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BRITISH FLUORSPAR LTD

TEARSALL QUARRY,
WINSTER,
DERBYSHIRE

REPORT ON ARCHAEOLOGICAL WORKS 2013-2017

JUNE 2019

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Wardell Armstrong LLP
Marconi Road, Burgh Road Industrial Estate, Carlisle, Cumbria CA2 7NA, United Kingdom
Telephone: +44 (0)1228 550575 www.wardell-armstrong.com

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British Fluorspar Ltd

Tearsall Quarry, Winster, Derbyshire

Report on Archaeological Works 2013-2017

PREPARED BY:

Sue Thompson and Cat Peters — Archaeological Supervisors

REVIEWED BY:

Frank Giecco — Technical Director

APPROVED BY:

Chloe Brownlee-Chapman — Regional Manager

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Figure 6: East Facing Section of Spoil Mound of Shaft 6/ Feature 117

SUMMARY

Wardell Armstrong LLP (WA) was commissioned by the client, British Flourspar, to produce a final document combining the results of several phases of archaeological works undertaken in association with the extension of existing Tearsall Quarry workings on Bonsall Moor, and to complete the project archive, in order to discharge the planning condition (Planning Condition 1; NP/DDD/0208/0104). This report outlines the different phases of archaeological work, comprising the initial archaeological monitoring of the soil strip prior to the quarry extension in 2013 and 2014, the post-blast photographic analysis of the quarry face undertaken between 2014 and 2017 and the final open area excavation of one of the known shafts, prior to the establishment of the final bund to mark the eastern limit of fluorspar extraction covered by this scheme.

The quarry extension lies within an area of known archaeological interest, with the potential for sub-surface archaeological remains to survive, ranging in date from the Romano-British/Medieval period through to the late 19th and early 20th centuries. The most probable remains likely to be encountered were post-medieval deposits/remains associated with lead-mining. This had been highlighted by the presence of existing features of this type and period, some of which had been previously accessed (TL Excavations Ltd 2007), and some revealed by an earthwork survey which had revealed previously unknown features (Cope-Faulkner and Hall 2007).

During the initial archaeological watching brief which monitored topsoil stripping in 2013 and 2014, sixteen features were encountered within the area. Ten of these were features of archaeological interest relating to earlier mining activities, four of which were previously unknown. This work has provided a rare opportunity to prove that as-yet unknown industrial remains of archaeological interest can survive sub-surface, leaving no trace at ground surface level.

After the archaeological monitoring of soil stripping in 2013 and 2014, photographs taken by the quarry manager after each phase of blasting were analysed by archaeologists at Wardell Armstrong, to assess the quarry face for any visible archaeological features revealed by the blasts. No features were identified during this work.

In March 2017, one mine shaft, previously investigated through exploration (TL Excavations Ltd 2007) and surveyed in 2007 (Cope-Faulkner and Hall 2007), was subjected to an open area archaeological investigation prior to its permanent partial burial/ demolition in the final phase of quarrying at the site. Although no structural remains were revealed, the investigation encountered a number of deposits relating to different phases of dumped deposits including

perhaps the initial sinking of the shaft, and/or possible continued extraction activity within the shaft. Except for the latest, these were restricted to the south side of the shaft and represented six phases of debris dumps. These deposits were the surviving remains of a spoil collar, and as such, Shaft 6/ Feature 117 was the only shaft encountered in the study area retaining such evidence. This open area excavation formed the final phase of archaeological work undertaken at Tearsall Quarry, in relation to quarrying at the site for fluorspar. No evidence of any other associated features were recorded.

Overall, the programme of archaeological work at Tearsall Quarry has facilitated the recording of 16 features, four of which were previously unknown, and has identified a surviving spoil collar at one of the shafts. No specific evidence for 16th or 17th century lead extraction activity was encountered however, despite the site's close proximity to the scheduled 'Northern Dales Mines (NHL 1021431) area which contain important and rare evidence of mining activity of these eras. The features encountered during this scheme are likely to have been of 18th or early 19th century origin. The lack of any associated features and evidence of ore processing linked to the size of spoil collars suggest that the recorded features on site represented an unsuccessful phase of prospection within the study area. The archaeological work at Tearsall Quarry has shown that further modern extraction works within the wider mining landscape have the potential to impact on as-yet unknown remains, and/ or increase our understanding of the known resource.

ACKNOWLEDGEMENTS

Wardell Armstrong (WA) thank British Fluorspar Ltd, for commissioning all elements of the project, and especially thank John McGough and Paul Dempster, for all their assistance throughout the work, and James Lawrance for his help on site. For the open area investigation phase, WA also thank Harvey Allan, quarry manager in March 2017. WA also extend their thanks to Sarah Whiteley and Natalie Ward, Peak District National Park Authority Archaeologists, for invaluable input throughout the work.

The archaeological watching brief was maintained by Cat Peters, Frank Giecco, Adam Slater and Sue Thompson. The photographic analysis of the quarry face was undertaken by Frank Giecco. The open area investigation was undertaken by Sue Thompson, Cat Peters and Fiona Lister. A watching brief report was written by Sue Thompson and Cat Peters in 2015, and an amended report was produced after the open area investigation phase in May 2017. This report incorporates these earlier drafts, alongside the post-blast photographic analysis work, and should be considered as the overall final document associated with the quarry extension works. The figures were produced by Adrian Bailey and Helen Phillips. The report was edited by Frank Giecco, Technical Director and approved by Chloe Brownlee-Chapman, Regional Manager. All stages of the project were managed by Frank Giecco.

1 INTRODUCTION

1.1 Project Circumstances and Planning Background

1.1.1 In May 2019 Wardell Armstrong LLP (WA) were commissioned to produce a final documentary report and archive to complete all phases of archaeological work at Tearsall Quarry in order to discharge the planning condition for the extension of the quarry (Planning Condition 1; NP/DDD/0208/0104). Though the original planning condition only outlined a requirement for archaeological monitoring, subsequent amendments to the scheme and resultant advice from the Peak District National Park archaeologists, resulted in the additional requirements for post-blast photographic analysis and an open area excavation targeting Shaft 6/ Feature 117. This final document and associated deposition of the archive for these works in accordance with professional guidelines and local planning authority requirements will result in the discharging of all archaeological conditions on the application for the extension of the quarry.

1.1.2 Tearsall quarry and the quarry extension lie within an area of substantial archaeological interest. Extant features, evidencing earlier mineral extraction, exist within the site boundary, including twelve shafts which were subjected to investigation (TL Excavations Ltd 2007). This 2007 investigation revealed that all twelve known shafts had been in-filled to some extent, but that those which were accessible provided no evidence of fire-setting, indicative of earlier workings, analogous with the adjacent Northern Dales Mine Scheduled Monument (Martin Bacon 2013). An earthwork survey undertaken in 2007 identified a further 43 possible archaeological features within the wider site boundary (Cope-Faulkner and Hall 2007). As a result of these findings, and because of the proximity of the Scheduled Monument of Northern Dales Mines (SAM 30945), which contain important and rare evidence of 16th and 17th century lead extraction, the Peak District National Park Authority (PDNPA) requested an archaeological watching brief during topsoil stripping, in order to record the archaeological evidence contained within the site, and to attempt a reconstruction of the history and use of the site. This is in line with government advice as set out in Section 12 of the National Planning Policy Framework (NPPF 2012) and with subsequent updated planning policies (MCHLG 2019).

1.1.3 Soil stripping was undertaken under archaeological supervision and all stages of the archaeological work was undertaken following the Standards and Guidance for

Archaeological Watching Briefs (CIfA 2008, and amendment of 2014), and consistent with the method statement (Martin Bacon 2013).

1.1.4 As part of the consent for extractive processes to occur, the blasting during the extraction of fluorspar was also subjected to archaeological monitoring, in the form of a photographic analysis of the rock face post-blast. This involved the archaeological analysis of photographs taken of the rock face after each blast. The methodology in place was that any archaeological features that were exposed during the blasting would be subsequently recorded using archaeological methods, prior to extractive processes or more blasting occurring.

1.1.5 As part of the final phase, and prior to the positioning of a final bund to mark the western limit of the extraction area and to provide a final barrier between the quarry and the public footpath to the west, a final open area investigation was required. This was because one of the features identified during the earthwork survey of the site in 2007 was due to be permanently buried by the perimeter bund. This was feature 117, one of only four of the known mining shafts in the area thought to have an extant spoil heap (Cope-Faulkner and Hall 2007, 2). The results of the access investigation, which targeted 12 of the known shafts within the site boundary, suggested that feature 117, referred to as Shaft 6, was one of only two mine shafts which may have been sunk to reach mineral levels, rather than sunk as an exploratory shaft (TL Excavations Ltd 2007). Because of the potential, therefore, for in-situ evidence of shaft-head activity surviving at this shaft in particular, and of the future permanent burial, or partial burial, of the shaft beneath a perimeter bund, the Peak District National Park Authority Archaeologist, as part of the permission, requested an archaeological investigation, prior to the positioning of the final bund. This took the form of an open excavation area, 8m by 8m, focused on the shaft head, to enable the archaeological recording of any surviving evidence for any such activity.

