

COAL MINING RISK ASSESSMENT

Proposed Residential Development

Former Dexine Mill

Spotland Road

Rochdale

OL12 0AU

Author: Daniel Slattery
Client: Hallmark Developments Ltd
Reference: rep-tjba-hallmark-dexine-CMRA-221020.docx

Revision	Date	Reason
0	November 2020 November 2021	Original
1	August 2021	Units 10-13 as built found confirmation & photos.

T J Booth Associates.

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1. INTRODUCTION.

T. J. Booth Associates have been appointed by Hallmark Developments Ltd to undertake a Coal Mining Risk Assessment (CMRA) to assess for the potential coal mining legacy and to support a Town & Country Planning permission for a mixed commercial & residential end use local to a proposed industrial development.

Dexine Rubber Company Ltd moved from the Application Site in 2007 which remained in a disused and dilapidated state until acquired by Hallmark Developments. It comprised a number of masonry buildings and steel-clad warehouses & storage buildings. The commercial nature of the site dates back to 1850s-1900s.

Since operations moved in 2007, planning permission was obtained for mixed commercial/residential use by Hallmark Developments in December 2015 (reference: 15/00463/HYBR). Subsequent planning amendments & applications have been undertaken.

Due to a new planning application being submitted for the Application Site, the Rochdale MBC Planning Department have requested a coal mining risk assessment to validate the planning application.

2. HISTORIC MAPS.

DATE	ON-SITE	OFF-SITE/SURROUNDING AREA
c1850 – present day	No Coal features noted on site.	No Coal features noted within the wider area.

3. BGS GEOLOGY.

Refer to BGS Geological Maps in the Appendix.

Superficial Geology:	Drift geology is noted as glaciofluvial SAND & GRAVEL. There are alluvial deposits to the S nominally 50-100m distant and boulder clays nominally 100m to the N/NW.
Bedrock Geology:	Bedrock geology comprises undifferentiated sandstone/mudstone of the Carboniferous Lower Coal Measures.
Coal Seams/Faults.	The Arley Mine coal seam sub-crops beneath the south east side of the site. The local stratigraphic dip is in the order of 5deg S.

4. BGS BOREHOLE RECORDS.

No relevant boreholes in the local area.

5. COAL AUTHORITY.

Refer to Coal Authority Interactive Map & Abandonment Plan in the Appendix.

Mine Shafts, Pits, Adits/Entries:	2 adits were noted off-site within approximately 30-40m SE of the southern tip of the site boundary. An additional adit is noted on-site to the N side of Spodden Street heading E through the alley between the terraces to the east of the site, to workings to the east. An on-site bell pit is also noted on the Abandonment Plan to the E on-site beneath a warehouse slab.
Past Recorded Underground Mining.	The CA interactive map indicated the on-site adit to be part of past recorded workings. However, the Abandonment Plan indicates this is an adit access to the workings to the E.

	The main underground coal workings that the adit lead to was to the E of Primrose Street from c1870s, targeting the Arley Coal Seam. Due to the presence of the above mentioned bell pit, there is expected to be some shallow workings local to the pit location only.
Unrecorded Probable/Potential Shallow Underground Workings:	The interactive map indicates the S part of the site around Spodden Street could be subject to potential unrecorded historic mining.
Past/Present Surface Mining/Opencast:	No opencast mining locally.
Mining Geology and Subsidence:	No site issue noted.
Hazards and Mine Gas:	No site issue noted.
Development High Risk Area:	The S side of the site is noted to be within a Development High Risk Area.

6. IDENTIFICATION OF SITE SPECIFIC RISKS.

Recorded Workings:	No risk of deeper workings beneath the site.
Probable/Potential Shallow Workings:	The Arley coal seam subcrops beneath the south east part of the site dipping to the south-east. Abandonment plan data indicates the presence of shallow workings to much of the local area east of the Application Site, and the seam was accessed via an on-site adit (amongst other entrances in the wider area). The presence of the adit suggests that there could also be shallow workings beneath the Application Site in areas to the south east of the coal seam subcrop location. There are no other shallow seams below the Arley.
Opencast Workings:	No risk locally.
Coal Pits/Shfts/Adits:	There is an adit on site that has been identified from Abandonment Plan data.
Mine Gas or subsidence:	Could be a minor residual risk of coal mine gas migrating through permeable strata.

7. SITE INVESTIGATIONS OCTOBER 2020.

Refer to Site Investigation Logs, and Site Investigation Plan in the Appendix.

Due to identification of potential shallow mining beneath the south east part of the site, site investigations were undertaken to identify potential risks around the critical location of Units 9 & 10.

A trial hole investigation was undertaken by T J Booth Associates on the 03.07.2020, generally to assess the ground vibro formation levels; however, one trial hole (TH6) was excavated in the area where the former adit was recorded by the abandonment plan. The trial hole was excavated to 5m depth and generally comprised an upper silty sand & gravel MADE GROUND (engineered demolition crush) to approx. the upper 1m, with MADE GROUND becoming more granular including angular sandstone cobbles & boulders (mining waste) to depth.

Due to the identification of the on-site adit, a Coal Authority Permit was obtained by T J Booth Associates on the 10/07/20, refer to Appendix.

Further site investigations were undertaken by Pennine Geotechnical Ltd on the 11.08.2020, which comprised 15No. rotary drilled boreholes to between 6.0m-8.1m deep. Refer to Borehole Logs & Site Investigation Plan & Section in Appendix. Mine gas was monitored in the borehole investigations, but no gas was detected.

The boreholes were undertaken to identify the position of the Arley seam sub-cropping beneath the glacial cover, prove cap rock depths, and to assess workings to identify a suitable mitigation plan.

