Environmental
Geotechnical
Specialists

COAL INVESTIGATION

job number	date
J3381/16/E/C	March 2019

site address
45 Coal Pit Lane
Lower Cumberworth
Huddersfield
HD8 8LP

written by	checked by
S. P. Rogers	I. M. Y. Sakoor

issued by
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GEOTECHNICAL ENVIRONMENTAL

Environmental Geotechnical Specialists

Contents

Appendices

Environmental Geotechnical Specialists

Report on Rotary Probing

Location:	45 Coal Pit Lane, Lower Cumberworth, Huddersfield, HD8 8LP.
For:	Northern Event Structures Ltd.
Consultants:	-
Report No.	J3381/16/E/C
Report date:	March 2019

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

Steve Rogers CEng, CGeol, MICE, MCIHT, FGS
Technical Director

Imran Sakoor BEng FGS
Geo-environmental Engineer

1. Introduction

It is understood that the existing property and barn at 45 Coal Pit Lane, Lower Cumberworth, HD8 8LP is to be demolished and replaced by two dwellings occupying the same footprint as the original buildings. 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 new houses. It should be appreciated, however, that Investigation of the adjacent commercial development has been undertaken by RGS Ltd for the same client in February 2016. At that time one of the boreholes (RO1) was undertaken within the site boundary for this development and this borehole has been employed during the current investigation. 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. 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 presented as J3381/17/EDS Res Dev, which was produced by RGS Ltd. in February 2017
- 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. The original borehole (RO1) was undertaken under licence number 11978, which was issued on the 10th March 2016. Permission was granted for the recent investigation (RO A and B) on the 4th March 2019 as permit reference number 17601. These permits are 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

Borehole RO1 was undertaken on the 29th February 2016 and the remaining boreholes (RO A and B) were sunk during the period 4th and 5th March 2019, all 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.

A single rotary open hole borehole (RO1) was sunk to 30m using the RGS001 track-mounted rotary drilling rig employing 140mm diameter drag and tricone roller bits. The recent boreholes (RO A and B) were sunk using a Comacchio 205 rotary drilling rig employing 130mm diameter drag and tricone roller bits. Where necessary, 150mm or 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.

Two of the boreholes (RO1 and RO B) were drilled to 30m depth, whilst the third borehole (RO A) was curtailed at 22.00m due to complete loss of flush at 19.2m. 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.

5. Geological Appraisal

The available published geological data for the site has been examined 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	Pennine Lower Coal Measures Formation	Lower Coal Measures Formation	Interbedded grey mudstone, siltstone and pale grey sandstone, commonly with mudstones containing fossils towards the lower boundary, and more numerous and thicker coal seams in the upper part.

The site is in close proximity to the Black Band Coal Seam, which is known to have been worked in the neighbouring quarry. Due to the removal of overburden and the seam from within the adjacent quarry, it is difficult to predict at what depth this seam will be observed below the site, however, this seam is thought to be present at or close to the site surface. Published data suggests that the Black Band Coal is 0.3m to 0.8m in thickness and is continuous in nature.

The Whinmoor Coal Seam (also known as the Cumberworth Thick Coal Seam) is also seen to outcrop in the local area. This seam is known to be 1.3m in thickness, however, it should be noted that coal seam thicknesses can vary over a relatively short distances. According to the stratigraphical section, the Whinmoor Coal Seam should lie approximately 15m below the Black Band Coal Seam. Therefore, taking into consideration the presence of artificial ground at the site, the Whinmoor coal seam may be present at depths of between 15m and 25m below any artificial deposits.

6. Strata Conditions

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

[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*]

Table 3: Generalised strata profile

Depth to base (m)	Strata type	Positions strata was revealed	Groundwater strikes (m)
0.50 – 1.30	MADE GROUND	All	None
1.60	COAL (probable made ground)	RO1	None
2.60 – 4.00	Light Brown CLAY	All	None
8.00 – 9.50	Predominantly light grey MUDSTONE	All	None
8.55 – 10.00	COAL	All	None
17.80 & 20.00	Predominantly grey MUDSTONE	All	None
19.00 – 21.25	COAL	RO1 & RO B	None
20.50	VOID	RO A	None
+22.00 - +30.00	Light grey MUDSTONE/SILTSTONE	All	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, made ground was revealed to depths ranging between 0.5m and 1.3m below surface, whereupon light brown clay representing the weathered fraction of the underlying Pennine Lower Coal Measures Formation was revealed to between 2.6m and 4.0m below ground level. Immediately beneath the obvious made ground in RO1, at 1.3m depth, a 0.3m thick layer of weathered coal was also encountered. On the basis that the deeper coal seams indicate that the strata is dipping gently to the north east and that the shallow seam was not encountered in the remaining two boreholes, it is considered that it represents a layer of fill and not an intact coal seam.

