



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

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

1st April 2019

Ref C331/02/GS

Dear Simon,

Ref: Shallow Mining Investigation on land at 35 Intake Road, Gawber, Barnsley

1. Introduction

On the instructions of Barnsley Electrical Ltd, Cape Site Services Ltd (Cape) have carried out an intrusive mining investigation on land at 35 Intake Road, Gawber, Barnsley. It is understood that proposed development of the site may comprise a single detached dwelling to be constructed on the site of an existing property.

This investigation work was undertaken to provide information on the underlying ground conditions and assess the likelihood of historical shallow mine workings affecting the area of the dwelling. This report presents the findings of the investigation.

A review of the Coal Authority (CA) Interactive Map (<http://mapaps2.bgs.co.uk/coalauthority/home.html>), shows the site to lie within a 'development high risk area', the same map shows 'past shallow coal mine workings' beneath the site.

The site has been subject to a coal mining risk assessment (CMRA), prepared by Rogers Geotechnical Services Ltd, details of which are summarised in Section 2 of this report and a full copy is presented in Attachment A.

The site is located on the east side of Intake Road, in Gawber approximately 2km north west of Barnsley Town centre. and is centred at National Grid Reference SE 326 070. The area under investigation is currently occupied by a bungalow and associated gardens.

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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. Background Information

2.1 Coal Mining Risk Assessment

The site, as a whole, has been subject to a coal mining risk assessment, Ref J4518/19/E/CRA, prepared by Rogers Geotechnical Services Ltd (RGS), dated 5th February 2019.

In preparing the CMRA RGS have reviewed the geological records held by the British Geological Survey (BGS) and obtained a "Consultant's Coal Mining Report" from the CA. A brief summary of their findings and conclusions are given below, the full report is presented in Attachment a.

The CMRA assessment has assessed that the site may be underlain at shallow depth by two seams of coal, the Barnsley Rider and the Barnsley Coal.

RGS discussion based on the BGS records is

- *Considering the generalised vertical section on the geological map, it is considered that the Barnsley Rider Coal may be present within 10m of surface beneath the site. In addition, the Barnsley Coal Seam is suggested to be present approximately 30m below the Barnsley Rider Coal Seam.*

The Consultant's Coal Mining Report states

- *With regard to past underground coal mining - The property is in a surface area that could be affected by underground mining in 6 seams of coal at 22m to 237m depth, and last worked in 1980. One of these seams, the Barnsley Coal is indicated to have been worked at a shallow depth of 22m below the site, with a thickness of approximately 3m.*
- *With regard to Coal Mining Subsidence - There is 1 claim within 50 metres of the property boundary that does not match the property address.*

RGS Summary

- *It should be noted that whilst the Consultants Coal Mining Report indicates the Barnsley Coal Seam to be present at 22m depth, the generalised vertical section on the geological map suggests that it is 30m below the Barnsley Rider Coal (i.e. at approximately 40m depth below the site surface). Notwithstanding this, the seam thickness appears to be similar between these sources.*

RGS Conclusion and recommendations

- *.....it is considered that there may not be a sufficient thickness of competent overburden above the Barnsley Rider Coal seams in order to prevent the risk of instability posed by the presence of any illicit workings. Therefore, a moderate risk rating has been placed on this seam.*
- *In addition, in view of the potential thickness of the Barnsley Coal, it is considered that there may not be a sufficient thickness of competent overburden above this seam. On this basis and in view of the Barnsley Coal having been worked locally, a moderate to high risk rating has been placed on this seam. In light of this, it is considered that further investigation is required to prove or disprove the presence of workings within both the Barnsley Rider Coal and the Barnsley Coal.*

- *In light of the potential risks of instability at the site from the working of shallow coal, it cannot be recommended that development takes place without further investigation to conclusively determine the presence of such workings. This work should include physical drilling methods to explore the ground conditions.*

2.2 Geological Memoir

The geological memoir published by the BGS for the Barnsley area details the thickness of strata between the Barnsley Rider and Barnsley Coal to vary across the area from 50 ft (15.2 m) to 100 ft (30.4 m). The memoir also details a sandstone, the Barnsley Rock to lie between the two seams. It states that the Barnsley Rock lies several feet above the Barnsley Coal in some areas, in other areas "it rests on the coal or cuts through the coal".