1.2 Project Documentation

1.2.1 The project conforms to a method statement, submitted by Wardell Armstrong LLP (Martin Bacon 2013) in response to a request by British Fluorspar Ltd, for an archaeological watching brief on the site. Following acceptance of this statement by the Peak District National Park Authority (PDNPA), WA was commissioned by the client to undertake the work. The method statement was adhered to in full, and the work was consistent with the Standards and Guidance for Archaeological Watching Briefs (CIfA 2008 and 2014). Subsequent work included the analysis of post-blast

photography, and this complied with advice by the PDNPA. The final stage of work, the open area excavation of Shaft 6/Feature 117, conformed to additional planning advice on 23rd August 2016 resulting from a site monitoring visit by PDNPA (M10213) which was for a '*detailed archaeological investigation*' of the shaft. An amendment to the original method statement was produced by Wardell Armstrong (Giecco 2017, paragraphs 5.8 to 5.10 within Martin-Bacon 2013) and approved by the PDNPA. This report, along with the associated archive, which will be deposited at a suitable repository, should complete the outstanding conditions and their completion should result in the final discharge of the archaeological conditions imposed on the quarry extension scheme at Tearsall Quarry.

1.2.2 This report outlines all of the archaeological work undertaken at the site, the subsequent programme of post-fieldwork analysis, and the results of all archaeological work in association with the quarry extension.

2 METHODOLOGY

2.1 Standards and Guidance

2.1.1 All archaeological work was undertaken following the relevant Chartered Institute for Archaeologists *Standard and Guidance for Watching Briefs* (CIfA 2008, revised 2014a), *Standard and Guidance for Archaeological Excavation* (CIfA 2014b) and the *Standard and Guidance for the Collection, Documentation, Conservation and Research of Archaeological Materials* (CIfA 2014c), and in accordance with the WA fieldwork manual (2013, revised 2017).

2.2 Written Schemes of Investigation

2.2.1 A method statement was submitted by Wardell Armstrong (WA) in response to a request by British Fluorspar Ltd, for an archaeological watching brief on the site (Martin-Bacon 2013), with subsequent amendment to include the excavation phase (Giecco 2017). Following acceptance of the statement by the Peak District National Park Authority (PDNPA), WA was commissioned by the client to undertake the work. All phases of the archaeological work were compliant with professional guidance, PDNPA guidance and with the method statements.

2.3 The Watching Brief

2.3.1 A watching brief was undertaken of soil stripping, to observe, record and excavate any archaeological deposits from within the quarry extension area. A watching brief is a formal programme of observation and investigation, conducted during any operation carried out for non-archaeological reasons, on a specified area or site on land, inter-tidal zone or underwater, where there is a possibility that archaeological deposits may be disturbed or destroyed (CIfA 2008).

2.3.2 The aims and principal methodology of a watching brief can be summarised as follows:

- to determine the presence/absence, nature, extent and state of preservation of archaeological remains;
- to produce a photographic record of all contexts using colour digital and monochrome formats as applicable, each photograph including a graduated metric scale;
- to recover artefactual material, especially that useful for dating purposes;
- to sample any environmental deposits encountered according to the WA standard sampling procedure and in consultation with appropriate specialists;

- to prepare a site archive in accordance with MoRPHE standards (English Heritage 2006).

2.4 The Open Area Investigation

2.4.1 The open area investigation was undertaken in March 2017, and followed amendments made to the method statement for archaeological mitigation at Tearsall Quarry. Paragraphs 5.8 to 5.10 stated that '*shaft 117 and its associated spoil collar will be subject to a detailed excavation. An area measuring approximately 8m by 8m will be recorded, centred on the extant shaft. The shaft is currently capped and was recorded in 2007 by TL Excavations, and due to health and safety considerations, the sleeper capping will not be removed during the archaeological recording of the site. The aims of this exercise are to record any evidence for shaft top activities. The first action will be to remove all modern overburden from the area of shaft 117, this will be done by a JCB 3CX under archaeological monitoring. Once the area has been cleared of overburden, the area will be surveyed by a survey quality Trimble R8 GPS system. The topographical survey will be followed by the excavation of a section across the spoil collar. The excavation will be undertaken by a JCB 3CX with a toothless grading bucket. The section will then be cleaned either side of the capped shaft and drawn at a scale of 1:10. Once the profile of the spoil collar has been recorded the spoil material will be fully removed from the study area around the shaft to either the top of an archaeological layer (other than shaft spoil) or natural geology. Following the removal of the spoil material, the area around the shaft will be cleaned by hand and recorded…*' (Giecco 2017 amendment in Martin-Bacon 2013)

2.5 Archive

2.5.1 A full professional archive has been compiled in accordance with the project specification, and the Archaeological Archives Forum recommendations (Brown 2011. The final archive has been deposited with Buxton Museum and Art Gallery, under accession number DERBS 2013.7 and utilising unique site codes, TQW-A and TQW-B. Copies of this final report will be sent to the PDNPA Archaeology Service, available upon request.

2.5.2 Wardell Armstrong LLP and the PDNPA, support the Online AccesS to the Index of Archaeological InvestigationS (OASIS) project. This project aims to provide an on-line index and access to the extensive and expanding body of grey literature, created as a result of developer-funded archaeological work. As a result, details of the results of this project will be made available by Wardell Armstrong, as a part of this national

project under the identifiers wardella2-152876, and for the amended updated final phase, wardella2-290266.

3 BACKGROUND

3.1 Location and Geological Context

3.1.1 Tearsall Quarry is located on the north-facing slope of Bonsall Moor, overlooking the Derwent Valley, within the Peak District National Park (NGR SK 26117 60111). The site is to the immediate west of the disused Tearsall limestone quarry workings and to the north of Tearsall Farm, 2km south-east of Winster and approximately 3.6km west of Matlock in Derbyshire (Figure 1).

3.1.2 The western extension area comprises four fields, until recently used for grazing, and defined by modern post and wire fencing and fragments of dry stone wall (Figure 2). Upland pasture and grassland surround the site.

3.1.3 The elevation of the site ranges from 320m aOD by 'Toothbrush Wood' to the south, falling northwards to 272m aOD on the lower northern boundary. The site entrance is at a height of 316m aOD.

3.1.4 This area of the Peak District National Park consists of superficial deposits of clay, silt, sand and gravel alluvium and a bedrock geology consisting of north-west to south-east aligned bands of Basaltic Lava, a lower Matlock Lava Member, and Eyam Limestone Formation. The western part of the area may have exposed dolomitic limestone from the Eyam Limestone Formation (BGS 2019).

3.2 Historical and Archaeological Background

3.2.1 ***Introduction:*** the following is a summary of the environmental statement which formed part 3 of the planning application for the proposed extraction of fluorspar ore and associated vein minerals (Hodgkinson 2008).

3.2.2 There are no Scheduled Ancient Monuments or Listed Buildings within the site. However, within the immediate area there are two Scheduled Ancient Monuments, the North Dale Lead Mine to the north and north-east of the site (NHLE 1021431), and the Mount Pleasant Lead Mine located to the north and north-west of the site (NHLE 1017756). There is one Grade II Listed Building to the north of the site, Wensley Hall (NHL 102777971). This is located in the village of Wensley, which, together with Wensley Dale, is included within the Wensley Conservation Area. The Lead Legacy report identifies the site within a High Priority Landscape; an area of historic lead mining remains that should be conserved.

3.2.3 There is some evidence for prehistoric settlement within the locality, including a possible Neolithic rock shelter at Bonsall Cave. Isolated finds of Neolithic and Bronze Age date and the presence of at least one Bronze Age barrow with burials represent further prehistoric activity in the wider area. No archaeological evidence for Iron Age activity is known in the vicinity, but the presence of two Iron Age burials at Winster, 2km west of the site boundary, suggests the potential for an associated Iron Age settlement in the region.

3.2.4 Romano-British settlement is represented in the area in the form of a possible enclosure complex (SMR 12709), which lies to the west of the site, and in the form of scattered artefactual material. The enclosure is substantial and was possibly associated with lead mining, although it has recently been suggested that '*in the Peak District, claims for Roman workings around Matlock Bath are 19th century tourist hype*' (Barnatt 2019, 13).

3.2.5 No early medieval remains are known from the area. Later medieval activity is largely indicated by the remains of ridge and furrow and lynchets, though lead mining is likely to have been an important element of the economy and mines located at Northern Dale and Tearsall are documented as active from as early as the 1530s and 1540s. The earliest known post-Roman mining activity occurred in the early 8th century in the Peak District and continued throughout the medieval period (Barnatt 2019, 13). The legacy of medieval mining across Bonsall Moor led to complaints in 1620 of cattle being killed by falling in the '*grove holes and olde pitts*' (quoted in Beresford and St Joseph 1979, 260).

3.2.6 Aerial photography has identified numerous archaeological features in the vicinity of the site. In particular, the possible Romano-British enclosure (SMR 12709), areas of medieval ridge and furrow and lynchets, and substantial evidence of past mining activities.

3.2.7 The earliest cartographic evidence accessed as part of the Environmental Statement (Hodgkinson 2008) was an 1840 Ordnance Survey map which shows numerous lead mines across Bonsall Moor, particularly on its northern edge where it dips down into Wensley Dale, and including several in the Tearsall area. The 1849 Tithe map is the earliest map to show the detailed layout of fields and the current field boundaries largely retain this same pattern. Nineteenth century Ordnance Survey mapping shows a large number of shafts related to lead mining within the site. The First Edition Ordnance Survey map of 1880 (25inch to 1 mile scale) annotates the area to the north

as '*Mountpleasant Mine (Lead disused)*' and the area to the north-east as '*Davis Mine (Lead disused)*', with tracks crossing the present Fluorspar site towards Davis Mine, perhaps suggesting the shafts within the site boundary were worked by that mine. The earliest mention of mining at Tearsall was an undated document within papers known to date between 1563 and 1639 and thought to predate 1633 concerning a dispute over the Tearsall Rake (Flindall 1974, 377). Mining in the Peak District was extensive by the 16th century, and reached its peak in the 17th and 18th centuries (Barnatt 2019, 14). The London Lead Company owned several mines in the area by the 18th century, and '*Davis Sough*' was described as '*nearly completed*' in 1783 (Flindall 1974, 379).

