

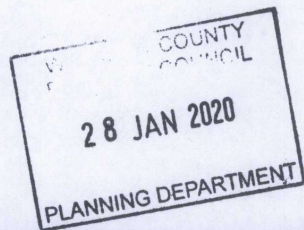
P2020/0050

Stori Brymbo Project

Mining Report

HF Machine Shop

Brymbo Heritage Trust



GroundSolve Ltd

Consulting Geotechnical, Engineering Geology and Environmental Engineers

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1.0 INTRODUCTION

Brymbo Heritage Trust (BHT) propose to develop sections of the old Brymbo Steel works.

Two planning applications have been submitted, one for the Heritage Area and one for the Machine Shop. As part of the planning application the Local Authority have requested a mining study for both sites.

TACP are the Architects for the scheme and they have appointed GroundSolve Ltd (GSL) on behalf of BHT to carry out a mining desk study.

As part of the desk study, the following sources were visited:

- Coal Authority headquarters in Mansfield,
- Wrexham Heritage Library,
- Site walkover with Mr. Gary Brown,
- Flintshire Records Offices.

This report presents the findings of the desk study for the Machine Shop and gives preliminary mining risk assessments for the proposed development. It also recommends the site investigation necessary to confirm the findings of the desk study.

2.0 THE SITE

2.1 Site Location and Description

The site is located in Brymbo, some 4km north west of Wrexham Town Centre at National Grid Reference SJ 293 535, see Figure 1.

The site is bounded to the east by a new access road for the development of the Brymbo Steel works site. To the south lies open land, with the ruins of the old steel works site to the west of the development area. To the north lies the Enterprise Centre and Blast Road, see Figure 2.

The main section of the site itself is flat and occupied by an old Steel Works building, with a drainage channel running eastwards through the site immediately north of the building. However, ground levels rise steeply surrounding these buildings. To the north of the building is a large masonry retaining wall, which is buttressed and showing signs of slight structural damage. Large retaining structures also define the western section of the site. To the south the land rises to the south and an access road leads to the western section of the site.

A site walkover of the site was undertaken on the 21st January 2020 with the Heritage Contract Manager Mr. Gary Brown, who treated GSL to a tour of the works.

This revealed the presence of an open adit in the south west corner of the works, which is outside of the Heritage site, from which red mine drainage water was issuing. Mr. Brown indicated that this adit had been driven circa 1843 to work a coal seam, which was rapidly exhausted. The walkover also inspected the old Brymbo colliery shafts to the west of the main development, which are both fenced off. According to Mr. Brown these have been partially backfilled by the Coal Authority to depths of around 50 to 60m, with the water standing at around 30m depth. One of the pits was reported to be covered with a metal grill.

In addition, previous open casting immediately south of the site exposed a coal seam, thought to be the Two-Yard seam, which was dipping gently in an easterly direction. However, immediately west of this outcrop, further coal was exposed dipping steeply to the west, probably indicating it was in the vicinity of the main Brymbo Fault, see Figure 3.

Immediately south east of these exposures is the Fossil Forest, and Mr. Brown indicated that possible Bell Pits had been encountered in excavations for the Fossil Forest.

Photographs of the site are presented in Appendix A.

2.2 Geology

The geology of the site has been studied from a number of sources, which include;

- 1:50,000 Geology plan, Sheet 121, Wrexham,
- 1:10,000 Geological plan, Sheet SJ 25 SE,
- The Geology of the Country around Wrexham, Reference 1,

- BGS planning study, at a scale of 1:25,000, Reference 2.

The geology plans failed to reveal the presence of any superficial deposits beneath the site, with bedrock shown at surface. However, the western and eastern sections of the site are shown to be underlain by made ground, which is anticipated.

The 1:10,000 plan shows the site to be underlain by the Productive Coal Measures, which are Carboniferous in age. The western half of the site is shown to be underlain by the Cefn Rock, which is a sandstone some 40m thick, while the eastern half of the site is underlain by interbedded grey siltstone/mudstone, with minor sandstones and seat earths and coal seams see Figure 3.

The conjectural outcrop of the Upper Stinking coal seam is shown to the west of the site, which as it dips eastward, would be expected to be beneath the western section of the site at fairly shallow depth.

Old open cast workings on this seam are shown to the south of the site. No mine shafts are shown in the immediate vicinity of the site, whilst the Brymbo fault lies to the west of the site, trending NNW to SSE, with its downthrow on its western side. However, Reference 2 records several shafts and adits close to the site.

The Brymbo fault has a reported westward downthrow, estimated at 460' (140m), with a rather steep hade (Angle), Reference 1.

East of the Brymbo Fault the outcrops of the coals below the Main coal seam have been traced by old workings in the Cegidig Valley and on its southern slope.

The 1:10,000 plan shows the conjectural outcrops of the Hollin, Crank and Quaker coals on the eastern side of Brymbo Fault. The Powell seam is also shown outcropping to the south of the development area.

Reference 1, records the following seams being worked from Brymbo Colliery:

- Drowsell,
- Crank,
- Ruabon or Lower Yard,
- Wall and Bench.

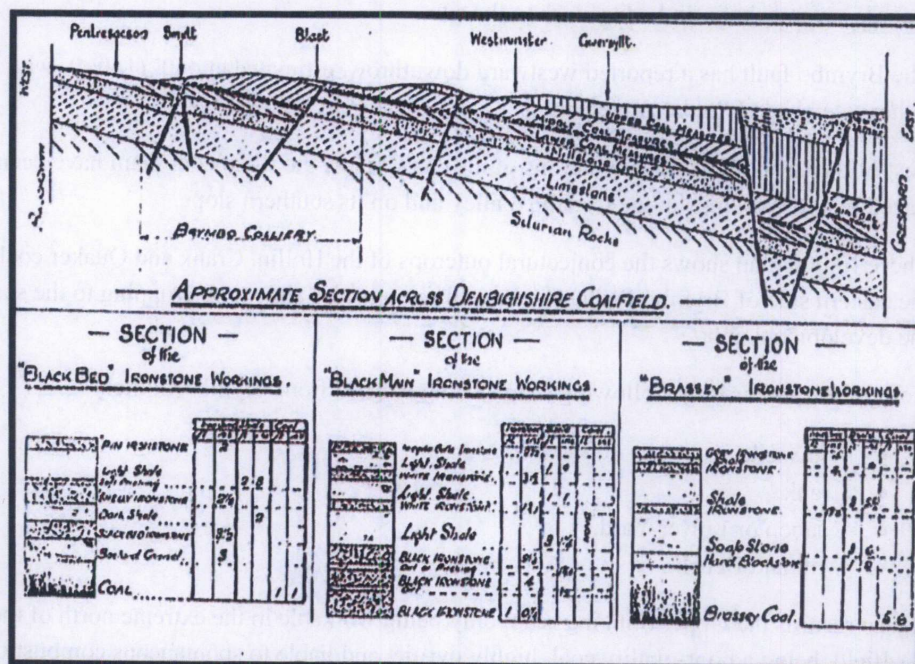
It also records the Upper Stinking seam only being workable in the extreme north of the coalfield, being a poor-quality coal, highly pyritic, and liable to spontaneous combustion.

Reference 1, records the Brymbo Colliery shaft being sat upon the sandstone, reaching the Drowsell the highest coal recorded in the plotted section of the shaft at a depth of 295' 6" (90m).

The following relevant sequence from the Brymbo colliery was obtained from the BGS website:

Seam	Depth	Thickness (m)
Upper Stinking coal	29.61	1
Lower Stinking coal	76	0.33
Drowsell Coal	87	1.85
Powell Coal	96	1.23
Ironstone	111	
Two-Yard (Hollin)	114	2.30
Crank Coal	117	2.46
Brassey Ironstone	126.5	
Brassey	130	1.95
Black Bed ironstone		
Black Bed Coal	140	2.25
Main	155	3.0

Sections of the pit, cross sections and the main ironstone horizons are presented below:



Cross Section through Brymbo Colliery showing fault and Main Ironstone horizons

STRATA AT THE BRYMBO COLLIERY.									
	Thickness		Distance		Depth				
	yds	ft	yds	ft	yds	ft			
Surface of Ground.									
Soil etc	5								
Rock	11								
White Shale	8								
Rock	9		4						
Little Top Coal - Upper Stinking Coal	1	2	32	3	32		3		
Rock	8								
Fireclay	1	2	6	10			32		3
Rock	39	7	40		82		3		
Strong Dark Shale	4	1	6						
Strong Black Shale	3	2	6	12	1		34	1	3
Strong Black Shale - Russell Coal	9	1	6	9	2	6	104		9
Strong Light Shale	45		16		120		9		
Shale with Ironstone	1	2	3	1	6		123	2	3
Two Yard Coal	2	2	6	3	5		126	2	3
Shale	8	2	6	10	6		137		2
Shale with Ironstone	1	3	3	1	9		140	1	11
Shale with Ironstone	8	2	10	2	2 1/2		151	1	1 1/2
Shale with Ironstone	7	1	3 1/2						
Shale with Ironstone	4	2	3 1/2						
Dark Shale	9	2	5 1/2	17	3 1/2		168	1	5
Hard Light Shale	7		7		8		175	2	1
Hard Rock, rather red, with Ironstone Balls	14	1	4	17	1	4	193	1	5
Strong Rock with beds of Ironstone	17	2	3	18	1	3	211	2	13
Two Yard Coal	6	1	6	2	4		218	2	
Hard Yellow Rock	4	1	2	5	2	8	224	1	0
Hard Rock	5	2	3	6	1	9	231		5
Hard Limestone	6	2	3	9	2	11	241		4
Shale	7	1	6						
Hard Shale	7	1	6						
Hard Shale	6	2	3	19	1	0	263	1	0
Shale & Beds of Ironstone	9	2	5	10	1	3	273	2	3
Hard Shale	5	1	3	7	1	0	280	2	9

Section of Brymbo Pits

Reference 1 records the dip of the strata to be gentle in an eastern direction typically at 6°.

