravel a rangular to get a random and innection. Coldes are of sandoms and innection. Coldes are of sandoms and innection. 1 slightly gravelly sandy CLAY Sand is time to art to subangular fine to coarse of limestone. 1 slightly gravelly sandy CLAY Sand is time to art to subangular fine to coarse of limestone. 1 slightly gravelly sandy CLAY Sand is time to art to subangular fine to coarse of limestone. 1 slightly gravelly sandy CLAY Sand is time to art to subangular fine to coarse of limestone. 1 slightly gravelly sandy CLAY Sand is time to art to subangular fine to coarse of limestone. 1 slightly gravely sandy gravely sandy CLAY Sand is time to coarse of limestone. 1 slightly gravely sandy sandy CLAY Sand is time to coarse of limestone. 1 slightly gravely sandy CLAY Sand is time to coarse of limestone. 1 slightly gravely sandy CLAY Sand is time to coarse of limestone. 1 slightly gravely sandy CLAY Sand is time to coarse of limestone. 1 slightly gravely sandy CLAY Sand is time to coarse of limestone. 1 slightly gravely sandy CLAY Sand is time to coarse of limestone. 1 slightly gravely sandy CLAY Sand is time to coarse of limestone. 1 slightly gravely sandy CLAY Sand is time to coarse of limestone. 1 slightly gravely sandy CLAY Sand is time to coarse of limestone. 1 slightly gravely sandy CLAY Sand is time to coarse of limestone. 1 slightly gravely sandy CLAY Sand is time to coarse of limestone. 1 slightly gravely sandy CLAY Sand is time to coarse of limestone. 1 slightly gravely sandy CLAY Sand is time to coarse of limestone. 1 slightly gravely sandy CLAY Sand is time to coarse of limestone. 1 slightly gravely sandy CLAY Sand is time to coarse of limestone. 1 slightly gravely sandy CLAY Sand is time to coarse of limestone. 1 slightly gravely sandy CLAY Sand is since to coarse of limestone. 1 slightly gravely sandy CLAY Sand is since to coarse of limestone. 1 slightly gravely sandy CLAY Sand is since to coarse of limes	comagain brown stightly gravetly sandy CLAV nt. Sand is the to coarse. Claseler is angular to of sandatone and limestone. 10.09 10.00	corangials brown slightly gravelly sandy CLAY It. Sard is fine to coase. Greek is against to of sandations and liverations. 1.000 507.42 1.000 507.42 509.43 509.22 1.000 509.43 509.43 509.43 509.44 509.45 509.65 509.60 509.45 509.45 509.	arangen brown slightly gravely sarely CLAV sense in time to meet a send fortox and limestone. Coubles are of extractions and limestone. The fortox of the extraction and limestone. Coubles are of extractions and limestone. Coubles are of extraction and limestone. The fortox of the extraction and limestone. The fortox of the extraction and limestone. The fortox of the extraction and limestone and limestone. The extraction and limestone and limestone and limestone and limestone. The extraction and limestone and limestone and limestone and limestone and limestone and limestone. The extraction and limestone and lime

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Log checked by MPB

Form No. SIEXPHOLELOG Issue Revision No. 2.05 Issue Date 02/03/2018

FINAL



Project	Name	Ner	nthead I	Mines -	- Pro	posed	STWM b	S, GI											H	lole ID	
Project	No	TA8	234											Exp	lorato	ry Hole	Log		WSF	3H101	1 R
Engine		Aec																	****	311101	
Employ	er		Coal A	uthority	/															et 1 of 1	1
Ground L Date Star			7.92mOD)9/2019						Coordina Date Cor			108.75E, 09/2019		1.76N			Grid	nation	OSGB 90° fro	m horizor	ntal
Top	Base		Date Ti	me Star	t Da	ate Tim	ne End R			Barrel Type			ant Use	d Shorin	ng Used	Pit Stability			Remark		itai
0.00 1.20	1.20 2.30	IP WLS		019 15:45 019 09:20		0/09/201 0/09/201		GC GC	MO MO	NA NA	NA NA	Insulat	ted Hand Terrier	Tools None	e used	Stable		0.50n	n x 0.50m :	(1.20m	
<u> </u>	. .	ъ п	Depth			GRESS						Б.	T	Depth	Depti	WATER n Depth	STRIKES Water	Time	1	D 1	
Date 09/09/20		Depth 0.80	Casing 0.00		r	d of Shift		Rema	rks			Date	Time	Strike	Casin		Rose To	Elapsed		Remark	(S
10/09/20 10/09/20	19 07:45	0.80 2.30	0.00 0.00	Dry Dry	Sta	art of Shift d of Hole	t														
				ABLE PE	RCU	SSION	DETAILS									SPT D	ETAILS				
Depth Top	Depth Base	Tim	ne Start	Duration	on	Tool	ı		Remar	ks		Depth Top	Test Type		Report	ed Result	ŀ	ammer Serial Number	Energy Ratio	Depth Casing	Depth Water
												1.20 2.00	S S	N=27 (6,7,6 N=50 (4,12		12)		TDP5 TDP5	58 58	0.00 0.00	Dry Dry
				ROTAR	Y FI I	JSH DE	TAILS														
Depth	Depth	Flu	ısh Type	Flus	h	Flush		F	Remarks												
Тор	Base	-		Retu	rn	Colour															
HOLE DI	AMETER	CASING	G DIAMET	ER			DYNAM	IC SAM	PLING												
Depth	Diameter	Depth	n Diamo	ter Depth	Top	Depth	Diameter		ion Si		Run										
Base		Base	:	1.20	- 1	Base 2.00		00:30	Re	covery Ref	erence 1										
	INSTA	<u> </u> 	N DETAII	LS			PIF	PE CONS	TRUCTION	 ON					DI	PTH RELAT	TED REM	ARKS			
Distance	ID .	Туре	esponse R	esponse Base	Pipe Ref	Pipe Ref	Тор	Base	Diamete	er Pipe T	уре	Depth	Dept Base					narks			
2.30	01	SP	Top 1.00	2.30	01	01 01	0.00 1.00	1.00 2.30	50 50	PLAIN SLOTTED	· ·	Тор	Base	*							
						01	1.00	2.50	30	SLOTTED											
				BAC	KFIL	L DETA	.ILS									LOCATIO	N DETAII	.S			
Depth Top	Depth Base		Descr	iption				Ren	narks							Ren	narks				
0.00 0.50	0.50 1.00	Concrete	e e																		
1.00	2.30	Gravel b																			
							millimetre														
AGS	8		eader she etails of a				g, progres	s and wa	iter.												
FINAL							me 17/01	/2020 1	9:25		L	og chec	ked by	MPB				SOI	L en	sinee	RING

Issue Revision No. 2.02 Issue Date 22/06/2016

Part of the Bachy Soletanche Group

Form No. SIEXPHOLEHDR

Project Name	Nenthead Mines - Proposed MW	/TS, GI											Hole ID	
Project No.	TA8234						Explor	ator	у Но	le Lo	g		WSBH101	ı D
Engineer	Aecom												VVJDITIO	
Employer	The Coal Authority												Sheet 1 of 1	L
Ground Level Hole Type		Coordinate nclination			'5E, 5435 horizonta			Grid	d	OS	GB			
. 1010 1940				Depth			Compline		ple /%	ws				
	Description of Strata	Weathering	Legend	(Thick- ness)	Datum Level	Waterstrike	Sampling		TCR/Sample Recovery %	SCR/Blows	RQD	<u></u>	In Situ Test Details	Install- ation
TOPSOIL.		*	X//XX//	0.05	437.87	W	Details D1 0.10	Dia.	75 S	SC				°
	rk brown very sandy angular to subrounded fine d fragments of sandstone and siltstone with hig			(0.45)			ES 2 0.20 B 3 0.20-0.50						- -	
fragments are angul	d sized fragments are fine to coarse. Cobble size ar to subangular of sandstone and siltstone.	d		0.50	437.42		D 4 0.50 ES 5 0.50						_ _	o · O
	ttled orange and light grey slightly gravelly sand	dy		(0.30) 0.80	437.12		B 6 0.50-0.80						-	
angular to subangul	e content. Sand is fine to coarse. Gravel is ar fine to coarse of sandstone. Cobbles are	//		1.00 -	436.92		D 7 1.00 ES 8 1.00						-	
	ULDERS. (Driller's description)	ال					D 9 1.20-1.65						SPT(S) N=27 (6,7,6,8,7,6)	
	ey angular to subangular fine to coarse GRAVEL, limestone and mudstone.	of		(1.30)			L 10 1.20-2.00						1.20	
				-			B 12 2.00-2.30						SPT(S) N=50 - (4,12,12,12,14,12)	
Complete at 2	2.30m. Termination Reason: Rockhead			2.30	435.62		D 11 2.00-2.45						2.00	⊟ .
													-	
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Notes:	All depth in metres, all diameters in millime	etres.												
AGS	See header sheet for details of boring, prog For details of abbreviations, see key.		water.											



Project	Name	Ner	thead	Mines	- Pr	opose	d MWT	S, GI											H	lole ID	
Project	No.	TA8	234											Exp	olorator	y Hole	Log		WS	TP10	1
Engine	er	Aec																	CI	. 1 . 6	1
Employ Ground L			Coal A		ty				Coordin	ates	378	3107.75E	, 543505	5.69N			Grid		OSGB	et 1 of 1	<u> </u>
Date Star			9/2019							mpleted		09/2019						nation		m horizor	ntal
Top 0.00	Base 1.20	Туре	Date T	ime Sta 2019 10:10		ate Tin		Rig Crew	Loggei MPB	Barrel Ty	pe Drill NA		ant Use		ng Used Pi	it Stability Stable	/		Remarl		
1.20	2.00	WLS		2019 11:10		10/09/201		GC	MPB	NA NA	NA NA		Terrier	oois Noi	ie useu	Stable		0.501	II X 0.50III	k 1.20111	
						GRESS											STRIKES				
Date		Depth	Casini	g Wat	er			Rema	arks			Date	Time	Depth Strike	Depth Casing	Depth Sealed	Water Rose To	Time Elapsed		Remark	(S
10/09/20	13 12:30	2.00	0.00	Dr.		nd of Hole															
Donath	Donath	1		CABLE F	PERCL	JSSION	DETAILS	i				Donath	T4			SPT D	ETAILS			Double	Donath
Depth Top	Depth Base	Tim	e Start	Dura	tion	Тоо	ı		Rema	rks		Depth Top 1.20	Test Type S	N=26 (3,4,	-	d Result	н	Number TDP5	Energy Ratio	Depth Casing 0.00	Depth Water Dry
Depth Top	Depth Base	Flu	sh Type	Flu	RY FL	USH DI Flush Colour	ETAILS		Remarks	S											
HOLE DI	AMETER	CASING	DIAME	ΓER			DYNAN	IIC SAM	PLING												
Depth Base	Diameter	Depth Base	Diame	Dept 1.	h Top 20	Depth Base 2.00	Diamete 90	00:10	rtion R	Sample ecovery R 35	Run Reference 1	2									
	INSTA		N DETAI		Dine	e Pipe	PI	PE CONS	STRUCT	ION		Depth	Dept	·	DEF	TH RELA	TED REM	ARKS			
Distance	ID 1	Гуре "	Тор	Base	Ref		Тор	Base	Diamet	er Pipe	е Туре	Тор	Base				Ren	narks			
Depth	Depth				CKFII	LL DETA	ILS									LOCATIO		.S			
Top 0.00	Base 2.00	Bentonite		ription				Rer	marks							Ren	narks				
AGS		See he		eet for d	etails	of borin	millimet ıg, progre		ater.												
FINAL				Pri	nt dat	e and tir	me 17/0	1/2020 1				Log chec	ked by	MPB				SOI	L en	ginee	RING
Form No. S	SIEXPHOLI	EHDR			Issu	e.Revisio	n No. 2.02			ssue Date	22/06/2	016						Part	of the Bac	hy Soletanch	e Group

Project Name	Nenthead Mines - Proposed	MWTS,	Gl											Hole ID	
	TA022/							Explo	orato	ry Ho	le Lo	og		WCTD10	11
roject No. ngineer	TA8234 Aecom													WSTP10	lΤ
mployer	The Coal Authority													Sheet 1 of	1
Ground Level	+437.82mOD	Coord	dinate	c	378107.7	75F 5435	.05.69N	<u> </u>	Gr	id	09	GB		SHEEL I OI	т
lole Type	IP+WLS	Inclin				horizonta		•	GI.	iu		Лав			
					Depth					용 %	s,				Τ
	Description of Strata		Weathering	Legend	(Thick-	Datum	Waterstrike	Sampling		TCR/Sample Recovery %	SCR/Blows	RQD	±	In Situ Test	Insta
			Wea		ness)	Level	Wate	Details	Dia.	Reco	SCR	~		Details	atio
TOPSOIL.				V///V//	0.05	437.77		D 1 0.10							-
to coarse GRAVEL	to coarse SAND and subangular to subround of sandstone, mudstone and siltstone.	led fine						ES 2 0.20 B 3 0.20-0.50							100000
					(0.80)			ES 4 0.50							1
															-
Stiff brown slightly	sandy slightly gravelly CLAY. Sand is fine to	coarse.			0.85	436.97		D 5 0.85							
Gravel is subangul mudstone, siltston	ar to subrounded fine to coarse of sandstone	e,			-			ES 7 1.00 B 6 0.85-1.20						CDT(C) N . 2C	7
muustone, siitston	e and innestone.													SPT(S) N=26 (3,4,6,7,4,9)	-
					(1.15)			D 8 1.20-1.65						1.20	-
								L 9 1.20-1.75						SPT(S) 50/165mm	‡===== ======‡
								D 10 1.75-2.00						(12,13/50,22,23,5	/
Complete a	t 2.00m. Termination Reason: Achiev	/ed			2.00 -	435.82								15) 1.75	-
	Scheduled Depth													10	1
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					[:										1
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					-			1							+
							1								
NIoto	s: All depth in metres, all diameters in m	illimatras		I	1	<u> </u>		i		1		1	1		
	See header sheet for details of boring,			vater.											
AGS	For details of abbreviations, see key.	. •													
													50	II enginer	

Issue Date 02/03/2018

Print date and time 17/01/2020 19:25

Issue.Revision No. 2.05

FINAL

Form No. SIEXPHOLELOG



Project	Name	Ner	nthead	d Min	es - F	Propose	d MWT	S, GI							Eve	loroto	ماملا بعد	Loo		F	Hole ID	
Project Engine		TA8 Aec	234 om												ĽΧļ	norate	ry Hole	Log		WS	STP10	2
Employ		The	Coal	Autho	ority															She	eet 1 of 1	1
Ground L			7.87mC						Coord					543514	4.44N			Gri		OSGB		
Date Star			9/2019		·	D . T				Comple			9/2019		1 6		D': 0: 1:1:		lination		m horizor	ntal
Top 0.00	Base 1.20	lype	Date 10/09	11me 3 9/2019 1		10/09/20	ne End I	Rig Crew GC	Logg		rel Type Dr NA	NA NA		nt Use ed Hand T		ng Used I e used	Pit Stability Stable	/	0.50	Remarl m x 0.50m		
1.20	2.95	WLS		9/2019 1:		10/09/20		GC	MPB		NA	NA		Terrier								
					PR	OGRESS	5										WATER	STRIK	ES			
Date	Time	Depth	Dep Casi		epth Vater			Rema	arks				Date	Time	Depth Strike	Depth Casing		Wate Rose			Remark	(S
10/09/20	19 14:40	2.95	0.0		Dry	End of Holi	3															
		I		CABL	E PER	CUSSION	DETAILS								-		SPT D	ETAILS				
Depth Top	Depth Base	Tim	ne Starf	t Du	ration	Too	ol		Rem	narks			Depth Top	Test Type		Report	ed Result		Hammer Serial Number	Energy Ratio	Depth Casing	Depth Water
													1.20	S	N=19 (4,6, N=9 (2,3,3,	6,7,2,4) 3,1,2)			TDP5 TDP5	58 58	0.00	Dry Dry
				P.C.	ΙΤΔΡ Υ	FLUSH D	FTAILS						2.70	S	50/125mn				TDP5	58	0.00	Dry
Depth	Depth	E1	sh Typ		Flush	Flush	LIAILS		Remar	·kc												
HOLE DI	AMETER			ETER			DYNAM	IIC SAM	IPLING	G												
Depth Base	Diamete	r Depth Base		neter D	epth To	Depth Base	Diamete	r Dura	ition	Sampl Recove	le Rur ery Refere											
					1.20 2.00	2.00 2.70	89 89	00:1 00:1		40 55	1 2											
	INST	ALLATIO			l s		PI	PE CON:	STRUC	TION			5			DE	PTH RELA	TED RE	MARKS			
Distance	ID	Type R	esponse Top	Respo Bas		pe Pipe ef Ref	Тор	Base	Diam	eter	Pipe Typ	е	Depth Top	Deptl Base				Re	emarks			
Depth	Depth	1				FILL DETA	AILS					+					LOCATIO		ILS			
Top 0.00	Base 2.95	Bentonit		criptio	n	\perp		Rei	marks								Ren	narks				
0.00	2.95	Bentonit	e																			
AGS	Note	See he	eader s	heet fo	r detai		n millimeti ng, progre		ater.													
FINAL							me 17/0	1/2020 1	9:25				-	ked by	MPB						Ginee	
Form No. S	SIEXPHOL	EHDR			ls	sue.Revisio	on No. 2.02			Issue I	Date 22/0	6/201	6						Pa	rt of the Bac	hy Soletanch	e Group

roject Name	Nenthead Mines - Proposed	IVIVVIS,	Gi											Hole ID	
oject No.	TA8234							Explo	orato	ry Ho	le Lo)g		WSTP10	2
	Aecom													VV311 10	_
•	The Coal Authority													Sheet 1 of 1	1
round Level	+437.87mOD	Coord	linate	 S	378113.8	9E. 5435	14.44N	<u> </u>	Gri	id	09	GB		011000 1 01	
	IP+WLS	Inclina			90° from										
			- Gu		Depth		ě			e %	SA				
	Description of Strata		Weathering	Legend	(Thick-	Datum	Waterstrike	Sampling		TCR/Sample Recovery %	SCR/Blows	RQD	<u>u</u>	In Situ Test	Instal
			Wea	_	ness)	Level	Wate	Details	Dia.	TCR/ Reco	SCR	4		Details	ation
TOPSOIL.					0.10 -	437.77		D1 0.10							-
ragments. Gravel siz	k grey clayey gravelly fine to coarse sand ed fragments are subangular to subroun	ded fine			-			ES 2 0.20 B 3 0.20-0.50							1
o coarse of sandston	ne, mudstone, siltstone, ash and clinker.				(0.90)			ES 4 0.50						-	1::::::
					` ′ -										
					1.00 -	436.87		D 6 1.00							
	andy slightly gravelly CLAY. Sand is fine to angular to subrounded fine to coarse of	0			1.00	430.07		ES 5 1.00						SPT(S) N=19]::::::
	e, siltstone and limestone.				(0.56)			B 7 1.00-1.20						(4,6,6,7,2,4)	}
Assumed zone of no i	***************************************				1.56	436.31								1.20	
ASSUMED ZONE OF NO	recovery.				(0.44)			D 8 1.20-1.65 L 9 1.20-2.00							ļ
					2.00 -	435.87								SPT(S) N=9 -	
	rown slightly sandy slightly gravelly CLAN vel is subangular to subrounded fine to co				(0.45)			D 10 2.00-2.45						(2,3,3,3,1,2)	
sandstone and mudst	tone.					/2F /2		L 11 2.00-2.70						2.00	
	e to coarse SAND and subangular to sub L of limestone, mudstone, sandstone and				2.45	435.42								·	
siltstone.	2 ocotone, muustone, sanustone and	-			(0.50)			D 12 2.70-2.95						SPT(S) 50/125mm (14,11/50,25,25/5	
Complete at 2.	95m. Termination Reason: Engine	eer's		. () ()	2.95	434.92								0) _	
, -	decision, refusal				:									2.70	1
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FINAL

Print date and time 17/01/2020 19:25

Log checked by MPB



Project	Name	Ner	thead N	Vines	- Pro	oposed	TWM b	S, GI											H	lole ID	
Project	No.	TA8	234											Exp	olorator	y Hole	Log		WS	TP10	3
Engine	er	Aec		ol se															CI	. 1 . 6	1
Employ Ground L			Coal Au '.84mOD	utnorit	<u>y</u>				Coordir	nates	378	3104.71E	, 543508	3.52N			Grid		OSGB	et 1 of 1	L
Date Star	ted	12/0	9/2019						Date Co	ompleted		09/2019					Inclir	nation	90° fro	m horizor	ntal
Top 0.00	Base 1.20	Туре	Date Til	me Sta		ate Tin		Rig Crew	Logge MO	r Barrel Typ	Drill NA		ant Use		ng Used Pi	t Stability Stable	,		Remark		
1.20	2.00	WLS		019 07:30		13/09/201		GC	МО	NA NA	NA NA		Terrier	0013	ic dated	Stable		1.001		X 1.20111	
						GRESS											STRIKES				
Date 12/09/20		Depth 1.20	Casing		er	1 (0):6		Rema	arks			Date	Time	Depth Strike	Depth Casing	Depth Sealed	Water Rose To	Time Elapsed	1	Remark	(S
13/09/20 13/10/20	19 09:00	2.00 1.20	0.00 0.00 0.00	Dry Dry Dry	Er	nd of Shift nd of Hole tart of Shif															
				ARI F P	FRCI	NOISSI	DETAILS									SPT D	DETAILS				
Depth Top	Depth Base	Tim	e Start	Durat		Too		'	Rema	arks		Depth Top	Test Type		Reporte			ammer Serial Number	Energy Ratio	Depth Casing	Depth Water
												1.20 1.80	S S	N=18 (3,5, 50/160mr	5,5,5,3) n (14,10/50,1	6,23,11/10)		TDP5 TDP5	58 58	0.00	Dry Dry
Depth	Depth	T	sh Type	ROTAF		USH DE	TAILS		Remark												
Тор	Base			Retu	ım	Colour															
HOLE DI	AMETER	CASING	DIAMET	ER			DYNAM	IIC SAM	IPLING			1									
Depth Base	Diameter	Depth Base	Diamet	ter Depth	-	Depth Base 1.80	Diamete 87	O0:0	ition F	Sample Recovery R 44	Run reference 1	:									
	INSTA		N DETAIL		Dino	Pipe	PI	PE CON	STRUCT	ION		Depth	Dept		DEF	TH RELA	TED REM	ARKS			
Distance	ID 1	Гуре	Тор	Base	Ref		Тор	Base	Diame	ter Pipe	Туре	Top 0.00	Base 0.50		ed IP to avoid	buried wall.	Rer	narks			
				BA	CKFII	LL DETA	ILS	1	1				1	1		LOCATIO	n detail	.S			
Depth Top 0.00	Depth Base 2.00	D	Descri	ption				Rei	marks							Ren	narks				
0.00	2.00	Bentonite	e																		
AGS		See he	pth in me eader she tails of ab	et for de obreviati	etails ons s	of borin see key.	g, progre	ss and w					des 12	MDD				SOL	L en	Ginee	Blue
FINAL Form No. 9	SIEXPHOLI	EHDR		Prin			me 17/0 n No. 2.02			Issue Date		Log ched 016	жеа ву	IVIPB						hy Soletanch	

Project Name	Nenthead Mines - Proposed MW	13, Gl					Explo	orato	rv Ha	ا مار	nn		Hole ID	
Project No.	TA8234						LXPIC	Jiatoi	y i ic	ne Lo	<i>y</i> g		WSTP10)3
Engineer Employer	Aecom The Coal Authority												Sheet 1 of	1
Ground Level		oordinate	es	378104.	71E, 5435	08.521	 N	Gri	id	09	SGB		SHEEL I OI	
Hole Type	IP+WLS In	clination	ı	90° from	horizonta	al								
		Weathering	l	Depth	Datum	trike	Sampling		TCR/Sample Recovery %	lows	D		In Situ Test	Insta
	Description of Strata	Neath	Legend	(Thick- ness)	Level	Waterstrike	Details	Dia.	CR/Sa Recove	SCR/Blows	RQD	Ŧ	Details	atio
TOPSOIL.				0.10	437.74	-	D1 0.10	Dia.		0,				
	Dark brown slightly gravelly sandy clay with low nd sized fragments are fine to coarse. Gravel sized			(0.30)			ES 2 0.20 B 3 0.20-0.50							1
	ular to subrounded fine to coarse of limestone and ized fragments are angular to subrounded of	1		0.40 0.50	437.44		D 4 0.50							}
limestone and sand	dstone.	_/]		ES 5 0.50 B 6 0.50-0.80							
MADE GROUND: D	Remains of wall. Driller's description) Dark brown mottled dark grey slightly gravelly	-/		-	1		D 7 1.00							
	edium cobble content. Sand sized fragments are vel sized fragments are angular to subrounded fine			(1.30)	1		ES 8 1.00 B 9 1.20						SPT(S) N=18	1
to coarse of limest	one and sandstone. Cobble sized fragments are ular of limestone and sandstone.				1		D 10 1.20-1.65						(3,5,5,5,5,3) 1.20	-
angular to subangt	uiai oi iimestone anu sanustone.]		L 11 1.20-1.80							1
	andy CLAY with high cobble content. Sand is fine to)	A	1.80	436.04		D 12 1.80-2.00						SPT(S) 50/160mm (14,10/50,16,23,1	
	e angular to subrounded of limestone. 2.00m. Termination Reason: Engineer's	-	-A O- V	2.00 -	435.84								1/10)	12222
Complete at	decision, refusal				1								1.80	1
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	s: All depth in metres, all diameters in millime													
AGS	See header sheet for details of boring, progr For details of abbreviations, see key.	ess and	water.											
NΔI	Print date and time 17/	04 /000-	10.25				ked by MPR					SO	L engine	SBIL
	Print date and time 17/	11/2020	14.72		1.0	a chac	KOU DV IVIDR							



Project	Name	Nen	thead N	∕lines -	Prop	osec	MWT	S, GI						-					H	lole ID	
Project Engine		TA8:												Ext	olorator	y Hole	Log		WS	TP10	5
Employ	er	The	Coal Au	ıthority															She	et 1 of	1
Ground L			.41mOD						Coordin				, 543470	0.02N			Grid		OSGB		
Date Star	Base		9/2019 Date Ti n	no Starl	Dat	to Tim	o End	Dia Cross		ompleted		09/2019	ant Use	d Shori	ng Used Pi	t Ctabilita		nation	90° fro Remark	m horizor	ntal
Top 0.00	1.20	IP	13/09/20	19 12:45	13/	/09/201	9 13:45	GC	МО	Barrel Typ	NA		ted Hand 1		ng used Pi ne used	Stability	1		m x 0.50m		
1.20	2.10	WLS	13/09/20	19 14:00	13/	/09/201	9 15:30	GC	МО	NA	NA		Terrier								
				F	ROG	RESS										WATER	STRIKES	<u> </u>			
Date ⁻	Гіте	Depth	Depth Casing	Depth Water				Rema	arks			Date	Time	Depth Strike	Depth Casing	Depth Sealed	Water Rose To	Time Elapsed		Remark	ks
13/09/20	19 15:30	2.10	0.00	Dry		of Hole															
			C	ABLE PE	RCUS	SION	DETAILS					-	1			SPT D	DETAILS				
Depth Top	Depth Base	Tim	e Start	Duratio	on	Tool			Rema	arks		Depth Top 1.20	Test Type S	N=7 (1,1,1	Reported	d Result	н	ammer Serial Number TDP5	Energy Ratio	Depth Casing	Depth Water Dry
Depth Top	Depth Base	Flus	sh Type	ROTAR'	h F	SH DE Flush Colour	TAILS		Remark	s		1.80	S	30/2031111	n (18,7/35,18	10,14/ 33)		TDP5	58	0.00	Dry
ТОР	Buse			Ketal		.coloui															
HOI E DI	A N A E T E E	CASINIC	DIAMETE	:D			DYNAM	IC CAN	IDLING												
Depth	Diamete	Donth		er Depth	C	Depth	Diamete			Sample	Run										
Base	Diamete	Base	Diamete	1.20	1	1.80	87	00:0	- '	Recovery R	eference 1										
	INST	<u>l</u> Allatioi	N DETAIL:	S			PI	PE CON	STRUCT	ION					DEP	TH RELA	TED REM	ARKS			
Distance	ID .	Туре Re	sponse Re Top		Pipe Ref	Pipe Ref	Тор	Base	Diame	ter Pipe	Туре	Depth Top	Dept Base				Rer	marks			
D 11	D			BAC	KFILL	DETA	ILS									LOCATIO	n detail	.S			
Depth Top 0.00	Depth Base 2.10	Bentonite	Descrip	otion				Re	marks							Ren	narks				
0.30	_																				
AGS	Note	See he	oth in met eader shee tails of ab	et for det breviatio	ails of ons see	f boring e key.		ss and w			L	og chec	ked by	MPB				SOI	L en	GINE	RING
Farm No. C	ILADITOT	TUDD			Inner E	D	No 202			I D-+-	22/00/20	11.0						-			

Project Name	Nenthead Mines - Proposed MV	NTS, G	àl											Hole ID	
Project No.	TA8234							Explo	rator	у Но	le Lo	g		WSTP10	5
Engineer Employer	Aecom The Coal Authority													Sheet 1 of	1
Ground Level		Coordir	nates		378153.2	27E, 5434	70.021		Gri	d	OS	GB		311661 1 01	1
Hole Type		Inclinat				horizonta									
	Description of Strata		Weathering	Legend	Depth (Thick- ness)	Datum Level	Waterstrike	Sampling Details	Dia.	TCR/Sample Recovery %	SCR/Blows	RQD	<u>u</u>	In Situ Test Details	Install- ation
fragments with med angular to subround Cobble sized fragme sandstone. MADE GROUND: Decorate sand sized fresized fragments are sandstone. Cobble sized fragments are sandstone and sandst	2.10m. Termination Reason: Engineer's decision, refusal All depth in metres, all diameters in millim	d de e		vater .	(0.40)	439.01		Details D1 0.10 ES 2 0.20 B3 0.20-0.50 D4 0.50 ES 5 0.50 B6 0.50-0.80 D7 1.00 ES 8 1.00 D9 1.20-1.65 L10 1.20-1.65 D11 1.80-2.10	Dia.	TC Re				SPT(S) N=7 (1,1,1,2,2,2) 1,20 SPT(S) 50/205mm (18,7/35,18,18,14/55) 1,80	
	See header sheet for details of boring, pro For details of abbreviations, see key.	gress a	nd w	vater.											

Print date and time 17/01/2020 19:25

FINAL

Form No. SIEXPHOLELOG

Log checked by MPB

Issue Revision No. 2.05 Issue Date 02/03/2018



Project	Name	Ner	thead	Mines	- Pr	opose	TWM b	S, GI											H	lole ID	
Project	No.	TA8	234											Exp	olorator	y Hole	Log		WS	TP10	6
Engine	er	Aec																	CI	. 1 . 6	1
Employ Ground L			Coal A		ty				Coordin	ates	378	3226.24E	, 543407	.29N			Grid		OSGB	et 1 of 1	L
Date Star			9/2019							mpleted		09/2019						nation		m horizor	ntal
Top 0.00	Base 1.20	Туре	Date T	ime Sta 2019 08:19		ate Tin		Rig Crew GC	Logge MO	Barrel Ty	pe Drill NA		ant Used		ng Used Pi	t Stability Stable	/		Remark		
1.20	1.50	WLS		2019 09:45		16/09/201		GC	MO	NA NA	NA NA		Terrier	JOIS NOT	ie useu	Stable		0.501	ii x 0.50iii :	k 1.20111	
					PRO	GRESS										WATER	STRIKES	6			
Date '		Depth	Casing	g Wat	er			Rema	arks			Date	Time	Depth Strike	Depth Casing	Depth Sealed	Water Rose To	Time Elapsed		Remark	(S
16/09/20	19 11:00	1.50	0.00	Dr.	y E	nd of Hole															
				CABLE F	PERCL	ISSION	DETAILS	5								SPT D	ETAILS				
Depth Top	Depth Base	Tim	e Start	Dura	tion	Too	I		Rema	rks		Depth Top	Test Type		Reporte		н	ammer Serial Number TDP5	Energy Ratio	Depth Casing 0.00	Depth Water
Depth Top	Depth Base	Flu	sh Type	Flu	RY FL ush urn	USH DI Flush Colour	ETAILS		Remark	S		-									
HOLE DI	AMETER	CASING	DIAME1	ΓER			DYNAM	1IC SAM	PLING												
Depth Base	Diameter	Depth Base	Diame	Dept 1.	h Top 20	Depth Base 1.50	Diamete 87	00:1	rtion R	Sample ecovery R 20	Run Reference 1										
			N DETAI		Dine	Pipe		IPE CON:	1			Depth	Depth		DEF	TH RELA	TED REM	ARKS		'	
Distance	ID 1	Гуре	Тор	Base	Ref		Тор	Base	Diamet	er Pipe	е Туре	Тор	Base				Ren	narks			
Depth	Depth				CKFII	LL DETA	ILS									LOCATIO		.s			
Top 0.00	Base 1.50	Bentonite		ription		-		Rei	marks							Ren	narks				
AGS		See he		eet for d Ibbreviat	etails tions s	of borin see key.		ess and w				lee -'	الموال •	ADP				SOI	L en	Ginee	RIDG
FINAL Form No. 9	SIEXPHOLI	EHDR		Prii			me 17/0 n No. 2.02	1/2020 1		ssue Date		Log chec 016	neu by N	vILD						hy Soletanche	

Project Name	Nenthead Mines - Proposed M	1WTS,	GI											Hole ID	
								Explo	rator	у Но	le Lo	g		WCTD10	_
Project No. Engineer	TA8234 Aecom													WSTP10	Ь
Employer	The Coal Authority													Sheet 1 of	1
Ground Level	+443.00mOD	Coord	linate	S	378226.2	4E, 5434	07.291	1	Gri	d	OS	GB			
Hole Type	IP+WLS	Inclin				horizonta				0 -				I	
	Description of Strata		Weathering	Legend	Depth (Thick- ness)	Datum Level	Waterstrike	Sampling Details	Dia.	TCR/Sample Recovery %	SCR/Blows	RQD	±	In Situ Test Details	Install- ation
MADE GROUND: De fragments with high angular to with high almestone. Cobble si siltstone, sandstone from 1.00m less gradient at 1.00m less	ompacted limestone surface. (Driller's descrip urk brown very gravelly fine to coarse sand siz a cobble content. Gravel sized fragments are led fine to coarse of siltstone, sandstone and ized fragments are angular to subangular of	's				442.90 441.50	Wate	Details D1 0.10 ES 2 0.20 B 3 0.20-0.50 ES 4 0.50 D5 1.00 ES 6 1.00 B 8 1.20-1.50 D 7 1.20-1.60	Dia.	TCRA ² (FCRA ² (FCR	S C C N			SPT(S) 50/240mm (5,3,7,25,12,6/15) 1.20	
	See header sheet for details of boring, p			vater.											

Issue Date 02/03/2018

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Form No. SIEXPHOLELOG

Print date and time 17/01/2020 19:25

Issue.Revision No. 2.05

soil engineering

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Project	Name	Nen	thead	Mines	- Pr	opose	TWM b	S, GI											H	łole ID	
Project	No.	TA8	234											Exp	olorator	y Hole	Log		WS	STP10	7
Engine	er	Aec																	CI	. 1 (1
Employ Ground L			Coal A		ty				Coordin	ates	378	3269.78E	, 543368	3.91N			Grid		OSGB	et 1 of :	1
Date Star			9/2019							mpleted		09/2019						nation		m horizor	ntal
Top 0.00	Base 1.20	Туре	Date T	ime Sta 2019 11:19		ate Tin	ne End	Rig Crew	Logge MO	Barrel Ty	ype Drill NA		ant Use		ng Used Pi	t Stability Stable	/		Remarl		
1.20	2.65	WLS		2019 12:15		16/09/201		GC	MO	NA NA	NA NA		Terrier	oois Noi	ie useu	Stable		0.501	ii x u.suiii	X 1.20111	
					PRO	GRESS										WATER	STRIKES				
Date '		Depth	Casini	g Wat	ter			Rema	arks			Date	Time	Depth Strike	Depth Casing	Depth Sealed	Water Rose To	Time Elapsed	ı	Remark	KS
16/09/20	19 14:50	2.65	0.00	Dr.	y	nd of Hole															
Donth	Donth			CABLE F	PERCU	JSSION	DETAILS	i				Donth	Toot			SPT D	ETAILS		Engrav	Donth	Donth
Depth Top	Depth Base	Tim	e Start	Dura	tion	Тоо	ı		Rema	rks		Depth Top 1.20	Test Type S	N=41 (2,4,	Reporte	d Result	H	Number	Energy Ratio	Depth Casing 0.00	Depth Water Dry
				ROTA	RY FL	LUSH DI	ETAILS					2.00	SS	50/25mm	4,13,12,11,11 (25/25,50/2!	5)		TDPS TDPS	58 58	0.00	Dry Dry
Depth Top	Depth Base	Flu	sh Type		ush turn	Flush Colour			Remarks	S											
HOLE DI Depth	AMETER	CASING Depth		ΓER	1	Depth	DYNAM	IIC SAM		Sample	Run										
Base	Diameter	Base	Diame		20 .00	Base 2.00 2.60	Biamete 87 65	00:04 00:04	R 3:00		Reference										
	INSTA	ALLATIO			1		PI	PE CONS	STRUCT	ION					DEF	TH RELA	TED REM	ARKS			
Distance	ID 1	Гуре	sponse f Top	Response	e Pipe Ref		Тор	Base	Diamet	er Pip	е Туре	Depth Top	Dept Base				Rer	narks			
Depth	Depth	I			ACKFI	LL DETA	ILS									LOCATIO		.S			
Top 0.00	Base 2.65	Bentonite		ription		+		Rer	marks							Ren	narks				
AGS		See he		eet for d	letails	of borin	millimet g, progre		ater.												n e
FINAL Form No. 9	SIEXPHOL	EHDR		Pri			me 17/0 n No. 2.02			ssue Date	e 22/06/2	Log chec	ked by	MPB						hy Soletanch	
					.500					- 5400	0, 2							L	540	,	

Project Name	Nenthead Mines - Proposed MWT	S, GI											Hole ID	
Project No.	TA8234					Explo	rator	у Но	le Lo	g		WSTP10	7	
Engineer Employer	Aecom The Coal Authority												Sheet 1 of	1
Ground Level		ordinate	!S	378269.7	'8E, 5433	68.91N	J	Gri	d	OS	GB		011000 1 01	_
Hole Type	IP+WLS Inc	lination		90° from	horizonta									
	Description of Strata	Weathering	Legend	Depth (Thick- ness)	Datum Level	Waterstrike	Sampling Details	Dia.	TCR/Sample Recovery %	SCR/Blows	RQD	느	In Situ Test Details	Install- ation
	mpacted limestone surface. (Driller's description) rk brown very gravelly fine to coarse sand sized			0.10	445.44		D 1 0.10 ES 2 0.20							
fragments with med angular to subround	lium cobble content. Gravel sized fragments are ed fine to coarse of siltstone, mudstone and zed fragments are angular to subangular of			(1.40)			B 3 0.20-0.50 ES 4 0.50 D 5 1.00 ES 6 1.00						-	
from 1.20m more cl	ayey			-			D 7 1.20-1.65						SPT(S) N=41 (2,4,2,9,15,15)	
cobble and boulder Gravel sized fragme limestone, sandston	rk brown slightly gravelly sandy clay with high content. Sand sized fragments are fine to coarse. nts are angular to subangular fine to coarse of e, siltstone and slate. Cobble and boulder sized ar to subangular of limestone, sandstone and			1.50 -	444.04		D 9 2.00-2.45 L10 2.00-2.60						SPT(S) N=47 - (9,14,13,12,11,11) 2.00 SPT(S) 50/25mm	
Complete at 2	.65m. Termination Reason: Engineer's decision, refusal		XXXXXXX	2.65	442.89								(25/25,50/25)	
	All depth in metres, all diameters in millimetr See header sheet for details of boring, progre		water	<u> </u>	<u> </u>		L	1		<u> </u>	<u> </u>			'
	For details of abbreviations, see key. Print date and time 17/0				Lo	n chec	ked by MPR					SOI	L enginee	RING

Issue Date 02/03/2018

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Form No. SIEXPHOLELOG

Print date and time 17/01/2020 19:25

Issue.Revision No. 2.05



SUPPORTING FACTUAL DATA

SECTION A

Exploratory Hole Records and Field Data

EXCAVATION RECORDS

Project No. TA8234 Engineer Accom Employer The Coal Authority Sheet 1 of Employer The Coal Authority Sheet 1 of Employer The Coal Authority Sheet 1 of Employer The Coal Authority Date Corplands: 37831757,5438361N Method Expounds: 9T Tracked Exceptor Dies Started O4/09/2019 Date Completion: 04/09/2019 Description of Strata Description of Description De	
Engilined According The Coal Authority Ground Level 498 30m0D Coordinates 378131.75E.5499261N Grid OSGB Hole Type TP Method/Equipment 9T Flacked Executor Date Started 0.04.99/2019 Date Completed 04-09/2019 Logged By MO Description of Strate Description of Strate Description of Strate Description of Strate AMDE GROUND Gray and brown sity very gravelly fire to coarse sand sized fragments with high cubble and boulder content. Grave last fragments was angular to subanquilar for executor devox, saidtiters and sized fragments was angular to subanquilar of executors and districts. Positive sized fragments was angular of effectives. Bits of excession at 2.56m. Teammation Reason: Too unbasine to contenue Easility Unstable Substitute Unstable Substitute DePth BELATED REMARKS Toppin Top Jum Reason Depth Belated Depth Selection Description Description of Depth Belated Depth Selection Description of Description Contention Contentio	
Found tiped 4-438 30mc0D Coordinates 37833.7175_52.44898(b)N Gird OSSGB Hole Type 1P Method Equipment 91 Tracked Executors Date Samed 04/09/2019 Date Completed 04/09/2019 Description of Strata MADE CRICIAND Groy and brown sity way gravely fee to cares and store fragments with high couble and boulder content. Greek iszed fragments are angular to subaniquilar of rocost, sandstone and strategies. The subaniquilar of rocost, sandstone and strategies. Research of the subaniquilar of subaniquilar of rocost, sandstone and strategies. Research of the subaniquilar of rocost, sandstone and strategies. Research 12.856. Termination Reason: Too unstable is continue. Subblity Unstable Exercised Strain Strai	
Find a Started D4/09/2013 Dues Completed 04/09/2019 Legand By MO Copyed By MO	
Description of Strata MADE CROUND: Grey and brown stilly very gravelly fine to coarse and cored fragments with high cookse and bootsfor content. Gravel sized fragments are angular to subangular for two dustrations and distance. Content Gravel sized fragments are angular to subangular for wood, sandstone and distance. Content regiments are angular of electronic. 2,00	
Sobility Unctable Solvaing None used Depth Related Demands Depth Depth Related Demands Depth Depth Related Demands Depth Depth Related Demands Depth Depth Depth Depth Demands Depth Depth Depth Depth Depth Demands Depth Depth Depth Depth Depth Demands Depth Depth Depth Demands Depth Depth Depth Depth Demands Depth Depth Depth Depth Depth Demands Depth	
Table (BOUND) Givey and brown elly very growthy the to coarse said state fragments with high coarse of wood, sandstore and sillations. Cobble said fragments are angular to subangular for coarse of wood, sandstore and sillations. Boulder sized fragments are angular of subsangular of wood, sandstore and sillations. Boulder sized fragments are angular of subsangular of wood, sandstore and sillations. Boulder sized fragments are angular of subsangular of wood, sandstore and sillations. Boulder sized fragments are angular of subsangular of wood, sandstore and sillations. Boulder sized fragments are angular of subsangular of wood, sandstore and sillations. Boulder sized fragments are angular of subsangular of wood, sandstore and sillations. Boulder sized fragments are angular of subsangular of wood, sandstore and sillations. Boulder sized fragments are angular of subsangular of wood, sandstore and sillations. Boulder sized fragments are angular of subsangular of wood, sandstore and sillations. Boulder sized fragments are angular of subsangular of wood, sandstore and sillations. Boulder sized fragments are angular of subsangular of wood, sandstore and sillations. Boulder sized fragments are angular of subsangular of wood, sandstore and sillations. Boulder sized fragments are angular of subsangular of wood, sandstore and sillations. Boulder sized fragments are angular of subsangular of wood, sandstore and sillations. Boulder sized fragments are angular of subsangular of wood, sandstore and sillations. Boulder sized fragments are angular of sillations. Boulder sized fragments are angular of sillations. Boulder sized fragments are angular to subsangular of wood, sandstore and sillations. Boulder sized fragments are angular to subsangular of wood, sandstore and sillations. Boulder sized fragments are angular to subsangular of wood, sandstore and sillations. Boulder sized fragments are angular to subsangular of wood, sandstore and sillations. Boulder sized fragments are angular to subsangular to subsangular of wood, sandst	Install- ation
End of excavation at 2.05m. Termination Reason: Too unstable to continue End of excavation at 2.05m. Termination Reason: Too unstable to continue End of excavation at 2.05m. Termination Reason: Too unstable to continue Establity Unstable Shoring None used Excavation Dimensions and Orientation Length (Sides A and C) 2.75m Length (Sides A and C) 2.75m Length (Sides B and D) 1.85m Depth Top Depth Base Depth Related Remarks Depth Gide B and D) 1.85m Depth Top Depth Base Depth Related Remarks Depth Gide B and D) 1.85m Depth Top Depth Base Depth Related Remarks Depth Gide B and D) 1.85m Depth Top Depth Base Depth Related Remarks Depth Gide B and D) 1.85m Depth Top Depth Base Depth Base Depth Gide B and D) 1.85m Depth Top Depth Base Depth Gide B and D) 1.85m Depth Top Depth Base Depth Gide B and D) 1.85m Depth Top Depth Base Depth Gide B and D) 1.85m Depth Top Depth Base Depth Gide B and D) 1.85m Depth Top Depth Base Depth Gide B and D) 1.85m Depth Top Depth Base Depth Gide B and D) 1.85m Depth Top Depth Gide B and D) 1.85m	
Shoring None used Length (Sides A and C) 2.75m DEPTH RELATED REMARKS Length (Sides B and D) 1.85m Depth Top Depth Base Remarks Remarks Depth 2.05m 0.30 0.50 Large wood log. Region place Side A toward Side Remarks 1.63°	
Shoring None used Length (Sides A and C) 2.75m DEPTH RELATED REMARKS Length (Sides B and D) 1.85m Depth Top Depth Base Remarks Remarks Depth 2.05m 0.30 0.50 Large wood log. Region place Side A toward Side Remarks 1.63°	
Depth Top Depth Base Remarks Depth 2.05m 0.30 0.50 Large wood log.	
0.30 0.50 Large wood log.	
0.30 2.05 Large siltstone blocks. Bearing along Side A toward Side B 162 1.40 1.45 Water seepage (insufficient for sample).	
WATER STRIKES WATER STR Date Time Depth Strike Depth Sealed Depth Water	
BACKFILL	
Depth Top Depth Base Description Remarks 0.00 2.05 Arisings	
DEPTH RELATED EXPLORATORY HOLE REMARKS GENERAL NOTES	
Depth Top Depth Base Remarks Remarks Remarks 1. All sides similar. 2. Photographs taken of sides A, D and spoil. 3. No	RR - too
gravelly.	ж - ю
Notes: All depth in metres, all soil strengths are average in kPa. For in situ test results, see accompanying records. All bearings given relate to magnetic North. For details of abbreviations, see key. FINAL Print date and time 17/01/2020 19:24 Form No. SIEXPHOLETPLOG Issue Revision No. 2.05 Issue Date 04/01/2019 Part of the Bachy Soletance	

Project Name	Nenthead Mines - Proposed	MWTS, GI									Н	ole ID	
Project No.	TA8234					Exc	avati	on Log			TI	P108	
Engineer	Aecom												
Employer Ground Level	The Coal Authority +462.11mOD	Coordinates 378458.80E	5432	96.48N			Grid	OSGB			Sne	et 1 of :	L
Hole Type	TP	Method/Equipment 9T Tracked											
Date Started	04/09/2019	Date Completed 04/09/2019	т —	1	1	L	ogged	Ву МО			1		1
	Description of Strata		Weathering	Legend	Depth (Thick- ness)	. Level	Waterstrike	Samp Deta				tu Test tails	Install- ation
TOPSOIL. MADE GROUND: M	Nottled orange and dark grey brown slightly	gravelly sandy clay with high cobble			0.10	462.01							
fine to coarse of said siltstone and sands		nts are angular to subangular of			(0.40) 0.50	461.61		B 1 0.45				-	
	End of excavation at 0.50m. Termination Rea	son: Stone Structure										_	
						-							
						-						-	
						-						_	
						-						-	
						-						-	
						-							-
]							
						-						=	
						-							
						-						-	
]							
						-							
						-						-	
]							
]							
						-							
Stability	All faces stable						L Ex	cavation Dime	ensions	and	1 Orientati	on	
Shoring	None used						-	des A and C)				2.60m	
Depth Top Depth Ba		TED REMARKS Remarks				Ler De _l		des B and D)				1.40m 0.50m	
0.20 0.25	Water seepage (insufficient for sample).							ong Side A tov	ward Sid	de B		3.30m 311°	
							Date Ti	WATER STRIK		rike D	epth Sealed	WATER STR	
		KFILL					Dute III	ne .	Бериго	ITING D	eptii Scalcu	Борин Мисс	тите вирос
Depth Top Depth Ba 0.00 0.50	Se Description Arisings	Remarks											
	DEPTH RELATED EXPLO	RATORY HOLE REMARKS						GEN	ERAL N	OTES	<u> </u>		
Depth Top Depth Ba	se	Remarks			1	. All sides si	milar. 2	. Photographs ta	Remark		A, D and s	poil.	
						01		J 7			91	•	
AGS Notes	: All depth in metres, all soil strengths a All bearings given relate to magnetic I		ults, se	e accomp	anying re	ecords.							
FINAL	For details of abbreviations, see key. Print date and time	e 17/01/2020 19:25	Lo	g checked	by MP	PB			\dashv	SOI	ıL end	sinee	RING
Farma Na CIEVELLOLE		No 20E Janua Data 0/			~y 1V11				-+	Dort -	ef +ha Da -L	u Coloto	ha Crai

Project Name	Nenthead Mines - Propos	ed MWTS, GI								F	lole ID	
Project No.	TA8234					Exc	avati	on Log		Т	P109	
Engineer	Aecom											
Employer	The Coal Authority	0 1:	F F (00				0 : 1	0000		She	et 1 of 1	1
Ground Level Hole Type	+469.41mOD TP	Coordinates 378500.78 Method/Equipment 9T Tracked					Grid	OSGB				
Date Started	04/09/2019	Date Completed 04/09/201				L	ogged	Ву МО				
	Description of St	ata	Weathering	Legend	Depth (Thick- ness)	Datum Level	Waterstrike	Samp Deta			tu Test etails	Install- ation
boulder content. Sai subangular fine to c	own mottled light orange slightly sand nd sized fragments are fine to coarse. (oarse of sandstone and siltstone. Cobb nne and sandstone. Boulder sized fragn	iravel sized fragments are angular to le sized fragments are angular to			0.10	469.31		B 1 0.50 D 3 1.00 ES 2 1.00 B 4 1.50			-	
End	of excavation at 1.90m. Termination Rea	son: Too unstable to continue			1.90	467.51		W 5 1.80			-	
Carletta.	H							Discontinua Discontinua		10:		
Stability Shoring	Unstable None used					Ler		cavation Dime des A and C)	nisions an		on 2.55m	
		ELATED REMARKS					-	des B and D)			1.60m	
Depth Top Depth Bas 1.70 1.90	e Water seepage (small sample taken).	Remarks				De		C: L A	16:1		1.90m	
						Dea		ong Side A tov		D	322°	
							Date Tir	WATER STRIKI		Depth Sealed		Time Elapse
		BACKFILL										
Depth Top Depth Bas 0.00 1.90	e Description Arisings	Remarks										
	,											
	DEPTH RELATED EX	LORATORY HOLE REMARKS						GENE	RAL NOT	ES	1	
Depth Top Depth Bas	е	Remarks			1	All sides si	milar a	Photographs ta	Remarks	e A Danda	noil 3 Ma	CRP - +^^
						avelly.	miiar. 2	. Pnotograpns ta	ken of side	s A, D and s	рон. з. №	СВК - 100
ACC	All bearings given relate to magne For details of abbreviations, see ke Print date and		Lo	og checked						DIL EN		

Project Na	ame	Nenthead Mines - Proposed	MWTS, GI									Н	ole ID	
Project No		TA8234					Exc	avati	on Log			TI	P110	
Engineer Employer		Aecom The Coal Authority										Sho	et 1 of :	1
Ground Leve		+491.33mOD	Coordinates 378670.90E	5433	305.09N			Grid	OSGB			3110	CC 1 OI .	
Hole Type		TP	Method/Equipment 9T Tracked	Excava	ator									
Date Started	d ———	05/09/2019	Date Completed 05/09/2019	т —	1			.ogged	By MO					
		Description of Strata		Weathering	Legend	Depth (Thick- ness)	- Datum	Waterstrike	Samp Deta				u Test tails	Install- ation
TOPSOIL. Soft to firm	grey mot	tled orange slightly gravelly sandy CLAY w	ith medium cobble content. Sand is		p. i	0.10	491.23							
		is angular to subangular fine to coarse of to subangular of siltstone and limestone.	sandstone, limestone and siltstone.			(0.85)			B 1 0.50				-	
to coarse. G	iravel is a	eish black slightly gravelly sandy CLAY wit ngular to subangular fine to coarse of silts				0.95	490.38		D 3 1.00 ES 2 1.00				-	
angular to s	subangula	r of siltstone.							B 4 1.50				-	
						(2.05)	-		D 6 2.00 ES 5 2.00				-	
									B 7 2.50				-	
	End of e	excavation at 3.00m. Termination Reason: A	chieved Scheduled Depth	_		3.00	488.33		D 9 3.00 ES 8 3.00				-	
													-	
							-						-	-
							-						-	
													-	
							-						-	
							-						-	
							-							
Stability		All faces stable						I E	cavation Dime	nsions	and O	rientatio	on	
Shoring		None used					Le	ngth (S	des A and C)			3	3.10m	
D 11 T D			ED REMARKS						des B and D)				L.60m	
Depth Top De	ериі ваѕе		Remarks					pth aring a	ong Side A tow	uard Sid	۵R		3.00m 342°	
						-		uning u	WATER STRIKE				WATER STE	WEG DETAIL
								Date Ti			rike Dep		Depth Water	
D 11 T D			KFILL											
Depth Top De 0.00	epth Base 3.00	Description Arisings	Remarks											
		DEPTH RELATED EXPLO	RATORY HOLE REMARKS						GENE	ERAL NO	OTES			
Depth Top De	epth Base		Remarks			1	All sides s	imilar 2	F Photographs ta	Remarks ken of si		D and sr	noil	
							2.300 0		.gp	. 27 31	- 17			
AGS	1	I All depth in metres, all soil strengths a All bearings given relate to magnetic N For details of abbreviations, see key.		ults, se	ee accomp	anying re	ecords.							
FINAL	/DUOLETE		2 17/01/2020 19:25		og checked	l by MP	В				SOIL	. end	sinee	RING
Larma NIA CITY	COLLOLETE	nav leer Desiries	No. 2 OF Janua Data O/	101/20	r:(O					1 1	last of	the De-L	u Calata	no Cross-

Project Name	Nenthead Mines - Propose	d MWTS, GI								Hol	le ID	
Project No.	TA8234					Exc	avati	on Log		TP [.]	111	
Engineer	Aecom									11.	111	
Employer	The Coal Authority									Sheet	1 of 1	1
Ground Level	+486.39mOD	Coordinates 378642.471					Grid	OSGB				
Hole Type Date Started	TP 05/09/2019	Method/Equipment 9T Tracked Date Completed 05/09/201:		ator		1	ogged	By MO				
			_	Ι	Depth		т —					
	Description of Stra	ta	Weathering	Legend	(Thick-	Datum Level	Waterstrike	Samp Deta		In Situ Deta		Install- ation
TOPSOIL.			×	X//XX///	ness)	486.29	8					
Firm to stiff orange fine to coarse. Grav angular to subangu	mottled black slightly sandy gravelly CL/el is angular to subangular fine to coarse lar of siltstone. Boulders are angular of s	of siltstone and sandstone. Cobbles are Itstone.			(2.15)	484.14		B1 0.50 D3 1.00 ES 2 1.00 B4 1.50 D6 2.00 ES 5 2.00		HV 1.00 HV 1.00 1.00		
												-
Stability	All faces stable					1.		cavation Dime	nsions an			
Shoring	None used DEPTH REI	ATED REMARKS						des A and C) des B and D)			20m 80m	
Depth Top Depth Ba	se	Remarks					pth			2.2	25m	
						Bea	aring al	ong Side A tov	ard Side E	3 20	٥	
								WATER STRIK				RIKES DETAI
	B	ACKFILL					Date Tir	ii6	⊔epτh Strike	Depth Sealed De	eptn Water	IIIme Elapse
Depth Top Depth Ba	se Description Arisings	Remarks										
0.00 2.25												
	DEPTH RFI ATFD FXP	ORATORY HOLE REMARKS						GFNI	RAL NOT	ES		
Depth Top Depth Ba		Remarks						-	Remarks			
						All sides si avelly.	milar. 2	. Photographs ta	ken of side	s A, D and spo	il. 3. No	CBR - too
AGS Notes	All bearings given relate to magneti For details of abbreviations, see key			ee accomp					so	DIL engi	inee	RING
FINAL Form No. SIEXPHOLE		on No. 2.05 Issue Date 04			י או או או או					t of the Bachy S		

Project Nan	ne	Nenthead Mines - Proposed	MWTS, GI									Н	lole ID	
Project No.		TA8234					Exc	avati	on Log			TI	P112	
Engineer Employer		Aecom The Coal Authority										Sha	et 1 of 1	1
Ground Level		+496.21mOD	Coordinates 378726.21E	, 5433	338.28N	1		Grid	OSGB		l		00101	
Hole Type		TP	Method/Equipment 9T Tracked I		ntor									
Date Started		05/09/2019	Date Completed 05/09/2019		I	I		ogged	By MO			I		
		Description of Strata		Weathering	Legend	Depth (Thick- ness)		Waterstrike	Samp Deta				tu Test tails	Install- ation
Gravel is angu siltstone and s	llar to su sandstor	rown sandy gravelly CLAY with medium bangular fine to coarse of siltstone and see. eish grey slightly sandy gravelly CLAY wi	andstone. Cobbles are angular of			(0.95)	495.26		B1 0.50					
	vel is an	gular to subangular fine to coarse of silts				(2.05)			ES 2 1.00 B 4 1.50 D 6 2.00 ES 5 2.00 B 7 2.50				-	
E	End of e	xcavation at 3.00m. Termination Reason: A	schieved Scheduled Depth		2 0 0 0 24 0 0 0	3.00	493.21		D 9 3.00 ES 8 3.00				-	
													-	
Stability		All faces stable							xcavation Dime	ensions	and (
Shoring Depth Top Dept		None used DEPTH RELA	TED REMARKS Remarks				Ler De	ngth (S pth aring a	ides A and C) ides B and D) long Side A tov		le B	<u>:</u> :	3.30m 1.55m 3.00m 63°	
								Date Ti	WATER STRIK		rike De		WATER STR Depth Water	
L			KFILL								T			
Depth Top Dept		Description Arisings	Remarks											
		DEPTH RELATED EXPLO	RATORY HOLE REMARKS			+			GENE	ERAL N	OTES	;	<u> </u>	
Depth Top Dept	th Base		Remarks				VII -: -	mail- ^	-	Remarks	3			
					. AII sides si	mılar. 2	. Photographs ta	iken of s	ides A	A, D and sp	DOII.			
AGS	Α	II bearings given relate to magnetic N or details of abbreviations, see key.									50'	1.00		nicc
FINAL	IOLETPI		2 17/01/2020 19:25		og checked	by MP	В			;	Dort	t the Day	GINEE	ho Cirri

Project Name	Nenthead Mines - Propos	ed MWTS, GI								Н	ole ID	
Project No.	TA8234					Exc	avati	on Log		TI	P113	
Engineer	Aecom											
Employer	The Coal Authority	0. 1:	F F (0)	207.071			0 : 1	0000		She	et 1 of 1	1
Ground Level Hole Type	+493.48mOD TP	Coordinates 378701.95 Method/Equipment 9T Tracked					Grid	OSGB				
Date Started	09/09/2019	Date Completed 09/09/201		3101		L	ogged	Ву МО				
	Description of St	rata	Weathering	Legend	Depth (Thick- ness)	Datum Level	Waterstrike	Samp Deta			u Test tails	Install- ation
TOPSOIL.			3	X//XX//	0.10	493.38	3					
content. Sand is fin are angular to suba	ueish mottled dark grey organic slightly to coarse. Gravel is angular to subang ngular of sandstone. ind of excavation at 1.10m. Termination f	ular fine to coarse of sandstone. Cobbles			(1.00)	- 492.38		B 1 0.50 D 3 1.00 ES 2 1.00			-	
											-	
											-	
Stability	All faces stable						E)	cavation Dime	nsions an	d Orientati	on	
Shoring Depth Top Depth Base		ELATED REMARKS Remarks				Ler De _l	igth (Si igth (Si pth	des A and C) des B and D) ong Side A tow		3 	3.10m 1.60m 1.10m 189°	
					-			WATER STRIKE			WATER STR	IKES DETAI
							Date Tii			Depth Sealed		
Depth Top Depth Base 0.00 1.10		BACKFILL Remarks										
Donth Ton Donale D		PLORATORY HOLE REMARKS							RAL NOT	ES		
Depth Top Depth Bas	se	Remarks				All sides si BR.	milar. 2	Photographs tal	lemarks ken of side	s A and spoi	l. 3. Too gr	anular for
AGS Notes:	All bearings given relate to magne For details of abbreviations, see ke		Lo	og checke						DIL ENG		

Project Na	me	Nenthead Mines - Proposed	MWTS, GI									Н	lole ID	
Project No		TA8234					Exc	avati	on Log			TI	P114	
Engineer Employer		Aecom The Coal Authority										Sha	et 1 of :	1
Ground Level		+493.62mOD	Coordinates 378702.54E	, 5432	281.98N	-		Grid	OSGB		<u> </u>			
Hole Type		TP	Method/Equipment 9T Tracked		ator									
Date Started		05/09/2019	Date Completed 05/09/2019		Τ	5		ogged 	By MO			Π		
		Description of Strata		Weathering	Legend	Depth (Thick- ness)	Level	Waterstrike	Samp Deta				tu Test tails	Install- ation
is fine to coar	rse. Grav	eled orangish brown slightly gravelly sand el is angular to subrounded fine to coarse of siltstone and sandstone.				0.10 (0.85)	493.52		B 1 0.50				-	
		y sandy gravelly CLAY with low cobble co d fine to coarse of limestone and sandsto				(0.70)	492.67		B 3 1.00 ES 2 1.00 B 4 1.50				-	
content. Sand siltstone. Stiff black mo	d is fine t	ottled yellowish brown slightly gravelly sa to coarse. Gravel is angular to subangular ue slightly gravelly sandy CLAY with medi ular to subangular fine to coarse of siltston	fine to coarse of limestone and um cobble content. Sand is fine to			1.65 1.85 (1.15)	491.97		B 7 1.70 D 6 1.70 ES 5 1.70 D 9 1.90 ES 8 1.90 D 11 2.00				-	
	End of e	excavation at 3.00m. Termination Reason: A	chieved Scheduled Depth	_		3.00	490.62		ES 10 2.00 B 12 2.50 B 13 3.00 D 14 3.00				-	
													-	
Stability		All faces stable			•				cavation Dime	ensions	and			•
Shoring Depth Top De			ED REMARKS Remarks				Ler De	ngth (Si pth aring a	des A and C) des B and D) long Side A tov		de B	3	3.40m 1.60m 3.00m 14°	
						}		Date Ti	WATER STRIK		rike De		WATER STR Depth Water	
Donti T. le	mth D		KFILL								T			
Depth Top Dep	3.00	Description Arisings	Remarks											
		DEPTH RELATED EXPLO	RATORY HOLE REMARKS						GEN	ERAL N	OTES	;		
Depth Top De	pth Base		Remarks			1	. All sides si	milar. 2	. Photographs ta	Remarks iken of s		C, D and sp	ooil.	
AGS FINAL	P	All depth in metres, all soil strengths a All bearings given relate to magnetic N For details of abbreviations, see key. Print date and time			e accompa						SOI	L end	Ginee	RING
Farm Na CIEVE	DUOLETD		No 20E Janua Data 04		-	•				-+	Dort -	f +ha Da-L	Colote	ha Crau

Project Na	ame	Nenthead Mines - Proposed	MWTS, GI									Н	ole ID	
Project N	0.	TA8234					Exc	avati	on Log			TF	P115	
Engineer		Aecom												
Employer Ground Leve		The Coal Authority +496.37mOD	Coordinates 378734.108	5433	281 91 N			Grid	OSGB			Shee	et 1 of 1	1
Hole Type	C1	TP	Method/Equipment 9T Tracked					ana	0342					
Date Started	d	06/09/2019	Date Completed 06/09/2019	т —	1	1	L	ogged	Ву МО					ı
		Description of Strate	a	Weathering	Legend	Depth (Thick- ness)	Level	Waterstrike	Samp Deta				u Test tails	Install- ation
Sand is fine	to coarse	light grey and orange slightly gravelly sa b. Gravel is angular to subangular fine to re angular to subrounded of sandstone a	coarse of sandstone, siltstone and			0.10	496.27		B1 0.50			Н	- - - - - - - - -	
coarse. Grav	vel is ang lar of sand	ed black slightly gravelly sandy CLAY with ular to subrounded fine to coarse of sand dstone and siltstone. (Possible Weathere d of excavation at 1.45m. Termination Rea	stone and siltstone. Cobbles are angular d Bedrock)			1.15 (0.30) 1.45	495.22		ES 2 1.00 D 5 1.20 ES 4 1.20			1.0 H 1.0	00 - IV _ 00 - IV -	
													-	
													- - - - - - - - -	
													-	
													-	
		All faces stable									\bot			
Stability Shoring Depth Top D	epth Base	None used DEPTH RELA	ATED REMARKS Remarks				Ler De	ngth (Si ngth (Si pth	des A and C) des B and D) ong Side A tov			3 1 1	3.30m 20m 45m	
									WATER STRIK		-		WATER STR	IKES DETAI
			CIVELLI					Date Ti			rike Dep		Depth Water	
Depth Top D	epth Base		CKFILL Remarks											
0.00	1.45	Arisings												
			DRATORY HOLE REMARKS						GEN	ERAL N	OTES			
Depth Top D	epth Base		Remarks			1	. All sides si	milar. 2	. Photographs ta	Remarks iken of s		D and sp	oil.	
AGS	/	All bearings given relate to magnetic For details of abbreviations, see key.									SOII	ene	inee	RING
FINAL	VDLIOI ETE		ne 17/01/2020 19:25		og checked	aby MP	. D				0			

Project Name	Nenthead Mines - Proposed	MWTS, GI									Н	ole ID	
Project No.	TA8234					Exc	avati	on Log			TF	P116	
Engineer	Aecom										CI.	. 4 . 6	
Employer Ground Level	The Coal Authority +507.86mOD	Coordinates 378813.65E	5432	186.89N			Grid	OSGB			Snee	et 1 of 1	L
Hole Type	TP	Method/Equipment 9T Tracked											
Date Started	10/09/2019	Date Completed 10/09/2019	т —		1	L	ogged	By MO					I
	Description of Strata		Weathering	Legend	Depth (Thick- ness)	Datum Level	Waterstrike	Samp Deta				u Test tails	Install- ation
and low boulder co	rown mottled orange and grey slightly grave ontent. Sand is fine to coarse. Gravel is angu one and siltstone. Cobbles and boulders are	lar to subangular fine to coarse of		<u> </u>	0.10	507.76		D4 050				-	
siltstone.		v v			(0.90)			B 1 0.50					
content. Sand is fir are angular to suba	tled orange and dark grey slightly gravelly s ne to coarse. Gravel is angular to subangular angular of sandstone. End of excavation at 1.10m. Termination Rea	fine to coarse of sandstone. Cobbles			1.00 1.10	506.86 506.76		D 3 1.00 ES 2 1.00				-	
						1							
Stability Shoring Depth Top Depth Ba 0.40 0.60		TED REMARKS Remarks	1			Ler De	igth (Si igth (Si pth	ccavation Dime des A and C) des B and D)			3 1 1	on 3.70m 1.55m 1.10m 136°	
							Date Tir	WATER STRIK		trike Inc		WATER STR	
	BAC	CKFILL					Juie III		Schrii 9i	eDE	,pui sealed	Dopai water	е старѕе
Depth Top Depth Ba	Description Arisings	Remarks											
1.20	, and a second												
	DEPTH RELATED EXPLO	RATORY HOLE REMARKS						GEN	ERAL N	OTES			
Depth Top Depth Ba	ase	Remarks			1.	. All sides si	milar. 2	. Photographs ta	Remark		, B and sn	ooil.	
						31463 51	ui. Z	o.ograpna te			., o ana ap		
AGS	s: All depth in metres, all soil strengths a All bearings given relate to magnetic For details of abbreviations, see key.	North.								501	. 000		חוחר
FINAL		e 17/01/2020 19:25		og checked	by MP	В				3UI	C C 1 10	sinee	KII IU

Project N	lame	Nenthead Mines - Proposed	MWTS, GI									Н	ole ID	
Project N	lo.	TA8234					Exc	avati	on Log			TF	2117	
Engineer		Aecom												
Employe Ground Lev		The Coal Authority +504.43mOD	Coordinates 378790.99E	5/30	192 UUNI			Grid	OSGB	1		She	et 1 of 1	1
Hole Type	/ei	TP	Method/Equipment 9T Tracked					anu	OSGB	,				
Date Starte	d	10/09/2019	Date Completed 10/09/2019)			L	.ogged	Ву МО					
		Description of Strata	ì	Weathering	Legend	Depth (Thick- ness)		Waterstrike	Samp Deta				u Test tails	Install- ation
TOPSOIL.	n dark grev	mottled orange and blue slightly gravell	y sandy CLAY with high cobble and low			0.10	504.33							
boulder co	ntent. San	d is fine to coarse. Gravel is angular to su ne. Cobbles and boulders are angular to :	bangular fine to coarse of sandstone,		D.O.	(1.10)	-		B 1 0.50				-	
	Er	d of excavation at 1.20m. Termination Rea	son: Probable Boulder	_	<u> </u>	1.20	503.23		D 3 1.00 ES 2 1.00				-	
Stability		All faces stable						E	cavation Dime	onciono	and (Oriontatio	20	
Shoring		None used					Lei		ides A and C)	511310113	, unu (3.30m	
			TED REMARKS				Lei	ngth (S	ides B and D)			1	L.60m	
Depth Top [Depth Base		Remarks					pth	lana Cida A tau	ward Cir	do D		L.20m	
							De		long Side A tov		ле в		245°	
						-		Date Ti	WATER STRIK		trike De		WATER STR Depth Water	
			CKFILL											<u> </u>
Depth Top [0.00	Depth Base 1.20	Description Arisings	Remarks											
			PRATORY HOLE REMARKS							ERAL N				
Depth Top [Depth Base		Remarks			1	. All sides s	imilar. 2	. Photographs ta	Remark aken of s		, B and sp	ooil.	
									-5.5pno to					
AGS		All depth in metres, all soil strengths All bearings given relate to magnetic For details of abbreviations, see key.	are average in kPa. For in situ test resu North.	ults, se	ee accomp	anying re	ecords.							
FINAL	VDLIQUET		e 17/01/2020 19:25		og checked	by MP	В				501	L end	sinee	KING

Project Nam	e Nenthead Mines - Proposed	l MWTS, GI									Н	ole ID	
Project No.	TA8234					Exc	avati	on Log			TF	2118	
Engineer	Aecom										C.I.		
Employer Ground Level	The Coal Authority +500.65mOD	Coordinates 378761.788	5430	063 30N			Grid	OSGB			Shee	et 1 of 1	<u> </u>
Hole Type	TP	Method/Equipment 9T Tracked					- Ciria	0000					
Date Started	10/09/2019	Date Completed 10/09/2019	9			L	ogged	Ву МО					
	Description of Strat	а	Weathering	Legend	Depth (Thick- ness)	Datum Level	Waterstrike	Samp Deta			In Situ Det		Install- ation
high boulder co	wn mottled light grey and orange slightly gra ntent. Sand is fine to coarse. Gravel is angula Cobbles and boulders are angular to subangu	to subangular fine to coarse of siltstone			0.10 (0.75)	500.55		B 1 0.50				- - - - -	
content. Sand is	nottled orange and black slightly gravelly san- fine to coarse. Gravel is angular to subangula bles and boulders are angular to subangular o	ar fine to coarse of sandstone and			0.85 (0.70) 1.55	499.80		D 3 1.00 ES 2 1.00				- - - - -	
	End of excavation at 1.55m. Termination Re	ason: Probable Boulder										-	
												-	
												-	
						-						-	
0.11	40.5						_						
Stability Shoring Depth Top Depth		ATED REMARKS Remarks				Ler De _l	igth (Si igth (Si pth	cavation Dime des A and C) des B and D) ong Side A tov			3 1 1	.60m .30m .55m 62°	
								WATER STRIK		L		WATER STR	
	BA	CKFILL					Date Tir	ne	Depth St	rike Depth	n Sealed	Depth Water	Time Elapse
Depth Top Depth	Base Description	Remarks											
0.00	SS Arisings												
		ORATORY HOLE REMARKS						GEN	ERAL N	OTES	!		
Depth Top Depth	Base	Remarks			1.	. All sides si	milar. 2	. Photographs ta	Remarks iken of s		and sp	oil.	
AGS No	tes: All depth in metres, all soil strengths All bearings given relate to magnetic For details of abbreviations, see key. Print date and tir			ee accomp						SOIL	end	inee	RING
E NI- CIEVELIC	NETRICO	an No. 2 OF Joseph Date Of	1 104 101	240						D . C.I	ъ .	0.1.	-

Project Name	Nenthead Mines - Propose	ed MWTS, GI									Н	ole ID	
Project No.	TA8234					Exc	avati	on Log			TI	P119	
Engineer Employer	Aecom The Coal Authority										Sha	et 1 of :	1
Ground Level	+503.46mOD	Coordinates 378782.49	E, 5431	115.12N			Grid	OSGB		<u> </u>	3110	CC I OI	<u> </u>
Hole Type	TP	Method/Equipment 9T Tracked		ator									
Date Started	10/09/2019	Date Completed 10/09/201			I	Lo	ogged o	By MO			1		
	Description of Str	ata	Weathering	Legend	Depth (Thick- ness)	Datum Level	Waterstrike	Samp Deta				tu Test tails	Install- ation
TOPSOIL. Soft to firm black	mottled orange slightly gravelly sandy CL	AY with medium cobble and low boulder			0.10	503.36							
	ine to coarse. Gravel is angular to subangu bangular of sandstone. Boulders are angul				(0.75)			B 1 0.50					
	End of excavation at 0.85m. Termination R	leason: Probable Boulder			0.85	502.61		D 3 0.80 ES 2 0.80				=	
Stability	All faces stable		•	•		•		cavation Dime	ensions	and			
Shoring	None used	LATED DEMANDIZO						des A and C)				3.50m	
Depth Top Depth I		LATED REMARKS Remarks				Len Der		des B and D)				1.30m 0.85m	
								ong Side A tov	vard Sid	le B		92°	
					H			WATER STRIK	ES			WATER STR	RIKES DETA
	P	ACKFILL				I	Date Tir	ne	Depth St	rike D	epth Sealed	Depth Water	Time Elapse
Depth Top Depth I		Remarks											
0.00 0.85	5 Arisings												
	DEDTH DELATED EVA	PLORATORY HOLE REMARKS						OF !!	ERAL N	OTT	•		
Depth Top Depth I		Remarks							Remarks		.		
					1.	All sides si	nilar. 2	. Photographs ta	iken of s	ides l	B, C and sp	ooil.	
AGS	es: All depth in metres, all soil strength All bearings given relate to magnet For details of abbreviations, see key		ults, se	ee accomp	anying re	ecords.							
FINAL		ime 17/01/2020 19:25	L(og checked	d by MP	В				SOI	ıL end	sinee	RING

Project Name	Nenthead Mines - Propose	d MWTS, GI									Н	ole ID	
Project No.	TA8234					Exc	avati	on Log			T	P120	
Engineer Employer	Aecom The Coal Authority										Sho	et 1 of	1
Ground Level	+503.97mOD	Coordinates 378792.778	E, 5431	175.01N			Grid	OSGB		<u> </u>	3110	CC I OI	<u>. </u>
Hole Type	TP	Method/Equipment 9T Tracked		ator				_					
Date Started	09/09/2019	Date Completed 09/09/2019	т —				ogged o	By MO			Ι		
	Description of Stra	ta	Weathering	Legend	Depth (Thick- ness)	Level	Waterstrike	Samp Deta				tu Test tails	Install- ation
	rown mottled orange slightly gravelly san				0.10	503.87							
angular to subang	rse. Gravel is angular to subrounded fine t ular of sandstone.	o coarse of sandstone. Cobbles are				-		B 1 0.50					
					(1.05)]							
					4.45	-		D 3 1.00				-	
high boulder conto	olue mottled dark grey and orange slightly ent. Sand is fine to coarse. Gravel is angul es and boulders are angular to subangular End of excavation at 1.30m. Termination R	of sandstone.			1.15 1.30	502.82		ES 2 1.00 D 5 1.20 ES 4 1.20					
						-						-	-
												-	-
												-	-
						-						-	- - - -
													-
						-						-	
													-
						-						-	-
]						-	
Cto billits -	All faces atal-1-							requestion D'	-ne:-		Oni :		
Stability Shoring	All faces stable None used					Ler		cavation Dime des A and C)	ensions	and		on 3.30m	
	DEPTH RE	ATED REMARKS				Ler	ngth (S	des B and D)			:	1.70m	
Depth Top Depth B 0.00 0.10	ase Stream flooded into pit from start - da	Remarks mmed.					pth	C: 1 A .	1.0:			1.30m	
						Bei		ong Side A tov				52°	
					-		Date Ti	WATER STRIK		trike D	epth Sealed	WATER STF Depth Water	
		ACKFILL											
Depth Top Depth B 0.00 1.30		Remarks											
	DEPTH RELATED EXP	LORATORY HOLE REMARKS						GEN	ERAL N	JOTE:	 S		
Depth Top Depth B	ase	Remarks			1	All sides si	milar 2	. Photographs ta	Remark		R C and si	noil	
						31463 31	ui. Z	o.ograpna te			_, = ana s		
AGS Note	I s: All depth in metres, all soil strength All bearings given relate to magneti For details of abbreviations, see key		ults, se	ee accomp	anying re	ecords.							
FINAL		me 17/01/2020 19:25		og checked	by MP	В				SOI	ıL end	sinee	RING
Form No CIEVELIOL	ETDLOC Inner Denie	on No. 2 OF Joseph Date Of	(101/2	110					1	Dovt :	of the De -1	u Calata	ha Crai

Project Name	Nenthead Mines - Proposed	MWTS, GI									Н	ole ID	
Project No.	TA8234					Exc	avati	on Log			T	P121	
Engineer Employer	Aecom The Coal Authority										Sha	et 1 of :	1
Ground Level	+503.39mOD	Coordinates 378781.41E	5430	78.69N			Grid	OSGB	3		3116	et I Oi	1
Hole Type	TP	Method/Equipment 9T Tracked	Excava	itor									
Date Started	10/09/2019	Date Completed 10/09/2019	т —	1	I	L	ogged	Ву МО			1		T
	Description of Strata		Weathering	Legend	Depth (Thick- ness)	- Datum	Waterstrike	Samp Det				tu Test tails	Install- ation
TOPSOIL. Soft to firm brown	mottled black and orange slightly gravelly s	andy CLAY with medium cobble and			(0.45) 0.45 (0.30)	502.94		B 1 0.50				-	
and limestone. Col Firm dark blue mo Sand is fine to coa Cobbles and bould	and is fine to coarse. Gravel is angular to subangula to bubbles and boulders are angular to subangula titled orange slightly gravelly sandy CLAY wirse. Gravel is angular to subangular fine to clers are angular to subangular of sandstone, End of excavation at 0.90m. Termination Rea	or of sandstone and limestone. th medium cobble and boulder content. coarse of sandstone and limestone. limestone and mudstone.			0.75 0.90	502.64							
						1							
Stability Shoring	All faces stable None used					1.		xcavation Dimo ides A and C)	ensions	s and		on 3.85m	
Shoring		TED REMARKS					-	ides B and D)				1.50m	
Depth Top Depth Ba		Remarks					pth	,				0.90m	
						Bea	aring a	long Side A tov	ward Si	de B	:	288°	
					H			WATER STRIK	ES			WATER STR	RIKES DETAI
							Date Ti	me	Depth S	trike D	epth Sealed	Depth Water	Time Elapse
Depth Top Depth Ba	*	CKFILL Remarks											
0.00 0.90	Arisings	Remarks											
	DEPTH RELATED EXPLO	RATORY HOLE REMARKS						GEN	ERAL N	OTE	S		-
Depth Top Depth Ba	ase	Remarks			1	All cidos ci	milar 2	. Photographs ta	Remark		A Panda	noil	
						All sides si	IIIIIai. Z	. Friotographs to	akeli Oi	sides	A, D allu s	JOII.	
AGS	: All depth in metres, all soil strengths a All bearings given relate to magnetic For details of abbreviations, see key.		ults, se	e accomp	anying re	ecords.							
FINAL		e 17/01/2020 19:25	l c	og checked	by MP	PB			\dashv	SO	ıL end	sinee	RING
FINAL		No. 2.05			v DA INIL	٥			+	Dove	of the De-l	Coloto:	ha Crai

Project Nan	ne	Nenthead Mines - Proposed	MWTS, GI									Н	ole ID	
Project No.		TA8234					Exc	avati	on Log			TF	2122	
Engineer		Aecom										0.1		
Employer Ground Level		The Coal Authority +504.36mOD	Coordinates 378792.28E	5431	128 99N			Grid	OSGB	?		She	et 1 of 1	L
Hole Type		TP	Method/Equipment 9T Tracked I					Gira	0000					
Date Started		09/09/2019	Date Completed 09/09/2019)			L	ogged	Ву МО					
		Description of Strata		Weathering	Legend	Depth (Thick- ness)		Waterstrike	Samp Det				u Test tails	Install- ation
cobble content Cobbles are an Soft to firm da boulder content	it. Sand ngular to irk blue nt. Sand oulders	orown mottled orange and light grey slig is fine to coarse. Gravel is angular to sub o subangular of sandstone. mottled orange and light grey slightly gr. is fine to coarse. Gravel is angular to sub are angular to subangular of sandstone. It of excavation at 0.90m. Termination Reas	ounded fine to coarse of sandstone. avelly sandy CLAY with high cobble and angular fine to coarse of sandstone.			0.10 (0.35) 0.45 (0.45) 0.90	504.26		B 1 0.50 D 3 0.80 ES 2 0.80					
							1						-	
Stability		All faces stable							cavation Dime	ensions	and (
Shoring		None used	TED DEMANDES					-	des A and C)				3.20m	
Depth Top Dept	th Base	DEPTH RELA	FED REMARKS Remarks					igui (Si pth	des B and D)				1.60m).90m	
									ong Side A tov	ward Sid	de B		273°	
						H			WATER STRIK	res.			WATER STR	IKES DETAI
								Date Ti			trike De		Depth Water	
	1		KFILL											
Depth Top Dept 0.00 0		Description Arisings	Remarks											
		DEPTH RELATED EXPLO	 RATORY HOLE REMARKS						GEN	ERAL N	IOTES			
Depth Top Dept	th Base		Remarks			1	All -: -!:	:		Remark			-:1	
							. All sides si	milar. 2	. Photographs ta	aken of s	sides B	i, ∟ and sp	oll.	
AGS	Α	Il depth in metres, all soil strengths a Il bearings given relate to magnetic I or details of abbreviations, see key.	re average in kPa. For in situ test resu North.	ılts, se	ee accomp	anying re	ecords.							
FINAL			e 17/01/2020 19:25		og checked	by MP	В				501	L end	sinee	KING

Project Name	Nenthead Mines - Proposed	MWTS, GI									Н	ole ID	
Project No.	TA8234					Exc	avati	on Log			TF	P123	
Engineer	Aecom										Cl	-11-61	
Employer Ground Level	The Coal Authority +503.02mOD	Coordinates 378789.34E	. 5432	238.09N			Grid	OSGB			21166	et 1 of 1	L
Hole Type	TP	Method/Equipment 9T Tracked I											
Date Started	06/09/2019	Date Completed 06/09/2019)		1	Lo	ogged	Ву МО					
	Description of Strata		Weathering	Legend	Depth (Thick- ness)		Waterstrike	Samp Det				u Test tails	Install- ation
content. Sand is fine and limestone. Cobb Firm to stiff dark blu Sand is fine to coarse Cobbles are angular	wn mottled orange and black slightly grav to coarse. Gravel is angular to subrounded olse are angular to subrounded of sandstor e mottled orange and black slightly gravel e. Gravel is angular to subangular fine to c to subangular of sandstone and siltstone. and of excavation at 1.10m. Termination Reason of the same and siltstone.	I fine to coarse of siltstone, sandstone e, siltstone and limestone. ly sandy CLAY with low cobble content. parse of siltstone and sandstone.			0.10 (0.45) 0.55 (0.55) 1.10	502.92		B1 0.50 D3 0.60 ES 2 0.60 B 6 1.00 D5 1.00 ES 4 1.00					
]							
						1							
Stability Shoring Depth Top Depth Base 0.25 0.45		TED REMARKS Remarks o side C.				Len De _l	igth (Si igth (Si oth aring al	des A and C) des B and D) ong Side A to	ward Sid		3 1 1	8.60m 1.25m 1.10m 1.09°	
					-		Date Tir	WATER STRIK ne		trike De		WATER STR Depth Water	
		KFILL								1			
Depth Top Depth Base 0.00 1.10	e Description Arisings	Remarks											
	DEPTH RELATED EXPLO	RATORY HOLE REMARKS						GEN	ERAL N	OTES			
Depth Top Depth Base		Remarks				AH ::			Remark	s			
						. All sides si	milar. 2	Photographs to	aken of s	sides C	., D and sp	ooil.	
ACC			Lo	og checked						SOI	L end	inee	RING

Project Name	Nenthead Mines - Pro	posed MWTS, GI									Hole ID	
Project No.	TA8234						Exc	avati	on Log		TP124	ŀ
Engineer Employer	Aecom The Coal Authority										Sheet 1 of	1
Ground Level	+479.37mOD	Coordinates	378551.328	E, 5433	371.68N	1		Grid	OSGB			
Hole Type	TP	Method/Equipme	nt 9T Tracked	Excava	ator							
Date Started	04/09/2019	Date Completed	04/09/2019	_		1	L	ogged	By MO		1	
	Description	of Strata		Weathering	Legend	Depth (Thick- ness)	Datum Level	Waterstrike	Sampli Detail		In Situ Test Details	Install- ation
content. Sand is fin and limestone. Cob from 1.50m mottle	e to coarse. Gravel is angular to si ibles and boulders are angular to s ed multicoloured	gravelly CLAY with high cobble an abrounded fine to coarse of sandst subangular of siltstone.	tone, siltstone	M		0.10 (2.45)	479.27	M	B 1 0.50 D 3 1.00 ES 2 1.00 B 4 1.50 D 6 2.00 ES 5 2.00 B 7 2.50		HV 1.00 HV 1.00 HV 1.00	
Stability	All faces stable								cavation Dimen	sions and		
Shoring	None used	THE DELATED DELATION						-	des A and C)		3.00m	
Depth Top Depth Ba		TH RELATED REMARKS Remarks					Ler De		des B and D)		1.50m 2.55m	
									ong Side A towa	rd Side B		
								Date Tir	WATER STRIKES		WATER ST Depth Sealed Depth Wat	TRIKES DETAI
		BACKFILL								,	,	<u>'</u>
Depth Top Depth Ba			Remarks									
0.00 2.55	Arisings											
Depth Top Depth Ba		D EXPLORATORY HOLE REMA Remarks	RKS							AL NOTE	:S	
Бериг тор	30	icinano				1.	All sides si	milar. 2	Photographs take		A, D and spoil.	
AGS	All bearings given relate to m For details of abbreviations, s	ee key.	in situ test resi							50	oil engine	epine
FINAL Form No. SIEXPHOLE		and time 17/01/2020 19:25	Issue Date 04		og checked	by MPI	5				of the Bachy Soletan	

Project Nam	e Nenthead Mines - Propose	d MWTS, GI									Н	ole ID	
Project No.	TA8234					Exc	avati	on Log			TF	P125	
Engineer Employer	Aecom The Coal Authority										Shor	et 1 of 1	ı
Ground Level	+475.37mOD	Coordinates 378521.44E	, 5433	308.71N			Grid	OSGB			31166	50 1 01 1	
Hole Type	TP	Method/Equipment 9T Tracked	Excava	ator									
Date Started	04/09/2019	Date Completed 04/09/2019	т —	T	Ι	Lo	ogged	By MO					
	Description of Str	ata	Weathering	Legend	Depth (Thick- ness)		Waterstrike	Samp Deta			In Situ Det		Install- ation
coarse. Gravel is are angular to st Firm to stiff ligh is fine to coarse. Cobbles are ang	prey very clayey very gravelly SAND with mangular to subangular fine to coarse of sau bibrounded of siltstone. It brown mottled orange slightly sandy grav Gravel is angular to subrounded fine to coular to subrounded of siltstone. Mottling present End of excavation at 2.40m. Termination F	dstone, limestone and siltstone. Cobbles elly CLAY with high cobble content. Sand arse of sandstone, limestone and siltstone.			0.10 0.20 (2.20)	475.27		D 2 0.25 ES 1 0.25 B 3 0.30 D 5 1.00 ES 4 1.00 B 6 1.50 D 8 2.00 ES 7 2.00			H 0:: H 0:: H 0::	70 - V _ 70 - V -	
Stability Shoring Depth Top Depth		LATED REMARKS Remarks				Len De _l	gth (Si gth (Si oth iring al	des A and C) des B and D) ong Side A tow	vard Sid		2 1 2 7	.10m .50m .40m 5°	IKES DETAI
							Date Tir			rike Deptl		Depth Water	
Double To la .	*	ACKFILL											
Depth Top Depth 0.00 2.4		Remarks											
	DEPTH RELATED EXI	LORATORY HOLE REMARKS						GEN	ERAL N	OTES			
Depth Top Depth		Remarks				All ::			Remarks	;		-:1	
					1.	. All sides si	milar. 2	. Photographs ta	iken of s	ıdes A, [) and sp	oil.	
AGS No	All bearings given relate to magnet For details of abbreviations, see ke		Lo	og checked						SOIL	enc	inee	RING

