The Restoration of the Deep Ecton Level Entrance (List Entry Number 1021175; SMC Ref No, S00168477): Recording and Findings during the Archaeological Watching Brief (October to November 2018)

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Introduction

The Ecton mines are of national importance for their extensive surface and underground remains. These include those for prehistoric mining for copper ores and large scale post-medieval extraction for copper, lead and zinc ores from the 17th to 19th centuries. The mine workings eventually extended from the high ridgetop here down to about 300m below the level of the adjacent River Manifold. Archaeological highlights at surface include: a Boulton and Watt winding engine house of the 1780s on the ridgetop: large dressing floors on the side of the ridge: other hillocks and shafts across the site as a whole: and last but not least entrances to both Deep Ecton Level and Clayton Level by the river. In both cases these adits, and one on the hillside above at Salts Level, lead to important accessible underground engine chambers and impressive workings.

The remedial works carried out in 2018 were at the entrance to the Deep Ecton Level, located at the base of the hill, on its west side, at SK 09635813. A drainage level here was first driven from beside the River Manifold in or shortly after 1723 but the entrance to this is now lost. When its outer part collapsed, where it passed through unstable ground comprising an ancient now grass-covered scree slope, a new Level was driven nearby in 1784-85, which bypassed

the collapsed section and curved to join the original passage once stable rock had been reached.

Plate 1: The 1774-75 Deep Ecton Level at its inner end where it reaches solid rock, with a semi-circular top to the drystone arching (Photograph: Paul Deakin).

The outer part of the 1784-85 Level collapsed sometime after 1863, probably at the time the mine was abandoned between 1875 and 1883; it was reopened in 1884-85 by the Ecton Company Ltd, the last mining company to work at Ecton, when they rebuilt this section of the Level.

This long adit, with finely arched outer section, gives access to: to the impressive near-vertical mineralised pipeworking where there are now extensive flooded workings that extend 300m below river level; to a vertical winding shaft coming down from the ridgetop to depth, which was used by the Boulton and Watt engine; and last but not least to two large engine chambers of the 1780s that contained infrastructure for pumping water from the mine below river level. One of these chambers once held a unique water balance engine, replaced in 1823 by a massive waterwheel. The other contained a horse and man operated 'capstan' of one-off design. These were important parts of the 18th century infrastructure of the then 'state of the art' mine owned by, and operated for, the Duke of Devonshire.

After the Ecton Company Ltd ceased work in 1889 the entrance to the Level lay abandoned, until the Ecton Creamery was built on the site between 1918 and 1932. Extensive creamery buildings, now largely demolished, lay near the passage entrance, including two much earlier smelting houses that were utilised, new buildings and other associated structures. A siding from the Leek and Manifold Light Railway was created and the passage itself was dammed and used as a water supply for the works.

Plate 2: The 1884-85 flat-arched rebuild of the outer part of Deep Ecton Level, with later render on the sides, looking in from the inner end of where the damage was repaired in 2018.

From 1932 when the creamery closed everything fell into disrepair; the Ecton mines eventually became a playground for cavers and mine explorers; a small creamery outbuilding that hadn't been demolished was used as caving club hut. The Deep Ecton Level was flooded and not used, and access to the workings inside was gained via Salts Level. By the 1970s at latest the entrance to the riverside passage was again fully blocked, with roof falls immediately inside. The Deep Ecton Level was reopened yet again in 1984 for Geoff Cox, the then owner of the mineral rights, who also opened a small education centre at Ecton. After digging through the collapses, various props were introduced into the outermost part of the passage to support the arched roof where there were two holes in it and also at another point where it was obviously in a poor state; security gates were put in place to prevent unauthorised access.

In the last five years or so it became apparent that a bulge in the north-west wall of the level, located below one of holes in the arching inside the entrance to the Deep Ecton Level, was

getting significantly worse; this reached a point in 2018 where access along the passage was restricted by the mine manager on health and safety grounds, because of fears of imminent collapse. If access to the important accessible underground workings was to be reinstated for the benefit of future research and for those with an interest in historic mines, it was necessary that parts of the first section of the passage be taken down and rebuilt. Thus, plans to carry this out were put in place.

The Level entrance lay within the 'The Copper Mines on Ecton Hill' Scheduled Monument (List Entry Number 1021175) for its archaeological interest, and the Hamps and Manifold SSSI for its ecology. The site is also within the Peak District National Park.

The repairs at Deep Ecton Level were carried out in October to November 2018 and were undertaken with Scheduled Monument Consent (SMC), with the SMC application made by Peter Huxtable for the Ecton Mine Educational Trust (EMET), in his capacity as one of the trustees, with assistance from Graham Woodrow the mine manager and this author who advises the Trust on archaeological matters. EMET manage the Ecton Mines and its Education Centre, with a separate organisation, the Ecton Hill Field Studies Association running the educational activities at Ecton.

The conditions for SMC applied by Historic England included the writing of a 'Written Scheme of Investigations' to be prepared in advance, which detailed the archaeological importance of what was to be done and how any archaeological features impacted upon were to be recorded (Barnatt 2018).

Permission was also gained from Natural England and the Environment Agency; the Peak District National Park Authority (PDNPA) was also consulted. Natural England decided that there was nothing in the small area of the SSSI to be disturbed that was of any exceptional ecological value and gave their blessing to the work going ahead. The main concern of the Environment Agency was that the River Manifold should not be polluted during the remedial work; a temporary dam, with a pipe leading from this was inserted along that part of the Level to be worked on, which channelled the water coming along the Level from inside the mine and hence pollution such as potential diesel spillage was avoided. To de-roof the first 10m of the passage in order to repair it, a large hole needed to be dug from surface, and a small dilapidated creamery outbuilding had to be largely demolished to make this possible. This had its roofing tiles stolen several years ago and cracks now existed at one corner of its walls; without extensive and expensive repairs it had only a limited life expectancy. The PDNPA decided that planning permission to demolish this was not required. EMET, who have the liability for the Ecton Mines, complied with their responsibilities by having a temporary stopping installed inside the Level just beyond the area that was worked on; which was designed to prevent illicit entry during the period of work because the security gates had been removed for refurbishment.

The 2018 work was funded by EMET and was subject to competitive tendering; the job was awarded to D-Geo a local firm. It was overseen by Nick Hardie, a professional mining engineer from Hard Rock Mining, on behalf of EMET, and he was the primary liaison point between them and the contractors and sub-contractors. One of the key considerations when appointing the contractor to do the remedial work was the approach to be taken by D-Geo. Other civil engineering companies intended to take down the whole of the first section of the Level, while D-Geo subcontracted the rebuilding to Peter Roe, one of the few people in Britain who had previous experience of rebuilding arched levels and a consummate drystone

wall builder with great skill; his approach was to take down only those parts of the passage that were directly at risk of collapse and this meant that much of the original fabric was retained; only about a quarter of the stonework had to be rebuilt.

The 2018 work comprised: digging the hole needed to access the damaged arching from above, which in the end was over 4.0m deep at one end, and included: the demolition of the creamery outbuilding; rebuilding the Level stonework where necessary; covering the first 10m of arching with reinforced concrete; and backfilling the site in keeping with what was there previously. The work was subject to an Archaeological Watching Brief carried out by this author, who recorded all archaeological features impacted upon, assessed the rebuilding work as it was proceeded to check the stonework was in keeping with what was replaced, and interpreted what had been found; this is presented in this report.

Past Research

The Ecton Mines as a whole, with Deep Ecton Level featuring strongly as an important component, have been widely researched over the last few decades. The first account of the history of the mines and surviving remains was that by Nellie Kirkham, the pioneering mine historian in the Peak District (Kirkham 1949; Kirkham and Ford 1967). Later the cudgels were taken up by John Robey and Lindsey Porter, who carried out extensive research into the mines in and around Ecton (Robey and Porter 1972; Porter and Robey 2000; Porter 2004). From the last decade of the 20th century, to date, this author has been involved with the Ecton Mines, with his work including a detailed survey in 2008 at surface and underground for Historic England. In the case of Deep Ecton the final survey built upon survey work he carried out with Garth Thomas in the 1990s. The 2008 results were eventually presented in tandem with extensive research into historic documents, resulting in publication of the findings in 2013 (Barnatt 2013); this includes specific descriptions of the late 19th century activity at the mine relevant to the rebuilding of the Deep Ecton Level at that time (Barnatt 2013, pp. 251-77, especially pp. 263-4). A more detailed account of the Deep Ecton Level survey exists in an unpublished report for English Heritage (Barnatt 2012).

No detailed published research has been undertaken into the 1918-32 creamery, but an outline of what is known is given in the author's main Ecton Mines publication (Barnatt 2013, p. 324). A number of old photographs exist of the creamery when in operation and those relevant to the current work are reference in this report. Accounts of the Leek and Manifold Light Railway have appeared in print (Porter 2002; Turner 2010; Barnatt 2013, pp. 321-24).

Extant Archaeological Structures

Before the 2018 intervention to restore the outermost section of the Deep Ecton Level was commenced there were a number of features visible on site at and in the immediate vicinity of where the work was to be undertaken. These were:

- The Level itself, which comprised (and still does) a drystone flat-arched passage going underground north-eastwards from close to the river. This has dry-walled sides, largely covered in render, and a 1984 concrete portal; just inside there are two 1980s security gates. Well beyond the area affected by the 2018 work the Level changes from a flat-arched feature to one with a semi-circular top; the latter is the original 1774-75 passage, while that going outwards from here was rebuilt in 1884-85. An outermost short section is an extension of the passage, built in the 1918-32 creamery phase in order that a railway siding could be created that ran above. By 1984 the Level was blocked near the entrance because of two falls of roof arching; in this year it was reopened and remedial roof supports were added to three collapsed/ unstable sections of the roof, using Acro-props, ring arches, metal grills and timbers. Approximately 10-15 years ago a bulge had started to develop in the north-west wall of the passage adjacent to the innermost hole on the roof arching; in the five years or so to 2018 this had been getting significantly worse.

Plate 3: The 1984 concrete portal to the Deep Ecton Level, with the outer security gate below.

Plate 4: Before the work of 2018, just inside the entrance to the Deep Ecton Level there were timber beams above metal supports (top), which were designed to hold up the outermost section of arching that had dropped and was in danger of collapse. Both were added in the 1980s, as were the security doors to either side.

Plate 5: The 1980s support under the south-western hole in the arching, with two 'home-made' ring arches with timber beam and planks above.

Plate 6: The 1980s support under the north-eastern hole in the arching, with three Acro-props and a metal grill. To the left is the modern bulge in the passage wall that was in danger of collapse.

- Outside the portal of the Level there are low vestiges of a dam across the walled outflow from this. This is the outermost of three dams built in the 1918-32 phase, the other two placed underground along the passage; the walls of the passage between them were rendered, added so that the dams would retain water. To one side of the Level entrance is a three-compartment concrete tank.

- The dilapidated one-storey 1918-32 Creamery Outbuilding, with a later outside toilet attached to the north side.

Plate 7: The dilapidated Creamery Outbuilding with a concrete unloading platform to the right, photographed from the road in May 2018.

Plate 8: The inside of the dilapidated Creamery Outbuilding, photographed in July 2018 after further collapse of the roof timbers.

- The 1918-32 Creamery Outbuilding Terrace, which to the south of the outbuilding comprised a yard with concrete floor. This was, bounded by a roadside wall and steps down to the yard, with metal railings to the south-west corner and a low retaining wall on the west side. The concrete floor extended northwards outside the outbuilding.

Plate 9: The Creamery Outbuilding and its terrace at the beginning of work in October 2018.

- The 1918-32 Railway Siding Terrace, which lies at a lower level immediately west of the Creamery Outbuilding Terrace. It has a high retaining wall at its western side, with a narrow area of land below between this and the river. On the terrace to the north, on its eastern side, there is a small concrete platform and abutted low wall, built against the outside of the 1918-32 Northern Creamery Building about to be noted.

- A largely demolished 1918-32 creamery building with only lower walls remaining, which lay a short distance north of the Creamery Outbuilding, and for the most part was buried. To the east side was an extant concrete unloading platform beside the road, with an adjacent concrete floor at road level.

- There are further creamery remains running north from the area affected by the 2018 work that are not considered in this assessment. Immediately south of the 2018 work, there is a deep hollow at the site of an 18th century smelting building that continued in use, but not as a smelter, into the early 20th century; this again lay outside the remit of the current assessment.

Plate 10: The Railway Siding Terrace at the beginning of work in October 2018.

The Intervention

The 2018 work by the contractors on site, with individual features recorded following the context numbers used during the archaeological recording (see Figs 1, 2 and Appendix 2), comprised:

- 8 Oct: Setting up and site clearance, including: removal of shrubs and one small tree; the full removal of the inner iron door on the Level (Context 37); and installation of a temporary wooden barrier inside the passage beyond the area affected by the works, added to prevent public underground access during the period of the works.

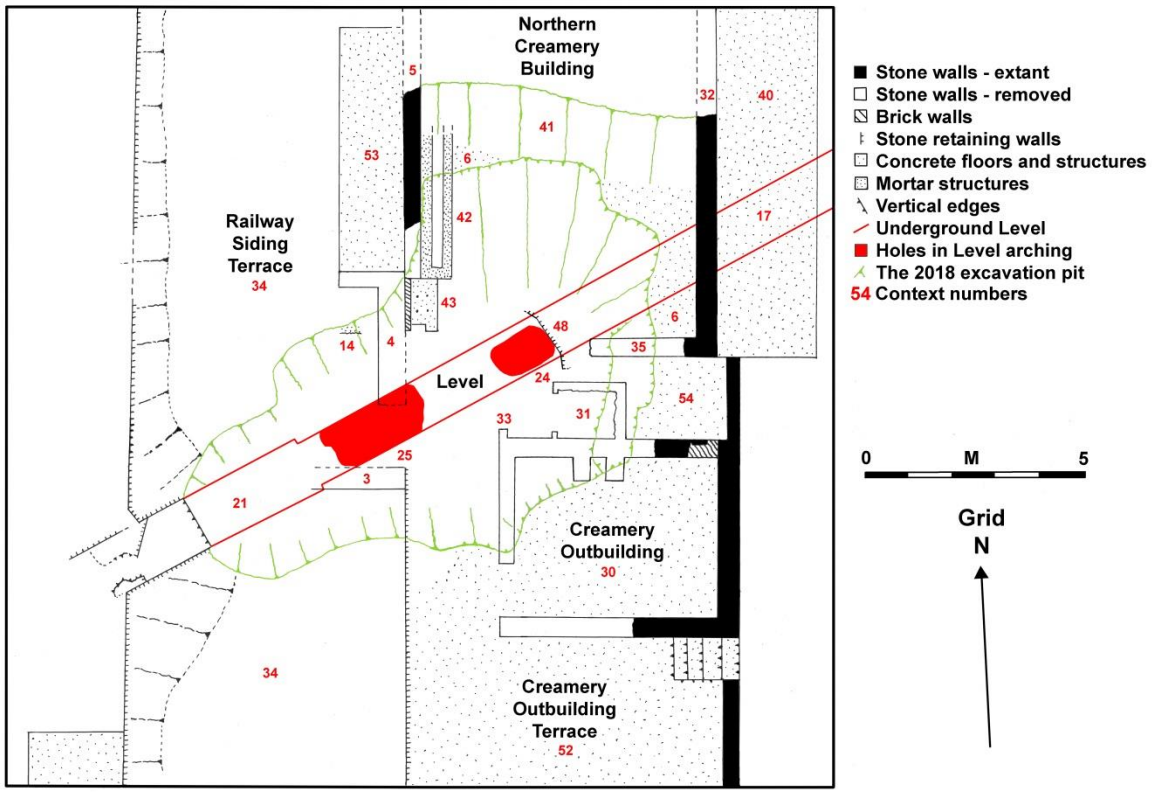

Figure 1: The site, showing the affected and nearby features, and the excavation pit upon completion.

- 9 Oct: The outer door on the Level (Context 36) was removed and a sandbag dam and plastic pipe were installed to take the water running out of the passage through the affected area so that pollution of the River Manifold was prevented. After creating ramps from the road work commenced, using a mini-digger initially placed on the Railway Siding Terrace (Context 34), on the removal of overburden over the Level. This included all of that in the shallow south-western part of the excavation pit down to an horizon about 30cm above the top of the arching (Contexts 20, 29), and the digging of a *c.* 2m deep exploratory pit to the north-east where the surface rose. This revealed a 1980s plug of mortar and rubble within a pit, placed over the north western hole in the arching (Contexts 24, 7, the latter on Fig. 6); when first dug this appears to have cut through a small part of a 20th century concrete floor (Context 6 – see Figs. 6, 7) at approximately the same horizon as the floor of the Creamery Outbuilding

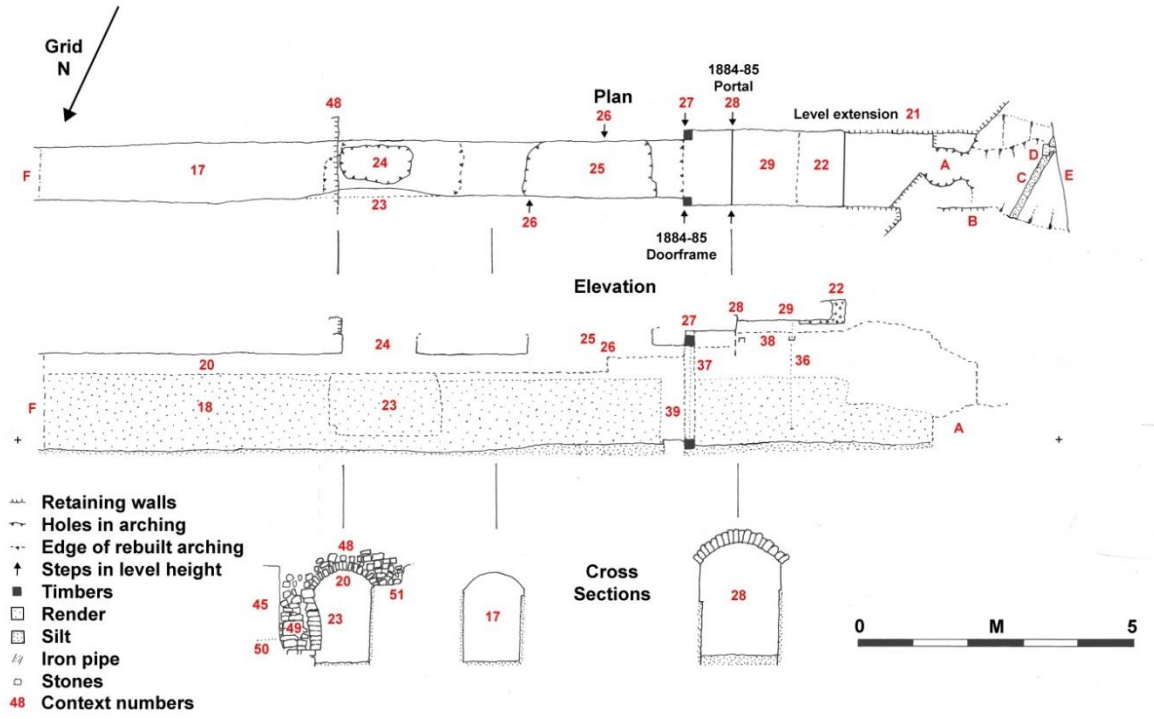

Figure 2: The outer part of the Level, with the elevation showing the roof and floor at the centre line of the passage, the wall height and render at the south-east wall of the passage and the bulge at the north-west wall; the cross-sections are drawn looking inwards (features not given context numbers are A: creamery dam, B: low side wall, C: iron pipe, D: ceramic pipe, E: wooden beam, F: temporary stopping).