3. Fieldwork

The fieldwork, was carried out on the 15th March 2019. Two rotary open holes, referenced BH1 and BH2 were drilled to a maximum depth of 23.0 m below ground level (bgl), to allow logging of the soils and solid strata through examination of flush returns and rate of penetration of the drill bit. A third borehole was not drilled as access was restricted to the front garden of the property.

The drilling works were undertaken by Cape using a Beretta T25 tracked rotary drilling rig and carried out under the Terms and Conditions of the CA Permission No 17660, a copy of which is presented in Attachment B of this report.

Drilling was initially progressed using 150mm diameter augers through the superficial soils, and where appropriate, cased into the underlying bedrock, to aid flush returns.

Drilling was undertaken using water flush. In accordance with the CA permission, the boreholes were monitored at surface for gases, during their advancement. The boreholes were backfilled on completion.

The locations of the boreholes are shown below.



4. Ground Conditions

Topsoil up to 0.3 m thick overlays subsoils comprising 'clay orange grey with flakes of coal dust' (driller's description) which was recorded in both boreholes BH1 and BH2 to depths of 2.4 m and 2.7 m bgl respectively. The subsoil was immediately underlain by bedrock. Mudstone was proved to a depth of 9.8 m and 10.2 in BH1 and BH2 respectively overlying sandstone, which was proved to a depth of 18.5 m and 18.0 m respectively. In BH1 coal was proved below the sandstone and in BH2 a void was encountered with associated loss of flush. The depth to the coal / void is summarised below.

BH No	Depth (m)	Depth to Top of Bed (m bgl)	Thickness (mm)	Probable Seam / Comments
1	23	18.5	2900	Barnsley Coal
2	19	18.0	1000	Void, obstruction met at 19.0 m

In BH1 sandstone was proved below the coal to completion depth. In BH2 an obstruction was encountered which was thought to be metal.

The exploratory hole records are presented in Attachment C of this report.

During the drilling, monitoring of methane, carbon monoxide, hydrogen sulphide and oxygen was undertaken at the borehole surface. No significant concentrations of methane, carbon monoxide or hydrogen sulphide were recorded, as detailed on the attached logs. Oxygen concentrations of between 21.2% and 21.5% were recorded during the works.

5. Discussion

It is evident from the two boreholes that the Barnsley seam has been worked beneath the site as recorded by the CA records. The Consultants report gives a depth of 22 m and the boreholes encountered a seam / void at 18.5 m and 18.0 m. The extracted thickness is recorded to be 2.97 m and 2.9 m of coal was proved in BH1.

The general rule of thumb used to assess the risk from pillar and stall mining is the rule of 10 x the seam thickness for competent rock cover. The seam encountered beneath this site is 2.9 m thick indicating a rock cover of 29 m. The seam was encountered at a depth of 18.5 m with a realistic rock cover of between 15.3 m and 16.1 m, i.e. the thickness of rock proven in the boreholes. In mitigation within this thickness 8.7 m and 7.8 m of sandstone was encountered. However, the CA record a coal mining subsidence claim within 50 m of the site "which does not match the property".

The site could therefore be adversely affected by historical mining. Mitigation measures should therefore be considered. These will, to some extent, be controlled by the proposed development.

The traces of coal encountered in the superficial deposits of clay at shallow depth may be an indication that the Barnsley Rider Coal is present at or close to outcrop and may be represented by a weathered layer.

6. Conclusions/Recommendations

In accordance with the instructions issued by Barnsley Electrical Ltd, an intrusive investigation has been carried out to investigate the possible mining legacy in the area. It is understood that the proposed development of the site may comprise a single detached dwelling to be constructed on the site of an existing property.

The investigation comprised the drilling of two rotary open-hole boreholes, to a maximum depth of 23 m bgl. The drilling works were carried out in accordance with the CA permission 17660.

The boreholes encountered subsoils up to a maximum thickness of 2.7 m bgl. A single seam of coal was encountered in one borehole from 18.5 m to 21.4 m, a void was encountered in the second borehole from 18.0 m to 19.0 m, this borehole terminated on an obstruction; the drilling flush was lost in this hole.

The site could therefore be adversely affected by historical mining. Mitigation measures should therefore be considered. These will, to some extent, be controlled by the proposed development.