Project Name	Nenthead Mines - Proposed	MWTS, GI									Н	ole ID	
Project No.	TA8234					Exc	avati	on Log			TF	P126	
Engineer Employer	Aecom The Coal Authority										Shor	et 1 of 1	1
Ground Level	+478.20mOD	Coordinates 378580.09E	, 5431	180.69N			Grid	OSGB	}		51100	CC 1 OI .	L
Hole Type	TP	Method/Equipment 9T Tracked	Excava	ator									
Date Started	06/09/2019	Date Completed 06/09/2019				L	ogged	Ву МО					ı
	Description of Strat	a	Weathering	Legend	Depth (Thick- ness)	Datum Level	Waterstrike	Samp Det				u Test tails	Install- ation
medium boulder co sandstone, limesto sandstone, limesto Brown mottled ora content. Gravel is a	Dark grey very gravelly fine to coarse sand sontent. Gravel sized fragments are angular nee and slitstone. Cobble and boulder sized one and siltstone. Inge very gravelly clayey fine to coarse SAN angular to subrounded fine to coarse of san ar to subangular of sandstone and siltstone	to subrounded fine to coarse of fragments are angular to subrounded of D with high cobble and low boulder dstone and siltstone. Cobbles and			(0.45) 0.45 (1.40)	477.75		B 1 0.50 D 3 1.00 ES 2 1.00 B 4 1.50				-	
	End of excavation at 1.85m. Termination Rea	ison: Probable boulder			1.85	476.35							
						1							
Stability Shoring	Clay lenses present. Minor collapse of side a - on corner wit					Ler De Bea	ngth (Si ngth (Si pth aring a	ccavation Dime des A and C) des B and D) ong Side A tow WATER STRIK	ward Sic	de B	3 2 1 1	DON 3.70m 2.05m 1.85m 1.52° WATER STR Depth Water	
Double To Jon 11		CKFILL											
Depth Top Depth Ba 0.00 1.85	sse Description Arisings	Remarks											
	DEPTH RELATED EXPLO	DRATORY HOLE REMARKS						GEN	ERAL N	OTES			<u> </u>
Depth Top Depth Ba	ase	Remarks			1	All sides of	milar ?	. Photographs to	Remarks		R and en	noil	
						. All Sides Si	ппаг. 2	. i nowyrapns ta	anell OF S	nues A,	and sp د	oli.	
AGS Notes	s: All depth in metres, all soil strengths All bearings given relate to magnetic For details of abbreviations, see key. Print date and tin			ee accomp						SOIL	. end	Sinee	RING
Farma Na. CIEVRIJOLE		n No. 20E Janua Data 04		-	,					Dark of	Alex Devil	. C-1-4-	C

Project Nam	e Nenthead Mines - Proposed	MWTS, GI									Hole ID	
Project No.	TA8234					Exc	avati	on Log			TP127	
Engineer	Aecom											1
Employer Ground Level	The Coal Authority +487.71mOD	Coordinates 378656.866	5430)96.85N			Grid	OSGB		5	heet 1 of	1
Hole Type	TP	Method/Equipment 9T Tracked					dila	0345				
Date Started	09/09/2019	Date Completed 09/09/2019	9			L	ogged	Ву МО				
	Description of Strat	a	Weathering	Legend	Depth (Thick- ness)	Datum Level	Waterstrike	Samp Deta		Ir	Situ Test Details	Install- ation
TOPSOIL.	D: Brown mottled dark grey and orange slightl	y arayally sandy clay with high cobble			0.10	487.61						
and boulder cor	ntent. Sand sized fragments are fine to coarse. e to coarse of sandstone. Cobble and boulder s	Gravel sized fragments are angular to			(1.20)	-		B 1 0.50 D 3 1.00 ES 2 1.00				
content. Sand is	x brown mottled light grey and orange slightly is fine to coarse. Gravel is angular to subangula ubangular of sandstone.				1.30	486.41		D 5 1.35 ES 4 1.35 B 6 1.50				
	End of excavation at 2.25m. Termination Rea	ason: Probable Boulder			2.25	485.46		D 8 2.00 ES 7 2.00				
Stability	All faces stable							cavation Dime	ensions	and Orien		
Shoring	None used	ATED REMARKS						des A and C)			3.60m 1.80m	
Depth Top Depth		Remarks					igui (Si pth	des B and D)			2.25m	
1.80 1.3 1.90 2.3								ong Side A tov	ward Sid	е В	322°	
	·						Date Tii	WATER STRIK		:I D+b C-		RIKES DETAI
	BA	CKFILL					Date III	110	pehrii 2(t	we nehtu 26	aled Depth Wate	. Time clapse
Depth Top Depth 0.00 2.3	Base Description 25 Arisings	Remarks										
0.00	Allings											
		DRATORY HOLE REMARKS							ERAL NO			1
Depth Top Depth	n Base	Remarks			1	. All sides si	milar. 2	. Photographs ta	Remarks aken of si		nd spoil.	
AGS	tes: All depth in metres, all soil strengths All bearings given relate to magnetic For details of abbreviations, see key.	North.								יוט:	ngine	apine
FINAL		ne 17/01/2020 19:25		og checked	d by MP	В				OIL E	i idii let	-KIIIU

Project Name	Nenthead Mines - Proposed	MWTS, GI									Н	lole ID	
Project No.	TA8234					Exc	avati	on Log			T	P128	
Engineer Employer	Aecom The Coal Authority										Sho	et 1 of :	1
Ground Level	+496.69mOD	Coordinates 378761.328	5429	992.53N			Grid	OSGB		l	0110	00101	
Hole Type	TP	Method/Equipment 9T Tracked		ator									
Date Started	09/09/2019	Date Completed 09/09/2019	1	Τ			ogged og	By MO			Ι		Ī
	Description of Strata	1	Weathering	Legend	Depth (Thick- ness)		Waterstrike	Samp Deta				tu Test tails	Install- ation
and medium boul sandstone and sil siltstone. Boulder Soft to firm dark the content. Sand is find mudstone. Cobble Soft to firm light the content. Sand is find are angular to suth Firm to stiff dark content. Sand is find the stiff dark content.	Dark grey very gravelly clayey fine to coarse der content. Gravel sized fragments are angular to suboble sized fragments are angular to subangular corown mottled orange sandy gravelly organic ne to coarse. Gravel is angular to subangular of grey mottled reddish brown sandy gravelly one to coarse. Gravel is angular to subrounde sand boulders are angular to subrounde sangular of sandstone. Diversity of sandstone. Diversity of sandstone of sandstone. Diversity of sandstone. End of excavation at 2.25m. Termination Real sandstone.	ular to subrounded fine to coarse of o subrounded of sandstone and of sandstone and siltstone. CLAY with medium cobble and boulder d fine to coarse of sandstone and sandstone and mudstone. rganic CLAY with medium cobble d fine to coarse of sandstone. Cobbles c CLAY with low cobble and boulder fine to coarse of limestone. Cobbles			0.10 (0.45) 0.55 (0.40) 0.95 1.20 (1.05)	496.59		B 1 0.50 D 3 0.60 ES 2 0.60 D 5 1.00 ES 4 1.00 D 7 1.25 ES 6 1.25 B 8 1.50 D 10 1.65 ES 9 1.65 B 11 2.00					
					L								
Stability Shoring Depth Top Depth E 1.18 1.22	Base	TED REMARKS Remarks				Len De _l	gth (Si gth (Si oth ring al	ccavation Dime des A and C) des B and D) long Side A tov	vard Sid		:	3.40m 1.90m 2.25m 257°	
							Date Tii	WATER STRIK		trike D	epth Sealed	WATER STR Depth Water	
Donale To Long	*	CKFILL											
Depth Top Depth E		Remarks											
	DEPTH RELATED EXPLO	PRATORY HOLE REMARKS			+			GEN	ERAL N	IOTES	S		<u> </u>
Depth Top Depth B		Remarks				AII ::			Remark	s			
					1	. All sides si	milar. 2	. Photographs ta	iken of s	sides i	A, D and s	poil.	
AGS	es: All depth in metres, all soil strengths a All bearings given relate to magnetic For details of abbreviations, see key.		ults, se	e accomp	anying re	ecords.							
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SUPPORTING FACTUAL DATA

SECTION A

Exploratory Hole Records and Field Data

IN SITU TEST DATA

Project Name Nenthead Mines - Proposed MWTS, GI **Photo Ionisation** Results Project No. TA8234 Table No. Aecom Engineer 1 Client The Coal Authority Sample Sample Number **Test Date** PID Temp. PID Device Type Test Hole ID Ref Weather Depth Remarks yyyy-mm-dd °C ppm Type m BH102R 0.20 ES 1 1 2019-09-19 < 0.1 16.0 Warm and dry Mini-Rae Lite BH102R 2019-09-19 0.50 < 0.1 16.0 Warm and dry Mini-Rae Lite ES 2 1 BH102R 1.00 ES 3 1 2019-09-19 < 0.1 16.0 Warm and dry Mini-Rae Lite BH102R 2.00 ES 6 1 2019-09-19 <0.1 16.0 Warm and dry Mini-Rae Lite BH102R 3.00 2019-09-19 < 0.1 16.0 Warm and dry Mini-Rae Lite ES 10 1 BH102R 4.00 2019-09-19 < 0.1 16.0 Warm and dry Mini-Rae Lite ES 14 1 2019-09-05 BH103 0.00 < 0.1 14.0 Mini-Rae Lite ES 1 Cold and dry 1 BH103 0.50 2019-09-05 < 0.1 14.0 Cold and dry Mini-Rae Lite ES 2 1 2019-09-05 Mini-Rae Lite BH103 1.00 FS 3 1 < 0.1 14.0 Cold and dry BH103 2.00 ES 7 1 2019-09-05 < 0.1 14.0 Cold and dry Mini-Rae Lite BH103 3.00 2019-09-05 < 0.1 14.0 Cold and dry Mini-Rae Lite ES 11 1 **BH103** 4 00 ES 15 1 2019-09-05 < 0.1 14.0 Cold and dry Mini-Rae Lite BH104 0.20 2019-09-19 1.0 16.0 Cold and dry Mini-Rae Lite ES 1 1 BH104 0.50 2019-09-19 160 ES 2 1 < 0.1 Cold and dry Mini-Rae Lite BH104 2019-09-19 1.00 ES 5 1 < 0.1 16.0 Cold and dry Mini-Rae Lite BH104 2.00 2019-09-19 < 0.1 16.0 Cold and dry Mini-Rae Lite ES 8 1 BH104 3.00 ES 12 1 2019-09-19 1.0 16.0 Cold and dry Mini-Rae Lite BH105 2019-09-19 1.0 0.20 ES 1 1 16.0 Cold and dry Mini-Rae Lite BH105 0.50 ES 2 2019-09-19 <0.1 16.0 Cold and dry Mini-Rae Lite 1 BH105 1.00 2019-09-19 < 0.1 16.0 Cold and dry Mini-Rae Lite FS 3 1 BH105 2.00 ES 7 1 2019-09-19 < 0.1 16.0 Cold and dry Mini-Rae Lite BH105 3.00 10 1 2019-09-19 1.0 16.0 Cold and dry Mini-Rae Lite ES BH106 0.20 ES 2 1 2019-09-19 1.0 16.0 Cold and dry Mini-Rae Lite BH106 0.50 ES 2019-09-19 < 0.1 16.0 Cold and dry Mini-Rae Lite 3 1 BH106 1.00 ES 4 1 2019-09-19 < 0.1 16.0 Cold and dry Mini-Rae Lite 2019-09-19 BH106 2.00 1 16.0 Cold and dry Mini-Rae Lite ES 7 BH106 3.00 2019-09-19 1.0 16.0 Mini-Rae Lite ES 11 1 Cold and dry BH106 4.00 2019-09-05 <0.1 14.0 Cold and dry Mini-Rae Lite ES 15 1 2019-09-19 1.0 BH106 5.00 16.0 Cold and dry Mini-Rae Lite ES 19 1 TP104 1.00 2019-09-05 <0.1 14.0 Cold and dry Mini-Rae Lite ES 2 1 2019-09-05 TP104 2.00 ES 6 1 < 0.1 14.0 Cold and dry Mini-Rae Lite TP109 1.00 ES 2 1 2019-09-05 < 0.1 14.0 Cold and dry Mini-Rae Lite TP110 1.00 2019-09-19 1.0 16.0 Cold and dry Mini-Rae Lite ES 2 1 Checked By: ian.swain Approved By: ian.swain 17/01/2020 17/01/2020 Date: Date: SOIL ENGINEERING 2.00 19/02/2015 orm No SE-EMS-F-001 Revision No Issue Date Part of the Bachy Soletanche Group

Project Name Nenthead Mines - Proposed MWTS, GI **Photo Ionisation** Results Project No. TA8234 Table No. Aecom Engineer 1 Client The Coal Authority Sample Sample Number **Test Date** PID Temp. PID Device Type Test Hole ID Ref Weather Depth Remarks yyyy-mm-dd °C ppm Type m TP110 2.00 ES 5 1 2019-09-19 1.0 16.0 Cold and dry Mini-Rae Lite TP110 3.00 2019-09-19 1.0 16.0 Cold and dry Mini-Rae Lite ES 8 1 **TP111** 1.00 ES 2 1 2019-09-19 1.0 16.0 Cold and dry Mini-Rae Lite TP112 1.00 ES 2 1 2019-09-19 1.0 16.0 Cold and dry Mini-Rae Lite TP112 2.00 2019-09-19 1.0 16.0 Cold and dry Mini-Rae Lite ES 5 1 **TP113** 1.00 2019-09-05 1.0 14.0 Cold and dry Mini-Rae Lite ES 2 1 2019-09-19 1.00 1.0 16.0 Mini-Rae Lite **TP114** ES 2 1 Cold and dry TP114 1.70 2019-09-19 1.0 16.0 Cold and dry Mini-Rae Lite ES 5 1 **TP114** 2019-09-19 16.0 Mini-Rae Lite 1.90 8 2.0 Cold and dry FS 1 **TP114** 2.00 ES 10 1 2019-09-19 1.0 16.0 Cold and dry Mini-Rae Lite TP114 3.00 2019-09-19 1.0 16.0 Cold and dry Mini-Rae Lite ES 13 1 TP115 1.20 ES 4 1 2019-09-19 20 16.0 Cold and dry Mini-Rae Lite TP116 1.00 2 2019-09-10 0.8 12.0 Cold and dry Mini-Rae Lite ES 1 1.00 TP117 2019-09-10 5.4 120 ES 2 1 Cold and dry Mini-Rae Lite 2019-09-10 **TP118** 1.00 ES 2 1 3.8 12.0 Cold and dry Mini-Rae Lite TP119 0.80 2019-09-10 4.3 12.0 Cold and dry Mini-Rae Lite ES 2 1 TP120 1.00 ES 2 1 2019-09-05 < 0.1 14.0 Cold and dry Mini-Rae Lite 2019-09-05 < 0.1 TP120 1.20 ES 4 1 14.0 Cold and dry Mini-Rae Lite TP121 0.80 ES 2 1 2019-09-10 7.6 12.0 Cold and dry Mini-Rae Lite 0.60 2019-09-19 1.0 16.0 TP123 Cold and dry Mini-Rae Lite FS 2 1 TP123 1.00 ES 4 1 2019-09-19 1.0 16.0 Cold and dry Mini-Rae Lite TP124 1.00 ES 2 1 2019-09-19 < 0.1 16.0 Cold and dry Mini-Rae Lite TP124 2.00 ES 5 1 2019-09-19 < 0.1 16.0 Cold and dry Mini-Rae Lite TP125 0.85 ES 2019-09-05 < 0.1 14.0 Cold and dry Mini-Rae Lite 1 1 TP125 1.00 ES 2 1 2019-09-05 < 0.1 14.0 Cold and dry Mini-Rae Lite 2019-09-05 TP125 2.00 4 1 < 0.1 Cold and dry Mini-Rae Lite ES 1.00 TP126 2 2019-09-19 1.0 16.0 Mini-Rae Lite ES 1 Cold and dry TP127 1.00 2019-09-05 <0.1 14.0 Cold and dry Mini-Rae Lite ES 2 1 1.35 2019-09-05 1.0 TP127 ES 14.0 Cold and dry Mini-Rae Lite 4 1 TP127 2.00 7 2019-09-05 <0.1 14.0 Cold and dry Mini-Rae Lite ES 1 2019-09-05 TP128 1.00 ES 8 1 < 0.1 14.0 Cold and dry Mini-Rae Lite TP128 1.25 ES 6 1 2019-09-05 < 0.1 14.0 Cold and dry Mini-Rae Lite TP128 1.65 2019-09-05 <0.1 14.0 Cold and dry Mini-Rae Lite ES 9 1 Checked By: ian.swain Approved By: ian.swain 17/01/2020 17/01/2020 Date: Date: SOIL ENGINEERING 2.00 19/02/2015 orm No SE-EMS-F-001 Revision No Issue Date Part of the Bachy Soletanche Group

Project Name Nenthead Mines - Proposed MWTS, GI **Photo Ionisation** Results Project No. TA8234 Table No. Aecom Engineer 1 Client The Coal Authority Sample Number Sample **Test Date** PID Temp. PID Device Type Test Hole ID Ref Weather Depth Remarks yyyy-mm-dd °C Type ppm m WS101 0.20 ES 1 2019-09-05 1.0 14.0 Cold and dry Mini-Rae Lite WS101 2019-09-05 0.50 1.0 14.0 Cold and dry Mini-Rae Lite ES 1 WS101 2019-09-05 1.00 ES 1 1.0 14.0 Cold and dry Mini-Rae Lite WS102 0.20 ES 2 1 2019-09-13 3.5 14.0 Raining Mini-Rae Lite WS102 0.50 2019-09-13 4.1 14.0 Mini-Rae Lite ES 4 1 Raining WS102 1.00 2019-09-13 2.0 14.0 Mini-Rae Lite ES 6 1 Raining 2019-09-12 WS104 0.20 10.2 14.0 Raining Mini-Rae Lite ES 2 1 WS104 0.50 2019-09-12 7.8 14.0 Raining Mini-Rae Lite ES 5 1 WS104 2019-09-12 Mini-Rae Lite 1.00 FS 8 1 8.7 14.0 Raining WS105 0.20 ES 2 1 2019-09-11 4.0 13.0 Cold and dry Mini-Rae Lite WS105 0.50 2019-09-11 6.9 13.0 Cold and dry Mini-Rae Lite ES 1 WS105 1.00 ES 6 1 2019-09-11 45 130 Cold and dry Mini-Rae Lite WS106 0.20 2 2019-09-11 11.1 13.0 Cold and dry Mini-Rae Lite ES 1 WS106 0.50 2019-09-11 32 130 ES 4 1 Cold and dry Mini-Rae Lite WS106 2019-09-11 1.00 ES 7 1 5.7 13.0 Cold and dry Mini-Rae Lite WS107 0.20 2019-09-11 0.7 13.0 Cold and dry Mini-Rae Lite ES 2 1 WS107 0.50 ES 4 1 2019-09-11 4.9 13.0 Cold and dry Mini-Rae Lite WS107 2019-09-11 1.00 ES 6 1 5.4 13.0 Cold and dry Mini-Rae Lite WS108 0.20 ES 2 1 2019-09-10 4.5 12.0 Cold and dry Mini-Rae Lite WS108 1.00 2019-09-10 7.9 12.0 Cold and dry Mini-Rae Lite 1 FS 6 WS109 0.20 ES 2 1 2019-09-10 17.4 12.0 Cold and dry Mini-Rae Lite WS109 0.50 ES 5 1 2019-09-10 1.8 12.0 Cold and dry Mini-Rae Lite WS109 1.00 ES 6 1 2019-09-10 16.7 12.0 Cold and dry Mini-Rae Lite WSBH101R 0.20 ES 2019-09-05 1.0 14.0 Cold and dry Mini-Rae Lite 2 1 WSBH101R 0.50 ES 4 1 2019-09-05 1.0 14.0 Cold and dry Mini-Rae Lite WSBH101R 2019-09-10 1.00 1 12.0 Cold and dry Mini-Rae Lite ES 8 WSTP101 2 2019-09-10 7.2 12.0 Mini-Rae Lite 0.20 ES 1 Cold and dry WSTP101 0.50 2019-09-10 11.0 12.0 Cold and dry Mini-Rae Lite ES 1 WSTP101 2019-09-10 9.2 1.00 7 12.0 Cold and dry Mini-Rae Lite ES 1 WSTP101 1.20-1.54 2019-09-10 6.4 12.0 Cold and dry Mini-Rae Lite LES 9.1 1 WSTP102 2019-09-10 0.20 ES 2 1 5.6 12.0 Cold and dry Mini-Rae Lite WSTP102 0.50 ES 4 1 2019-09-10 21.8 12.0 Cold and dry Mini-Rae Lite WSTP102 1.20-1.56 2019-09-10 6.1 12.0 Cold and dry Mini-Rae Lite LES 9.1 1 Checked By: ian.swain Approved By: ian.swain 17/01/2020 17/01/2020 Date: Date: SOIL ENGINEERING 2.00 19/02/2015 orm No SE-EMS-F-001 Revision No Issue Date Part of the Bachy Soletanche Group

Project Name	Nenthead	d Mine	es - P	ropos	ed MWTS, GI				lonisation		
Project No.	TA8234							K	esults		
Engineer	Aecom									Table I	Vo.
Client	The Coal	Autho	rity							1	
Hole ID	Sample Depth m	Sample Type	Sample Ref.	Test Number	Test Date yyyy-mm-dd	PI pp		Temp. °C	Weather	Remarks	PID Device Type
WSTP103	0.20	ES	2	1	2019-09-12	1.	6	14.0	Raining		Mini-Rae Lite
WSTP103	0.50	ES	5	1	2019-09-12	2.	1	14.0	Raining		Mini-Rae Lite
WSTP103	1.00	ES	8	1	2019-09-12	1.	9	14.0	Raining		Mini-Rae Lite
WSTP104	1.00	ES	5	1	2019-09-10	9.	6	12.0	Cold and dry		Mini-Rae Lite
WSTP105	0.20	ES	2	1	2019-09-13	1.	5	14.0	Raining		Mini-Rae Lite
WSTP105	0.50	ES	5	1	2019-09-13	5.	7	14.0	Raining		Mini-Rae Lite
WSTP105	1.00	ES	8	1	2019-09-13	3.	8	14.0	Raining		Mini-Rae Lite
WSTP106	0.20	ES	2	1	2019-09-16	1.	2	13.0	Sunny		Mini-Rae Lite
WSTP106	0.50	ES	4	1	2019-09-16	0.	8	13.0	Sunny		Mini-Rae Lite
WSTP106	1.00	ES	6	1	2019-09-16	2.	2	13.0	Sunny		Mini-Rae Lite
WSTP107	0.20	ES	2	1	2019-09-16	0.	5	13.0	Sunny		Mini-Rae Lite
WSTP107	0.50	ES	4	1	2019-09-16	0.	8	13.0	Sunny		Mini-Rae Lite
WSTP107	1.00	ES	6	1	2019-09-16	0.	6	13.0	Sunny		Mini-Rae Lite
WSTP108	0.50	ES	4	1	2019-09-10	5.	2	12.0	Cold and dry		Mini-Rae Lite
		Chec	ked I	 Зу:	ian.swain		Appr	oved By:	ian.swain		
		Date			17/01/2020		Date		17/01/2020	SOIL ENGINE	eering
Form No. SE	E-EMS-F-001		Revisi	on No.	2.00		Issue	Date 19	/02/2015	Part of the Bachy So	

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Project Nam	e Nenthead	Mines - Pr	Proposed MWTS, GI		Vane and		Hole ID
Project No.	TA8234				rometer Rer r Excavatio		TP111
Engineer	Aecom			10.	í EXCavacio)IIS	Table No.
Employer	The Coal A	uthority					1
Depth m	Test no.	Peak Vane kPa	kPa	Penetrometer kPa	Date		Remarks
1.00	1	>140	10		05/09/2019		
1.00	2	>140	68		05/09/2019		
1.00	3	>140	112		05/09/2019		
					+	L	
							_
							SOIL ENGINEERING
Form No. SE-I	IST-F-017	1/	ssueNo.RevisionNo 1	1.04	Issue Date 08/	/11/2012	Part of the Bachy Soletanche Group

Project No. TA8234	Project Nam	e Nenthead	Mines - Prop	osed MWTS, GI		Vane and	i	Hole ID
Employer The Coal Authority 1 Depth Test no	Project No.	TA8234				rometer l	Results	TP115
Depth Test no. Peak Vane Residual Vane Penetrometer SaPa Date Remarks	Engineer	Aecom			foi	r Excavati	ons	Table No.
M	Employer	The Coal A	Authority					1
1.00 2 16 14 06/09/2019 100/09/201		Test no.				Date		Remarks
100 S S 22 20 08/09/2019 100 10	1.00		48	28				
SOLL ENGINEERING SOLL ENGINEE								
	1.00	3	32	20		06/09/2019		
	Form No. SE-	IST-F-017	Issue	eNo.RevisionNo	L.04	Issue Date 0	8/11/2012	Part of the Bachy Soletanche Grou

Project Nam	e Nenthead	Mines - Prop	osed MWTS, GI		Vane and	l	Hole ID
Project No.	TA8234				rometer F		TP124
Engineer	Aecom			foi	r Excavati	ons	Table No.
Employer	The Coal A	Authority					1
Depth m	Test no.	Peak Vane kPa	Residual Vane kPa	Penetrometer kPa	Date		Remarks
1.00	1	52	30		04/09/2019		
1.00	2	44	18		04/09/2019		
1.00	3	48	20		04/09/2019		
		T					
							SOIL ENGINEERING
Form No. SE-	IST-F-017	Issue	eNo.RevisionNo	L.04	Issue Date 0	8/11/2012	Part of the Bachy Soletanche Grou

Project Nam	e Nenthead	Mines - Prop	osed MWTS, GI		Vane and	d l	Hole ID
Project No.	TA8234			Penet	rometer l		TP125
Engineer	Aecom			fo	r Excavati	ons _	Table No.
		\utharita					1
Employer	The Coal A	-utiliority			1		1
Depth m	Test no.	Peak Vane kPa	Residual Vane kPa	Penetrometer kPa	Date		Remarks
0.70	1	40	26		04/09/2019		
0.70	2	54	16		04/09/2019		
0.70	3	48	26		04/09/2019		
F	ICT F 047		N. B	1.07	1 2: -	0/44/0046	SOIL ENGINEERING
Form No. SE-	IST-F-017	Issue	eNo.RevisionNo	1.04	Issue Date 0	8/11/2012	Part of the Bachy Soletanche Group



SUPPORTING FACTUAL DATA

SECTION A

Exploratory Hole Records and Field Data

GROUNDWATER / GAS MONITORING RESULTS

Project Name	e Nenthead Mines - Prop	osed MW	TS, GI	Grour	ıdwate	er Inflov	NS	
Project No.	TA8234				Recorde			
Engineer	Aecom			Expl	lorator	y Holes	•	Table No.
Employer	The Coal Authority							
Hole ID	Date and time	Strike at depth	Rise to depth	Time taken to rise	Casing depth at strike time	Casing depth to seal flow	1	Remarks
	yyyy-mm-ddThh:mm	m	m	mins	m	m		
WS101	2019-09-16T14:30	1.50	1.30	20		Not sealed		
WS106	2019-09-11T14:30	1.20	1.00	20	0.00	Not sealed		
WS107	2019-09-11T11:00	1.00	0.80	20	0.00	Not sealed		
Recorded By:		ecked By:			7 7	d By: paul.i		
Date:	Various Date		11/11/20)19	Date:		1/2019	soil engineering
Form No. SE-P	GR-F-007 Issue	eNo.RevisionI	No 4.00		Issue Date	14/01/20	16	Part of the Bachy Soletanche Group

Project Name	Nenthead Mines - Proposed MWTS, GI	Groundwater	
Project No.	TA8234	Readings For	
Engineer	Aecom	Installations	Table No.
Client	The Coal Authority		
NOTES:	CDIE-Diazamatar CD-Standning		

NOTES: SPIE=Piezometer, SP=Standpipe

SE-PGR-F-008

Form No.

Issue.Revision No.

For multiple installations at the same depth, use different Installation IDs. Otherwise, the field is optional.

Monitoring point depth for piezometers = tip depth, for standpipes = base of response zone

COMMENTS

		Installatio	n Details					Recorde	d Water l	.evel			
Exploratory Hole ID	Туре	Depth to base of pipe	Monitoring point depth	ID	Date	Time	Reading	Date	Time	Reading	Date	Time	Reading
		m	m		dd/mm/yyyy	hh:mm	m	dd/mm/yyyy	hh:mm	m	dd/mm/yyyy	hh:mm	m
BH102R	SP	5.00	5.01	01	20/09/2019	09:45	2.75	01/10/2019	12:20	2.61	09/10/2019	12:30	2.52
BH103	SPIE	4.10	4.10	01	20/09/2019	12:30	1.40	01/10/2019	10:59	2.20	09/10/2019	14:00	2.32
BH104	SPIE	3.40	3.40	01	20/09/2019	13:45	1.20	01/10/2019	11:17	1.08	09/10/2019	14:05	1.00
BH106	SPIE	5.70	5.70	01	20/09/2019	14:15	1.40	01/10/2019	11:40	1.07	09/10/2019	14:20	0.93
BH107	SP	4.00	4.00	01	20/09/2019	14:00	0.75	01/10/2019	11:30	0.66	09/10/2019	14:10	0.46
WS103	SP	2.80	2.80	01	20/09/2019	12:15	0.65	01/10/2019	10:37	1.37	09/10/2019	13:50	1.35
WS104	SP	3.20	3.20	01	20/09/2019	12:45	0.45	01/10/2019	11:06	0.33	09/10/2019	13:45	0.23
WSBH101R	SP	2.30	2.30	01	20/09/2019	09:30	1.85	01/10/2019	11:57	1.76	09/10/2019	12:40	1.69
Recorded by:	Variou	ıs	Che	ecked	by: lan.Swa	in Apr	proved by	r: lan Swa	in				
	0/2019)	Dat	te: 17/01/2020 Date: 17/01/2020 SOIL engineering									

Issue Date

2.05

24/01/2014

Part of the Bachy Soletanche Group

Project Name	Nenthead Mines - Proposed MWTS, GI	Groundwater	
Project No.	TA8234	Readings For	
Engineer	Aecom	Installations	Table No.
Client	The Coal Authority		
NOTES:	SPIE=Piezometer. SP=Standpipe		

COMMENTS

30/09/2019

SE-PGR-F-008

Date: 17/01/2020

Issue.Revision No.

Date:

Form No.

For multiple installations at the same depth, use different Installation IDs. Otherwise, the field is optional. Monitoring point depth for piezometers = tip depth, for standpipes = base of response zone

		Installatio	on Details		Recorded Water Level									
Exploratory Hole ID	Туре	Depth to base of pipe	Monitoring point depth	ID	Date dd/mm/www	Time	Reading	Date dd/mm/www	Time hh:mm	Reading	Date dd/mm/www	Time	Reading	
DI IA COD		m	m	04	dd/mm/yyyy	hh:mm	m	dd/mm/yyyy		m	dd/mm/yyyy	nn:mm	m	
BH102R	SP	5.00	5.01	01	17/10/2019	11:12	2.55	25/10/2019	11:10	2.61				
BH103	SPIE	4.10	4.10	01	17/10/2019	12:09	2.16	25/10/2019	12:10	2.30				
BH104	SPIE	3.40	3.40	01	17/10/2019	12:28	1.08	25/10/2019	11:50	1.00				
BH106	SPIE	5.70	5.70	01	17/10/2019	12:38	1.00	25/10/2019	11:30	1.00				
BH107	SP	4.00	4.00	01	17/10/2019	12:50	0.68	25/10/2019	11:40	0.70				
WS103	SP	2.80	2.80	01	17/10/2019	12:07	1.24	25/10/2019	12:20	1.47				
WS104	SP	3.20	3.20	01	17/10/2019	12:18	0.27	25/10/2019	12:00	0.34				
WSBH101R	SP	2.30	2.30	01	17/10/2019	11:23	1.82	25/10/2019	11:00	1.82				
Recorded by:	Variou		C.	1	by: lan.Swa		roved by	r: lan Swa		<u> </u>		l .	1	

17/01/2020

24/01/2014

soil engineering Part of the Bachy Soletanche Group

Date:

Issue Date

2.05

Project Name No	enthead Mines - F	Proposed I	MWTS, GI		Reco	rd Of G	ias		Hole ID	
Project No. TA	8234				Мо	nitorin	g		BH102R	
Engineer Ae	ecom						-		Table No.	
Client Th	e Coal Authority									
Notes Type of	Sampling Point:	GMP = G	as Monito	rıng Point,	GMP+SP	= Gas Mon	itoring Poi	nt and Sta	andpipe, G	MP+SPIE
			_			iezometer,	GMP+GW	MP = Gas	s Monitori	ng Point
Fordo	ible ese valves re			Monitoring		onitorina [Doint ID			
Distance to monitoring poin	ıble gas valves, re	Coru vaive	5.00	riy, usiriy s	Monitoring		לווונים		01	
Top of response zone	m		1.00		Base of resp		m		5.01	
Well Type			SP			depth of insta			5.00	
	11.2	Detection	3F		IIIItiai base	ueptii oi iiista	illation m		3.00	
Measured Parameter	Units	Limit	4	2		, ,	-			
Monitoring round no.	N/A	N/A	1	2	3	4	5	6	7	8
Date	dd/mm/yyyy	N/A	17/10/2019	25/10/2019						
Time of initial readings	hh:mm:ss	N/A	11:06:00	11:10:00						
Water Level	m	0.01	2.55	2.61						
Atmospheric pressure	mb	1	951	956						
Relative pressure	mb	1	<1	<1						
Base depth of installation a time of monitoring	m	0.01	5.00	4.44						
Time of 'Peak' readings	hh:mm:ss	N/A	11:08:00	11:11:00						
CH ₄ : (LEL) Peak	%	1	<1	<1						
CH ₄ : Peak	%v/v	0.1	<0.1	<0.1						
CO ₂ : Peak	%v/v	0.1	1.1	1.3						
O ₂ : Minimum	%v/v	0.1	20.0	20.1						
CO: Peak	ppm	1	1	1						
H ₂ S: Peak	ppm	1	<1	<1						
Time of Steady readings	hh:mm:ss	N/A	11:10:00	11:12:00						
CH ₄ : (LEL) Steady State	%	1	<1	<1						
CH ₄ : Steady State	%v/v	0.1	<0.1	<0.1						
CO ₂ : Steady State	%v/v	0.1	1.0	1.3						
O ₂ : Steady State	%v/v	0.1	20.0	20.1						
CO: Steady State	ppm	1	1	1						
H ₂ S: Steady State	ppm	1	<1	<1						
Gas Flow	l/hr	0.1	-0.1	0.1						
\\\+bC			F:	Claud						
Weather Conditions: Equipment Type			Fine GA5000	Cloud GA5000						
Equipment Serial Number			G501004	G501004						
Equipment Last Calibrated			19/06/2019	19/06/2019						
Monitored By			CR	EB						
Comments										
								6	I DOCTION	
Form No. SE-EMS-F-002	Revision No	. 2.06		Issue Date	27/01/	2014		soil engi of the Bachy	Soletanche Gr	oup

Project Name Nen	thead Mines - I	Proposed I	MWTS, GI		Reco	ord Of G	ias		Hole ID	
Project No. TA82	234				Mo	nitorin	g		BH107	
Engineer Aeco	om						_		Table No.	
Client The	Coal Authority									
Notes Type of S	ampling Point:									
			nitoring P ndwater M			Piezometer,	GMP+GW	/MP = Gas	Monitorii	ng Point
For doubl	e gas valves, re			_		onitoring F	Point ID			
Distance to monitoring point	m		4.00	<u> </u>	Monitoring				1	
Top of response zone	m		1.00		Base of resp	oonse zone	m		4.00	
Well Type			SP		Initial base	depth of insta	ıllation m		4.00	
Measured Parameter	Units	Detection			<u> </u>		<u> </u>			
Monitoring round no.	N/A	Limit N/A	1	2	3	4	5	6	7	8
Date	dd/mm/yyyy	N/A	17/10/2019	25/10/2019						
Time of initial readings	hh:mm:ss	N/A	12:34:00	11:40:00						
Water Level	m	0.01	0.68	0.70						
Atmospheric pressure	mb	1	954	956						
Relative pressure	mb	1	<1	<1						
Base depth of installation at time of monitoring	m	0.01	3.61	3.70						
Time of 'Peak' readings	hh:mm:ss	N/A	12:35:00	11:41:00						
CH ₄ : (LEL) Peak	%	1	<1	<1						
CH ₄ : Peak	%v/v	0.1	<0.1	<0.1						
CO ₂ : Peak	%v/v	0.1	0.1	0.1						
O ₂ : Minimum	%v/v	0.1	21.7	22.2						
CO: Peak	ppm	1	2	<1						
H₂S: Peak	ppm	1	<1	<1						
Time of Steady readings	hh:mm:ss	N/A	12:38:00	11:42:00						
CH ₄ : (LEL) Steady State	%	1	<1	<1						
CH ₄ : Steady State	%v/v	0.1	<0.1	<0.1						
CO ₂ : Steady State	%v/v	0.1	0.1	0.1						
O ₂ : Steady State	%v/v	0.1	21.7	22.2						
CO: Steady State	ppm	1	<1	<1						
H ₂ S: Steady State	ppm	1	<1	<1						
Gas Flow	l/hr	0.1	-0.1	0.1						
Weather Conditions:			Fine	Cloud						
Equipment Type			GA5000	GA5000						
Equipment Serial Number			G501004	G501004						
Equipment Last Calibrated			19/06/2019	19/06/2019						
Monitored By Comments			CR	EB						
Comments										
Form No. SE-EMS-F-002	Revision No	o. 2.06		Issue Date	27/01/2	2014		SOIL ENGI t of the Bachy	NEERING Soletanche Gro	oup

Project Name Ne	nthead Mines - I	Proposed I	MWTS, GI		Reco	ord Of G	ias		Hole ID	
Project No. TAS	3234				Мо	nitorin	9		WS103	
Engineer Aed	com						-		Table No.	
Client The	Coal Authority									
Notes Type of S	Sampling Point:									
			-			Piezometer,	GMP+GW	MP = Gas	Monitorir	ng Point
For doub	ole gas valves, re			Monitoring		lonitorina F	Point ID			
Distance to monitoring point		cord varve	2.80	iy, using s	Monitoring		OIIICID	01		
Top of response zone					Base of res		m		2.80	
Well Type	Jonise Zone III				Initial base	depth of insta	allation m		2.80	
Measured Parameter	Units	Detection			<u> </u>	•				
Monitoring round no.	N/A	Limit N/A	1	2	3	4	5	6	7	8
Date	dd/mm/yyyy	N/A	17/10/2019	25/10/2019						
Time of initial readings	hh:mm:ss	N/A	12:02:00	12:20:00						
Water Level	m	0.01	1.24	1.47						
Atmospheric pressure	mb	1	945	949						
Relative pressure	mb	1	-1	<1						
Base depth of installation at	m	0.01	2.80	2.80						
time of monitoring Time of 'Peak' readings	hh:mm:ss	N/A	12:03:00	12:21:00						
CH ₄ : (LEL) Peak	%	1	<1	<1						
CH ₄ : Peak	%v/v	0.1	<0.1	<0.1						
CO ₂ : Peak	%v/v	0.1	0.9	1.4						
O ₂ : Minimum	%v/v	0.1	19.9	19.4						
CO: Peak	ppm	1	<1	<1						
H ₂ S: Peak	ppm	1	<1	<1						
Time of Steady readings	hh:mm:ss	N/A	12:05:00	11:02:00						
CH ₄ : (LEL) Steady State	%	1	<1	<1						
CH ₄ : Steady State	%v/v	0.1	<0.1	<0.1						
CO ₂ : Steady State	%v/v	0.1	0.3	1.0						
O ₂ : Steady State	%v/v	0.1	19.9	19.6						
CO: Steady State	ppm	1	<1	<1						
H ₂ S: Steady State	ppm	1	<1	<1						
Gas Flow	l/hr	0.1	-0.5	2.8						
Weather Conditions:			Fine	Cloud						
Equipment Type			GA5000	GA5000						
Equipment Serial Number Equipment Last Calibrated			G501004 19/06/2019	G501004 19/06/2019						
Monitored By			CR	EB						
Comments										
								4		
Form No. SE-EMS-F-002	Revision No	o. 2.06		Issue Date	27/01/	2014		SOIL ENGI	neering Soletanche Gro	oup
				-			1	٠,		

Project Name Nen	thead Mines - I	Proposed I	MWTS, GI		Reco	ord Of G	ias		Hole ID	
Project No. TA8	234				Мо	nitorin	g		WS104	
Engineer Aeco	om						-		Table No.	
Client The	Coal Authority									
Notes Type of S	ampling Point:									
			nitoring P ndwater M			Piezometer,	GMP+GW	/MP = Gas	Monitori	ng Point
For doub	le gas valves, re			_		onitoring F	Point ID			
Distance to monitoring point	m		3.20	<u>,, c</u>	Monitoring				01	
Top of response zone	m		1.00		Base of resp	oonse zone	m		3.20	
Well Type			SP			depth of insta	ıllation m		3.20	
Measured Parameter	Units	Detection				·				
Monitoring round no.	N/A	Limit N/A	1	2	3	4	5	6	7	8
Date	dd/mm/yyyy	N/A	17/10/2019	25/10/2019						
Time of initial readings	hh:mm:ss	N/A	12:12:00	12:00:00						
Water Level	m	0.01	0.27	0.34						
Atmospheric pressure	mb	1	945	949						
Relative pressure	mb	1	<1	<1						
Base depth of installation at	m	0.01	3.25	3.15						
time of monitoring Time of 'Peak' readings	hh:mm:ss	N/A	12:14:00	12:01:00						
CH ₄ : (LEL) Peak	%	1	<1	<1						
CH ₄ : Peak	%v/v	0.1	<0.1	<0.1						
CO ₂ : Peak	%v/v	0.1	1.0	0.6						
O ₂ : Minimum	%v/v	0.1	21.2	22.2						
CO: Peak		1	<1	<1						
H ₂ S: Peak	ppm	1								
	ppm		<1	<1						
Time of Steady readings	hh:mm:ss	N/A	12:16:00	11:02:00						
CH ₄ : (LEL) Steady State	%	1	<1	<1						
CH ₄ : Steady State	%v/v	0.1	<0.1	<0.1						
CO ₂ : Steady State	%v/v	0.1	0.4	0.6						
O ₂ : Steady State	%v/v	0.1	21.2	22.2						
CO: Steady State	ppm	1	<1	<1						
H ₂ S: Steady State	ppm	1	<1	<1						
Gas Flow	l/hr	0.1	<0.1	0.3						
Weather Conditions:			Fine	Cloud						
Equipment Type			GA5000	GA5000						
Equipment Serial Number			G501004	G501004						
Equipment Last Calibrated			19/06/2019	19/06/2019						
Monitored By			CR	EB						
Comments										
								SOIL ENGI	Deeping	
Form No. SE-EMS-F-002	Revision No	2.06		Issue Date	27/01/2	2014			Soletanche Gr	oup

Project Name Nen	thead Mines - F	Proposed I	MWTS, GI		Reco	rd Of G	ias		Hole ID	
Project No. TA82	234				Мо	nitorin	g	١	WSBH101	R
Engineer Aeco	om								Table No.	
Client The	Coal Authority									
Notes Type of S	ampling Point:									
			_			iezometer,	GMP+GW	MP = Gas	Monitorir	ng Point
For doubl	e gas valves, re			Monitoring		onitorina F	Point ID			
Distance to monitoring point	m gas varves, re		2.30	iy, using s	Monitoring		OIIIC ID	01		
Top of response zone					Base of resp		m		2.30	
Well Type					Initial base	depth of insta	Ilation m		2.30	
Measured Parameter	Units	Detection				•				
Monitoring round no.	N/A	Limit N/A	1	2	3	4	5	6	7	8
Date	dd/mm/yyyy	N/A	17/10/2019	25/10/2019						
Time of initial readings	hh:mm:ss	N/A	11:18:00	11:00:00						
Water Level	m	0.01	1.82	1.82						
Atmospheric pressure	mb	1	952	956						
Relative pressure	mb	1	<1	<1						
Base depth of installation at	m	0.01	2.30	2.30						
time of monitoring Time of 'Peak' readings	hh:mm:ss	N/A	11:20:00	11:01:00						
CH ₄ : (LEL) Peak	%	1	<1	<1						
CH ₄ : Peak	%v/v	0.1	<0.1	<0.1						
CO ₂ : Peak	%v/v	0.1	0.7	0.7						
O ₂ : Minimum	%v/v	0.1	20.3	20.5						
CO: Peak	ppm	1	<1	<1						
H ₂ S: Peak	ppm	1	<1	<1						
Time of Steady readings	hh:mm:ss	N/A	11:22:00	11:02:00						
CH ₄ : (LEL) Steady State	%	1	<1	<1						
CH ₄ : Steady State	%v/v	0.1	<0.1	<0.1						
CO ₂ : Steady State	%v/v	0.1	0.7	0.7						
O ₂ : Steady State	%v/v	0.1	20.3	20.5						
CO: Steady State	ppm	1	<1	<1						
H ₂ S: Steady State	ppm	1	<1	<1						
Gas Flow	l/hr	0.1	0.1	0.2						
Weather Conditions:			Fine	Cloud						
Equipment Type Equipment Serial Number			GA5000 G501004	GA5000 G501004						
Equipment Last Calibrated			19/06/2019	19/06/2019						
Monitored By			CR	EB						
Comments										
								•		
Form No. SE-EMS-F-002	Revision No	. 2.06		Issue Date	27/01/	2014		SOIL ENGI t of the Bachy	Soletanche Gro	oup



SUPPORTING FACTUAL DATA

SECTION B

Laboratory Testing

KEY TO LABORATORY TEST RESULTS AND SUMMARY SHEETS

SECTION B: KEY TO LABORATORY TEST RESULTS AND SUMMARY SHEETS

FIELD IDENTIFICATION

Sample Type	U UT P TW L	Undisturbed sample Thin wall open drive tube sample Piston sample Thin walled sample Liner sample	D B AMAL BLK C	Small disturbed sample Bulk disturbed sample Amalgamated sample Block sample Core sample
Test status		esult in italics indicates a test that is not s laboratory.	within the s	scope of the UKAS accreditation

SUMMARY OF LABORATORY SOIL TESTS: INDEX / CLASSIFICATION TESTS

Particle density	р	Small pyknometer method	9	Gas jar method
Plastic index	N/P	Non plastic, although liquid limit will ha	ave been	determined if requested
Particle size (PSD)	1 p	Following value in silt column denotes Following value in clay column denotes sedimentation is by hydrometer.		

SUMMARY OF LABORATORY SOIL TESTS: STRENGTH AND PERMEABILITY TESTS

Triaxial	UU UUM UU3 CU CUM CU3 CD CDM CD3	Single stage unconsolidated quick undrained Multi stage unconsolidated quick undrained Set of 3 unconsolidated quick undrained Single stage consolidated undrained Multi stage consolidated undrained Set of 3 consolidated undrained Single stage consolidated drained Multi stage consolidated drained Multi stage consolidated drained Set of 3 consolidated drained Note that single stage tests are reported assuming phi = 0 for total stress
Consolidation	Oed mv	One-dimensional oedometer Coefficient of compressibility quoted for range p0 to p0 + 100kPa, where determined
Permeability	С	Constant head permeability
Shearbox	SSB LSB p r	Small shear box Large shear box Peak value Residual shear strength Ring shear



SECTION B: KEY TO LABORATORY TEST RESULTS AND SUMMARY SHEETS

SUMMARY OF LABORATORY SOIL RE-USE TESTS

MCV	S	MCV value at natural or specified moisture content
	int	Intercept of calibration line in MCV calibration

SUMMARY OF LABORATORY ROCK STRENGTH TESTS

Point	Туре	D	Diametral	Α	Axial
Load	(combination	1	Irregular lump	В	Block
	of)	L	Test performed parallel to planes of weal	kness	
		P	Test performed perpendicular to planes of	of weakn	ess
		Χ	Invalid failure of point load (not broken b	etween _l	points of load application)

SUMMARY OF LABORATORY ROCK MATERIALS TESTS

Ten% fines w Soaked test	d Dry test
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Important note:

Summary sheets are provided for convenience and in no way replace individual test result sheets which shall, without exception, be regarded as the definitive result.

POINT LOAD INDEX RESULT

Point	Туре	D	Diametral	Α	Axial	
Load	(combination	1	Irregular lump	В	Block	
	of)	L	Test performed parallel to planes of weakness			
		Р	Test performed perpendicular to planes of weakness			
		Χ	Invalid failure of point load (not broken between points of load application)			
Dimensions		W	Diameter of core or average smallest width perpendicular to axis of loading in a block or irregular lump			
		D	Distance between platens when just in contact with specimen			
		D'	Distance between platens at point of failure			
		De	Equivalent core diameter	ls	P/De ²	
		Is(50)	FxIs	F	(De/50) ^{0.45}	
		Is(50) point load strength index corrected for a diametral test of core diameter 50mm For Axial/Lump tests $De^2 = (4/Pi) \times (W \times D')$ For Diametral tests $De^2 = D \times D'$				



SUPPORTING FACTUAL DATA

SECTION B

Laboratory Testing

LABORATORY SOIL TEST SUMMARY SHEETS

Project Name	Nenthead	Mine	es - P	roposed N	IWTS,	, GI		С	las	sific	atio	on 1	est	S						
Project No.	TA8234									Sui	nm	ary								
Engineer	Aecom																			
Employer	The Coal A	Autho	rity																	
				٤		ntent			ity				ш	age		Par	ticle	size		
Hole ID	Sample depth m	Sample no.	Sample type	Specimen depth m	Specimen no.	% Moisture Content	Bulk Density	do Density	Particle Density	% Liquid Limit	% Plastic Limit	% Plastic Index	% Passing 425µm	% Linear Shrinkage	% Clay	% Silt	% Sand	% Gravel	% Cobbles	
BH102R	1.50	4	D	1.50	1	14.8		vig/iii		70	,,,	70	70	70	70	70	70	,,	70	
BH102R	2.50	9	В	2.50	1											11.1 ¹	7.8	19.8	61.3	
BH102R	3.00	11	D	3.00	3	12.5														
BH102R	3.00	11	D	3.00	4					40	25	15	42							
BH102R	4.00	13	D	4.00	3	17.3														
BH102R	4.00	13	D	4.00	4					33	20	13	80							
BH103	0.00	4	В	0.00	1										14.8	29.3	35.6	20.3	0.0	
BH103	1.95	6	D	1.95	3	18.3														
BH103	1.95	6	D	1.95	4					35	19	16	80							
BH103	3.25	12	D	3.25	3	16.4														
BH103	3.25	12	D	3.25	4					31	16	15	55							
BH104	0.50	3	D	0.50	1	21.7														
BH104	0.50	3	D	0.50	2					42	25	17	98							
BH104	0.50	4	В	0.50	1										19.7	29.6	35.0	15.7	0.0	
BH104	2.25	9	D	2.25	3	17.1														
BH104	2.25	9	D	2.25	4					38	19	19	73							
BH105	1.50	5	u	1.74	2					31	NP	NP	71							
BH106	0.00	1	В	0.00	3	30.6														
BH106	0.00	1	В	0.00	4					48	35	13	52							
BH106	3.50	14	В	3.50	2										4.7	24.0	41.8	18.4	11.1	
BH106	4.25	16	D	4.25	3	13.7														
BH106	4.25	16	D	4.25	4					32	16	16	52							
TP104	1.00	4	В	1.00	1										3.0	10.9	25.7	60.4	0.0	
Approved by:			Leed	s Laborato	ry															
Steve Harper			Revisi	on No.	2.03			Issue	Date	Print da	te /11/20	07/11/2)12	1019						tanche (

Project Name	Nenthead	Mine	es - P	roposed N	1WTS	, GI		C	las	sific	atio	on 1	est	S						
Project No.	TA8234									Sui	mm	ary								
Engineer	Aecom																			
Employer	The Coal A	Autho	rity																	
				Ε		ntent			ity				ım	age		Par	ticle :	size		
Ное ID	Sample depth m	Sample no.	Sample type	Specimen depth m	Specimen no.	% Moisture Content	Bulk Density	S Dry Density	Particle Density	% Liquid Limit	% Plastic Limit	% Plastic Index	% Passing 425µm	% Linear Shrinkage	% Clay	% Silt	% Sand	% Gravel	% Cobbles	
TP108	0.45	1	S	0.45	2	70	'	vig/iii		70	70	70	70	70	12.1	12.8	46.6	28.5	0.0	
TP109	1.00	3	D	1.00	3	27.9														
TP109	1.00	3	D	1.00	4					33	23	10	63							
TP109	1.50	4	В	1.50	1										9.1	21.6	29.2	26.1	14.0	
TP110	1.00	3	D	1.00	1	36.0														
TP110	2.00	6	D	2.00	3	15.8														
TP110	2.00	6	D	2.00	4					39	17	22	77							
TP110	3.00	9	D	3.00	1	17.3														
TP112	2.00	6	D	2.00	3	15.2														
TP112	2.00	6	D	2.00	4					41	18	23	75							
TP114	0.50	1	В	0.50	1	27.5														
TP114	1.00	3	В	1.00	3	20.7														
TP114	1.00	3	В	1.00	4					38	19	19	71							
TP114	1.70	6	D	1.70	3	20.5														
TP114	1.70	6	D	1.70	4					31	NP	NP	77							
TP114	2.00	11	D	2.00	3	15.5														
TP114	2.00	11	D	2.00	4					38	19	19	74							
TP115	1.00	3	D	1.00	1	46.4														
TP115	1.00	3	D	1.00	2					62	29	33	95							
TP116	1.00	3	D	1.00	3	18.7														
TP116	1.00	3	D	1.00	4					44	21	23	55							
TP120	1.20	5	D	1.20	3	17.0														
TP120	1.20	5	D	1.20	4					34	19	15	65							
Approved by:			Leed	s Laborato	ry															
Steve Harper			Revisi	on No.	2.03			Issue	Date	Print da	te /11/20	07/11/2)12	.019				of the Ba			
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Project Name	Nenthead	Mine	es - P	roposed N	1WTS	, GI		C	las	sific	atio	on 1	est	S						
Project No.	TA8234									Sui	mm	ary								
Engineer	Aecom																			
Employer	The Coal A	Autho	rity																	
				ш		ntent			ity				ш	age		Par	ticle	size		
Hole ID	Sample depth m	Sample no.	Sample type	Specimen depth m	Specimen no.	% Moisture Content	Bulk Density	S Dry Density	Particle Density	% Liquid Limit	% Plastic Limit	% Plastic Index	% Passing 425µm	% Linear Shrinkage	% Clay	% Silt	% Sand	% Gravel	% Cobbles	
TP122	0.80	3	D	0.80	3	21.1		vig/iii		70	70	70	70	70	70	70	70	70	70	
TP122	0.80	3	D	0.80	4					45	22	23	77							
TP123	0.60	3	D	0.60	1	23.2														
TP123	1.00	5	D	1.00	1	17.8														
TP124	1.00	3	D	1.00	3	36.0														
TP124	1.00	3	D	1.00	4					45	24	21	98							
TP125	1.00	5	D	1.00	3	23.5														
TP125	1.00	5	D	1.00	4					45	25	20	81							
TP126	1.50	4	В	1.50	1										8.8	22.0	38.1	31.1	0.0	
TP128	0.60	3	D	0.60	3	497														
TP128	0.60	3	D	0.60	4					692	366	326	100							
WS102	0.20	3	В	0.20	1											6.9 ¹	14.3	37.3	41.5	
WS102	1.20	10	L	1.20	1	20.6														
WS102	1.20	10	L	1.20	2					24	17	7	100							
WS102	3.00	14	L	3.00	1											10.2 ¹	40.1	49.7	0.0	
WS103	1.20	10	L	1.20	3	15.4														
WS103	1.20	10	L	1.20	4					38	17	21	67							
WS104	1.70	12	L	1.70	1	16.5														
WS104	1.70	12	L	1.70	2					32	18	14	97							
WS105	0.20	3	В	0.20	1										8.0	13.8	33.1	42.9	2.2	
WS105	1.20	8	L	1.20	3	22.1														
WS105	1.20	8	L	1.20	4					37	19	18	61							
WS105	3.00	11	D	3.00	1	18.5														
Approved by:			Leed	s Laborato	ry															
Steve Harper			Revisi	on No.	2.03			Issue	Date	Print da	te /11/20	07/11/2)12	019					n GIN		

Project Name	Nenthead	Mine	es - P	roposed N	1WTS	, GI		C	las	sific	atio	on 1	est	S						
Project No.	TA8234									Su	mm	ary								
Engineer	Aecom																			
Employer	The Coal A	Autho	rity																	
				Е		ntent			sity				шr	age		Par	ticle :	size		
Hole ID	Sample depth m	Sample no.	Sample type	Specimen depth m	Specimen no.	% Moisture Content	Bulk Density	Solution Density	Particle Density	% Liquid Limit	% Plastic Limit	% Plastic Index	% Passing 425µm	% Linear Shrinkage	% Clay	% Silt	% Sand	% Gravel	% Cobbles	
WS107	1.00	5	D	1.00	1	13.9														
WS107	2.00	10	L	2.00	3	14.8														
WS107	2.00	10	L	2.00	4					36	19	17	51							
WS108	1.00	7	В	1.00	1										2.9	12.3	39.7	33.3	11.8	
WS108	2.00	11	L	2.00	3	19.1														
WS108	2.00	11	L	2.00	4					35	17	18	67							
WSBH101R	2.00	12	В	2.00	1											9.6 ¹	8.1	82.3	0.0	
WSTP101	0.20	3	В	0.20	1											12.9¹	28.3	43.6	15.2	
WSTP101	1.20	9	L	1.20	3	22.1														
WSTP101	1.20	9	L	1.20	4					40	24	16	26							
WSTP102	1.00	6	D	1.00	3	15.4														
WSTP102	1.00	6	D	1.00	4					36	21	15	40							
WSTP103	0.50	4	D	0.50	3	13.6														
WSTP103	0.50	4	D	0.50	4					35	26	9	38							
WSTP105	0.50	6	В	0.50	1											8.0 ¹	21.4	56.0	14.6	
WSTP107	2.00	10	L	2.00	3	9.4														
WSTP107	2.00	10	L	2.00	4					32	NP	NP	26							
Approved by:		<u> </u>	Leed	s Laborato	ry	<u> </u>	<u> </u>		<u> </u>	<u> </u>	l	<u> </u>	l	<u> </u>	<u> </u>		<u> </u>			
Steve Harper			Revisi	on No.	2.03			Issue	Date	Print da	te /11/20	07/11/2 012	1019					nGIN		

r															
Project Name	Nenthea	d Mir	nes - Pi	roposed N	/WT	S, GI				y Of La		ory			
Project No.	TA8234								Soil R	e-Use	Tests				
Engineer	Aecom														
Employer	The Coal	Auth	ority												
	_			шı					Comp	action	MCV		CBR	ion	
Hole ID	Sample depth m	Sample no.	Sample type	Specimen depth m	Specimen no.	Moisture Content	Job Bulk Density		OMC %	Max DD		Top %	Base %	Pinhole Dispersion	
BH104	1.50	07	В	1.50	01	24	ivig/.		70	ivig/iii	2.3 s	70	1 "		
BH105	0.00	04	В	0.00	01	8.2									
BH105	2.50	09	В	2.50	01	30									
BH106		01	AMAL		01				14	1.9					
BH106	2.50	10	В	2.50	01	16									
BH106	4.50	18	В	4.50	01	21									
TP109	0.50	01	В	0.50	01	22	2.0	1				0.26	0.38		
TP110	0.50	01	В	0.50	02	38	1.7	8				0.44	0.38		
TP112	0.50	01	В	0.50	01	34	1.8	1				0.24	0.27		
TP112	1.50	04	В	1.50	02				15	1.82					
TP113	0.50	01	В	0.50	02				15	1.89					
TP114	2.50	12	В	2.50	01	16					8.2 s				
TP115	0.50	01	В	0.50	01	32	1.8	6				0.42	0.41		
TP118	1.50	04	В	1.50	02				8.7	2.12					
TP119	0.50	01	В	0.50	02	29	1.9	1				0.73	0.62		
TP120	0.50	01	В	0.50	02				13	2.05					
TP121	0.50	01	В	0.50	04						29.2% int				
TP122	0.50	01	В	0.50	01	30					2 s				
TP123	0.50	01	В	0.50	02						29% int				
TP123	1.00	06	В	1.00	01	19					6.3 s				
TP124	0.50	01	В	0.50	01	30	1.9	0				1.2	1.4		
TP125	0.30	03	В	0.30	02	20	2.0	5				1.9	2.3		
TP126	0.50	01	В	0.50	01	24	2.0	0				1.1	1.7		
Approved by:															
			Dovis:	a No	2.03			cour F	Print d		07/11/2019			engine	
			Revisio	i IVO.	∠.∪≾		IS	ssue [Date	09/01/2013	•		Part of the	Bachy Soleta	icne Group

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Project Name	Nenthea	d Mir	nes - P	roposed N	/IVVT	S, GI	Su		y Of La		-			
Project No.	TA8234							Soil R	e-Use	Tests				
Engineer	Aecom													
Employer	The Coal	Auth	ority											
	ıth m		a)	lepth m	.0	ω	nsity	Comp	action	MCV	CI	BR	persion	
Hole ID	Sample depth m	Sample no.	Sample type	Specimen depth m	Specimen no.	Moisture Content	my Bulk Density	OMC %	Max DD Mg/m³		Top %	Base %	Pinhole Dispersion	
TP127	0.50	01	В	0.50	02	26	1.96	70	ivig/iii		0.39	0.36	ш.	
TP128	0.50	01	В	0.50	02	32	1.84				0.72	0.57		
WS105	2.00	10	В	2.00	01	29								
WS107	0.20	03	В	0.20	01			16	1.79					
WSTP105	0.20	03	В	0.20	01	12	2.29				1.8	2.2		
WSTP107	0.20	03	В	0.20	01	13	2.29				2.4	4.8		
Approved by:							<u> </u>					_		
Steve Harper								Print d	late	07/11/2019	1	SOIL	enginee	RING
			Revisio	n No.	2.03		Issue	Date	09/01/2013	}			Bachy Soletar	

									_								
Project Name	Nenthead	Mines	- Prop	osed MWTS	s, Gl			reng									
Project No.	TA8234					Pe	rmea	abilit	ty Su	ımm	ary						
Engineer	Aecom																
Employer	The Coal A	uthorit	ty														
									Triaxial		Co	nsol	Perm	eability	,	Shearbo	х
Ное ID	Sample depth m	Sample no.	Sample type	Specimen depth m	Specimen no.	% Moisture Content	© Bulk Density	Туре	,ɔ/ɔ/nɔ/nɔ kPa	,Φ/Φ.	Туре	mv m²/MN	Туре	K m/s	Type	c' kPa	φ'
BH103	1.50	5	u	1.54	1	15	2.14	иим	33	11.9							
BH106	2.50	10	В	2.5	2										SSB	p9.1	p30.5
TP116	0.50	1	В	0.5	1										SSB	p21	p25.5
TP117	0.50	1	В	0.5	1										SSB	p9.7	p29
TP118	0.50	1	В	0.5	1										SSB	p17	p27.5
Approved by: Steve Harper	1	1		s Laboratory		1			Print date		7/11/2019			SOI		ineer	ing
		Revision	on No.	3.04		lss	ue Date		24/11	L/2014				Part of	the Bachy	Soletanch	e Group

Project Name Project No.	Nenthead N Treatment S TA8234			osed Mine V	Vater	Pe			th a	nd ımma	ary						
Engineer	Aecom																
Employer	The Coal Au	ıthorit	y														
						π			Triaxial		Coi	nsol	Perme	eability	,	Shearbo	(
Hole ID	Sample depth m	Sample no.	Sample type	Specimen depth m	Specimen no.	% Moisture Content	S Bulk Density	Туре	c kPa	Ø	Туре	m _v m²/MN	Туре	K m/s	Туре	c kPa	Ø
BH105	1.50	05	s u	1.55	2	19	2.16	CUM End	2	38.0			<u>L</u>		<u>u</u>		
Approved by:			Leeds	Laboratory											1		
Kevin Walker		Dovisi-	n Na	204		la-	uo Data		Print date		3/11/2019				L eng	ıneer	
		Revisio	n No.	3.04		Iss	ue Date		24/11	/2014				Part of t	ne Bachy	Soletanch	e Group



SUPPORTING FACTUAL DATA

SECTION B

Laboratory Testing

LABORATORY SOIL TEST DATA SHEETS

Project Name	Nenthead	Mine	es - Pr	oposed M	WTS,	GI	Moi	sture Cont	ent		
Project No.	TA8234										
Engineer	Aecom										
Employer	The Coal A	Autho	rity				BS EN	N ISO 17892-1:2	2014		
Ноје ID	Sample depth m	Sample no.	Sample type	Specimen depth m	Specimen no.		Description			Remarks	Moisture % Content
BH102R	1.50	4	D	1.50	1	Dark grey s	lightly gravel	lly sandy CLAY.			14.8
BH102R	3.00	11	D	3.00	3	Dark browr	ı sandy grave	elly CLAY.			12.5
BH102R	4.00	13	D	4.00	3	Dark browr	ı slightly grav	elly sandy CLAY.			17.3
BH103	1.95	6	D	1.95	3	Brown sligh CLAY.	ntly gravelly s	slightly sandy			18.3
BH103	3.25	12	D	3.25	3	brown sligh	ntly gravelly s	andy CLAY			16.4
BH104	0.50	3	D	0.50	1	Brown sligh CLAY.	ntly gravelly s	lightly sandy			21.7
BH104	2.25	9	D	2.25	3	Brown sligh CLAY.	ntly gravelly s	slightly sandy			17.1
BH106	0.00	1	В	0.00	3	Brown clay rootlets.	ey gravelly SA	AND with some			30.6
BH106	4.25	16	D	4.25	3	Brown sligh	ntly gravelly s	sandy CLAY.			13.7
TP109	1.00	3	D	1.00	3	Brown sligh	ntly gravelly s	sandy CLAY.			27.9
TP110	1.00	3	D	1.00	1	Grey and or gravelly sar	rangish brow ndy CLAY.	n slightly			36.0
TP110	2.00	6	D	2.00	3	Brown sligh	ntly gravelly s	sandy CLAY.			15.8
TP110	3.00	9	D	3.00	1	Brown grav	elly sandy CL	.AY.			17.3
TP112	2.00	6	D	2.00	3	Grey slight	y gravelly CL	AY.			15.2
TP114	0.50	1	В	0.50	1	Brown grav	elly sandy CL	AY.			27.5
TP114	1.00	3	В	1.00	3	Brown grav	elly sandy CL	AY.			20.7
TP114	1.70	6	D	1.70	3	Brown grav	elly sandy CL	AY.			20.5
TP114	2.00	11	D	2.00	3	Brown sligh CLAY.	ntly gravelly s	slightly sandy			15.5
Approved by:			Leed	s Laborato	ry	1					
Steve Harper								Print date 07/11/2	019	soil ei	ngineering
			Revisi	on No.	2.03		Issue Date	21/11/2012		Part of the Ba	chy Soletanche Group

Project Name	Nenthead	Mine	es - Pr	oposed M	WTS,	GI	Moi	sture Cont	ent		
Project No.	TA8234										
Engineer	Aecom								-		
Employer	The Coal I	Autho	rity				BS EI	N ISO 17892-1:2	2014		
Ноје ID	Sample depth m	Sample no.	Sample type	Specimen depth m	Specimen no.		Description			Remarks	% Moisture Content
TP115	1.00	3	D	1.00	1	Brown sligh CLAY.	ntly gravelly s	lightly sandy			46.4
TP116	1.00	3	D	1.00	3	Brown sligh	ntly gravelly s	andy CLAY.			18.7
TP120	1.20	5	D	1.20	3	Brwon sligh	ntly gravelly s	andy CLAY.			17.0
TP122	0.80	3	D	0.80	3	Brown sligh CLAY.	ntly sandy slig	ghtly gravelly			21.1
TP123	0.60	3	D	0.60	1	Brown sligh CLAY.	ntly gravelly s	lightly sandy			23.2
TP123	1.00	5	D	1.00	1	Brown sligh CLAY.	ntly gravelly s	lightly sandy			17.8
TP124	1.00	3	D	1.00	3	Brown sligh	ntly gravelly s	andy CLAY.			36.0
TP125	1.00	5	D	1.00	3	Brown sligh	ntly gravelly s	andy CLAY.			23.5
TP128	0.60	3	D	0.60	3	Dark grey P	EAT.				497
WS102	1.20	10	L	1.20	1	Brown sligh	ntly gravelly o	layey SAND.			20.6
WS103	1.20	10	L	1.20	3	Brown grav	elly sandy CL	AY.			15.4
WS104	1.70	12	L	1.70	1	Grey mottle sandy CLAY		htly gravelly			16.5
WS105	1.20	8	L	1.20	3	Brown sligh	ntly gravelly o	layey SAND.			22.1
WS105	3.00	11	D	3.00	1	Dark grey s CLAY.	lightly gravel	ly slightly sandy			18.5
WS107	1.00	5	D	1.00	1	Brown grav	elly sandy CL	AY.			13.9
WS107	2.00	10	L	2.00	3	Brown grav	elly sandy CL	AY.			14.8
WS108	2.00	11	L	2.00	3	Brown sligh	ntly gravelly s	andy CLAY.			19.1
WSTP101	1.20	9	L	1.20	3	Brown sand	ly gravelly CL	AY.			22.1
Approved by:			Leed	s Laborato	ry	T					
Steve Harper								Print date 07/11/2	019	soil ei	ngineering
			Revisi	on No.	2.03		Issue Date	21/11/2012		Part of the Ba	chy Soletanche Group

Project Name	Nenthead	Mine	s - Pr	oposed M	WTS,	GI	Moisture Cont	ent		
Project No.	TA8234									
Engineer	Aecom									
Employer	The Coal A	۹utho	rity				BS EN ISO 17892-1:2	2014		
Hole ID	Sample depth m	Sample no.	Sample type	Specimen depth m	Specimen no.		Description		Remarks	Moisture % Content
WSTP102	1.00	6	D	1.00	3	Brown sligh	itly sandy gravelly CLAY.			15.4
WSTP103	0.50	4	D	0.50	3	Brown sligh	itly sandy gravelly CLAY.			13.6
WSTP107	2.00	10	L	2.00	3	Brown grav	elly clayey SAND.			9.4
Approved by:			Leed	s Laborato	ry	•				
Steve Harper							Print date 07/11/2	019	soil ei	ngineering
			Revisio	on No.	2.03		Issue Date 21/11/2012			achy Soletanche Group

Project Nam	e Nenthead Mir	nes - Proposed	l MWTS, GI	Liqu	uid And Pla	stic	Hole ID BH102R
Project No.	TA8234				Limit Test		Sample Depth
Engineer	Aecom						3.00m Sample Number
					art 2: 1990: Clause		11
Employer	The Coal Auth	ority		with Wa	ater Content to BS 17892-1: 2014	EN ISO	Sample Type D
Description	Dark brown san	dy gravelly CLA	Υ.		17032 1.2011		Specimen Depth
							3.00m Specimen Number
							4
27							
25							
_ 23							
E E							
10 <u>.</u> 21					/		
etra 19							
Cone Penetration mm 12							
Cone 1/				F			
15							
13							
	30	35		40		45	50
I-4				oisture Conte		•	58%
Natural moisti _iquid limit:	ure content:		12.5% 40%	-	e retained on 425 n of sample: Wet	•	58%
Plastic limit:			25%	Remarks:	·		
Plasticity inde	x: ent of soil passing	1 425um	15% 29.5%	<u>,</u>			
iquidity index		, 1 23μπ	0.303				
100		Cl		CI	СШ	CV	CE
100		CL		CI	СН	CV	CE
100		CL		CI	СН	CV	CE
80		CL		CI	СН	CV	CE
80		CL		CI	СН	CV	CE
80		CL		CI	СН	CV	CE
80		CL		CI	СН	CV	CE
80		CL		CI	СН	CV	CE
Plasticity Index(%) 09 08		CL		CI	СН	CV	CE
80		CL		CI	СН	CV	CE
Plasticity Index(%) 60 60 20		CL		CI	CH MH	CV	
Plasticity Index(%) 09 08			30 40	MI			/ ME
Plasticity Index(%) 60 60 20		ML	30 40	MI	MH 60	M	/ ME
Plasticity Index(%) 60 40 20		ML		MI 50	MH 60	M	/ ME 0 90 100
Plasticity Index(%) 60 40 0		ML 20		MI 50	MH 60	70 80	/ ME

Project Name	Nenthead Min	es - Proposed N	/IWTS, GI	Liq	uid And Plastic		Hole ID BH102R
Project No.	TA8234				Limit Test		Sample Depth
Engineer	Aecom						4.00m Sample Number
Employer	The Coal Autho	arity.			art 2: 1990: Clause 4.3 an ater Content to BS EN ISC		13 Sample Type
				VVICIT VV	17892-1: 2014	,	D
Description	Dark brown sligh	ntly gravelly sand	y CLAY.				Specimen Depth 4.00m
							Specimen Number 4
27							
25 –							
و 23							
Ē 21 +							
etratio + 19							
Penet							
Cone Penetration To 12 - 12 - 13 - 14 - 15 - 15 - 15 - 15 - 15 - 15 - 15		-					
15							
13							
30)			35			40
			М	oisture Cont	ent %		
Natural moistur	e content:		17.3%	Percentag	e retained on 425µm sie	ve:	20%
Liquid limit: Plastic limit:			33% 20%	Preparation Remarks:	on of sample: Wet sieve		
Plasticity index:			13%	Remarks.			
Moisture conter Liquidity index:	nt of soil passing	425µm	21.6% 0.121				
quiu.eyuox.							
100 -		CL		CI	СН	C∜	CE
	'	CL		Ci	CIT	CV	CE
80 -							
(%)							
60 -							
Plasticity Index(%)							
Plasti							
20 -							
0 -		ML		MI	MH	MV	ME
(0 10	20	30 40		60 70	80	90 100
				Liquid Limi	t (%)		
Approved by:		Leeds Laborato	onv.				
Approved by: Steve Harper		reens rannigi	Ji y				SOIL ADGIDAADIDG
store i lai pei		Revision No.	2.07	Issue Date	Print date 07/11/2019 19/11/2012		SOIL ENGINEERING Part of the Bachy Soletanche Group

Project Name	Nenthead Min	es - Proposed MWTS,	GI	Liqu	uid And Pla	stic	Hole ID BH103
Project No.	TA8234				Limit Test		Sample Depth
Engineer	Aecom						1.95m Sample Number
Employer	The Coal Autho	rity			art 2: 1990: Claus ater Content to B 17892-1: 2014		6 Sample Type D
Description	Brown slightly g	ravelly slightly sandy CLA	AY.				Specimen Depth 1.95m Specimen Number 4
27 T							
23 + E E							
ation 21 +							
Cone Penetration To 12 - 12 - 13 - 14 - 15 - 15 - 15 - 15 - 15 - 15 - 15							
9 17 +							
15		· 					
13 30	1			35			
30	ı		Б а. •		ont 0/		40
				sture Conte			
Natural moistur Liquid limit: Plastic limit: Plasticity index: Moisture conter Liquidity index:	e content: nt of soil passing	425μm	18.3% 35% 19% 16% 22.8% 0.237		e retained on 42 n of sample: We		20%
Elquidity macx.			0.231				
100 -		CL		CI	СН	CV	CE
80 -							
(%) 60							
Plasticity Index(%)							
20 -				_			
0 -	0 10	ML 20 30	40	MI 50	MH 60	70 80	
				Liquid Limi [.]		30	
Approved by:		Leeds Laboratory					
Steve Harper				1	Print date 07/11/	2019	SOIL ENGINEERING
		Revision No. 2.07		Issue Date	19/11/2012		Part of the Bachy Soletanche Group

Project Name	Nenthead Min	es - Proposed	MWTS, GI	Liq	uid And Plasti	С	Hole ID BH103
Project No.	TA8234				Limit Test		Sample Depth
Engineer	Aecom						3.25m Sample Number
					Part 2: 1990: Clause 4.3		12
Employer	The Coal Autho	ority		with W	later Content to BS EN 17892-1: 2014	ISO	Sample Type D
Description	Brown slightly g	ravelly sandy Cl	LAY.	1			Specimen Depth 3.25m
							Specimen Number
							4
27 -							
25 -							
25 -							
23 - E							
E _ 21 -							
etratio - 61							
Denet							
Cone Penetration mm - 51 - 51 - 51							
15 -			•				
13 -							
	0	25		30		35	40
			M	oisture Cont	ent %		
N						•	(50/
Natural moistu Liquid limit:	re content:		16.4% 31%	`	ge retained on 425µm on of sample: Wet siev		45%
Plastic limit:	_		16%	Remarks:			
Plasticity index Moisture conte	: ent of soil passing	425µm	15% 29.9%				
Liquidity index:			0.924				
100		CL		CI	СН	C∜	CE
80							
(%)							
Plasticity Index(%) 0							
city l							
lastici 40							
<u>م</u> 20							
20							
0		ML		MI	МН	MV	ME
	0 10	20	30 40	50	60 70	80	90 100
				Liquid Lim	it (%)		
		I					T
Approved by:		Leeds Labora	itory				
Steve Harper		Revision No	2 07	lecua Dato	Print date 07/11/2019 19/11/2012		SOIL ENGINEERING Part of the Bachy Soletanche Group
Steve Harper		Revision No.	2.07	Issue Date	Print date 07/11/2019 19/11/2012		SOIL ENGINEERING Part of the Bachy Soletanche Group

Project Name	Nenthead Min	es - Proposed	MWTS, GI	Liq	uid And Plastic	•	Hole ID BH104
Project No.	TA8234				Limit Test		Sample Depth
Engineer	Aecom						0.50m Sample Number
					Part 2: 1990: Clause 4.3		3
Employer	The Coal Autho	ority		with V	Jater Content to BS EN IS 17892-1: 2014	50	Sample Type D
Description	Brown slightly g	ravelly slightly s	andy CLAY.	•			Specimen Depth 0.50m
							Specimen Number
							2
²⁷ T							
25 +							
					•		
E 23 +							
<u> </u>							
etrati + 61							
Pene					•		
Cone Penetration mm 17 -							
15							
13							
30)	35		40	•	45	50
			M	oisture Con	tent %		
Natural moistur	e content:		21.7%	6 Estimate	d percentage retained o	n 425µm s	sieve: 2%
Liquid limit:			42%		on of sample: Natural		
Plastic limit: Plasticity index:			25% 17%	Remarks			
Moisture conte	nt of soil passing	425µm	22.1%				
Liquidity index:			-0.17	3			
100							
100		CL		CI	СН	CV	CE
80 -							
(%) x; 60							
Plasticity Index(%)							
£icit 40							
Plast							
20							
				_			
0 -		ML		MI	MH	MV	ME
	0 10	20	30 40		60 70	80	90 100
				Liquid Lim	it (%)		
		l and a late	.				
Approved by:		Leeds Labora	tory				
Steve Harper					Print date 07/11/2019		SOIL ENGINEERING

Project Name	Nenthead Min	es - Proposed	MWTS, GI	Liq	uid And Plastic		Hole ID BH104
Project No.	TA8234				Limit Test		Sample Depth
Engineer	Aecom						2.25m Sample Number
					Part 2: 1990: Clause 4.3 ar	-	9
Employer	The Coal Autho	ority		with W	ater Content to BS EN ISO 17892-1: 2014)	Sample Type D
Description	Brown slightly g	ravelly slightly s	andy CLAY.				Specimen Depth
							2.25m Specimen Number
							4
27 -							
25 -							
_ 23 -							
E 21 +							
ation			•				
Cone Penetration mm - 11 - 12 - 13 - 14 - 15 - 15 - 15 - 15 - 15 - 15 - 15							
မီ 17 -							
ලි 15 -							
12							
13		25		(0		<u> </u>	
30	U	35		40	4	5	50
			M	oisture Cont	ent %		
Natural moistu	re content:		17.1%	Percentag	ge retained on 425µm sie	eve:	27%
Liquid limit: Plastic limit:			38%		on of sample: Wet sieve		
Plastic limit:	:		19% 19%	Remarks:			
Moisture conte	nt of soil passing	425µm	23.4%	,			
Liquidity index:			0.23				
100		CL		CI	СН	CV	CE
80							
(%)							
odex (e							
Plasticity Index(%)							
astici 04							
20							
0		ML		MI	МН	MV	ME
	0 10	20	30 40	50	60 70	80	90 100
				Liquid Lim	it (%)		
				1	. /		
Approved by:		Leeds Labora	torv				
Steve Harper		2000000	,				SOIL ENGINEERING
		Revision No.	2.07	Issue Date	Print date 07/11/2019 19/11/2012		Part of the Bachy Soletanche Group

Project Name	Nenthead Min	es - Proposed	MWTS, GI	Liqu	uid And Plastic		Hole ID BH105
Project No.	TA8234				Limit Test		Sample Depth
Engineer	Aecom						1.50m Sample Number
_					art 2: 1990: Clause 4.4 ar	nd 5	5
Employer	The Coal Autho	ority		with W	ater Content to BS EN ISO 17892-1: 2014	0	Sample Type U
Description	Dark brown grav	velly very sandy	CLAY with low co	bble cobbles.			Specimen Depth
						5	1.74m pecimen Number
							2
27							
25 -							
22							
23 - E							
<u> </u>	•						
etratio							
ene.							
Cone Penetration mm 10 - 12							
ე 15 -							
13 - 3	n			35			40
3	O			33			40
			M	oisture Cont	ent %		
Natural moistu	re content:		19.1%	Estimated	percentage retained on	ι 425μm siev	e: 29%
iquid limit:			31%		on of sample: Natural	1	
Plastic limit: Plasticity index	:		NP	Remarks:	Tested as 1 point Limit sand and/or silt and it		
	nt of soil passing	425µm	26.7%		on a line.		
iquidity index:							
100		CL		CI	СН	CV	CE
80							
(%)							
60 (c							
Plasticity Index(%)							
astici							
20				$\overline{}$			
		ML	_	MI	MH	MV	ME
0	+		20 (0	•	1	i	1
	0 10	20	30 40	50	60 70	80	90 100
				Liquid Limi	it (%)		
Approved by:		Leeds Labora	atory				
Approved by: Steve Harper		Leeds Labora	atory		Print date 07/11/2019		SOIL ENGINEERING

Project Nam	e Nenthead Min	es - Proposed MWTS, GI			iid And Plast	ic	Hole ID BH106
Project No.	TA8234				Limit Test		Sample Depth
Engineer	Aecom						0.00m Sample Number
Employer	The Coal Autho	prity			art 2: 1990: Clause 4. ater Content to BS EN 17892-1: 2014		1 Sample Type B
Description	Brown clayey gr	avelly SAND with some root	lets.				Specimen Depth 0.00m Specimen Number 4
27							
25	-			•			
£ 23							
Cone Penetration mm 12							
etratic 61							
90 J7							
15							
13	 40	45		50		55	60
			Mois	sture Conte	ent %		
Natural moist		3	0.6%			:	48%
Liquid limit: Plastic limit: Plasticity inde:	x: ent of soil passing	425μm 5	48% 35% 13% 69.4%	_	e retained on 425µn n of sample: Wet sie		48%
Liquidity index	λ.		1.073	<u> </u>			
100		CL		CI	СН	С	CE
80							
60 60							
Plasticity Index(%) 09							
20							
0	0 10	ML 20 30	40	MI 50	MH 60 70	MV) 80	90 100
	0 10	20 30		50 Liquid Limit		, 60	50 100
Approved by:		Leeds Laboratory					
Steve Harper		-		1	Print date 07/11/2019		SOIL ENGINEERING
		Revision No. 2.07		Issue Date	19/11/2012		Part of the Bachy Soletanche Group

Project Name	e Nenthead Min	es - Proposed	MWTS, GI	Liq	uid And Plast	ic	Hole ID BH106
Project No.	TA8234				Limit Test		Sample Depth
Engineer	Aecom						4.25m Sample Number
				BS1377: F	Part 2: 1990: Clause 4.3	3 and 5	16
Employer	The Coal Author	ority		with W	ater Content to BS EN 17892-1: 2014	ISO	Sample Type D
Description	Brown slightly g	ravelly sandy Cl	AY.		17692-1. 2014		Specimen Depth
							4.25m Specimen Number
							4
27 -							
21 -							
25 -							
_ 23 -							
E E							
Cone Penetration mm - 17 - 17 - 17 - 17 - 17 - 17 - 17 -							
କ ଅ ବ୍ର 17 -					<i></i>		
15 -				—			
13 -							
2	0	25		30		35	40
			Me	oisture Cont	ent %		
Natural moistu	re content:		13.7%	Percentag	e retained on 425µm	ı sieve:	48%
Liquid limit: Plastic limit:			32%		on of sample: Wet sie	ve	
Plastic limit: Plasticity index	:		16% 16%	Remarks:			
	ent of soil passing	425μm	26.3%				
Liquidity index			0.642				
100		CL		CI	СН	CV	CE
80							
(%):							
)xəpu							
city I							
Plasticity Index(%) 0 09							
20			A				
0		ML		MI	MH	MV	ME
0	0 10	20	30 40	50	60 70		90 100
				Liquid Lim	it (%)		
Approved by:		Leeds Labora	tory				
Steve Harper					Print date 07/11/2019		SOIL ENGINEERING
		Revision No.	2.07	Issue Date	19/11/2012		Part of the Bachy Soletanche Group

Project Name	Nenthead Min	es - Proposed	MWTS, GI	Li	quid And P	lastic	Hole ID TP109
Project No.	TA8234				Limit Te	st	Sample Depth
Engineer	Aecom						1.00m Sample Number
Employer	The Coal Autho	ority			7: Part 2: 1990: Cla n Water Content to 17892-1: 201	BS EN ISO	3 Sample Type D
Description	Brown slightly g	ravelly sandy Cl	AY.				Specimen Depth 1.00m Specimen Number 4
27 — 25 — 23 — 21 — 21 — 27 — 25 — 23 — 21 — 25 — 25 — 25 — 23 — 25 — 25 — 25 — 25				35			40
			N	Noisture C	ontent %		
Natural moisture Liquid limit: Plastic limit: Plasticity index: Moisture conter Liquidity index:		425µm	27.9° 33% 23% 10% 44.0° 2.1	Prepar Remar	tage retained on a ation of sample: V ks:		37%
100 -		CL		CI	СН	CV	CE
80 -							
- 60 mg/s/							
Plasticity Index(%)							
20 -							
1	1		─	MI	МН	М	V ME
0 -	0 10	ML 20	30 40) 5	0 60	70 8	0 90 100
			30 40) 5 Liquid L		70 8	0 90 100
						70 8	0 90 100

Project Name	e Nenthead Min	es - Proposed MWTS, GI	Liquid And Plastic	Hole ID TP110
Project No.	TA8234		Limit Test	Sample Depth
Engineer	Aecom			2.00m Sample Number
-		ority	BS1377: Part 2: 1990: Clause 4.3 and 5 with Water Content to BS EN ISO	6 Sample Type
Employer	The Coal Autho		17892-1: 2014	D
Description	Brown slightly g	ravelly sandy CLAY.		Specimen Depth 2.00m
				Specimen Number 4
27 -				
25 -				
22			<u>,</u>	
23 - E E				
21 - .0				
etrat - 91				
Cone Penetration mm - 17 - 17 - 17 - 17				
15 -				
13 -				
3	80	35	40 45	50
		_		
		N	Moisture Content %	
Vatural moistu	re content:	15.8°		23%
iquid limit:	ire content:	15.8° 39%	% Percentage retained on 425µm sieve: 6 Preparation of sample: Wet sieve	23%
iquid limit: Plastic limit:		15.8'	 Percentage retained on 425µm sieve: Preparation of sample: Wet sieve Remarks: 	23%
iquid limit: Plastic limit: Plasticity index Moisture conte	c: ent of soil passing	15.8° 39% 17% 22% 425µm 20.6°	Percentage retained on 425µm sieve: Preparation of sample: Wet sieve Remarks:	23%
iquid limit: Plastic limit: Plasticity index Moisture conte	c: ent of soil passing	15.8° 39% 17% 22%	Percentage retained on 425µm sieve: Preparation of sample: Wet sieve Remarks:	23%
iquid limit: Plastic limit: Plasticity index Moisture conte iquidity index	c: ent of soil passing	15.8° 39% 17% 22% 425µm 20.6°	Percentage retained on 425µm sieve: Preparation of sample: Wet sieve Remarks:	23%
iquid limit: Plastic limit: Plasticity index Moisture conte	c ent of soil passing :	15.8° 39% 17% 22% 425µm 20.6°	Percentage retained on 425µm sieve: Preparation of sample: Wet sieve Remarks: 6 % 2	23% CV CE
iquid limit: Plastic limit: Plasticity index Moisture conte iquidity index	c ent of soil passing :	15.8' 39% 17% 22% 425μm 20.6' 0.16	Percentage retained on 425µm sieve: Preparation of sample: Wet sieve Remarks: 6 % 2	
iquid limit: Plastic limit: Plasticity index Moisture conte iquidity index 100	c ent of soil passing :	15.8' 39% 17% 22% 425μm 20.6' 0.16	Percentage retained on 425µm sieve: Preparation of sample: Wet sieve Remarks: 6 % 2	
iquid limit: Plastic limit: Plasticity index Moisture conte iquidity index 100	c ent of soil passing :	15.8' 39% 17% 22% 425μm 20.6' 0.16	Percentage retained on 425µm sieve: Preparation of sample: Wet sieve Remarks: 6 % 2	
iquid limit: Plastic limit: Plasticity index Moisture conte iquidity index 100	c ent of soil passing :	15.8' 39% 17% 22% 425μm 20.6' 0.16	Percentage retained on 425µm sieve: Preparation of sample: Wet sieve Remarks: 6 % 2	
iquidity index. 100 80	c ent of soil passing :	15.8' 39% 17% 22% 425μm 20.6' 0.16	Percentage retained on 425µm sieve: Preparation of sample: Wet sieve Remarks: 6 % 2	
Liquid limit: Plastic limit: Plasticity index Moisture conte Liquidity index 100 80 (%) Xapul At	c ent of soil passing :	15.8' 39% 17% 22% 425μm 20.6' 0.16	Percentage retained on 425µm sieve: Preparation of sample: Wet sieve Remarks: 6 % 2	
Liquid limit: Plastic limit: Plasticity index Moisture conte Liquidity index 100	c ent of soil passing :	15.8' 39% 17% 22% 425μm 20.6' 0.16	Percentage retained on 425µm sieve: Preparation of sample: Wet sieve Remarks: 6 % 2	
Indignate Plastic limit: Plastic limit: Plasticity index Moisture contection 100 80 60 40	ent of soil passing	15.8° 39% 17% 22% 425μm 20.6° 0.16	Percentage retained on 425µm sieve: Preparation of sample: Wet sieve Remarks: CI CH CH	CE CE
iquid limit: Plastic limit: Plasticity index Moisture conte iquidity index 100 80 (%) 60 40	ent of soil passing	15.8° 39% 17% 22% 425μm 20.6° 0.16	Percentage retained on 425µm sieve: Preparation of sample: Wet sieve Remarks: CI CH C	AV ME
iquid limit: Plastic limit: Plasticity index Moisture conte iquidity index 100 80 (%) 60 40 20	ent of soil passing	15.8° 39% 17% 22% 425μm 20.6° 0.16	Percentage retained on 425µm sieve: Preparation of sample: Wet sieve Remarks: CI CH C	CE CE
iquid limit: Plastic limit: Plasticity index Moisture conte iquidity index 100 80 (%) 40 20	ent of soil passing	15.8° 39% 17% 22% 425μm 20.6° 0.16	Percentage retained on 425µm sieve: Preparation of sample: Wet sieve Remarks: CI CH C	AV ME
iquid limit: Plastic limit: Plasticity index Moisture conte iquidity index 100 80 (%) 60 40 20	ent of soil passing	15.8° 39% 17% 22% 425μm 20.6° 0.16	Percentage retained on 425µm sieve: Preparation of sample: Wet sieve Remarks: CI CH C	MV ME 80 90 100
iquid limit: Plastic limit: Plasticity index Moisture conte iquidity index 100 80 (%) 40 20	ent of soil passing	15.8° 39% 17% 22% 425μm 20.6° 0.16	Percentage retained on 425µm sieve: Preparation of sample: Wet sieve Remarks: CI CH C	AV ME

