



Rotary Borehole Site Investigation Report

LOCATION	Watling Street, Bury BL8 3QW
ISSUE DATE	October 2022
FOR	Rosie Mackenzie
CLIENT REF.	
OUR REF.	G22403

Prepared by



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1. Introduction

In accordance with your instruction, Geoinvestigate Ltd carried out an intrusive rotary borehole site investigation at Watling Street, Bury BL8 3QW.

It is proposed to construct a new dwelling within the footprint provided in Appendix 1. The Approximate centre of the site is at National Grid Reference E375457, N413731.

The purpose of this study was to investigate the site for the possible presence of shallow, abandoned, underground coal mine workings beneath the site. Therefore, this investigation is limited to this aspect only.

A possible shallow or near surface mining risk at the site had been identified in a mining report provided by the Coal Authority and subsequent Coal Mining Risk Assessment carried out by Earth Environmental & Geotechnical (Report ref: A4355, Dated September 2021).

2. Coal Authority Mining Report

The Geoinvestigate Coal Mine Risk Assessment (Ref: A4355, dated: September 2021) is provided in Appendix 2. The Coal Authority supporting report has not been provided.

The geology map indicates that the site is absent of superficial and is underlain by the Pennine Lower Coal Measures Formation bedrock, which comprises of mudstone, siltstone, sandstone, with interbedded coal seams.

The CMRA shows that an outcrop of the Upper Foot Coal Seam is present within the northern area of the site. This is thought to dip to the south and potentially underlay the site within very shallow depth. This may also host unrecorded very shallow coal mine-workings.

Overall, the CMRA shows that due to the presence of coal seams near to this locality and beneath the proposed development at shallow depth, their presence cannot be determined without further **intrusive investigation**.

No mine shafts are recorded to be within the surrounding area or within the site.

The report therefore concluded that further investigation was required to determine the nature of coal mining legacy beneath the site.

Therefore, given the foregoing outcome it is our opinion that drilling is required to reliably establish drift/bedrock depth and the presence, depth, and nature of mine workings (if any) beneath this site.

In light of the possible presence of shallow coal workings below the site, the Client commissioned Geoinvestigate to carry out a borehole investigation to evaluate this possible hazard to the development.

3. Scope of Intrusive Investigation

3.1 Scope of Works

In line with the following borehole drilling investigation was carried out at the site to establish if abandoned coal mine-workings were present in the underlying strata:

- The sinking of two (2) boreholes (RH1 and RH2) to a depth of 20m to 25m with supervision of the drilling works by a qualified geotechnical engineer. The boreholes were rapidly driven to depth using Geoinvestigate's proprietary new high-speed Microdrilling system.
- Provision of an interpretative report including site plan and borehole logs.

Microdrill's small volume water injection system offers a safer method of investigating coal mine-workings, minimising the risk of combustion or explosion of coal and mine gases and the migration of hazardous gases into nearby buildings.

Gas monitoring was carried out during drilling to measure concentrations of Oxygen O₂ and potentially toxic and explosive levels of Carbon Dioxide CO₂, Methane CH₄ & Carbon Monoxide CO in the ground.

The ground conditions encountered in the boreholes (as described by the driller) are shown on the borehole log provided in Appendix 1.

The current report focuses only on the mining situation beneath the site. It does not deal with the condition of the surface drift horizon (made ground and natural soils) which cover the site.

3.2 Drilling Technique

The condition of the ground with regard to strength and rock type was assessed by the drillers using the variations in drilling progress, drilling flush pressure, "feel", and the nature of the arisings (drill debris) returned to surface in the water flush and whether the flush itself was returned. No rock cores were recovered from the boreholes.

The primary purpose of the boreholes in this investigation was to identify variations in rock strength and rock type and to highlight possible geotechnical hazards such as voids or broken / weak strata which might indicate abandoned mine workings or upward void migration.

4. Encountered Ground Conditions

4.1 RH1 & RH2

The boreholes encountered similar conditions comprising of superficial deposits to 4.20m. Followed by sandstone with interbedded mudstone in RH1 and sandstone/mudstone in RH2, to borehole termination (20m for RH1 and 25m for RH2).

No broken ground or voids were encountered in the boreholes drilled. No hazardous gas concentrations were noted from readings taken from the boreholes during drilling.

No water flush was recorded in RH1. Full flush was maintained in RH2.

5 Review of Ground Conditions.

The boreholes suggest that the drift deposits extend to a depth of 4.20m, underlain by sandstone and mudstone to the base of each borehole to between 20.00m and 25.00m.

