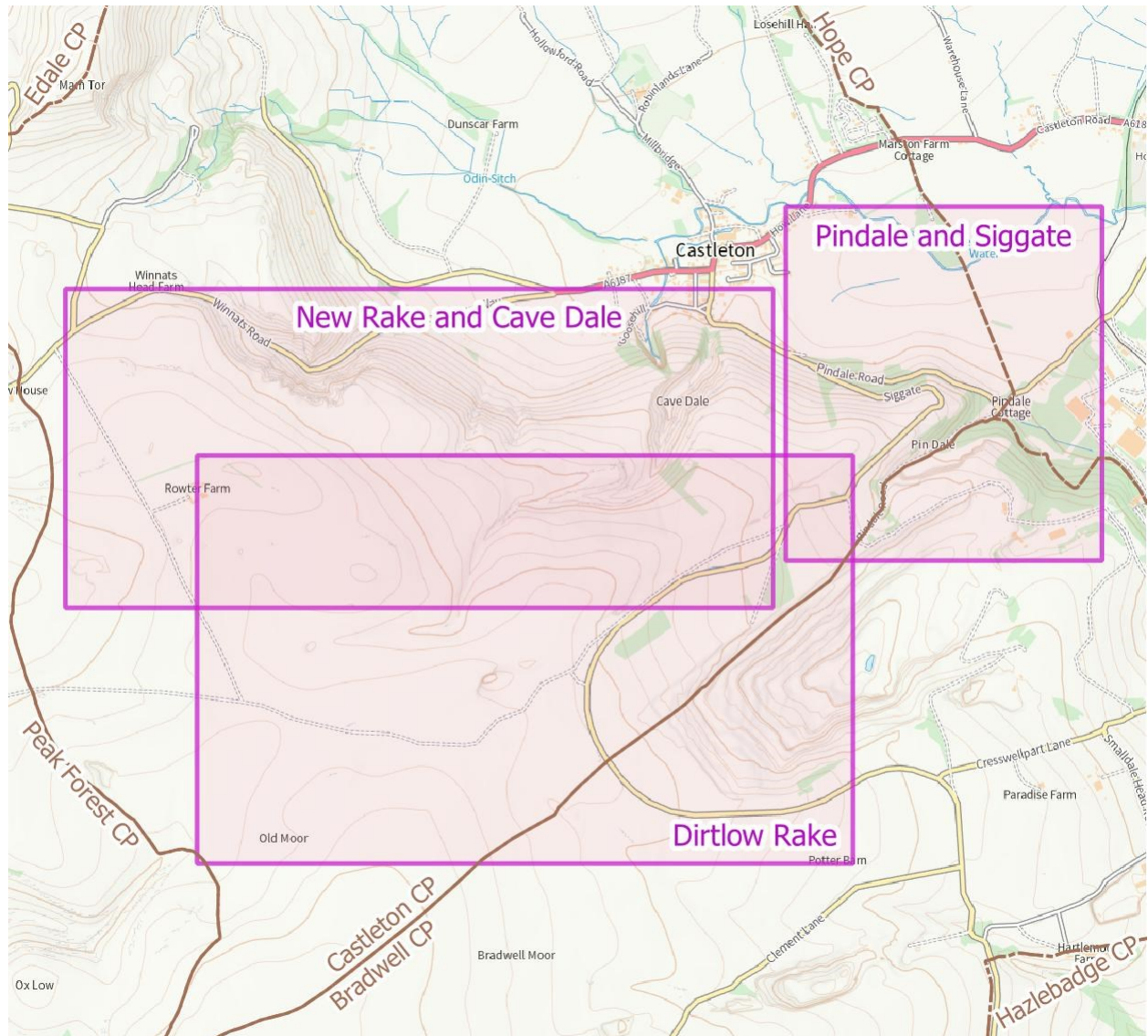


# Castleton Area



This is a field guide not a walking guide. Users are expected to be competent at planning and executing their own route, taking account of hazards, legal matters, and ethical conduct.

The mention of a site in this guide does not indicate right of access.

The maps provided are not a substitute for use of OS 1:25,000 mapping. They should not be taken as a reliable guide to what is present.

## Preface

### What Kind of Guide is This?

This is a field guide not a walking guide; it will generally refer only to locations, with a suggested order of visiting, and avoids route-finding information except where additional information to that found on the OS map will be helpful.

It is a guide which focusses on surface features; it avoids referring to locations where nothing can be seen today, even when these are historically significant, and generally restricts comment on underground features to information which helps in understanding the surface.

It is a field guide not a history; the history of the mining industry is brief, with published sources given where historical detail may be found.

It has been written as part of the author's personal exploratory wanderings, which has involved the collation of information from many sources. Many of these contain vague or incorrect location information and the author has attempted, so far as is reasonable, to ensure that all locations given are correct and accurate (subject to the limitations of consumer GPS). It represents the kind of guide which the author would like to have found and unashamedly embeds some of his idiosyncrasies.

It is not an academic source; information drawn from many sources is synthesised with personal observation and inference without formal citation. The principal sources used are, however, given. It has been written by an amateur; if rigour is important to you, refer to these sources! That said, I welcome communication of errors and omissions, and will incorporate those which fit with my view of what these guides should be.

**It is designed to be used "in the field"; it is distributed electronically for home printing, with separate large maps, and easily used in one or more transparent A4 sleeves. Users of GPS devices can download the location data, and digital maps are provided for use on PCs, tablets, and smartphones. See the section "Maps and Digital Location Data" towards the end of this guide.**

### Guides, Itineraries/Trips, Locations

Several guides have been prepared, and others are in preparation. These are published as single documents with supporting geospatial data for GPS enabled devices. They generally contain several individual itineraries (also called "trips" with no distinction of meaning) which are geographically close.

Each itinerary comprises some background information, historical notes, and a set of locations, which are one of features (things to see), viewpoints (places to see features from, and their wider context), and waypoints (significant access/egress places or suggestions of good places to leave a more obvious path). The historical notes are usually separated from the location descriptions, as "boxed-out" text, especially when several locations are part of the same historical entity.

Itineraries usually have a core route suggested, and one or more detours. The route is primarily a suggested sequence of visiting the locations, does not always indicate the path to be taken, and has not been designed to be an attractive walking route. Readers are left to plan where they put their feet, and incorporate whichever locations they see fit within longer walks/hikes...

### Note on Location Identifier Convention

Location identifiers comprise first a single character A-Z which indicates the trip/itinerary. Different guides may use the same letter.

There are three kinds of location given in the guide, which are indicated by the second character with the following meaning: F = a feature, V = a viewpoint, W = a waypoint.

Location identifiers are completed with two digits which follow the order of the suggested route. These increase independently for features, viewpoints, and waypoints.

## Pindale and Siggate

The small arrow-head of ground between the roads known as Siggate and Pindale Road, and Pindale itself contains a dense area of mineral veins and a wealth of surface features; it is almost entirely a Scheduled Monument. Siggate derives from placename parts *sīd* and *gata* literally meaning "side way/road", presumably referring to its position on the side of Pindale, through which ran Pindale Gate, although it is today known as Pindale Road.

The mineralisation and geology is a natural extension of Dirtlow Rake; this area is the termination of that major structure. On Pindale side, the closely-parallel nature of the geological faults which characterises Dirtlow Rake degenerates into a complex mesh of splays and branches. The veins are correspondingly narrower, although this does not necessarily mean there was less valuable mineral to be won and the hillside location would have made exploitation easier.

The veins which cut across the side of Pindale would surely have been recognised in the earliest periods of Peak District lead mining and may have been exploited in Roman times.

Features to be seen include open cuts with pick marks (presumed to date back to the 16<sup>th</sup> century, although the earliest recorded mining in this area is from 1727), a climbing and hauling shaft in good condition, shot-holes, evidence of the line of Pindale Sough, surface expressions of the complex array of veins, boulders of "Pindale Rock", and abundant Leadwort (in season). There are several features of geological interest which are not directly of mining relevance which illustrate the geological environment.

The Dirtlow and How Grove trip is easily combined with a circuit of Pindale and Siggate.

Chris Heathcote's papers in Mining History Volume 14 No. 6 and Volume 16 No. 6 should be consulted for more detail, particularly on the historical aspects. Henry Chatburn's paper in Volume 1 (then called the Bulletin) includes sketch plans of mine sites as they were in the early 1960's and contemporary and earlier photographs.

### PW01 – Parking

Some parking is available where Pindale Road departs from Siggate. This is a quarry access road. The roadside near to Siggate Head Mine (PF16) may also be used but it is more popular.

### PF01 – Pindale Rock

The area around here contains numerous boulders of Pindale Rock. This was limestone but the calcium carbonate has been substantially replaced by dark silicate rock and

contains occasional fluorite. Chunks of chert which formed part of the original rock are also present. Variations in the original limestone structure and extent of replacement gives an interesting variety of appearance.

The silica is more resistant to corrosion by naturally acidic rainwater, hence the boulders remain to litter the landscape, making several fields around here look rather different to the norm.

Geologists speculate that the source of the silica, which migrated hydrothermally, may be nearby volcanic rocks; a volcanic vent exists beneath the Hope Cement Works quarry and there are exposures of lava and tuff (lithified volcanic ash) in Cave Dale and Pindale.

Similar boulders are abundant to the West, and smaller fragments may be observed in Pindale Road as it descends.

