WINDERMERE REFLECTIONS

MINES AND QUARRIES

BANK'S QUARRY, GREENHEAD GILL MINE, FAIRFIELD MINE AND PROVIDENCE MINE IN GRASMERE AND ELTERWATER

Community Archaeology Survey Report

Oxford Archaeology North

December 2013

Lake District National Park Authority and The National Trust

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Linking Lakes, Landscapes & Lives

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Prepared by:	Peter Schofield	
Position:	Project Officer	
Date:	December 2013	
Checked by:	Jamie Quartermaine	Signed……
Position:	Senior Project Manager	
Date:	December 2013	
Approved by:	Alan Lupton	Signed……
Position:	Operations Manager	
Date:	December 2013	

Oxford Archaeology North
Mill 3, Moor Lane Mills
Moor Lane
Lancaster
LA1 1QD
t: (0044) 01524 541000
f: (0044) 01524 848606

w: www.oxfordarch.co.uk
e: info@oxfordarch.co.uk

Janus House
Osney Mead
Oxford
OX2 0EA
t: (0044) 01865 263800
f: (0044) 01865 793496

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SUMMARY

Oxford Archaeology North (OA North) was invited by the National Trust and the Lake District National Park Authority to provide supervision and support to facilitate and enable a community archaeology project examining a series of mines and quarries within the Windermere lake catchment. The project was financed by the Heritage Lottery Fund and was one of three community surveys being undertaken as part of Reflections on History, one of nineteen projects taking place under the umbrella of Windermere Reflections. Windermere Reflections is part of a wider range of conservation and heritage themed projects in the Windermere Catchment Restoration Programme. The project was intended to undertake a series of detailed topographic surveys and desk-based analyses of former mines and quarries, while providing support and training for volunteers in areas such as archaeological survey and archive research.

Topographic survey was undertaken to identify, record, and describe any extant structures and features associated with four mines and quarries within the Windermere lake catchment: Banks Quarry, near Elterwater (NY 3147 0432); Greenhead Gill Mine, Grasmere, (NY 3497 0864); Fairfield Mine, Grasmere (NY 3400 0980); and Providence Mine, Grasmere (NY 3390 1050). The surveys were undertaken between the 8th April and 3rd May 2013. Desk-top survey of historical information pertinent to each site, including historical maps, and records held in the Armitt Library and Kendal Record Office took place on the 8th and 10th May 2013.

Banks Quarry is a representative example of the type of slate quarry that were prevalent across the Coniston and Langdale valleys, characterised by the outcropping of the Borrowdale Volcanic Series (BVS) rocks that provided the characteristic green slates. The rock was won from open quarries or adits following a narrow seam of good quality rock, and there were many separate quarry and processing areas concentrated in a localised area, each working a different part of the same seam. At the entrance to the adits or quarries were a series of riving sheds, where the coarse rock was cleaved into thin roof slates. Much of the rock that was quarried, however, was discarded, producing considerable spoil which extended over earlier workings.

Banks Quarry, formerly Wood / Dales Quarry, was first documented in 1829, and saw a period of significant expansion and was well developed by the time of the OS 1st Edition mapping in 1861. This golden period of slate working, fuelled by the demand for roofing materials for the workers housing in the expanding industrial towns, continued through to the 1870s but by the late 1870s and mid 1880s there was a recession in the industry provoked by over supply by quarries and prices for slate had dropped by as much as a third from those earlier; this recession is reflected in the output for Banks. The fortunes of Banks Quarry improved in the 1890s and for a period it was profitable, but production was severely affected by the onset of the First World War in 1914. In 1918 there was a renewed demand for slate but a shortage of men to work it, and it was not until 1921 that the quarry was able to return back to production levels that were comparable to those prior to the war. Despite a period of prosperity in the 1920s, the years between the wars was a period of restructuring and investment in infrastructure to improve the efficiency of their operations; however, at Banks this investment in technology was too little, too late and the quarry was closed in the early 1930s.

The Greenhead Gill mine complex is located in a narrow isolated ravine-like valley and has two separate processing areas about 140m apart on the east side of Greenhead Gill. The documentary and archaeological evidence points to at least two separate phases of exploitation at the mines in Greenhead Gill, the first was the relatively short-lived Elizabethan workings, which were one of several small scale workings established around Grasmere. Then in the late-nineteenth century, the Elizabethan workings were reworked and exploratory working was undertaken to the south of the main complex using drilling and powder-blasting technology. The Elizabethan workings were organised and run by the Company of Mine's Royal under the guidance of Daniel Hechstetter and we are blessed with considerable documentary records that provide us with records of equipment, general layout of infrastructure and disbursement cost for construction, maintenance and wages. In certain cases, the sources can possibly be related to the archaeological evidence surveyed during the present project; these include a water wheel and stamp mill referred to in the documentation.

The survey has confirmed that Greenhead Gill is one of the most important early lead working sites in Cumbria which was relatively short-lived but forms an important facet of the Company's exploration and subsequent exploitation of various metalliferous ores of the region during the Elizabethan era. The relatively untouched nature of the main mine complex and the surviving extant surface remains for both extraction and processing contemporary with the earliest working of the site demonstrate a very rare survival of comparable remains both for the region and nationally.

Providence and Fairfield mines (often referred to as the Tongue Gill Mines) reflect a brief period of intense mining activity fuelled by high prices for ore, and accord with a number of other operations elsewhere in Cumbria. Being operational for only a few years they demonstrate single phase integrated workings and, as such, provide an opportunity to examine the working process of late nineteenth century iron mines. There is documentary evidence, dated to 1693, that refers to iron mining in Grasmere providing ore for a smelter in Langdale, but it is not known if this refers to the workings at Tongue Gill. There is though evidence of hushes and surface extraction on the vein at Fairfield, which predate the nineteenth century workings at the site, and could potentially relate to the documented episode of iron extraction.

There was an episode of short-lived but intensive activity at the Tongue Gill mines of Grasmere. Fairfield was active from 1874-1877 and Providence was worked from 1873-1876; the decline in both cases was prompted by the slump in iron ore prices in 1875, which was in itself prompted by the over production of iron ore across the region by a number of much larger mining operations. The iron workings in Grasmere were on a much smaller scale than those in Eskdale, Whitehaven and on the Furness Peninsula, the character of the working at Fairfield and Providence is instead comparable to the other 'boom period' mining sites. At Fairfield, there was a greater time depth, as there was limited working of the site prior to the intensive period in the 1870s. Some of the earliest mining remains at Fairfield comprised a series of inter-connected hushes that run downslope from Rydal Fell to Tongue Gill. The main mine complex comprised three adits driven south-east into the hillside. The ruins of mine buildings, and dressing floors/working areas are concentrated principally around the lowest adit, where there is the greatest spoil. At Providence Mine the workings are separated into two distinct zones, with the majority of the features at the upper workings in the north-west, comprising adits and spoil heaps clustering along the course of Little Tongue Gill. In the lower area is a single drainage adit with large spoil heap adjacent to a Grisedale Hause packhorse route.

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Oxford Archaeology North would like to thank the National Trust and the Lake District National Park Authority for commissioning the project, and the Heritage Lottery Fund for providing the funding. In particular, thanks must go to Jamie Lund, of the National Trust and Holly-Beavitt Pike, of the Lake District National Park Authority for their considerable involvement and support. We would also like to thank the landowners for giving permission to access the four mining sites. We are also grateful to the staff of the National Trust Sites and Monuments Record (NTSMR) and the Lake District National Park Historic Environment Record (LDNPHER), the Armitt Library and Museum, Ambleside and Cumbria Archives Centre, Kendal for their assistance during supervised volunteer visits. In particular, we would like to thanks Peter Eyre, Senior Archivist at the Cumbria Archives Centre, Kendal, and Deborah Walsh at the Armitt Library, Ambleside, for providing documentary training for the group.

The topographic surveys were primarily undertaken by volunteers whom we must thank for their boundless enthusiasm and energy throughout the project (Plate 1):

Judith Edwards; Tony Edwards; Hilary Corton; Kenneth Day; Piers Waterston; Roger Baker; David Hughes; Alan Dunthorne; Robin Smalley; Mark Simpson; David Benham; Betty King; Annie Warwick; Vince Warwick; Judith Horsley; Lynda Merrill; Bob Abram; Jane Abram; Bridget Gerry; Doug Stables; John Sayles; Mervyn Cooper; Helen Holmes; Roger Kingston; Liz Kingston; Jose Brock; John Brock; Richard Sutton; Derek Pullen; Anne Catterson; Brian Woodward; Bob Bell; Catherine Duncan; Jenny Kelly; John Harling; Joan Ferrero; John Edmondson; Alison Ewin; Stephen Cove; David Hughes; Barbara Stevens; Kate Young; D Clarkson; J Clarkson; Barbara Green; Frank Leaver; Tony Stuart-Smith; John Jordan; Lawrence Hill; Charles Rowntree; Jeremy Rowan Robinson; Yvonne Rowan Robinson; and Janice Wilson.

Plate 1: Part of the survey team at Banks Quarry

In addition, Judith Edwards, Anita Payne, Janice Wilson, Jeremy Rowan Robinson, Liz Blaney and Richard Sutton contributed considerably to the documentary study. Special thanks must go to Ted Bowness for providing much detailed oral history for the Banks Quarry complex and his family connection to it, and thanks to Warren Allison from Cumbria Amenity Trust Mining History Society for providing various secondary sources for the mines.

The volunteers were aided in primary documentary research by Alastair Vannan and topographic survey by Peter Schofield, Jamie Lund, Holly Beavitt-Pike, Kasia Litwa and Jamie Quartermaine. The report was written by Peter Schofield, and the illustrations were produced by Anne Stewardson. The report was edited by Jamie Quartermaine, who also managed the project.

1. INTRODUCTION

1.1 CIRCUMSTANCES OF THE PROJECT

1.1.1 Oxford Archaeology North (OA North) was invited by the National Trust and the Lake District National Park Authority to provide supervision and support to facilitate and enable a community archaeology project examining a series of mines and quarries located within the Windermere lake catchment. The project was financed by the Heritage Lottery Fund and was one of three community surveys being undertaken as part of Reflections on History, one of nineteen projects taking place under the umbrella of the Windermere Reflections project. Windermere Reflections is part of a wider range of conservation and heritage-themed projects in the Windermere Catchment Restoration Programme. The aim of the wider project is to improve water quality and to bring environmental and economic benefits to the area.

1.1.2 The first step towards planning the Reflections on History project was taken in 2010, with the commissioning of a GIS-based study examining the woodland, water and mineral-based heritage of the Windermere lake catchment (OA North 2010). This made recommendations for a series of community projects based around each of the three themes, and the present study is intended to develop the minerals theme. Previous surveys led by OA North had examined the water and woodlands themes (OA North 2012a and b). The present survey looked at the remains from the exploitation of the natural resources of the Lake District to produce slate, lead ore and iron ore

1.1.3 The project undertook a detailed topographic survey and desk-based analysis of four former mining/quarry sites in the northern and north-western parts of the Windermere lake catchment (locations shown on Figure 1):

- Banks Quarry, near Elterwater (NY 3147 0432);
- Greenhead Gill Mine, Grasmere, (NY 3497 0864);
- Fairfield Mine, Grasmere (NY 3400 0980);
- Providence Mine, Grasmere (NY 3390 1050);

1.2 AIMS

1.2.1 The principal aim of the project was to involve people from the local community with an interest in archaeology and their own local historic environment in archaeological investigation and survey that would provide new information on the wealth of archaeological remains in the Windermere lake catchment. The aim was to provide training for volunteers in surveying and documentary research that they would be able to continue to use beyond the life of the project. The range of techniques taught to the volunteer team were such that these would allow recording without the need for expensive or specialist equipment and provided a legacy of skills within the community. As well as aiming to be educational, it was important that the participants were provided with an experience that was both meaningful, in terms of learning, but was also social and enjoyable.

1.2.2 This training entailed providing a general introduction to the techniques of archaeological survey, supplemented by a guided tour of the sites under investigation. This general introduction took place at Langdale Village Hall, Chapel Stile on the 9th March 2013, in conjunction with a site visit to Banks Quarry, in advance of the start of fieldwork.

1.2.3 The objectives of the recording programme, undertaken by the volunteers with professional supervision, were to undertake outline documentary research into the individual mines and quarries identified for survey activity, together with detailed surveys of the four mines/quarries, and their local environs, to provide an appropriate context for the individual complexes. Ultimately, the information gathered through this process was to be disseminated in a report, and used to update records for the Lake District Historic Environment Record and the National Trust Sites and Monuments Record. The information collated will in due course be used for interpretation purposes by the various partners involved in Windermere Reflections to inform local communities and visitors to the catchment of the area's special qualities.

2. METHODOLOGY

2.1 INTRODUCTION AND PROJECT DESIGN

2.1.1 ***Project Design:*** a project design, submitted by OA North (*Appendix 2*) in response to a project brief by Eleanor Kingston (LDNPA) and Jamie Lund (National Trust) (*Appendix 1*), was used as the basis for this investigation. It was adhered to, and the work was consistent with the relevant standards and procedures of the Institute for Archaeologists, and generally accepted best practice.

2.1.2 The work programme was divided into three elements: desk-based research; detailed field survey and reporting. The survey areas were centred upon the core of each of the documented mine/quarry complexes, and was adjusted so as to ensure that the maximum possible area could be examined by the volunteers over the course of each survey. At Banks Quarry it had been intended to undertake the whole survey by traditional recording techniques, but it became apparent after a short period of time that it was not going to be possible to complete the survey by these techniques because of the scale and complexity of the quarry remains. In the event it was decided to map the whole landscape by photogrammetry, using photographs taken from a small model helicopter, and then the corrected images were drawn up in the field by the volunteers. The buildings were, however, still recorded by conventional techniques. With this combination of techniques it was ensured that all of the mining complexes and any associated water management systems and/or hushings were recorded. The areas of final survey are as shown on Figures 5-33.

2.2 DOCUMENTARY STUDY

2.2.1 The documentary study was undertaken to provide training for volunteers, and to allow them to get involved in the historical side of the project. In addition to research undertaken by OA North, two day-long tutored sessions were held at the Cumbria Record Office (Kendal) and Armitt Library (Ambleside), in order to provide training for volunteers in the use of the resources of the record office and the specific use of historical documents in the context of archaeological research. The tutored sessions were held during early May 2013, with instruction by Alastair Vannan from OA North, Peter Eyre, Senior Archivist at the Kendal Record Office, and Deborah Walsh, Curator at the Armitt Museum and Library. Further study was undertaken by the Kendal Oral History Group to record the testimony of Ted Bowness and his family connections with Banks Quarry. This recording and transcription are now held as part of the Kendal Library Local Studies Collection.

2.2.2 The documentary study sought archaeological information pertinent to each study area, such as earlier investigations of the site or aerial photography that provided a valuable insight into the character of the respective areas. This element of study obtained pertinent background information, and drew upon historical mapping and database sources. These included an appraisal of the information held in the Lake District National Park Historic Environment Record (HER) and the

National Trust Sites and Monuments Record (SMR); as well as appropriate sections of county histories, early maps, primary documentation, such as tithe and estate plans, and published documentary sources. The work accessed the following repositories: Lake District National Park HER; National Trust SMR Cumbria Record Offices (Kendal, Barrow and Carlisle); Lancashire Archives (Preston); Lancaster University Library; Armitt Library (Ambleside); the OA North library and on-line sources.

2.3 DETAILED SURVEY

2.3.1 Detailed topographic survey was undertaken at all four sites (Fig 1) using a methodology equating to the level of survey detail defined as English Heritage Level 3 (Ainsworth *et al* 2007). It was intended for this survey to serve primarily as a training exercise for the volunteers, so the survey techniques were devised to be easy to understand, to allow for plotting in the field, and to use equipment that can be acquired at low cost by the volunteers for follow on work. Initially, the following survey techniques were demonstrated to the volunteers as part of an introductory survey day:

- ***Plane Table:*** the technique produces drawings in the field and typically uses stadia tacheometry on the alidade to measure distances. However, the project alidade was modified to use a Disto, mounted onto the telescope, to measure distances of up to 120m. The Disto also measured vertical angle and output corrected horizontal distances;
- ***Theodolite and Disto:*** the project used a theodolite with a Disto distance measurement device mounted on top. The range of the Disto is 120m and was suitable for detailed recording. The survey data was plotted onto draughting film using a large protractor, allowing for the production of survey drawings in the field;
- ***High Accuracy GPS:*** the use of a Leica 1200 differential GPS was used for the peripheral elements of the survey, such as field boundaries and other topographic detail. It can achieve accuracies to +- 0.02m and provides graphic output of the survey results on its LCD screen. It allowed the volunteers to establish survey control at all four sites that could afterwards be used to locate and position the various hand-drawn surveys produced in the field using other techniques, and to visualise the survey results in the field in a meaningful way.

2.3.2 ***Survey Control:*** survey control was introduced to the sites by means of a high-accuracy survey-type differential GPS, ensuring the internal accuracy of the survey and also its location with respect to the Ordnance Survey National Grid.

2.3.3 ***Detail Survey:*** the detail survey was primarily undertaken using the theodolite and Disto and also the plane table. The plotting of the theodolite data was graphical onto field survey drawings using a large A3-sized paper protractor. The topographic survey recorded all structural and earthwork components, which were drawn by hachure survey. Survey points were marked on the ground using spray paint and the survey drawing was manually drawn up with respect to them. On completion of the survey, the field drawings were digitised into a CAD system and combined with survey data obtained from the Leica 1200 GPS.

2.3.4 ***Description:*** the final stage was the production of a descriptive record of all features, incorporating a provisional interpretation of the function of the features, where possible. A provisional interpretation of the site's chronology was also provided, where possible. The digital gazetteer was collated and edited, output as an Access Report and input directly into a Microsoft Word format.

2.3.5 ***Photographic Record:*** a digital photographic archive was generated in the course of the field project using a digital SLR camera with 12 megapixel resolution. The photographic record comprises landscape and detailed photography; the detailed photographs of archaeological features incorporated a scale bar. All photography was recorded on *pro-forma* sheets showing the subject, orientation and date.

2.3.6 ***LiDAR plotting:*** 1m resolution LiDAR mapping was available for selected study areas, notably at the Banks Quarry study area. This is very detailed terrain modelling data produced by laser scanning the ground from an aircraft. The data was initially provided as Raster images, but following discussion with staff from the Lake District National Park Authority it was agreed to obtain the LiDAR data in ASCII format which allows considerable manipulation of the model, including exaggeration of the vertical axis to enhance the earthwork remains. The LiDAR provided a basis for the interpretation and recording of the landscape and provided contour information for the Banks Quarry area.

