Minninglow Limekiln Level 3 Survey - Historic Building Recording Client: Mark Edge, Minninglow Grange

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Appendix I – Historic mapping Appendix 2 - WSI

Summary

The grade II listed carboniferous limestone field limekiln built to serve the Cromford and High Peak Railway near Minninglow Hill was erected circa 1828-1830. In 2019 it partially collapsed and this report records the structure prior to partial reconstruction, consolidation and repair. The limekiln is one of a considerable number which were erected alongside the railway but it is one of only two which are recorded in the Gazetteer of the railway (2004 - Arcus) and is the only one which is listed. It had a specific local function, to provide the lime mortar needed for the construction of the adjoining raised embankment, a massive limestone structure which bridges the immediate valley and provides the platform for the railway. Conceived in a similar way to canals, these mass masonry structures are a significant landscape feature and reveal the massive investment needed to construct a level railway in an upland setting. The nearby Minninglow Embankment to the north is another similar structure which is listed grade II. It too was erected at the same time and had an associated limekiln but that is not identified in the Gazetteer and has largely disappeared.

Location

The limekiln is situated 20 metres to the immediate east of the Tissington Trail, a long-distance cycleway and footpath which follows the route of the old Cromford and High Peak Railway, at grid reference: 420568, 357373 (SK 20569 57373). It lies approximately 2 kilometre south of the A5012. What3Words: collapsed.different.daunted

It falls within the parish of Bradbourne and lies within the farmland belonging to Minninglow Grange.



Plate I - Ordnance Survey Explorer map at 1:25,000 showing the location of the tower (arrowed) relative to the High Peak Trail and Minninglow Hill



Plate 2 - Aerial Photograph 12.5cm, 2006 - © Bluesky plc.

Local Landscape

The site falls within the Landscape Character Type known as the White Peak, locally as 'Limestone Plateau Pastures'. The solid geology is of carboniferous limestone, specifically Monsal Dale Limestone Formation – Limestone, a sedimentary Bedrock formed approximately 329 to 331 million years ago in the Carboniferous Period. The local environment was previously dominated by shallow carbonate seas.

The key characteristics of the landscape type include:

- A rolling upland plateau
- Pastoral farmland enclosed by limestone walls
- Localised field dewponds and farm limekilns
- Discrete trees groups and belts of trees
- Medieval granges surrounded by older fields
- Relicts lead mining and quarrying remains
- Prehistoric monuments, often on hilltops
- Open views to surrounding higher ground

All of these aspects can be seen and experienced from the site of the limekiln. Minninglow Grange Farmstead was established at the boundaries of Roystone Grange and Mouldridge Grange. Although the name suggests a Medieval origin, the farmstead is a later establishment. The 'low' or 'lowe' from the name Minninglow is a local regional term for a hill or a barrow. It comes from the Old English word 'Hlaw', meaning mound.

Archive Deposition

A full digital copy of this report, incorporating both PDF and CAD drawing files of the surveyed quarry and limekiln, orthorectified plan and orthorectified elevation, and an axonometric view, will be found at OASIS (via ADS Easy) – project ID. Minninglow Limekiln (2001 1966).

Survey

James Brennan Associates has produced the detailed measured drawings including a topographical survey of the site incorporating the limekiln structure and orthorectifed photographs in both elevation and plan, both illustrated on the subsequent pages (not to scale). These are produced as separate PDFs at a scale of 1:200 for the survey plan and 1:20 at A1 for the rectified photographs.

Photographs of the limekiln and its setting are included in the digital archive deposited with ADS Easy. In total there are 53 record photographs and we have selected 29 mages for reproduction and comment in this report.

Research

The assessment includes full Ordnance Survey map regression via Groundsure mapping and Emapsite. All Ordnance Survey maps are included in Appendix 1.

In addition, we have investigated aerial photographs held by the Peak District National Park dating from 1972 (not reproduced) and photographs from the Peak District National Park archive.



