

Environmental
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COAL MINING INVESTIGATION REPORT

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Rogers Geotechnical Services Ltd
Offices 1 & 2 Barncliffe Business Park, Near Bank, Shelley, Huddersfield, HD8 8LU
☎ 01484 604354 Company No. 5130864

Contents

		Page
1.	Introduction	1
2.	Limitations	1
3.	Preliminary Desk Study	2
4.	Fieldworks	2
4.1	Acquisition of Coal Authority Permit	2
4.2	Rotary Open-hole Boreholes	2
4.3	Summary of Works	3
5.	Geological Appraisal	3
6.	Strata Conditions	4
7.	Discussion of Ground Conditions	4
8.	Risk Assessment	5
9.	References	5

Appendices

1.	Coal Authority Permit
2.	Site Plan
3.	Rotary Borehole Records



Report on Rotary Probing

Location:	The Pit Yard Whams Road, Crow Edge, Sheffield. South Yorkshire, S36 4HF		
For:	Bulk Metals Limited		
Report No.	C2751/22/E/4710	Report date:	March 2023

For and on behalf of **Rogers Geotechnical Services Ltd**



James Finch BSc FGS
Graduate Engineer



Rob Palmer MSc FGS ACIEH
Senior Geo-environmental Engineer

1. Introduction

It is understood that the site is to be developed by the construction small permeant structure with a yard. As part of the planning process a site investigation has been undertaken to establish if coal workings are present beneath the area of the proposed works. This report presents the data obtained and discusses the ground conditions in relation to the proposed development.

2. Limitations

The recommendations made and opinions expressed in this report are based on the ground conditions revealed by the site works, together with an assessment of the site and of the laboratory test results. Whilst opinions may be expressed relating to sub-soil conditions in parts of the site not investigated, for example between borehole positions, these are for guidance only and no liability can be accepted for their accuracy.

This report has been prepared in accordance with our understanding of current best practice. However, new information or legislation, or changes to best practice may necessitate revision of the report after the date of issue.

3. Preliminary Desk Study

The following information has been considered during the works.

- Appraisal of available on-line British Geological Survey and Coal Authority data.
- Review of the Coal Mining Risk Assessment (CMRA) prepared by Rogers Geotechnical Services Ltd (ref: C2751/22/E/4796)

The Coal Mining Risk Assessment prepared by Rogers Geotechnical Services Ltd (referenced C2751/22/E/4796) recommended the undertaking of rotary openhole boreholes at three locations across the site. It was considered that the first borehole may be undertaken to a depth of 15m below the rockhead, with the remaining boreholes proving the depth and continuity of the coal seam(s).

4. Fieldworks

4.1 Acquisition of Coal Authority Permit

In order to undertake this investigation, it was necessary to obtain permission to enter or disturb Coal Authority interests. This permission was granted on the 9th March 2023 as permit reference number 26337, which is presented in Appendix 1 to this report. In accordance with the joint Coal Authority and Health and Safety Executive positioning statement, and under the requirements of the permit, the works were undertaken employing water flush drilling techniques. Furthermore, the drillers wore gas detectors on their person throughout the works.

4.2 Rotary Open-hole Boreholes

The fieldworks were completed on the 20th of March 2023, in accordance with the instruction to proceed issued by the client. These works were required in order to prove that workings were not present at shallow depths beneath the site, as identified within the coal mining risk assessment

The boreholes were sunk using a Comacchio 205 rotary drilling rig using rotary open-hole drilling techniques and employing 130mm diameter drag and tricone roller bits. Where necessary, 140mm diameter casing was temporarily installed through the overburden to support the bore. The investigation was undertaken using water flush drilling techniques in accordance with the Coal Authority and Health and Safety Executive positioning statement. Drill chippings brought to surface in the flush returns were inspected by the driller on a screen, which forms part of the re-circulation tanks. In addition, representative disturbed samples of the arisings were taken at regular depth intervals and sealed in plastic containers. The borehole positions are shown on the site plan, which is presented in Appendix 2 and the strata conditions are presented on the borehole records in Appendix 3.

Whilst it was necessary to ensure at least one borehole position was drilled to 25m depth beneath rockhead, the required termination depth of the other positions was reviewed during the course of the fieldworks, in accordance with the findings of the geological review and CMRA. A summary of the works completed is presented below.

4.3 Summary of Works

Table 1: Summary of Completed Works			
Location	Dates Drilled	Depth (m)	Comments
BH01	20/03/2023	20	Target depth reached.
BH02	20/03/2023	25	Target depth reached.
BH03	20/03/2023	15	Terminated as sufficient data was obtained.