2.3.7 ***Aerial Photographic Modelling:*** all four sites were modelled by photogrammetry using aerial photographs and corrected photographic texture photographic images for the complexes. New aerial photographs were taken using an Unmanned Aerial Vehicle (UAV), a small remote controlled helicopter. Survey control was introduced to the photographs by the placement of survey control targets across the site, which were located by means of survey grade GPS.

2.3.8 Photogrammetric processing was undertaken using Agisoft software which provided detailed modelling using an overlap of up to 130 photographs, and created a very detailed DTM (Digital Terrain Model) across the site. The photographs were then digitally draped over the model to create an accurate three-dimensional representation of the ground surface. The primary output, however, was an accurate two-dimensional image that was used to provide plan information (Figs 4, 15, 19, 21, 23, 25 and 30). At Banks Quarry, this technique was used as the primary means of recording the spoil heaps and quarry faces, and the volunteers drew up the archaeological remains from the plots generated by the photogrammetry. At the other sites, the primary recording was by theodolite or plane table survey.

2.3.9 ***Building Survey:*** at Banks Quarry there are extant remains of a number of quarry buildings which were recorded by means of photogrammetry. Survey control was established by means of taped offsets to selective detail on the walls. A series of photographs was taken from multiple locations of each elevations to provide the basis for photogrammetric analysis. Photogrammetric processing was undertaken using Agisoft software which provided detailed modelling using the overlaps of the photographs, and created a detailed DTM (Digital Terrain Model) of each elevations. The photographs were then digitally draped over the model to create an accurate three-dimensional textured surface of the walls (Fig 11).

2.4 REPORT AND GAZETTEER OF SITES

2.4.1 ***Reporting:*** the present report identifies areas of defined archaeology, and an assessment and statement of the actual and potential archaeological significance of the material within the broader context of regional and national archaeological priorities.

2.4.2 Information concerning the sites of archaeological interest within the study area has been collated into a gazetteer (*Section 5*). The gazetteer output from OA North's Access 97 database is compatible with the National Trust Sites and Monuments Record and Lake District National Park HER and was formatted within Word. Site locations are given as ten-figure National Grid References where possible. The *National Monuments Record Thesauri* (English Heritage 1999) was used as part of the site descriptions.

2.5 ARCHIVE

2.5.1 A full archive has been produced to a professional standard in accordance with English Heritage guidelines (1991) and the *Guidelines for the Preparation of Excavation Archives for Long Term Storage* (UKIC 1990). The project archive represents the collation and indexing of all the data and material gathered during the course of the project. The archive is provided in the English Heritage Centre for Archaeology format, both as a printed document and digitally.

3. THE MINERAL RESOURCE IN THE WINDERMERE CATCHMENT

3.1 INTRODUCTION

3.1.1 This summarised information is based on an earlier GIS study undertaken in advance of the Windermere Reflections Project (OA North 2010). Three mining sites were recorded by the present survey are located in the area of Grasmere, and a quarry site was recored near Elterwater, Great Langdale (Fig 1).

3.2 GEOLOGICAL BACKGROUND

3.2.1 The Lake District consists of a mass of ancient rocks, in three major bands running east-north-east to west-south-west, surrounded by a rim of appreciably newer rocks. The oldest are the Skiddaw Slates (Skiddaw Group) in the north of the area (Pickering 2001). These sedimentary rocks consist of a series of dark-coloured slates with occasional coarser grits, laid down some five hundred million years ago in the early Ordovician Period, when the region was covered by a shallow sea.

3.2.2 To the south is a broad band of hard rocks with a very different origin - the Borrowdale Volcanic Series (BVS), which was formed in the late Ordovician, some 450-410 million years ago, during a period of intense volcanic activity. Eventually the volcanic activity subsided, leaving behind a mixture of solidified lava, and ash that became the rocks we see today. A band of fine-grained tuff of the BVS group was used in the Neolithic period to make axes, and it also includes layers of slate, such as the green slates of Honister and Elterwater, that make superior roofing slates and building material (Pickering 2001, 10). It is from within these rocks that are found the bands of minerals that were extensively exploited in the post-medieval period.

3.2.3 At the southern edge of the BVS is a very narrow band of Coniston Limestone, older than much of the Carboniferous limestone surrounding much of the Lake District, and formed in the late Ordovician Period. Outcrops can be seen on either side of the North Basin of Windermere and are often associated with small limekilns (*ibid*).

3.2.4 The southern part of the Lake District, is composed of sedimentary rocks laid down in the Silurian Period (approximately 400 million years ago) at a time when the landmass, that corresponds with what is now Britain, was located to the south of the equator. Covered by a warm, shallow sea, sediments of sand and mud accumulated to a depth of over five kilometres and eventually formed the rocks now called the Windermere Supergroup of shales, grits and flags (*ibid*).

3.2.5 The region was successively covered by Devonian rocks and then by limestone from the Carboniferous Period (340 to 280 million years ago). During the Permo-Triassic Period (280 to 195 million years ago) the land was uplifted and became increasingly arid. Early Palaeozoic rocks are believed to underlie the whole region and the existing surface geology is complicated by diverse and ore-rich mineral deposits, which have had a marked influence on mining activity in the area (*op cit*, 11).

3.2.6 The southern part of the catchment lies on Silurian shales of the Windermere Supergroup; whereas the northern part lies on rocks of the BVS. These two contrasting parts of the catchment are separated by a thin band of Coniston Limestone. The lower slopes of the catchment are covered by glacial deposits of various thickness, with alluvial deposits on the valley floors of the rivers Rothay and Brathay. In general, the soils are poor but have been 'improved' by modern agricultural activity (Pickering 2001, 19).

3.3 EARLY MINERAL AND STONE WORKING

3.3.1 ***Mesolithic period:*** a single site of Mesolithic date was identified during the survey that related to the minerals theme (OA North 2010). The Ambleside flint find (HER 4435), comprised a Mesolithic core-trimming flake that was found during a rescue excavation ahead of cable laying in Borrans Road.

3.3.2 ***Neolithic period:*** the Borrowdale Volcanic rocks of the central Lake District include a fine-grained tuff that will fracture conchoidally and could also be ground down and polished. It outcrops in a band around the higher summits, including Scafell Pike, Glaramara, Fairfield and Langdale. It was during the Neolithic that the potential of the rock was recognised for the manufacture of tree felling axes. There are considerable numbers of axe working areas across the slopes of the craggy summits of Pike of Stickle and Harrison Stickle; there are at present a total of *c* 240 individual working sites within 19 known working areas in the Langdale area (Claris and Quartermaine 1989). Suitable stone was won either from naturally detached scree, or in a limited number of instances from quarries, where the rock was detached by fire setting, a process of heating and then quenching with water to form workable cracks in the rock. The artefacts produced were rough-out axes, which had the basic form of an axe but with rough irregular surfaces. The secondary stage of polishing to finish the axes took place away from the axe factory sites, and of the limited number of known polishing sites, none are documented from the Windermere catchment area. The final products, petrographically classified as Group VI axes, were distributed all across the country. They are the largest group of stone axes in the Neolithic and demonstrates that stone working was being undertaken on an impressive scale within the Windermere catchment from an early date.

3.3.3 From the HER the sites dating to the Neolithic period are all associated with the manufacture of stone tools, and include findspots for adze, chisels (HER 16936), maces / hammers (HER 19119) and flakes (HER 19479). There is a limited number of dispersed axes, including a Neolithic axe found in Dunney Beck (HER 1859), a rough-out axe of unspecified type found 1958 at High Close, just above the tarn (HER 1861), and two axe finds at Grasmere (HER 1862 and 1865), comprising a polished stone axe found in 1896 and a small stone axe found in a garden *c* 1925. At Huyton Hill, Ambleside, a polished stone axe was found in the school grounds (HER 1880). At Slackfoot, Troutbeck a five and a half inch long polished axe was found (HER 1903) and at Ibbotsholme two stone axes were found *c* 1899 (HER 1905). At Hawkshead, a broken polished stone was found at Waterson Ground in 1896, during the digging of a drain (HER 2037), and a perforated stone implement was also found at Hawkshead in 1885 (HER 3569). At Calgarth, a polished stone axe was found *c* 1913. The distribution of the

Neolithic axes is concentrated around the central and northern sections of the catchment. In the far north-east corner of the catchment, an adze was found in 1896 between High Bull Crag and John Bell's Banner (HER 17166).

3.3.4 ***Bronze Age period:*** nine sites of Bronze Age date have been identified within the catchment (OA North 2010); they included adze finds (HER 1882 and 1900), axe finds (HER 1901, 1859 and 2049), hammer finds (HER 2044), and finds of scrapers and arrow heads (HER 3008, 3009 and 3010). These discoveries were concentrated in the Langdale area in the north-west portion of the study area.

3.3.5 ***Romano-British period:*** the Windermere valley was strategically important to the Romans as it provided a line of communications into the heart of the Lake District. In addition to the fort at *Galava*, Ambleside, at the head of Lake Windermere, finds of Romano-British date, that were derived from quarrying, included a stone quern found in Dungeon Ghyll (HER 3005) and two inscribed stones identified at Ambleside (HER 1887) and at Brownsrig (HER 4059). There were no known mining or processing sites of Romano-British date within the study area.

3.3.6 ***Early Medieval to Late Medieval periods:*** a single site of early medieval date was identified during the survey. At Satterthwaite a stone resembling a Saxon millstone, with a small channel and a semi-circular recess, similar to a basin, was found at Field Head Moss near Graithwaite High (HER 2059)..

3.3.7 *Slate Working:* it is likely that slate has been worked and used in Cumbria since at least the Roman period; at the Roman fort at Hardknott, for example, there was evidence of the use of slate for roofing (Bidwell *et al* 1999). Medieval slate working from the central Lake District is difficult to demonstrate; there is documentary evidence that Calder Abbey was roofed with slate, but it cannot be proven that this slate came from the Lake District. There is a documentary reference to slate at Sadgill in 1283 (Cameron 1996, 8), but otherwise there is little historical evidence to attest to the working of green slate. The first reliable indications of slate production are from 1680s, by which time the industry was well established and working the Coniston Old Man, Tilberthwaite and Walna quarries (*op cit*, 9)

3.3.8 *Iron Production:* in the medieval period mineral extraction and processing was primarily represented by bloomeries, which are charcoal-fuelled iron smelting furnaces which produced wrought iron (in contrast to blast furnaces whose first product, cast iron, had to be refined into wrought iron). During the smelting of iron oxide, the ore is reduced leaving metallic iron, which forms a spongy mass or 'bloom' within the furnace. In addition, slag is produced from a combination of the gangue elements and some of the iron oxide, which liquefies at over 1200ºc separating from the bloom and which can then be tapped off from the bottom of the furnace. Once a smelt is complete the bloom is removed and must be hammered to squeeze out the residues of slag within it. This primary refining probably took place immediately to take advantage of the latent heat (Bowden 2000, 40). There are broadly two types of site, a simple bloomery marked solely by a mound of slag, and much larger 'bloomforges' equipped with water management systems and dedicated storage buildings (*ibid*). Bloomeries are mentioned in documents from the twelfth century onwards, and, in the absence of further evidence, a medieval date has often been assumed. However, recently

work on bloomeries within the Lake District National Park, by the LDNPA and National Trust, have been dated by radiocarbon analysis and have produced a range of dates between cal AD 1170 and cal AD 1650. Local place-names, such as Cinder hill, Cinderstone Beck and Black Beck are often indications of the presence of a bloomery (*ibid*). The furnaces of the simple bloomeries were probably cylindrical clay shafts, about 1-2m in height, and the furnace would have had a blowing hole to take the blast from the bellows and a small archway on one side to allow the slag to be tapped into a hollow outside (*ibid*).

3.3.9 In total, 12 medieval bloomeries were identified some with surviving evidence in the form of earthworks. The sites are very widely spread, on either side of Lake Windermere from the southern tip of the South Basin (near Newby Bridge) and as far north as Grasmere Common.

3.3.10 A good surviving example of a medieval bloomery is at Colwith Force, and lies 5km to west-south-west of Ambleside, close to the eastern end of Little Langdale on the southern bank of the River Brathay; only 100m upstream is Colwith Force waterfall. The site comprises a bloomery mound associated with the remains of two, rectangular, stone buildings, beside the River Brathay. The bloomery is probable of medieval date and is overlain by a later charcoal burning platform; a second charcoal burning platform lies on the periphery of the site. In 1997 the RCHME undertook a survey of the site as part of a project on the iron industry and related woodland industries of Furness and south-west Cumbria (Lax 1998).

3.3.11 Although the bloomery was situated close to a river, it was concluded, following the survey, that the water power was required for other purposes and that the bloomery did not rely on water power (Lax 1998, 10). The results also suggested that the stone buildings did not house the furnace (*ibid*). Excavation of comparable sites elsewhere, and the general lack of upstanding stone structures enclosing bloomery sites in Furness, implies that bloomeries were commonly enclosed by wooden structures. A network of tracks and paths was identified at the site including a principal access route via Colwith Bridge.

3.3.12 The earliest phase of activity at Cunsey Forge, which had a notable and extended post-medieval usage (*Section 3.4.8*), was of Elizabethan date. The forge was erected on a plot of land adjacent to Cunsey Beck which provided water power for the forge. A farm building was once the office for the forge at Cunsey (HER 2687), and was in use before 1584; it was known then as 'Les Smithies'.

3.3.13 Despite the predominance of medieval iron processing sites, relatively little is known about the extraction sites for the iron ore, and what is known comes from documentary evidence from the thirteenth, fourteenth and fifteenth centuries, and was evidently on a small, local scale and would have left little archaeological expression.

3.3.14 *Copper Extraction:* the intensive, systematic and heavily capitalised exploitation of the district's copper reserves began in the medieval / early post-medieval periods. A copper and silver mine was established at Caldbeck in 1331, and a medieval hand shovel was found underground at Silver Gill that was dated to 1020-1220 cal AD (Allison and Murphy 2010, 1, 29). In 1564 Thomas Thurland and Daniel Hechstetter were granted the right to mine gold, silver, copper and quicksilver in Cumberland, Westmorland and Lancashire. In 1565 a mining company was formed and in 1568, the company was incorporated by Royal

Charter as 'the Governor and Society for Mines Royal' (Adams 1988, 19; Donald 1989). Bloomeries or bloom-smithies had been prohibited in 1564 because of the alleged denudation of the woodlands, and perhaps the needs of the Mines Royal had been anticipated (Marshall and Davies-Shiel 1977, 32). The mining activity associated with the Mines Royal Company lasted well into the seventeenth century, but it ended with the break-down of Royal patronage and protection during the period of the civil war and the corresponding disruption of some of the operations by Parliamentary troops (*c* 1650) (Donald 1989).

3.3.15 A potential Elizabethan trial mine is known from the Grasmere area (HER 38816) and other sites of the period included the copper mine at Greenburn Beck (HER 3153), one of several copper mines in the Coniston area. The earliest date when mining began at Greenburn is unknown, however, documentary sources indicate that a reasonably intense and prolonged period of mining had been in existence by 1690.

3.3.16 *Lead Extraction and Processing:* an Elizabethan lead mine is represented by Greenhead Gill (HER 1891), characterised as a small well-documented sixteenth century Mines Royal mine, with later activity (Donald 1989). Documentary sources indicate that German miners and engineers began work at Grasmere in 1564, however, this may relate to other mines in the area and the earliest confirmed date of working at Greenhead Gill was in 1568. Lead ore was mined here until 1572 when the mine closed down (HER 1891; Adams 1988; Tyler 1999). The remains include stone buildings and walls, and associated with these were a leat, washing floor, mine shaft, an adit, two bridge abutments, and a number of box buddles, which were used to separate the crushed ore from the veinstone.

3.4 POST-MEDIEVAL MINERAL AND STONE WORKING

3.4.1 ***Introduction:*** the number of quarrying, mineral extraction and processing sites increased dramatically within the study area during the post-medieval period (Fig 2); the greatest number of these were associated with quarrying, most of which are distributed in central and north-central locations. Most mining activity is clustered in the central, northern section of the study area, around the northern fells of Grasmere. Post-medieval processing activity was represented by a total of 35 sites, including forge sites, lime kiln sites, a gunpowder works at Elterwater (HER 3124), an arsenal at Pull Wyke Powder Works (HER 17183), sledways and industrial buildings. The sites are widespread but are concentrated to the west and north-west of Lake Windermere. Some of the sites survive as earthworks, but many have been destroyed and only a limited number survive as extant buildings.

3.4.2 ***Quarrying***: outcrops of slate on the surface were the initial source, but these developed into open quarries, although later the so called 'metal' was mined underground via levels driven through the vein. Workable slate was obtained from the cleaved tuffs of the Ordovician period Borrowdale Volcanic Series which give the silver-grey slates of Coniston Old Man; the green slates of Broughton Moor, Hodge Close and Kirkstone (Taylor *et al* 1971), and the green slates of Coniston, Tilberthwaite, Elterwater, Borrowdale and Honister.

3.4.3 The massive expansion of the industry through the eighteenth and nineteenth centuries was in response to the demand for slate roofing as a result of the growth

of industrial towns in Northern England. It depended, however, on two factors that influenced supply - an effective transport system away from the quarries and mines, and advances in technology within them. Initially, goods were transported by cart or sledge down to water. The slate was originally won by hand, and then gunpowder was introduced from 1800 and compressed air drills from 1910. Diamond-tipped saws replaced the cutting of blocks by hammer and chisel from the 1930s. Railways provided a great stimulus to quarrying and, in particular, the opening of the Coniston branch of the Furness railway (1859). In a large number of quarries, extensive excavations have taken place in the twentieth century, such as at Loughrigg, Elterwater, Moss Rigg and Tilberthwaite. In some quarries, notably those worked by the Elterwater Green Slate Co Ltd, powerful and well-equipped steam and hydraulic machinery was used to raise slate from the deep portions of the quarries, as well as tramways for its transportation. The principal slate quarries being worked within the study area during the later twentieth century included: Moss Rigg; Parrock; Lords; Colt Howe; and Kirkstone.