In each borehole, no coal seams, broken ground, or voids, possibly indicative of past ground workings, were noted. No water flush was returned in RH1, but full flush was maintained over the entire depth of RH2.

6 Conclusions

At the positions drilled, drift deposits extend to circa 4.20m, underlain by rock of sandstone and mudstone to the base of each rotary borehole at 30.00m.

As no coal seams were encountered at very shallow to shallow depth, it is considered that the coal outcrop identified within the CMRA must outcrop further to the south (if at all). Therefore, no workings are present beneath the site within shallow depth.

In conclusion, the drilling has confirmed that no special foundations or ground treatments would be required to mitigate the risk to the site from damage such as subsidence, or collapse, due to the sites past coal mining legacy from potential shallow coal mine-workings.

Notwithstanding the above, although, as per section 3.1, the drilling technique is not able to determine the type of drift present, based on the driller's description of 'very weak drift' in RH1, it is recommended that a shallow borehole investigation is carried out, prior to construction, to determine a suitable foundation solution for the proposed dwelling. It is possible that the drift in this borehole was made ground, or a backfilled excavation, or such like.

END OF REPORT



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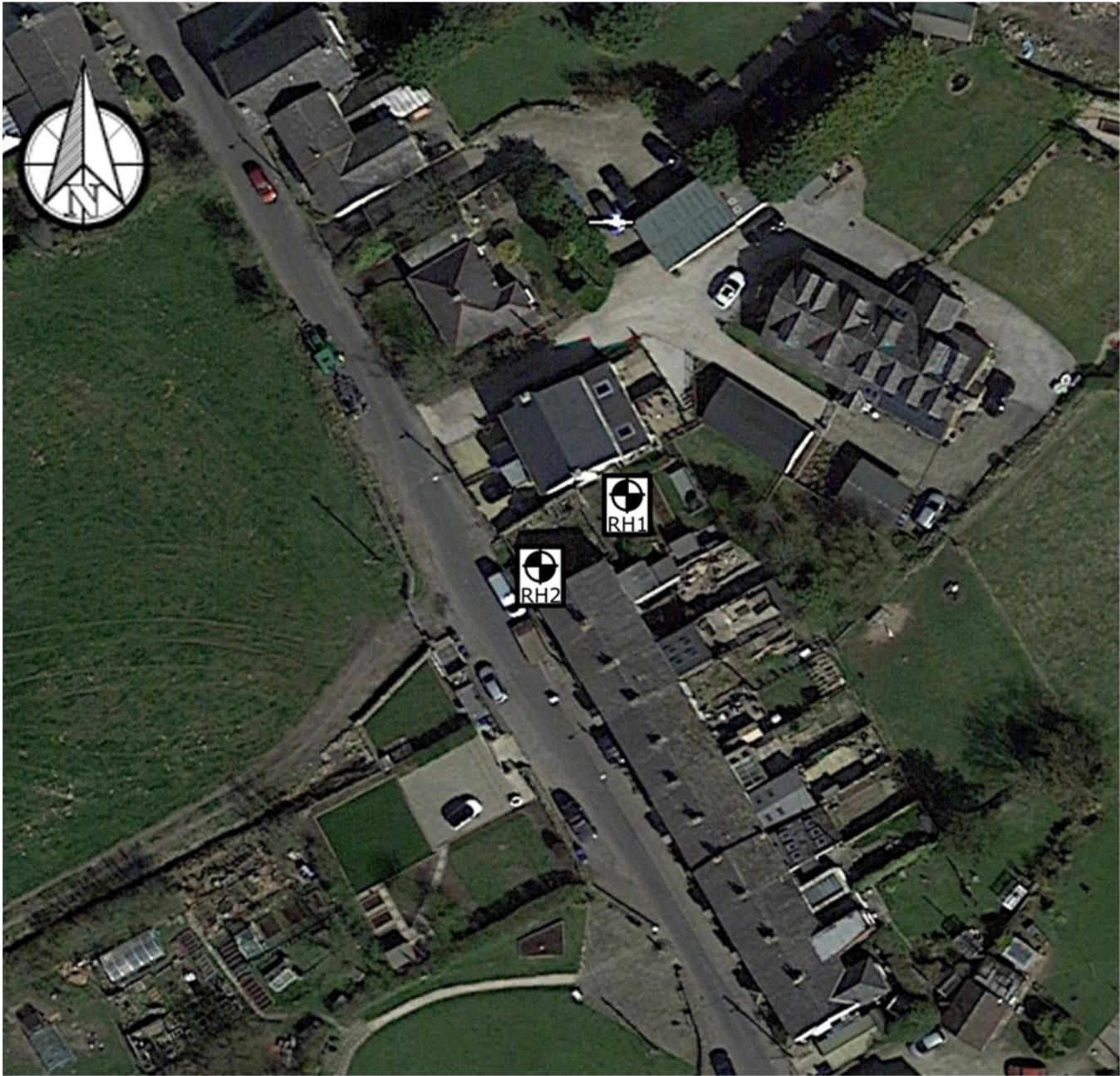
Email enquiries@geoinvestigate.co.uk

APPENDIX 1

Site Plan & Borehole Logs

GEOINVESTIGATE Ltd.

