COMPLETION REPORT
FOR AN INVESTIGATION INTO
SHALLOW MINE WORKINGS AT
HILLSIDE INDUSTRIAL PARK
DRAYCOTT CROSS ROAD
CHEADLE, STAFFS ST10 1AB

Drilling borehole R3

TMGS
TELFORD MINING &
GEOLOGICAL SERVICES

March 2017

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1. **Introduction and Executive Summary**
2. This report is prepared in accordance with instructions from Mr Julian Tideswell of H Tideswells and Sons Ltd. The Hillside Industrial Estate has the benefit of a full planning permission (ref No SMD/2015/0182) for… *Extension to existing industrial estate,* which is for the erection of an extension to an existing building. See the attached Drg No 002. Condition No 6 of that permission requires that …*prior to commencement of works on site, intrusive site investigation works of the ground conditions should be undertaken in order to establish the exact situation regarding coal mining legacy issues on the site.*
3. Appropriate exploratory drilling works were duly undertaken, under licence from the Coal Authority, by Messrs Sonic Drilling of Sandbach on the 8th March 2017, under the supervision of TMGS. This report details the results of that work and concludes that the proposed new building footprint is not at risk from coal mining legacy issues.

4. **Geological and Mining Position - General**
   The published geological mapping indicates the general site area to be free of glacial superficial deposits. However this site was long occupied by a sizeable colliery undertaking, originally under the name of Klondyke colliery and later renamed New Haden Colliery which finally closed in 1943. Throughout this period considerable volumes of colliery spoil were thrown up and whilst the present site does not lie within the known area of tipping nevertheless the presence of some colliery spoil may be anticipated.
5. The published mapping records Middle Coal Measure strata around the horizon of the 2 Yard coal to come to outcrop across the wider site area. These measures comprise mudstones, siltstones and sandstones together with interbedded coal seams and associated seatearths. The general strata sequence locally is as follows (these coals were part of what was known as the 'Upper Pale Group':

Potteries coalfield name	Cheadle coalfield name	thickness
Bellringer or Stoney 8ft	Unnamed coal and smut	0.76
	measures	12.65
Ten Feet	2 Yard coal	1.68
	Ouster coal and clay	0.81
	measures	15.67
	Getley coal	0.46
	measures	6.23
Bowling Alley	Half Yard coal	0.74
	measures	12.7
Holly Lane	Yard coal	1.01
	measures	16.77
Hard Mine	Litley coal	0.81

These measures dip gently to the south west at around 6 degrees. The above table presents the local Cheadle seam names against their well known equivalents in the neighbouring Potteries coalfield. The unnamed coal and smut at the top of the sequence is a mix of coal and dirt and was not workable underground. By contrast the Bellringer was a widely worked coal although frequently spoilt by bands of siltstone and sandstone. The 2 Yard coal was widely worked across the south west portion of the Cheadle coalfield due largely to its good thickness. Its quality however is poor, suffering as it does from a rather high ash content. The so called Ouster coal was a banded sequence of thin bench coals and clays. The Getley coal seems to have no direct equivalent in the Potteries coalfield but in any case it was an inferior coal and was labeled as 'useless' on the local shaft sections and consequently was not worked. The Half Yard coal is recorded as being of 'fair' quality and was widely worked although many of the workings are very early and went unrecorded. Its Potteries equivalent, the Bowling Alley, was famously of very good quality. The Yard coal is recorded as being very good coal and in fact as making the best house coal in Cheadle and consequently it is thought to have been mined to exhaustion although again many of the workings are very old and went unrecorded. The underlying Litley coal was of variable quality and consequently was only worked patchily.

6. As referred to above all of these measures came to be known as the Upper Pale Group. This takes its name from the preponderance of weak light grey fireclay floors and weak light grey mudstone roofs to the coals. These 'Pale' measures proved particularly soft, especially in the presence of water and consequently it proved difficult and hence very costly to keep workings open. The recent Draycott Cross colliery, in attempting to work the 2 Yard in the 1980s and early 1990s experienced this very same problem and consequently closed in 1991. New Haden colliery itself eventually abandoned the working of these coals as uneconomic and instead found a new lease of life in the 1920s by deepening the shafts down to the famous Woodhead coal at a depth of 311m. The final phase of mining activity came in the late 1980s and early 1990s when the New Haden colliery spoil heap was washed and the shallow underlying 2 Yard coal was opencasted just west of the present site (ref Brookhouses and Cheadle LOMs). The 2 Yard coal was chased up to outcrop which lay only some 66m to the south west of BH1.