5. Geological Appraisal

The available published geological data for the site has been examined and the following table presents the anticipated geology.

Table 2: Geological Data for the Site			
Strata Type	Strata Name ¹	Previous Name	Description ²
Superficial Geology	None recorded	-	-
Solid Geology	Pennine Lower Coal Measures Formation	-	Interbedded grey mudstone, siltstone and pale grey sandstone, commonly with mudstones containing marine fossils in the lower part, and more numerous and thicker coal seams in the upper part.

It should be appreciated that the site is underlain by a member of the Pennine Lower Coal Measures Formation. There are numerous dip indicator relevant to the site (i.e. within 500m of the site or within the same fault block) that suggests the solid geology beneath the site dips between 6° and 8° to the north.

There are three notable coal seams that outcrop within the vicinity of the site, as summarised below:

Table 3: Summary of Coal Seams within the Vicinity of the Site		
Seam Name	Seam Thickness*	Outcrop Distance from Site*
Middle Bed Coal	0 – 0.6m	25m SE
Soft Bed Coal (aka Coking or Bassy)	0.1 – 1.2m	652m SE

*All distances are given as approximations only. It should be noted that coal seam thicknesses may vary over relatively short distances.

The geological data suggests that the Middle Bed Coal seam could be observed at shallow depths; within the top 10m of the site surface. However, considering the generalised dip of the local strata and the topography of the area, the Soft Bed Coal is anticipated to be present at depths in excess of

¹ Sources: British Geological Survey (NERC) Map Sheets 86; Glossop; Solid and Drift Edition, and the Geology of Britain Viewer [online resource from www.bgs.ac.uk]

30m below ground level (bgl). Taking the above information into consideration, the geological review suggests that an intrusive investigation will encounter one coal seam (anticipated to represent the Middle Bed Coal) at relatively shallow depth. It should be appreciated that any coal seams within 30m of the site surface, if worked, could pose a risk of instability to the proposed development.

6. Strata Conditions

In accordance with the geology of the area, the succession has been shown to include the following:

Depth to Base (m)	Strata Type	Positions Strata was Revealed	Groundwater Strikes (m)
2 - 3	MADE GROUND	All	None
4 – 5	Brown/Black CLAY	All	None
5 – 7	Brown SANDSTONE	All	None
9 – 20	Grey MUDSTONE	All	None
15 – 25	Brown/Grey SANDSTONE	BH02, BH03	None

'+' Denotes that the strata extended below the termination depth of the investigated positions, thus the extent of the deposit is only proven to the depths indicated.

During this investigation, after initially encountering 2-3m of made ground, brown and black clay was revealed to a maximum depth of 5.00m. This stratum is anticipated to represent the upper most weathered fraction of the Pennine Lower Coal Measures formation, as indicated by the geological data for the site. It may be possible that the brown and black clay in particular could represent the Middle Bed Coal.

Below this stratum, competent layers of the Pennine Lower Coal Measures Formation were revealed to a depth of 25m, comprising interbedded layers of mudstones and sandstone.

No voids were encountered within the strata during the rotary probing. No loss of flush or drilling resistance was noted within the boreholes at any depth

No groundwater strikes were recorded during drilling. However, it is possible that the use of water flushing techniques may have masked the presence of any water strikes within the borehole locations. In any event, it should be appreciated that groundwater levels are subject to seasonal variation or changes in local drainage conditions.

7. Discussion of Ground Conditions

On the basis of all of the information provided above it is noted that there are no intact coal seams within 25m bgl, albeit the Middle Bed Coal may have been significantly weathered to a cohesive soil at the near surface. Consequently, it is considered that it is highly unlikely that shallow coal workings are present beneath or in close proximity to the area of the proposed development.

8. Risk Assessment

In light of the findings of this investigation, the risk to the proposed development is considered with reference to the following ratings and definitions:

- Low - The possibility of instability is unlikely therefore no further action is necessary.
- Moderate - The possibility of instability is likely and further investigation or remedial action may be required.
- High - The possibility of instability is highly likely and further investigation or remedial action will be necessary.