Project Name	Nenthead Min	es - Proposed	MWTS, GI	Liq	uid And Plastic		Hole ID TP112
Project No.	TA8234				Limit Test		Sample Depth
Engineer	Aecom						2.00m Sample Number
					Part 2: 1990: Clause 4.3		6
Employer	The Coal Autho	ority		with W	ater Content to BS EN I 17892-1: 2014	SO	Sample Type D
Description	Grey slightly gra	velly CLAY.		l			Specimen Depth 2.00m
							Specimen Number
							4
27 -							
25							
25 -							
23 - E							
E <u> </u>							
ratio							
Cone Penetration mm - 51 - 51 - 51 - 51 - 51 - 51 - 51 -				•			
e 17 -							
ن 15 -			•				
13 -							
3	0	35		40		45	50
			M	oisture Cont	ent %		
Natural moistu Liquid limit:	re content:		15.2% 41%	1	ge retained on 425µm s on of sample: Wet sieve		25%
Plastic limit:			18%	Remarks:			
Plasticity index	: ent of soil passing	425um	23% 20.2%				
Liquidity index:		120μπ	0.097				
100	1	CL		CI	СН	C∜	CE
		CL		Ci		CV	CL
80							
(%							
60 dex							
Plasticity Index(%) 0							
astici 40							
20							
_		ML	+	MI	МН	MV	ME
0	0 10	20	30 40	50	60 70	80	90 100
				Liquid Lim			
				9 414 1111	(/~/		
Approved by:		Leeds Labora	torv				
Steve Harper							SOIL ENGINEERING
2.2.0 Haipoi		Revision No.	2.07	Issue Date	Print date 07/11/2019 19/11/2012		Part of the Bachy Soletanche Group

Project Name	e Nenthead Min	es - Proposed	l MWTS, GI	Liqu	uid And Pl			ole ID P114
Project No.	TA8234				Limit Tes	t	Samp	le Depth
Engineer	Aecom							00m e Number
					art 2: 1990: Clau			3
Employer	The Coal Autho	ority		with Wa	ater Content to E 17892-1: 2014		Samp	ole Type B
Description	Brwon gravelly s	sandy CLAY.						en Depth
								00m en Number
								4
27 -								
25 -								
23 -								
E C								
تا <u>21</u> -			7					
- 19 -								
Cone Penetration mm - 12 - 12								
			•					
15 -								
13 -								
3	80	35		40		45		50
			N	loisture Cont	ent %			
Natural moistu	ıre content:		20.7%	6 Percentag	e retained on 42	•		29%
iquid limit:	ire content:		20.7%	6 Percentag Preparatio		•		29%
iquid limit: Plastic limit: Plasticity index	c		20.7%	6 Percentag Preparatio	e retained on 42	•		29%
iquid limit: Plastic limit: Plasticity index Moisture conte	c ent of soil passing	ı 425μm	20.79 38% 19% 19% 29.39	Percentag Preparatio Remarks:	e retained on 42	•		29%
iquid limit: Plastic limit: Plasticity index	c ent of soil passing	ι 425μm	20.79 38% 19% 19%	Percentag Preparatio Remarks:	e retained on 42	•		29%
iquid limit: Plastic limit: Plasticity index Moisture conte	c ent of soil passing :	ι 425μ m CL	20.79 38% 19% 19% 29.39	Percentag Preparatio Remarks:	e retained on 42	•	ψ	29% CE
iquid limit: Plastic limit: Plasticity index Moisture conte iquidity index:	c ent of soil passing :	•	20.79 38% 19% 19% 29.39	6 Percentag Preparatio Remarks:	e retained on 42 n of sample: We	et sieve	V	
iquid limit: Plastic limit: Plasticity index Moisture conte iquidity index:	c ent of soil passing :	•	20.79 38% 19% 19% 29.39	6 Percentag Preparatio Remarks:	e retained on 42 n of sample: We	et sieve	V	
iquid limit: Plastic limit: Plasticity index Moisture conte iquidity index: 100	c ent of soil passing :	•	20.79 38% 19% 19% 29.39	6 Percentag Preparatio Remarks:	e retained on 42 n of sample: We	et sieve	V	
iquid limit: Plastic limit: Plasticity index Moisture conte iquidity index:	c ent of soil passing :	•	20.79 38% 19% 19% 29.39	6 Percentag Preparatio Remarks:	e retained on 42 n of sample: We	et sieve	V	
iquid limit: Plastic limit: Plasticity index Moisture conte iquidity index:	c ent of soil passing :	•	20.79 38% 19% 19% 29.39	6 Percentag Preparatio Remarks:	e retained on 42 n of sample: We	et sieve	V	
iquid limit: Plastic limit: Plasticity index Moisture conte iquidity index: 100	c ent of soil passing :	•	20.79 38% 19% 19% 29.39	6 Percentag Preparatio Remarks:	e retained on 42 n of sample: We	et sieve	V	
Iniquid limit: Plastic limit: Plasticity index Moisture conte Liquidity index: 100 80 (%) 40	c ent of soil passing :	•	20.79 38% 19% 19% 29.39	6 Percentag Preparatio Remarks:	e retained on 42 n of sample: We	et sieve	V	
iquid limit: Plastic limit: Plasticity index Moisture conte iquidity index:	c ent of soil passing :	•	20.79 38% 19% 19% 29.39	6 Percentag Preparatio Remarks:	e retained on 42 n of sample: We	et sieve	V	
iquid limit: Plastic limit: Plasticity index Noisture conte iquidity index: 100 80 (%) 80 40 20	ent of soil passing	CL	20.79 38% 19% 19% 29.39 0.542	6 Percentag Preparatio Remarks:	e retained on 42 n of sample: We	ct sieve		CE
Indigential Plasticity Index (%) Plasticity Index (%) Indigential Indigentia	ent of soil passing	CL	20.79 38% 19% 19% 29.39 0.542	6 Percentag Preparatio Remarks:	e retained on 42 n of sample: We	et sieve C	1V	CE
iquid limit: Plastic limit: Plasticity index Noisture conte iquidity index: 100 80 (%) 80 40 20	ent of soil passing	CL	20.79 38% 19% 19% 29.39 0.542	6 Percentag Preparatio Remarks:	e retained on 42 n of sample: We CHI	et sieve C		CE
iquid limit: Plastic limit: Plasticity index Moisture conte iquidity index: 100 80 (%) 40 20	ent of soil passing	CL ML 20	20.79 38% 19% 19% 29.39 0.542	6 Percentag Preparatio Remarks:	e retained on 42 n of sample: We CHI	et sieve C	1V	CE
iquid limit: Plastic limit: Plasticity index Noisture conte iquidity index: 100 80 (%) 80 40 20	ent of soil passing	CL	20.79 38% 19% 19% 29.39 0.542	6 Percentag Preparatio Remarks:	e retained on 42 n of sample: We CHI	et sieve C	1V	CE

Project Name	Nenthead Min	es - Proposed	MWTS, GI	Liq	uid And Plastic	Hole ID TP114
Project No.	TA8234				Limit Test	Sample Depth
Engineer	Aecom					1.70m Sample Number
					Part 2: 1990: Clause 4.4 and	5 6
Employer	The Coal Autho	ority		with W	ater Content to BS EN ISO 17892-1: 2014	Sample Type D
Description	Brown gravelly s	andy CLAY.		"		Specimen Depth 1.70m
						Specimen Number
						4
27						
25 -						
23 -						
E E						
r 21 -	•					
Cone Penetration mm - 11 - 12 - 13 - 14 - 15 - 15 - 17 - 17 - 17 - 17 - 17 - 17						
<u>မ</u> ၅ 17 -						
Ö 15 -						
15						
13 -				35		40
3	o .					40
			Mo	oisture Cont	ent %	
Natural moistur Liquid limit:	re content:		20.5% 31%	1	je retained on 425µm sieve on of sample: Wet sieve	e: 23%
Plastic limit:			NP			iquid limit due to the sample being
Plasticity index	nt of soil passing	62Eum	26.8%		sand and/or silt and it is on a line.	very difficult to get all four points
Liquidity index:		423μπ	20.870		on a line.	
100		CL		CI	СН	CŲ CE
80						
(%)						
Plasticity Index(%)						
- city)						
Plasti						
20				_		
0	+	ML		MI	МН	MV ME
	0 10	20	30 40	50	60 70	80 90 100
				Liquid Lim	it (%)	
Approved by:		Leeds Labora	tory			
Steve Harper			,		Print date 07/11/2019	SOIL ENGINEERING
·		Revision No.	2.07	Issue Date	19/11/2012	Part of the Bachy Soletanche Group

Project Name	Nenthead Min	es - Proposed	MWTS, GI	Liq	uid And Plas	stic	Hole ID TP114
Project No.	TA8234				Limit Test		Sample Depth
Engineer	Aecom						2.00m Sample Number
					Part 2: 1990: Clause		11
Employer	The Coal Author	ority		with W	later Content to BS 17892-1: 2014	EN ISO	Sample Type D
Description	Brown slightly g	ravelly slightly s	andy CLAY.		17002 1.2011		Specimen Depth
							2.00m Specimen Number
							4
27 -							
21							
25 –							
_ 23 +					•		
E 21							
ig 21 –							
Cone Penetration mm 17 -							
e 17 +							
15 +							
13							
30)	35		40		45	50
			М	oisture Cont	ent %		
Natural moistur	e content:		15.5%	Percentac	ge retained on 425	um sieve:	26%
Liquid limit:			38%	Preparation	on of sample: Wet		
Plastic limit: Plasticity index:			19% 19%	Remarks:			
	nt of soil passing	425µm	21.0%	ó			
Liquidity index:			0.103				
100		CL		CI	СН	CV	CE
80							
(%							
60 dex(
Plasticity Index(%)							
astici							
20							
_		ML	+	MI	MH	MV	, ME
0 -	0 10	20	30 40	•	ı	70 80	
				Liquid Lim		. 30	
				Liquid Lim	it (70)		
		l and - L - L	.				
Approved by:		Leeds Labora	tory				
Steve Harper		Revision No.	2.07	Issue Date	Print date 07/11/20 19/11/2012	19	SOIL ENGINEERING Part of the Bachy Soletanche Group
			2.01	issue Date	10, 11, 2012		. a.c o. a.o bueny objetanche droup

Project Name	Nenthead Min	es - Proposed	MWTS, GI	Liq	uid And Plasti	С	Hole ID TP115
Project No.	TA8234				Limit Test		Sample Depth
Engineer	Aecom						1.00m Sample Number
Employer	The Coal Autho	ority			Part 2: 1990: Clause 4.3 Pater Content to BS EN		3 Sample Type
Description			and CLAV		17892-1: 2014	D Specimen Depth	
Description	Brown slightly g	ravelly slightly s	sandy CLAY.				1.00m
							Specimen Number 2
27							
27 -							
25 -						•	
23 - E							
Ē <u>c</u> 21 -							
Cone Penetration mm - 12 - 12 - 13 - 14 - 15 - 15 - 17 - 17 - 17 - 17 - 17 - 17							
Pene							
euo 17 -							
15 -							
13 -							
5	0	55		60		65	70
			Mo	oisture Cont	ent %		
Natural moistu	re content:		46.4%		percentage retained	on 425µm s	sieve: 5%
Liquid limit: Plastic limit:			62% 29%	Preparation Remarks:	on of sample: Natural		
Plasticity index			33%				
Moisture conte Liquidity index:	ent of soil passing	425μm	48.7% 0.598				
				•			
100	T	CL		CI	СН	C∜	CE
				Ci		Č V	CL
80							
(%)							
Plasticity Index(%) 0	+						
icity 40							
olasti					4		
20							
0	+	ML		MI	MH	MV	ME
	0 10	20	30 40	50	60 70	80	90 100
				Liquid Lim	ıt (%)		
Approved by:		Leeds Labora	tory				
Steve Harper		Leeus Labuld	LOI y		Drive data		SOIL ENGINEERING
		Revision No.	2.07	Issue Date	Print date 07/11/2019 19/11/2012		Part of the Bachy Soletanche Group

Project Name	Nenthead Min	es - Proposed	MWTS, GI	Liqu	uid And Plas	tic	Hole ID TP116
Project No.	TA8234				Limit Test		Sample Depth
Engineer	Aecom						1.00m Sample Number
Employer	The Coal Autho	ority			art 2: 1990: Clause 4 ater Content to BS E 17892-1: 2014		3 Sample Type D
Description	Brown slightly g	ravelly sandy CL	AY.				Specimen Depth 1.00m Specimen Number 4
27 — 25 — 23 — 21 — 21 — 27 — 27 — 27 — 27 — 27 — 27		•		45			50
40							50
			М	oisture Cont	ent %		
Natural moistur Liquid limit: Plastic limit: Plasticity index: Moisture conter Liquidity index:	e content: nt of soil passing	425μm	18.7% 44% 21% 23% 34.0% 0.564	Preparation Remarks:	e retained on 425μ on of sample: Wet s		45%
100 -		CL		CI	СН	C∜	CE
80 -							
Index(%)							
Plasticity Index(%)							
20 -							
0 -	0 10	ML 20	30 40	MI 50	MH 60 7	MV 0 80	90 100
				Liquid Limi			
Approved by:		Leeds Laborat	tory				
Steve Harper					Print date 07/11/2019)	SOIL ENGINEERING
		Revision No.	2.07	Issue Date	19/11/2012		Part of the Bachy Soletanche Group

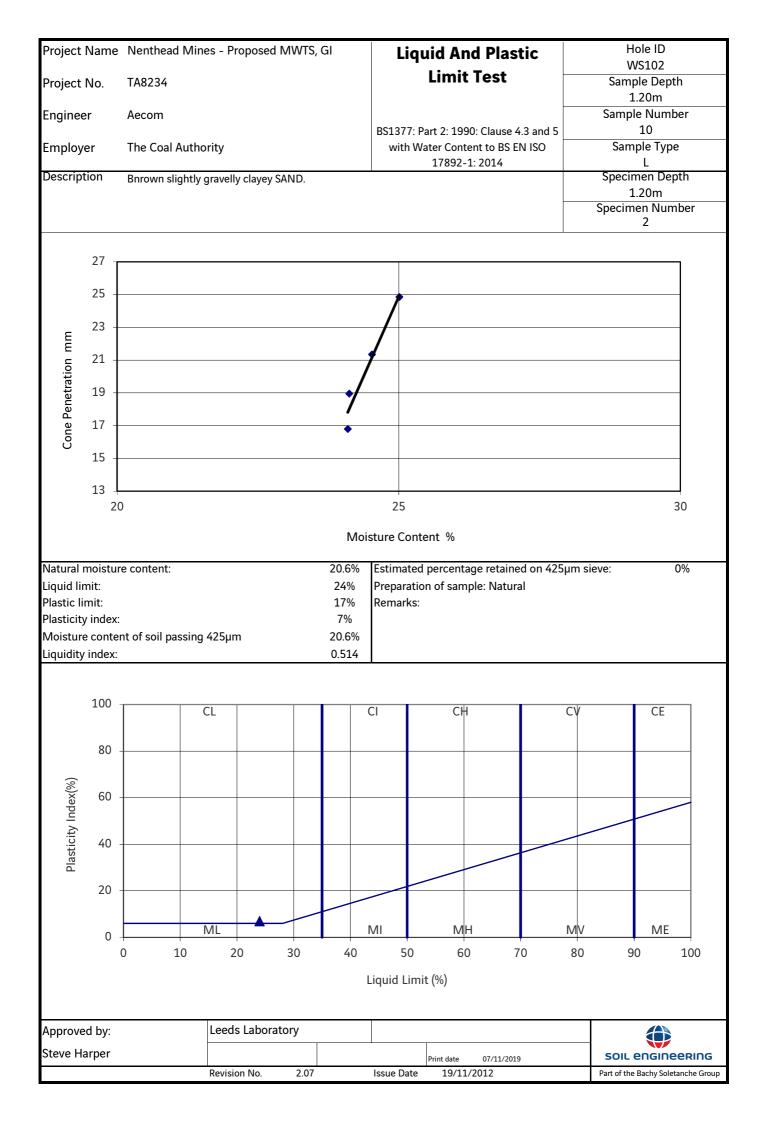
Project Name	Nenthead Min	es - Proposed	MWTS, GI	Liq	uid And Plastic	Hole ID TP120
Project No.	TA8234				Limit Test	Sample Depth
Engineer	Aecom					1.20m Sample Number
Employer	The Coal Autho				Part 2: 1990: Clause 4.3 and 5 later Content to BS EN ISO 17892-1: 2014	Sample Type D
Description	Brown slighlty g	ravelly sandy CL	AY.			Specimen Depth 1.20m Specimen Number 4
27 - 25 - 23 - 21 - 21 - 21 - 22 - 23 - 23 - 23						
OOD 15 -)			35		40
			N	loisture Cont	ent %	
Natural moistur Liquid limit: Plastic limit: Plasticity index: Moisture contel Liquidity index:		425μm	17% 34% 19% 15% 26.3%	Preparation Remarks:	e retained on 425μm sieve: on of sample: Wet sieve	35%
				•		
100		CL		CI	СН	CV CE
80 -						
lndex(%)						
Plasticity Index(%)						
20 -						
0 -	0 10	ML 20	30 40	MI) 50	MH 60 70	MV ME 80 90 100
				Liquid Limi	it (%)	
Approved by: Steve Harper		Leeds Labora	tory			
Steve Harper		Revision No.	2.07	Issue Date	Print date 07/11/2019 19/11/2012	Part of the Bachy Soletanche Group

Project Name	Nenthead Mines - Propo	sed MWTS, GI	Liquid And Plastic	Hole ID TP122
Project No.	TA8234		Limit Test	Sample Depth
Engineer	Aecom			0.80m Sample Number
Employer	The Coal Authority		BS1377: Part 2: 1990: Clause 4.3 and 5 with Water Content to BS EN ISO 17892-1: 2014	3 Sample Type D
27 - 25 - 23 - 25 - 27 - 25 - 27 - 25 - 27 - 27 - 27	Brown slightly sandy slightly	y gravelly CLAY.		Specimen Depth 0.80m Specimen Number 4
13 - 4)		45	50
Natural moistu Liquid limit: Plastic limit: Plasticity index Moisture conte Liquidity index:		21.1% 45% 22% 23% 27.3% 0.229	Percentage retained on 425µm sieve: Preparation of sample: Wet sieve Remarks:	23%
100	CL		CI CH (CV CE
80				
Plasticity Index(%) 6 9				
Plasticity 6				
20				
0	0 10 20	30 40	•	M V
			Liquid Limit (%)	
Approved by:	Leeds Lal	boratory		
Steve Harper			Print date 07/11/2019	soil engineering
	Revision No	o. 2.07	Issue Date 19/11/2012	Part of the Bachy Soletanche Group

Project Name	Nenthead Min	es - Proposed MW	/TS, GI	Liqu	uid And Pla	astic	Hole ID
Project No.	TA8234			•	Limit Test		TP124 Sample Depth
							1.00m
Engineer	Aecom			BS1377: P	art 2: 1990: Claus	se 4.3 and 5	Sample Number 3
Employer	The Coal Autho	rity			ater Content to B 17892-1: 2014	S EN ISO	Sample Type D
Description	Brown slightly g	ravelly sandy CLAY.					Specimen Depth 1.00m
							Specimen Number 4
27 -							
25 -							
23 + E							
E 21 +							
etrati				/			
Pene							
Oue 17 +							
15 +		•					
13							
40)			45			50
			Moi	sture Conte	ent %		
Natural moistur	e content:		36%		percentage reta		sieve: 2%
Liquid limit: Plastic limit:			45% 24%	Preparatio Remarks:	n of sample: Na	tural	
Plasticity index:			21%	Tromanto.			
Moisture conter Liquidity index:	nt of soil passing	425μm	36.8% 0.608				
				1			
100 -	1	21		Cl	CIL	CV	CF
		CL		CI	СН	CV	CE
80 -							
(%							
60 solution							
Plasticity Index(%)							
lastici 04							
20 -							
20							
0 -		ML		MI	МН	M	/ ME
	0 10	20 30	40	50	60	70 80	90 100
				Liquid Limi	t (%)		
Approved by:		Leeds Laboratory					
Approved by: Steve Harper		Leeus Laboratory					SOIL ADSIDABBIAS
Steve Halpel		Revision No. 2	1.07	Issue Date	Print date 07/11/ 19/11/2012	2019	SOIL ENGINEERING Part of the Bachy Soletanche Group
<i></i>							

Project Name	Nenthead Mines - Proposed N	MWTS, GI	Liquid And Plastic	Hole ID TP125
Project No.	TA8234		Limit Test	Sample Depth
Engineer	Aecom			1.00m Sample Number
Employer	The Coal Authority	BS1377: Part 2: 1990: Clause 4.3 with Water Content to BS EN 17892-1: 2014		5 Sample Type D
27 - 25 - 23 - 21 - 25 - 21 - 25 - 21 - 25 - 25 - 25	Brown slightly gravelly sandy CLA	AY.		Specimen Depth 1.00m Specimen Number 4
4)		45	50
		Moi	sture Content %	
Natural moistu Liquid limit: Plastic limit: Plasticity index Moisture conte Liquidity index:	nt of soil passing 425µm	23.5% 45% 25% 20% 29.0% 0.199	Percentage retained on 425µm sieve: Preparation of sample: Wet sieve Remarks:	19%
100	CL		CI CH (CV CE
80				
Plasticity Index(%) 0				
Plasticity 6				
20				
0	ML 20	•		MV ME
	0 10 20	30 40	50 60 70 Liquid Limit (%)	80 90 100
Approved by:	Leeds Laborate	ory		
Steve Harper			Print date 07/11/2019	SOIL ENGINEERING
	Revision No.	2.07	Issue Date 19/11/2012	Part of the Bachy Soletanche Group

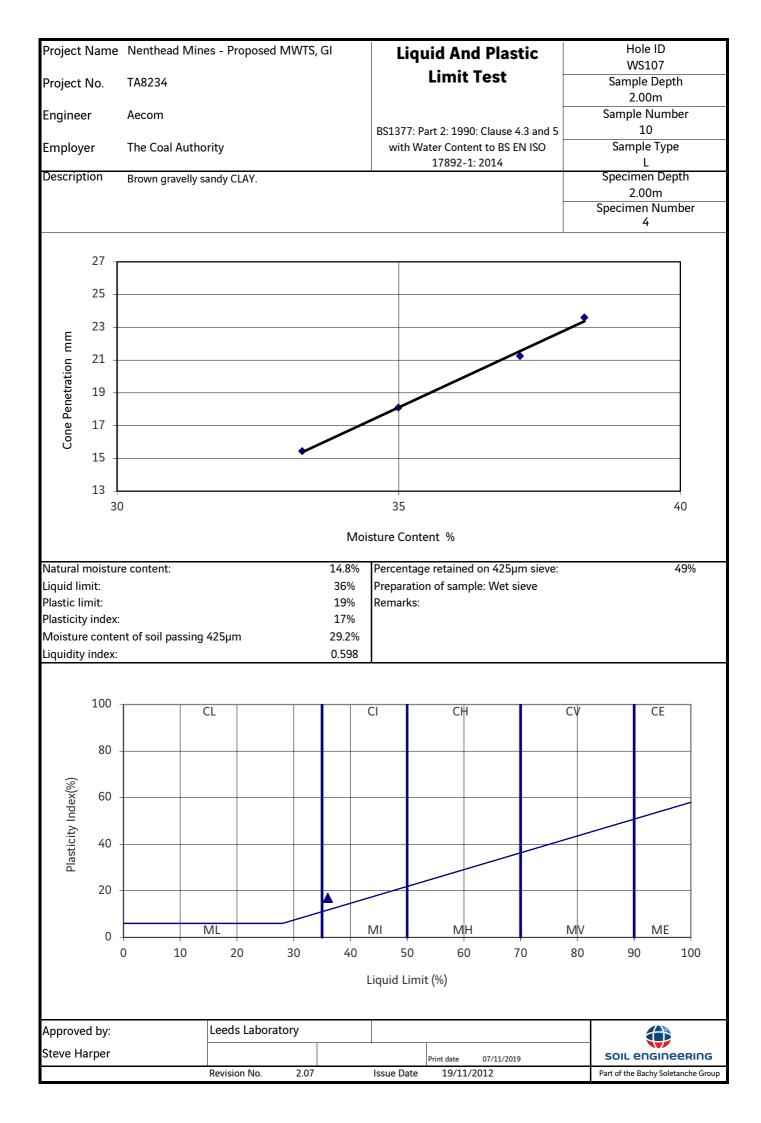
Project Name	Nenthead Mines - Proposed MWTS,	GI	Liqu	ıid And Pl	astic	Hole ID TP128		
Project No.	TA8234		Limit Test			Sample Depth 0.60m		
Engineer	Aecom					Sample Number 3 Sample Type		
Employer	The Coal Authority			art 2: 1990: Clau ater Content to	BS EN ISO			
Description	Dark grey PEAT.			17892-1: 2014	4	D Specimen Depth 0.60m Specimen Number 4		
27 <i>-</i> 25 -								
23 - m 21 - 21 -			•					
Cone Penetration mm 17 - 15 - 15 - 15 - 15 - 15 - 15 - 15 -								
13 - 6	70 675 680 685	690	695	700	705 710	715 720		
		Mois	sture Conte	ent %				
Natural moistu Liquid limit: Plastic limit: Plasticity index Moisture conte Liquidity index	: ent of soil passing 425µm	497% 692% 366% 326% 497% 0.402	Preparatio	n of sample: Na Unable to obta		stic limit test results. Val	llue	
100	CL	(СН	CV	CE		
80								
Plasticity Index(%)								
Dlastici 040								
0	ML	•	ИΙ	МН	MV	ME		
	0 10 20 30	40 L	50 iquid Limi	60 t (%)	70 80	90 100		
Approved by: Steve Harper	Leeds Laboratory			Print date 07/1:	1/2019	SOIL ENGINEERING	G	
	Revision No. 2.07		Issue Date	19/11/2012		Part of the Bachy Soletanche Gr	iroup	



	Nenthead Min	es - Proposec	l MWTS, GI	Liqu	id And Pla	Hole ID WS103		
Project No.	TA8234				Limit Test		Sampl	e Depth
Engineer	Aecom							20m Number
			BS1377: Part 2: 1990: Clause 4.3 and 5				-	10
Employer	The Coal Authority with Water Content to BS EN ISO 17892-1: 2014					EN ISO	Samp	le Type L
Description	Brown gravelly s	andy CLAY.			17002 1.2011			en Depth
								20m n Number
								4
27								
25								
25 -					•			
23 -								
E 21 -								
atior								
Cone Penetration mm 12 - 15 - 15 - 15 - 15 - 15 - 15 - 15 -								
မ မ 17 -								
15 -								
13								
3	0	35		40		45		50
				oisture Conte				
Natural moistu	re content:		15.4%	Percentage	rotained on (2E			33%
iouid limit:				_	e retained on 425			33%
iquid limit: Plastic limit:			38% 17%	_	n of sample: Wet			33%
Plastic limit: Plasticity index			38% 17% 21%	Preparation Remarks:				33%
Plastic limit: Plasticity index Moisture conte	ent of soil passing	425µm	38% 17% 21% 22.8%	Preparation Remarks:				33%
Plastic limit: Plasticity index	ent of soil passing	425µm	38% 17% 21%	Preparation Remarks:				33%
Plastic limit: Plasticity index Moisture conte	ent of soil passing		38% 17% 21% 22.8%	Preparation Remarks:	n of sample: Wet	sieve	V	
lastic limit: lasticity index Noisture conte iquidity index:	ent of soil passing	425μm CL	38% 17% 21% 22.8%	Preparation Remarks:			/	CE
lastic limit: lasticity index Noisture conte iquidity index:	ent of soil passing		38% 17% 21% 22.8%	Preparation Remarks:	n of sample: Wet	sieve	/	
Plastic limit: Plasticity index Moisture conte iquidity index:	ent of soil passing		38% 17% 21% 22.8%	Preparation Remarks:	n of sample: Wet	sieve	/	
Plastic limit: Plasticity index Moisture conte iquidity index:	ent of soil passing		38% 17% 21% 22.8%	Preparation Remarks:	n of sample: Wet	sieve	/	
Plastic limit: Plasticity index Moisture conte iquidity index:	ent of soil passing		38% 17% 21% 22.8%	Preparation Remarks:	n of sample: Wet	sieve		
Plastic limit: Plasticity index Moisture conte iquidity index:	ent of soil passing		38% 17% 21% 22.8%	Preparation Remarks:	n of sample: Wet	sieve		
Plastic limit: Plasticity index Plasticity index Plasticity index Plasticity index Plasticity index Plasticity index Plastic limit: Plastic l	ent of soil passing		38% 17% 21% 22.8%	Preparation Remarks:	n of sample: Wet	sieve		
Plastic limit: Plasticity index Moisture conte iquidity index:	ent of soil passing		38% 17% 21% 22.8%	Preparation Remarks:	n of sample: Wet	sieve		
lastic limit: lasticity index loisture conte iquidity index: 100 80 60 40	ent of soil passing	CL	38% 17% 21% 22.8%	Preparation Remarks:	n of sample: Wet	sieve		CE
lastic limit: lasticity index loisture conte iquidity index: 100 80 60 40	ent of soil passing	CL	38% 17% 21% 22.8% 0.278	Preparation Remarks:	CH MH	CV	V	CE
Plastic limit: Plasticity index Plastici	ent of soil passing	CL	38% 17% 21% 22.8%	Preparation Remarks:	CH	CV		CE
lastic limit: lasticity index loisture conte iquidity index: 100 80 (%) 60 40 20	ent of soil passing	CL	38% 17% 21% 22.8% 0.278	Preparation Remarks:	CH MH 60	CV	V	CE
Plastic limit: Plasticity index Plastici	ent of soil passing	CL ML 20	38% 17% 21% 22.8% 0.278	Preparation Remarks: CI MI 50	CH MH 60	CV	V	CE ME 100
lastic limit: lasticity index loisture conte iquidity index: 100 80 (%) 60 40 20	ent of soil passing	CL	38% 17% 21% 22.8% 0.278	Preparation Remarks: CI MI 50 Liquid Limit	CH MH 60	CV MM 70 8	V 0 90	CE

Project Name	Nenthead Min	es - Proposed M	WTS, GI	Liqu	uid And Pla	astic	Hole ID WS104
Project No.	TA8234				Limit Test	:	Sample Depth
Engineer	Aecom						1.70m Sample Number
Employer	The Coal Autho	ority		BS1377: Part 2: 1990: Clause 4.3 and 5 with Water Content to BS EN ISO			12 Sample Type
				VVICIIVV	17892-1: 2014	3 214 130	L
Description	Grey mottled bro	own slightly gravel	ly sandy CLAY.				Specimen Depth 1.70m
							Specimen Number 2
27						<u>'</u>	
27							
25 +				•			
E 23							
E 21 +							
Cone Penetration 17 - 17 - 17 - 18							
bene							
15 +	•						
13 1				25			
30)			35			40
			Moi	sture Conte	ent %		
Natural moistur	e content:		16.5%		percentage reta		sieve: 3%
Liquid limit: Plastic limit:			32% 18%	Remarks:	n of sample: Na	turai	
Plasticity index:	nt of soil passing	/2Fum	14% 17.0%				
Liquidity index:	it of soil passing	425μπ	-0.069				
100 -		CL		CI	СН	CV	CE
80 -							
(%) XX 60 -							
Plasticity Index(%)							
Ajicit 40 -							
Plas						1	
20 -				+			
		ML		MI	MH	M	/ ME
0 -	0 10		0 40	50	60	70 80	
				Liquid Limi			
Approved by:		Leeds Laborator	у				
Steve Harper					Print date 07/11/	2019	SOIL ENGINEERING
		Revision No.	2.07	Issue Date	19/11/2012		Part of the Bachy Soletanche Group

Project Name	Nenthead Min	es - Proposed	MWTS, GI	Liq	uid And Plastic	Hole ID WS105
Project No.	TA8234				Limit Test	Sample Depth
Engineer	Aecom					1.20m Sample Number
					Part 2: 1990: Clause 4.3 and 5	8
Employer	The Coal Author	ority		with W	ater Content to BS EN ISO 17892-1: 2014	Sample Type L
Description	Brown slightly g	ravelly clayey S/	AND.			Specimen Depth 1.20m
						Specimen Number
						4
27 -						
25						
돌 23 +						•
Cone Penetration mm 17 + 17						
etratic						
Pene				_		
ou 17 +						
15						
13						
30)			35		40
			М	oisture Cont	ent %	
Natural moisture	e content:		22.1%	Percentac	ge retained on 425µm sieve:	39%
Liquid limit:			37%	Preparation	on of sample: Wet sieve	
Plastic limit: Plasticity index:			19% 18%			
Moisture conter	nt of soil passing	425μm	36.0%			
Liquidity index:			0.947			
100						
100 -		CL		CI	СН	CV CE
80 -						
(%) ×a 60 -						
ğ						
l l						
rticity In						
Plasticity Index(%)						
Plasticity In - 05						
		NAI.	A	MI	MH	
20 -		ML 20		MI 50	MH 60 70	MV ME
20 -	0 10	ML 20	30 40	50	60 70	MV ME 80 90 100
20 -				Ť	60 70	+ -
20 - 0 - (20	30 40	50	60 70	+ -
20 -			30 40	50	60 70	+ -



Project Name	Nenthead Min	es - Proposed	MWTS, GI	L	iquid And P	lastic	Hole ID WS108
Project No.	TA8234				Limit Tes	st	Sample Depth
Engineer	Aecom						2.00m Sample Number
					7: Part 2: 1990: Cla		11
Employer	The Coal Autho	ority		wit	h Water Content to 17892-1: 201		Sample Type L
Description	Brown slightly g	ravelly sandy Cl	AY.	I	· · ·		Specimen Depth 2.00m
							Specimen Number
							4
27 -							
25 –							
돌 23 +						<u>, </u>	
E 21 +							
etratic 19							
Pene							
euo 17 +		•					
15							
13							
30)			35			40
			ľ	Moisture C	ontent %		
Natural moistur	e content:		19.1	% Derco	ntage retained on 4	25um sieve:	33%
Liquid limit:	e content.		35%	% Prepai	ration of sample: W		3370
Plastic limit: Plasticity index:			179 189		·ks:		
	nt of soil passing	425µm	28.5				
Liquidity index:			0.63	39			
100 -		CL		CI	СН	CV	CE
80 -							
(%):							
Plasticity Index(%)							
icity 1							
Plasti							
20 -							
0 -		ML	\bot	MI	МН	M\	/ ME
(0 10	20	30 4	.0 5	60	70 80	90 100
				Liquid I	imit (%)		
Approved by:		Leeds Labora	tory				
Steve Harper						1/2019	SOIL ENGINEERING
		Revision No.	2.07	Issue D	ate 19/11/2012		Part of the Bachy Soletanche Group

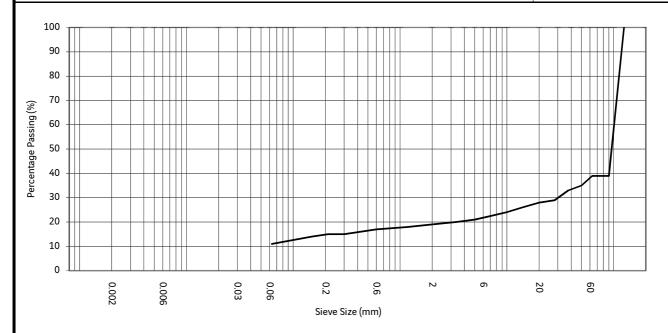
Project Nam	e Nenthead Min	es - Proposed MV	VTS, GI	Liqu	uid And Pla	stic	Hole ID WSTP101
Project No.	TA8234				Limit Test		Sample Depth
Engineer	Aecom						1.20m Sample Number
Employer	The Coal Autho	ority			art 2: 1990: Claus ater Content to B 17892-1: 2014		9 Sample Type
Description	Brown sandy gr	avelly CLAY.		1	17632-1. 2014		Specimen Depth 1.20m Specimen Number 4
27							
25					<u> </u>		
£ 23					<u>/*</u>		
Cone Penetration mm 12 12				/			
etratio 61							
Pene				7			
15			<u> </u>				
13	30	35		40		45	50
	30	33	N.4:		t 0/	43	30
				sture Conte			
Natural moist Liquid limit: Plastic limit: Plasticity inde Moisture cont Liquidity inde	ex: tent of soil passing	425μm	22.1% 40% 24% 16% 86.5% 3.908		e retained on 42 n of sample: We		74%
				1			
100		CL		CI	СН	CV	CE
80							
(9							
%)xəp	1						
Plasticity Index(%)	1						
20							
0		ML		MI	МН	MV	/ ME
	0 10	20 30) 40	50	60	70 80	90 100
				Liquid Limi	t (%)		
Approved by:		Leeds Laboratory	,				
Steve Harper					Print date 07/11/2	2019	SOIL ENGINEERING
		Revision No.	2.07	Issue Date	19/11/2012		Part of the Bachy Soletanche Group

Project Name	Nenthead Min	es - Proposed MWTS, GI		Liquid And Plastic	Hole ID WSTP102
Project No.	TA8234			Limit Test	Sample Depth
Engineer	Aecom				1.00m Sample Number
_			E	SS1377: Part 2: 1990: Clause 4.3 and 5 with Water Content to BS EN ISO	6
Employer	The Coal Autho	ority	Sample Type D		
Description	Brown slightly s	andy gravelly CLAY.			Specimen Depth 1.00m
					Specimen Number
					4
27 T					
25 -					
E 23 -					
g 21					
etrati					
Pene					
0 O					
15					
13					
30)			35	40
			Moistu	ure Content %	
Vatural moistur	o contont:	10	5.4% P	ercentage retained on 425µm sieve:	60%
Liquid limit:	e content.			reparation of sample: Wet sieve	00%
Plastic limit:				emarks:	
Plasticity index: Moisture conte	nt of soil passing		.5% 9.0%		
iquidity index:			.199		
100		CL	CI	СН	CV CE
80					
(%)					
60 (с					
Plasticity Index(%)					
astici 40					
<u>≂</u> 20					
20					
0		ML	M	МН	MV ME
	0 10	20 30	40	50 60 70	80 90 100
			Liq	uid Limit (%)	
		Leeds Laboratory			
Approved by:		Lecas Laboratory			
Approved by: Steve Harper		Lectus Ediboratory		Print date 07/11/2019	SOIL ENGINEERING

Project Name	Nenthead Min	es - Proposed	MWTS, GI	Liq	uid And Plastic	Hole ID WSTP103
Project No.	TA8234				Limit Test	Sample Depth
Engineer	Aecom					0.50m Sample Number
Employer	The Coal Autho			Sample Type D		
Description	Brown slightly sa	andy gravelly CL	AY.			Specimen Depth 0.50m Specimen Number 4
27 25					•	
23 + E E						
Cone Penetration 17 - 17 - 17 - 18						
one Pene 17 +						
15 +			•			
13 L 30)			35		40
			N	Noisture Cont	ent %	
Natural moistur	e content:		13.69	% Percentac	je retained on 425µm sieve	: 62%
Liquid limit: Plastic limit: Plasticity index: Moisture conter	nt of soil passing	425µm	35% 26% 9% 36.19	Remarks:	on of sample: Wet sieve	
Liquidity index:			1.12	3		
100 -		CL		CI	СН	СУ СЕ
80 -						
60 - 60						
Plasticity Index(%)						
20 -						
0 -	0 10	ML 20	30 40	MI) 50	MH 60 70	MV ME 80 90 100
				Liquid Lim	it (%)	
Approved by:		Leeds Labora	tory			
Steve Harper		Revision No.	2.07	Issue Date	Print date 07/11/2019 19/11/2012	SOIL ENGINEERING Part of the Bachy Soletanche Gro
1		VIOIOII INO.	2.01	issue Date	10, 11, 2012	. a.c or the bachy soletanene dio

Project Name	Nenthead Mine	es - Proposed	MWTS, GI		Liqu	uid And Pl	astic		e ID P107
Project No.	TA8234					Limit Tes	t	Sample	e Depth
Engineer	Aecom								0m Number
					BS1377: Part 2: 1990: Clause 4.4 and 5			1	.0
Employer	The Coal Autho	ority			with Wa	ater Content to 17892-1: 2014		Sampl	e Type L
Description	Brown gravelly c	layey SAND.				1,002 1.201			en Depth
									0m n Number
									4
27 -									
25 -									
E 23									
Ē 21 -									
ratio		•							
Cone Penetration mm 12 - 15 -									
မ မ 17 -									
ပိ 15 -									
10									
13 30)				35				40
				Maio	ture Conte	ont 0/			
Natural moistur Liquid limit:	re content:		9.4 32			e retained on 4 n of sample: W			74%
Plastic limit:			N					d limit due to th	he sample being
Plasticity index:		/25	20	, 0/		sand and/or si on a line.	It and it is very	difficult to get	all four points
Liquidity index:	nt of soil passing	425µm	36.4	4%		on a line.			
. ,									
100		CI .				CIL			CF
		CL		С	.1	СН		T.V	CE
80									
(9									
%) 60									
Plasticity Index(%)									
sticit 40									
20	+				-				
		ML	+	N	/ II	MH	N.	ИV	ME
0	0 10	20	30 4	+ 40	50	60	Ť	80 90	100
	10				iquid Limi				
				L	quiu LIIIII	· (/0)			
Approved by:		Leeds Labora	tory						
Steve Harper			,				1 (0010	SOIL OF	ngineering
		Revision No.	2.07		Issue Date	Print date 07/1: 19/11/2012	1/2019		chy Soletanche Group

Project Name	Nenthead Mines - Proposed MWTS, GI	Particle Size	Hole ID
		D: . : . :	BH102R
Project No.	TA8234	Distribution	Sample Depth
l			2.50m
Engineer	Aecom		Sample Number
			9
Employer	The Coal Authority	BS 1377: Part 2: 1990: 9.2	Sample type
	•	B3 1377. Part 2. 1990. 9.2	В
Description	Brown clayey very gravelly CLAY.	·	Specimen Depth
			2.50m
			Specimen No.
			1



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	COBBLES
CLAY		SILT		5	SAND		G	RAVE	COBBLES

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3.04

%

Silt and clay: 11.1 Sand: 7.8 Gravel: 19.8 Cobbles: 61.3

Approved by: Steve Harper

General remarks

Sample size was insufficient to be representative of particle size

	WET SIEVE DATA							
Sieve size mm	Cumulative	Sieve size mm	Cumulative					
	% passing		% passing					
		14	26					
		10	24					
		6.3	22					
125.0	100	5	21					
90.0	39	3.35	20					
75.0	39	2	19					
63.0	39	1.18	18					
50.0	35	0.6	17					
37.5	33	0.425	16					
28.0	29	0.3	15					
20.0	28	0.212	15					
		0.15	14					
		0.063	11					

Print date

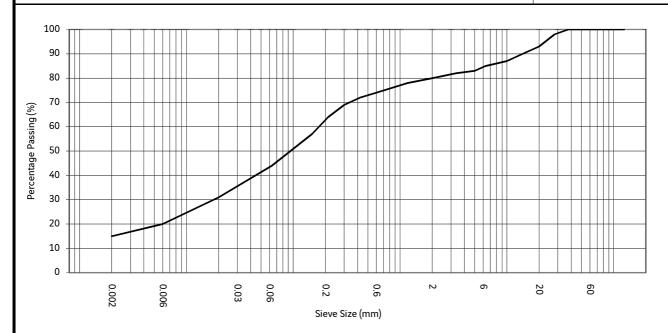
24/07/2015

Issue Date

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SOIL ENGINEERING

Project Name	Nenthead Mines - Proposed MWTS, GI	Particle Size	Hole ID
			BH103
Project No.	TA8234	Distribution	Sample Depth
l '			0.00m
Engineer	Aecom		Sample Number
			4
Employer	The Coal Authority	BS 1377: Part 2: 1990: 9.2 and 9.4	Sample type
' '	·	BS 1377. Part 2. 1990. 9.2 and 9.4	В
Description	Brown sandy gravelly CLAY with some rootlets.		Specimen Depth
			0.00m
			Specimen No.
			1



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	COBBLES
CLAY		SILT			SAND		G	RAVE	COBBLES

 PARTICLE SIZE
 %

 Clay:
 14.8

 Silt:
 29.3

 Sand:
 35.6

 Gravel:
 20.3

 Cobbles:
 0.0

Revision No.

3.04

Approved by: Steve Harper General remarks

	WET SIEV	SEDIMENTAT	ION DATA		
Sieve size mm	Cumulative	Sieve size mm	Cumulative	Equivalent	Cumulative
	% passing		% passing	particle	% passing
		14	90	diameter mm	
		10	87	0.020100	31
		6.3	85	0.006000	20
125.0	100	5	83	0.002000	15
90.0	100	3.35	82		
75.0	100	2	80		
63.0	100	1.18	78		
50.0	100	0.6	74		
37.5	100	0.425	72		
28.0	98	0.3	69		
20.0	93	0.212	64		
		0.15	57		
		0.063	44		

Print date

24/07/2015

Issue Date

07/11/2019

SOIL ENGINEERING

Project Name	Nenthead Mines - Proposed MWTS, GI	Particle Size	Hole ID
			BH104
Project No.	TA8234	Distribution	Sample Depth
l			0.50m
Engineer	Aecom		Sample Number
			4
Employer	The Coal Authority	BS 1377: Part 2: 1990: 9.2 and 9.4	Sample type
' '	•	BS 1377: Part 2: 1990: 9.2 and 9.4	В
Description	Brown gravelly sandy CLAY.		Specimen Depth
-			0.50m
			Specimen No.
			1



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	COBBLES
CLAY		SILT			SAND		G	RAVE	COBBLES

 PARTICLE SIZE
 %

 Clay:
 19.7

 Silt:
 29.6

 Sand:
 35.0

 Gravel:
 15.7

 Cobbles:
 0.0

General remarks

	WET SIEV		SEDIMENTAT	TON DATA	
Sieve size mm	Cumulative	Sieve size mm	Cumulative	Equivalent	Cumulative
	% passing		% passing	particle	% passing
		14	92	diameter mm	
		10	91	0.020100	39
		6.3	89	0.006000	26
125.0	100	5	88	0.002000	20
90.0	100	3.35	86		
75.0	100	2	84		
63.0	100	1.18	82		
50.0	100	0.6	78		
37.5	100	0.425	76		
28.0	100	0.3	73		
20.0	94	0.212	67		
		0.15	60		
		0.063	49		

 Approved by:
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 3.04
 Issue Date
 24/07/2015



Project Name	Nenthead Mines - Proposed MWTS, GI	Particle Size	Hole ID
			BH106
Project No.	TA8234	Distribution	Sample Depth
l			3.50m
Engineer	Aecom		Sample Number
Ĭ			14
Employer	The Coal Authority	BS 1377: Part 2: 1990: 9.2 and 9.4	Sample type
' '	•	BS 1377: Part 2: 1990: 9.2 and 9.4	В
Description	Brown clayey gravelly SAND with some rootlets and	low coblle content.	Specimen Depth
·			3.50m
			Specimen No.
			2



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	COBBLES
CLAY		SILT		5	SAND		G	RAVE	COBBLES

 PARTICLE SIZE
 %

 Clay:
 4.7

 Silt:
 24.0

 Sand:
 41.8

 Gravel:
 18.4

 Cobbles:
 11.1

General remarks

Sample size was insufficient to be representative of particle size

	WET SIEV	SEDIMENTAT	ION DATA		
Sieve size mm	Cumulative	Sieve size mm	Cumulative	Equivalent	Cumulative
	% passing		% passing	particle	% passing
		14	81	diameter mm	
		10	79	0.020100	9
		6.3	77	0.006000	7
125.0	100	5	76	0.002000	5
90.0	100	3.35	74		
75.0	89	2	71		
63.0	89	1.18	66		
50.0	89	0.6	58		
37.5	88	0.425	53		
28.0	86	0.3	48		
20.0	83	0.212	43		
		0.15	38		
		0.063	29		

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 3.04
 Issue Date
 24/07/2015



Project Name	Nenthead Mines - Proposed MWTS, GI	Particle Size	Hole ID
			TP104
Project No.	TA8234	Distribution	Sample Depth
'			1.00m
Engineer	Aecom		Sample Number
			4
Employer	The Coal Authority	DC 1277, David 2, 1000, 0.2 and 0.7	Sample type
' '	ŕ	BS 1377: Part 2: 1990: 9.2 and 9.4	В
Description	Brown very gravelly sandy CLAY.		Specimen Depth
			1.00m
			Specimen No.
			1



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	COBBLES
CLAY		SILT			SAND		G	RAVE	COBBLES

 PARTICLE SIZE
 %

 Clay:
 3.0

 Silt:
 10.9

 Sand:
 25.7

 Gravel:
 60.4

 Cobbles:
 0.0

General remarks

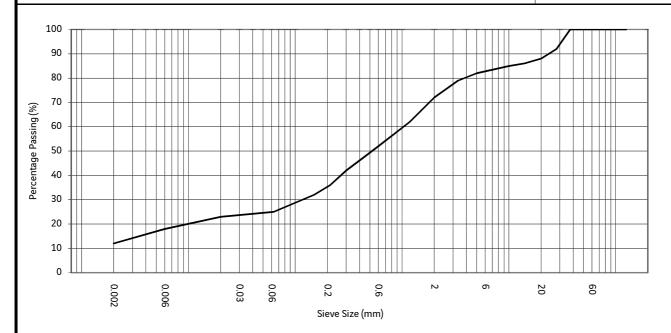
	WET SIEV		SEDIMENTATION DATA		
Sieve size mm	Cumulative	Sieve size mm	Cumulative	Equivalent	Cumulative
	% passing		% passing	particle	% passing
		14	65	diameter mm	
		10	61	0.020100	9
		6.3	54	0.006000	5
125.0	100	5	49	0.002000	3
90.0	100	3.35	44		
75.0	100	2	40		
63.0	100	1.18	36		
50.0	98	0.6	31		
37.5	94	0.425	29		
28.0	83	0.3	27		
20.0	73	0.212	24		
		0.15	21		
		0.063	14		

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 Revision No.
 3.04
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Project Name	Nenthead Mines - Proposed MWTS, GI	Particle Size	Hole ID
			TP108
Project No.	TA8234	Distribution	Sample Depth
l			0.45m
Engineer	Aecom		Sample Number
			1
Employer	The Coal Authority	BS 1377: Part 2: 1990: 9.2 and 9.4	Sample type
' '	•	BS 1377: Part 2: 1990: 9.2 and 9.4	В
Description	Brown sandy gravelly CLAY.		Specimen Depth
-			0.45m
			Specimen No.
			2



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	COBBLES
CLAY		SILT			SAND		G	RAVE	COBBLES

 PARTICLE SIZE
 %

 Clay:
 12.1

 Silt:
 12.8

 Sand:
 46.6

 Gravel:
 28.5

 Cobbles:
 0.0

General remarks

	WET SIEV	SEDIMENTAT	TON DATA		
Sieve size mm	Cumulative	Sieve size mm	Cumulative	Equivalent	Cumulative
	% passing		% passing	particle	% passing
		14	86	diameter mm	
		10	85	0.020100	23
		6.3	83	0.006000	18
125.0	100	5	82	0.002000	12
90.0	100	3.35	79		
75.0	100	2	72		
63.0	100	1.18	62		
50.0	100	0.6	52		
37.5	100	0.425	47		
28.0	92	0.3	42		
20.0	88	0.212	36		
		0.15	32		
		0.063	25		

 Approved by:
 Print date
 07/11/2019

 Revision No.
 3.04
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 24/07/2015



Project Name	Nenthead Mines - Proposed MWTS, GI	Particle Size	Hole ID
		D:	TP109
Project No.	TA8234	Distribution	Sample Depth
			1.50m
Engineer	Aecom		Sample Number
			4
Employer	The Coal Authority	BS 1377: Part 2: 1990: 9.2 and 9.4	Sample type
' '	·	BS 1377. Part 2. 1990. 9.2 and 9.4	В
Description	Brown clayey gravelly SAND.		Specimen Depth
			1.50m
			Specimen No.
			1



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	COBBLES
CLAY		SILT			SAND		G	RAVE	COBBLES

 PARTICLE SIZE
 %

 Clay:
 9.1

 Silt:
 21.6

 Sand:
 29.2

 Gravel:
 26.1

 Cobbles:
 14.0

Revision No.

3.04

Approved by: Steve Harper General remarks

Sample size was insufficient to be representative of particle size

	WET SIEV	SEDIMENTAT	TON DATA		
Sieve size mm	Cumulative	Sieve size mm	Cumulative	Equivalent	Cumulative
	% passing		% passing	particle	% passing
		14	69	diameter mm	
		10	67	0.020100	22
		6.3	64	0.006000	14
125.0	100	5	63	0.002000	9
90.0	86	3.35	62		
75.0	86	2	60		
63.0	86	1.18	58		
50.0	82	0.6	55		
37.5	79	0.425	53		
28.0	75	0.3	51		
20.0	72	0.212	47		
		0.15	42		
		0.063	31		

Print date

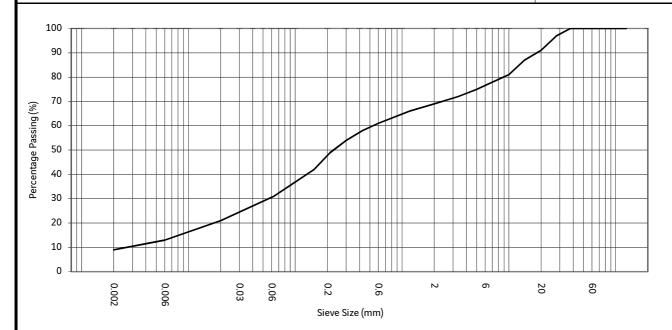
24/07/2015

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SOIL ENGINEERING

Project Name	Nenthead Mines - Proposed MWTS, GI	Particle Size	Hole ID
		D ' . 'I .'	TP126
Project No.	TA8234	Distribution	Sample Depth
			1.50m
Engineer	Aecom		Sample Number
			4
Employer	The Coal Authority	BS 1377: Part 2: 1990: 9.2 and 9.4	Sample type
' '	•	BS 1377. Part 2. 1990. 9.2 and 9.4	В
Description	Brown gravelly sandy CLAY.		Specimen Depth
			1.50m
			Specimen No.
			1



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	COBBLES
CLAY		SILT			SAND		G	RAVE	COBBLES

 PARTICLE SIZE
 %

 Clay:
 8.8

 Silt:
 22.0

 Sand:
 38.1

 Gravel:
 31.1

 Cobbles:
 0.0

General remarks

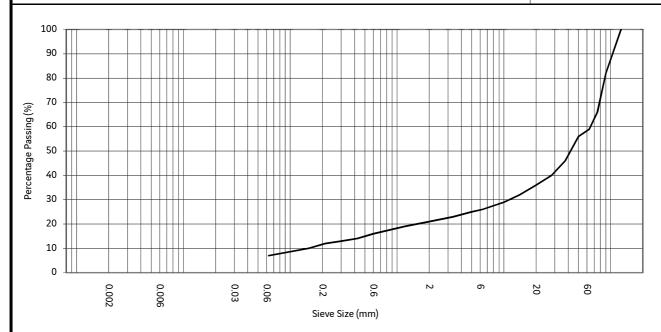
	WET SIEV	SEDIMENTAT	ION DATA		
Sieve size mm	Cumulative	Sieve size mm	Cumulative	Equivalent	Cumulative
	% passing		% passing	particle	% passing
		14	87	diameter mm	
		10	81	0.020100	21
		6.3	77	0.006000	13
125.0	100	5	75	0.002000	9
90.0	100	3.35	72		
75.0	100	2	69		
63.0	100	1.18	66		
50.0	100	0.6	61		
37.5	100	0.425	58		
28.0	97	0.3	54		
20.0	91	0.212	49		
		0.15	42		
		0.063	31		

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 Revision No.
 3.04
 Issue Date
 24/07/2015



Project Name	Nenthead Mines - Proposed MWTS, GI	Particle Size	Hole ID
		D.	WS102
Project No.	TA8234	Distribution	Sample Depth
			0.20m
Engineer	Aecom		Sample Number
			3
Employer	The Coal Authority	BS 1377: Part 2: 1990: 9.2	Sample type
	•	BS 1377. Part 2. 1990. 9.2	В
Description	Dark brown very gravelly sandy CLAY with medium	cobble content.	Specimen Depth
			0.20m
			Specimen No.
			1



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	COBBLES
CLAY		SILT			SAND		G	RAVE	COBBLES

 Silt and clay:
 6.9

 Sand:
 14.3

 Gravel:
 37.3

 Cobbles:
 41.5

General remarks

Sample size was insufficient to be representative of particle size

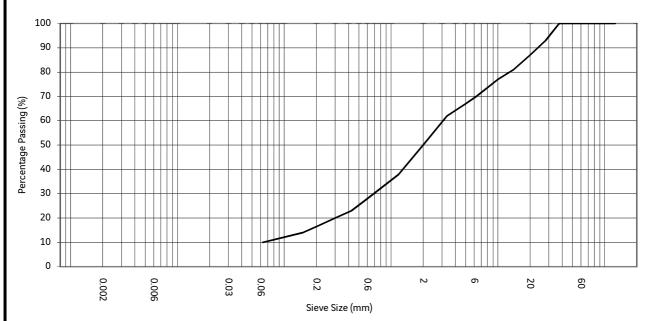
	WET SIEV	T DATA	
Sieve size mm	Cumulative	Sieve size mm	Cumulative
	% passing		% passing
		14	32
		10	29
		6.3	26
125.0	100	5	25
90.0	82	3.35	23
75.0	66	2	21
63.0	59	1.18	19
50.0	56	0.6	16
37.5	46	0.425	14
28.0	40	0.3	13
20.0	36	0.212	12
		0.15	10
		0.063	7

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 07/11/2019

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 3.04
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 24/07/2015



Project Name	Nenthead Mines - Proposed MWTS, GI	Particle Size	Hole ID WS102
Project No.	TA8234	Distribution	Sample Depth
Engineer	Aecom		3.00m Sample Number 14
Employer	The Coal Authority	BS 1377: Part 2: 1990: 9.2	Sample type L
Description	Brown clayey gravelly SAND.		Specimen Depth 3.00m Specimen No. 1



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	COBBLES
CLAY		SILT		5	SAND		G	RAVE	COBBLES

 Silt and clay:
 10.2

 Sand:
 40.1

 Gravel:
 49.7

 Cobbles:
 0.0

Revision No.

3.04

Approved by: Steve Harper General remarks

	WET SIEV	E DATA	
Sieve size mm	Cumulative	Sieve size m	m Cumulative
	% passing		% passing
		14	81
		10	77
		6.3	70
125.0	100	5	67
90.0	100	3.35	62
75.0	100	2	50
63.0	100	1.18	38
50.0	100	0.6	28
37.5	100	0.425	23
28.0	93	0.3	20
20.0	87	0.212	17
		0.15	14
		0.063	10

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soil engineering

Project Name	Nenthead Mines - Proposed MWTS, GI	Particle Size	Hole ID
		D::	WS105
Project No.	TA8234	Distribution	Sample Depth
			0.20m
Engineer	Aecom		Sample Number
			3
Employer	The Coal Authority	BS 1377: Part 2: 1990: 9.2 and 9.4	Sample type
		B3 1377. Part 2. 1990. 9.2 and 9.4	В
Description	Brown sandy gravelly CLAY with some rootlets.		Specimen Depth
			0.20m
			Specimen No.
			1



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	COBBLES
CLAY		SILT			SAND		G	RAVE	COBBLES

 PARTICLE SIZE
 %

 Clay:
 8.0

 Silt:
 13.8

 Sand:
 33.1

 Gravel:
 42.9

 Cobbles:
 2.2

General remarks

	WET SIEV		SEDIMENTATION DATA			
Sieve size mm	Cumulative	Sieve size mm	Cumulative	Equivalent	Cumulative	
	% passing		% passing	particle	% passing	
		14	70	diameter mm		
		10	67	0.020100	17	
		6.3	63	0.006000	12	
125.0	100	5	60	0.002000	8	
90.0	100	3.35	58			
75.0	100	2	55			
63.0	98	1.18	52			
50.0	95	0.6	47			
37.5	91	0.425	44			
28.0	85	0.3	40			
20.0	80	0.212	36			
		0.15	30			
		0.063	22			

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 3.04
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 24/07/2015



Project Name	Nenthead Mines - Proposed MWTS, GI	Particle Size	Hole ID
			WS108
Project No.	TA8234	Distribution	Sample Depth
l '			1.00m
Engineer	Aecom		Sample Number
			7
Employer	The Coal Authority	PC 1277, Part 2: 1000: 0.2 and 0.4	Sample type
' '	•	BS 1377: Part 2: 1990: 9.2 and 9.4	В
Description	Brown clayey gravelly SAND.		Specimen Depth
			1.00m
			Specimen No.
			1



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	COBBLES
CLAY		SILT			SAND		G	RAVE	COBBLES

 PARTICLE SIZE
 %

 Clay:
 2.9

 Silt:
 12.3

 Sand:
 39.7

 Gravel:
 33.3

 Cobbles:
 11.8

General remarks

Sample size was insufficient to be representative of particle size

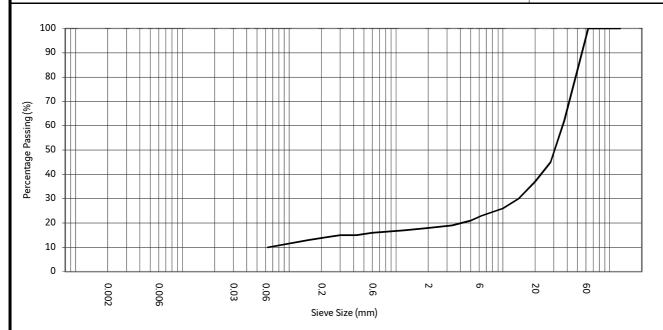
	WET SIEV	SEDIMENTATION DATA			
Sieve size mm	Cumulative	Sieve size mm	Cumulative	Equivalent	Cumulative
	% passing		% passing	particle	% passing
		14	71	diameter mm	
		10	69	0.020100	7
		6.3	65	0.006000	5
125.0	100	5	63	0.002000	3
90.0	88	3.35	59		
75.0	88	2	55		
63.0	88	1.18	49		
50.0	85	0.6	41		
37.5	81	0.425	36		
28.0	80	0.3	31		
20.0	76	0.212	27		
		0.15	21		
		0.063	15		

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 07/11/2019

 Revision No.
 3.04
 Issue Date
 24/07/2015



Project Name	Nenthead Mines - Proposed MWTS, GI	Particle Size	Hole ID
		D:	WSBH101R
Project No.	TA8234	Distribution	Sample Depth
,			2.00m
Engineer	Aecom		Sample Number
			12
Employer	The Coal Authority	BS 1377: Part 2: 1990: 9.2	Sample type
	•	B3 1377. Part 2. 1990. 9.2	В
Description	Brown very gravelly CLAY.	·	Specimen Depth
			2.00m
			Specimen No.
			1



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	COBBLES
CLAY		SILT			SAND		G	RAVE	COBBLES

9.6 8.1

82.3

0.0

Gravel: Cobbles:

Silt and clay:

Sand:

General remarks

Sample size was insufficient to be representative of particle size

		WET SIEV	E DATA			
Sieve size	mm	Cumulative	Sieve size	mm	Cumulative	
		% passing			% passing	
			14		30	
			10		26	
			6.3		23	
125.0		100	5		21	
90.0		100	3.35		19	
75.0		100	2		18	
63.0		100	1.18		17	
50.0		83	0.6		16	
37.5		62	0.425		15	
28.0		45	0.3		15	
20.0		37	0.212		14	
			0.15		13	
			0.063		10	

 Approved by:
 Print date
 07/11/2019

 Revision No.
 3.04
 Issue Date
 24/07/2015



Project Name	Nenthead Mines - Proposed MWTS, GI	Particle Size	Hole ID
		Distribution	WSTP101
Project No.	TA8234	Distribution	Sample Depth
			0.20m
Engineer	Aecom		Sample Number
			3
Employer	The Coal Authority	BS 1377: Part 2: 1990: 9.2	Sample type
	·	B3 13/1. Pail 2. 1990. 9.2	В
Description	MADE GROUND: Brown clayey gravelly sand with so	ome brick and concrete fragments.	Specimen Depth
			0.20m
			Specimen No.
			1



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	COBBLES
CLAY		SILT		5	SAND		G	RAVE	COBBLES

PARTICLE SIZE Sample size was insufficient to be representative of particle size %

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General remarks

Silt and clay: 12.9 Sand: 28.3 Gravel: 43.6

Cobbles: 15.2

Steve Harper

	WET SIEV	E DATA	
Sieve size mm	Cumulative	Sieve size mm	Cumulative
	% passing		% passing
		14	61
		10	57
		6.3	52
125.0	100	5	50
90.0	100	3.35	46
75.0	100	2	41
63.0	85	1.18	36
50.0	81	0.6	31
37.5	77	0.425	29
28.0	70	0.3	27
20.0	66	0.212	25
		0.15	23
		0.063	13
proved by:			

Print date

24/07/2015

Issue Date

07/11/2019

SOIL ENGINEERING

Project Name	Nenthead Mines - Proposed MWTS, GI	Particle Size	Hole ID
			WSTP105
Project No.	TA8234	Distribution	Sample Depth
l '			0.50m
Engineer	Aecom		Sample Number
			6
Employer	The Coal Authority	BS 1377: Part 2: 1990: 9.2	Sample type
' '	·	BS 1377. Part 2. 1990. 9.2	В
Description	Brown clayey very gravelly SAND.		Specimen Depth
			0.50m
			Specimen No.
			1



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	COBBLES
CLAY		SILT			SAND		G	RAVE	COBBLES

Silt and clay: 8.0
Sand: 21.4
Gravel: 56.0

14.6

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Cobbles:

Approved by: Steve Harper General remarks

Sample size was insufficient to be representative of particle size

	WET SIEV	E DATA	
Sieve size mm	Cumulative	Sieve size mm	Cumulative
	% passing		% passing
		14	47
		10	44
		6.3	39
125.0	100	5	37
90.0	100	3.35	33
75.0	88	2	29
63.0	85	1.18	25
50.0	80	0.6	20
37.5	69	0.425	17
28.0	60	0.3	15
20.0	54	0.212	13
		0.15	11
		0.063	8

Print date

24/07/2015

Issue Date

07/11/2019

SOIL ENGINEERING

Project Name	e Nenthead Mines - Proposed MWTS, GI	Dry Density /	Hole ID BH106			
Project No.	TA8234	Moisture Content	Sample Depth			
Engineer	Aecom	Relationship	Sample Number			
Employer	The Coal Authority	BS1377: Part 4: 1990: 3.3	1 Sample Type AMAL			
Description	Brown gravelly CLAY.		Specimen Depth			
Amalgamation:	BH106 1.50m 6 B +BH106 0.00m 1 B		Specimen Number 1			
1.89 ¬						
1.00		\ \	— · — 0% Air voids			
1.87	\\\\\\	\.\.\.\.\.\.\.\.\.\.\.\.\.\.\.\.\.\.\.	— — — 10% Air voids			
1.85		\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\				
1.83						
1.01						
1.81 - පූ						
6 1.79 -						
Dry density Mg/m ³						
کُم 1.75 –						
1.73						
1.73						
1.71			\.\.			
1.69			\			
1.67 + 6	8 10 12	14 16 18	20 22 24			
	M	loisture content %				
Лахітит dry с	lensity 1.86Mg/m³	Experime	ntal points			
ptimum moist		Moisture content %	Dry Density Mg/m³ 1.78			
emoval of grav		10.9	1.83			
		13.9 16.5	1.86 1.77			
lethod of com		19.4	1.69			
atches tested article density	Separate batches testor Assumed 2.65Mg/m³	ed.				
iravel retained	on 20mm sieve 7%					
	on 37.5mm sieve 3%					
General remark	s Test performed on specimen unsuital	ble due to gravel content.				
المالد مرسوس			48			
Approved by:			_			
Steve Harper		Print date 07/11/2019	soil engineering			
	Revision No. 2.03	Issue Date 21/11/2012	Part of the Bachy Soletanche Gr			

	Nenthead Mines - P	roposed MWTS, GI	Dry Density /	Hole ID TP112			
Project No.	TA8234		Moisture Content	Sample Depth			
- - - -	Aecom		Relationship	1.50m Sample Number			
Engineer	Aecom			4			
Employer	The Coal Authority		BS1377: Part 4: 1990: 3.3	Sample Type B			
Description	Brown slightly gravelly	CLAY.		Specimen Depth 1.50m Specimen Number 2			
1.84 —		1,		00/10/10			
1.82		\\					
1.80		\\		\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\			
E 1.78 —		`\					
1.78 — Dry density Mg/g							
1.74							
1.72	•		\\				
1.70 + 7	9	11	13 15	17 19			
		Мо	oisture content %				
Maximum dry de	nsity	1.82Mg/m³	Experim	nental points			
Optimum moistu	re content um dry density for	15% 1.82Mg/m³	Moisture content % 8.0 10.7 13.0	Dry Density Mg/m³ 1.72 1.71 1.76			
Method of compa	action	2.5KG	15.4 Nat 18.6	1.82 1.78			
	Assumed	Separate batches teste 2.65Mg/m³	d.				
Batches tested Particle density Gravel retained o Gravel retained o	n 20mm sieve	1% 0%					
Particle density Gravel retained o Gravel retained o	n 20mm sieve n 37.5mm sieve						
Particle density Gravel retained o	n 20mm sieve n 37.5mm sieve						

21/11/2012

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Issue Date

Revision No.

2.03

Project Nam	ne Nenthead Mines - Proposed MWTS, GI	Dry Density /	Hole ID TP113			
Project No.	TA8234	Moisture Content	Sample Depth 0.50m Sample Number 1			
Engineer	Aecom	Relationship				
Employer	The Coal Authority	BS1377: Part 4: 1990: 3.3	Sample Type B			
Description	Brown gravelly sandy CLAY.		Specimen Depth 0.50m Specimen Number 2			
1.78			— · —			
1.76		``\.	5% Air voids			
1.74						
1.72						
1.70						
еш /б И						
Dry density Mg/m3 1.68 1.66			·,			
1.64			``\			
1.62						
1.60			\ \\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\			
1.58						
1.56						
-	10 12 14 16 M	18 20 22 Noisture content %	24 26			
Maximum dry			ntal points			
Optimum mois Corrected max	sture content 15% kimum dry density for	Moisture content % 12.1	Dry Density Mg/m³ 1.72			
emoval of gra		13.8 16.5	1.76 1.75			
Method of cor	mpaction 2.5KG	20.4 21.6	1.67 1.63			
Batches tested	3 1	Nat 24.3	1.57			
Particle densit	y Assumed 2.65Mg/m³ d on 20mm sieve 20%					
	d on 20mm sieve 20% d on 37.5mm sieve 15%					
General remar	ks Test performed on specimen unsuita	ble due to gravel content.				
٠- الحادم						
Approved by:						
Steve Harper		Print date 07/11/2019	soil engineering			
	Revision No. 2.03	Issue Date 21/11/2012	Part of the Bachy Soletanche G			

Project Name	e Nenthead Mines - Proposed MWTS, GI	Dry Density /	Hole ID TP120
Project No.	TA8234	Moisture Content	Sample Depth
Engineer	Aecom	Relationship	0.50m Sample Number
ingineer			1
Employer	The Coal Authority	BS1377: Part 4: 1990: 3.3	Sample Type B
Description	Dark brown gravelly sandy CLAY.		Specimen Depth
			0.50m Specimen Number
			2
1.94 _T		N I	— · — 0% Air voids
	\	`.\	5% Air voids
1.92	\ \ \ \	· .	— — — 10% Air voids
1.00		\	
1.90		\ '\	
1.88		\ \ \	
	X '	\ \ \;	
_د 1.86 -		\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	
2.86 – 1.86 – 1.84 Mg/m² 1.84 – 1.85 – 1.86			
1.84 -		\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	
항 2 1.82 +	\		
Δ 1.02			
1.80	\		
1.78	1,		`\
1.76		\ \ \ \	
1.76		\ \	,
1.74		\\ \\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	`.
6	8 10 12	14 16 18	20 22
	М	oisture content %	
Maximum dry o Optimum moist		Experime Moisture content %	ental points Dry Density Mg/m³
	mum dry density for	8.3	1.83
removal of grav	el 2.05Mg/m³	10.8 13.1	1.88 1.91
Method of com	paction 2.5KG	15.9 Nat 18.6	1.82 1.75
			1.75
Batches tested Particle density	Separate batches teste Assumed 2.65Mg/m³	ed.	
Gravel retained	on 20mm sieve 24%		
aravei retained	on 37.5mm sieve 12%		
General remark	s Test performed on specimen unsuital	ble due to gravel content.	
Approved by:			
Steve Harper		Print date 07/11/2019	soil engineering
	Revision No. 2.03	Issue Date 21/11/2012	Part of the Bachy Soletanche Gro

Project Name	Nenthead Mine	es - Proposed MWTS, GI	Dry Density /	Hole ID WS107
Project No.	TA8234		Moisture Content	Sample Depth
Engineer	Aecom		Relationship	0.20m Sample Number
				3
Employer	The Coal Autho	rity	BS1377: Part 4: 1990: 3.3	Sample Type B
Description	Brown gravelly s	andy CLAY with some rootlets.		Specimen Depth 0.20m Specimen Number
1.78				1
1.74				
Dry density Mg/m3				
1.66				
1.62	9 10	11 12 13 14	15 16 17 18 19 Moisture content %	20 21 22 23 24
Maximum dry de Optimum moistu Corrected maxim removal of gravel	re content um dry density foi	1.75Mg/m³ 16% 1.79Mg/m³	Experi Moisture content % 9.3 11.3 15.8	imental points Dry Density Mg/m³ 1.70 1.73 1.75
Method of compa	action	2.5KG	18.5 21.3	1.73 1.65
Batches tested Particle density Gravel retained or Gravel retained or		Separate batches tes 2.65Mg/m³ 6% 2%	sted.	
General remarks	Test	performed on specimen unsuit	table due to gravel content.	
Approved by:				
Approved by: Steve Harper			Print date 07/11/2019	SOIL ENGINEERING

Project Name	Nenthead Mines - Proposed MWTS, GI	Dry Density /	Hole ID TP118
Project No.	TA8234	Moisture Content	Sample Depth
Engineer	Aecom	Relationship	1.50m Sample Number
			4
Employer	The Coal Authority	BS1377: Part 4: 1990: 3.5	Sample Type B
Description	Brown slightly sandy slightly gravelly CLAY.		Specimen Depth 1.50m
			Specimen Number
			2
2.10		`\	- 0% Air voids
		\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	5% Air voids 10% Air voids
			— — — 10% All Voids
2.06			
		\	
2.02			
Dry density Mg/m3 1.98		/ / /	
₹ M			
densi			
<u>2</u> 1.98			`.
			<u>, </u>
1.94	, ,		
		<u> </u>	\ \\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\
			\ \ \.
1.00			
1.90 4	5 6 7 8	9 10 11 12	13 14 15
	М	oisture content %	
Maximum dry de Optimum moistu		Experime Moisture content %	ental points Dry Density Mg/m³
Corrected maxim	um dry density for	5.8	2.02
emoval of gravel	2.12Mg/m³	7.3 9.7	2.07 2.07
Method of compa	action 4.5KG	11.5 13.5	2.00 1.92
Batches tested Particle density	Separate batches teste Assumed 2.65Mg/m³	eu.	
Gravel retained or Gravel retained or			
General remarks	Test performed on specimen unsuital	ole due to gravel content.	
Approved by:			
Steve Harper		Print date 07/11/2019	SOIL ENGINEERING
	Revision No. 2.03	Issue Date 21/11/2012	Part of the Bachy Soletanche Gro

Project Name	e Nenthead Mi	Nenthead Mines - Proposed MWTS, GI							nditio	Hole ID			
Project No.	TA8234	TA8234							!		BH104 Sample Depth 1.50m		
Engineer	Aecom	Aecom											
Employer	The Coal Authority BS1377 : Part 4 : 1990 : Clause 5.4 BS1377 : Part 4 : 1990 : Clause 5.4									уре			
Description Dark grey slightly gravelly slightly sandy CLAY.												1.50n ecimen N	n
					ľ	Number o	f Blows						
1 30 —	2	3	3 4	4	6	8	12	16	2	4 3	32	48 6	64
25													
]													
Change in Penetration - mm													
ion -													
etrat ===================================													
Pen L													
ige ir													
Chan 10													
5 -													
0 111	2	4	(5	8	10		12		14	16	1	.8
					M	loisture C	onditior	Value)				
Specimen num	her			,	lat								
Moisture cond	ition value MCV			2	2.3								
Moisture conte	ent ws until seepage				24 5								
Method of dete					st fit line								
	ter compaction #		Mg/n		.98								
	er compaction # ength after compac	ction #	Mg/n kF		.60								
Gravel retained	l on 20mm sieve			% C	0.0								
Remarks	Single sample t	tested.		ד	est per	formed in t	he Labor	atory					
# not part of te	st method												
Approved by:													
Steve Harper						1	Print date		07/11/20	19	so	ıL engii	neering
		Revision	No. 2	.04		Issue		1/11/20			Part o	f the Bachy S	oletanche Group

Project N	ame	Nenthead N	Mines - Pro	oposed	MWTS, GI		Moist		Condition	on		Hole II BH10	5		
Project N	0.	TA8234						Val	ue		Sample Depth 0.00m				
Engineer		Aecom									San	nple Nu			
Employer		The Coal Au	ıthority				BS1377 : I	Part 4 : 1	990 : Clause	e 5.4	Si	O.00m Sample Number 4 Sample Type B Specimen Depth 0.00m Specimen Number 1 48 64			
Descriptio	n	Brown grave	lly sandy CI	AY.		l					Spe	cimen l			
											Spec	imen N			
						Nu	mber of Bl	ows							
30	1		2	3	4	5	8 1	.2 1	.6 2	24 3	32 4	8 6	4		
25															
€ 20															
Change in Penetration - mm 01 02															
tion															
er 15															
Pen															
ie in															
g 10															
ਠ															
5	H														
	$\parallel \parallel \parallel$														
0	Ш														
	0	2	4		6	8 Moi	10 sture Cond		2 alue	14	16	1	8		
Specimen r	number	<u> </u>			Nat										
Moisture c	onditio	n value MC	V												
Moisture c Number of		until seepage	5		% 8.2 1										
		nining MCV			1										
		compaction :		Mg/											
		compaction # th after comp		Mg/	m³ 1.77 :Pa	•									
		ı 20mm sieve		ĸ	.ra % 8.2										
Remarks		Single sampl MCV result o		tes a tes		-	med in the l penetration		-	occurred	d after 4 blo	WS.			
# not part o		method										,461			
Approved	•										_				
Kevin Wal	lker		Not U					nt date	07/11/20	019			eering		
			Revisio	n No.	2.04		Issue Dat	e 21/1:	1/2012		Part of t	he Bachy So	oletanche Gro		

Project Name	Nenthead Mir	nes - Prop	osed M	1WTS, GI		Moist	ture (Condition	on	Hole ID					
Project No.	TA8234						Val	ue		Sample Depth 2.50m					
Engineer	Aecom														
		: 4													
Employer	The Coal Auth					BS1377 : F	Part 4 : 1	990 : Clause	e 5.4						
Description	Brown gravelly	sandy CLA	Υ.							-	2.50m	1			
										Spec		umber			
					Nu	mber of Bl	ows								
1	2	3	4	. 6				.6 2	14 32	2 4	8 6	4			
30															
25															
25															
E 20															
E 20															
- u															
Change in Penetration - mm 10 11 12															
Pene															
i e															
g 10 ==															
ğ 10 =															
5 🗔															
0															
0	2	4	6		8 Moi:	10 sture Cond			14	16	18	8			
Specimen numb	 er			Nat											
Moisture condit															
Moisture conte			9	% 30											
Number of blow Method of dete				1											
Bulk density afte			Mg/m												
Dry density afte		tion #	Mg/m kP		•										
Hand vane strer Gravel retained	ngth after compact on 20mm sieve	LIUII #		a % 9.9											
Remarks	Single sample to			Tes		med in the I				-ft- / ! !					
	ivicy result of 0	.u indicate	s a test	wnere a cha	ange in	penetration	ot 5mm	or less has	occurred	aπer 4 blo	ws.				
# not part of tes	t method														
Approved by:										T					
Steve Harper						Pri	nt date	07/11/20)19	SOIL	. engin	eering			
		Revision N	No. 2.	04		Issue Date		1/2012	-			letanche Group			

Project Na	ame Nenthead M	lines - Pro	posed N	/IWTS, GI		Mois	ture (Conditi	on		Hole II			
Project No	o. TA8234						Val	ue		Sample Depth 2.50m Sample Number				
Engineer	Aecom													
Employer	The Coal Aut	hority								S		vpe		
		-				BS1377	: Part 4 : 1	.990 : Claus	e 5.4		2.50m			
Description	n Brown gravell	y sandy CLA	AY.								2.50m	1		
											1			
					Nu	mber of E	Blows							
	1 2	2 3	3 4	4	6	8	12 1	16 2	24 3	32 4	4 8 6	4		
30 -														
0.5														
25 -														
돌 20 -														
- -														
Change in Penetration - mm - 07														
ta 15 -														
ו Pe														
Je in														
g 10 -														
ਠ														
5 -											<u> </u>			
0 -									###					
_) 2	4		5	8	10	1	.2	14	16	1	8		
	_	·				sture Cor						_		
Specimen n				Na	t									
Moisture co	ondition value MCV			% 16										
	blows until seepage			No see										
	determining MCV			·										
Bulk density	after compaction #		Mg/n	n³ 2.0°	7									
	after compaction #		Mg/n											
Hand vane s	strength after compa	action #	kF	Pa										
	ned on 20mm sieve	tostad		% 12. ⁻		madical.	.	\n'						
Remarks	Single sample MCV result of		es a test		•	med in the		-	occurred	d after 4 blo	ws.			
					g	,					- •			
	6 1 1 1 1													
	f test method										,/A\			
Approved I														
Steve Harp	er						Print date	07/11/2	019			eering		
		Revision	No. 2	2.04		Issue Da	ite 21/1	1/2012		Part of	the Bachy Sc	letanche Group		

Project N	lame Nenth	ead Min	nes - Prop	osed N	ЛWTS, G	il	Moi	sture	Conditi	on		Hole I				
Project N	lo. TA823	4						Val	ue		BH106 Sample Depth					
Engineer	Aecom	1									Sar	4.50n mple Nu				
_											Sample Number 18					
Employer	r The Co	oal Autho	ority				BS137	' : Part 4 : 1	1990 : Claus	e 5.4	S	ample T B	ype			
Description	on Brown	gravelly s	sandy CLA	Υ.							Spe	ecimen 4.50n				
											Spec	4.50n cimen N				
												1				
						N	Number of	Blows								
	1	2	3	} 4	4	6	8	12	16	24 3	2 4	48 6	64			
30																
25																
25																
£ 20																
Change in Penetration - mm 01 02																
ion .																
etra 15																
Pene																
.⊑ •																
g 10																
$\frac{c}{c}$																
5																
0		 			 	-		 	<u> </u>	 		 	 			
	0 2	2	4	(5	8 M	10 loisture Co		12 ′alue	14	16	1	8			
Specimen ı Moistura c	number condition value	MCV			ľ	lat										
Moisture c		IVICV			%	21										
	blows until se					1										
	determining M															
	ty after compa			Mg/r		.03										
	y after compact strength after		tion #	Mg/r kF		.68										
Gravel reta	ined on 20mm	sieve			% 1	2.8										
Remarks		sample te		es a test			ormed in tl		ory n or less has	OCCUITE O	after 4 hld	ows				
	IVICVIC	. 5 4.1. 01 0.	.s maicate	u 1631	cic a	Shange	ponociat	J., J. J.	0. 1000 1100	Josuite	L GILLOI T DIC					
# not nart	of test method															
# not part of Approved													<u> </u>			
Steve Har	-									010	-		Deeples			
	r =:		Revision	No. 2	2.04		Issue	Print date Date 21/1	07/11/2	U19			neering oletanche Group			

i roject ivallie	roject Name Nenthead Mines - Proposed MWTS, GI								Condi	Hole ID						
Project No.	TA8234							Val	ue		Sample Depth 2.50m Sample Number					
Engineer	Aecom															
Employer	The Coal Auth	nority										2.50m Sample Number 12 Sample Type B Specimen Depth 2.50m Specimen Number 1				
			1: 1.1		CI AV		BS1377	: Part 4 : 1	1990 : Claı	use 5.4						
Description	Dark grey sligh	itly gravelly	/ slightly	/ sandy	CLAY.							2.50 Specimen	m Number			
						Num	nber of E	Blows								
1	2	3	3 4	4	6	8		12	16	24	32	48	64			
30						=										
25																
E 20																
Change in Penetration - mm																
tratio																
Penetr 15						=										
ge in																
Change 10																
					\downarrow											
5											1					
0																
0	2	4	(6	8	N 4 - 1 - 1	10	: ndition V	12	14	16	5	18			
						IVIOIS	ture Cor	idition V	alue							
Specimen numbe	er				Nat											
Moisture conditi Moisture conten	ion value MCV			%	8.2 16											
Number of blows	s until seepage			70	17											
Method of deter					est fit li	ne										
Bulk density afte Dry density after			Mg/r Mg/r		2.18 1.88											
Hand vane streng Gravel retained o	gth after compac	ction #	kl	Pa %	0.0											
Remarks	Single sample	tested.		/0		erform	ned in the	e Laborat	ory							
# not part of test	t method												_			
						1										
Approved by: Steve Harper								Print date		./2019		4	ineering			

Project Name	Nenthead M	ines - Pro	posed N	MWTS, 0	GI	Mo	istur	e Co	nditi	on			le ID 122	
Project No.	TA8234						V	alue	•			Sample	e Depth	l
Engineer	Aecom											0.5 Sample	0m Numbe	er
Employer	The Coal Aut	hority				DC4.2-	77 . D t .	/ . 100/	0 - 61				1 le Type	
Description	Greyish browr	-	ndy ven	, aravell	, CL AV	B2137	77 : Part 2	4 : 1990	0 : Clause	e 5.4			В	h
Description	arcylan brown	r slightly sa	may very	y graveny	CLAT.							0.5 Specime	50m	
						Number o	f Blows							
30 <u> </u>	2	!	3 4	4	6	8	12	16	2	24 3	32	48	64	
30														
25														
Change in Penetration - mm 10														
- uoi														
21 etra #														
Pene														
ge in														
10 lang														
5														
0														
0	2	4	(6	8	10 Noisture C		12 2 Value		14	16	5	18	
					IV	noisture C	ondition	ii vaiu	c					
Specimen numbe	er				Nat									
Moisture conditi	on value MCV				2									
Moisture content Number of blows				%	30 2									
Method of deter				Steep	est fit line	•								
Bulk density afte			Mg/r		1.93									
Dry density after Hand vane streng		ction #	Mg/r kl	m³ : Pa	1.48									
Gravel retained o	n 20mm sieve			%	26.6									
Remarks	Single sample	tested.			Test pe	formed in	the Labo	ratory						
# not part of test	mathad													
## HOLDARI OF TACE														
	metriou													
Approved by: Steve Harper	metriod						Print date		07/11/20	210	$\prod_{i=1}^{n}$	soil en		oine

Project Nan	ne Nenthead Mir	nes - Prop	osed M	WTS, GI		Mois	ture (Conditi	on		Hole II	
Project No.	TA8234						Val	ue		Sá	mple D	epth
Engineer	Aecom									Sar	1.00m nple Nu	
Employer	The Coal Auth	ority				D04.077	5	000 01	. ,	S	6 ample T	уре
	Brown slightly		adv CLAV	,		BS1377 :	Part 4 : 1	.990 : Claus	e 5.4		B ecimen I	
Description	Brown slightly (graveny sar	idy CLAY								1.00m cimen N	1
					Nu	mber of B	lows					
1	2	3	4	(6	8	12 1	16 2	24 3	32 4	48 6	54
30 E												
25												
23												
- 20												
Change in Penetration - mm												
<u>_</u>												
ratic												
15 E												
n Pe												
ge i												
10												
0												
			X									
5 ቭ										<u> </u>		
H												
ο Ц		<u> </u>										
0	2	4	6		8 Moi	10 sture Con		.2 alue	14	16	1	8
Specimen nur	mber			Nat								
	dition value MCV			6.3								
Moisture con			9/	6 19 14								
	ows until seepage termining MCV			Steepest f	it line							
	after compaction #		Mg/m	³ 2.09)							
	fter compaction #	tion "	Mg/m		5							
	rength after compac ed on 20mm sieve	иоп #	kPa %									
Remarks	Single sample t	ested.	,			med in the	Laborato	ry				
# not part of t	test method											
Approved by	r:											
Steve Harpe	r					P	rint date	07/11/2	019	SOI	L engir	neering
		Revision N	No. 2.0	04		Issue Da		1/2012		Part of	the Bachy So	oletanche Group

Project Name	Nenthead Min	nes - Prop	osed N	1WTS, GI		Moist	ture (Condition	on		Hole II	
Project No.	TA8234						Valu	ue		Sa	WS105 mple De	epth
Engineer	Aecom									San	2.00m nple Nu	
											10	
Employer	The Coal Author	ority				BS1377 : I	Part 4 : 1	990 : Clause	e 5.4	Sa	ample T	ype
Description	Brown clayey sli	ightly grav	elly SAN	ID.						-	cimen [2.00m imen N	1
										Spec	1	umber
					Nu	mber of Bl	ows					
1	2	3	4	. 6				.6 2	.4 32	2 4	8 6	4
30												
25												
25												
E 20												
Change in Penetration - mm 10 10 10 10 10 10 10 10 10 10 10 10 10												
tion												
15 =												
Per												
ge ir												
10 E												
5												
, <u>I</u>												
0	2	4	6	i	8	10			14	16	18	8
					Moi	sture Cond	lition Va	alue				
Specimen numb				Nat								
Moisture condit	tion value MCV nt		9	% 29								
Number of blow				1								
Method of dete	rmining MCV											
	er compaction #		Mg/m									
Dry density afte Hand vane strer	r compaction # ngth after compact	tion #	Mg/m kP		'							
Gravel retained	on 20mm sieve			% 2.5								
Remarks	Single sample to MCV result of 0.		s a test			med in the l penetration			occurred	after 4 blo	ws.	
							•					
# not part of tes	st method											
Approved by:	-											
Steve Harper						Pri	nt date	07/11/20	019	SOIL	. engin	eering
		Revision N	No. 2.	.04		Issue Dat		1/2012	-			letanche Group

Project Name	Nenthead Mi	ines - Prop	osed MV	WTS, GI		Mois	ture	Condi	tion		Hole I	
Project No.	TA8234						Val	ue		Sa	TP12: ample D	epth
Engineer	Aecom									Sar	0.50n nple Nu	
											1	
Employer	The Coal Autl	hority				BS1377:	Part 4 : 1	1990 : Claı	use 5.5	S	ample 1 B	ype
Description	Brown clayey o	gravelly SAI	ND.		'					Spe	ecimen 0.50n	
										Spec	cimen N	
											4	
					Nur	mber of B	lows					
1	2	3	3 4	6	8	3 :	12 1	16	24 3	32 4	48 6	64
30												
25												
23												
ج 20												
Change in Penetration - mm												
io												
15 et at												
Pene												
. <u>⊑</u>												
g 10												
ਰ 🖹			$\rightarrow \downarrow$									
5												
				HHIN								
0					ШШ							
0	2	4	6		8 Mois	10 sture Con		l2 alue	14	16	1	.8
Specimen numbe	er			1		2		3	4			
Moisture conditi				2		5.1	(6.2	3.3			
Moisture conten			%		_	25		22	26			
Number of blows Method of deter				7 Stoopest fit		No seepage eepest fit lir		22 ust fit line 9	10 Stoopest fit	lino		
Bulk density afte			Mg/m³	1.84		1.93		96	1.91	iii le		
Dry density after			Mg/m³			1.54		60	1.52			
Hand vane streng		ction #	kPa	4- 6								
Gravel retained on Remarks	Separate batch	nes tested	%		perforn	med in the	Laborato	orv				
				. 530				,				
# not part of test	metnod				<u> </u>					$\overline{}$		
Approved by:												
Steve Harper		Povisi	No 30	<i>,</i>			int date		/2019			neering
		Revision	No. 2.04	+		Issue Dat	.e 21/1	1/2012		Part of	me Bachy S	oletanche Group

