

**Environmental
Geotechnical
Specialists**



COAL INVESTIGATION

job number	date
site address	
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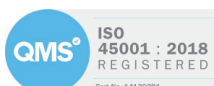
Rogers Geotechnical Services Ltd

Telephone 0843 50 666 87 **Fax** 0843 51 599 30

Email enquiries@rogersgeotech.co.uk

www.rogersgeotech.co.uk

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



GEOTECHNICAL
ENVIRONMENTAL



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Report on Rotary Probing

Location: Land adjacent to 81 Common End Lane
Lepton, Huddersfield, West Yorkshire, HD8 0AF

For: Lauren Clarke

Report No. C902/20/E/1438

Report date: September 2020

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

Imran Sakoor BEng FGS
Geo-environmental 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 a residential dwelling (planning reference 2020/62/91092/W). As part of the planning process and following on from the coal mining risk assessment, 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 undertaken by Rogers Geotechnical Services Ltd (report number: C902/20/E/1402, dated July 2020).
- 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 was permission was granted on the 26th August 2020 as permit reference number 20567, 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 during the period 4th to 7th September 2020 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 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. 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 30m and borehole BH3 was curtailed at 15m on the basis that sufficient data had been obtained. Additionally, borehole BH1 was terminated at 24m due to complete loss of flush at 22m.

0



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	Kirkburton Sandstone	-	Medium bedded, very fine to medium grained, ripple cross laminated, micaceous, buff to pale brown sandstone, interbedded with greenish grey siltstone.
	Pennine Lower Coal Measures Formation	-	Interbedded grey mudstone, siltstone and pale grey sandstone, commonly with mudstones containing marine fossils in the lower part, and more numerous and thicker coal seams in the upper part.

Based on the published available geological data, the following seams are anticipated to be present beneath the site.

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
Black Bed Coal (BL)	0.2 – 1.8m	On the western site Boundary	Within 15m.
Better Bed Band Coal (BRB)	0 – 0.1m	N/A	Within 30m.
Better Bed Coal (BB).	0.1 – 0.9m	96m W	Within 45m.

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

Based on the topography of the site, and assuming a shallow angle of geological dip, the Black Bed Coal is anticipated to be at or close to surface level within the western quadrant of the site, becoming progressively deeper moving east. Indeed, the seam is anticipated within 15m depth beneath the site surface of the proposed development. The Black Bed Coal is generally succeeded directly by dark grey mudstone with intermittent iron bands. The next coal seam is indicated to be the Better Bed Band Coal and anticipated to be present within 30m of the site surface. It should be noted that this seam is recorded to be thin and shaly, (see coal mining risk assessment C902/20/E/1402, July 2020, thus unlikely to have been worked.

¹ Sources: British Geological Survey (NERC) Map Sheets 77; Huddersfield; Solid and Drift Edition, and the Geology of Britain Viewer [online resource from www.bgs.ac.uk]



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)
1.20	MADE GROUND.	BH1, BH2	None
1.60	Yellow CLAY. (Residual Kirkburton Sandstone)	BH2	None
8.5 – 10.0	SANDSTONE. (Kirkburton Sandstone Formation)	All	None
+15 – +30	MUDSTONE with rare subordinate sandstone.	All	26m (BH2)

'+' 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.

Table 4: Notable Horizons & Flush Losses

Depth to base (m)	Horizon Details	Positions encountered
4.0	LOST FLUSH (zone thickness: 0.5m). Resistance present throughout.	BH2
5.95 – 8.45	LOST FLUSH. (zone thickness: 0.05m). Resistance present throughout.	BH2, BH3
7.0 - 8.15	VOID. Thickness: 0.15m and 0.2m.	BH1, BH2
20.5	COAL. Intact.	BH3
22.0 - 24.0	LOST FLUSH. Resistance present throughout.	BH1