### Aside – Palisaded Enclosure

The right of way just south of PV01 passes through the northern end of a late Bronze-age or early Iron-age palisaded enclosure. This semi-hexagonal feature, approximately 50m across, remains as stone footings where an earthen bank would have been topped with a palisade. It was probably used as a stock enclosure.

### Geological Detour

#### PF02 – Massed Crinoids

*This location is not dedicated as Open Access but access appears to be tolerated as in the quarry.*

Abundant fossilised crinoid stems may be found in the two low cliffs here, with longer than usual segments remaining intact.

Crinoids (there are species still in existence today) were filter-feeders with a long stem between the feeding head and their attachment to the sea floor. They would be too fragile to survive except behind the protection of a reef but benefitted from the influx of food from the deeper waters, so would thrive not far from the reef edge. The situation here corresponds well with this biological imperative; the reef margin corresponds with the steep slope down into the Hope Valley (see maps).

### PW02 – Access to Quarry Bench

A track on the east side, clearly used by motor-vehicles, gives access to the upper bench of Hadfields Quarry (also called Pindale Quarry).

### **PV01 – Fire Scrin and Pindale Side Vein**

The quarry bench provides an excellent vantage point to appreciate these two veins and the substantial quantity of crushed calcite which was tipped down the dale side at a later date. Fire Scrin (aka Walker Stickings) is left-most of the two slanting open-cuts and has its lower part obliterated by waste. Pindale Side Vein is further right is also sometimes called Pindale Scrin or Lawyers Vein. The position of the un-named SW-NE trending fault/vein may also be inferred from a break in the slope, particularly in winter when the trees are not in leaf.

Referring to the geological map, note that an outcrop of Litton Tuff (BGS lexicon) is marked in the base of Pindale Quarry and to your right. This is also known as Pindale Tuff and formed from volcanic ash (and larger particles than "ash"). Layers of such material were known as "channel" or "toadstone" to the miners, who also used the term for basalt (laid down as lava). It often forms barriers to water flow underground, especially when the tuff decomposes to clay. These volcanic layers also affected the flow of the mineralising fluids, leading to variation in the viability of veins above, within, and below the channel. On both – hydrology and mineralisation - its presence was a matter of great importance to the miners. Although the tuff has been observed in the quarry floor it is currently obscured and is currently only visible in a few places underground.

The quarrying which created the bench you are standing on and the area below dates from some time after 1950; until post-war expansion of the cement works only small quarries existed near the mouth of Pindale. OS Maps published in 1951/5 show a smaller quarry than today and an aerial ropeway to the works.

Turning around to view the cliff face behind you, notice that, while the bedding is not far from horizontal, the beds are not all parallel. These arose as shoals of calcereous material formed due to sea-water currents in a back-reef environment. There are also several vertical lines at about 2m separation, with the top part being a drilled hole and a line of intense fracturing below. These are from high explosive blasting.

### **PF03 – Bottom of Fire Scrin**

The track side on the approach to this location, and all along the calcite-strewn hillside has abundant leadwort (also known as spring sandwort) in late May and June. It has small white flowers with distinctive pink anthers. It is tolerant of lead contaminated ground, as well as the dryness which the sand-like soil has, so is often found in waste from lead mine crushing operations, but it is particularly abundant here.

The bottom of Fire Scrin affords the easiest views of pickwork in Pindale. The cut is rather narrow here – "scrin" is the local word for narrow veins - and the changing directions of the pick marks show how the miner worked around the obstructions. They would not have been using a pickaxe; whereas that tool is suitable for hewing coal, something more like a long pointed chisel would have been used here, and struck with a hammer.

Not far above, Fire Scrin is completely filled by crushing waste from above.

### **Detour - Caves**

#### **PF04 – Pindale Cave**

Pindale Cave is a near-horizontal passage with a cross-section which indicates a phreatic (i.e. sub-water-table) origin. It was extended to just under 50m long in 2007 and has both an aven (upwards shaft) and descending tube near the current extent. Although small, it demonstrates that water could flow freely here. This point is not far above the impermeable Litton Tuff. The water must have surfaced SW of the current line of the Edale Shales, and one possible resurgence point may be viewed at PF10.

Black Rabbit Cave is nearby; follow the rock face to the left of Pindale Cave. Its entrance is a jumble of boulders but it has phreatic morphology within, and is likely to be the continuation of Pindale Cave. It is 150m and contains a small stream at the furthest extent of exploration in a highly unstable area affected by quarrying.

### **PW03 – Route to Pindale Side Vein**

A scramble up the calcite waste from this point is the easiest way of accessing Pindale Side Vein. Take care to avoid excessive erosion.

### **PF05 – Pindale Side Vein**

This lower section of vein is somewhat wider than Fire Scrin at PF03 and has several areas of pickmarks. The remaining limestone forms a pillar in one place, which may indicate the place where another vein intersects Pindale Side Vein. This intersection may be where Pindale Sough changes course towards Dirlow Rake, although a route up to Kirtle End Vein from further NE would also be reasonable.

The site of Pindale Old Engine Shaft was a little W of here but surface evidence is absent.

### Detour

*This requires scrambling over some steep hillside and is best approached from lower down the hillside than PF05. Refer to newsletter 169 (see sources) for a description if the climb is not appealing. A torch will be useful.*

### **PF06 – Pipe Working**

This interesting small isolated area of working, comprising two small connected chambers, contains two thin volcanic (tuff = volcanic ash) horizons which have suffered weathering to create clay, examples of the "wayboards" which control natural water drainage in many mines.

*We leave Pindale and join the road at the small hamlet known as Black Rabbit in mining times.*

### **PF07 – Ashton's Engine House, Powder House, and Spoil Heaps**

*This site should be viewed from the road. It is also known as Pindale Mine, but I have opted not to use that name as I feel Ashton's Engine House is less likely to cause confusion. Note, however, that Ashton's Mine is a separate site on Dirtlow Rake but the mine at PF07 was also called Ashton's Mine.*

This compact engine house, which was restored by PDMHS members, housed both winding and pumping machinery (it is the only complete example of such a combined engine house in the PDNP) but is remarkably smaller than pumping engine houses at, for example, Magpie Mine, with which it is contemporary; the volume of water and lift is substantially smaller here. This contrast is evident from a comparison of the powerful flow of water from Magpie Sough and the meagre trickle into Peakshole Water (although we should bear in mind that Pindale Sough is heavily obstructed by collapse, the original flow can be inferred from the size of the tail portal).

The boiler house would have stood at right angles to the standing building, parallel with the side of the building which faces the road and butting up to the chimney. The road-side wall has been demolished, possibly to remove the boiler for scrap or use elsewhere.

Substantial spoil heaps may be made out behind the engine house, with the hollow marking probable site of shaft. A horizontal beam and crank would have been required to transfer the motion from the engine to the pumping rod in the shaft. The powder house remains are behind and to the East and there was a smithy which has been demolished.

The construction of the engine house and associated deeper mining would have shifted

the centre of operations from Pindale End (PF08/9) to this location.

### Ashton's Engine House and Underground

The engine house was built in 1869/70 by Robert How Ashton, who is recorded as having mining interests here since 1824.

The shaft is almost 100m deep but may have been initially constructed when the sough was made (see below) and deepened for pumping, and probably widened or a parallel shaft made to accommodate winding. The upper section is in easily worked Edale Shales, followed by the Litton Tuff at 27m (which used to be visible in the quarry floor), and eventually into the limestone at 73m. The geology here is evidently dipping down to the NE, in contrast to the almost level bedding observed in the quarry; the changed dip corresponds with the fore-reef and into the deeper waters (here, at PF07).

A cart-gate (a horizontal tunnel intended for use in extracting ore) was driven for around 500m along the fault/vein apparently following a roughly level path from the point where the limestone was breached. A few years of good ore production were achieved in the area beneath Pindale End Mine but lack of economic deposits further SW led to the cart gate not being extended after 1878. Most of the ore was recorded in the Hope Liberty, which has its boundary a mere 180m SW from the pumping shaft; the ore was only a small wedge just beneath the tuff. This was one of many loss-making ventures of its time.

Ashton's Engine House substantially post-dates the driving of the sough but its siting would be influenced by the same underlying geology and it seems reasonable to suppose that the engine shaft is on, or very close to, the position of a vein/fault.

### **PF08 – Pindale End Mine Climbing Shaft**

A few metres NE of the telegraph pole, a metal grating guards the top of a fine 20m deep climbing shaft into Pindale End Mine. Peering through the grating will reveal ginging with built-in foot- and hand-holds.

Chemically-altered tuff has been observed at the bottom of PF08/09, along with evidence of the fault. The sough has been accessed but a collapse prevents this now.

Pindale End Mine primarily worked the lead veins of Pindale End, but the Redseats/Calumy Vein was also worked from here.



### PF09 – Pindale End Mine Hauling Shaft

This is immediately to the W of the road. The shaft is capped as PF08.

Notice the waste material on the other side of the road, towards PF08.

### PF10 – Probable Working Area

A level terrace here is presumably where extracted ore/gangue from Pindale End Mine was processed, although there are no evident structures. A low phreatic cave known as Pindale Resurgence Cave is at the SE end and currently choked with domestic rubbish. This would have been a major spring before the Hope Valley was deepened, and the line the Edale Shales retreated, presumably in the latest post-glacial period.