3.4.4 In total, 498 quarry sites were identified during the survey, and of these, 20 were depicted on the 1st Edition map (*c* 1864). Flag Stone Quarry is the only site specifically named and recorded as a stone quarry, and appears on the 3rd Edition (1911-3) and modern mapping. Five other sites are recorded as evidence of stone quarrying, but do not appear on historic mapping. Of the 498 quarry sites identified during the survey, 76 sites were associated with slate quarrying. Of these, nine sites are shown on the 1st Edition map (*c* 1864); these include Sty Rigg, Mirk Hole and Sandbuts, all of which are situated in an area of intensive quarrying activity to the east of Great Intake, south of Little Langdale. The quarries at Tilberthwaite were both open and mined, with huge visible caverns; the rock was removed using blasting powder. Between 1864 and 1899 (2nd Edition OS maps) a further four slate quarries were operational; Mirk Hole Slate Quarry had expanded and Broad Moss Slate Quarry was operational. An additional two sites to the east of Tarn How were also operating at Old Slate Quarry and Highwood Slate Quarry.

3.4.5 ***Limekilns:*** small kilns, with associated quarries are scattered across the central northern section of the present study area. In total, 15 lime-kilns were identified. Many smaller limekilns were for local agricultural use, such as in Low Furness (Marshall and Davis-Shiel 1977, 158). The work was often a by-industry carried out by farmers and builders and involved a method of making lime that was achieved by burning alternative layers of broken limestone and charcoal or peat. During the firing process the calcium carbonate of the limestone was converted to calcium oxide or quicklime, cleared from the hearth after about 24 hours (*op cit*, 159). Mixed with water this produces slaked lime, calcium hydroxide, which was used as lime putty for building. The limekilns were of the simple draw type, in which the fuel and limestone were placed in the kiln in alternate layers; as the fire moves up the kiln burnt lime is drawn out at the bottom. Examples of this type of kiln can be found throughout the county, most dating from the late eighteenth to mid nineteenth century. Examples within the study area include Riddings Limekiln (HER 17244), lying to the west of Silverhowe, overlooking the shores of Grasmere, Low Grove limekiln, Lakes (HER 17274) and a lime kiln at Atkinson's Coppice, Colwith Bridge (HER 30697).

3.4.6 ***Iron Mining and processing:*** the nineteenth-century iron mining industry was conducted on a much larger scale to that of the medieval period. One of the main distinguishing features between early post-medieval and nineteenth century mines was the use of gunpowder for driving shafts and levels; prior to this date the mines were hand-worked, limiting their extent (Marshall and Davis-Shiel 1977, 135). The iron mines in the volcanic rocks of the Lake District were at one time of importance, although inferior to those in the Skiddaw Slates (Postlethwaite 1975, 127). Robinson (1709), cited in Postlethwaite (1975, 127), stated that 'Langdale and Coniston mountains do abound most with iron veins, which supplies with ore and keeps constantly going a furnace in Langdale, where great plenty of good and malleable iron is made'. The ore which supplied this furnace is supposed to have been raised at Red Tarn, at the head of Browney Gill to the south-west of Langdale and in Tongue Gill, at the foot of Fairfield, north-east of Langdale (*Sections 6 and 7*) .

3.4.7 *Bloomforge and Smelt Mills*: in total, 13 features defined as bloomforges or forge mills were identified, and included a blacksmiths workshop. The bloomforge operates on a similar basis as the bloomery, and again produced wrought iron, but had a more sophisticated water power system for the bellows, and mechanical hammers, and usually had stone-built hearths with iron plates. They were more productive operations and the furnaces were often associated with storage buildings. The sites are all of post-medieval or uncertain date and are distributed around the central to southern sections of the study area, on either side of Lake Windermere. The sites included Satterthwaite Bloomery Forge, Cunsey Forge and Blackwell Forge. These were for the most part located in areas of woodland and adjacent to a water supply, both being necessary for the manufacturing process.

3.4.8 *Cunsey Forge:* subsequent to the Elizabethan workings at Cunsey (*Section 3.3.12*) a bloomery/bloomsmithy was established in 1618-1715), a refining forge in *c* 1715-62 and buildings associated with later developments, post *c* 1762. The forge continued as an iron-working site for over 130 years, during which time it was refurbished and modified on several occasions. Much of the forge had been dismantled by the beginning of the nineteenth century (Fell 1908, 209). The mixed woodlands to the west and south-west of the forge, known as Great Ore Gate and Little Ore Gate respectively, comprise coniferous plantations, although both contain dense groups of hardwood species, some of which were coppiced in antiquity. Similarly, on the north side of Cunsey Beck, lies a tract of woodland known as 'Machell Coppice' (Miller 2005, 175).

3.4.9 The origins of Cunsey bloomforge may be traced to March 1618, when William Wright acquired a lease of land at Cunsey on which to erect an ironworks (Phillips 1977, 37). It is probable that much of the iron ore smelted at Cunsey was obtained from the mines in Low Furness, although other sources were sought such as the 'pits in Grasmere, or any other pits within their lease nearer to Windermere water' (LRO DDSa 38/2, cited in Miller 2005, 179). An early eighteenth century document, dated to 27 January 1701, refers to William Brathwayte of Bryars in Sawrey Extra agreeing to supply Miles Sandys '50 wayloads of charcoal yearly at Consey forge' (LRO DDsa 2/18, cited in Miller 2005, 180). It is likely this was only one of a number of sources, probably within a 5km or so radius of the forge (Miller 2005, 180). A refining forge appears to have supplanted a bloomsmithy or bloomforge of seventeenth century origins. The remains at Cunsey Forge as a

whole are substantial and extensive and provide one of the best examples of a bloomforge/refining forge in the region, but significantly there are few physical remains of the bloomforge itself (Miller 2005, 195). At the site of the forge is a silted-up pond created by building a 2m high dam across the valley bottom; the stream has broken through this towards its northern end, but close to its southern end is the headrace to the forge. The forge itself has been lost, but its wheelpit can be identified close to the track further up the valley (Bowden 2000, 68). Large slag and waste heaps fill the valley bottom below the dam, while beside the track are a series of ruined stone buildings associated with the forge. The principal remains are of a two-storey terrace of three single-fronted cottages, two rooms deep, radically altered on conversion to a barn. Eighteenth century re-modelling of the site, including a transition from wooden to stone construction, reflects significant changes in the iron industry as a whole during this period, and an expansion of the Cumbrian industry to serve the increased demands for iron throughout the country (*op cit*, 196).

3.4.10 The forge was in the hands of William Rawlinson or John Machell prior to the formation of the Backbarrow Company in 1711, when it became one of the Company's concerns. In 1715, the Backbarrow Company's lease expired, and was taken over by the Cunsey Company who immediately reconstructed the forge and worked it as a refinery in conjunction with their furnace (Fell 1908, 192). Cunsey Furnaces (HER 2687 and 2058) and Backbarrow, the first two blast furnaces in Furness, were built in 1711-12. Pig iron produced in the blast furnace was converted to wrought iron in the charcoal-fired finery forge.

3.4.11 It is probable that the most important trading and transport route was via Windermere. Iron ore will also have been transported to the smelting sites by packhorse, and some finished iron goods by the same means. In the years before 1750, a team of six packhorses made the journey from Hawkshead to Kendal twice a week, while another team made regular trips from Hawkshead to Whitehaven (Taylor 1983, 127). Upon the expiry of the Cunsey Company's lease in 1750, it was thought that their collateral passed to the Backbarrow Company, and that neither Cunsey blast furnace nor forge worked after this date (Fell 1908, 193). However, an inventory of goods, compiled in 1757, lists the equipment present in the forge, and suggests that the site may have remained in operation (LRO DDsa 2/27, cited in Miller 2005, 181). In 1818, the Backbarrow Company was bought out by Harrison, Ainslie and Company who, in 1824, inherited the Cunsey site as part of the Backbarrow Company concerns (Fell 1908, 209). The absence of Cunsey forge from Greenwood's 'Map of the County Palatine of Lancaster' (1818) suggests that little remained of the site at this date (Miller 2005, 181). The remaining structures were subsequently used for agricultural purposes until they were demolished in the 1980s. In 2003, OA North undertook an archaeological investigation of Cunsey Forge, and demonstrated that the site was one of the best examples of a bloomforge/refining forge in the region (Miller 2005, 195).

3.4.12 *Blast Furnaces:* the transition from the production of wrought iron by the bloomforge process to that of cast iron in the blast furnace had spread across Britain by the end of the seventeenth century. A few bloomforges continued in operation in Cumbria into the early eighteenth century, but the principal development was the introduction of the blast furnace. These were initially

charcoal fired and the industry was established because of the availability of high-quality hematite ore, water power and of extensive woods, which were being coppiced for the production of charcoal (Bowden 2000, 47). Blast furnaces vastly increased the output of iron, and were associated with investment from outside the region and the emergence of large iron companies (Miller 2005, 177). The large and extremely important blast furnace at Backbarrow, was just beyond the southern edge of the catchment area but would have drawn its charcoal from the woods within the catchment.

3.4.13 ***Copper Mining:*** the mining of copper in the Lake District was essentially initiated with the arrival of mining experts from Germany in 1556 when the Goldscope Mine was initially worked. It had a seem of copper ore that was 9' thick and was called God's Gift (Gottesgab), which then corrupted to Goldscope. By 1568 the Company of Mines Royal had been formed, and the mines of the Caldbeck Fells received a first mention in their accounts for this year (Donald 1989). The Company of Mines Royal worked the Coniston mines about 1599 (*ibid*), although the present traces of activity are those left mainly by the intensive nineteenth century activities.

3.4.14 Copper mines within the catchment include Drycove Bottom, Tilberthwaite and Greenburn and a trial mine at Dunmail Raise (Adams 1988; HER 36981). Tilberthwaite mine has left remains of buildings and earthworks, including wheelpits, crushing houses and terraced settling pits (Marshall and Davies-Shiel 1977, 148-9). A level or adit near Blake Rigg Gill, Tilberthwaite (HER No 35920), was apparently hand-worked to a depth of about 45m, probably by two or three local men on a small-scale when the price of copper justified the effort (*op cit*, 136). Another such example is a bowl-shaped depression at Dry Cove bottom, to the south of the catchment.

3.4.15 *Greenburn Copper Mine:* up to about 1870 many mining companies were formed with varying degrees of success, but thereafter a rapid decline set in as a result of foreign competition. Then in the twentieth century there were renewed, and sporadic bursts of mining activity, some on quite a large scale (Adams 1988, 20); one such example is the Greenburn Copper Mine which has episodes of activity over an extended period including the twentieth century. The mine occupies a remote location 3km west-south-west of Little Langdale (Oswald *et al* 2000, 1), and is regarded as an outlier of the Coniston Copper Mines. In 2000 English Heritage undertook a detailed archaeological survey and investigation of the Greenburn Copper Mine (*ibid*).

3.4.16 Greenburn is a relatively well preserved, extensive and impressive mining landscape containing the remains of a wide range of upstanding and buried mining components dating from the seventeenth to the twentieth centuries. These include levels, shafts, trials, water management systems for powering machinery, remains of transportation systems for moving ore, remains of buildings associated with processing ore, spoil heaps, dressing waste and remains of a range of associated buildings. An incline linking Pave York Mine with Greenburn Copper Works was laid with wooden rails and is dated to 1850 (Oswald *et al* 2000). The nearby Tilberthwaite mine was re-opened in 1850 by John Barratt (who also operated the phenomenally rich Hodbarrow haematite mine near Millom) who constructed a deep adit level for the purpose of intersecting all six veins. A number of

associated shafts are also known. Other associated features included an engine shaft, engine house, numerous buildings, tips and paths.

3.4.17 ***Lead mining:*** the copper mining enterprises of Coniston were undoubtedly impressive, but the lead mining enterprise at Greenside, in the Glenridding Valley just north of Patterdale, was perhaps the most important mine of the region during the nineteenth-century. The mine was eventually closed in 1962 after roughly two centuries of operations.

3.5 MINERAL RESOURCE ASSESSMENT

3.5.1 A map regression of mineral extraction in the Windermere catchment shows widespread quarrying activity since the mid-nineteenth century, although much of this activity was relatively small-scale. The OS 1st Edition mapping (*c* 1864) shows a large number of small-scale quarry sites distributed across the central to northern part of the catchment, and relatively few around the southern part of the area. This reflects the areas of good quality Borrowdale Volcanic slates, and, in particular, there is a cluster of sites in the High Wray and Pull Beck areas and to the south of Little Langdale. There are also clusters around Bowness and Windermere, where materials were required for buildings. There are far fewer mining sites, most of which are situated in the Tilberthwaite and Little Langdale areas, and were associated with Greenburn Beck Copper Mines, with another cluster of sites around Elterwater and a number of individual sites on the fells to the north of Grasmere, some of which are associated with a copper trial working at Dunmail Raise. A further five sites are known around the northern part of the catchment. Those on the west are associated with Pull Beck Copper Mines and those on the east with Troutbeck Iron Works. The completion of the Furness railway was completed in 1857, also bringing the relatively unknown southern Lake District to the attention of tourists and proposals for branch lines almost immediately followed (Millward and Robinson 1974, 242).

4. BANKS QUARRY DOCUMENTARY AND SURVEY RESULTS

4.1 BANKS QUARRY, ELTERWATER

4.1.1 ***Location:*** the Banks Quarry complex is located on the edge of Baysbrown Wood and the open ground of Lingmoor Fell, to the south west of Elterwater in the district of Great Langdale (HER 17214). The area around Elterwater contains an abundant source of good quality slate, and by at least the nineteenth century there were two quarries located in the royalty of the manor of Baysbrown (Bulmer 1885, 407). The most extensive quarries were located near to Elterwater, but outside of Baysbrown manor, ownership was by the Elterwater Green Slate Company, then Burlington Quarries (Elterwater and Spout Crag Quarries).

4.1.2 ***Late Eighteenth century:*** there is a reference in the Lonsdale Precedent Book (BD HJ PRECEDENT BOOK 7, 259-260) for an article of agreement for working slate quarries at Baysbrown. The agreement was between William Rigge of Walkerground, Hawkshead, John Atkinson of Broughton-in-Furness and Edward Jackson of Yewdale in Conistone, all in Lancashire, slate merchants; and George Wallace and John Jackson of Patterdale in Westmorland, slate getters, regarding slate from a quarry at Baysbrown in Langdale, Westmorland 1771.

4.1.3 ***Early to mid-nineteenth century:*** at this time, the manor and demesne of Bays-Browne belonged to John Atkinson, Esq, of Cockermouth (Parson and White 1829). The manor was enclosed in the thirteenth century when it was separated off from Langdale manor. The boundary extents of the holding ran from Elterwater along the River Brathay, up Lingmoor ridge, and over Side Pike. It then ran down into Great Langdale via Wall End and the Blea Tarn Road, then turned and ran along the valley bottom before returning back over to Elterwater (West 1778, 189; Bevan *et al* 1991, 23). The manor reportedly contained two extensive blue slate quarries by the early nineteenth century (Parson and White 1829). The first quarry was called Wood Quarry in 1829 (and was most likely the quarry later called Banks Quarry) and was owned by the lord of the manor John Atkinson. The other is almost certainly Lingmoor Quarry located on the open fell at the top of the intake on Lingmoor Fell, the only other owner of a quarry recorded at Baysbrown in 1829 was John Greenup (Parson and White 1829, 620). By the mid-nineteenth century the quarry was called Dale End Quarry and was depicted as such on the 1861 OS mapping (*Section 4.3.1*). It is possible that, at this time, the quarry was worked by the owner of Dale End farm located in Little Langdale and only *c*0.5km to the south; in 1858 this was James Dixon (Post Office 1858). An Edward Bowness was recorded by 1829 in Elterwater as being employed as a wheelright and joiner (Parson and White 1829), whilst a John Bowness was recorded in 1851 as a blacksmith (Mannex and Co 1851). The Bowness family were the leaseholders for Banks Quarry in the late nineteenth century.

4.1.4 ***Late nineteenth to early twentieth century:*** from the 1880s, the quarry was named Banks Quarry and was leased by John and E Bowness, with the mine agent being John Bowness (Durham Mining Museum nd). In 1894 and 1897 Mrs Ann Bowness was recorded as a slate quarry owner (Kelly 1894, 197; Kelly 1897). The sloping hillside descending from Lingmoor to the west of the quarry was depicted as 'Banks' on both the 1861 and 1898 OS mapping (*Section 4.3.1 and*

4.3.7). The quarry was recorded under this name in the mineral statistics between 1882 and 1922 (Durham Mining Museum nd). The quarry may have been worked on a relatively piecemeal basis, or just with limited manpower. It was recorded as employing three men (two below ground, one surface) in 1896; four men (three below ground, one surface) in 1902; in 1914 it was not worked, and three men (two below ground, one surface) in 1922 (*ibid*). In 1907 Banks quarry was recorded as being owned by John and Edward Bowness (Bulmer and Co 1907) and in 1921 Edward Bowness is recorded as a slate quarry owner residing at Lingmoor View, Great Langdale, whilst John Bowness is recorded as a farmer at Elterwater (Kelly 1921).

4.1.5 ***Twentieth century:*** Mr Ted Bowness, the grandson of Mr Bowness, who held the lease in the early 1900s, who worked at the quarry, has recently (July 2013) provided an account of life at the quarry to the Kendal Oral History Group.

4.1.6 Ted Bowness was born in 1928, and states that the quarry works ceased in 1933 or 1934 (Mr Edward Bowness was still recorded as a slate quarry owner residing at Lingmoor View, Great Langdale in 1934 (Kelly 1934)). His account is therefore a mixture of memories from early childhood and information and recollections passed on from his grandfather, and father, who also worked at the quarry. He also holds some documentary sources, such as account books, and a 'graph of the production of slate', as well as photographs.

4.1.7 Ted Bowness's father and grandfather worked together at Banks Quarry from 1903, when Ted's father was 13 and passed the 'labour exam', which allowed him to leave school and get work. The quarry is named as being held by John and Edward Bowness from the 1880s onwards (Durham Mining Museum nd), so presumably Ted Bowness's grandfather had worked at the quarry from this time.

4.1.8 Ted Bowness and his father lived at a house called Fir Garth in Chapel Stile, a village to the north-east of Banks Quarry. This was one of four houses owned by Ted's grandfather, and a further row of ten was also owned by him. He therefore was quite a wealthy man, which presumably allowed the family to lease the quarry for several decades.

4.1.9 The walk to work involved crossing Great Langdale Beck and then walking through the woods and up the mountainside, an approximate forty-five minute journey. As pay was entirely dependent on production and sale of the slate, the men worked daylight hours in all weathers, therefore entailing long days in summer and short days in winter. Old hemp sacks were used as waterproofs, and a packed lunch of sandwiches, with either cold black tea in summer or a thermos in winter, was eaten at the quarry. Everybody smoked; either pipes or woodbines.

4.1.10 As Banks Quarry was a small operation, the roles of the men were less specific than with larger quarries. However the work was approximately divided between 'rockhand', the man who would quarry the rock; 'river', who would split the rock into thin slates; 'dresser', who shaped the slates; and the 'weigh-lad' an apprentice, who would weigh and stack the slate produced each day and carry out other tasks, or help where required in order to learn the trades.