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Plate 3 - Survey Drawing of the Limekiln, route of the railway and quarried area to the south (James Brennan Associates)







Statutory Designation

The limekiln was listed grade II on 28th August 1984.

The following is the list description:

SK / 25 NW 3/151 PARISH OF BALLIDON HIGH PEAKTRAIL (East Side) Lime kiln at OS 206 574 II

Lime kiln. Early C19. Rubble limestone. Approximately fifteen feet tall, set into a cutting in the hillside. U-shaped in plan. Semi-circular opening partly closed up and with next charge ready for charging. Listing NGR: SK2056957370

The Historic Environment Record describes the structure as follows:

HER Number MDR8589 - Full Description

Minninglow Lime Kiln, north of Gallowlow Lane, Ballidon, a 19th century facility.

Peak Park photographic record. (1-3).

Drystone, roughly circular, structure constructed from limestone blocks. The kiln is built backing onto an excavated hollow, which is open to the north. The kiln is approximately 5m high and 7m in diameter. The opening to the kiln is still apparent on the north facing side, although the interior is infilled with rubble. Presumably the flue was directly above the centre of the kiln, but has now been demolished to ground level, which has left a depression approximately two metres deep in the centre of the kiln. (4-7)

Well preserved pit-type quarry with ramp down the working floor. There was former rail access nearby. The kiln's radial flues and entrance tunnel are visible. (8)

From the National Heritage List for England:

'SK / 25 NW PARISH OF BALLIDON HIGH PEAKTRAIL 3/151 (East Side) Lime kiln at OS 206 574 II

Lime kiln. Early C19. Rubble limestone. Approximabely fifteen feet tall, set into a cutting in the hillside. U-shaped in plan. Semi-circular opening partly closed up and with next charge ready for charging. (9)

Sources

(1) SDR18971: Photograph: Peak District National Park Authority (PDNPA). Slide Collection. 963. pp 1-2

(2) SDR18970: Photograph: Peak District National Park Authority (PDNPA). Black and white photograph collection. 447.3a

(3) SDR18975: Photograph: Peak District National Park Authority (PDNPA). Colour photograph collection. Film. 19: pp 4-6

(4) SDR19352: Archive: Jessop, O. 2003. Cromford & High Peak Railway and Peak Forest Tramway Survey. ARCUS 738b. Feature no: 196

(5) SDR19353: Photograph: ARCUS. 2003. Cromford & High Peak Railway and Peak Forest Tramway Survey, Project 738b. Digital photograph. 270-271

(6) SDR19350: Map: Ordnance Survey (OS). 2003. OS Landline (2003) from EDINA Digimap.

(7) SDR18789: Map: Ordnance Survey (OS). 1882. OS County Series, 1st edition, scale 1:2500 (c. 25" to one mile). Sheet: XXXIII.7

(8) SDR18788: Bibliographic reference: Fowkes, D (ed.). 1997. Derbyshire Industrial Archaeology. A Gazetteer of Sites. Part IV. Derbyshire Dales.

(9) SDR19551: Listed Building File: Historic England. 2011. The National Heritage List for England. https://historicengland.org.uk/listing/the-list/list-entry/1335285?section=official-listing

The ARCUS report on the Cromford and High Peak Railway, dated July 2004, recorded the limekiln in the Gazetteer as entry no. 196.

Historic Context

As described by Professor Colin Divall in the ARCUS report on the Cromford and High Peak Railway (2004), "the huge limestone deposits of the White Peak offered practically limitless supplies of a resource useful for building and essential both for agriculture and the nascent chemical industries of north-west Cheshire and south-east Lancashire." The Cromford and High Peak Railway was intended as an "intermodal" transport system, meaning that it adopted various means to get from A to B, and was a general purpose inter-regional link, so not exclusively concerned with moving limestone. Interestingly, the Derby Mercury described the opening of the line on 2nd June 1830 and celebrated the fact that it could transport coal from a distance, carting coal up steep hills and "the railway was opening by drawing about 100 tonnes of coal up four of the included planes, the greatest part of which was for the neighbourhood of Hartington". The main coal carrier was the Wheatcroft family, based at Cromford.

