

The Geological Code

The rocks and landscapes around us contain clues to the ancient past of the planet, long before man walked the Earth. Rock faces, whether in quarries, at the roadside or canalside or in other places are where we can access this ancient past. Just like sites for wildlife these can be damaged and destroyed by careless actions. So when visiting a special geological site:

- Make sure that you obey the countryside code and avoid undue disturbance to wildlife
- Stay on footpaths and never approach a rockface unless it is safe and permitted to do so
- Be considerate to other people, don't hammer indiscriminately or leave broken material where it may obstruct a footpath etc
- Keep collecting to a minimum, geological materials cannot be replaced, regrown or replenished. Collect only from fallen material.
- Never collect from walls or buildings
- Never collect directly from rockfaces
- Leaders of visiting parties must familiarise themselves with the current state of the exposures, carry out any risk assessment that is required by their organisation and plan their visit accordingly
- Appropriate waterproof clothing, stout footwear and where necessary hard hats and other protective wear should be worn as the site conditions dictate
- Field work even with specific research permissions and concessions must not disfigure rockfaces with markings or sampling damage
- Ensure that in the longer term your field notes and samples are offered to a local museum where they are available to others to study
- For more information contact Dudley Museum or The Geologist's Association, Burlington House, Piccadilly London W1V 9AG

Please follow this geological code to ensure that our fragile geological sites are protected and used wisely for the enjoyment and enlightenment of all both today and in the future.

The Countryside Code

From a gentle stroll or relaxing picnic to a long-distant walk or heart-pumping adventure, the countryside provides every opportunity for enjoyment and relaxation.

- Be safe - plan ahead and follow any signs
- Leave gates and property as you find them
- Protect plants and animals, and take your litter home
- Keep dogs under close control
- Consider other people

If you follow the Countryside Code wherever you go, you'll get the best enjoyment possible and you'll help to protect the countryside now and for future generations.

www.countrysideaccess.gov.uk

Dudley
Metropolitan Borough Council


The
Black
Country
Geological
Society


ENGLISH
NATURE
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Further Information

Dudley Museum - Dudley Museum houses one of the most important collections of local fossils in the country with displays illustrating the geological history of the Black Country. Books, fossil replicas and gift items can be purchased. Admission is free 10.00am - 4.00pm Mon - Sat. Dudley Museum & Art Gallery
1 St. James's Road, Dudley DY1 1HU
Tel: 01384 815575 • www.dudley.gov.uk

Black Country Geological Society - The society meets about once a month either at Dudley Museum to hear evening talks from visiting speakers, or daytime field trips to locally important sites and further afield. Programme details may be obtained from Dudley Museum. www.bcgs.info