Ironstones mined in the Denbighshire coalfield in descending order area as follows,

Reference 1:

- In shales or fireclays overlying the Lower Stinking,

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Chester Road, Bretton
Flintshire CH4 0DN

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- In shales overlying the Two-Yard (Hollin) coal,
- In shales overlying the Brassey (Quaker coal,
- Black bed or Black Vein ironstones above the Black Bed coal,
- In shales between the Black Bed and Bind coal,
- In underclay of Bind coal, just above the Main coal.

2.3 Abandoned Mining

A Coal Authority CON29M report has been provided by the client, the main points are summarised below, with the report presented in Full in Appendix B.

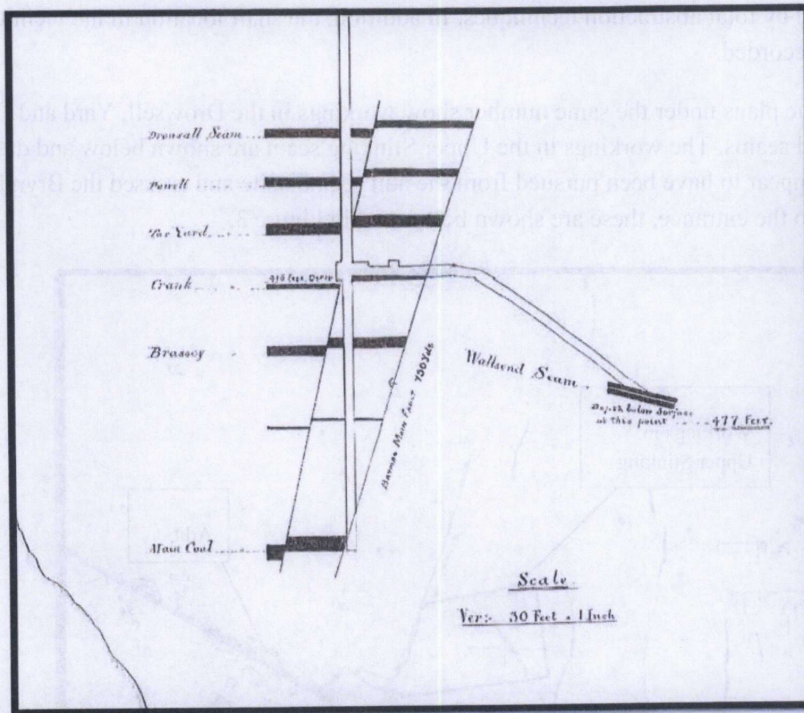
- The property is in an area that could be affected by underground mining in ten seams of coal at shallow to 230m depth, last worked in 1914,
- Within, or within 20m of the site boundary are our mine entrances,
 - 329353-126-Drift entrance bricked up and rendered in 1970,
 - 329353-136 – No treatment details
 - 329353-135 – no treatment details
 - 329353-131 – entry investigated in 2002 by JMC mining services and found to be within a building. The adit was found to be open.
- The site is not affected by past open casting
- No damage notices have been received for the site

2.4 Mine Plans

The offices of the Coal Authority in Mansfield were visited and copies obtained of mine plans that helped understand the mining risk at the site.

Mine plan 5973, dated 1910, showing recorded workings in the Wallsend seam presents a shaft section of the Bye Pit at the Brymbo colliery, see below. This shows the shaft going through the Drowsell, Powell, Two Yard and Crank seams before entering the Brymbo Fault at the level of the Crank seam at 418 feet depth (127m). A roadway is shown going to the Wallsend seam on the east side of the fault at a depth of 477 feet (145m), See below.

The downthrown on the fault is shown as 150 yards in a westerly direction.



Bye Pit showing Brymbo fault

Mine plan 6286 dated 1914, which shows workings and ventilation in the Powell, Queen and Drowsell coal seams. The Queen seam being at the same elevation as the Drowsell to the west of the fault, which is shown to have a 150-yard downthrow. The dip is shown as being 1 in 7 (8°) in a south easterly direction.

Mine plan NW730, shows the opencast workings in the Upper Stinking seam (Droughty) immediately south of the site beneath Brymbo Hall farm. No workings in the Upper Stinking were recorded close to the site. The sequence in the opencast proofed 35 feet (10.70m) of mudstone above the seam, overlain by over 50 feet (15.20m) of sandstone (Cefn Rock), with some 3 feet (0.90m) of glacial till at surface.

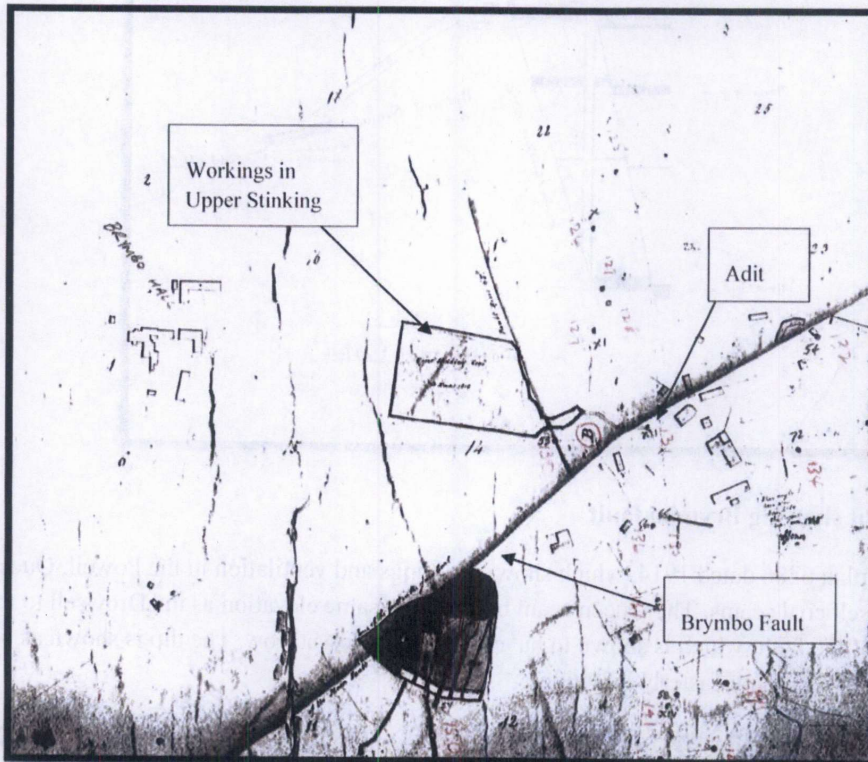
The Cefn Rock was described as medium grained, buff coloured, massive irregularly, broken by silty and shaly bands and sandstone. A thin coal was encountered at the bottom of the Cefn Rock.

The Upper Stinking comprised, 2ft of coal, overlying 2.70ft of mudstone overlying a further 3.74ft of coal, with the dip being in a south easterly direction at an angle of 9.5° .

Mine plan NW 1452 shows workings in the Black Bed Coal and ironstones and is dated 1812. However, these workings are to the west of the Brymbo fault, which appear to have

been pursued by total abstraction techniques. In addition, the shaft location in the vicinity of the site are recorded.

Separate mine plans under the same number show workings in the Drowsell, Yard and Upper Stinking coal seams. The workings in the Upper Stinking seam are shown below and dated 1818, they appear to have been pursued from the adit seen on site and crossed the Brymbo Fault close to the entrance, these are shown below and in Figure 3.