Table 5: Development Specific Risk Assessment

Item	Risk of Instability	Coal Seam(s) Considered	Risk Rating
1	Shallow coal workings	Middle Bed Coal Seam	Low to Moderate

In view of all the information obtained in this investigation, it is considered that there is likely a low risk of ground movement as a consequence of coal workings beneath the site. No established coal workings have been identified within the investigation. As outlined in the coal mining risk assessment, there is a potential for bell pits and near surface opencast workings to be present at the site, thus a low to moderate risk has been assigned. However, evidence of such works have not been confidently recognised in this investigation. Nonetheless, the potential presence of such features should be borne in mind during the groundworks phase. As a substantial thickness of made ground appears to be present beneath the site, it would be prudent to complete a subsequent ground investigation for foundation design.

9. References

- British Standards Institution (2015 +A1: 2020) BS 5930: *Code of practice for ground investigations*, B.S.I., London.
- Healy, P. and Head, J., 1984. *Construction over abandoned mine workings*. London: Construction Industry Research and Information Association [for] Directorate of Civil Engineering Services, Property Services Agency, Dept. of the Environment.
- Parry, D. and Chiverrell, C., 2019. *Abandoned mine workings manual*. London: CIRIA.
- British Geological Survey (NERC) (2023), BGS, Keyworth.
 - Geology of Britain Viewer: (http://maps.bgs.ac.uk/geologyviewer_google/googleviewer.html)
 - Borehole Scans: (<http://www.bgs.ac.uk/data/boreholescans/>)
 - Lexicon of Named Rock Units: (<http://www.bgs.ac.uk/lexicon/>)



Appendix 1

Coal Authority Permit



The Coal
Authority

Permit to Enter or Disturb Coal Authority Interests

Permit 26337

Name and Address of Permit Holder:

*Bulk Metals Limited
Springvale
Penistone
South Yorkshire
S36 6HG*

Site Location:

*The Pit Yard
Crow Edge
Sheffield
S36 4HF*

This certificate hereby grants the above named Permit Holder a Permit to carry out:-

A Ground Investigation comprising three boreholes to 20m within the Authority's interests at the identified site location above as shown on the Grant Permit Boundary (overleaf) for the period of **12 months** from the granted date shown below. *The granting of this Permit does not constitute advice given by the Authority in relation to the proposed operations. It is the Permit Holder's responsibility to obtain appropriate health, safety, environmental, technical and legal advice.*

Conditions:

- *Manned entry (i.e.) into mine entries/workings) is strictly prohibited.*
- *Water flush*
- *Gas Monitoring CO, CH₄, CO₂, O₂, H₂S at borehole and rig*
- *Operators undertaking the work must be in possession of this certificate and the Permit boundary plan at the time of works*
- *Appropriate borehole sealing without delay and to withstand site level changes*

Signed: Michael Amirtash Granted Date: 9th March 2023

For and on behalf of The Coal Authority

Nominated Representative: Michael Amirtash, Permitting Manager;

The Coal Authority, Permitting Office, 200 Lichfield Lane, Mansfield, Notts, NG18 4RG

Tel: 01623 637450; E-Mail: permissions@coal.gov.uk



The Coal
Authority

Granted Permit Boundary

Permit Ref: 26337

Permit Boundary:

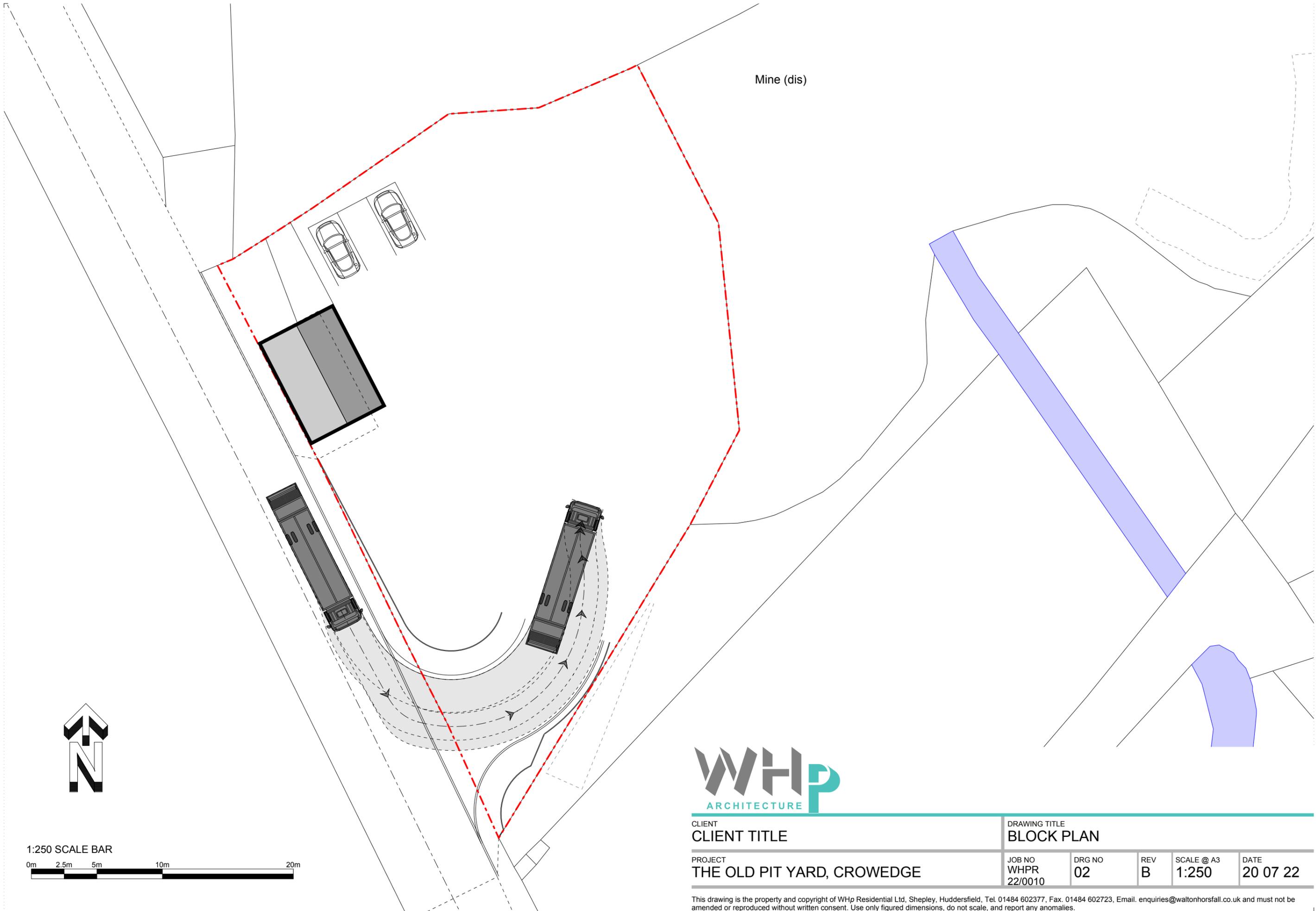


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Appendix 2

Site Plan



Appendix 3

Borehole Records



Borehole Log

Borehole No.
BH01
Sheet 1 of 2
Hole Type
RO
Scale
1:50
Logged By
ABK

Project Name: The Pit Yard, Crow Edge
Project No. C2751/22/E/4710
Co-ords:
Location: The Pit Yard, Whams Road, Crow Edge, Sheffield, S36 4HF
Level:
Client: Bulk Metals Limited
Dates: 20/03/2023

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
							MADE GROUND (Drillers Notes)	
				0.50			CONCRETE	
				0.80			(Drillers Notes) MADE GROUND (Black CLAY fill) (Drillers Notes)	1
				3.00			Light brown sandy CLAY. (Drillers Notes)	3
				5.00			Light brown SANDSTONE. (Drillers Notes)	5
				5.50			Dark grey MUDSTONE. (Pennine Lower Coal Measures Formation) (Drillers Notes)	6
								7
								8
								9
								10

Continued on Next Sheet

Remarks
Casing to 5m.
Dayworks: 1 Hour collecting water.
Standing: 1 Hour waiting for key to be let on to site.





Borehole Log

Borehole No.

BH01

Sheet 2 of 2

Project Name: The Pit Yard, Crow Edge	Project No. C2751/22/E/4710	Co-ords:	Hole Type RO
Location: The Pit Yard, Whams Road, Crow Edge, Sheffield, S36 4HF	Level:		Scale 1:50
Client: Bulk Metals Limited	Dates: 20/03/2023		Logged By ABK

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
									11
									12
									13
					14.00			Hard dark grey MUDSTONE. (Pennine Lower Coal Measures Formation)	14
							(Drillers Notes)		15
									16
									17
									18
									19
					20.00			End of Borehole at 20.00m	20

Remarks
 Casing to 5m.
 Dayworks: 1 Hour collecting water.
 Standing: 1 Hour waiting for key to be let on to site.





Borehole Log

Borehole No.