7. **Rotary Drilling Investigation and Interpretation**
8. This investigation was first of all designed to identify the detailed geological succession and structure directly beneath the site and in particular to prove the positions of the various named coal seams in relation to rockhead. Three rotary boreholes were drilled by Messrs Sonic Drilling on the 8th March 2017 using a Klemm 802 rotary percussive rig on water flush. The boreholes were located as shown on Drg No 002. A graphic presentation is given at Drg No 003 which correlates the boreholes against the New Haden colliery No 8 shaft section (just off the plan to the south east). Written borehole logs are given at Appendix 3.
9. BH1 proved thin fills onto yellow clays (probably completely weathered mudstones) at about 1.0m depth, becoming fresh rockhead at about 4.0m. This was followed by a sequence of grey mudstones and sandstones which gave way at 7.5m to a 1.0m thick zone of dark grey mudstone and coal bands representing the Getley coal. Further grey mudstones followed to 15.3m depth below which the borehole proved another zone of dark grey mudstone and abundant coal fragments to 16.0m which represents the Half Yard coal horizon. A partial loss of drill flush at 10.8m suggests the presence of workings in this coal although no soft ground was encountered. There then followed a sequence of grey mudstones and siltstones/sandstones until drill flush was lost at 23.3m. This was partially regained but lost again at 27.5m when the borehole proved broken ground extending to 28.4m, representing old workings in the Yard coal. The borehole proved solid ground immediately beneath

the Yard. Flush returned at 30.5m with mudstones and silty sandstones down to the full depth of 34.3m.

10. BH2 proved fills down to 1.8m followed by yellow clays to fresh rockhead at 3.5m depth. This was followed by grey mudstones down to 6.0m below which a dark mudstone wash together with abundant coal fragments down to 8.0m again marks the Getley coal horizon. Further grey mudstones followed to 13.4m and from 13.4m to 14.2m the borehole again encountered a dark wash with much coal debris. A partial loss of flush at 12.5m again is suggestive of workings in the Half Yard although the drilling proved only solid ground. Below the Half Yard a further sequence of grey mudstone was proved down to 17.4m when drill flush was lost and, after a partial recovery was finally lost at 18.8m depth. Although no soft or broken ground was encountered the loss of flush can only be due to workings in the Yard coal hereabouts. The borehole proved only solid ground down to a final depth of 33.0m.
11. BH3 proved somewhat thicker fills down to 2.3m, overlying yellow clays and with fresh rockhead at 3.0m depth. The Getley coal horizon was proved between 5.5m and 6.5m depth and a second zone of dark grey clay and coal from 13.0m to 14.0m represents the Half Yard coal. Drill flush was repeatedly lost and regained from 19.8m to 25.5m and a zone of black shale and soft coal was proved from 26.2m to 27.5m overlying a very soft zone to 27.8m depth. This is a remnant pillar in the Yard coal workings. Flush was finally lost at 27.5m and the borehole proved solid drilling from 27.8m to the final depth of 33.0m.

12. **Appraisal of Shallow Mining Position**
13. The drilling, logging and interpretation of the three rotary boreholes has confirmed the proposed new building footprint to be underlain by relatively thin fill overlying completely weathered mudstones, with fresh rockhead at between 3m and 4m depth. Below rockhead a sequence of mudstones, sandstones and coal horizons was proved which correlates remarkably well with both the neighbouring New Haden No 8 shaft section and the nearby Delphouse colliery section. Old workings were proven (directly or indirectly) in the Yard coal in all three boreholes, which was anticipated. There are also strong indications of workings in the overlying Half Yard coal – ie loss of drill flush overlying the Half Yard in boreholes 1 and 2, although the abundant coal fragments encountered at the Half Yard horizon possibly suggest only partial extraction with remnant crushed pillars everywhere. If this were the case it would tie in with old accounts of great difficulties in keeping workings open with a rapid tendency for floor heave. The Shallow Getley coal horizon was solid where drilled which is as expected as this is recorded as not being workable.
14. Shallow mining subsidence is all about the upwards migration of cavities from within a mined mineral horizon. Cavities will naturally tend to migrate upwards until the bulkage of the collapsing roof strata ultimately choke fills the cavity and the process is arrested. To assess whether this proposed new plot will remain secure it is necessary to assess whether the overlying strata is sufficient to arrest the possible upwards migration of cavities from the worked horizons as proved or as suspected. This has been done using a simple calculation method as outlined in the publication CIRIA SP32, *Construction Over Abandoned Mine Workings*. SP32 recommends that bulkage for coal measure rocks varies from 30% (mudrocks) to 50% (sandstones). Thus a calculation has been done in respect of old workings in the Yard coal and also suspected workings in the Half Yard coal. This calculation reveals there is more than adequate rock cover beneath the site. The Coal Authority also encourage the use of the rather more simple approach of 10 times seam thickness as minimum cover. In this case the Half Yard coal is nominally 0.74m thick and hence would require a minimum of 7.4m rock cover. This is easily achieved on this site, with an actual minimum of 9.9m cover in BH2.