OUR REF: G22403	YOUR REF:	SITE PLAN (NOT TO SCALE)
DATE: 29/09/2022	LOCATION: Watling Street, Bury BL8 3QW	



Key:



Rotary borehole positions

GEOINVESTIGATE Ltd.**Your Ref.****Our Ref.** G22403**RH No.1 Sheet No. 1 of 1****Location:** 88 Watling Street, Affetside, Bury BL8 3QR**Date**

29/09/22

Depth (m)	Description of Strata	Thick-ness	Legend	Gas Well	Sample	Test Type Result	Flush	Depth to Water	Depth (m)
4.20	Very weak DRIFT								2.50
20.0	SANDSTONE with MUDSTONE inclusions								5.00
									7.50
									10.00
									12.50
									15.00
									17.50
									20.00
	Borehole terminated at 20.00m due to refusal								

Remarks: Casing to 1.00m

Microdrill rotary open hole borehole to 20.00m

No cores recovered from borehole

No gas detected from borehole on completion

No Flush.

No voids encountered.

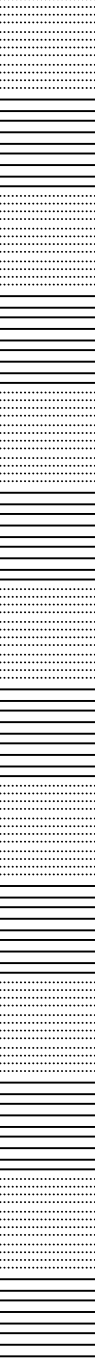
Key:

 Slotted Pipe
 Plain Pipe
 Bentonite
 Gravel Filter

O Disturbed sample**Cv** Shear vane**W** Water sample**S** Standard Penetration Test**C** Cone Penetration Test**RH1**

GEOINVESTIGATE Ltd.**Your Ref.****Our Ref.** G22403**RH No.2 Sheet No. 1 of 1****Location:** 88 Watling Street, Affetside, Bury BL8 3QR**Date**

29/04/22

Depth (m)	Description of Strata	Thickness	Legend	Gas Well	Sample	Test Type Result	Flush	Depth to Water	Depth (m)
4.20	Brown and light brown DRIFT	4200							2.50
25.0	Brownish grey SANDSTONE/ MUDSTONE Becoming light yellowish brown from 4.60m Becoming orangish brown and grey from 9.0m	20800							5.00 7.50 10.00 12.50 15.00 17.50 20.00 22.50 25.00
25.0	Borehole terminated at 25.00m								25.00

Remarks: Casing to 1.00m

Microdrill rotary open hole borehole to 25.00m

No cores recovered from borehole

No gas detected from borehole on completion

Full flush maintained. No voids encountered.

Key:
 Slotted Pipe
 Plain Pipe
 Bentonite
 Gravel Filter
O Disturbed sample**Cv** Shear vane**W** Water sample**S** Standard Penetration Test**C** Cone Penetration Test**RH2**



The Coal
Authority

Permit to Enter or Disturb Coal Authority Interests

Permit 25629

Name and Address of Permit Holder:

Mr & Mrs A Mackenzie
Tom Nook Farm
Turton Road
Tottington
Bury
BL8 3QG

Site Location:

Land adj to
88 Watling Street
Affetside

DesignTeam:(3) DESIGN102 - TEAM:Claire Hothy:DECC
Horizon outline 2.png

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

Ground investigation by two 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: Paul Hobson Granted Date: 23 September 2022

For and on behalf of The Coal Authority

Nominated Representative: Paul Hobson, 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: 25629

Permit Boundary:



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APPENDIX 2

Coal Mining Risk Assessment



EARTH ENVIRONMENTAL
& GEOTECHNICAL

Coal Mining Risk Assessment

Watling Street

Bury

September 2021

On behalf of

Mrs. Mackenzie

Earth Environmental & Geotechnical Ltd
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COAL MINING RISK ASSESSMENT