4.1.11 The quarrying was done by drilling a hole into the rock, mostly with a hand-drill, hammer and jumper (a long sharpened chisel). Gunpowder was then inserted into the hole and closed with compressed cotton. A hole was then made through the cotton wad with a pricker (Plate 2), to allow the fuse to be pushed in. After the

shot was fired, the broken rock was called 'clog', which was broken into smaller pieces, and was split with a docking hammer and chisel along its line of weakness.

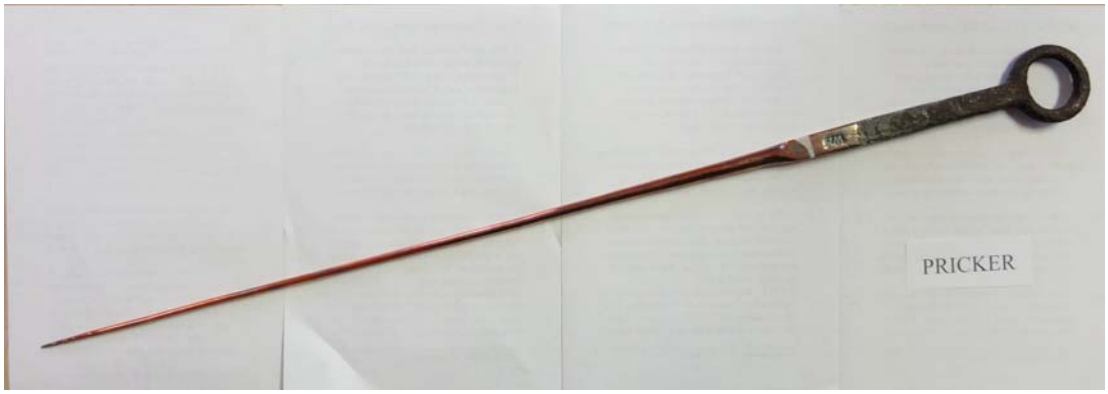


Plate 2: An example of a copper pricker used to prepare the fuse for a charge

4.1.12 Ted's father was the river (Plate 3) and worked in one of three sheds at the quarry (all of which are now in ruins). He would have worked with a wooden mallet and steel chisel to split the rock into thin slates (Plate 4).

Plate 3: Mr Bowness riving slate in a shed at Banks Quarry probably prior to the First World War

Plate 4: A riving mallet and chisel used to split the stone into thin slates

4.1.13 There was some dust created in the drilling process, but as this was done in the open air, it was not too hazardous to health. The main danger in the quarry was from falling rock. There was no phone, and if there was an accident, the doctor had to be fetched from Ambleside.

4.1.14 Two fatalities were recorded at Banks Quarry in this period and the contemporary descriptions provide an insight into the working practises. The first was Thomas Gregg, a miner, aged 35 years, killed on 5th January 1885 when a piece of loose stone fell and knocked him from a ladder, when his head struck against some rocks. The second was John Bowness, miner (Ted Bowness's Great Uncle) aged 53 years, who was killed by a fall of stone on 27th June 1905 (died 4th July) (Durham Mining Museum nd).

"The second of the fatal cases occurred on June 27th at the Banks Slate Mine and caused the death of a miner. On the morning of the accident the deceased man climbed up on to some blocks of rock which had previously been shot down, to examine the place, which at this point is about 30 feet high. He saw that a portion of the top rock had stirred or parted and said to his mate that he would put a shot in and blow it down. He and his mate then went to fill some of the fallen rock from behind a pillar, working till about 5.30 p.m. when they went out for tea — about 6 o'clock the deceased went in again alone, remarking that he was going to drill a hole in the large stone on which he had been standing when he made his examination in the morning. About 7.30 his brother went to call him, but getting no reply, he got another man and went in, where they found him sitting in a semi-conscious condition a few yards from the large stone referred to, and very severely injured. The drill he had been using was still in the hole, much bent by some stone which had fallen on to it and also on to the man as he was standing drilling. He never was able to give any account of the accident and died of pneumonia, consequent upon the accident, on the 4th July. The man is said to have been an experienced miner, but what induced him to go and work under

stone which he knew from his own examination in the morning to be dangerous is beyond comprehension.

I do not think in this instance the fact that he was alone had anything to do with his death, as his injuries, a broken arm and fractured skull, were very serious which was naturally to be expected with stone falling from such a great height — but I do not like to have men working alone in a mine of this sort. In the event of anything happening what would otherwise be quite a trivial accident might develop into a very serious one it there was no one at hand to render assistance." (Mine Inspectors Report)

4.1.15 Only one part of the quarry was worked at a time, as there was only a small team of men working it. Prior to the death of Ted's Great Uncle there had been two working areas, but after the tragedy, this area was never worked again.

4.1.16 The slate was transported from the quarry by sledge, a wooden base lowered on a rope. A haulage firm named John West and Sons, based in Windermere (operational 1889-1950 (http://www.archiveweb.cumbria.gov.uk)), brought a lorry close to the quarry (a track is shown on the historic mapping).

4.1.17 Mineral statistics identified from available published sources for the quarry (Durham Mining Museum nd) record the quantities and value of extracted slate between 1894-1913, as well as records held by Ted Bowness for the years 1913 to 1932:

Year	**Quantity (Tons)**	**Value (£)**
1894	70	210
1895	60	165
1896	80	180
1897	70	158
1898	90	192
1899	150	527
1900	150	525
1901	75	262
1902	80	280
1903	72	252
1904	72	270
1905	80	280
1906	80	280
1907	80	240
1908	90	270
1909	90	270
1910	200	450
1911	240	750
1912	240	750

1913	240	750
1914	29	
1916	19	
1918	10	
1920	69	
1922	139	
1924	157	
1926	99	
1928	50	
1930	45	
1932	36	

4.1.18 In 1912 a day's wage was 10 shillings, and one ton of best slate could fetch about £7-10 shillings. The majority of the slate produced at Banks Quarry was purchased by a firm of builders named George Henry Pattinson (Slate) of Elm Bank, Lake Road, Bowness on Windermere (operational 1867-1984 (http://www.archiveweb.cumbria.gov.uk)). Ted's father would talk about 'going to see Patti', which was always bad news. Ted thinks that Pattinsons possibly owned the land, or the mineral rights and the 'bad news' was an increase in rent. However, in his interview, Ted also mentions the possibility of either the Lowther or the Muncaster Estate owning the land, or even the nearby Baysbrown Farm. The account books from 1912 onwards (this is all that Ted has) have entries stating 'Royalty paid', which would have been a percentage of the sales paid for the mineral rights.

4.1.19 Windermere was the main market for the slate, as construction was thriving at this time. However, some of the slate was transported further, as far as Manchester, and was done by rail, from Windermere station.

4.1.20 Work at the quarry came to a virtual standstill during the First World War. This was partly due to men going to fight, and also due to the fact that there was little demand for slate during the war, as house building virtually ceased. The slate was not produced to store, it was always produced to sell. In the immediate aftermath of the war, there was much demand for slate, and production peaked around 1919-20. However, after this sales deteriorated and never picked up, until work at the quarry came to a halt in 1933-4.

4.1.21 The 1930s saw some modernisation of the quarry works, including wheeled trucks and rail lines, to transport the slate off the site. Compressed air was also used in the drilling process from around this time. This involved a large piece of machinery, so a pulley system was devised to haul it up to the quarry. An engine-house was also built at this time to house the machinery, but this expenditure was never recouped by increased output as had been expected, and this may have contributed to the demise of the quarry.

4.2 THE SLATE WORKINGS - DESCRIPTION AND FORM

4.2.1 ***Introduction:*** the survey of the slate workings was produced using aerial photography, which was drawn up in the field, combined with surveys of the quarry buildings by theodolite and plane table survey (Figs 3, and 4-9). This was overlain with contours that were generated from LiDAR modelling (Fig 5). In addition, elevation drawings were created of selected buildings (Fig 11) by means of manual survey and photogrammetry. These survey drawings are presented below, along with a description of the slate workings, and an assessment of the phasing of the quarries development (Fig 10).

4.2.2 ***The Methods of Slate Working:*** slate working entailed the extraction of a narrow stratum of green slate that cleaved easily into thin roof slates with the use of a hammer and chisel, a process called riving. The rarity of slates that would easily cleave in this way meant that much of the stone material extracted was not suitable to be made into roofing slate, and had to be discarded. Initially exposed seams of quality slate were worked, but increasingly it was necessary to work further into the rock face to win the slate. When these were worked as an open quarry, there was a lot of wastage as the unusable rock above the seam had to be removed and discarded. The alternative was to work horizontal adits through the seam, leaving the unusable rock *in-situ*, and thereby saving on labour. The limitations of the adits is that it became impractical to work large areas underground because of the risk of roof collapse, so, as operations became more intensive there was a case for using large open cast working which it increased the area of seams that could be worked even though it entailed considerable labour resources.

4.2.3 At Banks Quarry there was a consistency of form for much of the working operations and was typified by that of Site **01**, which comprised a long, narrow (2m x 5.5m) open cast gully set into the hillside, leading to an adit, which is now blocked (Plate 5; Fig 6). Extending out from the entrance was a large spoil heap, that was considerably larger than the extant gully, indicating that much of the spoil derived from the underground adit. The spoil heap had a large, deliberately worked, flat upper surface that served as a processing platform for the quarry, and leading out of the narrow quarry cut is a small linear revetted wagonway. On either side of the entrance were two small, approximately square, single-celled, dry-stone buildings (Plate 5). That on the eastern side was open-sided facing towards the entrance, and was at the time of survey unroofed, but originally the roof sloped to the east; it was only 3.5m x 3.5m in extent and stood to a height of 1.5m. This was the riving shed where the slate was cleaved by hand into thin slates; in the same shed, the slate was worked into rectangular slates of different sizes for roofing. The waste from the riving would have been discarded over the spoil heap and the final product was stored on the processing platform before it could be loaded onto a waiting cart.

Plate 5: Aerial view of the Site ***01*** workings showing the quarry / adit, the riving sheds, the processing platform and spoil heap

4.2.4 The building on the west is slightly smaller, being 3.2m x 2.8m, and had some wooden joists vestiges of a slate roof that sloped to the north (Plate 6). There was a doorway on the eastern side with an extant wooden lintel, and adjacent to the entrance was a small tool store. This would have served as a store, in particular for the explosives, which had to be kept dry, but may also have served as a shelter or general utility room. At other riving sheds across the extent of the complex there would often be niches for tools and supplies, and also stone seats to rest upon (Plate 7).

Plate 6: Square store shed (Site ***01b***) with remnants of the slate roof surviving

Plated 7: Niches in the wall of riving shed ***102f***

4.2.5 Site **01**, like many of the quarries on the western side of the site (eg Sites ***05***, ***07***, ***205***, ***209*** and ***212***) was a small independent operation that was worked on a relatively small scale by comparison with the main workings to the east (Fig 6). The larger-scale quarrying entailed more expansive workings with larger spoil heaps, and greater extraction hollows / cuts; however, the processing facilities, such as the riving sheds and working platforms, were only slightly larger, but generally comparable. The implication is that these had a longer period of use, rather than a short lived intensive use. Latterly, much of the working was undertaken from adits that followed the line of a seam. The notable exception is the working of the very large quarry Site ***215***. This was an open pit and the need

to win large amounts of workable slate indicates meant that the narrow adits were no longer sufficiently productive. Working by conventional means was no longer intensive enough and there was a need for an engine and compressor to provide air for power drills (Plate 21).

4.3 DEVELOPMENT OF BANKS QUARRIES

4.3.1 There is apparently one large good quality seam being exploited running upslope in a north-east/south-west orientation with two smaller subsidiary trials flanking it on the north-western and south-eastern sides (Sites ***107/217*** and ***203***) (Figs 3, 7 and 9). A series of at least six working floors, often with large spoil heaps, have been constructed running up the hill-slope. In addition, there is a group of smaller, semi-independent workings to the west of the main quarry workings. Presented below is the development and expansion of the Banks Quarries based on map regression and survey evidence.

4.3.1 ***Phase 1 Quarry Activity (pre 1861):*** the earliest cartographic evidence is supplied by the OS 1st Edition map (1861) (Plate 8; Fig 3) which shows that the overall complex was called Dale End Quarry. There were evidently multiple centres of quarry activity, an area at the bottom (Site ***107***) was accessed by a recently constructed access road that came in from the east, and there was a separate higher open quarry with two riving sheds (Sites ***101a*** and ***102***; Fig 6), which, on the archaeological evidence, was accessed by a trackway (Site ***06***) that came in diagonally from the north-west from the area of Baysbrown Farm. This is an erratic trackway that is, in places, marked by marker stones (Sites ***210a-d*** and ***03c***), and in places is a very substantial earthwork (Site ***06***) where it links into a later east/west track (established after the Ordnance Survey 1861 map). However, there was evidently an earlier, slightly erratic line of track as shown on Google Earth and the LiDAR which extends between Site ***06*** and the area of Baysbrown Farm. The fact that there were two independent points of access for the complex suggests that these areas may have had independent origins / ownership, although by the time of the OS 1st Edition map (1861) they were seemingly under the same ownership. Parts of the north-west / south-east access route have the appearance of being adopted wear lines rather than a constructed track, by contrast with the access track for Site ***107***, which was very clearly constructed. The upper Site ***101*** and ***102*** quarry had seemingly an early more *adhoc* origin, and was possibly the earliest part of the complex.

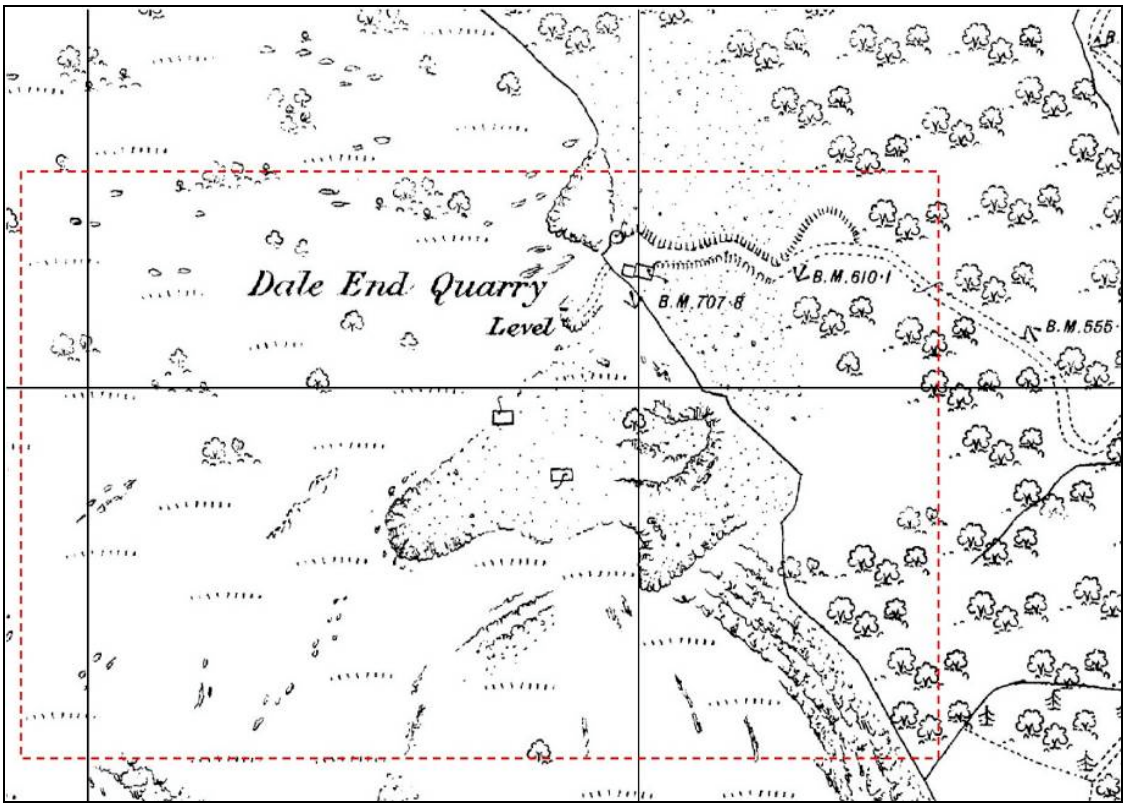


Plate 8: Ordnance Survey 25 inch map (1861) showing Dale End Quarry

4.3.2 The top quarry element was evidently in use over an extended period being from before the OS 1st Edition map (1861) and was still being worked up to the point of suspension at the start of the First World War (Ordnance Survey 1915 map). At the point of abandonment it had four processing areas being fed by a single quarry / adit, but some of these were evidently later in date as they were established on the floor of the excavated quarry. The earliest processing area was Site ***102***, which had a large, well-built two-celled riving shed (***102a***) (Plate 9; Figs 6 and 12) and store on the top of a large flat-topped spoil heap. Interestingly it is at the northern edge of the spoil heap platform, and has entrances facing south. The implication is that the buildings were constructed when the spoil heap was near its furthest (northernmost) extent and this begs the question as to where the riving was being undertaken during the earlier stages of the spoil heap's development. This processing area was sourced by rock from an open quarry rather than an adit, and its extent is shown on the OS 1st Edition map (1861); the outline of the quarry had not changed significantly by the time of the 1915 map, which suggests that for much of its later life the stone was provided from an adit.

4.3.3 Slightly to the south-east and above the Site ***102*** processing area was a platform and processing area with a two-celled riving shed on it (Site ***101a***; Plate 10). The spoil mound overlies that of Site ***102*** and it is evident that it was a later episode of working than Site ***102***, although both riving sheds are shown on the OS 1st Edition map (1861). In its earliest manifestation this shed and processing area would have been supplied directly from the open cast quarry; however, there is a wall-revetted track extending between the adit at the western end of the quarry (Site ***100d***; Fig 8) and the ***101*** processing area, which would indicate that in the later phases of use this processing area continued to operate when adit ***100d*** was being used as the stone source. The spoil heap of this processing area has been cut

by the extraction for the large pit (Site ***215***) which was the latest phase of activity at Banks Quarry. It is also partly overlain by the spoil heap (Site ***100b***) associated with riving shed Site ***100a,*** which was also a later phase of activity (Fig 8).