#### Detour – Kytile End Vein

##### PF11 – Rake and Open Workings

A short scramble up the hillside reveals an open entrance to a deep open stope, and several sections of workings around the hillside.

#### Pindale Sough

The productivity of the mines from Siggate to Pindale End was sufficient in the 1730s that, as the miners reached the water table, a sough was proposed in 1743. It isn't known exactly when building commenced but increased production figures in the late 1750's show when it is likely to have come into use.

The tail end is near to Peakshole Water where a "cut and cover" approach was used while it is shallow. Driving was largely through Edale Shales and a series of spoil heaps and air shaft sites occur in the fields on the way towards Ashton's Engine Mine. Shale is easily worked but prone to bad air, so ventilation would be essential.

The sough builders would take the most direct route to intersect the fault/vein, which was followed in the Pindale Tuff for a while, eventually reaching the limestone beneath it ("beneath" in a geological sense, as the beds are dipping to the NE here).

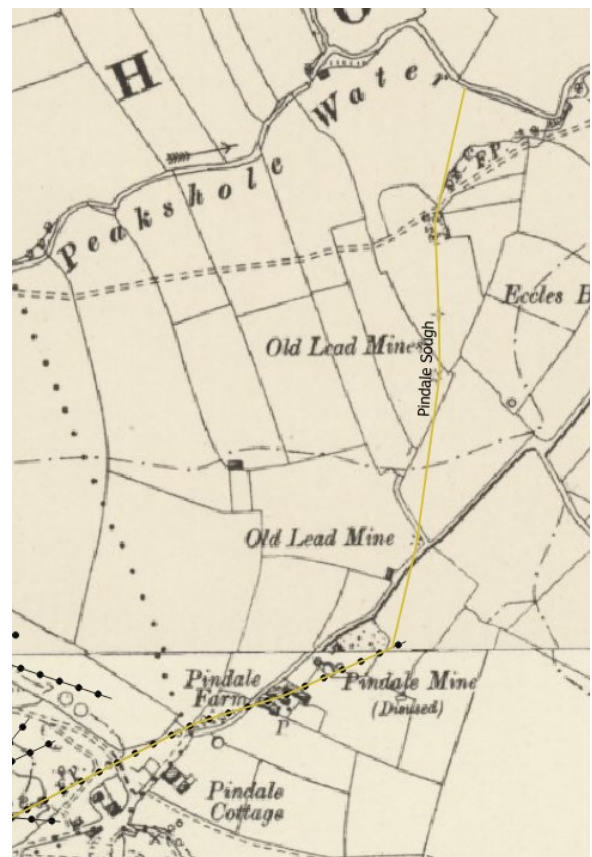
The sough continued along the vein to Pindale Old Engine (see PF05). This was the limit of Pindale Sough in the 18<sup>th</sup> century but late 19<sup>th</sup> century mine plans show that it had been extended up to Siggate Head Mine along the line of Pindale Side Vein. Circumstantial evidence suggests this occurred some time after 1843 and the sough may have later been continued as far as Nether Dirlow on Dirlow Rake, but the evidence is weak.

*The maps showing the line of the sough/vein, below, are the author's best guess from available information, which he acknowledges differs from other published maps.*

### PV02 – Pindale End, Pindale Sough, and Redseats Vein

This location provides all-round interest!

Looking NE, it is possible to trace some of the line of Pindale Sough by the heaps of spoil, which are covered by hawthorn trees. Old maps show a heap near to the road, near to the modern farm buildings, but this has been removed.



*Late 19th century map showing conjectured line of sough.*

To the North is the eastern end of Redseats Vein (see below). Waste material on the up-hill side, near to the road, may indicate the dump site for the working area PF10. The material is distinctly ochreous in character; its orange-brown colour probably being due to clay rich in iron minerals. Underground discoveries on Redseats Vein were described in PDMHS Newsletter 181.

To the South-west, the older surface workings of Pindale End Mine are evident, with Kytile End Vein coming directly towards PV02.

### **PV03 – Redseats Open Cut**

A section of open cut on Redseats Vein is worth a pause as you pass by.

### **PF12 – Ochreous Spoil**

Heavily ochreous spoil-heaps are evident close to the road, and more are visible towards the SE on the line of a vein for which we have no name.

A number of mines in the area - in addition to the placename Redseats - have "red" in their names: Red Shanks Vein and Radcliffe Founder (red -> rad is a believable vowel sound mutation, such as raddle vs reddle, used of the red ochre used to mark sheep). Bearing in mind that "red" used to be used as we now refer to the colour of foxes, squirrels, and hair, we might have found an explanation for those names in the spoil.

#### Redseats or Calumy/Callamy Vein

Redseats is an early-attested (mid 15<sup>th</sup> century) site name for a lost settlement, and the name Red Seats Wood appears in 1840. The name Redseatswood Vein exists in contemporary documents (1753) but this vein is commonly known by the name Redseats Vein in modern literature. Farey listed Redseats as a mine where calamine was found in 1811.

The hummocks and open cut is unremarkable to see but unusual (although not unique) in being the site of zinc mining. Sphalerite (zinc sulphide) is occasionally found in small amounts, along with the more common vein minerals, but Redseats Vein contained substantial deposits of zinc as sphalerite and calamine (smithsonite to geologists), hence the alternative names of the mine. Calamine is zinc carbonate and is the "secondary mineral" formed when sphalerite is weathered in the presence of carbon dioxide (the sulphide is oxidised). This can occur relatively close to the ground surface, where dissolved carbon dioxide in rainwater percolates.

The origin of the name "Callamy Vein", which first appeared in 1760 is now clear!

The demand for zinc was low before the middle of the 18<sup>th</sup> century, so if this mine was worked for lead at an earlier date, the zinc minerals would probably have initially been left underground or piled up as waste.

The calamine from here may have been ground in Milldale (Dove Dale), which was a calamine mill from 1730 to 1764 and ultimately found its way into brass with copper from Ecton Hill in the Cheadle Brass and Copper works.

There was also zinc working in Sheffield at a later date but there is no evidence of Redseats zinc travelling that way.

See the separate box on Zinc Metallurgy at the end of this itinerary.

### **PV04 – Possible Centre of Redseats Mine**

A substantial building may be made out through the trees. This might have previously been a building associated with Redseats Mine, and there is some evidence of a pond. On the other hand, there is no firm evidence that these are not later agricultural structures.

The results of a published survey of lead and zinc enrichments does not support the view that these buildings were used for mineral processing; the particularly high enrichments occur around the hummocks in the vicinity of the vein, to the SE, rather than near to the building.

### **PV05 – View of Sough Route**

The better vantage point of PV05 gives a longer view of the route of the sough. Binoculars will be useful. Following a line from Ashton's Engine House through the new farm buildings by the road-side will take you to a hawthorn covered mound and a little further along a fenced depression. Continuing along the same line will take you to a further mound just behind a footpath marker post. Beyond this, the ground falls away a little and the remaining extent to Peakshole Water cannot be seen.

### **PW04 – Access Gate**

The suggested way in!

### **PF13 – Vein Intersection**

The open cuts here show a minor E-W vein intersecting the SW-NE trend of Kytley Vein. Such features are known as a "rather points" in Derbyshire mining terminology and the upstanding block known as a "rider" or sometimes "horse".

### **PV06 – How Many Veins?**

Although a single vein is shown on the maps (as on the BGS maps), a careful visual survey of the landscape here (especially facing NE) shows this is an over-simplification. Documentary sources from a dispute of 1843 refer to "Middle Vein" and "North Vein", from which we infer the three veins observable here.

Situations such as here, where multiple veins are close and sometimes intersecting gave rise to numerous mining disputes as it makes it difficult to clearly distinguish separate veins, hence ownership. Resolution required the members of Jury of the Barmote Court to visit the mine and give their verdict.

### **PF14 – Small Vugh**

To the West of the open cut, a small vugh (a medium sized somewhat rounded cavity) may be found, showing some fluorite in calcite.

### **PF15 – Shot Holes**

A series of six shot holes, all exceeding 1m in depth may be found close to the ground in a rock face on the NW side. The placement makes no sense unless these are practice or demonstration holes.

Following a report of these shot holes in the PDMHS Newsletter, Alan Medhurst (Pindale Farm) reported that he and other members of the Technical Speleological Group had made them in 1976. They had acquired a rock drill and compressor and were conducting experimental archaeology.

While they are not original, a single short hole in a detached block (behind you as you face the six) illustrates some points of interest. It clearly shows a stepped appearance, with a smaller "pilot" hole at the centre. Less clear is a wavy appearance due the rhythmic impacts of the cutting tool.

#### Siggate Head Mine

The name Siggate Head appears to have been coined by Henry Chatburn (see sources) in the 1960's for want of knowledge of the historical name. The name Sidegate Top is recorded in contemporary documents and is thought to be the same mine.

The shaft was deepened in stages, being around 90m deep in 1843 and probably reaching sough level (around 120m) some time later.

The mine was productive in the middle of the 19<sup>th</sup> century and was probably working a combination of new deposits below the shaft bottom and previously uneconomic deposits higher up. The latter doubtless became more important towards the end of the century, and the large quantities of waste material are testament to the removal and processing of vein material containing valuable ore embedded in (at the time) worthless calcite.

### **PV07 – View into Pindale Side Vein**

This is the top of Pindale Side Vein.