During this investigation, made ground was encountered within BH1 and BH2 to 1.2m depth. Within BH2, yellow clay was revealed to 1.6m below ground level, anticipated to represent residual soils. Beneath the made ground and residual soils, and from ground level at the location of BH3, sandstone was encountered to depths of between 8.5m and 10m below ground level. These units are anticipated to represent the Kirkburton Sandstone Formation. Within this unit, losses of flush but without loss of resistance were experienced at 4m in BH2 and 6m in BH3. It is felt that these losses of flush are likely to be associated with fractures present within the rock. It should be noted that a loss of flush was encountered at the base of the sandstone within BH2 at 8.5m depth. However, as above, no loss of resistance was experienced. Notwithstanding this, a 0.15m and 0.2m thick void was encountered at 8.15m in BH1 and 7.0m BH2. It is considered that these voids are associated with workings within the Black Bed coal seam.

However, on the basis of the Coal Mining Risk Assessment, 0.7m thick workings were considered to be present within the Black Bed Coal seam at the base of the Kirkburton Sandstone at around 14m depth. In this instance no distinct voids or coal seams were encountered at the base of the sandstone unit,



and whilst a loss of flush was encountered at 8.5m in BH2, no loss of resistance was experienced. One possibility is that collapsed workings were present at the depth of the Black Bed Coal and that void migration has occurred. The numerous occasions where flush losses were encountered may be potentially be associated with such void migration.

Below the sandstone unit, mudstone with subordinate sandstone was encountered to 22m in BH1, 30m in BH2 and 15m in BH3. At 20.5m within BH2, a 0.5m thick coal was encountered. It is considered that this seam is likely to be associated with the Better Bed Band coal. A further loss of flush was experienced at 22m depth in BH1, however resistance was present throughout. In view of the depth similarity to the coal within BH2, it is likely that these features are related. It is probable that the loss of flush may have masked the presence of coal in this instance. However, for this seam it is considered that workings are not present and the loss of flush is related to joints and fractures within the rock.

One groundwater strike was recorded at 26m within BH2 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 locations. In any event, it should be appreciated that groundwater levels are subject to seasonal variation or changes in local drainage conditions.

In addition, negligible concentrations of methane and carbon dioxide were detected, with oxygen levels of 20.8% being recorded during the drilling phase.

7. Discussion of Ground Conditions

On the basis of the information provided above, it is considered that voids associated with workings within the Black Bed Coal seam are present beneath the site. However, it would appear that the Better Bed Band coal has not been worked below the site.

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 additional treatment of the coal workings would not be required.

In this instance the thickness of the voided ground is 0.2m at a depth of 6.0m, thus 2.2m of competent rock is required to mitigate the risk of instability. In this case, 3.8m of competent cover, not including the fractured ground (where flush losses were experienced) was encountered above the voids, thus it is considered that instability may be deemed unlikely. Whilst it should be noted that the competent overburden comprises sandstone, which is more able to bridge workings and less likely to delaminate than mudstones of the Pennine Coal Measures Formation, there remains a risk that the voids could migrate to the surface. Therefore, some remedial measures will be required.

In addition, the results of the gas monitoring conducted during the drilling phase suggest that there is a limited risk of gasses associated with mine workings being present below the proposed development. However, it should be noted that the use of water flush techniques are likely to have resulted in reduced



levels of mine gas being detected. Moreover, given the fractured nature of the ground, mine gas may be able to migrate more readily.

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	Black Bed Coal Seam	Low to Moderate
		Better Bed Coal Seam	Low
2	Mine Gas	Workings Attributed to the Black Bed Coal Seam	Moderate

In relation to the Black Bed Coal seam, it would appear that sufficient competent cover is present in order to mitigate the risk of instability. However, given the numerous losses of flush encountered during the drilling and the uncertainty of void migration having occurred, it is recommended that the new building incorporates raft foundations in order limit any settlement that may be induced should instability occur at depth. For the Better Bed Coal seam, it is considered that sufficient competent cover is present above the seam, such that the risk of instability is low.