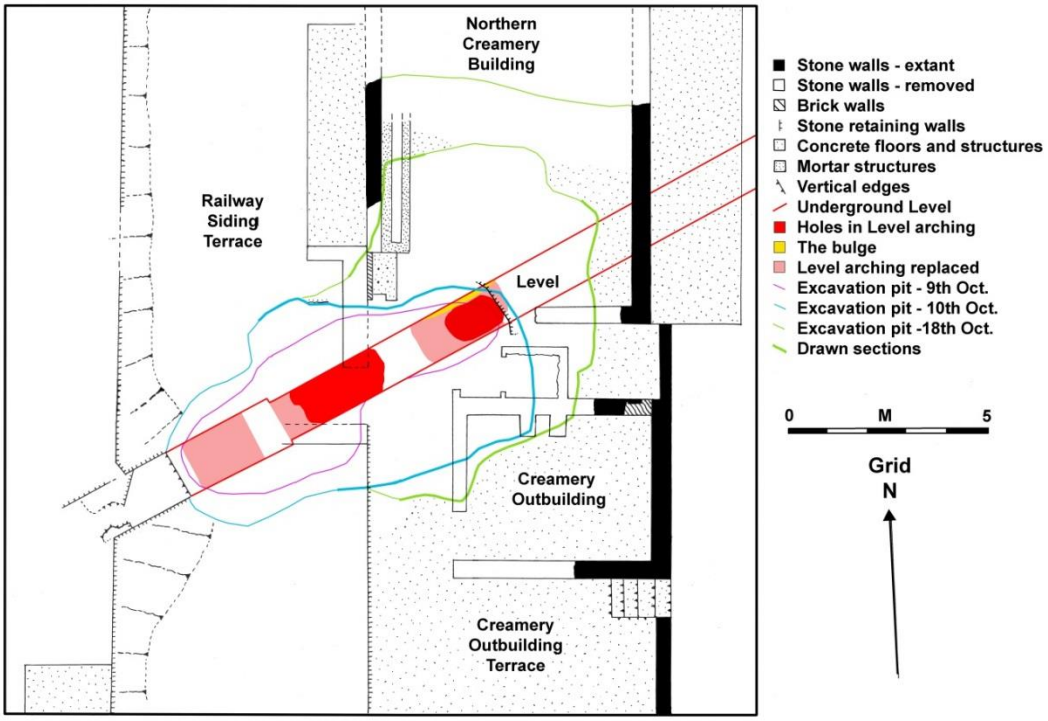

Figure 3: The site, showing the extent of the excavation pit on 9th, 10th and 18th October, and also the rebuilt parts of the Level.

Terrace to the south (Context 52). At the end of the day part of the 1980s pit fill remained high in the western side of the 2018 excavation pit. During these 2018 works a small part of a low and part-collapsed stone wall was found (Context 4); it was removed after being recorded. Similarly the basal course of a robbed wall (Context 3), which crossed the Railway Siding Terrace (Context 34), was recorded and removed. A metrical plan and elevation of the first 17m of the inside of the Level was produced.

Plate 11: The 2018 excavation pit at the end of work on 9th October; part of the 1980s plug, with a lump of reused concrete with re-bars bent by the excavator, is visible in the bottom of the hole.

- 10 Oct: Much of the Creamery Outbuilding and associated structures (Contexts 30, 31, 33) were demolished using an 11 ton 360 degree excavator; this was necessary because the north-western corner lay above the proposed excavation pit in its intended form and because the western side of the outbuilding was in the way of the excavator, sited here after the demolition at a point where it could be placed to excavate the hole above the Level at the northern end of the Creamery Outbuilding Terrace (Context 52). The eastern wall of the outbuilding and parts of the walls at right angles to this were left *in-situ*. The removal of the overburden in the north-eastern half of the excavation pit was continued using the 11 ton excavator placed on the Creamery Outbuilding Terrace (Context 52) and part of the site of the outbuilding itself (Context 30). The *c.* 3m deep hole created here was cut with near-vertical sides to the north-west side and north-east end to a horizon close to the top of the arching; similarly material was removed to this horizon over the rest of the excavation pit, but with stable battered sides to the pit made here. Late in the day a start was made with clearing by hand the remaining overburden over the arching (Contexts 20, 29),

identifying the holes in this (Contexts 24, 25), and also an area where the arching was in poor condition to the south-west (Context 29).

Plate 12: The demolition of the Creamery Outbuilding in progress.

Plate 13: Starting to enlarge the excavation pit on 10th October, with a 1918-32 iron pipe pulled upwards by the excavator.

Plate 14: The excavation pit towards the end of 10th October, with work starting by hand to expose the arching of the Level.

- 11-12 Oct: In the excavation pit the remaining overburden over the arching was removed by hand over much of its extent and the top of the arching stones and holes through this were exposed (Contexts 20, 24, 25, 29), fully identifying what areas needed remedial work and what remained in stable condition. On the 12th Oct. stabilisation infrastructure was installed at the south-western side and north-eastern end of the excavation pit to attempt to make this part of the site safe to work within. This comprised netting, 'rock bolts' near the base, and wooden shoring with two Acro-props leading up to the base of the remaining part of the 20th century concrete floor (Context 6).

Plate 15: The outermost section of the Level after the unstable arching here had been removed to expose the 1980s timberwork that was holding this up. The 1980s portal, which incorporated arching stones, is partially buried by stones placed here shortly before the photograph was taken.

Plate 16: The south-western hole in the arching after rubble was removed to expose the 1980s timberwork beneath, which had been designed to prevent further rubble entering the Level through the hole.

Plate 17: The netting and props placed at the north-eastern end of the excavation pit on the 12th October, designed to allow safe working below; a minor collapse nearby, after heavy rain, of the same unstable material as behind the netting, led to all being removed in advance of extending the pit to batter back its sides.

- 15th Oct: Following a minor collapse in the north-eastern corner of the excavation pit after heavy rain over the weekend, it was realised that the protection measures put in place on the 12th Oct were potentially inadequate; the excavation pit needed extending so that battered sides could be created to the north and north-east. Neil Rimmington of Historic England was contacted for permission to make the excavation pit a little larger than agreed in the original SMC; after discussion with John Barnatt, this was granted the following day by email.

- 15th-17th Oct: Work progressed in the south-eastern 'safe' half of the excavation pit, cleaning the arching stones, removal of the arching stones that needed repositioning, creation of formers and the rebuilding of the outermost section of Level arching (Context 29).

Plate 18: The outermost section of the Level arching after this had been rebuilt. The wooden former used, with planks placed above when in place, lies behind ready for reuse in modified form further along the passage.

Plate 19: The outermost section of the Level arching after having been rebuilt. Immediately beyond is the 1884-85 portal behind the inner 1980s iron beam, with further steps down in the passage height beyond, photographed after they had also been rebuilt.

- 18th Oct: A 21 ton 360 degree excavator was brought to site and the north-eastern half of the excavation pit was extended to create battered/stepped sides, with the machine positioned above the site of the Northern Creamery Building and unloading platform (Contexts 6, 40-41). The first stage comprised the removal of part of the fill of the Northern Creamery Building (Context 41) down to its concrete floor (Context 6); this was then recorded before part of the floor and short lengths of wall to its south end (Contexts 4, 5, 35) were removed. Deposits below were then removed to batter back, and in one small section to the east stepped-back, the excavation pit sides for safe working at the pit base.

Plate 20: The 21 ton excavator removing the demolition rubble from inside what remained of the Northern Creamery Building on the 18th October.

- 19th Oct: The excavation pit side to its north-western side was netted to make this area safe to work in. Formers were made for the south-western hole in the arching (Context 25) and re-arching commenced.

- 22nd Oct: The north-eastern hole in the arching (Context 24) was cleared of debris deposited there on the 18th Oct, the 1980s acro-props supporting metal grid above were removed and the Level wall tops, and the intact arching from here to the south-western hole, were cleaned ready for rebuilding.

- 23rd Oct: The new arching at the south-western hole (Context 25) was completed. The north-eastern hole in the arching (Context 24) was prepared for re-arching, which included removal of *in-situ* original arching to either end that was above the bulge in the north-western wall of the Level below (Context 23), so that this could be safely accessed. The walling at the bulge in the north-western wall was removed to the base of the bulge, which was two courses from its bottom; each course was stacked separately in the right order so that they could be rebuilt as was. Also the stone fill behind the wall (Context 49), to the vertical edge of the 1884-85 trench cut into

natural (Context 45) was also removed to allow room for the reinforced concrete that was to be added. Re-walling of this section of passage wall was started.

Plate 21: the excavation pit, as finished by the 21 ton excavator on the 18th October, with battered back north-eastern end. The north-eastern hole in the Level arching had become buried in the process and was later dug out again.

Plate 22: Putting in the formers at the south-western hole in the Level arching.

Plate 23: Rebuilding the arching at the south-western hole in the Level roof as it neared completion.

Plate 24: The completed re-arching at the south-western hole in the Level; behind is a section of the original arching beyond the innermost step down in height, which was in good condition and didn't need repair.

Plate 25: Removing *in-situ* arching at the inner end of the north-eastern hole in the Level roof, after the drystone wall above had been taken down, in order to fully access the bulge in the side wall so that this section of passage wall could be rebuilt.

Plate 26: The wall at the bulge in the process of being taken down, with the stone fill within the 1884-85 trench being exposed, which was still fitted tightly against the natural material at the original vertical cut edge; only the facing stones of the wall had moved.

Plate 27: The Level side at the bulge area after the walling here had been rebuilt; the 1980s ring arches originally placed nearer the entrance were moved to here to support the formers to be used to rebuild the arching.

- 24th Oct: The new walling at the site of the bulge in the north-western wall of the Level (Context 23) was completed and reinforced concrete was placed behind. The 1918-32 arching by the portal (Context 29) had its interstices filled with grout to help stabilise this, added as a precaution, given that little weight of overburden would eventually be placed here when the site was restored.

- 25-26th Oct: The arching at the hole above the site of the bulge (Contexts 23, 24) was completed and the whole length of arching accessed in 2018 had two sheets of reinforcing grids put in place ready for the concreting to be added.

Plate 28: The rebuilt arching over the north-eastern hole in the Level roof.

Plate 29: The rebuilt bulge area (left) and the new arching above.

- 29th Oct: Concrete poured over all the arching from the portal to the far end of the repaired north-eastern hole (Context 24). This was then left for several days to cure before being buried.

- 3rd Nov: The two 1980s security doors (Contexts 36, 37) were brought back to site and reinstatement started.

- 6th Nov: Door reinstatement was completed, the excavation pit was backfilled and the site generally landscaped and tidied using the 21 ton 360 degree excavator. The retaining wall between the Creamery Outbuilding Terrace (Context 52) and the Railway Siding Terrace below (Context 34), which was in poor condition, was left buried as a precaution against future collapse. Otherwise the site was left much as it had been when the work started except for the partial demolition of the Creamery Outbuilding (Context 30). A heap of walling stone was stockpiled on the Railway Siding Terrace for future use by EMET, which includes repair to the roadside wall for health and safety reasons.

Plate 30: Pouring the concrete over the whole of the outermost 10m of arching that had been repaired, and the passage sides, at Deep Ecton Level (Photograph: Steve Henley).

Plate 31: The Creamery Outbuilding Terrace after the area had been cleared of spoil and the excavation pit had been backfilled.

Plate 32: The Railway Siding Terrace after the excavation pit had been backfilled and the area landscaped; the hollow to the left lies above the Level 1984 portal and matches what was here prior to the 2018 work being undertaken.

Plate 33: What remained of the Creamery Outbuilding at the end of the main phase of 2018 work; the wall tops still await capping to militate against damage from the elements.

Plate 34: The Deep Ecton Level entrance after landscaping and the reinstatement of the refurbished security doors.

- Jan. 2019: A gap in the roadside wall at the Creamery Outbuilding Terrace yard was repaired by EMET to make the site safe.

The Archaeological Recording

Aims and Objectives: These were given in the Written Scheme of Archaeological Investigations (Barnatt 2018) as follows:

1: To observe and record any new structural evidence at the arching that informs on how this was built.

2: To observe and record any structural evidence for the original arched level of 1774-75 that we know from historical documentation was replaced in the 1880s by the current structure.

3: To observe and record any evidence in the surrounding fill behind and above the arching, all or most of which are thought to date from the 1880s when this section of cut-and-cover arching was created, that informs on the history and development of this part of the mine site.

Revisited in retrospect, one further point should have been added:

4: To observe and record any new structural evidence for the 1918-32 creamery buildings, terraces, etc. within the footprint of the 2018 work and its immediate vicinity that informs on how these were built and used.

Methodology: This was also given in the Written Scheme of Archaeological Investigations, as follows:

1: A full documentary assessment of the Ecton Mines in general, and the Deep Ecton Level has already been undertaken (see Barnatt 2013 and the detailed unpublished reports provided to English Heritage at the time of the assessment carried out for them previously).

2: Photographic recording of the outermost section of the adit has already been undertaken, including the portal of Deep Ecton Adit and the first 10m of the passage that will be affected by the proposed rebuilding.

3: In the period when the old portal passage and surrounding fill is being removed, there will be a continuous watching brief as the work proceeds, which will be undertaken by the contractors using mechanised digging equipment. Should archaeological structures be uncovered these will be drawn and photographed, with written details being made on context sheets. Similarly, all layers dug through will be recorded on context sheets.

Any exposed potentially archaeologically significant features will be cleaned by hand and recorded in plan and/or section as appropriate. No excavation beyond the depths of agreed groundworks will be undertaken.

All drawn and written records will be clearly marked with a unique site code, and will be individually identified. Drawings of any newly discovered structures will be made at not less than 1:20 scale and will be drawn on dimensionally stable media.

An adequate photographic record of exposed deposits/structures will be compiled. All photographs will be high definition images and these will feature a scale wherever possible. All photographs will be in digital format and will feature an appropriately sized scale where possible. Selected photographs will be included on a DVD archive accompanying the project report.

4: Any artefacts recovered from the excavations will remain the property of the Landowner (EMET).

5: In the period when the arched portal passage will be rebuilt, periodic inspections will be made to ensure that like is being replaced with like in terms of the passage dimensions and the character of the stonework.

6: On the assumption that the creamery building will be affected by the groundwork, photographic recording of the small derelict 20th building of the Ecton Creamery above has already been undertaken. This includes external and internal photographs of the building. In addition, measurements of the size of the building and notes that will allow a brief description in the report have already been made.

Archaeological Recording in Practice: At the outset the site was given the recording code DEP18. The author was present whenever the excavation pit was being dug or extended and when decisions were made as to which parts of the Level were to be rebuilt. Other periodic visits were made to check on progress with the rebuilding of the passage arching and the wall where the bulge had been taken down, to ensure the new masonry was in keeping with what was there originally, and to observe the backfilling and restoration of the site. (on site: 8-11 Oct, 15 Oct, 18th-19th Oct, 23rd-24th Oct, 26 Oct, 2 Nov, 6 Nov.).

Photographic recording of the Level and the Creamery Outbuilding were made in May and June 2018 in advance of the work.

During the October digging of the excavation pit needed to restore the Level, the recording of structures included metrical surveys of the overall site at surface and the Level underground. Both were done before excavation work affected what was being recorded, with the former plan started on the 8th October and the latter on the 9th October, with additional features added subsequently as they were revealed. Drawn sections of the stratigraphy and structures that were cut through were also produced, but health and safety constraints regarding detailed archaeological work in the excavation pit prevented detailed metrical drawings being made. When the visible sections were at their optimum, at the unsupported deep vertical faces before netting was put in place, they were photographed, where possible with strategically placed ranging poles as an aid to scale. The final drawings were produced retrospectively from the photographs and sketch drawings made at the time. When the 360 degree excavators were at work, the pace of progress was such that initial archaeological recording as a whole was done using photographs and rapid sketches, with context sheets again filled in soon afterwards. Because of the pace of the work as a whole, sometimes shortcuts in the context sheet process were made, as for example, cuts and the fills they contained (normally given separate numbers) were given only one number where this did not impact on the understanding of what was being recorded. In layers being dug through by the mechanical excavator, for the most part no attempt was made as they were being dug to record individual tip lines within the individual contexts identified (except at the drawn sections); changes in

detail often were visible fleetingly and were different with the next sweep of the excavator bucket.

Artefacts: No pre-20th century artefacts of any consequence were found in meaningful stratified contexts and nothing was retained for permanent curation; selected items were photographed. In one well-stratified context, parts of a ceramic roofing tile had been used when building the north-west side of the 1884-85 Level's wall. Other mining-related artefacts, redeposited in later layers, included what may have been a fire bar from one of the 18th century smelting furnaces, and two fused bricks that may well have come from one of these smelting furnaces. Several square-section iron bars, some with a perforated end, were also found. Artefacts related to the creamery demolition included stamped bricks, a flattened metal bucket and a similarly damaged watering can.

The Archaeological Findings

Outline descriptions of all features and layers encountered during the 2018 work are given here, with further description given in Appendix 2.

The Eighteenth and Nineteenth Century Level

The 1774-45 Deep Ecton Level (Context 45): No stonework was found that belonged to the Level built in 1774-45. This is documented as having its entrance in the area investigated in 2018 and having run on the same line as the present passage. The original 18th century build still survives in the inner half of today's arched level, where the tunnel is of roughly the same width and height as that near the entrance but has a different profile. Here it has a semi-circular arched top rather than the flattened arch which was used in the 1884-85 rebuild forced after collapse of the outer section sometime after 1863 and probably in the period when the mine was abandoned between 1875 and 1883 (Barnatt 2013, pp. 67-8, 263). The distinction between the two phases of work is reinforced underground by the side walls of the two builds being offset from each other by about 0.1m at the interface between them (Barnatt 2013, pp. 68, plate 17). This and the lack of original build in the small area of passage side at the bulge investigated in 2018 shows that rather than use the original 1774-75 walls when they removed the collapsed arching in 1884-85, they stripped out everything and started again. It may be that the original 'cut and cover' trench into the natural subsoil was a little narrower than that for the 1884-85 Level (Context 45) and thus was cut back and the evidence thus lost, or alternatively it was of the same width and when the original stonework taken out this was quickly replaced before erosion of the cut took place.

It is known that there was a stone inscribed 'RS 1774' (Robert Shore was the mine manager at this date) at the entrance to the Level, with this reported in 1949 as in the arch (Kirkham 1949, p. 2); it is now missing. We now know that while it presumably was originally within the 1774 portal, most probably used as its keystone, it was not used in the 1884-85 portal. Thus, it must have been found during the creamery re-structuring of the entrance and was placed in their portal.

The 1884-85 Deep Ecton Level (Contexts 17-20, 26-28, 45, 48-51): Much of the passage investigated in 2018 is part of its 1884-85 rebuild. This work was carried out to reopen the access to Deep Ecton Mine at river level, necessitated by the collapse of the Level's outer part through unstable ground, probably after 1875 when the mine was temporarily abandoned and before 1883 when the Ecton Company Limited was formed (Barnatt 2013, pp. 251-70). The passage comprises a drystone structure with side walls that are *c.* 1.4m high and set *c.* 1.2m apart at their tops but with these walls sloping slightly inwards to the base. The whole is carefully built with sturdy well-coursed limestone slabs placed horizontally. Above there is a flattened arch, with a total passage height of *c.* 1.6m that at its central apex (Contexts 17-20). The stones of the arching are set on end to run parallel with the axis of the passage; there are 15 of these lines of carefully chosen stones, except at the outer end of the passage where it is wider (see below). The side walls were covered with render in the 1918-32 period, when the outer section of the passage was used for water storage (see below); at the bulge in the north-western wall of the Level repaired in 2018, located between 7.3m and 9.8m from the 1984 portal, the render had peeled off revealing it had been built of about nine courses of large stone slabs, with springer course above; thin stones and a roofing tile had been placed where necessary to make a horizontal base for the next course above.

Plate 35: The 1884-85 Level just beyond the damaged area, with the roof arched with lines of slabs with their flat edges downwards; the walls are covered with render added in the 1918-32 period.

Plate 36: The bulge in the Level's north-western wall as seen through the north-eastern hole in the arching, photographed before the latter was enlarged to facilitate rebuilding.

At this one 2.5m long stretch of the Level side wall, where remedial work was necessary because it bulged, the wall was largely removed in 2018 and then rebuilt (Context 23). Here it was found that the passage walls were in a vertical-sided, *c*. 1.8m deep, cut in the natural subsoil (Contexts 45, 50). The material cut through comprised an orange-brown sand with many small stones, in a 2.4m thick deposit, with a layer of pale orange-brown silty clay of unknown total depth beneath. This vertical-sided trench was a little less than 2.5m wide. The sides of the Level were built within this and the void between the facing stones and the cut

were fully filled with stone slabs, often of similar character to the facing stones and also commonly laid horizontally (Contexts 49, 51).

Plate 37: The area of the Level's north-western wall which bulged, photographed after the facing stones and the stonework behind had been removed and the hole in the arching enlarged to facilitate this. The bottom two courses of the passage wall had not slipped and were left *in-situ*. The vertical face of the material behind is the original 1884-85 cut into the natural; the stonework in front peeled off cleanly and thus no damage to this cut edge was sustained.

Plate 38: The area of the Level's north-western wall which bulged, photographed after the facing stones had been removed but before the *in-situ* stonework behind was taken out; the facing stones are stacked on the other side of the passage is such a fashion that they can be put back in the correct order.

The upper natural layer is interpreted as a frost shatter breccia derived from the hillside above, while the clay below is probably part of a river terrace (Richard Shaw pers. comm.).

At a point directly north-east of the area with the wall bulge and the hole in the arching above, the 2018 excavations exposed a short and crudely-built drystone wall (Context 48). This was placed directly over the arching and extended to the edges of the cut for the Level. At one end, over the passage side to the south-east, the wall was *c.* 0.7m high; the other end had collapsed or was never finished. This drystone wall running above the arching is interpreted as built to retain the backfill being placed over a finished section of the arching in order to fill the upper parts of the 'cut and cover' trench north-east of the wall. Thus, the Level construction and subsequent backfilling starting at the inner end of the 'cut and cover' trench further to the north-east, with the build progressing towards the portal.