BH02

Sheet 1 of 3

Project Name:	The Pit Yard, Crow Edge	Project No.	C2751/22/E/4710	Co-ords:		Hole Type	RO
Location:	The Pit Yard, Whams Road, Crow Edge, Sheffield, S36 4HF			Level:		Scale	1:50
Client:	Bulk Metals Limited			Dates:	20/03/2023	Logged By	ABK

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.20		CONCRETE	
					0.50		(Drillers Notes) MADE GROUND (Black fill)	
					1.00		(Drillers Notes) MADE GROUND (Dark brown to black CLAY fill)	1
					2.00		(Drillers Notes) MADE GROUND (Grey CLAY fill)	2
					2.50		(Drillers Notes) CONCRETE	
					3.00		(Drillers Notes) Dark brown CLAY.	3
					4.00		(Drillers Notes)	
					4.50		Dark brown SANDSTONE. (Pennine Lower Coal Measures Formation)	4
					5.00		(Drillers Notes)	
					5.50		Dark grey MUDSTONE. (Pennine Lower Coal Measures Formation)	5
					6.00		(Drillers Notes)	6
					7.00			7
					8.00			8
					9.00			9
					10.00			10

Continued on Next Sheet

Remarks
 Casing to 3m.
 Dayworks: 1 Hour collecting water.





Borehole Log

Borehole No.

BH02

Sheet 2 of 3

Project Name: The Pit Yard, Crow Edge	Project No. C2751/22/E/4710	Co-ords:	Hole Type RO
Location: The Pit Yard, Whams Road, Crow Edge, Sheffield, S36 4HF	Level:		Scale 1:50
Client: Bulk Metals Limited	Dates: 20/03/2023		Logged By ABK

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
							Light brown SANDSTONE. Traces of coal. (Middle Band Rock) (Drillers Notes)	11	
					12.00		Dark brown SANDSTONE. (Middle Band Rock) (Drillers Notes)	12	
					15.00		Dark brown and grey SANDSTONE. (Middle Band Rock) (Drillers Notes)	15	
							Continued on Next Sheet	20	

Remarks
 Casing to 3m.
 Dayworks: 1 Hour collecting water.





Borehole Log

Borehole No.

BH02

Sheet 3 of 3

Project Name: The Pit Yard, Crow Edge	Project No. C2751/22/E/4710	Co-ords:	Hole Type RO
Location: The Pit Yard, Whams Road, Crow Edge, Sheffield, S36 4HF	Level:		Scale 1:50
Client: Bulk Metals Limited	Dates: 20/03/2023		Logged By ABK

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
									21
									22
									23
									24
					25.00			End of Borehole at 25.00m	25
									26
									27
									28
									29
									30

Remarks
 Casing to 3m.
 Dayworks: 1 Hour collecting water.





Borehole Log

Borehole No.

BH03

Sheet 1 of 2

Project Name:	The Pit Yard, Crow Edge	Project No.	C2751/22/E/4710	Co-ords:		Hole Type	RO
Location:	The Pit Yard, Whams Road, Crow Edge, Sheffield, S36 4HF			Level:		Scale	1:50
Client:	Bulk Metals Limited			Dates:	20/03/2023	Logged By	ABK

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.10		CONCRETE		
							(Drillers Notes)		
							MADE GROUND (Black fill)		
							(Drillers Notes)		
					1.00		MADE GROUND (Fill, traces of coal)	1	
							(Drillers Notes)		
					2.00		Black sandy CLAY.	2	
							(Drillers Notes)		
					3.00		Light brown sandy CLAY.	3	
							(Drillers Notes)		
					5.00		Light brown SANDSTONE. (Middle Band Rock)	5	
							(Drillers Notes)		
					7.00		Light grey MUDSTONE.	7	
							(Drillers Notes)		
					9.00		Very hard light grey SANDSTONE. (Middle Band Rock)	9	
							(Drillers Notes)		
							Continued on Next Sheet	10	

Remarks
 Casing to 3m.
 Dayworks: 1 Hour collecting water.





Borehole Log

Borehole No.

BH03

Sheet 2 of 2

Project Name:	The Pit Yard, Crow Edge	Project No.	C2751/22/E/4710	Co-ords:		Hole Type	RO
Location:	The Pit Yard, Whams Road, Crow Edge, Sheffield, S36 4HF			Level:		Scale	1:50
Client:	Bulk Metals Limited			Dates:	20/03/2023	Logged By	ABK

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
									11
									12
									13
									14
					15.00			End of Borehole at 15.00m	15
									16
									17
									18
									19
									20

Remarks
 Casing to 3m.
 Dayworks: 1 Hour collecting water.