3.2.8 A study of the lead industry in the Peak District in 2004, and including '*Davis and Mount Pleasant Mines, and Basrobin Sough*', noted '*surface remains comprising hillocks along numerous small pipe and vein workings, many still relatively intact. There are many capped shafts, opencuts (some from 19th century reworking). The Mount Pleasant and Davis Mines are not documented as having been explored in recent times but may well be important… The site as a whole has extensive surface evidence for the relative age of mining, medieval strip lynchets/ridge and furrow and Romano-British settlements*' (Barnatt and Penny 2004, 85-86).

3.3 Previous Work

3.3.1 Extant features, evidencing earlier mineral extraction, exist within the site boundary, including twelve shafts which were subjected to investigation (TL Excavations Ltd 2007). This revealed that all twelve had been in-filled to some extent, but that those which were accessible provided no evidence of fire-setting, indicative of earlier workings, analogous with the adjacent Northern Dales Mine Scheduled Ancient Monument (Martin Bacon 2013). Three of the shafts (4, 5 and 7) were found to lead to accessible workings, the most extensive being those in Shaft 5, located in the south-west corner of the northernmost field. It was concluded that if mineral extraction was to take place, it would provide the best opportunity to investigate the deeper workings, particularly in the areas of Shafts 5, 6, 7 and 11. Shafts 5, 6 and 7 were all located in the northernmost Field 1, and Shaft 11, in the north-western corner of Field 3.

3.3.2 An earthwork survey undertaken in 2007 identified a further 43 possible archaeological features within the wider site boundary (Cope-Faulkner and Hall 2007; Figure 3). This referenced Shaft 6, one of the shafts accessed by TL Excavations in 2007

as Shaft 117. This is the shaft that was subjected to the open area investigation during the final phase of the present archaeological investigation.

4 ARCHAEOLOGICAL WATCHING BRIEF

4.1 Introduction

4.1.1 The watching brief monitoring was undertaken between the 7th May 2013 and 1st May 2014. The first phase of the monitoring occurred over eleven days between the 28th of May and the 29th of June 2013, followed by three days between 30th August and 2nd September 2013. The final phase of the watching brief occurred over twenty one days between 11th March and 1st May 2014.

4.1.2 The archaeological monitoring involved the supervised removal of all overburden layers down to either the superficial glacial tills or the limestone bedrock as part of the fluorspar extraction programme at Tearsall Quarry (Figure 2).

4.1.3 Features identified during the watching brief are summarised in Appendix 1. All figures can be found in Appendix 2 and colour plates are included in Appendix 3.

4.2 Results

4.2.1 The watching brief monitored the topsoil strip prior to the quarry extension of existing workings at Tearsall Quarry.

4.2.2 The watching brief monitoring was situated mainly within Fields 1 and 3, with a small area within the northern boundary of Field 2 (Figure 2). The soil-stripping using a 16-tonne tracked mechanical excavator fitted with a toothless bucket, and was undertaken in 4-5m wide linear strips, the excavated soil was deposited in bunds 3m wide and 2.5m tall surrounding the quarry site. Excess excavated soil was arranged in the southern part of Field 2, an area which was left unexcavated.

4.2.3 The topsoil consisted of a mid-dark brown silt which was an average of 0.15m in depth, overlying a mid orange-brown sandy clay subsoil, ranging from between 0.2m to over 3m in depth. Both topsoil and subsoil deposits were encountered across the site. In places, the soil strip revealed a thick degraded clay, and in others, the soil strip encountered a weathered fragmentary limestone sherd deposit with sandy patches, interspersed with boulders up to 0.8m in diameter, and overlying the limestone bedrock.

4.2.4 The depth of soil overlying bedrock deposits varied dramatically across the western part of Field 1, from 0.2m at the southern end, to over 3m towards the north. This was due to the presence of an east–west orientated mound of basaltic lava, overlying a

deposit of green clay toadstone above the limestone bedrock (Plate 18). A total of sixteen man-made features were encountered during the watching brief.

4.2.5 The first 12 features were identified during initial topsoil stripping in Field 3. These included Feature 3, which was a linear compacted crushed grey stone deposit running on a north-west/ south-east alignment. It was 1.2m wide and 0.3m thick (Plate 5). It is clear that this deposit was the make-up layer forming the pre-existing bridleway dating to between 1844 and 1899 which extended across the site, and as such, was of little archaeological significance. Features 4-8 were five small circular features which coincided with the locations of geological boreholes undertaken during initial analysis of the site as part of this scheme of works and, therefore, do not merit further discussion (Plate 1). Feature 9 was located in the north-eastern area of the site and was a roughly circular depression, measuring 1.7m east to west and 1.1m north to south and extended to a depth of 0.6m (Plate 6). Yellow and blue-grey clay were observed in the vicinity and British Fluorspar Ltd geologists advised that this was a sinkhole, formed from degrading dolomite clay, to create a natural geological void. There was no evidence for an archaeological origin. Feature 10 located on the eastern edge of Field 3, consisted of a deep void, between large boulders. The void measured 0.85m north-east to south-west and 0.2m north-west to south-east and extended to a depth of 2.7m. Geologists from British Fluorspar Ltd suggested it to be a natural gorge (sink hole) formed from water eroding the soft limestone.

4.2.6 The remaining features related to the mining heritage of the area. Feature 1 was a previously unknown roughly circular shaft lined with dressed limestone. It measured 0.8m north to south and 0.95m east to west and its top was encountered 0.6m below the present ground surface level. The shaft had been filled with large stones and boulders (Plate 2), and a dark black silty loam had formed around the surface. It was located beneath the field boundary dividing Fields 1 and 3 (Plate 3). The level of recording possible on the shaft locations was heavily compromised by health and safety constraints with the ground proving unstable around the majority of the surface workings following the topsoil stripping. These limitations on recording were discussed on site with both the Quarry manager British Fluorspar Ltd and Sarah Whitely of Peak District National Park Authority (PDNPA). Recommendations for alternative recording methodologies that may be utilised on future projects of a similar nature are proposed in section 7.2

4.2.7 Feature 2 was an irregular shaped large stone edged pit or shaft, in-filled with large stone boulders and a dark black silty loam. It measured 1.7m north to south and 0.76m east to west and was encountered at 0.55m below the ground surface level (Plate 4).

4.2.8 Feature 11 had been previously recorded in the earthwork survey of 2007 (Cope-Faulkner and Hall 2007, Feature 142), and was stripped in very wet weather. At the centre of the mound area, a darker roughly circular feature was exposed (Plate 8). This was investigated by mechanical excavator, and at a depth of *c*. 3m below ground surface level, beneath several boulders, a deep oval possible shaft opened up with narrow workings visible at the north and south edges. This measured approximately 1.7m north-south and 1.2m east-west (Plates 9 and 10). Unfortunately, it was unsafe to investigate fully, but no obvious evidence for any form of tooling could be seen in the sides of the bedrock-cut shaft. The full depth could not be measured, but it was likely to exceed 5m. The base was not visible from the surface.

4.2.9 Feature 12 consisted of a circular shaft measuring roughly 1m in diameter. This shaft had been previously recorded as Shaft 12 (TL Excavations Ltd 2007), and Feature 141 (Cope-Faulkner and Hall 2007), and had been previously capped with concrete blocks (Plate 11). Some in-situ ginging survived, however this was unstable and the shaft badly collapsed. The survey carried out by TL Excavations Ltd identified a large block jammed in the entrance to the shaft but did not investigate further. The soil strip exposed a void of unknown depth (Plate 12).

4.2.10 Four archaeological features (Features 13 - 16) were observed during the watching brief in the western half of Field 1, all of which consisted of stone lined shafts measuring roughly 1m in diameter. Of these, three had been previously recorded and one, Feature 13, was previously unrecorded.

4.2.11 Feature 13 was a shaft lined with in-situ limestone ginging of drystone construction, located approximately 14m south of Feature 16. There were no surface features associated with this shaft and there had been no attempt to cap the shaft. It is possible that the shaft had been backfilled with rough limestone blocks and a dark silty loam had formed across the entrance to the shaft. The shaft measured *c*. 1m in diameter and was excavated to 1m below the ground surface, where the stone lining was seen to continue. The depth of the shaft was not confirmed (Plate 13).

4.2.12 The remaining features seen during the watching brief had all been previously recognised and recorded. Feature 14 had been recorded in the earthwork survey (Cope-Faulkner and Hall 2007, Feature 114), and by TL Excavations Ltd as Shaft 8. The

shaft was defined by a small mound of stone chippings, and had been capped with concrete sleepers. The shaft was ginged to a depth of approximately 5m but this stone lining was unsupported above the level of the bedrock and therefore considered too dangerous to explore at depth (TL Excavations Ltd 2007). The internal diameter of the shaft at ground level measured 0.75m becoming wider lower down, and was at least 13m in depth (Plate 14).

4.2.13 Feature 15 was recorded during the earthwork survey as Feature 115 (Cope-Faulkner and Hall 2007), and by TL Excavations Ltd as Shaft 7 (TL Excavations Ltd 2007). This shaft, measuring 0.9m (Plate 15) was surrounded by a small mound to the south of the trackway (Feature 3), crossing Field 1, and had been capped by concrete sleepers. When these were removed, in-situ ginging was revealed. A wooden beam survived in-situ below the limestone ginging at a depth of 1.8m below ground surface, on the northern side of the shaft (Plate 16). This shaft was dug through basalt lava deposits, through soft green clay toadstone and into the limestone.