8.1 Risks Posed by Migration of Hazardous Ground Gas

Whilst no elevated levels of hazardous mines gas were recorded during the drilling phase, it should be appreciated that a regime of long term monitoring has not been undertaken as part of this assessment. In this case, it is evident that some shallow mining is present beneath the proposed development. Moreover, the numerous flush losses indicate that pathways are likely to be present for the migration of mine gas. As such, a moderate risk rating has been assigned, and further investigation should be undertaken by means of gas monitoring, and subsequent remedial action may be required if elevated levels are found.



Notwithstanding the above, given the potential risks posed by mine gasses, it is considered prudent to budget for gas protection measures for the new development until monitoring has been undertaken and the gas risks fully assessed.

9. References

- British Standards Institution (2015 +A1: 2020) BS 5930: *Code of practice for ground investigations*, B.S.I., London.
- P.R.HEALY, J.M.HEAD: Construction over abandoned mine workings, SP 32, 1984, CIRIA
- British Geological Survey (NERC) (2020), 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 License



The Coal
Authority

Permit to Enter or Disturb Coal Authority Interests

Permit 20567

Name and Address of Permit Holder:

Lauren Clarke
81 Common End Lane
Huddersfield
HD8 0AF

Site Location:

81 Common End Lane
Huddersfield
HD8 0AF

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

Ground investigation by three boreholes to c.30m bgl

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:

- *Water flush*
- *Gas Monitoring CO, CH₄, CO₂, O₂, at borehole and rig*
- *Appropriate borehole sealing without delay and to withstand site level changes*
- *Operators undertaking the work must be in possession of this certificate and the Permit boundary plan at the time of works*

Signed: Darren Hurst Granted Date: 26 August 2020

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 637450; E-Mail: permissions@coal.gov.uk



The Coal
Authority

Granted Permit Boundary

Permit Ref: 20567

Permit Boundary:

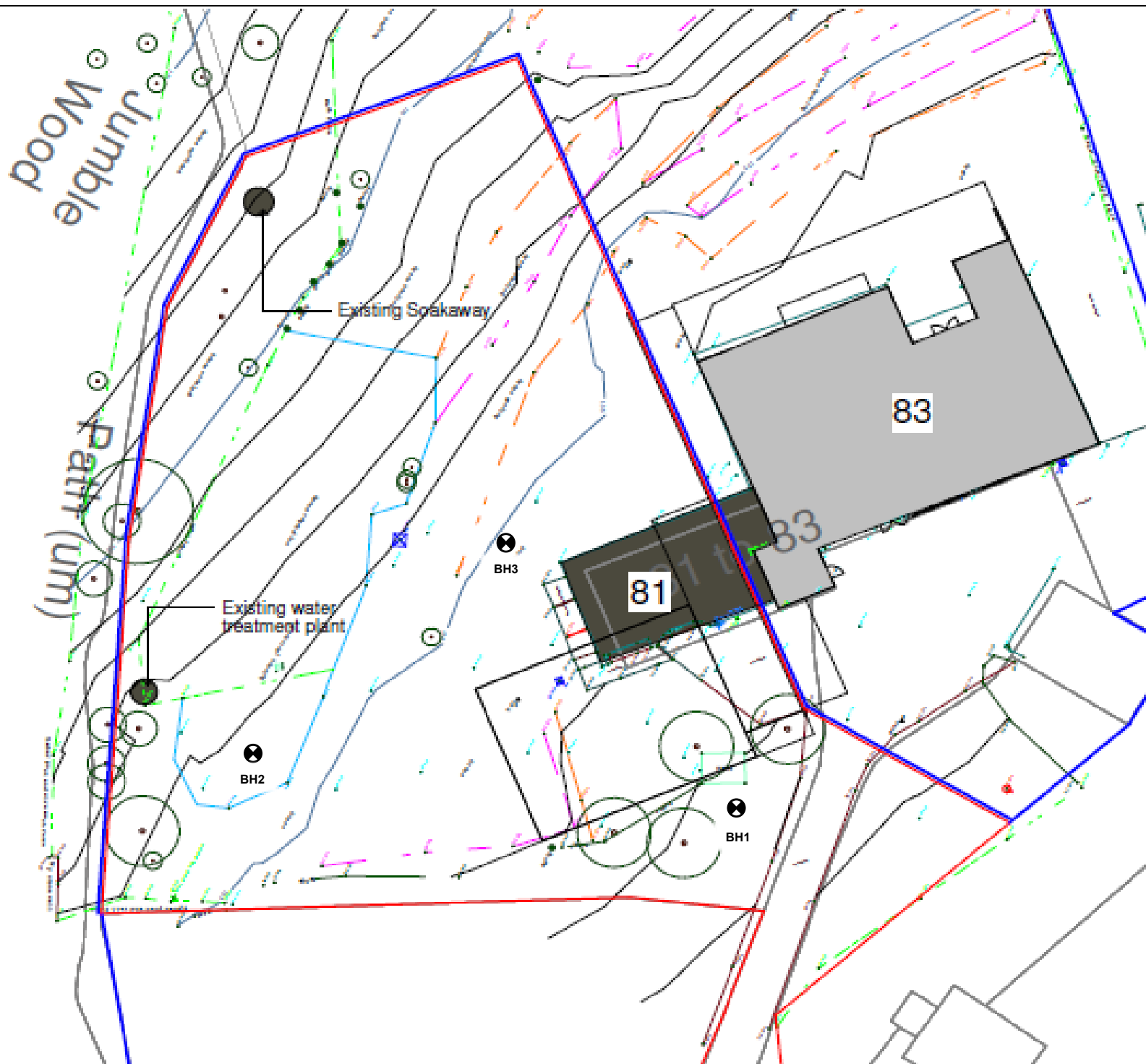


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Appendix 2

Site Plan



Notes:

Investigation positions approximated from site operative's notes.

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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:

Lauren Clarke

Job Number:

C902/20/E/1438

Project Details:

81 Common End lane, Lepton,
Huddersfield, HD8 0AF.

Scale: Not to scale - reference only





Appendix 3

Rotary Probing Records



Borehole Log

Borehole No.

BH1

Sheet 1 of 3

Project Name: 81 Common End Lane

Project No.
C902/20/E/1438

Co-ords:

Hole Type
RO

Location: Lepton, Huddersfield, HD8 0AF.

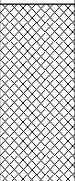
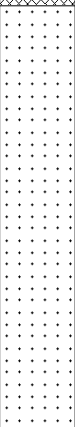
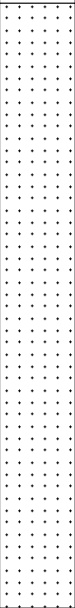
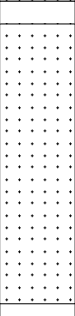
Level:

Scale
1:50

Client: Lauren Clarke

Dates:

Logged By
IMY

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					1.20			MADE GROUD (Clayey sandy GRAVEL). (Driller's description).	1
					4.00			Clayey fractured SANDSTONE. (Driller's description).	2
					8.00 8.15			Yellow SANDSTONE. (Driller's description).	3
					10.00			VOID. Lost flush. (Driller's description). Yellow SANDSTONE. (Driller's description).	4
								Continued on Next Sheet	5

Remarks

Inspection pit to 1.2m depth. Cased to 9m depth.





Borehole Log

Borehole No.

BH1

Sheet 2 of 3

Project Name: 81 Common End Lane

Project No.
C902/20/E/1438

Co-ords:

Hole Type
RO

Location: Lepton, Huddersfield, HD8 0AF.

Level:

Scale
1:50

Client: Lauren Clarke

Dates:

Logged By
IMY

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					13.00			Very dark brown and grey MUDSTONE. (Driller's description).	11
									12
								Grey MUDSTONE. (Driller's description).	13
									14
									15
									16
									17
									18
									19
									20

Continued on Next Sheet

Remarks

Inspection pit to 1.2m depth. Cased to 9m depth.





Borehole Log

Borehole No.

BH1

Sheet 3 of 3

Project Name: 81 Common End Lane

Project No.
C902/20/E/1438

Co-ords:

Hole Type
RO

Location: Lepton, Huddersfield, HD8 0AF.