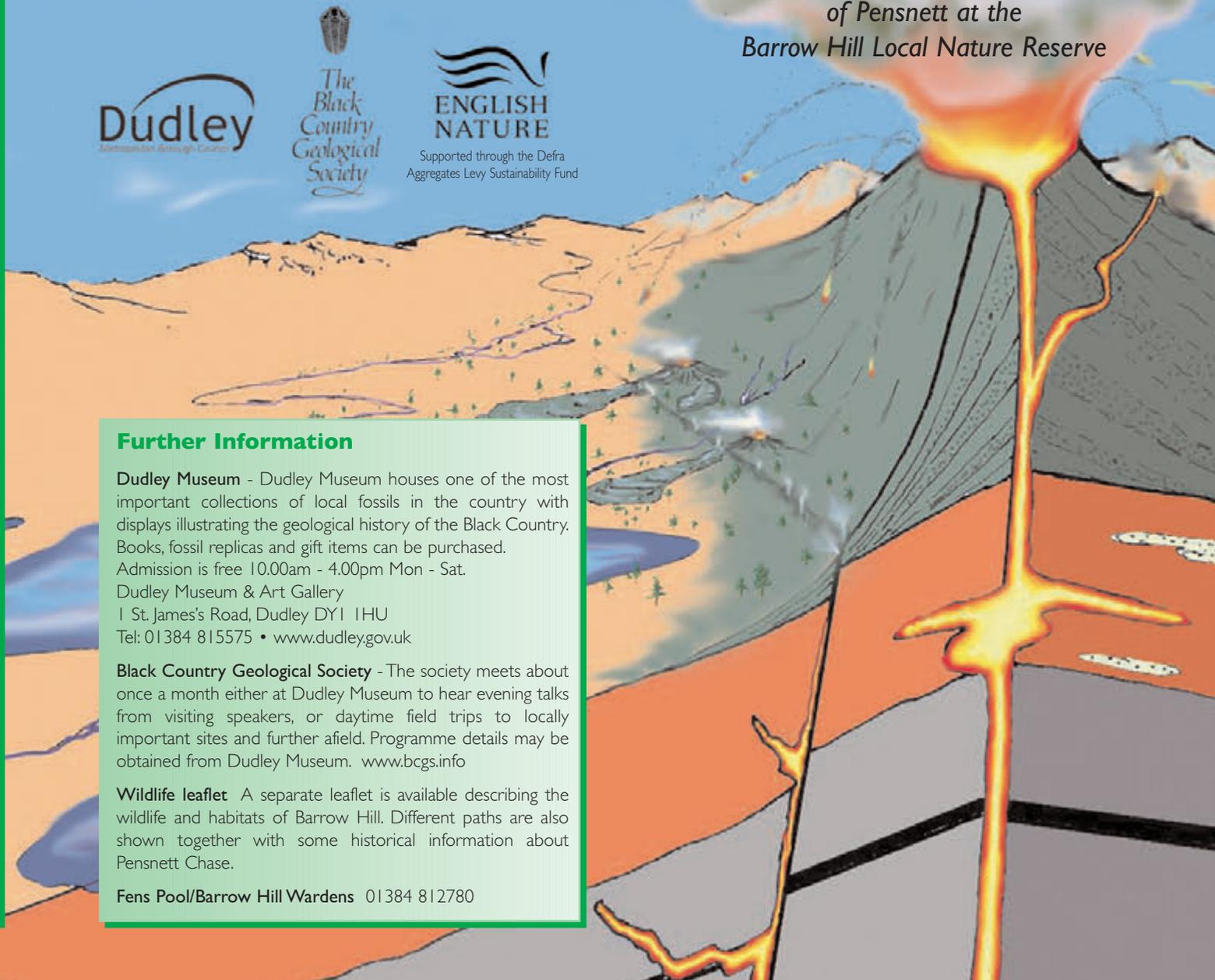
Wildlife leaflet A separate leaflet is available describing the wildlife and habitats of Barrow Hill. Different paths are also shown together with some historical information about Pensnett Chase.