4.2.14 Feature 16 had also been recorded by the earthwork survey (Cope-Faulkner and Hall 2007, Feature 113), and by TL Excavations Ltd as Shaft 4. Like Feature 15, the shaft was surrounded by a small mound and capped using concrete sleepers. This shaft had an internal diameter of 0.8m and had in-situ ginging to a depth of at least 1.8m (Plate 17).

4.2.15 An earthwork in the northernmost corner of the site, a possible buddle dam, was noted in the earthwork survey (Cope-Faulkner and Hall 2007, Feature 118), but was not encountered during the watching brief due to its location beneath the boundary soil bund. This feature had also been damaged by the relocation of the footpath across the site, to follow the western boundary of the quarry extension area.

4.2.16 The eastern part of the quarry extension area was soil stripped in September 2013. No features were identified during the work. However, this was a period of very wet weather and due to the conditions, the machinery on site needed a large area to manoeuvre. In addition, a bulldozer was employed on site to remove waterlogged deposits and allow site access to the dump trucks. Slight features were therefore damaged or removed before the actual topsoil strip commenced.

4.2.17 This problem continued in the north-western portion of the site, an area of high archaeological potential, where increasingly limited space and ground conditions led to many of the features recorded in the earthwork survey, other than the shafts, not being identifiable during the watching brief.

4.3 Discussion

4.3.1 A total of 16 features were encountered during the watching brief monitoring of the soil stripping work. Seven of these were of no further archaeological interest; five were geological boreholes created during earlier geological analysis of the site (Features 4, 5, 6, 7 and 8) and two were naturally occurring geological features (Features 9 and 10).

4.3.2 Feature 3 was the recently re-routed public bridleway which had previously run across the site. A track was marked in this position on the Ordnance Survey Map of 1899 (Cope-Faulkner and Hall 2007), though not on earlier mapping.

4.3.3 The remaining features were of archaeological interest. Feature 11 had been referred to as a '*hillock*' in the earthwork survey text (Cope-Faulkner and Hall 2007, 4; Feature 142), and a '*mound*' in the feature summary list (*ibid*, 9), and as possibly marking the position of a shaft. The monitored soil strip showed it to be a vertical oval shaft, excavated directly into the bedrock and possibly excavated to exploit the same seam as Feature 1.

4.3.4 Feature 1 was a previously unrecorded mineshaft located beneath a later field boundary (Plate 3). The Environmental Statement, forming Part 3 of the Planning Application, indicated that the present layout of fields and field boundaries was in place by 1849 (Hodgkinson 2008, 95). The presence of a shaft beneath one of these field boundaries suggests that the workings had been out of use for some time before this, otherwise the shaft would have been visible and presumably avoided. This supports evidence from other sites in the area that the exploitation of lead in the Peak District had largely ceased by the late 18th and 19th centuries, earlier than that in the North Pennines, largely due to competition from there and abroad.

4.3.5 The origin of Feature 2 was less clear, though it may have been a stone-getting pit or exploratory shaft, explaining its unusual shape and limited depth.

4.3.6 Features 12, 13, 14, 15 and 16 were also stone lined (ginged) mineshafts. Of these, only Feature 13 was previously unrecorded. It was not within the remit of this stage of the project to access the shafts, which were unsafe, but they were archaeologically recorded in plan. No finds or dating evidence was recovered from any of these features.

5 POST-BLAST PHOTOGRAPHIC ANALYSIS

5.1 Introduction

5.1.1 A key reason for the requirement for an analysis of photography taken after each operational blast during the workings of the new quarrying, was to mitigate against a key threat, '*the removal of historic workings during subsequent quarrying or mineral extraction*' (Barnatt 2019, 5). The aim of the analysis phase was to check that no such historic workings were revealed by the blasts, and if they were, an archaeological team could be mobilised to record them prior to future blasts.

5.2 Analysis

5.2.1 During the blasting operations undertaken as part of the extraction of fluorspar between May 2014 and March 2017, post-blasting digital photographs were taken of the blast face and forwarded on to Wardell Armstrong for analysis.

5.2.2 Frank Giecco, Technical Director at Wardell Armstrong, received and studied these images. Should anything of interest have been noted in these images, the procedure was for archaeologists to attend the site and record the features, following health and safety protocol, prior to further quarrying activities or additional blasting occurring in those identified areas.

5.1 Discussion

5.1.1 No such archaeological features from any of the forwarded images were identified (Plates 19 and 20).

6 OPEN AREA EXCAVATION

6.1 Introduction

6.1.1 Between 27th and 29th March 2017, a small team of archaeologists undertook a targeted open area excavation to investigate a specific shaft, Shaft 6/ Feature 117 (NGR SK 25992 60397). This occurred prior to the final positioning of a perimeter bund to the extended quarry area, marking the limits of the quarry, to provide a permanent buffer between the deep excavations and a public right of way to the immediate west. The aim of the archaeological investigation was to record any surviving evidence for historic shaft top activities, identified as having the potential to be preserved beneath the possible surviving shaft-related spoil heap. This was of particular concern as the shaft was due to be, at least partially if not completely, permanently obscured by the perimeter bund.

6.2 Results

6.2.1 The work commenced with the removal of all modern overburden from the capped shaft head, to reveal the possible spoil collar. A topographic survey was then undertaken of the possible spoil collar area to record in plan, the levels prior to further excavation (Figure 5).

6.2.2 Following this, and under archaeological direction and monitoring, the western half of the 8m by 8m investigation area was removed, either side of the capped shaft, to reveal the natural geology (Plate 21). This exposed a section through the spoil collar, revealing a sequence of deposits relating to possible mining debris deposits (Figure 6). These are summarised in Appendix 2. Due to health and safety considerations, the shaft itself was not investigated.

6.2.3 A grey stoney clay deposit, the natural substrate (111), was overlain by a mid-brown loose soft silt recorded as being *c*. 3m in diameter and up to 0.22m in depth (110). This appeared to have been cut by Shaft 6/ Feature 117, and is likely to be the former topsoil surface pre-dating mining related activity in the area, preserved by the later deposits (109-101 and 100). Overlying this former topsoil (110) was a firm red-brown silty clay (109), measuring up to 0.22m in depth, and extending for a distance of 1.05m to the south of the shaft. This must represent the earliest dump of material associated with shaft activity. Above this was a mid yellow clay with silty sand inclusions (108) between 0.05 and 0.16m thick and overlain by a firm grey clay loam with silty small stone inclusions (107) of up to 0.1m depth. Both deposits were also only seen to the

south of the shaft. Deposits 110, 109, 108, 107 and 105 were sealed by a firm pale yellow gravelly silty clay (106), which measured between 0.16m and 0.24m in thickness. This was overlain by a firm variable black clay loam with paler clay lenses, also noted only to the south of the shaft and varying in depth from between 0.12m and 0.36m (105). These deposits (109, 108, 107, 106 and 105) were not noted on the north side of the shaft indicating that the earliest material from the shaft was removed and placed on its southern, rather than northern, side.

6.2.4 The upper deposit noted in the exposed east facing section of the spoil collar, was a firm mid-yellow silty clay with small stone inclusions and small fragments of fluorspar (104). This varied in depth between 0.2m north of the shaft and 0.4m south of the shaft. This deposit sealed the earlier deposits (109, 108, 107, 106 and 105), and must have been the final dumping deposit occurring as part of the shaft's active use. Overlying and abutting this deposit were five east-west orientated concrete sleepers, each measuring 2.5m in length, 0.26m in width and 0.16m in height (103) and these were laid once the shaft had been abandoned as a safety measure.

6.2.5 Overlying the southern two of the concrete sleepers capping the shaft (103) was a firm grey-brown silty clay which measured 0.15m in depth with small gritty stone inclusions (102). This was a modern dumped deposit and must post-date the capping of the shaft. Overlying this deposit was a loose very dark brown silty soil with root inclusions up to 0.06m thick (101). This was a recently buried turf layer, representing the pre-quarrying activity ground level, preserved beneath the recent bund. This bund comprised a moderate mid-brown mixed loam (100), that had been removed, prior to this phase of archaeological work. This bund was one of several marking the extent of the present quarrying activity, formed from the mixed topsoil and overburden that had been removed from the whole area under archaeological monitoring during the first phase of the archaeological work at Tearsall Quarry (*confer* Section 4).

6.2.6 No evidence for machinery, buildings, gin gangs or any other structures were revealed during the archaeological work, and no finds or organic matter was recovered that could have provided dating evidence.

6.3 Results

6.3.1 The open area excavation at Shaft 6/ Feature 117 provided the rare opportunity to investigate whether any evidence for historic-shaft top activity survived. None had been located at any of the other shaft features encountered during earlier phases of archaeological work as part of this project. The Earthwork Survey of 2007 had only

identified four shafts of the 55 within the study area at Tearsall Quarry with the potential to retain spoil heaps (Cope-Faulkner and Hall 2007, 2). The mine shaft investigative survey of 2007 highlighted Shaft 6/ Feature 117 as one of only two that may have been sunk to reach mineral levels (TL Excavations Ltd 2007, 26), so this was of particular significance.

6.3.2 Shaft 6/Feature 117 was due to be, at least partially, concealed by the final perimeter bund, to create a safe and permanent barrier between the area recently quarried for fluorspar and the public right of way to the immediate west. The aim of this archaeological work was to record any surviving traces of shaft-top activity before this bund was created.