In 1825 the Act of Parliament was obtained for a "railway or tramroad" to be propelled by "stationary or locomotive steam engines". The original engineer was Josias Jessop. Jessop's survey took the railway 33 miles from its junction with the Peak Forest Canal at Whaley Bridge (which had opened in 1799) through to that with the Cromford Canal, at Cromford. The route followed was essentially that of a canal, with more or less level sections following the contours, sometimes circuitously, and generally modest earthworks, plus three tunnels, linked with rope-worked inclines. Jessop had considered the use of locomotives, but it was only in 1833 that a steam locomotive by the name of 'No. 1 - Peak' built by Robert Stephenson and Company was first employed. Until then, the railway was horse-drawn.

The Cromford and High Peak Railway (C&HPR) was completed in 1831, to carry minerals, goods and passengers between the Cromford Canal at Cromford Wharf and the Peak Forest Canal at Whaley Bridge. The first part of the line from Cromford Wharf, by the Cromford Canal, to Hurdlow opened in 1830. From the canal it climbed over a thousand feet in five miles, through four inclines ranging from 1 in 14 to 1 in 8. The line then proceeded up the relatively gentle Hurdlow incline at 1 in 16. The second half from Hurdlow to Whaley Bridge opened in 1832 descending through four more inclines, the steepest being 1 in 7.

The limekiln would have been built in order to provide the lime needed for the construction of the massive embankments and bridge which supported the line. It is likely to date from ca. 1825-30. Slightly further to the north-west the Minninglow Embankment is listed grade II and lime mortar is likely to have been provided by a separate limekiln located to the east of that structure, which is evident on old OS maps. The embankment alongside the surviving limekiln is not listed although it is contemporary and of a slightly smaller scale and detail as the Minninglow Embankment. To the north of the line and running alongside it is a quarry (Minninglow Quarry) which first appears on the 1922 OS map.

There was a railway sidings at Minninglow (Mr Glossop's Siding), and a station or 'loading stage' near Parwich Road, which was recorded on drawings of the line (Rimmer, 50-51).

Professor Divall explains that it was an almost complete failure as a link between the industrial towns of the north-west and Derby/ Nottingham area because it never reached the levels of traffic originally conceived, although it was taken over by the London and North Western Railway in April 1861. In 1874 there was one main train daily in each direction, which included the 'fly' coach carrying passengers, but it took 5 hours and 25 minutes to get from High Peak Junction to Whaley Bridge and passengers had to get out and walk up and down the inclines. There were other cross-route trains, but by 1891 on weekdays these cross-routes were timetabled to just one train in each direction between Cromford and Whaley Bridge and one between Cromford and Shallcross.

The railway closed piecemeal from 12 August 1963 until September 1967 and following the removal of the trackbed was turned into the High Peak Trail and the separate Tissington Trail by Derbyshire County Council and the Peak District National Park.

Map Regression

Sequential Ordnance Survey maps are illustrated in Appendix 1 – Map Regression.

The line of the railway is first visible on the 1836 1-inch OS (surveyor's draft), provided by the British Library from its digital collections.

https://commons.wikimedia.org/wiki/Category:Ordnance_Survey_Drawings

and from the Georgian / Victorian 1 inch to 1 mile Ordnance Survey Old Series / First Series Old Map Collection (1805-1869).