Below this weathered zone, competent mudstone of the Pennine Lower Coal Measures Formation was revealed to the full depth of all boreholes, with a maximum depth of 30m being recorded. Within this deposit two seams of coal were encountered, which are thought to represent the Black Band Coal and Whinmoor Coal seam (also known as the Cumberworth Thick Coal seam). The Black Band Coal was revealed at depths ranging between 8.0m and 9.5m depth, which was observed to be intact and between 0.5m and 0.6m in thickness. The Whinmoor Coal seam was then encountered at depths ranging between 17.8m and 20.0m depth in RO1 and RO B and was of a recorded thickness of 1.2m (RO1) and 1.25m (RO B). At the location of borehole RO A, a void was noted between 19.2m and 20.5m depth (1.3m), below which competent rock was proved to 22.0m below ground level. No further coal seams or voids were encountered during the drilling operations.

7. Discussion of Ground Conditions

On the basis of all of the information provided above it is noted that there are two coal seams present within 30m of the surface and that the deeper of these seams, thought to represent the Whinmoor Coal, has been worked in part. It may be noted that guidance available from both the NHBC and the CIRIA publication *construction over abandoned mine* workings suggests that an overburden thickness above the coal should be greater than 10 times the thickness of a seam plus the seam thickness in order that

the collapse of workings would pose a low risk to surface structures. In this case the base of the worked seam was revealed at depths of between 19.0m and 21.25m depth, with a maximum thickness of 1.3m. Consequently, the thickness of competent material above the coal seam of 14.3m is required to meet the requirements outlined above. In this case there is a minimum of 15m of competent rock (assuming that the clay will be revealed to 4.0m depth (RO1). Therefore, whilst workings are present in the deeper coal seam, they are not considered to represent a significant risk to the proposed new building.

In addition, the results of the gas monitoring conducted during the drilling phase suggest that there is a negligible risk of gasses associated with mine workings being present below 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	Coal Seam(s) Considered	Comments	Risk Rating
1	Black Bed Coal	Shallow depth but intact	Low
2	Whinmoor Coal	Void detected but sufficient cover.	Low

In view of all the information obtained in this investigation, it is considered that there is a low 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) (2019), BGS, Keyworth.
  - Geology of Britain Viewer: (*http://maps.bgs.ac.uk/geologyviewer_google/googleviewer.html*)
  - Lexicon of Named Rock Units: (*http://www.bgs.ac.uk/lexicon/*)

Appendix 1

Coal Authority Licences

The Coal Authority

Permit to Enter or Disturb Coal Authority Mining Interests

Permit Reference Number 17601

Name and Address of Permit Holder:

Northern Event Structures Ltd
Event House
45 Coal Pit Lane
Lower Cumberworth
Huddersfield
HD8 8PL

Site Location:

Land at
45 Coal Pit Lane
Lower Cumberworth
Huddersfield
HD8 8PL

This certificate hereby grants the above named Permit Holder a Permit to carry out the works, as listed below, 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.

Permitted Works:

Ground investigation by 2 boreholes to c.30m to determine ground conditions

Conditions:

- ***Water flush***
- ***Gas monitoring CO, CH_4, CO_2, O_2 @ BH and Rig***
- ***Operators undertaking the work must be in possession of this certificate and permit boundary plan at the time of works***

Signed: Darren Hurst Granted Date: ***04 March 2019***

For and on behalf of The Coal Authority

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

The Coal Authority

Permit to Enter or Disturb Coal Authority Mining Interests

Permit Reference Number 11987

Name and Address of Permit Holder:

Northern Event Structures Ltd
Event House
45 Coal Pit Lane
Lower Cumberworth
Huddersfield
West Yorkshire
HD8 8PL

Site Location:

45 Coal Pit Lane
Lower Cumberworth
Huddersfield
West Yorkshire
HD8 8PL

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

Ground Investigation by 3 Boreholes to determine presence of shallow coal seams/workings

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: Helen Bennett Granted Date: ***10.3.16***