The former 4 storey mill, steel framed sheds, and other miscellaneous site buildings had been demolished, and foundations (including the steam engine power house basement) grubbed out, sorted & re-usable material crushed and graded to make

hardcore for filling. The ground beneath the buildings in the potentially affected areas was identified to require vibro improvement, which is to be undertaken in stages starting with Units 9 & 10.

The boreholes were undertaken on the Units 9 & 10 vibro piling platforms, so ground level was nominally level.

The investigation identified the following thickness of strata:

- Nominally 1m of silty sand & gravel MADE GROUND;
- Between 4.0-5.5m of silty SAND & GRAVEL with occasional pockets of made ground;
- Between 0.0-2.3m of shaley MUDSTONE dependent on location and dip of the seam beneath (see SI section);
- Generally between 1-1.5m of VOID, BACKFILL/COAL depending on location, occasionally 2.5m.
- Hard MUDSTONE beneath, proven to max 10m depth.

8. MITIGATION STRATEGY

The investigations have proven coal workings at shallow depth beneath the SE end of the site, nominally 5.5-6.0m below Proposed Unit 9-10.

The workings are generally 1-2m deep, but had been noted at 2.5m deep in isolated locations suggesting some limited migration has occurred since working.

Normally to mitigate the risk from shallow seam/void migration, the 10t rule is applied to ensure there is enough ground cover above workings. However, CIRIA C758 allows departure from the 10t rule subject to either satisfactory ground or engineering factors.

To ensure that the building superstructure remains in tact, buildings may be designed in accordance with CIRIA C758 to ensure foundations are designed to span or cantilever potential future surface subsidence in the case of migration reaching the surface.

The vibro improvement was undertaken in the upper 3.6 m of loose to medium dense granular deposits creating a densified zone suitable to support the superstructure foundations and ground bearing slabs. Due to the close spacing of the vibro piles, a specific clause was added to the vibro improvement specification to deal with 'crown holes' should they be encountered, and out of nearly 300 piles under each of the units, no voids / holes were encountered.

It is unlikely that within the timeframe of development that a migration would occur, but to mitigate against the risk, all site foundations within affected areas will be capable of spanning 3.0m, and cantilevering 1.5m, in accord with C758. Other areas used for access, parking and services were untreated in agreement with the Client.

Foundations in accordance with the above specification can be found in the appendix, refer to TJBA Unit 9-10 & 11-12 Vibro Ground Improvement Plan & Sections in Appendix.

Although no gas was detected in the borehole logs, it would be prudent given the workings and granular formation to design the foundations to incorporate CS2 protection measures.

9. CONCLUSIONS & RECOMMENDATIONS.

Ground Gas:	No mine gas was encountered on drilling/BH investigations, and the Coal Authority has indicated no presence or evidence for gas migration issues in the local area. However, considering the shallow depth of the seam and the granular material above, there is the pathway for potential gas migration. The risk category for development is classified by the type of development (residential/industrial) in accordance with BS 8485:2015+A1:2019, and are as follows: • Commercial Type D building Low risk; • Residential Type A building High risk. CS2 gas protection measures are recommended within the development which should include the following to provide the minimum score indicated from at least two sources in accordance with BS8485:2019: <table border="1"> <tr> <td>INDUSTRIAL DEVELOPMENT – TYPE D RISK BUILDING CS2 GAS PROTECTIVE MEASURES</td><td>BS8485:2019 score required: 1.5</td></tr> </table>	INDUSTRIAL DEVELOPMENT – TYPE D RISK BUILDING CS2 GAS PROTECTIVE MEASURES	BS8485:2019 score required: 1.5
INDUSTRIAL DEVELOPMENT – TYPE D RISK BUILDING CS2 GAS PROTECTIVE MEASURES	BS8485:2019 score required: 1.5		

	SLAB	Monolithic reinforced cast in situ suspended slab	1.5
	MEMBRANE	Standard DPM 2000g	0
	VOID/SUBSPACE	N/A.	0.5
	VENTILATION	Granular formation pressure relief pathway	
	RESIDENTIAL DEVELOPMENT – TYPE A RISK BUILDING CS2 GAS PROTECTIVE MEASURES		BS8485:2019 score required: 3.5
	SLAB	Reinforced ground bearing raft or reinforced suspended slab.	1.5
	MEMBRANE	Reinforced gas membrane Alderprufe GRA comprising <40ml/day/m2 CH4 transmission rate, >0.4mm thick. All joints and penetrations sealed to manufacturers details & specifications.	2
	VOID/SUBSPACE	N/A.	0
	VENTS	N/A.	
	Foundations:	The proposed steel framed sheds for units 9-10 & 11-12 are a relatively light clad construction, provided with continuously reinforced ground beams and floor slabs in turn founded on a vibro improved formation to a depth of nlt 3.6 m. Vibro improved formations, reinforced ring beams and reinforced raft/slabs, and those capable of spanning 3.0m/cantilevering 1.5m, are suitable mitigation measures for shallow workings in accord with CIRIA c758, cl15.2.2. For the avoidance of doubt, as of August 2021, the above foundation measures have been incorporated into all development units. Ancillary areas for roads, access & services were not 'improved' and normal engineered subbase foundations employed. Retaining structures employed flexible pcc & reinforced earth construction to tolerate potential settlement. Detailed and separate design calculations for foundations in accordance with the above specification will be submitted to Rochdale Building Control as part of the Building Regulation submission.	

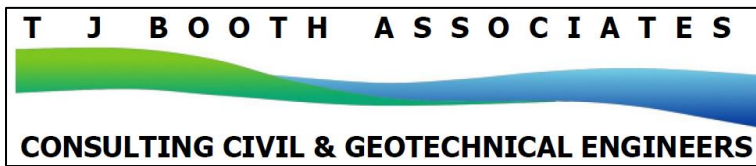
Signed.....