There are a number of ways of dealing with old coal workings, these options are:

- Drill and grout. The area beneath the proposed property is drilled and grout pumped in to fill any voids. Given the thickness of the seam and therefore the potential size of any void it may be prudent to back fill the void with granular material prior to pumping the grout, this should reduce the grout take and limit the possibility of the grout flowing off in to adjacent voided ground.
- Construction of the property on a reinforced raft foundation designed to span any potential depressions that could occur due to void migration. This would need to be designed by a structural engineer.

Given the mining history of the area it is suggested that, following demolition and clearance of the site, a site strip is carried out in areas of proposed construction to determine if there is evidence of any shallow / crop workings associated with the Barnsley Rider. The ground should be examined by a suitably qualified person to assess if any evidence exists.

We trust this report and the attachments meet with your approval and are sufficient for your present needs. Your client should submit this document to the relevant regulatory bodies for their comment/approval on the efficacy of the options, prior to undertaking any development work or demolition of the existing property.

Yours sincerely

A handwritten signature in black ink, appearing to read 'G.S.', followed by a long horizontal flourish.

Graeme Swinbourne

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

Attachments



ATTACHMENT A – CMRA

**Environmental
Geotechnical
Specialists**



REPORT

job number	J4518/19/E/CRA	date	05/02/2019
site address			
35 Intake Road,			
Barnsley,			
S75 2HX			
written by	M.Cook	checked by	I.Sakoor
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Constructionline



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Contents

	Page
1. Introduction	1
2. Geological Desk Study	1
2.1 British Geological Survey Map Viewer	2
2.2 Coal Authority Mines Report	3
2.3 Geological Survey Borehole Records	4
3. Risk Assessment	5
4. Conclusions	6

Appendices

1. Site Plan
2. Coal Authority Report
3. BGS Borehole Records



Report on a Coal Mining Risk Assessment

Location: 35 Intake Road,
Barnsley, S75 2HX.

For: Fox Architecture

Report No. J4518/19/E/CRA

Report date: February 2019

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

Mike Cook BSc
Graduate Environmental Engineer

Imran Sakoor BEng FGS
Geo-environmental Engineer

1. Introduction

It is understood that as part of the planning application at the site, a Coal Mining Risk Assessment has been requested by the planning authority. Consequently, a desktop study was commissioned in order to assess the risk to the development from coal mining. This report presents the findings of the study.

2. Geological Desk Study

The geological desk study has been undertaken using the following sources of information.

- British Geological Survey map sheet¹.
- British Geological Survey *Geology of Britain Viewer*².
- Coal Authority Report³.
- British Geological Survey *Borehole Records*⁴.

¹ Sources: British Geological Survey (NERC) Map Sheet 87; Barnsley

² Sources: British Geological Survey (NERC) *Geology of Britain Viewer* [online resource from www.bgs.ac.uk]

³ Coal Authority Reference: 51002023627001 dated 01st February 2019.

⁴ Sources: British Geological Survey (NERC) *Borehole Records* [online resource from <http://www.bgs.ac.uk/>]



2.1 British Geological Survey Maps and Viewer

The appropriate map sheet for the site and the geology viewer has been examined and the following table presents the indicated geology:

Table 1: Geological Data for the Site

Strata Type	Strata Name ⁵	Previous Name ⁶	Description ⁶
Superficial Geology	-	-	None recorded.
Solid Geology	Western Part of the Site		
	Pennine Middle Coal Measures Formation – Undifferentiated	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 fossil-bearing mudstones in the upper half of the unit.
	Eastern Part of the Site		
	Pennine Middle Coal Measures Formation – Sandstone	Middle Coal Measures Formation	An unnamed sandstone member within the Pennine Middle Coal Measures Formation.

There are no dip indicators relevant to the site (i.e. within 500m of the site or within the same fault block) on the geological map. There are two local coal seams that are shown to outcrop within the local area. These seams are summarised as follows:

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

Seam Name	Seam thickness ^{5*}	Outcrop distance from site ^{5*}	Anticipated depth below site
Barnsley Rider Coal (BR)	0 – 0.7m	95m SE	5 to 10m.
Barnsley Coal (B)	0 – 3.9m	150m SE	40m (anticipated to be approximately 30m below the Barnsley Rider Coal)

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

Considering the generalised vertical section on the geological map, it is considered that the Barnsley Rider Coal may be present within 10m of surface beneath the site. In addition, the Barnsley Coal Seam is suggested to be present approximately 30m below the Barnsley Rider Coal Seam.

