G&M CONSULTING

Contaminated Land Appraisals
Brownfield Remediation Solutions
Site Investigation Services
Earthworks Design and Control
Flood Risk Assessments

Mr Simon Fish
Cape Site Services Ltd
Unit 2
Rear of Castle Buildings
Carlton Road
Carlton
Barnsley
S71 3HX

20th September 2017

Ref C220/02/GS

Dear Simon,

Ref: Preliminary Intrusive Mining Investigation on land off Bismarck Street, Worsbrough Common, Barnsley.

1. Introduction

On the instructions of Mr David Barlow, Cape Site Services Ltd (Cape) has carried out an intrusive investigation to assess possible historical mining on land off Bismarck Street, Worsbrough Common, near Barnsley. The work was carried out in general accordance with the findings of the mining risk assessment prepared by Rogers Geotechnical Services Ltd, Report Ref J3943/17/E, dated June 2017.

It is understood that a submission for planning is to be made for a residential development; at the time of writing of this report, a proposed layout drawing is unavailable, and therefore comments/recommendations contained herein may be subject to review and change in due course.

The site is located in Worsbrough Common, approximately 1km south of Barnsley town centre, South Yorkshire. The site is accessed off Bismarck Street, which runs adjacent to the western boundary of the site, as shown below.

It is understood that the plot of land highlighted in red, shown below, will be subject to a separate planning application and was consequently not investigated as part of this current work.

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Robin Hood Airport, DN9 3GA
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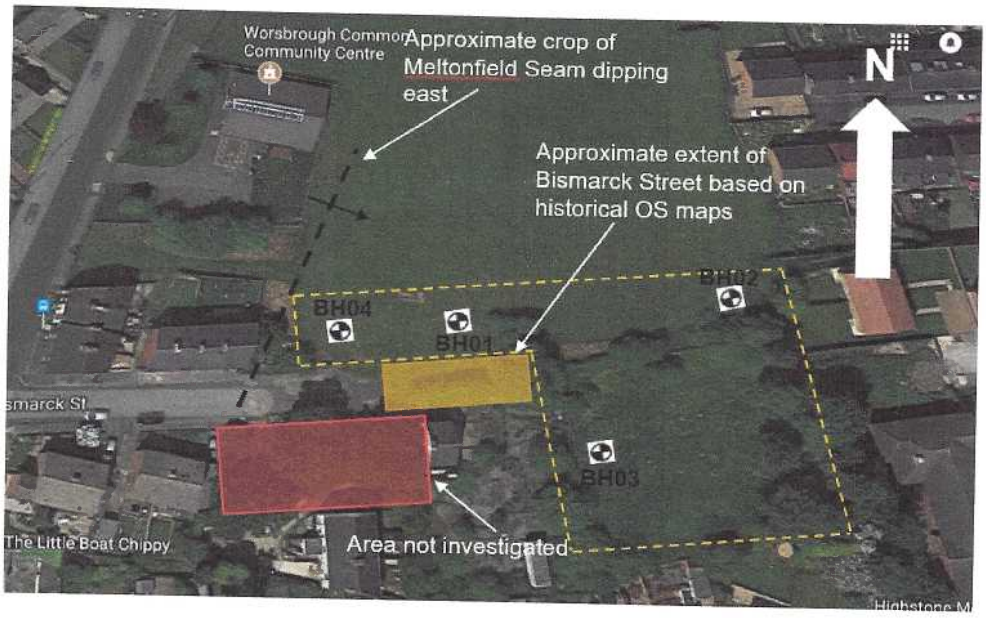


G&M was present on site during some of the fieldwork, and this report presents the findings of the investigation, prepared by G&M.

The comments and opinions presented in this report are based on the findings of a review of available information and ground conditions encountered during the intrusive investigation work. There may be other conditions prevailing on the site which have not been disclosed by this investigation and which have not been taken into account by this report. Responsibility cannot be accepted for conditions not revealed by the investigation. Any diagram or opinion of the possible configuration of ground conditions between exploratory holes is conjectural and given for guidance only and confirmation of intermediate ground conditions should be considered if deemed necessary.

2. Site Description

The site is an irregular shaped piece of land, with a pronounced drop in level from the rear, southern boundary of the site (approximately 155 mAOD) to the northern boundary (approximately 150 mAOD). There is a break in level, adjacent to Bismarck Street, before a further drop towards playing fields located adjacent to the northern boundary of the site.

The majority of the site comprises rough vegetation with semi-mature and mature trees. The northern portion of the site, including the break in level, is covered by well-maintained grass and appears to currently form part of the playing fields to the north.

