

Environmental Geotechnical Specialists

COAL MINING INVESTIGATION REPORT

RGS

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Report on Rotary Probing								
Location:	Low Cudworth Green Cudworth, Barnsley, S72 8EF.							
For:	Smart Developments Ltd.							
Consultants:	Northern Design Partnership.							
Report No.	C3124/22/E/4730	Report date:	June 2023					

For and on behalf of Rogers Geotechnical Services Ltd

Steven Hale BSc Scott Alexander BSc FGS Geo-Environmental Technician Geo-Environmental Engineer

1. Introduction

It is understood that the site is to be developed by the demolition of the current residential property and the construction of 4 detached residential dwellings. 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) provided by the client, produced by Matrix Consulting Engineers (ref: 21126-MCE-XX-ZZ-RP-S-1001)

The above mentioned CMRA recommended that three investigatory boreholes should be undertaken, down to a depth of 12m below bedrock level in order to establish the nature and thickness of rock cover to any coal seams, as well as any evidence that the coal seams have been worked.

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 31st May 2023 as permit reference number 26734, 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 between the 27th and 29th of June 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 to a depth of 12m below the bedrock on this site.

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.



4.3 Summary of Works

Table 1: Summary of Completed Works										
Location	Dates Drilled	Depth (m)	Comments							
RO1	29/06/23	21	Terminated as sufficient data was obtained.							
RO2	28/06/23	26	Terminated due to significant loss of flush. Could not progress casing to the depth of the void/fracture. Sufficient data was obtained.							
RO3	27/06/23	12	Terminated due to drill head being damaged.							

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 Middle Coal Measures Formation	Middle Coal Measures Formation	Interbedded grey mudstone, siltstone, pale grey sandstone and commonly coal seams, with a bed of a mudstone containing marine fossils at the base, and several such marine fossil-bearing mudstones in the upper half of the unit.					

It should be appreciated that the site is underlain by the Pennine Middle Coal Measures Formation. There are no geological dip indicators relevant to the site (i.e. within the same faulted block) shown on the available geological map data.

There are two 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*						
Sharlston Top (ST)	0 to 1.90m	50m SW						
Sharlston Low (SL)	0 to 2.60m	400m SW						

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

While the geological data suggests that the Sharlston Top coal seam outcrops 50m south west of the site, it also outcrops to the north east suggesting that this coal seam is likely to have been weathered on site and will not be present. It is noted in the geological data that the Sharlston Low coal seam outcrops 400m south west of the site and the geology in the area dips at around 5°

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*]



eastward. It is anticipated that the seam may outcrop on the site at a depth in excess of 30m below ground level (bgl). Taking the above information into consideration, it is unlikely that an intrusive investigation will encounter either of the coal seams noted to outcrop in the area. 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

Table 4: Generalised Strata Profile Depth to Base Strata Type **Positions Strata** Groundwater (m) was Recorded (m) TOPSOIL 0.30 None All Dark brown CLAY 1.00 - 1.50 **RO1 & RO2** None 1.00 RO3 Light orange and brown CLAY None 2.00 Light brown and orange sandy CLAY RO1 None 2.00 Dark brown mottled orange and grey CLAY RO2 None 3.00 - 6.00Light brown. Orange and yellow SANDSTONE All None Light grey and brown SANDSTONE and MUDSTONE +12.00 - +24.00All None

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

'+' 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 0.30m of topsoil, dark brown, light brown, orange and grey clay was revealed to maximum depths of 1.00 - 2.00m. 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. Casing was installed to 1.50m within RO2 and RO3, and to 3.0m within RO1.

Below this stratum, competent layers of the Pennine Middle Coal Measures Formation were revealed to a depth of 24m, comprising interbedded layers of mudstones and sandstone. No coal seams or evidence of mine workings were found during the investigation.

Notwithstanding the above, no voids were encountered within the strata or horizon of coal during the rotary probing. However, flush was lost within borehole RO2 at a depth of 26m in material described as 'light grey and brown sandstone', causing this hole to be terminated at a shorter depth than initially envisaged. It should be noted, however, that no loss of drilling resistance was recorded, suggesting that this feature does not represent voided ground. Furthermore, no loss of flush or drilling resistance was noted within borehole RO1 at similar depths and within the corresponding sandstone strata. Therefore, taking into account the depth of this feature, and the fact that the surrounding strata appears to be intact and comprises sandstone only, it may be anticipated that this feature may represent a localised zone of naturally fractured rock, and not a zone of illicit mining activity. Borehole RO3 was terminated early due to very hard drilling that damaged the drill head..

No groundwater strikes were noted during the investigation.

In addition, no methane was detected, with levels of carbon dioxide between 0% and 0.1% and oxygen between 20.2% and 20.8% being recorded during the drilling phase.