Plate 39: The 1884-85 drystone wall placed directly over the Level arching just beyond the inner end of the north-eastern hole.

The 'cut and cover' trench had one end at the 1884-85 portal and the other probably at the far side of the road where the ground starts to rise steeply. Going north-eastwards from the portal it would have soon have been cut through deep pre-existing deposits and it would have been something like 10m wide at its top, with its upper sides battered back and located beyond the excavation pit of 2018 and thus not identified during the work reported here; only the lower part of this trench, where the arching itself was to be built, had vertical sides, cut this way to help stabilize the structure by careful backfilling with stones behind the Level walls. The total width of the trench above would have been necessary because of the likely unstable nature of what was being dug through, which may well have comprised mine waste near surface and below this loose stony natural subsoil (as seen *in-situ* at Context 45 and in redeposited form in the 'cut and cover' backfill in Context 11 – see 'The Late 19th Century Stratigraphy' below). The depth of 'cut and cover' backfill above the arching of the Level investigated in 2018 was around 2m at the north-eastern end of the excavation pit. Under the road further north-eastwards the deposits that needed to be dug through in 1884 to reach a point coincident with the roof of the arched passage to be built are likely to have been more like 3m deep.

The outer section of the Level has a more complex architecture than the simple arched tunnel within. An important breakthrough in our understanding of the outermost section of the Deep Ecton Level came during the 2018 work, when the original 1884-85 portal was found (Context 28). This had been previously hidden behind the 1980s stabilisation timberwork below the passage roof; this identification was confirmed by detailed comparison with a pre-1918 photograph (Robey and Porter 1972, plate 3); this matched stone for stone. Apart from one short section near the top of the north-western side of the passage, there were no butt joints down the passage sides here, explained by removal when the stonework for a creamery-period short extension to the passage was keyed in (see 'The 1918-32 Deep Ecton Level Extension' below).

Plate 40: The original 1884-85 Level portal, discovered after the 1980s timberwork that masked it had been removed. Behind, when photographed, parts of the 1884-85 doorframe remained in place; soon afterwards it had to be removed to allow for the rebuilding of the arching behind that had dropped at the centre of the arch and was thus unstable.

At the 1884-85 portal, the passage is *c.* 1.5m wide and a little over 2.1m high, with the 18 lines of portal stones comprising the end-stones of the arching that extended inwards from here. At 0.9m inside the portal there is a step down in the arching (Context 27), originally of *c.* 0.25m depth but before the 2018 restoration it was somewhat more because the arching going in from here had dropped slightly. At this point the sides of the Level also step in by 0.15m to either side. These alterations in height and width were designed to accommodate the 1880s doorframe for the two wooden doors that opened outwards and when closed prevented unauthorised access to the mine (Robey and Porter 1972, plate 3). The dimensions of the passage beyond the wooden doorframe matched the latter's inner sides, with the upper corners set into the arching so that at the centre of the passage the base of the arching matched the horizontal top timber's bottom edge.

While the doors are long gone, the 1884-85 pitch-pine doorframe remained *in-situ* until 2018 (Context 27); this had to be removed to repair the arching and was too rotten to be put back. Each of the four doorframe timbers, vertically-set to the two sides, and horizontally-placed to top and bottom, measured between 0.14m and 0.16m in cross-section; they were joined together with open-tenon carpentry joints. Two door hanger pins remained to the south-eastern side.

Plate 41: The south-western doorframe side after it had been removed. Each end has an open-tenon carpentry joint and the original door hanger pins remain.

A further step down in the Level height a little further into this is harder to explain (Context 26); this was located in a section of the arching that had collapsed before the 1980s but was clearly recognised in 2018 by steps in the tops of the two walls. These were offset from each other, that on the north-west side was located 1.47m from the doorframe step-down, dropping the wall height by 0.20m, that on the other side was a further 0.48m inwards from here and dropped 0.27m. This asymmetry would have led to the arching here being inherently weakened and was probably the cause of the eventual collapse. One explanation for these steps down is that the arching was being built from both directions and where the two met they realised they had inadvertently been placing this at different heights from the passage floor; rather than take down one of the built sections a compromise was adopted.

Three old photographs show the 1884-85 portal prior to the alteration made in the 1918-32 creamery phase (Robey and Porter 1972, plate 3; Porter and Robey 2000, p. 89; Barnatt 2013, p. 268); one of these has previously been ascribed to 1883 but it must be slightly later because the portal was not built until 1884-85. There were buttresses to either side of the portal that, if butted on, must have been removed when the Level was extended outwards in the 1918-32 phase or, if not, it may have been these that were keyed into the new build. More intriguingly the portal itself was set just outside the bottom of a high sub-rectangular structure with an end wall that sloped steeply rather than being vertical. Its centre point was offset northwards from the portal, built as if retaining something above; we do not know what stood here. The rectangular structure is shown on mine plans of 1809 and 1818 (Barnatt 2013, p.

225) and hence is early enough to relate to the ore smelting on site that took place between the 1760s and the 1820s (Barnatt 2013, pp. 171-72, 182-84).

Damage to the Level and repairs in the 1980s are returned to below.

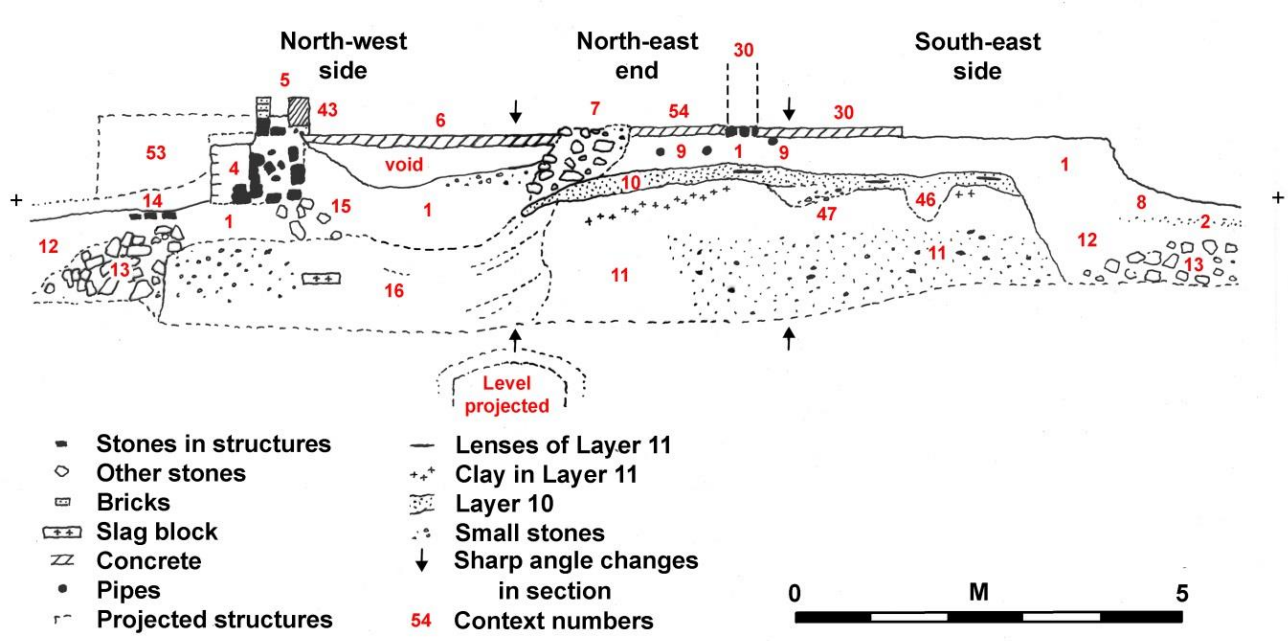

Figure 4: A section showing features and layers exposed in the near-vertical faces of the excavation pit at the end of Oct 10th.

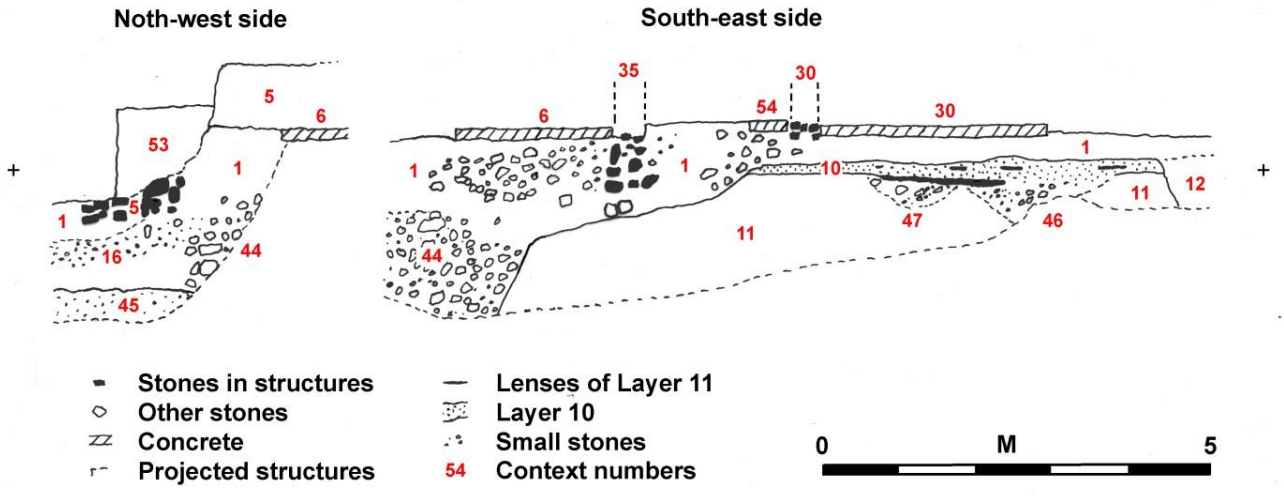

Figure 5: A section showing features and layers exposed in the near-vertical faces of the excavation pit to the north-west and south-east sides at the end of Oct 18th; the area between could not be drawn as it was battered back and the stratigraphy obscured.

The Late 19th Century Stratigraphy (Contexts 1, 10-11, 15-16, 44, 46-47): The main 19th century layer dug through in 2018 at the north-eastern end and south-eastern side of the excavation pit comprised a deep deposit of orange-brown loose sand with many small stones that was at least 1.6m thick (Context 11), the base of which was not dug through. This material looked like 'clean' natural subsoil but must be redeposited; it mostly occurs to the southeast side of the Level but in part overlay its' arching and more significantly it ran over the deposit of stones above the south-eastern wall of the Level (Context 51). Layer 11 is somewhat variable in character with some of the lower part of deposit comprised virtually nothing but small angular stones up to 3cm across, while in the upper parts there were areas with more clay, and in two places there was true clay with little sand and only a few stones.

Plate 42: The redeposited orange-brown 'natural' (Context 11) in the 1880s 'cut and cover' trench above the Level, photographed during excavation on the 10th October at the south-eastern side of the excavation pit. The coal-rich layer lies above (Context 10) and the cut for the Railway Siding Terrace (Context 12) lies to the right.

Layer 11 is directly overlain by a *c.* 20-30cm thick black layer (Context 10). This comprises a discrete layer of coal dust and small fragments of coal; a small lens with a purple-brown colour is interpreted as comprising burnt coal. In one small area to the south-west there was a deposit of small stones in the layer's bottom half. Where dug away by machine in 2018 Layer 10 only appeared in plan as a stripe no more than *c.* 2.5m wide to the north-western side of the excavation pit's south-eastern edge. There was no soil horizon at the base of Layer 10, indicating it is roughly contemporary with Context 11 beneath, as confirmed by thin lenses of this material within Layer 10.

At the north-western side of the 2018 excavation pit there was a similar deposit to Layer 11. This thick layer (Context 16) was effectively a continuation of Layer 11 in terms of the character of much of the material deposited but the soil colour was different, having changed from pale orange brown to a darker, mottled, grey-brown. At the north-eastern end of the excavation pit, as seen at the end of the stripping of 10th October, this can be explained as modified by water ingress via the adjacent 1980s pit (Context 7), which also led to the slumping of the deposit, with sloping tip lines reflecting this seen in section, leaving a void under the concrete floor of the Northern Creamery Building (Context 6). However, this does not offer a full explanation of the difference between Layers 11 and 16, for further south-west along the 10th Oct section there is different material with ill-defined boundaries. This derives from 18th and early 19th century ore processing and smelting activity on site, the material

from which had also been redeposited at the same time as the rest. Near the base of the section there was a fine example of a large slag block from the smelters, cast into a mould and designed to be used for building and paving purposes (see for example Barnatt 2016). In this same area, at the section of 18th October, the upper part of Layer 16 similarly comprised many angular but somewhat eroded stones of *c.* 5-10cm size, with voids and the same grey soil in the interstices; these were of largely of limestone from within the mine, some with secondary coatings of oxidised copper ore. Also there was one lump, out of several smashed in half to determine their make-up, which had a core of chalcopyrite, mixed with an iron mineral, with oxidised surfaces. There was also a small lump of unburnt coal. All are typical of deposits associated with ore processing at Ecton, with these particular stones presumably left in a surface heap for some time, after being rejected for further processing, before Layer 16 was created. Above Layer 11 for the most part there was no coal rich layer that would have been the equivalent to Layer 10.

Plate 43: The small purple lens within the coal-rich layer (Context 10), at the end of the step in the section excavated on the 18th October.

Plate 44: The layer of small stones within the redeposited material (Context 16) in the 1884-85 'cut and cover' trench above the Level to the north-western side of the excavation pit, photographed on 19th October. The *in-situ* orange-brown natural material lies below (Context 45), the footings of the Northern Creamery Building are above (Context 5), and the rubble fill (Context 44) of a pit beneath this building lies to the right.

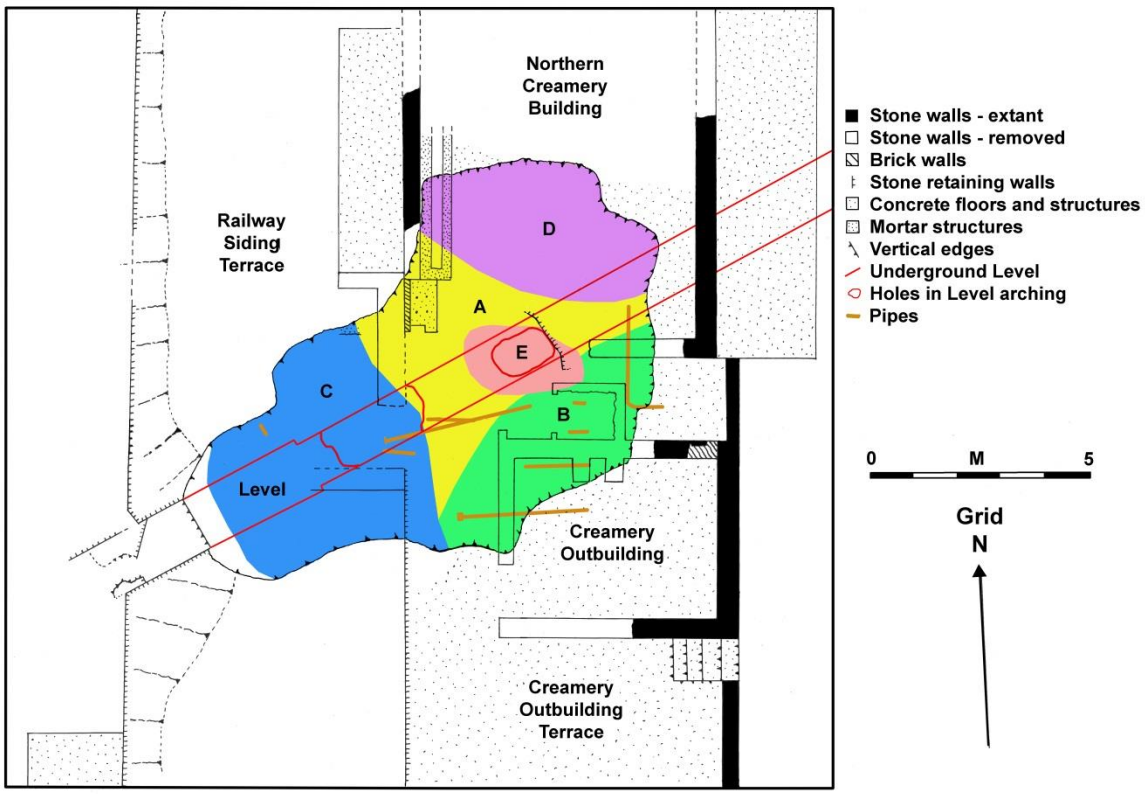

Figure 6: The site, showing the approximate extent of key layers and fills exposed within the excavation pit and also the positions of creamery pipework where known (A: 1884-85 cut and cover backfill (Contexts 11/16); B: Late 19th century coal dust deposit (Context 10), overlying the cut and cover backfill at A; C: 1919-24 cut for the Creamery Sidings Terrace filled with rubble and soil (Contexts 13/12); D: 1918-24 pit under the Northern Creamery Building (Context 44); E: 1980s pit (Context 7)).

Layer 11 is interpreted as the clean subsoil (see Context 45) dug out when a trench was dug in 1884 to rebuild the Level using the 'cut and cover' method, which was thrown back in the trench soon after the stonework had been completed. Each variation in its composition represents tip lines of redeposited material from different parts of the dug-out natural. The clay in Context 11 probably derived from the silty clay (Context 50) beneath the stony natural (Context 45) that comprised the majority of what was thrown back. At Layer 16 the 'cut and cover' infill also included material derived from ore processing and smelting, which was presumably also dug through when the trench for the 'cut and cover' was excavated in 1884. Layer 10 is also late-19th century in date, probably deposited in the last phase of the mine's use, between 1883 and 1889, soon after the 'cut and cover' trench for the 1884-85 rebuilding of the Level was backfilled. There had been no smelting on site for over 50 years by this date and the layer contains no clicker to associate it directly with a smithy or engine boiler, therefore it is likely to have derived from a coal heap, perhaps within a coal yard, somewhere in close proximity. We know that the South Smelter building was reused as a smithy in 1883-89 and the coal may derive from the stockpile that this used.

To the south-east side of the Level, Layers 10 and 11 taken together, were exposed depth of a little under 2.0m in the 2018 excavation pit; given what was found to the north-western side of the Level where the bulge was taken down to reveal a cut into *in-situ* natural (Contexts 45,

50), with the natural extending upwards at the 2018 excavation pit edge to its north-western side by *c*. 0.4m, it is likely the base of the redeposited natural had almost been reached elsewhere in the excavation pit. This *in-situ* natural and the features inserted into it have been described above under 'The 1884-85 Deep Ecton Level'; the majority (Context 45) was very similar in character to Layer 11, comprising an orange-brown sand with many small stones; the two were primarily distinguished from each other by the contexts in which they were found.

Plate 45: The edge of the 1884-85 vertical cut through natural deposits, which mostly comprises an orange-brown sand with many small stones (Context 45), but when cut back near the base of the cut, to make room for the reinforced concrete to be placed behind the rebuilt passage side, this exposed a silty clay (Context 50).

Towards the south-western end of the 2018 excavation pit, the 'cut and cover' deposits were truncated by a deep steep-sided cut (Context 12), made when the Level was extended in the 1918-32 period (see the 1918-32 Railway Siding Terrace below).

Cut into the 1884-85 'cut and cover' backfill to the south-west side of the 2018 excavation pit were two adjacent pit-like features; these were only seen clearly in the south-eastern pit edges at the end of machine stripping on the 10th and 18th of October. On the 10th October that to the south-west (Context 46) appeared to a be round-bottomed pit or trench, with a mottled grey soil fill, cut into Context 11; it was not clear whether the feature also cut Layer 10 or it was overlain by this. However, on the 18th October the feature was larger, the profile appeared less regular, the soil contained some small stones and there was a lens of the orange-brown soil of Context 11 partially overlying it. On the 10th October the other 'pit' (Context 47) comprised an amorphously-profiled feature with only a steep edge to the north side. It had a lower fill that looked distinctively like a tip-line like and comprised a deposit of small limestone of 2-5cm size, with some voids between. Elsewhere within the lower part of the feature there was a dark-brown soil, while above there was a dark-grey soil, with all surmounted by Layer 10. However, on the 18th October the fill was more mixed with two larger stones and the whole was surmounted by a large lens of Layer 11 material and Layer 10.

Plate 46: The north-eastern side of the excavation pit, photographed on 11th October; to the right of the reinforcing mesh a pit-like feature (Context 46) can be seen cutting the orange-brown redeposited natural (Context 11), while to the right of this the cut (Context 12) for the Railway Siding Terrace can also be seen.