### **PF16 – Capped Shafts**

There are two capped shafts here, being the climbing and engine shafts of Siggate Head Mine.

This point marks the area where Pindale Side Vein and Kytile Vein; the point of intersection is likely to be an easier place to drive an engine shaft, as vein material is much easier to work than limestone. There is no evidence of a horse gin, but it seems likely there was once one on the dale side.

### **PF17 – Site of Pond**

A shallow hollow here may be the site of a pond for water used for the separation of ore from gangue after crushing, and generally washing the ore.

### **PF18 – Crushing Circle**

The ground here is witness to the presence of a crushing circle, although neither the wheel nor the bed remains. The bed is now part of the PDMHS mining display at the Crich Tramway Museum, while the crushing wheel is part of a patio at Aston Hall Farm.

### **PV08 – View into Fire Scrin**

Whereas the lower part of Fire Scrin (PF03) is narrow and largely filled with waste material tipped from above, here it is open and quite wide. The width of the open cut does not necessarily indicate the width of vein material; the mineralisation might have been in the form of close narrow scrins, which are characteristic of the structures in this area.

Pick marks are visible, as are places where recesses for timbers to be placed across, but these are not easily made out from the safety of the top of the steep slope into the open cut.

### **PW05 – Egress Gate**

The gate here may be convenient if continuing with the Dirlow and How Grove itinerary. Alternatively take another look at PF01.



### Zinc Metallurgy

As mentioned above, the early miners had no use for zinc ores, whether the sulphide, which the miners called blackjack or “mock ore” (in poor light it has a superficial appearance similar to galena, lead ore), or the secondary carbonate, calamine.

The lack of demand for these minerals arose from the difficulty in turning the mineral into metal. The usual way of achieving this, called “reduction” by chemists, is to heat the mineral with carbon (charcoal in the old days) in a furnace. Unfortunately, zinc is a vapour at the temperature required to reduce it, so it tends to escape from the furnace and burn in the presence of oxygen.

The earliest technology we know of got around this problem by adding chunks of copper into which the zinc atoms diffused before they could escape from the crucible and is known as the “cementation process”. This made brass, but with a limited zinc content, and there is evidence that the ancient Romans used this technique in Britain, using the brass for coinage and ornaments.

Indian alchemists had managed to isolate metallic zinc by 1300AD, but it was not until 1738 that William Champion patented a process for extracting zinc. In crude terms, he simply connected an iron pipe to a sealed crucible containing charcoal and calamine and put the other end in a bucket of water to capture the zinc. In this period, the zinc was still used for brass making but, aside from greater economy, the zinc content could be arbitrarily controlled. This would place the first boost of demand for calamine no earlier than around 1750.

The centre of mining and processing calamine in the Peak District in the latter part of the 18<sup>th</sup> century appears to have been in the Bonsall and Cromford area, with investments being made by two companies in that locale. Presumably this up-scaling of production capacity reflects the increased demand.

The next innovation was working out how to make sheet and wire by hot rolling zinc, which was patented in 1805 by two Sheffield industrialists. This stimulated greater demand as zinc sheet was cheaper than copper and could replace it on ships’ bottoms and building roofs.

Demand increased further as the century wore on; galvanising was invented (1837 for hot dip and 1844 for electro-galvanising) and zinc oxide became used as a replacement for lead compounds in paint.

Although a process for calcining blackjack to create the feedstock for smelting had been patented in 1758, the mineral was still largely left in the mine or on the spoil heaps until well into the 19<sup>th</sup> century and exploitation of surface tips and underground sources of former waste seems not to have peaked until the 1840s-50s.

## Dirtlow Rake and How Grove Mine

Dirtlow Rake extends from Siggate Head Mine to Hollandtwine Mine (W end, near Hazard Mine). The former is covered in the Pindale and Siggate itinerary, while the latter has been obliterated, making How Grove Mine the most westerly point of interest on the rake.

Dirtlow Rake must have a long history since its western end was referred to as "Dyrtlow Rake hed" as early as 1538, although documentary evidence for mining does not go back so far, and is very sparse until the 18<sup>th</sup> century. That it was called a "rake" indicates there was existing mining along the vein(s).

Dirtlow itself is an inconspicuous small hill just the other side of Dirtlow Rake from the suggested parking place. Dirtlow Rake, on the other hand is an impressive and frequently wide open-cut, although partially obliterated by late 20<sup>th</sup> century sparring (processing old spoil heaps for minerals such as calcite) and landscape "restoration".

Along much of its length, Dirtlow Rake consists of two or more close parallel veins, with its W end being marked by a distinct split and continuation and its E end marked by a transition to complex splaying and termination, as can be seen from the Pindale and Siggate itinerary.

In some places the parallel veins are separated by narrow blocks of limestone known as a "riders" or "rithers" (these features were also called "horses" in Derbyshire mining terminology and also apply to the limestone nose between two veins cutting at a low angle). Some of the riders in Dirtlow are only around 1m thick.

The mineralisation occurred in cavities left by geological faults, which take the form of a wrench fault in Dirtlow Rake. Wrench faults involve shearing movement in a horizontal plane. In places where the layers of rock are not horizontal, the faulting can lead to different kinds of rock being either side of the fault-line, as shown in the maps (see below). When account is taken of both the dip of strata and the ground topology it gets very hard to work out exactly what movement occurred, but geologists have determined a relative movement of approximately 25m (although this varies from place to place). Looking at the maps we can see that the rocks on the northern side moved to the right relative to the southern side; this is a dextral wrench fault.

The large open-cuts which resulted from exploitation of the rake are particularly impressive and contain good examples of pick-work and occasional post-holes. The mine buildings and other structures which formerly surrounded the rake have largely been lost, with

the notable exception of How Grove Mine, which remains as an excellent, and relatively-complete example of a late 19<sup>th</sup> century small-medium mining enterprise.

Mining History 15-2, "Excavation and Conservation at How Grove, Dirtlow Rake" provides historical information for other mines than How Grove and, along with Chris Heathcote's paper "Surface Remains of the Castleton/Peak Forest Area", are recommended for further information.

This itinerary would combine well with that for New Rake and Cave Dale, or as a figure-8 with Pindale and Siggate.

### **PW01 – Parking**

Park as for the Pindale and Siggate trip.

Alternatively, park at NW01

### **DW01 – Access Gate**

A second gate 30m north gives access to the area of interest.

### **DF01 – Relocated Crushing Wheel/Track**

*We are in the area known as Nether Dirtlow, specifically within the bounds of Ashton Grove Mine.*

The crushing wheel/track here were moved from Rush Mine on Eldon Hill after the "restoration" of the area in the 1990's. The area had previously been reworked for spar (calcite), which entailed the removal of substantial mounds of what had previously been waste, along with the destruction of buildings and a crushing circle which previously stood here; the very flat and uniform character of the landscape just here is a function of modern bulldozer landscaping, rather than mining history.

See Henry Chatburn's paper (see sources) for a description and photograph (looking NE along the vein from around DF02) of Nether Dirtlow in the early 1960's, just as the hillock reworking operations were starting.

### **DF02 – Gin Circle and Shaft Head**

Although the site has been altered by later reworking, reconstruction, or landscaping, it gives a good impression of the size of the gin circle and its relationship to the shaft which it served. This gin (short for "engine") was of the type which has been reconstructed at Magpie Mine; a large horizontal drum pivoted above the centre of the circle was rotated by horse power such that a rope wrapped around it, passing over a pair of wheels at the shaft top, wound items up or down the shaft.

The shaft shows the use of skilfully built dry stone walling, known as ginging, to stabilise the upper part.

Before descending into the rake and heading West, take a moment to look SW. Notice the evidence for parallel veins which the prominent rither provides.

### **DW02 – Descend into Rake**

The next section of route follows the bottom of the rake. GPS performance is not good in here, so observation is a better guide for the next few features than data. There are abundant chunks of calcite on the ground, some with flecks of galena, the dominant ore of lead, and some with bits of baryte (barium sulphate). Calcite is variable in appearance but you can usually see some flat crystal faces in the translucent or white mineral; galena has a grey metallic appearance, and barytes tends to have a more opaque, and sometimes pinkish, appearance than calcite. The original miners considered calcite and baryte to be waste, but these have been worth working since the early 20<sup>th</sup> century.

At the point where the open-cut is about to be entered, we can again see that there were semi-parallel veins, with a narrower and deeper (and inaccessible) feature on the left side.

### **DF03 – Stemple Sockets, Drilled Holes, and Pick-marks**

This area contains numerous features; the more you look, the more you see. On the right wall an approx. 12cm diameter recess for a timber stemple is easily seen. There are several other recesses along the rake; these would have served as supports for working platforms etc. Some are so close to the ground that they seem to be redundant, so we can suppose that the open-cut was deeper when they were made.

About 10m further on some pick-marks may be seen. They would not have been made using a pickaxe; whereas that tool is suitable for hewing coal, something more like a long pointed chisel would have been used here, and struck with a hammer.

In addition to the pick-marks there are some drilled holes. These have smooth sides, were drilled almost parallel to the face, and are about 2.5cm across. Close inspection reveals the cross-section of the hole is somewhat triangular, which is typical of shot-holes drilled for explosives. In this case, however, it is probable that the holes were drilled and then wedges used to force a chunk of mineral/rock to break off. This is inferred from the observation that there are no fracture marks from explosive use and the angle of drilling would not have led to much material being broken off. Notice that pick-marks are very close-by, suggesting that these were made afterwards. Drilled holes of this form

are not expected for ancient working, being more typical of 18<sup>th</sup> century activity or later.