7. Discussion of Ground Conditions

On the basis of all of the information provided above it is not anticipated that any coal seams are present at a shallow depth beneath the site. The target of the investigation named as the Sharlston Top coal seam was thought to be present at a depth of approximately 10 to 15m beneath the surface of the site. This coal seam from geological records was inferred to be present at the stratigraphic boundary between the mudstone and the underlying sandstone. In two of the boreholes this boundary has been fully penetrated and has been proven to be wholly absent with no evidence of voids or workings, thus there exists no risk from this coal seam. It is expected that the next shallowest seam that may outcrop underneath the site is anticipated to represent Sharlston Low coal seam. However, as this seam has not been proven during this investigation it likely lies at a depth which is unlikely to influence any developments on the surface of the site.. Consequently, it is considered that it is unlikely that shallow coal workings are present beneath or in close proximity to the area of the proposed development.

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 5: Development Specific Risk Assessment							
Item	Risk of Instability	Coal Seam(s) Considered	Risk Rating				
1	Shallow coal workings	Sharlston Top coal seam	Negligble				
1	Shallow coal workings	Sharlston Low coal seam	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 +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: (<u>http://maps.bgs.ac.uk/geologyviewer_google/googleviewer.html</u>)
 - Borehole Scans: (http://www.bgs.ac.uk/data/boreholescans/)
 - Lexicon of Named Rock Units: (<u>http://www.bgs.ac.uk/lexicon/</u>)



Appendix 1

Coal Authority Permit



Permit to Enter or Disturb Coal Authority Interests

Permit 26734

Name and Address of Permit Holder:

Smart Developments (West Yorkshire) Ltd 107 Bradford Road Huddersfield HD1 6DZ Site Location:

28 Low Cudworth Green Cudworth Barnsley S72 8EF

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

Ground investigation by three boreholes to 30m 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:	Richard Morson	Granted Date:	31/05/23	
For and on be	ehalf of The Coal Authority			

Nominated Representative: Richard Morson, Permitting Manager; The Coal Authority, Permitting Office, 200 Lichfield Lane, Mansfield, Notts, NG18 4RG Tel: 01623 637450; E-Mail: permissions@coal.gov.uk



Granted Permit Boundary

Permit Ref: 26734

Permit Boundary:



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Appendix 2 Site Plan





Notes:

Environmental Geotechnical Specialists

Rogers Geotechnical Services Ltd

Offices 1 & 2, Barncliffe Business Park, Near Bank, Shelley, Huddersfield, HD8 8LU

Telephone: 0843 50 66 87 www.rogersgeotech.co.uk

Client:

Smart Developments Ltd

Job Number:

C3124/22/E/4730

Project Details:

Low Cudworth Green, Cudworth, Barnsley, S72 8EF

Scale:

Not to scale - reference only





Appendix 3

Rotary Borehole Records

alle	RGS	Environmental Geotechnical Specialists				Bc	orel	nole	e Log	Borehole No. RO1 Sheet 1 of 3	
Projec	Project Name: Low Cudworth Green			Project No.	Project No. Co-ords:				Hole Type	•	
Locati	on:	Cudwo	orth, Bar	nsley, S72 8EF	100.12.02020		Level			Scale	
Client	:	Smart	Develop	oments Ltd			Dates	:	29/06/2023	Logged By AB	/
Well	Water Strikes	Depth	amples Type	and In Situ Testi Resi	ng ults	Depth (m)	Level (m)	Legend	Stratum Description	on	
		(m)				0.30 1.00 2.00 3.00			TOPSOIL (Drillers notes). Dark brown sandy CLAY (Drill Light brown and orange sandy (Drillers notes). Light brown and yellow SAND (Drillers notes).	ers notes). y CLAY STONE ers notes).	
Rema Casin	rks g to 1.5	m.								AGS	

2		Environmental								Borehole N	0.
	RGS 8	Geotechnical Specialists				BC	orei		e Log	R01	
				Proiect No.					Sheet 2 of Hole Type	3	
Projec	t Name:	: Low	Cudworth	Green	C3124/22/E/47	730	Co-or	ds:		RO	
Locati	on:	Cudv	worth, Bar	nsley, S72 8EF			Level:			Scale	
										Logged B	у
Client	:	Sma	rt Develo	oments Ltd			Dates	:	29/06/2023	AB	
	Water		Samples	and In Situ Testi	ng	Depth	Level				
vveli	Strikes	Depth (m)	Туре	Resu	ılts	(m)	(m)	Legend	Stratum Descripti	on	
									Light grey MUDSTONE (Drille	ers notes).	-
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						12.00			Dark grey MUDSTONE and S	SANDSTONE	12 -
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										Borehole N	lo.
	RGS	Environmental Geotechnical Specialists			Borehole Log					RO1	
0					-				Sheet 3 of	3	
Project Name: Low Cudworth Green			Project No. C3124/22/E/47	Project No. C3124/22/E/4730				Hole Type RO			
Locati	on:	Cudw	vorth, Bar	nsley, S72 8EF			Level:			Scale 1:50	
Client	:	Sma	rt Develop	oments Ltd			Dates	:	29/06/2023	Logged B	у
			0								1
Well	Water Strikes	Depth (m)	Type	Resu	ilts	Depth (m)	Level (m)	Legend	Stratum Descripti	on	
		()							Dark grey MUDSTONE and S (Drillers notes).	SANDSTONE	-
											-
											-
_						21.00			End of Borehole at 21	00m	21 -
										0011	-
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Rema Casin	rks g to 1.5	im.		<u> </u>				<u> </u>	<u> </u>	AGS	5