Plate 47: A detail of the north-eastern side of the excavation pit photographed on 18th October; both pit-like features (Contexts 46, 47) can be seen cutting the orange-brown redeposited natural (Context 11), each with a thick lens of this material above their fills, with the coal rich layer (Context 10) above.

Above the fill of the 1884-85 'cut and cover' backfill there was a dark soil, sometimes mixed with stones (Contexts 1, 15) and also a deep pit under the Northern Creamery Building (Context 44); it is unclear whether these were deposited late in the 19th century or in the early 20th century; to save repetition these are described below under 'The 20th Century Stratigraphy'.

The Creamery and Early Twentieth Century Modifications to the Level

The 1918-32 Creamery: This creamery was built to collect and process milk from the surrounding upland farms and take it by rail down the Leek and Manifold Light Railway, which opened in 1904, for sale in the surrounding lowlands (Barnatt 2013, pp. 321-24). It was opened in 1918 by F. W. Guilbert Ltd and was later absorbed into United Dairies. The creamery was never a financial success and shut in 1932, with the railway closing two years later. In 1918, when the creamery was first established, they took over two old smelter buildings. The South Smelter, located immediately south of the area investigated in 2018, had been used in the 1880s as a '*smithy*' and '*changing room*', while the Clockhouse Smelter further north was probably a '*fitting shop*' and '*store room*' (Barnatt 2013, pp. 264-270). The Ordnance Survey 25inch to a mile map revised in 1919 shows these two buildings, with a new two-compartment building running south from the Clockhouse Smelter; the railway siding only ran as far as the north-western corner of the Clockhouse Smelter and must have been unfinished when mapped. Clearly the site was still being developed, for a photograph taken in 1924 shows significantly more structures (Porter and Robey 2000, p. 37). By now the new two compartment building of 1918 was one long continuous building with no break in roof line or obvious butt joints (this is the Creamery North Building of the 2018 assessment – see below). To its southern end there was a raised water tank placed above a narrow covered area and immediately beyond stood a small building (the Creamery Outbuilding of the 2018 assessment – see below); other photographs show that the outbuilding was added later than the water tank structures (Porter and Robey 2000, p. 237; Porter 1997, pp. 60-61; Porter 2002, pp. 75, 78). To the west side of the long 1918-19 building, by 1924 the Railway Siding Terrace had been extended to close to the South Smelter, with a high retaining wall on its west side that incorporated a new portal to the Deep Ecton Level. To the east side of the long 1918-19 building there a large roofed but open-fronted platform and a narrow unroofed platform extending to the south from here (with detail clarified on the other photographs noted above). At the northern end of the Clockhouse Smelter other buildings had also been added, and to the west of these and the old smelter there were roofed but open-sided platforms that fronted onto the siding; these were used for loading the product into railway tankers. A late photograph, of about 1930, shows that the railway siding's single track terminated part-way along the long building between the two old smelters, near its southern end, rather than extending further southwards along the full length of the Railway Siding Terrace (Porter 2002, p. 60); it is now not clear whether previously it had run here.

The 1918-32 Creamery Outbuilding and Terrace (Contexts 30, 33, 52, 54): The one storey roofless Creamery Outbuilding (Context 30), with cracks in the wall near the north-western corner, was largely demolished in 2018 to access the damaged parts of the 1884-85 Level beneath; the exception was its roadside wall to the east which was retained. The outbuilding was built of limestone blocks and slabs in rough courses; it once had a roof of Staffordshire Blue ceramic tiles. There was a doorway and window at its western side and a second window in the southern end. This building had a concrete floor, added immediately after it was built; the footings of the former were only shallow, descending only to just below the base of the floor. The northern gable end was part of the pre-existing structure with raised water tank, which we know from old photographs stood immediately to the north (Porter 1997, pp. 60-61; Porter and Robey 2000, pp. 376, 237; Porter 2002, p. 75); one, or more probably two, openings were blocked when the outbuilding was added. A brick pillar attached outside (Context 33), next to the north-western corner of the outbuilding, originally stood to one side of a doorway into the structure immediately to the north, as shown by an old

photograph taken when the creamery was in ruins and had been partially demolished (Porter 2004, p. 64).

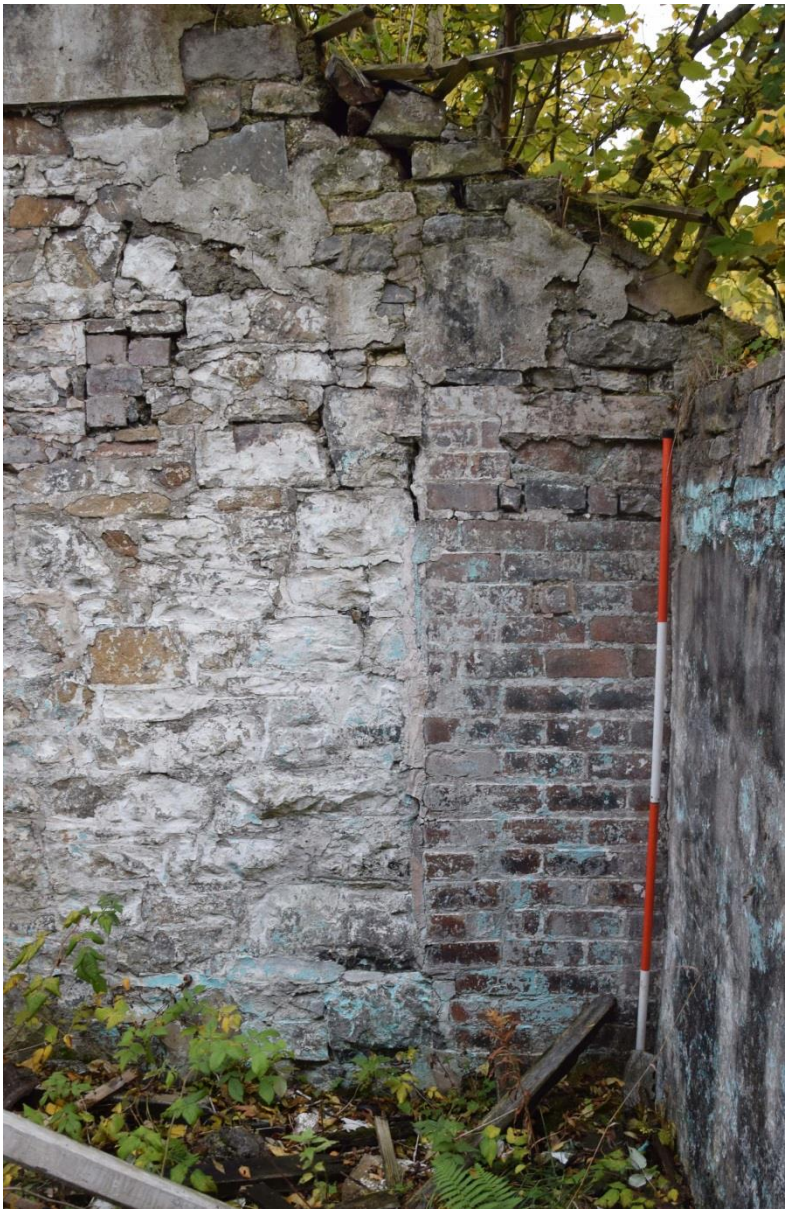

Plate 48: A brick-filled opening at the eastern end of the north wall of the Creamery Outbuilding, which was almost certainly filled when the outbuilding was erected.

Outside the building there is flat terrace, a little over 7m wide, again with a concrete floor (Contexts 52, 54). This lies between the road to the east and the Railway Siding Terrace to the west (Context 34). To the south of the building there was a small yard on the Creamery Outbuilding Terrace with a flight of four steps from the road set against the outside wall of the building. To the yard's east and south sides there were low boundary walls, with a second set of steps from the road near the corner and another going down to river level, entering a deep hollow where the Southern Smelter building once stood; above there was an iron railing in the south-west corner of the yard that remains extant. The west side had a dilapidated, *c.* 0.9m high, retaining wall to the lower Railway Siding Terrace below. The northern half of the

Creamery Outbuilding Terrace was largely taken up by the Creamery Outbuilding and the water tank structure immediately to its north. However, to the west the concrete floor extended between the building and the retaining wall to the lower terrace. Only the northern half of the Creamery Outbuilding Terrace was disturbed in 2018, when the Creamery Outbuilding was largely removed, together with parts of the concrete floor to it west.

Plate 49: A stone-filled opening in the north wall of the Creamery Outbuilding, to the right and above the ranging pole; the date at which this infilling was done is unclear but it seems most likely that this took place when the Creamery Outbuilding was erected, although the bricks to the right side in their present configuration may well represent a later repair. The fireplace and chimney were added later when the building was used as a caving club hut.

The 1918-32 Creamery Northern Building (Contexts 5-6, 32, 35, 41-43): When it became clear that the excavation pit needed to be enlarged to give it battered sides, the southern part of this long building was investigated prior to partial removal. The building had been previously demolished down to the level of the top of a remaining roadside unloading platform to its eastern side (see below - Other 1918-32 Creamery Structures, Context 40); only the stubs of its' walls remained.

The backfill within the building (Context 41) in its lower half comprised much demolition rubble, with: limestone blocks and irregularly-shaped pieces; lumps of concrete, some of which were large; machine-made bricks, and mortar, all resting directly on the concrete floor of the building. Small finds included a flattened galvanised watering can and a similarly flattened galvanised bucket. The bricks were mostly stamped with PB C^{o} L^{td}. These were made for the Potteries Brick Co, which operated from the late 19th century to 1966, with its office in Handley, which was a marketing and sales merchanting company for a group of at least seventeen of the Potteries area brick producers. Above the backfill just described was soil containing many lumps of calcrete and loose limestone chatter, all presumably imported from the calcrete quarry just across the road, introduced to bring the backfill up to the roadside platform horizon. The whole of the infill was consistent with demolition of the building relatively soon after the creamery closed in 1932.

Plate 50: The crushed galvanised watering can from the demolition rubble that filled the lower part of the interior of the Northern Creamery Building.

Plate 51: Bricks stamped 'PB C^{o} L^{td}', with a code letter 'B' below, which came from the demolition rubble filling the lower part of the interior of the Northern Creamery Building.

Within the area investigated in 2018 the Northern Creamery Building had remaining lower parts of walls to both sides and at its southern end (Contexts 5, 32, 35), although part of the last had been removed in the 1980s (or had collapsed previously) when a pit (Context 7) was dug to access the north-eastern collapse of the Level from above; the southern edge of the building's concrete floor (Context 6) was also damaged here. The remaining lower mortared walls, built of limestone blocks and slabs in rough courses, were 0.40-0.42m thick and stood between 0.80m and 1.65m high, as measured from the thick internal concrete floor of the building; this floor lay 1.00m below the roadside level. The walls had all been rendered to the inside of the building. The western wall descended to the outside of the building for *c.* 1.00m to the Railway Siding Terrace (Context 34). The western and southern walls were partially removed by the 2018 excavation pit, where footings of limestone blocks and slabs were exposed; they were 0.65-0.90m deep.

Plate 52: The south-eastern corner of the Northern Creamery Building after the demolition rubble in the interior had been removed; the point of the ranging pole is resting on the un-swept concrete floor.

Plate 53: The footings of the western wall of the Northern Creamery Building, at the point where they were cut through by the 11 ton excavator on the 10th October.

Plate 54: The footings of the southern wall of the Northern Creamery Building, with a remnant of the building's floor directly to the left, as cut through by the 21 ton excavator on the 18th October.

To the western side of the interior there was a narrow but long trough made from ceramic half-pipes of 23cm diameter set end to end (Context 42), which were placed in a low mortar plinth that was created *in-situ* and rose *c.* 0.03m above the concrete floor, with the two bonded together. The trough was seen running for 3.5m northwards to where in continued under un-removed backfill. It was presumably used for milk or whey.

Plate 55: The ceramic trough and its low plinth within the Northern Creamery Building, set against its western wall.

Immediately to the south of the trough and partially set into the western wall of the building at its south-western corner, there was small sub-rectangular concrete plinth (Context 43), of *c.* 0.25m height, rising from concrete floor level which was bonded with it. The main part of the plinth was 1.10m by 0.60m in plan with a protruding section to the southern end. It had been cast *in-situ* and had four fastening down bolts placed in a rectangle for a machine of unknown function. These protruded upwards, where the bolts were threaded, while below the plinth they were set in lead. The western wall of the building here, unlike elsewhere, was built of bricks and comprised a one-brick thick blocking to the outside of the plinth.

Plate 56: The machine plinth, set partially within the western wall of the Northern Creamery Building at its south-western corner, photographed when first found as the demolition rubble within the interior of the building was being stripped; the four small holding down bolts on its top were not recognised before the feature was removed.

The 1918-32 Railway Siding Terrace and Deep Ecton Level Extension (Contexts 2-3, 12-13, 21, 29, 34): The flat-topped terrace here (Context 34), which terminated to the south at the same point as the southern end of the yard above, was built sometime between 1919 and 1924. It is just over 6m wide and lies between the Creamery Outbuilding Terrace above to the east, and the river level ground below to the west. There was a dilapidated *c.* 0.9m high retaining wall of mortared limestone blocks and slabs between the two terraces, which had already collapsed or had been removed in the area of the 2018 excavation pit, with only less-than convincing possible remains of its basal courses seen briefly as machine stripping was in progress. The retaining wall to the west side of the Railway Siding Terrace, again built of mortared limestone blocks and slabs, was significantly higher, standing *c.* 2.00m above the riverside ground.

A small part of the original floor of the Railway Siding Terrace was exposed during the 2018 work in the area immediately above the Level (Context 2); it comprised a horizontal flat surface of limestone chatter, which lay over a grey-brown soil (Context 12), above a layer of stones (Context 13), both within a cut into pre-existing ground that was made on the upslope side to create the Railway Siding Terrace, which in turn rests on the top of the arching of the outer section of Level (Contexts 20, 21). The stone layer comprised a dump of large- to medium-sized limestones with voids between, which was up to *c.* 1.0m thick. Both the soil and stones of Contexts 12 and 13 lay within a cut with sharp edge to the north-east that truncated the late 19th century stratigraphy (Contexts 10, 11, 16), which may well have been made at the time the Railway Siding Terrace was being constructed. The stone deposit was placed to add weight to the arching and thus prevent its stones from loosening and also to bring the ground level up, while the soil above gave a regular base on which to place the terrace's surface limestone chatter.

Plate 57: The rubble fill (Context 13), with soil above (Context 12), both within the cut made for the Railway Siding Terrace, as seen at the north-western edge of the 2018 excavation pit on the 10th October; to the far right is the cut edge; the wall-like feature within the rubble had no integrity and was a fortuitous arrangement of stones.

The high retaining wall of the Railway Siding Terrace is interrupted by a modified entrance to the Deep Ecton Level (Context 17). Here high walls to the sides extend back to the 1984 portal (Context 22) and beyond. The outermost section of the passage (Contexts 21, 29) was added sometime between 1919 and 1924 to allow the Railway Siding Terrace above to be built while retaining access to the Level where they had dams for water (see 'Other 1918-32 Creamery Structures' below). From the 1884 portal (Context 28), the side walls of the passage were extended towards the river by 4.25m to the south-east side and 3.25m to the north-west side, where they meet the terrace's retaining wall at an angle. The new stonework was keyed into the old. The new section of the Level was made higher than that of 1884-85, originally this addition was *c.* 2.35m high before the new arching started to collapse and became flattened. This added height allowed the new arching to be built over that of the 1884-85 portal at its inner end. The 1.8m long stretch of now very-flattened arching that survived between the 1884-85 and 1984 portals, made of limestone slabs set on edge in 16 lines running parallel with the axis of the passage, was supported in the 1980s by timber beams that had been added to prevent collapse (Context 38). When taken apart for rebuilding in 2018 it was found that there were structural problems with how the 1919-24 arching had been built (Pete Roe pers. comm.); the primary one was that it had been erected using lime mortar between each stone, rather than this being added afterwards to fill the voids in drystone-built arching; as the mortar rotted this substantially weaken the structure. In addition, several of the stones used were too small, not being deep enough; wall copers with semi-circular tops had been reused in the arching that again were not deep enough. It may well be that the arching was erected by a local builder who had no experience of building arched tunnels, with only a partial understanding of what was required. It seems likely that this new arching originally extended further outwards to a portal aligned with the retaining wall of the Railway Siding Terrace (Context 34). However, old photographs show that the portal was later rebuilt in crude fashion, probably in haste, sometime in the 1918-32 period; this was built at right-angles to the Level at a point coincident with the north-western end of the side walling where it met the terrace's retaining wall (Robey and Porter 1972, plate 2; Porter 2004, p. 64); the outermost section of arching presumably collapsed or had become unstable prior to the portal rebuilding.

The remaining 1919-24 arching was rebuilt in 2018 with stronger arching stones than the original and without the mortar, but with grout later poured from above to fill the voids between the stones to increase the arch stability; reinforced concrete was then placed above.

While the Railway Siding Terrace definitely contained the sleepers and rails of the single track railway siding in the area to the north beyond the 2018 intervention, it is not clear whether they ever extended this far south, even though the southern part of the terrace was clearly created to allow for this possibility. No sleeper slots were observed in the original terrace surface above the Level, although only a relatively small area was seen. A cross wall (Context 3) was added at some point in the 1918-32 period that prevented the line running here. This may well have been added as an extra precaution to prevent anyone passing over the Level with anything heavy, presumably after the arching of the passage was showing signs of instability. All that remained of this wall was its base at its eastern end, made of un-mortared limestone blocks, mostly only two courses high, and it appears to have largely been purposefully taken down because there was little tumble.

Plate 58: The base of the robbed cross wall (Context 3) on the Railway Siding Terrace, visible as a low raised linear feature (foreground centre), photographed shortly before the 2018 excavation pit was started.

Other 1918-32 Creamery Structures (Contexts 4, 9, 14, 39-40, 53): A series of small creamery structures also exist in and around the 2018 excavation pit; these are located in a variety of places that will be described in turn.

By the roadside and abutted to the Northern Creamery Building there is a concrete unloading platform (Context 40). This is 12.65m long, 2.25m wide and 0.65m high. An old photograph (Porter and Robey 2000, p. 237) shows that the platform was used for unloading milk churns from lorries. It is joined to a larger *in-situ* platform at its northern end, probably as part of the same build, but the latter has a floor at a slightly higher level. At road level a hardstanding of concrete exists between the southern platform and the road. None of these structures were damaged in 2018, although vegetation and topsoil were removed from them.

In the area affected by the 2018 excavation pit as a whole, at least six iron water pipes (Context 9) were broken and largely removed during machine stripping (see Fig. 6); these proved impossible to record adequately as they were buried and the excavator pulled them out of place before their existence was recognised; later only broken stub ends remained and their exact original courses were already lost. One pipe had a flange at the end with four bolt holes, while others had screw threads at the ends, one with a brass valve attached. Their external diameters varied between 6cm and 9cm. For the most part they ran between the creamery buildings and the entrance area of the Level; some of these originally probably ran up to the raised water tank seen on old photographs between the Northern Creamery Building and the Creamery Outbuilding further south (Porter and Robey 2000, pp. 37, 237; Porter 2002, p. 75).

Plate 59: The roadside concrete unloading platform (Context 40) after it was stripped of turf and topsoil on the 6th November. The excavator driver is skilfully leaving the site after backfilling the 2018 excavation pit in a way that avoided damaging the platform.

Plate 60: Two *in-situ* iron pipes (Context 9) at the eastern edge of the Railway Siding Terrace, as first seen when the excavation pit was started on 9th October.

On the Railway Siding Terrace (Context 34) there are three features close to the southern end of the Northern Creamery Building. Two of these (Contexts 4, 53) were abutted to its western wall (Context 5), while the third lies close by (Context 14). The largest of these structures is a

concrete platform (Context 53) that is 5.50m long, 1.45m wide and 1.15m high; this was presumably built for milk churns placed ready to load their milk into railway tankers. Abutting both the Northern Creamery Building and the southern end of the concrete platform just noted was a low rough-coursed mortared limestone wall, which turned through 90 degree at the north end. In its northern half it stood to full height with seven courses, while where starting to run southwards it had only one course missing; here it had a measurable height of just over 1m. Further south the wall had been much reduced, to only 2 courses remaining, presumably because of collapse or robbing; this was in the same area as where the western retaining wall of the Creamery Outbuilding Terrace was also wrecked (see above). The wall's original purpose is obscure.