Workings in Upper Stinking Seam from Adit on site

It also records that all of the Two Yard coal on the eastern side of the fault had been exhausted before Mr. Wilkinson purchased the land (Circa 1792).

NW 1482 records working in the Crank Coal dated 1911, which also shows the above workings in the Upper Stinking seam, which may have been pursued further to the north west i.e. up dip.

NW 1483 records workings in the Brassey seam, which are undated, but to the west of Brymbo Fault. The pattern of workings was longwall, i.e. total abstraction.

2.5 History

Reference 3, explains that in its heyday Brymbo had around 100 pits and levels, which equated to around six per acre.

The right to dig coal in the wards of Brymbo and Coedpoeth was issued to the Burgesses of Holt in 1410. However, the first records of coal pits at Brymbo is from 1620, when six mines were recorded. The early pits were on the eastern side of the Brymbo Fault, where the coal was at surface. So much so that fires were reported when seams were exposed.

In 1783 Henry Cord took out a patent for using Sulphurous coal to refine Iron, hence the Upper and Lower Stinking coals could be used.

It records the output of ironstone in 1828 being 1716 tons, increasing to 4,900 tons in 1834.

The Brymbo Colliery sank the Blast or Furnace pits in 1843 and 1844

According to Reference 4, Mr. John Wilkinson purchased the Brymbo Hall estate in 1792, when he constructed two major blast furnaces, with the intention of producing 4,000 tons of pig iron each year. The first of these furnaces still survives. By 1796 it was producing 884 tons and remained in production until 1894.

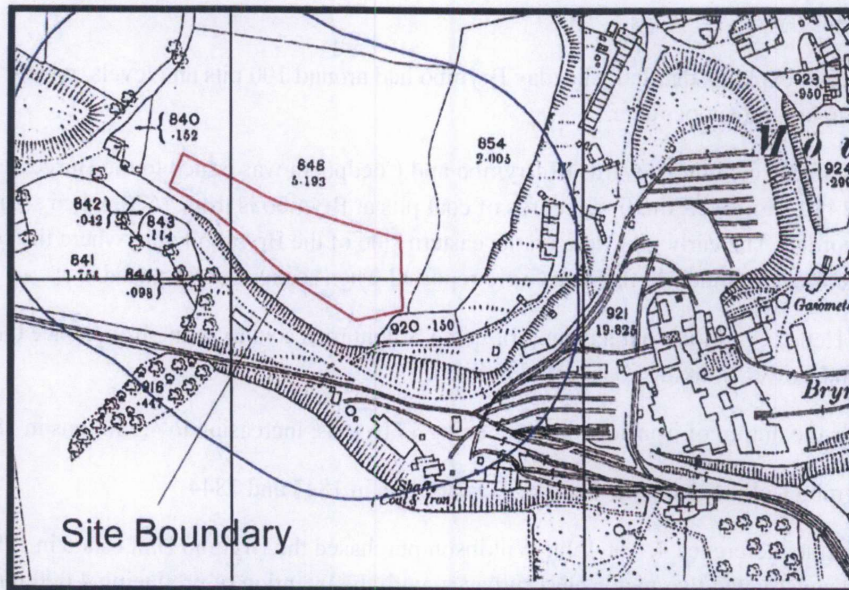
The Brymbo works were then purchased by Mr. Reid in 1830 and in 1841 by Robert Roy.

Brymbo Steel Works was incorporated in June 1884 and the No 1 Furnace produced the first open hearth steel to be produced in Britain. The first by product coke oven to be operated in conjunction with a steel plant was introduced at Brymbo.

During WWII an electric melting shop was opened to supply high quality steel to the Air Ministry. In addition, four arc furnaces were installed in 1940.

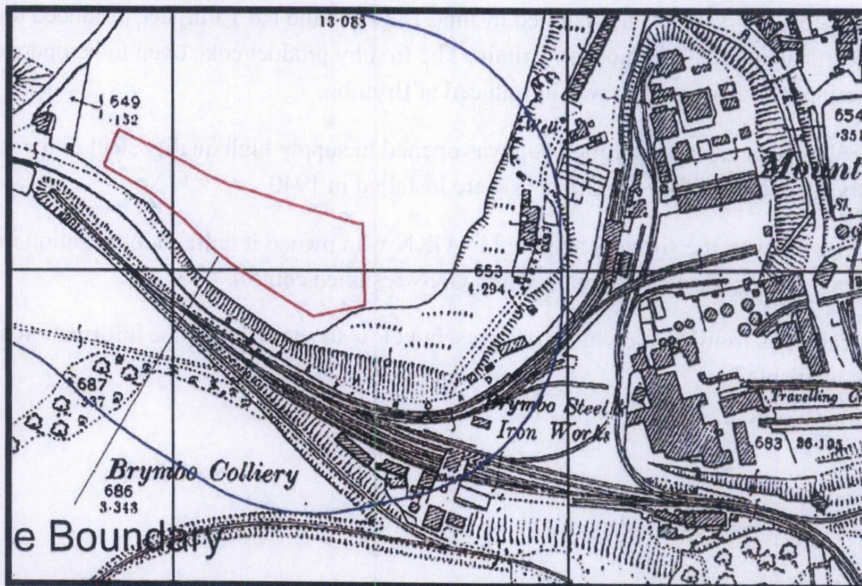
Following the war, the site was acquired by GKN who owned it until nationalization in 1951. Four years later it was de nationalized and GKN resumed control.

Historical plans from GSL archives are present below to show the sparse information on mining available.



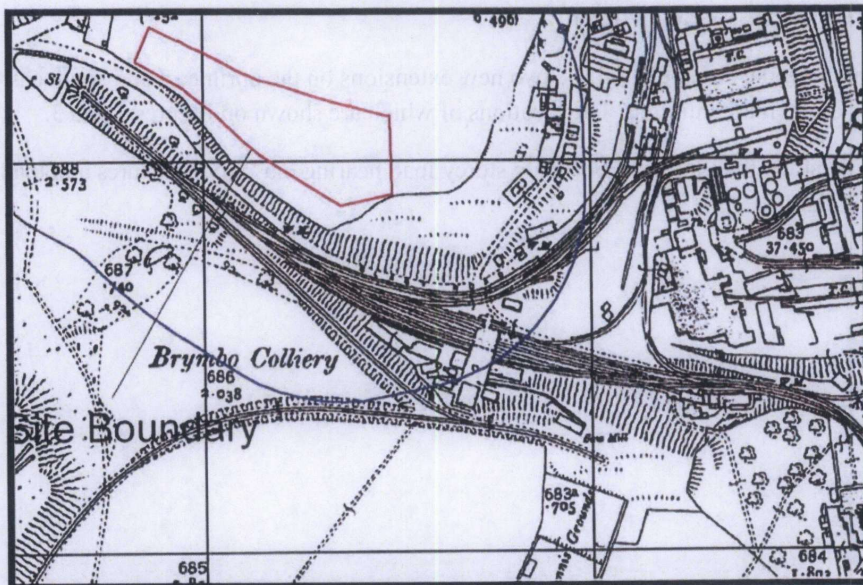
1873 OS plan

The only mine entrances on site are the two shafts, which were annotated Coal & Iron.



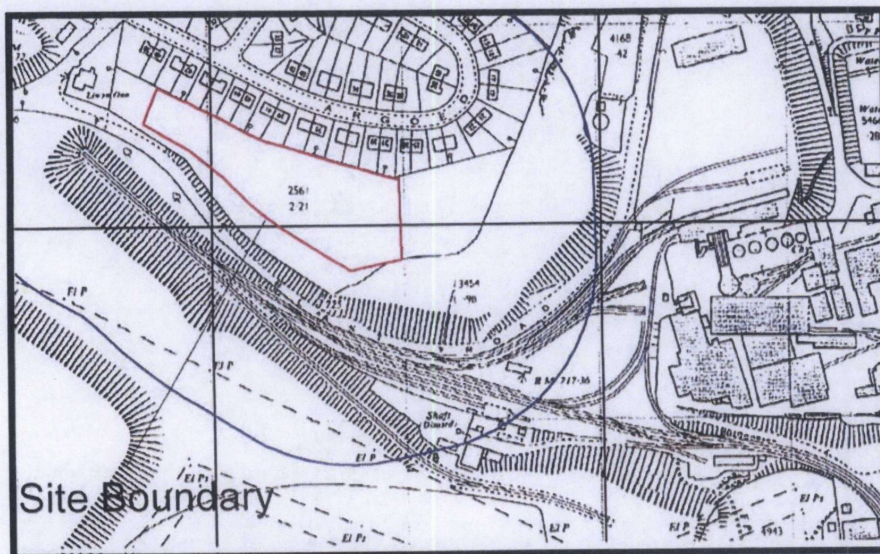
1899 OS plan

By 1899 the shafts were recorded as being part of Brymbo Colliery.