D.S.Slattery BSc (Hons).

T J Booth Associates.

Authorised.....

T J Booth BSc (Hons), C. Eng. C. Env. MICE.



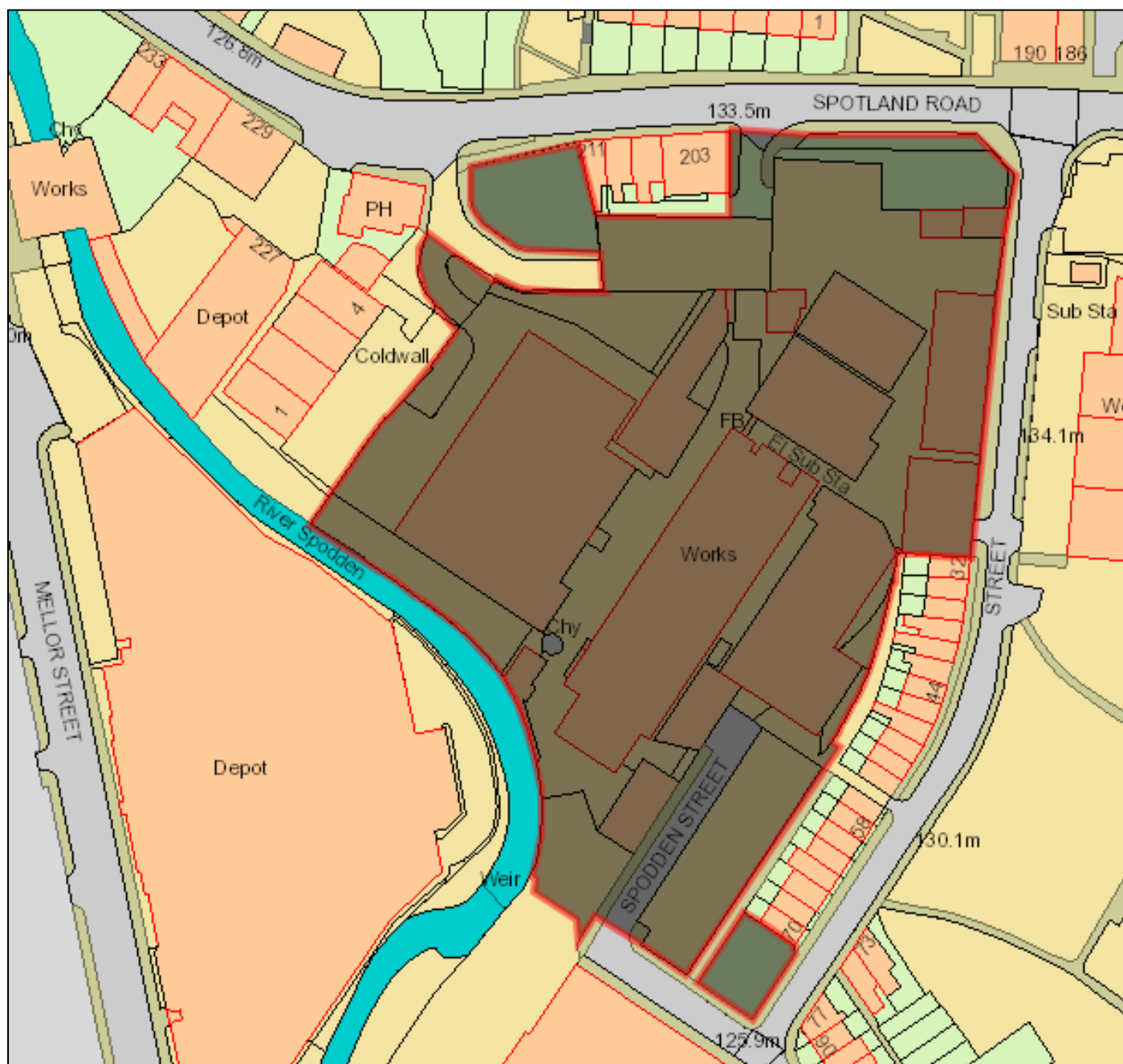
T J Booth Associates.