15. **Summary and Conclusions**
16. The proposed new building footprint on land at Hillside Industrial Estate, Cheadle, has been investigated by the drilling of 3 rotary boreholes together with searches of appropriate geological and mining archives. The boreholes have proven the footprint to be underlain at moderate depth by strata containing the Half Yard and Yard coals, both of which are known to have been widely worked in this area.
17. The boreholes passed through suspected old workings in the Half Yard coal and definite old workings in the Yard coal. The strata both within and above these workings was found to contain no voids and, based both upon the drilling results and historical mining accounts of the Upper Pale Group strata, it would appear that the process of strata collapse and/or convergence has probably effectively ceased. Notwithstanding this, an appraisal has been made of the strata cover overlying the shallowest workable coal horizon and this appraisal confirms there is adequate strata cover present.
18. It is thus concluded that the site of the proposed new building is free from the risk of shallow mining subsidence.
19. There are no recorded mine entries within 20m of the site boundary and the development should therefore be allowed to proceed without the need for any further mining precautions.

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proposed new industrial unit

BH1 rotary borehole

outcrop of 2 Yard coal

Metres
0 10 20 30 40 50

1:1250

DRG No 002

BOREHOLE LOCATION

EXTENSION TO EXISTING
INDUSTRIAL UNIT
HILLSIDE INDUSTRIAL ESTATE
DRAYCOTT CROSS ROAD
CHEADLE,STAFFS ST10 1AB

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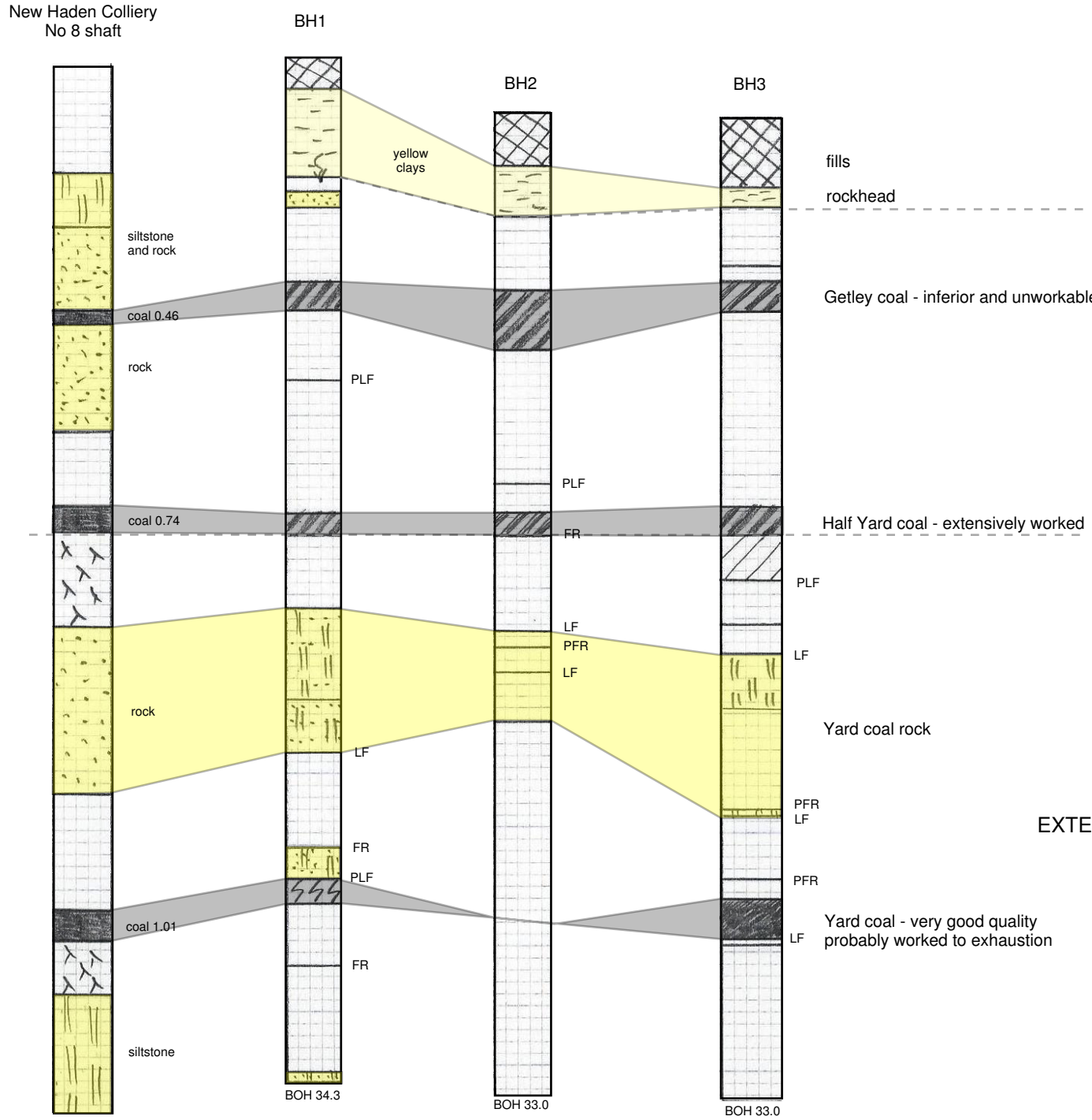
Help and advice for all mining related problems