1912 OS plan

The 1912 OS plan shows further expansion of the colliery surface buildings.



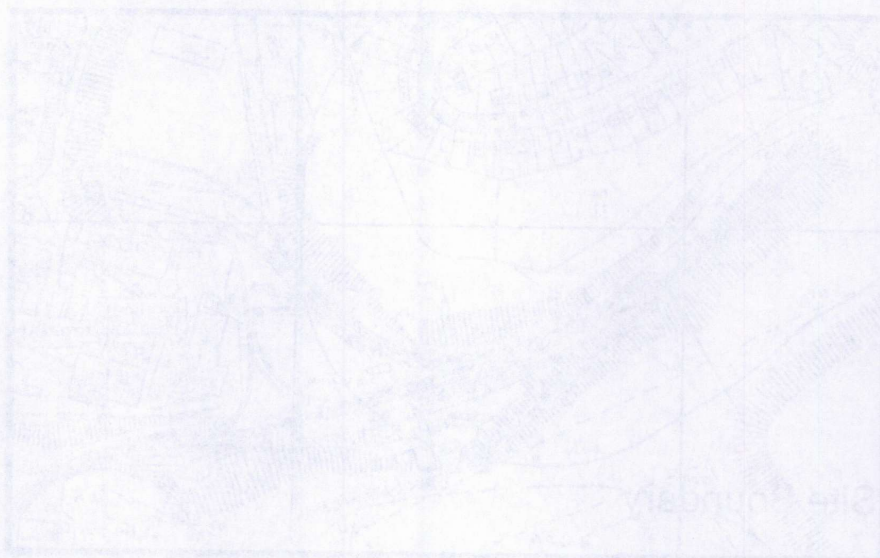
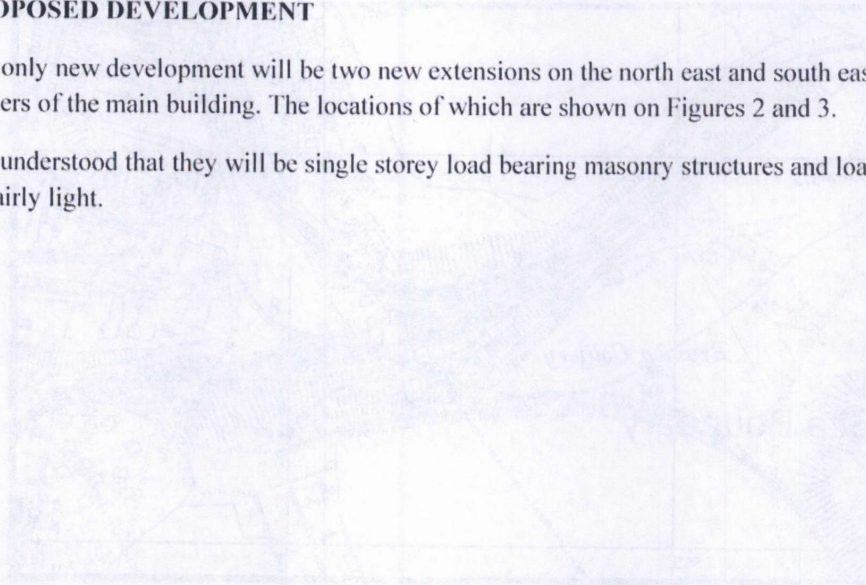
1963 OS plan

By the 1963 OS plan the colliery was dis used.

3.0 PROPOSED DEVELOPMENT

The only new development will be two new extensions on the north east and south east corners of the main building. The locations of which are shown on Figures 2 and 3.

It is understood that they will be single storey load bearing masonry structures and loads will be fairly light.



4.0 MINING TYPES

To understand the risk to the site the type of mining needs to be understood, as they differ across the site, mainly between the mineral types being won. In addition, the history of the mining needs to be understood.

The history is such that the workings to the east of the fault were pursued at a very early period, as the seams were close to surface, probably from the early 1600's. Consequently, no mine plans have been found for this area. Whilst to the west of the fault the mining is much younger and mine plans have survived. These generally confirmed the working to be by total extraction techniques.

To the west of the Brymbo fault the mining is relatively deep, with the shallowest coal seam being the Upper Stinking seam at a depth of 29m. It is also possible that an associated ironstone may have been worked with this seam. All other seams are so deep, as not to present a risk to any site development.

To the east of Brymbo fault both coal and ironstone workings would have been pursued at shallow depth.

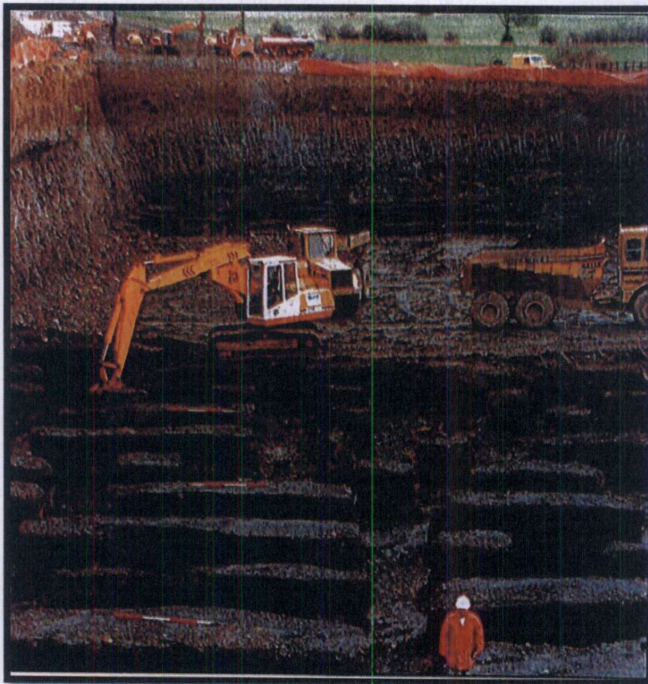
Coal Mining is such that the mineral is abstracted, which can leave large voids if pursued by Pillar and Stall workings. This is whereby pillars of coal are left in situ to support the roof of the mine, although pillars may be worked at a later date on abandonment of the mine. In addition, the main roadway, which were the main access to the mine would have been the only well engineered sections and would probably still be open, see below:



Example of Mine roadway

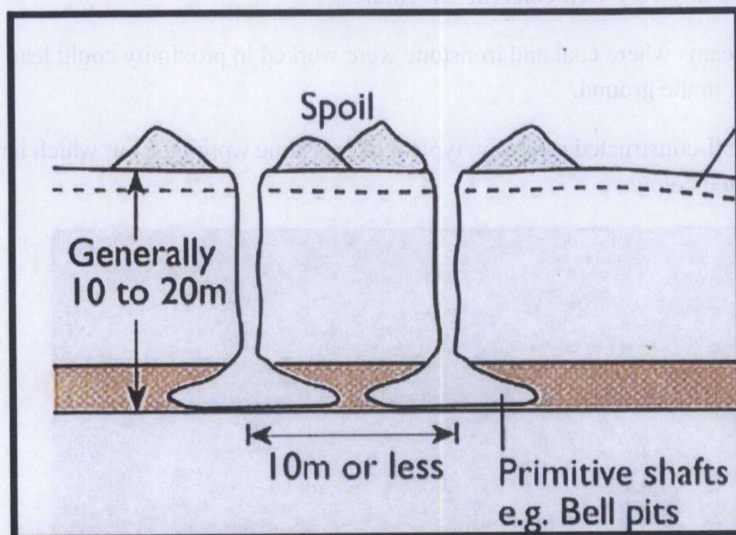


Coal being works with pillars either side

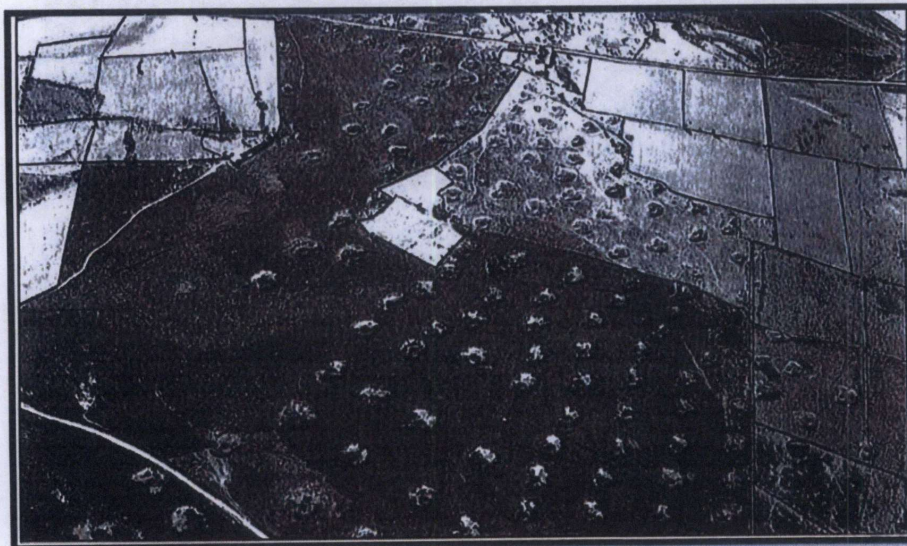


Example of pillar and stall workings exposed in an opencast

There is also the possibility in this area, as the coals were so shallow, that they could have been worked by "Bell Pits". These were shallow pits, usually unsupported where the coal was won at the base of the pit until it became unstable. The pit was then abandoned and backfilled, with the miners starting a new pit usually within 10m of the last pit, see below:



Example of Bell Pitting



Example of Bell Pits from Yorkshire

Ironstone mining was different to coal mining in that the mineral only comprises a small volume of the host rock. Therefore, there is a lot of waste during the mining operation. This was generally used to backfill the worked stalls to avoid bringing the waste to surface. However, the author's inspection of several ironstone mines revealed that the access roadways were generally very well constructed features.