Plate 5 - 1836 Ordnance Survey Surveyor's Drawing, showing the route of the Cromford and High Peak Railway at Mininglow Hill (British Library Ordnance Survey Drawings -Ashbourne (OSD 348).jpg

At a later date the limekiln is visible for all of the 25-inch OS maps (see Appendix I – Map Regression). It is marked as on 'Old Limekiln' by 1880, indicating that it was no longer operational. There are some subtle differences in the landscape and contours shown on the OS maps, and the 1922 map, for the first time, states that the area to the immediate south is an 'old quarry'. The HER record also states there was a pit-type quarry and a ramp down to the working floor (Fowkes, D (ed.). 1997. Derbyshire Industrial Archaeology. A Gazetteer of Sites. Part IV. Derbyshire Dales). The 'workings' are visible on the aerial photographs of the site, but it seems likely that the land was primarily excavated to create a platform and level working area for the top of the kiln, and quarrying was primarily in association with the construction of the kiln. There are no signs of any radial flues, as recorded in the HER.



5045 1-527ha 3-77 6043 1-672ha 4-13 6043 1-672ha 4-13 5033 591ha 1-46 Q

Plate 6 - 1880 Ordnance Survey map at 1:2500



The anomalies in the description are not explained. It is only in 1975 that the flat polygonal sides of the kiln are first shown on the map. We can, therefore, only treat the early maps with caution and not assume that they are reliable depictions of the structure.

Aerial Photography

Aerial photography is limited for this area. An aerial photograph dated 1972 (copy held by the Peak Park) shows the site and the latest aerial photographs from Bluesky plc dated 2006 shows the kiln before it collapsed in 2019. There are no discernible differences.



Plate 8 - Aerial photograph of the kiln in 2006, prior to collapse - Bluesky plc

Types of Kiln and Context

Lime has been used for hundreds of years for both building and later for agriculture, as a fertiliser. Calcium oxide (quicklime) is the product of lime-burning. In its primary burnt state it is known as lump lime. It would have been removed in this form and used as a mortar by crushing and then adding water to create quicklime. When water was added it became calcium hydroxide (or lime putty).

<u>Pre-industrial age</u> Flare kiln – pre-industrial Clamp kiln – pre-industrial Pye type kiln – pre-industrial

Industrial age: Field Kiln Intermittent Kiln Running Kiln Draw Kiln

In a 'clamp' kiln layers of fuel and limestone were stacked together in a mound, covered with clay or turf and slowly burned in a method similar to that used in charcoal burning.

Local variations of clamp kilns are known as 'pye kilns' and 'sow kilns'.

In a 'double pye-kiln' two flues were needed to extract the lime, simply due to the size of the structure and the amount of material being burned. In contrast to the commercial dry-walled 'running kilns', in which fuel and limestone were continually fed in through a hole in the top, 'pye-kilns' tended to be purely domestic and may have been used only once or twice before being abandoned. They are a common feature of the limestone plateau of Derbyshire and are found in all the limestone areas of England.

More sophisticated stone or brick-built lime kilns were of two basic types: 'Flare kilns', also known as 'intermittent' or 'periodic' kilns; and 'perpetual', 'running' or 'draw' kilns. As their name suggests, 'flare kilns' were loaded with a single charge of limestone and burning had to stop for this to be removed before it could be re-loaded for the next firing.

An intermittent kiln had its charge of burnt lime dug out from above or from the side. The draughting tunnel was not used to remove the lime.

'Draw' kilns were loaded with alternate layers of fuel and stone which was kept burning continuously while further supplies of raw material and fuel were fed in at the top and the lime was drawn off at the bottom. Both types had the same basic structure, consisting of a thick-walled stone chamber with a hearth at the base.

The continuous Draw Kiln and the Running Kiln both received their charge from the top and the burnt lime is removed from the bottom through the access arch / draughting tunnel. These are part of a continuous industrial process.