Aller	RGS	Environmental Geotechnical Specialists				Borehole No. RO2					
Project	Name	: Low C	udworth	Green	Project No.	730	Co-or	ds:		Hole Type RO	
Locatio	on:	Cudwo	orth, Bar	nsley, S72 8EF	Level:						
Client:	Client: Smart Developments Ltd					Dates: 28/06/2023				Logged By AB	
Well	Water Strikes Samples and In Situ Testing (m)		ting Depth I sults (m)	Level (m)	Legend	Stratum Description					
		(m)	Type			0.30 1.00 2.00 5.00			TOPSOIL (Drillers notes). Light orange and brown CLAY notes). Dark brown mottled orange and (Drillers notes). Light brown and orange SANI (Drillers notes).	r (Drillers nd grey CLAY DSTONE Prs notes).	
Remar Casing	ks i to 3m.									AGS	<u> </u>

ADU	RGS	Environmental Geotechnical Specialists			Borehole Log					Borehole No. RO2	
Projec	t Name	: Low C	udworth	Green	Project No.		Co-or	ds:		Hole Type	3 9
, Locati	on:	Cudw	orth Bar	nslov S72 8EE	C3124/22/E/4730					RO Scale	
	011.	Cuaw							1:50		
Client:	Client: Smart Developments Ltd					Dates: 28/06/2023				AB	
Well	Water -	S Depth	amples	and In Situ Testii	ng	Depth	Level	Legend	Stratum Descripti	on	
		(m)	Туре	Resu	lits	(11)	(11)		Light grey MUDSTONE (Drille	ers notes).	-
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						18.00			Light grey SANDSTONE (Dril	lers notes).	18 -
											-
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Pomo	rke							• • • • • •			20 —
Casinę	g to 3m.									AGS	5

RGS Environmental Geotechnical						Borehole No.					
VV		Specialists							LOG	Sheet 3 of 3	
Proied	ct Name	: Low C	udworth	Green	Project No. Co-ords:					Hole Type	
	-			C3124/22/E/4730					RO Scale		
Locati	Location: Cudworth, Barnsley, S72 8EF					Level	:		1:50		
Client: Smart Developments Ltd				Dates		tes: 28/06/2023		Logged By AB			
Well	Water Strikes	Depth (m)	amples Type	and In Situ Testi Resu	ng ults	Depth (m)	Level (m)	Legend	Stratum Description		
		(m)				21.00 24.00 26.00			Light grey SANDSTONE (Drill Light grey and brown SANDS (Drillers notes).	Iers notes). TONE	
Rema Casin	g to 3m		<u> </u>	l			<u> </u>			AGS	5

Aller	RGS	nvironmental ieotechnical pecialists				Borehole No. RO3 Sheet 1 of 2					
Projec	t Name:	Low C	udworth	Green	Project No.	'30	Co-or	ds:		Hole Type	
Locatio	Location: Cudworth, Barnsley, S72 8EF				Level:					Scale	
Client: Smart Developments Ltd						Dates	:	27/06/2023	Logged By		
Well	Water Strikes	S Depth (m)	amples Type	and In Situ Testin Resu	ng ults	Depth (m)	Level (m)	Legend	Stratum Description	on	
		(iii)				0.20			TOPSOIL (Drillers notes).		-
						1.50			Dark brown CLAY (Drillers r	tes).	1
Rema	ks					6.00			Light brown SANDSTONE (D	SANDSTONE	
Casing	κs g to 1.5n	n.								AGS	5

								Borehole N	lo.		
	RGS	Environmental Geotechnical Specialists				e Log	RO3				
									-	Sheet 2 of 2	
Projec	t Name	e: Low C	Cudworth	Green	Project No. C3124/22/E/47	Co-ords:				Hole Type RO	
Location: Cudworth, Barnsley, S72 8EF				Level:					Scale		
Client: Smart Developments Ltd					Dates: 27/06/2023				Logged By	у	
	Samples and In Situ Testing				na						
Well	Water Strikes	Depth (m)	Туре	Resu	llts	Depth (m)	Level (m)	Legend	Stratum Description		
									Light grey MUDSTONE and S (Drillers notes).	SANDSTONE	-
											-
											11 -
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						12.00			End of Borehole at 12.	00m	12 -
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