In addition, those seams where coal and ironstone were worked in proximity could lead to very high voids left in the ground.

An example of a well-constructed roadway, typical of ironstone workings, but which has collapsed is presented below.



Well-constructed roadway with collapse

5.0 MINING RISK ASSESSMENT

When assessing the risk of shallow mining to a development several issues need to be considered, such as the type of working, depth to workings etc.

There are generally two types of mining, partial and total extraction. Methods of partial extraction are nearly all variations of, "Pillar and Stall" techniques, with pillars of coal being left to support the roof of the mine. Extraction ratios of between 30 to 75% were typical, depending on geological conditions and depths. However, it was common practice to work pillars on withdrawal from the mine, so higher extraction ratios may have been possible.

Total extraction is achieved by long wall workings and also by various pillar and stall techniques, where the pillars were removed in a second phase of mining, normally on retreat from the mine.

It is important to know the method of mining employed, as total extraction methods normally result in total collapse of the workings, with the exception of the main roadways. While partial abstraction techniques leave voids in the mine, which can become unstable and migrate to surface. These take the form of "crown holes" at surface, which are generally circular and can be several metres in diameter.

However, this is complicated to a certain extent, when coal and ironstone mining are pursued in close proximity to each other.

No detailed mine plans to the east of the Brymbo Fault showing the method of working have survived, which is not surprising as it pre dates 1872, when it became legal to deposit mine plans. Due to the age of the mining and the proximity to outcrop, it must be assumed that it would vary between Bell Pits close to outcrop and Pillar and Stall techniques further away from outcrop. Potential for voids may therefore exist in both the coal and ironstone seams.

However, to the west of the fault mine plans on most of the seams are available, which show the workings to have generally been by longwall methods, i.e. Total abstraction.

No detailed research into mining subsidence in North Wales has been undertaken. However, extensive research has been carried out in South Wales by the author of this report, where similar pillar and stall mining has taken place, this research revealed:

- Almost all incidents are "crown holes" in form, delayed general subsidence is very rare,
- About 75% of subsidence incidents are caused by the collapse of mine entrances or workings close to outcrop,
- Mine entrances present the greatest risk and account for over 50% of recorded incidents,
- The recorded rate of occurrence is very low.

The remaining subsidence incidents were analysed for their migration ratio (H/T), where H is the thickness of rock above the workings and T is the typical seam/void thickness, taken here as 2m, the height of a typical roadway. Of these 75% of the incidents had an H/T ratio of less than 2 (4m rock cover), with 90% of incidents having an H/T ratio of less than 6 (12m rock cover). The majority of the remaining incidents were related to special events, probably relating to collapses on main roadways, which would have continually been cleared by miners leading to bigger residual voidage.

There is also strong evidence from data gathered from grouting contracts, opencast sites and site investigations that migration of voids above workings generally extends to a limited height above the original void. Records of over 10,000 drill and grout boreholes were collected, in almost every case, the record of broken ground, workings or voids, occurred at or immediately above the anticipated elevation of the worked horizon.

From the above it can be concluded that the majority of residual voids have already collapsed to a stable profile. Otherwise voids would be encountered at a wide range of depths as they progress to the surface.

To assess the risk from shallow abandoned mining the following risk-based approach is followed, where risk (R) may be defined as: -

$$R = F \times C$$

Where F is the frequency of an undesirable event and C is the consequences of it happening.

The assessment of risk due to mining subsidence is a twofold process, involving first the assessment of probability of a subsidence event happening, i.e. the subsidence potential; secondly the consequences resulting from that event. For a crown hole to occur, the following must coincide at any one point:

- There must be a potential for mining (PM),
- There must be workings under the site (PW),
- A void must remain in the workings (PV),
- The void must be unstable and able to migrate to surface (PI),
- The thickness of rock overburden must be insufficient to choke the collapse feature before hitting rock head (PR),
- The thickness of drift must be insufficient to prevent the void reaching the surface (PD).

PW Workings Exist

West of Brymbo Fault

The workings on this side of the fault are considered to be sufficiently deep as not to carry a risk to the development, with the exception of the workings in the Upper Stinking seam, which were pursued from the adit (131) on site. This adit crossed the Brymbo Fault, before entering the workings, see Figure 3.

This roadway and workings will not affect the Heritage site. Mainly as the area underlain by the Upper Stinking workings is at sufficient depth and overlain by a considerable thickness of sandstone bedrock.

East of Brymbo Fault

Working on this side of the fault are likely to have been pursued by pillar and stall techniques in both the coal seams and the ironstone horizons.

Research of mining text books, such as;

- Mining, Lupton, 1893,
- Coal Mining, Cockin, T H, 1906,
- Practical Coal Mining, Kerr G L, 1920.

Have revealed that stalls would typically be between four to six yards wide, with pillars being five yards wide, although pillar robbing on abandoning the mine would account for 50 to 75% of the mine coal production.

It is therefore considered a certainty that workings and voids exist at shallow depth on this side of the fault.

The geology plan shows the Two Yard (Hollin seam) outcropping to the east of the site. However, the site walkover observed it to be above the site elevation, with the Crank seam likely to be at shallow depth beneath this site. Therefore, the seams that need to be considered are the Crank and those below it and their associated ironstones. The sequence is presented again below, which shows the Brassey ironstone and coal seam and possible the Black Bed ironstone and coal seam within influencing distance of the surface.

Seam	Depth (m)	Thickness (m)
Two-Yard (Hollin)	114	2.30
Crank Coal	117	2.46
Brassey Ironstone	126.5	
Brassey	130	1.95
Black Bed ironstone		
Black Bed Coal	140	2.25
Main	155	3.0

PV Voids remain in Workings

West of Brymbo Fault

It is likely that the only voids which could influence the site would be the main roadways accessing the Upper Stinking seam. However, the adit is open to tours by the Heritage Trust and the condition of the adit beneath the site can be inspected regularly.

East of Brymbo Fault

To the east of the fault the potential for voids to remain in the ground from main roadways and workings is considered to be high. The height of a roadway would typically be 2m, however, when combining coal and ironstone workings, voids could be much larger.

PI Voids become unstable

The potential for voids to become unstable has to be considered. To the west of the fault this is considered to be very low as the seam is overlain by a considerable thickness of strong sandstone, which was observed at surface.

However, to the east of the fault this is considered to be very likely especially in the underlying Brasseley horizon, whereby the ironstone and coals were both works in close proximity, which could lead to high residual voidage. As the depth to these seams is anticipated to be shallow, this would cause a high risk of voids becoming unstable. This could be exasperated by interacting with workings in higher seams such as the Crank.

PR Rock cover insufficient to prevent migration of rock

As mentioned above, the rock cover to the west of the Brymbo Fault is considered sufficient to prevent any void migration to surface.

However, to the east of the fault there is very little cover to the workings and void migration is a strong possibility.

PD Drift cover insufficient to prevent migration to surface

Only a thin layer of superficial deposits is possible to the west of the fault, whilst there may be made ground to the east of the fault, which may be quite thick. However, neither of these would have any strong ameliorating effect on any upward migration of voids to surface.

6.0 GEOTECHNICAL RECOMMENDATIONS

6.1 West of Brymbo Fault - Area A

To the west of the Brymbo fault the workings are at sufficient depth as not to present a risk to any of the proposed development or future site users.