The intermittent flare kiln was the type of lime kiln generally used in Roman and medieval Britain. It most commonly consisted of an open-topped cylindrical combustion chamber and a hearth, with one

or more draw-holes, also referred to as 'flues', 'stoke-holes' or 'eyes', at the base. A vault of stone blocks, resting on an internal ledge, was built over the hearth. The rest of the limestone or chalk was stacked above this. This meant that the fuel was not in direct contact with the charge and so good quality lime, unmixed with ash, was produced. The fire, usually of wood but sometimes coal, was lit at the end of a draw-hole leading into the hearth. The ashes were raked out through the same hole, or a further draw-hole. The fire needed to be stoked for several days for all the limestone to be calcined and the kiln then had to cool down completely before the entire load of lime was removed. Flare kilns used a greater amount of fuel than draw kilns, had to be partially dismantled to extract the lime and frequently required relining, so they were not the most cost-effective or convenient method of lime production.

In general lime kilns developed from the flare kiln to the more economical continuous draw kiln. Draw kilns had a permanent grate fixed over the hearth and limestone was stacked above this, alternating in layers with fuel. As the fuel burned the calcified limestone dropped down and was raked out, while new layers of fuel and limestone were added at the top of the kiln. This method of production was an industrial process and was most commonly used in later periods. **This is the kiln we find at Minninglow.**

Derbyshire - In all the pre-19th century limeburning complexes, the quarries are shallow and the limestone was burnt in kilns set in circular earthen mounds. The quarries are normally upslope of the kiln and there are large waste heaps of ash, slag and burnt coal on the downslope side. When production carried on over a long period there is a large number of kilns as it was better to build a new kiln rather than transport the limestone over greater distances.

(https://www.brocross.com/industrial%20history/derbyshire%20limekilns/derbyshire%20limekilns.htm)

Small Field Limekiln Elements

The following list of elements of field kilns can be used to inform our understanding of the surviving remains of the kiln at Minninglow.

Access Arch – the access arch or draughting tunnel is the short tunnel which leads to the draw hole. It provides the air needed for efficient combustion. Sometimes the end of the access arch has a cast metal surround or grate leading into the Draw Hole.

Draw hole or 'eye' – located at the base of the bowl and at end of the tunnel or access arch. The draw hole was separated from the fuel (the mixture of layers of limestone and coal) from within which the fire (usually a wood fire) was lit.

Charging bowl or 'pot' – sometimes with a distinct heat resistant lining, the shape of the 'bowl' could vary, but was generally circular in plan, and often filled in at a later date to prevent accidents. Freshly quarried limestone was sent via a horse-drawn rail or cart to the top of the limekiln.

'Charge' - the layers of limestone and coal tipped in from the top

Poking hole - the kiln might have a poking hole from which the fired could be stoked.

Support bars - a metal grille which held back the calcium oxide before it fell down into the drawhole and was extracted.





Plate 9 (general_view_01) January 2022 View of the limekiln looking south showing the level platform from the base of the limestone embankment



Plate 10 (general_view_03) January 2022 View looking south-west of the limekiln from the track-bed of the former Cromford and High Peak Railway across the massive raised embankment



Plate 11 (01_040122) West flank apex, showing current 'crest' of remaining limestone rubble, where collapse has taken place.



Plate 12 (03_040122) Turf to south of limekiln and view of the railway boundary walls



Plate 13 (04_040122) Turf and apex to south-east side of limekiln



Plate 14 (08_040122) Apex of limekiln - east flank



Plate 15 (09_040122) East flank - cap with larger stones



Plate 16 (15_040122) East flank with straight-sided batter



Plate 17 (16_040122) East flank 'wingwall'



Plate 18 (18_040122) East flank and area of collapse to north



Plate 19 (21_040122) Viewv of collapsed north face



Plate 20 (25_040122) West flank and jcn. with north face



Plate 21 (23_040122) $\,$ - west flank remains and collapsed rubble



Plate 22 (27_040122) Apex of west flank with straigjt-sided batter and very slight curve towards the former north face (collapsed)