6.3.3 Although no structural remains were revealed, the archaeological investigation did reveal a number of deposits which must have related to different phases of dumped deposits. These may have related to the initial sinking of the shaft and perhaps continued activity at the shaft. Except for the latest deposit, these were restricted to the south side of the shaft and represented six phases of debris dumps. The small size of these waste tips indicate that the shaft was only ever used for prospection and never the production of ore. These deposits were the surviving remains of a mining-era spoil collar and as such, Shaft 6/ Feature 117 was the only shaft encountered in the study area retaining such evidence.

7 CONCLUSIONS

7.1 Interpretation

7.1.1 Wardell Armstrong was invited by British Fluorspar Ltd, to initially maintain an archaeological watching brief at Tearsall Quarry, Winster, Derbyshire, during groundworks associated with the extraction of fluorspar at the western extension of the pre-existing Tearsall quarry. Subsequent operations and amended methodologies resulted in additional archaeological work, eventually including a post-blast photographic analysis phase, an open-area excavation targeting one of the known shafts and the final compilation of the project archive and summary report.

7.1.2 Tearsall Quarry lies within an area of substantial archaeological interest, with significant sub-surface archaeological remains surviving within the area, largely relating to post-medieval mineral exploitation.

7.1.3 The archaeological watching brief during topsoil stripping was required in order to establish whether archaeological features and deposits survived in the area, sub-surface, and to record any such features encountered in order to attempt the reconstruction of the history and use of the site. No dating evidence was found during the watching brief monitoring. However, the features encountered were consistent with 18th and 19th century lead mining activity and have added to the knowledge of this site that earlier surveys provided. It has shown that as-yet unknown industrial remains of archaeological interest can survive sub-surface, leaving no trace at ground surface level.

7.1.4 The post-blasting digital photographic analysis, undertaken in conjunction with the extraction of fluorspar between May 2014 and March 2017, revealed no new features. The open area excavation of Shaft 6/ Feature 117 in March 2017, did not encounter any evidence for shaft-top structures, but did reveal a number of waste tip deposits. These must have related to different phases of dumped deposits possibly relating to the initial sinking of the shaft and perhaps, continued activity at the shaft. These deposits were the surviving remains of a mining-era spoil collar and as such, the only one encountered in the study area retaining such evidence. This highlights the potential for other shafts within the wider mining landscape to retain similar evidence and perhaps even structural remains for shaft-top activity.

7.1.5 Overall, this archaeological work has encountered and recorded 16 features, four of which were previously unknown. This work has identified that the spoil collar survived

at one of the shafts, comprising six differing deposits, demonstrating six phases, however short-lived, of excavation/ activity within the shaft. No specific evidence for 16th or 17th century lead extraction activity was encountered, despite the site's close proximity to the scheduled 'Northern Dales Mines (SM 30945)' area which contain important and rare evidence of mining activity of these periods. The features encountered during this scheme are likely to have been of 18th or early 19th century origin. However, the findings do show that further modern extractive works within the wider mining landscape has the potential to impact on as-yet unknown remains and/ or increase our understanding of the known resource.

7.1.6 This report, along with the final deposition of the archive, culminates the archaeological work required in order to fulfil Condition 1 of the planning permission for the extension of quarrying activity at Tearsall Quarry and should be considered as the final discharge of this condition. The archive has been deposited in Buxton Museum and Art Gallery.

7.2 Recommendations on the use of different recording methodologies

7.2.1 Following the problems encountered in recording WA LLP have been asked to consider the possibilities of alternative recording methodologies being utilised in future projects of a similar nature. Each phase of works is addressed below, and the efficacy considered and, if applicable alternative methodologies considered.

7.2.2 The initial desk based study and walkover provided a solid baseline for the proceeding fieldwork. The lack of direct documentary evidence for the surface workings on the site is not surprising as the fieldwork confirmed that the features were unsuccessful prospection shafts, leaving little evidence on site other than the shafts themselves or within the documentary record. It is unlikely that any more intensive documentary research would have revealed any significant additional information. As mining related features (particularly pre 19th century) are not always obvious to the uninformed eye it is essential that this work is undertaken by a specialist with a firm understanding of mining related activities and the evidence that is left behind on the landscape.

7.2.3 The archaeological watching brief over the whole development area yielded five additional shafts that had not been picked up during the walkover and desk based study. No other features of any significance were recorded. This lack of any other surface activity encountered during the extensive watching brief does not mean this methodology was unsuccessful, but rather confirms a real lack of activity other than

the prospection shafts on site. Again, this work was undertaken by an archaeologist experienced in the archaeology of mining.

7.2.4 Where this methodology became problematic was when it came to the recording of open (or partially open shafts). The conventional approach to standard archaeological recording techniques could not be used, as the shaft locations were unstable which resulted in significant buffer zones being created around each feature into which no access was permitted. A possible alternative approach that could be used for the capped shafts that were visible as surface features, would be laser scanning. The capping could be partially removed (often concrete sleepers) and a laser scanner lowered down the shaft on a temporary A-frame. It is always preferential to undertake this work prior to the topsoil stripping phase as unprotected shaft locations could be heavily disturbed by the heavy earthmoving plant used in these operations. This is also a safer approach. Such a technique has been used successfully on similar sites, in the North Pennines, and can provide a useful 3D model of the shaft that could be supplemented by digital photography.

7.2.5 The recording of partially filled shafts is more problematic. Should laser scanning not be possible due to obstructions in the shaft there is no easy answer regarding the recording of such features. Should laser scanning be possible on a number of associated or similar features it may be deemed unnecessary to undertake scans of all shafts but instead, an agreed percentage of features could be sample recorded. For later 19th century shafts, should the feature be tied into a known mine plan, cross sections may already exist in the documentary record, making detailed survey of the feature unnecessary. In rare cases it may be deemed proportionate, due to a high archaeological significance, to undertake a full or partial excavation of the shaft. This work could only be progressed following a detailed structural and engineering solution that would allow a safe system of working to be proposed. To progress this work there would need to be a very robust research base to justify the considerable expense required to undertake such an exercise.

7.2.6 There will always be cases with such shaft type features that the health and safety constraints and mitigation measures required to facilitate such work make the full recording of such features prohibitively expensive. During the work at Tearsall Quarry outlined in this report, Shaft 6 was chosen for open area excavation. This work was undertaken to record the surface profile of the shaft and its spoil collar and aimed to find evidence of shaft top activity. In this instance no recording of the shaft itself was

undertaken as it had already been recorded historically. The methodology used in this approach was successful in recording the spoil collar and should any surface activity have been present (there wasn't) it would have been encountered and recorded.

7.2.7 The final phase of works that formed part of this recording programme was the analysis and commenting on post-blast photographs of the quarry face. The process of photographing each blast face and commenting on each set of images by Wardell Armstrong continued throughout the project. It was initially hoped that this approach would allow for the recording of shafts in section as the quarry face moved through the areas of known historic surface workings. The depth of blast between each exposed face proved too blunt a tool to allow for any vertical sections to be recorded through a 1.2m-1.5m diameter shaft. Not one of the known shafts or any mine workings were seen in any of the blast photos. As a result of the data recovered, this methodology must be regarded as a failure and the need for systematic recording of each blast photo must be called into question. An alternative approach would be to undertake intensive site toolbox talks to the quarry team and have a robust communication protocol put in place to enable call outs if necessary. .

8 BIBLIOGRAPHY

Barnatt, J, 2019, *The Archaeology of Underground Mines and Quarries in England*, Historic England: Swindon

Barnatt, J. and Penny, R, 2004, *The Lead Legacy: The Prospects for the Peak District's Lead Mining Heritage*, Peak District National Park Authority, English Heritage and English Nature

Beresford, M.W, and St Joseph, J.K.S, 1979, *Medieval England: An Aerial Survey*, Cambridge University Press: Cambridge

Brown D.H, 2011. Archaeological Archives: A Guide to Best Practice in Creation, Compilation, Transfer and Curation. Archaeological Archives Forum

CIfA, 2008. Standard and Guidance for Archaeological Watching Briefs. Reading Institute for Archaeologists

CIfA, 2014a. *Standard and Guidance for Archaeological Watching Briefs, updated*. Chartered Institute of Field Archaeologists: Reading

CIfA 2014b. *Standard and Guidance for Archaeological Excavations*. Chartered Institute of Field Archaeologists: Reading

CIfA, 2014c. *Standard & Guidance for the Collection, Documentation, Conservation and Research of Archaeological Materials* Chartered Institute of Field Archaeologists: Reading

Cope-Faulkner P and Hall R 2007. 'Earthwork Survey at Tearsall Quarry, Winster, Derbyshire' unpublished report by Archaeological Project Services

Flindall, R, 1974, 'A Survey of a Mine in Tearsall Rough, Wensley', in *Bulletin of the Peak District Mines Historical Sociery, Volume 5, Party 6, pp 373-382, October 1974*

Giecco, F 2017. 'Amendment to Method Statement for Archaeological Mitigation Recording during Fluorspar Extraction' unpublished report by Wardell Armstrong Archaeology

Hodgkinson D 2008. 'Planning Application Part 3: Environmental Statement' unpublished report by Wardell Armstrong LLP on the 'Proposed Extraction of Fluorspar Ore and Associated Vein Minerals by Open Pit Methods from Extension to the Workings at Tearsall, Bonsall Moor' for Glebe Mines Limited

Martin Bacon H 2013. 'Method Statement for Archaeological Mitigation Recording during Fluorspar Extraction' unpublished report by Wardell Armstrong Archaeology

MHCLG, 2019. *National Planning Policy Framework*. Ministry of Housing, Communities and Local Government: London