10. REFERENCES.

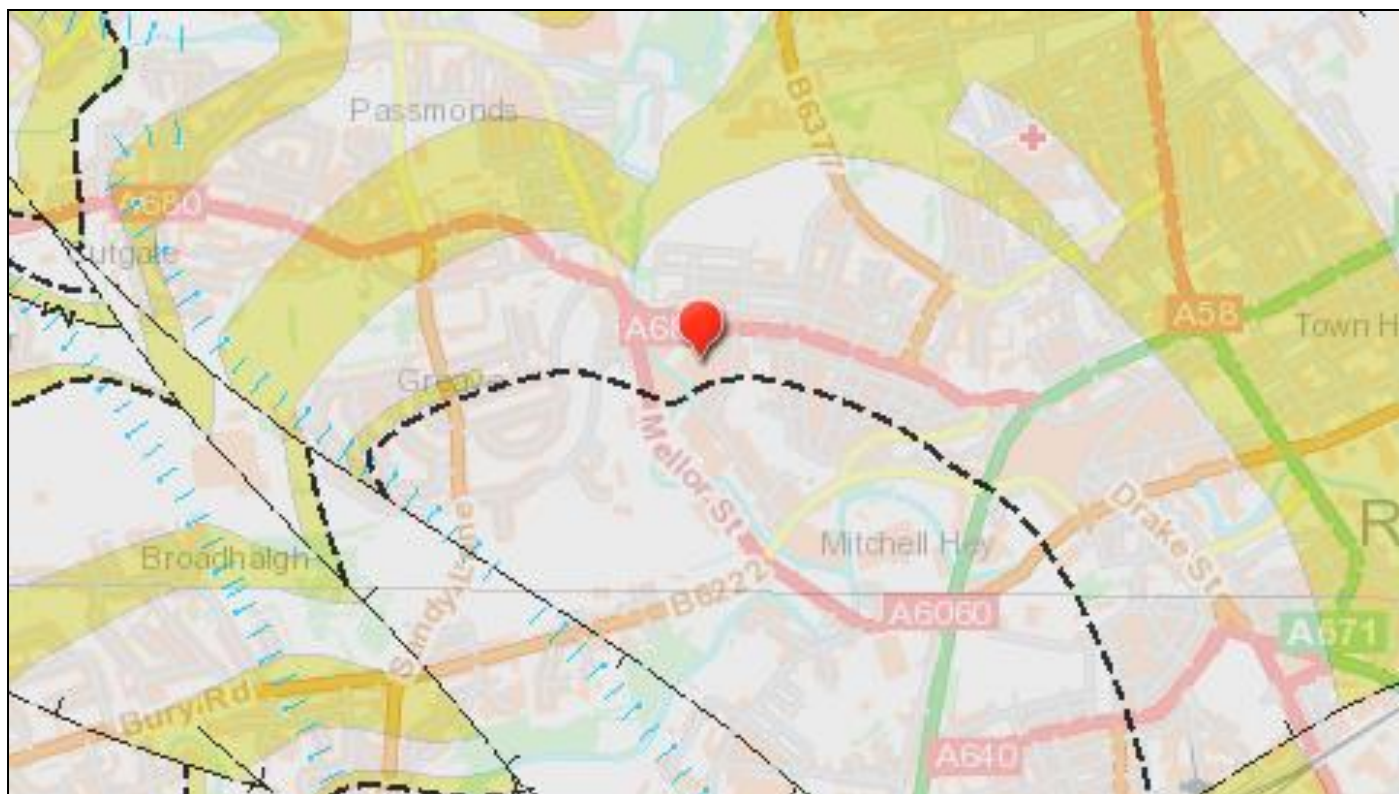
- CIRIA. Report C758.
- CIRIA. Report SP32.

11. APPENDIX.

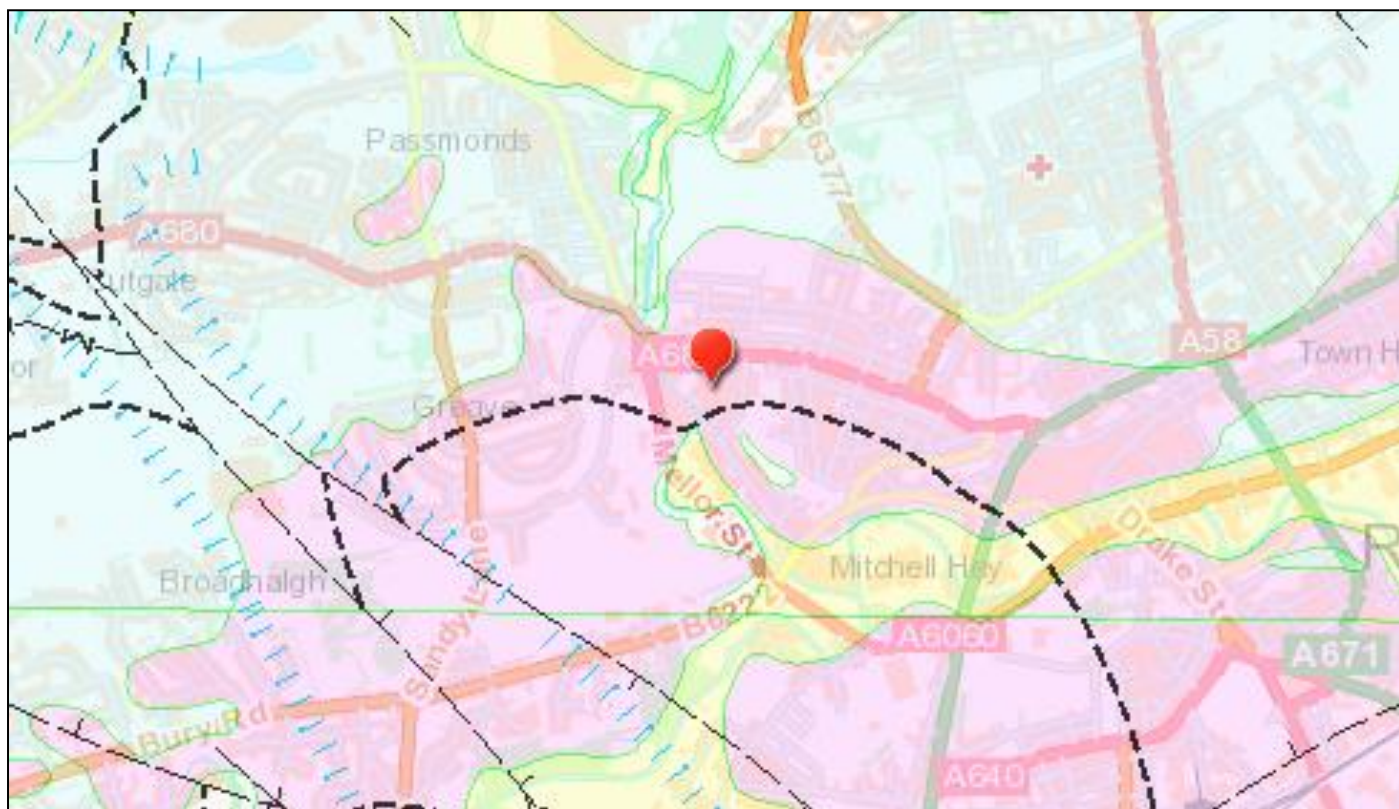
11.1. Location Plan/Pre-development Plan.



