

**Environmental
Geotechnical
Specialists**



REPORT

job number	J3586/16/E	site address	Wharncliffe Silkstone WMC,
date	27/09/16		Worsbrough View,
written by	R.A. Palmer		Tankersley, Barnsley,
			S75 3AH
checked by	S.P. Rogers	issued by	R.A. Palmer

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Report on Rotary Probing

Location: **WHARNCLIFFE SILKSTONE WMC**
Worsbrough View, Tankersley, Barnsley, S75 3AH

For: John Wales

Report No. J3586/16/E

Report date: September 2016

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

Rob Palmer MSc FGS
Graduate Geotechnical Engineer

Steve Rogers CEng CGeol MICE MCIHT FGS
Technical Director

1. Introduction

It is understood that the site is to be developed by the construction of four residential properties. 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. 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 produced by Rogers Geotechnical Services (ref: J3586/16/EDS)
- Acquisition of The Coal Authority licence.

4. Fieldworks

4.1 Acquisition of Licence

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 12th September 2016 as permit reference number 12814, 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 licence, the works were undertaken employing water flush drilling techniques with gas monitoring of the boreholes during the fieldworks.

4.2 Rotary Open-hole Boreholes

The fieldworks were undertaken on the 19th September 2016 in accordance with the instruction to proceed issued by the client. These works were required in order to prove that workings were not present to a depth of 30m beneath this site.

The boreholes were sunk using a track mounted rotary drilling rig using rotary open-hole drilling techniques and employing 140mm diameter drag and tricone roller bits. Where necessary, 150mm 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. These samples were returned to the laboratory for further inspection. 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 30m depth, the required termination depth of the other position was reviewed during the course of the fieldworks. In this case, borehole BH2 was sunk to 15m and borehole BH1 was curtailed at 10m on the basis that sufficient data had been obtained.



5. Geological Appraisal

The available published geological data for the site was examined within the desk study and the following table presents the anticipated geology.

Table 1: Geological Data for the Site

Strata Type	Strata Name ¹	Previous Name	Description ²
Superficial Geology	None recorded	-	-
Solid Geology	Haigh Moor Rock	-	Commonly fine-grained and false bedded sandstone, locally flaggy, with impersistent bands of sandy mudstone.
	Pennine Middle Coal Measures Formation	Middle Coal Measures Formation	Interbedded grey mudstone, siltstone, pale grey sandstone and commonly coal seams, with a bed of mudstone containing marine fossils at the base, and several such marine-fossils bearing mudstones in the upper half of the unit.
		Grey Measures of Yorkshire and Nottingham	

The available geological data suggests the site is located upon a named sandstone member of the Pennine Middle Coal Measures Formation. The dip indicators and the outcropping features on the geological map suggest that the solid geology beneath the site and within the surrounding areas dips at a shallow angle to the east. Furthermore there is a fault trending north-west immediately to the west of the site boundary which is known to have been downthrown to the east. In addition, the Birdwell Fault, which trends north-east, is present 170m to the south-east.

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

Table 2: Summary of coal seams within the vicinity of the site.

Seam name	Seam thickness*	Outcrop distance from site*
Haigh Moor Coal	0.6m – 2.0m	20m SW 630m NE
Joan Coal	0.0m – 1.4m	190m SW (opposite side of fault)
Flockton Thick Coal	0.0m – 3.7m	310m SW (opposite side of fault)
Lidget Coal	0.3m – 1.5m	600m SE (opposite side of Birdwell Fault)

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

¹ Sources: British Geological Survey (NERC) Map Sheets 87; Barnsley; Solid and Drift Edition, and the Geology of Britain Viewer [online resource from www.bgs.ac.uk]



The geological data suggests that the Haigh Moor Coal seam will be observed below the site. This coal seam is indicated to have a thickness of between 0.6m and 2.0m, however, is discontinuous in nature.

The Haigh Moor Coal seam outcrops immediately to the west of the site and also 630m to the north-east of the site. The Haigh Moor Rock, a named sandstone member of the Pennine Middle Coal Measures Formation, is present between these outcropping coal seams. This sandstone member has formed high ground and thus it is interpreted that there is a thickness of strata above the Haigh Moor Coal Seam. Therefore, when considering the generalised dip of the local strata, the positions of the outcropping coal seams and the surface topography, it is anticipated that the Haigh Moor Coal seam will be present beneath the site at an approximate depth of 5m below ground level.