On the right wall, at ground level and slightly slanting-off from the line of the main passage is a patch of smoothed limestone with a wavy appearance in the vertical direction. This is a slickenside (see DF11).

### **DF04 – Area of Veins and Riders**

This is a good area to see the continuing composite nature of Dirlow Rake, with several sub-parallel veins wandering around such that the miners left elongated pillars of limestone remaining, the "riders".

### **DF05 – Features Near Slot**

A descending slot on the left-hand side at ground level marks this location.

The pick marks here are generally quite short and show working occurred from several directions within a small area. Another drilled hole is visible at eye height (looking at the left wall while standing on the central bank).

About 10-15m past the slot and in between the now-familiar pick marks are areas where small craters have been created around single pick points, with the pick perpendicular to the surface. These look like trials, where the miner was checking the thickness/composition of the mineralisation.

In some places, the surface around these trials has a globular appearance. This is one of the forms in which baryte grows, and its appearance suggests that no later mineral grew over it. Hence, at these places, it is clear that the mineralisation which encrusts the limestone is quite thin; what remains was clearly not worth working. Such thin layers could not have contained the size of galena which was necessary for smelting before the late 16<sup>th</sup> century. Consequently, especially when also considering the evidence of the drilled holes, although some of the pick marks in Dirlow and Pindale are plausibly ancient, others may not be.

### **DW03 – Exit Rake**

The next features are not in the rake.

### **DF06 – Fluorite in Spoil**

There are a few examples of purple fluorite among the largely calcite spoil, although few classic cubic forms. Please leave specimens for others to enjoy.

### **DV01 – Top View of Pick-marks**

*These were not mentioned as previous features, but you probably noticed them.*

A minor detour to this point, where there is another one of many small gridded shafts, affords a higher vantage point to view the pick marks which are longer and more consistent in their

orientation than those observed near the bottom of the rake. Their form suggests the working was easier, and was from above.

#### **DF07 – Narrow Rib Rider**

A particularly narrow rider may be seen not far from an oval shaft to the S side of the open cut.

#### **DF08 – Underground Workings in Kirk Grove**

We have now moved into the area known to the miners as Kirk Grove, having passed through Smith Grove, Royse Grove, and Needham Grove since entering the open-cut. There are quite a few separately-named mines along Dirlow Rake, often quite close together and difficult to separate today. Although the miners of old would have been much more clear about boundaries to mining titles, the complexity of veins splitting and intersecting also meant that there were disputes to be settled by the Barmote Court.

The underground workings of Kirk Grove are described in PDMHS Newsletter No 164.

#### **DV02 – Hentley Vein and Another Shaft**

If you like staring down shafts and admiring the ginging...

Looking NE from here, the eastern extension of Hentley Vein can be seen cutting the field wall at an acute angle. West from the visible workings, in the field behind DF11, several parallel veins, which were historically productive, have been obliterated by later reworking and restoration.

#### **DW04 – Access Gates**

Egress from DF01-DF08 and access to DF09 detour.

#### Detour – DF09 – Double Shaft?

This shaft, with its top clearly restored/rebuilt in the 1990's appears to have two compartments. This arrangement was used when hauling or pumping (this is not known of here) used the same shaft as miners used for climbing. The appearance may be a result of later rebuilding work. A double shaft with a bridge of stacked deads was noted by Nellie Kirkham in this area some time before 1952.

#### **DV03 – Pindale Rock**

The field to the SE is strewn with boulders of Pindale Rock. Refer to the Pindale and Siggate itinerary.

#### **DW05 – How Grove Access**

Branch right off the right of way into a level area on the line of the rake. A fence obstructs access to How Grove Mine features.

#### **DV04 – Vantage Point**

*The surface remains of How Grove Mine are a Scheduled Monument.*

This point, on a heap of material which post-dates the historic mining (and has some galena/barite specimens, chunks of banded vein material, and impressive massive calcite) provides a good vantage point to view How Grove Mine (see map on next page).

The mound has largely filled the former water storage pond, but the dam is just visible beyond the NE foot of the bank. Above it and to the left is the buddling area, which is fed by a leat (water channel). Between the buddles and the leat is a narrow walk way. Water would have been pumped up from the pond to the top processing area and made its way by gravity back to the pond via the buddles.

The coe was shown on an 1819 township map.

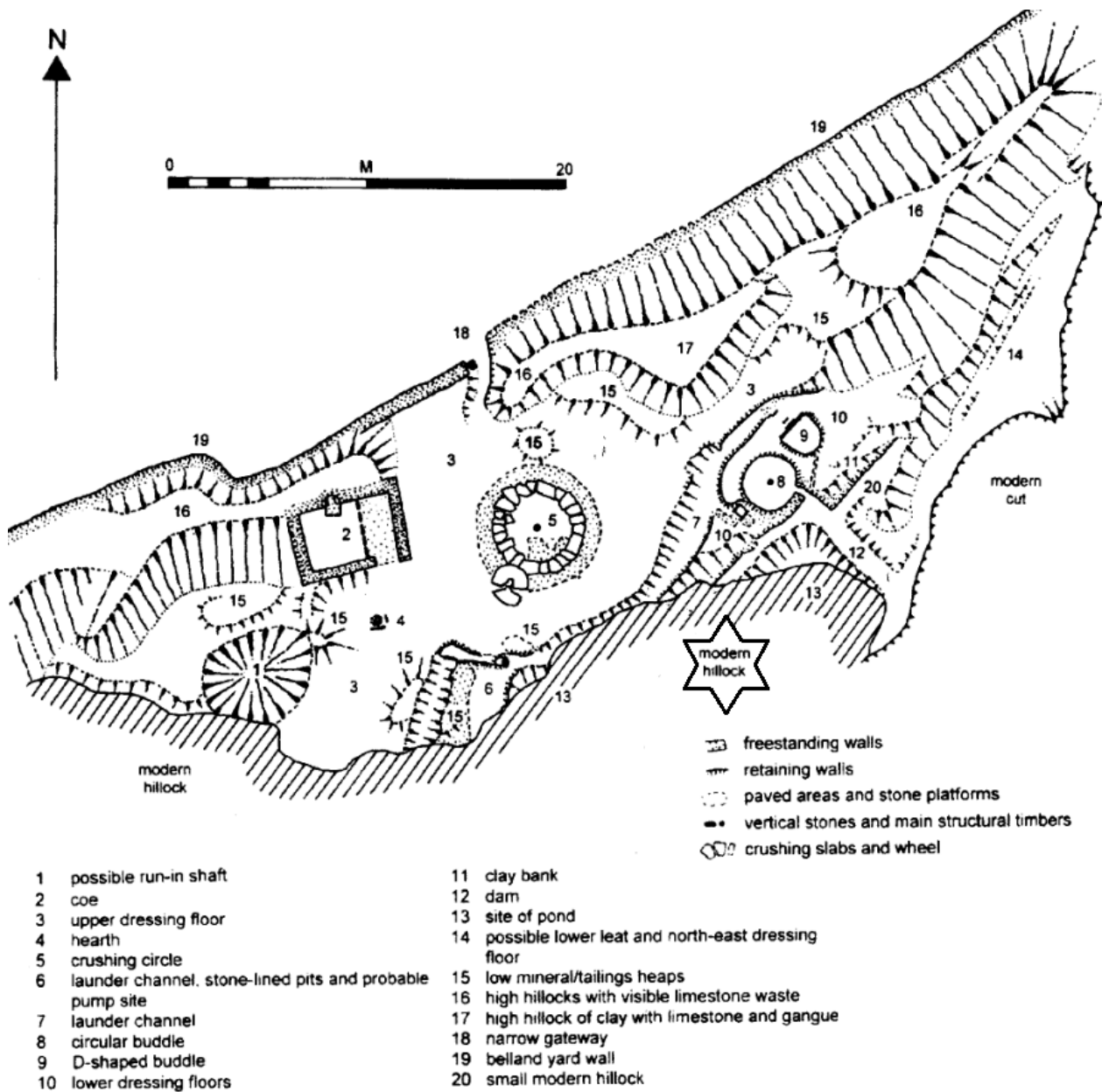
#### How Grove Mine

How Grove Mine had a lucky escape, managing to avoid complete obliteration by late 20<sup>th</sup> century sparring. It was excavated and conserved between 1998 and 2000 and both the archaeological remains and history extensively reported in Mining History 15-2 (see sources).

The earliest records of working How Grove date back to 1754 and the mine changed hands many times before achieving peak output in 1817-19. The remains are from the latest stage of working, with the last recorded lead ore being recorded in 1886.

The later miners attempted to squeeze a small profit from what previous miners had deemed waste material, and either disposed of on the surface or left underground. Hence, the operations at this stage revolved around crushing followed by several stages of different technologies to separate lead ore from (largely) calcite by relying on the different density of galena and calcite and either "jigging" the larger solids in water or using the flow of water over finer particles. There is circumstantial evidence that calcite was a product in the later years but this would not be recorded by the Barmaster as their responsibility was for lead ore only. Calcite production might have continued into the early 20<sup>th</sup> century since the 1899 OS map shows modification of the pond and a probable pump taking water to the top of the site.