⁵ Sources: British Geological Survey (NERC) Map Sheets 87; Barnsley; Solid and Drift Edition, and Geology of Britain Viewer [online resource from www.bgs.ac.uk]

⁶ Sources: British Geological Survey (NERC) Lexicon of Named Rock Units [online resource from www.bgs.ac.uk]



2.2 Coal Authority Mines Report

As part of this study a Coal Authority Consultants Coal Mining Report has been obtained. The report is presented as Appendix 2 and for the purposes of discussion has been summarised below:

Table 3: Summary of the Consultant's Coal Mining Report

Mining Feature	Comments
Past Underground Coal Mining	The property is in a surface area that could be affected by underground mining in 6 seams of coal at 22m to 237m depth, and last worked in 1980. One of these seams, the Barnsley Coal is indicated to have been worked at a shallow depth of 22m below the site, with a thickness of approximately 3m.
Probable Unrecorded Shallow Workings	None recorded.
Spine Roadways at Shallow Depth	No spine roadway recorded at shallow depth.
Mine Entries	None recorded within 100m of the enquiry boundary.
Abandoned mine plans	Plans of abandoned mine workings below the site are suggested to be available by the Coal Authority. Catalogue numbers for these are as follows; NE3, FGB6, 7698, FGB148, NE584, NE919, BE17, 2566, NE1024.
Outcrops	No outcrops recorded.
Geological Faults	No faults, fissures or breaklines recorded.
Opencast Mines	One opencast mine is noted, located approximately 125m southwest of the site.
Coal Authority Managed Tips	None recorded within 500 metres of the enquiry boundary.
Site Investigations	None recorded within 50 metres of the enquiry boundary
Remediated Sites	None recorded within 50 metres of the enquiry boundary.
Coal Mining Subsidence	There is 1 claim within 50 metres of the property boundary that does not match the property address. There is no current Stop Notice delaying the start of remedial works or repairs to the property. The Coal Authority is not aware of any request having been made to carry out preventive works before coal is worked under section 33 of the Coal Mining Subsidence Act 1991.
Mine Gas	None recorded within 500 metres of the enquiry boundary.
Mine Water Treatment Schemes	None recorded within 500 metres of the enquiry boundary.
Future underground mining	
Coal mining licensing	
Court orders	
Section 46 notices	For further information please see section 3 of the Consultant's Coal Mining Report (ref 51002023627001).
Withdrawal of support notices	
Payments to owners of former copyhold land	

It should be noted that whilst the Consultants Coal Mining Report indicates the Barnsley Coal Seam to be present at 22m depth, the generalised vertical section on the geological map suggests that it is 30m below the Barnsley Rider Coal (i.e. at approximately 40m depth below the site surface). Notwithstanding this, the seam thickness appears to be similar between these sources.



2.3 Geological Survey Borehole Records

The British Geological Survey (NERC) keeps borehole records from across Britain which are available for public viewing through their website⁷. As part of this study, the records in the area around the site have been reviewed in order to assist in establishing the geological conditions.

Based upon records provided by the British Geological Survey (NERC) the following table has been produced as a summary for the most applicable features of note in relation to this study, the logs of the boreholes are presented as Appendix 3:

Table 4: Notable Geological Features

Borehole	Approx. Distance from Site	Depth of borehole (m)	Notable features
SE30NW234	280m W	3.0m	Coal at 0.6m depth. 1m Thickness.
SE30NW235	300m NW	3.0m	Clay with coal fragments at 0.4m depth. 2m Thickness
SE30NW240	280m W	1.8m	Weathered Coal at 0.6m. 0.3m Thickness.
SE30NW12	930m N	446.9m	Coal seam at 42.2m depth (noted as Barnsley Seam). 2.6m Thickness.

It should be appreciated that there was limited borehole data within the immediate vicinity of the site that was available for public viewing. Other borehole scans were available at a greater distance from the site (within other fault blocks), however, these were felt to be of limited value to the study as they are not anticipated to present comparable ground conditions to those below the surface of the site.

Nonetheless boreholes SE30NE234, SE30NW235 and SE30NW240 have been undertaken within an opencast site. These boreholes indicate coal present at depths of between 0.4 and 0.6m with a thickness of 1.0m to 2.0m. It should be noted that whilst the seam present within SE30NW240 is only 0.3m thick, this horizon is considered to have been weathered. Considering the location of these boreholes and the geological data, it is anticipated that the coal encountered represents the Barnsley Coal seam.