NPPF 2012. National Planning Policy Framework: Archaeology and Planning. Department for Communities and Local Government

TL Excavations Ltd 2007. 'Investigation of Mine Shafts at Tearsall Quarry' unpublished investigative report

WA 2013, revised 2017, Fieldwork Manual, unpublished internal guidance by Wardell Armstrong

Websites

British Geological Survey, 2019. *Geology of Britain Viewer,* http://mapapps.bgs.ac.uk/geologyofbritain/home.html, British Geological Survey, accessed (05/05/19)

APPENDIX 1: LIST OF FEATURES

Feature Number	*Summary*	*Type*	*Dimensions*	*Description*
1	Mineshaft	Structure	Roughly circular: 0.95m east-west; 0.8m north-south	A vertical probable climbing mineshaft of dressed stone, boulder in-filled
2	Stone-getting Pit or Exploratory Shaft	Structure	1.7m north-south and 0.76m east-west	Irregular-shaped stone edged feature with boulder in-fill and a black silty deposit
3	Bridleway	Track	9m; 1.2m; 0.3m	Linear compacted crushed grey stone deposit
4	Circular Hole	Geological Borehole	0.11m diameter; at least 5m deep	Deep circular hole angled at 27.5 degrees to north-west
5	Circular Hole	Geological Borehole	0.11m diameter; at least 5m deep	Deep vertical circular hole, 180 degree angle
6	Circular Hole	Geological Borehole	0.11m diameter; at least 5m deep	Deep vertical circular hole, 180 degree angle
7	Circular Hole	Geological Borehole	0.11m diameter; at least 5m deep	Deep circular hole angled at 27.5 degrees to north-west
8	Circular Hole	Geological Borehole	0.11m diameter; at least 5m deep	Deep vertical circular hole, 180 degree angle
9	Circular Depression	Probable Sinkhole	1.7m; 1.1m; 0.6m deep	Roughly circular depression with clay at base.
10	Chasm/ void	Geological Feature	0.85m; 0.2m; 2.7m deep	Rectangular deep chasm, geological origin
11	Mineshaft	Structure	1.7m; 1.2m; unknown depth	Oval vertical stone feature cut directly into bedrock. Feature 142 from Earthwork Survey (Cope-Faulkner and Hall 2007)
12	Mineshaft	Structure	Roughly circular: *c.*1m diam	A vertical climbing mineshaft of dressed stone. Feature 141 from Earthwork Survey (Cope-Faulkner and Hall 2007)
13	Mineshaft	Structure	Roughly circular: *c.*1m diam	A vertical probable climbing mineshaft of dressed stone
14	Mineshaft	Structure	Roughly circular: 0.75m diam	A vertical climbing mineshaft of dressed stone. Feature 114 from Earthwork Survey (Cope-Faulkner and Hall 2007)
15	Mineshaft	Structure	Roughly circular: 0.9m diam	A vertical climbing mineshaft of dressed stone. Feature 115 from Earthwork Survey (Cope-Faulkner and Hall 2007)
16	Mineshaft	Structure	Roughly circular: 0.8m diam	A vertical climbing mineshaft of dressed stone. Feature 113 from Earthwork Survey (Cope-Faulkner and Hall 2007)

APPENDIX 2: LIST OF CONTEXTS

Context Number	*Context Type*	*Depth*	*Description*
100	Deposit	0.3m	Modern bund material
101	Deposit	0.06m	Very dark brown/ black pre-bund topsoil
102	Deposit	0.15m	Grey-brown silty clay deposit south of concrete sleepers (103)
103	Deposit	0.16m	Concrete capping sleepers, 2.5m by 0.26m by 0.16m
104	Deposit	Max 0.4m	Firm yellow clay deposit- upper spoil collar dumping deposit
105	Deposit	Max 0.36m	Firm variable black deposit with paler lenses- spoil collar dumping deposit
106	Deposit	Max 0.24m	Firm pale yellow gravelly silty clay deposit- spoil collar dumping deposit
107	Deposit	Max 0.4m	Quite firm mid grey clay deposit- spoil collar dumping deposit
108	Deposit	Max 0.16m	Mid yellow clay with sand mixed deposit- spoil collar dumping deposit
109	Deposit	Max 0.22m	Quite firm red-brown silty clay- spoil collar dumping deposit
110	Deposit	0.22m	Soft mid brown loose silty deposit- pre mining topsoil
111	Geology	N/A	Firm grey-brown stony clay- natural substrate

APPENDIX 3: PLATES

Plate 1; Example of one of five geological boreholes encountered, Feature 4 - Looking north. 0.5m scale

Plate 2; Feature 1 - Looking south-south-east. 0.5m scale

Plate 3; Feature 1, with field boundary in background - Looking west-north-west. 1m scales

Plate 4; Feature 2 - Looking west-north-west. 1m scales

Plate 5; Feature 3 - Looking south-west. 1m scale

Plate 6; Feature 9 - Looking south-south-west. 2m scales

Plate 7; Feature 10 - Looking north-north-west. 2m scale

Plate 8; Feature 11 prior to stripping - Looking south-east. 2m scales

Plate 9; Feature 11 - Looking north.

Plate 10; Feature 11 - Looking south.

Plate 11; Feature 12 during soil strip - looking north. 1m scale

Plate 12; Feature 12 (Shaft 12), showing in-situ ginging and void - looking north. 1m scale

Plate 13; Feature 13 during soil strip - looking west. 1m scale

Plate 14; Feature 14 (Shaft 8) south east facing section – looking north-west. 2m scale

Plate 15; Feature 15 (Shaft 7) - looking south west. 1m scale

Plate 16; Feature 15 (Shaft 7) showing wooden beam supporting ginging - looking north

Plate 17; Feature 16 (Shaft 4) - looking south east. 1m scale

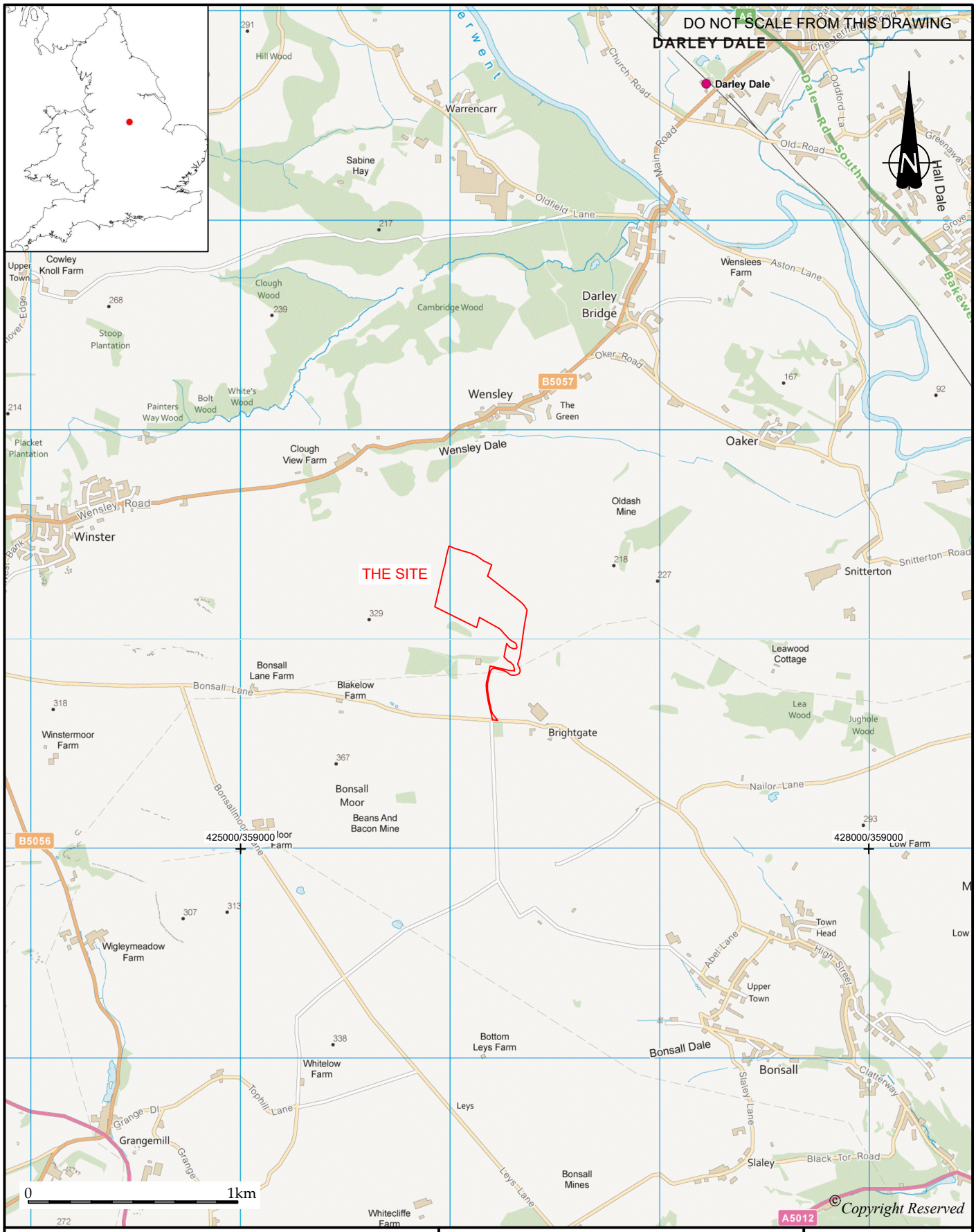
Plate 18; Basaltic lava mound - looking north