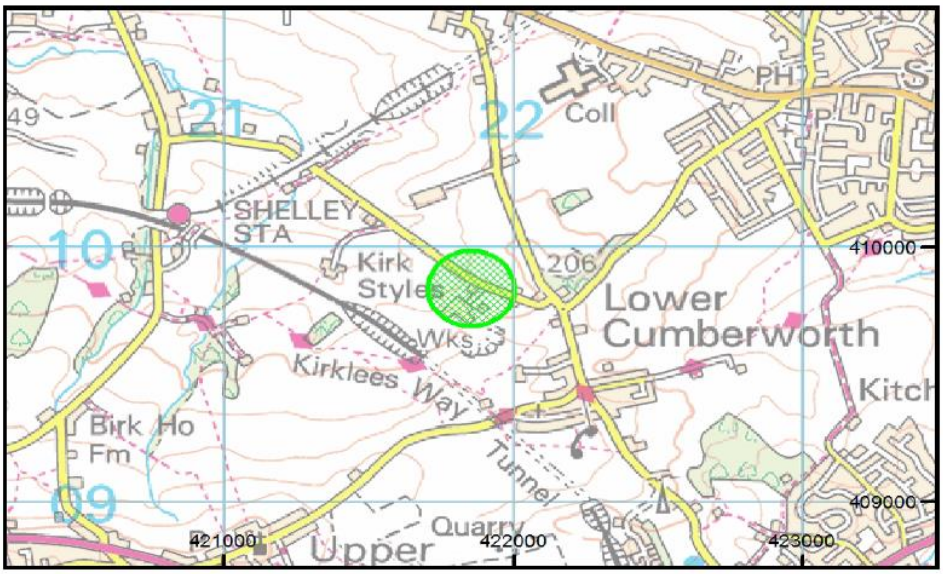
For and on behalf of The Coal Authority

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

The Coal Authority

Site Location **Permit Ref: 17601**

Overview map



Permit Boundary

Appendix 2

Site Plan

Title: **Investigation Location Plan**

Rogers Geotechnical Services Ltd	Site Name: **Coal Pit Lane, Cumberworth**	Job No: **J3381/16/E**

Appendix 3

Rotary Borehole Records

Borehole Log

Borehole No. **RO1**

Sheet 1 of 3

Project Name: 45 Coal Pit Lane	Project No. J3381/16/E	Co-ords:	Hole Type RO
Location: Lower Cumberworth, Huddersfield, HD8 8LP		Level:	Scale 1:50
Client: Northern Event Structures		Dates: 29/02/2016	Logged By DH

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.05			Grass Top (Driller's Notes). MADE GROUND (brick, clay and concrete) (Drillers Notes).
					1.30			COAL (Driller's Notes).
					1.60			Light brown CLAY. (Driller's Notes).
					4.00			Grey MUDSTONE. (Driller's Notes).
					8.00			SANDSTONE with scattered coal. (Driller's Notes).
					9.00			MUDSTONE with scattered coal. (Driller's Notes).
					9.50			COAL. (Driller's Notes).
					10.00			Continued on Next Sheet

Remarks

Casing to 8.5m. Termination at 30m due to final depth met.

Borehole Log

Borehole No. **RO1**

Sheet 2 of 3

Project Name: 45 Coal Pit Lane	Project No. J3381/16/E	Co-ords:	Hole Type RO
Location: Lower Cumberworth, Huddersfield, HD8 8LP		Level:	Scale 1:50
Client: Northern Event Structures		Dates: 29/02/2016	Logged By DH

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
								MUDSTONE. (Driller's Notes). *Gas readings: C02- 0, CH4- 0, O2- 21.9, AP- 1013*
					11.50			Grey MUDSTONE. (Driller's Notes).
					17.80			COAL. (Driller's Notes).
					18.40			MUDSTONE with coal. (Driller's Notes).
					18.50			COAL. (Driller's Notes). *Gas readings: C02- 0.6, CH4- 0, O2- 21.2, AP- 1004*
					19.00			Grey MUDSTONE. (Driller's Notes).
								Continued on Next Sheet

11 12 13 14 15 16 17 18 19 20

Remarks

Casing to 8.5m. Termination at 30m due to final depth met.

Borehole Log

Borehole No. **RO1**

Sheet 3 of 3

Project Name: 45 Coal Pit Lane	Project No. J3381/16/E	Co-ords:	Hole Type RO
Location: Lower Cumberworth, Huddersfield, HD8 8LP		Level:	Scale 1:50
Client: Northern Event Structures		Dates: 29/02/2016	Logged By DH

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					23.00			Light grey MUDSTONE/SILTSTONE. (Driller's Notes).
					30.00			End of Borehole at 30.00m

21 22 23 24 25 26 27 28 29 30

Remarks

Casing to 8.5m. Termination at 30m due to final depth met.