WATLING STREET

BURY

FOR

MRS. MACKENZIE

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Tel 0161 9756088

Report No. A4355/21

SEPTEMBER 2021

Report Title:	Watling Street, Bury Coal Mining Risk Assessment	
Report Reference:	A4355/21	
Client:	Mrs. Mackenzie	
Issue Date:	27th September 2021	
Drafted By:	E Czarnecki	
Reviewed By:	A Czarnecki BSc (Hons) FGS CGeol	<i>A Czarnecki</i>
Authorised By:	A Czarnecki BSc (Hons) FGS CGeol	<i>A Czarnecki</i>

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The findings and opinions conveyed in this report are based on information obtained from a variety of sources as detailed and which Earth Environmental & Geotechnical assumes to be reliable but have not been independently confirmed. Therefore, Earth Environmental & Geotechnical cannot and does not guarantee the authenticity or reliability of third-party information it has relied upon.

Where opinions expressed in this report are based on current available guidelines and legislation, no liability can be accepted by Earth Environmental & Geotechnical for the effects of any future changes to such guidelines and legislation.

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Appendix 1	Coal Authority Consultants Mining Report
Appendix 2	Report Limitations

1.0 INTRODUCTION

Appointment

- 1.1 Earth Environmental & Geotechnical Ltd have been commissioned by Mrs. Mackenzie (the Client), to undertake a Coal Mining Risk Assessment for a proposed new residential dwelling on vacant land along Watling Street, Bury.
- 1.2 This Coal Mining Risk Assessment is required to accompany a future planning application to Bury Council.

Objective

- 1.3 The purpose of the Coal Mining Risk Assessment is to collate available geological, mining, and historical data to assess the potential for the site to be affected by underground mining.
- 1.4 This report has been drafted in accordance with the Coal Authority (CA) Guidance Risk Based Approach to Development Management, Version 4, 2017.

Sources of Information

- 1.5 The Coal Mining Risk Assessment compiles a review of the following information sources:
- British Geological Survey of England, Sheet 76 Rochdale, 1/50,000 scale, 2008 edition.
 - British Geological Survey of England, SD71SE, 1/10,000, 2007 edition.
 - Coal Authority Interactive Map Viewer.
 - Coal Authority Mining Report.
 - British Geological Survey online borehole records.
 - Google Earth imagery.
 - Online Historical Ordnance Survey maps.
 - Site Investigations in Areas of Mining Subsidence, FG Bell, 1975.
 - The threat of abandoned mines on the stability of urban areas, Barry Clarke, IAEG2006 Paper Number 379, The Geological Society of London, 2006.
 - The collapse of shallow coal mine workings, Durham theses, Durham University, Garrard, 1981.
 - Construction over abandoned mineworking's, CIRIA Special Publication 32, 2002.
 - Abandoned Mineworking's Manual, CIRIA 2019.
 - Bury Council planning portal.
 - Geology of the Burnley Area, BGS Internal Report WA/00/30, 2004.

2.0 SITE LOCATION AND DESCRIPTION

- 2.1 The site is located approximately 1.9km west of Tottington town centre and lies at an elevation of approximately 273mAOD (centre of site).
- 2.2 The approximate National Grid Reference for the centre of the site is SD75454 13730 with the closest postcode being BL8 3QN.
- 2.3 The site lies adjacent to Watling Street adjacent to terraced properties in an agricultural setting on the fringe of an urban area.
- 2.4 A location plan is shown below as Figure 1 together with a photograph as Figure 2 (overleaf).