The Joan Coal seam and the Flockton Thick Coal seam are indicated to outcrop to the south-west of the site. However, these seams are present on the opposite (west) side of a fault which appears to have displaced strata by a significant amount. The generalised vertical section (GVS) indicates that there is approximately 80m of strata between the Haigh Moor Coal seam and the Joan Coal and Flockton Thick Coal seams. Therefore, it is unlikely that these seams will be present at shallow depths.

However, reference to the GVS indicates that there are other coal seams present between the Haigh Moor Coal seam and the Joan Coal seam and, despite not outcropping within the faulted block that the site is located upon, the Low Haigh Moor Coal seam and the Lidget Coal seam could be present at shallow depths (within 30m). The Lidget Coal seam is known to be present within the area and outcrops 600m to the south-east of the site but on the opposite side of the Birdwell Fault.

6. Strata Conditions

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

Table 3: Generalised strata profile

Depth to base (m)	Strata type	Positions strata was revealed	Groundwater strikes (m)
0.20 – 0.60	MADE GROUND	All	None
1.80	CLAY	BH1	None
1.80 – 1.90	SANDSTONE	BH2, BH3	None
2.00 – 3.10	COAL	BH2, BH3	None
22.4	SILTSTONE	BH3	None
+10.00 – +30.00	MUDSTONE	All	12.6 (BH2) 12.5 (BH1)

'+' 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 approximately 0.60m of made ground, brown clay was revealed to a depth of 1.80m within BH1 and sandstone was observed to depths of up to 1.90m within BH2 and BH3. These stratum are anticipated to represent the upper most weathered fraction of the Haigh Moor Rock. Casing was installed to 3.00m within all the boreholes.



Below this stratum, competent layers of the Pennine Middle Coal Measures Formation were revealed to a depth of 30m, comprising interbedded layers of mudstone and siltstone. One seam of coal was encountered during drilling; this seam was observed at borehole positions BH2 and BH3 at depths ranging between 1.80m and 2.90m bgl, and, in both positions, had a thickness of 0.20m. It would appear that this seam outcrops on the site as it is not evident in BH1. Due to its depth below ground level, the available geological data suggest that this coal seam is consistent with the Haigh Moor Coal seam. Moreover, no voids were encountered within the strata or horizon of coal during the rotary probing.

Groundwater strikes were recorded at 12.5m and 12.6m within BH2 and BH3 during drilling. However, it is possible that the use of water flushing techniques may have masked the presence of any water strikes within the other borehole location. 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 is one coal seam within 3.0m bgl that is considered to represent the Haigh Moor Coal seam. Given the limited thickness, it has been determined that this seam would not prove commercially viable for extraction. Moreover, this horizon of coal was proven to be intact in two positions. No coal was revealed at shallow depths within BH1. On the basis of the information provided above, 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 4: Development specific risk assessment

Item	Risk of Instability	Coal Seam(s) Considered	Risk Rating
1	Shallow coal workings	Haigh Moor Coal Low Haigh Moor Coal (not present)	Low



In view of all the information obtained in this investigation, it is considered that there is a null to negligible risk of ground movement as a consequence of coal workings beneath the site.

9. References

- British Standards Institution (2015) BS5930: *Code of practice for site investigations*, B.S.I., London.
- P.R.HEALY, J.M.HEAD: Construction over abandoned mine workings, SP 32, 1984, CIRIA
- British Geological Survey (NERC) (2016), 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 Licence



The Coal
Authority

Permit to Enter or Disturb Coal Authority Mining Interests

Permit Reference Number 12814

Name and Address of Permit Holder:

*Gibson Booth Limited
Chartered Accountants
12 Victoria Street
Barnsley
South Yorkshire
S75 3AH*

Site Location:

*Land at
Wharnccliffe Silkstone WMC
Worsborough View
Tankersley
Barnsley
S75 3AH*

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

Ground investigation by three boreholes to determine presence of shallow coal seams

within the Authority's mining interests at the identified site location 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 Applicant's responsibility to obtain appropriate health, safety, environmental, technical and legal advice.

Signed: Paul Hobson Granted Date: 12 September 2016

For and on behalf of The Coal Authority

Nominated Representative: Paul Hobson, Permitting Manager;

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

Tel: 01623 637339; E-Mail: permissions@coal.gov.uk



Appendix 2

Site Plan



Plan not to scale and investigation positions approximated from site operative's notes.

Title: **Investigation Location Plan**



Rogers Geotechnical Services Ltd

Site Name:

Wharncliffe Silkstone WMC

Job No:

J3586/16/E



Appendix 3

Rotary Borehole Records



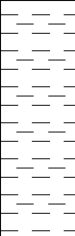
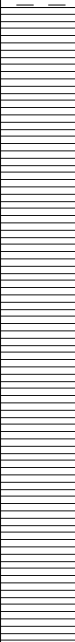
Borehole Log

Borehole No.