Plate 9: North-eastern view of Riving Shed ***102a***

Plate 10: Northern view of Riving Shed ***101a***

4.3.4 The lower workings (Sites ***214*** and ***107***) related to a constructed miners track that approximately followed the present track, but at this date (OS 1st Edition 1861) terminated at the southern side of the Site ***107*** quarry (Fig 7). The spoil from both workings was evidently being used to build up the track, to gain access to a

processing area (Site ***216***) which was part way up the slope towards the base of the Site ***214*** workings. The outline of quarry ***107*** on this map was smaller than the present outline and indicates that it had been expanded substantially between the OS 1st and Second Edition mapping, and indicate that they were working an open quarry rather than an adit at this time. Near the south-eastern corner of the quarry two adjacent buildings (riving shed and store house) are located on the 1st Edition OS map; and by the time of the Second Edition map these had been covered over with a substantial spoil heap (Site ***216***). This same spoil heap had extended over much of the quarry by the time of the Second Edition map, and by this date the quarry had achieved its full extent as recorded by the present survey. An adit (Site ***107***; Plate 11) had by this date been established at the back of the quarry and a retaining wall (Site ***105***; Plate 12) was constructed at the north-western end of the spoil heap to ensure that access could continue to be maintained to the adit.

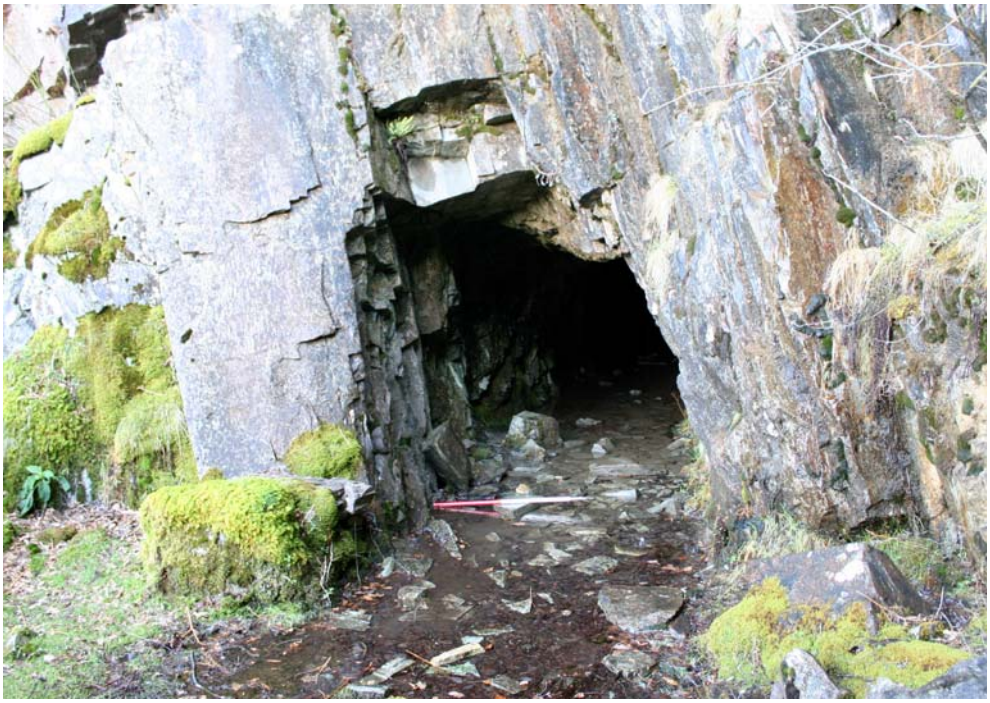


Plate 11: Entrance to adit ***107*** at the back of an open quarry

Plate 12: Retaining wall ***105*** around the base of a large spoil heap

4.3.5 The Site ***214*** quarry was a small cut into the hillside as shown on the OS 1st Edition map, but was described as having a 'Level'. No evidence of an adit was observed during the survey, but the working has been substantially increased in size subsequently and this may have obscured or removed evidence for an adit.

4.3.6 Some of the larger workings on the OS 1st Edition map (1861) were at the south-eastern part of the complex (Site ***202***). The outline of the quarry did not change significantly between the 1861 and 1915 mapping; however, the spoil heap in front of the quarry increased substantially during the intervening period. The implication is that an adit within the quarry was being worked; although no evidence for one was identified during the survey. Despite the fact that it represents a substantial amount of working there were no riving sheds depicted on the OS 1st Edition mapping (1861) in association with it, which raises the question as to where the stone was being processed. While there are presently three sheds within the quarry these were not depicted until much later.

4.3.7 ***Phase 2 Quarry Activity (1861-1898):*** on the western side of the complex is a group of smaller, and seemingly independent, workings (Sites ***01***, ***05***, ***07***, ***205***, ***209***, ***207*** and ***212***) (Fig 6; Plate 13). They comprise a single linear cutting, with a single spoil heap and, for the most part, a single riving shed. These were evidently not all contemporary as some have their spoil encroaching on the processing areas of others, for example the spoil of Site ***205*** has expanded onto the shed of Site ***204***. In addition, the spoil mound of Site ***05*** has expanded, blocking the early access track Site ***06***, and this indicates that in their later forms these workings were not using the upper sections of the track. The small-scale character of these working contrast with the intensive operations of the main Banks Quarry and it is tempting to regard them as independent workings that may have preceded the larger works. However, none of them are shown on the OS 1st Edition map (1861); some start appearing on the 1898 map (Plate 14), and they were all shown in place by the 1915 map, at which point they were described as 'Old Quarries'. While it is possible that they were in place at the time of the 1st Edition map, but not depicted, it is considered that this is unlikely as elements at least are of later

date, given that the spoil of one overlies the early track (Site ***06***; Fig 6), and the fact that the track was not specifically orientated towards any of them, but was orientated towards Site ***102*** of the main complex. The 1898 mapping shows all the sheds of the main complex, yet does not show any sheds of these smaller workings and interestingly the 1915 map shows Site ***01*** as having only a single shed, whereas it ultimately had two. This suggests that these smaller workings were being developed between 1861 and 1915, in which case it may be that these were small trial workings being undertaken alongside the main quarry to explore a different seam; the fact that they did not develop to the same extent may suggest that it was not a profitable seam. The majority were, however, evidently abandoned some time before the 1915 mapping given that they had acquired the 'Old Quarries' descriptor.

Plate 13: Riving shed Site ***205*** looking south

4.3.7 Within the main complex the main changes shown on 1898 map were in the substantial expansion of the spoil heaps (Fig 7). The miners road had been rerouted slightly to extend around an encroaching spoil heap (Site ***216***) and a substantial spoil heap had developed extending north from the road. Much of this spoil derived from adit ***107***, and there is a long finger spoil mound (Site ***110***) extending out from the aperture of the adit. The 1898 map shows two sheds associated with this working, one against the retaining wall (Site ***105***) of the large spoil heap, and one immediately to the north of the present track; neither survive to the present.

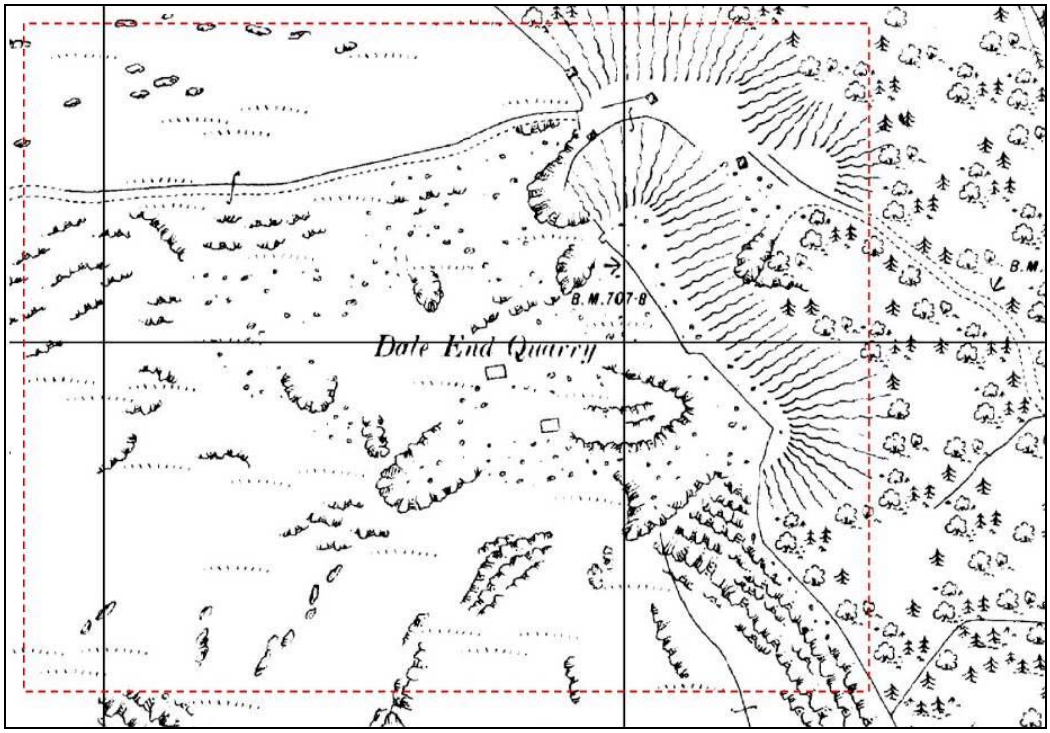


Plate 14: Ordnance Survey 25 inch map (1898) showing Dale End Quarry

4.3.8 The Ordnance Survey 1898 map shows a small quarry cut just to the south of the miners road, which was partly encroached upon by the large spoil heap (Site ***103e***) above and to the south-west of it. The spoil from this was deposited onto the large spoil to the north of the miners road and immediately opposite the entrance to the quarry. There was also depicted a riving shed to the north-west of the entrance and immediately adjacent to the miners road; this was not depicted on the 1915 maps and is now no longer evident. This quarry continued to expand in subsequent OS map editions but now has been buried by the encroaching spoil heap above it.

4.3.9 The other large spoil heap to appear on the 1898 map was the large and wide mound (Site ***103e***) associated with the Site ***202*** workings, and an adjacent quarry to the north. Interestingly, there is an enclosure wall extending over the top of the processing platform of the spoil heap, and separating the lip of the spoil from the quarry sources (Plate 15). It currently has no gaps so would have rather severely restricted the movement of spoil. Given that this is on top of the spoil mound and there are no gaps, it must have been constructed after the workings at the quarry and adit had been discontinued. The wall, however, is shown on the 1861 map before the large spoil heap had been completed, and any wall in this location, constructed prior to the completion of the spoil heap, would have been buried. The implication is that this reflects a significant property boundary dividing mineral rights and that there was a need to maintain the marking of the boundary, even though an earlier boundary marker had been buried by spoil. In which case, it would seemingly have been rebuilt, and there are indications that there are slightly different lines followed by the boundaries marked on the 1898 and the 1861 maps. The absence of gaps may suggest that the wall was constructed after all working of Quarry ***202*** had stopped; however, there is the possibility that any gaps through the wall were filled in the course of later repairs to the wall.

Plate 15: the enclosure wall constructed over the top of a spoil heap, which is now in a good condition without gaps

4.3.10 The 1898 OS map shows no riving sheds in association with the Site ***202*** workings, but there was one (Site ***200***) on the 1915 mapping and presently three sheds survive (Sites ***200***, ***202a*** and ***202c***) (Fig 9). This demonstrates that although the outline of the quarry had not changed significantly since the 1st Edition map, it has continued to be worked from an adit, although there are no surviving remains of it.

4.3.11 ***Phase 3 (1898-1915):*** there was a large enlargement of the site between the OS 1898 and 1915 maps at the top of the complex and at the bottom, entailing considerable expansion of the spoil heaps. Although Phase 3 is defined as ending in 1915 on cartographic evidence, the reality is that the quarry had to all intents and purposes closed temporarily at the onset of the First World War in 1914. The northernmost, lower, quarry that had started before 1898 was expanded substantially, and was depositing its spoil on the northern side of the miners road. To prevent obstruction of the road a large bridge abutment (Site ***109***) was constructed to take the spoil over the miners road onto the spoil heap (Plate 16; Fig 7). Two, two-celled riving sheds were constructed to the north-west of the quarry entrance. Subsequent to the 1915 map the quarry and sheds were buried by the large spoil mound (Site ***103e***) and now all that survives of this working area is the bridge abutment (Site ***109***).

Plate 16: the bridge abutments (***109***) allowing the passage of spoil over the miners road

4.3.12 One of the largest areas of expansion was the working of a large quarry pit (Site ***215***) which was very small in 1898 and even by 1915 was still fairly modest in scale; it did though also expand substantially after the First World War. It had a narrow entrance and a tram line was shown extending out from it and along the large flat-topped processing area for depositing the spoil onto the Site ***103e*** spoil heap, and along a finger spoil mound to the south-east. At the entrance were three riving / store sheds (Sites ***9-11***) all of which are extant today (Plates 17 and 18).

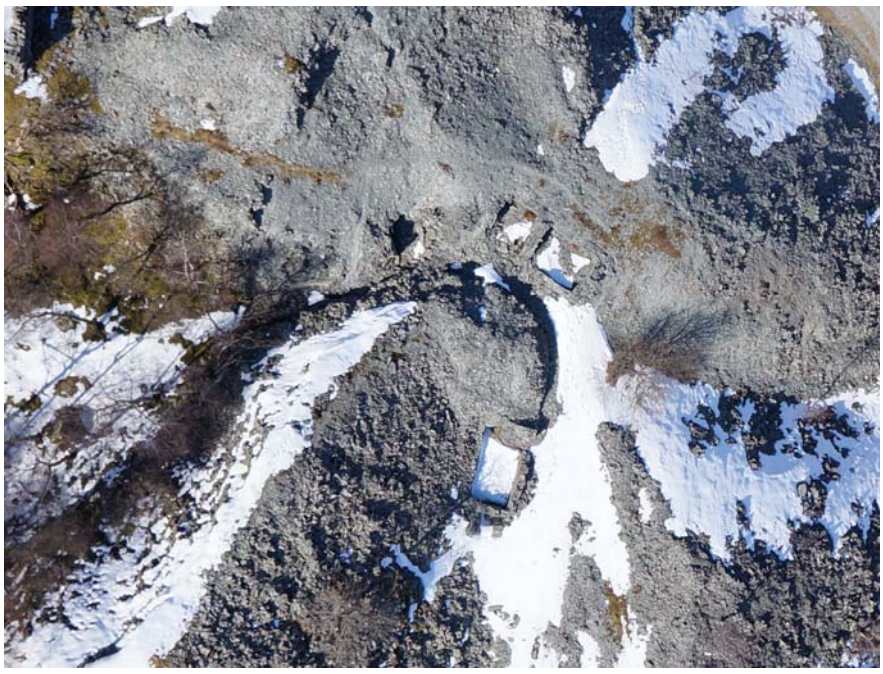


Plate 17: Aerial view of the three extant sheds (Sites ***9, 10*** and ***11***) at the entrance of the big pit (Site ***215***)

Plate 18: Surveying riving shed Site ***10***

4.3.13 By the time of the start of the First World War (1914) the top quarry operations had been expanded; Site ***102*** processing area and riving sheds had been abandoned, but the Site ***101*** processing area had seemingly been developed with a narrow-walled revetted track allowing the movement of spoil from the adit at the head of the cut (Site ***100d***) (Figs 6 and 8). To the south of, and above, the Site ***101*** area, a further processing area on top of a spoil heap (Site ***100b***) had been established, and was supplied by a separate track from the ***100d*** adit. On top of this processing platform was a rather fine two-celled riving shed and store room (Site ***100a***; Plate 19); this had a pile of riving waste outside and to the north-east of a window aperture, and it would appear that the waste stone was discarded through the aperture by the river sitting on a still extant seat by the window. Within the construction of the sheds are re-used stones that have inscribed quarry tally marks on them.

Plate 19: Riving shed ***100a*** with a large pile of riving waste outside the window

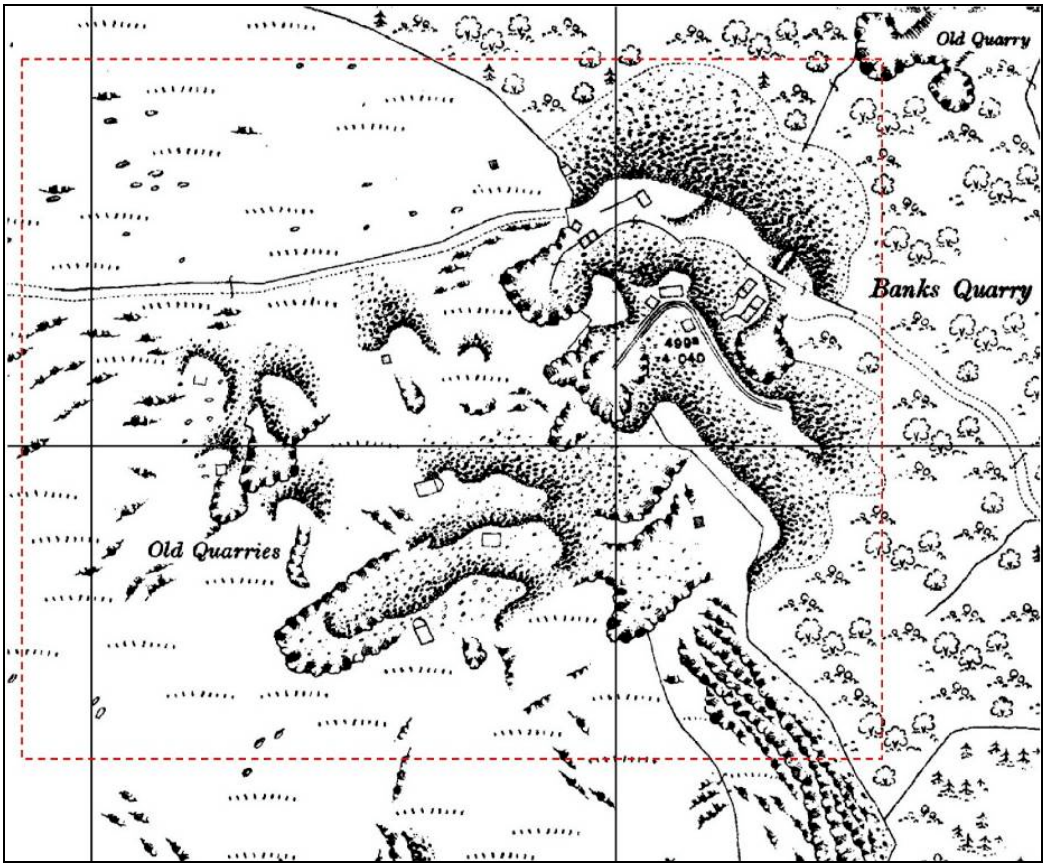


Plate 20: Ordnance Survey 25 inch map (1915) showing Banks Quarry

4.3.14 In the base of the top quarry is a further operation, comprising a wall-revetted access track (Site ***102e***) leading from the general area of the adit to a small riving shed (Site ***102f***) and then continuing to the east of the riving shed as an embanked rail track (Site ***102e***) to the end of a narrow finger spoil heap that extends onto the earlier processing area of Site ***102a*** (Figs 6 and 8). The spoil mound is relatively small, and was evidently a fairly limited working, and was clearly fairly late in date, in part because it overlies earlier workings, but also because it does not appear to be depicted on the 1915 OS map. The implication is that this small scale working dates to the period of operation after the end of the First World War. Interestingly this late working was cut by an access track that led up from the area of the Site ***102a*** platform to the Site ***101a*** platform.