Although this is clearly a compact and small scale operation, here we have a quite complete suite of remains which comprised a viable independent enterprise. Although the quantity of ore produced was modest, so too was the capital invested in the mine; this was an appropriate strategy given the remaining mineral and the market prices for lead ore.



*How Grove Mine site features, taken from Mining History 15-2 (see Sources), (c) John Barnatt.*

*The "modern hillock" marked with the 6-pointed star is the approximate position of DV04.*

### DF10 – Riders and Slickensided Fault

Down in the deep open cut, in addition to more examples of riders, the slickensided wall high up on the left demonstrates the displacement of the fault.

Imagine the uneven faces either side of a rock fracture being scraped past each other such that the prominences are worn down. That is the mechanism and appearance of a slickenside, and the direction of movement is evident from the orientation of the residual troughs and valleys. Here we can see evidence that Dirtlow Rake is on a wrench fault.

### DV05 – Later In-filling and Restoration

From here we can see that Dirtlow Rake has been filled with boulders; these were probably created as part of open casting operations a little further west in ground which has now been landscaped except for a residual low cliff at SK142814.

Several small mines existed in the made-up ground, including Hollandtwine Mine, but nothing now remains until we get to Hazard Mine and the end of Dirtlow Rake

To the South of the road, the E-W trending Wet Rake can be made out heading across the fields.

#### Detour and Link – Hazard Mine to New Rake

*Hazard Mine is more than a 2km round trip, so it is marked as a "detour", but it would be easier with a bicycle or combine well with a visit to New Rake and Cave Dale via DV06 and DV07.*

### DW06 – Access to Hazard Mine

A pair of "five bar" gates affords access.

### DF11 - Hazard Mine Engine Shaft

Hazard Mine lies a few hundred metres west of where Wham Rake (and associated veins) branches off from Dirtlow Rake. Following the trajectory of Dirtlow Rake takes us to Daisy Rake and Bradshaw Vein, and so to Oxlow Rake, which have a similar appearance as fairly close sub-parallel veins.

Hazard Mine was a remarkably productive mine in the period 1830-1850; in some years it out-produced all of the other mines in the Castleton area combined, although before 1830 it was wholly insignificant.

Hazard Mine was fortunate in that it was able to drain water into a natural cave passage, the Great Swallow, rather than having to employ a sough or pumping. The Great Swallow is at 100 fathoms depth, almost 200m, which is only some 40-50m above the water emerging from Peak Cavern, which it is likely (but not proven) to join.

Although most of the ground around has been subject to later reworking and landscaping, a few calcite-rich spoil heaps and a section of belland yard wall surround a good example of a horse gin circle adjacent to its "engine shaft" remains. Note that here, as generally, the use of a horse gin can bestow on the shaft the word "engine"; such names do not necessarily mean a steam engine. The gin circle walls remain and spoil heaps piled against them on the outside.

The engine shaft is on the South Vein and there used to be a separate climbing shaft nearby, on the North Vein.

A picture from 1910 appears in H E Chatburn's paper (see sources), showing the extensive spoil heaps present at that time.

Some good crystals of calcite, illustrating its characteristic rhombohedral cleavage, have been found here. Please leave any you find.

### DV06 – View South to Daisy and Oxlow Rakes

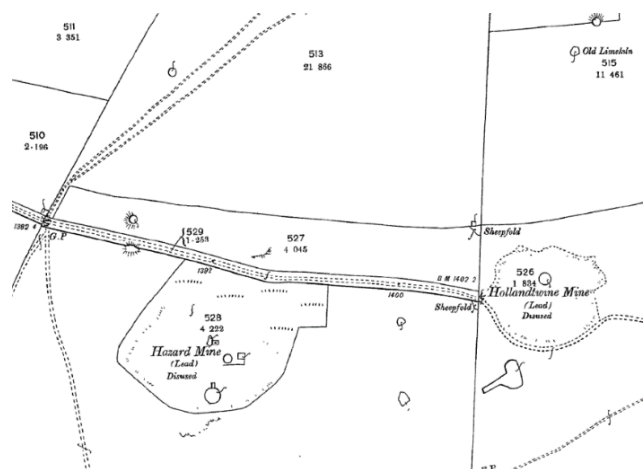
This is a good point to consult the map showing rakes and to identify Wrangling Rake, Wham Rake (and associated), and the obvious band of Daisy and Oxlow Rakes in the distance. The latter follow the trajectory of Dirtlow Rake.

These rakes are visited in another field guide (in preparation).

### DV07 – Linicar and Slack Hole Vein

To the West is what is probably Slack Hole Vein, with its continuation on the eastern side of the track having been lost in agricultural improvement (it does look like good pasture!).

To the NW is the site of Linicar Mines, on a complex area of mineralisation. Further north is an area of quarrying and lime burning, with heaps of burning waste.



*Hazard Mine and the now-lost Hollandtwine Mine on the 1898 OS map. DF11 gin circle is at the southern end of the walled mine site.*



## New Rake and Cave Dale

New Rake, and the neighbouring Horsepit Rake, provide a good example of a relatively unmodified 18<sup>th</sup> century surface feature. Although there are relatively few specific remains – a small ore storage bin being the exception – the lay of the land makes for easy appreciation.

Between New Rake and into Cave Dale, the Cave Dale Lava becomes apparent. This band of basalt rock, which would have been known as "toadstone" or "channel", and similar bands elsewhere were important to the miners because of their effect on drainage and mineralisation. Whereas the limestone naturally drains due to the formation of conduits (cave passages when enlarged), the toadstone does not, so that it collects and channels water. Veins often become attenuated when entering these rocks, but sometimes become highly profitable beneath them because of their "capping effect" on mineralising fluids.

Cave Dale is a spectacular gorge and, although the lead veins which cross it are small and unproductive, the topography makes for some satisfying observations of the geological structures, which is the focus of this itinerary. More geological detail may be found in the Geological Association Guide (see sources).

This itinerary combines well with that for Dirtlow Rake and How Grove Mine.

### NW01 – Car Parking

If not combining with the Dirtlow Rake and How Grove Mine itinerary, this is a convenient parking place. In this case, the last few points of that itinerary will be passed anyway; see "Detour and Link – Hazard Mine to New Rake".

The New Rake and Cave Dale Itinerary may, of course, be followed as part of a circuit involving Mam Tor, Winnats, etc. If doing it that way, maybe visit Odin Mine, where there is a fine crushing wheel.

### NV01 – New Rake and Horsepit Rake

The stile makes a good vantage point to see these two rakes and another – for which we do not have a name – about another 100m further south.

The area in the foreground, around New Rake, has doubtless been modified by the business of Rowter Farm, but further east the hummocks and hollows are seemingly grassed-over original structures.

### NW02, 03 – Stiles

The right of way takes a different route, but access to the area of the rakes is permitted.

### NF01 – Entrance to JH

A secure metal lid marks an entrance to both natural and mined chambers known to cavers as "JH", or James Hall Over Engine Shaft, although historians think this name should properly apply to a location 100m to the East, beyond the next major wall.

A metal lid is not a mining history feature, but what is below is worthy of note, and searching online for photographs of the mine/cave, in particular of Leviathon Pitch, will reveal a great deal.

The entrance shaft drops about 50m, after which a horizontal section follows. This passes over flooded mine workings, with the water presumably held back by a bed of toadstone. Subsequently more vertical passage is entered, with a 40cm thick toadstone band (far thinner than the Cave Dale Lava at NF04) being reached about 90m below the entrance. This vertical section contains the Leviathon Pitches, where large timbers which were placed by the miners still remain wedged across the shaft/chambers. These are likely to have supported a series of ladders.

There is also evidence of mineral processing being undertaken underground at several places; boarded floors, remains of sieves, and buddles have been found.. Although working by candle light cannot have been easy, and candles would have to be bought, there is a plentiful supply of water. Working underground may also have been preferable to working on the exposed ground above in winter-time. Underground processing would not be practicable in many mines, but here the natural cave chambers afforded the space needed to mine, process, and dispose of waste. It may also have been the case that the exit via the JH entrance shaft was not acceptable, being in "another man's mine" (MH 11-6)

The bottom of Leviathon drops into the Peak Cavern and Speedwell complex of cave passages.

*A paper in Mining History 13-3 (Nixon and Warriner) describes the connection of JH into the Peak/Speedwell system.*

### NF02 – Small Ore Bin

A small (approx. 2m across) "U" shape of dry stone wall with a supporting bank of material (probably calcite waste) on its outside, is probably an ore storage bin/hopper. Even though galena is dense (about 7.5 g/cm<sup>3</sup>), this cannot have held much more than a ton. Ore may have been stored underground as well.

There are reservoirs and water channels feeding from the land S of the rakes.

The semi-parallel pair of rakes – New and Horsepit – are quite clear here, but Horsepit Rake disappears around the next stile. Somewhere this side of the stile is the site of Hurdlo Stile Mine (sometimes “Hurdlo Steel Pipe” and similar variations). This appears to have been found from Horsepit Rake but does not follow the general line of that or New Rake, which follow geological fault lines; pipe workings exploit pipe-like ore bodies which do not have such an intuitive genesis as the sheet-like bodies which develop in the spaces left between the two sides of a fault.

