

**Mr Rob Agus
Office One
34 Victoria Road
Barnsley
S70 2BU**

**CAPE SITE SERVICES
COAL MINING & GEOTECHNICAL
CONSULTANCY**

Web: www.cape-site.co.uk
Email: cape-site@btconnect.com
Tel: 01226 725050

Date: 14th June 2019
Your ref: (S75 1LR)
My Ref: SI 00212

FOR THE ATTENTION OF MR ROB AGUS

Dear Sir,

**COAL MINING RISK INTERPRETATION REPORT – FOLLOWING THE SITE
INVESTIGATION FOR A PROPOSED WORKSHOP EXTENSION DEVELOPMENT AT KEN
MALINSON LTD, CLAYCLIFFE ROAD, BARUGH BARNESLEY S75 1LR**

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

THIS REPORT IS BASED ON AND LIMITED TO THE INFORMATION IN MY RECORD AT THE TIME THE ENQUIRY IS ANSWERED. It is based on my professional opinion in line with the guidelines set out in CIRIA Special Publication 32 - "Construction Over Abandoned Mine Workings. Copyright in this report belongs to M.A.Lyons. All rights are reserved and unauthorised use is prohibited. Copyright is not transferred to external parties by possession of this report, however, those for whom the report is compiled have the right to use it. If any unauthorised third party comes into possession of this report, they rely upon it entirely at their own risk and the author does not owe them any Duty of Care or Skill.

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1. Introduction

Planning permission is being considered for the development of a workshop extension at the above location subject to the mining legacy risks been fully realised and mitigated from on site, if necessary. Cape Site Services has now undertaken this work via an intrusive site investigation of 5 boreholes, the location of which is outlined on plan no. 00212/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 Top & Low Haigh Moor coal seams
- 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 5 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 as detailed in the Coal Mining Risk Assessment ref: TH/RA/MALL/001 dated 16th March 2016 – as prepared by Timothy Hyett of Earth Tech Consulting Ltd. 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: 17995. Considering the risk assessment detail, along with regulatory requirements, both the Top and Low Haigh Moor coal seams were deemed necessary to be checked, as the Low Haigh Moor seam is of a thickness and distance below the Top seam that suggests it may interact with stability issues should old workings be present. The Top Haigh Moor seam is indicated to have been worked via pillar and stall methods beneath this area, therefore the exact depth and nature needs to be ascertained to fully realise the situation.

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. 00212/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 uncharted 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 a dangerous level of methane 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

In general, the investigation has determined the following sectional detail in order from the surface:

Thicknes (m)	Details
0.3	Concrete hardstanding
2 to 4.3	Colliery spoil fill with some hydrocarbon (fuel) contamination
2.5 to 6.2	Very weathered and soft sandstone
1	Coal seam; worked; packed waste; voids (Top Haigh Moor)
8.2	Firm grey/brown sandstone
1.2	Coal; in-tact (Low Haigh Moor)
to 4.2	Firm sandstone

Evidence of fuel was noticed within the fill/colliery spoil beneath the hardstanding both visibly (sheen) and through odour in holes 2, 3 and 5. Casing was ensured to below this level to protect from ingress of contamination.

With regard to the higher Top Haigh Moor coal seam (generally proved at around 10m deep), poor coal was encountered in holes 1 and 3 which was considered to be packed waste material. Slightly better coal of 1m in thickness was encountered in hole 2, but was broken

with slight loss of flush, possibly indicating a coal pillar side. Holes 4 and 5 indicted voided old workings of 1.5m and 1.8m – indicting some likely void migration or roadway.

With regard the bottom Low Haigh Moor coal seam (generally proved at around 19.5m deep), the coal seam was proved in-tact at a thickness of 1.2m in holes 1, 2 and 3. Considering the firm strata above this horizon, no associated workings can be concluded of this seam at these locations.

Depths to firm ground varies between 7m and 11m, sometimes below the Top Haigh Moor coal seam horizon.