However, the location of mine entrances needs more careful consideration. Shafts if they have not been treated run the risk of sudden collapse, this is due to the fact that they were rarely backfilled full depth, especially if there was insufficient nearby fill. Instead a staging would be constructed at one of the levels, which may deteriorate with time and collapse leading to a surface failure. However, there are no known shafts to the west of the fault that could influence the development area, shafts 127 and 128 being sunk straight into sandstone rock head.

In addition, adits, which are tunnels into the mine are also well constructed and may remain open beyond a sealed entrance. On collapse these could cause crown holes to develop at surface.

The information provided by the Coal Authority shows the possibility of several adits that could trend beneath the path leading westwards from the main development area. As the only risk is to site walkers and not to any proposed structures the risk is considered to be very low, and no further works would be required to locate and treat these adits.

The site walkover did not reveal any evidence of these features at surface. The only records are for adit 126, which was bricked up and rendered. The presence of these adits has to be queried, as they are located at elevations of around 15 to 20m above the Upper Stinking seam, which is the only seam they could have been driven to. However, they probably pre date Adit 131 and therefore drainage would have been difficult.

6.2 East of Brymbo Fault – Area B

Beneath this area, it is considered highly likely that shallow mineworking's in both ironstone and coal seams have been pursued. Therefore, it will be necessary to undertake a site investigation to confirm:

- Geological sequence,
- Depth to mine workings,
- State of mine workings,
- Rock cover to the seams.

The site investigation should comprise rotary percussive boreholes to determine the above.

It is also considered highly likely that it will be necessary to drill and grout any shallow mine workings beneath the proposed new buildings. With the associated new development founded on a raft foundation designed to span 3m, and cantilever 1.5m at its edge.

In addition, two recorded shafts are present (135 and 136) close to the south eastern extension building for the Heritage development. There is no recorded treatment for these shafts, which were shown on the mine plans. It will therefore be necessary to undertake a site investigation to locate these shafts to establish whether they will influence the new structure.

If this is proved to be the case, the shaft will need to be treated in accordance with current standards, Reference 5, which will involve a concrete plug below rock head and a reinforced concrete cap at rock head. Permission for this work will need to be obtained from the Coal Authority for any intrusive works.

An alternative to the above would be to move the extension away from the shafts to avoid having to consider their effect on the development, which would save the associated high costs involved with locating and treating shafts.

In addition, the above development could be affected by Bell Pits, these were typically backfilled on abandonments and would be treated by drilling and grouting on a close, say 3m, grid beneath the proposed development.

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David W. Brown, William W. Brown, and William W. Brown
2. Applied Regional Science in the Western Hemisphere: A Review of the Literature
David W. Brown, William W. Brown, and William W. Brown
3. The Effects of the 1990s on the U.S. Economy: A Review of the Literature
David W. Brown, William W. Brown, and William W. Brown
4. The Effects of the 1990s on the U.S. Economy: A Review of the Literature
David W. Brown, William W. Brown, and William W. Brown
5. The Effects of the 1990s on the U.S. Economy: A Review of the Literature
David W. Brown, William W. Brown, and William W. Brown

FIGURES



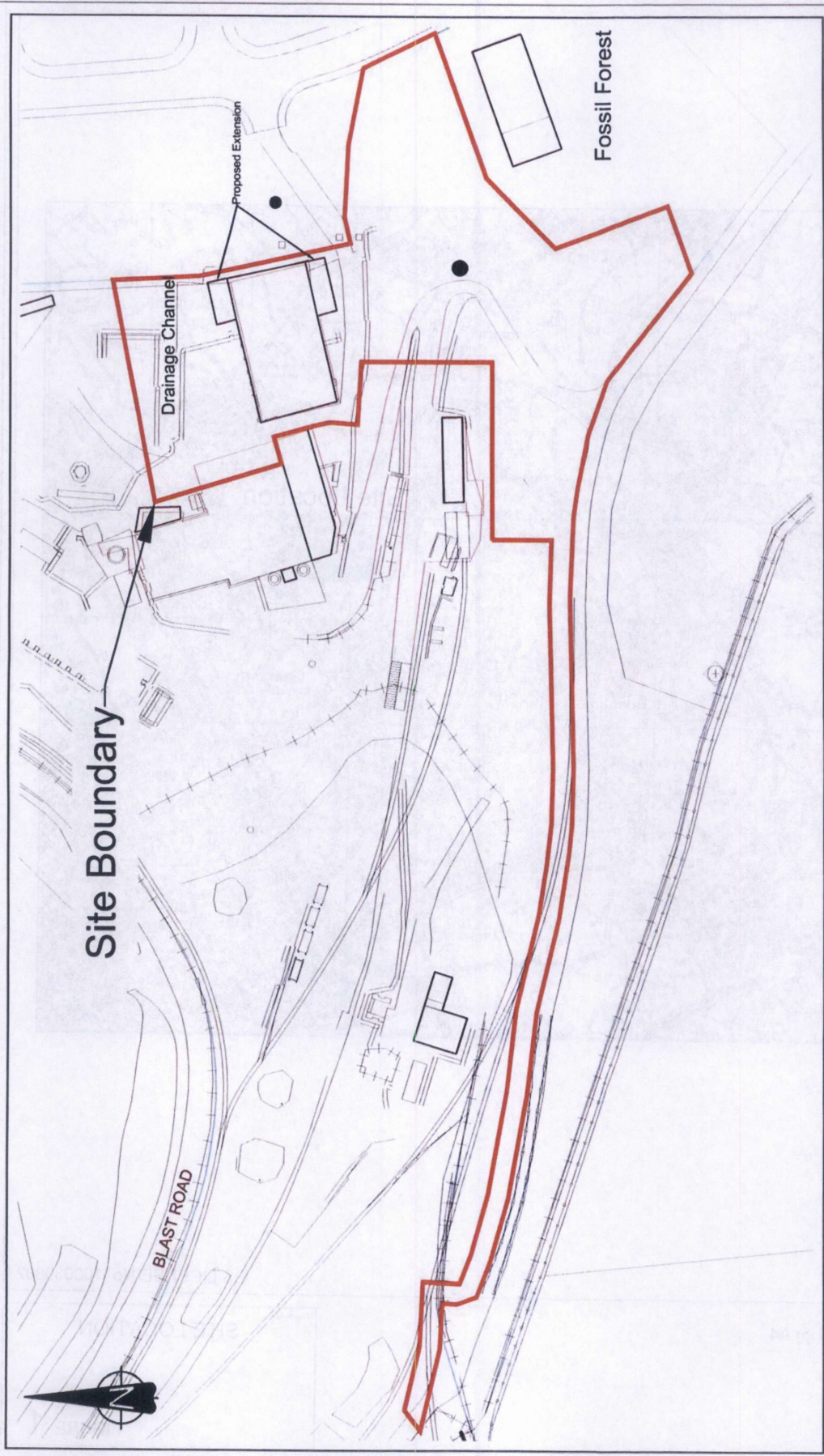
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SCALE 1:50,000 @ A4