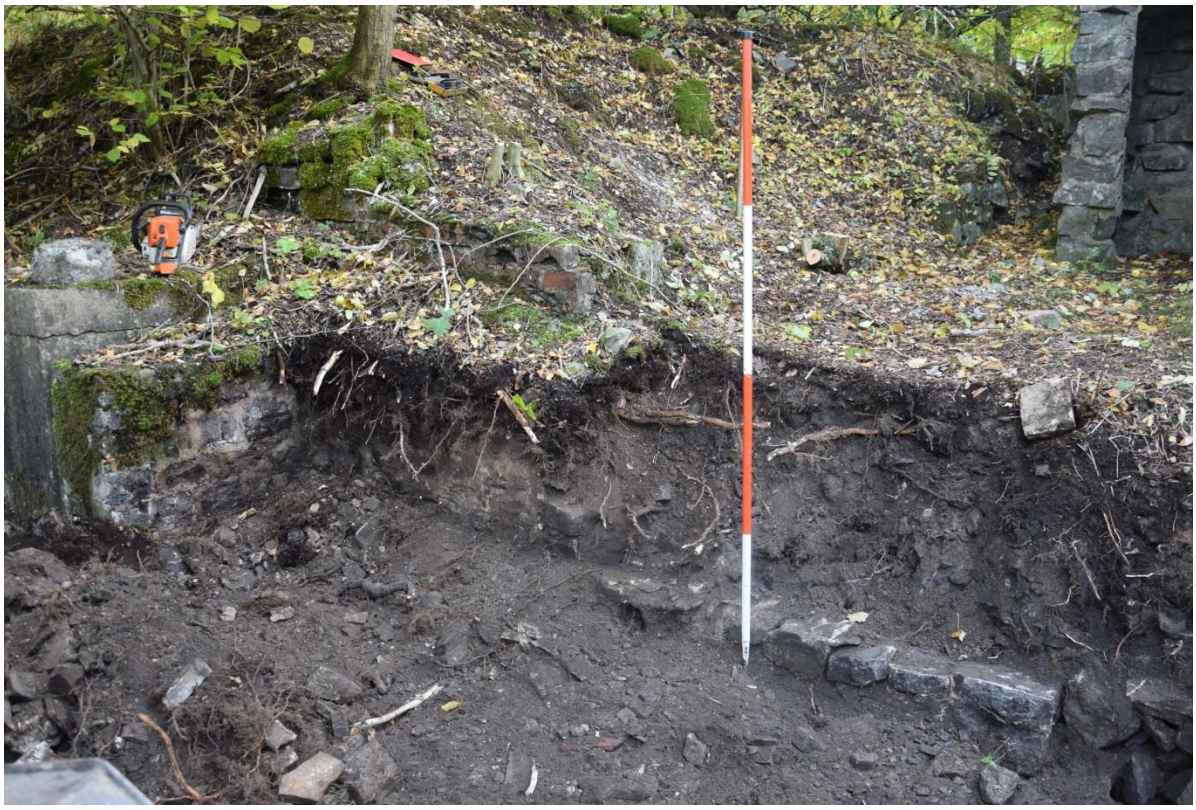

Plate 61: The remaining courses of the low wall (Context 4) at the eastern edge of the Railway Siding Terrace; its southern end had been robbed or collapsed, as first seen when the excavation pit was started on 9th October.

In the small area defined by the two sides of Wall 4 there was a small area of floor (Context 14) that was only seen is section after the machine stripping on 10th October in the north-western side of the excavation pit; beyond the pit it was covered in topsoil. As seen, this floor was 0.95m long and comprised three stone blocks with tops at a common level, with some lime mortar in the interstices. It may be that this floor never covered a large area but was confined to a strip of ground that was of the same width as the northern arm of Wall 4, and was bounded to the east by the other branch of this wall.

Platform 5 was not disturbed during the 2018 work, except for scratches caused by the digger bucket, but Wall 4 which abutted it at the south end was removed. The part of Floor 14 beyond the excavation pit remained covered in topsoil, whereas within the excavation pit, if it extended here, it was removed before it was recognised.

On the ground by the river, abutted to the Railway Siding Terrace's retaining wall (Context 34), just over 3m to the south of the entrance to Deep Ecton Level (Context 17), there is a large three-compartment concrete tank, presumably for water. This was not affected by the 2018 work and thus was not allocated a context number.

Plate 62: The small fragment of stone floor (Context 14), below the recently placed concrete slab at surface with topsoil between, as seen in the north-western edge of the 2018 excavation pit on 10th October.

There are three dams across the Deep Ecton Level, with render on the passage walls (Contexts 18, 19). This render originally went to their tops and was placed to make them watertight so that water up to just less than 1.5m deep could be contained. Both of the inner two dams lay underground within the Level and were built of brick, and both had been subsequently removed in the 1980s or previously. The innermost lies well beyond the outer section recorded in 2018 and was not allocated a context number. The presence of the central dam (Context 39), placed immediately inside the 1884 doorframe (Context 27), is indicated at the passage walls by 48-50cm wide gaps in the render; at the floor, under the water, the basal brick course still remains. The outermost dam lay at the outer end of the flanking walls of the Level (Contexts 18, 19) and was not allocated a context number because it was again unaffected by the 2018 work. Today it comprises a truncated stone wall, a little over 0.5m high, with a break at the centre where it has been fully removed to allow water to flow out of the Level. Only the inner face is visible and to the north it runs roughly parallel with the retaining wall of the Railway Siding Terrace (Context 34), while to the south it is a right-angles to the passage side.

The 20th Century Stratigraphy (Contexts 1, 8, 12-13, 15, 44): Directly under the creamery-phase structures, with their walls set into it, there was a mixed layer (Context 1), which consistently had a mid- to dark grey-brown soil with small stones and was often relatively free of larger stone, but with these present in specific places. In the deep north-western half of the 2018 excavation pit it was clearly distinguished from what lay beneath (Contexts 10, 11, 16). The metal pipes of Context 9 lay within it. No attempt to distinguish between the lateral

extents of different parts of the Layer 1 was made, nor indeed would this have been possible because of the nature of the machine stripping. For the most part it is not known whether Layer 1 was deposited in the late 19th or early 20th century (but see Contexts 8 and 44 described below).

Specific parts of Layer 1 were given separate context numbers to distinguish them from other contexts around them. In the case of a topsoil (Context 8) at the Railway Siding Terrace (Context 34) this was post 1918-32 in date. Similarly, there was a grass-covered soil over parts of the concrete floor of the Creamery Outbuilding Terrace (Context 52); these were not given a context number because they were not identified within the 2018 excavation pit, while where the concrete floors were not present, a discrete topsoil could not be distinguished from the rest of Layer 1. Randomly placed stones (Context 15) in Layer 1, located below the footings of the western wall of the Northern Creamery Building (Context 5), were given a specific context number to differentiate between the two.

Plate 63: The rubble fill (Context 44) of a pit (bottom centre) beneath the Creamery Northern Building (above). The steep cut side was made into the redeposited material (Context 11) (right) in the 1884-85 'cut and cover' trench above the Level. This was first seen and photographed to the south-eastern side of the excavation pit on the 18th October as machine stripping was underway.

In three other cases parts of Layer 1 lay within identified cut features, as with Context 12 and 13, which are described above under 'The 1918-32 Railway Siding Terrace'. At the north-eastern end of the 2018 excavation pit there was a deep, steep-sided, pit (Context 44) under the concrete floor of the Northern Creamery Building (Context 6), which was cut into the 1884-85 'cut and cover' backfill (Contexts 11, 16). This was identified during machine stripping on the 18th October; its edge had not been intersected during the stripping on the 10th October, indicating the pit did not extend this far south-westwards. A clear cut-edge was visible where the pit truncated Contexts 10 and 11, but to the west the interrelationship of Contexts 44 and 16 was less clear and this could be alternatively interpreted as two contemporary tipped deposits (see Plate 44). The fill of the first pit (Context 44) comprised

large- to medium-sized limestone blocks and irregular pieces in a grey soil, with quite a few machine-made bricks and sherds of a stoneware marmalade jar and other ceramics. While this feature obviously predated the floor of the Northern Creamery Building, its exact date is uncertain; however, the bricks and jar suggest a date in the early 20th century, with the fill being primarily demolition rubble and placed here immediately prior to the erection of the Northern Creamery Building in its present form. There was a two compartment building here in 1919 when the Ordnance Survey made their revisions to the 25 inch to a mile map. However, a photograph of 1924 shows one continuous building with no break in roof line or obvious butt joints (Porter and Robey 2000, p. 37). There is no known building activity on site between 1889, when the mining ceased, and 1918 when the creamery was started and nothing existed here when the site was photographed in 1912 (Barnatt 2013, p. 268), so perhaps the Northern Creamery Building was first built in 1918-19 but had been radically remodelled or rebuilt by 1924, although why a deep pit would have been dug in the process is not clear.

Modern Changes

The Mid-Twentieth Century Caving Club Hut (Contexts 30-31): When the Creamery Outbuilding (Context 30) was taken over by Birmingham Cave and Crag Club as a 'caving hut', with John Coyle as the leader of this initiative (Simon Brooks pers. comm.), it was presumably in a dilapidated state after nearly 30 years of abandonment; a series of alterations were made.

A fireplace and brick chimney were added to the inside of the northern gable end wall; nearby a small metal money box was inserted into the wall for donations made by people using the caving hut (Simon Brooks pers. comm.); a raised timber sleeping platform was added at above head height in the interior of the building in its western third; and at least one new window frame was inserted, the same may apply to the other widow and the door but no archaeological evidence was found as both frames no longer survived. Outside the building a crudely built lean-to toilet was added against the northern wall (Context 31).

Plate 64: The fireplace and chimney, with small money box in the wall to the right, within the Creamery Outbuilding, which were added when the building was used as a caving club hut.

Plate 65: The sleeping platform within the Creamery Outbuilding, which was added when the building was used as a caving club hut.

Plate 66: The outside toilet attached to the northern wall of the Creamery Outbuilding that was added when the building was used as a caving club hut.

A limestone block found in the rubble after the building had been demolished in 2018 is crudely carved ‘Jan 1960’; this may relate to when the building was first taken over and it is known that the club’s activities continued into the 1970s.

A roadside wall between the Creamery Northern Building and the Creamery Outbuilding is a late addition of uncertain date; again it may have been built when the caving club hut was in use.

Damage to the Level and the 1980s Repairs (Contexts 7, 22-25, 36-38): By the 1980s the Deep Ecton Level was impassable with water backed up in the passage inside. In 1949 the entrance was described as ‘flooded’ (Kirkham 1949, p. 2), which may suggest the collapse of the arching near the entrance had already taken place by that date, but alternatively it may be that the creamery dams here were still in place and it was the water in these that was being alluded to. The collapses were certainly here in the 1970s, when the Deep Ecton Level was entered from within the mine via the Salts Level entrance; at that date the water in the Deep Ecton Level near its outer end came to near the roof (Richard Shaw pers. comm.)

A successful reopening in 1984 was undertaken by Jim Plant and others for Geoff Cox, the then owner of part of the Ecton mines and the mineral rights for all of what had been the Duke of Devonshire’s liberty. The supports within the Level that were added to damaged sections of the arching were still extant in 2018 and their removal revealed the nature and extent of the prior damage that they were designed to remediate. That a hole had also been dug from surface over the innermost collapse of the arching and then backfilled was not obvious in 2018 before the excavation pit was dug.

Details of the damage to the Level and the 1980s repairs are detailed in Appendix 2. In summary, there were two holes in the arching that had been covered and propped from inside the passage (Contexts 24, 25); the innermost of these collapses had also had a deep, steep-sided pit dug above it from surface, which was plugged part way down, presumably to prevent further material migrating downwards into the passage (Context 7). In addition to the two arching collapses, the outermost part of the Level’s arching had dropped and as a precaution against future collapse this was also supported from beneath (Contexts 29, 38); the outer end of this arching was encased in a new concrete portal to stabilise this (Context 22). This portal has a raised rectangular panel at the centre that is carefully inscribed in three lines ‘ECTON ADIT / DRIVEN 1774 / REOPENED 1984’.

When the remedial work was completed two security doors were fitted, between the new portal and the 1884-85 portal, added to prevent unauthorised access to the Level (Contexts 36, 37).

Since the 1980s, in the last few years, a bulge (Context 23), located in the Level’s north-western wall below the innermost of the holes in the arching supported in the 1980s, had started to form. Investigations in 2018 showed that all but the lowermost two courses of the facing stones of the passage wall had parted company by up to 15cm from the stone packing behind (Context 49). Why this had happened is far from clear as there were no large tree roots, as wrongly assumed before the remedial work started; it is suspected the cause is something to do with increased water ingress via the hole above but why this caused the problem is not understood as the location is sufficiently deep underground that freezing and thawing is unlikely to have caused it. As the bulge was becoming increasingly worse and this could have let to catastrophic collapse, the restoration work of 2018 was undertaken.

Plate 67: Looking down on the stonework of the side wall of the Level where the bulge had developed, showing how the facing stones had parted company from the rest of the stonework behind that was placed between the face and the edge of the 1884-85 vertical cut into the natural.

Observations

The 2018 work has given the opportunity for a more detailed record of the outer section of Deep Ecton Level than had previously been made; it has also led to various discoveries that add to our understanding of the Level itself and the creamery buildings that were added in the 1918-32 period.

The main things newly learnt, and others that were confirmed where interpretative postulations had already been made, are:

The Eighteenth and Nineteenth Century Level

- The documented rebuilding of the outer part of the Level in 1884-85 was a complete rebuild rather than the pre-existing walls of the 1774-75 Level being utilised when access into the mine using this route was re-established.

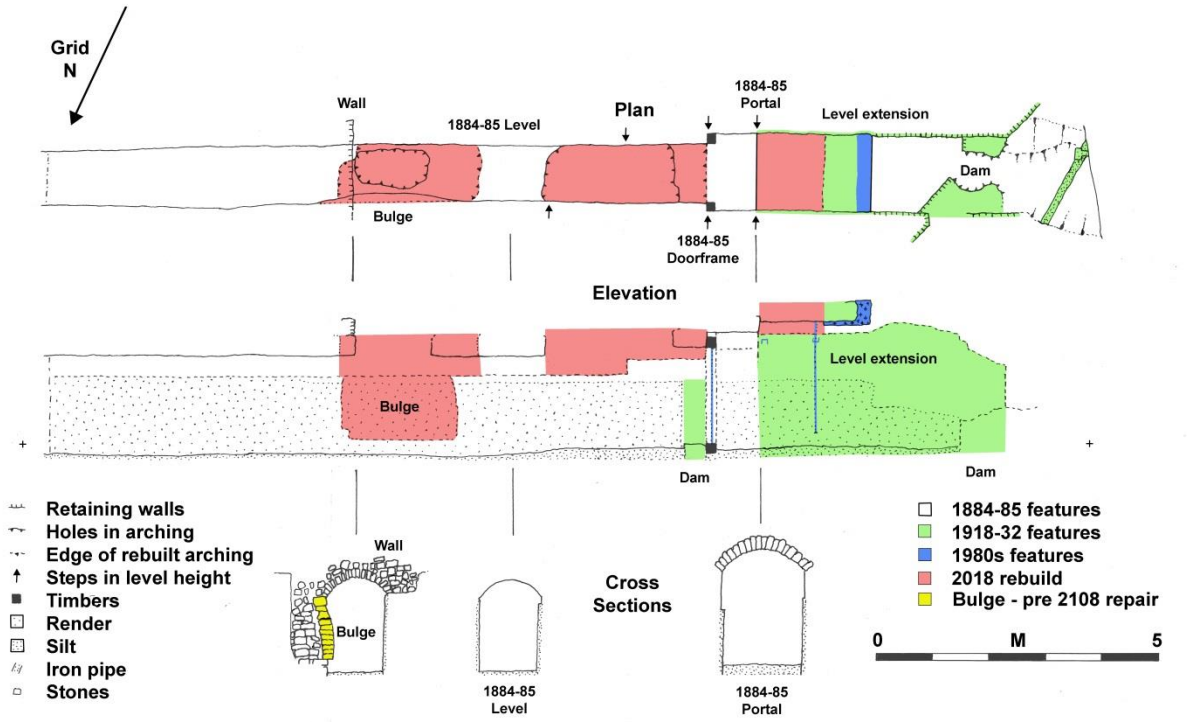

Figure 7: The Level, showing late 19th century, early 20th century and 1980s features, together with parts rebuilt in 2018.

- The 1884-85 rebuild was achieved using 'cut and cover', with the trench cut through mine waste deposits and into natural subsoil. At the Level horizon the rebuilt tunnel was placed in a narrow cut with vertical sides in order to maximise the stability of the new stonework, while above, the 1884-85 trench sides were battered back so that they did not collapse during the rebuilding work. If they had achieved the rebuild by tunnelling rather than 'cut and cover', the tunnel would have needed to have been significantly higher than the arched roof in order to build this; this would have been clearly visible in the 2018 trench and was not there. Given the unstable nature of the ground dug through, which mainly comprised loose sandy subsoil with many small

stones but also with redeposited old ore processing material, it may well have been impossible to adopt the tunnelling method for reopening this part of the passage.

- The stonework of the 1774-75 Level removed in 1884-85 must have also have been in a vertical-sided trench in the subsoil following the same line as the 1884-85 tunnel, for we know it followed the same course, as it is shown on 1809 and 1818 mine plans. The original 18th century build must have also been in a 'cut and cover' trench near the entrance; towards its base, where the stonework itself was placed, the vertical-sided trench was of the same width or was slightly narrower than that employed in 1884-85.

- An unanticipated drystone retaining wall was found placed immediately over the arching in the section of the 1884-85 'cut and cover' backfill investigated. The wall held back the backfill immediately above the newly completed arching to the north-east, while arching work was still in progress in the adjacent area to the south-west. Thus, in this section of the 'cut and cover' at least, the tunnel arching was completed at the inner end and work proceeded towards the portal.

- The 1884-85 portal for the Level still exists a short distance in from the present 1984 portal; prior to 2018 it had been hidden behind 1980s timber roof supports.

Plate 68: The drystone wall (left), placed directly above the Level arching by the north-eastern hole in this, with intact arching (right), which is interpreted as designed to hold back the backfill of the 'cut and cover' trench as this was being

put back behind the wall.

Plate 69: The original 1884-85 portal to Deep Ecton Level at the top of the photograph, which between the 1980s and 2018 was hidden by timberwork holding up the 1918-32 period arching of the extension built under the Railway Siding Terrace. Behind, the next step down in the arching is where the 1884-85 doorframe and doors were placed. The arching beyond here has been rebuilt, while the arching at the back, behind the north-easternmost step down in height is original.

- A short distance in from the 1884-85 portal, the original doorframe, for doors to prevent unauthorised access, also survived. Immediately beyond the doorframe the passage width and height was reduced so that the doorframe's timber sides that faced the centre of the passage were flush with the tunnel beyond. Similarly, the frame's top timber was flush with the arching beyond at the centre of the passage.

- A short distance beyond the doorframe the Level height stepped down again. This is harder to explain with any certainty, but it is postulated that it is the result of an error during building, when it was found that the new stonework being built progressively from the north-east towards the portal had been constructed with a slightly lower height than the portal; rather than take anything down the passage height was adjusted.

The Creamery and Early Twentieth Century Modifications to the Level

- The 1918-32 creamery had new buildings built between the two pre-existing old smelter buildings that they adapted for use. Old photographs show that these new structures were added progressively from north to south. The long building, termed in this report the 'Northern Creamery Building' as it lay at the northern side of the 2018 excavation pit, may have been modified or rebuilt sometime between 1919 and 1924. A deep backfilled pit beneath the concrete floor of the final structure may be

associated with these modifications. Extant external concrete platforms to the east and west sides of the building were used respectively for unloading milk churns that came from surrounding farms, and for placing these ready for loading milk into rail tankers.

- The southern end of the large and long Northern Creamery building was investigated in 2018. Although it features in several old photographs of the creamery in use, it was not known that it had a concrete floor and rendered internal walls, with the former set at a lower level than the road to the east. Unsuspected internal details included a ceramic trough at floor level placed against the western wall and a nearby machine plinth with holding-down bolts placed within this wall. The character of the infill of the remaining lower part of the building showed that it had been purposefully demolished; the top of the backfill was flush with the top of the roadside concrete unloading plinth, with this achieved by importing material from the calcrete quarry across the road.