Plate 19; Example of post-blast photographic image

Plate 20; Example of post-blast photographic image

Plate 21; East facing section through Shaft 6/ Feature 117. 1m and 2m scale

APPENDIX 4: FIGURES



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PROJECT: Tearsall Quarry, Winster, Derbyshire	DRAWN BY: HP	CHECKED BY: FG	APPROVED BY: CBC
DRAWING TITLE: Figure 1: Site location			

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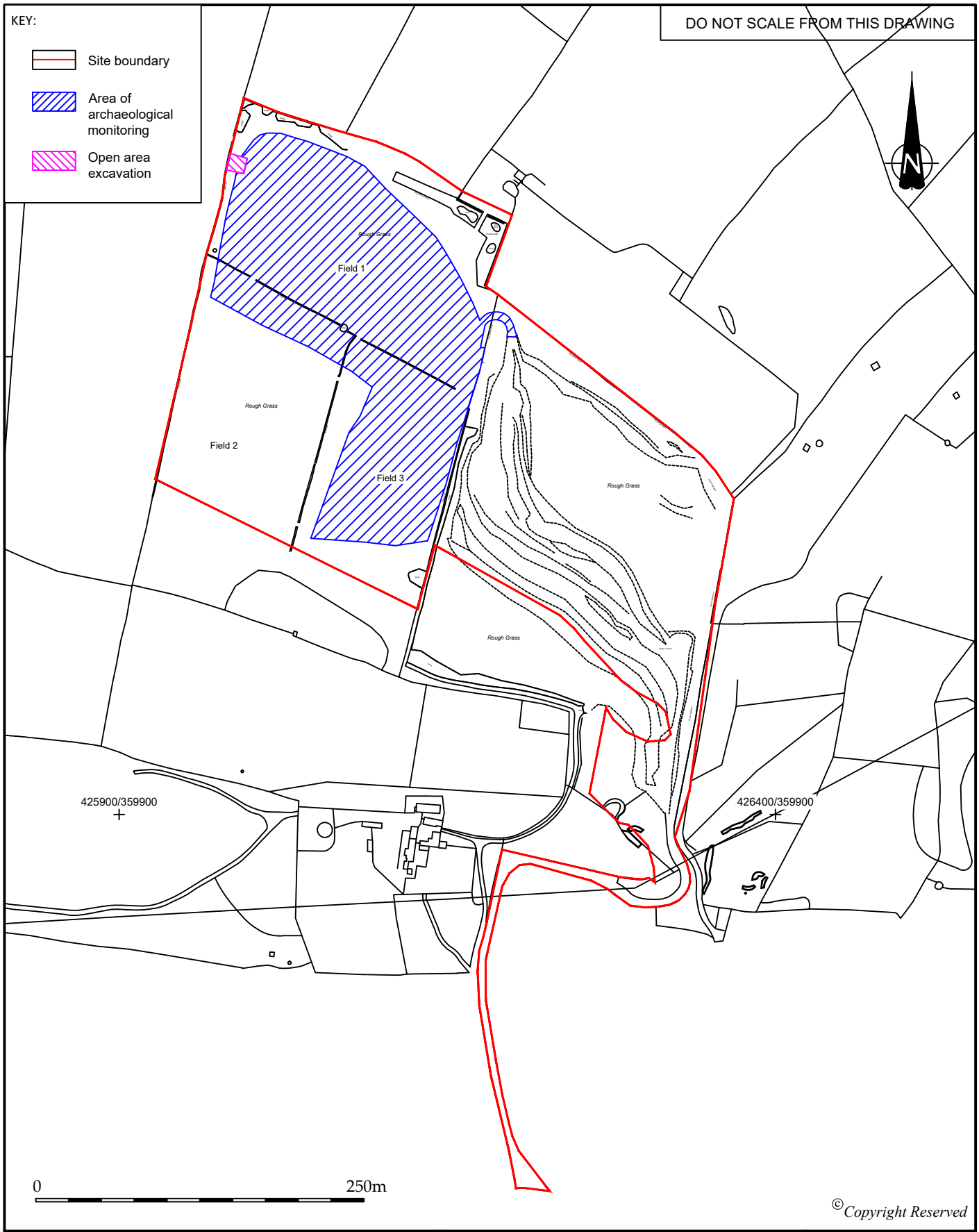

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Figure 2:
Location of areas subjected to archaeological works

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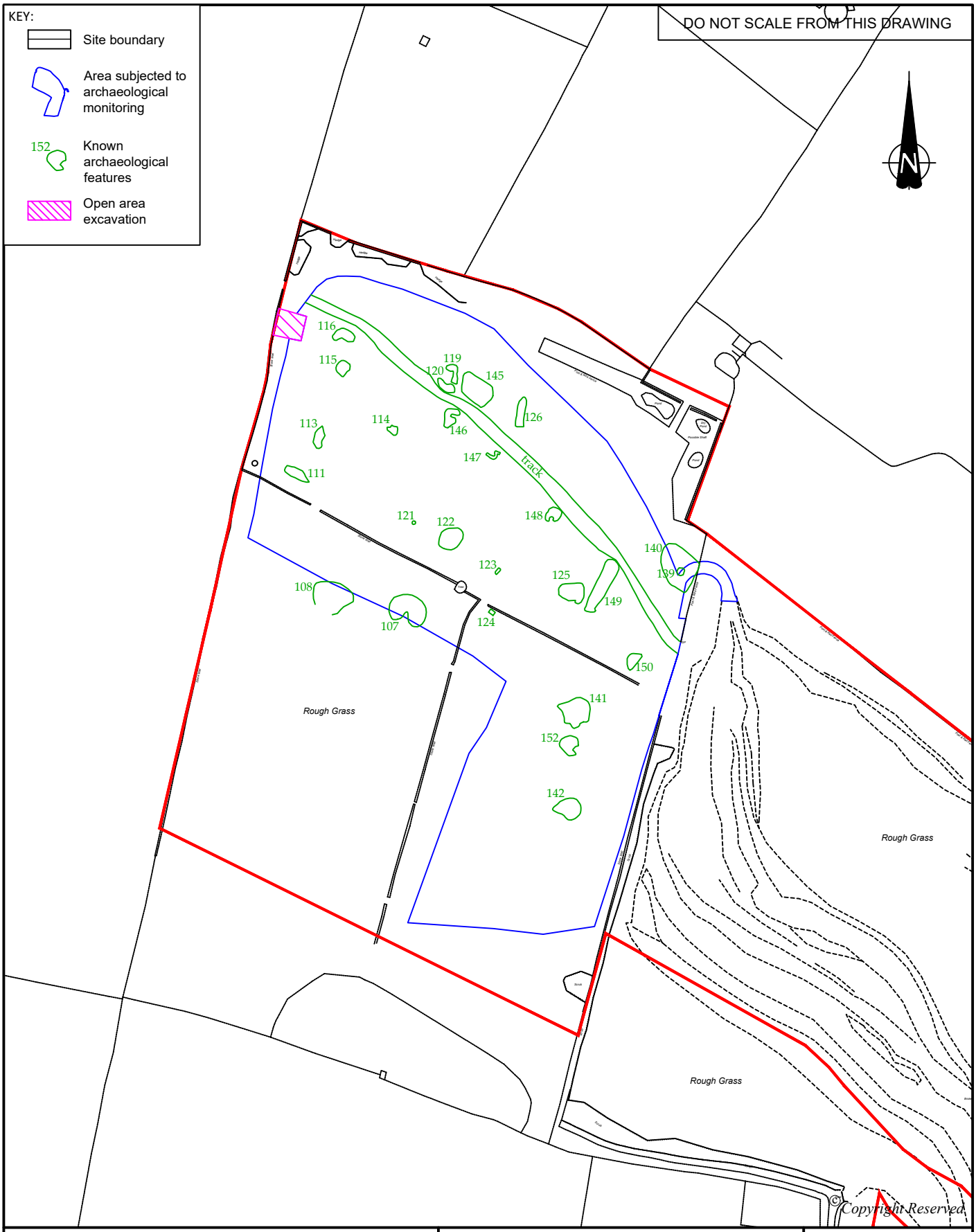

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	DRAWN BY: HP	CHECKED BY: FG	APPROVED BY: CBC

DRAWING TITLE

Figure 3:
Results of previous archaeological survey withing monitored area
(after Cope-Faulkner and Hall 2007)