BH1

Sheet 1 of 1

Project Name:	Wharnccliffe Silkstone WMC	Project No. J3586/16/E	Co-ords:	Hole Type RO
Location:	Worksbrough View, Tankersley, S75 3AH	Level:	Scale 1:50	Logged By DS/RAP
Client:	JPW Yorkshire Ltd	Dates:	19/09/2016	

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.20			MADE GROUND (Asphalt). (Operative's notes).	
								Brown CLAY. (Operative's notes).	1
					1.80			Brown MUDSTONE. (Operative's notes).	2
									3
									4
									5
					6.10			Light grey MUDSTONE. (Operative's notes).	6
									7
									8
									9
					10.00			End of Borehole at 10.00m	10

Remarks

Casing to 3m. Pull casing and back fill hole - 10mins.





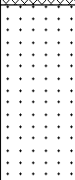
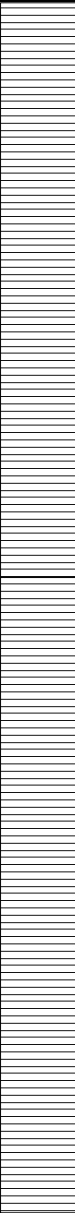
Borehole Log

Borehole No.

BH2

Sheet 1 of 2

Project Name:	Wharnccliffe Silkstone WMC	Project No.	J3586/16/E	Co-ords:		Hole Type	RO
Location:	Worksbrough View, Tankersley, S75 3AH	Level:		Scale	1:50	Logged By	DS/RAP
Client:	JPW Yorkshire Ltd	Dates:	19/09/2016				

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.60			MADE GROUND (Brown and dark grey SAND and GRAVEL of ash and brick). (Operative's notes).	
								Yellowish brown SANDSTONE. (Operative's notes).	1
					1.80			COAL. (Operative's notes).	
					2.00			Brown MUDSTONE. (Operative's notes).	2
									3
									4
									5
					5.80			Light grey MUDSTONE. (Operative's notes).	6
									7
									8
									9
									10
Continued on Next Sheet									

Remarks

Casing to 3m. Pull casing and back fill hole - 10mins.





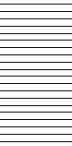
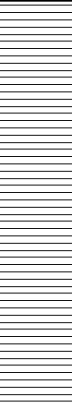
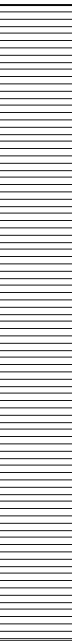
Borehole Log

Borehole No.

BH3

Sheet 1 of 3

Project Name:	Wharnccliffe Silkstone WMC	Project No.	J3586/16/E	Co-ords:		Hole Type	RO
Location:	Worksborough View, Tankersley, S75 3AH	Level:		Scale	1:50	Logged By	DS/RAP
Client:	JPW Yorkshire Ltd	Dates:	19/09/2016				

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.60			MADE GROUND (Dark brown and yellowish brown SAND and GRAVEL of brick and sandstone. Occasional sandstone cobbles). (Operative's notes).	
								Yellowish brown SANDSTONE. (Operative's notes).	1
					1.90			Brown MUDSTONE. (Operative's notes).	2
					2.90			COAL. (Operative's notes).	3
					3.10			Yellowish brown MUDSTONE. (Operative's notes).	4
									5
					5.80			Light grey MUDSTONE. (Operative's notes).	6
									7
									8
									9
									10
Continued on Next Sheet									

Remarks
Casing to 3m. Pull casing and back fill hole - 10mins. Fill bowser - 30mins.







Borehole Log

Borehole No.

BH3

Sheet 3 of 3

Project Name:	Wharnccliffe Silkstone WMC	Project No. J3586/16/E	Co-ords:	Hole Type RO
Location:	Worksbrough View, Tankersley, S75 3AH	Level:	Scale 1:50	Logged By DS/RAP
Client:	JPW Yorkshire Ltd	Dates:	19/09/2016	

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					20.40			Light grey SILTSTONE. (Operative's notes).	21
					21.20			Light grey MUDSTONE. (Operative's notes).	22
					22.20			Light grey SILTSTONE. (Operative's notes).	23
					22.40			Light grey MUDSTONE. (Operative's notes).	24
									25
									26
									27
									28
					28.60			Dark grey MUDSTONE. (Operative's notes).	29
					30.00			End of Borehole at 30.00m	30

Remarks

Casing to 3m. Pull casing and back fill hole - 10mins. Fill bowser - 30mins.