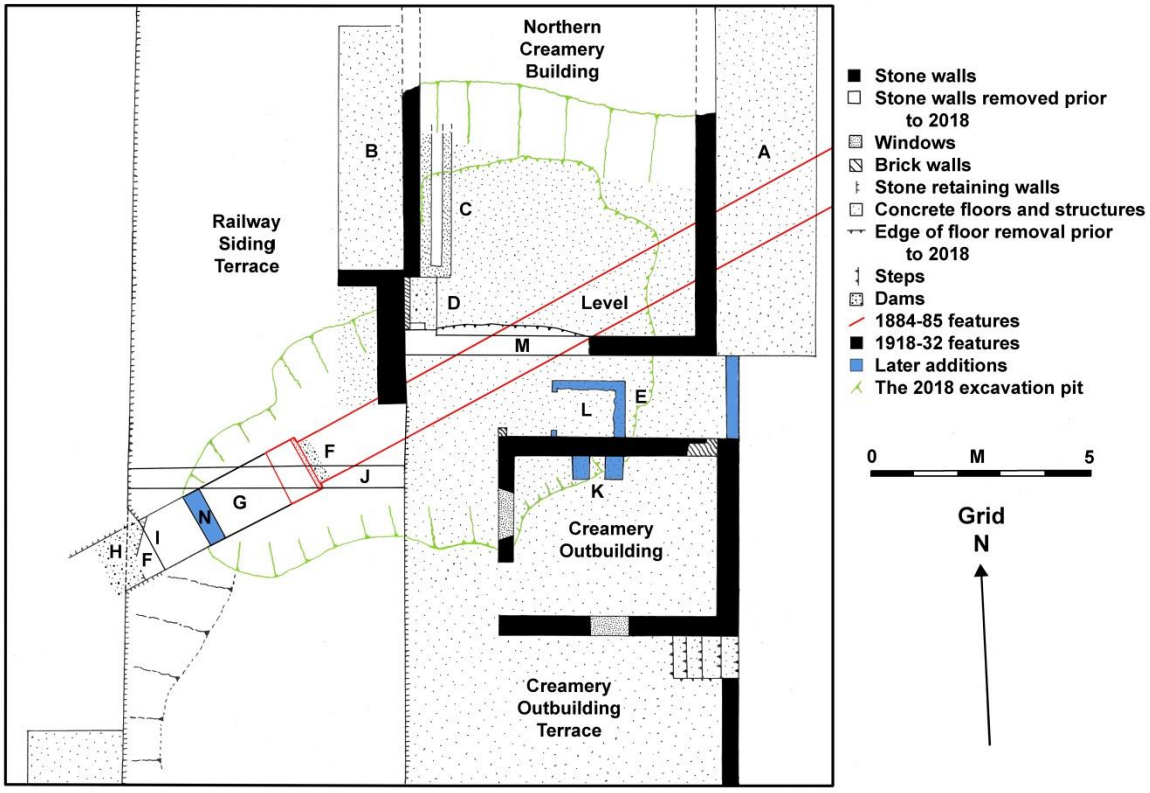

Figure 8: The site, showing late 19th century, early 20th century and later features (A: unloading platform, B: loading platform, C: ceramic trough, D: machine plinth, E: site of water tank; F: creamery dams, G: Level extension, H: postulated original 1919-24 portal, I: rebuilt creamery portal, J: Railway Siding blocking wall, K: fireplace, L: outside toilet, M: wall and floor probably removed in 1980s, N: 1984 portal).

- Detailed recording of the Creamery Outbuilding at the southern end of the new 1918-32 buildings, done prior to its demolition, showed that this small one storey shed built sometime between 1919 and 1924 had incorporated a pre-existing wall from a roofed

structure below a raised water tank that is visible on several old photographs. When the outbuilding was built this older wall became the northern wall of the new building. Nothing was found to indicate the use to which the building was put by the creamery after being built.

- The Level was used for water storage in the 1918-32 period, as indicated by vestiges of three dams across it, one well inside the passage, with the Level's drystone walls rendered to make them watertight. A series of metal water pipes were found during the digging of the 2018 excavation pit that showed water was being brought from here to the raised water tank sited between the two creamery buildings investigated in 2018, and also to other parts of the creamery.

- Sometime between 1919 and 1924 the creamery built the Railway Siding Terrace, with a high supporting wall on its downslope side that contained a remodelled entrance to Deep Ecton Level. This terrace was taken over the Level and the tunnel was lengthened south-westwards to make this possible. The new arching was done wrongly, presumably by a local builder with no experience of arched tunnel construction, as mortar was used between each of the arching stones; as this rotted it made the arching inherently unstable causing it to drop. The outermost section of this new arching may well have collapsed while the creamery was still in use, leading to a new portal being hastily built and it is this 'bodge-job' that is visible on photographs taken after the creamery had closed. It is not known for certain whether the rail tracks of the siding were ever taken over the Level but this seems unlikely because no sleeper slots were found in its flat chatter surface. As an added precaution, presumably as a consequence of the new arching becoming unstable, a wall was built across the terrace above the Level to prevent access with anything heavy here.

Modern Changes

- The Creamery Outbuilding was used as a caving club hut in the 1960s and early 1970s, and modifications were made, as identified during the recording of the building in 2018. These included the creation of a fireplace and chimney, the erection of a timber sleeping platform, insertion of at least one new window in a pre-existing opening, and the erection of an outside toilet.

- Repairs were made to the outermost section of Deep Ecton Level in the 1980s after two previous collapses had helped blocked access. Two holes in the arching were supported from inside the passage, the innermost primarily by three Acro-props with a metal grill above, and the other using two ring arches supporting planks. The first collapse had a 3m deep pit dug above it from surface, probably removing the lower part of the southern wall of the Northern Creamery Building, which was plugged to help prevent further material from descending into the passage. The previously fallen material that had dropped into the Level, and perhaps the creamery dams, were removed. A third section of unstable arching, immediately adjacent to the 1980s end of the passage roof, was supported on timber baulks. A concrete portal at the then outer end, with an inscription dated 1984, was cast *in-situ*. While the various repair measures within the Level were found to be still sound in 2018, they were getting old and would not have lasted forever. The bulge in the passage's side wall beneath the innermost remediated collapse, which had developed in recent years and in 2018 was

on the move, meant that action was essential to maintain access to the important underground remains in Deep Ecton Mine.

Plate 70: The bulge in the Level side wall as it appeared in May 2018.

Plate 71: The Level wall after the bulge had been taken down and the wall rebuilt in October 2018.

Appendix 1: SMC Conditions

The following conditions in the Scheduled Monument Consent apply to the Archaeological watching brief reported here:

(b) No ground works shall take place until the applicant has confirmed in writing the commissioning of a programme of archaeological work (including recording of the roofless 20th century building), during the works in accordance with a written scheme of investigation which has been submitted to and approved by the Secretary of State advised by Historic England.

(g) A report on the archaeological recording shall be sent to the Peak District National Park Historic Environment Record and to Dr Neil Rimmington at Historic England within 3 months of the completion of the works (or such other period as may be mutually agreed).

(i) The contractor shall complete and submit an entry on OASIS (On-line Access to the Index of Archaeological Investigations – http://oasis.ac.uk/england/) prior to project completion, and shall deposit any digital project report with the Archaeology Data Service, via the OASIS form, upon completion.

Appendix 2: Context Numbers, Descriptions and Chronology

The following context numbers were ascribed to features and layers during the watching brief (Site code DEP18). Only features directly affected by the excavation works were included; a number of structures associated with the 1918-32 Creamery in the vicinity that were not impacted upon were excluded. The context numbers used, cross references to drawings and photographs in the project archive, overview descriptions, and the dating phases (in brown), are as follows (the drawings are numbered in the same sequence as the figures used above, while photographs are numbered differently to the plates above and when taken of the Level and Creamery Outbuilding before the October-November work they are prefaced by L or C):

1: Upper soils and soil/rubble directly under Creamery-Phase structure (Drawings 4, 5; Photographs 32, 41, 43, 49, 86, 88, 92-93, 120). This mixed layer consistently had a mid- to dark grey-brown soil with small stones and was often relatively free of larger stone, but with these present is specific places. In the deep north-western parts of the excavation pit this layer usually underlay the concrete floors of the Creamery-Phase buildings and associated terraces, incorporated the building footings (Contexts 4, 5, 30, 35) and overlay earlier clearly distinguished layers (Contexts 10, 11, 16). The possibility that parts of Context 1 are late 19th century rather than early 20th century in date cannot be discounted. Contexts 15 and 44 may be lower parts of Layer 1 and the metal pipes of Context 9 lay within it. In the shallow south-western part of the excavation pit, Layer 12, which is part of Layer 1, is the upper fill under the surface of the Railway Siding Terrace (Context 2), while the stony layer beneath (Context 13) was deposited as part of the same Creamery-Phase modifications to the site. No attempt to distinguish between the lateral extents of different parts of the Layer 1 was made, nor indeed would this have been possible because of the nature of the machine stripping (late 19th and/or early 20th century).

2: Railway Siding Terrace original surface (Drawing 4; Photograph 8). Flat surface of limestone chatter, with angular stones of 2-4cm size, at the original surface of the Creamery's Railway Siding Terrace of Context 35; there were no positive indicators that railway sleepers were laid here (early 20th century).

3: Wall base (Drawings 1, 8; Photograph 6). A wall base of un-mortared limestone blocks, mostly two courses high. It may well be that this wall was built after the creamery extension to the Level showed signs of instability to prevent movement of waggons southwards along the Railway Siding Terrace where it ran over the Level. It appears to have largely been taken down, at a date unknown, as there was little tumble (early 20th century).

4: Low wall (Drawings 1, 4, 8; Photographs 3, 9-10, 12-13, 17, 37, 60). This low mortared limestone wall, which turns through 90 degree at the north end, is butted to the outside of the west wall of the Northern Creamery Building (Context 6) and also the Concrete Platform (Context 53). In its northern half it still stood to nearly full height (just over 1m) and was rough-coursed with seven courses, but to the south it had been much reduced, to only 2 courses, presumably because of collapse or removal. Its original purpose is obscure (early 20th century).

5: Northern Creamery Building – Western wall and footings (Drawings 1, 4, 5, 8; Photographs 3, 10, 12-13, 17, 37, 60, 74-78, 87, 90). The main part of this 0.40m thick wall is a mortared limestone wall that was freestanding to 0.8m high above the sunken internal floor of the building (Context 6), with a rendered surface to the inside; to the outside it went lower and retained the *c.* 1m high platform upon which the building stood. At the south end the build was different, with the concrete machinery bed incorporated to the inside (Context 43) and a single-brick thickness wall of machine-made bricks to the outside. The corner and south wall of the building had previously collapsed or had been removed (early 20th century).

6: Northern Creamery Building - Concrete floor (Drawings 1, 4, 5, 8; Photographs 6, 33-34, 37, 73, 82, 86, 92, 120). Thick concrete floor, laid horizontally, covering virtually all of the southern part of the Northern Creamery Building that was exposed during the work; at the western edge of the building it was bonded with the trough and mortar plinth of Context 42 rather than running beneath this; This concrete floor is sunken compared with the ground level to the east, but because the fall in the ground towards the river, to the west the building was on a retained platform at Context 5 (early 20th century).

7: Pit and plug (Drawings 4, 6; Photographs 15, 17, 34-35). A deep and largely steep-sided pit, with a mortar and metal sheet at *c.* 1.50m down (with the latter perhaps from the side of a trailer) that had been inserted to plug the material collapsing into the Level below. In the *c.* 1.5m by 1.00m hole below the plug there was loose limestone rubble and one piece of concrete incorporating two lengths of rebar; this descended to the hole in the Level arching at Context 24. The upper half of the pit fill went unrecognised during machine removal, as the surrounding deposit of Context 1 was also stony in parts; it must have been wider near the top as part of its fill was recognised retrospectively on photographs and in the vertical section left at the end of excavation on 10th October. This pit probably dates to the 1980s (or could be slightly earlier or later), dug in an attempt to investigate the nature of the collapse in the arching below and was plugged to prevent further material from entering the Level from above (late 20th century).

8: Topsoil and rubble in the south-western half of the excavation (Drawing 4; Photograph 8). Topsoil, with patches of limestone rubble from collapsing structures, which has accumulated after the Railway Siding Terrace (Context 34), was abandoned in the 1930s (mid- to late 20th century).

9: Metal pipes (Drawings 4, 6; Photographs 9, 11-12, 14, 16, 30-32, 45, 49, 52, 79). At least six iron water pipes were broken and largely removed during machine stripping; these proved impossible to record adequately as for the most part they were buried and the excavator pulled them out of place before their existence was recognised and only broken stub ends remained. One had a flange at the end with four bolt holes while others had a screw thread at the ends, one with a brass valve at one end. Their diameters varied between 6cm and 9cm. For the most part they ran between the creamery buildings and the entrance area of the Level; some probably ran up to the raised water tank seen on old photographs between the Northern Creamery Building and the Creamery Outbuilding further south (Porter and Robey 2000, pp. 37, 237; Porter 2002, p. 75) (early 20th century).

10: Coal-rich layer (Drawings 4, 5, 6; Photographs 32, 36, 42, 49, 84-85, 93). This layer was found in the area between the two creamery buildings and running under the north-west corner of the southern Creamery Outbuilding; it did not extend far under the Northern Creamery Building to the north (Context 35) but, where seen in section, stopped just within this (Drawing 4), while a short distance away to the east it was truncated south of here (Drawing 5). The layer was also truncated by a pit to the south-west just short of the retaining wall of the Creamery Outbuilding Terrace (Context 52); where dug away by machine in 2018 it only appeared in plan as a stripe no more than *c.* 2.5m wide to the north-western side of the excavation pit's south-eastern edge. It comprises a discrete 'clean' black layer of coal dust and small fragments of coal that was *c.* 20-30cm thick; a small lens with a purple-brown colour is interpreted as comprising burnt coal. It also contained several lenses of material derived from Context 11 below.

There was no soil horizon at the base of Layer 10, indicating it is roughly contemporary with Context 11 beneath, confirmed by the thin lenses of this material within Layer 10. Thus, the layer is late-19th century in date, probably deposited in the last phase of the mines use (1883-89) soon after the 'cut and cover' trench for the 1884-85 rebuilding of the Level was backfilled. There had been no smelting on site for many years by this date and the layer contains no clicker to associate it with a smithy or engine boiler, therefore it is likely to derive from a coal heap or coal yard somewhere in close proximity (late 19th century).

11: Orange-brown redeposited subsoil with small stones (Drawings 4, 5, 6; Photographs 32, 36, 42, 49, 85-86, 92-93). A layer of loose sand with many small stones that is at least 1.6m thick, the base of which was not dug through, which looks like 'clean' natural subsoil but must be redeposited. It occurs to the southeast side of the Level but in part overlies its arching. It is the same material as Context 16 on the other side of the Level except for its colour (see this for an explanation) and this has certainly been redeposited. Layer 11 overlies the deposit of stones above the south-eastern wall of the Level (Context 51). It is somewhat variable in character with some of the lower part of deposit comprising virtually nothing but small angular stones up to 3cm across, while in the upper parts there are areas with more clay, and in two parts there is true clay with little sand and only a few stones.

This layer is interpreted as the clean subsoil (see Context 45) dug out when a trench was dug in 1884-85 to rebuild the Level using the 'cut and cover' method, which was thrown back in the trench soon after the Level has been completed. The clay in Context 11 probably derives from the silty clay (Context 50) beneath the stony natural of Context 45 (late 19th century).

At Layer 16 the 'cut and cover' infill also included material derived from ore processing and smelting, which was presumably also dug through when the trench for the 'cut and cover' was excavated in 1884-85.

12: Grey-brown soil within a cut (Drawings 4, 5, 6; Photographs 49). This soil lay within a cut which truncates Layers 10 and 11 at their south-western end and lay in the top half of the fill, above Context 13, of the area modified in the 1918-32 period for the creation of the Railway Siding Terrace (Context 34). This layer is part of Context 1 but was given a separate number here to distinguished it from what lay above, which was a darker soil (Contexts 1 and 8) (early 20th century).

13: Stone dump (Drawings 4, 6; Photographs 41, 43). Placed directly over the Level arching extended in the 1918-32 period (Context 29), in the cut dug for the purpose and to create the Railway Siding Terrace (Context 34), there was dump of large- to medium-sized limestones with voids between, which was up to *c.* 1.0m high and was overlain by the soil of Context 12. The stones added weight to the arching and the dump was designed to increase its stability. This stone dump was only briefly seen during machine stripping (early 20th century).

14: Mortared stone floor (Drawing 4; Photographs 41, 43-44). This small area of floor was only seen is section after the machine stripping on 10th October in the north-western side of the excavation pit; beyond the pit it was covered in topsoil and its extent could thus not be assessed. In section this floor was 0.95m long and comprised three stone blocks with tops at a common level, with some lime mortar in the interstices. It may be that this floor never covered a large area but was confined to a strip of ground that was of the same width as the northern arm of Wall 4, and bounded to the east by the other branch of this wall (early 20th century).

15: Irregularly placed stones under footings of Wall 5 (Drawing 4; Photograph 37). This small patch of stones was only clearly seen in section at the end of the machine digging on the 10th October. It extended downwards diagonally to the north from beneath the base of the footings of Wall 5 and may well be a random stony patch with soil in the interstices within Layer 1 rather than being associated with a structural feature (late 19th century or early 20th century).

16: Grey-brown, mottled, redeposited natural subsoil with small stones (Drawings 4, 5, 6; Photographs 33, 43, 87, 90). This thick layer is effectively a continuation of layer 11 in terms of the character of much of the material deposited but the soil colour is different, having changed from pale orange brown to a darker, mottled, grey-brown. At the north-eastern end of the excavation pit, as seem at the end of the stripping of 10th October, this can be explained as having been modified by water ingress via the adjacent 1980s pit (Context 7). This also led to the slumping of the deposit, with tip lines reflecting this seen in section, leaving a void under the concrete floor of the Northern Creamery Building (Context 6). However, this does not offer a full explanation of the difference between Layers 11 and 16, for further south-west along the 10th Oct section there is different material, with ill-defined boundaries to the change in deposition. This derives from 18th and early 19th century ore processing and smelting activity on site, the material from which has also been redeposited in the 'cut and cover' backfill. Near the base of the section there was a fine example of a large slag block from the smelters, cast into a mould and designed to be used for building and paving purposes (see for example Barnatt 2016). In this same area, at the section of 18th October, the upper part of Layer 16 comprises many angular but somewhat eroded stones of *c.* 5-10cm size, with voids of the same grey soil in the interstices; these are of largely of limestone from within the mine, some with secondary coatings of oxidised copper ore. Also there was one lump, out of several smashed in half to determine their make-up, which had a core of chalcopyrite, mixed with an iron mineral, with oxidised surfaces. There was also a small lump of unburnt coal. All are typical of deposits associated with ore processing at Ecton, with these particular stones left in a surface heap for some time before Layer 16 was created, presumably after being rejected for further processing. For an interpretation of Layer 16 as part of the backfilling of the 1884-85 'cut and cover' see Context 11 (late 19th century).

17: Deep Ecton Level (Drawings 1, 2, 3, 7; Photographs L1-23, 5, 38). This drystone-arched tunnel gives entry to Deep Ecton Mine, the outermost section of which was the subject of repair in 2018. For the side walls and arching see Contexts 18-21 and 29; for purposeful changes in its dimensions and the 1884-85 portal and doorframe see Contexts 26-28; for the trench cut to construct it using the 'cut and cover' method see Contexts 48-51; for damage to the Level see Contexts 23-25 and 29; and for remediation and additions made in the 1980s see Contexts 22 and 36-39.

Inside, the Level is *c.* 1.6m high (with a little to be added because of silting above the original floor), *c.* 1.2m wide the top and *c.* 1.0m wide at the bottom, but towards the entrance there are three steps up in height, and one where the width was also increased. The innermost has a raise in height of *c.* 0.25m, with one side offset from the other, but the reasons for this are now obscure; it may be that the arching was being built from both directions and the builders found they had being creating the arching at different heights. The middle step up of *c.* 0.25m (now a little more due to the collapsing arching to the inside), which was purposefully created, is where the original door to the Level is placed and the passage width here was increased to *c.* 1.5m to accommodate the doorframe. The outermost step up, of *c.* 0.20m and again purposefully created, is at the 1884-85 portal as shown by a match, stone for stone, with a photograph dating to pre-1918 (Robey and Porter 1972, plate 3). Here the Level was a little over 2.1m high and *c.* 1.5m wide at the top of the side walls. The old photograph, and another (Porter 1997, p. 58), shows two sloping-topped buttresses to either side of the portal; no sign of these were present in 2018. They were presumably removed in the 1918-32 period, or incorporated into a new build, when the Level entrance was moved a little to the south-west to accommodate railway sidings above created for use by the creamery. While the new arching has a 'butt joint' with that of 1884-85, with the end of the former placed above the latter, there is no butt joint to the sides, with alternate stones of the original build, either at the portal or the buttresses presumably taken out to key in the new wall. This outer section of the Level today is *c.* 1.5m wide and *c.* 2.2m high (with *c.* 0.2m to be added because of the subsequent flatting of the arching and a little to be added because of silting above the original floor).