3. Mining Risk Assessment

3.1 Summary of Mining Risk Assessment (As prepared by Rogers Geotechnical Services Ltd)

The site has been subject to a mining risk assessment (including information provided by the Coal Authority (CA)) carried out by Rogers Geotechnical Services Ltd (Rogers), Report Ref J3943/17/EDS, dated June 2017. A summary of the findings of this assessment is as follows;

- *The available geological data indicates that solid geology changes from northwest to southeast across the site. The north western quadrant of the site is underlain by undifferentiated Pennine Middle Coal Measures Formation, whereas the south eastern quadrant of the site is underlain by the Woolley Edge Rock. These units are separated by the Meltonfield Coal.*
- *Taking into account the structure of the regional geology and outcrop patterns, it can be anticipated that the solid geology within the local area dips at shallow angles towards the east.*
- *The CA report confirms the site is within the likely zone of influence from recorded workings in 8 seams of coal at shallow (<30m) to 520m depth last worked in 1974.*
- *The CA report. confirms the site is not within the boundary of an opencast site from which coal has been removed by opencast methods.*
- *The CA confirms that there are 2 known coal mining entries within, or within 20m of the boundary of the property.*

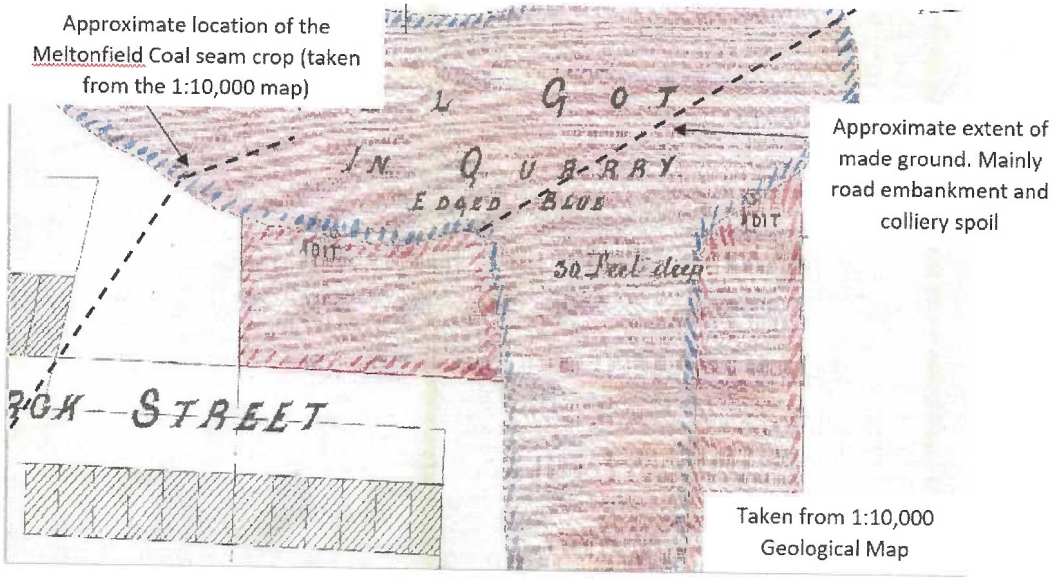
- *The site relevant borehole have indicated two notable coal seams are present within 30 metres of the ground surface within the local area. The first coal seam appears to be ranging between 10m to 15m bgl. Taking into consideration the available geological data, this seam is anticipated to represent the Meltonfield Coal seam. In addition, within the deeper borehole scans a second seam of coal was noted at around 30m bgl. This seam is anticipated to represent the Two-foot Coal Seam. Considering the outcrop patterns of these seams topography, the borehole scans suggest that the solid geology within the local area dips around 4° east*

3.2 Additional Information

According to the report prepared by Rogers '*the geological data suggests that made ground will be present on the north western and eastern site boundary. Taking into account the available historical maps, it may be assumed that these deposits may be related to the Brickworks located off Warren Quarry Lane. Although this feature is not anticipated in ingress far onto the site, the potential for opencast workings to be present should be taken into account.*'

An examination of the geological map (1:10,000 SE30NW) appears to support this assumption; this shows the quarry encroaching onto the northern boundary of the site; shown approximately on the drawing below.

Information kindly supplied by the CA, included an abandonment plan (Ref 5002), which appears to indicate that in fact the brickpit/quarry extended further onto the site than was anticipated (see below), extending past the line of houses along Bismarck Street (now partially demolished), towards the southern boundary of the site. It is understood that the blue hatching indicates where coal was removed from the quarry face and that the red hatching possibly indicates shallow workings.