Borehole Log

Borehole No. **RO A**

Sheet 1 of 3

Project Name: 45 Coal Pit Lane	Project No. J3381/16/E	Co-ords:	Hole Type RO
Location: Lower Cumberworth, Huddersfield, HD8 8LP		Level:	Scale 1:50
Client: Northern Event Structures		Dates: 05/03/2019	Logged By DnG/SPR

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
								MADE GROUND - Brick/Rubble (Driller's Notes).
					0.50			Light brown CLAY. (Driller's Notes).
					2.60			Light grey MUDSTONE (Driller's Notes).
					7.00			Grey MUDSTONE (Driller's Notes).
					8.00			COAL (Driller's Notes).
								Gas readings: C02- 0, CH4- 0, O2- 20.8, AP- 0
					8.60			Light grey MUDSTONE (Driller's Notes).
								Continued on Next Sheet

1 2 3 4 5 6 7 8 9 10

Remarks

Termination at 22m. Casing to 9m.

Borehole Log

Borehole No. **RO A**

Sheet 2 of 3

Project Name: 45 Coal Pit Lane	Project No. J3381/16/E	Co-ords:	Hole Type RO
Location: Lower Cumberworth, Huddersfield, HD8 8LP		Level:	Scale 1:50
Client: Northern Event Structures		Dates: 05/03/2019	Logged By DnG/SPR

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					19.20			Void (Driller's Notes) Continued on Next Sheet

11 12 13 14 15 16 17 18 19 20

Remarks

Termination at 22m. Casing to 9m.

Borehole Log

Borehole No. **RO A**

Sheet 3 of 3

Project Name: 45 Coal Pit Lane	Project No. J3381/16/E	Co-ords:	Hole Type RO
Location: Lower Cumberworth, Huddersfield, HD8 8LP		Level:	Scale 1:50
Client: Northern Event Structures		Dates: 05/03/2019	Logged By DnG/SPR

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
								Gas readings: C02- 0, CH4- 0, O2- 20.8, AP- 0
					20.50			Probable MUDSTONE (Driller reported good resistance to drilling, but no flush returns)
					22.00			End of Borehole at 22.00m

21 22 23 24 25 26 27 28 29 30

Remarks

Termination at 22m. Casing to 9m.

Borehole Log

Borehole No. **RO B**

Sheet 1 of 3

Project Name: 45 Coal Pit Lane	Project No. J3381/16/E	Co-ords:	Hole Type RO
Location: Lower Cumberworth, Huddersfield, HD8 8LP		Level:	Scale 1:50
Client: Northern Event Structures		Dates: 04/03/2019	Logged By DnG/SPR

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
								MADE GROUND - Concrete, Brick & Rubble (Driller's Notes).
					0.50			Light brown CLAY. (Driller's Notes).
					2.80			Light grey MUDSTONE (Driller's Notes).
					7.80			Dark grey MUDSTONE (Driller's Notes).
					8.00			COAL (Driller's Notes).
								Gas readings: C02- 0, CH4- 0, O2- 20.8, AP- 0
					8.55			Light grey MUDSTONE (Driller's Notes).
								Continued on Next Sheet

1 2 3 4 5 6 7 8 9 10

Remarks

Termination at 30m. Casing to 9m.

AGS

Borehole Log

Borehole No. **RO B**

Sheet 2 of 3

Project Name: 45 Coal Pit Lane	Project No. J3381/16/E	Co-ords:	Hole Type RO
Location: Lower Cumberworth, Huddersfield, HD8 8LP		Level:	Scale 1:50
Client: Northern Event Structures		Dates: 04/03/2019	Logged By DnG/SPR

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					20.00			Continued on Next Sheet

11 12 13 14 15 16 17 18 19 20

Remarks

Termination at 30m. Casing to 9m.

Borehole Log

Borehole No. **RO B**

Sheet 3 of 3

Project Name: 45 Coal Pit Lane	Project No. J3381/16/E	Co-ords:	Hole Type RO
Location: Lower Cumberworth, Huddersfield, HD8 8LP		Level:	Scale 1:50
Client: Northern Event Structures		Dates: 04/03/2019	Logged By DnG/SPR

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
								COAL (Driller's Notes).
								Gas readings: C02- 0, CH4- 0, O2- 20.8, AP- 0
					21.25			Grey MUDSTONE (Driller's Notes).
					21.40			Light grey MUDSTONE/SILTSTONE (Driller's Notes).
					30.00			End of Borehole at 30.00m

21 22 23 24 25 26 27 28 29 30

Remarks

Termination at 30m. Casing to 9m.

AGS