Figure 2 Site Location Plan

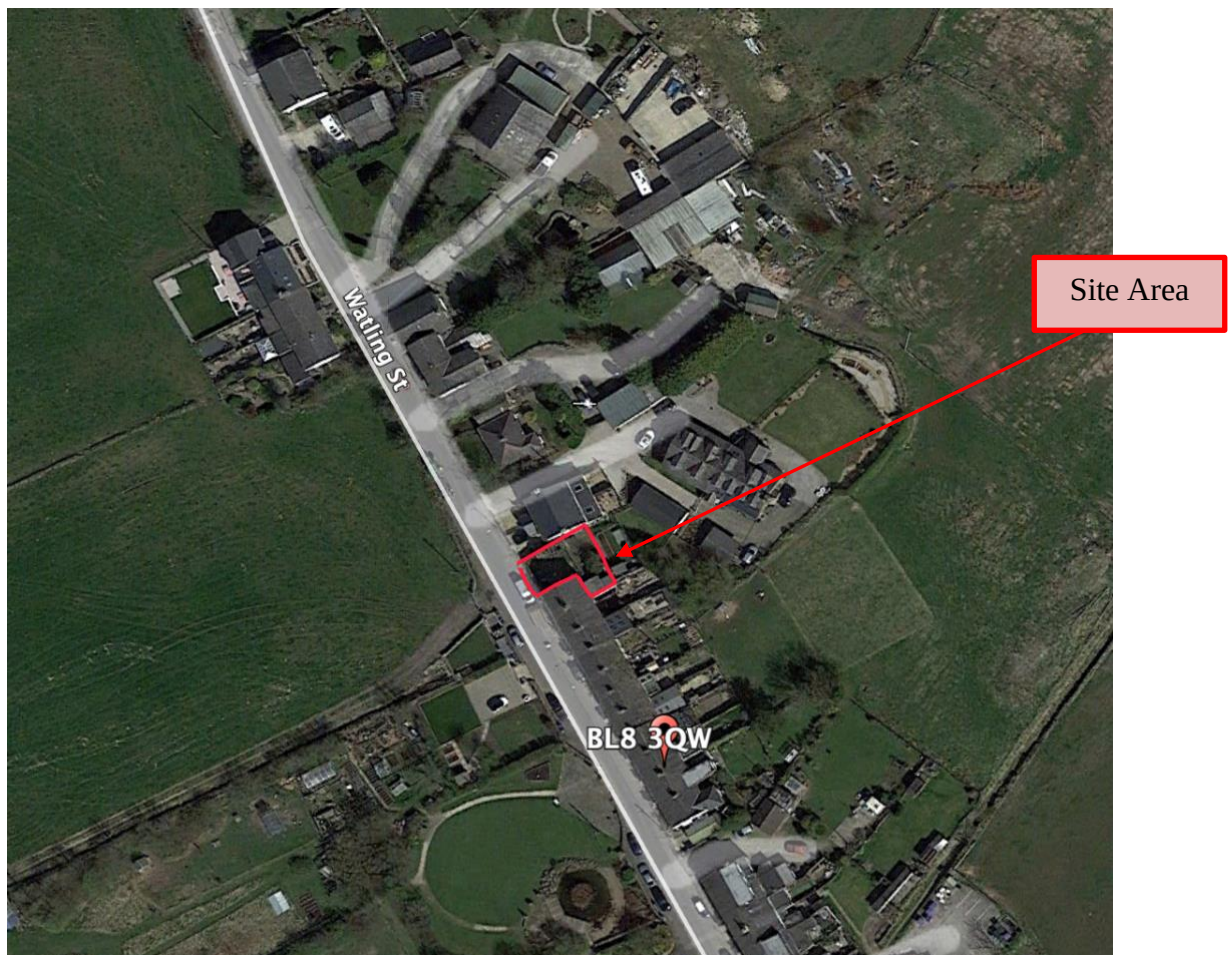
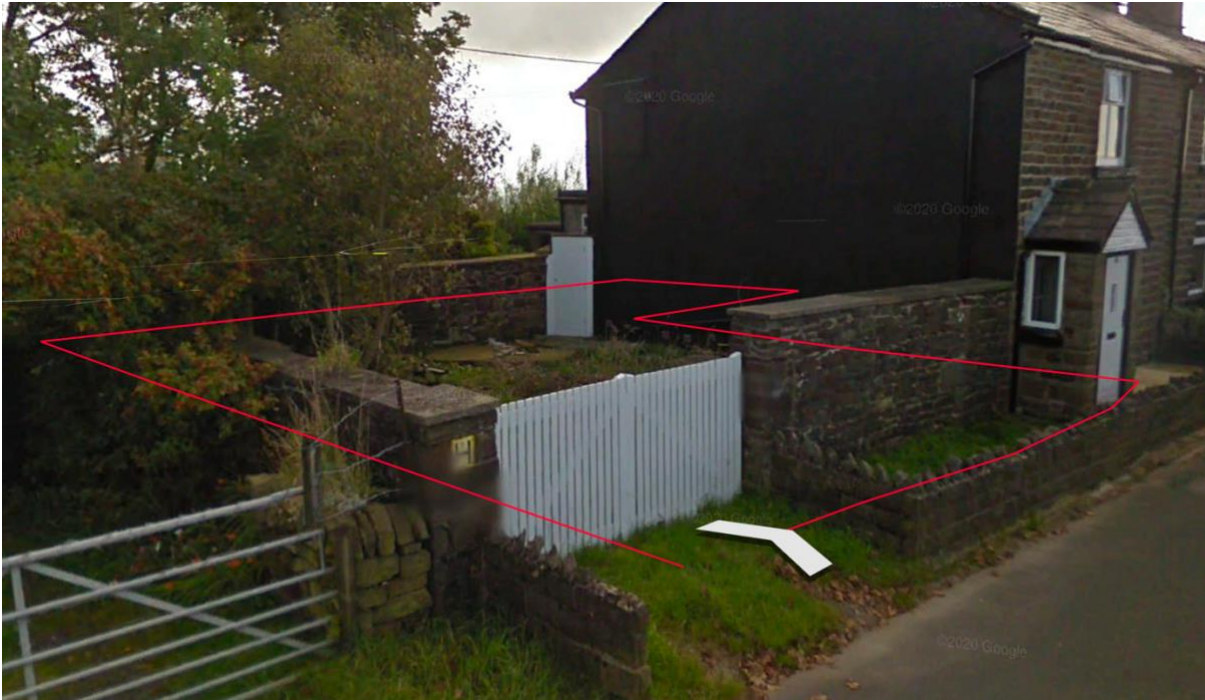