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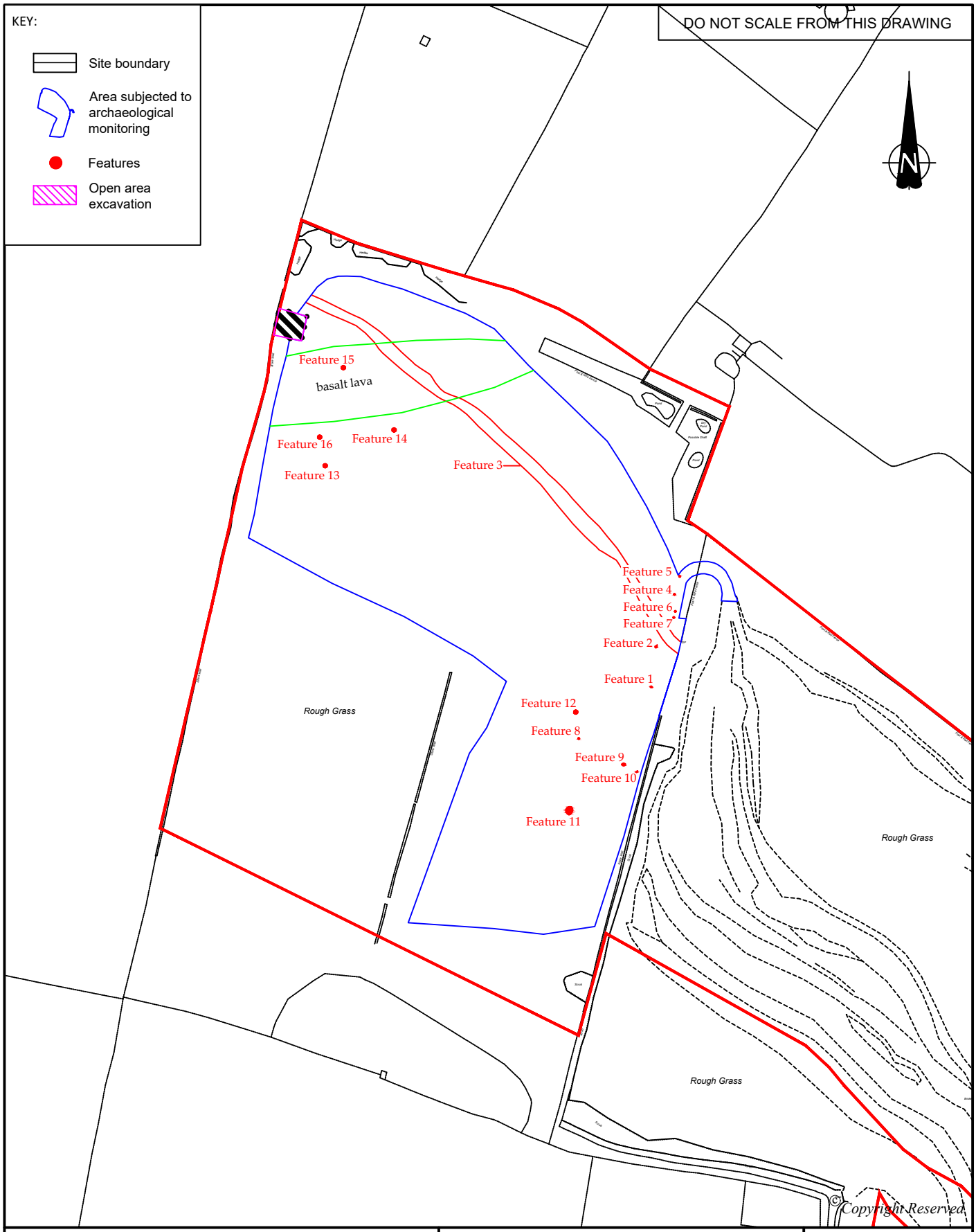

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Figure 4:
Results of archaeological monitoring

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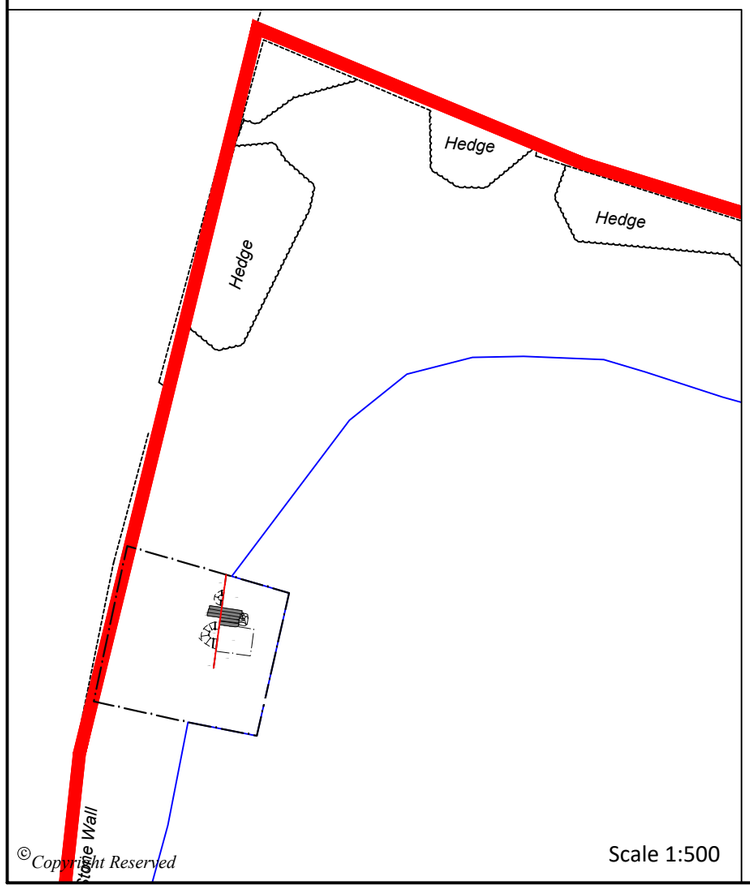

Scale 1:500

0 5m

DO NOT SCALE FROM THIS DRAWING

KEY:

(101) Context number

Section location

Limit of excavation

Concrete sleepers

REVISION	DETAILS	DATE	DR'N	CHK'D	APP'D

CLIENT

British Fluorspar Ltd

PROJECT

Tearsall Quarry,
Winster,
Derbyshire

DRAWING TITLE

Figure 5:
Plan of Shaft 6 (feature 117)

DRG No.		REV
CL12285-005		A
DRG SIZE	SCALE	DATE
A3	1:50	June 2019
DRAWN BY	CHECKED BY	APPROVED BY
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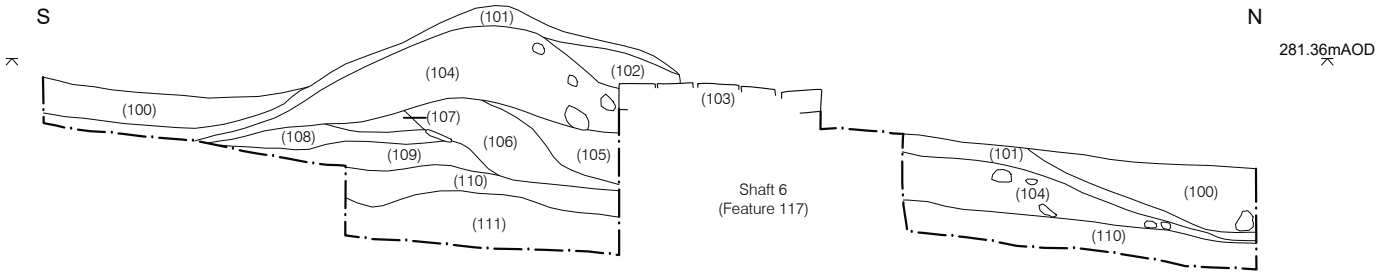

Section 2. East facing section across spoil mound around Shaft 6 (Feature 117).

0 2m

DO NOT SCALE FROM THIS DRAWING

KEY:

(101) Context number

Height mAOD

Limit of excavation

REVISION	DETAILS	DATE	DRAWN	CHK'D	APP'D

CLIENT

British Fluorspar Ltd

PROJECT

Tearsall Quarry,
Winster,
Derbyshire

DRAWING TITLE

Figure 6:
East facing section of spoil mound of
Shaft 6 (Feature 117)

DRG No	REV	
CL12285-006	A	
SIZE A4	SCALE 1:50	DATE June 2019
DRAWN BY HP	CHECKED BY FG	APPROVED BY CBC

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CARLISLE | TEL 01228 550 575
WWW.WARDELL-ARMSTRONG.COM
BIRMINGHAM LONDON
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wardell-armstrong.com

STOKE-ON-TRENT
Sir Henry Doulton House
Forge Lane
Etruria
Stoke-on-Trent
ST1 5BD
Tel: +44 (0)178 227 6700

BIRMINGHAM
Two Devon Way
Longbridge Technology Park
Longbridge
Birmingham
B31 2TS
Tel: +44 (0)121 580 0909

CARDIFF
Tudor House
16 Cathedral Road
Cardiff
CF11 9LJ
Tel: +44 (0)292 072 9191

CARLISLE
Marconi Road
Burgh Road Industrial Estate
Carlisle
Cumbria
CA2 7NA
Tel: +44 (0)122 855 0575

EDINBURGH
Great Michael House
14 Links Place
Edinburgh
EH6 7EZ
Tel: +44 (0)131 555 3311

GLASGOW
2 West Regent Street
Glasgow
G2 1RW
Tel: +44 (0)141 433 7210

LONDON
46 Chancery Lane
London
WC2A 1JE
Tel: +44 (0)207 242 3243

MANCHESTER (City Centre)
76 King Street
Manchester
M2 4NH
Tel: +44 (0)161 817 5038

MANCHESTER (Greater)
41-50 Futura Park
Aspinall Way
Middlebrook
Bolton
BL6 6SU
Tel: +44 (0)120 422 7227

NEWCASTLE UPON TYNE
City Quadrant
11 Waterloo Square
Newcastle Upon Tyne
NE1 4DP
Tel: +44 (0)191 232 0943

SHEFFIELD
Unit 5
Newton Business Centre
Newton Chambers Road
Thorncliffe Park
Chapeltown
Sheffield
S35 2PH
Tel: +44 (0)114 245 6244

TRURO
Baldhu House
Wheal Jane Earth Science Park
Baldhu
Truro
TR3 6EH
Tel: +44 (0)187 256 0738

International offices:
ALMATY
29/6 Satpaev Avenue
Regency Hotel Office Tower
Almaty
Kazakhstan
050040
Tel: +7(727) 334 1310

MOSCOW
21/5 Kuznetskiy Most St.
Moscow
Russia
Tel: +7(495) 626 07 67

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