The 1:10,000 geological map indicates that the Meltonfield Coal seam crops in the north west edge of the site (shown above) and dips, probably at a shallow angle towards the east; i.e beneath the site. The stratigraphic column of the map shows the Meltonfield seam (recorded as between 0.69m to 0.89m in thickness) to be underlain by the Two-Foot coal (between 0.56 to 0.63m in thickness), approximately 12m below; which is itself underlain by the Winter or Abdy seam (between 1.22m to 1.42m in thickness), approximately a further 16m below.

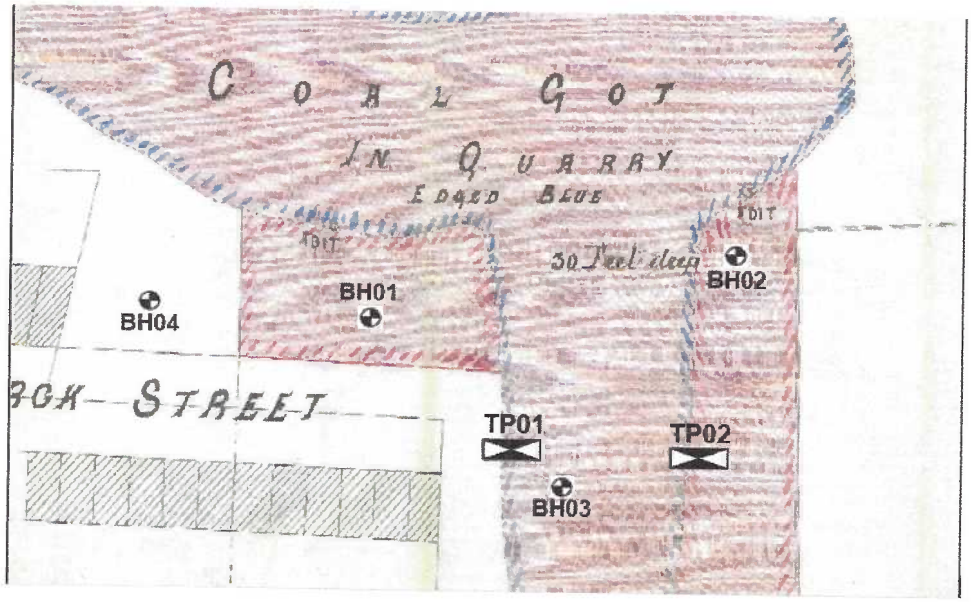
4. Fieldwork

The fieldwork was carried out between 31st August and 4th September 2017 in accordance with the requirements of the CA Permit No 14655 and the recommendations of the risk assessment. A copy of this Permit is presented in Attachment A of this report. The drilling works were undertaken by Cape using a Beretta T25 tracked rotary rig, and comprised the drilling of four boreholes, referenced BH1 to BH4 inclusive to depths of between 20m to 32m below ground level (bgl) to allow logging of soils and solid strata through examination of water flush returns and rate of penetration of the drill bit.

In accordance with the CA permission, each of the boreholes, at surface, was monitored for gases during drilling. The gases comprised methane, carbon monoxide, hydrogen sulphide and oxygen. No significant concentrations of gas, or depleted oxygen, were recorded during the works.

Drilling was progressed initially through made ground encountered on site using an ODEX system on to the underlying bedrock, using air/mist as a flushing medium. This allowed temporary steel casing to be set into the underlying solid strata. Once the casing had been installed the rotary drilled part of the borehole was advanced using water as the flushing medium

A plan showing the exploratory hole locations is shown below. Each hole was located to assess particular features identified by the abandonment plan.



The drillers logs are presented in Attachment B of this report.

5. Ground Conditions

The boreholes generally encountered deep made ground over mudstone and sandstone with coal seams.

Made ground was encountered in all of the boreholes varying between 5.2m (BH4) to 9.7 bgl (BH3). As part of the enabling works a JCB 3CX excavator was used to clear an access onto the main portion of the site. This machine was also used to excavate two trial pits, both to the maximum reach of the machine (4.5m bgl) into the made ground for a close examination across the likely high-wall of the quarry, shown above. These materials were found to comprise clayey gravels and cobbles predominantly of sandstone; localised evidence of bottles, pottery, bricks and concrete was also observed within the made ground at shallow depth. No evidence of a high-wall was observed at either location as both pits terminated within made ground materials.

The made ground deposits were underlain by Coal Measures bedrock in all of the boreholes to the full depth of each borehole and predominantly comprised mudstone with occasional interbedded sandstone and siltstone.