This Level was first driven in 1774-75 as a bypass to the original Level driven from 1723 which collapsed in 1774, the nearby entrance to which is now lost. This was built over when the creamery was in use in 1918-32 but lay a few metres north of the current entrance. The outer half of 1774-75 passage collapsed in the later 19th century and was completely rebuilt in 1884-85; no sign of the earlier structure was found during the 2018 work. Given that further into the Level than the area assessed in 2018 there is mismatch at the two side walls between the 1774-75 build and that of 1884-85, with offsetting by *c.* 10cm, it is highly unlikely that the 1884-85 work confined itself to the arching but retained the earlier side walls; this observation is reinforced by differences in build at the two dates. The original build has near-vertical walls and an arching profile that is semi-circular. The 1884-85 rebuild has wall that taper inwards from top to bottom and the arching was built flattened rather than semi-circular.

In the 1918-32 period the Level was used for water storage with three dams placed across it and the Level walls between rendered to make them watertight; the entrance section was lengthened slightly when the railway siding was built over its top; during this period it seems the outermost section of arching collapsed and the portal was crudely rebuilt on a slightly different line. By the 1980s this second entrance portal had collapsed and the

passage was blocked; there were two collapses in the arching inside. The Level was reopened in 1984 for Geoff Cox, the then owner of the mineral rights, with 'temporary' remedial work done on the two arching holes and an outer section of arching that was potentially unstable. Also a new portal in concrete was added and two security gates placed just inside to prevent unauthorised entry (late 19th century onwards).

18: Deep Ecton Level – North-western side wall (Drawing 2; Photographs L10, L12-14, 121). Inside the Level this wall is *c.* 1.4m high (with a little to be added because of silting above the original floor) and built drystone. However, the bulk of the wall is covered by a thick layer of render added in the 1918-32 period from its base to the top of the wall, making a full appraisal of the number of courses of stone impossible Where the stonework is visible, in the section of wall removed to repair the bulge (Context 23), there are nine courses of large limestone slabs, with a springer course above, with additional thin stones placed to level courses off; one ceramic roofing tile was found that had been used for the same purpose. Because of increases in height of the arching (see Context 17) by the time it reaches the 1984 portal the wall is *c.* 2.0m high and was built with *c.* 15 courses of stones; here the render has partially weathered off outside the entrance (late 19th century).

19: Deep Ecton Level – South-eastern side wall (Drawing 2; Photographs L10, L12-14, 91). This wall matches its counterpart (Context 18) and the same observations apply, except that there are no significant signs of collapse and the render had weathered off the top course of stonework to a point a short distance beyond the bulge on the other side of the passage (late 19th century).

20: Deep Ecton Level – Arched roof (Drawings 2, 7; Photographs L10-14, L21, 99, 101-03, 106-08). Inside the Level beyond the steps down in the roof, the arching, with flattened profile as originally built, was made of sturdy limestone slabs set on edge, each with rectangular bottom ends visible from inside the Level, running in lines running parallel with the axis of the Level. Here there were 15 lines of slabs. Outside the second step up, where the width of the Level was increased there were 18 lines of stones as seen at the 1884-85 portal (Context 28). By the 1980s two collapses in the arching had occurred leaving holes in the roof (Contexts 24-25) (late 19th century).

21: Deep Ecton Level – Outer Level (Drawings 2, 7; Photographs L3, L17-18, 52, 54, 57, 59, 129-30, 134). Running out from the 1884-85 portal (Context 28) to the 1984 portal (Context 22) and originally beyond here, the Level was extended in the 1918-32 period; this has been largely described above under Contexts 17-19 and is returned to under Contexts 22 and 29. Beyond the 1984 portal the corners of the original walls, where they meet the retaining wall of the Railway Siding Terrace (Context 34) have collapsed in their upper parts (early 20th century).

22: Deep Ecton Level – 1984 concrete portal (Drawings 2, 7, 8; Photographs L1-2, 5, 52, 59, 130). This concrete portal spans the Level at the current outer end of the stone arching. It has a visible flat base with arched profile that follows the arching inside in its flattened form, and the vertical outside face is *c.* 0.45m high at the centre. This has a raised rectangular panel at the centre that is carefully inscribed in three lines ECTON ADIT / DRIVEN 1774 / REOPENED 1984. Before the 2018 work the portal appeared to be a solid concrete structure; this was not the case but it was cast *in-situ* with formers, to

form an outer face and base, which encased the end arching stones of Context 21. The portal was left *in-situ* during the 2018 work (late 20th century).

23: Deep Ecton Level – The bulge in the north-western side wall (Drawings 2, 3, 7; Photographs L6-8, L14-15, L19-20, L22-23, 100, 107-15, 116, 119, 121, 123-28, 137, 142-44). Within the Level, between 7.3m and 9.8m from the 1984 portal (Context 22), the north-western side wall (Context 18) has developed a potentially catastrophic bulge which had got significantly worse over the last 10 years; access to the Level was closed to visitors to the mine in 2018 due to concerns over sudden collapse.

The bulge was worst in the lower half of the wall, except for the lowermost two courses that had remained on their original line, with the seven courses above of large limestone slabs having slipped laterally by up to *c.* 15cm; the arching directly above the hole had not moved but towards the other side of the passage it had collapsed prior to the 1980s. Much of the render at the bulge has flaked off.

When the bulge was taken down in preparation for rebuilding this section of wall, this showed that the damage was not caused by tree roots as had originally been suspected; there were none more than 1mm in diameter. Only the wall facing stones had moved laterally, leaving voids between this and the rest of the stonework behind (Context 49) that filled the trench dug into the natural to originally build the wall (early 21st century).

24: Deep Ecton Level – North-eastern hole in late 19th century arching (Drawings 1, 2, 3, 7; Photographs L6, L9, L15, L19, 47, 89, 98-103, 106-08, 132-32, 135-38, 142). A hole in the roof arching of the Level, with collapse occurring before the 1980s, was *c.* 1.3m long and *c.* 0.7m wide, with the outermost one course of the arching remaining *in-situ* to the south-east side and four courses remaining at the northwest side. In the 1980s the hole was 'stabilised' by placing a plate of iron walkway-type mesh a short distance below the hole which was supported by three vertically-placed Acro-props coming up from the Level floor. Above this mesh were a small RSJ and a sturdy timber beam running along the length of the hole, with a scaffold pole at right-angles set into the stonework just beyond the inner end of the hole which supported the RSJ. Also a steep-sided pit had been dug from surface (Context 7), which was plugged about half way down in an attempt to further stabilize the collapse (late 20th century).

In preparation for repairing the arching in 2018, in order to make a stable platform from which to build and to access the bulge below in the side wall (Context 23), which lay to one side of the hole, the arching courses to either side of the hole were removed, and loose/slipping arching stone beyond either end of the original hole were also taken down. Only a few stones to the north-east were taken out, but in the other direction more had to be taken down in order to find a stable part of the arching. The final hole to be repaired measured *c.* 2.5m long and spanned the full width of the passage. The arching was rebuilt with arching stones of identical character to the original and had reinforced concrete placed above to relieve the weight of the backfill that was to be placed here.

25: Deep Ecton Level – South-western hole in late 19th century arching (Drawings 1, 2, 3, 7; Photographs L4-5, L16, 46-48, 50-51, 95-98, 104-05, 133, 136). A hole in the roof arching of the Level, with collapse occurring before the 1980s and this presumably being the main cause of the mid-twentieth century blocking of the Level and the ponding up of the water behind to nearly reach the top of the level walls, was up to *c.* 2.4m long and spanned the full width of the Level. This section of the arching may well have been inherently unstable due to a mismatched change in height of the arching here when first built (Context 26), which led to the eventual collapse.

In the 1980s the hole was 'stabilised' by placing two layers of 'builders planks' and a sturdy timber beam, directly below the hole, with their ends at the intact arching to either end; these were supported on two 'ring arches'. These were both 'home-made' from I-section steel beams, with two 'vertical' sides which sloped inwards slightly towards the base to match the side walls of the Level. Each side was welded to a 'horizontal' roof piece that was angled upwards towards the centre of the arching. These two pieces were bolted together with reinforcing plates (late 20th century).

In preparation for repairing the arching in 2018, the *in-situ* arching to the south-west end, as far as the second step up in the roof (Context 27, was removed as it had previously slipped downwards; the resulting hole was *c.* 2.9m long. The arching was rebuilt with arching stones of identical character to the original and had reinforced concrete placed above to relieve the weight of the backfill that was to be placed here

26: Deep Ecton Level – The first (north-eastern) step up in late 19th century arching (Drawings 2, 7; Photographs 129, 131-32). This step up was hidden by the planking of the 1980s repair (Context 25) and was only discovered when this was removed. To the north-west side the vertical step up in the side wall was of a total height of 0.27m and comprised three courses of stones. The vertical step up on the other side was 0.48m further to the south-west and was only 0.20m high and comprised two courses of stone. This may well have made the arching above inherently unstable because of the asymmetry. Perhaps the arching was original built from both directions and it was found they had inadvertently been placing this at different heights from the passage floor (late 19th century).

When the arching was repaired in 2018, the step up on the south east side was moved north-eastwards to match that on the other side of the Level in order to make the rebuilt arching more stable.

27: Deep Ecton Level – The second step up in the late 19th century arching and wooden doorframe (Drawings 2, 7, 8; Photographs L3, 58, 61-65, 129, 131-32, 140-41). This step up in the arching, originally of *c.* 0.25m at the centre of the arching, was hidden behind the wooden doorframe that supported the 1980s inner door (Context 37) before it was removed. Comparison with a late 19th century photograph shows that two wooden doors, which opened outwards and when closed sealed the Level, were hung off this doorframe. The step up and the widening of the Level at this point were made to accommodate the doorframe (late 19th century).

The doorframe was made from four sturdy pitch-pine timbers, in 2018 with somewhat rotted outer faces, each of 14cm to 16cm square cross-section, with open-tenon joints that joined the sides to the top and bottom timbers, with their tongues in the two side pieces. The two sides each once had two hinge hanger pins for the doors, set on the side that faced

the Level entrance; those to the south-east side remained. At the top of the frame, its two corners were set into purposefully made recesses in the arching. At the base, the bottom piece was at floor level (late 19th century).

Unfortunately in 2018 the doorframe was initially assumed to be a 1980s feature and was taken out before its true date was realised and it was measured in detail; because it was somewhat rotten and would have been in the way of rebuilding the arching behind, it would have needed to be taken out in any event.

28: Deep Ecton Level – The third step up (south-western) in the arching – the original 1884-85 portal (Drawings 2, 7, 8; Photographs 52, 54-55, 129-32). This step up, of *c.* 0.20m at the centre of the arching, was hidden behind the 1980s stabilisation timbers below the outer section of arching (Context 29) before they were removed. Comparison with a pre-1884 photograph shows the stonework to north-eastern side is the 1884-85 portal, with the 1918-32 extension to the arching built at a higher level so that its inner end could be placed above the earlier arching (late 19th century).

Above this portal, a line of horizontally-laid stones had been placed, presumably immediately in advance of the arching being extended to the south-west (Context 21).

29: Deep Ecton Level – The flattened outer arching (Drawings 2, 3, 7, 8; Photographs L3, 129-130). This 1.8m long stretch of now very-flattened arching, made of limestone slabs set on edge in 16 lines running parallel with the axis of the Level, had settled and was supported by the 1980s timber beams of Context 38 that had been added to prevent collapse. When taken apart for rebuilding in 2018 it was found that there were structural problems with how the arching was originally built; the primary one was that it had been built using lime mortar between each stone, rather than this being added afterwards to fill the voids in drystone-built arching; as the mortar rotted this substantially weaken the structure. In addition, several stones used were too small, not being deep enough, and several wall copers that were semi-circular topped had been reused, which again were not deep enough. It may well be that the arching was built by a local builder who had no experience in building arched tunnels and who only had a partial understanding of what was required.

It may that this arching originally extended further outwards to a portal aligned with the retaining wall of the Railway Siding Terrace (Context 34), but old photographs show that the portal was rebuilt in crude fashion in the 1918-32 period, to lie at right-angles to the Level at a point further out from the 1984 portal (Robey and Porter 1972, plate 2; Porter 2004, p. 64); the outermost section of arching must have collapsed in the intervening period (early 20th century).

The arching was rebuilt with stronger arching stones than the original and without the mortar, with grout later poured from above to fill the voids between the stones to increase the arch stability; reinforced concrete was then placed above to relieve the weight of the backfill which was to be placed here.

30: Creamery Outbuilding – Walls and internal concrete floor (Drawings 1, 4, 5, 8; Photographs C1-18, 20-25, 32-38, 1, 4, 20, 23-28, 66, 72, 140, 154). This small building was built as an outbuilding of unknown purpose as part of the 1918-32 Creamery. It does not appear on early photographs of the site in use, but was here by 1924 (Porter and Robey 2000, pp. 36, 237; Porter 2002, pp. 75, 78). When the creamery was closed in 1932 all of its buildings except this one were demolished; why it was kept is not known. After a period of a little over 25 years, when it must have deteriorated as it was presumably derelict, the building was taken over by a group of cavers from Birmingham Cave and Crag Club in the mid-20th century, who put it in good order for use as a caving club hut. A date-stone, comprising a block of limestone crudely carved with 'JAN 1960', was found in the demolition rubble in October 2018 that may relate to this event.

The building, which had become disused again from the 1970s, has been deteriorating badly over several years, ever since its roof of Staffordshire Blue ceramic roof tiles was stolen. By 2018 its roof timbers were is bad state of collapse and cracks had appeared at the north-west corner of the building's wall and in the southern gable end. Further deterioration in the roof timber occurred between the record made in May 2018 and the buildings demolition in October 2018.

In plan, internally the building measured 3.65m on its north/south axis where the gables were positioned, by 4.65m east/west; externally it was 4.50-4.55m by 5.50m. All the walls of the building, which were 0.35-0.45m thick, were of mortared rough-coursed limestone blocks. At the level of the yard to south, and external platform to the north, the two gables end were of 3.65m height, while the building corners were 2.20-2.30m from the ground; to the east the wall here rose to 1.10-1.20m from the road level which was 1.10m higher than the yard. Details of the remaining fabric are:

West Wall: This had two openings, a doorway at the south end and a near-central window; both had timber lintels in the inside and outside faces. The doorway had no remaining doorframe and the opening was 1.25m wide and 1.90m high. The window opening, which had chamfered sides, was 1.10m wide to the inside and 1.00m high. The original window was about 0.10m deeper but had its base heightened by 1-2 layers of thin limestones, to insert a mid-20th century metal L-section window frame with fragments of Perspex remaining. On the inner face of the west wall there were remaining large areas of render/coarse-plaster covered in blue paint.

South Wall: The only feature in this wall is a central window opening with sides at right angles to the wall, which was 0.90m wide and 1.10m high; there were timber lintels to inside and outside. The now-missing window frame was set to the outside and the inner sides and base of the opening were rendered; the inner lintel was cut short to one side and where it once continued the wall had been patched with bricks. On the inner face of the south wall there were remaining patches of render/coarse-plaster covered in blue paint.

East Wall: This side wall, which faces the road, has no openings, had an internal covering of render/coarse-plaster except near the top where it had weathered off. All had traces of blue paint added in the mid-20th century.

North Wall: This gable end had indications of several alterations to the inside face. The most obvious was a crude fireplace with concrete arched top and protruding sides built of limestone blocks, with chimney above made from bricks that, from just over 2m up, went

slightly diagonally up to the apex of the gable. Both were abutted to the original wall. To the east side, at about 1.3 m from the floor and about 0.3m away from the chimney breast a small metal box with door had been set into the wall; this was apparently used for donations for overnight-stays (Simon Brooks pers. comm.). Diagonally upwards to the east there was a small blocked opening in the wall, with a metal plate forming the lintel and bricks to the sides, but with those to the east apparently moved later; the date of its creation and blocking was not clear, but it may well have been made when the Creamery Outbuilding was created. At the eastern end of the wall there was a neat rectangular blocked doorway-like opening from floor to a height of about 2m, which had been filled with a brick wall; there was no stone lintel above. The apex of the gable end, east of the chimney, had thick unpainted and well-preserved render down to a neat horizontal line; below there was patchy remains of whitewash, in places with a covering of blue paint, on both the wall and chimney breast.

To the outside the north wall was partially obscured by the outside toilet (Context 31) and by shrubs with a thick leaf cover, but it appeared featureless except for the blocked opening to the east end. Here it was somewhat different and far less regular compared with what was visible inside, as became clear when the shrub coverage was partially removed in October 2018. The outer face of the brick infill was, in its western part recessed inwards and there was a crude 'sill' of limestones near ground level following the line of the outer face of the rest of the wall. The recess continued westwards where the build was of limestone blocks partially covered in render. The top of the blocked opening was irregular, stepping inwards to the centre.

Roof: Only the timberwork for the roof to the western half remained relatively intact when recorded in May 2018. There were collapsing support timbers at the roof apex, below mortared ridge tiles, and a purlin at a point halfway down to the western wall, with horizontal laths above and horizontal boards below. To the east side only the purlin half way down the roof remained.

Sleeping Platform: This was installed at above head height across the western third of the building. It had three joists running north/south supported on timber props from floor level at the corners. Above, the platform was made of timber planks laid at right angles to the joists.

Floor: This was covered in debris before demolition, but when the site was cleared in October 2018 it could be seen to comprise a concrete floor.

When the building was created, the creamery adapted its northern wall, which was originally part of an earlier structure that stood immediately to the north and comprised a narrow roofed area with water tank above (see Context 31). Indications of this survive in the fabric, with a butt joint between the northern and western walls at the north-west corner. A bricked-up opening in the north wall near its eastern end, which looks to have been a doorway, does not appear on an earlier photograph taken before the outbuilding was added and thus may have been part of the new outbuilding fabric that was later infilled (early 20th century).

Additions made in the caving club hut phase included the addition of a chimney, a raised timber sleeping platform, at least one new window and perhaps another at the second window opening and a new door, and an outside toilet at Context 31 (mid-20th century alterations).

31: Creamery Outbuilding – The outside toilet (Drawings 1, 8; Photographs C19-20, 1, 3-4). Butted to the outside of the north end of the Creamery Outbuilding (Context 30) was a small structure with walls to east and north and an open doorway to the west with two flimsy wooden doorframe sides and top and also a wooden lintel above. The two walls were a single limestone-block thick, with the outer with rough-faces but inner ones that were left rough. There was a rotting roof of roofing felt on support timbers. This is interpreted as an outside toilet added in the mid-20th century when the outbuilding was used as a caving club hut (mid-20th century).

32: Northern Creamery building – Eastern wall (Drawings 1, 8; Photographs 69, 73, 92). This wall had been reduced in height at the time the building was demolished, its top at the same level as the surface of the adjacent concrete loading platform (Context 40), which has a height of 0.65m above the adjacent road level. To the inside of the building it is 1.65m down to the concrete floor inside the building (Context 6). The wall has a thickness of 0.42m, is built of limestone blocks and irregular pieces that are rough coursed; it has lime mortar and was rendered on the inside, but with this now eroded away in the upper remaining half. No part of Wall 32 was removed in 2018.

Old photographs show that the Northern Creamery Building was a long one storey structure, only the southernmost part of which was affected by the 2018 work (Porter and Robey 2000, p. 37; Porter 2002, p.75); it was terraced into the west-facing slope, hence the sunken floor. Wall 32 was originally never high, but stood to only about 0.4m above the top of the concrete platform (early 20th century).

33: Creamery Outbuilding – Brick doorframe side (Drawings 1, 8; Photographs C19, 1, 3-4). Butted against the north-west corner of the Creamery Outbuilding (Context 30) there is a brick pillar standing to a little over 2m height that is 0.25m wide. An old photograph, taken in 1963 when the creamery was in ruins, shows that this supported a timber doorframe lintel which extended northwards to another brick pillar that has now gone (Porter 2004, p. 64). The doorway once gave access to the space between the Creamery Outbuilding and the Northern Creamery Building that, when the creamery was in use, as other old photographs show (Porter and Robey 2000, pp. 37, 237; Porter 2002, p. 75), was roofed with a water tank above (early 20th century).

34: Railway Siding Terrace (Drawings 1, 6, 8; Photographs 2, 4, 6-8, 91). This flat topped terrace lies between the Creamery Outbuilding Terrace above to the east (Context 52) and the narrow area of land besides the river below to the west. It is just over 6m wide and was designed for a railway siding that ran along the west side of the creamery buildings and terminated at its southern end at Context 34. The retaining wall to the west was originally *c.* 2.0m high and in parts is somewhat ruinous; it is interrupted part way along by the entrance to the Deep Ecton Level (Context 17), which was extended in the 1918-32 period at Context 21 to run under the siding (early 20th century).

The only part of the Railway Siding Terrace that was disturbed in 2018 was in the area immediately above the Level; here there an original surface of limestone chatter (Context

2), which lay over a soil (Context 12) above a layer of stones (Context 13) that in turn rests on the top of the arching of the outer section of Level (Context 21), with all added in the 1918-32 period when the terrace was created.