*The dilapidated building to the North is Hurdlow Barn and the hillside you are walking down is of Hurd Low. Earlier forms of the name lack the “d”, and the place name is supposed, by the English Place-Name Society to derive from hār (grey – we might say “hoary”) + hlāw (a rounded hill). In place names, “Stile” is likely to come from Old English “stigel”, meaning a steep ascent, which is apt for the route from Castleton, rather than the modern use for the way over a wall etc - as Trevor Ford considers in Mining History 2-4 - although the shared sense is evident (consider also that “stige” is Danish for a ladder and “bergsteiger” is German for mountain-climber).*

#### **NF03 – Termination of New Rake Working**

What appears to be the last hummock on New Rake is some 40m north of the stile. This corresponds with the point where the Cave Dale Lava (basalt rock) is close to the surface and where mineralisation petered out. It may be the case that the geological fault continues, and it is possible that the feature marked as Weather Rake (see maps) is a structural continuation of the same fault, but in limestone beneath the horizon of the basalt beds.

#### **NV02 – Small Scarp**

Looking west from here we can see a small limestone scarp, with a lower gradient slope beneath it (north). This is a common landform where limestone overlays basalt; whereas acidic rainwater corrodes limestone to form conduits, it remains resilient and can form steep slopes, whereas the basalt weathers to a crumbly material which forms more gentle slopes.

Referring to the map showing bedrock geology we can also see that the BGS data is slightly in error. This is not surprising given the inevitable losses in the process from survey to initial map-making (before GPS) and subsequent digitisation. It is a reminder not to take the bedrock maps too literally.

*The recommended route from here is to follow the high ground.*

#### **NW04 – Route into Cave Dale**

An easy way of avoiding the cliff!

#### **NF04 – Outcrop of Cave Dale Lava**

*Looking across the valley from here shows the slanting path which is our later route – see NW06.*

This is the highest exposure of Cave Dale Lava around here and further exposures can be seen on the far side of Cave Dale. Basalt is usually a dark grey colour when fresh but weathers to a brown or orange-brown colour. Weathering tends to turn angular blocks into rounded blocks as it proceeds, a process known as “spheroidal weathering” and some examples of more weathered rock can be found here.

A short way down hill, a tree marks a low cliff of basalt. The basalt in the cliff is evidently in bands, some has small gas bubbles (vesicles) whereas some does not: evidence of several distinct lava flows creating the Cave Dale Lava.

At the foot of the cliff is a small spring, with water cross showing it usually flows: evidence of the drainage-controlling effect of the lava beds.

#### **NW05 – Access Bridleway**

An open gateway gives access to the bridleway from the permissive access land.

Permissive open access land and a permissive footpath permit a return to near NW01. This is shown as a detour (hatched arrow) on the maps.

#### **NW06 – Start of Miners(?) Path**

The clear slanting path from this point is the easiest way of accessing the eastern top of Cave Dale. It is not known whether this was a miners path but the middle section appears to have been cut into the limestone.

*From the top of the path, proceed through the beech trees between the boundary and the steep side of Cave Dale.*

#### **NF05 – Cave Dale Pipe**

An obvious excavated area on the hillside and a diffuse area of ground over the boundary marks what is known to cavers as Cave Dale Cave No.7, or Cave Dale Pipe. Committed cavers have entered a short low crawl at the base of the rock face but there is nothing interesting to see.

Notice that there is no band of mineralisation in the rock face as this is a pipe deposit rather than a vein deposit (although shown as a vein on the map); pipe deposits do not follow geological faults. The hollows in the field may be either a collapse or due to working from the surface.

#### **NV03 – Weather Rake and Beyond to Foreside (Faucet) Rake and Longcliffe**

A series of small narrow open cuts ranges up the opposite valley side and a linear hollow/bank curves around its top. These are believed to be called Weather Rake and may be the structural

continuation of New Rake (see NF03). There is a distinct lack of surface spoil and the open-cuts are rather limited, suggestive of a series of trials which failed to find economically viable deposits.

In the distance, a little to the left of Mam Tor, the gorge of Winnats Pass is easily picked out. About half way between this and the western top of Cave Dale is the gully of Cowlow Nick, at the top of which Fawcett (also called Foreside) Rake can be picked out. On the hillside between Winnats and Cowlow Nick is a "Y" shape of Langcliffe Rake and Shack (or Slack) Hole Scrin, and the disturbed ground of Longcliffe Mine.

#### **NF06 – Vein to Michill Bank**

The rake here makes a good turning point, as the hillside curves round above Michill Bank. Small workings occur some way down this bank. The Cave Dale end is a rather narrow/shallow open cut without much evidence of great production.

#### **NW07 – Gentle Descent**

Above where the vein (NF06) dives over the cliff a gently-sloping downwards path may be picked up, leading to the remains of a dry stone wall, which should be followed as the line of descent into the valley.

#### **NF07 – Trial Cuttings**

The extension of Weather Rake is crossed at this point, where a pair of small cuttings into the line of the vein can be viewed. These look like unsuccessful trials; both are small and without much spoil.

#### **NF08 – Cave Dale Rising**

Here we have another spring controlled by the impermeability of the basalt beds; somewhere a little up-hill from this point is where the Cave Dale Lava thins and terminates ("wedges out").

Some specimens of limestone talus (small pieces of angular scree) in a tufa cement may be found here. Tufa is a porous form of calcium carbonate deposited when heavily mineralised water emerges from springs. This level of dissolved minerals indicates quite a long period of contact with the limestone bedrock, a situation which is often found where basalt beds control the flow of ground water.

#### **NF09 – Peak Cavern Vent**

The cave with the prison gate connects with Peak Cavern and is used for ventilation, particularly to remove Radon gas, which forms from the radioactive decay of Uranium in volcanic rocks such as the Cave Dale Lava. Radon is radioactive, as are the products of its decay (and their products in turn and for several steps further), and since it is a gas it is a particular hazard as we breathe it in. Caves and

basements with poor ventilation in many parts of the White Peak tend to accumulate Radon.

#### **NF10 – Weather Rake**

The western side of the valley has a really tenuous line in the cliff where Weather Rake descends, the merest vestige of the geological structure without any inviting mineralisation. The eastern side has a wedge of largely-calcite vein material and a short trial passage (known as Cave Dale Cave No.9).

## Maps and Digital Location Data

Several different maps and location data are provided with this guide, within the “zip” file which contains this document:

- There are three PDF files for printing, viewing on-screen, or using in some mobile device apps.
  - One contains the route and points of interest.
  - One contains geological information, including the lead veins (black lines with circular dots overlain) and geological faults (plain black lines).
  - One is based on Lidar data and shows the ground surface (without trees, buildings, walls etc).
- The GPX file can be used in many GPS devices as well as mobile device mapping apps.
- The Microsoft Excel file contains grid references for all the features, viewpoints, and waypoints. The same information is included below, in the Supplement.

*Maps covering the Pindale and Siggate, Dirtlow Rake, and New Rake and Cave Dale trips are combined but then split into Western and Eastern Parts to accommodate the fact that the Eastern parts have closely-spaced points of interest while the Western parts are rather spread-out.*

### Caveat concerning the bedrock geology and faults/veins shown on the maps

As is often the case, the BGS mapping of mineral veins does not precisely match what is inferred from observed workings. This is thought to arise from the unavailability of GPS locations when the BGS surveys were recorded. This is particularly noted in relation to the sough. Observations of soughs elsewhere and common sense suggest that the sough would be driven to the line of a vein at the closest point available, and that Ashton's Engine shaft would be sunk on the same vein, but the location of the fault (and associated dislocation of bedrock) recorded by the BGS does not match.

The principal upshot in this area is that, where faults affect the surface bedrock distribution, there are jarring anomalies in the maps shown below because the vein locations have been altered but the bedrock left as the BGS indicates.

### Using Maps and Data on Mobile Devices

*There are too many options to give a comprehensive picture, so this section is meant only to give some hints and a basis for some “desk research”.*

The GPX file is probably the best starting point if you already have a digital mapping app installed, especially if you have OS maps in that app as this file only contains the location data.

An alternative which includes a map is to use one the “mbtiles” files. These are not included in the zip file as they are rather large but can be downloaded separately. My preferred app for using these is SWMaps but a better app people with less digital mapping experience is MapTiler Mobile. It allows for relatively easy loading of MBTiles maps but it will be necessary to register and get the Free (rather than Anonymous) plan. MBTiles can be put on Google Drive and then accessed on Android phones as “local” storage. MBTiles maps can also be used on a desktop/laptop PC using the Maptiler Desktop software.

*The MBTiles maps have a slightly different coverage and map content than the PDF maps, which are really designed for printing to-scale.*

Finally: the PDF files are “georeferenced” so can be used with suitable software on a mobile phone or tablet, combined with its GPS, to show your location in relation to the itinerary or geology. Software which can work with these “geopdf” maps includes Avenza and GeoPDF.