Fens Pool/Barrow Hill Wardens 01384 812780

BARROW HILL

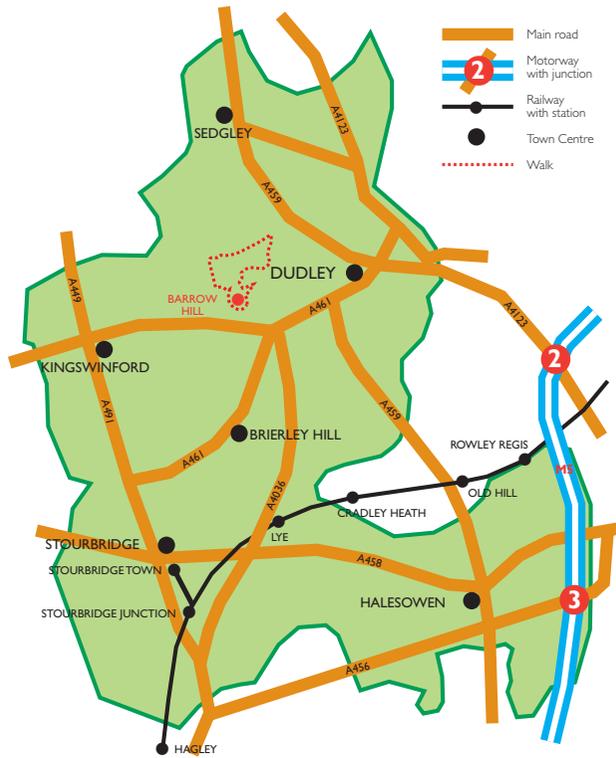
THE DUDLEY VOLCANO

*Discovering the ancient past
of Pensnett at the
Barrow Hill Local Nature Reserve*



How to find us

The site is accessible by road
Bus stop near to Russells Hall Hospital



ACCESS	Numerous access points on foot
PARKING	Limited parking near St Mark's church and small car park off Merryfield Road
BUSES	Centro Hotline for information 0121 200 2700
GROUPS	Pensnett Wildlife Group - contact Wildspace Officers for details on 01384 815718

Neither Dudley Metropolitan Borough Council nor any of its employees, nor The Black Country Geological Society accepts responsibility for any loss or injury, howsoever caused, to anyone visiting The Barrow Hill Local Nature Reserve.

Barrow Hill

Barrow Hill, located in Pensnett a short distance from Russell's Hall Hospital, is a conspicuous landscape feature made prominent by a large cross on its summit. The hill is made of a dome shaped mass of dolerite (sometimes locally called Basalt) which is a hard dark grey/black igneous rock formed underneath what was once the Dudley Volcano. The dolerite was originally molten rock (magma) which rose up from below the Earth's crust penetrating the surrounding rocks of the Coal Measures over 300 million years ago. Over the millions of years that have passed since its formation, most of the softer rocks and ash, that spewed forth from the volcano and covered the underground magma chamber, have been eroded away. The dolerite is so hard that it has weathered much more slowly than the surrounding rocks of the Black Country Coalfield and it has been left standing proud as the hill we see today.

Although the outcrop is relatively small in area, the dolerite was extensively quarried in the 19th Century for use as road stone. The now derelict quarries record a special phase in our local geological history, and with the spoil heaps and surrounding grasslands and woodland make an important and attractive place for wildlife and people, recognised by the designation of the area as a local nature reserve (LNR).

The rocks which can be seen today show a number of interesting features which throw considerable light on the volcanic history of the region. The site as a whole, including the former claypit at nearby Tansey Green, is of such national importance to geologists that it is a Geological Conservation Review site currently being considered as a geological Site of Special Scientific Interest (SSSI).



Tansey Green Claypit
Inset: Fossilised conifer

Dudley 300 million years ago

The rocks beneath our feet are a record of the natural history of our world and the prehistoric animals and plants that have lived at different times over millions of years.

The Dudley landscape has looked very different through time and has been subject to great environmental change.

315 million years ago during what is known as the Carboniferous Period, Dudley lay at the southern margin of a vast tropical river delta swamp which stretched as far north as what is now southern Scotland. This 'Pennine Basin' as it is called, was itself part of an even larger complex which included northern France and Germany. It would have resembled today's Mississippi delta swamplands but on an even greater scale.

What is even more remarkable is that the part of the Earth's crust on which Dudley now stands was then situated near the Equator. It has moved through time to its present position as a result of continental drift, often referred to now as plate tectonics, over the eons of time.

The sediments deposited in the delta swamps formed rocks which are known as the Coal Measures. These rocks vary from grey to black shales formed in either fresh, salt, or brackish (slightly salt) water; grey to yellow sandstones and siltstones; seatearths (fossil soils) which can be sandy or clay. There are also ironstones which formed chemically in some of the shales and coal seams which formed from the peat derived from decaying vegetation which grew in the swamp.