Within the depth of the boreholes one or two coal seams were recorded, depending on the location of the borehole, as detailed below;

Borehole No	Depth (m)	Depth to top of coal (m)	Thickness (mm)	Likely Seam	Loss of Flush (m)	Possible Working		Drillers Comments
						From (m)	To (m)	
1	24.0	-	-	Two-Foot	22.5	22.5	23.4	Void
2	20.0	18.0	600	Two-Foot	-	-	-	
3	26.5	25.2	700	Two-Foot	-	-	-	
4	32.0	6.5	800	Meltonfield	-	-	-	
		21.0	600	Two-Foot	-	-	-	

Evidence of potential workings was recorded in BH1, within the seam assessed as the Two-Foot coal. The driller recorded a 'void' between 22.5 m and 23.4 m bgl. The drilling flush was lost across this depth range, and not recovered to surface for the remainder of the borehole to 24 m bgl.

6. Conclusions and Recommendations

In general terms the ground conditions encountered on site accord with the geological maps for the area. The boreholes confirmed the presence of up to two seams of coal, considered to be the Meltonfield and Two-Foot coals. The Meltonfield coal is shown to outcrop immediately to the east of the properties located on the northern side of Bismarck Street. Based on the results of the investigation it would appear that some coal extraction has been carried out beneath the site. The Meltonfield coal appears to have been removed from a significant portion of the site by means of extraction during the operation of the quarry/brick pit.

The boreholes were located to assess various features identified on the CA abandonment plan Ref 5002.

Borehole BH4 was located in the area of the abandonment plan which indicated that coal had neither been extracted from the quarry or by shallow mining. Two intact coal seams were encountered within this hole. The Meltonfield seam, encountered at 6.5m bgl and the Two-Foot seam, encountered at 21m bgl, with intervening mudstone bedrock of 13.5m in thickness. This is consistent with the separation between the two seams shown on the stratigraphic column of the geological map, which is indicated to be approximately 12m.

Borehole BH3 confirmed that the base of the quarry extended further onto the site, than indicated on the geological map, which accords with the CA abandonment plan.

Borehole BH1 was drilled in the area shown as shallow workings in the north western part of the site. The made ground encountered at this location extended below the anticipated depth that the Meltonfield coal would be present based on the depth it had been encountered in BH4. The only coal encountered was assessed as the Two-Foot coal, which appeared to have been worked at this point; the driller recorded a void between 22.5 m and 23.4 m bgl. It is possible that the shallow Meltonfield seam may have been extracted as part of the quarrying process, which extends closer to the line of Bismarck Street than is indicated on the abandonment plan.

Borehole BH2 was also drilled in an area indicated as shallow mining, again the depth of made ground was such that it appears that the Meltonfield, at this borehole location, may have been extracted by quarrying, or the overlying bedrock removed after extraction, as part of the quarrying operation.

The Winter or Abdy seam is shown on the stratigraphic column to be 16m below the Two-Foot coal. This would place the seam at a depth of approximately 37m below the site based on BH4. The thickness of this seam is indicated to be between 1.24m and 1.42m. Assuming the rule of ten times seam thickness (discussed later) it is at a sufficient depth not to affect the shallow seams and therefore the surface. The Winter seam has not been proven in this investigation. BH4 was drilled to 32m bgl, which was 11m below the Two-Foot seam, and this deeper (Winter) seam was not encountered.

The abandonment plan included within this report shows the potential locations of two adits, likely to have been driven from the face of the quarry/brick pit. Based on the results of boreholes BH1 and BH2 it is considered possible that these entrances may have been removed, at the locations drilled, as part of the historical quarrying. These adits were presumably driven into the face following the outcrop of the Meltonfield seam. It is not considered likely that these entrances were driven down to the deeper Two-Foot seam, as the abandonment plan does not appear to show any shallow working beneath the base of the quarry, linking the two areas of mining, either side of the quarry high-wall. All of the boreholes showed, with

the exception of BH4, competent bedrock beneath the base of the quarry before encountering what was assessed as the Two-Foot seam.

Given the depth of made ground encountered across the site, the most likely foundation option is likely to be piled foundations. Given the depth to the Two-Foot seam, either from the base of the quarry/brick pit, or immediately beneath the Meltonfield seam, encountered in BH4, competent ground suitable for piles to terminate in should be present at these depths. This is based on the fact that, for typical Coal Measures strata it is generally accepted that there is a risk of ground instability where the thickness of competent bedrock above the worked seam is less than ten times the seam thickness. Based on this premise, the deeper seam, assessed as the Two-Foot coal (600 mm to 700 mm in thickness), is overlain by between 8.5 m (BH2, base of quarry) and 13.7 m (BH4, from the base of the Meltonfield coal), which equates to between 12 to 20 times seam thickness of overlying competent bedrock. Therefore it is considered likely that the piles should terminate outside the zone of influence of the Two-Foot coal seam.