Project Name	Nenthead Mines - Proposed MWTS, GI	Moisture Condition	Hole ID TP121
Project No.	TA8234	Value	Sample Depth
·			0.50m
Engineer	Aecom		Sample Number
Employer	The Coal Authority	BS1377 : Part 4 : 1990 : Clause 5.5	1 Sample Type B
Description	Brown clayey gravelly SAND.		Specimen Depth 0.50m
			Specimen Number 4
	MCV cal	ibration line	
30			
28 — % tt 26 —			
Woisture Content %			
Moistur 22 —			

Characteristics of calibration line

2

determined using linear regression

Intercept Slope

20 +

29.2 -1.001

8

Moisture Condition Value MCV

Sensitivity

0.999

10

MCV per MC%

12

14

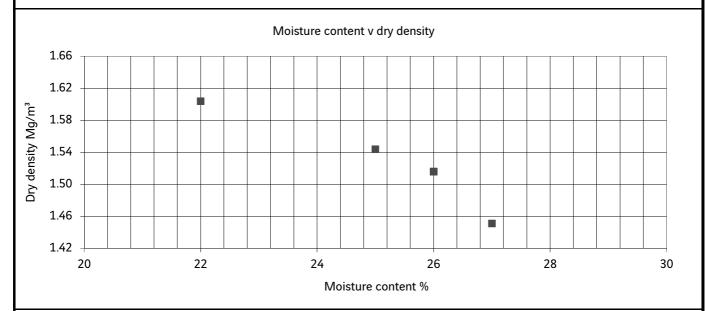
16

18

Correlation -0.931

4

6



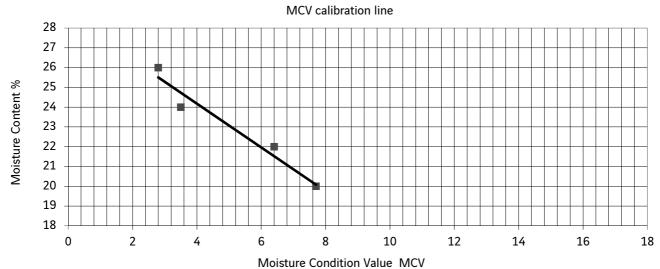
Remarks Separate batches tested

Test performed in the Laboratory

Approved by:				
Steve Harper			Print date 07/11/2019	soil engineering
	Revision No. 2.04	Issue Date	21/11/2012	Part of the Bachy Soletanche Group

Project Name	Nenthead Mir	nes - Prop	osed MW	TS, GI	Moi	sture Co	onditio	n		Hole II	
Project No.	TA8234					Valu	e		Sa	TP123 mple De	epth
Engineer	Aecom								San	0.50m nple Nu	
Employer	The Coal Auth	ority							Sá	1 ample T	vne
		-			BS1377	: Part 4 : 19	90 : Clause 5	5.5		В	
Description	Brown sandy gr	ravelly CLA	Υ.							cimen [0.50m imen N 2	1
					Number of	Blows					
1 30 —	2	3	4	6	8	12 16	24	32	4	8 6	4
1											
25											
돌 20											
Change in Penetration - mm		$\overline{}$									
atio											
15			\Rightarrow								
Per			$\overline{}$								
Je in		X									
10 E											
5											
0											
0	2	4	6	8	10 Moisture Co	12 ndition Valu		4	16	18	8
Specimen numbe				1	2	3		4			
Moisture condition			2,	2.8	3.5	6.4		7.7			
Moisture content Number of blows			%	26 6	24 8	22 18		20 30			
Method of deterr			St		e Steepest fit I				e		
Bulk density after			Mg/m³	1.89	1.94	2.0	0	2.04			
Dry density after			Mg/m³	1.50	1.56	1.6	4	1.70			
Hand vane streng Gravel retained o		tion #	kPa %	15.6							
Remarks	Separate batche	es tested	,,,		rformed in th	e Laboratory	/				
# not part of test	method										
Approved by:											
Steve Harper						Print date	07/11/2019		SOIL	. engin	eering
		Revision I	No. 2.04		Issue D						letanche Group

Project Name	Nenthead Mines - Proposed MWTS, GI	Moisture Condition	Hole ID
			TP123
Project No.	TA8234	Value	Sample Depth
			0.50m
Engineer	Aecom		Sample Number
			1
Employer	The Coal Authority	BS1377 : Part 4 : 1990 : Clause 5.5	Sample Type
	•	BS1377 : Part 4 : 1990 : Clause 5.5	В
Description	Brown sandy gravelly CLAY.		Specimen Depth
			0.50m
			Specimen Number
			2



Characteristics of calibration line

determined using linear regression

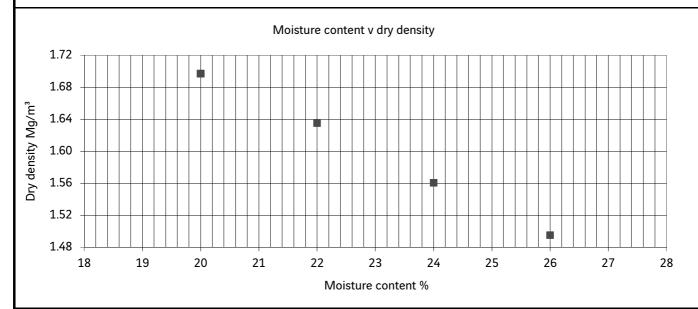
Intercept Slope

29.0 -1.110

MCV per MC% 0.901

Sensitivity

Correlation -0.973



Remarks

Separate batches tested

Test performed in the Laboratory

Approved by:				
Steve Harper			Print date 07/11/2019	soil engineering
	Revision No. 2.04	Issue Date	21/11/2012	Part of the Bachy Soletanche Group

1	Nenthead Mine	es - Propo	sed MWT	S, GI	Califo	rnia Be	earing			ole ID P109	
Project No.	TA8234				R	atio Te	st		Samp	le Depth	
Engineer	Aecom							9		50m Number	
_										1	
Employer	The Coal Autho	-				irt 4: 1990: npactive ef	7.2.4 2.5kg fort			ole Type B	
Description	Brown slightly sa	ındy slightl	y gravelly C	CLAY.				5		ien Depth 50m	
								Sį	pecime	en Numbe	r
0.12 ¬										1	
0.12	—×— Top dat	ta		– Base data	- →	← – 2.5 top	•		5.0 top		
	2.5 base	е		5.0 base		— Тор со	rrection		Base co	orrection	
0.10 -											_
0.20									_		
0.08 -											
 -						سر					
3 0.06 -											
d KN				_							
Force applied kN											
0.04 -											
		/									
*											
0.02 -											
		•									
			İ				į				
			į				-				
0.00				[1 1	-	<u> </u>				
0.00	0.5 1.0	1.5	2.0 2.	5 3.0	3.5 4.0	4.5	5.0 5.5	6.0	6.5	7.0	7.5
	0.5 1.0	1.5	2.0 2.9	5 3.0	3.5 4.0 Penetration mn		5.0 5.5	6.0	6.5	7.0	7.5
0.0	CBR value	es %			Penetration mn	n oisture con		2	2	%	7.5
0.0 Penetration			2.0 2.1 Accepte	d CBR	Penetration mn	n oisture con			2		7.5
Penetration 2.50 mm 5.00 mm	CBR value Top	es % Base	Accepte	d CBR	As received modesture cont	n oisture con ent - top		2 2	2 3 2	% %	7.5
0.0 Penetration 2.50 mm	CBR value Top 0.24	es % Base 0.33	Accepte	d CBR	As received m Moisture cont	n oisture con ent - top		2 2	2 3 2 01	% % % Mg/m³	7.5
Penetration 2.50 mm 5.00 mm Curve correction	CBR value Top 0.24 0.26	es % Base 0.33	Accepte N/A	d CBR A	As received modesture contour Moisture contour Bulk density Dry density	oisture con eent - top eent - base		2 2 2.0 1.6	2 3 2 01 64	% %	7.5
Penetration 2.50 mm 5.00 mm Curve correction Seating load - top	CBR value Top 0.24 0.26	es % Base 0.33	Accepte	d CBR	As received modesture contents Moisture contents Bulk density	oisture con eent - top eent - base		2 2 2 2.0	2 3 2 01 64	% % % Mg/m³	7.5
Penetration 2.50 mm 5.00 mm Curve correction Seating load - top Seating load - bas Surcharge	CBR value Top 0.24 0.26	es % Base 0.33	Accepte N// 10 10 5.2	nd CBR A N N N kg	As received modesture contour Moisture contour Bulk density Dry density	oisture con eent - top eent - base		2 2 2.0 1.6	2 3 2 01 64	% % % Mg/m³	7.5
Penetration 2.50 mm 5.00 mm Curve correction Seating load - top Seating load - bas Surcharge Gravel retained o	CBR value Top 0.24 0.26 p se	es % Base 0.33	Accepte N//	od CBR A N N	As received modesture contents Moisture contents Bulk density Dry density	oisture con eent - top eent - base		2 2 2.0 1.6	2 3 2 01 64	% % % Mg/m³	7.5
Penetration 2.50 mm 5.00 mm Curve correction Seating load - top Seating load - bas Surcharge Gravel retained o	CBR value Top 0.24 0.26 p se	es % Base 0.33 0.38	Accepte N// 10 10 5.2 12	nd CBR A N N N kg %	As received modesture contents Moisture contents Bulk density Dry density	oisture con eent - top eent - base		2 2 2.0 1.6	2 3 2 01 64	% % % Mg/m³	7.5
Penetration 2.50 mm 5.00 mm Curve correction Seating load - top Seating load - bas Surcharge Gravel retained o Gravel retained o General remarks	CBR value Top 0.24 0.26 p se n 20mm sieve n 37.5mm sieve	es % Base 0.33 0.38	Accepte N// 10 10 5.2 12	nd CBR A N N N kg %	As received modesture contents Moisture contents Bulk density Dry density	oisture con eent - top eent - base		2 2 2.0 1.6	2 3 2 01 64	% % % Mg/m³	7.5
Penetration 2.50 mm 5.00 mm Curve correction Seating load - top Seating load - bas Surcharge Gravel retained o	CBR value Top 0.24 0.26 p se n 20mm sieve n 37.5mm sieve	es % Base 0.33 0.38	Accepte N// 10 10 5.2 12	nd CBR A N N N kg %	As received modesture contents Moisture contents Bulk density Dry density	oisture con eent - top eent - base		2 2 2.0 1.6	2 3 2 01 64	% % % Mg/m³	7.5

Project Name	Nenthead Mines - Pro	posed MWTS,	GI	California	Bearing		Hole TP11		
Project No.	TA8234			Ratio 1	Test		Sample	Depth	
Engineer	Aecom					S	0.50 Sample N		
				D04077 D . / 40			1		
Employer	The Coal Authority			BS1377: Part 4: 19 compactive			Sample B	Туре	
Description	Brown sandy CLAY.		•			S	pecimen 0.50		
						Sp	ecimen		r
0.10							2		
0.12	—×— Top data		Base data	2.5	top	×- :	5.0 top		
	- 2.5 base	!	5.0 base	—— Тор	correction		Base corre	ection	<u> </u>
0.10 -									
0.10							_		_
*						,			
0.08 -									
•				/					
3 0.06 -					İ				
y pe		/							
ig									
 					j				
Force applied kN	/								
o.04 -									
0.04 -									
0.02 -									
0.02				25 40 45			-	70	7.5
0.02 -	0.5 1.0 1.5	2.0 2.5	3.0 Pe	3.5 4.0 4.5 enetration mm	5.0 5.5	6.0	6.5	7.0	7.5
0.02		2.0 2.5	Pe	enetration mm					7.5
0.02	0.5 1.0 1.5 CBR values % Top Base		Pe		content	6.0	3 %	6	7.5
0.02 - 0.00 0.0 Penetration 2.50 mm	CBR values % Top Base 0.43 0.34	e Accepted (Pe // CBR I	As received moisture of Moisture content - to	content p	38	3 % 3 %	% %	7.5
0.02 - 0.00 0.0 Penetration	CBR values % Top Base	e Accepted (Pe CBR I	enetration mm	content p	38	3 % 3 %	/6 /6	7.5
0.02 - 0.00 0.0 Penetration 2.50 mm 5.00 mm	CBR values % Top Base 0.43 0.34	e Accepted (Pe CBR I	As received moisture of Moisture content - to	content p	38 38	3 % 3 % 3 %	% %	7.5
0.02 - 0.00 Penetration 2.50 mm 5.00 mm Curve correction Seating load - top	CBR values %	e Accepted (4 0.41 8	Pe CBR I	As received moisture of Moisture content - to Moisture content - bar	content p ase	38 38 38 1.7	3 9 3 9 8 N	% % % Mg/m³	7.5
0.02 - 0.00 Penetration 2.50 mm 5.00 mm Curve correction Seating load - top Seating load - base	CBR values %	e Accepted (4 0.41 8 10 10 10	Pe CBR I I I I N	As received moisture of Moisture content - to Moisture content - ba Bulk density Dry density	content p ase	38 38 38 1.7 1.2	3 9 3 9 8 N	% % % Mg/m³	7.5
0.02 - 0.00 0.0 Penetration 2.50 mm 5.00 mm	CBR values %	e Accepted 6 0.41 3 10 10 4.2	Pe CBR I	As received moisture of Moisture content - to Moisture content - ba Bulk density Dry density	content p ase	38 38 38 1.7 1.2	3 9 3 9 8 N	% % % Mg/m³	7.5
0.02 - 0.00 Penetration 2.50 mm 5.00 mm Curve correction Seating load - top Seating load - bas Surcharge Gravel retained o Gravel retained o	CBR values % Top Base 0.43 0.34 0.44 0.38 o se n 20mm sieve n 37.5mm sieve	10 10 4.2 0	Pe CBR I I I N I N kg	As received moisture of Moisture content - to Moisture content - ba Bulk density Dry density	content p ase	38 38 38 1.7 1.2	3 9 3 9 8 N	% % % Mg/m³	7.5
0.02 - 0.00 Penetration 2.50 mm 5.00 mm Curve correction Seating load - top Seating load - bas Surcharge Gravel retained o Gravel retained o	CBR values %	10 10 4.2 0	CBR I I I I I I I I I I I I I I I I I I I	As received moisture of Moisture content - to Moisture content - ba Bulk density Dry density	content p ase	38 38 38 1.7 1.2	3 9 3 9 8 N	% % % Mg/m³	7.5
0.02 - 0.00 Penetration 2.50 mm 5.00 mm Curve correction Seating load - top Seating load - bas Surcharge Gravel retained o Gravel retained o General remarks	CBR values % Top Base 0.43 0.34 0.44 0.38 o se n 20mm sieve n 37.5mm sieve	10 10 4.2 0	CBR I I I I I I I I I I I I I I I I I I I	As received moisture of Moisture content - to Moisture content - ba Bulk density Dry density	content p ase	38 38 38 1.7 1.2	3 9 3 9 8 N	% % % Mg/m³	7.5
0.02 - 0.00 Penetration 2.50 mm 5.00 mm Curve correction Seating load - top Seating load - bas Surcharge	CBR values % Top Base 0.43 0.34 0.44 0.38 o se n 20mm sieve n 37.5mm sieve	10 10 4.2 0	CBR I I I I I I I I I I I I I I I I I I I	As received moisture of Moisture content - to Moisture content - ba Bulk density Dry density	content p ase	38 38 1.7 1.2 4.5kg ran	3 9 3 9 8 N	% % % Mg/m³ Mg/m³	

	Nenthead Min	es - Propo	osed MW	TS, GI	Cali	fornia E	Bearing			ole ID P112	
Project No.	TA8234					Ratio T	est		Sam	ole Depth	
Engineer	Aecom).50m le Numbe	r
Employer	The Coal Autho	vit.			RS1377	: Part 4: 199	n·72425	ko	Sam	1 ple Type	
		-				compactive		Ng .		В	
Description	Brown slightly sa	andy slight	ly gravelly	CLAY with	rootlets.					men Deptl).50m	1
									Specim	en Numb	er
0.08 ¬										-	
	─ Top da	ta	-	Base da	ta .	× 2.5 t	ор	>	← – 5.0 to	р	
	• 2.5 bas	se		5.0 base	е .	Тор	correction	_	— Base o	correction	
0.07 -											_
									2		×
0.06 -											
•							,	,			
0.05											
X-											
3 0.04 -											
V V											
pplie											
Force applied kN			//				İ				
ш											
0.02 -				1							
		/									
0.01 -											
0.01 -											
0.01 -					,						
	0.5 1.0	1.5	2.0	× , , , , , , , , , , , , , , , , , , ,		.0 4.5	5.0	5.5 6	.0 6.5	7.0	7.5
0.00	0.5 1.0	1.5	2.0	*	3.5 4 Penetration		5.0	5.5 6	.0 6.5	7.0	7.5
0.00	CBR value	es %			Penetration As received	mm d moisture co	ontent	5.5 6	35	%	7.5
0.00			Accept	2.5 3.0	Penetration As received	mm	ontent	5.5 6			7.5
0.00 0.0 Penetration 2.50 mm 5.00 mm	CBR value Top	es % Base	Accept	ted CBR	As received Moisture of Moisture of	mm d moisture content - top content - bas	ontent	5.5 6	35 34 34	% %	7.5
0.00 0.0 Penetration 2.50 mm	CBR value Top 0.23	es % Base 0.25	Accept	ted CBR	As received Moisture o	mm d moisture content - top	ontent	5.5 6	35 34	% %	7.5
0.00 Penetration 2.50 mm 5.00 mm Curve correction	CBR value Top 0.23 0.24	es % Base 0.25	Accept 0.	ted CBR 26	As received Moisture of Bulk density	mm d moisture content - top content - bas ty	ontent		35 34 34 1.81 1.35	% % % Mg/m³	7.5
0.00 Penetration 2.50 mm 5.00 mm Curve correction Seating load - to Seating load - ba	CBR value Top 0.23 0.24	es % Base 0.25	Accept 0. 10 10	ted CBR	As received Moisture of Bulk density	mm d moisture content - top	ontent		35 34 34 1.81	% % % Mg/m³	7.5
0.00 Penetration 2.50 mm 5.00 mm Curve correction Seating load - to Seating load - ba Surcharge	CBR value Top 0.23 0.24	es % Base 0.25	10 10 5.2	ted CBR 26 N N kg	As received Moisture of Bulk density	mm d moisture content - top content - bas ty	ontent		35 34 34 1.81 1.35	% % % Mg/m³	7.5
0.00 Penetration 2.50 mm 5.00 mm Curve correction Seating load - to Seating load - ba Surcharge Gravel retained of	CBR value Top 0.23 0.24	es % Base 0.25	Accept 0. 10 10	ted CBR 26 N N	As received Moisture of Bulk density	mm d moisture content - top content - bas ty	ontent		35 34 34 1.81 1.35	% % % Mg/m³	7.5
0.00 Penetration 2.50 mm 5.00 mm Curve correction Seating load - to Seating load - ba Surcharge Gravel retained of	CBR value Top 0.23 0.24 p p ase	es % Base 0.25 0.27	10 10 5.2 4.1 2	n N N kg %	As received Moisture of Bulk density	mm d moisture content - top content - bas ty	ontent		35 34 34 1.81 1.35	% % % Mg/m³	7.5
0.00 Penetration 2.50 mm 5.00 mm Curve correction Seating load - to Seating load - ba Surcharge Gravel retained of Gravel retained of	CBR value Top 0.23 0.24 pp ase on 20mm sieve on 37.5mm sieve	es % Base 0.25 0.27	10 10 5.2 4.1 2	n N N kg %	As received Moisture of Bulk density	mm d moisture content - top content - bas ty	ontent		35 34 34 1.81 1.35	% % % Mg/m³	7.5
0.00 Penetration 2.50 mm 5.00 mm Curve correction Seating load - to Seating load - ba Surcharge Gravel retained of	CBR value Top 0.23 0.24 pp ase on 20mm sieve on 37.5mm sieve	es % Base 0.25 0.27	10 10 5.2 4.1 2	n N N kg %	As received Moisture of Bulk density	mm d moisture or ontent - top content - bas by / compaction	ontent		35 34 34 1.81 1.35 kg rammer	% % % Mg/m³	

	Nenthead Mine	es - Proposed I	MWTS, GI	California Bearin	ıg		ole ID P115	
Project No.	TA8234			Ratio Test			ole Depth	
	Accom						.50m le Number	
Engineer	Aecom					-	1	
Employer	The Coal Autho			BS1377: Part 4: 1990: 7.2.4 2 compactive effort	2.5kg		ple Type B	
Description	Brown slightly gr	avelly sandy CL	AY with some ro	otlets.			nen Depth .50m	1
						Specim	en Numbe	er
0.12							1	
0.12	—×— Top dat	ta •	—• — Base dat	a – –× – 2.5 top		- - 5.0 top	o	
	• 2.5 bas	е -	5.0 base	——— Top correction	n ·	——— Base o	correction	
							2	_
0.10 -								
					, w			
0.08			.~~~~~					
≥ 0.06 -								
lied *								
Force applied kN								
O.04 -								
0.02 -								
0.02 -								
0.02 -								
0.02					ı			
	0.5 1.0	1.5 2.0	2.5 3.0	3.5 4.0 4.5 5.0	5.5	6.0 6.5	7.0	7.5
0.00	0.5 1.0	1.5 2.0	2.5 3.0	3.5 4.0 4.5 5.0 Penetration mm	5.5	6.0 6.5	7.0	7.5
0.00	CBR value	es %		Penetration mm As received moisture content	5.5	32	%	7.5
0.00 0.0	CBR value Top	es % Base Ac	cepted CBR	Penetration mm	5.5			7.5
0.00 0.0 Penetration	CBR value	es %		Penetration mm As received moisture content	5.5	32	%	7.5
0.00 0.0 Penetration 2.50 mm	CBR value Top 0.42	es % Base Ac 0.38	cepted CBR	As received moisture content Moisture content - top Moisture content - base Bulk density	5.5	32 32 32 1.86	% % % Mg/m³	7.5
0.00 0.0 Penetration 2.50 mm 5.00 mm	CBR value Top 0.42	es % Base Ac 0.38	cepted CBR	As received moisture content Moisture content - top Moisture content - base	5.5	32 32 32	% %	7.5
0.00 Penetration 2.50 mm 5.00 mm Curve correction Seating load - top	CBR value Top 0.42 0.41	Base Ac 0.38 0.41	ecepted CBR 0.42	As received moisture content Moisture content - top Moisture content - base Bulk density		32 32 32 1.86	% % % Mg/m³	7.5
0.00 Penetration 2.50 mm 5.00 mm Curve correction Seating load - top Seating load - ba	CBR value Top 0.42 0.41	es % Base Ac 0.38 0.41	ccepted CBR 0.42	As received moisture content Moisture content - top Moisture content - base Bulk density Dry density Method of compaction		32 32 32 1.86 1.41	% % % Mg/m³ Mg/m³	7.5
0.00 Penetration 2.50 mm 5.00 mm Curve correction	CBR value Top 0.42 0.41	Base Ac 0.38 0.41	ccepted CBR 0.42	As received moisture content Moisture content - top Moisture content - base Bulk density Dry density		32 32 32 1.86 1.41 2.5kg rammer	% % % Mg/m³	7.5
0.00 Penetration 2.50 mm 5.00 mm Curve correction Seating load - top Seating load - bas Surcharge Gravel retained o	CBR value Top 0.42 0.41 p se on 20mm sieve on 37.5mm sieve	es % Base Ac 0.38 0.41 10 10 5.5	ccepted CBR 0.42 N N N N K K K K K K K K K K K K K K K	As received moisture content Moisture content - top Moisture content - base Bulk density Dry density Method of compaction Curing period		32 32 32 1.86 1.41 2.5kg rammer	% % Mg/m³ Mg/m³	7.5
0.00 Penetration 2.50 mm 5.00 mm Curve correction Seating load - top Seating load - bas Surcharge Gravel retained o	CBR value Top 0.42 0.41 p p sse	es % Base Ac 0.38 0.41 10 10 5.5	ccepted CBR 0.42 0 N 0 N 0 N 5 kg	As received moisture content Moisture content - top Moisture content - base Bulk density Dry density Method of compaction Curing period Soaking period		32 32 32 1.86 1.41 2.5kg rammer	% % Mg/m³ Mg/m³ 4 Days	7.5
0.00 Penetration 2.50 mm 5.00 mm Curve correction Seating load - top Seating load - bas Surcharge Gravel retained o Gravel retained o General remarks	CBR value Top 0.42 0.41 p se on 20mm sieve on 37.5mm sieve	es % Base Ac 0.38 0.41 10 10 5.5	ccepted CBR 0.42 0 N 0 N 0 N 5 kg	As received moisture content Moisture content - top Moisture content - base Bulk density Dry density Method of compaction Curing period Soaking period		32 32 32 1.86 1.41 2.5kg rammer	% % Mg/m³ Mg/m³ 4 Days	7.5
0.00 Penetration 2.50 mm 5.00 mm Curve correction Seating load - top Seating load - bas Surcharge Gravel retained o Gravel retained o	CBR value Top 0.42 0.41 p se on 20mm sieve on 37.5mm sieve	es % Base Ac 0.38 0.41 10 10 5.5	ccepted CBR 0.42 0 N 0 N 0 N 5 kg	As received moisture content Moisture content - top Moisture content - base Bulk density Dry density Method of compaction Curing period Soaking period		32 32 1.86 1.41 2.5kg rammer	% % Mg/m³ Mg/m³ 4 Days	

Project Nam	e Nenthead Min	es - Propos	ed MWTS	, GI	Cali	fornia E	Bearing			ole ID P119	
Project No.	TA8234					Ratio T	est		Samı	ole Depth	
Engineer	Aecom									.50m le Numbe	r
_									·	1	•
Employer	The Coal Author	ority				: Part 4: 199 compactive	0: 7.2.4 2.5kg effort	9	Sam	ple Type B	
Description	Brown clayey gr	avelly SAND.							· c	nen Deptl .50m en Numb	
									Specifi	2	lei
0.20	—×— Top da	nta.		Base data			on		5.0 to	2	
	2.5 ba			5.0 base	- -	× 2.5 t Top :	-	×		orrection _	
0.18 -	2.0 84			0.0 5400		100	00110011011		<i></i>		
0.16 -										مسد	_
) 0.14 -	«							ىد			
)										
0.12 -	,										
_ 0.10 -											
Force applied kN	<										
9 0.08 -							İ				
orce a)	/					İ				
0.06 -		/ /									
0.04 -											
0.04							İ				
0.02 -							İ				
							İ				
0.00 d 0.	0 0.5 1.0	1.5 2	.0 2.5	3.0	3.5 4.		5.0 5.	5 6.0	0 6.5	7.0	7.5
					Penetration	mm					
	CBR valu		-			l moisture c			30	%	
Penetration 2.50 mm	Top 0.73	Base 0.57	Accepted 0.68	CBR	Moisture c	ontent - top			29	%	
5.00 mm	0.73	0.62	0.00		Moisture c	ontent - bas	ie		29	%	
Curve correction	1				Bulk densit	-			1.91	Mg/m³	
					Dry density	'			1.47	Mg/m³	
Seating load - Seating load -			10 10	N N	Method of	compaction		2.5kç	g rammer		
Surcharge			5.5	kg	Curing peri	od				3 Days	
Gravel retained	d on 20mm sieve d on 37.5mm sieve		11.4 4.7	%	Soaking pe Amount of	riod			0.1	4 Days 12 mm	
General remarks		e 5.496kg.	r. <i>i</i>	/0	Amount of				0.1	LE 111111	
Approved by:				T		I			_		
Steve Harper						Print date	07/11/2019		SOIL (enginee	RING
		Revision No.	2.03		Issue Date	20/11/20					

Sample Depth		Nenthead Mines - P	roposed IVIVV	TS, GI		rnia Bea			Hole ID TP124	
Sample Number Sample Type Sample Type Sample Type Secription Specimen Depth O.50m Specimen Number 1	Project No.	TA8234			Ra	atio Tes	t	San	ple Depth	
## Provided Head of Cardinary Base Sample Type Specimen	Engineer	Aecom							ole Number	
Specimen Depth O.50m Specimen Number 1	Employer	The Coal Authority						Sar	nple Type	
Specimen Number 1	Description	Brown gravelly sandy	CLAY.			.,				
0.40 Top data									nen Number	•
Top data — Base data — — 2.5 top — — 5.0 top Top correction — Base correction — Base correction — Base correction — Base correction — 0.35 0.30 0.25 0.00 0.05 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 Penetration mm CBR values % enertation Top Base Accepted CBR Moisture content top 30 % Somm 1.2 1.4 1.3 0.00 mm 1.2 1.4 1.3 Moisture content - top 30 % Sulk density 1.90 Mg/m² Dry density 1.90 M	0.40 -								1	
0.35 0.30 0.25 0.20 0.00 0.05 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 Penetration mm CBR values % enetration Top Base Accepted CBR 5.0 mm 1.2 1.4 1.3 0.0 mm 1.2 1.4 1.3 Moisture content: top 3.0 Moisture content: top 3.0 Moisture content: top 3.0 Moisture content: base 3.0 Moisture content base 3.0 Moisture content base 3.0 Moisture content base 3.0 Moisture content base 3.0 Moisture content base 3.0 Moisture content base 3.0 Moisture content base 3.0 Moisture content base 3.0 Moisture content base 3.0 Moisture content base 3.0 Moisture content base 3.0 Moisture content base 3.0 Moisture content base 3.0 Moisture content base 3.0 Moisture content base 3.0 Moisture content base 3.0 Moisture content base 3.0 Moistu	0.40	—— Top data	-	Base data	>	← – 2.5 top		> − 5.0 to	ор	
0.30 0.25 0.20 0.00 0.00 0.01 0.00 0.00 0.01 0.00 0.00 0.01 0.00		2.5 base		5.0 base		— Top corr	ection	——— Base	correction	_
0.25 0.20 0.00	0.35 -							-		
0.25 0.20 0.00									~	
0.20 0.00 0.00 0.00 0.00 0.00 0.00 0.00	0.30									
0.20 0.00 0.00 0.00 0.00 0.00 0.00 0.00	0.25				_					
O.15 O.00 O.00 O.00 O.00 O.00 O.00 O.00 O.0	0.23 ¥ ·									
O.15 O.00 O.00 O.00 O.00 O.00 O.00 O.00 O.0	0.30									
CBR values % CBR values value va	Z 0.20 -									
CBR values % CBR values value va	applie *-		·/-/-							
CBR values % CBR values value va	0.15									
CBR values % enetration Top Base Accepted CBR Moisture content 131 % .50 mm 1.2 1.4 1.3 Moisture content - top 30 % urve correction Multiple of the properties of the properti							 			
CBR values % enetration	0.10			 			i 			
CBR values % enetration										
CBR values %	0.05									
CBR values %							 			
enetration Top Base Accepted CBR Moisture content - top 30 %		0.5 1.0 1.5	5 2.0 2				.0 5.5	6.0 6.5	5 7.0	\neg
enetration Top Base Accepted CBR Moisture content - top 30 %		CPP values %				nicture cente	nt		0/	7.5
Moisture content - base 30 % urve correction Bulk density 1.90 Mg/m³ Dry density 1.45 Mg/m³ eating load - top 10 N Method of compaction 2.5kg rammer eating load - base 10 N urcharge 5.4 kg Curing period 3 Days iravel retained on 20mm sieve 8.1 % Soaking period 4 Days iravel retained on 37.5mm sieve 5.3 % Amount of swell 0.02 mm eneral remarks Soaked, Surcharge 5.425kg.			aca Accont		As received me			21	U/ ₀	7.5
Bulk density Dry density 1.90 Mg/m³ Dry density 1.45 Mg/m³ eating load - top eating load - base 10 N urcharge 5.4 kg Curing period 3 Days iravel retained on 20mm sieve 8.1 % Soaking period 4 Days iravel retained on 37.5mm sieve 5.3 % Amount of swell print date print date 07/11/2019 Bulk density 1.90 Mg/m³ 1.45 Mg/m³ 2.5kg rammer 3 Days 4 Days 6 Day	Penetration	тор ва	ase Accept	ed CBR						7.5
eating load - top eating load - top eating load - base 10 N urcharge 5.4 kg Curing period 3 Days iravel retained on 20mm sieve 8.1 % Soaking period 4 Days iravel retained on 37.5mm sieve 5.3 % Amount of swell pproved by: teve Harper	Penetration 2.50 mm	1.2 1	4 1		Moisture cont	ent - top	iic	30	%	7.5
eating load - base 10 N urcharge 5.4 kg Curing period 3 Days iravel retained on 20mm sieve 8.1 % Soaking period 4 Days iravel retained on 37.5mm sieve 5.3 % Amount of swell 0.02 mm eneral remarks Soaked, Surcharge 5.425kg.	2.50 mm 5.00 mm	1.2 1	4 1		Moisture conto	ent - top		30 30	%	7.5
urcharge 5.4 kg Curing period 3 Days iravel retained on 20mm sieve 8.1 % Soaking period 4 Days iravel retained on 37.5mm sieve 5.3 % Amount of swell 0.02 mm eneral remarks Soaked, Surcharge 5.425kg.		1.2 1	4 1		Moisture conto	ent - top		30 30 1.90	% % Mg/m³	7.5
iravel retained on 20mm sieve 8.1 % Soaking period 4 Days iravel retained on 37.5mm sieve 5.3 % Amount of swell 0.02 mm eneral remarks Soaked, Surcharge 5.425kg. approved by: teve Harper Print date 07/11/2019	2.50 mm 5.00 mm Curve correction Seating load - to	1.2 1 1.2 1	10	N	Moisture contone Moisture contone Bulk density Dry density	ent - top ent - base		30 30 1.90 1.45	% Mg/m³ Mg/m³	7.5
iravel retained on 37.5mm sieve 5.3 % Amount of swell 0.02 mm eneral remarks Soaked, Surcharge 5.425kg. approved by: teve Harper Print date 07/11/2019	2.50 mm 5.00 mm Curve correction Seating load - to Seating load - ba	1.2 1 1.2 1	10 10	N N	Moisture contoned Moisture contoned Moisture contoned Moisture Con	ent - top ent - base		30 30 1.90 1.45	% Mg/m³ Mg/m³	7.5
pproved by: teve Harper Print date 07/11/2019 SOIL ENGINEERING	2.50 mm 5.00 mm Curve correction Seating load - to Seating load - ba Surcharge	1.2 1 1.2 1	10 10 5.4	N N kg	Moisture contoned Moisture contoned Moisture contoned Moisture Contoned Moisture Contoned Moisture Curing period	ent - top ent - base npaction		30 30 1.90 1.45	% Mg/m³ Mg/m³ T	7.5
teve Harper Print date 07/11/2019 SOIL ENGINEERING	2.50 mm 5.00 mm Curve correction Seating load - to Seating load - ba Surcharge Gravel retained c	1.2 1 1.2 1 p se n 20mm sieve	10 10 5.4 8.1	N N N kg %	Moisture conto	ent - top ent - base npaction		30 30 1.90 1.45 2.5kg ramme	% Mg/m³ Mg/m³ r 3 Days 4 Days	7.5
teve Harper Print date 07/11/2019 SOIL ENGINEERING	2.50 mm 5.00 mm Curve correction Geating load - to Geating load - ba Gurcharge Gravel retained c	1.2 1 1.2 1 0 se n 20mm sieve n 37.5mm sieve	10 10 5.4 8.1 5.3	N N N kg %	Moisture conto	ent - top ent - base npaction		30 30 1.90 1.45 2.5kg ramme	% Mg/m³ Mg/m³ r 3 Days 4 Days	7.5
Time date 07/11/2015	2.50 mm 5.00 mm Curve correction Seating load - to Seating load - ba Surcharge Gravel retained c Gravel retained c General remarks	1.2 1 1.2 1 0 se n 20mm sieve n 37.5mm sieve	10 10 5.4 8.1 5.3	N N N kg %	Moisture conto	ent - top ent - base npaction		30 30 1.90 1.45 2.5kg ramme	% Mg/m³ Mg/m³ r 3 Days 4 Days	7.5
Revision No. 2.03 Issue Date 20/11/2012 Part of the Bachy Soletanche Gro	2.50 mm 5.00 mm Curve correction Seating load - to Seating load - ba Surcharge Gravel retained of Gravel retained of General remarks	1.2 1 1.2 1 0 se n 20mm sieve n 37.5mm sieve	10 10 5.4 8.1 5.3	N N N kg %	Moisture conto	ent - top ent - base npaction		30 30 1.90 1.45 2.5kg ramme	% Mg/m³ Mg/m³ r 3 Days 4 Days	7.5

•	e Nenthead Mine	s - Proposed MWTS, GI	California Bearing	Hole ID TP125
Project No.	TA8234		Ratio Test	Sample Depth
	Accom			0.30m Sample Number
Engineer	Aecom			3
Employer	The Coal Author		BS1377: Part 4: 1990: 7.2.4 2.5kg compactive effort	Sample Type B
Description	Brown sandy grav	velly CLAY.		Specimen Depth 0.30m
				Specimen Number 2
0.70 ¬				2
0.70	——— Top data	a —— Base da	>← - 2.5 top	※ - 5.0 top
	• 2.5 base	e 5.0 base	Top correction	——— Base correction
0.60 -				
0.50 -				
	·			
0.40 -				
*				
Z				
9 <u>ie</u> 0.30 -				
Force applied kN				
			!	
	(
0.20 -	(
	(
0.20 -				
0.20 -				
0.20 -	0 05 10	15 20 25 30	35 40 45 50 55	60 65 70 75
0.20 -	0 0.5 1.0	1.5 2.0 2.5 3.0	3.5 4.0 4.5 5.0 5.5 Penetration mm	6.0 6.5 7.0 7.5
0.20 -			Penetration mm	
0.20 - 0.10 - 0.00 d	0 0.5 1.0 CBR values Top			6.0 6.5 7.0 7.5 21 % 20 %
0.20 - 0.10 - 0.00 d 0.00	CBR values Top 1.8	s % Base Accepted CBR 2 2.1	As received moisture content Moisture content - top	21 % 20 %
0.20 -	CBR values Top 1.8 1.9	s % Base Accepted CBR	As received moisture content Moisture content - top Moisture content - base	21 % 20 % 21 %
0.20 - 0.10 - 0.00 0.4 Penetration 2.50 mm 5.00 mm	CBR values Top 1.8 1.9	s % Base Accepted CBR 2 2.1	As received moisture content Moisture content - top	21 % 20 %
0.20 - 0.10 - 0.00 d 0.00 Penetration 2.50 mm 5.00 mm Curve correction	CBR values Top 1.8 1.9	s % Base Accepted CBR 2 2.1	As received moisture content Moisture content - top Moisture content - base Bulk density	21 % 20 % 21 % 2.05 Mg/m³
0.20 - 0.10 - 0.00 Penetration 2.50 mm 5.00 mm Curve correction Seating load -	CBR values Top 1.8 1.9	s % Base Accepted CBR 2 2.1 2.3 10 N 10 N	As received moisture content Moisture content - top Moisture content - base Bulk density Dry density Method of compaction	21 % 20 % 21 % 2.05 Mg/m³ 1.70 Mg/m³
0.20 - 0.10 - 0.00 0.00 Penetration 2.50 mm 5.00 mm Curve correction Seating load - Seating load - Surcharge	CBR values Top 1.8 1.9 top base	s % Base Accepted CBR 2 2.1 2.3 10 N 10 N 5.4 kg	As received moisture content Moisture content - top Moisture content - base Bulk density Dry density Method of compaction Curing period	21 % 20 % 21 % 2.05 Mg/m³ 1.70 Mg/m³ 2.5kg rammer
0.20 - 0.10 - 0.00 0.10 Penetration 2.50 mm 5.00 mm Curve correction Seating load - Seating load - Surcharge Gravel retained	CBR values Top 1.8 1.9	s % Base Accepted CBR 2 2.1 2.3 10 N 10 N 5.4 kg	As received moisture content Moisture content - top Moisture content - base Bulk density Dry density Method of compaction	21 % 20 % 21 % 2.05 Mg/m³ 1.70 Mg/m³
0.20 - 0.10 - 0.00 Penetration 2.50 mm 5.00 mm Curve correction Seating load - Surcharge Gravel retained	CBR values Top 1.8 1.9 top base d on 20mm sieve d on 37.5mm sieve	s % Base Accepted CBR 2 2.1 2.3 10 N 10 N 5.4 kg 14.6 % 12.2 %	As received moisture content Moisture content - top Moisture content - base Bulk density Dry density Method of compaction Curing period Soaking period	21 % 20 % 21 % 2.05 Mg/m³ 1.70 Mg/m³ 2.5kg rammer 3 Days 4 Days
0.20 - 0.10 - 0.00 d 0.00 Penetration 2.50 mm 5.00 mm Curve correction Seating load - Surcharge Gravel retained Gravel retained General remarks	CBR values Top 1.8 1.9 top base d on 20mm sieve d on 37.5mm sieve Soaked, Surcharge 5	s % Base Accepted CBR 2 2.1 2.3 10 N 10 N 5.4 kg 14.6 % 12.2 %	As received moisture content Moisture content - top Moisture content - base Bulk density Dry density Method of compaction Curing period Soaking period Amount of swell	21 % 20 % 21 % 2.05 Mg/m³ 1.70 Mg/m³ 2.5kg rammer 3 Days 4 Days
0.20 - 0.10 - 0.00 0.10 Penetration 2.50 mm 5.00 mm Curve correction Seating load - Seating load - Surcharge Gravel retained	CBR values Top 1.8 1.9 top base d on 20mm sieve d on 37.5mm sieve Soaked, Surcharge 5	s % Base Accepted CBR 2 2.1 2.3 10 N 10 N 5.4 kg 14.6 % 12.2 %	As received moisture content Moisture content - top Moisture content - base Bulk density Dry density Method of compaction Curing period Soaking period Amount of swell	21 % 20 % 21 % 2.05 Mg/m³ 1.70 Mg/m³ 2.5kg rammer 3 Days 4 Days

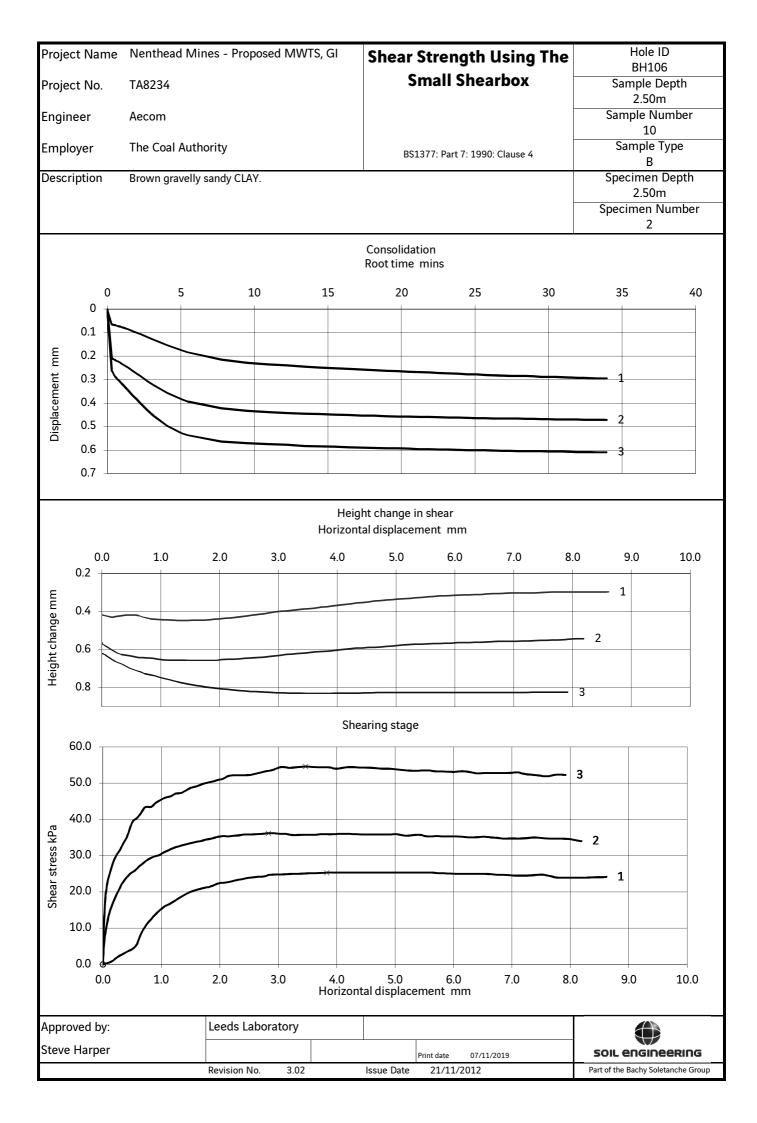
Proje	ct Name	Nenthead Mine	es - Propo	sed MV	NTS, G	âl	Ca	alifo	rnia B	earin	ng			ole ID	
Proje	ct No.	TA8234							itio Te					P126 le Depth	
Éngir		Aecom												.50m e Number	,
							2010				. = .		-	1	
Empl	loyer	The Coal Autho	rity				BS13		t 4: 1990 pactive e		2.5kg		Samı	ple Type B	
Desci	ription	Brown sandy gra	velly CLAY										0.	nen Depth .50m	
													Specime	en Numbe 1	er
	0.50				_										
		Top dat				ase data 0 base			2.5 to Top co	-	n		5.0 topBase or	orrection	
	0.45 -	- 2.3 bas	C		J J.	o base			— тор с	Sirection	11		— base c	orrection	
	0.40														
	0.35														×
	0.30 -														
Z	0.25 -									د					
plied	*-							. – – –							
Force applied kN	0.20														
For	0.15														
	*		<i>. f</i> -												
	0.10 -														
	0.05 -														
	0.00	0.5 1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0			6.5	7.0	7.5
	0.0	0.5 1.0	1.5	2.0	2.5	3.0	3.5 Penetrati			5.0	5.5	6.0	0.5	7.0	7.5
		CBR value	es %				As recei	ved mo	oisture co	ntent			26	%	
Penet		Top	Base	•	oted CI	BR	Moistu	e conte	ent - top				25	%	
2.50 n 5.00 n		0.88 1.1	1.3 1.7	ļ	N/A		Moistu	e conte	ent - base				24	%	
	correction						Bulk de	nsity					2.00	Mg/m³	
							Dry den						1.60	Mg/m³	
	ng load - top ng load - ba			10 10	N N		Method	of com	npaction			2.5kg	rammer		
Surch				5.2	k										
Grave	l retained o	on 20mm sieve		11	%	b									
	I retained o	on 37.5mm sieve Unsoaked, Surchar	ge 5.182ka	4.1	%)									
		, , <u>.</u> , <u></u>	J												
Appro	oved by:														-
	Harper							Print	date 07	7/11/2019			SOIL 6	engineer	RING
			Revision N	o. 2	2.03		Issue Da		20/11/201			- 	Part of the	Bachy Soletano	he Group

Engineer Aecom Employer The Coal Authority BS1377: Part 4: 1	Test 1990: 7.2.4 4.5kg tive effort	Samp 0. Sample	P127 le Depth 50m P Number		
Employer The Coal Authority BS1377: Part 4: 1 compact	-	Sample	Number		
Employer The Coal Authority BS1377: Part 4: 1 compact	-	Samr	4		
compact	-	Sample Type B Specimen Depth			
Description Brown slightly sandy gravelly CLAY with medium cobble cntent.					
			ien Depth 50m		
		Specime	en Number 2		
0.12 ¬					
——— Top data ——— Base data — ——— – 2	2.5 top	– → – 5.0 top			
• 2.5 base• 5.0 base ——— T	op correction	——— Base co	orrection		
0.10 -			×		
0.10					
0.08 -					
*					
3 0.06 -					
R					
V. O.00 - O.04 - O.004					
0.04 -					
0.02					
0.02					
0.00					
0.0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5	5 5.0 5.5	6.0 6.5	7.0 7.5		
Penetration mm					
CBR values % As received moisture		26	%		
Penetration Top Base Accepted CBR Moisture content - 2.50 mm 0.38 0.33 0.38	top	26	%		
5.00 mm 0.39 0.36 Moisture content -	base	26	%		
Curve correction Bulk density Dry density		1.96 1.56	Mg/m³ Mg/m³		
	·		y, !!!		
Seating load - top 10 N Method of compact	tion	4.5kg rammer			
Seating load - base 10 N					
Seating load - base 10 N Surcharge 5.2 kg					
Seating load - base 10 N Surcharge 5.2 kg Gravel retained on 20mm sieve 40.8 %					
Seating load - base 10 N Surcharge 5.2 kg Gravel retained on 20mm sieve 40.8 % Gravel retained on 37.5mm sieve 33.1 %	ravel content.				
Seating load - base 10 N Surcharge 5.2 kg Gravel retained on 20mm sieve 40.8 % Gravel retained on 37.5mm sieve 33.1 % General remarks Unsoaked, Surcharge 5.188kg. Test performed on specimen unsuitable due to gr	ravel content.		40.		
Seating load - base 10 N Surcharge 5.2 kg Gravel retained on 20mm sieve 40.8 % Gravel retained on 37.5mm sieve 33.1 %	ravel content.		(

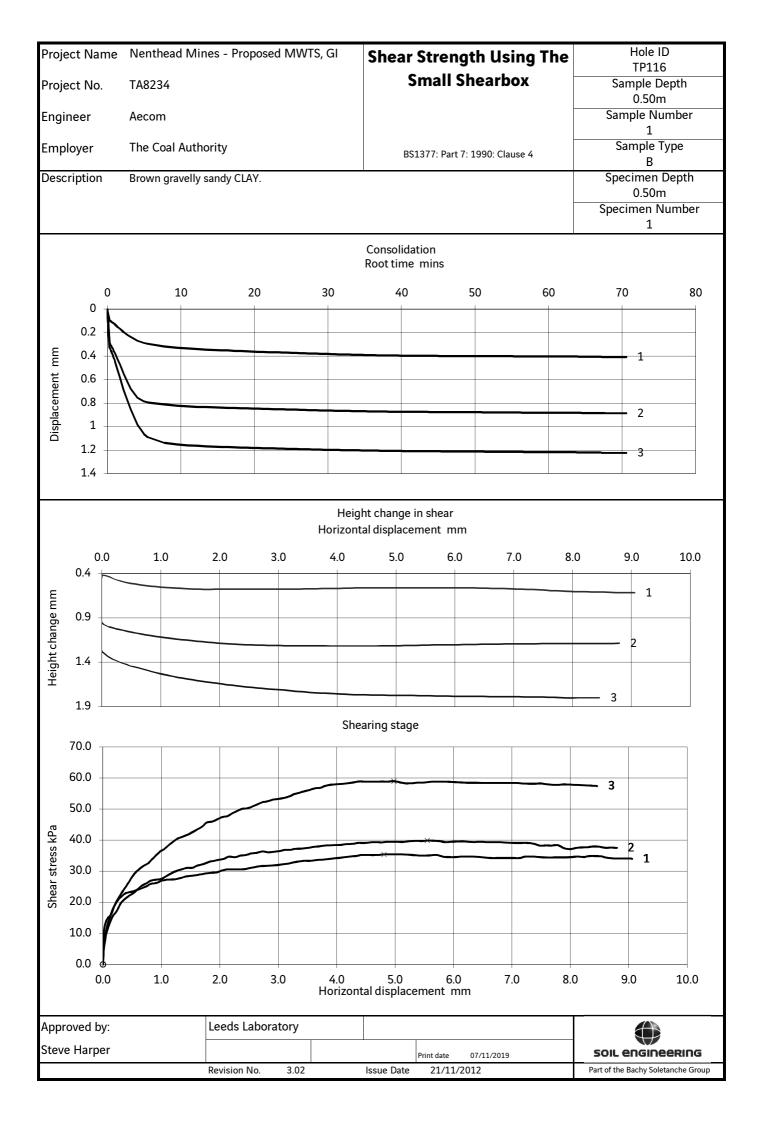
Project Name	Nenthead Mine	es - Proposed	1 1010015, 0	וג	Califor	nia Be	earing)			le ID 128	
Project No.	TA8234				Ra	tio Te	st			Sampl	e Depth	
Engineer	Aecom								Si		50m : Number	r
_					D04077 B .		70 (0 5				1	
Employer	The Coal Author				BS1377: Part comp	t 4: 1990: pactive ef		kg			le Type B	
Description	Brown gravelly sli	ightly sandy C	LAY.						SI		en Depth 50m	1
									Sp	ecime	n Numbe	er
0.25											2	
0.25	——— Top data	a	— В	ase data		- 2.5 top		-	- - -× 5	5.0 top		
	• 2.5 base	e	5.	.0 base		— Тор со	rrection	-	—— В	Base co	rrection	
0.20 -												<u>/</u>
										-		مر
0.15							/				سممره	
×									2			
z					_		_	Name of the last				
A					/	سر						
ild 0.10 -												
Force applied kN			/									
Force appli		 /	/									
- 0.10 - Eorce appli												
* - •	 											
* - •												
0.05												
* - •	0.5 1.0	1.5 2.0	2.5	3.0	3.5 4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5
0.05	0.5 1.0	1.5 2.0	2.5		3.5 4.0 enetration mm	4.5	5.0	5.5	6.0	6.5	7.0	7.5
0.00	CBR value	s %		Pe	enetration mm As received moi	isture con		5.5	31	-	%	7.5
0.05 - 0.00 0.0 Penetration	CBR values	s % Base A	Accepted C	Pe	enetration mm	isture con		5.5		-		7.5
0.05 - 0.00 0.0 0.0 Penetration 2.50 mm	CBR value	s %		Pe BR	enetration mm As received moi	sture cont nt - top		5.5	31	- }	%	7.5
0.00	CBR value: Top 0.59	s % Base # 0.45	Accepted C	Pe	As received moi Moisture conte	sture cont nt - top		5.5	31 33 31 1.84		% % % Mg/m³	7.5
0.00	CBR value Top 0.59 0.72	s % Base A 0.45 0.57	Accepted C N/A	Pe BR	As received moi Moisture conte Moisture conte Bulk density Dry density	isture conf nt - top nt - base			31 33 31 1.84	3 4 0	% %	7.5
0.00 0.0 Penetration 2.50 mm 5.00 mm Curve correction Seating load - top	CBR value: Top 0.59 0.72	s % Base # 0.45 0.57	Accepted C N/A	BR I	As received moi Moisture conte	isture conf nt - top nt - base			31 33 31 1.84	3 4 0	% % % Mg/m³	7.5
0.05 - 0.00 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	CBR value: Top 0.59 0.72	s % Base A 0.45 0.57	Accepted C N/A	BR A	As received moi Moisture conte Moisture conte Bulk density Dry density	isture conf nt - top nt - base			31 33 31 1.84	3 4 0	% % % Mg/m³	7.5
0.05 - 0.00 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	CBR value: Top 0.59 0.72 p se	s % Base 4 0.45 0.57	Accepted C N/A 10 N 10 N 10 K 12 k 3.8 %	BR A A A A A A A A A A A A A A A A A A A	As received moi Moisture conte Moisture conte Bulk density Dry density	isture conf nt - top nt - base			31 33 31 1.84	3 4 0	% % % Mg/m³	7.5
0.05 O.00	CBR value: Top 0.59 0.72 p se n 20mm sieve n 37.5mm sieve	s % Base A 0.45 0.57	Accepted C N/A 10 N 10 N 10 N 1.2 k 3.8 %	BR J J G G 6 6	As received moi Moisture contel Moisture contel Bulk density Dry density Method of com	isture cont nt - top nt - base paction	tent		31 33 31 1.84	3 4 0	% % % Mg/m³	7.5
0.05 O.00	CBR value: Top 0.59 0.72 p se	s % Base A 0.45 0.57	Accepted C N/A 10 N 10 N 10 N 1.2 k 3.8 %	BR J J G G 6 6	As received moi Moisture contel Moisture contel Bulk density Dry density Method of com	isture cont nt - top nt - base paction	tent		31 33 31 1.84	3 4 0	% % % Mg/m³	7.5
0.00 0.00 Penetration 2.50 mm 5.00 mm Curve correction Seating load - top Seating load - bas Surcharge Gravel retained o Gravel retained o Gravel retained o General remarks	CBR value: Top 0.59 0.72 p se n 20mm sieve n 37.5mm sieve	s % Base A 0.45 0.57	Accepted C N/A 10 N 10 N 10 N 1.2 k 3.8 %	BR J J G G 6 6	As received moi Moisture contel Moisture contel Bulk density Dry density Method of com	isture cont nt - top nt - base paction	tent		31 33 31 1.84	3 4 0	% % % Mg/m³	7.5
0.05 - 0.00 0.0 Penetration 2.50 mm	CBR value: Top 0.59 0.72 p se n 20mm sieve n 37.5mm sieve	s % Base A 0.45 0.57	Accepted C N/A 10 N 10 N 10 N 1.2 k 3.8 %	BR J J G G 6 6	As received moi Moisture contel Moisture contel Bulk density Dry density Method of com	isture cont nt - top nt - base paction	tent		31 33 31 1.84 1.40 2.5kg ram	4 0	% % % Mg/m³	

Project Name	Nenthead Mine	es - Propose	a ivivvi5,	GI	Califo	rnia Be	arıng			ole ID STP105	
Project No.	TA8234				R	atio Tes	it		Samp	ole Depth	
Engineer	Aecom									.20m e Numbe	r
_					DC1277. D.	+ /· 1000· ⁻	72//51			3	
Employer	The Coal Author	rity				art 4: 1990: 7 npactive eff			Sam	ple Type B	
Description	Brown clayey grav	velly SAND.								nen Deptl .20m	h
								S		en Numb	er
										1	
0.60	——— Top data	a	—	Base data	>	← – 2.5 top			5.0 top)	
	• 2.5 base	e		5.0 base		—— Top cor	rection		Base c	orrection	
0.50 -								,			
									•		
0.40					/		/				
0.40											
^							₹ !				
_ 0.30 -							į				
N P											
<u>:=</u>							1				
dde			/				i				
orce app											
Force applied kN											
O.20 -											
0.10 -											
*											
*											
0.10		15 2			25 (0	,			6.5	7.0	7.5
0.10 -	0.5 1.0	1.5 2.0	0 2.5	3.0 F	3.5 4.0 Penetration mr		* - 5.5	6.0	6.5	7.0	7.5
0.10			0 2.5		Penetration mr	m					7.5
0.10	CBR values Top	s % Base	0 2.5	F		n oisture cont		1	6.5	7.0	7.5
0.10 - 0.00 0.0 Penetration 2.50 mm	CBR values Top 1.3	s %		F	As received m	n oisture cont tent - top		1 1	.1 .2	% %	7.5
0.10	CBR values Top	s % Base	Accepted	F	Penetration mr	n oisture cont tent - top		1 1 1	l 1	%	7.5
0.10 - 0.00 - 0.0 Penetration 2.50 mm	CBR values Top 1.3	s % Base	Accepted	F	As received m Moisture conf	n oisture cont tent - top		1 1 1 2.	.1 .1 .2	% %	7.5
0.10 - 0.00 Penetration 2.50 mm 5.00 mm Curve correction Seating load - to	CBR values Top 1.3 1.8	s % Base 2.2	Accepted N/A	CBR	As received m Moisture conf Moisture conf Bulk density	noisture cont tent - top tent - base		1 1 1 2.	11 12 11 29 06	% % % Mg/m³	7.5
0.10 - 0.00 Penetration 2.50 mm 5.00 mm Curve correction Seating load - to Seating load - b	CBR values Top 1.3 1.8	s % Base 2.2	Accepted N/A 10	CBR N N	As received m Moisture conf Moisture conf Bulk density Dry density Method of co	noisture contitent - top tent - base mpaction		1 1 2. 2.	11 12 11 29 06	% % Mg/m³ Mg/m³	7.5
0.10 - 0.00 Penetration 2.50 mm 5.00 mm Curve correction Seating load - to	CBR values Top 1.3 1.8	s % Base 2.2	Accepted N/A 10 10 5.4	CBR	As received m Moisture cont Moisture cont Bulk density Dry density	noisture conti tent - top tent - base mpaction		1 1 2. 2.	11 12 11 29 06	% % % Mg/m³	7.5
0.10 - 0.00 - 0.00 Penetration 2.50 mm 5.00 mm Curve correction Seating load - to Seating load - b Surcharge Gravel retained	CBR values Top 1.3 1.8 Op asse on 20mm sieve on 37.5mm sieve	s % Base 2.2	Accepted N/A 10 10 5.4 27.3	CBR N N kg %	As received m Moisture conf Bulk density Dry density Method of co Curing period Soaking perio Amount of sw	noisture contitent - top tent - base mpaction d	ent	1 1 2. 2.	11 12 11 29 06	% % Mg/m³ Mg/m³	7.5
0.10 - 0.00 Penetration 2.50 mm 5.00 mm Curve correction Geating load - to Geating load - b Gravel retained Gravel retained	CBR values Top 1.3 1.8 op ase on 20mm sieve	s % Base 2.2	Accepted N/A 10 10 5.4 27.3	CBR N N kg %	As received m Moisture conf Bulk density Dry density Method of co Curing period Soaking perio Amount of sw	noisture contitent - top tent - base mpaction d	ent	1 1 2. 2.	11 12 11 29 06	% % Mg/m³ Mg/m³ 4 Days	7.5
0.10 - 0.00 Penetration 2.50 mm 5.00 mm Curve correction Seating load - to Seating load - b Surcharge Gravel retained Gravel retained General remarks	CBR values Top 1.3 1.8 Op asse on 20mm sieve on 37.5mm sieve	s % Base 2.2	Accepted N/A 10 10 5.4 27.3	CBR N N kg %	As received m Moisture conf Bulk density Dry density Method of co Curing period Soaking perio Amount of sw	noisture contitent - top tent - base mpaction d	ent	1 1 2. 2.	11 12 11 29 06	% % Mg/m³ Mg/m³ 4 Days	7.5
0.10 - 0.00 - 0.00 Penetration 2.50 mm 5.00 mm Curve correction Seating load - to Seating load - b Surcharge Gravel retained	CBR values Top 1.3 1.8 Op asse on 20mm sieve on 37.5mm sieve	s % Base 2.2	Accepted N/A 10 10 5.4 27.3	CBR N N kg %	As received m Moisture conf Bulk density Dry density Method of co Curing period Soaking perio Amount of sw unsuitable due to	noisture contitent - top tent - base mpaction d rell to gravel conte	ent	1 1 2. 2. 4.5kg ra	.11 .29 .06 mmer	% % Mg/m³ Mg/m³ 4 Days	

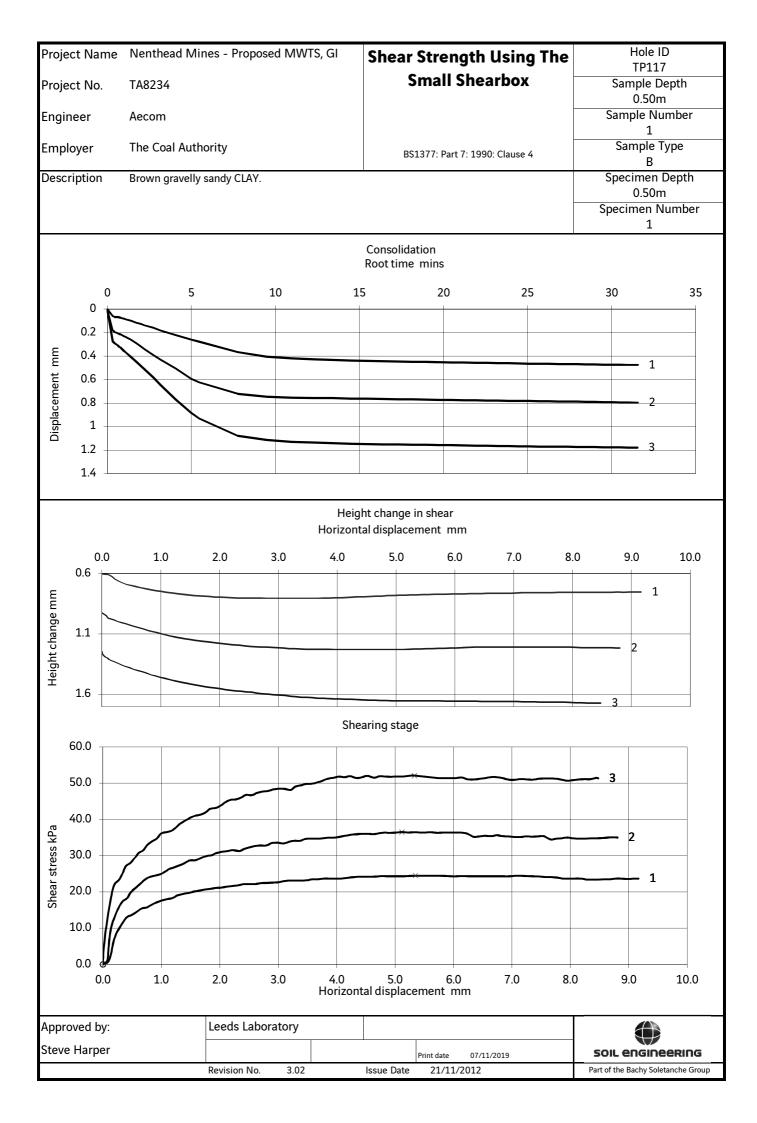
I ,,	ct Name	Nenthead Min	es - Prop	osed M	WTS, G	âl	Califo	rnia B	earing		,	Hole ID WSTP107	
Proje	ect No.	TA8234					R	atio Te	est			mple Deptl	h
Engii	neer	Aecom									San	0.20m nple Numb	er
							201022 2		70 (05)			3	
Empl	loyer	The Coal Author	ority				BS1377: Pa	irt 4: 1990 npactive e		g	Sa	ample Type B	!
Desc	ription	Brown clayey gr	avelly SAN	ID.				•			Spe	cimen Dep 0.20m	th
											Spec	imen Num	ber
	1 00											1	
	1.80	—×— Top da	nta	_	•— Ва	ase data	>	← – 2.5 to _l	р	_	- ≫ - 5.0	top	
	1.60	• 2.5 ba	se		 5.	0 base		— Тор со	orrection	_	—— Bas	se correction	1
	1.00												
	1.40 -												
											/		
	1.20 -									/			
	1.00												
Ŝ													
lied k	0.80 -												
Force applied kN													
orc	0.60												
	-						/	·	-				
<u> </u>	0.40			 		کر			-*				
ш						. /.			-*				
T.	0.40								-* 				
т.	0.20 -					- f			-* *				
T.		0.5 1.0	1.5	2.0	2.5	3.0	3.5 4.0	4.5	5.0 5	5.5	6.0 6	5.5 7.0	7.5
т.	0.20	0.5 1.0	1.5	2.0	2.5	3.0	3.5 4.0 Penetration mr		5.0 5	5.5	6.0 6	5.5 7.0	7.5
	0.20	CBR valu	es %				Penetration mr	n oisture cor		5.5	13	%	7.5
Penet 2.50 r	0.20	CBR valu Top 1.1			2.5		Penetration mr	n oisture cor		5.5			7.5
Penet 2.50 r 5.00 r	0.20	CBR valu Top	es % Base		epted CI		As received m Moisture cont	n oisture cor ent - top	ntent	5.5	13 13 13	% %	
Penet 2.50 r 5.00 r	0.20	CBR valu Top 1.1	es % Base 3		epted CI		As received m Moisture cont	n oisture cor ent - top	ntent	5.5	13 13	% %	3
Penet 2.50 r 5.00 r Curve	0.20	CBR valu Top 1.1 2.4	es % Base 3		epted CI	BR	As received m Moisture cont Moisture cont Bulk density	oisture cor eent - top eent - base	ntent		13 13 13 2.29	% % % Mg/m Mg/m	3
Penet 2.50 r 5.00 r Curve Seatir Seatir	0.20	CBR valu Top 1.1 2.4	es % Base 3	10 10	epted CI N/A N N	BR	As received m Moisture cont Moisture cont Bulk density Dry density	oisture cor eent - top eent - base	ntent		13 13 13 2.29 2.02	% % % Mg/m Mg/m	3
Penet 2.50 r 5.00 r Curve Seatir Seatir Surch	0.20	CBR valu Top 1.1 2.4	es % Base 3	Acce	epted CI N/A N	BR I I	As received m Moisture cont Moisture cont Bulk density Dry density	oisture cor eent - top eent - base	ntent		13 13 13 2.29 2.02	% % % Mg/m Mg/m	3
Penet 2.50 r 5.00 r Curve Seatir Seatir Surch Grave	0.20 0.00 cration mm mm correction ng load - tol ng load - ba arge el retained o	CBR valu Top 1.1 2.4	es % Base 3	10 10 5.2	epted CI N/A N N k	BR	As received m Moisture cont Moisture cont Bulk density Dry density	oisture cor eent - top eent - base	ntent		13 13 13 2.29 2.02	% % % Mg/m Mg/m	3
Penet 2.50 r 5.00 r Curve Seatir Seatir Surch Grave	0.20 0.00 cration mm mm correction ng load - tol ng load - ba arge el retained o	CBR valu Top 1.1 2.4 p p sse	es % Base 3 4.8	10 10 5.2 9.5 0	Ppted CI N/A N N N k W	BR	As received m Moisture cont Moisture cont Bulk density Dry density	oisture cor eent - top eent - base	ntent		13 13 13 2.29 2.02	% % % Mg/m Mg/m	3
Penet 2.50 r 5.00 r Curve Seatir Seatir Surch Grave Grave Genera	0.20	CBR valu Top 1.1 2.4 p se on 20mm sieve on 37.5mm sieve	es % Base 3 4.8	10 10 5.2 9.5 0	Ppted CI N/A N N N k W	BR	As received m Moisture cont Moisture cont Bulk density Dry density	oisture cor eent - top eent - base	ntent		13 13 13 2.29 2.02	% % % Mg/m Mg/m	3
Penet 2.50 r 5.00 r Curve Seatir Seatir Surch Grave Grave Genera	0.20 - 0.00 0.0 cration mm mm correction ng load - tol ng load - ba arge el retained o	CBR valu Top 1.1 2.4 p se on 20mm sieve on 37.5mm sieve	es % Base 3 4.8	10 10 5.2 9.5 0	Ppted CI N/A N N N k W	BR	As received m Moisture cont Bulk density Dry density Method of con	oisture cor ent - top ent - base mpaction	ntent		13 13 2.29 2.02 5kg ramm	% % % Mg/m Mg/m	3 3



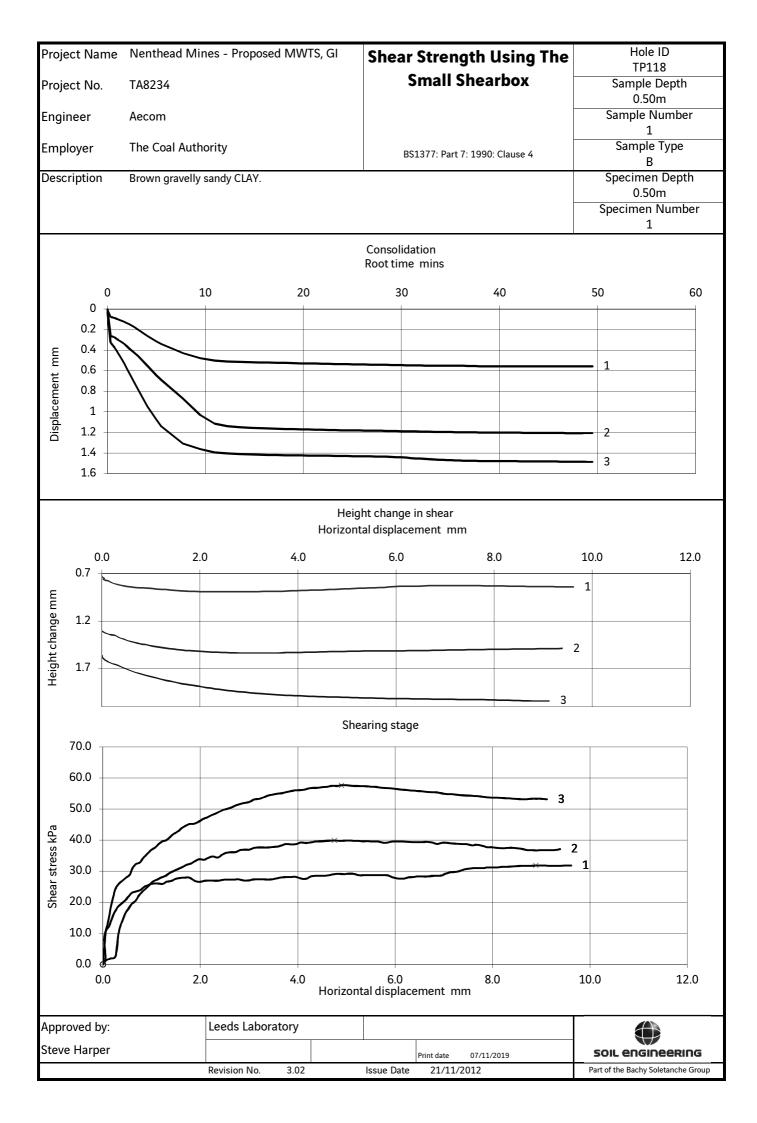
Project Name Nenthea	ad Mines - Proposed	MWTS, GI	Shear Stren	gth Using The	Hole ID
Project No. TA8234			Small 9	Shearbox	BH106 Sample Depth
·					2.50m
Engineer Aecom					Sample Number 10
Employer The Coa	l Authority		RS1377: Dart	7: 1990: Clause 4	Sample Type
			B31377. Fait	7. 1330. Clause 4	B Considerate Double
Description Brown gr	ravelly sandy CLAY.				Specimen Depth 2.50m
					Specimen Number
					2
			Coulom	b envelope	
Peak		150.0			
_					
c' 9 φ' 30 1/2	kPa 。				
φ 30 1/2					
		<u>s</u> 100.0			
		Shear stress			
		Shea		х	
		50.0			
		0.0			
		0.0	50.0	100.0	150.0
			Norn	nal stress kPa	
			× Peak shear strength	O Residual shear strength	
Test run number			1	2	3
Normal stress		kPa	25.8	50.0	75.9
Particle density Trimmings moisture conter	Assumed	Mg/m3 %	2.65 18.4	2.65 18.4	2.65 18.4
Moisture content of specim		%	19	19	19
Moisture content of specim		%	18	17	17
Specimen dimensions Side 1		mm	59.98	60.04	60.02
Side 1 Side 2		mm mm	59.96	60.02	59.98
Height		mm	22.28	21.80	22.08
Bulk density		Mg/m3	2.13	2.17	2.15
Dry density		Mg/m3	1.79	1.83	1.81
Saturation		%	106.8	111.1	107.4
Initial voids ratio	•		0.48	0.45	0.47
Voids ratio after consolidati Voids ratio after shear	ion		0.46 0.46	0.42 0.41	0.42 0.41
voids ratio aπer snear Rate of displacement		mm/min	0.46	0.41 0.024	0.41
Displacement at peak		mm	3.8	2.8	3.5
Shear strength at peak		kPa	25.3	36.2	54.6
a. oa ongan at pour		ĸгa			
Displacement at residual		mm			
Displacement at residual Shear strength at residual		mm kPa	8 €	9 2	7 9
Displacement at residual Shear strength at residual Final displacement		mm	8.6	8.2	7.9
Displacement at residual Shear strength at residual Final displacement Method of reversal	n tested submarged	mm kPa	8.6	8.2 Peak only	7.9
Displacement at residual Shear strength at residual Final displacement Method of reversal Remarks Specimei	n tested submerged. Ito shearbox.	mm kPa	8.6		7.9
Displacement at residual Shear strength at residual Final displacement Method of reversal Remarks Specimei		mm kPa	8.6		7.9
Displacement at residual Shear strength at residual Final displacement Method of reversal		mm kPa mm	8.6		7.9
Displacement at residual Shear strength at residual Final displacement Method of reversal Remarks Specimel Specimen lightly tamped in	to shearbox.	mm kPa mm	8.6		7.9



Project Name	Nenthead Mir	nes - Proposed	MWTS, GI	Shear Stre	ngth Using	The	Hole ID TP116
Project No.	TA8234			Smal	l Shearbox		Sample Depth
Engineer	Aecom						0.50m Sample Number
Employer	The Coal Auth	ority		BS1377: P	art 7: 1990: Clause 4		1 Sample Type
Description	Brown gravelly	sandy CLAY.					B Specimen Depth
							0.50m Specimen Number
				Could	omb envelope		1
			150.0 —	oou.	от от от от от от от от от от		
Peak	(150.0				
c'	21 kPa						
φ'	25 1/2 °		100.0				
			호 100.0				
			Shear stress				
			Shear		ar-r-×		
			50.0	×			
			0.0 0.0	50.0	100.	0	150.0
				No	ormal stress kPa		
				× Peak shear strength	O Residual	shear strength	
Test run number Normal stress			kPa	1 25.		2 50.1	3 76.0
Particle density		Assumed	Mg/m3	2.6		2.65	2.65
Trimmings moist			%	33		33.2	33
Moisture content Moisture content			% %	35 31		34 30	34 28
Specimen dimens		ei lest	70	21	L	30	20
Side 1	510113		mm	59.9	98	59.94	59.96
Side 2			mm	59.9		59.98	60.02
Height			mm	24.1		24.36	24.22
Bulk density			Mg/m3	1.9		1.89	1.90
Dry density			Mg/m3	1.4		1.41	1.41
Saturation			%	105		102.4	103.6
Initial voids ratio				0.8		0.88	0.88
Voids ratio after o Voids ratio after s				0.8 0.8		0.81 0.79	0.78 0.74
Rate of displacen			mm/min	0.02		0.79	0.74
			mm	4.8		5.6	5.0
Displacement at i			kPa	35.		39.9	59.0
	peak		11.1 G				
Shear strength at Displacement at i	residual		mm				
Shear strength at Displacement at I Shear strength at	residual residual		mm kPa		_		
Shear strength at Displacement at I Shear strength at	residual residual		mm	9.3	1	8.8	8.5
Shear strength at Displacement at I Shear strength at Final displacemen Method of revers	residual residual nt al	ed submerced	mm kPa	9.:	1 Peak		8.5
Shear strength at or Displacement at or Shear strength at Final displacement Method of reversor Remarks	residual residual nt al Specimen teste		mm kPa	9.:			8.5
Shear strength at Displacement at I Shear strength at Final displacemen Method of revers Remarks Specimen lightly	residual residual nt al Specimen teste		mm kPa mm	9.:			8.5
Displacement at a Shear strength at Displacement at a Shear strength at Shear strength at Final displacement Method of revers Remarks Specimen lightly Approved by: Steve Harper	residual residual nt al Specimen teste	arbox.	mm kPa mm	9.1	Peak		8.5



Project Name	Nenthead	Mines - Propose	d MWTS, GI	Shear Streng	th Using The	Hole ID TP117
Project No.	TA8234			Small S	hearbox	Sample Depth
Engineer	Aecom					0.50m Sample Number 1
Employer	The Coal A	uthority		BS1377: Part 7:	: 1990: Clause 4	Sample Type B
Description	Brown grave	elly sandy CLAY.				Specimen Depth 0.50m
						Specimen Number 1
				Coulomb	envelope	
Peak			150.0			
c'	10 k	кРа				
φ'	29 °					
			_ 100.0			
			KP ₃			
			Shear stress			
			ar st			
			50.0 -		×	
			33.3	·		
				**		
			0.0			
			0.0	50.0	100.0	150.0
				Norma	l stress kPa	
				× Peak shear strength	O Residual shear strength	
est run number				1	2	3
lormal stress			kPa	25.8	50.1	76.0
article density		Assumed	Mg/m3	2.65	2.65	2.65
rimmings moistu Ioisture content		n hefore test	% %	27.2 29	27.2 29	27.2 28
Noisture content			%	27	25	24
pecimen dimens						
ide 1			mm	59.98	59.94	59.96
ide 2 eight			mm mm	59.98 23.76	59.98 23.64	60.02 23.70
ulk density			Mg/m3	1.94	1.95	1.95
ry density			Mg/m3	1.50	1.52	1.52
aturation			%	100.7	101.7	99.1
nitial voids ratio				0.77	0.75	0.74
oids ratio after c		l		0.73	0.69	0.65 0.62
oids ratio after s ate of displacem			mm/min	0.71 0.024	0.66 0.024	0.62 0.024
isplacement at p			mm	5.4	5.1	5.3
hear strength at	peak		kPa	24.5	36.5	52.1
isplacement at r			mm			
hear strength at inal displacemer			kPa mm	9.2	8.8	8.5
mai aispiaceillei			111111	J.2	0.0	0.3
Method of reversa					Peak only	
emarks pecimen lightly t		ested submerged. shearbox.				
		l d- l -b			T	
Approved by:		Leeds Labora	atory		I	
Approved by: Steve Harper		Leeds Labora	atory	Print date	07/11/2019	soil engineering



Project Name	Nenthead Mines - Pro	pposed MWTS, GI	Shear Strength	Using The	Hole ID
Project No.	TA8234		Small Shea	arbox	TP118 Sample Depth
·					0.50m
Engineer	Aecom				Sample Number 1
Employer	The Coal Authority		DC1277, D+ 7, 100	0. 61	Sample Type
	•		BS1377: Part 7: 199	0: Clause 4	В
Description	Brown gravelly sandy CL	AY.			Specimen Depth 0.50m
					Specimen Number
					1
			Coulomb enve	lope	
5 1		150.0 —			
Peal	<				
c'	17 kPa				
φ'	27 1/2 °				
		g 100.0			
		KPa			
		tress			
		Shear stress			
		භ _{50.0} ↓	×		
			2		
			X		
		0.0			
		0.0	50.0	100.0	150.0
			Normal stre	ess kPa	
			× Peak shear strength	O Residual shear strength	1
est run number			1	2	3
Normal stress Particle density	Assume	kPa d Mg/m3	25.8 2.65	50.0 2.65	75.9 2.65
rimmings moist		4 Ng/1113 %	28.9	29.1	30.2
Noisture content	t of specimen before test	%	30	31	31
	t of specimen after test	%	27	26	25
ipecimen dimen: iide 1	sions	mm	59.98	60.02	60.02
ide 1		mm	59.98	60.04	59.98
leight		mm	23.76	23.52	23.28
Bulk density		Mg/m3	1.94	1.96	1.98
Ory density		Mg/m3	1.50	1.49	1.51
aturation		%	102.3	105.9	108.5
nitial voids ratio 'oids ratio after o			0.77	0.77	0.75
oids ratio after o			0.73 0.71	0.68 0.66	0.64 0.60
roids ratio after s Rate of displacen		mm/min	0.71	0.024	0.60
Displacement at		mm	8.9	4.8	4.9
hear strength at		kPa	31.9	39.9	57.7
Displacement at		mm			
hear strength at	residual	kPa			
inal displaceme	nt	mm	9.6	9.4	9.1
/lethod of revers				Peak only	
Remarks	Specimen tested subme tamped into shearbox.	rged.			
рресппен пдппу	таптрец ппо ѕпеагрох.				
Approved by:	Leeds I	aboratory			
Steve Harper		,			
	Pavision	No. 3.02	Print date 07/11	1/2019	Part of the Rachy Soletanche Group

Revision No.

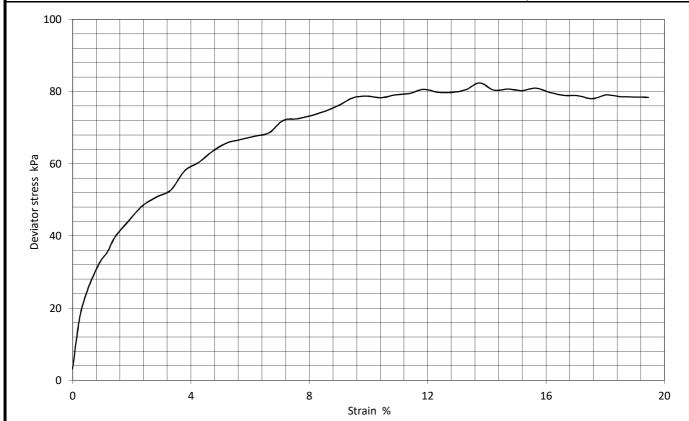
3.02

Issue Date

21/11/2012

Part of the Bachy Soletanche Group

Project Name	Nenthead Mines - Proposed MWTS, GI	Undrained Triaxial	Hole ID BH103
Project No.	TA8234	Compression Without Measurement Of Pore	Sample Depth 1.50m
Engineer	Aecom	Pressure (Multistage Method)	Sample Number 5
Employer	The Coal Authority	BS1377: Part 7: 1990: 9	Sample Type U
Description	Dark brown very sandy very gravelly CLAY.		Specimen Depth 1.54m
			Specimen Number 1



Shear strength parameters	c 14 kPa	φ 11.9 °	Apparent c	33 kPa
Test type		UNDISTURBED	Multi stage	
Test number		1	2	3
Cell pressure	kPa	30	60	90
Deviator stress	kPa	50.80	67.67	82.41
Corrected deviator stress	kPa	50	67	81
Membrane correction	kPa	0.31	0.61	1.13
Membrane thickness	mm	0.392		
Moisture content	%	15		
Bulk density	Mg/m3	2.14		
Dry density	Mg/m3	1.86		
Diameter	mm	99.97		
Length	mm	210.73		
Failure strain	%	2.8	6.2	13.8
Cu	kPa	25	34	41
Rate of strain	%/min	0.47		
Mode of failure			Compound	•

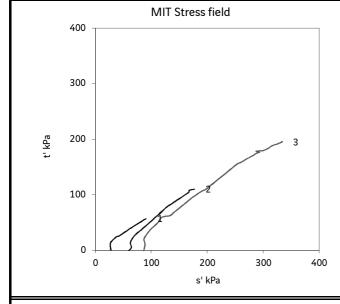
High density rubber latex membrane used. Specimen cut with longest axis in a vertical orientation. Remarks

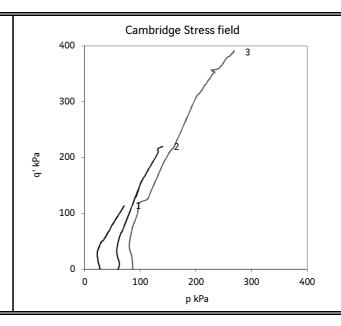
Approved by:						
Steve Harper			Print	t date (07/11/2019	SOIL ENGINEERING
	Revision No. 2.05	I	ssue Date 2	22/08/203	18	Part of the Bachy Soletanche Group

Project Name	Nenthead Mines - Treatment Scheme	Proposed Mine Water		d Undrained	Hole ID BH105		
Project No.	TA8234			ompression ore Water	Sample Depth 1.50m		
Engineer	Aecom			re water leasurement	Sample Number		
Employer	The Coal Authority			ed on K H Head: Manual	05 Sample Type		
Description		sandy CLAY with rare cobb	of Soils Te	U Specimen Depth			
Description	Dark brown graveny	salidy CLAT Willi Tale CODD	ies.		1.55m Specimen Number		
SDECIMEN INIT	TAL DIMENSIONS				2		
Test number	I/LE DIVIENSIONS		1	2	3		
Specimen diam	eter	mm	105.32	107.37	108.50		
Specimen lengt		mm	172.27	162.93	158.01		
Density		Mg/m ³	2.16	2.18	2.19		
Moisture conte	nt	ivig/m %	19	18	17		
	IIL		1.81	1.85	1.87		
Ory density SATURATION S	TAGE	Mg/m ³	1.01	1.85	1.87		
		I.D.	1.2		Ī		
Initial pore water	•	kPa					
•	water pressure	kPa	49.9				
Final cell pressu	ıre	kPa	50				
3 value	NI OTA CE		0.974				
CONSOLIDATIO	N STAGE	1					
Cell pressure		kPa	330	360	390		
Back pressure		kPa	300	300	300		
ffective cell pr		kPa	30	60	90		
nitial pore wate		kPa	328.2	349.6	365		
Final pore wate		kPa	300.3	299.5	302.7		
Pore pressure d	issipation	%	98.9	101.0	95.8		
c _{vi}		m²/year	55.89	172.12	372.98		
m _{vi}		m²/MN	0.61	0.25	0.13		
	ER CONSOLIDATION			<u> </u>			
Density		Mg/m³	2.18	2.19	2.20		
Moisture conte	nt	%	18	17	17		
Ory density		Mg/m ³	1.85	1.87	1.88		
1.2	Saturatio	on	0.0	Consolida	tion		
1.0			5.0				
0.8			를 10.0				
					3		
4.			l gg l				
9.0 Jane			change				
B value			— l de change				
9 0.6 ———————————————————————————————————			15.0 Normal Park 15.0 N		2		
			No. 20.0		2		
			15.0 – 15.0 – 25		2		
0.4			20.0		2		
0.4			20.0		2		
0.4	10 20 3 Cell Pressi		25.0		0 40 50		
0.4	Cell Pressi	ure kPa	25.0	10 20 3 Root time r	0 40 50		
0.4	Cell Pressi Specimen orientati	ure kPa on Vertical	25.0 25.0 30.0 0		0 40 50		
0.4	Specimen orientati Specimen conditio	ure kPa ion Vertical n for test Undistu	25.0 25.0 30.0 0	Root time r	0 40 50		
0.4	Specimen orientati Specimen conditio Saturation with 50l	ure kPa ion Vertical n for test Undistu kPa increments with a d	25.0 25.0 30.0 0	Root time r	0 40 50		
0.4 0.2 0.0 0	Specimen orientati Specimen conditio Saturation with 50l Drainage from both	ure kPa ion Vertical n for test Undistu kPa increments with a d n ends	25.0 25.0 30.0 0	Root time r	0 40 50		
0.4	Specimen orientati Specimen conditio Saturation with 50l Drainage from both	ure kPa ion Vertical n for test Undistu kPa increments with a d	25.0 25.0 30.0 0	Root time r	0 40 50		
0.4 0.2 0.0 0	Specimen orientati Specimen conditio Saturation with 50l Drainage from both	ure kPa ion Vertical n for test Undistu kPa increments with a d n ends	25.0 25.0 30.0 0	Root time r	0 40 50		

Project Name	Nenthead Mines - Proposed Mi	ne Wate	r Co	onsolidate	d Undrained	Hole ID BH105			
Project No.	Treatment Scheme TA8234		'		mpression re Water	Sample Depth 1.50m			
Engineer	Aecom		Р		easurement	Sample Number 05			
Employer	The Coal Authority			louse Method base	ed on K H Head: Manual	Sample Type			
Description	Dark brown gravelly sandy CLAY	with rar	e cobbl		esting, Vol 3	U Specimen Depth 1.55m Specimen Number			
COMPRESSION	I STAGE					2			
Test number		L.D.		1	2	3			
Cell pressure		kPa		330	360 300	390 303			
Initial pore wat Initial effective		kPa kPa		301 30	299 60	303 90			
Failure condition	•		Anvimuu	m stress ratio	60	90			
Axial strain at f		%	/laximui	1.7	7.6	12.9			
Maximum devi		kPa		49	216	357			
Pore water pre	1 3	kPa		316	300	281			
	principal stress σ_1	kPa		63.11	276.10	465.56			
	r principal stress σ_3 '	kPa		14.10	60.00	109.00			
	pal stress ratio	4		4.48	4.60	4.27			
Membrane cor		kPa		0.33	1.24	1.87			
	rection not applicable	kPa		0.0	0.0	0.0			
Pore pressure of				0.32	0.00	-0.06			
	GTH PARAMETERS	<u> </u>	c'	2	kPa φ'	38.0 °			
335.0 —	ompression - Pore pressure v axial	strain		450.0 — Co	ompression - Deviator	stress v axial strain			
335.0									
330.0 a 325.0 a 320.0 315.0 305.0 300.0 0	5 10	15	20	400.0 350.0 Reg 300.0 State 200.0 150.0 100.0 50.0 0 0	5 1	0 15 20			
	Axial strain %					strain %			
5.0	Compression - Stress ratio v Axial strain			400	Mohr Circ	eles			
4.5 4.0 3.5 3.0 2.5 2.5 2.0			3	Shear stress kPa 000					
1.5 1.0 0.5 0.0 0	5 10 Axial strain %	15	20	100	0 100 200 Effective pres				
Approved by:	Leeds Laboratory					A			
Kevin Walker									
TOVIII VVAIKEI				Print date	08/11/2019	soil engineering			
	Revision No. 2.0	3	Issue	Date 21/11/20	U12	Part of the Bachy Soletanche Group			

Project Name Project No.	Nenthead Mines - Proposed Treatment Scheme TA8234	l Mine Wate	Consolidated Triaxial Cor	Hole ID BH105 Sample Depth				
Engineer Employer	Aecom The Coal Authority		With Porce Pressure Me In-House Method based of Soils Test	asurement on K H Head: Manual	1.50m Sample Number 05 Sample Type			
Description	Dark brown gravelly sandy (CLAY with ra			Specimen Depth 1.55m Specimen Number 2			
SPECIMEN AFT Test number	ER TEST		1					
Mode of failure			Compound					
Final moisture of	content	%	18	17	17			
Final bulk densi	•	Mg/m ³	2.18	2.19	2.20			
Final dry densit		Mg/m³	1.85	1.87	1.88			
	PECIMEN DETAILS		•		•			
Rate of strain		%/hour	0.25	0.25	0.25			
Failure criterior	1		Maximum stress ratio					





REMARKS

Approved by:	Leeds Laboratory					
Kevin Walker			•	Print date	08/11/2019	soil engineering
	Revision No. 2.03	1	Issue Date	21/11/20	12	Part of the Bachy Soletanche Group



SUPPORTING FACTUAL DATA

SECTION B

Laboratory Testing

LABORATORY ROCK TEST SUMMARY SHEETS

Project Name	Nenthead N	Sur	nma	ry O	f Lab	orat	ory										
Project No.	TA8234								ngth								
Engineer	Aecom																
Employer	The Coal Au	ıthority	y														
				-					,	Р	oint loa	ıd				S	0
Hole ID	Sample depth m	Sample no.	Sample type	Specimen depth m	Specimen no.	% Water Content	ह्र बु Bulk Density	Bry Density	Particle density	Туре	ls MN/m²	Is50 MN/m²	SON MN/m²	™ Brazil	% Porosity	සි Elastic Modulus	Posissons Ratio
BH105R	5.00	2	С	5.00	01	0.9	J		Ĵ	_	2.60	3.35					
BH105R	5.00	2	С	5.10	02	1				I	1.98	2.13					
BH105R	5.00	2	С	5.23	03	0.8				I	5.04	4.70					
BH105R	6.00	3	С	6.00	01	10.8				I	0.00	0.00					
BH105R	6.00	3	С	6.40	02	10.7				D+X	0.03	0.04					
BH105R	6.00	3	С	6.70	03	8.9				Α	0.04	0.05					
BH105R	9.00	6	С	9.15	01	4.7				D+L	0.75	0.95					
BH105R	9.00	6	С	9.60	02	1.5				I+P	2.14	2.60					
BH105R	9.00	6	С	10.10	03	2.3				I+L	0.92	0.93					
BH107	9.00	4	С	9.15	01	5.7				I	0.00	0.00					
BH107	9.00	4	С	9.60	02	1.6				I	1.59	1.95					
BH107	9.00	4	С	9.95	03	2.8				I+P	0.19	0.24					
Approved by:			Leeds	Laboratory													
Kevin Walker		Revisio	n No.	2.03		lss	ue Date		Print date	/2012	2/11/2019				engii he Bachy		



SUPPORTING FACTUAL DATA

SECTION B

Laboratory Testing

LABORATORY ROCK TEST DATA SHEETS

Project Name	Nenthead	Mine	es - Pr	oposed M	WTS,	GI Water Content of	Rock					
Project No.	TA8234											
Engineer	Aecom											
Employer	The Coal A	Autho	rity			ISRM: Suggested metho						
Hole ID	Sample depth m	Sample no.	Sample type	Specimen depth m	Specimen no.	determining water cont	Remarks	% Water Content				
BH105R	5.00	02	С	5.00	01	Grey SANDSTONE.		0.9				
BH105R	5.00	02	С	5.10	02	Grey SANDSTONE.		1				
BH105R	5.00	02	С	5.23	03	Grey SANDSTONE.		0.8				
BH105R	6.00	03	С	6.00	01	Thinly laminated dark grey MUDSTONE.		10.8				
BH105R	6.00	03	С	6.40	02	Thinly laminated dark grey MUDSTONE.		10.7				
BH105R	6.00	03	С	6.70	03	Thinly laminated dark grey MUDSTONE.	hinly laminated dark grey MUDSTONE.					
BH105R	9.00	06	С	9.15	01	Interlaminated grey and black SILTSTONE.		4.7				
BH105R	9.00	06	С	9.60	02	Interlaminated grey and black SILTSTONE.		1.5				
BH105R	9.00	06	С	10.10	03	Interlaminated grey and black SILTSTONE.		2.3				
BH107	9.00	04	С	9.15	01	Grey SANDSTONE.		5.7				
BH107	9.00	04	С	9.60	02	Grey SANDSTONE.		1.6				
BH107	9.00	04	С	9.95	03	Thinly laminated grey SILTSTONE.		2.8				
Approved by:			Leed	s Laborato	ry							
Kevin Walker					<u>-</u>	2: 4 44. 22/41/2021	SOII.	engineering				
Teviii vuikei			Revisi	on No.	2.03	Print date 22/11/2019 Issue Date 20/11/2012		e Bachy Soletanche Group				

Project Name	Nenthea	d Mir	nes -	Proposed	MW	TS, GI	Point Load Ir	ndex	Res	ult						
Project No.	TA8234															
Engineer	Aecom															
Client	The Coal	Auth	ority	T		ı	Test method: ISRM Meth		: Sugg	ested	_					
Hole ID	Sample depth m	Sample type	Sample no.	Specimen depth m	Specimen ref.		Description	Туре	W mm	D mm	D' mm	est Res	ult De mm	Is MN/m2	ш	ls(50) MN/m2
BH105R	5.00	С	2	5.00	1	Grey SANDS	STONE.	I	86.6	72.79	69.17	19.85	87.33	2.6	1.29	3.35
BH105R	5.00	С	2	5.10	2	Grey SANDS	STONE.	I	68.75	42.02	39.11	6.78	58.51	1.98	1.07	2.13
BH105R	5.00	С	2	5.23	3	Grey SANDS	STONE.	ı	55.27	29.09	25.9	9.19	42.69	5.04	0.93	4.7
BH105R	6.00	С	3	6.00	1	Thinly lamin	I	63.04	45.86	42.86	0	58.65	0	1.07	0	
BH105R	6.00	С	3	6.40	2		Thinly laminated dark grey MUDSTONE.			84.27	74.52	0.18	79.25	0.03	1.23	0.04
BH105R	6.00	С	3	6.70	3	Thinly lamin MUDSTONE	nated dark grey E.	А	91.19	72.69	64.97	0.28	86.85	0.04	1.28	0.05
BH105R	9.00	С	6	9.15	1	Interlaminat SILTSTONE.	ted grey and black	D+L	86.47	86.04	82.55	5.32	84.28	0.75	1.26	0.95
BH105R	9.00	С	6	9.60	2	Interlaminat SILTSTONE.	ted grey and black	I+P	86.37	62.67	54.33	12.76	77.30	2.14	1.22	2.6
BH105R	9.00	С	6	10.10	3	Interlaminat SILTSTONE.	ted grey and black	I+L	67.97	34.16	30.94	2.46	51.75	0.92	1.02	0.93
BH107	9.00	С	4	9.15	1	Grey SANDS	STONE.	I	53.15	30.13	27.12	0	42.84	0	0.93	0
BH107	9.00	С	4	9.60	2	Grey SANDS	STONE.	I	83.88	64.27	59.1	10.01	79.45	1.59	1.23	1.95
BH107	9.00	С	4	9.95	3	Thinly lamin	I+P	79.78	68.05	62.18	1.21	79.47	0.19	1.23	0.24	
Approved by: Kevin Walker	1	<u> </u>	Revis	ion No.	2.04		Print da	ite 4/11/20	22/11/20	19				L eng		



SUPPORTING FACTUAL DATA

SECTION B

Laboratory Testing

ENVIRONMENTAL AND CHEMICAL RESULTS



Certificate Number 19-19167

03-Oct-19

Client Soil Engineering

Parkside Lane

Leeds

West Yorkshire

LS11 5SX

Our Reference 19-19167

Client Reference TA8234

Order No (not supplied)

Contract Title Nenthead Mines - Proposed MWTS, GI

Description 13 Soil samples, 3 Leachate samples.