Figure Title

SITE LOCATION

FIGURE 1



Site Boundary

Drainage Channel

Proposed Extension

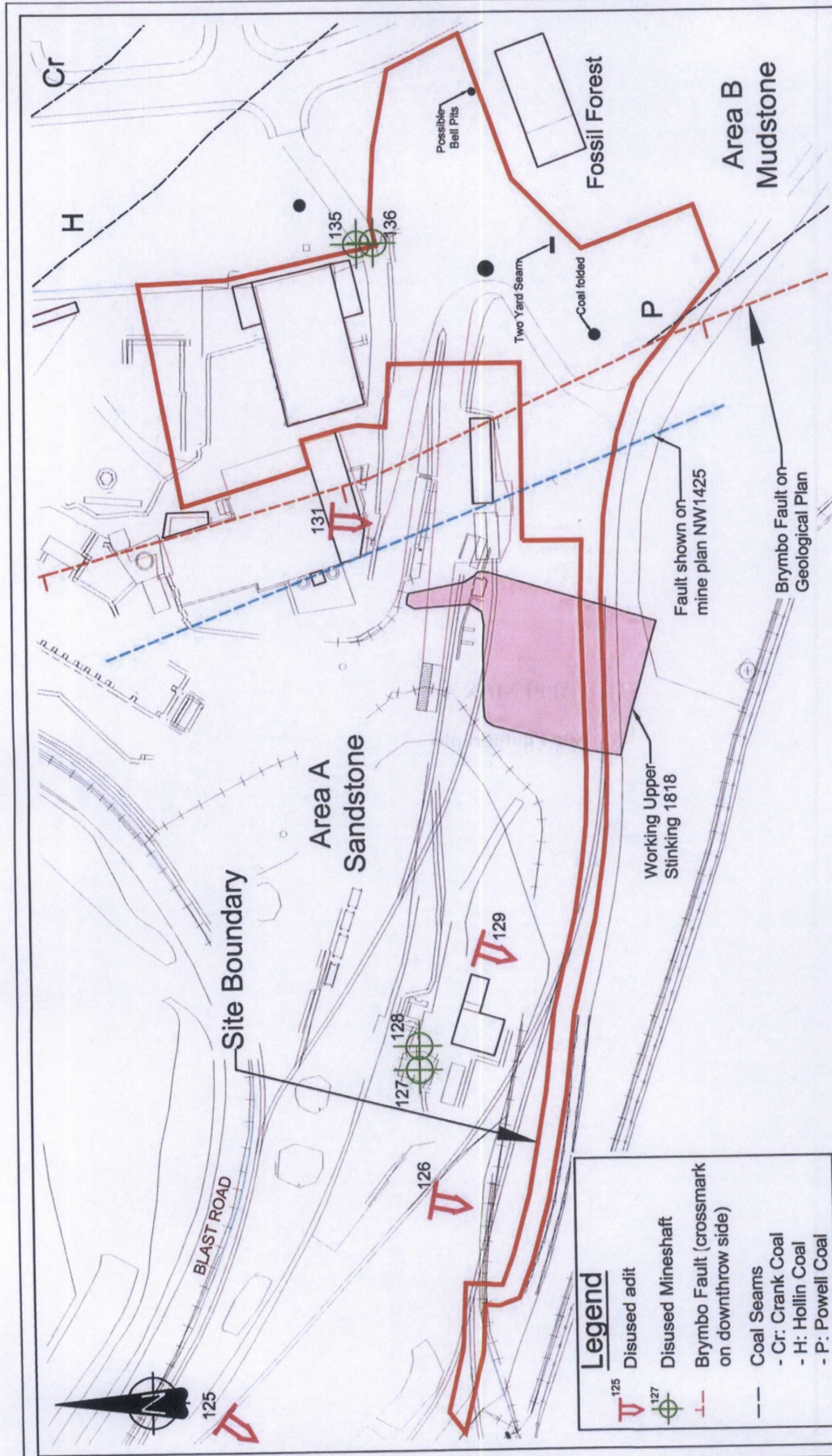
Fossil Forest

BLAST ROAD

SCALE 1: 1250 @ A4

Figure Title
EXISTING SITE LAYOUT
MACHINE SHOP SITE

FIGURE 2



GEOLOGY
MACHINE SHOP

FIGURE 3

SCALE 1: 1250 @ A4

FIGURE 3

WVCBIE SHOB
GEOLOGY

WVCBIE SHOB
GEOLOGY

APPENDIX A
Site Photographs

SCALE 1:1000 @ 1/4"

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WVCBIE SHOB
GEOLOGY

WVCBIE SHOB
GEOLOGY





Photograph 1 Mine water discharge from adit



Photograph 2 outcrop of sandstone close to site entrance



Photograph 3 Southern side of site showing ground level rising rapidly to the south



Photograph 4 Main building at front of site



Photograph 5 drainage channel through site



Photograph 6 Retaining structure on northern site boundary



Photograph 7 Inside previous building



Photograph 8 Adit inside right had entrance



Photograph 9 Steel works structures on site



Photograph 10 Adit entrance



Photograph 11 View up adit



Photograph 12 Path on southern site boundary



Photograph 13 Same path heading upslope



Photograph 14 Agents house, which is on the old plans



Photograph 15 Sandstone outcrop on higher section of the site



Photograph 16 Shaft 128



Photograph 17 Shaft 127



Photograph 18 Outcrop of Two-yard (Hollin) seam dipping eastwards



Photograph 19 Two-yard (Hollin) seam tilted in close proximity to fault



Photograph 20 Area of bell pitting close to Fossil Forest



Photograph 21 Showing elevation of Bell Pits to Crank seam



Photograph 22 Showing relationship with site



Photograph 23 Eastern site boundary with access road



Photograph 24 Fossil Forest

CONZAM

coal mining report

BRYMBO HERITAGE TRUST, BRYMBO IRON AND STEEL WORKS HERITAGE
CENTRE, NEW HIGH STREET, BRYMBO, WIRKHAM, LL11 5AX

	Known or potential coal mining risks	Page 1
	Further action	Page 2
	Further action	Page 3
	Further action	Page 4
	Further action	Page 5
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APPENDIX B

Coal Authority Report

on page 10

Professional opinion

The Coal Authority has been consulted on the proposed development and has provided the following professional opinion. The Coal Authority has been consulted on the proposed development and has provided the following professional opinion. The Coal Authority has been consulted on the proposed development and has provided the following professional opinion.



The Coal
Authority

CON29M

coal mining report

BRYMBO HERITAGE TRUST, BRYMBO IRON AND STEEL WORKS HERITAGE
CENTRE, NEW HIGH STREET, BRYMBO, WREXHAM, LL11 5AX



Known or potential coal mining risks

Past underground coal mining	Page 4
Future underground coal mining	Page 4
Mine entries	Page 5
Hazards related to coal mining	Page 6



Further action

These additional reports can
give further detail on the risks
identified:

- Mine entry interpretive
report
- Mine entry plan and data
sheets
- Surface hazard incident
report

For more information please
see our Further action reports
on page 10



Professional opinion

According to the official mining information records held by the Coal Authority at the time of this search, evidence of, or the potential for, coal mining related features have been identified. In view of the coal mining circumstances we would recommend that any planned or future development should follow detailed technical advice before beginning work on site. Please see **page 3** for further details on Future development.

Your reference:

Our reference: 51002199116001

Date:

13 December 2019

Client name:

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The Law
Society

Enquiry boundary

Key

Approximate position of enquiry boundary shown



Disused adit



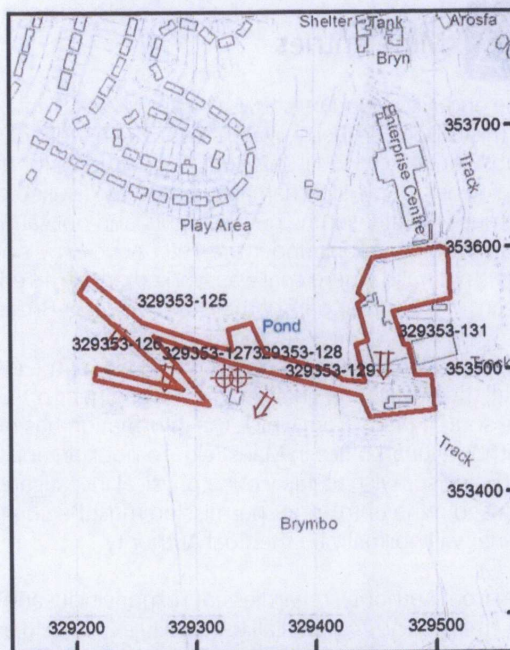
Disused mineshaft



We can confirm that the location is
on the coalfield



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This report is prepared in accordance with the latest Law Society's Guidance Notes 2018, the User Guide 2018 and the Coal Authority's Terms and Conditions applicable at the time the report was produced.



Accessibility

If you would like this information in an alternative format, please contact our communications team on 0345 762 6848 or email communications@coal.gov.uk.

Your reference

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Professional opinion



Mine entries

The enquiry boundary shows the approximate location of the disused mine entry/entries referred to in this report. Property owners have the benefit of statutory protection (under the Coal Mining Subsidence Act 1991). This contains provision for the making good, to the reasonable satisfaction of the owner, of physical damage caused by disused coal mine workings including disused coal mine entries. A leaflet setting out the rights and obligations of either the Coal Authority or other responsible persons under the 1991 Act can be obtained by visiting www.coal.gov.uk. Please note this Act is not valid where coal was worked or extracted by virtue of the grant of a gale in the Forest of Dean, or any other part of the Hundred of St. Briavels in the county of Gloucester.

If you wish to discuss the relevance of any of the information contained in this report, you should seek the advice of a qualified mining engineer or surveyor. If you or your advisor wishes to examine the source plans from which the information has been taken, these are available to view, at our Coal Authority head office in Mansfield. To book an appointment please call **01623 637 225**. Should you or your advisor wish to carry out a physical investigation that may enter, disturb or interfere with any disused mine entry, prior permission must be sought from the owner. For coal mine entries, the owner will normally be the Coal Authority.

The Coal Authority, regardless of responsibility and in conjunction with other public bodies, provide an emergency, 24 hour call out facility in coalfield areas to assess the public safety implications of mining features (including disused mine entries). To report an emergency you can call **01623 646 333**.



Future development

If development proposals are being considered, technical advice relating to both the investigation of coal and former coal mines and their treatment should be obtained before beginning work on site. All proposals should apply specialist engineering practice required for former mining areas. No development should be undertaken that intersects, disturbs or interferes with any coal or coal mines without first obtaining the permission of the Coal Authority. Developers should be aware that the investigation of coal seams, mine workings or mine entries may have the potential to generate and/or displace underground gases. Associated risks both to the development site and any neighbouring land or properties should be fully considered when undertaking any ground works. The need for effective measures to prevent gases migrating onto any land or into any properties, either during investigation or remediation work, or after development must also be assessed and properly addressed.