4.3.15 ***Phase 4 (1918 –1933 (closure)):*** after the First World War the quarry operations were restarted and it developed slowly. Although there were a few profitable years in 1922-4 (*Section 4.1.20*), generally the quarry was never worked on the scale prior to the war. The workings were, for the most part, rationalised to working the big pit, which did increase substantially over this period. The spoil heap ***103e*** also increased and engulfed the northern quarry, which was evidently no longer in use at this time. Despite the extensive working of the quarry the riving sheds and stores at the entrance to the big pit continued in use largely unchanged. There was, however, the addition of an engine house (Site ***103a***) which was established at some date, shortly before the closure of the quarry in 1933-4 (Plate 21; Figs 9 and 11). This was an air compressor to produce compressed air for the drills that were used to bore holes for the blasting explosives, and was a heavy and expensive piece of machinery. It was intended to modernise the operation, but was too little,

too late and the quarry closed a short later, possibly in part because the additional finance necessary to purchase the engine made the quarry commercially unsustainable (Ted Bowness pers comm; *Sections 4.1.21* and *8.2.5*). Inside the building are the concrete mounting blocks for the engine and ancillary equipment (Plate 22).

Plate 21: The engine shed (***103a***) looking south-east

Plate 22: Engine mounting block inside engine shed ***103a***

4.4 CONCLUSIONS

4.4.1 The somewhat irregular and erratic form of the quarry complex reflects the workings of a localised seam for an extensive period (Fig 10). Overall, there were at least 21 processing areas, some small and were little more than trials, but there were some exceptionally large workings, such as Site ***215***, which was developed

at the end of the quarry's life. The large number of processing areas exploiting a localised seam meant that each extraction and processing site was typically adjacent to another one. Because the process generated huge amounts of spoil the workings needed considerable management and planning to prevent the spoil of one processing area impinging and compromising the workings of another. In many cases retaining walls were constructed to restrict the expansion of spoil heaps. The classic indicator of this is at the top quarry, where initially an open cut, and then an adit, provided the source rock for four processing sites, and entailed extended tracks and rail lines to transport the rock to different processing areas, and where their spoil could be dispersed without impacting on the adjacent processing platform.

4.4.2 While there is relatively little documentary information available for the operation, we have been blessed with an oral account of the workings of the quarry from Ted Bowness, which provides a remarkable insight into how the quarry was worked. He gives an account of the workings being largely a family affair, with the quarry leased by his grandfather and his father being the quarry river (Plate 3). Despite the extensive size of the extant remains, it would appear that the work force was no more than five or six, with most working the quarry and the rest processing the slate. All of the working was done manually, as mechanised drilling only came in shortly before the closure of the quarry. Despite the production of huge amounts of waste the production of usable slate was relatively small, on average they would have produced only 98 tons of slate per annum and even in their best years they only produced 240 tons (*Section 4.1.17*).

5. GREENHEAD GILL MINE DOCUMENTARY AND SURVEY RESULTS

5.1 GREENHEAD GILL, GRASMERE

5.1.1 ***Location:*** the Greenhead Gill mine complex is located in a narrow isolated ravine-like valley on the open fellside sandwiched between Stone Arthur and Rydal Fell to the north-east of Grasmere village (HER 1891; NTSMR 20326). The main complex is between the confluences of Grains Gill and Rowantree Gill with Greenhead Gill; there are two separate processing areas about 140m apart on the east side of Greenhead Gill where the ground is relatively flat and the remains comprise stone buildings, walls and buddles. The core area of the Greenhead Gill mine complex is statutorily protected as a Scheduled Monument (SM 27748).

5.1.2 The documentary and archaeological evidence points to at least two separate phases of exploitation at the mines on Greenhead Gill, the first was the relatively short-lived Elizabethan workings, which were one of several small scale workings established around Grasmere (Fig 13). Then in the late-nineteenth century the original workings were reworked and exploratory working was undertaken to the south of the main complex using drilling and powder-blasting technology. All standing structures within the complex have the potential to relate to these nineteenth century investigations.

5.1.3 ***Mid/Late-Sixteenth Century:*** we are blessed with thorough documentary records for the exploration and subsequent exploitation of lead in and around Grasmere district in this period as the Greenhead Gill complex was a small mine organised and run by the Company of Mine's Royal under the guidance of Daniel Hechstetter. The documentary sources provide us with detailed inventories of equipment, general layout of infrastructure and disbursement cost for construction, maintenance and wages. In certain cases, the sources can possibly be related to the archaeological evidence surveyed during the present project.

5.1.4 After the accession of Elizabeth to the throne in 1558 private enterprise of all sorts was encouraged, particularly that from which the crown would benefit through levy or taxation. Mining was one area in which the crown and wealthy landowners could benefit if the right mining expertise could be found. Discussions with the German mining company of Haug and Langnauer after 1561 paved the way for the creation of the Company of Mines Royal, via Letters Patent (which is a written order by the queen granting title to a person or company) in 1564 for exploration purposes then incorporation by Royal Charter in 1568 as a new joint stock company (Donald 1989; Holland 1986, 16-7). The company based themselves in Keswick, quickly establishing a smelter there and immediately setting to work prospecting and extracting ores of copper, lead, iron and silver at locations throughout the Lake District fells. In 1564 the Mines Royal began establishing a mining group in Grasmere, and the Company worked there without break until 1568, after which there is no mention of Grasmere for a whole year (Bridge and Matheson 1994, 108).

5.1.5 It is possible that all of the recorded expenditure dated before May 1568 relates to the work at the Grasmere mines, rather than specifically at Greenhead Gill itself (*ibid*). The accounts record that £116 8s 3d was invested constructing a lodging house and smithy in Grasmere and opening trials at several locations (Tyler 1999,

36). A shaft ten fathoms deep was also opened '*inside the smithy'*, which yielded poor quality lead ore (Donald 1989, 181-2; Hammersley 1988, 372-3; Tyler 1999, 38). The site of some of the initial trials can be seen today on the exposed veins near Alcock Tarn (Site ***48***), along with two coffin levels and related working at Brackenthwaite (Sites ***49-53***), located to the north of Dove Cottage (Tyler 1999, 36-38; Fig 13).

5.1.6 The location of the lodging house and smithy remains unclear, although it may have been close to the coffin levels but the area between Dove Cottage and Brackenthwaite was transformed beyond recognition by the expansion of Grasmere after 1800. The area is now characterised by a series of villas with surrounding formal gardens, and through their construction and landscaping any surface remains of the smithy and shaft are unlikely ever to be found (Tyler 1999, 42).

5.1.7 At some point, perhaps by 1568, the Mines Royal turned their focus from Grasmere to Greenhead Gill, suggesting that the initial trials there of the four visible veins had proven to be encouraging and that the Grasmere veins were 'pinching out'(Tyler 1999, 38). It is reasonable to suppose that the existence of mineral veins in Greenhead Gill would have been identified by the Mines Royal in 1564 during their initial survey of the area; however, for whatever reason, the initial investment was made at Grasmere, rather than at Greenhead Gill (Tyler 1999, 36). It is therefore possible that some of the small-scale surface working of veins exposed at Greenhead Gill (and Grains Gill) could have got underway as early as 1564, without them being recorded in the accounts.

5.1.8 The period between May 1568 and July 1569 is likely to have witnessed the main development of the mining operation at Greenhead Gill. Tyler mentions initial exploration of north shaft ***31*** as being from 1566 (Tyler 1999, 39), although it has not been possible to find evidence for this claim within the scope of the recent investigations. Initial work is likely to have concentrated at the northern end of the site where the most northerly of the four mineral veins at Greenhead Gill is visible in the beck (Site ***47***; Plate 35). Early extraction is likely to have focused on the exposed mineral veins, resulting in the creation of the surface workings seen today on the western side of the gill and also higher up on Grains Gill (Site ***35***). The surface extraction is likely to have involved simple techniques of fire setting and the splitting of the rock with plug and feather (Bridge and Matheson 1994, 108); it is likely that the sinking of both shafts were started during this period. The first (Site ***31***) is simply referred to as the northern shaft, Tyler thought that this was started in 1566 to explore the most northerly vein near (Tyler 1999, 39) which would have been on the edge of a sloping hanging wall on the north side of the level (Shaw 1939). The second shaft located to the south (Site ***16***), opposite the main working floor ***05***, at the centre of the site, is referred to as St Benedict's, which was '*near the stamp'* (Bridge and Matheson 1994, 108).

5.1.9 In September 1569 '*four great augers to bore the wooden pipes*' were transported from Grasmere to Newlands (Bridge and Matheson 1994, 108). This entry would suggest that at least one of the shafts (most likely St Benedict's) was then supplied with either a suction or a paternoster or 'rag and chain' type pump (Plate 25). This would have been constructed of a series of connected hollowed-out sections of timber up which water was drawn from the shaft and to allow mining

to continue (Hoover and Hoover 1912 176; Plates 23-5). Shallow open workings could be dewatered by hand, winching the water to the surface in heavy wooden 'kibbles' (Tyler 1999, 39); however, this was impractical for deeper shaft workings where pumps would be needed. The account books for 1569 record that nine water kibbles (fashioned from wooden planks bound together by an iron band) were taken to the mine (Bridge and Matheson 1994, 108), and is the same year that a pump was installed . The pump sections did not arrive on site until Sept 1569 and therefore the kibbles referred to might have been used to as a temporary measure to bail water from St Benedict's shaft until the pump was working.

A—Erect timber. B—Axle. C—Sweep which turns about the axle. D—Piston rod. E—Cross-bar. F—Ring with which two pipes are generally joined.

Plate 23: Example of a suction pump using hollowed-out logs (Agricola 1556, 178)

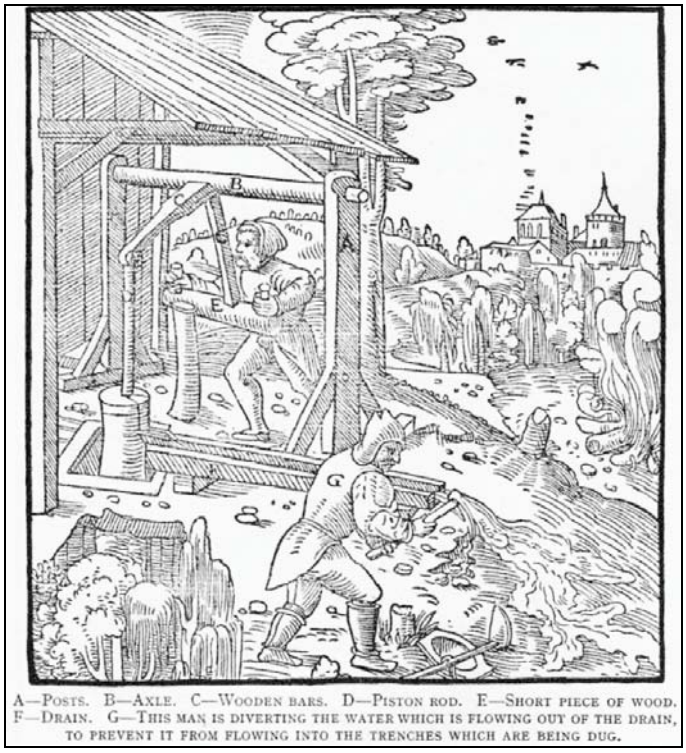


Plate 24: Example of a suction pump using hollowed-out logs (Agricola 1556, 179)

Plate 25: Example of a rag and chain pump drawing water through hollowed-out timbers (Agricola 1556)

5.1.10 While it was feasible to sort and crush small volumes of lead ore to a usable and transportable size by hand, the volume of lead ore being raised in 1568/9 from St Benedict's shaft would have been too great to use manual methods economically. In May 1569 the head carpenter Wolffgang Hochholzer was involved in starting construction of the stamp mill; the felling and transportation of 63 oak trees and sixty thick planks to site is recorded in the company accounts for that month. By July the timber frame was complete, with work continuing to erect the stone walls and build the stamps (Bridge and Matheson 1994, 108-9). The accounts for July record a bucket for grease, and iron and steel for the smithy for eight 'Schiesser' – stamp rods. In September an English smith was paid to cut off the 'Seneysen', which may have been the 'Zähne eisen' – iron for the teeth set in the waterwheel axle tree for lifting the stamp rods (*ibid*). The stamp mill cost £107 7s 3d to complete, and was a huge investment for the time (Tyler 1999, 40).

5.1.11 A later inventory drawn up by the Mines Royal of property surviving at the disused Grasmere mine (dated 1586: *Section 5.1.11*) recorded the stamp as measuring 36ft x 31ft and constructed of stone with lime and very good timber. The inventory for the stamp mill included a great waterwheel with axle tree, and three launder supports *'standing without the howse for the troughs or water race of the great wheel'* (Donald 1989, 181-2; Hammersley 1988, 372-3). The stamps may have been built to accommodate 12 stamps but in practice the accounts record only eight being used (Bridge and Matheson 1994, 111). Beneath the stamps there were large '*troughs*' which contained the ore during stamping, indicating that rather than being a 'dry stamp mill' (Plate 24) this was a 'wet stamp mill' where the ore was crushed by the stamps within a steady flow of water. The water aided the separation of the heavier lead ore from the lighter gangue or natural rock while also washing the ore to assist with subsequent sorting and grading. Agricola described the process in the contemporary era at the similar stamp mill at Meissen (Tyler 1999, 36; Plates 25-7):

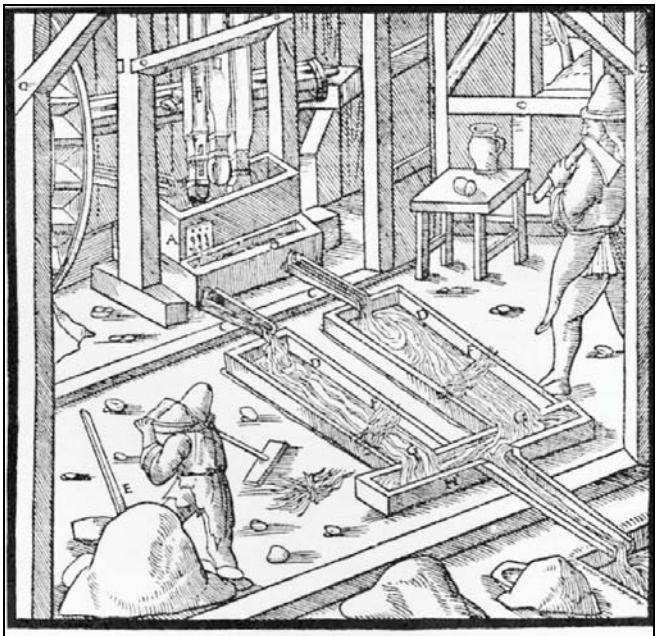
'In the year 1512, George, the illustrious Duke of Saxony, gave the overlordship of all the dumps ejected from the mines in Meissen to the noble and wise Sigismund Maltitz, father of John, Bishop of Meissen. Rejecting the dry stamps, the large sieve, and the stone mills of Dippoldswalde and Altenberg, in which places are dug the small black stones from which tin is smelted, he invented a machine which could crush the ore wet under iron-shod stamps. That is called "wet ore " which is softened by water which flows into the mortar box, and they are sometimes called "wet stamps" because they are drenched by the same water; and on the other hand, the other kinds are called "dry stamps" or "dry ore," because no water is used to soften the ore when the stamps are crushing' (Hoover and Hoover 1912, 310).

5.1.12 At Greenhead Gill there were nineteen wooden stamp shafts on the premises as well as two long ore washing tables and one long and one short ore trough (*ibid*). The stamp mill also contained a loft above for the miners to sleep and a small room behind the loft that could possibly have been used as an office (*ibid*; Bridge and Matheson 1994, 111). In 1571 Steffan Nusspaumer was recorded as doing clerk work at the mine for part of the year and he would have needed a separate chamber to work in (*ibid*). There were eleven square timber troughs recorded (boxed 'buddles') *'for the receaving of stamped Ewers and slighte'* (*ibid*) that

were likely to have been present by 1569 as they would have been necessary to collect the crushed, fine particle lead ore flowing from the wet stamp mill.

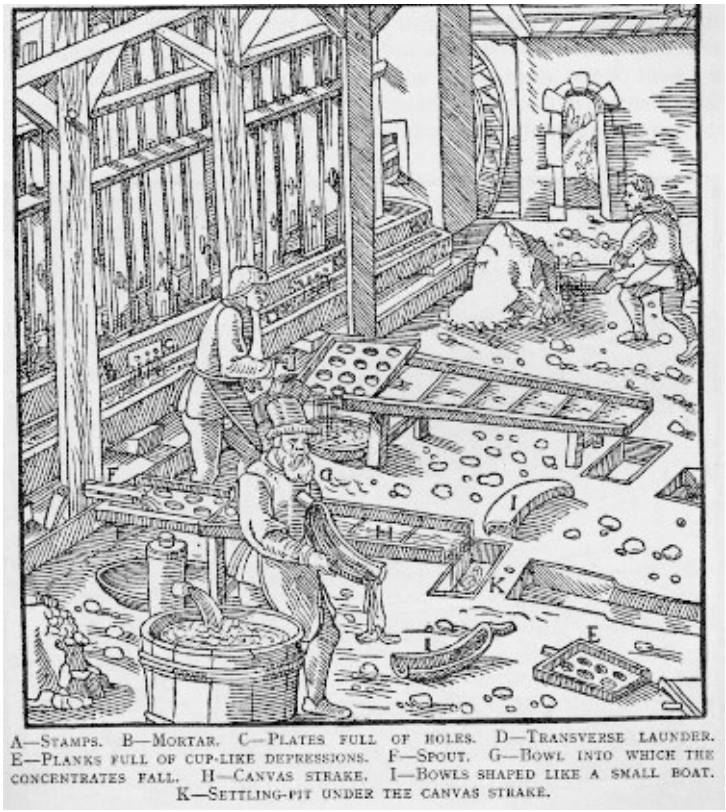
Plate 26: Example of a dry stamp mill (Agricola 1556, 287)

Plate 27: Example of a wet stamp mill (Agricola 1556, 313)



A—LAUNDER REACHING TO THE SCREEN. B—TRANSVERSE TROUGH. C—SPOUTS. D—LARGE BUDDLES. E—SHOVEL. F—INTERWOVEN TWIGS. G—BOARDS CLOSING THE BUDDLES. H—CROSS TROUGH.