Level:

Scale
1:50

Client: Lauren Clarke

Dates:

Logged By
IMY

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					22.00			UNKNOWN STRATA. Loss of flush but no loss of resistance on drill string. Noted as likely fracture. (Driller's description).	21
					24.00			End of Borehole at 24.00m	22
									23
									24
									25
									26
									27
									28
									29
									30

Remarks

Inspection pit to 1.2m depth. Cased to 9m depth.





Borehole Log

Borehole No.

BH2

Sheet 1 of 3

Project Name: 81 Common End Lane

Project No.
C902/20/E/1438

Co-ords:

Hole Type
RO

Location: Lepton, Huddersfield, HD8 0AF.

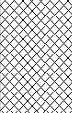
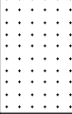
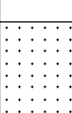
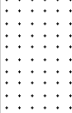
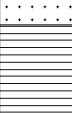
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Client: Lauren Clarke

Dates:

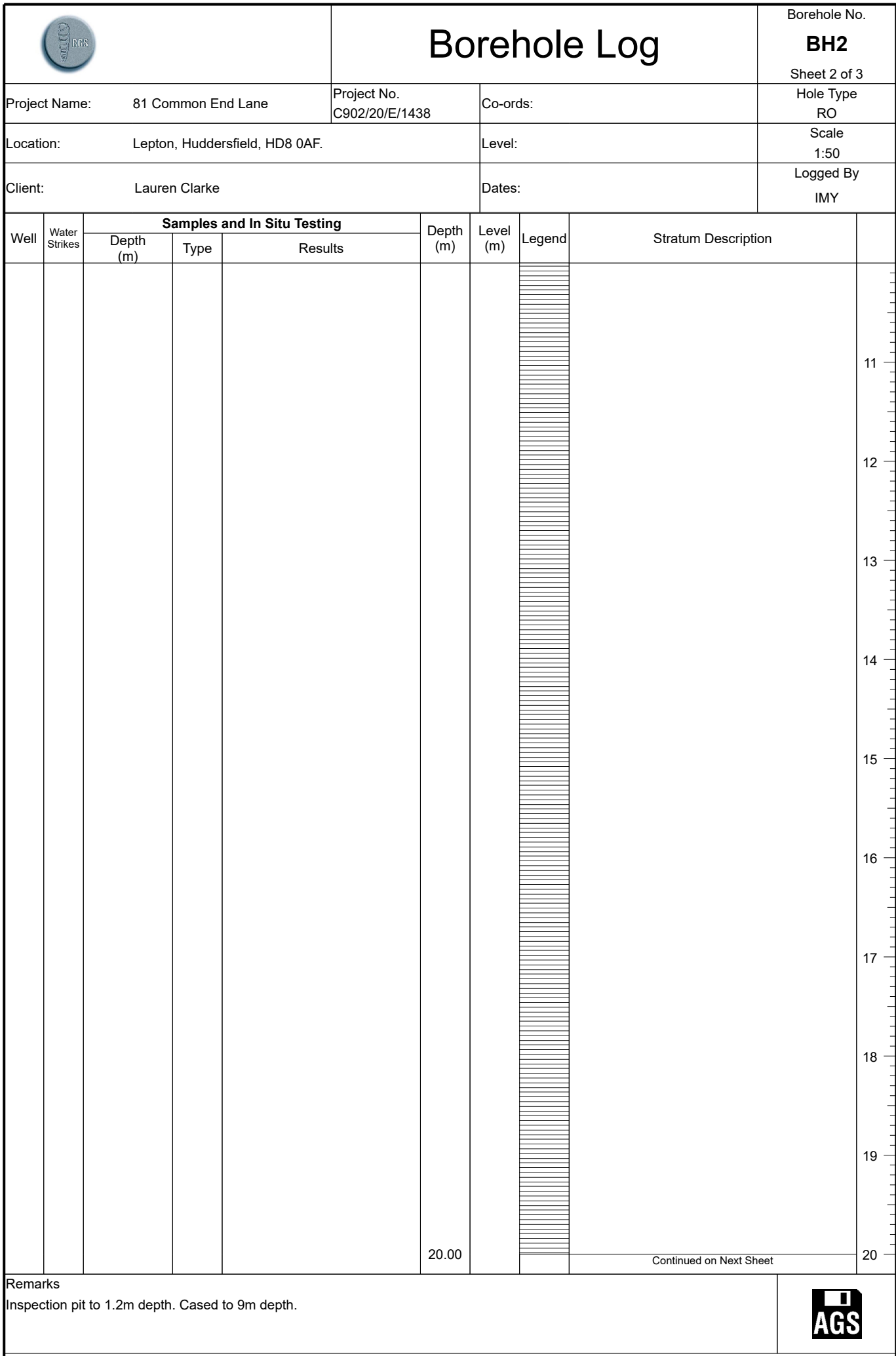
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IMY