Date Received 26-Sep-19

Date Started 26-Sep-19

Date Completed 03-Oct-19

Test Procedures Identified by prefix DETSn (details on request).

Notes Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be

reproduced except in full, without the prior written approval of the laboratory.

Approved By

Adam Fenwick Contracts Manager





1570309

1570310

1570311

Summary of Chemical Analysis Soil Samples

Our Ref 19-19167 Client Ref TA8234

Contract Title Nenthead Mines - Proposed MWTS, GI

		Sa	mple ID	BH103	BH103	TP104	TP109	TP110	TP110
			Depth	0.20	1.00	1.00	1.00	1.00	2.00
			Other ID	1	3	2	2	2	5
			ple Type	ES	ES	ES	ES	ES	ES
		-	ing Date	04/09/19	04/09/19	n/s	n/s	n/s	n/s
		-	ing Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	Method	LOD	Units						
Metals				TI.		1			
Arsenic	DETSC 2301#	0.2	mg/kg	8.8	11	12	11	6.4	12
Barium	DETSC 2301#	1.5	mg/kg	190	280	210	130	120	390
Beryllium	DETSC 2301#	0.2	mg/kg	1.9	1.7	1.8	1.4	1.7	1.8
Boron, Water Soluble	DETSC 2311#	0.2	mg/kg	< 0.2	< 0.2	0.2	< 0.2	< 0.2	< 0.2
Cadmium	DETSC 2301#	0.1	mg/kg	0.4	0.8	1.1	6.2	0.1	0.3
Chromium	DETSC 2301#	0.15	mg/kg	14	12	13	7.3	13	13
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	20	20	27	18	17	20
Lead	DETSC 2301#	0.3	mg/kg	130	220	730	900	64	110
Mercury	DETSC 2325#	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Nickel	DETSC 2301#	1	mg/kg	32	30	19	26	11	32
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	2.8	< 0.5	< 0.5
Vanadium	DETSC 2301#	0.8	mg/kg	18	16	15	13	16	17
Zinc	DETSC 2301#	1	mg/kg	130	270	390	2100	65	90
Inorganics									
рН	DETSC 2008#		рН	6.1	5.3	5.4	8.0	5.2	5.2
Cyanide, Total	DETSC 2130#	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Cyanide, Free	DETSC 2130#	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
FOC	DETSC 2084#	0.001		0.013	0.011	0.021	0.008	0.014	0.014
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	29	13	17	< 10	15	< 10
Sulphide	DETSC 2024*	10	mg/kg	48	44	72	< 10	12	16
Sulphur as S, Total	DETSC 2320	0.01	%	0.02	0.03	0.05	0.03	0.02	0.02
Petroleum Hydrocarbons		•		·			·		
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	< 3.4	< 3.4	< 3.4	< 3.4	< 3.4	< 3.4
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	< 10	< 10	< 10
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	< 1.4	< 1.4	< 1.4	< 1.4	< 1.4	< 1.4
Aromatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	< 10	< 10	< 10
Alomatic Co-Coo	DL13C 3072	10	1118/ NB	/ 10	/ 10	/ 10	/ 10	/ 10	/ 10

Lab No

1570306

1570307

1570308



Our Ref 19-19167 Client Ref TA8234

Client Ref TA8234									
Contract Title Nenthead	Mines - Propose	d MWTS	, GI _						
			Lab No	1570306	1570307	1570308	1570309	1570310	1570311
		Sa	ample ID	BH103	BH103	TP104	TP109	TP110	TP110
			Depth	0.20	1.00	1.00	1.00	1.00	2.00
			Other ID	1	3	2	2	2	5
		Sam	ple Type	ES	ES	ES	ES	ES	ES
		Sampl	ing Date	04/09/19	04/09/19	n/s	n/s	n/s	n/s
		Sampl	ing Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	Method	LOD	Units						
TPH Ali/Aro Total	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	< 10	< 10	< 10
Benzene	DETSC 3321#	0.01	mg/kg		< 0.01				< 0.01
Ethylbenzene	DETSC 3321#	0.01	mg/kg		< 0.01				< 0.01
Toluene	DETSC 3321#	0.01	mg/kg		< 0.01				< 0.01
Xylene	DETSC 3321#	0.01	mg/kg		< 0.01				< 0.01
PAHs	'		•	<u>'</u>	'		<u> </u>	<u> </u>	
Naphthalene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthylene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluorene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Phenanthrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(a)anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Chrysene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(b)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(k)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(a)pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Indeno(1,2,3-c,d)pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Dibenzo(a,h)anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(g,h,i)perylene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Coronene	DETSC 3301*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
PAH Total	DETSC 3301	1.6	mg/kg	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6
Phenols	I	<u> </u>	<u> </u>						
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
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Lab No 1570312 1570313 1570314 1570315 1570316

Summary of Chemical Analysis Soil Samples

Our Ref 19-19167 Client Ref TA8234

			Lab NO	13/0312	13/0313	13/0314	13/0313	13/0310	13/031/
		Sa	mple ID	TP110	TP111	TP112	TP114	TP124	TP125
			Depth	3.00	1.00	1.00	1.00	1.00	0.25
		(Other ID	8	2	2	2	2	1
		Sam	ple Type	ES	ES	ES	ES	ES	ES
		Sampl	ing Date	n/s	n/s	n/s	n/s	n/s	n/s
		Sampli	ing Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	Method	LOD	Units						
Metals									
Arsenic	DETSC 2301#	0.2	mg/kg	16	11	20	12	26	12
Barium	DETSC 2301#	1.5	mg/kg	420	250	150	170	180	33
Beryllium	DETSC 2301#	0.2	mg/kg	2.0	1.5	2.5	1.6	4.4	0.6
Boron, Water Soluble	DETSC 2311#	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Cadmium	DETSC 2301#	0.1	mg/kg	0.1	< 0.1	7.2	< 0.1	1.5	1.8
Chromium	DETSC 2301#	0.15	mg/kg	12	12	11	12	10	14
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	34	19	23	21	27	13
Lead	DETSC 2301#	0.3	mg/kg	240	41	100	47	170	730
Mercury	DETSC 2325#	0.05	mg/kg	< 0.05	< 0.05	0.05	< 0.05	0.07	< 0.05
Nickel	DETSC 2301#	1	mg/kg	31	27	30	21	43	12
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	1.0
Vanadium	DETSC 2301#	0.8	mg/kg	16	14	13	14	14	17
Zinc	DETSC 2301#	1	mg/kg	92	65	840	44	540	260
Inorganics									
рН	DETSC 2008#		рН	5.1	5.5	5.4	5.1	4.9	6.2
Cyanide, Total	DETSC 2130#	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Cyanide, Free	DETSC 2130#	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
FOC	DETSC 2084#	0.001		0.019	0.016	0.035	0.014	0.020	0.011
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	11	16	52	< 10	40	< 10
Sulphide	DETSC 2024*	10	mg/kg	28	12	96	12	< 10	< 10
Sulphur as S, Total	DETSC 2320	0.01	%	0.06	0.02	0.34	0.01	0.03	0.01
Petroleum Hydrocarbons		<u> </u>				II.		II.	
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	< 3.4	< 3.4	< 3.4	< 3.4	< 3.4	< 3.4
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	< 10	< 10	< 10
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C10-C12	DETSC 3072#	0.01	mg/kg	< 0.9	< 0.01	< 0.9	< 0.01	< 0.01	< 0.9
Aromatic C12-C16	DETSC 3072#	0.9	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	< 1.4	< 1.4	< 1.4	< 1.4	< 1.4	< 1.4
Aromatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	< 10	< 10	< 10



Our Ref 19-19167 Client Ref TA8234

Client Ref TA8234									
Contract Title Nenthead	Mines - Propose	d MWTS	, GI						
			Lab No	1570312	1570313	1570314	1570315	1570316	1570317
		Sa	ample ID	TP110	TP111	TP112	TP114	TP124	TP125
			Depth	3.00	1.00	1.00	1.00	1.00	0.25
			Other ID	8	2	2	2	2	1
		Sam	ple Type	ES	ES	ES	ES	ES	ES
		Sampl	ing Date	n/s	n/s	n/s	n/s	n/s	n/s
		Sampl	ing Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	Method	LOD	Units						
TPH Ali/Aro Total	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	< 10	< 10	< 10
Benzene	DETSC 3321#	0.01	mg/kg						
Ethylbenzene	DETSC 3321#	0.01	mg/kg						
Toluene	DETSC 3321#	0.01	mg/kg						
Xylene	DETSC 3321#	0.01	mg/kg						
PAHs									
Naphthalene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthylene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluorene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Phenanthrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(a)anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Chrysene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(b)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(k)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(a)pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Indeno(1,2,3-c,d)pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Dibenzo(a,h)anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(g,h,i)perylene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Coronene	DETSC 3301*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
PAH Total	DETSC 3301	1.6	mg/kg	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6
Phenols	L		<u> </u>						
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
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Our Ref 19-19167 Client Ref TA8234

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Lab No	1570318
Sample ID	TP125
Depth	2.00
Other ID	7
Sample Type	ES
Sampling Date	n/s
Sampling Time	n/s

Test	Method	LOD	Units	
Metals				
Arsenic	DETSC 2301#	0.2	mg/kg	18
Barium	DETSC 2301#	1.5	mg/kg	140
Beryllium	DETSC 2301#	0.2	mg/kg	2.7
Boron, Water Soluble	DETSC 2311#	0.2	mg/kg	< 0.2
Cadmium	DETSC 2301#	0.1	mg/kg	1.9
Chromium	DETSC 2301#	0.15	mg/kg	14
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	31
Lead	DETSC 2301#	0.3	mg/kg	5300
Mercury	DETSC 2325#	0.05	mg/kg	0.12
Nickel	DETSC 2301#	1	mg/kg	32
Selenium	DETSC 2301#	0.5	mg/kg	4.9
Vanadium	DETSC 2301#	0.8	mg/kg	20
Zinc	DETSC 2301#	1	mg/kg	1400
Inorganics				
рН	DETSC 2008#		рН	5.3
Cyanide, Total	DETSC 2130#	0.1	mg/kg	< 0.1
Cyanide, Free	DETSC 2130#	0.1	mg/kg	< 0.1
FOC	DETSC 2084#	0.001		0.011
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	22
Sulphide	DETSC 2024*	10	mg/kg	< 10
Sulphur as S, Total	DETSC 2320	0.01	%	0.04
Petroleum Hydrocarbons				
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	< 1.5
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	< 3.4
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	< 10
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	< 0.9
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	< 0.5
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	< 0.6
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	< 1.4
Aromatic C5-C35	DETSC 3072*	1.4	mg/kg	< 10
ALOHIBUT CO-COO	DE 13C 3072	10	iiig/ kg	/ 10



Our Ref 19-19167 Client Ref TA8234

Lab No	1570318
Sample ID	TP125
Depth	2.00
Other ID	7
Sample Type	ES
Sampling Date	
Sampling Time	n/s

Test	Method	LOD	Units	
TPH Ali/Aro Total	DETSC 3072*	10	mg/kg	< 10
Benzene	DETSC 3321#	0.01	mg/kg	< 0.01
Ethylbenzene	DETSC 3321#	0.01	mg/kg	< 0.01
Toluene	DETSC 3321#	0.01	mg/kg	< 0.01
Xylene	DETSC 3321#	0.01	mg/kg	< 0.01
PAHs				
Naphthalene	DETSC 3301	0.1	mg/kg	< 0.1
Acenaphthylene	DETSC 3301	0.1	mg/kg	< 0.1
Acenaphthene	DETSC 3301	0.1	mg/kg	< 0.1
Fluorene	DETSC 3301	0.1	mg/kg	< 0.1
Phenanthrene	DETSC 3301	0.1	mg/kg	< 0.1
Anthracene	DETSC 3301	0.1	mg/kg	< 0.1
Fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1
Pyrene	DETSC 3301	0.1	mg/kg	< 0.1
Benzo(a)anthracene	DETSC 3301	0.1	mg/kg	< 0.1
Chrysene	DETSC 3301	0.1	mg/kg	< 0.1
Benzo(b)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1
Benzo(k)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1
Benzo(a)pyrene	DETSC 3301	0.1	mg/kg	< 0.1
Indeno(1,2,3-c,d)pyrene	DETSC 3301	0.1	mg/kg	< 0.1
Dibenzo(a,h)anthracene	DETSC 3301	0.1	mg/kg	< 0.1
Benzo(g,h,i)perylene	DETSC 3301	0.1	mg/kg	< 0.1
Coronene	DETSC 3301*	0.1	mg/kg	< 0.1
PAH Total	DETSC 3301	1.6	mg/kg	< 1.6
Phenols		'	•	
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3



Our Ref 19-19167 Client Ref TA8234

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Contract Title Nenthead Mines - Proposed MWTS, GI

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Lab No	1570307	1570311	1570318
Sample ID	BH103	TP110	TP125
Depth	1.00	2.00	2.00
Other ID	3	5	7
Sample Type	ES	ES	ES
Sampling Date	04/09/19	n/s	n/s
Sampling Time	n/s	n/s	n/s
LOD Units			

Test	Method	LOD	Units			
VOCs						
Vinyl Chloride	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,1 Dichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Trans-1,2-dichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,1-dichloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Cis-1,2-dichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
2,2-dichloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Bromochloromethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Chloroform	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,1,1-trichloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,1-dichloropropene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Carbon tetrachloride	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Benzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,2-dichloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Trichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,2-dichloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Dibromomethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Bromodichloromethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
cis-1,3-dichloropropene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Toluene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
trans-1,3-dichloropropene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,1,2-trichloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Tetrachloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,3-dichloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Dibromochloromethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,2-dibromoethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Chlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,1,1,2-tetrachloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Ethylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
m+p-Xylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
o-Xylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Styrene	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Bromoform	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Isopropylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Bromobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,2,3-trichloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
n-propylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
2-chlorotoluene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,3,5-trimethylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
4-chlorotoluene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Tert-butylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
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Our Ref 19-19167 Client Ref TA8234

Contract Title Nenthead Mines	- Proposed MWT	S, GI				
			Lab No	1570307	1570311	1570318
		Sa	imple ID	BH103	TP110	TP125
			Depth	1.00	2.00	2.00
			Other ID	3	5	7
			ple Type	ES	ES	ES
		_	ing Date	04/09/19	n/s	n/s
_		-	ing Time	n/s	n/s	n/s
Test	Method	LOD	Units			
1,2,4-trimethylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
sec-butylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
p-isopropyltoluene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,3-dichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,4-dichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
n-butylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,2-dichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,2-dibromo-3-chloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,2,4-trichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Hexachlorobutadiene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,2,3-trichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
MTBE	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
SVOCs	•		•	•		
Phenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Aniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
2-Chlorophenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Benzyl Alcohol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
2-Methylphenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Bis(2-chloroisopropyl)ether	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
3&4-Methylphenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
2,4-Dimethylphenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Bis-(dichloroethoxy)methane	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
2,4-Dichlorophenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
1,2,4-Trichlorobenzene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
4-Chloro-3-methylphenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
2-Methylnaphthalene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Hexachlorocyclopentadiene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
2,4,6-Trichlorophenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
2,4,5-Trichlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
2-Chloronaphthalene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
2-Nitroaniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
2,4-Dinitrotoluene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
3-Nitroaniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
4-Nitrophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Dibenzofuran	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
2,6-Dinitrotoluene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
2,3,4,6-Tetrachlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Diethylphthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
4-Chlorophenylphenylether	DETSC 3433*	_		< 0.1	< 0.1	
		0.1	mg/kg			< 0.1
4-Nitroaniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1



Our Ref 19-19167 Client Ref TA8234

Contract Title Nenthead Mine	s - Proposed MWT	S, GI				
			Lab No	1570307	1570311	1570318
		S	ample ID	BH103	TP110	TP125
			Depth	1.00	2.00	2.00
			Other ID	3	5	7
		Sam	ple Type	ES	ES	ES
		Samp	ling Date	04/09/19	n/s	n/s
		Sampl	ing Time	n/s	n/s	n/s
Test	Method	LOD	Units			
2-Methyl-4,6-Dinitrophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Diphenylamine	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
4-Bromophenylphenylether	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Hexachlorobenzene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Pentachlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1

2-Methyl-4,6-Dinitrophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Diphenylamine	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
4-Bromophenylphenylether	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Hexachlorobenzene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Pentachlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Di-n-butylphthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Butylbenzylphthalate	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Bis(2-ethylhexyl)phthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Di-n-octylphthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
1,4-Dinitrobenzene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Dimethylphthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
1,3-Dinitrobenzene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
1,2-Dinitrobenzene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
2,3,5,6-Tetrachlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Azobenzene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Carbazole	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1



Summary of Chemical Analysis Leachate Samples

Our Ref 19-19167 Client Ref TA8234

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Lab No	1570319	1570320	1570321
Sample ID	BH103	TP110	TP125
Depth	1.00	2.00	2.00
Other ID	3	5	7
Sample Type	ES	ES	ES
Sampling Date	04/09/19	n/s	n/s
Sampling Time	n/s	n/s	n/s

Test	Method	LOD	Units			
Preparation						
Leachate 2:1 250g Non-WAC	DETSC 1009*			Υ	Υ	Υ
Metals						
Arsenic, Dissolved	DETSC 2306	0.16	ug/l	0.46	0.26	0.25
Barium, Dissolved	DETSC 2306	0.26	ug/l	3.7	3.5	8.2
Beryllium, Dissolved	DETSC 2306*	0.1	ug/l	< 0.1	< 0.1	< 0.1
Boron, Dissolved	DETSC 2306*	12	ug/l	< 12	< 12	< 12
Cadmium, Dissolved	DETSC 2306	0.03	ug/l	< 0.03	< 0.03	< 0.03
Chromium, Dissolved	DETSC 2306	0.25	ug/l	< 0.25	< 0.25	< 0.25
Chromium, Hexavalent	DETSC 2203	0.007	mg/l	< 0.007	< 0.007	< 0.007
Copper, Dissolved	DETSC 2306	0.4	ug/l	< 0.4	< 0.4	< 0.4
Lead, Dissolved	DETSC 2306	0.09	ug/l	0.45	0.22	0.15
Mercury, Dissolved	DETSC 2306	0.01	ug/l	< 0.01	< 0.01	< 0.01
Nickel, Dissolved	DETSC 2306	0.5	ug/l	0.6	< 0.5	< 0.5
Selenium, Dissolved	DETSC 2306	0.25	ug/l	< 0.25	< 0.25	< 0.25
Vanadium, Dissolved	DETSC 2306	0.6	ug/l	< 0.6	< 0.6	< 0.6
Zinc, Dissolved	DETSC 2306	1.3	ug/l	16	8.4	6.1
Inorganics						
Conductivity	DETSC 2009	1	uS/cm	9.9	11.3	17.1
рН	DETSC 2008		рН	7.5	7.2	7.0
Cyanide, Total	DETSC 2130	40	ug/l	< 40	< 40	< 40
Cyanide, Free	DETSC 2130	0.02	mg/l	< 0.02	< 0.02	< 0.02
Ammoniacal Nitrogen as N	DETSC 2207	0.015	mg/l	0.11	0.068	0.096
Chloride	DETSC 2055	0.1	mg/l	1.1	1.2	1.6
Nitrate as N	*	0.1	mg/l	0.44	0.15	0.15
Sulphate as SO4	DETSC 2055	0.1	mg/l	0.96	1.4	2.8
Sulphide	DETSC 2208	10	ug/l	< 10	< 10	< 10
Sulphur as S, Total	DETSC 2320*	10	mg/l	< 10	< 10	< 10
Petroleum Hydrocarbons		<u> </u>	<u> </u>	<u> </u>		
Aliphatic C5-C6	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1
Aliphatic C6-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1
Aliphatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1
Aliphatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0
Aliphatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0
Aliphatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0
Aliphatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0
Aliphatic C5-C35	DETSC 3072*	10	ug/l	< 10	< 10	< 10
Aromatic C5-C7	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1
Aromatic C7-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1
Aromatic C8-C10	DETSC 3322	0.1	-	< 0.1	< 0.1	< 0.1
Aromatic Co-C10	DE13C 3322	0.1	ug/l	< 0.1	\ U.1	\ U.1



Summary of Chemical Analysis Leachate Samples

Our Ref 19-19167 Client Ref TA8234

Contract Title Nenthead Mines - Proposed MWTS, GI											
			Lab No	1570319	1570320	1570321					
		Sa	mple ID	BH103	TP110	TP125					
			Depth	1.00	2.00	2.00					
			Other ID	3	5	7					
			ple Type	ES	ES	ES					
		-	ing Date	04/09/19	n/s	n/s					
		=	ing Time	n/s	n/s	n/s					
Test	Method	LOD	Units	4.0	1.0	1.0					
Aromatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0					
Aromatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0					
Aromatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0					
Aromatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0					
Aromatic C5-C35	DETSC 3072*	10	ug/l	< 10	< 10	< 10					
TPH Ali/Aro Total	DETSC 3072*	10	ug/l	< 10	< 10	< 10					
PAHs											
Naphthalene	DETSC 3304	0.05	ug/l	< 0.05	< 0.05	< 0.05					
Acenaphthylene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01					
Acenaphthene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01					
Fluorene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01					
Phenanthrene	DETSC 3304	0.01	ug/l	0.02	0.02	< 0.01					
Anthracene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01					
Fluoranthene	DETSC 3304	0.01	ug/l	0.02	0.03	< 0.01					
Pyrene	DETSC 3304	0.01	ug/l	0.01	0.02	< 0.01					
Benzo(a)anthracene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01					
Chrysene	DETSC 3304	0.01	ug/l	< 0.01	0.01	< 0.01					
Benzo(b)fluoranthene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01					
Benzo(k)fluoranthene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01					
Benzo(a)pyrene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01					
Indeno(1,2,3-c,d)pyrene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01					
Dibenzo(a,h)anthracene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01					
Benzo(g,h,i)perylene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01					
Coronene	DETSC 3304*	0.01	ug/l	< 0.01	< 0.01	< 0.01					
PAH Total	DETSC 3304	0.2	ug/l	< 0.20	< 0.20	< 0.20					
Phenols			<u> </u>								
Phenol - Monohydric	DETSC 2130	0.1	mg/l	< 0.1	< 0.1	< 0.1					



Summary of Asbestos Analysis Soil Samples

Our Ref 19-19167 Client Ref TA8234

Contract Title Nenthead Mines - Proposed MWTS, GI

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
1570306	BH103 1 0.20	SOIL	NAD	none	Jordan Eadington
1570307	BH103 3 1.00	SOIL	NAD	none	Jordan Eadington
1570308	TP104 2 1.00	SOIL	NAD	none	Jordan Eadington
1570309	TP109 2 1.00	SOIL	NAD	none	Jordan Eadington
1570310	TP110 2 1.00	SOIL	NAD	none	Jordan Eadington
1570311	TP110 5 2.00	SOIL	NAD	none	Jordan Eadington
1570312	TP110 8 3.00	SOIL	NAD	none	Jordan Eadington
1570313	TP111 2 1.00	SOIL	NAD	none	Jordan Eadington
1570314	TP112 2 1.00	SOIL	NAD	none	Jordan Eadington
1570315	TP114 2 1.00	SOIL	NAD	none	Jordan Eadington
1570316	TP124 2 1.00	SOIL	NAD	none	Jordan Eadington
1570317	TP125 1 0.25	SOIL	NAD	none	Jordan Eadington
1570318	TP125 7 2.00	SOIL	NAD	none	Jordan Eadington

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos.

Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos

Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: *
not included in laboratory scope of accreditation.



Information in Support of the Analytical Results

Our Ref 19-19167 Client Ref TA8234

Contract Nenthead Mines - Proposed MWTS, GI

Containers Received & Deviating Samples

		Date			Inappropriate container for
Lab No	Sample ID	Sampled	Containers Received	Holding time exceeded for tests	tests
1570306	BH103 0.20 SOIL	04/09/19	GJ 250ml, GJ 60ml, PT 1L		
1570307	BH103 1.00 SOIL	04/09/19	GJ 250ml, GJ 60ml, PT 1L		
1570308	TP104 1.00 SOIL		GJ 250ml, GJ 60ml, PT 1L		
1570309	TP109 1.00 SOIL		GJ 250ml, GJ 60ml, PT 1L		
1570310	TP110 1.00 SOIL		GJ 250ml, GJ 60ml, PT 1L		
1570311	TP110 2.00 SOIL		GJ 250ml, GJ 60ml, PT 1L		
1570312	TP110 3.00 SOIL		GJ 250ml, GJ 60ml, PT 1L		
1570313	TP111 1.00 SOIL		GJ 250ml, GJ 60ml, PT 1L		
1570314	TP112 1.00 SOIL		GJ 250ml, GJ 60ml, PT 1L		
1570315	TP114 1.00 SOIL		GJ 250ml, GJ 60ml, PT 1L		
1570316	TP124 1.00 SOIL		GJ 250ml, GJ 60ml, PT 1L		
1570317	TP125 0.25 SOIL		GJ 250ml, GJ 60ml, PT 1L		
1570318	TP125 2.00 SOIL		GJ 250ml, GJ 60ml, PT 1L		
1570319	BH103 1.00 LEACHATE	04/09/19	GJ 250ml, GJ 60ml, PT 1L		
1570320	TP110 2.00 LEACHATE		GJ 250ml, GJ 60ml, PT 1L		
1570321	TP125 2.00 LEACHATE		GJ 250ml, GJ 60ml, PT 1L		

Key: G-Glass P-Plastic J-Jar T-Tub

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months



Certificate Number 19-19242-1

13-Dec-19

Client Soil Engineering

Parkside Lane

Leeds

West Yorkshire

LS11 5SX

Our Reference 19-19242-1

Client Reference TA8234

Order No (not supplied)

Contract Title Nenthead Mines - Proposed MWTS, GI

Description 44 Soil samples, 16 Leachate samples.

Date Received 27-Sep-19

Date Started 27-Sep-19

Date Completed 13-Dec-19

Test Procedures Identified by prefix DETSn (details on request).

Notes This report supersedes 19-19242, extra testing added

Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By

Adam Fenwick Contracts Manager





Our Ref 19-19242-1 Client Ref TA8234

Lab No	1571208	1571209	1571210	1571211	1571212	1571213
Sample ID	BH104	BH104	BH104	BH105	BH105	BH105
Depth	0.50	2.00	3.00	1.00	2.00	3.00
Other ID	2	8	12	3	7	10
Sample Type	ES	ES	ES	ES	ES	ES
Sampling Date	05/09/19	05/09/19	05/09/19	06/09/19	06/09/19	06/09/19
Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s

Barium	Test	Method	LOD	Units						
Barium	Metals									
Beryllium		DETSC 2301#								19
Boron, Water Soluble DETSC 2311# 0.2 mg/kg 0.4 0.2 0.3 0.3 0.3 0.3 0.6		DETSC 2301#								400
Cadmium		DETSC 2301#								3.9
Chromium	Boron, Water Soluble	DETSC 2311#				0.2	0.3	0.3	0.3	< 0.2
Chromium, Hexavalent DETSC 2204* 1 mg/kg < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0 < 1.0	Cadmium	DETSC 2301#								1.0
Copper			0.15							9.4
Lead	Chromium, Hexavalent	DETSC 2204*								< 1.0
Mercury		DETSC 2301#	0.2							20
Nickel	Lead	DETSC 2301#								76
Selenium		DETSC 2325#	0.05							< 0.05
Vanadium	Nickel	DETSC 2301#	1		14	23	37	57	57	110
Detect D		DETSC 2301#								5.4
DETSC 2008# DH S.0 S.7 G.5 S.7 S.9 G.	Vanadium	DETSC 2301#	0.8		17					16
Detail D		DETSC 2301#	1	mg/kg	150	68	22	740	860	1200
Cyanide, Total DETSC 2130# 0.1 mg/kg < 0.1	Inorganics									
Cyanide, Free DETSC 2130# 0.1 mg/kg < 0.1	рН	DETSC 2008#		рН	5.0	5.7	6.5	5.7	5.9	6.3
FOC DETSC 2084# 0.001 0.024 0.017 0.023 0.010 0.008 0.01 Sulphate Aqueous Extract as SO4 DETSC 2076# 10 mg/l 34 15 270 27 23 5 Sulphide DETSC 2024* 10 mg/kg 10 < 10 31 < 10 < 10 3 Sulphur as S, Total DETSC 2320 0.01 % 0.03 0.03 1.4 0.04 0.04 0.1 Petroleum Hydrocarbons Aliphatic C5-C6 DETSC 3321* 0.01 mg/kg < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01	Cyanide, Total	DETSC 2130#	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Sulphate Aqueous Extract as SO4 DETSC 2076# 10 mg/l 34 15 270 27 23 5 Sulphide DETSC 2024* 10 mg/kg < 10 < 10 31 < 10 < 10 3 Sulphur as S, Total DETSC 2320 0.01 % 0.03 0.03 1.4 0.04 0.04 0.1 Petroleum Hydrocarbons Aliphatic C5-C6 DETSC 3321* 0.01 mg/kg < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01	Cyanide, Free	DETSC 2130#	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Sulphide	FOC	DETSC 2084#	0.001		0.024	0.017	0.023	0.010	0.008	0.011
Sulphur as S, Total DETSC 2320 0.01 % 0.03 0.03 1.4 0.04 0.04 0.1 Petroleum Hydrocarbons Aliphatic C5-C6 DETSC 3321* 0.01 mg/kg < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01	Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	34	15	270	27	23	54
Petroleum Hydrocarbons	Sulphide	DETSC 2024*	10	mg/kg	< 10	< 10	31	< 10	< 10	32
Aliphatic C5-C6 DETSC 3321* 0.01 mg/kg < 0.01	Sulphur as S, Total	DETSC 2320	0.01	%	0.03	0.03	1.4	0.04	0.04	0.18
Aliphatic C6-C8 DETSC 3321* 0.01 mg/kg < 0.01	Petroleum Hydrocarbons							·		
Aliphatic C8-C10 DETSC 3321* 0.01 mg/kg < 0.01	Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C10-C12 DETSC 3072# 1.5 mg/kg < 1.5	Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C12-C16 DETSC 3072# 1.2 mg/kg < 1.2	Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C16-C21 DETSC 3072# 1.5 mg/kg < 1.5	Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C21-C35 DETSC 3072# 3.4 mg/kg < 3.4	Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
Aliphatic C21-C35 DETSC 3072# 3.4 mg/kg < 3.4	Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C5-C35 DETSC 3072* 10 mg/kg < 10	Aliphatic C21-C35	DETSC 3072#	3.4		< 3.4	< 3.4	< 3.4	< 3.4	< 3.4	< 3.4
Aromatic C5-C7 DETSC 3321* 0.01 mg/kg < 0.01	Aliphatic C5-C35	DETSC 3072*	10		< 10	< 10	< 10	< 10	< 10	< 10
Aromatic C7-C8 DETSC 3321* 0.01 mg/kg < 0.01			0.01		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C8-C10 DETSC 3321* 0.01 mg/kg < 0.01										< 0.01
Aromatic C10-C12 DETSC 3072# 0.9 mg/kg < 0.9 < 0.9 < 0.9 < 0.9 < 0.9 < 0.9							< 0.01			
										< 0.9
Aromatic C12-C16 DETSC 3072# 0.5 mg/kg < 0.5 < 0.5 < 0.5 < 0.5 < 0.5		_								
										< 0.6
										< 10



Our Ref 19-19242-1 Client Ref TA8234

Client Ref TA8234	_								
Contract Title Nenthead Mines - P	Proposed MWT	S, GI							
		_	Lab No	1571208	1571209	1571210	1571211	1571212	1571213
		Sa	ample ID	BH104	BH104	BH104	BH105	BH105	BH105
			Depth	0.50	2.00	3.00	1.00	2.00	3.00
			Other ID	2	8	12	3	7	10
			ple Type	ES	ES	ES es (as)	ES	ES	ES
		-	ling Date	05/09/19	05/09/19	05/09/19	06/09/19	06/09/19	06/09/19
Test	Method	LOD	ing Time Units	n/s	n/s	n/s	n/s	n/s	n/s
TPH Ali/Aro Total	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	< 10	< 10	< 10
Benzene	DETSC 3321#	0.01	mg/kg	< 0.01	V 10	< 0.01	< 0.01	V 10	<u> </u>
Ethylbenzene	DETSC 3321#	0.01	mg/kg	< 0.01		< 0.01	< 0.01		
Toluene	DETSC 3321#	0.01	mg/kg	< 0.01		< 0.01	< 0.01		
Xylene	DETSC 3321#	0.01	mg/kg			< 0.01	< 0.01		
PAHs				0.01					
Naphthalene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthylene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluorene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Phenanthrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(a)anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Chrysene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(b)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(k)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(a)pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Indeno(1,2,3-c,d)pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Dibenzo(a,h)anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(g,h,i)perylene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Coronene	DETSC 3301*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
PAH Total	DETSC 3301	1.6	mg/kg	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6
Phenols									
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	1.0	0.9	0.5	0.4	0.4	< 0.3



Our Ref 19-19242-1 Client Ref TA8234

Lab No	1571214	1571215	1571216	1571217	1571218	1571219
Sample ID	BH106	BH106	BH106	TP113	TP115	TP115
Depth	1.00	2.00	3.00	1.00	1.00	1.20
Other ID	4	7	11	2	2	4
Sample Type	ES	ES	ES	ES	ES	ES
Sampling Date	09/09/19	09/09/19	09/09/19	09/09/19	06/09/19	06/09/19
Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s

		Janipi	ing inite	11/3	11/3	11/3	11/3	11/3	11/3
Test	Method	LOD	Units						
Metals									
Arsenic	DETSC 2301#	0.2	mg/kg	16	11	9.9	11	16	16
Barium	DETSC 2301#	1.5	mg/kg	200	630	470	96	130	140
Beryllium	DETSC 2301#	0.2	mg/kg	1.5	1.7	1.3	1.1	2.0	3.5
Boron, Water Soluble	DETSC 2311#	0.2	mg/kg	0.3	0.3	0.3	< 0.2	0.2	< 0.2
Cadmium	DETSC 2301#	0.1	mg/kg	0.3	0.2	< 0.1	< 0.1	0.3	0.2
Chromium	DETSC 2301#	0.15	mg/kg	11	13	11	8.1	10	12
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	20	21	17	13	19	16
Lead	DETSC 2301#	0.3	mg/kg	1100	100	100	31	76	30
Mercury	DETSC 2325#	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.05
Nickel	DETSC 2301#	1	mg/kg	30	36	19	14	11	18
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	0.5	< 0.5	< 0.5	< 0.5	< 0.5
Vanadium	DETSC 2301#	0.8	mg/kg	13	16	12	9.9	13	12
Zinc	DETSC 2301#	1	mg/kg	190	150	45	82	180	380
Inorganics	1								
рН	DETSC 2008#		рН	5.1	6.6	6.9	6.9	6.2	5.2
Cyanide, Total	DETSC 2130#	0.1	mg/kg	0.2	< 0.1	< 0.1	0.1	< 0.1	< 0.1
Cyanide, Free	DETSC 2130#	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
FOC	DETSC 2084#	0.001		0.019	0.014	0.011	0.018	0.020	0.035
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	50	38	28	16	17	14
Sulphide	DETSC 2024*	10	mg/kg	48	< 10	36	< 10	12	< 10
Sulphur as S, Total	DETSC 2320	0.01	%	0.06	0.05	0.03	0.02	0.02	0.02
Petroleum Hydrocarbons		·							
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	< 3.4	< 3.4	< 3.4	< 3.4	< 3.4	< 3.4
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	< 10	< 10	< 10
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	< 1.4	< 1.4	< 1.4	< 1.4	< 1.4	
Aromatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	< 10	< 10	< 10
ATOMATIC CO-COO	DE13C 3072"	10	ilig/ kg	< 10	< 10	< 10	< 10	< 10	< 10



Our Ref 19-19242-1 Client Ref TA8234

Client Ref TA8234									
Contract Title Nenthead Mines - P	roposed MWT	S, GI							
			Lab No	1571214	1571215	1571216	1571217	1571218	1571219
		Sa	ample ID	BH106	BH106	BH106	TP113	TP115	TP115
			Depth	1.00	2.00	3.00	1.00	1.00	1.20
			Other ID	4	7	11	2	2	4
			ple Type	ES	ES	ES	ES	ES	ES
		-	ling Date	09/09/19	09/09/19	09/09/19	09/09/19	06/09/19	06/09/19
		-	ing Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	Method	LOD	Units		1.5				
TPH Ali/Aro Total	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	< 10	< 10	< 10
Benzene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01			< 0.01	
Ethylbenzene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01			< 0.01	
Toluene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01			< 0.01	
Xylene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01			< 0.01	
PAHs	Т			T	[T			
Naphthalene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthylene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluorene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Phenanthrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(a)anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Chrysene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(b)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(k)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(a)pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Indeno(1,2,3-c,d)pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Dibenzo(a,h)anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(g,h,i)perylene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Coronene	DETSC 3301*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
PAH Total	DETSC 3301	1.6	mg/kg	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6
Phenols		'		,	·	'	<u>'</u>	"	
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3	0.3	< 0.3



Our Ref 19-19242-1 Client Ref TA8234

Lab No	1571220	1571221	1571222	1571223	1571224	1571225
Sample ID	TP116	TP117	TP118	TP119	TP120	TP122
Depth	1.00	1.00	1.00	0.80	1.00	0.80
Other ID	2	2	2	2	2	2
Sample Type	ES	ES	ES	ES	ES	ES
Sampling Date	10/09/19	10/09/19	10/09/19	10/09/19	09/09/19	09/09/19
Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s

Test	Method	LOD	Units						
Metals									
Arsenic	DETSC 2301#	0.2	mg/kg	10	8.5	8.0	8.6	4.5	17
Barium	DETSC 2301#	1.5	mg/kg	390	230	260	440	190	390
Beryllium	DETSC 2301#	0.2	mg/kg	1.8	1.5	1.4	1.2	1.4	1.7
Boron, Water Soluble	DETSC 2311#	0.2	mg/kg	< 0.2	0.2	0.2	0.2	0.2	< 0.2
Cadmium	DETSC 2301#	0.1	mg/kg	< 0.1	0.4	< 0.1	0.6	0.5	0.2
Chromium	DETSC 2301#	0.15	mg/kg	14	8.7	11	8.0	10	13
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	21	17	19	15	19	23
Lead	DETSC 2301#	0.3	mg/kg	61	51	25	180	40	61
Mercury	DETSC 2325#	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Nickel	DETSC 2301#	1	mg/kg	21	20	19	15	27	25
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	0.6
Vanadium	DETSC 2301#	0.8	mg/kg	15	10	13	9.5	12	15
Zinc	DETSC 2301#	1	mg/kg	54	230	38	220	450	140
Inorganics									
рН	DETSC 2008#		рН	5.3	5.4	5.3	5.9	5.9	5.1
Cyanide, Total	DETSC 2130#	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Cyanide, Free	DETSC 2130#	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
FOC	DETSC 2084#	0.001		0.014	0.013	0.014	0.028	0.013	0.016
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	< 10	23	12	16	16	12
Sulphide	DETSC 2024*	10	mg/kg	< 10	52	< 10	< 10	< 10	< 10
Sulphur as S, Total	DETSC 2320	0.01	%	0.01	0.03	0.01	0.02	0.01	0.02
Petroleum Hydrocarbons									
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	< 3.4	< 3.4	< 3.4	< 3.4	< 3.4	< 3.4
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	< 10	< 10	< 10
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	< 1.4	< 1.4	< 1.4	< 1.4	< 1.4	< 1.4
Aromatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	< 10	< 10	< 10



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Client Ref TA8234									
Contract Title Nenthead Mines - P	roposed MWT	S, GI							
			Lab No	1571220	1571221	1571222	1571223	1571224	1571225
		Sa	ample ID	TP116	TP117	TP118	TP119	TP120	TP122
			Depth	1.00	1.00	1.00	0.80	1.00	0.80
			Other ID	2	2	2	2	2	2
			ple Type	ES	ES	ES	ES	ES	ES
			ing Date	10/09/19	10/09/19	10/09/19	10/09/19	09/09/19	09/09/19
			ing Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	Method	LOD	Units	[1	1			
TPH Ali/Aro Total	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	< 10	< 10	< 10
Benzene	DETSC 3321#	0.01	mg/kg			< 0.01			
Ethylbenzene	DETSC 3321#	0.01	mg/kg			< 0.01			
Toluene	DETSC 3321#	0.01	mg/kg			< 0.01			
Xylene	DETSC 3321#	0.01	mg/kg			< 0.01			
PAHs		г г				T			
Naphthalene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthylene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluorene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Phenanthrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(a)anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Chrysene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(b)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(k)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(a)pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Indeno(1,2,3-c,d)pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Dibenzo(a,h)anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(g,h,i)perylene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Coronene	DETSC 3301*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
PAH Total	DETSC 3301	1.6	mg/kg	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6
Phenols									
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	0.3	< 0.3	< 0.3	< 0.3	< 0.3



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Lab No	1571226	1571227	1571228	1571229	1571230	1571231
Sample ID	TP123	TP126	TP127	TP128	TP128	WS101
Depth	0.60	1.00	1.00	0.60	1.00	0.20
Other ID	2	2	2	2	4	2
Sample Type	ES	ES	ES	ES	ES	ES
Sampling Date	06/09/19	06/09/19	09/09/19	09/09/19	09/09/19	09/09/19
Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s

Method	LOD	Units						
,								
DETSC 2301#	0.2							
DETSC 2301#							340	
DETSC 2301#							1.1	1.3
DETSC 2311#								< 0.2
DETSC 2301#								
	0.15							
DETSC 2204*	1							< 1.0
DETSC 2301#								
								0.90
DETSC 2301#								53
DETSC 2301#								
DETSC 2301#								
DETSC 2301#	1	mg/kg	190	2000	91	4600	490	U/S
					,			
DETSC 2008#								
DETSC 2130#	0.1	mg/kg	< 0.1	< 0.1	< 0.1	0.3	0.3	0.2
DETSC 2130#	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
DETSC 2084#	0.001		0.028	0.008	0.016	0.13	0.091	0.018
DETSC 2076#	10	mg/l	27	170	24	100	66	48
DETSC 2024*	10	mg/kg	< 10	< 10	< 10	110	100	380
DETSC 2320	0.01	%	0.04	0.14	0.01	1.7	0.13	0.45
DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5
DETSC 3072#	1.2	mg/kg	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5
DETSC 3072#	3.4	mg/kg	< 3.4	< 3.4	< 3.4	< 3.4	< 3.4	< 3.4
DETSC 3072*	10	mg/kg	< 10	< 10	< 10	< 10	< 10	< 10
DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
DETSC 3321*	0.01		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
DETSC 3321*	0.01			< 0.01	< 0.01	< 0.01	< 0.01	
DETSC 3072#	0.9		< 0.9	< 0.9	< 0.9		< 0.9	
_					< 0.5		< 0.5	
			< 1.4					
DETSC 3072#	1.4	M5/K51	< 1.4	< 1.4	< 1.4	< 1.4	< 1.4	< 1.4
	DETSC 2301# DETSC 3301# DETSC 3072# DETSC 3321* DETSC 3072# DETSC 3072# DETSC 3072# DETSC 3321* DETSC 3321* DETSC 3072# DETSC 3321* DETSC 3072# DETSC 3321* DETSC 3072# DETSC 3321* DETSC 3072# DETSC 3321* DETSC 3072# DETSC 3321* DETSC 3072#	DETSC 2301# 0.2 DETSC 2301# 0.2 DETSC 2301# 0.2 DETSC 2311# 0.2 DETSC 2311# 0.1 DETSC 2301# 0.15 DETSC 2301# 0.15 DETSC 2301# 0.2 DETSC 2301# 0.2 DETSC 2301# 0.2 DETSC 2301# 0.3 DETSC 2301# 0.3 DETSC 2301# 0.5 DETSC 2301# 1 DETSC 2301# 1 DETSC 2301# 0.5 DETSC 2301# 0.5 DETSC 2301# 0.5 DETSC 2301# 0.5 DETSC 2301# 0.1 DETSC 2301# 0.1 DETSC 2008# 0.1 DETSC 2130# 0.1 DETSC 2024* 10 DETSC 2076# 10 DETSC 2076# 10 DETSC 3321* 0.01 DETSC 3321* 0.01 DETSC 3321* 0.01 DETSC 3321* 0.01 DETSC 3072# 1.5 DETSC 3072# 1.5 DETSC 3072# 1.5 DETSC 3321* 0.01 DETSC 3321* 0.01 DETSC 3321* 0.01 DETSC 3321* 0.01 DETSC 3072# 1.5 DETSC 3072# 1.5 DETSC 3072# 1.5 DETSC 3072# 0.01 DETSC 3321* 0.01 DETSC 3321* 0.01 DETSC 3321* 0.01 DETSC 3321* 0.01 DETSC 3072# 0.5 DETSC 3072# 0.5 DETSC 3072# 0.5 DETSC 3072# 0.5 DETSC 3072# 0.5 DETSC 3072# 0.5	DETSC 2301# 0.2 mg/kg DETSC 2301# 1.5 mg/kg DETSC 2301# 0.2 mg/kg DETSC 2311# 0.2 mg/kg DETSC 2301# 0.1 mg/kg DETSC 2301# 0.15 mg/kg DETSC 2301# 0.15 mg/kg DETSC 2301# 0.2 mg/kg DETSC 2301# 0.2 mg/kg DETSC 2301# 0.3 mg/kg DETSC 2301# 0.3 mg/kg DETSC 2301# 0.3 mg/kg DETSC 2301# 1 mg/kg DETSC 2301# 1 mg/kg DETSC 2301# 1 mg/kg DETSC 2301# 0.5 mg/kg DETSC 2301# 0.8 mg/kg DETSC 2301# 0.8 mg/kg DETSC 2301# 0.8 mg/kg DETSC 2301# 0.8 mg/kg DETSC 2301# 0.1 mg/kg DETSC 2301# 0.1 mg/kg DETSC 2008# 0.1 mg/kg DETSC 2030# 0.1 mg/kg DETSC 2030# 0.01 mg/kg DETSC 2076# 10 mg/l DETSC 2076# 10 mg/kg DETSC 3321* 0.01 mg/kg DETSC 3321* 0.01 mg/kg DETSC 3321* 0.01 mg/kg DETSC 3072# 1.5 mg/kg DETSC 3072# 1.5 mg/kg DETSC 3072# 1.5 mg/kg DETSC 3072# 1.5 mg/kg DETSC 3072# 1.5 mg/kg DETSC 3321* 0.01 mg/kg DETSC 3072# 1.0 mg/kg DETSC 3072# 1.0 mg/kg DETSC 3072# 1.0 mg/kg DETSC 3072# 0.0 mg/kg DETSC 3321* 0.01 mg/kg DETSC 3072# 0.01 mg/kg DETSC 3321* 0.01 mg/kg DETSC 3072# 0.01 mg/kg DETSC 3321* 0.01 mg/kg DETSC 3072# 0.01 mg/kg DETSC 3072# 0.01 mg/kg DETSC 3072# 0.01 mg/kg DETSC 3072# 0.9 mg/kg DETSC 3072# 0.9 mg/kg DETSC 3072# 0.9 mg/kg DETSC 3072# 0.5 mg/kg DETSC 3072# 0.5 mg/kg DETSC 3072# 0.6 mg/kg	DETSC 2301# 0.2 mg/kg 280	DETSC 2301# 0.2 mg/kg 14 22	DETSC 2301# 0.2 mg/kg 280 270 320	DETSC 2301# 0.2 mg/kg 14 22 13 64 DETSC 2301# 1.5 mg/kg 280 270 320 1000 DETSC 2301# 0.2 mg/kg 2.2 1.6 2.2 6.2 DETSC 2301# 0.2 mg/kg 0.4 <0.2 0.2 <0.2 DETSC 2301# 0.1 mg/kg 0.2 4.9 0.2 11 DETSC 2301# 0.15 mg/kg 9.7 12 9.1 49 DETSC 2301# 0.2 mg/kg 21 22 21 110 DETSC 2301# 0.2 mg/kg 270 1000 71 2800 DETSC 2301# 0.3 mg/kg 270 1000 71 2800 DETSC 2301# 0.5 mg/kg 0.7 0.09 <0.05 0.60 DETSC 2301# 1 mg/kg 21 27 35 95 DETSC 2301# 0.5 mg/kg 0.5 2.2 <0.5 9.3 DETSC 2301# 0.8 mg/kg 13 17 13 67 DETSC 2301# 1 mg/kg 190 2000 91 4600 DETSC 2304# 0.1 mg/kg <0.1 <0.1 <0.1 <0.1 DETSC 2304# 0.001 mg/kg <0.1 <0.1 <0.1 <0.1 DETSC 2304# 0.001 mg/kg <0.1 <0.1 <0.1 <0.1 DETSC 2304# 0.001 mg/kg <0.1 <0.1 <0.1 <0.1 DETSC 2304# 10 mg/kg <0.1 <0.1 <0.1 <0.1 DETSC 2304# 10 mg/kg <0.1 <0.1 <0.1 <0.1 DETSC 2084# 10 mg/kg <0.1 <0.1 <0.1 <0.1 DETSC 2084# 10 mg/kg <0.0 <0.01 <0.01 <0.01 DETSC 2084# 10 mg/kg <0.01 <0.01 <0.01 <0.01 DETSC 2320 0.01 mg/kg <0.01 <0.01 <0.01 <0.01 DETSC 3321* 0.01 mg/kg <0.01 <0.01 <0.01 <0.01 DETSC 3321* 0.01 mg/kg <0.01 <0.01 <0.01 <0.01 DETSC 3072# 1.5 mg/kg <1.5 <1.5 <1.5 <1.5 DETSC 3072# 1.5 mg/kg <1.5 <1.5 <1.5 <1.5 DETSC 3321* 0.01 mg/kg <0.01 <0.01 <0.01 <0.01 <0.01 DETSC 3321* 0.01 mg/kg <0.01 <0.01 <0.01 <0.01 <0.01 DETSC 3321* 0.01 mg/kg <0.01 <0.01 <0.01 <0.01 <0.01 DETSC 3321* 0.01 mg/kg <0.01 <0.01 <0.01 <0.01 <0.01 DETSC 3321* 0.01 mg/kg <0.01 <0.01 <0.01 <0.01 <0.01 DETSC 3321* 0.01 mg/kg <0.01 <0.01 <0.01 <0.01 <0.01 DETSC 3321* 0.01 mg/kg <0.01	DETSC 2301#



Our Ref 19-19242-1 Client Ref TA8234

Client Ref TA8234									
Contract Title Nenthead Mines - P	roposed MWT	S, GI							
			Lab No	1571226	1571227	1571228	1571229	1571230	1571231
		S	ample ID	TP123	TP126	TP127	TP128	TP128	WS101
			Depth	0.60	1.00	1.00	0.60	1.00	0.20
			Other ID	2	2	2	2	4	2
			ple Type	ES	ES	ES	ES	ES	ES
			ling Date	06/09/19	06/09/19	09/09/19	09/09/19	09/09/19	09/09/19
			ing Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	Method	LOD	Units	1.0	4.0	10	4.0	10	10
TPH Ali/Aro Total	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	< 10	< 10	< 10
Benzene	DETSC 3321#	0.01	mg/kg		< 0.01			< 0.01	
Ethylbenzene	DETSC 3321#	0.01	mg/kg		< 0.01			< 0.01	
Toluene	DETSC 3321#	0.01	mg/kg		< 0.01			< 0.01	
Xylene	DETSC 3321#	0.01	mg/kg		< 0.01			< 0.01	
PAHs	T	0.4	//	0.4	0.4	0.4	0.4	0.4	0.4
Naphthalene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	0.1	< 0.1	< 0.1
Acenaphthylene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	0.3	< 0.1	< 0.1
Fluorene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	0.3	< 0.1	< 0.1
Phenanthrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	0.8	< 0.1	0.2
Anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	0.3	< 0.1	< 0.1
Fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	0.6	< 0.1	0.1
Pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	1.3	< 0.1	0.1
Benzo(a)anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	0.3	< 0.1	< 0.1
Chrysene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	0.3	< 0.1	< 0.1
Benzo(b)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(k)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(a)pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Indeno(1,2,3-c,d)pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Dibenzo(a,h)anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(g,h,i)perylene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Coronene	DETSC 3301*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
PAH Total	DETSC 3301	1.6	mg/kg	< 1.6	< 1.6	< 1.6	4.5	< 1.6	< 1.6
Phenols							<u> </u>	<u> </u>	
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	< 0.3	< 0.3	1.1	0.4	< 0.3



Our Ref 19-19242-1 Client Ref TA8234

Lab No	1571232	1571233	1571234	1571235	1571236	1571237
Sample ID	WS101	WS102	WS102	WS103	WS104	WS105
Depth	1.00	0.50	1.00	0.50	1.00	0.50
Other ID	8	4	6	5	8	4
Sample Type	ES	ES	ES	ES	ES	ES
Sampling Date	09/09/19	13/09/19	13/09/19	12/09/19	12/09/19	11/09/19
Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s

Test	Method	LOD	Units						
Metals									
Arsenic	DETSC 2301#	0.2	mg/kg	29	49	37	12	13	15
Barium	DETSC 2301#	1.5	mg/kg	120	350	71	210	130	160
Beryllium	DETSC 2301#	0.2	mg/kg	6.1	2.2	3.8	1.8	3.2	2.1
Boron, Water Soluble	DETSC 2311#	0.2	mg/kg	< 0.2	< 0.2	0.3	< 0.2	0.2	< 0.2
Cadmium	DETSC 2301#	0.1	mg/kg	11	30	14	4.9	1.0	0.8
Chromium	DETSC 2301#	0.15	mg/kg	5.9	7.7	8.2	11	14	8.9
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	38	87	35	27	24	21
Lead	DETSC 2301#	0.3	mg/kg	1400	5300	850	890	160	550
Mercury	DETSC 2325#	0.05	mg/kg	0.15	0.72	0.31	0.11	< 0.05	< 0.05
Nickel	DETSC 2301#	1	mg/kg	64	34	32	20	18	25
Selenium	DETSC 2301#	0.5	mg/kg	0.7	1.3	0.7	< 0.5	< 0.5	< 0.5
Vanadium	DETSC 2301#	0.8	mg/kg	7.7	12	11	15	15	11
Zinc	DETSC 2301#	1	mg/kg	5100	U/S	U/S	1900	350	360
Inorganics									
pH	DETSC 2008#		рН	7.1	7.4	7.1	6.1	5.1	6.5
Cyanide, Total	DETSC 2130#	0.1	mg/kg	0.1	0.2	0.1	0.1	< 0.1	< 0.1
Cyanide, Free	DETSC 2130#	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
FOC	DETSC 2084#	0.001		0.028	0.030	0.033	0.012	0.012	0.011
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	50	56	120	44	19	27
Sulphide	DETSC 2024*	10	mg/kg	130	180	320	80	< 10	44
Sulphur as S, Total	DETSC 2320	0.01	%	0.48	0.36	1.3	0.06	0.08	0.02
Petroleum Hydrocarbons	_								
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	< 3.4	< 3.4	< 3.4	< 3.4	< 3.4	< 3.4
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	< 10	< 10	< 10
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	< 1.4	< 1.4	< 1.4	< 1.4	< 1.4	< 1.4
Aromatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	< 10	< 10	< 10



Our Ref 19-19242-1

Client Ref TA8234									
Contract Title Nenthead Mines -	Proposed MWT	S, GI							
			Lab No	1571232	1571233	1571234	1571235	1571236	1571237
		S	ample ID	WS101	WS102	WS102	WS103	WS104	WS105
			Depth	1.00	0.50	1.00	0.50	1.00	0.50
			Other ID	8	4	6	5	8	4
			ple Type	ES	ES	ES	ES	ES	ES
		-	ing Date	09/09/19	13/09/19	13/09/19	12/09/19	12/09/19	11/09/19
		-	ing Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	Method	LOD	Units		1.0		1.0		
TPH Ali/Aro Total	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	< 10	< 10	< 10
Benzene	DETSC 3321#	0.01	mg/kg		< 0.01		< 0.01		
Ethylbenzene	DETSC 3321#	0.01	mg/kg		< 0.01		< 0.01		
Toluene	DETSC 3321#	0.01	mg/kg		< 0.01		< 0.01		
Xylene	DETSC 3321#	0.01	mg/kg		< 0.01		< 0.01		
PAHs	1			[[[
Naphthalene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthylene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluorene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Phenanthrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Pyrene	DETSC 3301	0.1	mg/kg	< 0.1	0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(a)anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Chrysene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(b)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(k)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(a)pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Indeno(1,2,3-c,d)pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Dibenzo(a,h)anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(g,h,i)perylene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Coronene	DETSC 3301*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
PAH Total	DETSC 3301	1.6	mg/kg	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6
Phenols	•				•	<u>'</u>		<u>'</u>	
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3



Our Ref 19-19242-1 Client Ref TA8234

Lab No	1571238	1571239	1571240	1571241	1571242	1571243
Sample ID	WS106	WS107	WS108	WS108	WS109	WSBH101
Depth	1.00	0.50	0.50	1.00	0.20	0.20
Other ID	7	4	4	6	2	2
Sample Type	ES	ES	ES	ES	ES	ES
Sampling Date	11/09/19	11/09/19	10/09/19	10/09/19	10/09/19	09/09/19
Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s

Test	Method	LOD	Units						
Metals									
Arsenic	DETSC 2301#	0.2	mg/kg	8.6		2.6	7.6	54	97
Barium	DETSC 2301#	1.5	mg/kg	290	530	130	450	930	130
Beryllium	DETSC 2301#	0.2	mg/kg	2.1	1.5	0.5	1.9	3.1	1.1
Boron, Water Soluble	DETSC 2311#	0.2	mg/kg	0.3	0.2	< 0.2	0.3	< 0.2	< 0.2
Cadmium	DETSC 2301#	0.1	mg/kg	0.5	0.4	0.4	0.2	18	U/S
Chromium	DETSC 2301#	0.15	mg/kg	12	11	4.3	11	12	3.9
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	24	18	7.1	21	14	60
Lead	DETSC 2301#	0.3	mg/kg	68	230	130	130	970	U/S
Mercury	DETSC 2325#	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05	0.20	1.0
Nickel	DETSC 2301#	1	mg/kg	27	22	9.0	28	42	54
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	1.1	< 0.5	< 0.5	2.4	3.0
Vanadium	DETSC 2301#	0.8	mg/kg	14	13	6.1	14	16	7.8
Zinc	DETSC 2301#	1	mg/kg	280	180	100	160	4700	U/S
Inorganics									
рН	DETSC 2008#		рН	5.6	5.7	5.4	5.6	6.8	7.5
Cyanide, Total	DETSC 2130#	0.1	mg/kg	< 0.1	< 0.1	0.1	0.1	0.2	0.1
Cyanide, Free	DETSC 2130#	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
FOC	DETSC 2084#	0.001		0.017	0.012	0.005	0.012	0.021	0.038
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	16	21	39	22	24	31
Sulphide	DETSC 2024*	10	mg/kg	< 10	< 10	< 10	20	< 10	< 10
Sulphur as S, Total	DETSC 2320	0.01	%	0.02	0.02	0.01	0.04	0.08	0.10
Petroleum Hydrocarbons									
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	< 3.4	< 3.4	< 3.4	< 3.4	< 3.4	< 3.4
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	< 10	< 10	< 10
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	< 0.5			< 0.5	< 0.5	< 0.5
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	< 0.6		l	< 0.6	< 0.6	< 0.6
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	< 1.4	< 1.4		< 1.4	< 1.4	< 1.4
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Our Ref 19-19242-1 Client Ref TA8234

Client Ref TA8234 Contract Title Nenthead Mines - F	Proposed MWT	s GI							
contract rate inclined willies i	Toposca WWW	J, G.	Lab No	1571238	1571239	1571240	1571241	1571242	1571243
		Sa	ample ID	WS106	WS107	WS108	WS108		WSBH101
			Depth	1.00	0.50	0.50	1.00	0.20	0.20
			Other ID	7	4	4	6	2	2
		Sam	ple Type	ES	ES	ES	ES	ES	ES
		Sampl	ing Date	11/09/19	11/09/19	10/09/19	10/09/19	10/09/19	09/09/19
		Sampl	ing Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	Method	LOD	Units	·	·				
TPH Ali/Aro Total	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	< 10	< 10	< 10
Benzene	DETSC 3321#	0.01	mg/kg			< 0.01		< 0.01	< 0.01
Ethylbenzene	DETSC 3321#	0.01	mg/kg			< 0.01		< 0.01	< 0.01
Toluene	DETSC 3321#	0.01	mg/kg			< 0.01		< 0.01	< 0.01
Xylene	DETSC 3321#	0.01	mg/kg			< 0.01		< 0.01	< 0.01
PAHs									
Naphthalene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthylene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluorene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Phenanthrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.3
Anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.3
Pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.3
Benzo(a)anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.1
Chrysene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.1
Benzo(b)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.1
Benzo(k)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(a)pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.2
Indeno(1,2,3-c,d)pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Dibenzo(a,h)anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(g,h,i)perylene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Coronene	DETSC 3301*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
PAH Total	DETSC 3301	1.6	mg/kg	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6
Phenols	•			,	<u>'</u>	•	1		
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3



Our Ref 19-19242-1 Client Ref TA8234

Lab No	1571244	1571245	1571246	1571247	1571248	1573134
Sample ID	WSBH101	WSTP101	WSTP102	WSTP102	WSTP103	WSTP105
Depth	0.50	1.20-1.56	0.50	1.20-1.56	0.50	0.50
Other ID	5	9.1	4	9.1	5	5
Sample Type	ES	ES	ES	ES	ES	ES
Sampling Date	09/09/19	10/09/19	10/09/19	10/09/19	12/09/19	13/09/19
Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s

Method	LOD	Units						
DETSC 2301#	0.2	mg/kg		250	64	110	72	
DETSC 2301#	1.5	mg/kg	89	130	200	80	75	
DETSC 2301#	0.2	mg/kg	1.3	2.9	3.3	1.4	1.0	
DETSC 2311#	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
DETSC 2301#					16	12	48	
DETSC 2301#	0.15				2.9			
DETSC 2204*	1				< 1.0			< 1.0
DETSC 2301#	0.2							
DETSC 2301#	0.3							
DETSC 2325#	0.05							1.0
DETSC 2301#	1		39	120	67	68	33	
DETSC 2301#	0.5		2.6	3.3	0.8	2.5	1.6	
DETSC 2301#	0.8							
DETSC 2301#	1	mg/kg	U/S	U/S	U/S	U/S	U/S	
DETSC 2008#		рН	7.2	7.5	7.8	7.7	7.9	7.8
DETSC 2130#	0.1	mg/kg	0.1	0.1	< 0.1	< 0.1	0.1	0.2
DETSC 2130#	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
DETSC 2084#	0.001		0.007	0.008	0.017	0.002	0.027	0.009
DETSC 2076#	10	mg/l	180	45	32	48	96	180
DETSC 2024*	10	mg/kg	< 10	< 10	210	< 10	320	500
DETSC 2320	0.01	%	0.89	0.17	0.49	0.09	1.8	0.66
			·			·	•	
DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5
DETSC 3072#	1.2	mg/kg	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5
DETSC 3072#	3.4		< 3.4	< 3.4	< 3.4	< 3.4	< 3.4	< 3.4
DETSC 3072*	10		< 10	< 10	< 10	< 10	< 10	< 10
DETSC 3321*	0.01		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
DETSC 3321*	0.01		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
DETSC 3321*	0.01		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
							< 0.9	< 0.9
_								< 0.5
								< 0.6
								< 1.4
DETSC 3072#	1.4	mg/kgi	< 1.41	< 1.41	< 1.4	< 1.4	< 1.4	< 1.4
	DETSC 2301# DETSC 331# DETSC 3321* DETSC 3321* DETSC 3072# DETSC 3072# DETSC 3072# DETSC 3321* DETSC 3321* DETSC 3321* DETSC 3321* DETSC 3072# DETSC 3321* DETSC 3072# DETSC 3321* DETSC 3072# DETSC 3321* DETSC 3072# DETSC 3072# DETSC 3072# DETSC 3321* DETSC 3072# DETSC 3072# DETSC 3072# DETSC 3072# DETSC 3072# DETSC 3072# DETSC 3072# DETSC 3072# DETSC 3072# DETSC 3072# DETSC 3072# DETSC 3072# DETSC 3072# DETSC 3072# DETSC 3072# DETSC 3072# DETSC 3072# DETSC 3072#	DETSC 2301# 0.2 DETSC 2301# 0.2 DETSC 2301# 0.2 DETSC 2311# 0.2 DETSC 2301# 0.1 DETSC 2301# 0.15 DETSC 2301# 0.15 DETSC 2301# 0.2 DETSC 2301# 0.2 DETSC 2301# 0.2 DETSC 2301# 0.2 DETSC 2301# 0.3 DETSC 2301# 0.5 DETSC 2301# 1 DETSC 2301# 1 DETSC 2301# 0.5 DETSC 2301# 0.5 DETSC 2301# 0.5 DETSC 2301# 0.5 DETSC 2301# 0.1 DETSC 2301# 0.1 DETSC 2301# 0.1 DETSC 2008# 0.1 DETSC 2130# 0.1 DETSC 2130# 0.1 DETSC 2076# 10 DETSC 2076# 10 DETSC 2076# 10 DETSC 3321* 0.01 DETSC 3321* 0.01 DETSC 3321* 0.01 DETSC 3321* 0.01 DETSC 3072# 1.5 DETSC 3072# 1.5 DETSC 3072# 1.5 DETSC 3072# 1.5 DETSC 3321* 0.01 DETSC 3321* 0.01 DETSC 3321* 0.01 DETSC 3072# 1.5 DETSC 3072# 1.5 DETSC 3072# 1.5 DETSC 3072# 0.01 DETSC 3321* 0.01 DETSC 3321* 0.01 DETSC 3321* 0.01 DETSC 3072# 0.5 DETSC 3072# 0.9 DETSC 3072# 0.9 DETSC 3072# 0.5 DETSC 3072# 0.5 DETSC 3072# 0.5 DETSC 3072# 0.5	DETSC 2301# 0.2 mg/kg DETSC 2301# 0.2 mg/kg DETSC 2301# 0.2 mg/kg DETSC 2311# 0.2 mg/kg DETSC 2301# 0.1 mg/kg DETSC 2301# 0.15 mg/kg DETSC 2301# 0.15 mg/kg DETSC 2301# 0.2 mg/kg DETSC 2301# 0.2 mg/kg DETSC 2301# 0.3 mg/kg DETSC 2301# 0.3 mg/kg DETSC 2301# 0.3 mg/kg DETSC 2301# 0.5 mg/kg DETSC 2301# 1 mg/kg DETSC 2301# 1 mg/kg DETSC 2301# 0.5 mg/kg DETSC 2301# 0.8 mg/kg DETSC 2301# 0.8 mg/kg DETSC 2301# 0.8 mg/kg DETSC 2301# 0.1 mg/kg DETSC 2301# 0.1 mg/kg DETSC 2301# 0.1 mg/kg DETSC 2008# 0.1 mg/kg DETSC 2130# 0.1 mg/kg DETSC 2076# 10 mg/l DETSC 2076# 10 mg/l DETSC 2024* 10 mg/kg DETSC 3321* 0.01 mg/kg DETSC 3321* 0.01 mg/kg DETSC 3321* 0.01 mg/kg DETSC 3321* 0.01 mg/kg DETSC 3072# 1.5 mg/kg DETSC 3072# 1.5 mg/kg DETSC 3072# 1.5 mg/kg DETSC 3072# 1.5 mg/kg DETSC 3072# 1.0 mg/kg DETSC 3072# 1.0 mg/kg DETSC 3072# 1.0 mg/kg DETSC 3072# 1.0 mg/kg DETSC 3072# 0.01 mg/kg DETSC 3321* 0.01 mg/kg DETSC 3072# 0.01 mg/kg DETSC 3321* 0.01 mg/kg DETSC 3072# 0.01 mg/kg DETSC 3321* 0.01 mg/kg DETSC 3072# 0.01 mg/kg DETSC 3072# 0.01 mg/kg DETSC 3072# 0.01 mg/kg DETSC 3072# 0.9 mg/kg DETSC 3072# 0.9 mg/kg DETSC 3072# 0.5 mg/kg DETSC 3072# 0.5 mg/kg DETSC 3072# 0.5 mg/kg DETSC 3072# 0.6 mg/kg	DETSC 2301# 0.2 mg/kg 83	DETSC 2301#	DETSC 2301# 0.2 mg/kg 83 250 64 DETSC 2301# 1.5 mg/kg 89 130 200 DETSC 2301# 0.2 mg/kg 1.3 2.9 3.3 DETSC 2311# 0.2 mg/kg 4.0 4.0 4.0 DETSC 2301# 0.1 mg/kg 54 80 16 DETSC 2301# 0.15 mg/kg 3.3 6.2 2.9 DETSC 2301# 0.15 mg/kg 4.0 4.0 4.0 DETSC 2301# 0.2 mg/kg 110 800 34 DETSC 2301# 0.3 mg/kg 1.9 1.0 1.2 DETSC 2301# 0.5 mg/kg 3.9 120 67 DETSC 2301# 0.5 mg/kg 5.5 11 4.1 DETSC 2301# 0.8 mg/kg 5.5 11 4.1 DETSC 2301# 1 mg/kg 0.1 0.1 4.0 DETSC 2301# 1 mg/kg 4.0 4.0 4.0 DETSC 2301# 0.1 mg/kg 4.0 4.0 4.0 DETSC 2303# 0.1 mg/kg 4.0 4.0 4.0 DETSC 2304# 10 mg/kg 4.0 4.0 4.0 DETSC 2305# 10 mg/kg 4.0 4.0 4.0 DETSC 2305# 10 mg/kg 4.0 4.0 4.0 DETSC 2305# 10 mg/kg 4.0 4.0 4.0 DETSC 2305# 10 mg/kg 4.0 4.0 4.0 DETSC 2320 0.01 mg/kg 4.0 4.0 4.0 DETSC 2320 1.5 mg/kg 4.0 4.0 4.0 DETSC 3321* 0.01 mg/kg 4.0 4.0 4.0 DETSC 3321* 0.01 mg/kg 4.0 4.0 4.0 DETSC 3321* 1.5 mg/kg 4.15 4.15 4.15 DETSC 3072# 1.5 mg/kg 4.15 4.15 4.15 DETSC 3072# 1.5 mg/kg 4.15 4.15 4.15 DETSC 3072# 1.5 mg/kg 4.10 4.0 4.0 DETSC 3321* 0.01 mg/kg 4.15 4.15 4.15 DETSC 3072# 1.5 mg/kg 4.10 4.0 4.0 DETSC 3072# 1.5 mg/kg 4.10 4.0 4.0 DETSC 3072# 1.5 mg/kg 4.10 4.0 4.0 DETSC 3321* 0.01 mg/kg 4.0 4.0 4.0 DETSC 3072# 1.5 mg/kg 4.0 4.0 4.0 DETSC 3072# 1.5 mg/kg 4.0 4.0 4.0 DETSC 3321* 0.01 mg/kg 4.0 4.0 4.0 DETSC 3072# 1.5 mg/kg 4.0 4.0 4.0 DETSC 3072# 1.5 mg/kg 4.0 4.0 4.0 DETSC 3072# 0.01 mg/kg 4.0 4.0 DETSC 3072# 0.01 mg/kg 4.0 4.0 DETSC 3072# 0.01 mg/kg 4.0 4.0 DETSC 3072# 0.01 mg/kg 4.0 4.0	DETSC 2301# 0.2 mg/kg 83 250 64 110 DETSC 2301# 1.5 mg/kg 89 130 200 80 DETSC 2301# 0.2 mg/kg 1.3 2.9 3.3 1.4 DETSC 2301# 0.2 mg/kg <0.2 <0.2 <0.2 <0.2 DETSC 2301# 0.1 mg/kg 54 80 16 12 DETSC 2301# 0.15 mg/kg 3.3 6.2 2.9 5.2 DETSC 2301# 0.15 mg/kg 3.3 6.2 2.9 5.2 DETSC 2301# 0.2 mg/kg 110 800 34 240 DETSC 2301# 0.3 mg/kg U/S 8700 960 9800 DETSC 2301# 0.3 mg/kg U/S 8700 960 9800 DETSC 2301# 0.5 mg/kg 39 120 67 68 DETSC 2301# 0.5 mg/kg 2.6 3.3 0.8 2.5 DETSC 2301# 0.8 mg/kg 5.5 11 4.1 9.1 DETSC 2301# 1 mg/kg U/S U/S U/S U/S DETSC 2301# 1 mg/kg 0.1 0.1 <0.1 <0.1 DETSC 2300# 0.1 mg/kg <0.1 <0.1 <0.1 DETSC 2130# 0.1 mg/kg <0.1 <0.1 <0.1 DETSC 2084# 0.001 0.007 0.008 0.017 0.002 DETSC 2084# 10 mg/kg <10 <10 <10 <10 DETSC 2321* 0.01 mg/kg <10 <10 <10 <10 DETSC 2321* 0.01 mg/kg <10 <10 <10 <10 DETSC 3321* 0.01 mg/kg <0.01 <0.01 <0.01 <0.01 DETSC 3321* 0.01 mg/kg <0.01 <0.01 <0.01 <0.01 DETSC 3321* 0.01 mg/kg <1.5 <1.5 <1.5 DETSC 3072# 1.5 mg/kg <1.5 <1.5 <1.5 DETSC 3321* 0.01 mg/kg <1.5 <1.5 <1.5 DETSC 3321* 0.01 mg/kg <1.5 <1.5 <1.5 DETSC 3321* 0.01 mg/kg <1.5 <1.5 <1.5 DETSC 3321* 0.01 mg/kg <1.5 <1.5 <1.5 DETSC 3321* 0.01 mg/kg <1.0 <1.0 <0.01 <0.01 DETSC 3321* 0.01 mg/kg <1.5 <1.5 <1.5 DETSC 3321* 0.01 mg/kg <0.01 <0.01 <0.01 <0.01 DETSC 3321* 0.01 mg/kg <0.01 <0.01 <0.01 <0.01 DETSC 3321* 0.01 mg/kg <0.01 <0.01 <0.01 <0.01 DETSC 3321* 0.01 mg/kg <0.01 <0.01 <0.01 <0.01 DETSC 3321* 0.01 mg/kg <0.01 <0.01 <0.01 <0.01 DETSC 3321* 0.01 mg/kg <0.01 <0.01 <0.01	DETSC 2301#



Our Ref 19-19242-1

Client Ref TA8234									
Contract Title Nenthead Mines - P	roposed MWT	S, GI							
			Lab No		1571245	1571246	1571247	1571248	1573134
		Sa		WSBH101		WSTP102	WSTP102	WSTP103	WSTP105
			Depth		1.20-1.56	0.50	1.20-1.56	0.50	0.50
			Other ID	5	9.1	4	9.1	5	5
			ple Type	ES	ES	ES	ES	ES	ES
		-	ling Date		10/09/19	10/09/19	10/09/19	12/09/19	13/09/19
		-	ing Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	Method	LOD	Units	. 10	. 10	. 10	. 10	. 10	. 10
TPH Ali/Aro Total	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	< 10	< 10	< 10
Benzene	DETSC 3321#	0.01	mg/kg						
Ethylbenzene	DETSC 3321#	0.01	mg/kg						
Toluene	DETSC 3321#	0.01	mg/kg						
Xylene	DETSC 3321#	0.01	mg/kg						
PAHs	DETCC 2204	0.1		401	.01	< 0.1	.01	101	101
Naphthalene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1 < 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthylene	DETSC 3301	0.1	mg/kg						
Acenaphthene	DETSC 3301	0.1	mg/kg		< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluorene	DETSC 3301	0.1	mg/kg		< 0.1	< 0.1	< 0.1	< 0.1	< 0.1 < 0.1
Phenanthrene Anthracene	DETSC 3301 DETSC 3301	0.1	mg/kg		< 0.1 < 0.1	< 0.1 < 0.1	< 0.1	< 0.1	< 0.1
		0.1	mg/kg	< 0.1		< 0.1			
Fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1 < 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Pyrene Renze/a)anthrasana	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(a)anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Chrysene Benzo(b)fluoranthene	DETSC 3301 DETSC 3301	0.1	mg/kg mg/kg		< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(k)fluoranthene	DETSC 3301 DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(a)pyrene	DETSC 3301 DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Indeno(1,2,3-c,d)pyrene	DETSC 3301 DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Dibenzo(a,h)anthracene	+	0.1			< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
	DETSC 3301 DETSC 3301	0.1	mg/kg		< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(g,h,i)perylene Coronene	DETSC 3301*	0.1	mg/kg		< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
PAH Total	-	1.6	mg/kg			< 1.6	< 1.6	< 1.6	< 1.6
	DETSC 3301	1.6	mg/kg	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6
Phenols Rhonol Manahydria	DETCC 2420"	0.3	m = /l-	< 0.3	< 0.3	< 0.3	< 0.3	.02	-02
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3



Our Ref 19-19242-1 Client Ref TA8234

Lab No	1573135	1573136		
Sample ID	WSTP106	WSTP107		
Depth	0.50	1.00		
Other ID	4	6		
Sample Type	ES	ES		
Sampling Date	16/09/19	16/09/19		
Sampling Time	n/s	n/s		

Test	Method	LOD	Units		
Metals					
Arsenic	DETSC 2301#	0.2	mg/kg		
Barium	DETSC 2301#	1.5	mg/kg		
Beryllium	DETSC 2301#	0.2	mg/kg		
Boron, Water Soluble	DETSC 2311#	0.2	mg/kg	< 0.2	0.2
Cadmium	DETSC 2301#	0.1	mg/kg		
Chromium	DETSC 2301#	0.15	mg/kg		
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg		
Lead	DETSC 2301#	0.3	mg/kg		
Mercury	DETSC 2325#	0.05	mg/kg	0.38	1.4
Nickel	DETSC 2301#	1	mg/kg		
Selenium	DETSC 2301#	0.5	mg/kg		
Vanadium	DETSC 2301#	0.8	mg/kg		
Zinc	DETSC 2301#	1	mg/kg		
Inorganics					
рН	DETSC 2008#		рН	7.9	7.9
Cyanide, Total	DETSC 2130#	0.1	mg/kg	0.2	0.1
Cyanide, Free	DETSC 2130#	0.1	mg/kg	< 0.1	< 0.1
FOC	DETSC 2084#	0.001		0.007	0.014
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	440	190
Sulphide	DETSC 2024*	10	mg/kg	12	760
Sulphur as S, Total	DETSC 2320	0.01	%	0.39	1.3
Petroleum Hydrocarbons	•				
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2	< 1.2
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg		< 3.4
Aliphatic C5-C35	DETSC 3072*	10	mg/kg		< 10
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg		< 0.01
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg		< 0.9
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg		< 0.5
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg		< 0.6
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg		< 1.4
Aromatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10



Our Ref 19-19242-1 Client Ref TA8234

Lab No	1573135	1573136		
Sample ID	WSTP106	WSTP107		
Depth	0.50	1.00		
Other ID	4	6		
Sample Type	ES	ES		
Sampling Date	16/09/19	16/09/19		
Sampling Time	n/s	n/s		

Test	Method	LOD	Units		
TPH Ali/Aro Total	DETSC 3072*	10	mg/kg	< 10	< 10
Benzene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01
Ethylbenzene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01
Toluene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01
Xylene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01
PAHs	_				
Naphthalene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1
Acenaphthylene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1
Acenaphthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1
Fluorene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1
Phenanthrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1
Anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1
Fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1
Pyrene	DETSC 3301	0.1	mg/kg	< 0.1	0.2
Benzo(a)anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1
Chrysene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1
Benzo(b)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1
Benzo(k)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1
Benzo(a)pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1
Indeno(1,2,3-c,d)pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1
Dibenzo(a,h)anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1
Benzo(g,h,i)perylene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1
Coronene	DETSC 3301*	0.1	mg/kg	< 0.1	< 0.1
PAH Total	DETSC 3301	1.6	mg/kg	< 1.6	< 1.6
Phenols					
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	< 0.3



Our Ref 19-19242-1 Client Ref TA8234

Lab No	1571208	1571210	1571211	1571214	1571215	1571218
Sample ID	BH104	BH104	BH105	BH106	BH106	TP115
Depth	0.50	3.00	1.00	1.00	2.00	1.00
Other ID	2	12	3	4	7	2
Sample Type	ES	ES	ES	ES	ES	ES
Sampling Date	05/09/19	05/09/19	06/09/19	09/09/19	09/09/19	06/09/19
Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s

		о ар.	ing inneL	11/5	11/5	11/5	11/5	11/5	11/5
Test	Method	LOD	Units						
VOCs									
Vinyl Chloride	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,1 Dichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Trans-1,2-dichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,1-dichloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Cis-1,2-dichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
2,2-dichloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Bromochloromethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chloroform	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,1,1-trichloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,1-dichloropropene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Carbon tetrachloride	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,2-dichloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Trichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,2-dichloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Dibromomethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Bromodichloromethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
cis-1,3-dichloropropene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Toluene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
trans-1,3-dichloropropene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,1,2-trichloroethane	DETSC 3431	0.01	mg/kg	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Tetrachloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,3-dichloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Dibromochloromethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,2-dibromoethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,1,1,2-tetrachloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Ethylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
m+p-Xylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
o-Xylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Styrene	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Bromoform	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Isopropylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Bromobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,2,3-trichloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	0.01	< 0.01	< 0.01	0.01
n-propylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
2-chlorotoluene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,3,5-trimethylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
4-chlorotoluene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Tert-butylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01



Our Ref 19-19242-1 Client Ref TA8234

Contract Title Nenthead Mines - Proposed MWTS, GI												
			Lab No	1571208	1571210	1571211	1571214	1571215	1571218			
		Sa	mple ID	BH104	BH104	BH105	BH106	BH106	TP115			
			Depth	0.50	3.00	1.00	1.00	2.00	1.00			
			Other ID	2	12	3	4	7	2			
			ple Type	ES	ES	ES	ES	ES	ES			
			ing Date	05/09/19	05/09/19	06/09/19	09/09/19	09/09/19	06/09/19			
		=	ng Time	n/s	n/s	n/s	n/s	n/s	n/s			
Test	Method	LOD	Units									
1,2,4-trimethylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01			
sec-butylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01			
p-isopropyltoluene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01			
1,3-dichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01			
1,4-dichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01			
n-butylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01			
1,2-dichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01			
1,2-dibromo-3-chloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01			
1,2,4-trichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01			
Hexachlorobutadiene	DETSC 3431	0.01	mg/kg	0.01	0.01	0.01	0.01	< 0.01	0.01			
1,2,3-trichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01			
MTBE	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01			
SVOCs												
Phenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1			
Aniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1			
2-Chlorophenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1			
Benzyl Alcohol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1			
2-Methylphenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1			
Bis(2-chloroisopropyl)ether	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1			
3&4-Methylphenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1			
2,4-Dimethylphenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1			
Bis-(dichloroethoxy)methane	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1			
2,4-Dichlorophenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1			
1,2,4-Trichlorobenzene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1			
4-Chloro-3-methylphenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1			
2-Methylnaphthalene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1			
Hexachlorocyclopentadiene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1			
2,4,6-Trichlorophenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1			
2,4,5-Trichlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1			
2-Chloronaphthalene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1			
2-Nitroaniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1			
2,4-Dinitrotoluene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1			
3-Nitroaniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1			
4-Nitrophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1			
Dibenzofuran	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1			
2,6-Dinitrotoluene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1			
2,3,4,6-Tetrachlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1			
Diethylphthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1			
4-Chlorophenylphenylether	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1			
4-Nitroaniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1			
4-Nitroaniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1			