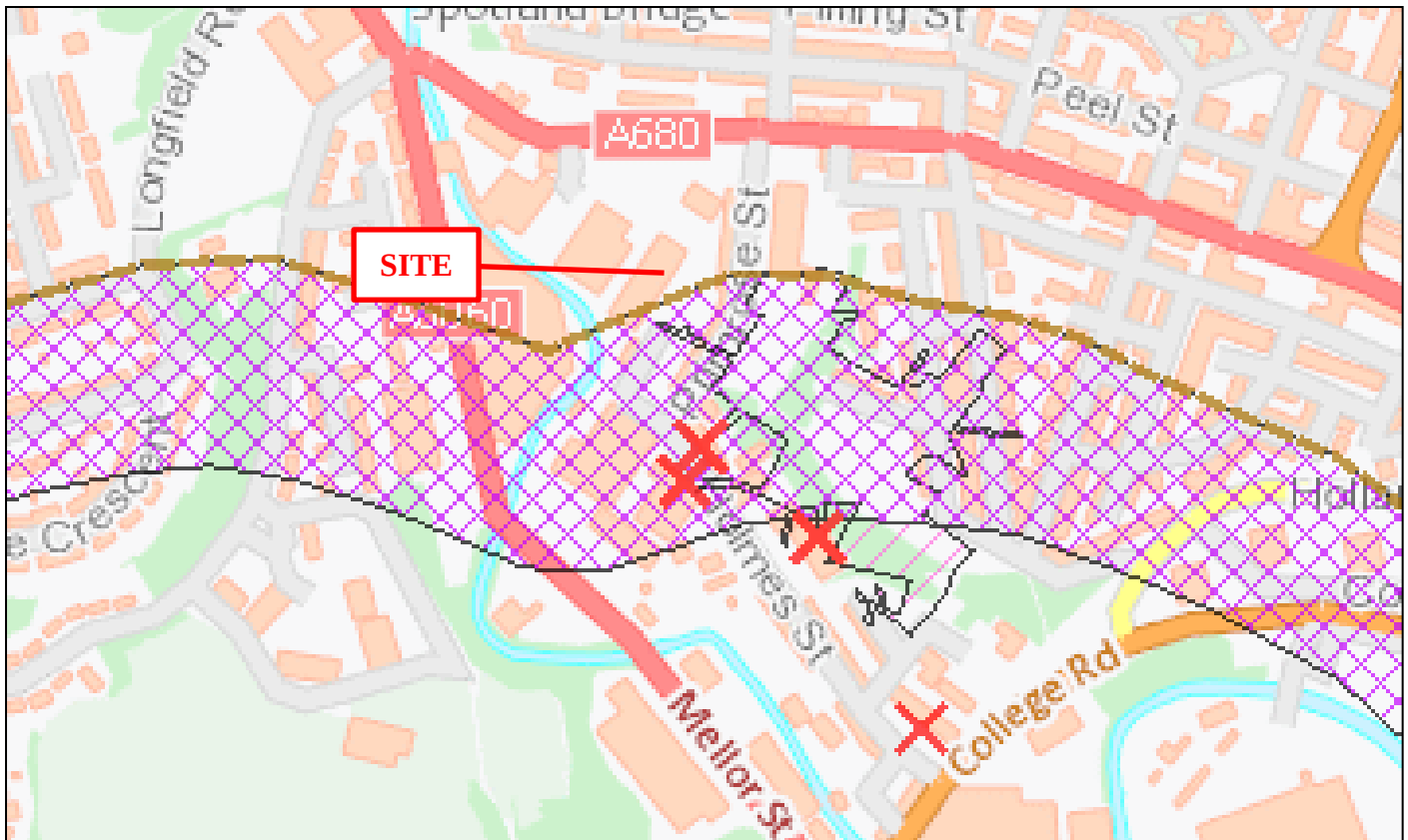
11.3. Solid Geology.