In the Dudley area the tropical swamps were brought to an end by earth movements which elevated the land to the south causing changes in geography and drainage. Gradually the poorly drained swamps gave way to a periodically waterlogged alluvial (river) plain which in turn developed into a well drained flood-plain. The Etruria Marl was formed in this new phase and it is these rocks which immediately surround Barrow Hill.

Significantly, the earth movements also caused stretching and shallow faulting in the Earth's crust which allowed the onset of volcanism. This was mainly expressed as thin horizontal sheets or sills of dolerite intruded into the buried sediments. At Barrow Hill surges of ash and agglomerates (loose mixtures of ash, dolerite and blocks of Coal Measures) blasted from the volcano tumbling down the volcano sides, similar to those seen in Iceland today. It appears that the volcanic activity was quite localised and probably of relatively short-lived duration.

The clays of the Etruria Marl are very important locally for brickmaking.

The Barrow Hill Trail

This leaflet describes a self guided geological walk around Barrow Hill with particular places or features of interest being identified on the map with an accompanying description.

The reserve may be entered from several access points shown on the map. The sequence of numbering starts from Vicarage Lane but as the stops are self contained the walk can be started at any point.

1. Summit of Barrow Hill

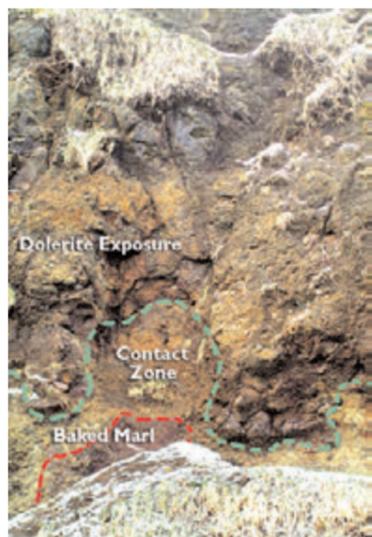
The summit is over 150m (500ft) above sea level and affords a wonderful view of the surrounding area. Directly to the east is the high ground of the Rowley Hills, also formed of dolerite but of considerably greater extent.

On the summit itself the dolerite can be seen immediately below one's feet where the grass has worn away. The rock here is weathered to a brown colour but the rounded, spherical form so typical of dolerite is discernable. In the middle distance looking north are the green fields of Coopers Bank, under which are the rocks of the Etruria Marl and the Productive Coal Measures, once the scene of much mining activity for coal and brick clay.

2. East Quarry

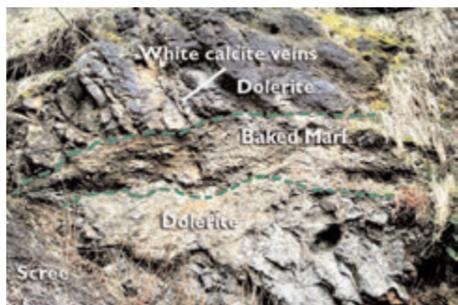
After about 25 metres along the access path into the quarry, where the path divides, the ground is strewn with dolerite rubble and scree which is mostly weathered brown on the surface but fresher specimens exhibit the normal dark grey crystalline nature of the rock.

2(a) The left hand section (east side) of the quarry has two faces. In the north face it is possible to make out sets of vertical fractures and shrinkage cracks in the rock which is the beginning of columnar structure in the dolerite. This is another typical weathering feature of this rock. Although it cannot be seen here, the columns are hexagonal in cross-section which is a feature developed naturally during the slow cooling of the molten mass of the magma.