Plate 23 (29_040122) Rubble and remains of charge



Plate 24 (31_040122) West flank'wingwall' and grass covering



Plate 25 (32_040122) View from the west showing the 'bowl

Description and Analysis of the Minninglow Limekiln

The large size and regular, square-sided, battered form of the masonry abutments of the Minninglow limekiln indicate a structure which was designed to be used multiple times as a draw kiln. The amount of over-burden to the west side of the kiln, which has encapsulated the flank, may be largely made up of waste material, which has been deposited over time and which may have been consolidated with turf. Excavation and removal of collapsed rubble during September 2022 has identifed that the facing stone does not extend beyond the wing walls, and that instead the limekiln is built onto and into existing bedrock limestone. The fissures and cracking in the bedrock suggest that this was partially blasted out to create the space for a kiln.

The structural engineer's report refers to a 1.5 degree batter. This is not an even batter and there is a distinct tapering change in the outward face of the kiln at the northern apex where the batter is closer to 15 degrees, as recorded in photographs.

Draw kilns had a permanent grate and were more often than not lined with fire-bricks. A hard mortared lining, or Roman cement render is likely to survive in-situ buried within the 'charge'. The arched access tunnel or draughting tunnel was intact prior to the collapse of the front of the battered limestone wall. Because of the strength of the arch construction, a large part of the arched tunnel still survives buried. This was not built from gritstone, as previously thought, but entirely from limestone.

Although the original purpose of the limekiln was for the railway, and would have been short-lived, because it was a draw kiln, it may have been in later use to provide lime as a fertiliser on the local fields. The source for the Coal is less clear. Coal was quarried in mid Derbyshire, accessible via the the Cromford Canal and its principal coal carrier Wheatcrofts from 1794 when the canal went as far as Cromford and would have been available via the inclines from High Peak Junction where the railway met the canal.

The faceted external form of the limekiln (prior to collapse) is most clearly evident on the 1975 Ordnance Survey map and the Aerial Photograph from 2006. Earlier OS maps show a solitary circle, depicted as the former limekiln, probably the 'bowl', and are not accurate depictions of its external form. All of the available evidence shows a construction in rubble carboniferous limestone, built in the form of drystone walling, with a rubble core, which would have been consolidated as construction took place, possibly with a lime mortar fill.

Photographic Evidence

The Limekiln was photographed in 1984 and 1995 by the Peak Park. Black and white photos illustrate the draw hole with a small section of boundary wall within the arch, presumably to prevent sheep from entering. At that time the top of the limekiln had a soft capping of turf, and this appears to be a deliberate form of consolidation; it has a uniform finish. By 1995 the short section of drystone wall within the draw hole had partially collapsed. The last set of Peak Park record photos date from 2002 and are in colour. The only obvious difference is that some of the side / flanking soil is more heavily eroded and a little more of the base of the kiln to the east is visible, with some large gaps in the masonry (see arrow – plate 30). Photographs taken by David Hitchins in around 2009 show similar details but have one notable addition, which is a photograph within the draw hole. None of the Peak Park images show the draw hole. This reveals that the Draw Hole is lined with blocks of gritstone ashlar, not limestone, within a separate lower vault than the outer limestone masonry. A photograph taken on

9th February 2018 by A Badcock shows the kiln prior to its collapse.

Photographs for this archival record were taken on 4th January 2022 and were taken on 7th September 2022, immediately after the collapsed rubble had been removed. A selection of images of the record photographs from September 2022 are reproduced on pages 28-32.

Following removal of the collapsed rubble in September 2022, further observations can be made:

- The 'rubble charge', which is referred to in the list description, is mainly building rubble, as it contains extensive deposits of brick and sandstone, although there were also some pieces of vitrified slag. These materials would not have been added to the charge, as they would have contaminated the limestone. It appears, therefore, that a large proportion of the material which was inserted into the kiln was building rubble, in order to 'cap' the kiln and prevent livestock from being harmed and falling into the kiln.
- The dressed stones from the face of the arch had collapsed and approximately 800mm of the face of the arch has collapsed. The arch is not even.
- The base of each abutment finishes in partially dressed limestone with approximately 500mm of dressed jointed stone previously covered over, as seen in photographs from January 2022. Approximately 500mm of bedrock is visible in front of the base of this dressed stone, suggesting that this would have been back-filled with crushed limestone as a base for cart access under the arch.