Figure 2 Aerial Photograph



3.0 ASSESSMENT OF DATA

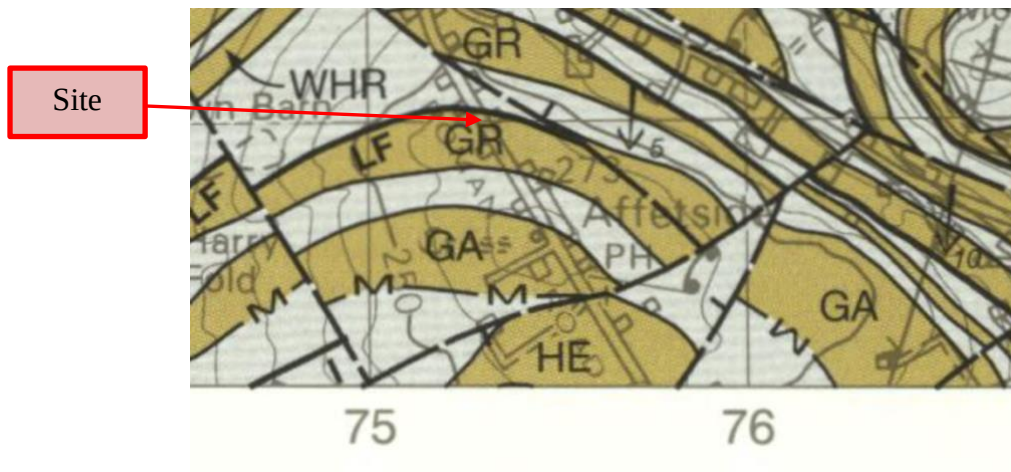
Geological Information

- 3.1 The geology of the site has been determined from geological maps for the area and examination of Coal Authority (CA) records.

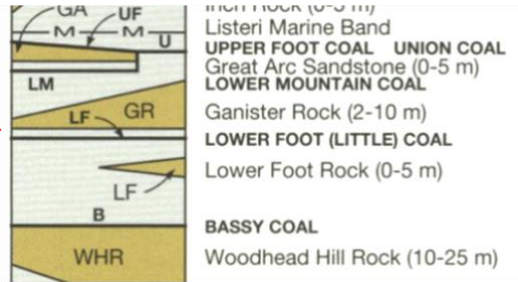
British Geological Survey Published Data Assessment

- 3.2 The site is not underlain by superficial deposits.
- 3.3 The solid geology beneath the site is shown to be the Pennine Lower Coal Measures Formation consisting of coal seams, sandstones, siltstones, and mudstones.
- 3.4 There no BGS borehole records that allow for further assessment of the local geology or shallow coal mining regime.
- 3.5 An extract from the most recently published geological map showing the approximate site location and key local geological features are presented below in Figure 3.
- 3.6 The outcrop of the Lower Foot coal seam is shown on the site, underlain by the Bassy coal seam. The Lower Foot coal seam is present about 13m above the Bassy coal the intervening strata being composed of mudstone. The thickness of the Lower Foot coal seam is 0.31m at Old Burnt Hall Pit (SD82NW/4).
- 3.7 The local dip direction is five degrees to the south.