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.80			MADE GROUND (Hardcore). (Driller's description).	
					1.20			MADE GROUND (CLAY). (Driller's description).	1
					1.60			Yellow CLAY. (Driller's description).	
					2.40			Whitish SANDSTONE. (Driller's description).	2
					3.50			Yellow SANDSTONE. (Driller's description).	3
					4.00			LOST FLUSH. No loss of resistance of drill string. (Driller's description).	
					6.80			Yellowish brown SANDSTONE. (Driller's description).	4
					7.00			VOID. Loss of flush. (Driller's description).	5
					8.50			Yellowish brown SANDSTONE. (Driller's description).	6
					8.50			LOST FLUSH. No loss of resistance. Grey MUDSTONE. (Driller's description).	7
									8
									9
									10
								Continued on Next Sheet	

Remarks

Inspection pit to 1.2m depth. Cased to 9m depth.







Borehole Log

Borehole No.

BH2

Sheet 3 of 3

Project Name: 81 Common End Lane

Project No.
C902/20/E/1438

Co-ords:

Hole Type
RO

Location: Lepton, Huddersfield, HD8 0AF.

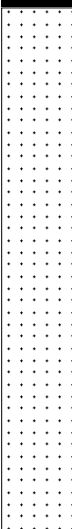
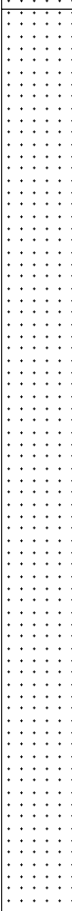
Level:

Scale
1:50

Client: Lauren Clarke

Dates:

Logged By
IMY

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					20.50			COAL. (Driller's description).	
								Yellow SANDSTONE. (Driller's description).	21
									22
									23
					24.00			Grey MUDSTONE. (Driller's description).	24
									25
		26.00							26
									27
									28
									29
					30.00			End of Borehole at 30.00m	30

Remarks

Inspection pit to 1.2m depth. Cased to 9m depth.





Borehole Log

Borehole No.

BH3

Sheet 1 of 2

Project Name: 81 Common End Lane

Project No.
C902/20/E/1438

Co-ords:

Hole Type
RO

Location: Lepton, Huddersfield, HD8 0AF.

Level:

Scale
1:50

Client: Lauren Clarke

Dates:

Logged By
IMY

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
								Clayey silty SANDSTONE. (Driller's description).	1
									2
									3
									4
									5
					6.00				6
					6.00			LOST FLUSH. Resistance present on drill string throughout. Fractured SANDSTONE. Slight but not complete loss of flush. (Driller's description).	7
									8
									9
					10.00			Continued on Next Sheet	10

Remarks

Cased to 7m depth.





Borehole Log

Borehole No.

BH3

Sheet 2 of 2

Project Name: 81 Common End Lane

Project No.
C902/20/E/1438

Co-ords:

Hole Type
RO

Location: Lepton, Huddersfield, HD8 0AF.

Level:

Scale
1:50

Client: Lauren Clarke

Dates:

Logged By
IMY

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
								Grey MUDSTONE. (Driller's description).	
									11
									12
									13
									14
					15.00				15
								End of Borehole at 15.00m	16
									17
									18
									19
									20

Remarks

Cased to 7m depth.