Comparisons

The following limekilns are comparable with that at Minninglow: Gratton – square fronted (SK 20415 61422), north of the A5012 and Pikehall – the similarity of construction form with the Mininglow kiln suggests it may have been built by the same company.

Johnson's Knoll, Eaton and Alsop (SK 15813 57196) – running kiln close to the Tissington Trail, north of the A515. Contemporary.

Tissington – square-fronted (SK15577 52559) https://www.brocross.com/industrial%20history/derbyshire%20limekilns/tissington.htm

Madge Dale, Hartington – square-fronted (SK 13173 61641) https://www.brocross.com/industrial%20history/derbyshire%20limekilns/madge%20dale.htm

Beacon Rod, Great Longstone (SK221733)

East Midlands Historic Environment Research Framework

Provision is made for updating the East Midlands Historic Environment Research Framework (EMHERF) where the results of a fieldwork project contribute towards agenda topics.

Strategic Objective 9H

Characterising the rural environment: identify and record historic buildings and landscape features

This record is of a limekiln which is a well-documented structure within upland Derbyshire, but many field limekilns are unrecorded and this is one of only two surviving limekilns from the railway, although many appear to have been built along its length.



Plate 26

Peak Park photograph from 1984 (00095). The segmental arch is even with an inserted section of wall.



Plate 27

Peak Park photograph from 1984 (00096). The distinctive batter to the north face shows an angle of approximately 15-degrees at the apex. Compare with Plate 24. A large area of masonry to the west flank has collapsed.



Plate 28

Peak Park photograph from 1984 (00098). Compare with Plate 29 below. A large area of masonry to the west flank has collapsed. This image shows it to be a relatively even upper face, capped with turf.



Plate 29 (12_040122)

Comparison with plate 28 from 1984 suggests that a large amount of the charge has inwardly collapsed into the 'bowl'. Photographs from 2002 suggest that this inward collapse had already taken place.



Plate 30 (000245) photo of 2002, Peak Park, showing erosion



Plate 31 (9th Feb. 2018 - 1335285) photo by Anna Badcock (Peak Park) The photo shows a similar amount of masonry to that recorded in 1984.



Plate 32 (37_070922) - post excavation of rubble. Note limestone bedrock to both sides at base.



Plate 33 (36_070922) post excavation of rubble. Note dressed face of arch is missing



Plate 34 (41_070922) right abutment with 30cm rule



Plate 35 (42_070922) right abutment. 500mm of bedrock at the base of the excavated pit.



Plate 36 (50_070922) right abutment with 30cm rule and natural limestone bedrock to the right, with some shatter / fissure marks from blasting



Plate 37 (49_070922) right abutment with losses and missing face of arch



Plate 38 (44_070922) left abutment with bedrock at the base and to the left



Plate 39 (46_070922) underside of arch in limestone with rubble from kiln core



Plate 40 (48_070922) rubble fill at base of kiln. No signs of charge. Building rubble with sandstone, brick and limestone, with some burnt slag deposits.



Plate 41 (38_070922) face of kiln with excavated ground



Plate 42 (51_070922)



Plate 43 (53_070922)

Sources Consulted and Bilbiography

Historic England - NHLE database and Archives for aerial photography (Swindon) Peak District National Park Authority - aerial photography and photographs Historic Environment Record, including ARCUS survey of the Cromford and High Peak Railway

https://www.brocross.com/industrial%20history/limekilns.htm

http://archive.bugsworthbasin.org/pages/lime.htm

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