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Mr Rob Agus
Office One
34 Victoria Road
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S70 2BU

Date: 1st August 2019
Your ref: (S70 5ET)
My Ref: SI 00216

FOR THE ATTENTION OF MR ROB AGUS & MR DOUGLAS REMINGTON

Dear Sir,

COAL MINING RISK INTERPRETATION REPORT – FOLLOWING THE SITE INVESTIGATION FOR PROPOSED RESIDENTAIL DEVELOPMENT AT FORMER GARAGE SITE, CLAYROYD, WORSBROUGH BRIDGE, BARNSLEY S70 5ET.

I am pleased to supply the following report for the above named project and trust that this satisfies your requirements. Please do not hesitate to contact myself at any time for further clarification or advice.

Yours Sincerely,

M Lyons

M. Lyons
Consultant Mining Engineer
BSci CSci MIMMM

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1. Introduction

Conditional planning permission has been secured for the development of four semi-detached dwellings (two separate buildings) at the above location subject to the mining legacy risks being fully realised and mitigated from on site, if necessary. Cape Site Services has now undertaken this work via an intrusive site investigation of 4 boreholes, the location of which is outlined on plan no. 00216/B – as illustrated in appendix 5.2.

2. Scope of the Report

The mining legacy risks to the development are as follows:

- Instability from shallow coal workings in the Low Beamshaw coal seam
- Colliery spoil / made ground / associated contamination
- Uncharted mine entries
- Fugitive gas emissions

As such, these risks need to be properly determined to ensure sound stability for the development. A borehole investigation consisting of 4 or 6 holes was deemed a reasonable level of investigation in the outset regarding potential void migration given the scale and nature of development combined with the available geological and mining information. A watching brief would also be implemented for any signs of mine entries.

It should be noted that this investigation is focused mainly on determining stability from potential shallow historic coal workings and will only provide limited information regarding the risks of uncharted mine entries. A good level of detail should be obtained to provide a more informed opinion as to fugitive gas risks and the potential for colliery spoil and/or contamination.

The works were undertaken under the Coal Authority permit ref: 18093. Considering the risk assessment detail, along with regulatory requirements, only the Low Beamshaw coal seam was thought necessary to be investigated – local details show that the next seam below (Kents Thin seam at around 600mm thickness) is very likely to be too deep to interact be it worked or otherwise (estimated at around 15m or more below the Low Beamshaw).

It should be noted that the details of this report should be presented to suitably qualified design/structural engineers to use the information provided in order to arrive at an agreed foundational solution with the regulators and Coal Authority prior to any further works taking place.

3. Site Investigation

3.1 Methodology

Prior to the intrusive site investigation, a search for utilities was undertaken both via online data providers and physically on site using a Cable Avoidance Tool (CAT). Boreholes were marked out with tape measure from boundary and building lines as illustrated on plan no. 00216/B outlined in appendix 5.2, where boreholes to investigate the coal seam are marked as 'BH'. As part of the mine entry watching brief, a pre survey was undertaken with no visible evidence of any unchartered mine entries. The process for the intrusive coal seam investigation is outlined via the system chart in appendix 5.4.

An investigation utilising a tracked Baretta Rotary Drill Rig equipped with 2m long 70mm diameter drill rods and 100mm drill bit was deemed appropriate in this instance along with water flush technique to analyse returns and minimise any risks associated with mine gas emissions and spontaneous combustion. Gas monitoring equipment would be employed during works for risks associated with Methane, Carbon Monoxide, Oxygen and Carbon Dioxide. Any boreholes emitting dangerous levels of gas would be terminated and sealed immediately. All holes to be filled and sealed as soon as possible with bentonite upon termination. Prior agreement had been secured for these works from the Coal Authority - permit ref: 17995.

The works were to be supervised by the Drilling Engineers Mr. S. Fish and Mr I. Wiles, and overseen by the Principal Engineer Mr. M. Lyons.

3.2 Interpretation of Findings

The surface is shown as between 0.4m and 0.7m of fill material, above around 1.2m of sandy/silty brown firm clay. Below this is mainly sandstone with some mudstone bands included. A main zone of badly broken ground, of around 1m thickness, which led to total loss of flush was encountered in holes 2, 3 and 4 at between 6.9m to 9m deep. This appears consistent with what depths the Low Beamshaw seam would be anticipated at according to latest BGS records. The strata above, mainly sandstone, contained fracturing in all holes that led to some loss of flush, but which returned after a short while. Apart from the fracturing, the rock appeared very firm above and below the suspected seam horizon, which suggests that very historic coal workings may well have worked out virtually the entire Low Beamshaw coal in these parts, with having a good roof structure at that time. As such it is anticipated that the majority of settlement into such historic mining voids is very likely to have already taken place, hence no major voids encountered. The loss of flush meant that we could not reach further depths that 11m, but considering the details (seam thickness/CIRIA 32) this was considered enough detail to be able to draw adequate conclusions from, with no deeper seams requiring investigation. No dangerous levels of gas were encountered throughout the investigation.