Our Ref 19-19242-1 *Client Ref* TA8234

Client Ref TA8234									
Contract Title Nenthead M	ines - Propose	d MWTS	, GI						
			Lab No	1571208	1571210	1571211	1571214	1571215	1571218
		Sa	ample ID	BH104	BH104	BH105	BH106	BH106	TP115
			Depth	0.50	3.00	1.00	1.00	2.00	1.00
	Other ID					3	4	7	2
Sample Type				ES	ES	ES	ES	ES	ES
Sampling Date			· ·	05/09/19	05/09/19	06/09/19	09/09/19	09/09/19	06/09/19
		Sampl	ing Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	Method	LOD	Units						
2-Methyl-4,6-Dinitrophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Diphenylamine	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
4-Bromophenylphenylether	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Hexachlorobenzene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Pentachlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Di-n-butylphthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Butylbenzylphthalate	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Bis(2-ethylhexyl)phthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Di-n-octylphthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
1,4-Dinitrobenzene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Dimethylphthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
1,3-Dinitrobenzene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
1,2-Dinitrobenzene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2,3,5,6-Tetrachlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Azobenzene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Carbazole	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1



Our Ref 19-19242-1 Client Ref TA8234

Lab No	1571222	1571227	1571230	1571233	1571235	1571240
Sample ID	TP118	TP126	TP128	WS102	WS103	WS108
Depth	1.00	1.00	1.00	0.50	0.50	0.50
Other ID	2	2	4	4	5	4
Sample Type	ES	ES	ES	ES	ES	ES
Sampling Date	10/09/19	06/09/19	09/09/19	13/09/19	12/09/19	10/09/19
Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s

		Sampling Time		n/s	n/s	n/s	n/s	n/s	n/s
Test	Method	LOD	Units						
VOCs									
Vinyl Chloride	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,1 Dichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Trans-1,2-dichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,1-dichloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Cis-1,2-dichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
2,2-dichloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Bromochloromethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chloroform	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,1,1-trichloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,1-dichloropropene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Carbon tetrachloride	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,2-dichloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Trichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,2-dichloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Dibromomethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Bromodichloromethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
cis-1,3-dichloropropene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Toluene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
trans-1,3-dichloropropene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,1,2-trichloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Tetrachloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,3-dichloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Dibromochloromethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,2-dibromoethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,1,1,2-tetrachloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Ethylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
m+p-Xylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
o-Xylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Styrene	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Bromoform	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Isopropylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Bromobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,2,3-trichloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
n-propylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
2-chlorotoluene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,3,5-trimethylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
4-chlorotoluene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Tert-butylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01



Our Ref 19-19242-1 Client Ref TA8234

Contract Title Nenthead Mines - Proposed MWTS, GI												
			Lab No	1571222	1571227	1571230	1571233	1571235	1571240			
		Sa	imple ID	TP118	TP126	TP128	WS102	WS103	WS108			
			Depth	1.00	1.00	1.00	0.50	0.50	0.50			
			Other ID	2	2	4	4	5	4			
			ple Type	ES	ES	ES	ES	ES	ES			
			ing Date	10/09/19	06/09/19	09/09/19	13/09/19	12/09/19	10/09/19			
		-	ing Time	n/s	n/s	n/s	n/s	n/s	n/s			
Test	Method	LOD	Units									
1,2,4-trimethylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01			
sec-butylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01			
p-isopropyltoluene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01			
1,3-dichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01			
1,4-dichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01			
n-butylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01			
1,2-dichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01			
1,2-dibromo-3-chloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01			
1,2,4-trichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01			
Hexachlorobutadiene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	0.01	< 0.01	< 0.01	0.01			
1,2,3-trichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01			
MTBE	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01			
SVOCs												
Phenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1			
Aniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1			
2-Chlorophenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1			
Benzyl Alcohol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1			
2-Methylphenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1			
Bis(2-chloroisopropyl)ether	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1			
3&4-Methylphenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1			
2,4-Dimethylphenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1			
Bis-(dichloroethoxy)methane	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1			
2,4-Dichlorophenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1			
1,2,4-Trichlorobenzene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1			
4-Chloro-3-methylphenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1			
2-Methylnaphthalene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1			
Hexachlorocyclopentadiene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1			
2,4,6-Trichlorophenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1			
2,4,5-Trichlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1			
2-Chloronaphthalene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1			
2-Nitroaniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1			
2,4-Dinitrotoluene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1			
3-Nitroaniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1			
4-Nitrophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1			
Dibenzofuran	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1			
2,6-Dinitrotoluene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1			
2,3,4,6-Tetrachlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1			
Diethylphthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1			
4-Chlorophenylphenylether	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1			
4-Nitroaniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1			
		0.1	0/ '\0	. 0.1		. 0.1	. 0.1	. 0.1	. 0.1			



Our Ref 19-19242-1 Client Ref TA8234

Client Ref TA8234											
Contract Title Nenthead Mines - Proposed MWTS, GI											
			Lab No	1571222	1571227	1571230	1571233	1571235	1571240		
		Sa	ample ID	TP118	TP126	TP128	WS102	WS103	WS108		
			Depth	1.00	1.00	1.00	0.50	0.50	0.50		
			Other ID	2	2	4	4	5	4		
			ple Type	ES	ES	ES	ES	ES	ES		
		-	ing Date	10/09/19	06/09/19	09/09/19	13/09/19	12/09/19	10/09/19		
		-	ing Time	n/s	n/s	n/s	n/s	n/s	n/s		
Test	Method	LOD	Units								
2-Methyl-4,6-Dinitrophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1		
Diphenylamine	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1		
4-Bromophenylphenylether	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1		
Hexachlorobenzene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1		
Pentachlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1		
Di-n-butylphthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1		
Butylbenzylphthalate	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1		
Bis(2-ethylhexyl)phthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1		
Di-n-octylphthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1		
1,4-Dinitrobenzene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1		
Dimethylphthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1		
1,3-Dinitrobenzene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1		
1,2-Dinitrobenzene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1		
2,3,5,6-Tetrachlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1		
Azobenzene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1		
Carbazole	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1		



Our Ref 19-19242-1 Client Ref TA8234

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Lab No	1571242	1571243	1573135	1573136
Sample ID	WS109	WSBH10	WSTP106	WSTP107
Depth	0.20	0.20	0.50	1.00
Other ID	2	2	4	6
Sample Type	ES	ES	ES	ES
Sampling Date	10/09/19	09/09/19	16/09/19	16/09/19
Sampling Time	n/s	n/s	n/s	n/s

Test	Method	LOD	Units				
VOCs							
Vinyl Chloride	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
1,1 Dichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Trans-1,2-dichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
1,1-dichloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Cis-1,2-dichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
2,2-dichloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Bromochloromethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Chloroform	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
1,1,1-trichloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
1,1-dichloropropene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Carbon tetrachloride	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Benzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
1,2-dichloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Trichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
1,2-dichloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Dibromomethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Bromodichloromethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
cis-1,3-dichloropropene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Toluene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
trans-1,3-dichloropropene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
1,1,2-trichloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Tetrachloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
1,3-dichloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Dibromochloromethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
1,2-dibromoethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Chlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
1,1,1,2-tetrachloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Ethylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
m+p-Xylene	DETSC 3431	0.01	mg/kg		< 0.01	< 0.01	< 0.01
o-Xylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Styrene	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Bromoform	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Isopropylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Bromobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
1,2,3-trichloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
n-propylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
2-chlorotoluene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
1,3,5-trimethylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
4-chlorotoluene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Tert-butylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01



Our Ref 19-19242-1 Client Ref TA8234

Contract Title Nemineau Wil	'	1571242	1571243	1573135	1573136		
		WS109	WSBH10	WSTP106	WSTP107		
			Depth	0.20	0.20	0.50	1.00
			Other ID	2	2	4	6
		Sam	ple Type	ES	ES	ES	ES
		Sampl	ing Date	10/09/19	09/09/19	16/09/19	16/09/19
		=	ing Time	n/s	n/s	n/s	n/s
Test	Method	LOD	Units				
1,2,4-trimethylbenzene	DETSC 3431	0.01	mg/kg		< 0.01		< 0.01
sec-butylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01		< 0.01
p-isopropyltoluene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
1,3-dichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
1,4-dichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
n-butylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
1,2-dichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
1,2-dibromo-3-chloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
1,2,4-trichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Hexachlorobutadiene	DETSC 3431	0.01	mg/kg	0.01	< 0.01	< 0.01	< 0.01
1,2,3-trichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
MTBE	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
SVOCs							
Phenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Aniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
2-Chlorophenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Benzyl Alcohol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
2-Methylphenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Bis(2-chloroisopropyl)ether	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
3&4-Methylphenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
2,4-Dimethylphenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Bis-(dichloroethoxy)methane	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
2,4-Dichlorophenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
1,2,4-Trichlorobenzene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
4-Chloro-3-methylphenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
2-Methylnaphthalene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Hexachlorocyclopentadiene	DETSC 3433*	0.1	mg/kg		< 0.1		< 0.1
2,4,6-Trichlorophenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1		
2,4,5-Trichlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1		< 0.1
2-Chloronaphthalene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
2-Nitroaniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
2,4-Dinitrotoluene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1		< 0.1
3-Nitroaniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
4-Nitrophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1		< 0.1
Dibenzofuran	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
2,6-Dinitrotoluene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
2,3,4,6-Tetrachlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Diethylphthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1		< 0.1
4-Chlorophenylphenylether	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1		< 0.1
4-Nitroaniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
4-Madailline	DE 13C 3433	0.1	ilig/ kg	< ∪.1	< 0.1	\ ∪.1	\ ∪.1



Our Ref 19-19242-1 Client Ref TA8234

Chent kej 1A8234											
Contract Title Nenthead Mines - Proposed MWTS, GI											
			Lab No	1571242	1571243	1573135	1573136				
		Sa	ample ID	WS109	WSBH10	WSTP106	WSTP107				
			Depth	0.20	0.20	0.50	1.00				
			Other ID	2	2	4	6				
		Sam	ple Type	ES	ES	ES	ES				
		ling Date	10/09/19	09/09/19	16/09/19	16/09/19					
		Sampl	ing Time	n/s	n/s	n/s	n/s				
Test	Method	LOD	Units								
2-Methyl-4,6-Dinitrophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1				
Diphenylamine	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1				
4-Bromophenylphenylether	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1				
Hexachlorobenzene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1				
Pentachlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1				
Di-n-butylphthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1				
Butylbenzylphthalate	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1				
Bis(2-ethylhexyl)phthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1				
Di-n-octylphthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1				
1,4-Dinitrobenzene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1				
Dimethylphthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1				
1,3-Dinitrobenzene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1				
1,2-Dinitrobenzene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1				
2,3,5,6-Tetrachlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1				
Azobenzene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1				
Carbazole	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1				



Our Ref 19-19242-1 Client Ref TA8234

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Lab No	1571249	1571250	1571251	1571252	1571253	1571254
Sample ID	BH104	BH104	BH105	BH106	BH106	TP115
Depth	0.50	3.00	1.00	1.00	2.00	1.00
Other ID	2	12	3	4	7	2
Sample Type	ES	ES	ES	ES	ES	ES
Sampling Date	05/09/19	05/09/19	06/09/19	09/09/19	09/09/19	06/09/19
Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s

Test	Method	LOD	Units						
Preparation									
Leachate 2:1 250g Non-WAC	DETSC 1009*			Υ	Υ	Υ	Υ	Υ	Υ
Metals									_
Arsenic, Dissolved	DETSC 2306	0.16	ug/l	< 0.16	0.20	< 0.16	0.20	0.20	< 0.16
Barium, Dissolved	DETSC 2306	0.26	ug/l	6.7	11	2.5	3.3	2.9	1.6
Beryllium, Dissolved	DETSC 2306*	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Boron, Dissolved	DETSC 2306*	12	ug/l	< 12	< 12	< 12	< 12	< 12	< 12
Cadmium, Dissolved	DETSC 2306	0.03	ug/l	< 0.03	0.07	< 0.03	< 0.03	< 0.03	< 0.03
Chromium, Dissolved	DETSC 2306	0.25	ug/l	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25
Chromium, Hexavalent	DETSC 2203	0.007	mg/l	< 0.007	< 0.007	< 0.007	< 0.007	< 0.007	< 0.007
Copper, Dissolved	DETSC 2306	0.4	ug/l	< 0.4	0.8	< 0.4	0.5	0.4	< 0.4
Lead, Dissolved	DETSC 2306	0.09	ug/l	< 0.09	< 0.09	0.10	2.2	1.0	0.50
Mercury, Dissolved	DETSC 2306	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Nickel, Dissolved	DETSC 2306	0.5	ug/l	< 0.5	6.3	0.8	1.3	< 0.5	< 0.5
Selenium, Dissolved	DETSC 2306	0.25	ug/l	< 0.25	2.0	< 0.25	< 0.25	< 0.25	< 0.25
Vanadium, Dissolved	DETSC 2306	0.6	ug/l	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6
Zinc, Dissolved	DETSC 2306	1.3	ug/l	5.7	15	12	12	5.1	5.2
Inorganics									<u></u>
Conductivity	DETSC 2009	1	uS/cm	13.4	76.2	10.7	10.9	10.9	7.7
рН	DETSC 2008		рН	7.1	6.2	6.3	5.8	7.4	7.1
Cyanide, Total	DETSC 2130	40	ug/l	< 40	< 40	< 40	< 40	< 40	< 40
Cyanide, Free	DETSC 2130	0.02	mg/l	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Ammoniacal Nitrogen as N	DETSC 2207	0.015	mg/l	< 0.015	0.018	< 0.015	< 0.015	< 0.015	< 0.015
Chloride	DETSC 2055	0.1	mg/l	1.3	1.3	1.2	1.4	1.3	1.2
Nitrate as N	*	0.1	mg/l	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Sulphate as SO4	DETSC 2055	0.1	mg/l	1.4	25	1.1	2.5	1.6	1.1
Sulphide	DETSC 2208	10	ug/l	< 10	< 10	< 10	< 10	< 10	< 10
Sulphur as S, Total	DETSC 2320*	10	mg/l	< 10	12	< 10	< 10	< 10	< 10
Petroleum Hydrocarbons									<u></u>
Aliphatic C5-C6	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C6-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0	2.2	< 1.0	< 1.0	< 1.0
Aliphatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0	4.7	< 1.0	< 1.0	< 1.0
Aliphatic C16-C21	DETSC 3072*	1	ug/l	5.7	< 1.0	7.2	< 1.0	< 1.0	5.4
Aliphatic C21-C35	DETSC 3072*	1	ug/l	1.3	8.6	14	< 1.0	< 1.0	< 1.0
Aliphatic C5-C35	DETSC 3072*	10	ug/l	< 10	< 10	28	< 10	< 10	< 10
Aromatic C5-C7	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C7-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1



Our Ref 19-19242-1 Client Ref TA8234

Contract Title Nenthead Mines - Proposed MWTS, GI											
			Lab No	1571249	1571250	1571251	1571252	1571253	1571254		
		Sa	ample ID	BH104	BH104	BH105	BH106	BH106	TP115		
			Depth	0.50	3.00	1.00	1.00	2.00	1.00		
			Other ID	2	12	3	4	7	2		
			ple Type	ES	ES	ES	ES	ES	ES		
		_	ing Date	05/09/19	05/09/19	06/09/19	09/09/19	09/09/19	06/09/19		
			ing Time	n/s	n/s	n/s	n/s	n/s	n/s		
Test	Method	LOD	Units								
Aromatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0		
Aromatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0		
Aromatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0		
Aromatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0		
Aromatic C5-C35	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10	< 10	< 10		
TPH Ali/Aro Total	DETSC 3072*	10	ug/l	< 10	< 10	28	< 10	< 10	< 10		
PAHs			1	1		1					
Naphthalene	DETSC 3304	0.05	ug/l	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05		
Acenaphthylene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		
Acenaphthene	DETSC 3304	0.01	ug/l	< 0.01	0.01	< 0.01	< 0.01	< 0.01	< 0.01		
Fluorene	DETSC 3304	0.01	ug/l	< 0.01	0.02	< 0.01	< 0.01	< 0.01	< 0.01		
Phenanthrene	DETSC 3304	0.01	ug/l	0.02	0.03	0.01	0.05	0.03	< 0.01		
Anthracene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		
Fluoranthene	DETSC 3304	0.01	ug/l	0.02	0.01	< 0.01	0.03	0.03	0.01		
Pyrene	DETSC 3304	0.01	ug/l	0.01	< 0.01	< 0.01	0.02	0.02	< 0.01		
Benzo(a)anthracene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	0.01	< 0.01	< 0.01		
Chrysene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	0.01	< 0.01	< 0.01		
Benzo(b)fluoranthene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	0.02	0.01	< 0.01		
Benzo(k)fluoranthene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		
Benzo(a)pyrene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		
Indeno(1,2,3-c,d)pyrene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		
Dibenzo(a,h)anthracene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		
Benzo(g,h,i)perylene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		
Coronene	DETSC 3304*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		
PAH Total	DETSC 3304	0.2	ug/l	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20		
Phenols											
Phenol - Monohydric	DETSC 2130	0.1	mg/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1		



Our Ref 19-19242-1 Client Ref TA8234

Lab No	1571255	1571256	1571257	1571258	1571259	1571260
Sample ID	TP118	TP126	TP128	WS102	WS103	WS108
Depth	1.00	1.00	1.00	0.50	0.50	0.50
Other ID	2	2	4	4	5	4
Sample Type	ES	ES	ES	ES	ES	ES
Sampling Date	10/09/19	06/09/19	09/09/19	13/09/19	12/09/19	10/09/19
Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s

		•	ing Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	Method	LOD	Units						
Preparation									
Leachate 2:1 250g Non-WAC	DETSC 1009*			Υ	Υ	Υ	Υ	Υ	Υ
Metals									
Arsenic, Dissolved	DETSC 2306	0.16	ug/l	< 0.16	< 0.16	0.90	0.40	< 0.16	0.30
Barium, Dissolved	DETSC 2306	0.26	ug/l	1.8	5.2	17	46	7.7	7.5
Beryllium, Dissolved	DETSC 2306*	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Boron, Dissolved	DETSC 2306*	12	ug/l	< 12	< 12	< 12	< 12	< 12	< 12
Cadmium, Dissolved	DETSC 2306	0.03	ug/l	< 0.03	< 0.03	< 0.03	0.60	< 0.03	< 0.03
Chromium, Dissolved	DETSC 2306	0.25	ug/l	< 0.25	0.90	0.80	0.30	< 0.25	0.40
Chromium, Hexavalent	DETSC 2203	0.007	mg/l	< 0.007	< 0.007	< 0.007	< 0.007	< 0.007	< 0.007
Copper, Dissolved	DETSC 2306	0.4	ug/l	< 0.4	0.6	2.1	1.5	< 0.4	1.4
Lead, Dissolved	DETSC 2306	0.09	ug/l	0.20	0.10	0.90	3.6	2.1	6.8
Mercury, Dissolved	DETSC 2306	0.01	ug/l	< 0.01	< 0.01	< 0.01	0.02	< 0.01	< 0.01
Nickel, Dissolved	DETSC 2306	0.5	ug/l	< 0.5	< 0.5	1.0	< 0.5	0.5	1.6
Selenium, Dissolved	DETSC 2306	0.25	ug/l	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25
Vanadium, Dissolved	DETSC 2306	0.6	ug/l	< 0.6	< 0.6	1.4	< 0.6	< 0.6	0.6
Zinc, Dissolved	DETSC 2306	1.3	ug/l	5.1	10	16	140	37	23
Inorganics									
Conductivity	DETSC 2009	1	uS/cm	8.5	90.8	47.8	141	13.5	9.0
рН	DETSC 2008		рН	6.7	6.4	7.0	6.9	7.1	6.9
Cyanide, Total	DETSC 2130	40	ug/l	< 40	< 40	< 40	< 40	< 40	< 40
Cyanide, Free	DETSC 2130	0.02	mg/l	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Ammoniacal Nitrogen as N	DETSC 2207	0.015	mg/l	< 0.015	< 0.015	0.090	0.060	0.040	0.030
Chloride	DETSC 2055	0.1	mg/l	1.4	2.5	1.7	13	1.3	1.3
Nitrate as N	*	0.1	mg/l	0.17	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Sulphate as SO4	DETSC 2055	0.1	mg/l	1.4	30	12	14	1.9	1.9
Sulphide	DETSC 2208	10	ug/l	< 10	< 10	< 10	< 10	< 10	< 10
Sulphur as S, Total	DETSC 2320*	10	mg/l	< 10	11	< 10	< 10	< 10	< 10
Petroleum Hydrocarbons		•	•		•			·	
Aliphatic C5-C6	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C6-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
· ·	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C5-C35	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10	< 10	< 10
· ·	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1



Our Ref 19-19242-1 Client Ref TA8234

Contract Title Nenthead I	Mines - Propose	d MWTS	, GI _						
			Lab No	1571255	1571256	1571257	1571258	1571259	1571260
		Sa	mple ID	TP118	TP126	TP128	WS102	WS103	WS108
			Depth	1.00	1.00	1.00	0.50	0.50	0.50
			Other ID	2	2	4	4	5	4
			ple Type	ES	ES	ES	ES	ES	ES
		-	ing Date	10/09/19	06/09/19	09/09/19	13/09/19	12/09/19	10/09/19
			ing Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	Method	LOD	Units						
Aromatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C5-C35	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10	< 10	< 10
TPH Ali/Aro Total	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10	< 10	< 10
PAHs									
Naphthalene	DETSC 3304	0.05	ug/l	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.02
Fluorene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.02
Phenanthrene	DETSC 3304	0.01	ug/l	0.02	0.02	< 0.01	0.05	0.03	0.05
Anthracene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	0.02	< 0.01	0.02
Fluoranthene	DETSC 3304	0.01	ug/l	0.02	< 0.01	0.02	0.03	0.05	0.05
Pyrene	DETSC 3304	0.01	ug/l	0.01	< 0.01	0.02	0.02	0.04	0.03
Benzo(a)anthracene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	0.01	0.01	< 0.01
Chrysene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	0.01	0.03	0.02	0.02
Benzo(b)fluoranthene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	0.02	0.05	0.02	0.02
Benzo(k)fluoranthene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	0.02	< 0.01	< 0.01
Benzo(a)pyrene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	0.02	< 0.01	< 0.01
Indeno(1,2,3-c,d)pyrene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	0.02	< 0.01	< 0.01
Dibenzo(a,h)anthracene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(g,h,i)perylene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	0.01	0.03	0.01	0.01
Coronene	DETSC 3304*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
PAH Total	DETSC 3304	0.2	ug/l	< 0.20	< 0.20	< 0.20	0.31	< 0.20	0.27
Phenols	•	· · · · · · · · · · · · · · · · · · ·			l.	<u> </u>	<u> </u>	<u> </u>	
Phenol - Monohydric	DETSC 2130	0.1	mg/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
•			<u> </u>						



Our Ref 19-19242-1 Client Ref TA8234

Lab No	1571261	1571262	1573137	1573138
Sample ID	WS109	WSBH10	WSTP106	WSTP107
Depth	0.20	0.20	0.50	1.00
Other ID	2	2	4	6
Sample Type	ES	ES	ES	ES
Sampling Date	10/09/19	09/09/19	16/09/19	16/09/19
Sampling Time	n/s	n/s	n/s	n/s

Sampling time				11/5	11/5	11/5	11/5
Test	Method	LOD	Units				
Preparation							
Leachate 2:1 250g Non-WAC	DETSC 1009*			Υ	Υ	Υ	Υ
Metals			-				
Arsenic, Dissolved	DETSC 2306	0.16	ug/l	1.2	0.20	< 0.16	< 0.16
Barium, Dissolved	DETSC 2306	0.26	ug/l	13	21	20	19
Beryllium, Dissolved	DETSC 2306*	0.1	ug/l	0.1	< 0.1	< 0.1	< 0.1
Boron, Dissolved	DETSC 2306*	12	ug/l	< 12	< 12	< 12	< 12
Cadmium, Dissolved	DETSC 2306	0.03	ug/l	0.30	1.3	3.1	2.2
Chromium, Dissolved	DETSC 2306	0.25	ug/l	0.30	< 0.25	< 0.25	< 0.25
Chromium, Hexavalent	DETSC 2203	0.007	mg/l	< 0.007	< 0.007	< 0.007	< 0.007
Copper, Dissolved	DETSC 2306	0.4	ug/l	1.1	1.1	1.2	0.9
Lead, Dissolved	DETSC 2306	0.09	ug/l	10	7.0	7.2	3.1
Mercury, Dissolved	DETSC 2306	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01
Nickel, Dissolved	DETSC 2306	0.5	ug/l	0.8	1.2	0.6	< 0.5
Selenium, Dissolved	DETSC 2306	0.25	ug/l	< 0.25	< 0.25	< 0.25	< 0.25
Vanadium, Dissolved	DETSC 2306	0.6	ug/l	< 0.6	< 0.6	1.9	0.8
Zinc, Dissolved	DETSC 2306	1.3	ug/l	230	440	320	310
Inorganics							
Conductivity	DETSC 2009	1	uS/cm	33.8	55.2	314	83.3
рН	DETSC 2008		рН	6.5	7.5	6.3	6.6
Cyanide, Total	DETSC 2130	40	ug/l	< 40	< 40	< 40	< 40
Cyanide, Free	DETSC 2130	0.02	mg/l	< 0.02	< 0.02	< 0.02	< 0.02
Ammoniacal Nitrogen as N	DETSC 2207	0.015	mg/l	0.040	0.050	0.35	0.33
Chloride	DETSC 2055	0.1	mg/l	1.7	1.4	0.92	1.2
Nitrate as N	*	0.1	mg/l	< 0.10	< 0.10	0.13	0.19
Sulphate as SO4	DETSC 2055	0.1	mg/l	3.6	5.7	140	20
Sulphide	DETSC 2208	10	ug/l	< 10	< 10	< 10	< 10
Sulphur as S, Total	DETSC 2320*	10	mg/l	< 10	< 10	51	11
Petroleum Hydrocarbons			<u> </u>				
Aliphatic C5-C6	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C6-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C12-C16	DETSC 3072*	1	ug/l		< 1.0	< 1.0	< 1.0
Aliphatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C5-C35	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10
Aromatic C5-C7	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C7-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C8-C10	+				< 0.1		
ALOHIALIC CO-CIO	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1



Our Ref 19-19242-1 Client Ref TA8234

Contract Title Nenthead Mines - Proposed MWTS, GI										
			Lab No	1571261	1571262	1573137	1573138			
		Sa	ample ID	WS109	WSBH10	WSTP106	WSTP107			
			Depth	0.20	0.20	0.50	1.00			
			Other ID	2	2	4	6			
			ple Type	ES	ES	ES	ES			
		-	ing Date	10/09/19	09/09/19	16/09/19	16/09/19			
		-	ing Time	n/s	n/s	n/s	n/s			
Test	Method	LOD	Units							
Aromatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0			
Aromatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0			
Aromatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0			
Aromatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0			
Aromatic C5-C35	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10			
TPH Ali/Aro Total	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10			
PAHs										
Naphthalene	DETSC 3304	0.05	ug/l	< 0.05	< 0.05	< 0.05	< 0.05			
Acenaphthylene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01			
Acenaphthene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01			
Fluorene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01			
Phenanthrene	DETSC 3304	0.01	ug/l	0.02	0.07	< 0.01	0.02			
Anthracene	DETSC 3304	0.01	ug/l	< 0.01	0.02	< 0.01	< 0.01			
Fluoranthene	DETSC 3304	0.01	ug/l	0.02	0.06	< 0.01	0.03			
Pyrene	DETSC 3304	0.01	ug/l	< 0.01	0.04	< 0.01	0.03			
Benzo(a)anthracene	DETSC 3304	0.01	ug/l	< 0.01	0.02	< 0.01	< 0.01			
Chrysene	DETSC 3304	0.01	ug/l	< 0.01	0.05	< 0.01	0.01			
Benzo(b)fluoranthene	DETSC 3304	0.01	ug/l	< 0.01	0.06	< 0.01	< 0.01			
Benzo(k)fluoranthene	DETSC 3304	0.01	ug/l	< 0.01	0.02	< 0.01	< 0.01			
Benzo(a)pyrene	DETSC 3304	0.01	ug/l	< 0.01	0.01	< 0.01	< 0.01			
Indeno(1,2,3-c,d)pyrene	DETSC 3304	0.01	ug/l	< 0.01	0.02	< 0.01	< 0.01			
Dibenzo(a,h)anthracene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01			
Benzo(g,h,i)perylene	DETSC 3304	0.01	ug/l	< 0.01	0.03	< 0.01	< 0.01			
Coronene	DETSC 3304*	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01			
PAH Total	DETSC 3304	0.2	ug/l	< 0.20	0.44	< 0.20	< 0.20			
Phenols										
Phenol - Monohydric	DETSC 2130	0.1	mg/l	< 0.1	< 0.1	< 0.1	< 0.1			



Summary of Asbestos Analysis Soil Samples

Our Ref 19-19242-1 Client Ref TA8234

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
1571208	BH104 2 0.50	SOIL	NAD	none	Colin Patrick
1571209	BH104 8 2.00	SOIL	NAD	none	Colin Patrick
1571210	BH104 12 3.00	SOIL	NAD	none	Colin Patrick
1571211	BH105 3 1.00	SOIL	NAD	none	Colin Patrick
1571212	BH105 7 2.00	SOIL	NAD	none	Colin Patrick
1571213	BH105 10 3.00	SOIL	NAD	none	Colin Patrick
1571214	BH106 4 1.00	SOIL	NAD	none	Colin Patrick
1571215	BH106 7 2.00	SOIL	NAD	none	Colin Patrick
1571216	BH106 11 3.00	SOIL	NAD	none	Colin Patrick
1571217	TP113 2 1.00	SOIL	NAD	none	Colin Patrick
1571218	TP115 2 1.00	SOIL	NAD	none	Colin Patrick
1571219	TP115 4 1.20	SOIL	NAD	none	Colin Patrick
1571220	TP116 2 1.00	SOIL	NAD	none	Colin Patrick
1571221	TP117 2 1.00	SOIL	NAD	none	Colin Patrick
1571222	TP118 2 1.00	SOIL	NAD	none	Colin Patrick
1571223	TP119 2 0.80	SOIL	NAD	none	Colin Patrick
1571224	TP120 2 1.00	SOIL	NAD	none	Colin Patrick
1571225	TP122 2 0.80	SOIL	NAD	none	Colin Patrick
1571226	TP123 2 0.60	SOIL	NAD	none	Colin Patrick
1571227	TP126 2 1.00	SOIL	NAD	none	Colin Patrick
1571228	TP127 2 1.00	SOIL	NAD	none	Colin Patrick
1571229	TP128 2 0.60	SOIL	NAD	none	Colin Patrick
1571230	TP128 4 1.00	SOIL	NAD	none	Colin Patrick
1571231	WS101 2 0.20	SOIL	NAD	none	Colin Patrick
1571232	WS101 8 1.00	SOIL	NAD	none	Colin Patrick
1571233	WS102 4 0.50	SOIL	NAD	none	Colin Patrick
1571234	WS102 6 1.00	SOIL	NAD	none	Colin Patrick
1571235	WS103 5 0.50	SOIL	NAD	none	Colin Patrick
1571236	WS104 8 1.00	SOIL	NAD	none	Colin Patrick
1571237	WS105 4 0.50	SOIL	NAD	none	Colin Patrick
1571238	WS106 7 1.00	SOIL	NAD	none	Colin Patrick
1571239	WS107 4 0.50	SOIL	NAD	none	Colin Patrick
1571240	WS108 4 0.50	SOIL	NAD	none	Colin Patrick
1571241	WS108 6 1.00	SOIL	NAD	none	Colin Patrick
1571242	WS109 2 0.20	SOIL	NAD	none	Colin Patrick
1571243	WSBH101R 2 0.20	SOIL	NAD	none	Colin Patrick
1571244	WSBH101R 5 0.50	SOIL	NAD	none	Colin Patrick
1571245	WSTP101 9.1 1.20-1.56	SOIL	NAD	none	Colin Patrick
1571246	WSTP102 4 0.50	SOIL	NAD	none	Colin Patrick
1571247	WSTP102 9.1 1.20-1.56	SOIL	NAD	none	Colin Patrick
1571248	WSTP103 5 0.50	SOIL	NAD	none	Colin Patrick
1573134	WSTP105 5 0.50	SOIL	NAD	none	Colin Patrick
1573135	WSTP106 4 0.50	SOIL	NAD	none	Colin Patrick
1573136	WSTP107 6 1.00	SOIL	NAD	none	Colin Patrick



Summary of Asbestos Analysis Soil Samples

Our Ref 19-19242-1 Client Ref TA8234

Contract Title Nenthead Mines - Proposed MWTS, GI

Lab No Sample ID Material Type Result Comment* Analyst

Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: * not included in laboratory scope of accreditation.



Information in Support of the Analytical Results

Our Ref 19-19242-1 Client Ref TA8234

Contract Nenthead Mines - Proposed MWTS, GI

Containers Received & Deviating Samples

Date						
Lab No	Sample ID	Sampled	Containers Received	Holding time exceeded for tests	tests	
1571208	BH104 0.50 SOIL	05/09/19	GJ 250ml, GJ 60ml x2, PT 1L	Aliphatics/Aromatics (14 days), BTEX (14 days), Naphthalene (14 days), PAH FID (14 days), pH + Conductivity (7 days), Cyanide/Mono pHoh (14 days), SVOC (14 days)		
1571209	BH104 2.00 SOIL	05/09/19	GJ 250ml, GJ 60ml, PT 1L	Aliphatics/Aromatics (14 days), BTEX (14 days), Naphthalene (14 days), PAH FID (14 days), pH + Conductivity (7 days), Cyanide/Mono pHoh (14 days)		
1571210	BH104 3.00 SOIL	05/09/19	GJ 250ml, GJ 60ml, PT 1L	Aliphatics/Aromatics (14 days), BTEX (14 days), Naphthalene (14 days), PAH FID (14 days), pH + Conductivity (7 days), Cyanide/Mono pHoh (14 days), SVOC (14 days)		
1571211	BH105 1.00 SOIL	06/09/19	GJ 250ml, GJ 60ml, PT 1L	Aliphatics/Aromatics (14 days), BTEX (14 days), Naphthalene (14 days), PAH FID (14 days), pH + Conductivity (7 days), Cyanide/Mono pHoh (14 days), SVOC (14 days)		
1571212	BH105 2.00 SOIL	06/09/19	GJ 250ml, GJ 60ml, PT 1L	Aliphatics/Aromatics (14 days), BTEX (14 days), Naphthalene (14 days), PAH FID (14 days), pH + Conductivity (7 days), Cyanide/Mono pHoh (14 days)		
1571213	BH105 3.00 SOIL	06/09/19	GJ 250ml, GJ 60ml, PT 1L	Aliphatics/Aromatics (14 days), BTEX (14 days), Naphthalene (14 days), PAH FID (14 days), pH + Conductivity (7 days), Cyanide/Mono pHoh (14 days)		
1571214	BH106 1.00 SOIL	09/09/19	GJ 250ml, GJ 60ml, PT 1L	Aliphatics/Aromatics (14 days), BTEX (14 days), Naphthalene (14 days), PAH FID (14 days), pH + Conductivity (7 days), Cyanide/Mono pHoh (14 days), SVOC (14 days)		
1571215	BH106 2.00 SOIL	09/09/19	GJ 250ml, GJ 60ml, PT 1L	Aliphatics/Aromatics (14 days), BTEX (14 days), Naphthalene (14 days), PAH FID (14 days), pH + Conductivity (7 days), Cyanide/Mono pHoh (14 days), SVOC (14 days)		
1571216	BH106 3.00 SOIL	09/09/19	GJ 250ml, GJ 60ml, PT 1L	Aliphatics/Aromatics (14 days), BTEX (14 days), Naphthalene (14 days), PAH FID (14 days), pH + Conductivity (7 days), Cyanide/Mono pHoh (14 days)		
1571217	TP113 1.00 SOIL	09/09/19	GJ 250ml, GJ 60ml, PT 1L	Aliphatics/Aromatics (14 days), BTEX (14 days), Naphthalene (14 days), PAH FID (14 days), pH + Conductivity (7 days), Cyanide/Mono pHoh (14 days)		
1571218	TP115 1.00 SOIL	06/09/19	GJ 250ml, GJ 60ml, PT 1L	Aliphatics/Aromatics (14 days), BTEX (14 days), Naphthalene (14 days), PAH FID (14 days), pH + Conductivity (7 days), Cyanide/Mono pHoh (14 days), SVOC (14 days)		
1571219	TP115 1.20 SOIL	06/09/19	GJ 250ml, GJ 60ml, PT 1L	Aliphatics/Aromatics (14 days), BTEX (14 days), Naphthalene (14 days), PAH FID (14 days), pH + Conductivity (7 days), Cyanide/Mono pHoh (14 days)		



Inappropriate

Information in Support of the Analytical Results

Our Ref 19-19242-1 Client Ref TA8234

		Date			container for
Lab No	Sample ID	Sampled	Containers Received	Holding time exceeded for tests	tests
1571220	TP116 1.00 SOIL	10/09/19	GJ 250ml, GJ 60ml, PT 1L	Aliphatics/Aromatics (14 days), BTEX (14 days), Naphthalene (14 days), PAH FID (14 days), pH + Conductivity (7 days), Cyanide/Mono pHoh (14 days)	
1571221	TP117 1.00 SOIL	10/09/19	GJ 250ml, GJ 60ml, PT 1L	Aliphatics/Aromatics (14 days), BTEX (14 days), Naphthalene (14 days), PAH FID (14 days), pH + Conductivity (7 days), Cyanide/Mono pHoh (14 days)	
1571222	TP118 1.00 SOIL	10/09/19	GJ 250ml, GJ 60ml, PT 1L	Aliphatics/Aromatics (14 days), BTEX (14 days), Naphthalene (14 days), PAH FID (14 days), pH + Conductivity (7 days), Cyanide/Mono pHoh (14 days), SVOC (14 days)	
1571223	TP119 0.80 SOIL	10/09/19	GJ 250ml, GJ 60ml, PT 1L	Aliphatics/Aromatics (14 days), BTEX (14 days), Naphthalene (14 days), PAH FID (14 days), pH + Conductivity (7 days), Cyanide/Mono pHoh (14 days)	
1571224	TP120 1.00 SOIL	09/09/19	GJ 250ml, GJ 60ml, PT 1L	Aliphatics/Aromatics (14 days), BTEX (14 days), Naphthalene (14 days), PAH FID (14 days), pH + Conductivity (7 days), Cyanide/Mono pHoh (14 days)	
1571225	TP122 0.80 SOIL	09/09/19	GJ 250ml, GJ 60ml, PT 1L	Aliphatics/Aromatics (14 days), BTEX (14 days), Naphthalene (14 days), PAH FID (14 days), pH + Conductivity (7 days), Cyanide/Mono pHoh (14 days)	
1571226	TP123 0.60 SOIL	06/09/19	GJ 250ml, GJ 60ml, PT 1L	Aliphatics/Aromatics (14 days), BTEX (14 days), Naphthalene (14 days), PAH FID (14 days), pH + Conductivity (7 days), Cyanide/Mono pHoh (14 days)	
1571227	TP126 1.00 SOIL	06/09/19	GJ 250ml, GJ 60ml, PT 1L	Aliphatics/Aromatics (14 days), BTEX (14 days), Naphthalene (14 days), PAH FID (14 days), pH + Conductivity (7 days), Cyanide/Mono pHoh (14 days), SVOC (14 days)	
1571228	TP127 1.00 SOIL	09/09/19	GJ 250ml, GJ 60ml, PT 1L	Aliphatics/Aromatics (14 days), BTEX (14 days), Naphthalene (14 days), PAH FID (14 days), pH + Conductivity (7 days), Cyanide/Mono pHoh (14 days)	
1571229	TP128 0.60 SOIL	09/09/19	GJ 250ml, GJ 60ml, PT 1L	Aliphatics/Aromatics (14 days), BTEX (14 days), Naphthalene (14 days), PAH FID (14 days), pH + Conductivity (7 days), Cyanide/Mono pHoh (14 days)	
1571230	TP128 1.00 SOIL	09/09/19	GJ 250ml, GJ 60ml, PT 1L	Aliphatics/Aromatics (14 days), BTEX (14 days), Naphthalene (14 days), PAH FID (14 days), pH + Conductivity (7 days), Cyanide/Mono pHoh (14 days), SVOC (14 days)	
1571231	WS101 0.20 SOIL	09/09/19	GJ 250ml, GJ 60ml, PT 1L	Aliphatics/Aromatics (14 days), BTEX (14 days), Naphthalene (14 days), PAH FID (14 days), pH + Conductivity (7 days), Cyanide/Mono pHoh (14 days)	
1571232	WS101 1.00 SOIL	09/09/19	GJ 250ml, GJ 60ml, PT 1L	Aliphatics/Aromatics (14 days), BTEX (14 days), Naphthalene (14 days), PAH FID (14 days), pH + Conductivity (7 days), Cyanide/Mono pHoh (14 days)	
1571233	WS102 0.50 SOIL	13/09/19	GJ 250ml, GJ 60ml, PT 1L	pH + Conductivity (7 days), VOC (7 days)	



Inappropriate

Information in Support of the Analytical Results

Our Ref 19-19242-1 Client Ref TA8234

		Date			container for
Lab No	Sample ID	Sampled	Containers Received	Holding time exceeded for tests	tests
1571234	WS102 1.00 SOIL	13/09/19	GJ 250ml, GJ 60ml, PT 1L	pH + Conductivity (7 days)	10010
1571235	WS103 0.50 SOIL	12/09/19	GJ 250ml, GJ 60ml, PT 1L	Aliphatics/Aromatics (14 days), BTEX (14 days),	
				Naphthalene (14 days), PAH FID (14 days), pH +	
				Conductivity (7 days), Cyanide/Mono pHoh (14	
				days), SVOC (14 days)	
1571236	WS104 1.00 SOIL	12/09/19	GJ 250ml, GJ 60ml, PT 1L	Aliphatics/Aromatics (14 days), BTEX (14 days),	
				Naphthalene (14 days), PAH FID (14 days), pH +	
				Conductivity (7 days), Cyanide/Mono pHoh (14 days)	
1571237	WS105 0.50 SOIL	11/09/19	GJ 250ml, GJ 60ml, PT 1L	Aliphatics/Aromatics (14 days), BTEX (14 days),	
ì				Naphthalene (14 days), PAH FID (14 days), pH +	
				Conductivity (7 days), Cyanide/Mono pHoh (14 days)	
1571238	WS106 1.00 SOIL	11/09/19	GJ 250ml, GJ 60ml, PT 1L	Aliphatics/Aromatics (14 days), BTEX (14 days),	
i				Naphthalene (14 days), PAH FID (14 days), pH +	
				Conductivity (7 days), Cyanide/Mono pHoh (14 days)	
1571239	WS107 0.50 SOIL	11/09/19	GJ 250ml, GJ 60ml, PT 1L	Aliphatics/Aromatics (14 days), BTEX (14 days),	
				Naphthalene (14 days), PAH FID (14 days), pH +	
				Conductivity (7 days), Cyanide/Mono pHoh (14 days)	
1571240	WS108 0.50 SOIL	10/09/19	GJ 250ml, GJ 60ml, PT 1L	Aliphatics/Aromatics (14 days), BTEX (14 days),	
				Naphthalene (14 days), PAH FID (14 days), pH +	
				Conductivity (7 days), Cyanide/Mono pHoh (14	
				days), SVOC (14 days)	
1571241	WS108 1.00 SOIL	10/09/19	GJ 250ml, GJ 60ml, PT 1L	Aliphatics/Aromatics (14 days), BTEX (14 days),	
				Naphthalene (14 days), PAH FID (14 days), pH +	
				Conductivity (7 days), Cyanide/Mono pHoh (14 days)	
1571242	WS109 0.20 SOIL	10/09/19	GJ 250ml, GJ 60ml, PT 1L	Aliphatics/Aromatics (14 days), BTEX (14 days),	
				Naphthalene (14 days), PAH FID (14 days), pH +	
				Conductivity (7 days), Cyanide/Mono pHoh (14	
				days), SVOC (14 days)	
1571243	WSBH101R 0.20 SOIL	09/09/19	GJ 250ml, GJ 60ml, PT 1L	Aliphatics/Aromatics (14 days), BTEX (14 days),	
				Naphthalene (14 days), PAH FID (14 days), pH +	
				Conductivity (7 days), Cyanide/Mono pHoh (14	
				days), SVOC (14 days)	
1571244	WSBH101R 0.50 SOIL	09/09/19	GJ 250ml, GJ 60ml, PT 1L	Aliphatics/Aromatics (14 days), BTEX (14 days),	
				Naphthalene (14 days), PAH FID (14 days), pH +	
				Conductivity (7 days), Cyanide/Mono pHoh (14 days)	
1571245	WSTP101 1.20-1.56 SOIL	10/09/19	GJ 250ml, GJ 60ml, PT 1L	Aliphatics/Aromatics (14 days), BTEX (14 days),	
				Naphthalene (14 days), PAH FID (14 days), pH +	
				Conductivity (7 days), Cyanide/Mono pHoh (14 days)	
1571246	WSTP102 0.50 SOIL	10/09/19	GJ 250ml, GJ 60ml, PT 1L	Aliphatics/Aromatics (14 days), BTEX (14 days),	
				Naphthalene (14 days), PAH FID (14 days), pH +	
				Conductivity (7 days), Cyanide/Mono pHoh (14 days)	
1571247	WSTP102 1.20-1.56 SOIL	10/09/19	GJ 250ml, GJ 60ml, PT 1L	Aliphatics/Aromatics (14 days), BTEX (14 days),	
				Naphthalene (14 days), PAH FID (14 days), pH +	
				Conductivity (7 days), Cyanide/Mono pHoh (14 days)	
	1	1		1	1



Inappropriate

Information in Support of the Analytical Results

Our Ref 19-19242-1 Client Ref TA8234

Contract Nenthead Mines - Proposed MWTS, GI

		Date			container for
Lab No	Sample ID	Sampled	Containers Received	Holding time exceeded for tests	tests
1571248	WSTP103 0.50 SOIL	12/09/19	GJ 250ml, GJ 60ml, PT 1L	Aliphatics/Aromatics (14 days), BTEX (14 days),	
				Naphthalene (14 days), PAH FID (14 days), pH +	
				Conductivity (7 days), Cyanide/Mono pHoh (14 days)	
1571249	BH104 0.50 LEACHATE	05/09/19	GJ 250ml, GJ 60ml x2, PT 1L		
1571250	BH104 3.00 LEACHATE	05/09/19	GJ 250ml, GJ 60ml, PT 1L		
1571251	BH105 1.00 LEACHATE	06/09/19	GJ 250ml, GJ 60ml, PT 1L		
1571252	BH106 1.00 LEACHATE	09/09/19	GJ 250ml, GJ 60ml, PT 1L		
1571253	BH106 2.00 LEACHATE	09/09/19	GJ 250ml, GJ 60ml, PT 1L		
1571254	TP115 1.00 LEACHATE	06/09/19	GJ 250ml, GJ 60ml, PT 1L		
1571255	TP118 1.00 LEACHATE	10/09/19	GJ 250ml, GJ 60ml, PT 1L		
1571256	TP126 1.00 LEACHATE	06/09/19	GJ 250ml, GJ 60ml, PT 1L		
1571257	TP128 1.00 LEACHATE	09/09/19	GJ 250ml, GJ 60ml, PT 1L		
1571258	WS102 0.50 LEACHATE	13/09/19	GJ 250ml, GJ 60ml, PT 1L		
1571259	WS103 0.50 LEACHATE	12/09/19	GJ 250ml, GJ 60ml, PT 1L		
1571260	WS108 0.50 LEACHATE	10/09/19	GJ 250ml, GJ 60ml, PT 1L		
1571261	WS109 0.20 LEACHATE	10/09/19	GJ 250ml, GJ 60ml, PT 1L		
1571262	WSBH101R 0.20 LEACHATE	09/09/19	GJ 250ml, GJ 60ml, PT 1L		
1573134	WSTP105 0.50 SOIL	13/09/19	GJ 250ml, GJ 60ml, PT 1L		
1573135	WSTP106 0.50 SOIL	16/09/19	GJ 250ml, GJ 60ml, PT 1L		
1573136	WSTP107 1.00 SOIL	16/09/19	GJ 250ml, GJ 60ml, PT 1L		
1573137	WSTP106 0.50 LEACHATE	16/09/19	GJ 250ml, GJ 60ml, PT 1L		
1573138	WSTP107 1.00 LEACHATE	16/09/19	GJ 250ml, GJ 60ml, PT 1L		

Key: G-Glass P-Plastic J-Jar T-Tub

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425μm sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/- 2°C .

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months



Certificate Number 19-19852

23-Oct-19

Client Soil Engineering

Parkside Lane

Leeds

West Yorkshire

LS11 5SX

Our Reference 19-19852

Client Reference TA8234

Order No (not supplied)

Contract Title NENTHEAD MINE - PROPOSED MWTS, GI

Description 5 Water samples.

Date Received 04-Oct-19

Date Started 04-Oct-19

Date Completed 23-Oct-19

Test Procedures Identified by prefix DETSn (details on request).

Notes Opinions and interpretations are outside the laboratory's scope of ISO 17025

accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be

reproduced except in full, without the prior written approval of the laboratory.

Approved By

Adam Fenwick Contracts Manager





Our Ref 19-19852
Client Ref TA8234
Contract Title NENTHEAD MINE - PROPOSED MWTS, GI

Lab No	1575836	1575837	1575838	1575839	1575840
					WSBH101
Sample ID	BH102R	BH104	WS103	WS104	R
Depth	2.61	1.08	1.37	0.33	1.76
Other ID	MW1	MW1	MW1	MW1	MW1
Sample Type	EW	EW	EW	EW	EW
Sampling Date	01/10/19	01/10/19	01/10/19	01/10/19	01/10/19
Sampling Time	1220	1117	1037	1106	1157

		Sampl	ing Time	1220	1117	1037	1106	1157
Test	Method	LOD	Units					
Metals								
Arsenic, Dissolved	DETSC 2306	0.16	ug/l	0.28	0.36	16	5.9	0.35
Barium, Dissolved	DETSC 2306	0.26	ug/l	93	98	830	98	88
Beryllium, Dissolved	DETSC 2306*	0.1	ug/l	< 0.1	< 0.1	8.8	0.8	< 0.1
Boron, Dissolved	DETSC 2306*	12	ug/l	14	65	33	35	< 12
Cadmium, Dissolved	DETSC 2306	0.03	ug/l	3.5	< 0.03	1.7	0.14	2.5
Calcium, Dissolved	DETSC 2306	0.09	mg/l	44	47	100	20	42
Chromium, Dissolved	DETSC 2306	0.25	ug/l	< 0.25	< 0.25	21	3.3	0.30
Chromium, Hexavalent	DETSC 2203	0.007	mg/l	< 0.007	< 0.007	< 0.007	< 0.007	< 0.007
Copper, Dissolved	DETSC 2306	0.4	ug/l	3.5	1.1	210	28	4.3
Lead, Dissolved	DETSC 2306	0.09	ug/l	26	0.40	660	20	19
Magnesium, Dissolved	DETSC 2306	0.02	mg/l	3.6	6.2	16	4.6	3.5
Mercury, Dissolved	DETSC 2306	0.01	ug/l	< 0.01	< 0.01	< 0.01	0.05	< 0.01
Nickel, Dissolved	DETSC 2306	0.5	ug/l	7.8	1.0	150	23	7.0
Potassium, Dissolved	DETSC 2306	0.08	mg/l	1.1	4.5	7.1	3.9	1.6
Selenium, Dissolved	DETSC 2306	0.25	ug/l	3.7	1.8	11	8.6	11
Sodium, Dissolved	DETSC 2306	0.07	mg/l	13	50	84	100	30
Vanadium, Dissolved	DETSC 2306	0.6	ug/l	< 0.6	< 0.6	91	12	< 0.6
Zinc, Dissolved	DETSC 2306	1.3	ug/l	1900	3.3	420	33	680
Inorganics	•		•	·	•	,		
Conductivity	DETSC 2009	1	uS/cm	285	526	503	560	365
рН	DETSC 2008		рН	7.2	7.1	9.4	8.2	7.6
Cyanide, Total	DETSC 2130	40	ug/l	< 40	< 40	< 40	< 40	< 40
Cyanide, Free	DETSC 2130	0.02	mg/l	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Hardness	DETSC 2303	0.1	mg/l	125	143	316	68.3	119
Ammoniacal Nitrogen as N	DETSC 2207	0.015	mg/l	0.047	0.035	0.038	0.15	0.91
Chloride	DETSC 2055	0.1	mg/l	7.2	8.1	5.8	5.7	6.3
Nitrate as NO3	DETSC 2055	0.1	mg/l	1.9	< 0.10			0.87
Nitrate as N	*	0.1	mg/l	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Sulphate as SO4	DETSC 2055	0.1	mg/l	27	89	96	62	42
Sulphide	DETSC 2208	10	ug/l	< 10	< 10	93	< 10	< 10
Sulphur as S, Total	DETSC 2320*	10	mg/l	< 10	30	20	20	11
Petroleum Hydrocarbons								
Aliphatic C5-C6	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C6-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	1.4	< 1.0	< 1.0	< 1.0
Aliphatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	170	110	< 1.0	< 1.0
Aliphatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	370	400	< 1.0	< 1.0
Aliphatic C5-C35	DETSC 3072*	10	ug/l	< 10	540	510	< 10	< 10
Aromatic C5-C7	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1

Key: * -not accredited. Page 2 of 7



Our Ref 19-19852
Client Ref TA8234
Contract Title NENTHEAD MINE - PROPOSED MWTS, GI

CONTract Title NENTHEAD MINE - I	NOI OSED WW	713, 01	Lab No	1575836	1575837	1575838	1575839	1575840
			- Lub (10)	1373030	1373037	1373030	1373033	WSBH101
		Sa	mple ID	BH102R	BH104	WS103	WS104	R
		Ju	Depth	2.61	1.08	1.37	0.33	1.76
	Other ID			MW1	MW1	MW1	MW1	MW1
			ole Type	EW	EW	EW	EW	EW
			ng Date	01/10/19	01/10/19	01/10/19	01/10/19	01/10/19
		Sampli	ng Time	1220	1117	1037	1106	1157
Test	Method	LOD	Units					
Aromatic C7-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C5-C35	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10	< 10
TPH Ali/Aro Total	DETSC 3072*	10	ug/l	< 10	540	510	< 10	< 10
Benzene	DETSC 3322	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	DETSC 3322	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	DETSC 3322	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Xylene	DETSC 3322	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
PAHs								
Naphthalene	DETSC 3304	0.05	ug/l	< 0.05	< 0.05	0.22	0.18	< 0.05
Acenaphthylene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.10	< 0.10	< 0.01
Acenaphthene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.10	< 0.10	< 0.01
Fluorene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	0.22	< 0.10	< 0.01
Phenanthrene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	1.4	0.18	0.01
Anthracene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	2.1	< 0.10	< 0.01
Fluoranthene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	0.41	< 0.10	< 0.01
Pyrene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	0.44	< 0.10	< 0.01
Benzo(a)anthracene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	0.19	< 0.10	< 0.01
Chrysene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	0.98	< 0.10	< 0.01
Benzo(b)fluoranthene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	0.71	< 0.10	< 0.01
Benzo(k)fluoranthene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	0.16	< 0.10	< 0.01
Benzo(a)pyrene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.10	< 0.10	< 0.01
Indeno(1,2,3-c,d)pyrene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	0.10	< 0.10	< 0.01
Dibenzo(a,h)anthracene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.10	< 0.10	< 0.01
Benzo(g,h,i)perylene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	0.20	< 0.10	< 0.01
PAH Total	DETSC 3304	0.2	ug/l	< 0.20	< 0.20	7.0	< 1.60	< 0.20
Phenols								
Phenol - Monohydric	DETSC 2130	0.1	mg/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1

Key: * -not accredited. Page 3 of 7



Our Ref 19-19852 Client Ref TA8234

Contract Title NENTHEAD MINE - PROPOSED MWTS, GI

Lab No	1575836	1575837	1575838	1575839	1575840
					WSBH101
Sample ID	BH102R	BH104	WS103	WS104	R
Depth	2.61	1.08	1.37	0.33	1.76
Other ID	MW1	MW1	MW1	MW1	MW1
Sample Type	EW	EW	EW	EW	EW
Sampling Date	01/10/19	01/10/19	01/10/19	01/10/19	01/10/19
Sampling Time	1220	1117	1037	1106	1157

		Sampl	ing Time	1220	1117	1037	1106	1157
Test	Method	LOD	Units					
VOCs								
Dichlorodifluoromethane	DETSC 3432	1	ug/l	< 1	< 1	< 1	< 1	< 1
Chloromethane	DETSC 3432	1	ug/l	< 1	< 1	< 1	< 1	< 1
Vinyl Chloride	DETSC 3432	1	ug/l	< 1	< 1	< 1	< 1	< 1
Bromomethane	DETSC 3432	1	ug/l	< 1	< 1	< 1	< 1	< 1
Chloroethane	DETSC 3432	1	ug/l	< 1	< 1	< 1	< 1	< 1
Trichlorofluoromethane	DETSC 3432*	1	ug/l	< 1	< 1	< 1	< 1	< 1
1,1-dichloroethylene	DETSC 3432	1	ug/l	< 1	< 1	< 1	< 1	< 1
Methylene Chloride	DETSC 3432*	27	ug/l	< 27	< 27	< 27	< 27	< 27
Trans-1,2-dichloroethylene	DETSC 3432	1	ug/l	< 1	< 1	< 1	< 1	< 1
1,1-dichloroethane	DETSC 3432	1	ug/l	< 1	< 1	< 1	< 1	< 1
Cis-1,2-dichloroethylene	DETSC 3432	1	ug/l	< 1	< 1	< 1	< 1	< 1
2,2-dichloropropane	DETSC 3432	2	ug/l	< 2	< 2	< 2	< 2	< 2
Bromochloromethane	DETSC 3432	4	ug/l	< 4	< 4	< 4	< 4	< 4
Chloroform	DETSC 3432	1	ug/l	< 1	< 1	< 1	< 1	< 1
1,1,1-trichloroethane	DETSC 3432	1	ug/l	< 1	< 1	< 1	< 1	< 1
1,1-dichloropropene	DETSC 3432	1	ug/l	< 1	< 1	< 1	< 1	< 1
Carbon tetrachloride	DETSC 3432	1	ug/l	< 1	< 1	< 1	< 1	< 1
Benzene	DETSC 3432	1	ug/l	< 1	< 1	< 1	< 1	< 1
1,2-dichloroethane	DETSC 3432	1	ug/l	< 1	< 1	< 1	< 1	< 1
Trichloroethylene	DETSC 3432*	1	ug/l	< 1	< 1	< 1	< 1	< 1
1,2-dichloropropane	DETSC 3432	1	ug/l	< 1	< 1	< 1	< 1	< 1
Dibromomethane	DETSC 3432	1	ug/l	< 1	< 1	< 1	< 1	< 1
Bromodichloromethane	DETSC 3432	4	ug/l	< 4	< 4	< 4	< 4	< 4
cis-1,3-dichloropropene	DETSC 3432	1	ug/l	< 1	< 1	< 1	< 1	< 1
Toluene	DETSC 3432	1	ug/l	< 1	< 1	< 1	< 1	< 1
trans-1,3-dichloropropene	DETSC 3432	1	ug/l	< 1	< 1	< 1	< 1	< 1
1,1,2-trichloroethane	DETSC 3432	1	ug/l	< 1	< 1	< 1	< 1	< 1
Tetrachloroethylene	DETSC 3432	1	ug/l	< 1	< 1	< 1	< 1	< 1
1,3-dichloropropane	DETSC 3432	1	ug/l	< 1	< 1	< 1	< 1	< 1
Dibromochloromethane	DETSC 3432	1	ug/l	< 1	< 1	< 1	< 1	< 1
1,2-dibromoethane	DETSC 3432	1	ug/l	< 1	< 1	< 1	< 1	< 1
Chlorobenzene	DETSC 3432	1	ug/l	< 1	< 1	< 1	< 1	< 1
1,1,1,2-tetrachloroethane	DETSC 3432	1	ug/l	< 1	< 1	< 1	< 1	< 1
Ethylbenzene	DETSC 3432	1	ug/l	< 1	< 1	< 1	< 1	< 1
m+p-Xylene	DETSC 3432	2	ug/l	< 2	< 2	< 2	< 2	< 2
o-Xylene	DETSC 3432	1	ug/l	< 1	< 1	< 1	1	< 1
Styrene	DETSC 3432	1	ug/l	< 1	< 1	< 1	< 1	< 1
Bromoform	DETSC 3432	1	ug/l	< 1	< 1	< 1	< 1	< 1
Isopropylbenzene	DETSC 3432	1	ug/l	< 1	< 1	< 1	< 1	< 1

Key: * -not accredited. Page 4 of 7



Our Ref 19-19852 Client Ref TA8234

Contract Title NENTHEAD MINE - PROPOSED MWTS, GI

CONTROL NEW TIERD WINE		-, -	Lab No	1575836	1575837	1575838	1575839	1575840 WSBH101
		Sa	ample ID	BH102R	BH104	WS103	WS104	R
			Depth	2.61	1.08	1.37	0.33	1.76
			Other ID	MW1	MW1	MW1	MW1	MW1
		Sam	ple Type	EW	EW	EW	EW	EW
		Sampl	ing Date	01/10/19	01/10/19	01/10/19	01/10/19	01/10/19
		Sampl	ing Time	1220	1117	1037	1106	1157
Test	Method	LOD	Units					
1,1,2,2-tetrachloroethane	DETSC 3432	1	ug/l	< 1	< 1	< 1	< 1	< 1
Bromobenzene	DETSC 3432	1	ug/l	< 1	< 1	< 1	< 1	< 1
1,2,3-trichloropropane	DETSC 3432	1	ug/l	< 1	< 1	< 1	< 1	< 1
n-propylbenzene	DETSC 3432	1	ug/l	< 1	< 1	< 1	< 1	< 1
2-chlorotoluene	DETSC 3432	1	ug/l	< 1	< 1	< 1	< 1	< 1
1,3,5-trimethylbenzene	DETSC 3432	1	ug/l	< 1	< 1	< 1	2	< 1
4-chlorotoluene	DETSC 3432	1	ug/l	< 1	< 1	< 1	< 1	< 1
Tert-butylbenzene	DETSC 3432	1	ug/l	< 1	< 1	< 1	< 1	< 1
1,2,4-trimethylbenzene	DETSC 3432	1	ug/l	< 1	< 1	< 1	< 1	< 1
sec-butylbenzene	DETSC 3432	1	ug/l	< 1	< 1	< 1	< 1	< 1
p-isopropyltoluene	DETSC 3432	1	ug/l	< 1	< 1	< 1	< 1	< 1
1,3-dichlorobenzene	DETSC 3432	2	ug/l	< 2	< 2	< 2	< 2	< 2
1,4-dichlorobenzene	DETSC 3432	1	ug/l	< 1	< 1	< 1	< 1	< 1
n-butylbenzene	DETSC 3432	1	ug/l	< 1	< 1	< 1	< 1	< 1
1,2-dichlorobenzene	DETSC 3432	1	ug/l	< 1	< 1	< 1	< 1	< 1
1,2-dibromo-3-chloropropane	DETSC 3432	1	ug/l	< 1	< 1	< 1	< 1	< 1
1,2,4-trichlorobenzene	DETSC 3432	1	ug/l	< 1	< 1	< 1	< 1	< 1
Hexachlorobutadiene	DETSC 3432	1	ug/l	< 1	< 1	< 1	< 1	< 1
1,2,3-trichlorobenzene	DETSC 3432	1	ug/l	< 1	< 1	< 1	< 1	< 1
MTBE	DETSC 3432*	1	ug/l	< 1	< 1	< 1	< 1	< 1
SVOCs	22.000.02		~ <i>6</i> / ·					
Phenol	DETSC 3434*	1	ug/l	< 1.0	< 2.0	< 10.0	< 10.0	< 2.0
Aniline	DETSC 3434*	1	ug/l	< 1.0	< 2.0	< 10.0	< 10.0	< 2.0
2-Chlorophenol	DETSC 3434*	1	ug/l	< 1.0	< 2.0	< 10.0	< 10.0	< 2.0
Benzyl Alcohol	DETSC 3434*	1	ug/l	< 1.0	< 2.0	< 10.0	< 10.0	< 2.0
2-Methylphenol	DETSC 3434*	1	ug/l	< 1.0	< 2.0	< 10.0	< 10.0	< 2.0
Bis(2-chloroisopropyl)ether	DETSC 3434*	1	ug/l	< 1.0	< 2.0	< 10.0	< 10.0	
3&4-Methylphenol	DETSC 3434*	1	ug/l	< 1.0	< 2.0	< 10.0	< 10.0	
Bis(2-chloroethoxy)methane	DETSC 3434*	1	ug/l	< 1.0	< 2.0	< 10.0	< 10.0	
2,4-Dimethylphenol	DETSC 3434*	1	ug/l	< 1.0	< 2.0	< 10.0	< 10.0	
2,4-Dichlorophenol	DETSC 3434*	1	ug/l	< 1.0	< 2.0	< 10.0	< 10.0	
1,2,4-Trichlorobenzene	DETSC 3434*	1	ug/l	< 1.0	< 2.0	< 10.0	< 10.0	
4-Chloro-3-methylphenol	DETSC 3434*	1	ug/I	< 1.0	< 2.0	< 10.0	< 10.0	
2-Methylnaphthalene	DETSC 3434*	1		< 1.0	< 2.0	< 10.0	< 10.0	
Hexachlorocyclopentadiene	DETSC 3434*	1	ug/l	< 1.0	< 2.0	< 10.0	< 10.0	
2,4,6-Trichlorophenol	DETSC 3434*	1	ug/l	< 1.0	< 2.0	< 10.0	< 10.0	
2,4,5-Trichlorophenol		1	ug/l	< 1.0	< 2.0		< 10.0	
<u> </u>	DETSC 3434*		ug/l			< 10.0		
2-Chloronaphthalene	DETSC 3434*	1	ug/l	< 1.0	< 2.0	< 10.0	< 10.0	
2-Nitroaniline	DETSC 3434*	1	ug/l	< 1.0	< 2.0	< 10.0	< 10.0	< 2.0
2,4-Dinitrotoluene	DETSC 3434*	1	ug/l	< 1.0	< 2.0	< 10.0	< 10.0	< 2.0

Key: * -not accredited. Page 5 of 7



Our Ref 19-19852
Client Ref TA8234
Contract Title NENTHEAD MINE - PROPOSED MWTS. GI

Contract Title NENTHEAD MINE -	PROPOSED MIV	VTS, GI	_					
			Lab No	1575836	1575837	1575838	1575839	1575840
								WSBH101
		Sa	mple ID	BH102R	BH104	WS103	WS104	R
			Depth	2.61	1.08	1.37	0.33	1.76
			Other ID	MW1	MW1	MW1	MW1	MW1
		-	ple Type	EW	EW	EW	EW 04 (40 (40	EW
		-	ing Date ing Time	01/10/19 1220	01/10/19 1117	01/10/19 1037	01/10/19	01/10/19 1157
Test	Method	LOD	Units	1220	1117	1037	1100	1157
3-Nitroaniline	DETSC 3434*	1	ug/l	< 1.0	< 2.0	< 10.0	< 10.0	< 2.0
4-Nitrophenol	DETSC 3434*	1	ug/l	< 1.0	< 2.0	< 10.0	< 10.0	< 2.0
Dibenzofuran	DETSC 3434*	1	ug/l	< 1.0	< 2.0	< 10.0	< 10.0	< 2.0
2,6-Dinitrotoluene	DETSC 3434*	1	ug/l	< 1.0	< 2.0	< 10.0	< 10.0	< 2.0
2,3,4,6-Tetrachlorophenol	DETSC 3434*	1	ug/l	< 1.0	< 2.0	< 10.0	< 10.0	< 2.0
Diethylphthalate	DETSC 3434*	1	ug/l	< 1.0	< 2.0	< 10.0	< 10.0	< 2.0
4-Chlorophenylphenylether	DETSC 3434*	1	ug/l	< 1.0	< 2.0	< 10.0	< 10.0	< 2.0
4-Nitroaniline	DETSC 3434*	1	ug/l	< 1.0	< 2.0	< 10.0	< 10.0	< 2.0
Diphenylamine	DETSC 3434*	1	ug/l	< 1.0	< 2.0	< 10.0	< 10.0	< 2.0
4-Bromophenylphenylether	DETSC 3434*	1	ug/l	< 1.0	< 2.0	< 10.0	< 10.0	< 2.0
Hexachlorobenzene	DETSC 3434*	1	ug/l	< 1.0	< 2.0	< 10.0	< 10.0	< 2.0
Bis(2-ethylhexyl)ester	DETSC 3434*	1	ug/l	< 1.0	< 2.0	< 10.0	< 10.0	< 2.0
Pentachlorophenol	DETSC 3434*	1	ug/l	< 1.0	< 2.0	< 10.0	< 10.0	< 2.0
Di-n-butylphthalate	DETSC 3434*	1	ug/l	< 1.0	< 2.0	< 10.0	12	< 2.0
Butylbenzylphthalate	DETSC 3434*	1	ug/l	< 1.0	< 2.0	< 10.0	< 10.0	< 2.0
Bis(2-ethylhexyl)phthalate	DETSC 3434*	1	ug/l	< 1.0	< 2.0	< 10.0	< 10.0	< 2.0
Di-n-octylphthalate	DETSC 3434*	1	ug/l	< 1.0	< 2.0	< 10.0	< 10.0	< 2.0
1,4-Dinitrobenzene	DETSC 3434*	1	ug/l	< 1.0	< 2.0	< 10.0	< 10.0	< 2.0
Dimethylphthalate	DETSC 3434*	1	ug/l	< 1.0	< 2.0	< 10.0	< 10.0	< 2.0
1,3-Dinitrobenzene	DETSC 3434*	1	ug/l	< 1.0	< 2.0	< 10.0	< 10.0	< 2.0
2,3,5,6-Tetrachlorophenol	DETSC 3434*	1	ug/l	< 1.0	< 2.0	< 10.0	< 10.0	< 2.0
Azobenzene	DETSC 3434*	1	ug/l	< 1.0	< 2.0	< 10.0	< 10.0	< 2.0
Carbazole	DETSC 3434*	1	ug/l	< 1.0	< 2.0	< 10.0	< 10.0	< 2.0
1-Methylnaphthalene	DETSC 3434*	1	ug/l	< 1.0	< 2.0	< 10.0	< 10.0	< 2.0

Key: * -not accredited. Page 6 of 7



Information in Support of the Analytical Results

Our Ref 19-19852 Client Ref TA8234

Contract NENTHEAD MINE - PROPOSED MWTS, GI

Containers Received & Deviating Samples

		Date		Holding time exceeded for	Inappropriate container for
Lab No	Sample ID	Sampled	Containers Received	tests	tests
1575836	BH102R 2.61 WATER	01/10/19	GJ 250ml x4, GJ 60ml x2, PB 1L	pH/Cond/TDS (1 days)	VOC
1575837	BH104 1.08 WATER	01/10/19	GJ 250ml x4, GJ 60ml x2, PB 1L	pH/Cond/TDS (1 days)	VOC
1575838	WS103 1.37 WATER	01/10/19	GJ 250ml x4, GJ 60ml x2, PB 1L	pH/Cond/TDS (1 days)	VOC
1575839	WS104 0.33 WATER	01/10/19	GJ 250ml x4, GJ 60ml, PB 1L	pH/Cond/TDS (1 days)	VOC
1575840	WSBH101R 1.76 WATER	01/10/19	GJ 250ml x4, GJ 60ml x2, PB 1L	pH/Cond/TDS (1 days)	VOC
V C Cl	- D DI+:- I I D D-++I-				

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months



Certificate Number 19-21000

04-Nov-19

Client Soil Engineering

Southern Office Foundation Court Riverside Way Watchmoor Park

Camberley GU15 3RG

Our Reference 19-21000

Client Reference TA8234

Order No (not supplied)

Contract Title Nenthead Mines GI

Description 9 Soil samples.

Date Received 18-Oct-19

Date Started 18-Oct-19

Date Completed 04-Nov-19

Test Procedures Identified by prefix DETSn (details on request).

Notes Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By

Adam Fenwick Contracts Manager





Summary of Chemical Analysis Soil Samples

Our Ref 19-21000
Client Ref TA8234
ontract Title Nenthead Mines G

Client Ref TA8234												
Contract Title Nenthead Mines G	il											
			Lab No	1583986	1583987	1583988	1583989	1583990	1583991	1583992	1583993	1583994
							WSBH101	WSBH101				
		Sa	mple ID	BH102R	TP104	TP112	R	R	WSTP101	WSTP101	WSTP102	WSTP103
			Depth	1.75	1.00	1.00	0.10	1.00	0.85	1.20	0.10	1.00
		(Other ID	7	3	3	1	7	5	8	1	7
		Samp	ole Type	D	D	D	D	D	D	D	D	
		Sampli	ing Date	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s
		Sampli	ng Time	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s
Test	Method	LOD	Units									
Inorganics												
рН	DETSC 2008#		рН	7.9	7.6	6.5	7.8	7.6	7.9	7.7	7.8	8.0
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	190	37	260	57	54	61	40	26	71
Sulphur as S, Total	DETSC 2320	0.01	%	0.59	0.26	0.50	0.12	0.15	0.61	0.18	0.44	0.27
Sulphate as SO4, Total	DETSC 2321#	0.01	%	0.23	0.14	0.27	0.16	0.22	0.26	0.13	0.19	0.21



Information in Support of the Analytical Results

Our Ref 19-21000 Client Ref TA8234

Contract Nenthead Mines GI

Containers Received & Deviating Samples

					Inappropriate	
		Date			container for	
Lab No	Sample ID	Sampled	Containers Received	Holding time exceeded for tests	tests	
1583986	BH102R 1.75 SOIL		PT 1L	Sample date not supplied, Anions 2:1 (365 days),		
				Total Sulphur ICP (365 days), Total Sulphate ICP (730		
				days), Metals ICP Prep (365 days), pH + Conductivity		
				(7 days)		
1583987	TP104 1.00 SOIL		PT 1L	Sample date not supplied, Anions 2:1 (365 days),		
				Total Sulphur ICP (365 days), Total Sulphate ICP (730		
				days), Metals ICP Prep (365 days), pH + Conductivity		
				(7 days)		
1583988	TP112 1.00 SOIL		PT 1L	Sample date not supplied, Anions 2:1 (365 days),		
				Total Sulphur ICP (365 days), Total Sulphate ICP (730		
				days), Metals ICP Prep (365 days), pH + Conductivity		
				(7 days)		
1583989	WSBH101R 0.10 SOIL		PT 1L	Sample date not supplied, Anions 2:1 (365 days),		
				Total Sulphur ICP (365 days), Total Sulphate ICP (730		
				days), Metals ICP Prep (365 days), pH + Conductivity		
				(7 days)		
1583990	WSBH101R 1.00 SOIL		PT 1L	Sample date not supplied, Anions 2:1 (365 days),		
				Total Sulphur ICP (365 days), Total Sulphate ICP (730		
				days), Metals ICP Prep (365 days), pH + Conductivity		
				(7 days)		
1583991	WSTP101 0.85 SOIL		PT 1L	Sample date not supplied, Anions 2:1 (365 days),		
				Total Sulphur ICP (365 days), Total Sulphate ICP (730		
				days), Metals ICP Prep (365 days), pH + Conductivity		
				(7 days)		
1583992	WSTP101 1.20 SOIL		PT 1L	Sample date not supplied, Anions 2:1 (365 days),		
				Total Sulphur ICP (365 days), Total Sulphate ICP (730		
				days), Metals ICP Prep (365 days), pH + Conductivity		
				(7 days)		
1583993	WSTP102 0.10 SOIL		PT 1L	Sample date not supplied, Anions 2:1 (365 days),		
				Total Sulphur ICP (365 days), Total Sulphate ICP (730		
				days), Metals ICP Prep (365 days), pH + Conductivity		
				(7 days)		
1583994	WSTP103 1.00 SOIL		PT 1L	Sample date not supplied, Anions 2:1 (365 days),		
				Total Sulphur ICP (365 days), Total Sulphate ICP (730		
				days), Metals ICP Prep (365 days), pH + Conductivity		
Kov: D-Dlact				(7 days)		

Key: P-Plastic T-Tub

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.



Information in Support of the Analytical Results

Our Ref 19-21000 Client Ref TA8234

Contract Nenthead Mines GI

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425μm sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28° C +/- 2° C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months



SUPPORTING FACTUAL DATA

SECTION CPlans and Drawings

SITE LOCATION PLAN

Project Name	e Nenthead Mines -	Proposed MW	/TS, GI Sit	e Location	Plan	Scale
Project No.	TA8234					1:50,000
Engineer	Aecom					Figure No.
Employer	The Coal Authority					
		pWellgi	Dykeh White Ne Paragraphic Shaw	hall hall hall hall Mis Old Mill	Black Hill o o o	644 Slate Hill
Reproduced f	rom Ordnance Surve	y's 1:50,000 m	nap number 87			
	wight 2016 OC 100	057933				
© Crown copy				1		T
© Crown copy Recorded By: Date:		Checked By:	paul.rodgers 11/11/2019	Approved By:	paul.rodgers 11/11/2019	

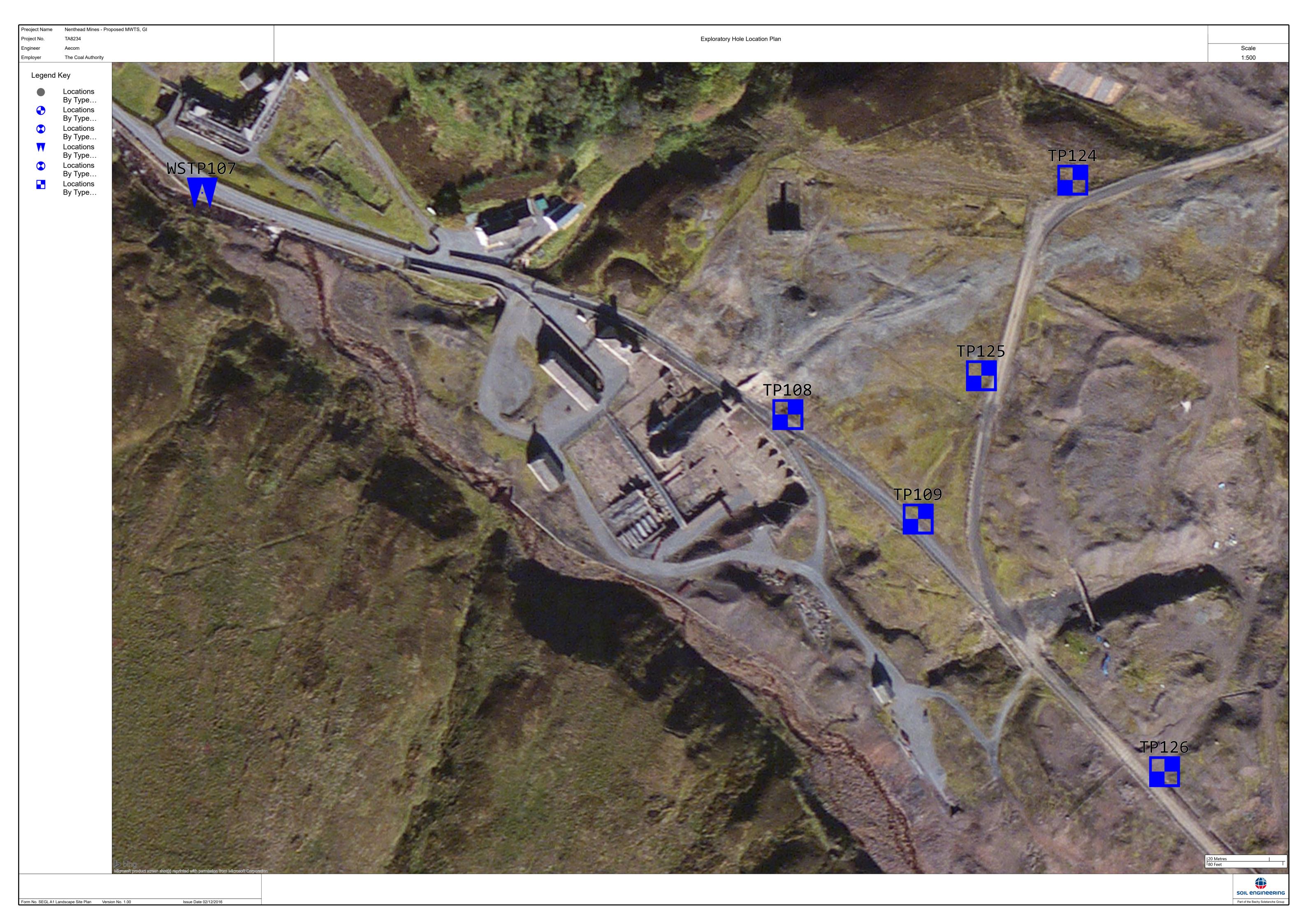


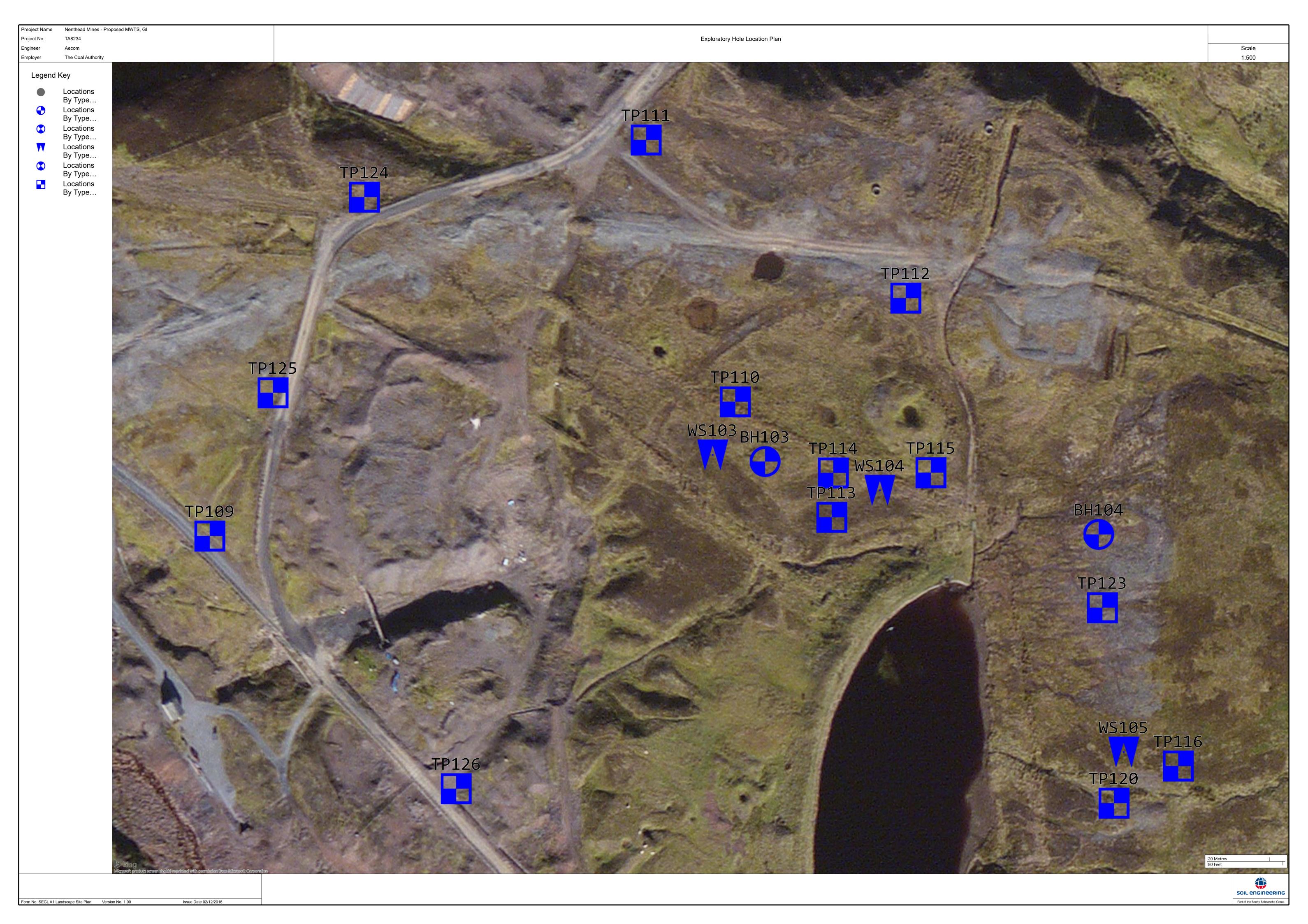
SUPPORTING FACTUAL DATA

SECTION CPlans and Drawings

EXPLORATORY HOLE LOCATION PLAN







Preject Name Nentheed Mines - Proposed MWTS, GI
Project No. 7A8234
Engineer Aecom
Employer The Coal Authority

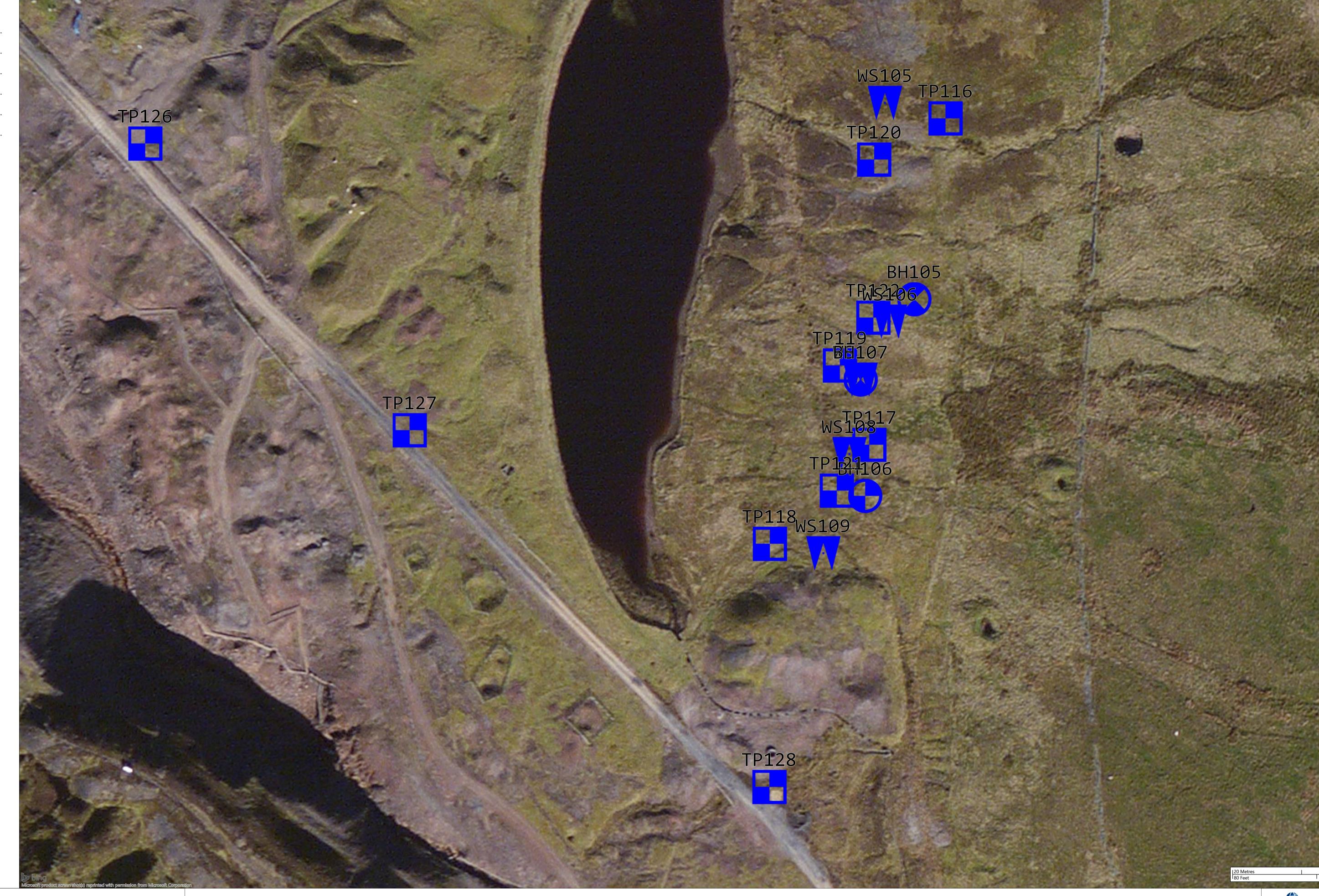
Legend Key

Locations
By Type...
Locations

By Type...
Locations
By Type...
Locations
Locations
By Type...

By Type...
Locations
By Type...

By Type... Locations By Type...