KEY

LF lost flush
PLF partial loss of flush
PFR partial flush return
FR flush returns

SCALE 1/200
VERT

DRG No 003

BOREHOLE CORRELATION

EXTENSION TO EXISTING INDUSTRIAL UNIT
HILLSIDE INDUSTRIAL ESTATE
DRAYCOTT CROSS ROAD
CHEADLE, STAFFS ST10 1AB

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Appendix 3
Rotary Borehole Logs

BH1	Sonic Drilling Ltd		Klemm 802 RP	Water Flush	Drilled 8/3/17 Logged NRW
	FROM	TO	DESCRIPTION		
	0.0	0.2	concrete		
	0.2	1.0	FILL		
	1.0	4.0	CLAY yellow		
	4.0	4.5	MUDSTONE yellow		
	4.5	5.0	SANDSTONE yellow		
	5.0	6.0	MUDSTONE yellow		
	6.0	7.5	MUDSTONE grey		
	7.5	8.5	MUDSTONE d grey with thin COAL bands		
PLF at 10.8	8.5	15.3	MUDSTONE grey		
	15.3	16.0	MUDSTONE dark grey with much COAL debris - possible OWs		
	16.0	18.5	MUDSTONE grey		
	18.5	21.5	MUDSTONE grey with thin SANDSTONE bands		
LF at 23.3	21.5	23.3	SANDSTONE / SILTSTONE grey		
FR at 26.5	23.3	26.5	solid		
	26.5	27.5	SANDSTONE / SILTSTONE grey hard		
PLF at 27.5	27.5	28.4	BROKEN GROUND - OLD WORKINGS		
	28.4	30.5	solid hard		
FR at 30.5	30.5	32.2	grey wash with coal fragments		
	32.2	34.0	grey wash		
	34.0	34.3	SANDSTONE / SILTSTONE hard		
		BOH			

BH2	Sonic Drilling Ltd		Klemm 802 RP	Water Flush	Drilled 8/3/17 Logged NRW
	FROM	TO	DESCRIPTION		
	0.0	1.8	FILL		
	1.8	3.5	CLAY yellow		
	3.5	4.5	MUDSTONE yellow		
	4.5	6.0	MUDSTONE grey brown		
	6.0	8.0	MUDSTONE grey with COAL fragments		
PLF at 12.5	8.0	13.4	MUDSTONE grey		
	13.4	14.2	COAL debris with dark grey wash		

FR at 14.2	14.2	17.4	MUDSTONE grey
LF at 17.4	17.4	18.0	solid
PFR at 18.0	18.0	18.8	MUDSTONE grey
LF at 18.8	18.8	20.5	solid
	20.5	33.0	solid
		BOH	

BH3	Sonic Drilling Ltd	Klemm 802 RP	Water Flush	Drilled 8/3/17 Logged NRW

	FROM	TO	DESCRIPTION
	0.0	2.3	FILL
	2.3	3.0	CLAY yellow
	3.0	5.0	MUDSTONE grey
	5.0	5.5	MUDSTONE dark grey
	5.5	6.5	COAL and MUDSTONE bands
	6.5	13.0	MUDSTONE grey
	13.0	14.0	COAL and CLAY dark grey
	14.0	15.5	MUDSTONE dark grey
	15.5	17.0	MUDSTONE grey
PLF at 17.0	17.0	18.0	solid
	18.0	19.8	SILTSTONE grey
LF at 19.8	19.8	23.2	solid hard
PFR at 23.2	23.2	23.4	MUDSTONE grey silty
LF at 23.4	23.4	25.5	solid
PFR at 25.5	25.5	26.2	MUDSTONE grey
	26.2	27.5	COAL with black SHALE to top
LF at 27.5	27.5	27.8	very soft
	27.8	33.0	solid
		BOH	