Figure 3 Geology Map Extract



Lower
Foot coal
seam

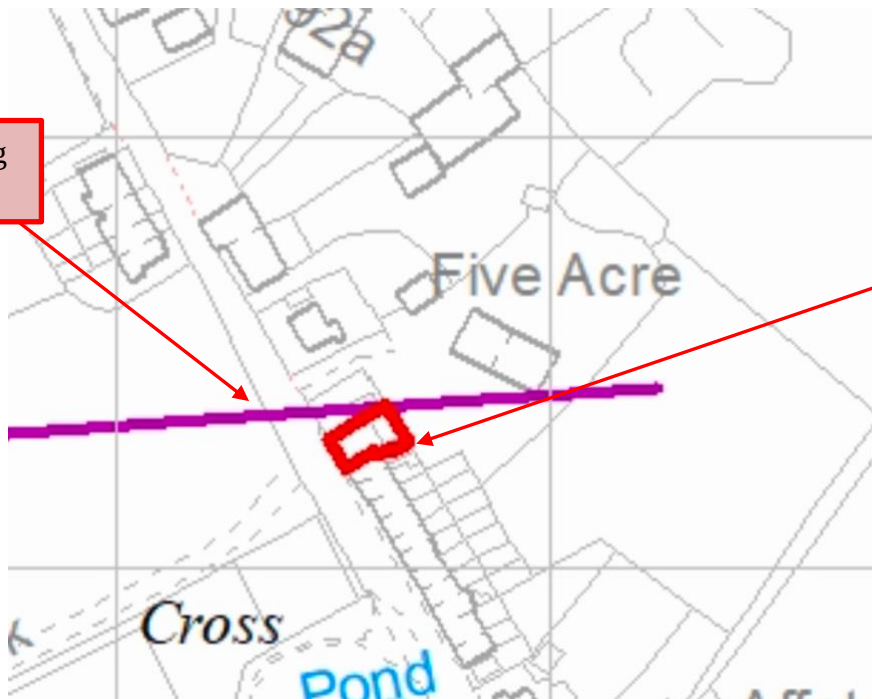


Coal Authority Records

- 3.8 Reference to the Coal Authority Online Interactive viewer shows the site to be located within a Development High Risk Area and area of Probable Shallow Mineworkings.
- 3.9 A Coal Authority Mining Report (extract shown as Figure 4) has been acquired for the site and reveals that there are no proven records of past underground mine workings beneath the site.

Figure 4 Coal Authority Map Extract

Outcropping
coal seam



Site

- 3.10 The Coal Authority report suggests that there are probable unrecorded shallow workings beneath the site. There are no past shallow coal mine workings within the area.
- 3.11 The Upper Foot coal seam outcrops on the northern the site boundary.
- 3.12 There are no records of any geological faults, opencast mines, subsidence, managed tips, or remediated sites.

Historical information

- 3.13 The available historical plans dating back to 1875 show no mining features on the site or in the local area.

4.0 COAL MINING RISK ASSESSMENT

Scope of Coal Mining Risk Assessment

- 4.1 Objectives of the coal mining risk assessment are to provide a desk-based assessment of available geological and mining information relating to the site (and wider area) and to use this information so as to identify risks present to the development from the legacy of mining.
- 4.2 As part of the risk assessment, potential mitigation measures (if required) should be considered, including any necessary remedial works.
- 4.3 The outcome of the risk assessment should demonstrate to the Local Authority that the proposed development is or can be made safe (and stable) to meet the requirements of the National Planning Policy Framework (NPPF).

Data Limitations

- 4.4 It should be appreciated that it did not become a legal requirement to deposit coal mining abandonment plans until the 1870's and that this requirement was not rigorously enforced for some time after. Many shallow coal seams were worked prior to the introduction of first edition Ordnance Survey Maps and information on these workings is often not available. Therefore, if coal seams were accessible then there is the potential that they could have been worked by formal or informal means.
- 4.5 It is also possible that if unrecorded workings are present then unrecorded mine entries may be present.

Coal Mining Risks

- 4.6 The risks associated with coal mining are as follows:
- Collapse of relict workings beneath buildings causing damage to the building fabric and infrastructure.
 - Migration of mine gases from old mine workings and mine entries resulting in accumulation of flammable and asphyxiating gases in confined areas.
 - Consolidation of relict workings and overlying strata causing structural defects in building fabric and infrastructure.
 - Failure of mine entries causing loss of ground beneath building and external areas.
 - Spontaneous combustion of old mine workings.

Conclusions

- 4.7 The development area lies within a Coal Authority Development High Risk Area due to probable shallow mine workings beneath the site, associated with the Lower Foot coal seam.

Proposed Mitigation Strategy

- 4.8 There is a risk to the development from shallow coal mining activity beneath the site from a thin and a locally outcropping coal seam.
- 4.9 It would be prudent to incorporate a reinforced raft foundation for the new residential dwelling.
- 4.10 During the construction process all foundation excavations should be inspected if coal seams or evidence of former mineworkings are exposed.
- 4.11 If such features are found, then a remediation strategy will need to be implemented.
- 4.12 This report should allow for planning permission to be granted with relevant conditions.