Should any properties be proposed in the north western part of the site, i.e. where the Meltonfield seam was encountered around BH4, piles should be extended through this seam to the underlying competent bedrock, this should mitigate any risk associated with any potential 'informal' localised working of the seam in this area.

It is recommended that the advice of a suitably experienced piling contractor is sought to review these options. Further investigation should be undertaken at the time of detailed foundation design, following agreement on the proposed development layout. This investigation work should comprise rotary cored boreholes, which should extending at least five metres below the likely pile depth, to aid pile design. Depending on the proposed layout, this further investigation may also be required to confirm the extent of the quarried area (and therefore pile depths) and the likelihood of shallow workings, within the Meltonfield seam along the southern and western margins of the site, or whether in fact these workings have been removed as part of the historical quarrying.

Foundation design should be carried out by a suitably qualified structural engineer and should be constructed to take into account the mining legacy associated with the site.

We trust this report and the attachments meet with your approval. This report should be submitted the various regulatory bodies for their consideration.

Yours sincerely



Graeme Swinbourne
For and on behalf of **G&M Consulting Ltd**

Attachments



ATTACHMENT A – CA PERMIT

The Coal Authority

Permit to Enter or Disturb Coal Authority Mining Interests

Permit Reference Number 14655

Name and Address of Permit Holder:

G Fisher
36 Westfield Avenue
Thurlstone
Sheffield
S36 9RL

Site Location:

Land off
Bismark Street
Worsborough Common
Barnsley
S70 4NA

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

Investigation of shallow mine workings by four boreholes to 30m bgl

Investigation of mine entries 434405-008 and 009 by trial trenching

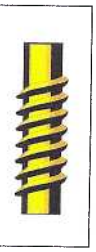
within the Authority's mining interests at the identified site location for the period of 12 months from the granted date shown below. The granting of this Permit does not constitute advice given by the Authority in relation to the proposed operations. It is the Applicant's responsibility to obtain appropriate health, safety, environmental, technical and legal advice.

Signed: Paul Heap Granted Date: ***29/08/2017***

For and on behalf of The Coal Authority

Nominated Representative: Paul Heap, Permitting Manager;
The Coal Authority, Permitting Office, 200 Lichfield Lane, Mansfield, Notts, NG18 4RG
Tel: 01623 637339; E-Mail: permissions@coal.gov.uk

ATTACHMENT B – DRILLER'S LOGS

Client: David Barlow	Site: Bismark Street, Barnsley, S70 4NA	Cape Site Services Ltd Unit 2, Rear of castle buildings, Carlton Road, Barnsley, South Yorkshire, S71 3HX	
Date: 31/08/2017-04/09/2017	METHOD Rotary Water Flush		

Measurements In Meters

BH no	FROM	TO	THICKNESS	Description
1	0.0	8.5	8.5	Made ground
	8.5	19.0	10.5	Mudstone grey silty
	19.0	20.0	1.0	Mudstone dark grey
	20.0	22.5	2.5	Mudstone black
	22.5	23.4	0.9	Void
	23.4	24.0	0.6	No returns but solid
				Cased to 9.0m No gases present
2	0.0	9.5	9.5	Made ground
	9.5	14.5	5.0	Mudstone grey silty
	14.5	15.5	1.0	Mudstone dark grey
	15.5	18.0	2.5	Mudstone black
	18.0	18.6	0.6	Coal
	18.6	20.0	1.4	Mudstone grey silty bands
				Cased to 10.0m No gases present
3	0.0	9.7	9.7	Made ground
	9.7	19.5	9.8	Mudstone grey
	19.5	21.3	1.8	Sandstone mudstone bands grey
	21.3	25.2	3.9	Mudstone black
	25.2	25.9	0.7	Coal
	25.9	26.5	0.6	Mudstone grey
				Cased to 10.0m No gases present
4	0.0	5.2	5.2	Made ground
	5.2	6.5	1.3	Mudstone grey
	6.5	7.3	0.8	Coal
	7.3	16.5	9.2	Mudstone grey
	16.5	21.0	4.5	Mudstone black
	21.0	21.6	0.6	Coal
	21.6	32.0	10.4	Mudstone grey silty bands to base
				Cased to 5.8m No gases present

Driller Ian Wiles	Driller's Assistant Simon Fish
Driller's Signature	Page ……1…… of ……1……..