2(b) The south face indicates a much more complex arrangement. Here the dolerite is mixed up with Etruria Marl (the local country rock) as shown by the different colours and textures which can be seen. 'Tongues' of dolerite have intruded into the clays of the Etruria Marl, baking it in the process and giving it a natural terracotta appearance in places. In some instances the actual contact shows a dark purple or pale reaction zone. Because the altered rock is of fairly limited extent it is believed that cooling of the magma must have been quite rapid and that the original Etruria sediment was probably water-logged which acted as a dampener. On close inspection the rock face has a quite rubbly appearance where the dolerite has churned up the Etruria Marl. Small vertical cracks which developed when the dolerite was still hot have been filled in with some of this rubble and in other places the cracks have been subjected to rising hydrothermal fluids depositing white calcite where they cooled.

2(c) In the southwestern section of the quarry there are more examples of the contact zone between the dolerite and the Etruria sediments.

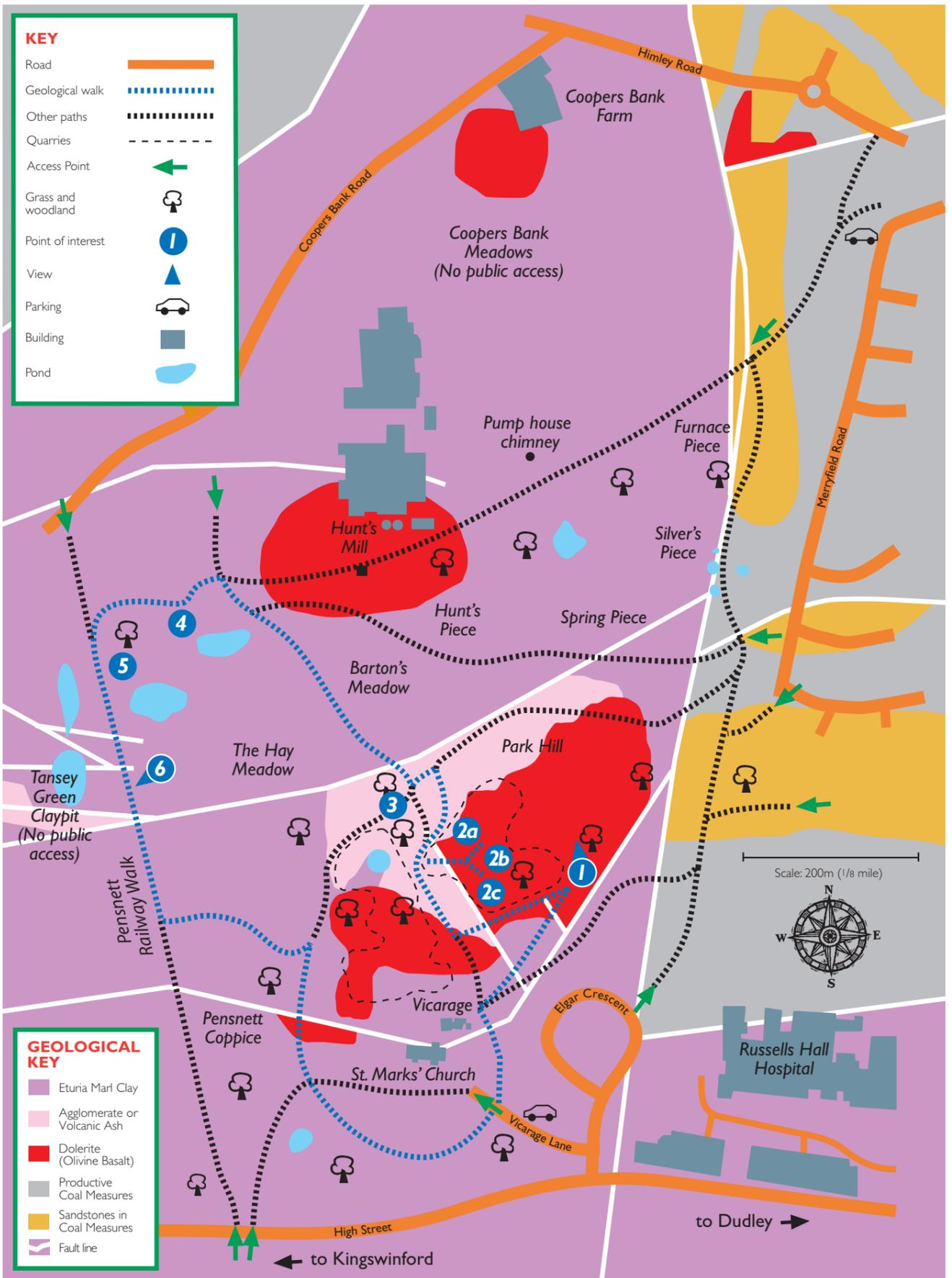


Halfway up the centre of the rock face, captured blocks, called xenoliths, of the Etruria Marl, have been surrounded by the dolerite forming a rubbly looking texture. The xenoliths show varying degrees of partial baking but in general the alteration is quite limited in extent.

Thin white veins of calcite can be seen, indicating once again the action of hot hydrothermal fluids percolating upwards through the rock mass. Some of the xenoliths were also affected by rising fluids as the stripy colouration indicates.

Curious smooth rounded holes here and there resemble gas bubbles or perhaps where rounded lumps of dolerite may have broken away.

The evidence seen here leads to the conclusion that this spot is at the edge of the main dolerite emplacement where hydrothermal vents reached up possibly only a matter of a few hundreds of metres to the ancient ground level which was eroded away long ago.



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3. Archaeological remains

Large scale quarrying began here in the late 18th Century when turnpike roads, such as the nearby Himley Road, were built due to the increase in travel for trade and other purposes. The main workforce would have been local residents. At the same time, the surrounding area was changing rapidly with the enclosure of Pensnett Chase and expansion of industry and mining all around the area.