4. CONCLUSIONS AND RECOMMENDATIONS

(Based on CIRIA Special Publication 32 – development over abandoned mine workings)

1) Appropriates depths to sound formation level beneath the fill material should be agreed with the appointed Building Control Officer for the development.

2) Although the investigation has determined what is believed to be evidence of mine workings at what is thought to be the Low Beamshaw seam horizon, it is considered that the overlying strata will have largely settled now and that few major voids will exist. Nevertheless, some risk still remains for slight settlement given the findings, particularly as the strata becomes loaded with the proposed development. As such, a drilling and grouting plan could be considered if a belt and braces approach is desired (to fill any remaining mining voids), but it may be a more pragmatic solution, given scale of development, that a suitably designed/strengthened foundation is adopted such as a reinforced raft - that could span for example a 3m soft spot and cantilever 1.5m. Of course some element of piling could also be considered, with or without the raft. *This information should be presented to a structural engineer for further advice accordingly.*

3) A watching brief should be employed during future ground works for any signs of weak ground in areas not covered by this investigation. Further enquiries may be necessary or suitably designed/strengthened foundations if required.

4) No signs of any mine entries were observed during the investigation, however some risks are always present within the exposed coalfield for discovering such features, particularly when shallow coal workings are present. Watching briefs should be undertaken during future ground works for any associated signs of either an old mine shaft or adit. The Coal Authority should be notified where any such feature is suspected.

5) No fugitive gases were encountered and given the findings it is considered unlikely for such issues in this instance. However, if any are suspected during future excavation work, further studies/monitoring should be undertaken with a view to any mitigation requirements by way of methane membranes and/or positive ventilation.

6) If a drilling and grouting solution is preferred then a prior agreement and permit will be required from the Coal Authority.

NOTE: This report and future development proposals should be submitted to the regulators for their approval prior to any works taking place.

I trust that this satisfies your requirements, however please do not hesitate to contact myself at any time for further clarification or advice.

Yours Sincerely,

M Lyons

M. Lyons
Consultant Mining Engineer
BSc CSci MIMMM

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5 Appendix

5.1 References

5.1.1 CIRIA Special Publication No 32 ‘Construction Over Abandoned Mine Workings’.

5.1.2 British Standards Institution: BS 5930:2015 ‘Code of practice for ground investigations’ BSI 2015.

5.1.3 British Standards Institution: BS EN ISO 14688-1: 2002 + A1 2013 ‘Geotechnical Investigation and Testing - Identification and Classification of Soil - Part 1 - Identification and Description. BSI 2013.

5.1.4 British Standards Institution: BS EN ISO 14689-1: 2003 ‘Geotechnical Investigation and Testing – Identification and Classification of Rock – Part 1 – Identification and Description. BSI 2003. Incorporating Corrigendum No. 1 February 2007.

5.1.5 British Standards Institution: BS 10175 ‘The Investigation of Potentially Contaminated Sites. Codes of Practice’. BSI 2011+A1 2013.

5.1.6 British Standards Institution: BS EN ISO 22476-3: 2005 + A1 2011 ‘Geological Investigating and Testing. Field Testing. Standard Penetration Test’.

5.1.7 British Stardard 1377:1990 Parts 1-9 ‘Methods of Test for Soils for Civil Engineering Purposes’.

5.2 Borehole Location Plan – Scale 1 : 500 ***(image @A4)***



5.3 Drilling log sheets

Borehole	From (m)	To (m)	Thickness (m)	Description
1	0.00	0.70	0.70	Fill
	0.70	3.50	2.80	Sandstone; brown; silty
	3.50	4.00	0.50	Broken; bad; lost water, no returns
	4.00	5.00	1.00	Solid
2	0.00	0.50	0.50	Fill
	0.50	1.80	1.30	Clay; sandy; brown
	1.80	4.00	2.20	Sandstone; brown
	4.00	6.00	2.00	Fractured; lost flush; no returns
	6.00	6.90	0.90	Flush returned; sandstone; brown; broken
	6.90	7.90	1.00	Lost flush; broken; bad
	7.90	9.00	1.10	Solid; no returns
3	0.00	0.40	0.40	Fill
	0.40	1.50	1.10	Clay; sandy; brown
	1.50	3.00	1.50	Sandstone; brown; mudstone bands
	3.00	3.50	0.50	Lost flush; no returns
	3.50	9.00	5.50	Flush returned; sandstone; brown; some loss @5m
	9.00	9.80	0.80	Lost flush; broken; bad
	9.80	11.00	1.20	Solid; no returns
4	0.00	0.40	0.40	Fill
	0.40	1.50	1.10	Sandstone; silty brown clay
	1.50	3.50	2.00	Sandstone; brown; mudstone bands
	3.50	3.80	0.30	Lost flush; no returns
	3.80	8.50	4.70	Flush returned; sandstone; brown
	8.50	9.30	0.80	Lost flush; broken; bad
	9.30	11.00	1.70	Solid; no returns

5.4 Site Investigation Process