SUPPORTING FACTUAL DATA

SECTION D

Photographs

SOIL SAMPLE / ROCK CORE / CONCRETE CORE PHOTOGRAPHS

Project Name	Nenthead Mines - Proposed MWTS, GI	Photographic Record	Hole ID
Project No.	TA8234		BH105
Engineer	Aecom		Plate No.
Employer	The Coal Authority		01



3.60 to 8.00m



					0.00 to 22.00
Photogra	phed by	Date photographed	TA8234_	_3.60-8.002	
Lee Winn	ing		23/09/2019 TA8234_	_8.00-11.004	SOIL ENGINEERING
Form No.	SE-SDP-F-005	IssueNo.RevisionNo 2	.04 Issue Date	05/11/2012	Part of the Bachy Soletanche Group

Project Name	Nenthead Mines - Proposed MWTS, GI	Photographic Record	Hole ID
Project No.	TA8234		BH105
Engineer	Aecom		Plate No.
Employer	The Coal Authority		02



11.00m to 14.80m

Photographed by	Date photographed TA8234_11.00-	14.80_4
Lee Winning	23/09/2019	SOIL ENGINEERING
Form No. SE-SDP-F-005	IssueNo.RevisionNo 2.04 Issue Date 05/1	1/2012 Part of the Bachy Soletanche Group

Project Name	Nenthead Mines - Proposed MWTS, GI	Photographic Record	Hole ID
Project No.	TA8234		BH107
Engineer	Aecom		Plate No.
Employer	The Coal Authority		01



4.50m to 7.50m



						7.50111 to 10.00111
Photograp	hed by	Date photographed	I	TA8234_V	VS07_4.50-7.50_3	
Lee Winni	ng		23/09/2019	TA8234_V	VS07_7.50-10.00_3	SOIL ENGINEERING
Form No.	SE-SDP-F-005	IssueNo.RevisionNo	2.04	Issue Date	05/11/2012	Part of the Bachy Soletanche Group



SUPPORTING FACTUAL DATA

SECTION D

Photographs

EXCAVATION PHOTOGRAPHS

Project Name	Nenthead Mines - Proposed MWTS, GI	Photographic Record	Hole ID
Project No.	TA8234		TP104
Engineer	Aecom		Plate No.
Employer	The Coal Authority		01



Photograph of Side A - 2.05m



			Photograph of Side D - 2.05m
Photographed by	Date photographed	Side A_2	
Matthew Olley	04/09	/2019 Side D_2	soil engineering
Form No. SE-SDP-F-005	IssueNo.RevisionNo 2.04	Issue Date 05/11/2012	Part of the Bachy Soletanche Group

Project Name	Nenthead Mines - Proposed MWTS, GI	Photographic Record	Hole ID
Project No.	TA8234		TP108
Engineer	Aecom		Plate No.
Employer	The Coal Authority		01



Photograph of Side A - 0.75m



		Pho	otograph of Side D - 0.75m
Photographed by	Date photographed	Side A_2	
Matthew Olley	04/09/2019	9 Side D_4	SOIL ENGINEERING
Form No. SE-SDP-F-005	IssueNo.RevisionNo 2.04	Issue Date 05/11/2012	Part of the Bachy Soletanche Group

Project Name	Nenthead Mines - Proposed MWTS, GI	Photographic Record	Hole ID
Project No.	TA8234		TP108
Engineer	Aecom		Plate No.
Employer	The Coal Authority		02



Photograph of Spoil - 0.75m

Photographed by	Date photographed Spoil_2	&
Matthew Olley	04/09/2019	SOIL ENGINEERING
Form No. SE-SDP-F-005	IssueNo.RevisionNo 2.04 Issue Date 05/11/201	2 Part of the Bachy Soletanche Group

Project Name	Nenthead Mines - Proposed MWTS, GI	Photographic Record	Hole ID
Project No.	TA8234		TP109
Engineer	Aecom		Plate No.
Employer	The Coal Authority		01



Photograph of Side A - 1.90m



			Photograph of Side D - 1.90m
Photographed by	Date photographed	Side A_3	
Matthew Olley	04/0	9/2019 Side D_1	SOIL ENGINEERING
Form No. SE-SDP-F-005	IssueNo.RevisionNo 2.04	Issue Date 05/11/2012	Part of the Bachy Soletanche Group

Project Name	Nenthead Mines - Proposed MWTS, GI	Photographic Record	Hole ID
Project No.	TA8234		TP110
Engineer	Aecom		Plate No.
Employer	The Coal Authority		01



Photograph of Side A - 3.00m



			Photograph of Side D - 3.00m
Photographed by	Date photographed	Side A_2	
Matthew Olley	05/09	9/2019 Side D_2	SOIL ENGINEERING
Form No. SE-SDP-F-005	IssueNo.RevisionNo 2.04	Issue Date 05/11/2012	Part of the Bachy Soletanche Group

Project Name	Nenthead Mines - Proposed MWTS, GI	Photographic Record	Hole ID
Project No.	TA8234		TP111
Engineer	Aecom		Plate No.
Employer	The Coal Authority		02



Photographed by	Date photographed Spoil_2	
Matthew Olley	05/09/2019	SOIL ENGINEERING
Form No. SE-SDP-F-005	IssueNo.RevisionNo 2.04 Issue Date 05/11/203	Part of the Bachy Soletanche Group

Project Name	Nenthead Mines - Proposed MWTS, GI	Photographic Record	Hole ID
Project No.	TA8234		TP112
Engineer	Aecom		Plate No.
Employer	The Coal Authority		01



Photograph of Side A - 3.00m



			Photograph of Side D - 3.00m
Photographed by	Date photographed	Side A_2	
Matthew Olley	05/09	/2019 Side D_2	SOIL ENGINEERING
Form No. SE-SDP-F-005	IssueNo.RevisionNo 2.04	Issue Date 05/11/2012	Part of the Bachy Soletanche Group

Project Name	Nenthead Mines - Proposed MWTS, GI	Photographic Record	Hole ID
Project No.	TA8234		TP113
Engineer	Aecom		Plate No.
Employer	The Coal Authority		01



Photograph of Side A - 1.10m



			Photograph of Spoil
Photographed by	Date photographed	Side A_1	
Matthew Olley	09/09/	2019 Spoil_2	SOIL ENGINEERING
Form No. SE-SDP-F-005	IssueNo.RevisionNo 2.04	Issue Date 05/11/2012	Part of the Bachy Soletanche Group

Project Name	Nenthead Mines - Proposed MWTS, GI	Photographic Record	Hole ID
Project No.	TA8234		TP114
Engineer	Aecom		Plate No.
Employer	The Coal Authority		02



Photographed by	Date photographed Spoil_1	
Matthew Olley	05/09/2019	SOIL ENGINEERING
Form No. SE-SDP-F-005	IssueNo.RevisionNo 2.04 Issue Date 05/11/2012	Part of the Bachy Soletanche Group

Project Name	Nenthead Mines - Proposed MWTS, GI	Photographic Record	Hole ID
Project No.	TA8234		TP115
Engineer	Aecom		Plate No.
Employer	The Coal Authority		02



Photographed by	Date photographed	Spoil_1	
Matthew Olley	06/09/	2019	SOIL ENGINEERING
Form No. SE-SDP-F-005	IssueNo.RevisionNo 2.04	Issue Date 05/11/2012	Part of the Bachy Soletanche Group

Project Name	Nenthead Mines - Proposed MWTS, GI	Photographic Record	Hole ID
Project No.	TA8234		TP116
Engineer	Aecom		Plate No.
Employer	The Coal Authority		02



Photographed by	Date photographed Sppil_2	
Matthew Olley	10/09/2019	SOIL ENGINEERING
Form No. SE-SDP-F-005	IssueNo.RevisionNo 2.04 Issue Date 05/11/2012	Part of the Bachy Soletanche Group

Project Name	Nenthead Mines - Proposed MWTS, GI	Photographic Record	Hole ID
Project No.	TA8234		TP117
Engineer	Aecom		Plate No.
Employer	The Coal Authority		02



Photographed by	Date photographed Spoil_1	4
Matthew Olley	10/09/2019	SOIL ENGINEERING
Form No. SE-SDP-F-005	IssueNo.RevisionNo 2.04 Issue Date 05	/11/2012 Part of the Bachy Soletanche Group

Project Name	Nenthead Mines - Proposed MWTS, GI	Photographic Record	Hole ID
Project No.	TA8234		TP118
Engineer	Aecom		Plate No.
Employer	The Coal Authority		02



Photographed by	Date photographed Spoil_1	
Matthew Olley	10/09/2019	soil engineering
Form No. SE-SDP-F-005	IssueNo.RevisionNo 2.04 Issue Date 05/11/20	Part of the Bachy Soletanche Group

Project Name	Nenthead Mines - Proposed MWTS, GI	Photographic Record	Hole ID
Project No.	TA8234		TP119
Engineer	Aecom		Plate No.
Employer	The Coal Authority		01



Photograph of Side B - 0.85m



			Photograph of Side C - 0.85m
Photographed by	Date photographed	Side B_1	
Matthew Olley	10/09	9/2019 Side C_1	SOIL ENGINEERING
Form No. SE-SDP-F-005	IssueNo.RevisionNo 2.04	Issue Date 05/11/2012	Part of the Bachy Soletanche Group

Project Name	Nenthead Mines - Proposed MWTS, GI	Photographic Record	Hole ID
Project No.	TA8234		TP120
Engineer	Aecom		Plate No.
Employer	The Coal Authority		01



Photograph of Side B - 1.30m



			Phot	ograph of Side C - 1.30m
Photographed by	Date photographed	Side B_1		
Matthew Olley	09/09/2019	Side C_1		SOIL ENGINEERING
Form No. SE-SDP-F-005	IssueNo.RevisionNo 2.04	Issue Date	05/11/2012	Part of the Bachy Soletanche Group

Project Name	Nenthead Mines - Proposed MWTS, GI	Photographic Record	Hole ID
Project No.	TA8234		TP121
Engineer	Aecom		Plate No.
Employer	The Coal Authority		01



Photograph of Side A - 0.90m



			Photograph of Side B - 0.90m
Photographed by	Date photographed	Side A_2	
Matthew olley	10/0	9/2019 Side B_1	SOIL ENGINEERING
Form No. SE-SDP-F-005	IssueNo.RevisionNo 2.04	Issue Date 05/11/2012	Part of the Bachy Soletanche Group

Project Name	Nenthead Mines - Proposed MWTS, GI	Photographic Record	Hole ID
Project No.	TA8234		TP122
Engineer	Aecom		Plate No.
Employer	The Coal Authority		02



Photographed by	Date photographed Spoil_1	
Matthew Olley	09/09/2019	SOIL ENGINEERING
Form No. SE-SDP-F-005	IssueNo.RevisionNo 2.04 Issue Date 05/11/	Part of the Bachy Soletanche Group

Project Name	Nenthead Mines - Proposed MWTS, GI	Photographic Record	Hole ID
Project No.	TA8234		TP123
Engineer	Aecom		Plate No.
Employer	The Coal Authority		01



Photograph of Side C - 1.10m



			Photograph of Side D - 1.10m
Photographed by	Date photographed	Side C_1	
Matthew Olley	06/09/2	2019 Side D_1	SOIL ENGINEERING
Form No. SE-SDP-F-005	IssueNo.RevisionNo 2.04	Issue Date 05/11/2012	Part of the Bachy Soletanche Group

Project Name	Nenthead Mines - Proposed MWTS, GI	Photographic Record	Hole ID
Project No.	TA8234		TP124
Engineer	Aecom		Plate No.
Employer	The Coal Authority		02



Photographed by	Date photographed Spoil_2	
Matthew Olley	04/09/2019	soil engineering
Form No. SE-SDP-F-005	IssueNo.RevisionNo 2.04 Issue Date 05/11/20	Part of the Bachy Soletanche Group

Project Name	Nenthead Mines - Proposed MWTS, GI	Photographic Record	Hole ID
Project No.	TA8234		TP125
Engineer	Aecom		Plate No.
Employer	The Coal Authority		01



Photograph of Side A - 2.40m



			Photograph of Side D - 2.40m
Photographed by	Date photographed	Side A_1	<u> </u>
Matthew Olley	04/09/2	2019 Side B_1	SOIL ENGINEERING
Form No. SE-SDP-F-005	IssueNo.RevisionNo 2.04	Issue Date 05/11/2012	Part of the Bachy Soletanche Group

Project Name	Nenthead Mines - Proposed MWTS, GI	Photographic Record	Hole ID
Project No.	TA8234		TP126
Engineer	Aecom		Plate No.
Employer	The Coal Authority		02



Photographed by	Date photographed	Spoil_2	
Matthew Olley	06/09/2	019	SOIL ENGINEERING
Form No. SE-SDP-F-005	IssueNo.RevisionNo 2.04	Issue Date 05/11/2012	Part of the Bachy Soletanche Group

Project Name	Nenthead Mines - Proposed MWTS, GI	Photographic Record	Hole ID
Project No.	TA8234		TP127
Engineer	Aecom		Plate No.
Employer	The Coal Authority		01



Photograph of Side A - 2.25m



			Photograph of Side D - 2.25m
Photographed by	Date photographed	Side A_2	
Matthew Olley	09/0	9/2019 Side D_1	soil engineering
Form No. SE-SDP-F-005	IssueNo.RevisionNo 2.04	Issue Date 05/11/2012	Part of the Bachy Soletanche Group

Project Name	Nenthead Mines - Proposed MWTS, GI	Photographic Record	Hole ID
Project No.	TA8234		TP128
Engineer	Aecom		Plate No.
Employer	The Coal Authority		01



Photograph of Side A - 2.25m



			Photograph of Side D - 2.25m
Photographed by	Date photographed	Side A_2	
Matthew Olley	09/09	9/2019 Side D_1	SOIL ENGINEERING
Form No. SE-SDP-F-005	IssueNo.RevisionNo 2.04	Issue Date 05/11/2012	Part of the Bachy Soletanche Group



SUPPORTING FACTUAL DATA

APPENDIX 1

Explanatory Notes on Fieldwork, Logging and Laboratory Testing

FIELDWORK PROCEDURES

1.0 CABLE PERCUSSION BORING TECHNIQUES

Unless otherwise stated the light cable percussion technique of 'soft ground' boring has been employed in the formation of boreholes for this contract. In cohesive soils a clay cutter has been used to advance the boreholes whilst in granular deposits a shell has been employed. The combination of clay cutter and shell bring up disturbed material which is generally sufficiently representative to permit identification of the strata. Whilst these particular techniques allow the maximum data to be obtained on strata conditions, a degree of mixing of some layered soils (e.g. thin layers of coarse and fine granular material) is inevitable.

2.0 DYNAMIC SAMPLING

As an alternative to cable percussion boring, Soil Engineering employs a number of techniques for the sampling of soils. The most common alternative techniques comprise some form of dynamic sampling system which involves sampling tubes being driven into the ground by means of a sliding weight.

'Window sampling' techniques form the most common type of dynamic sampling and typically comprise 1.0m long steel cylinders with elongated windows. These are driven to the required depth by the use of a percussive hammer. In the 'windowless' mode a plastic liner can be placed in the steel cylinders such that effectively continuous sampling can be undertaken. This method of sampling only produces Quality Class 3 or 4 samples which are not suitable for any form of laboratory machine testing.

3.0 ROUTINE SAMPLING

In the UK "undisturbed" samples of predominantly cohesive soils have historically generally been obtained in a 102mm diameter open drive sampler as described in the British Standard Code of Practice BS 5930: 1999 (ref 01). These samplers are known as U100 and historically are of two types; a metal tube or a plastic liner. BS EN ISO 22475-1: 2006 (ref 03) however makes it clear that such samplers will not produce a quality class 1 sample. It is this class of sample that is required for laboratory machine testing.

Alternative methods of sampling which will produce a class 1 sample are available and these include piston samplers, Shelby tubes and the UT100. The latter is a modification of the U100 and classifies as a thin wall sampler and as such is capable of obtaining class 1 samples. It should be noted however that this type of sampler is only suitable for certain ground conditions and cannot be used in very stiff to hard cohesive soils or in very granular cohesive soils. Equally other thin walled samplers such as the piston sampler are more appropriate for very soft and soft cohesive soils.

Soil Engineering recognise that in certain soil types, there will not be a single solution to sampling and it will be necessary to utilise a variety of sampling techniques in order to obtain the best quality samples possible. Such techniques may include rotary coring and this is described in section 4.0. For some 'difficult' soil types it may not be possible to obtain truly undisturbed samples, and engineering judgement will be required if such samples are to be used for geotechnical laboratory testing. Where such challenging soil types have been encountered and alternative sampling techniques used, this is discussed in the report text.



APPENDIX 1: FIELDWORK PROCEDURES

In granular deposits and mixed cohesive granular deposits where it is not possible to recover undisturbed samples, either large or small disturbed samples are normally obtained. The size of these samples are in accordance with the requirements of BS 5930: 1999 whilst the frequency of sampling is unique to this contract.

It is important to note that the number of blows taken to drive any kind of sampling tube is not necessarily indicative of the strength of the material being sampled. For this reason Soil Engineering recommends that no attempt is made to correlate such blows with the strength of cohesive strata.

4.0 ROTARY DRILLING

Where rotary open hole drilling techniques have been employed it is important to note that descriptions of the strata encountered are generally solely based on the lead drillers observations of cuttings and drill flush returns. Whilst such techniques can provide useful information in certain ground conditions it should be recognised that an accurate determination of subsurface rock strata can only be obtained by rotary coring techniques.

An examination of rock cores obtained by rotary drilling generally enables bedding planes, fissuring and consistency to be observed but does not necessarily reveal the presence of vertical fissures or joints. Where an appropriate core diameter and flushing medium have been used, sub-sampling of the core immediately following removal from the core barrel can produce quality Class 1 samples. Such samples require to be sealed and waxed in order to prevent moisture loss.

Details of the strata encountered are given on the borehole log along with the geologist's assessment of Total Core Recovery (TCR), Solid Core Recovery (SCR) and Rock Quality Designation (RQD) each expressed as a percentage of the individual core runs. When appropriate the Fracture Index (FI) or Fracture Spacing (If) is also given on the logs and represents respectively the number of natural fractures per metre run of core for core that has a similar intensity of fracturing, or the minimum, average and maximum spacing of such natural fractures over an arbitrary length of core of similar intensity of fracturing.

The symbols and abbreviations used on the rotary borehole logs are explained on the exploratory hole legend and notation sheet that precedes the exploratory hole records. It is considered however that the meaning of the abbreviations NI and NA needs further clarification. NI denotes material recovered non intact and applies to material that has numerous fractures or incipient fractures and which is either naturally broken up or which becomes broken up by drilling activities. The result in both cases is that the core is recovered in a highly fragmented state, generally as a gravel. The term NA is the abbreviation for not applicable and refers to any materials to which determination of a fracture index would be inappropriate, i.e. for clay bands.

Where significant core loss (>300mm) has occurred, it is Soil Engineering general policy to insert a separate 'stratum' on the log to coincide with the inferred zone of core loss. Unless there is good evidence as to the rock (or soil) type that has been lost, the legend column is left blank. For zones of inferred mine workings, an appropriate legend is used and this together with all the legends used on the logs is shown on the log notation sheet that precedes the exploratory logs in the report.

A summary of logging methodology for rock strata and core measurements is given in Appendix 1: Terminology used in the Description and Classification of Rocks.

5.0 IN SITU DYNAMIC PENETRATION TESTS

The Standard Penetration Test using either a split spoon (SPT) or a solid cone (SPT(C)), is generally employed where undisturbed samples cannot be obtained e.g. in granular soils, fill and rock etc, in order to obtain an indication of the in situ density, compaction or hardness. It can also be used as an alternative to undisturbed sampling in cohesive deposits. Inherent difficulties are present in obtaining true SPT or SPT(C) "N" values in water bearing fine grained granular deposits and careful consideration of the test technique and groundwater conditions are necessary before test results are used for design purposes.

The full procedure for carrying out the Standard Penetration Test (SPT) is given in BS EN ISO 22476-3: 2005 (ref 02). For fine to medium granular deposits and in clays the test consists of driving a 50mm external diameter split barrel sampler into the soil using a 63.5kg hammer dropping 760mm. In coarse granular soils or in rock, the split barrel may be replaced by a solid cone. The penetration resistance is expressed as the number of blows required to obtain 300mm penetration below an initial seating drive of 150mm through any disturbed ground at the bottom of the borehole. The number of blows for the 300mm test drive penetration is recorded on the borehole logs as the "N" value. A full record of the number of blows required to drive the sampler at 75mm intervals throughout the total 450mm drive is also tabulated along with the groundwater level at the time of test. Where full 450mm penetration is not achieved, it is important to distinguish how the blow count relates to the penetration of the sampler and this may be achieved in the following manner:

- (i) Where the test drive is terminated before full (300mm) penetration the number of blows for the partial test drive (usually 50) and the penetration of the sampler within the test drive are recorded. An approximate "N" value may be obtained by linear extrapolation of the number of blows recorded for the partial test drive.
- (ii) If the total seating drive penetration is equal to or less than 150mm then the number of blows (usually 25) and the depth of penetration within the initial seating penetration are recorded on the borehole logs.

The "N" value obtained from the Standard Penetration Test may be used to assess the relative density of sands and gravels in accordance with Clause 41.3.2 of BS 5930: 1999 (ref 01), as shown in table 1.

It should be noted that the "N" values reported on the logs are uncorrected, as specified in section 7.1.2 of BS EN ISO 22476-3:2005.

SPT's performed by Soil Engineering are carried out using automatic trip hammers that have been calibrated in accordance with BS EN ISO 22476-3:2005. The hammer ID and energy ratio are recorded on the 'header page' of each log and calibration certificates for the hammers used on the project are contained in the Appendix Section of the report, as required by BS EN ISO 22476-3:2005.

TABLE 1: DETERMINATION OF RELATIVE DENSITY FROM PENETRATION TESTS (from BS 5930)

Term	SPT N-Value: Blows/300mm Penetration
Very Loose	0-4
Loose	4-10
Medium Dense	10-30
Dense	30-50
Very Dense	Over 50



APPENDIX 1: FIELDWORK PROCEDURES

It should be noted that it is a requirement of BS EN ISO 22476-3: 2005 that all test hammers are calibrated. Soil Engineering routinely calibrate all their test hammers and the results of the calibration are expressed as an Energy Ratio (Er) on the exploratory hole logs. The Er value is required for design purposes and should be applied to the recorded test N value in the manner described in BS EN ISO 22476-3: 2005.

Standard Penetration Testing may also be performed in very stiff/hard clays in which it would be difficult to obtain undisturbed samples. In such cases the SPT "N" values may be used for design purposes based on correlations between "N" value and various soil parameters such as those proposed by Stroud and Butler (1975) (ref 04) and by Stroud (1989) (ref 05).

6.0 GROUNDWATER

The groundwater conditions entered on the exploratory hole records are those encountered at the time of the investigation. These however, may not represent the actual conditions or those which may apply in large excavations. The normal rate of boring does not always permit the recording of an equilibrium water level for any one water strike, particularly because the entry of water into a borehole may be reduced or even eliminated due to casing off a water bearing layer or due to a skin being formed on the borehole wall by the drilling tools. It should also be noted that groundwater conditions may vary seasonally and/or tidally and that the water levels as shown at the time of investigation should not necessarily be taken as being constant because they may be subject to such fluctuations.

More accurate information on groundwater conditions can be obtained from exploratory hole installations such as piezometers and standpipes. Normally a minimum of three or four monitoring visits are required at the site to provide this information.

References

- 01) BS 5930: 1999: Code of Practice for Site Investigation. British Standards Institution.
- 02) BS EN ISO 22476-3: 2005: Geotechnical Investigation and Testing Field Testing Part 3: Standard Penetration Test.
- 03) BS EN ISO 22475-1: 2006: Geotechnical Investigation and Testing Sampling Methods and Groundwater measurements - Part 1: Technical Principles for Execution.
- 04) Stroud, M.A, Butler, F.G April 1975: 'The Standard Penetration Test and the Engineering Properties of Glacial Materials'. The Engineering Behaviour of Glacial Materials Proc. of Symp.
- 05) Stroud, M.A. 1989: 'The Standard Penetration Test Its Application and Interpretation. Thomas Telford, London.



SUPPORTING FACTUAL DATA

APPENDIX 1

Explanatory Notes on Fieldwork, Logging and Laboratory Testing

TERMINOLOGY USED IN SOIL DESCRIPTIONS

1.0 GENERAL PROCEDURES

Soil descriptions contained in this report have been produced in accordance with the procedures and principles given in BS EN ISO 14688-1: 2002 (ref 01), BS EN ISO 14688-2: 2004 (ref 02) and also where there is no conflict with the European standards, in accordance with BS 5930: 1999 (ref 03).

For a soil description the main soil characteristics should be given in a standard word order although the word order can be adjusted to enhance and clarify if appropriate. The main soil characteristics can be divided as follows:-

- 1 Mass Characteristics comprising state and structure
- 1a Density and Field Strength
- 1b Discontinuities
- 1c Bedding

- 2 Material Characteristics comprising nature and state
- 2a Colour
- 2b Composite Soil Types: particle grading and composition, shape and size
- 2c Principal Soil Type, name in capitals eg CLAY

3 Stratum Name (optional)

3a Geological group or Formation

The basic soil categories may be broadly summarised as follows, with categories i to iii covered by these notes and categories iv and v by separate notes.

- (i) Very coarse soils: greater than 63mm in diameter, ie cobbles and boulders.
- (ii) Coarse soils: 0.063mm to 63mm in diameter, ie sands and gravels.
- (iii) Fine soils: less than 0.063mm in diameter, ie clays and silts.
- (iv) Organic soils.
- (v) Man made "soils".

2.0 MASS CHARACTERISTICS OF SOILS

2.1 Cohesive Soils

For cohesive material determination of consistency is made in accordance with Table 1. The undrained shear strength of clays is determined by laboratory or field testing and is made in accordance with the terms given in Table 2.

TABLE 1: CONSISTENCY GUIDE FOR COHESIVE MATERIAL (from BS EN ISO 14688-1: 2002)

Term	Field Identification
Very Soft	Exudes between fingers when squeezed in the hand
Soft	Can be moulded by light finger pressure
Firm	Cannot be moulded, but can be rolled into 3mm thick thread
Stiff	Crumbles when rolled into 3mm thick thread
Very Stiff	Cannot be moulded and crumbles under pressure. Indented by thumbnail



APPENDIX 1: TERMINOLOGY USED IN SOIL DESCRIPTIONS

TABLE 2: STRENGTH TERMS OF FINE SOILS (from BS EN ISO 14688-2: 2004)

Strength Term	Undrained shear strength (Cu) kPa
Extremely Low	<10
Very Low	10 to 20
Low	20 to 40
Medium	40 to 75
High	75 to 150
Very High	150 to 300
Extremely High¹	>300

¹ Materials with shear strengths greater than 300kPa may behave as weak rocks and should be described in accordance with BS EN ISO 14689-1

2.2 Granular Soils

For granular deposits relative density may only be determined by the Standard Penetration Test (SPT). The following table provides a scale of terms related to SPT 'N' values from BS 5930: 1999 (ref 03).

TABLE 3: ASSESSMENT OF RELATIVE DENSITY FOR GRANULAR SOILS (from BS 5930: 1999)

Term Very loose Loose	Field Identification (generally in trial pits) Can be excavated with a spade and 50mm wooden peg can be easily driven	SPT 'N' Values (blows for 300mm penetration) 0-4 4-10
Loose	and somm wooden peg can be easily driven	4-10
Medium dense	-	10-30
Dense	Requires pick for excavation	30-50
Very dense	and 50mm wooden peg is hard to drive	over 50

N.B: The field identification terms for very loose/loose material and dense/very dense material are very subjective and should be treated with caution.

2.3 Discontinuities

The type of discontinuity should be described eg fissures, faults and shear planes together with their spacing as given in Table 4. Discontinuity openness, and surface texture eg rough, smooth, polished and striated are recorded although these may not always be added to the borehole log if the required level of detail is low.

2.4 Bedding

Bedding spacing is assessed using the thickness terms given in Table 4.

TABLE 4: DESCRIPTIONS FOR DISCONTINUITIES AND BEDDING (from BS 5930: 1999)

DISCONTINUITIES Scale of SpacingTerm	Mean Spacing mm	BEDDING Scale of BeddingTerm	Mean Thickness mm
Very widely	>2000	Very thickly bedded	>2000
Widely	2000-600	Thickly bedded	2000-600
Medium	600-200	Medium bedded	600-200
Closely	200-60	Thinly bedded	200-60
Very closely	60-20	Very thinly bedded	60-20
Extremely closely	<20	Thickly laminated	20-6
		Thinly laminated	<6

N.B: Spacing terms are also used for describing the distance between partings, isolated beds, laminae or roots etc.

Interbedded/interlaminated: alternating layers of different material type. These terms are given a thickness if material is present in equal proportions. Otherwise the thickness of and spacing between subordinate layers are defined.

3.0 MATERIAL CHARACTERISTICS OF SOIL

An examination of insitu soil deposits, disturbed or undisturbed samples allows the material characteristics to be recorded. These characteristics include colour, particle shape, particle grading and particle composition.

3.1 Colour

The recorded colour is based on the logger's general impression of the overall colour. For material with more than three colours the term multicoloured may be used. The term mottled is applied to soils which exhibit two colours, one of which is subordinate to the other.

White, cream, grey, black, yellow, orange, red, brown, green and blue etc may be used but supplemented as necessary with: light, dark, mottled and reddish brownish etc. All colouration associated with chemical changes is noted ie grey gleying on fissures.

3.2 Soil Types (Including Composite Soils)

3.2.1 Very Coarse Soils (Boulders and Cobbles)

Where the soil sample is considered large enough to be representative, material is described as shown in Table 5.

TABLE 5: DESCRIPTORS FOR VERY COARSE SOILS (from BS 5930: 1999)

Main Name	Estimated Boulder/Cobble Content of Very Coarse Fraction
BOULDERS	Over 50% is of boulder size (>200mm)
COBBLES	Over 50% is of cobble size (200mm to 63mm)

Mixtures of very coarse and finer materials are described by combining terms for the very coarse constituents with those for the finer constituents as shown in Table 6.



APPENDIX 1: TERMINOLOGY USED IN SOIL DESCRIPTIONS

TABLE 6: DESCRIPTORS FOR MIXTURES OF VERY COARSE AND FINER SOILS (from BS 5930: 1999)

Term	Composition (Approx %)
BOULDERS (or COBBLES) with a little finer material (1)	Up to 5% finer material
BOULDERS (or COBBLES) with some finer material (1)	5% to 20% finer material
BOULDERS (or COBBLES) with much finer material (1)	20% to 50% finer material
FINER MATERIAL with low boulder content	<5% boulders
FINER MATERIAL with low cobble content	<10% cobbles
FINER MATERIAL with medium boulder content	5% to 20% boulders
FINER MATERIAL with medium cobble content	10% to 20% cobbles
FINER MATERIAL with high boulder content (or cobbles)	>20% boulders or cobbles

⁽¹⁾ The description of "finer material" is made in accordance with BS 5930: 1999 ignoring the very coarse fraction; the principal soil type name of the finer material may also be given in capital letters, e.g. sandy GRAVEL with low boulder content; COBBLES with some sandy CLAY.

3.2.2 Coarse Soils (Gravel and Sand)

A coarse soil (omitting any cobbles and boulders) contains 65% or more of SAND or GRAVEL. The terms given in Table 7 are used to describe the coarse fraction.

TABLE 7: DESCRIPTORS FOR MIXTURES OF COARSE SOILS (from BS 5930: 1999)

Term	Principal Soil Type	Approximate Proportion
		of Secondary Constituent
Slightly sandy or gravelly	SAND	<5%
Sandy or gravelly	or	5% to 20%
Very sandy or gravelly	GRAVEL	>20%
-	SAND and GRAVEL	About equal proportions

3.2.3 Fine Soils and Mixtures of Fine and Coarse Soils

Fine soil should be described as either a SILT or a CLAY. The use of silty CLAY or clayey SILT is however permitted, where the presence of the secondary constituent is considered important.

For deposits that contain a mixture of soil types the descriptors given in Table 8 are used. The dominant secondary fraction is placed immediately before the principal soil type. It should also be noted that the terms silty and clayey are mutually exclusive in a coarse soil. The use of the terms sandy and gravelly are however permitted.

APPENDIX 1: TERMINOLOGY USED IN SOIL DESCRIPTIONS

TABLE 8: DESCRIPTORS FOR FINE SOILS AND COMPOSITE SOIL TYPES (from BS 5930: 1999)

Term	Principal Soil Type	Approximate Proportion o Coarse Soil	f Secondary Constituent Coarse and/or Fine Soil
Slightly clayey or silty and/or sandy or gravelly	SAND and/or		<5%
Clayey or silty and/or sandy or gravelly	GRAVEL		5% - 20% *
Very clayey or silty and/ or sandy or gravelly			>20% *
Very sandy or gravelly	SILT or	>65% +	
Sandy and/or gravelly	CLAY	35% - 65%	
Slightly sandy and/or gravelly		<35%	

^{*} or described as fine soil depending on assessed engineering behaviour

3.3 Particle Shape and Grading

For coarser granular deposits (gravel and cobbles) the particle shape is described as shown in Table 9. A schematic of angularity and form terms is given in Figure 1.

TABLE 9: DESCRIPTORS FOR PARTICLE SHAPE (from BS EN ISO 14688-1: 2002)

Angularity	Form	Surface Texture
Very Angular	Cubic	
Angular	Flat	Rough
Subangular	Elongated	Smooth
Subrounded		
Rounded		
Well Rounded		

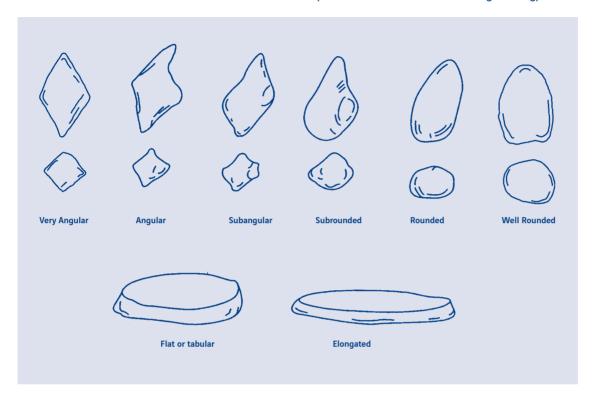
The distribution of particle sizes within sands and gravels is described stating the predominant size fraction present eg fine to medium SAND.



⁺ or described as coarse soil depending on assessed engineering behaviour

APPENDIX 1: TERMINOLOGY USED IN SOIL DESCRIPTIONS

FIGURE 1: PARTICLE ANGULARITY AND FORM TERMS (from BS 5930: 1999 and Soil Engineering)



References

- 01) BS EN ISO 14688-1: 2002: Geotechnical Investigation and Testing Identification and Classification of Soil Part 1: Identification and Description.
- 02) BS EN ISO 14688-2: 2004: Geotechnical Investigation and Testing Identification and Classification of Soil Part 2: Principles for a Classification.
- 03) BS 5930: 1999: Code of Practice for Site Investigation. British Standards Institution.



SUPPORTING FACTUAL DATA

APPENDIX 1

Explanatory Notes on Fieldwork, Logging and Laboratory Testing

TERMINOLOGY USED IN THE DESCRIPTION OF MADE GROUND

1.0 GENERAL DEFINITIONS

Man made soils may be defined as those materials that have not been laid down by geomorphological processes. Under the heading of 'man made soils' two distinct material types can be identified as follows:-

TABLE 1: DEFINITIONS FOR MAN MADE SOILS

Term NATURAL SOILS (Reworked)	Description Use terminology outlined for soils in BS EN ISO 14688-1: 2002 (ref 01), BS EN ISO 14688-2: 2004 (ref 02) and BS 5930: 1999 (ref 03). Can be described using normal approach for soils. Can be tested in accordance with BS1377: 1990.
MAN MADE MATERIALS	Can also frequently be described using normal approach and terminology as above, and tested geotechnically. Includes materials that defy description in any standard manner and includes a range of exotic materials and artifacts. Often not testable in the field or in the laboratory. For example it is not possible to measure strength of a bicycle frame or liquid limit of plastic.

There is also a distinction between the terms "Fill" and "Made Ground" as follows:

FILL = Material placed under engineering control
MADE GROUND = Material placed without any kind of control, ie non engineered

2.0 IDENTIFICATION OF MAN MADE SOILS

Some common examples of man made soils are given in Table 2 on page 2. The table illustrates that the heading of 'man made' soils can cover a wide variety of materials, some of which may not readily appear to be anything other than natural.

Natural soils re-laid by man may be difficult to identify as such and so it is necessary to look for evidence in the form of artifacts or relic structure in the material.

For example as few as one or two artifacts may be diagnostic (rare brick fragments or car body at base of trial pit). Lenses or pockets of clay that are laminated etc help to indicate natural material that has been relaid. However be aware of the following:

Contamination by driller (Clinker from around rig, green grass from 15m...).

Contamination during trial pitting (brick rubble can fall from the upper layers in a pit and then get pushed in to natural deposits by the action of the excavator bucket).



APPENDIX 1: TERMINOLOGY USED IN THE DESCRIPTION OF MADE GROUND

TABLE 2: DEFINITIONS FOR MAN MADE SOILS

CATEGORY	EXAMPLE
Natural Soils re-laid by man	Embankment Fill
	Colliery Spoil (Coarse Discard)
	Drainage Layer e.g Gravel
Man Made Materials that can be desc	ribed and Abutment backfill e.g Crushed rock
which are testable geotechnically	Colliery Spoil (Fine Discard)
	Mine Tailings from non-coal mines
	Crushed Concrete
	Pulverised Fuel Ash (PFA)
	Chalk whiting (slurry from cement manufacture)
Man Made Materials that are NOT rea	ndily Landfill
describable and which are not testable	Demolition rubble (including frames, slates etc)
geotechnically	Fly tipped materials
	Burgy (glass work waste)

3.0 DESCRIPTION OF MAN MADE SOILS

Information that is be reported to define the material includes the following:-

Origin of materials, if known from desk study.

Layers and their inclination to inform on mode of tipping, whether ponded, end tipped, spread or stockpiled. Large objects, obstructions such as concrete, masonry walls, old cars.

Presence of hollow objects, compressible/collapsible objects or voids such as oil drums, cellars, tanks.

Chemical wastes and dangerous or hazardous substances such as creosote, hospital wastes, unlabelled drums, asbestos.

Decomposable materials with note on degree of decomposition such as garden waste, paper.

Smell such as organic, phenolic, sulphurous, petrol.

Striking colours

Any dating possible such as type of bottles, newspapers, papers.

Signs of heat or combustion such as steam, smoke, burnt shale.

NOTES

Because of the variability of the constituents of man made soils, strength or in situ density descriptors are not generally assigned to made ground. Where describing fill as opposed to made ground it may be possible to use the descriptors that are used for natural soils.

Large or hollow objects cannot be sampled so the description is the sole information on condition and character of the features.

The constituents of made ground are grouped together under the above categories and it is usual to give volumetric percentages where possible.

Granular made ground may be given a particle size, although the following description methodology is employed.

MADE GROUND: Grey fine to coarse gravel sized fragments of brick and concrete.

OR

MADE GROUND: Grey gravelly clay with occasional subangular cobble sized fragments of brick. Gravel sized fragments are angular to subangular, fine, medium and coarse of brick.

APPENDIX 1: TERMINOLOGY USED IN THE DESCRIPTION OF MADE GROUND

In these two examples, note the use of term 'sized fragments' to describe the granular content. Because the material is man made we do not use the terms sand, gravel or cobbles etc in the same context as for natural soils. In other words it would be incorrect to use the following:

MADE GROUND: Grey gravelly clay with occasional cobbles. Gravel is angular coarse of brick, cobbles are rounded of brick.

The use of sand, gravel or cobble prior to 'sized fragments' is only intended to define a size range to the granular made ground material.

Similar grain size indicators are also used to describe the size of other man made materials such as concrete, bituminous road surfacing etc. In addition the terms can also be used to describe natural material that has been modified by man, such as wood that may be present in the form of railway sleepers etc. Where whole man made items are identified they should be described as follows:

'with numerous wooden railway sleepers'

For such materials it is necessary to add size measurements, since no other quantifying terms are used.

4.0 DEFINITIONS OF SOME MAN MADE SOILS

There is generally a lack of national guidance on the meaning of common terms used in made ground. This applies particularly to man made materials. For this reason descriptions of man made soils within this report aim to provide as much information as possible on the material being logged, whilst staying within the guidance provided in these notes.

For some sites a set of definitions for the likely range of made ground to be encountered may have been determined and where this is the case it is identified within the report text.

Some terms for one group of commonly encountered made ground are given below.

COMBUSTION PRODUCTS, often physically unstable and usually containing concentrations of metals and poly-aromatic hydrocarbons. The definitions below are workable compromises.

ASH: Sand or silt size by definition, so do not need but can use "ash sand", and cannot have "gravel size ash" although cinders can be gravel size but readily crush down. Can include unburnt coal.

CLINKER: Gravel size or larger by definition so do not need but can use "clinker gravel", and cannot have "sand size clinker".

SLAG: Materials fused or poured as liquid or scum or froth, of any size or shape, and will be at least strong. If in blocks or layers, can present difficulties for borehole or trial pit penetration. Slag is often pelletised, expanded or crushed for reuse in construction.



APPENDIX 1: TERMINOLOGY USED IN THE DESCRIPTION OF MADE GROUND

References

- 01) BS EN ISO 14688-1: 2002: Geotechnical Investigation and Testing Identification and Classification of Soil Part 1: Identification and Description.
- 02) BS EN ISO 14688-2: 2004: Geotechnical Investigation and Testing Identification and Classification of Soil Part 2: Principles for a Classification.
- 03) BS 5930: 1999: Code of Practice for Site Investigation. British Standards Institution.



SUPPORTING FACTUAL DATA

APPENDIX 1

Explanatory Notes on Fieldwork, Logging and Laboratory Testing

TERMINOLOGY USED IN PEAT AND ORGANIC SOIL DESCRIPTIONS

APPENDIX 1: TERMINOLOGY USED IN PEAT AND ORGANIC SOIL DESCRIPTIONS

The basic designation for soils consisting principally of organic matter is summarised in Table 1.

TABLE 1: IDENTIFICATION AND DESCRIPTION OF ORGANIC SOIL

Term	Description		
Fibrous Peat	Fibrous structure, easily recognisable plant structure, retains some strength		
Pseudo-fibrous Peat	Recognisable plant structure, no strength of apparent plant material		
Amorphous Peat	No visible plant structure, mushy consistency		
Gyttja	Decomposed plant and animal remains, may contain inorganic constituents		
Humus	Plant remains, living organisms and their excretions together with inorganic constituents, from the topsoil		

If a soil contains organic material in identifiable fragments these are individually described using the "occasional, some and much" terms as appropriate. Any smells or odours should be noted. Where the organic materials are disseminated throughout the soil the term "organic" should be given prior to the soil type.

eg: Soft grey organic CLAY

Where the soil is composed of natural organic material a peat description may be more appropriate. Peats are normally described after BS EN ISO 14688-1: 2002 (ref 01), although as the descriptive scheme in that standard is very limited, the additional terms summarised by Hobbs (ref 02) may be used if required.

Peats can be identified as shown in Table 2. The word order is as for other natural soils, however different terms are used to describe the consistency of the peat and the soil type is preceded by an additional term (Fibrous or Amorphous).

No guidance is given in either BS EN ISO 14688-1: 2002 or 14688-2: 2004 or BS 5930: 1999 as to how to deal (in terms of description) with peat soils that contain other materials such as clay or gravel. If the peat has a coarse soil fraction the proportions given in Terminology Used in Soil Descriptions, Table 6 (Descriptors for Mixtures of Very Coarse and Finer Soils) are used. It is difficult to assess visually what proportion of the fine soil is mineral and what proportion is organic therefore the terms "clayey" or "silty" are used with caution if at all.

eg: Firm black fibrous PEAT (H3)
Plastic brown amorphous PEAT (H8)
Spongy black slightly sandy fibrous PEAT (H4)

References

- 01) BS EN ISO 14688-1: 2002: Geotechnical Investigation and Testing Identification and Classification of Soil Part 1: Identification and Description.
- O2) Hobbs, N.B. 1986: 'Mire morphology and the properties and behaviour of some British and foreign peats.' Q.J. Engng Geol. 19, No 1, 7-80.
- 03) BS 5930: 1999: Code of Practice for Site Investigation. British Standards Institution.
- 04) BS EN ISO 14688-2: 2004 Geotechnical Investigation and Testing Identification and Classification of Soil Part 2: Principles for a Classification.



TABLE 2: GUIDANCE ON THE IDENTIFICATION AND DESCRIPTION OF PEAT (AFTER BS 5930 AND HOBBS)

RESIDUE IN HAND		Not pacty		Somewhat pasty		Thick, pasty	Very thick paste	1	Fridit 100ts and fibre which resist decomposition	
MATERIAL EXTRUDED BETWEEN FINGERS	Clear, colourless water	Yellowish water	Brown, muddy water, no peat	Dark brown muddy water, no peat	Muddy water and some peat	Above one third of peat squeezed out; water dark brown	About one half of peat squeezed out, consistency like porridge; any water is very dark brown	About two thirds of peat squeezed out, also some pasty water	Nearly all the peat squeezed out as a fairly uniform paste	All the peat passes between the fingers, no free water visible
DESCRIPTION	Entirely unconverted mud-free peat	Almost entirely unconverted mud-free peat	Very slightly converted or very slightly muddy peat	Slightly converted or somewhat muddy peat	Fairly converted or rather muddy peat, plant structure still quite evident	Fairly converted or rather muddy peat, plant structure indistinct but more obvious after squeezing	Fairly well converted or markedly muddy peat; plant extract still discernible	Well converted or very muddy peat, very indistinct plant structure	Almost completely converted or mud-like peat, plant structure almost not recognisable	Completely converted or entirely muddy peat, no plant structure visible
DECOMPOSITION	None	Insignificant	Very slight	Slight	Moderate	Moderately strong	Strong	Very strong	Nearly complete	Complete
DEGREE OF HUMIFICATION	H1	Н2	Н3	H4	H5	Н6	Н7	8H	6Н	H10
SOIL TYPE	Fibrous							Amorphous PEAT		
CONSISTENCY SOIL TYPE	Firm or Spongy							Plastic		



SUPPORTING FACTUAL DATA

APPENDIX 1

Explanatory Notes on Fieldwork, Logging and Laboratory Testing

TERMINOLOGY USED IN THE DESCRIPTION AND CLASSIFICATION OF ROCKS

1.0 GENERAL PROCEDURES

Rock descriptions contained in this report have been produced in accordance with the procedure and principles given in BS EN ISO 14689-1: 2003 (ref 01) and where there is no conflict with the European standards in accordance with BS 5930: 1999: Section 6 (ref 02). For rock descriptions the main rock characteristics should be given in a standard word order. The description and classification is therefore based on the following:-

- 1 Material Characteristics
- 1a Strength
- 1b Structure
- 1c Colour
- 1d Texture
- 1e Grain size
- 1f Weathering and alteration effects
- 1g Rock name (in capitals e.g. SANDSTONE)
- 3 Mass Characteristics
- 3a State of weathering
- 3b Fracture state
- 3c Discontinuities

- 2 General Information
- 2a Minor Constituents
- 2b Geological Formation

2.0 MATERIAL CHARACTERISTICS OF ROCK

2.1 Strength

The descriptors given in Table 1 are used to assess rock strength.

TABLE 1: DESCRIPTORS AND FIELD IDENTIFICATION FOR ROCK STRENGTH

Term Extremely weak ¹	FIELD IDENTIFICATION Indented by thumbnail	UNCONFINED COMPRESSIVE STRENGTH (MPa) <1
Very weak	Crumbles under firm blows with point of geological hammer, can be peeled by pocket knife	1 to 5
Weak	Can be peeled by pocket knife with difficulty, shallow indentations can be made by firm blow with point of geological hammer	5 to 25
Medium strong	Cannot be scraped or peeled with a pocket knife, specimen can be fractured with a single firm blow of geological hammer	25 to 50
Strong	Specimen requires more than one blow of geological hammer to fracture it	50 to 100
Very strong	Specimen requires many blows of geological hammer to fracture it	100 to 250
Extremely strong	Specimen can only be chipped with geological hammer	>250

¹ Some extremely weak rocks will behave as soils and should be described as soils in accordance with BS EN ISO 14688-1



2.2 Structure

The descriptive terms for structure cover the inter-relationship of lithology and textural features in the rock. Terms include: bedding, laminated, foliated and banded. The thicknesses of these structures are described by the terms given in table 2 which also apply to the spacing of discontinuities (see section 4.3).

TABLE 2: DESCRIPTIVE TERMS FOR STRUCTURE AND DISCONTINUITY SPACING (from BS EN ISO 14689-1: 2003)

STRUCTURE	DISCONTINUITY (FG. IOINIT, FISSURE)	SPACING
(EG BEDDING, CLEAVAGE) Very thickly (bedded)	(EG JOINT, FISSURE) Very widely (jointed)	> 2m
Thickly (bedded)	Widely (jointed)	0.6m-2m
Medium (bedded)	Medium (jointed)	0.2m-0.6m
Thinly (bedded)	Closely (jointed)	60mm-200mm
Very thinly (bedded)	Very closely (jointed)	20mm-60mm
Laminated	Extremely closely (jointed)	6mm-20mm
Thinly laminated	-	< 6mm

2.3 Coloui

Colour is described according to the scheme given in BS EN ISO 14689-1.

2.4 Texture

A description of rock texture is not normally required but when used refers to the arrangement of individual grains in the rock. Terms which may be used include: porphyritic, crystalline, amorphous and vitreous. For further guidance refer to BS 5930: 1999: section 44.2.4 (ref 02).

2.5 Grain Size

The descriptive scheme given in Table 14 of BS 5930: 1999 (ref 02) is used together with the accompanying notes in section 44.2.5.

2.6 Weathering and Alteration Effects

The results of weathering or alteration of the rock material are described in accordance with the principals given for rock mass in section 4.0.

2.7 Rock Name

An aid to the identification of rock type is given in Table A1 of BS EN ISO 14689-1:2003 (ref 01).

3.0 GENERAL INFORMATION

3.1 Minor/Other Characteristics

Information can include minor constituents as for soils (see Terminology used in Soil Descriptions) and can include abnormal mineralogy, presence of vugs etc.

3.2 Geological Formation

The geological formation, age and type of deposit are only given where this can be done with confidence and where no conjecture is involved.

4.0 MASS CHARACTERISTICS

4.1 Description of Weathering for the Rock Mass

Approach 1 in BS 5930 1999, provides guidance on the factual description of weathering effects at the material and mass scales. This factual description is mandatory and requires the following indicators of weathering to be described:

- Changes in colour - Changes in fracture state

Reduction in strength
 Presence, character & extent of weathering products

When further classification is required, use is made of Approach 4 in Figure 19 of BS 5930 and this table is reproduced as Table 3. Approach 4 is used for many specific formations in the UK, such as London Clay, Lias Clay and Mercia Mudstone. Chalk however is classified under Approach 5 as a special case.

It should be noted that Tables 2 and 13 in BS EN ISO 14689-1 are not relevant to the majority of rocks in the UK and are not reproduced in these notes.

TABLE 3: CLASSIFICATION OF WEATHERING INCORPORATING MATERIAL AND MASS FEATURES (Approach 4 in BS 5930 1999)

CLASS A	CLASSIFIER Unweathered	TYPICAL CHARACTERISTICS Original strength, colour and fracture spacing
В	Partially Weathered	Slightly reduced strength, slightly closer fracture spacing, weathering penetrating in from fractures. Brown oxidation
С	Distinctly Weathered	Further weakened, much closer fracture spacing, grey reduction
D	Destructured	Greatly weakened, mottled, ordered lithorelics in matrix becoming weakened and disordered
E	Residual or reworked	Matrix with occasional altered random lithorelics, bedding destroyed. Classed as reworked if with foreign inclusions

4.2 Fracture State

For the purposes of logging and the recording of mechanical properties, fractures include: Joints (a discontinuity in the body of the rock along which there has been no visible displacement), Faults (a fracture along which there has been visible displacement), Bedding Fracture (a fracture along the bedding) and Cleavage Fracture (a fracture along a cleavage).

Fracture state is recorded in accordance with the terms detailed in BS EN ISO 22475-1: 2006 (ref 03) as follows:

Solid core

Core with at least one full diameter (but not necessarily a full circumference) between two natural fractures. By this definition core that has a single set of inclined fractures would have a solid core recovery of 100%. Where there are two or more sets of non parallel fractures only sections of the core in which the fractures actually intersect are excluded from the assessment of solid core.

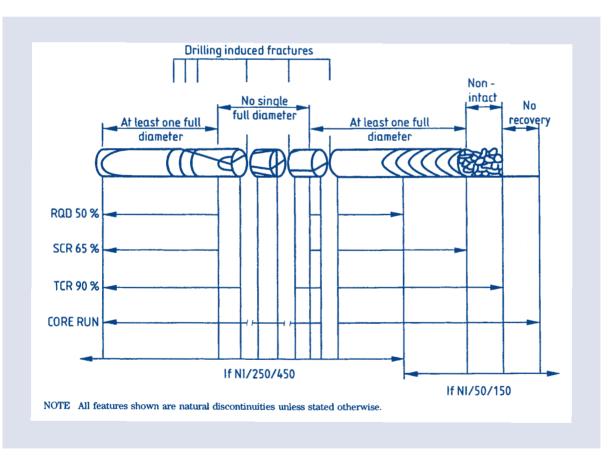
Based on these definitions the terms in Table 4 are defined and these are shown schematically in Figure 1.



TABLE 4: DESCRIPTORS FOR THE MECHANICAL LOGGING OF ROCK CORE

TERM Total Core Recovery	ABBREVIATION TCR (%)	DEFINITION The percentage ratio of core recovered (both solid and non-intact) to the total length of core run
Solid Core Recovery	SCR (%)	The percentage of solid core recovered to total length of core run
Rock Quality Designation	RQD(%)	The total length of solid core pieces greater than 100mm between natural fractures expressed as a percentage of total length of core run
Fracture Index	FI	The number of natural fractures contained within a metre of core of similar intensity of fracturing. This need not correspond to core runs. (NI) is used to denote non intact fragmented core.
Fracture Spacing	If min ave max	The minimum, average & maximum spacing of natural fractures within core of similar intensity of fracturing. This need not correspond to core runs. (NI) is used to denote non intact fragmented core.

FIGURE 1: ILLUSTRATION OF FRACTURE LOGGING TERMS



APPENDIX 1: TERMINOLOGY USED IN THE DESCRIPTION AND CLASSIFICATION OF ROCKS

4.3 Discontinuities

Discontinuities are breaks in the rock mass and when observed in rock cores are described as:

Joint, Fissure, Fault, Induced Fracture, Incipient Fracture, Bedding Fracture and Vein. Descriptive terms for discontinuities are given below in the correct order:

Spacing: Described in accordance with Table 1

Persistence: Discontinuous or Continuous

Roughness: See Table 5
Aperture: See Table 6
Infill: See Table 7

TABLE 5: DESCRIPTORS FOR DISCONTINUITY ROUGHNESS (After BS EN ISO 14689-1: 2003)

MEDIUM SCALE	SMALL SCALE DESCRIPTORS	
DESCRIPTORS	Rough (irregular)	Smooth
Stepped	Stepped rough	Stepped smooth
Undulating	Undulating rough	Undulating smooth
Planar	Planar rough	Planar smooth

Note: The large scale terms: wavy, curved and straight are only seen at the mass scale and are not observed in rock cores.

TABLE 6: DESCRIPTORS FOR DISCONTINUITY APERTURE (After BS EN ISO 14689-1: 2003)

APERTURE SIZE TERM	APERTURE
Very Tight	<0.1mm
Tight	0.1mm to 0.25mm
Partly Open	0.25mm to 0.5mm
Open	0.5mm to to 2.5mm
Moderately Wide	2.5mm to 10mm
Wide	1cm to 10cm
Very Wide	10cm to 100cm
Extremely Wide	>1.0m

TABLE 7: DESCRIPTORS FOR DISCONTINUITY INFILL

INFILL	INFILL DESCRIPTION DEFINITION
Clean	No fracture infill material
Stained	Colouration on rock only. No recognisable infill material
Filled or partially filled	Discontinuity filled with recognisable infill material which should be described, eg clay, gypsum etc, together with its thickness.



APPENDIX 1: TERMINOLOGY USED IN THE DESCRIPTION AND CLASSIFICATION OF ROCKS

References

- 01) BS EN ISO 14689-1: 2003: Geotechnical Investigation and Testing Identification and Classification of Rock Part 1: Identification and Description.
- 02) BS 5930: 1999: Code of Practice for Site Investigation. British Standards Institution.
- 03) BS EN ISO 22475-1: 2006: Geotechnical Investigation and Testing Sampling Methods and Groundwater Measurements Part 1: Technical Principles for Execution.



SUPPORTING FACTUAL DATA

APPENDIX 1

Explanatory Notes on Fieldwork, Logging and Laboratory Testing

ASSESSMENT OF AGGRESSIVE GROUND AND GROUNDWATER CONDITIONS

APPENDIX 1: ASSESSMENT OF AGGRESSIVE GROUND AND GROUNDWATER CONDITIONS

Certain ground and groundwater conditions may be described as aggressive depending on their chemical composition which is related to previous industrial use. Where foundations are proposed to be constructed on industrial sites or on landfill sites in which the ground or groundwater may be contaminated with chemical waste, detailed consideration needs to be given to both the method of investigation and the severity of ground and groundwater conditions with respect to construction materials. For such sites it will usually be necessary to undertake a full chemical analysis in order to identify the potentially aggressive compounds.

On sites where new concrete foundations are to be constructed in natural ground it is usually only necessary to examine the sulfate content and pH level of the ground. The sulfate content of soils varies widely and can range from being virtually absent to extremely high concentrations in crystals such as gypsum. In between these two extremes sulfate may be disseminated throughout a soil or may be present in discrete bands or lenses. Because of this wide variation in the sulfate content of soils, the most reliable indication of possible aggressive conditions can be obtained by testing representative samples of groundwater. In order to take account of natural variations in the distribution of sulfates in the ground, samples should be taken at a number of locations that are well spaced across the site and at different depths.

The methods for the determination of total sulfate of soil and the sulfate content of groundwater and 2:1 aqueous soil extracts are given in various specifications including BS 1377 1990: Part 3: Section 5 (ref 01). The results of tests performed in accordance with BS 1377 yield results which are expressed as percentage of dry weight retained or grammes/litre SO_3 . Tests performed in accordance with other specifications however, tend to express results as SO_4 .

The classification of natural sulfate conditions is based on BRE Special Digest 1 2005 (ref 02). This digest makes most use of sulfate values expressed as milligrammes/litre SO_4 . In order to convert the results expressed as SO_3 (BS 1377) to SO_4 (BRE Special Digest 1) it is necessary to apply a multiplication factor of 1.2. In the following discussion of sulfate conditions values given in the tables are expressed in terms of SO_4 . The current approach to the classification of aggressive ground conditions given in BRE Special Digest 1 is based on the Aggressive Chemical Environment for Concrete (ACEC). This takes into account the type of site, sulfate concentration and groundwater acidity and mobility. Different site assessment procedures are used for natural ground, for brownfield sites that contain industrial waste and pyritic ground. The reactions of sulfates in the presence of other ions, notably carbonate and magnesium are also taken into account.

In general when the results of sulfate determinations are assessed, emphasis must be given to the samples which fall in the higher classes. Therefore if eight out of ten samples are found to be non aggressive and fall within Class DS1 and the remainder fall within Class DS2 it will be necessary to adopt the precautions appropriate to Class DS2 conditions for the whole site. The current digest differentiates between 'natural ground locations' and 'brownfield locations'.

Table 1 on page 2 is reproduced from the digest and deals with natural ground locations.



TABLE 1: AGGRESSIVE CHEMICAL ENVIRONMENT FOR CONCRETE (ACEC) CLASSIFICATION FOR NATURAL GROUND LOCATIONS (a) (From BRE Special Digest 1)

SULFATE				GROUNDWAT	ΓER	
DESIGN SULFATE CLASS FOR LOCATION	2:1 WATER/SOIL EXTRACT (b)	GROUNDWATER	TOTAL POTENTIAL SULFATE (c)	STATIC WATER	MOBILE WATER	ACEC CLASS FOR LOCATION
1	2 (SO ₄ mg/l)	3 (SO ₄ mg/l)	4 (SO ₄ %)	5 (pH)	6 (pH)	7
DS-1	<500	<400	<0.24	>2.5	>5.5 (d) 2.5-5.5	AC-1s AC-1 _(d) AC-2z
DS-2	500-1500	400-1400	0.24-0.6	>3.5	>5.5 2.5-5.5	AC-1s AC-2 AC-2s AC-3z
DS-3	1600-3000	1500-3000	0.7-1.2	>3.5	>5.5 2.5-5.5	AC-2s AC-3 AC-3s AC-4
DS-4	3100-6000	3100-6000	1.3-2.4	>3.5	>5.5 2.5-5.5	AC-3s AC-4 AC-4s AC-5
DS-5	>6000	>6000	>2.4	>3.5 2.5-3.5	>2.5	AC-4s AC-5

NOTES

- a) Applies to locations on sites that comprise either undisturbed ground that is in its natural state or clean fill derived from such ground.
- b) The limits of Design Sulfate Classes based on 2:1 water/soil extracts have been lowered relative to previous digests.
- c) Applies only to locations where concrete will be exposed to sulphate ions (SO₄) which may result from the oxidation of sulfides (eg pyrite) following ground disturbance.
- d) For flowing water that is potentially aggressive to concrete owing to high purity or an aggressive carbon dioxide level greater than 15mg/l, increase the ACEC Class to AC-2z.

Explanation of suffix symbols to ACEC Class

Suffix 's' indicates that the water has been classified as static

Concrete placed in a ACEC Class that includes the suffix 'z' primarily have to resist acid conditions and may be made with any of the cements listed in Table D2 in the Digest.

Additional testing is required for those natural sites that contain pryrite. In particular it is essential to take account of the total potential sulfate content which might result from oxidation following ground disturbance. On such sites it is necessary to determine total sulfate content (AS% SO₄), total sulfur (TS%S). The total potential sulfate is then determined from TPS%SO₄=3.0 x TS%S. Finally the amount of oxidisable sulfides (OS as %SO₄) is determined by subtracting the acid soluble sulfates (AS%SO₄) from the total potential sulfate content: OS%SO₄ = TPS%SO₄ – AS%SO₄. It is important to note that this testing is in addition to and not instead of the standard sulfate determination testing.

Unless the site can be demonstrated to comprise natural ground, Table 2 for brownfield locations must be used in all assessments for the design of concrete. It should be noted that the effects of the magnesium ion become relevant to concrete design for certain Design Sulfate Classes.

TABLE 2: AGGRESSIVE CHEMICAL ENVIRONMENT FOR CONCRETE (ACEC) CLASSIFICATION FOR BROWNFIELD LOCATIONS (a) (From BRE Special Digest 1)

	SULFATE AND MAGNESIUM GROUNDWATER							
DESIGN SULFATE CLASS FOR LOCATION	2:1 WATER/SOI EXTRACT (b)	L GROUNDWATE	R	TOTAL	STATIC POTENTIAL SULFATE (c)			CLASS FOR LOCATION
1	2 (SO ₄ mg/l)	3 (Mg mg/l)	4 (SO ₄ mg/l)	5 (Mg mg/l)	6 (SO ₄ %)	7 (pH) _(d)	8 (pH) _(d)	9
DS-1	<500	-	<400	-	<0.24	>2.5	>6.5 (d) 5.5-6.5 4.5-5.5 2.5-4.5	AC-1s AC-1 AC-2z AC-3z AC-4z
DS-2	500-1500	-	400-1400	-	0.24-0.6	>5.5 2.5-3.5	>6.5 5.5-6.5 4.5-5.5 2.5-4.5	AC-1s AC-2 AC-2s AC-3z AC-4z AC-5z
DS-3	1600-3000	-	1500-3000	-	0.7-1.2	>5.5 2.5-5.5	>6.5 5.5-6.5 2.5-5.5	AC-2s AC-3 AC-3s AC-4 AC-5
DS-4	3100-6000	<1200	3100-6000	<1000	1.3-2.4	>5.5 2.5-3.5	>6.5 2.5-6.5	AC-3s AC-4 AC-4s AC-5
DS-4m	3100-6000	>1200 (e)	3100-6000	>1000 (e)	1.3-2.4	>5.5 2.5-5.5	>6.5 2.5-6.5	AC-3s AC-4m AC-4ms AC-5m
DS-5	>6000	<1200	>6000	<1000	>2.4	>5.5 2.5-3.5	>2.5	AC-4s AC-5
DS-5m	>6000	>1200 (e)	>6000	>1000 (e)	>2.4	>5.5 2.5-5.5	>2.5	AC-4ms AC-5m

NOTES

- a) Brownfield locations are those sites or parts of sites that might contain chemical residues produced by industrial processes.
- b) The limits of Design Sulfate Classes based on 2:1 water/soil extracts have been lowered relative to previous digests.
- c) Applies only to locations where concrete will be exposed to sulfate ions (SO_4) which may result from the oxidation of sulfides (eg pyrite) following ground disturbance.
- d) An additional account is taken of hydrochloric and nitric acids by adjustment to sulfate content
- e) The limit on water soluble magnesium does not apply to brackish groundwater (chloride content between 12000mg/l and 17000mg/l). This allows 'm' to be omitted from the relevant ACEC classification. Sea water (chloride about 18000mg/l) and stronger brines are not covered by this table.

Explanation of suffix symbols to ACEC Class

Suffix 's' indicates that the water has been classified as static

Concrete placed in ACEC Classes that include the suffix 'z' primarily have to resist acid conditions cements listed in Table D2 in the Digest. Suffix 'm' relates to the higher levels of magnesium in Design Sulfate Classes 4 and 5.



APPENDIX 1: ASSESSMENT OF AGGRESSIVE GROUND AND GROUNDWATER CONDITIONS

The pH value of groundwater provides a crude measure of the potential aggressiveness due to the presence of organic acids. The standard procedure for measuring the acidity of soils and groundwater is the electrometric method using a pH meter and is described in BS 1377: 1990: Part 3: Section 5. The pH value of pure water is 7.0 and the presence of acid substances will yield results with values less than 7. It should be noted however that the pH of most natural waters depends mainly on the dissolved carbon dioxide content and therefore lies between pH values of 6.5 and 8.5. It is generally accepted that soils or groundwater with pH values in the range 6 to 9 may be classified as near neutral. It should be noted that the pH value of soil and groundwater can change with time and it is therefore necessary to carry out testing on fresh samples of soil or water.

The pH value of the soil or groundwater also needs to be taken into consideration when the recorded sulfate content is borderline between two classes or approaches the upper limit of a given class. In these circumstances both the pH value and the mobility of the groundwater needs to be assessed and where doubt exists, the sample should be placed in the more severe class of the sulfate classification. This general approach may be justified on the grounds that the acids present will tend to break down the concrete surface and therefore make it more susceptible to sulfate attack. This will be especially so if the sample contains large amounts of sulfides since these can be converted to sulfuric acid.

Organic acids are often found in peaty or marshy soils in which the pH value is below 6.0. In such soils it will be necessary to take specific precautions to protect any concrete which would be exposed to organic acids. The recommended precautionary measures outlined in Tomlinson 2001 (ref 03) could be followed. In all cases where mineral acids are present the groundwater is likely to be aggressive with regard to foundation concrete and in these circumstances the recommendations given in BRE Special Digest 1 Part C will need to be followed.

Apart from acid groundwater, the effects of static and mobile groundwater tables are taken into account in BRE Special Digest 1 in 'Box C9' and the incremental rules in this table need to be viewed in relation to Tables C1 and C2 in the Digest.

Alkaline groundwater is not generally considered aggressive to concrete unless present in high concentrations. Unless the aggregate used in foundation concrete is of a reactive type, pH values of groundwater up to pH = 14 need not be considered as problematic.

References

- 01) BS 1377: 1990: Methods of Test for Soils for Civil Engineering Purposes. Part 3: Chemical Electrochemical Tests, British Standards Institution.
- 02) Building Research Establishment 2005: Concrete in Aggressive Ground. BRE Special Digest 1. Building Research Station, Garston
- 03) Tomlinson M.J 2001: Foundation Design and Construction. 7th Edition, Pearson, Prentice Hall.



SUPPORTING FACTUAL DATA APPENDIX 2

SUBCONTRACT REPORTS

AOC Archaeology Watching Brief Report

Nenthead (Caplecleugh), Mine Water Treatment

Archaeological Watching Brief Report

National Grid Reference Number: NY 78430 43298

AOC Project No: 52055

Date: November 2019





Nenthead (Caplecleugh) Mine Water Treatment Archaeological Watching Brief Report

On Behalf of: **The Coal Authority**

200 Lichfield Lane

Mansfield

Nottinghamshire NG18 4RG United Kingdom

National Grid Reference (NGR): NY 78430 43298

AOC Project No: 52055

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Fieldwork undertaken: 02 - 16 September 2019

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6 November 2019 Date:

This document has been prepared in accordance with AOC standard operating procedures.

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Document Stage: Final Draft Date: 06 November 2019

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Figure 2: Plan of Trial Pit and Window Sample locations

Plates

Plate 1: Trial Pit 103a showing structure TP3001a, viewed from the southeast.

Plate 2: Trial Pit 103b showing structure TP3002b, viewed from the southeast.

Plate 3: Trial Pit 104, viewed from the SSE.

Plate 4: Trial Pit 109, viewed from the southwest.

Plate 5: Trial Pit 113, viewed from the west.

Plate 6: Trial Pit 115, viewed from the north.

Plate 7: Trial Pit 116, viewed from the north.

Plate 8: Trial Pit 118, viewed from the north.

Plate 9: Trial Pit 120, viewed from the northwest.

Plate 10: Trail Pit 124, viewed from the ESE.

Plate 11: Trial Pit 125, viewed from the southeast.

Plate 12: Trail Pit 126, viewed from the southwest.

Plate 13: Trial Pit 128, viewed from the north.

Non-Technical Summary

AOC Archaeology Group was commissioned by The Coal Authority through their agents AECOM to monitor a series of groundwork investigations at the Nenthead Mine, Cumbria, for a Mine Water Treatment Scheme.

Twenty-eight trial pits and nine window samples were excavated. Made ground deposits were encountered in the trial pits on the northwestern part of the site and these are thought to represent redeposited mining waste. The trial pits on the main body of the site revealed more conventional soil profiles (topsoil/subsoil/natural). Three potential structures were also encountered, at least one of which is thought to relate to the historic mine complex.

1 Introduction

- 1.1 AOC Archaeology Group was commissioned by The Coal Authority through their agents AECOM to undertake an archaeological watching brief during geotechnical investigations in advance of the construction of a Mine Water Treatment Scheme for the Nenthead Mine, Cumbria. The works fall partly within the boundaries of a scheduled monument encompassing historic lead mines, ore works and a smelthill at Nenthead (NHLE 1015858).
- 1.2 The archaeological evaluation was undertaken in accordance with a Written Scheme of Investigation (WSI) prepared by AECOM Limited and approved by Cumbria County Council's Historic Environment Officer (AECOM 2019). The work also met the requirements of nationally recognised guidance for archaeological excavations, including the professional standards published by the Chartered Institute for Archaeologists (specifically, the *Standard and Guidance for an Archaeological Watching Brief* (CIfA, 2014a)).
- 1.3 The archaeological work was managed to the standards laid down in the Historic England guideline publication *Management of Research Projects in the Historic Environment (MoRPHE): Project Managers Guide* (2006a), and the *MoRPHE: Project Planning Note 3: Archaeological Excavation (PPN3)* (2008). It also met the requirements of the National Planning Policy Framework (NPPF; Chapter 16: 'Conserving and enhancing the historic environment'; DCLG 2019).

2 Site Location and Description

- 2.1 The proposed development site is situated on the south side of the A689 adjacent to the village of Nenthead, within the scheduled monument of Nenthead Mine (Figure 1). The site occupies mainly vacant land consisting of mining waste heaps, ruined mining facilities, rocky outcrops, and low vegetated hills on the north side of the River Nent. It is bounded to the south by the River Nent and to the north by the A689, and is centred at NGR: NY78430 43298 (Figure 2). The western edge of the site slopes steeply down towards the mining museum in the northwest, whilst there is open countryside to the east. The topography of the site varies but much lies at approximately 457m above Ordnance Datum (aOD).
- 2.2 The solid geology of the area consists of limestone and sandstone of the Alston Formation and limestone of the Stainmore Formation. The bedrock geology is overlain by superficial deposits of clay, sand and gravel (River Terrace Deposits) (BGS 2019). The local soils are acid upland soils with a peaty texture and generally impeded drainage (Soilscapes 2019).

3 Summary of Proposed Development Plans

3.1 The current development proposal comprises three compost based treatment ponds (CBTPs), one balancing pond, one wetland, a single storey stone clad building, welfare facilities, access and maintenance tracks, a mine water capture structure, a pumping station, transfer pipelines and a new outfall to the River Nent.

4 Archaeological and Historical Background

4.1 Extensive prehistoric, Roman and medieval activity was identified in the landscape surrounding Alston as part of Historic England's North Pennines National Mapping Programme. A possible Roman/Iron Age settlement has also been identified through LiDAR about 920m NNE of the eastern entrance to the development site, near to the Bloomsberry Lead Mine. Although exploitation of natural resources, including lead and silver, can be traced back to Roman times in the region, the first documented mining activity on Alston Moor dates from the 12th century; this activity is likely to have been small-scale and

intermittent. Larger-scale ore extraction at Nenthead is thought to have begun in the late 17th century when the Rampgill Vein was discovered in 1690. Nenthead had become one of the main mining areas of the London Lead Company by the mid-18th century, and the existing village of Nenthead grew out this process of industrialisation, beginning as accommodation and services for workers and their families. During the 19th century, the focus of mining shifted towards zinc extraction, and the mine continued to operate into the 20th century until production ceased in 1963. The mine complex is now a scheduled monument and is regarded as the most intact mining landscape within the North Pennines (NHLE 1015858). The list entry for the mine notes:

4.2 "The main importance of the site lies in the unusually high level of preservation not only of the obvious features such as the buildings and dams, but also the network of roadways built by the London Lead Company. The wide range of mining features provide an important resource for the study of the developments in mining technology in the 18th and 19th centuries, particularly the development of deep mining based on long adits (levels). The monument also preserves a good example of the interrelationships between the mining features, buildings and water managements system."

5 Aims and Objectives

- 5.1 The aim of the archaeological watching brief was to gather sufficient information to establish the presence/absence, character, extent, state of preservation and date of any archaeological remains within the areas to be impacted by the development, and to inform further archaeological mitigation strategies should they be necessary.
- 5.2 The specific objectives of the archaeological fieldwork were to:
 - Locate, record, characterise, and determine the extent of any surviving sub-surface archaeological remains
 - Excavate and record identified archaeological features and deposits to a level appropriate to their extent and significance
 - Report the results of the fieldwork and place them within their local and national context
 - Produce a comprehensive site archive and a descriptive and interpretive report
- 5.3 The specific research objectives of the archaeological fieldwork were:
 - · Where possible, to determine the presence and date of unknown surviving features associated with historic mining and smelting activities at Nenthead, particularly those that relate to the scheduled remains of 18th to 19th century lead mining.
 - To assess the degree to which deposits have been disturbed or truncated by the later mining operations and 20th century developments;
 - To confirm the presence or absence of any other surviving archaeological remains within the Site; and
 - To preserve by record the sequence, thickness and elevation of the stratigraphic units and archaeological horizons which survive between the current ground surface and underlying bedrock.

6 Methodology

6.1 The archaeological watching brief involved monitoring the excavation of twenty-eight GI trial pits (TP's 101-128), and nine window samples (WS 101-109) (see Figure 2).

- 6.2 The trial pits were excavated using a back acting excavator fitted with a smooth bladed bucket, whilst the window samples were carried out using a drilling rig operated by the GI technicians. These groundworks were carried out under direct archaeological supervision.
- 6.3 Where archaeology was judged to be present during the watching brief the methodology employed was as follows (see AECOM 2019, 8-9):
 - limited hand cleaning of archaeological sections and surfaces sufficient to establish the stratigraphic sequence exposed;
 - the collection of dating evidence from in situ deposits and visual scanning of spoil heaps for dateable artefacts;
 - a scaled drawn record of representative exposed sections and surfaces;
 - photographs of exposed deposits within the trial pits, with an appropriate scale, and sufficient further photographs to establish the setting of the groundworks undertaken; and
 - a record of the datum levels of the archaeological deposits.
- 6.4 Where no archaeological remains were encountered, a photographic record was taken of the test pit and a written description with sketch section recorded.
- 6.5 A full written, drawn and photographic record was made of all features revealed during the archaeological watching brief. Plans were completed at a scale of 1:50 or 1:20 (as appropriate), with section drawings at a scale of 1:10 or 1:20 as appropriate. All recording was undertaken to meet the standards and requirements of the Archaeological Field Manual (MOLAS 1994).
- 6.6 All areas of ground disturbance were recorded on a suitable base map, even if no archaeological remains were present.
- 6.7 Digital photography was employed using a camera with a resolution of at least 10 megapixels.
- 6.8 All identified finds and artefacts were collected and retained. Finds were bagged according to their context, and significant finds were allocated a recorded finds number and their positions surveyed individually. Finds were exposed, lifted, cleaned, conserved, marked, bagged and stored in accordance with the guidelines set out in the United Kingdom Institute for Conservation's Conservation Guidelines No. 2 and the CIfA guidelines Standard and Guidance for the collection, documentation, conservation and research of archaeological materials (2014b). Where required, conservation was undertaken by approved conservators in line with the First Aid for Finds guidelines (Watkinson and Neal 1998).
- 6.9 The paleoenvironmental sampling strategy comprised the removal of a bulk sample from securely sealed, hand-excavated contexts, excepting those with excessive levels of residuality or those with minimal 'soil' content (such as building rubble). Bulk samples comprised a representative 40 litre sample, or, from small features, the maximum amount of material that it was practicable to collect.

Variations to the methodology

- 6.10 Archaeological visibility was occasionally limited by heavy rainfall, particularly when water drained from the higher ground to the lower, eroding the sides of some test pits.
- 6.11 The excavation of Trial Pit 101 was not observed due to the simultaneous excavation of WS 104 across site.
- 6.12 Trial Pit 108 was abandoned due to an obstruction that could not be removed.

7 **Results**

Natural deposits

- 7.1 Natural subsoil was encountered in most of the trial pits (TPs 102, 104, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, and 128). The excavation of Trial Pits 103a, 103b, 105, 106, 107, and 108 ceased before natural subsoil was reached. All of the window samples exposed natural deposits.
- 7.2 The natural subsoil can be divided into two main categories across site. Most trial pits contained mixed dark grey and orange clays. Other natural deposits encountered in Trial Pits 102, 109, and 125, and Window Sample 109 consisted of mid-brown clay.

Trial Pits

Trial Pit 102

Table of Stratigraphic Sequence

Context No	Туре	Description	Depth
TP2000	Topsoil	Dark grey clay loam with sub-angular stone inclusions throughout	0.00m- 0.10m
TP2001	Made Ground	Grey clay with frequent sub-angular stone inclusions throughout	0.10m- 1.11m
TP2002	Natural	Red brown clay	1.11m- 1.12m+

7.3 Trial Pit 102 was located at the western limit of the site and was excavated to a depth of 1.12m. The lower of the three deposits identified within the pit comprised a 0.01m+ deep deposit of red brown clay (TP2002) which appeared to be natural material and contained no finds. This was sealed by a 1.01m deep deposit of grey clay with frequent sub-angular stone inclusions throughout (TP2001) which had possibly been dumped during mining works.

Trial Pit 103a (Plate 1)

Table of Stratigraphic Sequence

Context No	Туре	Description	Depth
TP3000a	Topsoil	Mid-brown clay loam	0.00m- 0.30m
TP3001a	Structure	Truncated sandstone structure, composed of sub-angular blocks, no bonding material	-

7.4 Trial Pit 103a was located at the western limit of the site, immediately north-east of TP102. The trial pit measured 0.44 by 0.46m and was excavated to a depth of 0.3m. At this depth a sandstone structure or surface was encountered (TP3001a). It consisted of angular sandstone fragments and extended across the base of the trial pit and beyond the limit of excavation in all directions. Excavation ceased at this level and a new trial pit was excavated 1m to the northeast. It is unclear whether the structure encountered in Trial Pit 103a is part of a wall or a rough stone surface.

Trial Pit 103b (Plate 2)

Table of Stratigraphic Sequence

Context No	Туре	Description	Depth
TP3000b	Topsoil	Mid-brown clay loam	0.00m- 0.30m
TP3001b	Made Ground	Deposit of firmly compacted demolition material, slag, metal, and crushed sandstone	0.30m- 1.12m+
TP3002b	Structure	Sandstone structure, composed of sub-angular blocks, no bonding material	0.3m- 1.12m+

7.5 Trial Pit 103b was located towards the western limit of the site, 1.00m northeast of TP103a. It was excavated to a depth of 1.12m. On the northeastern side of the pit the edge of a substantial stone structure was partially exposed which was constructed from angular sandstone blocks (TP3002b). It was possible to continue to excavate the trial pit to the southwest of the structure which demonstrated that the structure continued beyond the base of the pit (it was greater than 0.82m in depth/height). It was abutted by a deposit of firmly compacted demolition material (TP3001b) which contained inclusions of slag, metal and crushed sandstone. This deposit was sealed by 0.30m of clay loam topsoil.

Trial Pit 104 (Plate 3)

Table of Stratigraphic Sequence

Context No	Туре	Description	Depth
TP4000	Made Ground	Type 1	0.00m- 0.32m
TP4001	Made Ground	Friable ashy deposit with medium sub-angular stones	0.32m- 0.73m
TP4002	Made Ground	Friable grey sandy clay with large angular stones and timber fragments	0.73m- 2.05m+

7.6 Trail Pit 104 lay close to the western limit of the site, to the east of TP102, and was excavated to a depth of 2.05m. It was orientated NNW-SSE and was 2.8m long by 0.8m wide. The lowest deposit identified was a friable grey sandy clay (TP4002) which contained wood fragments and continued to the limit of excavation (2.05m). Water was encountered at a depth of 1.40m. Deposit (TP4002) was sealed by 0.41m of made ground consisting of a mixed ashy soil with large sub-angular stone inclusions (TP4001). The upper 0.32m of the pit contained modern type 1 material forming the ground surface.

Trial Pit 105

Table of Stratigraphic Sequence

Context No	Туре	Description	Depth
TP5000	Made Ground	Compacted type 1	0.00m- 0.30m
TP5001	Made Ground	Firmly compacted crushed sandstone	0.30m- 1.00m+

7.7 Trial Pit 105 lay in the western part of the site along the western access road and was excavated to a depth of 1.00m. The lowest deposit consisted of compacted crushed sandstone (TP5001), which was sealed by compacted type 1 (0.30m thick) (TP5000). These materials represent raised made ground for the road surface.

Trial Pit 106

Table of Stratigraphic Sequence

Context No	Туре	Description	Depth
TP6000	Made Ground	Compacted type 1	0.00m- 0.20m
TP6001	Made Ground	Firmly compacted crushed sandstone	0.20m- 0.45m
TP6002	Made Ground	Soft dark brown grey sandy clay with occasional stone inclusions	0.45m- 1.20m+

7.8 Trial Pit 106 lay in the western part of the site, along the western access road, south-east of TP105, and was excavated to a depth of 1.20m. The lowest deposit consisted of dark brown grey sandy clay with occasional stone inclusions (TP6002) which is interpreted as made ground (>0.75m deep). The upper two deposits in the pit both represented made ground and comprised (TP6001), a 0.25m deep crushed sandstone deposit, and (TP6000), a 0.20m deep compacted type 1 deposit (the road surface).

Trial Pit 107

Table of Stratigraphic Sequence

Context No	Туре	Description	Depth
TP7000	Made Ground	Type 1	0.00m- 0.27m
TP7001	Redeposited Natural	Angular and sub-angular limestone fragments	0.27m- 0.57m
TP7002	Made Ground/Mine Waste	Dark brown grey sandy silt with frequent small stone inclusions	0.57m- 1.20m+

7.9 Trial Pit 107 was located in the western part of the site, along the western access road, outside the historic mine buildings, and was excavated to a depth of 1.20m. The lowest deposit (TP7002) recorded at the base of the pit was a dark brown-grey sandy silt with frequent small stone inclusions from which no finds were recovered. This is interpreted as levelling for the road possibly consisting of waste from the mines. This was sealed by a 0.30m deep deposit (TP7001) that contained angular and sub-angular limestone fragments representing redeposited natural bedrock. The upper deposit comprised a 0.27m deep made ground deposit of type 1 stone (TP 7000).

Trial Pit 108

Table of Stratigraphic Sequence

Context No	Туре	Description	Depth
TP8000	Made Ground	Mid-blackish brown clay	0.00m- 0.58m
TP8001	Structure	Possible structure	-

7.10 Trial Pit 108 was located to the west of the centre of the site, along the western access road. The trial pit was orientated NW-SE and was 2.40m long by 0.72m wide. The uppermost deposit encountered comprised mid blackish brown clay which is interpreted as made ground; this extended to a depth of 0.58m. At this depth an obstruction was encountered and excavation was abandoned. The pit also rapidly filled with water due to the prevailing weather conditions, preventing further archaeological recording.

Trial Pit 109 (Plate 4)

Table of Stratigraphic Sequence

Context No	Туре	Description	Depth
TP9000	Topsoil	Dark brown silty clay	0.00m- 0.10m
TP9001	Natural	Light brown sandy clay with large rounded boulders throughout	0.10m- 1.90m+

7.11 Trial Pit 109 was located in the centre of the site, along the edge of the western access road and was excavated to a depth of 1.90m. The trench was orientated NW-SE and was 2.30m long and 1.60m wide. The lower deposit encountered comprised light brown sandy clay natural with large rounded boulders throughout (TP9001). This was sealed by a topsoil deposit (TP9000).

Trial Pit 110

Table of Stratigraphic Sequence

Context No	Type	Description	Depth
TP110000	Topsoil	Dark grey peat/clay	0.00m- 0.10m
TP110001	Natural	Mid-grey and patchy orange clay	0.10m- 3.00m+

7.12 Trial Pit 110 was located in the central eastern part of the site, immediately to the east of the proposed reed bed, along the proposed access track; it was excavated to a depth of 3.00m. The trial pit was orientated NE-SW and was 3.00m long and 1.6m wide. The lowest deposit encountered was a 2.90m+ deep clay natural (TP11001) from which no finds were recovered; this was sealed by 0.10m of peaty clay topsoil (TP11000).

Trial Pit 111

Table of Stratigraphic Sequence

Context No	Type	Description	Depth
TP111000	Topsoil	Dark silty clay	0.00m- 0.10m
TP111001	Natural	Mid-grey clay with orange patches and occasional sub-angular stones throughout	0.10m- 2.25m+

7.13 Trial Pit 111 was located in the central northern part of the site, along the intended route for the mains pipe, to the north of TP110, and was excavated to a depth of 2.25m. The lowest deposit encountered was 2.15m+ in depth and comprised mid-grey clay with orange patches and occasional angular stones (TP111001). This deposit was sealed by topsoil (TP111000) that occupied the upper 0.10m of the pit.

Trial Pit 112

Table of Stratigraphic Sequence

Context No	Туре	Description	Depth
TP120000	Topsoil	Black silty clay topsoil	0.00m- 0.12m
TP120001	Natural	Mixed grey and orange clay	0.12m- 3.00m+

7.14 Trail pit 112 was located close to the north-east boundary of the site, along the intended route for the mains pipe, and was excavated to a depth of 3.00m. The trial pit was orientated ENE-WSW and was 2.30m long by 1.70m wide. The lowest deposit encountered (TP112001) was a mixed grey and orange clay natural (2.88m+ deep) which contained no finds. This deposit was sealed by 0.10m of black silty clay topsoil (TP112000).

Trial Pit 113 (Plate 5)

Table of Stratigraphic Sequence

Context No	Туре	Description	Depth
TP130000	Topsoil	Dark grey/black clayey peat	0.00m- 0.10m
TP130001	Natural	Mid-grey sandy clay with orange flecks	0.10m- 1.10m+

7.15 Trial Pit 113 was located in the eastern central part of the site, along the proposed access track to the south of the proposed reed bed; it was excavated to a depth of 1.10m. The trial pit was orientated N-S and was 3.10m long by 1.50m wide. The lowest deposit encountered (TP113001) was a mid-grey sandy clay with orange flecks (0.90m+ deep) which contained no finds. This deposit was sealed by 0.10m of dark grey clayey peat (TP113000).

Trial Pit 114

Table of Stratigraphic Sequence

Context No	Type	Description	Depth
TP114000	Topsoil	Dark grey/black clayey peat	0.00m- 0.09m
TP114001	Natural	Mid-grey clay with patches of orange and occasional sub-angular stones	0.09m- 3.00m+

7.16 Trial Pit 114 was located in the eastern central part of the site, in the centre of the proposed reed bed and was excavated to a depth of 3.00m. The trial pit was orientated N-S and was 3.00m long by 1.53m wide. The lowest deposit encountered (TP114001) was a mid-grey clay with patches of orange and occasional sub-angular stones (2.91m+ deep) which contained no finds. This deposit was sealed by 0.09m of dark grey clayey peat (TP114000).

Trial Pit 115 (Plate 6)

Table of Stratigraphic Sequence

Context No	Туре	Description	Depth
TP115000	Topsoil	Dark grey clayey peat	0.00m- 0.12m
TP115001	Natural	Mixture of yellow and orange clay	0.12m- 1.54m+

7.17 Trial Pit 115 was located in the eastern central part of the site, along the proposed access track to the south of the proposed reed bed; it was excavated to a depth of 1.54m. The trial pit was orientated W-E and was 3.30m long by 1.03m wide. The lowest deposit encountered (TP115001) was a mixed yellow and orange clay (1.42m+ deep) which contained no finds. This deposit was sealed by 0.12m of dark grey clayey peat (TP115000).

Trial Pit 116 (Plate 7)

Table of Stratigraphic Sequence

Context No	Туре	Description	Depth
TP116000	Topsoil	Dark grey peat/clay	0.00m- 0.08m
TP116001	Subsoil	Mid-grey clay with orange patches and occasional medium sized sub- angular inclusions	0.08m- 0.80m+
TP116002	Natural	Dark grey clay with occasional medium sized sub-angular stone inclusions throughout	0.80- 1.06m+

7.18 Trial Pit 116 was located in the north-eastern part of the site, to the east of the northernmost proposed pond, and was excavated to a depth of 1.06m. The trial pit was orientated E-W and was 3.70m long by 1.56m wide. The lowest deposit encountered (TP116002) was a dark grey clay with occasional medium sized sub-angular stone inclusions (0.08m deep) which contained no finds. This deposit was sealed by 0.72m of mid-grey clay with orange patches and occasional medium sized sub-angular stones (TP116001). This in turn was sealed by topsoil comprising dark grey peat/clay (TP116000).

Trial Pit 117 Table of Stratigraphic Sequence

Context No	Туре	Description	Depth
TP117000	Topsoil	Dark grey/black peat	0.00m- 0.31m
TP117001	Natural	Mid-grey clay with orange patches and occasional small and medium sized sub-angular stones	0.31m- 1.13m
TP117002	Bedrock	Limestone	1.13m- 1.20m+

7.19 Trial Pit 117 was located in the south-eastern part of the site, to the east of the southernmost proposed pond, and was excavated to a depth of 1.20m. The trial pit was orientated SE-NW and was 3.30m long by 1.53m wide. The lowest deposit encountered (TP117002) comprised limestone bedrock (0.07m+ deep). This deposit was sealed by 0.82m of mid-grey clay with orange patches and occasional small and medium sized sub-angular stones (TP117001); this, in turn, was sealed by 0.31m of dark grey/black peat topsoil (TP117000).

Trial Pit 118 (Plate 8)

Table of Stratigraphic Sequence

Context No	Туре	Description	Depth
TP118000	Topsoil	Dark grey clay/peat	0.00m- 0.27m
TP118001	Subsoil	Mid-orange clay with small sub-angular stone inclusions	0.27m- 0.52m
TP118002	Natural	Mid-grey clay with occasional sub-angular stone inclusions	0.52m- 1.55m
TP118003	Bedrock	Limestone	1.55m+

7.20 Trial Pit 118 was located in the south-eastern part of the site, to the south-west of the southernmost proposed pond, and was excavated to a depth of 1.55m. The trial pit was orientated W-E and was 3.30m long by 1.70m wide. The lowest deposit encountered (TP118003) comprised limestone bedrock at the limit of the excavation. This deposit was sealed by 1.03m of mid-grey clay with occasion subangular stone inclusions (TP118002). Above this lay 0.25m of mid-orange clay with small sub-angular stone inclusions (TP118001). The topsoil consisted of dark grey clay/peat 0.27m deep (TP118000).

Trial Pit 119 Table of Stratigraphic Sequence

Context No	Туре	Description	Depth
TP119000	Topsoil	Dark grey clay/peat	0.00m- 0.06m
TP119001	Subsoil	Mid-orange clay with few sub-angular stone inclusions	0.06m- 0.11m
TP119002	Natural	Dark grey clay with orange flecks and few sub-angular stone inclusions	0.11m- 0.25m
TP119003	Bedrock	Limestone	0.25m- 0.9m+

7.21 Trial Pit 119 was located in the eastern part of the site, to the west of the central proposed pond, and was excavated to a depth of 0.90m. The trial pit was orientated SE-NW and was 3.30m long by 1.53m wide. The lowest deposit encountered (TP119003) comprised limestone bedrock (0.65m+). This deposit was sealed by 0.14m of dark grey clay with orange flecks and few sub-angular stone inclusions (TP119002). Above this lay 0.05m of mid-orange clay with few sub-angular stone inclusions (TP119001). The topsoil consisted of dark grey clay/peat 0.06m deep (TP119000).

Trial Pit 120 (Plate 9)

Table of Stratigraphic Sequence

Context No	Туре	Description	Depth
TP120000	Topsoil	Dark grey clayey peat with occasional medium sized sub-angular stones	0.00m- 0.14m
TP120001	Made ground	Mixed orange/grey clay with very occasional small sub-angular stones	0.14m- 0.65m
TP120002	Natural	Mudstone	0.65m- 1.30m

7.22 Trial Pit 120 was located in the eastern part of the site, to the south-west of the northernmost proposed pond, and was excavated to a depth of 1.30m. The trial pit was orientated NE-SW and was 1.65m long by 3.10m wide. The lowest deposit encountered (TP120002) consisted of natural mudstone (0.65m+). This layer was sealed by a made ground deposit of mixed orange/grey clay with very occasional small sub-angular stones (TP120001; 0.51m deep). This was sealed by a thin 0.14m layer of dark grey clayey peat with occasional medium sized sub-angular stones (TP120000).