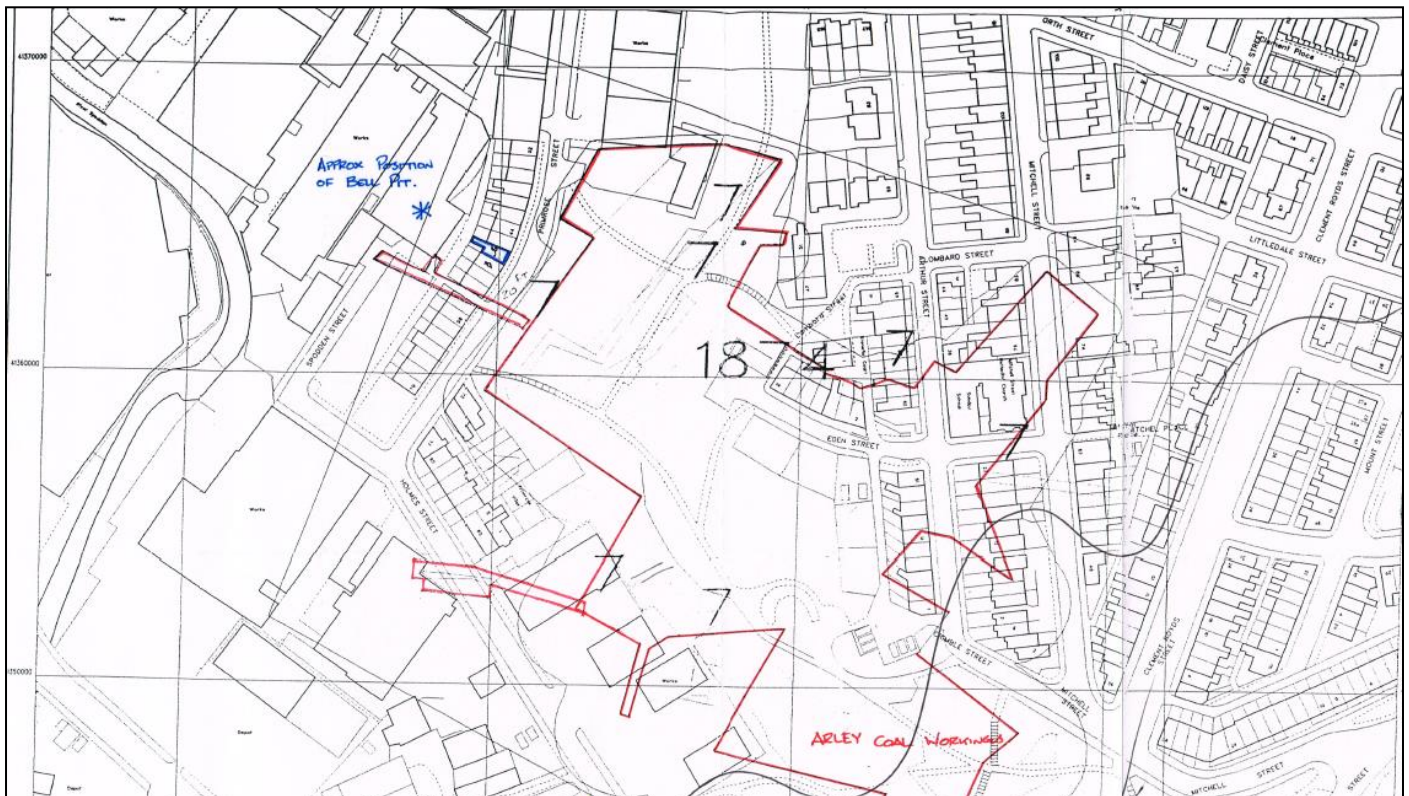
11.4. Drift Geology.



11.5. Coal Authority Interactive Map.



11.6. Coal Authority Arley Mine Abandonment Plan.

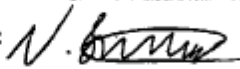


11.7. Penning Geotechnical Ltd.

Client: GUARDIAN DEV.	Site: DEXINE	 Pennine Geotechnical Services Ltd, 234 College Rd, Rochdale, Lancashire, OL12 6AF T: 01706 861823 F: 01706 860580
Date: 11-8-20	Method: Rotary - Perc, Water Flush	

Measurements In Metres

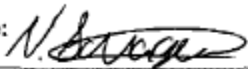
BH no	From	To	Thickness	Description
01	0.00	5.50	5.5 metres	Variable Made Ground / Cased to 6 metres / Full flush returns
	5.50	6.50	1.0 metres	Shaley Mudstone
	6.50	7.50	1.0 metres	Void / Lost all flush returns
	7.50	10	2.5 metres	Hard drilling / No flush returns
02	0.00	4.00	4 metres	VARIABLE MADE GROUND / CASSED TO 3M / FULL FLUSH RETURNS
	4.00	6.20	2.2 metres	SHALEY MUDSTONE
	6.20	8.10	1.9 metres	VOID / LOST FLUSH RETURNS
	8.10	10.00	1.9 metres	HARD STRATA NO RETURNS
03	0.00	3.90	3.9 metres	VARIABLE MADE GROUND / CASSED TO 3M / FULL FLUSH RETURNS
	3.90	6.10	2.2 metres	SHALEY MUDSTONE
	6.10	7.50	1.4 metres	VOID / LOST FLUSH RETURNS
	7.50	10.00	2.5 metres	HARD STRATA NO RETURNS
04	0.00	3.70	3.7 metres	VARIABLE MADE GROUND / CASSED TO 3M / FULL RETURNS
	3.70	6.00	2.3 metres	SHALEY MUDSTONE
	6.00	7.50	1.5 metres	VOID / LOST FLUSH RETURNS
	7.50	10.00	2.5 metres	HARD STRATA NO RETURNS
05	0.00	3.50	3.5 metres	VARIABLE MADE GROUND / CASSED TO 3M / FULL RETURNS
	3.50	5.50	2.0 metres	SHALEY MUDSTONE
	5.50	7.00	1.5 metres	VOID / LOST FLUSH RETURNS
	7.00	10.00	3 metres	HARD STRATA NO RETURNS
06	0.00	3.60	3.6 metres	VARIABLE MADE GROUND / CASSED TO 3M / FULL RETURNS
	3.60	4.50	0.9 metres	SHALEY MUDSTONE
	4.50	7.00	2.5 metres	VOID / LOST FLUSH RETURNS
	7.00	10.00	3.0 metres	HARD STRATA NO RETURNS
07	0.00	3.70	3.7 metres	VARIABLE MADE GROUND / CASSED TO 3M / FULL RETURNS
	3.70	6.00	2.3 metres	SHALEY MUDSTONE
	6.00	7.00	1.0 metres	VOID / LOST FLUSH RETURNS
	7.00	10.00	3.0 metres	HARD STRATA NO RETURNS