Furthermore, borehole SE30NW12 indicated a 2.6m coal seam present at 42.2m depth. Based on the location of this borehole and the geological data, it is anticipated that this seam represents the Barnsley Coal seam. Furthermore, the thickness of this seam correlates with the thickness given in the generalised vertical section on the geological map.



3. Risk Assessment

The risk to the stability of the proposed residential development has been evaluated from the data obtained and 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 seams	Barnsley Rider Coal (BR)	Moderate
		Barnsley Coal (B)	Moderate-High
2	Coal workings at depth	Dunsil Coal (D) and below	Low

Given the historical coal mining activity within the area, the presence of workings below the site cannot be discounted. It should be noted that whilst the Barnsley Rider Coal seam is indicated to be discontinuous, due to its anticipated shallow depth (<10m), it is possible that this seam could have been removed illicitly via shallow mining methods with relative ease.

Furthermore, whilst the geological map and the Consultants Coal Mining Report offer different estimates of the depth of the Barnsley Coal, both of these sources indicate similar thicknesses. Moreover, the Consultants Coal mining report indicates workings within this seam of around 3m.

On this basis, it may be noted that guidance available from both the NHBC and the CIRIA publication, SP32 - *construction over abandoned mine workings*, suggests that competent overburden thickness above a coal seam should be greater than 10 times the thickness of a seam plus seam thickness in order that the collapse of workings would pose a low risk to surface structures.

Therefore, assuming a maximum thickness of the coal seams, the table below suggests the thickness of competent overburden required above each seam to mitigate instability at the surface.

Table 6: Required thickness of competent overburden

Seam Name	Seam thickness	Anticipated depth below site	Required thickness of competent overburden.
Barnsley Rider Coal (BR)	0 – 0.7m	Within 10m.	7.7m
Barnsley Coal (B)	0 – 3.9m	40m.	42.9m

Based on the above information, it is considered that there may not be a sufficient thickness of competent overburden above the Barnsley Rider Coal seams in order to prevent the risk of instability posed by the presence of any illicit workings. Therefore, a moderate risk rating has been placed on this seam.



In addition, in view of the potential thickness of the Barnsley Coal, it is considered that there may not be a sufficient thickness of competent overburden above this seam. On this basis and in view of the Barnsley Coal having been worked locally, a moderate to high risk rating has been placed on this seam. In light of this, it is considered that further investigation is required to prove or disprove the presence of workings within both the Barnsley Rider Coal and the Barnsley Coal.

4. Conclusions

In light of the potential risks of instability at the site from the working of shallow coal, it cannot be recommended that development takes place without further investigation to conclusively determine the presence of such workings. This work should include physical drilling methods to explore the ground conditions.

General practice is to undertake rotary openhole boreholes at three locations across the site to mitigate against the potential for drilling through intact columns associated with pillar and stall workings. In this case, in addition to the risk of instability from shallow workings, a risk from the deeper seam (due to its thickness) is also considered to be present. As with the shallow seam, the objective should be to ensure that the seams are either un-worked or have sufficient competent cover. It may therefore be possible, in the first instance, to undertake one borehole in order to prove the deeper Barnsley Coal (anticipated to be about 40m depth), with the remaining boreholes proving the depth and continuity of the Barnsley Rider Coal. In any event, it is considered that approval should be sought with the Local Authority as to the efficacy of this approach.

It is of note that Rogers Geotechnical Services would be happy to assist in any further intrusive investigation that may be required.



ATTACHMENT B – CA DRILLING PERMIT



The Coal
Authority

Permit to Enter or Disturb Coal Authority Mining Interests

Permit Reference Number 17660

Name and Address of Permit Holder:

*Barnsley Electrical
10 Grosvenor Walk
Barnsley
S70 6HG*

Site Location:

*35 Intake Lane
Barnsley
S75 2HX*

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

Investigation by three boreholes to 40m to determine conditions 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: Stuart Brown Granted Date: 11/03/2019

For and on behalf of The Coal Authority

*Nominated Representative: Stuart Brown, Permitting Manager;
The Coal Authority, Permitting Office, 200 Lichfield Lane, Mansfield, Notts, NG18 4RG
Tel: 01623 637243; E-Mail: permissions@coal.gov.uk*



ATTACHMENT C – DRILLING RECORDS