4. CONCLUSIONS AND RECOMMENDATIONS

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

- 1) Given the section of made ground/fill material above the shallow Top Haigh Moor coal workings, there is clearly a potential for settlement issues affecting stability of the proposed development from any migration of remaining voids and unconsolidated areas of the workings, particularly as the strata becomes loaded by the development. This is largely due to there not being at least ten times the coal thickness of competent strata between the top of the coal/workings and the likely formation level. A design solution to safeguard from this risk is recommended therefore by way of either a) piles driven to below the Top Haigh Moor seam and into the firm rock beneath (CIRCA 12m); b) a drill and grout regime to stabilise the coal mining voids and unconsolidated material; c) a strengthened foundation pad/raft; d) re-engineering and compaction of the made ground; or e) a combination of 2 or more of those.
- 2) Given the findings of this investigation along with the mines records it is unlikely that any workings in the Low Haigh Moor seam (at around 19.5m deep) are present to further affect stability. However, it would be prudent for during further works (once agreed upon) that the rock beneath the Top Haigh Moor seam is checked to ensure competency. Should any signs of weak collapsing ground (beneath the Top Haigh Moor seam) be noticed, further investigation of the Low Haigh Moor seam would be prudent.
- 3) Some contamination clean-up/remediation works are very likely to be required in regard to the contamination noticed within the colliery spoil fill material at the surface. A solution in this regard should be determined with use of a suitably qualified professional in consultations with the Local Authorities Contaminated Land Officer. Future trenching exercises may be utilised to determine more precise information as to the scale of likely requirements.
- 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, although given the presence of shallow coal workings, made ground, colliery spoil with some contamination, gas mitigation measures such as a methane membrane and/or positive ventilation would be recommended. A period of gas monitoring could be utilised to ascertain such requirements in more detail if desired.
- 6) It should be noted that another Permit will be required from the Coal Authority for any further works that will intersect their interests (coal/coal workings), such as piled foundations and/or drilling and grouting, in order to gain permission, understand their requirements and design the works accordingly.

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

Enc.

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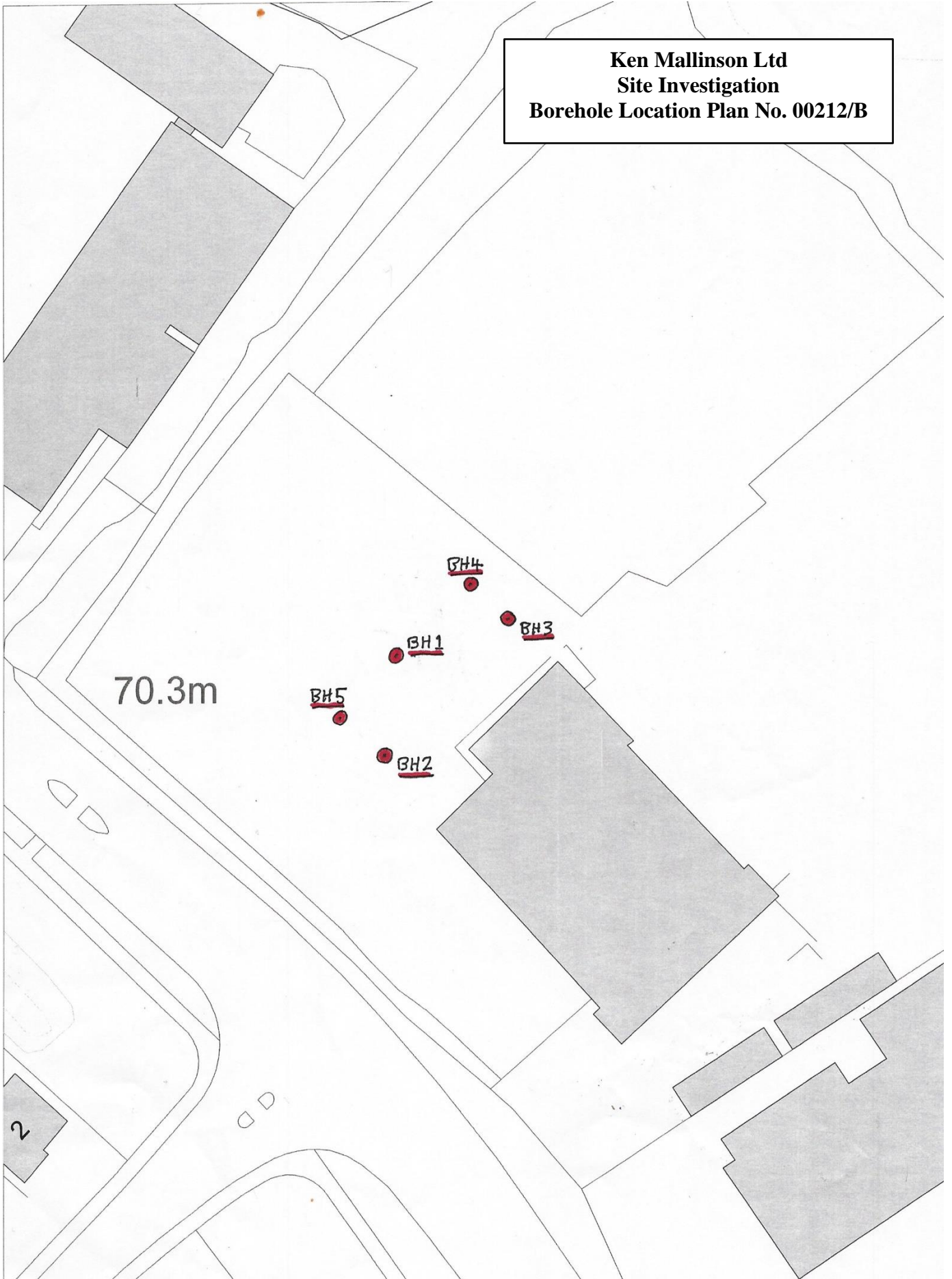
5 Appendix