Plate 28: Example of a wet stamp mill (Hoover and Hoover, 314)



A—STAMPS. B—MORTAR. C—PLATES FULL OF HOLES. D—TRANSVERSE LAUNDER. E—PLANKS FULL OF CUP-LIKE DEPRESSIONS. F—SPOUT. G—BOWL INTO WHICH THE CONCENTRATES FALL. H—CANVAS STRAKE. I—BOWLS SHAPED LIKE A SMALL BOAT. K—SETTLING-PIT UNDER THE CANVAS STRAKE.

Plate 29: Example of a wet stamp mill with fining tables (Agricola 1556)

5.1.13 The ore raised from both shafts was presumably carried over in wooden '*kibbles*', to the dressing floor ***05*** for initial sorting and crushing by hand on a 'bucking floor' (Bridge and Matheson 1994, 112). Given the quantities of ore being produced in 1569 it is possible that the ore store ***04*** located on the edge of the

working floor was built at this time. The mine accounts record that a local slater was paid to roof the 'little house at the stamps' (Bridge and Matheson 1994, 109). The opening at the back of the surviving structure would have allowed ore to be tipped in from the rear and it still presently still contains ore-rich material.

5.1.14 With all necessary infrastructure set in place to service the mine activity at Greenhead Gill productivity increased, and in 1569 a workforce of six men and one ore washerwoman was recorded (Tyler 1999, 41). There were three miners involved in working St Benedict's shaft, whilst the rest were processing the raised ore on the surface (*ibid*). Later in the same year the workforce swelled to ten, with additional lodgings being taken for them in Grasmere itself (*ibid*). Unsurprisingly, the year 1569 proved to be the most productive in the life of the mine, with 782 '*kibbles*' of lead ore being raised by a tributer named Steffan Nusspaumer (Bridge and Matheson 1994, 108-9) which equated to approximately 55 tons of ore raised (Tyler 1999, 41). The following year the ore started to pinch out and the newly established processing equipment sat idle (*op cit*, 42).

5.1.15 During 1571 only three people were working full time at the mine, including the ore washerwoman and her husband, which suggests that little, if any, deep mining was taking place (*ibid*). By 1572 the miners previously employed at Greenhead Gill begin to appear in the account books at other Mines Royal sites in Borrowdale, Newlands and the Caldbecks (*ibid*). The following year the mine was officially closed down and Eddie Watson was retained as a caretaker (Tyler 1999, 42; Bridge and Matheson 1994, 109). Little is heard again in the accounts about Greenhead Gill mine until 1581 when Christopher Mason of Grasmere, an ex-employee of the Company, rented the original lodging and smithy in Grasmere on the proviso that it was kept in good order (Donald 1989, 181-2; Hammersley 1988, 372-3). In total, the mine was worked on and off for a period of ten years and cost the company nearly £1,200 (Tyler 1999, 42).

5.1.16 The inventory of the mothballed mine drawn up by Sir Richard Ledes the English accountant of the Company of Mines Royal in 1586 revealed that Christopher Mason '*a shiftye person'* had asset stripped the smithy in Grasmere (Hammersley 1988, 372-3). He removed the bellows and other items of value, including the boards of the former sleeping loft (Tyler 1999, 42). Also recorded in the inventory of 1586 were '*More than one rowle wagon serving for within the Mynes*' (Hammersley 1988, 372-3). This is the only scant evidence that a level may have been driven into the hillside near to the stamp mill (Bridge and Matheson 1994, 111). However, whether these items had ever been in use at Greenhead Gill as part of an underground wagonway, or had simply been left in storage at the smithy in Grasmere before transportation elsewhere, is not clear. Agricola had described contemporary four-wheeled wagons with an iron guide pin on the front which would be used in mine adits running along two parallel planks with the guide pin running in the gap between (*ibid*; Plate 28). At Silvergill Mine, which was contemporary with the Mines Royal workings, there were discovered wooden rails, which demonstrate that rails and wheeled tubs were used underground in this period (Allison and Murphy 2010).

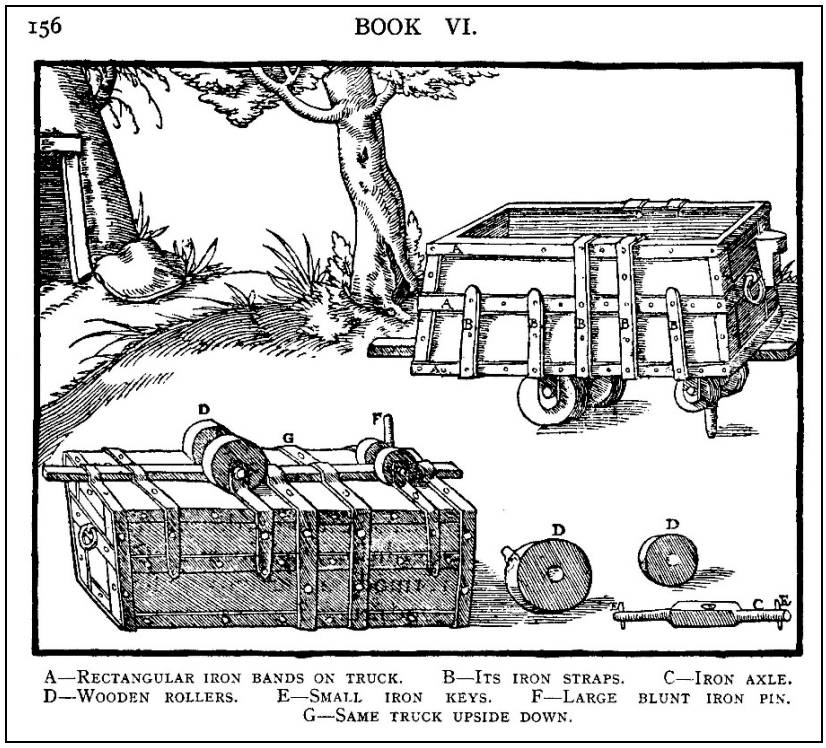


Plate 30: Examples of wooden waggons used in horizontal mine levels (Agricola 1556)

5.1.17 ***Late Nineteenth Century:*** on the 18th November 1870 Benson Harrison and W Bowness of Ambleside were given a take note on the mine from the Earl of Lonsdale via his agent Edward Wadham (Tyler 1999, 43). They drove an adit (Site ***21a***) beneath the earlier workings for over 100 yards into the rock but they found the individual thin quartz veins to be pinched out beneath the earlier workings with no ore evident (*ibid*). They also drove an adit further down Greenhead Gill (Site ***45***).

5.1.18 The mineral statistics for 1874 record no detailed return for the mine. The mine was owned 1873-5 by the Grasmere Haematite Iron Co. and from 1876 by John Muse, J Straughton, Ashton & Others, with Is Mossop as chief agent (Burt *et al* 1983, 45). The mine was recorded as being idle between 1877 and 1882 (*ibid*). This same company had also acquired the Providence Mine, which was also not worked during this period and raises the possibility that the lease on both mines was taken out as a speculative measure in case prices increased.

5.1.19 ***Map Regression***: the survey area of the mine complex was shown on both the OS 1st and Second Edition 25 inch mapping of 1861 and 1898 as blank open moorland with Greenhead Gill, Rowantree Gill and Grains Gill depicted, but with no recorded industrial remains. On the 1915 Edition mapping (Plate 29), however, the two rectangular structures, the putative ore bin ***4*** and bothy ***40a***, were depicted on the main working floor ***05***. The area of open surface working/adits across the gill from these structures ***32-34*** are depicted as a steep craggy area. The western retaining wall and the internal sub-division wall of the remote upper working floor ***01*** are also depicted, as are some of the probable surface workings on the steep sides of Grains Gill (Site ***35***). The blocked stream gully containing the buddles located to the south of the main working floor was also depicted.

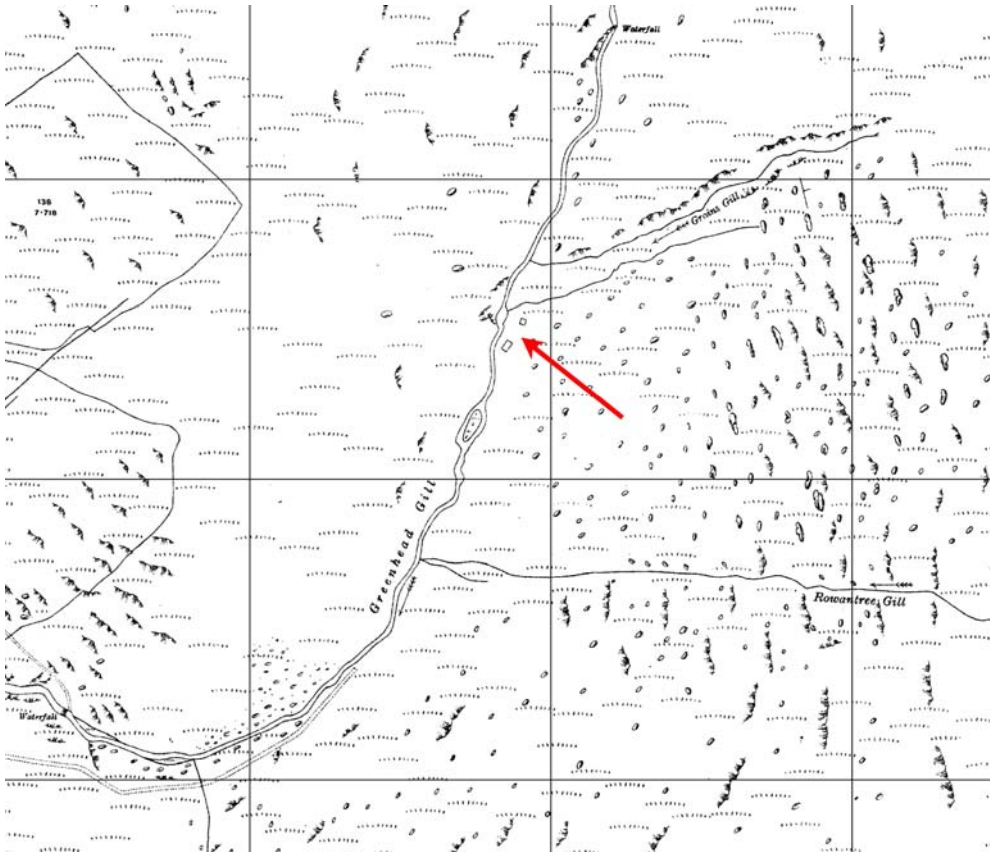


Plate 31: Ordnance Survey 25 inch mapping of the mine area in Greenhead Gill (1915)

5.1.20 ***Previous archaeological investigation:*** the surface layout of the Greenhead Gill mine complex has been subject to at least four separate investigations in the twentieth century. The earliest investigation by Shaw in 1939 described the working along with a sketched plan (Plate 30), he incorrectly recorded the bothy structure ***40a*** as the stamp mill and the nearby pair of bridge abutments as the foundation for the bearing of the water wheel (Sites ***14*** and ***15***). He did, however, identify and describe the working floor and ore store, along with the open workings, shafts and later adit to the south. In 1939 the northern shaft (Site ***30***) was still open to at least 20ft depth and St Benedict's shaft (Site ***16***) was by then mostly infilled. The pile of crushed ore on the working floor ***05*** was also sampled to test the amount of residual ore present. Cannell and Cannell (1969b) briefly visited the area and gave a description of the trial adit ***45*** that was located a little distance to south-west of the mine complex.

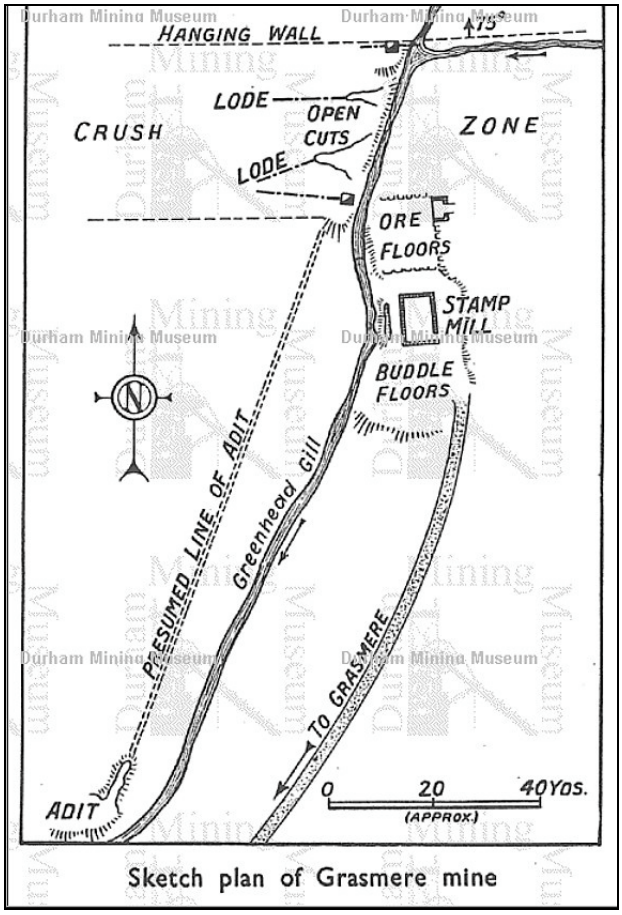


Plate 32: Shaw's sketch plan of the surface layout at Greenhead Gill (1939)

5.1.21 The first detailed investigation of the complex and explanation of the features with reference to the surviving Elizabethan records of the site was undertaken by Bridge and Matheson (1994). The second detailed investigation of the mine complex was undertaken by Tyler (1999) and culminated in a thorough description of the wider putative Elizabethan trial mining in and around Grasmere (Plate 31). In particular, this described the trial mining at Alcock's Tarn, and the coffin levels, trials and surface working at Brackenfell (Fig 13). The smithy with attached shaft located within Grasmere village was also depicted, although recent correspondence with the author has revealed that this depiction is simply indicative of what is likely to have existed (Ian Tyler pers comm). The description of the Greenhead Gill complex itself was related to a sketched drawing of the surface layout of the mine (Plate 32; Surveyed on 10th August 1983). In general terms, the investigation highlighted many of the salient features of the mine complex, albeit without a metrically accurate drawing. Tyler also investigated the mines and, in particular, the highest of the nineteenth century adits (Site ***21a***) that undercut the Elizabethan workings. He reopened and partially drained it before exploring the full 166 yards of it to the forehead.

5.1.22 The metrically accurate survey undertaken for the current project has picked up much further detail, in particular about different areas of mineral extraction, the water management on site, access to the mineral veins and the mine structures themselves (including buddles).

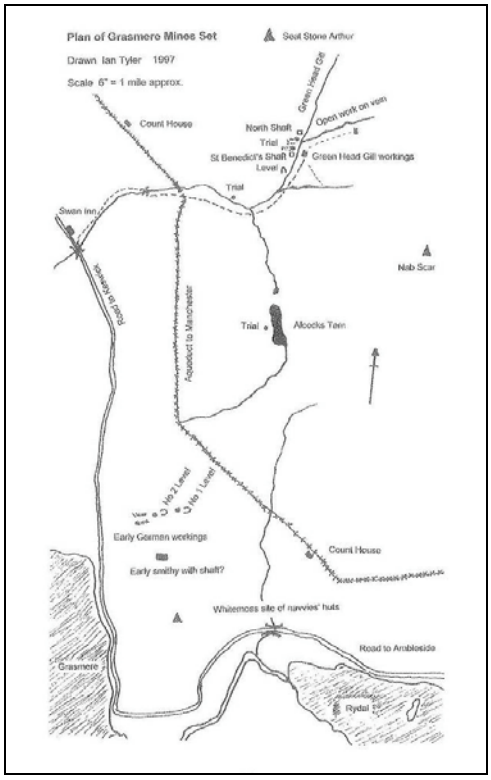


Plate 33: Tyler's plan of the wider distribution of mine workings around Grasmere

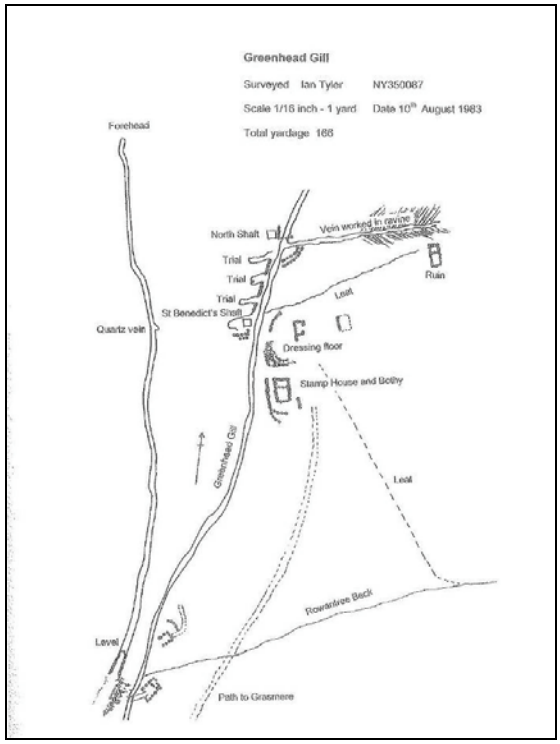


Plate 34: Tyler's sketch plan of the surface layout at Greenhead Gill (1983)

5.2 THE MINE WORKINGS - DESCRIPTION AND FORM

5.2.1 ***Introduction:*** the survey of the mining site was produced by means of GPS survey, aerial photography and surveys of the processing areas by theodolite and plane table survey (Figs 14-23). These survey drawings are presented below, along with a description of the mines and processing areas, and an assessment of the phasing of the mine's development. There are two principal phases of working: the Elizabethan Mines Royal period of activity and a nineteenth century re-use. An attempt has been made to separate the description into these two phases of activity; where there is doubt as to the chronology of select elements they have been examined under the heading of the earlier phase.