If you are looking to develop, or undertake works, within a coal mining development high risk area your Local Authority planning department may require a Coal Mining Risk Assessment to be undertaken by a qualified mining geologist or engineer. Should you require any additional information then please contact the Coal Authority on **0345 762 6848** or email cmra@coal.gov.uk.

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Detailed findings

Information provided by the Coal Authority in this report is compiled in response to the Law Society's CON29M Coal Mining enquiries. The said enquiries are protected by copyright owned by the Law Society of 113 Chancery Lane, London WC2A 1PL.

The Coal Authority owns the copyright in this report and the information used to produce this report is protected by our database rights. All rights are reserved and unauthorised use is prohibited. If we provide a report for you, this does not mean that copyright and any other rights will pass to you. However, you can use the report for your own purposes.

1 Past underground coal mining

The property is in a surface area that could be affected by underground mining in 10 seams of coal at shallow to 230m depth, and last worked in 1914.

2 Present underground coal mining

The property is not within a surface area that could be affected by present underground mining.

3 Future underground coal mining

The property is not in an area where the Coal Authority has received an application for, and is currently considering whether to grant a licence to remove or work coal by underground methods.

The property is not in an area where a licence has been granted to remove or otherwise work coal using underground methods.

The property is not in an area likely to be affected from any planned future underground coal mining.

However, reserves of coal exist in the local area which could be worked at some time in the future.

No notices have been given, under section 46 of the Coal Mining Subsidence Act 1991, stating that the land is at risk of subsidence.

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4 Mine entries

Within, or within 20 metres of, the boundary of the property there are 6 mine entries, the approximate positions of which are shown on the enquiry boundary plot. For reasons of clarity, mine entry symbols may not be drawn to the same scale as the plan.

Our records disclose the following information:

329353-126. Drift entrance bricked up and rendered in 1970.

329353-125. No treatment details.

329353-127. In 1968 the shaft top was covered with RSJs and sheeting. The entry was found to be open to a depth of 31.5m in 2002. The area around this shaft was secured with palisade fencing.

329353-129. No treatment details.

329353-128. This shaft was found to be open to a depth of 61m from the top of the heapstead in 2002. The shaft was secured by constructing a palisade fencing on top of the brick heapstead.

329353-131. This entry was investigated in 2002 by JMC Mining Services and was found to be within a building. A metal grill was placed across the entrance to the building to prevent access. The adit was found to be open.

This information is based on the information that the Coal Authority has at the time of this enquiry.

Based on the Coal Authority's knowledge of the mining circumstances at the time of this enquiry, there may be unrecorded mine entries in the local area that do not appear on Coal Authority records.

For an additional fee, the Coal Authority can provide a Mine Entry Interpretive Report. The report will provide a separate assessment for the mine entry/entries referred to in this report. It gives an opinion on the likelihood of mining subsidence damage caused from ground movement as a consequence of the mine entry/entries. It also gives details of the remedies available for subsidence damage where the mine entry was sunk in connection with coal mining.

Please note that it may not be possible to produce a report if the main building to the property cannot be identified from Coal Authority plans (ie for development sites and new build).

For further advice on how to order this additional information please visit www.groundstability.com.

5 Coal mining geology

The Coal Authority is not aware of any damage due to geological faults or other lines of weakness that have been affected by coal mining.

Your reference
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6 Past opencast coal mining

The property is not within the boundary of an opencast site from which coal has been removed by opencast methods.

7 Present opencast coal mining

The property does not lie within 200 metres of the boundary of an opencast site from which coal is being removed by opencast methods.

8 Future opencast coal mining

There are no licence requests outstanding to remove coal by opencast methods within 800 metres of the boundary.

The property is not within 800 metres of the boundary of an opencast site for which a licence to remove coal by opencast methods has been granted.

9 Coal mining subsidence

The Coal Authority has not received a damage notice or claim for the subject property, or any property within 50 metres of the enquiry boundary, since 31 October 1994.

There is no current Stop Notice delaying the start of remedial works or repairs to the property.

The Coal Authority is not aware of any request having been made to carry out preventive works before coal is worked under section 33 of the Coal Mining Subsidence Act 1991.

10 Mine gas

The Coal Authority has no record of a mine gas emission requiring action.

11 Hazards related to coal mining

The property has been subject to remedial works, by or on behalf of the Coal Authority, under its Emergency Surface Hazard Call Out procedures.

Your reference

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12 Withdrawal of support

The property is not in an area where a notice to withdraw support has been given.

The property is not in an area where a notice has been given under section 41 of the Coal Industry Act 1994, cancelling the entitlement to withdraw support.

13 Working facilities order

The property is not in an area where an order has been made, under the provisions of the Mines (Working Facilities and Support) Acts 1923 and 1966 or any statutory modification or amendment thereof.

14 Payments to owners of former copyhold land

The property is not in an area where a relevant notice has been published under the Coal Industry Act 1975/Coal Industry Act 1994.

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Statutory cover



Coal mining subsidence

In the unlikely event of any coal mining related subsidence damage, the Coal Authority or the mine operator has a duty to take remedial action in respect of subsidence caused by the withdrawal of support from land or property in connection with lawful coal mining operations.

When the works are the responsibility of the Coal Authority, our dedicated public safety and subsidence team will manage the claim. The house or land owner ("the owner") is covered for these works under the terms of the Coal Mining Subsidence Act 1991 (as amended by the Coal Industry Act 1994). Please note, this Act does not apply where coal was worked or gotten by virtue of the grant of a gale in the Forest of Dean, or any other part of the Hundred of St. Briavels in the county of Gloucester.

If you believe your land or property is suffering from coal mining subsidence damage and you need more information on what to do next, please use the following link to our website which sets out what your rights are and what you need to consider before making a claim.

www.gov.uk/government/publications/coal-mining-subsidence-damage-notice-form



Coal mining hazards

Our public safety and subsidence team provide a 24 hour a day, 7 days a week hazard reporting service, to help protect the public from hazards caused by past coal workings, such as a mine shaft or shallow working collapse. To report any hazards please call **01623 646 333**. Further information can be found on our website: www.gov.uk/coalauthority.

Your reference:

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13 December 2019

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Glossary



Key terms

- adit** - horizontal or sloped entrance to a mine
- coal mining subsidence** - ground movement caused by the removal of coal by underground mining
- Coal Mining Subsidence Act 1991** - the Act setting out the duties of the Coal Authority to repair damage caused by coal mining subsidence
- coal mining subsidence damage** - damage to land, buildings or structures caused by the removal of coal by underground mining
- coal seams** - bed of coal of varying thickness
- future opencast coal mining** - a licence granted, or licence application received, by the Coal Authority to excavate coal from the surface
- future underground coal mining** - a licence granted, or licence application received, by the Coal Authority to excavate coal underground. Although it is unlikely, remaining coal reserves could create a possibility for future mining, which would be licensed by the Coal Authority
- mine entries** - collective name for shafts and adits
- payments to owners of former copyhold land** - historically, copyhold land gave rights to coal to the copyholder. Legislation was set up to allow others to work this coal, but they had to issue a notice and pay compensation if a copyholder came forward
- shaft** - vertical entry into a mine
- site investigation** - investigations of coal mining risks carried out with the Coal Authority's permission
- stop notice** - a delay to repairs because further coal mining subsidence damage may occur and it would be unwise to carry out permanent repairs
- subsidence claim** - a formal notice of subsidence damage to the Coal Authority since it was established on 31 October 1994
- withdrawal of support** - a historic notice informing landowners that the coal beneath their property was going to be worked
- working facilities orders** - a court order which gave permission, restricted or prevented coal mine workings

Your reference
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Further action reports

Mine entry interpretive report - assesses the risk of ground movement from mine entries in, or within 20 metres of, the property boundary. To order this report, use the same boundary as the CON29M report, then draw the building on the additional map screen.

For more information and to order this report please visit:

<https://www2.groundstability.com/interpretive-report>

Mine entry plan and data sheets - give additional information on mine entries recorded on a piece of land. To order this report use the same boundary as the CON29M report and a member of our team will contact you to confirm the mine entries to include in this bespoke report.

For more information and to order this report please visit:

<https://www2.groundstability.com/plan-and-data-sheets>

Surface hazard incident report - gives copies of documents from the incident file from the Coal Authority archives. To order this report, use the same boundary as the CON29M mining report.

For more information and to order this report please visit:

<https://www2.groundstability.com/surface-hazard-incident>

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