## Supplement

### Summary of Grid References

DF01	Relocated Crushing Wheel/Track	feature	SK15468214
DF02	Gin Circle and Shaft Head	feature	SK15438216
DF03	Stemple Sockets, Drilled Holes, and Pick-marks	feature	SK15348214
DF04	Area of Veins and Riders	feature	SK15318212
DF05	Features Near Slot	feature	SK15288209
DF06	Flourite in Spoil	feature	SK15248206
DF07	Narrow Rib Rider	feature	SK15218202
DF08	Underground Workings in Kirk Grove	feature	SK15188201
DF09	Double Shaft?	feature	SK15008190
DF10	Riders and Slickensided Fault	feature	SK14738172
DF11	Hazard Mine	feature	SK13688116
DV01	Top View of Pick-marks	viewpoint	SK15268206
DV02	Hentley Vein and Another Shaft	viewpoint	SK15118197
DV03	Pindale Rock	viewpoint	SK14958181
DV04	Vantage Point	viewpoint	SK14828176
DV05	Later In-filing and Restoration	viewpoint	SK14698168
DV06	View South to Daisy and Oxlow Rakes	viewpoint	SK13358137
DV07	Linicar and Slack Hole Vein	viewpoint	SK13268156
DW01	Access Gate	waypoint	SK15478210
DW02	Descend into Rake	waypoint	SK15418216
DW03	Exit Rake	waypoint	SK15238204
DW04	Access Gates	waypoint	SK15058193
DW05	How Grove Access	waypoint	SK14798172
DW06	Access Hazard Mine	waypoint	SK13768126
NF01	Entrance to JH	feature	SK13498200
NF02	Small Ore Bin	feature	SK13808205
NF03	Termination of New Rake Working	feature	SK14258216
NF04	Outcrop of Cave Dale Lava	feature	SK14788219
NF05	Cave Dale Pipe	feature	SK14988233
NF06	Vein to Michill Bank	feature	SK15108248
NF07	Trial Cuttings	feature	SK14988240
NF08	Cave Dale Rising	feature	SK14868223
NF09	Peak Cavern Vent	feature	SK14868232
NF10	Weather Rake	feature	SK14898241
NV01	New Rake and Horsepit Rake	viewpoint	SK13098192
NV02	Small Scarp	viewpoint	SK14428217
NV03	Weather Rake and Beyond	viewpoint	SK14998235
NW01	Car Parking	waypoint	SK14568147
NW02	Stile	waypoint	SK13368194
NW02	Stile	waypoint	SK13538198
NW04	Route into Cave Dale	waypoint	SK14718225
NW05	Access Bridleway	waypoint	SK14828219
NW06	Start of Miners(?) Path	waypoint	SK14738212
NW07	Gentle Descent	waypoint	SK15058247
PF01	Pindale Rock	feature	SK15618211
PF02	Massed Crinoids	feature	SK15618197
PF03	Bottom of Fire Scrin	feature	SK15758225
PF04	Pindale Cave	feature	SK15748219
PF05	Pindale Side Vein	feature	SK15788228
PF06	Pipe Working	feature	SK15808230
PF07	Ashton's Engine House	feature	SK16288258
PF08	Pindale End Mine Climbing Shaft	feature	SK16138249
PF09	Pindale End Mine Hauling Shaft	feature	SK16068246
PF10	Probable Working Area	feature	SK16028249

PF11	Kytle End Vein Open Stope	feature	SK15998247
PF12	Ochreous Spoil	feature	SK15698252
PF14	Vein Intersection	feature	SK15868241
PF15	Small Vugh	feature	SK15748233
PF16	Shot Holes	feature	SK15698228
PF17	Capped Shafts	feature	SK15698228
PF18	Site of Pond	feature	SK15688227
PF19	Crushing Circle	feature	SK15668226
PV01	Fire Scrin and Pindale Side Vein	viewpoint	SK15788217
PV02	Pindale End, Pindale Sough, and Redseats Vein	viewpoint	SK16048249
PV03	Redseats Open Cut	viewpoint	SK15848257
PV04	Possible Centre of Redseats Mine	viewpoint	SK15648254
PV05	View of Sough Route	viewpoint	SK15888245
PV06	How Many Veins?	viewpoint	SK15808236
PV07	View into Pindale Side Vein	viewpoint	SK15708227
PV08	View into Fire Scrin	viewpoint	SK15698224
PW01	Parking	waypoint	SK15548210
PW02	Access to Quarry Bench	waypoint	SK15678215
PW03	Route to Pindale Side Vein	waypoint	SK15828227
PW04	Access Gate	waypoint	SK15888244
PW05	Egress Gate	waypoint	SK15628223

## Information Sources and Further Reading

Historical information and geological details have been obtained from the following sources. My thanks go to the authors of these articles.

Mining History back issues and PDMHS Newsletters are available from the PDMHS website (see below).

The trip(s) which each relates to are indicated by the content of brackets following a source, using the same letter as begins each location code. e.g. [P]

### Mining History:

#### **The Surface Remains on Dirtlow Rake**

H E Chatburn, volume: 1, number: 7, pp: 22-26 [P, D]

#### **Hourdlo Steel Pipe, Castleton**

T D Ford, volume: 2, number: 4, pp: 230-233 [N]

#### **Field Meeting at Castleton: Report of the Director**

T D Ford, volume: 3, number: 3, pp: 191-193 [D, N, P]

#### **The Earliest Lead-mine Soughs in Derbyshire**

J H Rieuwerts, volume: 7, number: 5, pp: 241-314

#### **A Hitherto Unknown Account of a Late 18<sup>th</sup> Century Visit to the Speedwell Mine at Castleton by James Plumtre**

T D Ford, volume: 11, number: 6, pp: 281-282 [N]

#### **The Connection of James Hall's Over Engine Mine to Peak and Speedwell Caverns**

DA Nixon and D Warriner, volume 13, number 3, pp.57 [N]

#### **Surface Remains in the Pindale Area, Castleton, Derbyshire**

C Heathcote, volume: 14, number: 6, pp: 35-41 [P]

#### **Excavation and Conservation at How Grove, Dirtlow Rake, Castleton (errata 15-3)**

J Barnatt, volume: 15, number: 2, pp: 1-40 [D]

#### **A Gazeteer of the Lead Mines within Castleton and Hope Liberties, 1748-1898**

C Heathcote, volume: 16, number: 6, pp: 1-30 [P]

#### **The Geological Setting of the Lead mines in the Northern Part of the White Peak**

T D Ford, volume: 17, number: 5, pp: 1-48 [D, N, P]



## PDMHS Newsletter Observations and Discoveries:

N/L No.		
164	Underground Workings at Kirk Grove, Dirlow Rake, Castleton, SK15183 82015	D
169	Unnamed Pipe Working in Pindale, Castleton, Derbyshire, SK 15802 82305	P
181	Old Workings on Red Seats Vein, Pindale, Castleton, SK 15936 82565	P
181	Siggate Miscellanea, Castleton, within grid square SK1582	P
182	Update: Shot Holes at Siggate Top, Castleton, at SK 1569 8229	P

## Other Sources:

**Lead Mining in the Peak District, Ed. T D Ford & J H Rieuwerts, 2000**

Contains an itinerary covering the same area as this guide. It is currently out of print but available second-hand.

**Geologists' Association Guide No. 56: The Castleton Area, T D Ford**

**Lead Legacy** (updated inventory in Mining History 18-6) inventory numbers: 5[N], 12 [P, D]; 13, 14 [P]; 10, 16 [D].

**Lead Mining in Derbyshire: volume 1. Castleton to the River Wye, J H Rieuwerts**

**Scheduled Monument Listings, Historic England** (some of these contain comprehensive detail and good background information, accessible from <https://historicengland.org.uk/listing/the-list/>):

- Pindale Side – 1017651
- How Grove Lead Mine – 1402079
- Palisaded hilltop enclosure above Pindale head – 1020306

**Lead: an investigation into geochemical signatures from past lead production in the Hope Valley, Derbyshire, N Clarke**

[https://www.academia.edu/34968940/Burying\\_the\\_Lead\\_an\\_investigation\\_into\\_geochemical\\_signatures\\_from\\_past\\_lead\\_production\\_in\\_the\\_Hope\\_Valley\\_Derbyshire](https://www.academia.edu/34968940/Burying_the_Lead_an_investigation_into_geochemical_signatures_from_past_lead_production_in_the_Hope_Valley_Derbyshire) [P]

## Other Information

Maps were created using QGIS open source GIS software. Field observations were recorded using the SWMaps Android app.

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The maps with this guide have been created with the aid of data and images from a variety of sources.

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Source: <https://www.openstreetmap.org/export>

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Source: <https://www.ordnancesurvey.co.uk/opendatadownload/products.html>

Licence: <http://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/>

#### Geological Information

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Source: <https://www.bgs.ac.uk/data/services/digmap50wms.html>

Licence: <http://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/>

Mineral vein locations have been informed by reference to the British Geological Survey Southern Pennine Orefield dataset, which was kindly made available to the author. In many cases, the locations shown in this guide have been adjusted by the author to better correspond with field observation, lidar, and satellite images.

#### LIDAR DTM and Composite Data from the Department for Environment Food & Rural Affairs

Digital terrain models used for creating profiles and composite map visualisations are from Defra, used under the Open Government Licence v3.0.

Source: <https://environment.data.gov.uk/DefraDataDownload/>

Licence: <http://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/>

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Source: <https://maps.nls.uk/os/6inch-england-and-wales/>

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## This Work

This is version 1.0, 11 May 2023.

An electronic copy and all map and data downloads may be obtained from:  
<https://adam.hilltop-cottage.info/field-guides>.

New guides and new versions will be published there. Errors and omissions may be sent to [arc@hilltop-cottage.info](mailto:arc@hilltop-cottage.info) (please indicate “Field Guide” and the name of the excursion) or via the website.

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