Driller: N. SAUAGE	Driller's Assistant:
Driller's Signature: 	Page 1 / 2

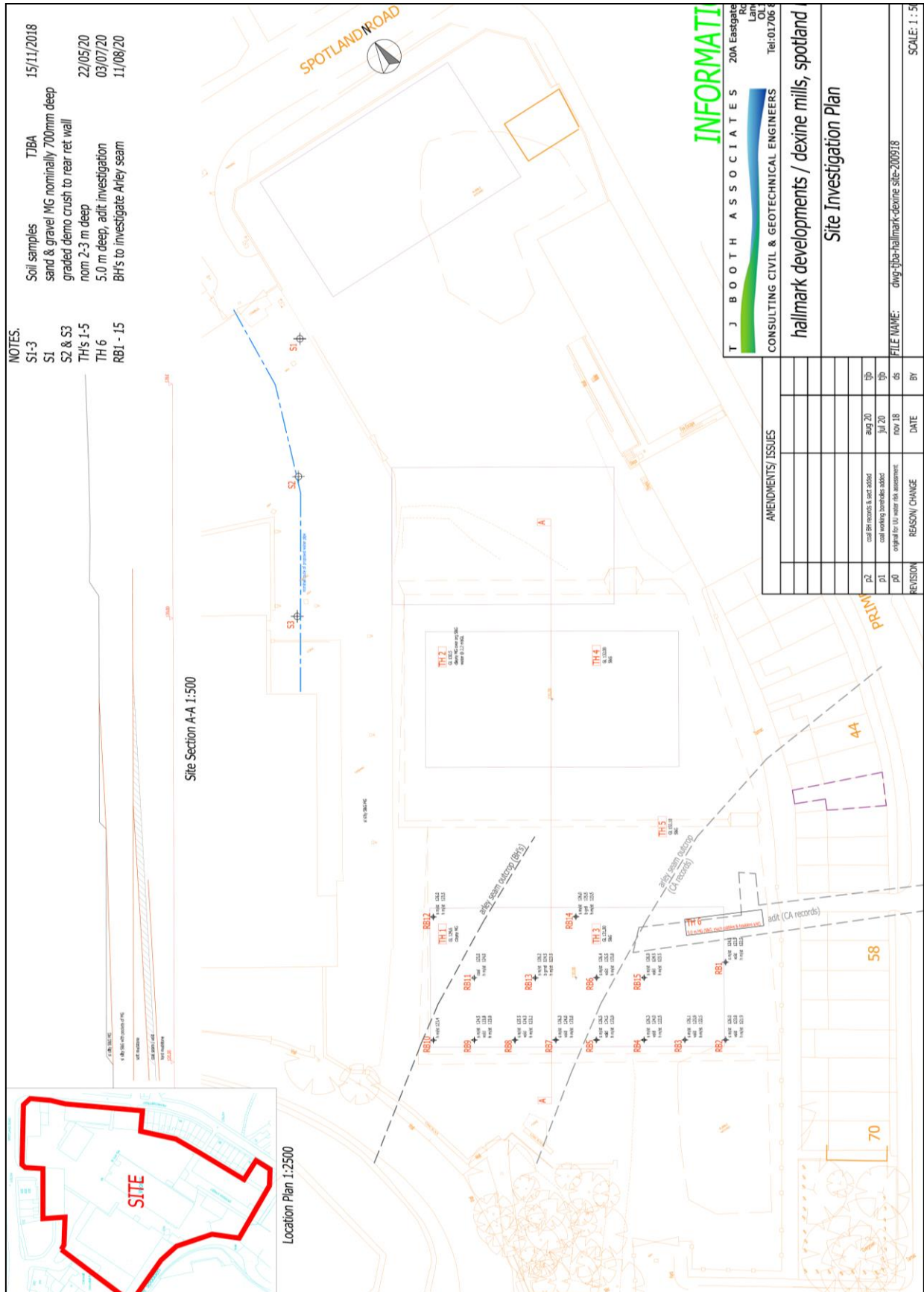
Client: GUARDIAN PEU	Site: DEXINE	 PENN NE Pennine Geotechnical Services Ltd, 234 College Rd, Rochdale, Lancashire, OL12 6AF T: 01706 881823 F: 01706 880580
Date: 11.8.20	Method: LOTARY PEC WATER FLUSH	

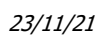
Measurements In Metres

BH no	From	To	Thickness	Description
08	0.00	4.50	4.5 METRES	VARIABLE MADE GROUND / CASED TO 3M / FULL RETURNS
	4.50	5.70	1.2 METRES	SHALEM MUDSTONE
	5.70	6.90	1.2 METRES	VOID / LOST FLUSH RETURNS
	6.90	10.00	3.1 METRES	HARD STRATA NO RETURNS
09	0.00	5.50	5.5 METRES	VARIABLE MADE GROUND / CASED TO 3M / FULL RETURNS
	5.50	6.20	0.7 METRES	SHALEM MUDSTONE
	6.20	7.00	0.8 METRES	VOID / LOST FLUSH RETURNS
	7.00	10.00	3.0 METRES	HARD STRATA NO RETURNS
10	0.00	6.60	6.6 METRES	SOFT PUSH NO FLUSH RETURNS
	6.60	10.00	3.4 METRES	HARD STRATA NO RETURNS
11	0.00	5.00	5.0 METRES	VARIABLE MADE GROUND / CASED TO 3M / FULL RETURNS
	5.00	6.00	1.0 METRES	SOFT COAL
	6.00	10.00	4.0 METRES	MUDSTONE
12	0.00	4.00	4.0 METRES	VARIABLE MADE GROUND / 3M CASING / FULL RETURNS
	4.00	6.50	2.5 METRES	SOFT COLLAPSED WORKINGS / PARTIAL FLUSH RETURNS
	6.50	10.00	3.5 METRES	HARD STRATA NO RETURNS
13	0.00	3.80	3.8 METRES	VARIABLE MADE GROUND / CASED TO 3M / FULL RETURNS
	3.80	5.50	1.7 METRES	SHALEM MUDSTONE
	5.50	6.50	1.0 METRES	BROKEN GROUND NO RETURNS
	6.50	10.00	3.5 METRES	HARD STRATA NO RETURNS
14	0.00	4.00	4.0 METRES	VARIABLE MADE GROUND / CASED TO 3M / FULL RETURNS
	4.00	4.50	0.5 METRES	SHALEM MUDSTONE
	4.50	6.50	2.0 METRES	BROKEN GROUND NO RETURNS
	6.50	10.00	3.5 METRES	HARD STRATA NO RETURNS
15	0.00	4.00	4.0 METRES	VARIABLE MADE GROUND / CASED TO 3M / FULL RETURNS
	4.00	5.50	1.5 METRES	SHALEM MUDSTONE
	5.50	6.50	1.0 METRES	VOID / LOST FLUSH RETURNS
	6.50	10.00	3.5 METRES	HARD STRATA NO RETURNS