While this terrace definitely contained the sleepers and rails of the railway siding further north, it is not clear whether they ever extended this far south, although the southern part of the terrace was clearly created to allow for this possibility. No sleeper slots were observed in the original terrace surface above the Level and a cross wall (Context 3) was added at some point in the 1918-32 period that prevented the line running here, perhaps after the arching of the Level was showing signs of instability.

35: Northern Creamery Building – Southern wall and footings (Drawings 1, 5, 8; Photographs 73. 86, 92-93, 118). This wall had been reduced in height at the time the building was demolished to the same level as the top of the adjacent concrete loading platform (Context 40), which has a height of 0.65m above the adjacent road level and abuts Wall 35 at its corner with the eastern wall of the building (Context 32). To the inside of the building it is 1.65m down to the concrete floor inside the building (Context 6). The wall has a thickness of 0.42m, was built of limestone blocks and irregular pieces that are rough coursed; it has lime mortar and was rendered on the inside (early 20th century).

The western half of this wall had been removed prior to 2018, probably when a pit was dug over the north-eastern hole in the Level arching in the 1980s (Contexts 7, 24).

36: Deep Ecton Level – Outer iron door (Drawings 2, 7; Photographs L2, L17-18, 5, 156). Installed after the Level was reopened in 1984, this outer iron door, which opened inwards, comprises seven vertical bars set in a frame, with five horizontal plates to prevent the bars being prized apart for illicit entry. Surrounding the door is a second iron frame, with two additional bars to either side, fixed above to the outer beam of Context 38 and the walls of the Level to the sides; below is a small gap to keep the gate and frame out of the water. The gate has a sturdy horizontal draw bar to the inside with a surrounding box open at the ends designed to prevent the padlock being easily cut off. It was temporarily removed in 2018 for shot-blasting and galvanising (late 20th century).

37: Deep Ecton Level – Inner iron doors (Drawings 2, 7; Photographs L3, L17, 5, 19, 21, 156). This blocking, installed after the Level was reopened in 1984, is made of sturdy iron/steel plates, until 2018 was fastened to the 1884-85 wooden doorframe (Context 27), and comprises two doors with angle-iron around the edges that opened outwards, hinged to an outer iron frame that until 2018 was fastened with coach bolts to the pre-existing wooden doorway. There is a sturdy horizontal draw bar to the inside that could be padlocked shut and an additional long draw bolt that goes downwards to a hole in the base of the outer frame. It was temporarily removed in 2018 for shotblasting and galvanising; as the wooden doorframe was removed in Oct. 2018, it is now fastened directly to the level walls (late 20th century).

38: Deep Ecton Level – iron beams, upper iron barred frame and support timbers (Drawings 2, 7; Photographs 54, 59, 129-32, 156). Two U-section iron beams of 1980s date have been set above head height into the walls of the Level in its outer part extended in the 1918-32 period. The inner one is face downwards, while the other is upwards and held an iron framed set of vertical bars that match the outer door below (Context 36). There were four bolts that went through the beam and secured the upper frame of the outer door. Resting on both beams and passing between the bars were 12 smooth-planed timber beams inserted in the 1980s to support the collapsing arching directly above (late 20th century).

39: Deep Ecton Level – Site of central dam (Drawings 2, 7, 8; Photographs L4, 140-41). The site of a brick dam installed across the Level in the 1918-32 period is indicated at the Level walls by 48-50cm wide gaps in the render; at the floor, under the water, the basal brick course remains. The other two dams across the Level were not affected by the 2018 work and were not given context numbers; one lay at the outer end of the flanking walls of the Level (Contexts 18, 19) and the other was placed well into the Level beyond the area affected by the 2018 work. Between all three dams the walls of the Level were rendered to the top of the side drystone walls to make them watertight (parts of which in the outer section have subsequently weathered); the whole created two deep water storage reservoirs for the creamery (early 20th century).

40: Northern Creamery Building - Unloading platform (Drawings 1, 8; Photographs 68, 148-50). The roadside platform has concrete walls and top; it is 12.65m long, 2.25m wide and 0.65m high; nothing was removed in 2018. An old photograph (Porter and Robey 2000, p. 237) shows that the platform was used for unloading milk churns from lorries (early 20th century).

41: Northern Creamery Building – Interior fill (Drawing 1; Photographs 56, 68, 70-72, 146). The whole of the interior of the Northern Creamery building, in the southern part of the building affected by the 2018 removal, was filled with material resting directly on its concrete floor and rising to the largely-flat land surface at the level of the top of concrete platform to the east (Context 40). In the lower parts this fill included much demolition rubble; with limestone blocks and irregularly-shaped pieces; lumps of concrete, some of which were large; machine-made bricks; and mortar. Small finds included a flattened galvanised watering can and a flattened galvanised bucket. The upper fill comprised soil and many lumps of calcrete and loose limestone chatter, all presumably imported from the calcrete quarry across the road to provide enough material to fully fill the interior of the part-demolished building. The both fills were consistent with demolition of the building relatively soon after the creamery closed in 1932 (early 20th century).

The most common bricks were stamped with PB C^{o} L^{td} and a code letter B beneath, both in the frog. These were made for the Potteries Brick Co, which operated from the late 19th century to 1966, with its office in Handley, which was a marketing and sales merchanting company for a group of at least 17 of the Potteries' area brick producers. The company itself did not have a manufactory but must have had arrangements with the respective producers for them to press their wares with the P B Co. stamp. Each manufacturer was given a specific allocation of code letters to use, but which letters were used by each producer remains unclear (David Kitching pers. comm.). Other bricks, with only single examples identified, were stamped 'GLOSSOP', 'CBS' and 'WALL GRANGE', which

were respectively made by the Glossop Brickworks Company Ltd, the Cobridge Brick & Marl Company Ltd and the Wall Grange Brick and Tile Company Ltd.

42: Northern Creamery Building – 'Trough' (Drawings 1, 8; Photographs 75-76, 80-81). Set against the western wall of the Northern Creamery Building, to the inside, and slightly raised from the concrete floor which did not extend beneath it, was a long trough that was 23cm wide and 13cm deep, presumably for used for milk or whey. This comprised a series of stoneware half-pipes set end to end into mortar, with this 70cm wide mortared plinth having a flat top that was raised *c.* 3cm from the concrete floor of the building (Context 6). It ran for at least 3.3m northwards, from the northern end of the machine plinth (Context 43) to the edge of the area exposed, and continued beneath the backfill of the building here (Context 41). When this feature was demolished it could be seen that the half-pipe was placed in the mortar when this was still wet (early 20th century).

43: Northern Creamery Building – Machine plinth (Drawings 1, 4, 8; Photographs 17, 75, 77-78, 83, 87). In the south-west corner of the Northern Creamery Building, within the western wall (Context 5) but protruding into the interior of the building, was a concrete plinth, with fine inclusions within its mortar and two visible bricks within it. There were four small fastening-down bolts set in a rectangle protruding vertically from its upper face; the character of the machinery that was fastened here is not known. This plinth was rectangular, *c.* 110cm by *c.* 60cm in plan and *c.* 25m high, with a part protruding horizontally by a further *c.* 20cm in the south-east corner. Immediately to the west of the plinth there was a single-brick thickness brick wall which formed the outer face of Wall 5 here, while to the interior there was no wall above the plinth and whatever the plinth supported was thus in a recess in the wall. The base of the plinth was coincident with the level of the upper surface of the concrete floor of the building and this ran beneath it (Context 6). When the plinth was recognized *in-situ* during machine stripping the top was covered in topsoil and the bolts were not recognised and details were recorded on the spoil heap. Upon removal it could be seen that the plinth had been cast *in-situ* with impressions to be seen of the brickwork it was set against to the western side and there was shuttering beneath and to the north end. The four bolts ran right through the plinth and beneath this they had been set into holes with lead. At the top the bolts were corroded but it could be seen they were threaded (early 20th century).

44: Northern Creamery Building – Deep pit under floor and its fill (Drawings 5, 6; Photographs 86-87, 90, 120). A deep, steep-sided, pit under the concrete floor of the Northern Creamery Building, cut into the 1884-85 'cut and cover' backfill (Contexts 11, 16), was identified during machine stripping on the 18th October; its edge had not been intersected during the stripping on the 10th October, indicating the pit did not extend this far southwards. A clear cut-edge was visible where the pit truncated Contexts 10 and 11, but to the west the interrelationship of Contexts 16 and 44 was less clear and these could be postulated as two contemporary tipped deposits (but see below). The fill of Pit 44 comprised large- to medium-sized limestone blocks and irregular pieces in a grey soil, with quite a few machine-made bricks and sherds of a stoneware marmalade-type jar and other ceramic sherds. While this feature obviously predated the floor of the Northern Creamery Building, its exact date is uncertain; however, bricks and jar suggest a date in the early 20th century, with the fill being primarily demolition rubble and placed here immediately prior to the erection of the Northern Creamery Building in its present form. There was a two compartment building here in 1919 when the Ordnance Survey made their revisions to the 25 inch to a mile map. However, a photograph of 1924 shows one

continuous building with no break in roof line or obvious butt joints (Porter and Robey 2000, p. 37). There is no known building activity on site between 1889 when the mining ceased and 1918 when the creamery was started, and nothing existed here when the site was photographed in 1912 (Barnatt 2013, p. 268), so perhaps the Northern Creamery Building was first built in 1918-19 but had been radically remodelled or rebuilt by 1924, although why a deep pit would have been dug in the process is not clear (late 19th century or early 20th century).

45: Deep Ecton Level – Orange-brown subsoil with small stones (Drawings 2, 5; Photographs 87, 90, 98, 103, 109, 111-12, 119, 123-25). This layer is very similar in character to Context 11 but its position, and the presence of Context 50 beneath it, indicate that it is an *in-situ* natural subsoil. It comprises a layer of loose sand with many small stones that is about 2.4m thick and is fairly homogeneous throughout. The layer was first identified near the base of the main excavation pit to its north-west side when it was enlarged on the 18th Oct, where the bottom 0.7m comprised this material. A short distance away, when the bulge in the north-western wall of the Level was removed, it was also found at the top of the cut made to construct the Level in 1884-85, which is roughly coincident with the base of the main excavation pit, extending downwards to near it base where it overlay the natural silty-clay of Context 50. In total the trench cut of the Level was *c.* 1.8m deep but with the bottom not seen in 2018 as the bottom two courses of stonework were not removed (natural).

46: 'Pit' cut into Context 11 and its fill (Drawings 4, 5; Photographs 49, 85). This feature was only seen clearly in the south-eastern trench edges at the end of machine stripping on the 10th and 18th of October. On the 10th October the 'feature' appeared to a be round-bottomed pit or trench, with a mottled grey soil fill, cut into Context 11; it was not clear whether the feature also cut Layer 10 or was overlain by this. However, on the 18th October the feature was larger, the profile appeared less regular, the soil contained some small stones, and there was a lens of the orange-brown soil of Context 11 partially overlying it (probably late 19th).

47: 'Pit' cut into Context 11 and its fill (Drawings 4, 5; Photographs 85, 117, 122). This feature was only seen clearly in the south-eastern excavation pit edge at the end of machine stripping on the 10th October and later on the 18th of October, again at the excavation pit edge. On the 10th October it comprised an amorphously-profiled feature with only a steep edge to the north side, which had a lower fill that looked distinctively tip-line like and comprised a deposit of small limestone of 2-5cm size, with some voids between. Elsewhere in the lower fill there was a dark soil, while above there was a dark grey soil, with all surmounted by Layer 10. However, on the 18th October the fill was more mixed with two larger stones and the whole was surmounted by a large lens of Layer 11 material (late 19th century).

48: Deep Ecton Level – Drystone wall above the 1884-85 arching (Drawings 1, 2, 7; Photographs 99, 101, 103, 106, 116, 119, 121, 123-25). This crude drystone wall, which is up to 0.6m high to the south-east side, was built directly over the arching of the Level (Context 18) adjacent to the modern north-eastern hole in this above its inner end (Context 24). To the south-east side it comprised 4-6 courses, stood *c.* 0.7m high, and ended vertically at a point coincident with the edge of the trench dug the repair the bulge in the north-west wall of the Level (Context 23), which is presumably close to the edge of the vertical trench edge cut in 1884-85. It was only 1-2 courses high at the apex of the arch

and looked damaged or unfinished at the north-west side. To both sides it rested on the packing stones (Contexts 49, 51) behind the wall facings of the Level (Contexts 18, 19). It is interpreted as a wall built to hold back covering material added as a section of Level arching was completed, indicating that the Level construction and 'cut and cover' backfilling of 1884-85 had started to the north-east end, presumably near the other side of the road where the hillside and main Deep Ecton Mine main waste tip starts to ascend. Thus, this backfilling was completed in stages that started at the north-east end of the hole dug for the rebuilding and was finished at the wall while work was ongoing further towards the portal (late 19th century).

49: Deep Ecton Level – Stonework behind the NW side of the Level (Drawing 2; Photographs 98, 110-15). This material is identical with that of Context 51 to the south-east side of the Level. At the top it comprises rubble made up of large to medium sized limestone blocks resting at a variety of angles with voids between them, which extended upwards to a point roughly coincident with the apex of the arching (Context 20). In the section removed in 2018, the stonework of Context 49, where it descended behind the Level side wall (Context 18), mostly comprised large stones, of identical character to the facing stones, which were laid in roughly horizontal courses to be wall-like. However, to the south-western end of trench cut in 2018 where Context 49 was removed, the stone became less regularly placed and include more stones that were smaller, showing that the neatness of the stone placing was not consistent. The only small finds in the part of Context 49 that was removed were three broken ceramic roof tiles in a cluster, close to where a piece of identical tile had been used to level the coursing of the facing stones; the implication is that the facing stones and stonework behind were added at the same time. The stones of Context 49 butted neatly against the vertical 1884-85 cut in the natural (Contexts 45, 50) and their introduction was clearly designed to make the Level wall as stable as possible. The depth of the rubble dump as recorded on Figure 2, but including that at the top removed earlier in the day, was 1.85m and it almost certainly extended a further 0.30m to the base of the wall. The neatness of the cut-side dug into the natural, and its relationship with the stone introduced, shows that there was only a short interval of time between the cut being dug and it's infilling with stone as the Level was built. As the facing stone of the Level and the stonework behind was removed in 2018, it could be seen that only the facing stones had moved when the bulge in the wall developed, while the stonework behind remained as built, leaving wider voids at the interface (late 19th century).

50: Deep Ecton Level – Silty-clay subsoil in Level construction trench (Drawing 2; Photograph 124). This layer, which comprises a sticky silty-clay of pale orange-brown colour, was seen near the base of the 1884-85 trench when the bulge in the north-western wall of the Level was removed, overlain by the natural sandy deposit with small stones of Context 45. It only became apparent when the lower part of the trench was cleaned and slightly cut back immediately prior to rebuilding the Level wall. A depth of 0.25m was observed but the bottom two courses of the Level wall were left in place and its actual depth is not known. The deposit is consistent in character with being part of a natural river terrace, whereas Context 45 may be derived from the now grass-covered scree deposit on the lower slope of the steep hillside that is exposed in the nearby calcrete quarry (natural).

51: Deep Ecton Level – Stonework behind the SE side of the Level (Drawing 2; Photographs 99, 101). This material is identical with that of Context 49 to the north-west side of the Level. It comprises rubble made up of large to medium sized limestone blocks resting at a variety of angles, with voids between before these were infilled with soil in the process of digging the trench here in 2018. These stones were added behind the facing stones of the Level side (Context 19) and above up to a point roughly coincident with the apex of the arching (Context 20). Only the top *c.* 0.50m of the rubble of Context 51 was removed in 2018, in a band that was *c.* 0.40m wide from the Level wall outwards; beyond here it remained un-investigated. If this side of the trench cut to rebuild the Level in 1884-85 matched that to the north-west, then the cut edge would have been *c.* 0.25m to the south-east. While the direct relationship between Context 51 and Context 11 was not observed during machine stripping, the latter almost certainly lay directly above and thus confirms Context 11 is redeposited material associated with the 'cut and cover' trench dug when the Level was rebuilt in 1884-85 (late 19th century).

52: Creamery Outbuilding Terrace (Drawings 1, 8; Photographs C26-31, 1-2, 4). This flat-topped terrace lies between the road and the lower Railway Siding Terrace to the west (Context 34). It is just over 7m wide and in its southern half it comprises a yard with concrete floor. This yard is bounded by: the wall to the roadside at a higher level to the east; to the south by a right-angled continuation of this wall and then an iron railing, with flights of steps up to the road and down to the deep hollow immediately south of the yard; to the west by a retaining wall where the land drops to the Railway Siding Terrace; and to the north by the Creamery Outbuilding. The wall to the east and south sides of the yard rises to above road level and is capped horizontal concreted slabs, except where this has collapsed at the south-east corner. At its northern end there is a gap in the wall with a flight of four concrete steps with total height of just under 1.00m, abutted to the outside of the Creamery Outbuilding (Context 30), which gave access from road to yard; there is a second flight of four concrete steps to the south. The nearby longer flight of steps down from the yard to the hollow below is currently inaccessible. The retaining wall to the west was originally *c.* 0.9m high and in parts is very ruinous and extends northwards beyond the yard. The northern half of the Creamery Outbuilding Terrace is largely taken up by the Creamery Outbuilding, except to the west where the concrete floor extended between the building and the retaining wall to the west, and to the north where it extends to the Northern Creamery Building (early 20th century).

Only the northern half of this terrace was disturbed in 2018, when the Creamery Outbuilding was largely removed, together with parts of its concrete floor and the extension of this outside the building on the western and northern sides.

53: Concrete platform on the Railway Siding Terrace (Drawings 1, 4, 5, 8; Photographs 3, 10, 12). This concrete platform lies on the Railway Siding Terrace (Context 34) to the north, on its eastern side where it is abutted the Northern Creamery Building. It is 5.50m long, 1.45m wide and 1.15m high. The platform was not disturbed during the 2018 work, except for scratches made by the excavator bucket at the southern end, but Wall 4 which abutted here was removed (early 20th century).

54: Concrete floor between the two Creamery buildings (Drawings 1, 4, 5, 8; Photograph 60). The small areas between the two creamery buildings, later occupied by the outside toilet (Context 31), had a concreted floor that was not properly seen during the machine stripping. Parts of it can be seen in section on photographs taken on the 10th and 18th October where it is similar in character to that further south at Context 52. They may well be parts of the same thing but the intervening area was machine stripped on 9th and 10th October without the link between the two being observed; this area had probably been fully removed by the pit dug in the 1980s at Context 7 (early 20th century).

Appendix 3: The Project Archive

The following items comprise the Restoration of the Deep Ecton Level Entrance Project archive:

1. This report.
2. A folder of context sheets and notes.
3. Field drawings on drafting film that form the basis of the digitally produced final Drawings 1-9 listed below.
4. Drawing 1 - a site plan at 1:500, in digital format, showing the features and excavation pit upon completion on 18th October (also included in Item 1).
5. Drawing 2 - a plan, elevations and cross sections of the affected part of the Level at 1:400, in digital format (also included in Item 1).
6. Drawing 3 - a site plan at 1:500, in digital format, showing the extent of the excavation pit on 9th, 10th and 18th October and the rebuilt parts of the Level (also included in Item 1).
7. Drawing 4 – a measured sketch section of the deposits and features cut through in the north-eastern section of the excavation pit by the end of Oct 10th at 1:500, in digital format (also included in Item 1).
8. Drawing 5 – measured sketch sections of the deposits and features cut through during excavation pit to the north-west and south-east sides of the pit by end of Oct 18th at 1:500, in digital format (also included in Item 1).
9. Drawing 6 - a site plan at 1:500, in digital format, showing the approximate extent of selected layers and fills exposed, and the positions of creamery pipework where known (also included in Item 1).
10. Drawing 7 - Interpretative drawing showing 19th century, early 20th century and 1980s features in the Level, in digital format (also included in Item 1).
11. Drawing 8 - Interpretative site plan showing 19th century, early 20th and later features, in digital format (also included in Item 1).
12. Photographs - a folder of digital JPEG photographs of the outer part of the Deep Ecton Level, taken before the work was undertaken, with appended catalogue of these.
13. Photographs - a folder of digital JPEG photographs of the Creamery Outbuilding to be demolished, taken before this happened, with appended catalogue of these.
14. Photographs - a folder of digital JPEG photographs of the work in progress in October and November 2018, and archaeological features revealed during excavation, with appended catalogue of these.

These items have been supplied to the following organisations as follows:

- Ecton Mine Educational Trust: Items 1, 4-14.
- Historic England: Items 1, 4-14.
- The County Archaeologist at Staffordshire County Council: Items 1, 4-14.
- The Peak District National Park Cultural Heritage Team: Items 1, 4-14.
- Archaeological Data Storage, York: Item 1.

Copies of Items 1-14, and all photographs as both RAW and JPEG images, have been retained by John Barnatt.

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