Trial Pit 121 Table of Stratigraphic Sequence

Context No	Туре	Description	Depth
TP121000	Topsoil	Dark grey peat	0.00m- 0.26m
TP121001	Subsoil	Mid-orange clay	0.26m- 0.46m
TP121002	Subsoil	Dark grey clay with occasional sub-angular stone inclusions	0.46m- 0.86m
TP121003	Bedrock	Limestone	0.86m- 0.90m+

7.24 Trial Pit 121 was located in the south-eastern part of the site, in the centre of the southernmost proposed pond, and was excavated to a depth of 0.90m. The trial pit was orientated SW-NE and was 3.74m long by 1.51m wide. The lowest deposit encountered (TP121003) comprised limestone bedrock (0.04m+). This layer was sealed by 0.40m of subsoil which consisted of dark grey clay with occasional sub-angular stone inclusions (TP121002). This was sealed by 0.20m of mid-orange clay (TP121001) which, in turn, was sealed by 0.26m of dark grey peat topsoil (121000).

Trial Pit 122 Table of Stratigraphic Sequence

Context No	Туре	Description	Depth
TP122000	Topsoil	Mid-brown peat	0.00m- 0.16m
TP122001	Subsoil	Mid-orange clay with grey patches	0.16m- 0.38m
TP122002	Subsoil	Mid-grey clay with orange patches	0.38m- 0.90m
TP122003	Bedrock	Limestone	0.90m+

7.25 Trial Pit 122 was located in the eastern part of the site, in the north portion of the central proposed pond, and was excavated to a depth of 0.90m. The trial pit was orientated NW-SE and was 3.2m long by 1.56m wide. The lowest deposit encountered (TP122003) consisted of limestone bedrock at a depth of 0.90m. Overlying the bedrock was 0.62m of mid-grey clay subsoil with orange patches (TP122002). This was sealed by 0.22m of mid-orange clay with grey patches (TP122001) which, in turn, was sealed by 0.16m of mid-brown peat topsoil (122000).

Trial Pit 123

Table of Stratigraphic Sequence

Context No	Туре	Description	Depth
TP123000	Topsoil	Mid-brown peat	0.00m- 0.10m
TP123001	Subsoil	Mid-orange clay with grey patches	0.10m- 1.00m
TP123002	Bedrock	Limestone	1.00m- 1.10m+

7.26 Trial Pit 123 was located in the north-eastern part of the site, in the north portion of the northernmost proposed pond, and was excavated to a depth of 1.10m. The trial pit was orientated E-W and was 3.5m long by 1.15m wide. The lowest deposit encountered (TP123002) consisted of limestone bedrock at a depth of 1.00m. Overlying the bedrock was 0.90m of mid-orange clay with grey patches (TP123001), consistent with that found in TP121 and TP122. This was sealed by 0.10m of mid-brown peat topsoil (123000).

Trial Pit 124 (Plate 10)

Table of Stratigraphic Sequence

Context No	Туре	Description	
TP124000	Topsoil	Dark grey silty clay	0.00m- 0.04m
TP124001	Subsoil	Mid-grey clay with patches of orange and very occasional sub-angular large stones	0.04m- 2.50m+

7.27 Trial Pit 124 was located in the north part of the site along the proposed route for the mains pipe, and was excavated to a depth of 2.50m. The trial pit was orientated WSW-ENE and was 1.76m long by 1.50m wide. The lowest deposit encountered (TP123001) comprised mid grey clay which contained patches of orange clay and occasional sub-angular stones (2.46m+ deep). This was sealed by a thin layer of dark grey silty clay topsoil (124000) (0.04m deep).

Trial Pit 125 (Plate 11)

Table of Stratigraphic Sequence

Context No	Туре	Description	Depth
TP125000	Topsoil	Dark-grey/black silty clay	0.00m- 0.19m
TP125001	Natural	Mid-orange/brown clay with small angular stone inclusions	0.19m- 2.40m+

7.28 Trial Pit 125 was located in the central northern part of the site along the proposed mains route, and was excavated to a depth of 2.40m. The trial pit was orientated NE-SW and was 2.00m long by 1.50m wide. The lowest deposit encountered (TP125001) comprised natural mid-orange/brown clay with small angular stone inclusions. Overlying this was 0.19m of dark-grey/black silty clay topsoil (TP125000).

Trial Pit 126 (Plate 12)

Table of Stratigraphic Sequence

Context No	Туре	Description	Depth
TP126000	Made Ground	Pea gravel	0.00m- 0.51m
TP126001	Subsoil	Orange/yellow clay with occasional sub-angular stones	0.51m- 1.85m+

7.29 Trial Pit 126 was located in the south-central part of the site, along the NW-SE access road, and was excavated to a depth of 1.85m. The trial pit was orientated SE-NW and was 3.5m long by 1.15m wide. The lowest deposit encountered (TP126001) comprised orange/yellow clay natural with occasional sub-angular stones. This was sealed by 0.51m of pea gravel forming the road surface (126000).

Trial Pit 127

Table of Stratigraphic Sequence

Context No	Туре	Description	Depth
TP127000	Topsoil	Dark grey clayey peat	0.00m- 0.20m
TP127001	Subsoil	Mixed mid-grey/orange clay with medium sized sub-angular stones	0.20m- 2.25m+

- 7.30 Trial Pit 127 was located in the south-eastern part of the site, along the NW-SE access road, and was excavated to a depth of 2.25m. The trial pit was orientated NE-SW and was 3.5m long by 1.55m wide. The lowest deposit encountered comprised 2.05m of mixed mid-grey/orange clay with medium sized sub-angular stones (TP127001). This was sealed by 0.20m of dark grey clayey peat topsoil (127000).
- 7.31 A possible construction pile was encountered in SW edge of the pit; this was left in situ.

Trial Pit 128 (Plate 13)

Table of Stratigraphic Sequence

Context No	Туре	Description	Depth
TP128000	Made Ground	Mid-grey sandy clay with medium sized sub-angular stones throughout	0.00m- 0.60m
TP128001	Subsoil	Dark brown peat with wood throughout	0.60m- 1.10m
TP128002	Subsoil	Grey clay	1.10m- 2.25m
TP128003	Bedrock	Limestone	2.25m+

7.32 Trial Pit 128 was located in the south-eastern part of the site, along the NW-SE access road, and was excavated to a depth of 2.25m. The trial pit was orientated E-W and was 3.4m long by 1.90m wide. The lowest deposit encountered (TP128003) comprised limestone bedrock at a depth of 2.25m. Sealing the bedrock was 1.15m of grey clay (TP128002) which, in turn, was sealed by 0.50m of peat (TP128001). This was sealed by 0.60m of mid-grey sandy clay with medium sized sub-angular stones throughout (128000); this deposit formed the road surface.

Window Samples

Window Sample 101

7.23 Window Sample 101 measured 0.8m by 0.5m and was excavated to a depth of 1.14m. Natural mid brown clay was encountered at the base of the pit (WS101002). This was sealed by a made ground deposit which comprised dark grey clay with frequent small sub-angular stones (WS101001; 0.9m deep). This, in turn, was sealed by dark grey sandy loam topsoil (WS101/000; 0.13m deep).

Window Sample 102

7.24 Window Sample 102 measured 0.58m by 0.55m and was excavated to a depth of 1.3m. A dark brown sandy clay was encountered at the base of the pit (WS102002). This was sealed by a deep made ground deposit which comprised crushed sandstone and demolition rubble (WS102001; 1.2m deep).

Window Sample 103

7.25 Window Sample 103 measured 0.45m by 0.4m and was excavated to a depth of 1.05m. Bedrock was encountered at the base of the pit (WS103002). This was sealed by a subsoil deposit which comprised mid grey clay with orange flecks and occasional sub-angular stone inclusions (WS103001; 0.87m deep). This, in turn, was sealed by dark grey peat-rich topsoil (WS103/000; 0.18m deep).

Window Sample 104

7.26 Window Sample 104 measured 0.6m by 0.4m and was excavated to a depth of 1.09m. Bedrock was encountered at the base of the pit (WS104002). This was sealed by a subsoil deposit which comprised mid grey clay with orange flecks and occasional sub-angular stone inclusions (WS104001; 0.95m deep). This, in turn, was sealed by dark grey peat-rich topsoil (WS104/000; 0.14m deep).

Window Sample 105

7.27 Window Sample 105 measured 0.65m by 0.35m and was excavated to a depth of 1.10m. Bedrock was encountered at the base of the pit (WS105002). This was sealed by a subsoil deposit which comprised mid grey and orange clay which contained occasional sub-angular stone inclusions (WS105001; 0.9m deep). This, in turn, was sealed by dark brown peat-rich topsoil (WS105/000; 0.10m deep).

Window Sample 106

7.28 Window Sample 106 measured 0.55m by 0.4m and was excavated to a depth of 1m. Bedrock was encountered at the base of the pit (WS106002). This was sealed by a subsoil deposit which comprised mid grey clay with orange flecks and occasional sub-angular stone inclusions (WS106001; 0.86 deep). This, in turn, was sealed by dark brown peat-rich topsoil (WS106/000; 0.14m deep).

Window Sample 107

7.29 Window Sample 107 measured 0.58m by 0.47m and was excavated to a depth of 0.85m. Bedrock was encountered at the base of the pit (WS107002). This was sealed by a subsoil deposit which comprised dark grey clay with orange flecks (WS107001; 0.72 deep). This, in turn, was sealed by dark grey peat-rich topsoil (WS107000; 0.13m deep).

Window Sample 108

7.30 Window Sample 108 measured 0.52m by 0.45m and was excavated to a depth of 0.8m. The earliest deposit encountered comprised mid orange/grey clay which contained occasional sub-angular stones (WS108001; 0.7 deep). This was sealed by dark grey peat-rich topsoil (WS108/000; 0.1m deep).

Window Sample 109

7.31 Window Sample 109 measured 0.5m by 0.3m and was excavated to a depth of 0.87m. Bedrock was encountered at the base of the pit (WS109002). This was sealed by a subsoil deposit which comprised mid brown clay which contained occasional sub-angular stones (WS109001; 0.74 deep). This, in turn, was sealed by dark grey peat-rich topsoil (WS109000; 0.13m deep).

8 Conclusion

- 8.1 The trial pits excavated on the northwestern part of the site, in the vicinity of the mining museum, revealed varying depths of made ground, most of which is likely to represent redeposited mining waste. In contrast, the trial pits on the main body of the site generally revealed topsoil/subsoil/natural profiles, only a few of the pits revealing isolated deposits of made ground (Trial Pits 120, 126 and 128).
- 8.2 At the northwestern extent of the development area, in Trial pits 103a and 103b, two stone structures were encountered. The structure in Trial Pit 103a appeared to be fairly rudimentary and could represent the remains of a drystone wall or a rough stone surface or area of hardstanding. The structure in Trial Pit 103b was much more substantial and is likely to be related to the historic mine complex. However, it should be noted that only small portions of each structure were exposed which limits interpretation.
- 8.3 A third stone obstruction was encountered in Trial Pit 108 on the proposed course of the rising main but its depth and flooding prevented it from being investigated.
- 8.4 With regard to the research objectives of the project, the following comments can be made:
 - Potential structures were located in Trial Pits 103a, 103b and 108. The structure in Trial Pit 103b is likely to be associated with the historic mining complex. It was abutted by a made ground deposit which contained crushed sandstone and slag, which may represent mining waste dumped in this area once the structure fell out of use. However, no secure dating evidence was recovered for any of the encountered structures.
 - The results of the watching brief suggest widespread deposition of potential mining waste on the northwestern part of the site (Trial Pits 102 to 108). There appears to have been less disturbance on the main body of the development site.
 - No archaeological features were encountered which might shed light on earlier periods of human activity in the area.

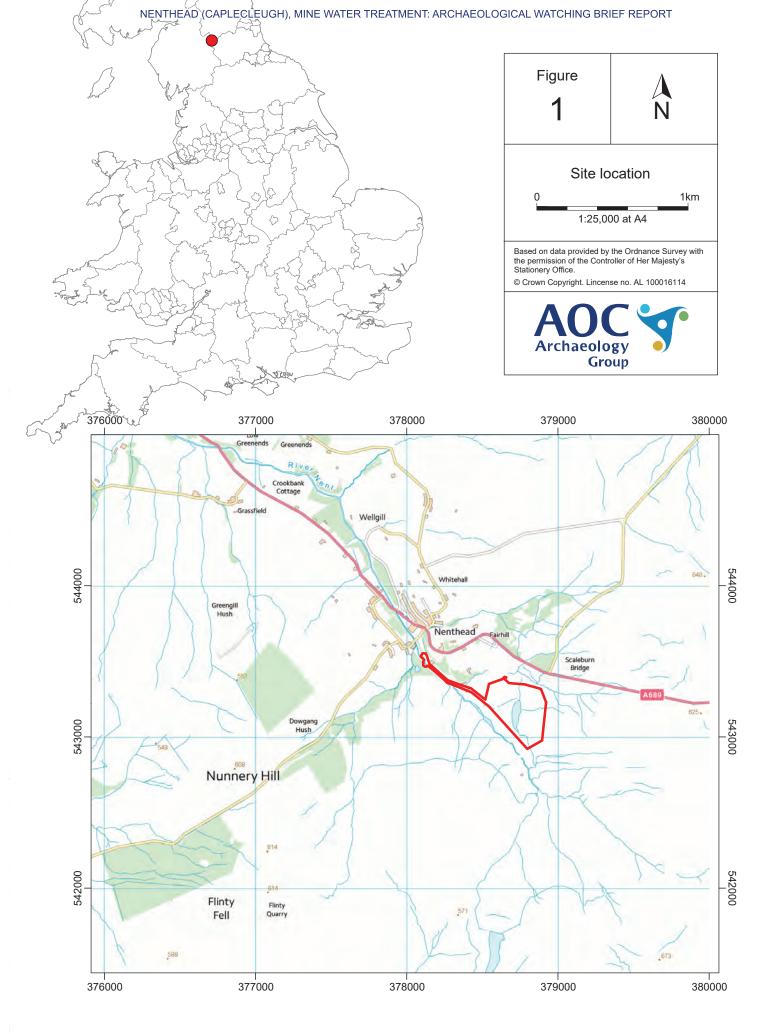
9 Archiving

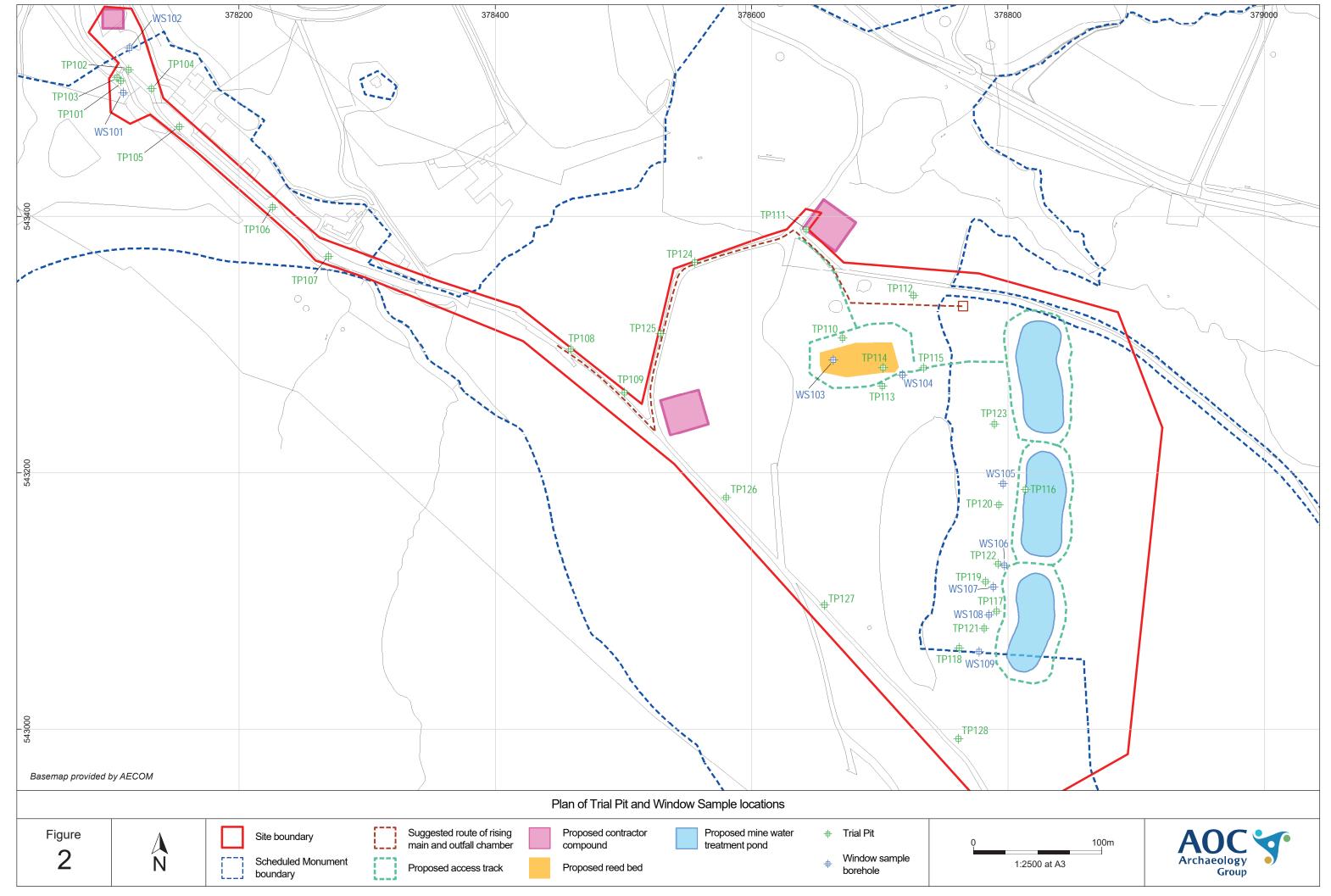
- 9.1 A full site archive will be produced which will contain all the data collected during the archaeological works, including the finds (if required by the receiving institution). The archive will be quantified, ordered, indexed and internally consistent, and will be deposited at the appropriate local museum.
- 9.2 The archive will be assembled in line with the recommendations provided in Historic England's MoRPHE Project Planning Note 3: Archaeological Excavation (PPN3) (2008), and in accordance with the Guidelines for the preparation of Excavation Archives for long–term storage (United Kingdom Institute for Conservation, 1990) and Standards in the museum care of archaeological collections (Museums and Galleries Commission 1994).
- 9.3 An OASIS form has been completed and uploaded for this project and a copy of this is provided in Appendix 2.

10 **Bibliography**

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Figures





Plates



Plate 1: Trial Pit 103a showing structure TP3001a, viewed from the southeast.



Plate 2: Trial Pit 103b showing structure TP3002b, viewed from the southeast.



Plate 3: Trial Pit 104, viewed from the SSE.



Plate 4: Trial Pit 109, viewed from the southwest.



Plate 5: Trial Pit 113, viewed from the west.



Plate 6: Trial Pit 115, viewed from the north.



Plate 7: Trial Pit 116, viewed from the north.



Plate 8: Trial Pit 118, viewed from the north.



Plate 9: Trial Pit 120, viewed from the northwest.



Plate 10: Trail Pit 124, viewed from the ESE.



Plate 11: Trial Pit 125, viewed from the southeast.



Plate 12: Trail Pit 126, viewed from the southwest.



Plate 13: Trial Pit 128, viewed from the north.

Appendix 1

Context No	Туре	Description	Length	Width	Depth
TP2000	Deposit	Topsoil	-	-	0.1m
TP2001	Deposit	Made Ground	-	-	1.01mm
TP2002	Deposit	Natural	-	-	>0.01m
TP3000a	Deposit	Topsoil	-	-	0.30m
TP3001a	Structure	Sandstone structure	-	-	-
TP3000b	Deposit	Topsoil	-	-	0.30m
TP3001b	Deposit	Made Ground	-	-	>0.82m
TP3001c	Structure	Sandstone wall	-	-	>0.82m
TP4000	Deposit	Made Ground	-	-	0.32m
TP4001	Deposit	Made Ground	-	-	0.41m
TP4002	Deposit	Made Ground	-	-	>1.32m
TP5000	Deposit	Made Ground	-	-	0.30m
TP5001	Deposit	Made Ground	-	-	>0.70m
TP6000	Deposit	Made Ground	-	-	0.20m
TP6001	Deposit	Made Ground	-	-	0.25m
TP6002	Deposit	Made Ground	-	-	>0.75m
TP7000	Deposit	Made Ground	-	-	0.27m
TP7001	Deposit	Redeposited Natural	-	-	0.30m
TP7002	Deposit	Made Ground/ Mine Waste	-	-	>0.63m
TP8000	Deposit	Made Ground	-	-	0.58m
TP8001	Structure	Structure	-	-	-
TP9000	Deposit	Topsoil	-	-	0.10m
TP9001	Deposit	Natural	-	-	>1.80m

TP11000	Deposit	Topsoil	-	-	0.10m
TP11001	Deposit	Natural	-	-	>2.90m
TP111000	Deposit	Topsoil	-	-	0.10m
TP111001	Deposit	Natural	-	-	>2.15m
TP120000	Deposit	Topsoil	-	-	0.12m
TP120001	Deposit	Natural	-	-	>2.88m
TP130000	Deposit	Topsoil	-	-	0.10m
TP130001	Deposit	Natural	-	-	>1.00m
TP114000	Deposit	Topsoil	-	-	0.09m
TP114001	Deposit	Natural	-	-	>2.91m
TP115000	Deposit	Topsoil	-	-	0.12m
TP115001	Deposit	Natural	-	-	>1.42m
TP116000	Deposit	Topsoil	-	-	0.08m
TP116001	Deposit	Subsoil	-	-	0.72m
TP116002	Deposit	Natural	-	-	>0.26m
TP117000	Deposit	Topsoil	-	-	0.31m
TP117001	Deposit	Natural	-	-	0.82m
TP117002	Deposit	Bedrock	-	-	>0.07m
TP118000	Deposit	Topsoil	-	-	0.27m
TP118001	Deposit	Subsoil	-	-	0.25m
TP118002	Deposit	Natural	-	-	1.03m
TP118003	Deposit	Bedrock	-	-	-
TP119000	Deposit	Topsoil	-	-	0.06m
TP119001	Deposit	Subsoil	-	-	0.05m

TP119002	Deposit	Natural	-	-	0.14m
TP119003	Deposit	Bedrock	-	-	>0.65m
TP120000	Deposit	Topsoil	-	-	0.14m
TP120001	Deposit	Subsoil	-	-	0.51m
TP120002	Deposit	Natural	-	-	>0.65m
TP121000	Deposit	Topsoil	-	-	0.26m
TP121001	Deposit	Subsoil	-	-	0.20m
TP121002	Deposit	Subsoil	-	-	0.40m
TP121003	Deposit	Bedrock	-	-	>0.04m
TP122000	Deposit	Topsoil	-	-	0.16m
TP122001	Deposit	Subsoil	-	-	0.22m
TP122002	Deposit	Subsoil	-	-	0.52m
TP122003	Deposit	Bedrock	-	-	-
TP123000	Deposit	Topsoil	-	-	0.10m
TP123001	Deposit	Subsoil	-	-	0.90m
TP123002	Deposit	Bedrock	-	-	>0.10m
TP124000	Deposit	Topsoil	-	-	0.04m
TP124001	Deposit	Natural	-	-	>2.46m
TP125000	Deposit	Topsoil	-	-	0.19m
TP125001	Deposit	Natural	-	-	>2.21m
TP126000	Deposit	Topsoil	-	-	0.51m
TP126001	Deposit	Natural	-	-	>1.34m
TP127000	Deposit	Topsoil	-	-	0.20m
TP127001	Deposit	Natural	-	-	>2.05m

TP128000	Deposit	Made Ground	-	-	0.60m
TP128001	Deposit	Subsoil	-	-	0.50m
TP128002	Deposit	Subsoil	-	-	1.15m
TP128003	Deposit	Subsoil	-	-	-
WS101000	Deposit	Topsoil	-	-	0.13m
WS101001	Deposit	Subsoil	-	-	0.90m
WS101002	Deposit	Natural	-	-	-
WS102001	Deposit	Made Ground	-	-	1.20m
WS102002	Deposit	Natural	-	-	-
WS103000	Deposit	Topsoil	-	-	0.18m
WS103001	Deposit	Subsoil	-	-	>0.87m
WS103002	Deposit	Bedrock	-	-	-
WS104000	Deposit	Topsoil	-	-	0.14m
WS104001	Deposit	Subsoil	-	-	0.95m
WS104002	Deposit	Bedrock	-	-	-
WS105000	Deposit	Topsoil	-	-	0.10m
WS105001	Deposit	Subsoil	-	-	0.90m
WS105002	Deposit	Bedrock	-	-	-
WS106000	Deposit	Topsoil	-	-	0.14m
WS16001	Deposit	Subsoil	-	-	0.86m
WS106002	Deposit	Bedrock	-	-	-
WS107000	Deposit	Topsoil	-	-	0.13m
WS107001	Deposit	Subsoil	-	-	0.72m
WS107002	Deposit	Bedrock	-	-	-

WS108000	Deposit	Topsoil	-	-	0.10m
WS108001	Deposit	Subsoil	-	-	0.70m
WS109000	Deposit	Topsoil	-	-	0.13m
WS109002	Deposit	Subsoil	-	-	0.74m
WS109003	Deposit	Bedrock	-	-	0.74m

Appendix 2

OASIS Form

OASIS DATA COLLECTION FORM: England

List of Projects | Manage Projects | Search Projects | New project | Change your details | HER coverage | Change country | Log out

Printable version

OASIS ID: aocarcha1-372820

Project details

Project name Nenthead (Caplecleugh) Mine Water Treatment: Archaeological Watching Brief

Short description of

the project

AOC Archaeology Group was commissioned to monitor a series of groundwork investigations at the Nenthead Mine, Cumbria, for a Mine Water Treatment Scheme. Twenty-eight trial pits and nine window samples were excavated. Made ground deposits were encountered in the trial pits on the northwestern part of the site and

these are thought to represent redeposited mining waste. The trial pits on the main body of the site revealed more conventional soil profiles (topsoil/subsoil/natural). Three potential structures were also encountered, at least one of which is thought to

relate to the historic mine complex.

Project dates Start: 02-09-2019 End: 16-09-2019

Previous/future

work

Not known / Not known

Any associated project reference

codes

52055 - Contracting Unit No.

Type of project Recording project

Site status Scheduled Monument (SM)

Current Land use Other 8 - Land dedicated to the display of a monument

WALL Post Medieval Monument type

Significant Finds **NONE None**

Investigation type "Watching Brief"

Prompt National Planning Policy Framework - NPPF

Project location

Country England

CUMBRIA EDEN ALSTON MOOR Nenthead (Caplecleugh) Mine Water Treatment Site location

Postcode CA9 3PB

Study area 0 Square metres

Site coordinates NY 78430 43298 54.784022489733 -2.335430928125 54 47 02 N 002 20 07 W Point

Project creators

Name of Organisation **AOC Archaeology Group**

Project brief originator

No formal brief issued

1 of 3 06/11/2019, 12:10 Project design originator

AECOM

Project

director/manager

Stephen Potten

Developer

Project supervisor Stuart Wilson Project supervisor Matthew Walker

Type of

sponsor/funding

body

Name of sponsor/funding

body

The Coal Authority

Project archives

Physical Archive

Exists?

No

Digital Archive recipient

To be confirmed

Digital Contents

"Survey", "other"

Digital Media available

"Images raster / digital photography", "Survey"

Paper Archive

recipient

To be confirmed

Paper Contents

"Stratigraphic","other"

Paper Media available

"Context sheet", "Notebook - Excavation", "Research", "General Notes", "Plan", "Report"

Project bibliography 1

Grey literature (unpublished document/manuscript)

Publication type

Title Nenthead (Caplecleugh) Mine Water Treatment: Archaeological Watching Brief

Report

Author(s)/Editor(s)

Davis, B.

Date

2019

Issuer or publisher

AOC Archaeology Group

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Entered on

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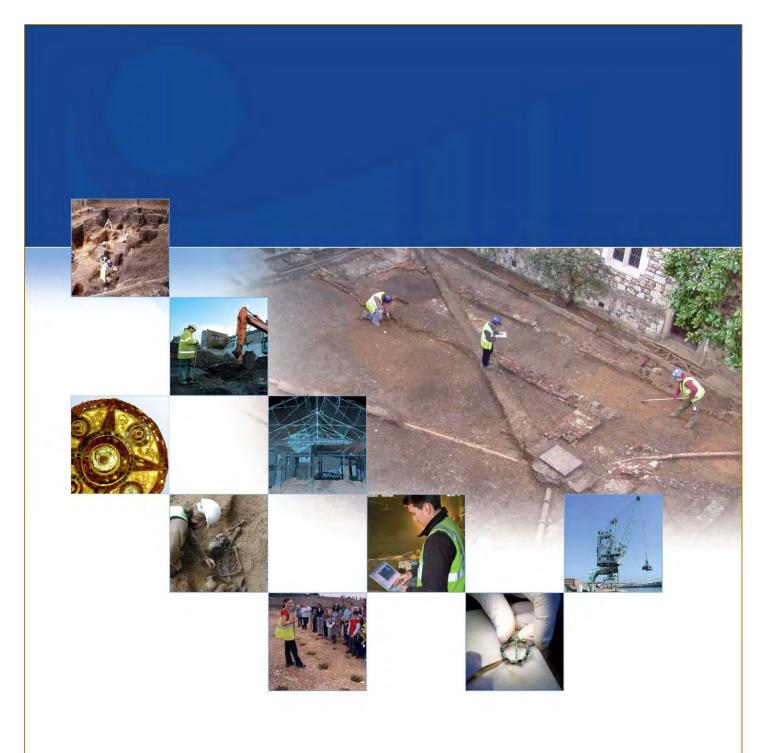
OASIS:

Please e-mail Historic England for OASIS help and advice © ADS 1996-2012 Created by Jo Gilham and Jen Mitcham, email Last modified Wednesday 9 May 2012

2 of 3 06/11/2019, 12:10 Cite only: $\label{limits} \text{Cite only: } http://www.oasis.ac.uk/form/print.cfm for this page \\$

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3 of 3





AOC Archaeology Group, The Raylor Centre, James Street, York, YO10 3DW tel: 01904 413 404 | e-mail: york@aocarchaeology.com



SUPPORTING FACTUAL DATA APPENDIX 2

SUBCONTRACT REPORTS

Zetica PAS128 Survey Report





Client: The Coal Authority Reference: P8560-19-R1-B Site: Nenthead Mines, Cumbria

Date: 30th October 2019

utilitysurveys

Zetica House Southfield Road, Eynsham Witney, OX29 4JB United Kingdom

Tel: 01993-886682 Fax: 01993-886683

Email: <u>projects@zetica.com</u> Website: www.zetica.com













SUMMARY REPORT

Location: Nenthead Mines, Nenthead, Cumbria

Client: The Coal Authority Reference: P8560-19-R1-B

1. INTRODUCT	ON	
Scope	Zetica were commissioned by The Coal Authority (the Client) to carry out a survey for a ~1.5ha area within the Nenthead Mines Scheduled Monumer south of Nenthead, Cumbria.	
	The utility services survey was required to map detectable in-ground including electric, gas, telecommunications, water and foul and surface wa	
	The utility services survey was carried out in accordance with the PAS 128 (specification for underground utility detection, verification and location).	:2014 standard
	The survey was undertaken between 2 nd and the 11 th of September 2019.	
Site	The Site is ~1.5ha area within the Nenthead Mines Scheduled Monument imm of Nenthead Cumbria as shown in Figure 1. The Client requested:	nediately south
	 Utility survey of the access road shown below (Figure 1). Utility clearance of 50No. exploratory locations. 	
	The access road construction was gravel track. The exploratory holes were the access track and to the North and East of the reservoir. The ground con the reservoir were moorland.	
	The Overwater Cherry Tree Cottage Aday Aday Aday Nenthead Min. O	North
	Source: Google Earth	Survey extents
	Figure 1: Survey extents	Scale: NTS
1	1 ~	1

P8560-19-R1-B Page 1





	OGY

Summary of techniques

The utility survey utilised a combination of techniques and was carried out in accordance with the PAS 128:2014 standard. This PAS sets out the accuracy to which the data are captured, the quality expected of these data and a means which to assess and indicate the confidence that can be placed in such data.

A key feature of PAS 128:2014 is the inclusion of quality levels for detected utility services. Zetica has produced an interpretation of the quality level for detected utility services across the Site. The results of this interpretation are shown on drawing P8560-19-DWG01-A.

Each utility service was assigned a quality level ranging from B4 (inferred location) to A (verification). Utility services that have been located from visual inspection and/or traced within manhole chambers have been given a PAS quality level A.

Zetica conducted a Type B M2P utility services detection survey utilising the following techniques:

- Full visual inspection of manholes and ID of services (including recording to provide a detailed manhole schedule including photographs and CAD schematic). See Zetica Drawing P8560-19-DWG01-A.
- Tracing utility services using radio frequency location (RFL) system.
- Area scans in passive mode to locate active cables.
- Ground penetrating radar survey of the client's key targeted accessible areas fully post-processed.
- Topography survey to pick up mapped services and manholes.
- 2D CAD drawing with PAS 128:2014 quality level annotation for each individual service.

Factual report (this document).

Useful Links

https://www.zetica.com/resources/method/

P8560-19-R1-B Page 2



Summary of survey design	Technique	Configuration	Line Spacing	Station interval	Depth Accuracy		
	GPR	Dual-channel - 250MHz antenna. 700MHz antenna.	Exploratory Locations - 1m x 1m orthogonal grid	0.01m	+/-15% of recorded depth		
			Access Track - 2m x 2m orthogonal grid.				
	RFL	Passive and Active mode.	N/A	N/A	+/-10% of recorded depth		
Limitations	The following clarifies some of the limitations relevant to the survey:						
	Factors such as multiple utility services or conductive sub-surface conditions (such as water retentive soils) can reduce the detectability of utility services.						
	Depths of interpreted features were indicated where possible and were measured relative to the ground surface. These are based on data modelling and may not necessarily indicate the exact depth.						
	The detectability depth for potential features depends on target size and site-specific signal to noise ratios. Large diameter features will be detectable at greater burial depth than small diameter features in the same environment.						
	GPR depth of detection is strongly dependent on the material properties of the ground. GPR signals can be attenuated by conductive soils and scattered by in-ground targets (clutter) resulting in reduced detection depths.						
	RFL depths are derived from an induced signal that is centred on the utility service. The diameter of the utility service has not been considered.						
	The results of electro-detection techniques are not infallible. Whilst all reasonable efforts are made, the completeness of the utility services information cannot be guaranteed.						
	Inaccessible areas of the Site are shown on Zetica drawing P8560-19-DWG01- A.						

P8560-19-R1-B Page 3





PAS 128:2014 Quality Levels

In line with PAS 128:2014 the following quality levels were achieved. Each utility service is annotated with a PAS quality level to display the accuracy achieved at the time of the survey.

Quality Level	Post Processing	Horizontal Accuracy	Vertical Accuracy	Supporting Data
Α	-	±50 mm	±25 mm	Visual inspection
B1P	Yes	±150 mm	±15% of detected depth	Two techniques with post- processing
B1	-	±150 mm	±15% of detected depth	Two techniques no post- processing
B2P	Yes	±250 mm	±40% of detected depth	One technique with post- processing
B2	-	±250 mm	±40% of detected depth	One technique no post- processing
ВЗР	Yes	±500 mm	Undefined	One technique with post- processing
В3	-	±500 mm	Undefined	One technique no post- processing
B4	-	Undefined	Undefined	Inferred location





3. DATA

Data Presentation

The utility survey results are presented as an interpretative CAD drawing. An example plot of the geophysical data is provided as Figures 2-4. These are referenced below.

Figure Reference	Title
Figure 1	Site Location: Survey area outlined in blue
Figure 2	Example GPR vertical radargram (linear feature)
Zetica Drawing Reference	Title
P8560-19-DWG01-A	Utility Services Plan

Data Quality

GPR dual channel antenna data quality was good with the maximum signal penetration depth across the Site estimated as 1.25m with an average TWTT to the 'noise floor' of 26.3ns and an estimated average signal velocity through the near-surface materials of 95mm/ns. The signal velocity was determined using the hyperbolic curve-fitting method applied to selected anomalies observed within the data.

The dual channel antenna based GPR system produces a 2D vertical profile of data. Figure 2 comprise grey-scale plots of the GPR data from a slice through this volume in a vertical direction, which is **referred to as a 'radargram'. The colours of the** radargram represent the measured GPR signal amplitude within that specific slice. Mid-tones (grey) represents low amplitude, white represents high positive amplitudes and black represent high negative amplitudes.

A typical reflection from an object is comprised of an alternating negative - positive - negative cycle of amplitudes, as seen in a vertical radargram slice. It is not generally possible to determine the type of utility service from GPR data alone so features without corresponding detected utilities are included with a dedicated 'GPR' linetype in Zetica Drawing P8560-19-DWG01-A.

Detectability & Accuracies

The detection of utility services across the Site was good with numerous services being mapped between surface level and a modelled depth of ~1.20m. Most of the mapped utility services produced coincident results with multiple methods providing a good level of detection confidence.

GPR was deployed where accessibility was possible within the site, with the resulting detection depth of approximately 1.75m bgl. Areas inaccessible to GPR are shown on Zetica drawing P8560-19-DWG01-A (Combined Utility Services Plan).

The RFL survey was undertaken across the entire accessible Site areas. The majority of the mapped utility services were located <1m bgl. and the detection of the deepest utility service found on Site was 2.49m. The horizontal accuracy for RFL detected utility services is estimated to be better than 0.15m.

For both GPR and RFL an approximate modelled depth of a utility service has been provided. The accuracy of these modelled depths is estimated to be $\pm 15\%$ and $\pm 10\%$ of the stated depth for the GPR and RFL respectively.





4. DISCUSSION

Interpretation

The interpretation of a feature in GPR data depends on the characteristics of the received response. The following sections provide examples of the response to features observed on Site with associated interpretations.

Linear feature

Figure 2 provide examples of the GPR response to a linear feature. This is characterised by a continuous high amplitude hyperbola response across multiple swaths. These are interpreted as utility services or trenches associated with construction features.

Example radargram showing the GPR response to linear utility services in cross section (blue circles). Depth axis shows modelled depth.

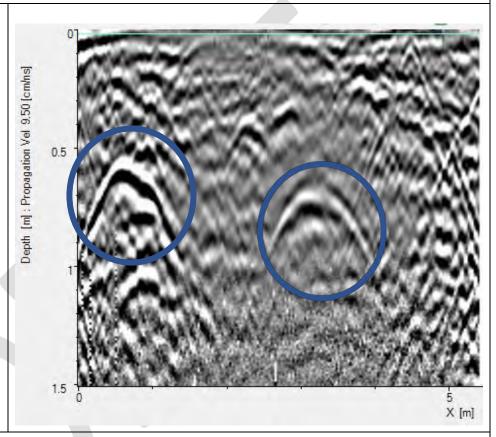


Figure 2: Example radargram (linear feature)





5. RESULTS

The table below provides a summary of identified buried features detected on the Site. This table should be read in conjunction with Zetica drawing P8560-19-DWG01-A (Utility Services Plan).

Feature	No.	Estimated Depth Range (m)	Comments
Electricity Cables	3	0.00 - 1.25	-
Surface Water Sewer	4	0.00 - 0.65	-
Foul Water Sewer	6	0.40 - 1.38	-
Combined Drainage	1	0.50 - 0.70	-
Water	7	0.00 - 2.20	4No. water pipes could not be traced dues to polyethylene construction.
Unknown	3	0.10 - 1.85	3No. utility services were traced on Site which could not be assigned to a service type.
GPR Linear	10	0.20 - 2.20	Linear features mapped are assumed to relate to utility services or trenches associated with construction features.





6. SUMMARY

Summary

44No. exploratory locations were surveyed. 8No. locations contained a feature potentially linked to utility services.

The utility survey has mapped numerous utility services including electricity, surface water, foul water, water supply and other unknown services.

The survey results are summarised on Zetica Drawing P8560-19-DWG01-A.







Appendix 1

General Notes

- . This report has been prepared in relation to the specific requirement of the contract or commission. The report should not be used by third parties without prior consultation with Zetica Ltd. Any advice, recommendations, or statements within the report should be addressed only in the context of the report as a whole.
- 2. The copyright for this report remains with Zetica Ltd. No part of this report may be reproduced, published or amended without prior written consent from Zetica Ltd.
- 3. The report refers to the conditions of the Property at the time of investigation. Zetica Ltd cannot accept liability for subsequent changes of Property conditions.
- 4. Zetica Ltd may have relied on externally provided information. Under no circumstances does Zetica Ltd accept responsibility for the accuracy of such information or data supplied.
- 5. It should be noted that the detection performance is dependent on a measurable physical contrast between the item for detection and host materials. Where significant noise is present sufficient detection may not be possible.
- 6. Interpretation relies largely on experience of similar conditions. Site-specific conditions can create variations that may not be detectable by non-intrusive investigation techniques. It should be noted that the detail of an interpretation might vary from that identified by later intrusive investigation, although the general identification of a feature should not vary.
- 7. The report has been written in line with relevant guidance and legislation in use at the time of report compilation. Subsequent improvement in techniques, changes in legislation, or changes in site conditions, may render parts of this report obsolete. If the report is used after such changes have occurred, or at a time in excess of 1 year of the issue date, it would be prudent to contact Zetica Ltd to reassess the report under a new contract.





Established for over 28 years, Zetica's services include

- Desk studies
- Unexploded ordnance risk assessments and risk mitigation
- Utility services detection
- Archaeological geophysics
- Environmental and engineering geophysical surveys
- Transport infrastructure surveys
- Pipeline & cable route surveys
- Intrusive ground investigations

More details are available at www.zetica.com



MH5 Foul Water CL: 437.81m

Reference: MH5 Cover Level: 437.81m Pipe SL (m) Ø (mm) Notes: Foul Water

A 436.47 100 MH Cover MH Chamber

B 436.90 150

Deeper pipes in chamber. Unable to see or trace due to depth.

Notes

A Base map provided by the Client.

B Limitations imposed by site conditions and current technologies mean that there can be no guarantee of detection for utility services. It is the responsibility of the user to satisfy

themselves as to the location of site services prior to undertaking any excavation.

C Zetica do not accept responsibility for the accuracy of information supplied by third parties.

D Where they could be obtained, the depths for apparatus that were traced by RFL are

identified alongside the apparatus in metres below ground level. The depths obtained are modelled and do not necessarily indicate the exact depth to a duct or pipe.

E Factors such as multiple utility services can reduce the detectability of utility services.

F Survey conducted to PAS 128:2014 M3P.

G Where PAS128 utility detection and location quality levels could be determined the level is shown in brackets alongside the apparatus. The table below shows the correlating accuracies for each quality level.

Quality Level Horizontal Accuracy Vertical Accuracy Supporting Data

Quality Level	Horizontal Accuracy	Vertical Accuracy	Supporting Data
A	±50 mm	±25 mm	Visual inspection
B1P	±150 mm or ±15% of detected depth, whichever is greater	±15% of detected depth	Two techniques with post-processing
B1	±150 mm or ±15% of detected depth, whichever is greater	±15% of detected depth	Two techniques no post-processing
B2P	±250 mm or ±40% of detected depth, whichever is greater	±40% of detected depth	One technique with post-processing
B2	±250 mm or ±40% of detected depth, whichever is greater	±40% of detected depth	One technique no post-processing
ВЗР	±500 mm	Undefined	One technique with post-processing
B3	±500 mm	Undefined	One technique no post-processing
B4	Underfined	Undefined	Inferred location
	1		I .

Client Exploratory Locations

Cable percussion borehole

Windowless sampling

H Drawing should be read in conjunction with report P8560-19-R1-B.

Legend

Drainage - Foul w
Electricity Cables
Electricity cables
Water Pipes
Water pipe

Unknown Utility

Unknown

GPR Feature

GPR GPR GPR linear feature

Site Boundary - Utility survey
Site Boundary - Exploratory locations
Inaccessible

Abbreviations and annotations

UTL Unable to Lift

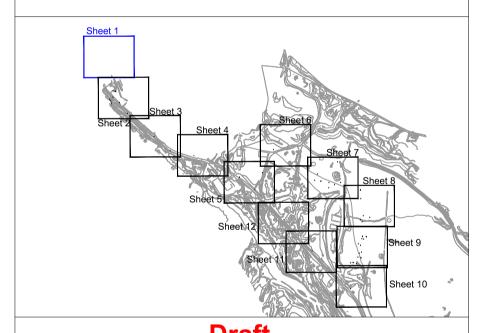
UTT Unable to Trace

UTS Unable to Sonde

OS Service runs Off Site

MH Manhole





User to check for latest issue

Checked by

The Coal Authority

Nenthead Mines

_ocation

Nenthead, Cumbria

	T. Carroll			R. Grant			
ŀ	Horizontal Scale (A1)		Date of Survey		Issue Date		
	1:200		02/09/2019- 11/09/2019		31/10/2019)19
F	Project Code		Drawing No.		Sheet Is		Issue
	P8560-19		DWG01		1 of	12	В
Is	ssue	Remarks			Drawn	Checke	ed Date
	A Draft issue, for commer		nt		TC	RG	20/09/2019
	B Draft issue, for commer		nt		TC	RG	31/10/2019
	-	-			-	-	-





- A Base map provided by the Client.
- B Limitations imposed by site conditions and current technologies mean that there can be no guarantee of detection for utility services. It is the responsibility of the user to satisfy
- themselves as to the location of site services prior to undertaking any excavation.
- C Zetica do not accept responsibility for the accuracy of information supplied by third parties. D Where they could be obtained, the depths for apparatus that were traced by RFL are
- identified alongside the apparatus in metres below ground level. The depths obtained are modelled and do not necessarily indicate the exact depth to a duct or pipe.
- E | Factors such as multiple utility services can reduce the detectability of utility services.

Quality Level | Horizontal Accuracy | Vertical Accuracy | Supporting Data

- F Survey conducted to PAS 128:2014 M3P.
- G Where PAS128 utility detection and location quality levels could be determined the level is shown in brackets alongside the apparatus. The table below shows the correlating accuracies for each quality level.

Α	±50 mm	±25 mm	Visual inspection
B1P	±150 mm or ±15% of detected depth, whichever is greater	±15% of detected depth	Two techniques with post-processing
B1	±150 mm or ±15% of detected depth, whichever is greater	±15% of detected depth	Two techniques no post-processing
B2P	±250 mm or ±40% of detected depth, whichever is greater	±40% of detected depth	One technique with post-processing
B2	±250 mm or ±40% of detected depth, whichever is greater	±40% of detected depth	One technique no post-processing
ВЗР	±500 mm	Undefined	One technique with post-processing
В3	±500 mm	Undefined	One technique no post-processing
B4	Underfined	Undefined	Inferred location

Client Exploratory Locations Cable percussion borehole

Windowless sampling

H Drawing should be read in conjunction with report P8560-19-R1-B.



Utility Services Arrow indicates flow direction Drainage - Combined waterDrainage - Surface waterDrainage - Foul water

Electricity Cables Electricity cables Water pipe

Unknown Utility GPR Feature GPR linear feature

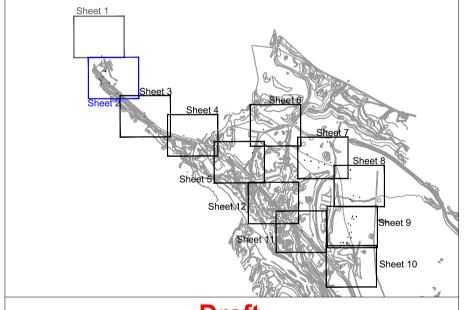
Site Boundary - Utility survey
Site Boundary - Exploratory locations

Abbreviations and annotations

Inaccessible

UTL Unable to Lift
UTT Unable to Trace
UTS Unable to Sonde
OS Service runs Off Site
MH Manhole





Draft User to check for latest issue

The Coal Authority

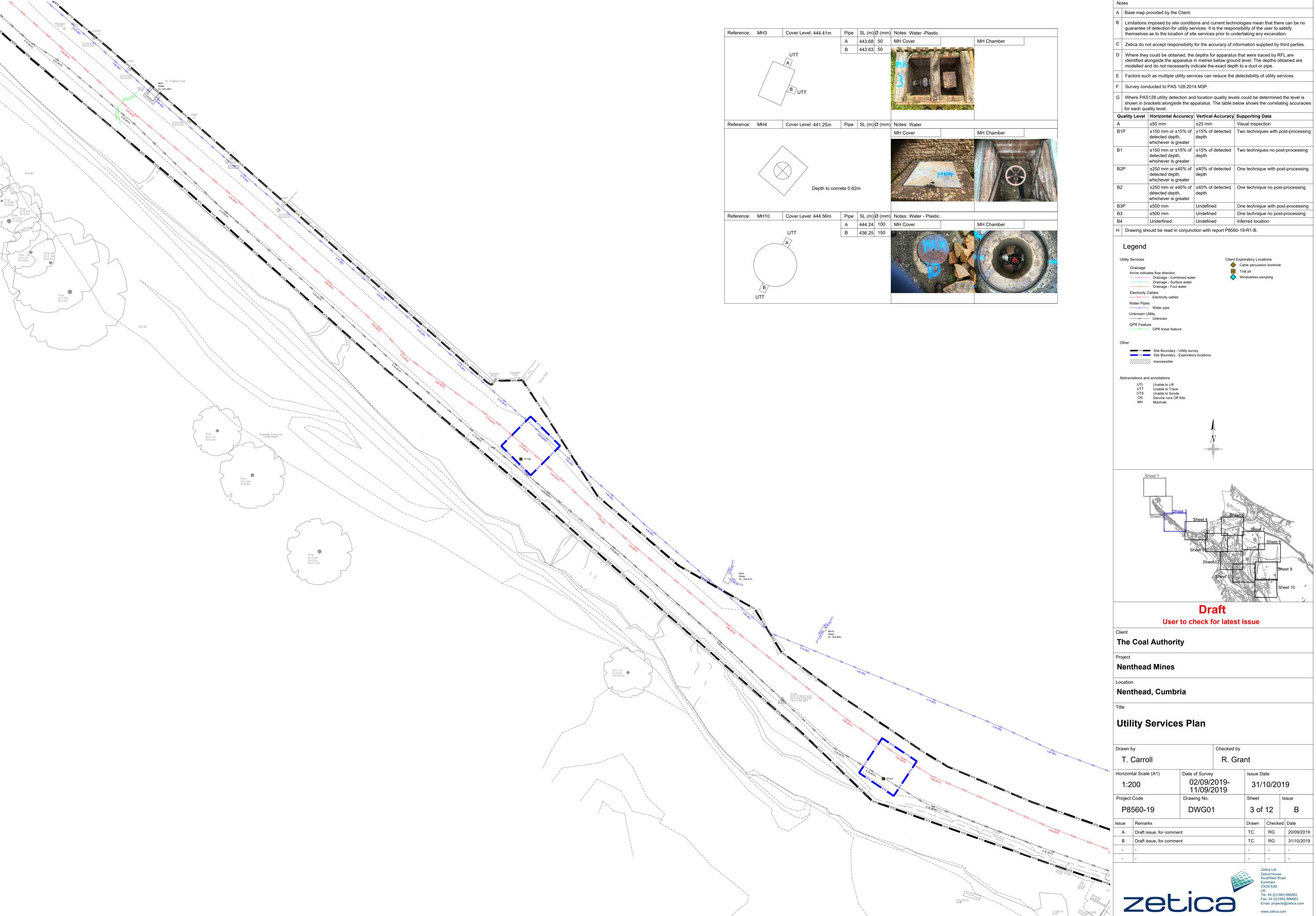
Nenthead Mines

Nenthead, Cumbria

Drawn by	Checked by
T. Carroll	R. Grant

Horizontal Scale (A1)		Date of Survey		Issue Date		
1:200		02/09/2019- 11/09/2019		31/10/201		19
Project Code		Drawing No.		Sheet		Issue
P8	560-19	DWG01		2 of	12	В
Issue	Remarks			Drawn	Checke	Date
Α	A Draft issue, for comment			TC	RG	20/09/20
	Draft issue, for comment					
В	Draft issue, for comme	nt		TC	RG	31/10/20





B Limitations imposed by site conditions and current technologies mean that there can be no guarantee of detection for utility services. It is the responsibility of the user to satisfy

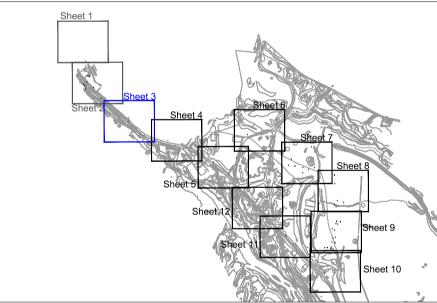
themselves as to the location of site services prior to undertaking any excavation.

E Factors such as multiple utility services can reduce the detectability of utility services.

G Where PAS128 utility detection and location quality levels could be determined the level is

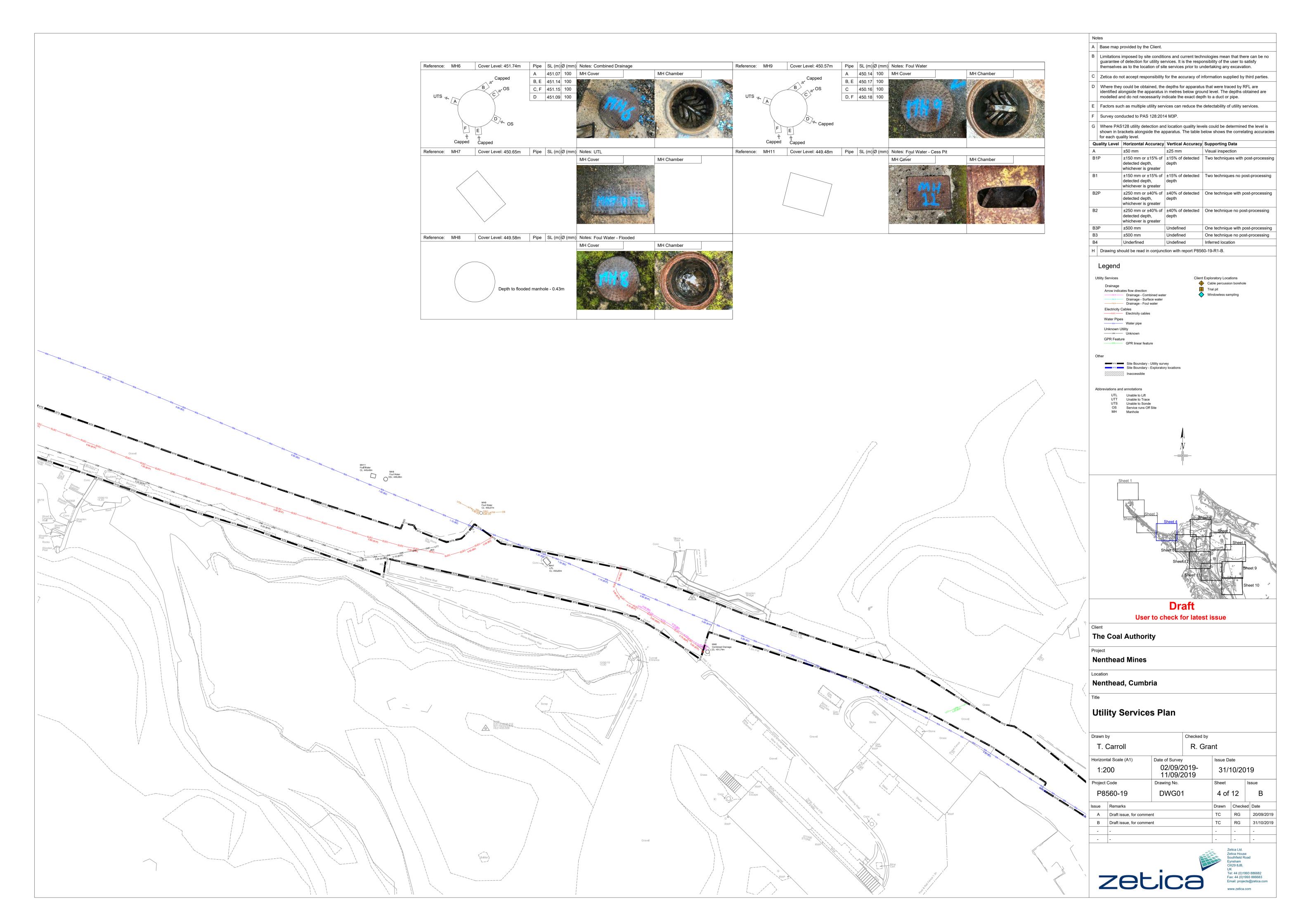
Quality Level	Horizontal Accuracy	Vertical Accuracy	Supporting Data
Α	±50 mm	±25 mm	Visual inspection
B1P	±150 mm or ±15% of detected depth, whichever is greater	±15% of detected depth	Two techniques with post-processing
B1	±150 mm or ±15% of detected depth, whichever is greater	±15% of detected depth	Two techniques no post-processing
B2P	±250 mm or ±40% of detected depth, whichever is greater	±40% of detected depth	One technique with post-processing
B2	±250 mm or ±40% of detected depth, whichever is greater	±40% of detected depth	One technique no post-processing
В3Р	±500 mm	Undefined	One technique with post-processing
B3	±500 mm	Undefined	One technique no post-processing

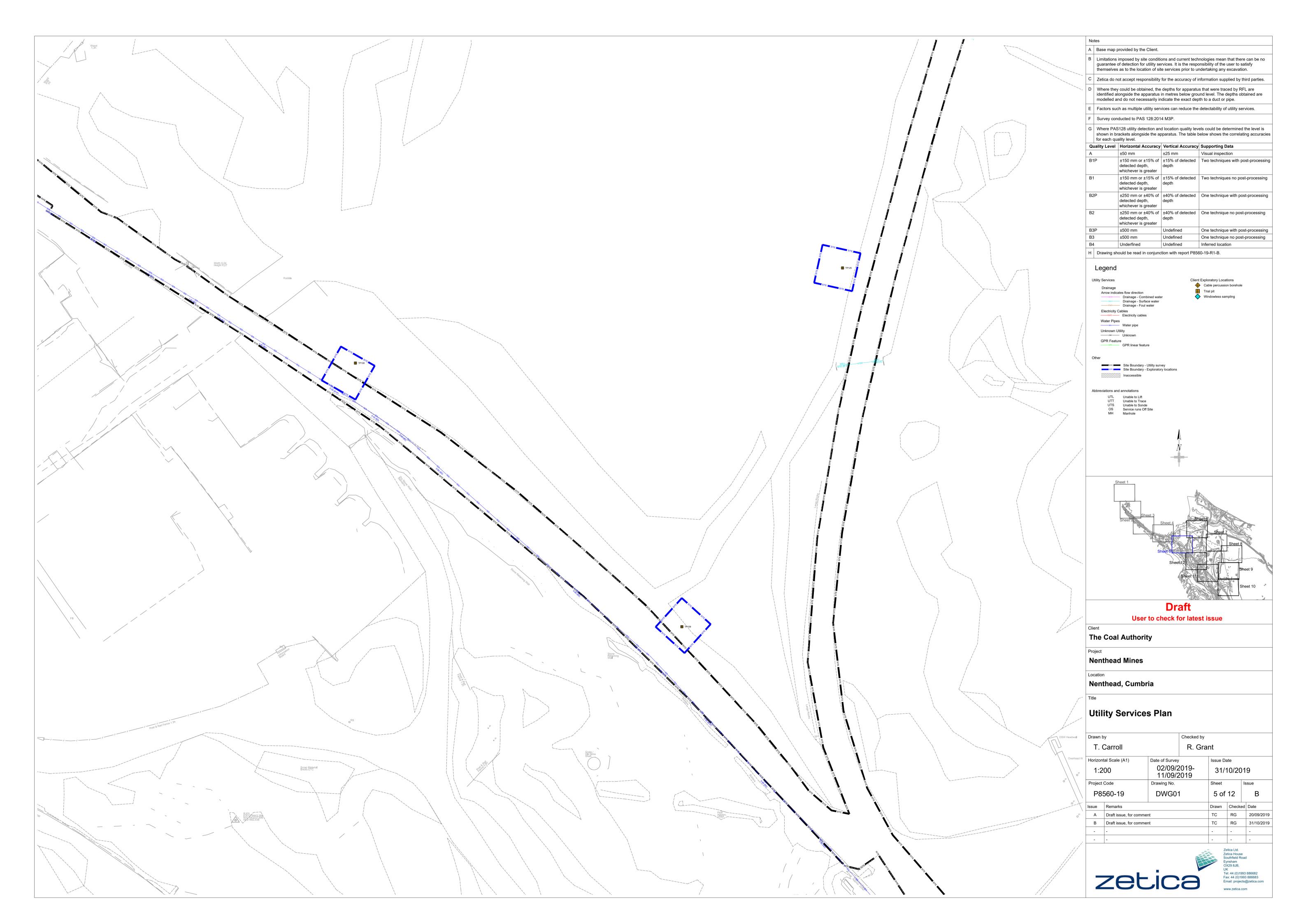
Inferred location

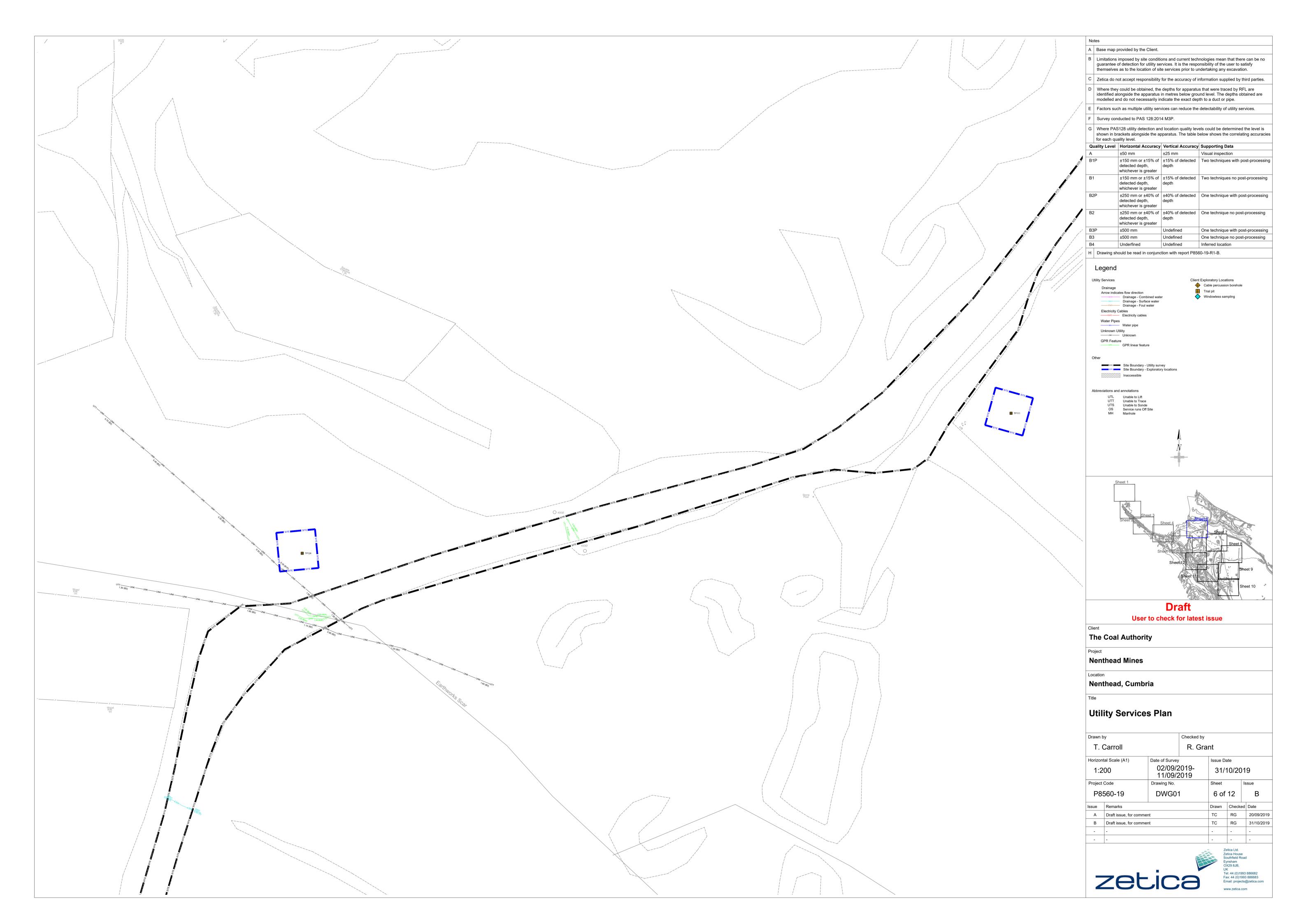


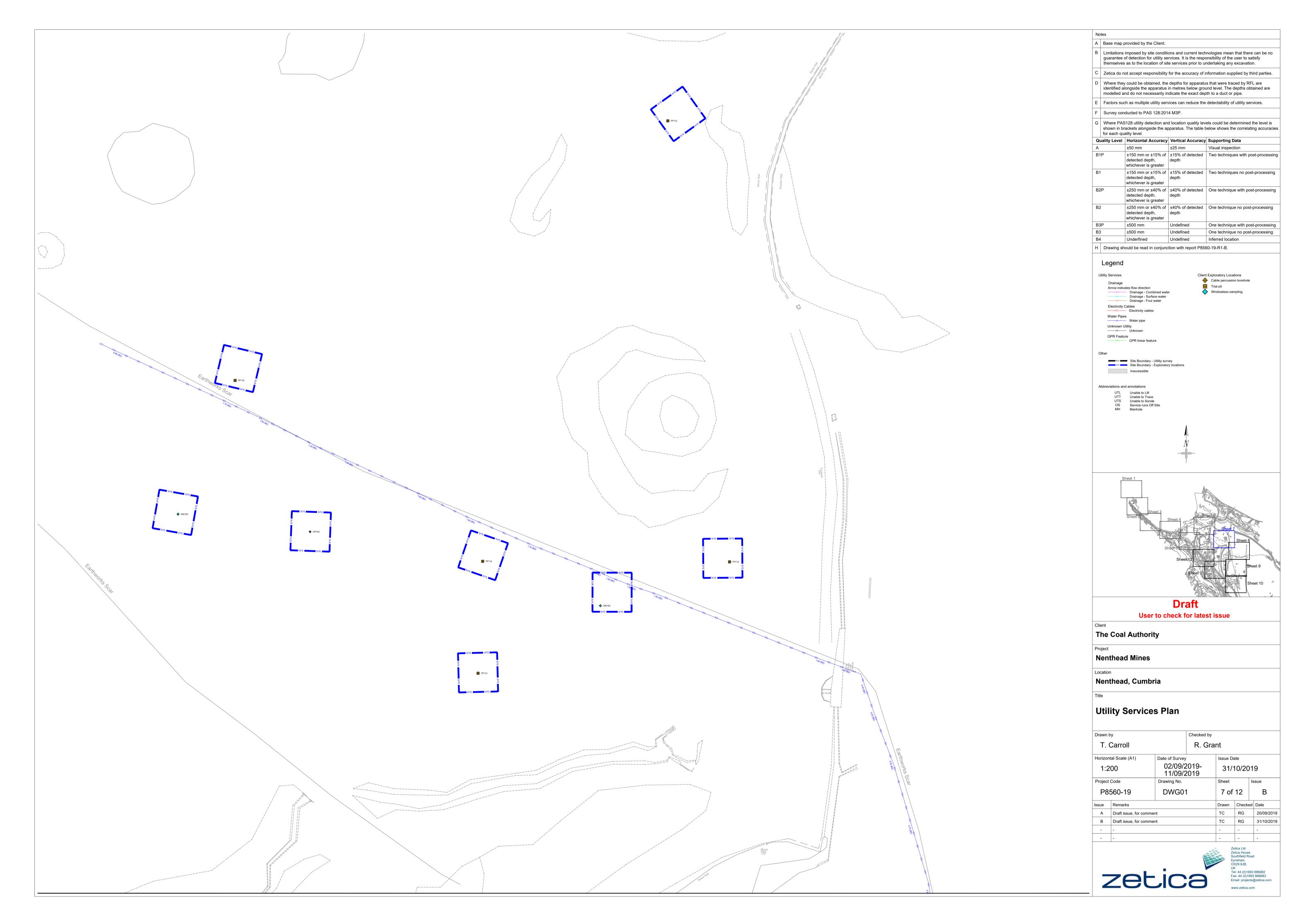
	T. Carroll			R. Gra	nt				
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	1:200		02/09/2019- 11/09/2019		31/10/2019		9		
	Project (Code	Drawing No.		Sheet		ls	sue	
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	Issue	Remarks			Drawn	Checke	ed	Date	
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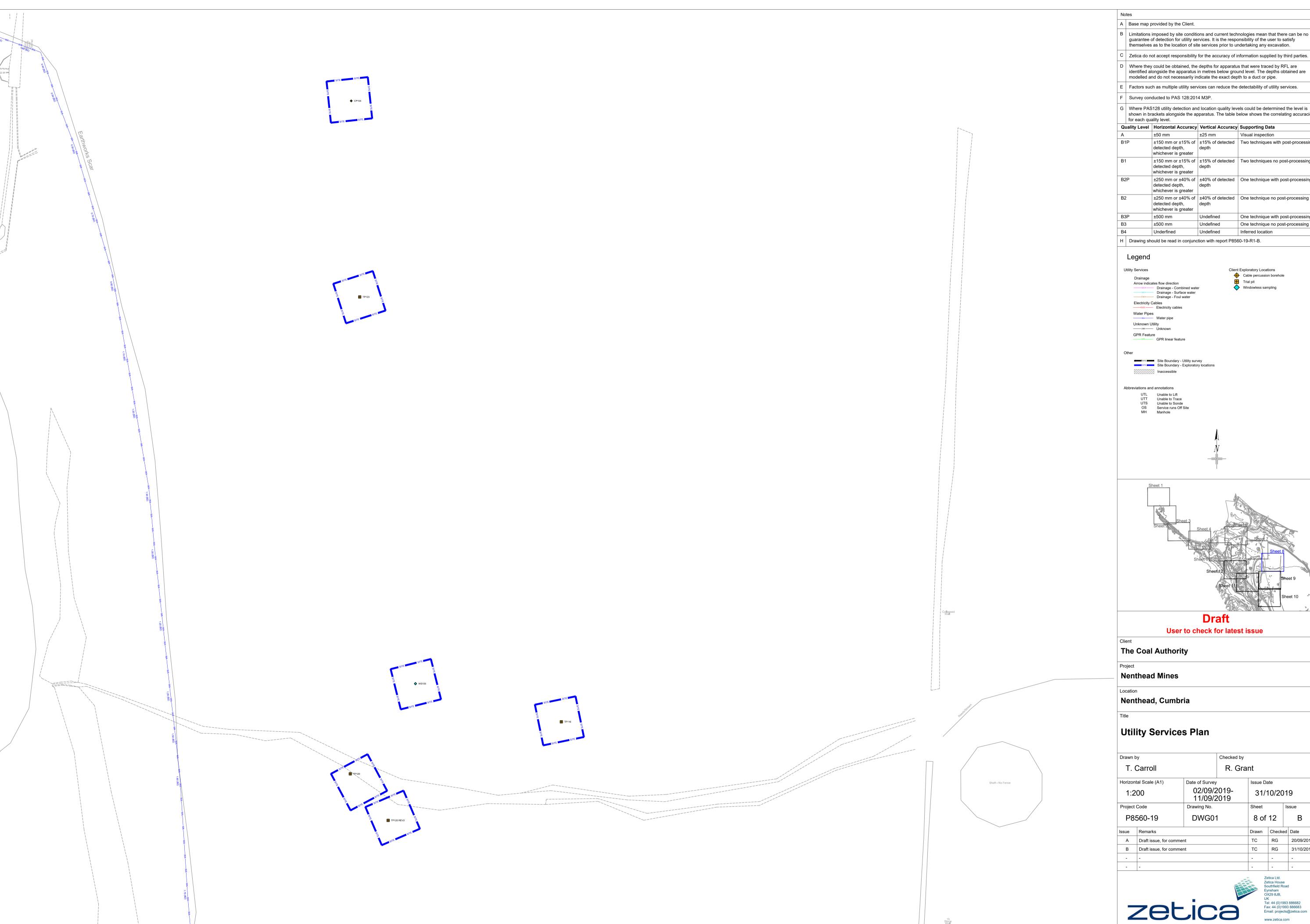












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themselves as to the location of site services prior to undertaking any excavation.

C Zetica do not accept responsibility for the accuracy of information supplied by third parties. D Where they could be obtained, the depths for apparatus that were traced by RFL are

E Factors such as multiple utility services can reduce the detectability of utility services.

G Where PAS128 utility detection and location quality levels could be determined the level is shown in brackets alongside the apparatus. The table below shows the correlating accuracies

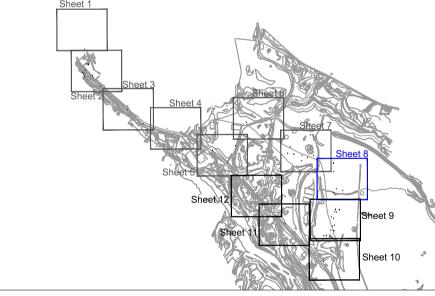
Quality Level Horizontal Accuracy Vertical Accuracy Supporting Data

Quality Level	Horizoniai Accuracy	vertical Accuracy Supporting Data	
А	±50 mm	±25 mm	Visual inspection
B1P	±150 mm or ±15% of detected depth, whichever is greater	±15% of detected depth	Two techniques with post-processing
B1	±150 mm or ±15% of detected depth, whichever is greater	±15% of detected depth	Two techniques no post-processing
B2P	±250 mm or ±40% of detected depth, whichever is greater	±40% of detected depth	One technique with post-processing
B2	±250 mm or ±40% of detected depth, whichever is greater	±40% of detected depth	One technique no post-processing
ВЗР	±500 mm	Undefined	One technique with post-processing
B3	±500 mm	Undefined	One technique no post-processing
D4	Line de office e d	11	If

Client Exploratory Locations Cable percussion borehole

Windowless sampling

Site Boundary - Utility survey
Site Boundary - Exploratory locations



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1:200		02/09/2019- 11/09/2019		31/10/2019		19	
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Checked by





A Base map provided by the Client.

B Limitations imposed by site conditions and current technologies mean that there can be no guarantee of detection for utility services. It is the responsibility of the user to satisfy

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E Factors such as multiple utility services can reduce the detectability of utility services.

F Survey conducted to PAS 128:2014 M3P.

G Where PAS128 utility detection and location quality levels could be determined the level is shown in brackets alongside the apparatus. The table below shows the correlating accuracies for each quality level.

Quality Level Horizontal Accuracy Vertical Accuracy Supporting Data

Quality Level	Horizoniai Accuracy	Vertical Accuracy	Supporting Data
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B1P	±150 mm or ±15% of detected depth, whichever is greater	±15% of detected depth	Two techniques with post-processing
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B4	Underfined	Undefined	Inferred location

Client Exploratory Locations Cable percussion borehole

Windowless sampling

H Drawing should be read in conjunction with report P8560-19-R1-B.

Legend

Utility Services Arrow indicates flow direction

Drainage - Combined water
Drainage - Surface water
Drainage - Foul water **Electricity Cables** ——ELEC Electricity cables

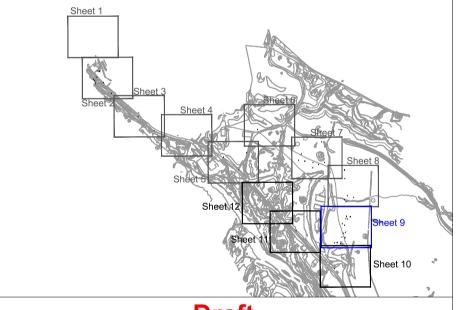
Unknown Utility
——unk—— Unknown GPR Feature

GPR linear feature

Site Boundary - Utility survey
Site Boundary - Exploratory locations Inaccessible

Abbreviations and annotations UTL Unable to Lift
UTT Unable to Trace
UTS Unable to Sonde
OS Service runs Off Site
MH Manhole





User to check for latest issue

The Coal Authority

Nenthead Mines

Nenthead, Cumbria

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T. Carroll		R. Gra	nt
Horizontal Scale (A1)	Date of Survey		Issue Date
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Project Code	Drawing No.		Sheet
P8560-19	DWG01	1	9 of 12

		11/03/2013			
Project Code		Drawing No.	Sheet		Issue
P8	560-19	DWG01	9 of	12	В
Issue	Remarks		Drawn	Checked	Date
Α	Draft issue, for comment		TC	RG	20/09/201
В	Draft issue, for comment		TC	RG	31/10/201
-	-		-	-	-





- A Base map provided by the Client.
- B Limitations imposed by site conditions and current technologies mean that there can be no guarantee of detection for utility services. It is the responsibility of the user to satisfy themselves as to the location of site services prior to undertaking any excavation.
- C Zetica do not accept responsibility for the accuracy of information supplied by third parties.
- D Where they could be obtained, the depths for apparatus that were traced by RFL are identified alongside the apparatus in metres below ground level. The depths obtained are modelled and do not necessarily indicate the exact depth to a duct or pipe.
- E Factors such as multiple utility services can reduce the detectability of utility services.
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±50 mm	±25 mm	Visual inspection
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±250 mm or ±40% of detected depth, whichever is greater	±40% of detected depth	One technique with post-processing
±250 mm or ±40% of detected depth, whichever is greater	±40% of detected depth	One technique no post-processing
±500 mm	Undefined	One technique with post-processing
±500 mm	Undefined	One technique no post-processing
Underfined	Undefined	Inferred location
	±50 mm ±150 mm or ±15% of detected depth, whichever is greater ±150 mm or ±15% of detected depth, whichever is greater ±250 mm or ±40% of detected depth, whichever is greater ±250 mm or ±40% of detected depth, whichever is greater ±250 mm or ±40% of detected depth, whichever is greater ±500 mm ±500 mm	±50 mm ±150 mm or ±15% of detected depth, whichever is greater ±150 mm or ±15% of detected depth ±150 mm or ±15% of detected depth, whichever is greater ±250 mm or ±40% of detected depth, whichever is greater ±250 mm or ±40% of detected depth, whichever is greater ±250 mm or ±40% of detected depth, whichever is greater ±250 mm Undefined ±500 mm Undefined

Client Exploratory Locations Cable percussion borehole

Windowless sampling

Arrow indicates flow direction Drainage - Combined waterDrainage - Surface waterDrainage - Foul water

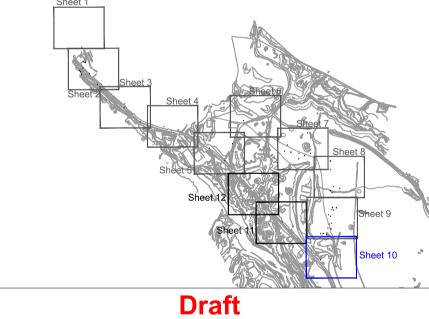
Water pipe

GPR linear feature

Inaccessible

UTL Unable to Lift
UTT Unable to Trace
UTS Unable to Sonde
OS Service runs Off Site
MH Manhole





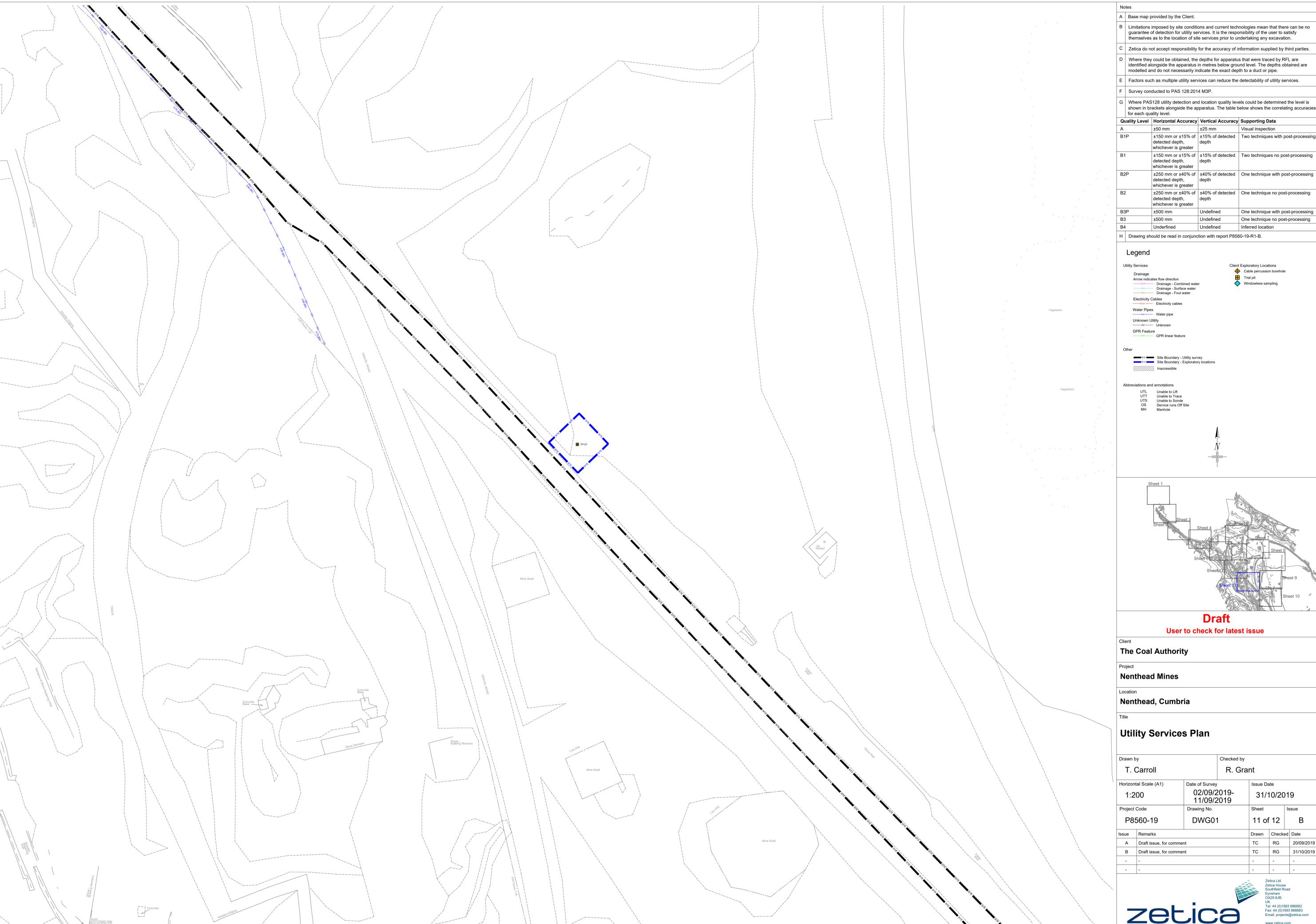
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Nenthead, Cumbria

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lorizontal Scale (A1)	Date of Survey		Issue Date

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Issue	Remarks		Drawn	Checke	ed Date
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- E | Factors such as multiple utility services can reduce the detectability of utility services.

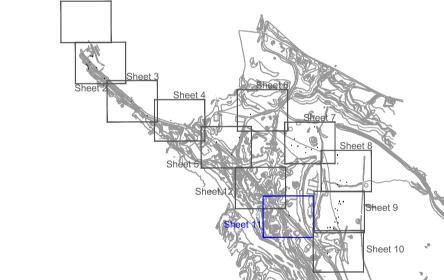
- G Where PAS128 utility detection and location quality levels could be determined the level is shown in brackets alongside the apparatus. The table below shows the correlating accuracies

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Α	±50 mm	±25 mm	Visual inspection
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B2	±250 mm or ±40% of detected depth, whichever is greater	±40% of detected depth	One technique no post-processing
ВЗР	±500 mm	Undefined	One technique with post-processing
B3	±500 mm	Undefined	One technique no post-processing

Inferred location

Cable percussion borehole

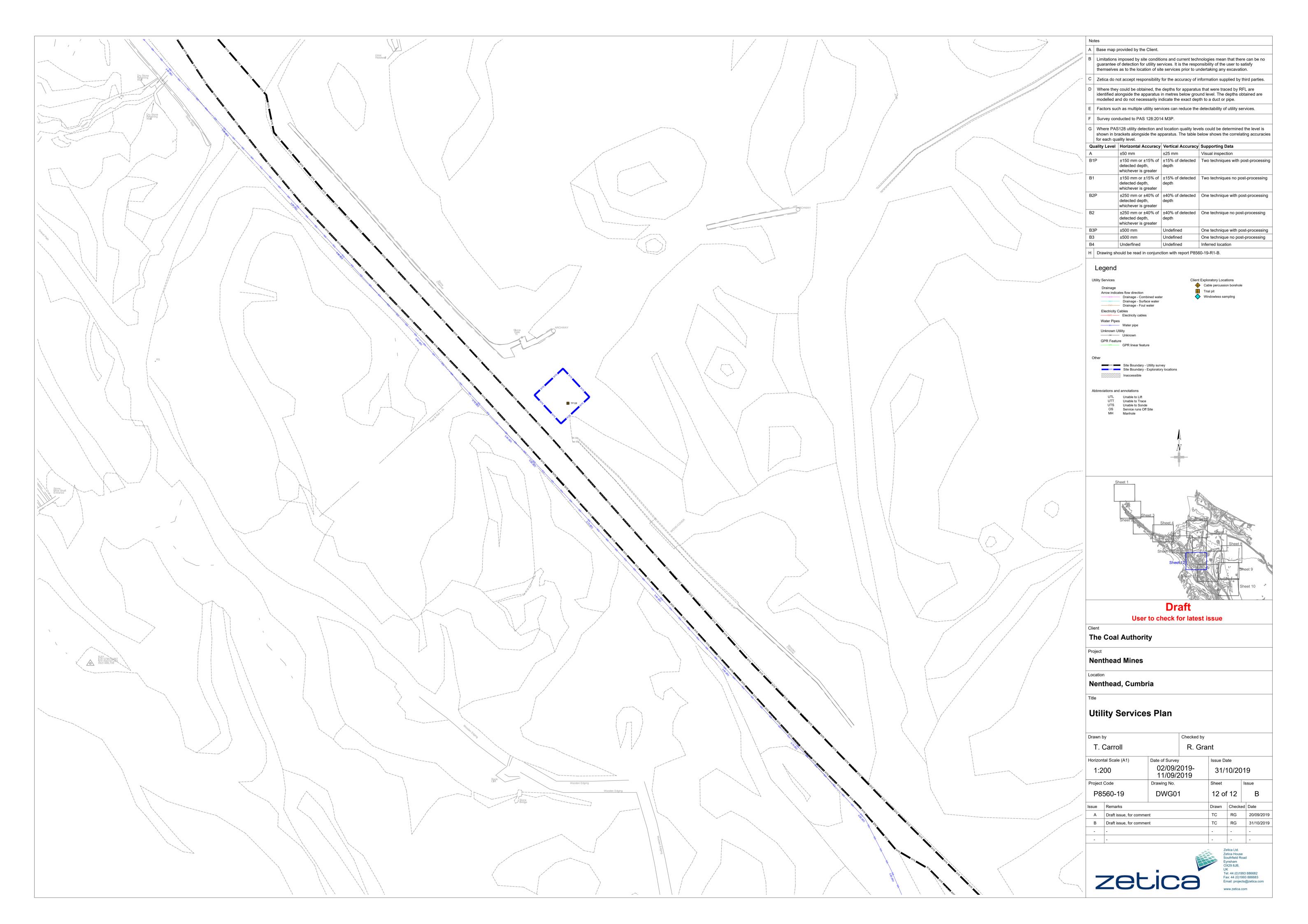
Windowless sampling



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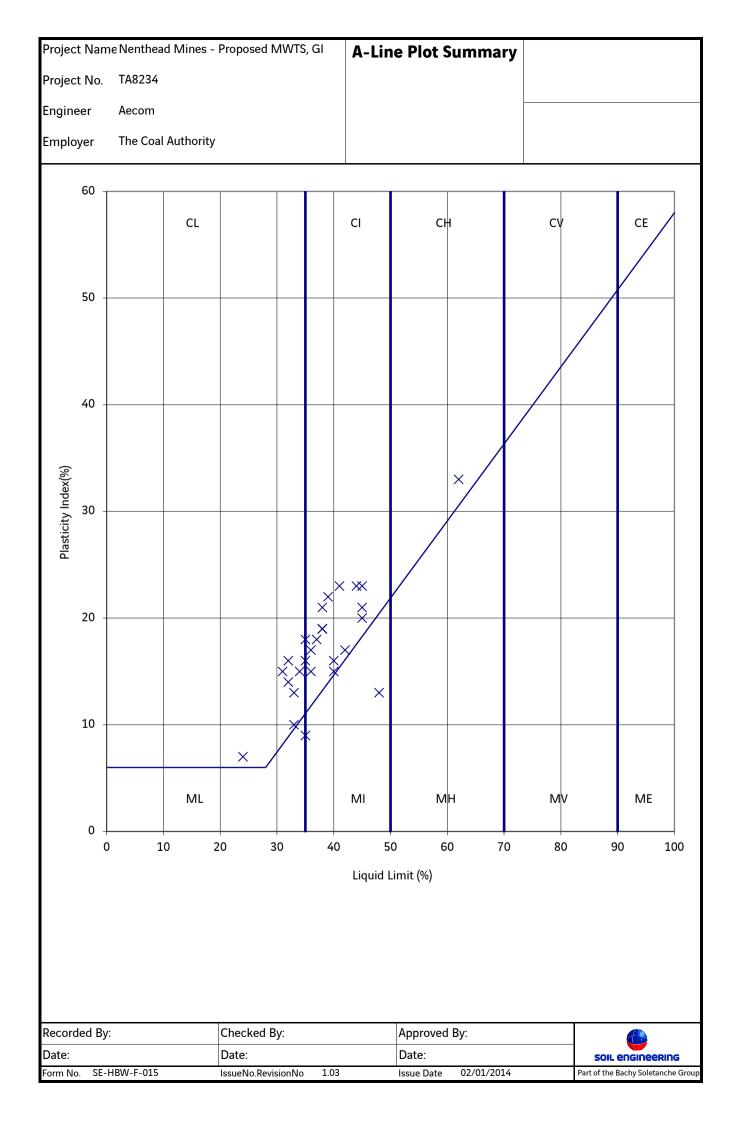


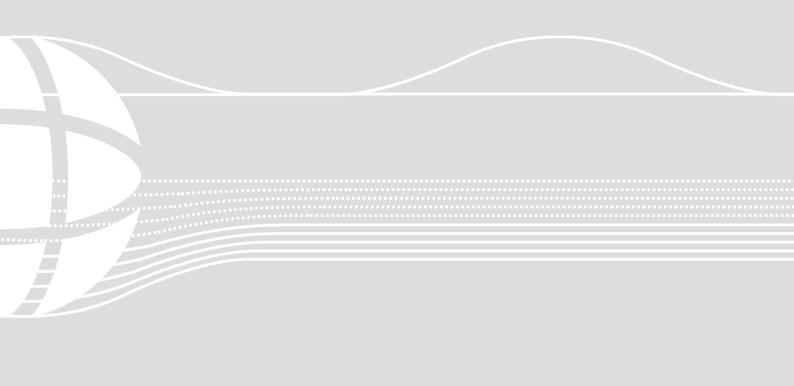




SUPPORTING FACTUAL DATA APPENDIX 3

A-Line Plot







Leeds

Head Office & Geotechnical Laboratory Parkside Lane, Dewsbury Road, Leeds LS11 5SX T: 0113 2711111 E: enquiries@soil-engineering.co.uk

Camberley

Southern Office Foundation Court, Riverside Way, Watchmoor Park, Camberley GU15 3RG T: 01276 674940 E: southern@soil-engineering.co.uk

Coatbridge

Block 6, Greenhill Industrial Estate, Coatbridge ML5 2AG T: 01698 863 400 E: scotland@soil-engineering.co.uk