APPENDIX 1

COAL AUTHORITY MINING REPORT

APPENDIX 2

REPORT LIMITATIONS

REPORT LIMITATIONS

This contract was completed by Earth Environmental & Geotechnical Ltd on the basis of a defined programme and scope of works and terms and conditions agreed with the client. This report was compiled with all reasonable skill, and care, bearing in mind the project objectives, the agreed scope of works, the prevailing site conditions, the budget and staff resources allocated to the project.

Other than that, expressly contained in the above paragraph, Earth Environmental & Geotechnical Ltd provides no other representation or warranty whether express or implied, is made in relation to the services. Unless otherwise agreed this report has been prepared exclusively for the use and reliance of the client in accordance with generally accepted consulting practices and for the intended purposes as stated in the agreement under which this work was completed. This report may not be relied upon, or transferred to, by any other party without the written agreement of a Director of Earth Environmental & Geotechnical Ltd.

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The report was written in 2021 and should be read in light of any subsequent changes in legislation, statutory requirements and industry best practices. Ground conditions can also change over time and further investigations, or assessment should be made if there is any significant delay in acting on the findings of this report. The passage of time may result in changes in site conditions, regulatory or other legal provisions, technology or economic conditions which could render the report inaccurate or unreliable. The information and conclusions contained in this report should not be relied upon in the future without the written advice of Earth Environmental & Geotechnical Ltd. In the absence of such written advice of Earth Environmental & Geotechnical Ltd, reliance on the report in the future shall be at the client's own and sole risk. Should Earth Environmental & Geotechnical Ltd be requested to review the report in the future, Earth Environmental & Geotechnical Ltd shall be entitled to additional payment at the then existing rate or such other terms as may be agreed between Earth Environmental & Geotechnical Ltd and the client.

The observations and conclusions described in this report are based solely upon the services that were provided pursuant to the agreement between the client and Earth Environmental & Geotechnical Ltd. Earth Environmental & Geotechnical Ltd has not performed any observations, investigations, studies or testing not specifically set out or mentioned within this report.

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The services are based upon Earth Environmental & Geotechnical Ltd observations of existing physical conditions at the site gained from a walkover survey of the site together with Earth Environmental & Geotechnical Ltd interpretation of information including documentation, obtained from third parties and from the client on the history and usage of the site. The findings and recommendations contained in this report are based in part upon information provided by third parties, and whilst Earth Environmental & Geotechnical Ltd have no reason to doubt the accuracy and that it has been provided in full from those it was requested from, the items relied on have not been verified.

No responsibility can be accepted for errors within third party items presented in this report. Further Earth Environmental & Geotechnical Ltd was not authorised and did not attempt to independently verify the accuracy or completeness of information, documentation or materials received from the client or third parties, including laboratories and information services, during the performance of the services. Earth Environmental & Geotechnical Ltd is not liable for any inaccurate information, misrepresentation of data or conclusions, the discovery of which inaccuracies required the doing of any act including the gathering of any information which was not reasonably available to Earth Environmental & Geotechnical Ltd and including the doing of any independent investigation of the information provided to Earth Environmental & Geotechnical Ltd save as otherwise provided in the terms of the contract between the client and Earth Environmental & Geotechnical Ltd.

Where field investigations have been carried out these have been restricted to a level of detail required to achieve the stated objectives of the work. Ground conditions can also be variable and as investigation excavations only allow examination of the ground at discrete locations. The potential exists for ground conditions to be encountered which are different to those considered in this report. The extent of the limited area depends on the soil and groundwater conditions, together with the position of any current structures and underground facilities and natural and other activities on site. In addition, chemical analysis was carried out for a limited number of parameters [as stipulated in the contract between the client and Earth Environmental & Geotechnical Ltd] based on an understanding of the available operational and historical information, and it should not be inferred that other chemical species are not present.

The groundwater conditions entered on the exploratory hole records are those observed at the time of investigation. The normal speed of investigation usually does not permit the recording of an equilibrium water level for any one water strike. Moreover, groundwater levels are subject to seasonal variation or changes in local drainage conditions and higher groundwater levels may occur at other times of the year than were recorded during this investigation.

Any site drawing(s) provided in this report is (are) not meant to be an accurate base plan but is (are) used to present the general relative locations of features on, and surrounding, the site.

APPENDIX 3

Site Images