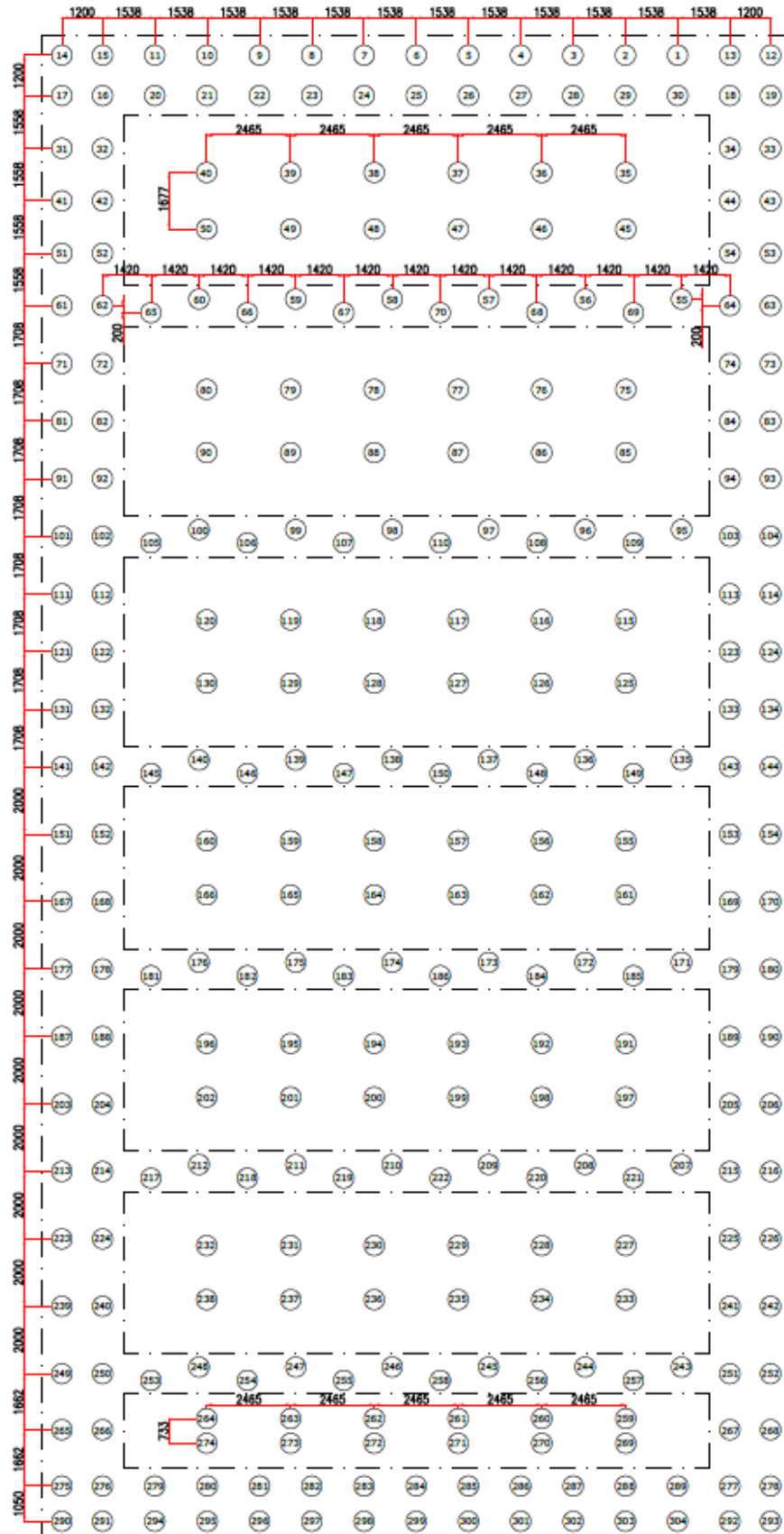
Driller: N. SAVAGE	Driller's Assistant:
Driller's Signature: 	Page 2/2

11.8. TJBA Site Investigation Plan & Section.





11.10. Tritech - Unit 9-10 Vibro Ground Improvement Pile Plan.



11.11. Photos



11.12. TJBA Coal Authority Permit.



The Coal
Authority

Permit to Enter or Disturb Coal Authority Interests

Permit 20418

Name and Address of Permit Holder:

*Hallmark Developments (NW) Ltd
Hallmark Court
132 Manchester Rd
Rochdale
OL11 4JQ*

Site Location:

*Dexine Mills
Spotland Road
Rochdale*

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

Ground investigation by two boreholes to 30m to determine depth and condition of shallow mine workings/coal seams 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, 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*

Signed: *Jake Morris* Granted Date: *10/07/2020*

For and on behalf of The Coal Authority

*Nominated Representative: Jake Morris, 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: 20418

Permit Boundary:



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