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 Standard 1377:1990 Parts 1-9 'Methods of Test for Soils for Civil Engineering Purposes'.

5.2 Borehole Location Plan – Scale 1 : 500 @A4

Ken Mallinson Ltd
Site Investigation
Borehole Location Plan No. 00212/B



5.3 Drilling log sheets

CAPE SITE SERVICES
COAL MINING & GEOTECHNICAL
CONSULTANCY

Daily Return (Drilling)

Sheet No.	1
Date	03/06/2019
Contract Name	Mr. R. Agus
Contract No.	212
Working Day No.	1

Hole No.	Depth (m)	Casing (m)	Dia (m)	Angle	From (m)	To (m)	Description
BH1	25.00	2.00	100mm	Vertical	0	0.30	Concrete
					0.30	4.50	Fill / colliery spoil
					4.50	7.00	Sandstone; brown; very soft
					7.00	10.40	Sandstone; brown; hard
					10.40	11.40	Poor Coal; broken
					11.40	19.60	Sandstone; grey/brown; hard
					19.60	20.80	Coal
					20.80	25.00	Sandstone; grey/brown
BH2	22.00	4.20	100mm	Vertical	0	0.30	Concrete
					0.30	4.10	Fill; colliery spoil; fuel odour
					4.10	10.30	Sandstone; brown; soft
					10.30	11.30	Coal/broken; slight water loss
					11.30	19.50	Sandstone; grey/brown
					19.50	20.70	Coal
					20.70	22.00	Sandstone; grey/brown
					BH3	22.00	2.50
0.30	2.30	Fill; colliery spoil; fuel odour					
2.30	4.50	Mudstone; grey/silty					
4.50	7.30	Sandstone; brown; soft/fractured					
7.30	10.90	Sandstone; brown					
10.90	11.90	Poor Coal; broken					
11.90	20.00	Sandstone; grey/brown; hard					
20.00	21.20	Coal					
					21.20	22.00	Sandstone; grey/brown

Holes	Depth (m)	Casing (m)					
3	69.00	8.70	Sheet Total Previous Sheet Total Cumulative Total	Crew		Plant Beretta Rotary	
0	0.00	0.00		I. Wiles			
3	69.00	8.70		S. Fish	M. Lyons		

Signed: *M Lyons*

Date: 03/06/2019

CAPE SITE SERVICES
COAL MINING & GEOTECHNICAL
CONSULTANCY

Daily Return (Drilling)

Sheet No.	2
Date	04/06/2019
Contract Name	Mr. R. Agus
Contract No.	212
Working Day No.	2

Hole No.	Depth (m)	Casing (m)	Dia (m)	Angle	From (m)	To (m)	Description
BH4	11.30	2.00	100mm	Vertical	0	0.30	Concrete
					0.30	2.50	Fill / colliery spoil
					2.50	4.20	Mudstone; grey/silty
					4.20	7.00	Sandstone; brown; soft
					7.00	9.50	Sandstone: brown
					9.50	11.30	Void / workings
BH5	10.50	4.50	100mm	Vertical	0	0.30	Concrete
					0.30	4.30	Fill; colliery spoil; wet at base
					4.30	9.00	Sandstone; brown; soft
					9.00	10.50	Void / workings
2	21.80	6.50	Sheet Total Previous Sheet Total Cumulative Total	Crew		Plant Beretta Rotary	
0	0.00	8.70		I. Wiles			
5	90.80	15.20		S. Fish	M. Lyons		

Signed: *M Lyons*

Date: 04/06/2019

5.4 Site Investigation Process

Borehole Site Investigation (SI) Process Guide (Shallow Underground Coal Workings)

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