The lower slopes of the hill are covered in large grassed over mounds of quarry waste. A large concrete block at the bottom of the hill appears to be a rather lonely vestige of the quarrying activities. It is thought to be a foundation of an aerial bucket ropeway used to carry stone from the quarry originally down to Coopers Bank Road or later to the former Pensnett Railway.

A little further along the route the scrub hides other examples probably connected to the western quarry.

4. Poolside

The walk from the east quarry has been over the outcrop of Etruria Marl but because of its softness giving no marked physical features and the absence of quarrying here, there are no significant exposures. However a small exposure displaying the distinctive red clay is evident in the sides of the small pool.

5. Barrow Hill Incline

The Barrow Hill Incline was once part of the route of the Pensnett Railway. After about 200 metres going uphill a gap in the hedge to the right affords a view into Tansey Green Claypit.

6. Tansey Green Claypit

Etruria Marl clay was extracted here up until the end of the 1990s for making house bricks at the nearby former brick works. The claypit has been extensively regraded and landscaped.

On the far side of the claypit there are dark grey mounds of colliery waste dumped here when coalmining was in operation locally. Over to the left a low ridge of dark grey clay can be seen which is in stark contrast to the usual red colour. This black clay is quite different in constitution to the normal, being the top of a deposit of volcanic ash. Originally the ash would probably have been deposited over a more extensive area but has subsequently been lost by erosion later in the Carboniferous Period.

The deepest (lowest) ash bed contains small fossil conifer stems. These were buried by a gentle but rapid air-fall ash deposit which has preserved them as fossils in situ. Although the temperatures were sufficient to char the outer bark, the internal structure has been well preserved making these the oldest three dimensional conifers discovered in the world to date and of international importance. The ash beds were very susceptible to weathering and rapid degrading, so it was decided their best protection was to rebury them when the general restoration of the claypit was carried out. Re-excavation still being possible whenever the scientific need should arise. Some of these conifer fossils can be seen at Dudley Museum.

Imagine the volcanic vents on the side of ancient Barrow Hill spewing out clouds of ash with flows of lava debris running down the sides of the cinder cones. This would not have been a safe place to stand 300 million years ago!

Continue along the old railway line to the starting point.