5.2.2 ***Elizabethan - Mines Royal Activity:*** the earliest substantial workings are at the north end of the complex, and on the western bank of Greenhead Gill. This consists of two vertical square-cut shafts (Sites ***31*** and ***16***) which are nearly 50m apart with further open surface workings stretching between them (Sites ***32-34***; Figs 14, 16 and 18). The steep hillslope has been cut back to a vertical edge by extraction and two slumped oval depressions are also evident. These workings are located just to the south of an ore-stained section of stream bed ***47***, which was presumably where the earliest trial surface working of the ore vein was undertaken (Plate 33). The two shafts are now both infilled, but the northern example (Site ***31***; Plates 34 and 35) was still open to a depth of 20ft in living memory (Shaw 1939). The southern shaft ***16*** was known as St Benedict's, and is mentioned in company account books for 1569. The shaft has a narrow rock-cut notch (Plate 36) on the side which may have aided the drainage of the mine when kibbles of water were raised from the mine and could be tipped away using this feature (Shaw 1939). Alternatively, it might have allowed water raised by means of a pump to flow away, such features are evident on the illustrations of mine pumps by Agricola in the 1550s.

Plate 35: The lead ore vein exposed in Greenhead Gill (Site ***47***)

Plate 36: The northern shaft with upcast bank on the east side (Site ***31***)

Plate 37: Detail of the flooded northern shaft ***31***

Plate 38: Drainage channel cut on the side of St Benedict's Shaft ***16***

5.2.3 Earlier investigation, particularly by Tyler (1999), indicated that all workings in this area were surface extraction trials with the main explorative workings being the vertical shafts. Shaw (1939), however, intimated that at least two of the surface depressions (Sites ***32*** and ***34***) may have had short sections of now collapsed adit, that may have originally chased the direction of the ore vein (Plate 37). There is some evidence to support this hypothesis in the form of a large oval depression or collapse located on the hillside above these features (Site ***36***) which may hint at subterranean mine workings, typically adits, that have collapsed resulting in a surface depression on the hillside. The two depressions (Sites ***32*** and ***34***) may be the slumped entrances of two roughly east/west-orientated adit tunnels that would have explored the orientation of the ore lode. From the present surface evidence it is not possible to tell if either of these features were original Elizabethan coffin levels or are nineteenth century speculative explorations. There is a single stone located opposite on working floor ***06*** that tantalisingly has a triangular drill mark upon it, and is the only slight evidence for possible nineteenth century working on this part of the mine.

Plate 39: The cuttings of St Benedict's shaft ***16*** (left), a pair of depressions/adits ***32*** and ***34***, and surface working ***33*** on the west side of Greenhead Gill

5.2.4 The only other potential Elizabethan era extraction is found at some distance upslope to the north-east of the main complex where there is a small stone wall retained working floor ***01*** (Plate 38) located on the south side of the large stream ravine of Grains Gill. The ravine has evidently been surface worked along the orientation of the ore vein ***35*** (Plate 39; Fig 14).

Plate 40: The working floor platform located far upslope on Grains Gill ***01***

Plate 41: Surface working of the craggy ravine containing Grains Gill ***35***

5.2.5 In the wider area to the south-west of the main mine complex, there is evidence for extensive surface exploration in the form of a large curvilinear hushed channel ***38*** located on the steep hillside west of Greenhead Gill (Plate 40; Fig 17). This excavation would have been used to chase near-surface deposits of the north-east/south-west-orientated ore vein that was downslope of the main complex. This feature could potentially be of Elizabethan origin, and certainly prospecting in the form of hushing was widespread during and after the Elizabethan period in the Lake District '*… [people] make continual searches and no doubt in time discover as plentiful veins as God's Gift and Coniston, which were found by poor shepherds and like people tending their sheep in the mountains. And as proof that*

this of damming cannot but bring good effects, in viewing these mountains it is to be seen how the very natural working of these floods, falling from the height in winter storms, have broken down and worn such rifts and slits in the rock. Hereby the dead leaders of metal fins or veins have appeared unto us above ground, which before were hid by the earth and stones formerly covering the rocks some 2 or 3 fathoms deep' (Donald 1989, 164). The site was, however, located quite close to a clearly nineteenth century drilled and blasted adit ***21a***, but this does not necessarily indicate that that the hushing was of a contemporary date.

Plate 42: A large curvilinear hushing ***38*** located downslope of Greenhead Gill Mine

5.2.6 The main processing area has two phases of working superimposed with at least one nineteenth century dry-stone structure (a miners bothy) constructed on top of the Elizabethan platform (Fig 18). The main Elizabethan processing area (Site ***05***) was where the reduction and sorting of veinstone into grades suitable for further processing took place, the ore would have been alternately dressed, stamp crushed and washed. The extant structure consists of a large trapezoidal working floor that has been levelled behind a platformed retaining wall on the east side of Greenhead Gill ***8a*** and ***8b*** (Plate 41). The working floor is also defined by a wall retaining the hillslope on the east side ***8c*** where a later small ore bin structure ***04*** has been inserted. Adjacent to the platform are a series of small enigmatic wall foundations on the southern end ***40b-e*** (Plate 42), at least two of these (Sites ***40e*** and ***40c)*** are square areas that may be the locations of troughs, sorting tables or primary buddles for separating ore from the veinstone immediately adjacent to the stamp mill. The others (Sites ***40b*** and ***40d***) are perhaps more likely related to the bothy and the nineteenth century phase of working (*Section 5.2.14*).

Plate 43: The southern end of the main working floor ***05***, with retaining wall ***08b*** and later bothy ***40***

Plate 44: Enigmatic wall foundations of possible buddles ***40b-d*** located on the southern end of the main working floor ***05***

5.2.7 There are fragmentary surface remains of a possible rectangular structure ***41*** that located adjacent to the north side of the bothy. Its date and function remain unknown, but was possibly the foundations for the small building/office attached to the stamp mill that was referred to in the 1586 inventory of the site (*Section 5.1.9*). Certainly the fragmentary evidence for these walls to the north of the platform cannot be reconciled with any nineteenth century functions on the site.

5.2.8 The largest ruinous dry-stone-constructed bothy structure (Site ***40***) surviving on the working floor clearly post-dates the Elizabethan mine working (*Section 5.2.14*); however, the northern end wall of this structure (Site ***40a***) is of an earlier, more massive construction than the rest of the building, and it would appear that this is an earlier wall against which the bothy was built. The north wall was previously interpreted as possibly being a gable end, but is most likely to be the residual load-bearing footing wall for a water wheel. Indeed, if this is the case then the large standing wall surviving adjacent to the site of the wooden stamp

mill building would have been an obvious location to build a later bothy structure against. This putative bothy structure (Site ***40***) is too small in size when compared to the extent of the stamp mill recorded in the Elizabethan documents (Fig 18; *Section 5.1.9*), and it is more likely that the stamp mill took up more space on the southern end of the working floor, as defined by the substantial kinked retaining wall ***8b*** on the west side (Bridge and Matheson 1994, 113).

5.2.9 The east/west-orientated water wheel would have served to provide power for the Elizabethan stamp mill on this platform. There are no clear indications for any footings for a water wheel surviving along Greenhead Gill itself, although Shaw (1939) did suggest that the large bridge footings adjacent to the bothy (Sites ***14*** and ***15***; Plate 43) may have been footings for the bearing of a water wheel. The water wheel mounted on the ***40a*** bearing mount would have been fed from a long south-east/north-west-orientated leat ***03***. This is evident running diagonally down the steep slope for around 155m on the east side of Greenhead Gill towards the working floor from Rowantree Gill. The water would have been taken-off at the downslope northern end via a wooden launder running to the east side of the water wheel to provide power for the stamp mill, but could also have served to provide water for a wet stamp mill operation. There is also extensive evidence of water management elsewhere within the complex, in particular, associated with the water supply for the buddles.

5.2.10 Other potential early evidence of structures on the main complex include one definite (Sites ***14***/***15***; Plate 43) and two possible (Sites ***42*** and ***43***) pairs of bridge abutments crossing Greenhead Gill (Fig 18). These would originally have given access between the mine workings on the western bank of the gill and the working floor opposite. In addition, there is an artificial platform (Site ***37***) located slightly upslope on the eastern side of the working floor, which had been identified by Tyler (1999). It is *c*13m by 10m in size and has been cut into the slope on the eastern side, and is up to 1m high. There is a set of three shallow scoops (Site 37b) downslope and to the west of the platform which are possible water erosion features. Overall the purpose and date of the platform is uncertain.

5.2.11 There are also fragmentary remains of one, or possibly two, buddles (Sites ***17*** and ***18***) that were potentially fed by a sinuous section of leat (Site ***19***) running downslope from Grains Gill on the north side of the complex. There is another probable small section of leat (Site ***07***) that may have provided water from a small tributary stream to the main working floor immediately north of the putative ore store (Site ***04***).

Plate 45: Bridge footings located between St Benedict's shaft and the working floor ***14*** and ***15***

5.2.12 While the bothy structure is undoubtedly of nineteenth century date there is some uncertainty as to the date of the adjacent ore store (Site ***04***), which is located at the eastern edge of the working floor. The ore store is 3m square internally with walls of drystone construction up to 1.4m high (Plate 44). It is infilled to a high level with crushed rock/ore and has been interpreted as an ore bin, which would have been loaded from upslope.

Plate 46: Putative ore store located on the eastern side of the main working floor ***04***

Plate 47: The miner's bothy/shelter attached to the putative waterwheel foundation wall ***40a***

5.2.13 Between the two extant buildings, at the northern end of the complex on the main working floor ***05a,*** is a sloping patch of ground with broken veinstone exposed of irregular size (Fig 19; Plates 46 and 47). This spread of crushed ore (analysed by Shaw*: Section 5.1.8*) is likely to be evidence for, at the very latest, some nineteenth century reworking at the site. It could equally be a bucking floor of Elizabethan date for primary dressing of the ore before it was inserted into the stamps.

Plate 48: The spread of crushed ore between the ore bin ***04*** and miner's bothy ***40a*** on the main working floor ***05***

Plate 49: Detail of the spread of crushed ore on the main working floor ***5***

5.2.14 The other most obvious surviving evidence for buddles are located to the south of the main working floor; the fragmentary remains of a group of adjoining buddles (Fig 20; Sites ***23-29***) are located in the base of a dried up streambed on the eastern side of Greenhead Gill. The streambed has been blocked on the upslope end and water has been taken off at a small dammed area ***22b***. The water would have been fed over a wooden launder, via a platform (Site ***22a***) so as to regulate water flow onto and between the cascade of buddles, and then the water would have drained down and back into Greenhead Gill further downslope. In addition there is a well-preserved buddle located on the eastern bank of Greenhead Gill upslope of the dammed area ***13*** (Plate 48).

Plate 50: A well-preserved buddle depression on the east bank of Greenhead Gill (Site ***13***)

5.2.15 ***Nineteenth Century Activity:*** the main area of nineteenth century mining was centred upon an adit (Site ***21***) in the southern part of the site, but in addition there was seemingly a bothy (Site ***40***) constructed on the site of the Elizabethan stamp mill at the northern part of the site. It is unknown how much reworking of this

northern, main site complex was undertaken in the nineteenth century other than the documented adits driven further downstream in 1870. It is uncertain if any of the shafts or adits/open workings (Sites ***16*** and ***31-34***) were investigated in this last stage of exploration. It is unlikely that the water-system was reinstated, particularly for the buddles, and no support or pit for a nineteenth-century water wheel is evident that would have post-dated the construction of the miner's bothy ***40*** where the earlier water wheel was probably located. Any nineteenth century working, at least on the main site, could have been limited in extent for trial purposes only, as there are no large industrial-sized spoil heaps in the complex unlike at other mines of a similar period in and around Grasmere. Tantalisingly, there is one drilled stone sat on top of the main working floor ***06***, but this could be out of situ and does not provide a reliable indication of nineteenth century activity, particularly when there is no other evidence for drilling and blasting technology in this area.

5.2.16 The one probable nineteenth century feature was a substantial dry-stone walled structure (Site ***40***) which butts against the axle support wall (***40a***) of the earlier water wheel and appears to post-date the Elizabethan phase of working at the mine or at least post-dates the initial wood-constructed stamp mill described in the documentary sources (Fig 18). The building is *c*4.7m x 3.4m in size with a doorway and external steps at the south-east end of the east wall (Plate 45). This rectangular dry-stone structure had previously been identified as a bothy but is most likely to have been constructed for miner's rather than shepherd's accommodation. This standing dry-stone structure (Site ***40***) located on the larger working platform is too small in size when compared to the extent of the stamp mill recorded in the Elizabethan documents (Fig 18; *Section 5.1.9*). The surviving wall fragments located to the south of this structure ***40b*** and ***40d*** are not the stone foundations for a building with a wooden superstructure and are more likely to be the result of activity on site after the demise of the Mines Royal, possibly contemporary with the setting up of the bothy (***40***). One of the east/west-orientated wall stubs ***40e*** could possibly relate to a foundation wall on the south-west corner of the earlier stamp mill, but this is only a tentative interpretation when relying on such scant surface evidence.

5.2.17 This dry-stone-constructed structure (Site ***40***) could potentially have been intact in the nineteenth century but it is difficult to reconcile this structure to the sheepfold mentioned in Wordsworth's poem of 1800 'Michael – A pastoral poem' as the sheepfold located 'up the tumultuous brook of Greenhead Ghyll', as it does not match the description given in one of Dorothy Wordsworth's diary entries in 1800 (Wordsworth 1800; Knight 1904). In any case, several stone roofing slates with peg holes were recorded in the debris surrounding the structure (Bridge and Matheson 1994, 112).

5.2.18 *Adits 21a and 45:* readily identifiable evidence for the nineteenth century working on the complex is limited to two drilled and blasted adits located to the south of the main working floor (Fig 20; Sites ***21a*** and ***45***). The first (Site ***21a***; Plate 49) was explored by Tyler (1999) and was driven to explore the south-western end of the vein lode as it dipped down beneath the earlier workings (Fig 22). He followed it for 166 yards to a forehead and he interpreted the quartz vein exposed in the adit wall to be located in the hillside 50 yards to the west of the earlier workings and be evidence for the pinched-out ore vein. A series of one and a quarter inch drill holes are visible internally for much of the length of the adit but not near the adit mouth

(Bridge and Matheson 1994, 114). The adit has a small yard ***21b*** and possible shelter ***21c*** located on the east side. To the south of the adit, on the opposite side of the gill, are fragmentary foundation remains for at least one rectangular structure (Site ***20a***; Plate 50) which has been platformed and is cut perpendicularly into the hillside. None of the fragmentary foundation walls now form a complete building outline and they appear to have been considerably disturbed. The platform suggests a domestic/industrial function for this structure rather than it being a sheepfold. The structure has a series of small yards and/or working areas on the north side (Sites ***20c*** and ***20d***) and an outer curtain wall and yard on the south side ***20b***. Some of the stones within the structure have evidence for drilling on them. The structure is clearly associated with nineteenth century mining activity represented in the form of the adit ***21a*** and may have functioned as a miner's bothy or tool store. This structure is probably not related to the sheepfold mentioned in Wordsworth's poem (1800), which would probably have pre-dated this late nineteenth century exploration of the mine. Confusingly, an entry in Dorothy Wordsworth's diary (11th October 1800; Knight 1904) regarding the sheepfold on Greenhead Gill mentions that 'The sheepfold is falling away. It is built nearly in the form of a heart unequally divided.' This would more likely describe the shape of this structure ***20a-d*** than the bothy ***40a*** upslope.

Plate 51: Inside the nineteenth century trial adit ***21a***

Plate 52: Fragmentary remains of a mine building ***20a*** with surrounding yard and working areas ***20b-d***

5.3 OTHER ELIZABETHAN MINING SITES AROUND GRASMERE

5.3.1 Tyler (1999) had identified other Elizabethan trial workings undertaken in the wider surrounding area in and around Alcock Tarn and Brackenfell to the south of the Greenhead Gill workings and nearer to Grasmere village (Plate 31). The sites were not easy to relocate during the present project, but were identified (Sites ***48-53***: Fig 13).

5.3.2 ***Alcock Tarn:*** there is a possible surface trial (Site ***48***) located 50m south-west of Alcock Tarn identified by Tyler (1999). The trial is located close to a ruined building attached to the nearby fell wall to the north, and it appears as a scoop roughly 2m in width, 1.5m in length and 0.25m in depth, surrounded by a grassy bank on three sides. It is likely that the scoop represents the actual trial excavation to test for the mineral vein and that the upcast banks to the south and east were spoil heaps resulting from this activity. A short distance downslope from this feature is a second, almost identical possible trial, consisting of a shallow scoop surrounded by grassy banking on three sides. This scoop is once again roughly 2m in width across the scope and 1.2m in length, with the scoop having a depth of around 0.25m. There was no sign of any 'rock debris containing pyrite at either site' as described by Tyler at the time of the visit.

5.3.3 ***Brackenfell:*** the highest trial or short level located on Brackenfell (Site ***49***; Plate 51; Fig 13) is the highest of the recorded Elizabethan mine workings on Brackenfell described as part of the 'Grasmere sett' by Tyler (1999). The entrance to the level is very narrow, typical of Elizabethan workings of the period, and gives access to a short 'coffin' level around 10 metres in length. The coffin level is less than 0.5m in width, with a sloping hanging wall on the north side of the level, and is nearly 2m in height in places and has a distinctive flattened roof some 0.3m in width. The workings are clearly hand cut, with no sign of any drilling or blasting marks. There is some evidence of secondary mineralisation at the head of the level, although there is no sign of any significant mineral vein. Below the

entrance to the level is a small spoil heap. The mound is grassed over and, therefore, it was impossible to look for evidence of mineralisation amongst the waste.

5.3.4 There is a possible small trial or surface working (Site ***50***), that was not referred to by Tyler (1999) but is located just above the public footfall through Brackenfell. The feature is a linear scoop aligned roughly north/south and is 1m deep. There is some fractured stone in the area and the shape and profile of the scoop seems to suggest mining activity as opposed to water erosion or the result of a tree throw. There is a further small trial or surface working ***51*** located just below the public footpath through Brackenfell. It is a linear extraction pit or trench infilled with a considerable depth of leaf litter, although it is likely to be at least 0.8m in depth.

Plate 53: The upper coffin level on Brackenfell, Grasmere (Site ***49***)

5.3.4 There is a second mine level ***52***, located on land to the west of Brackenfell (Plate 52). The entrance to the level is very modest in scale, appearing as a low portal cut directly into the rock face some 0.6m in width. The floor of the level contains a considerable depth of leaf litter making the roof of the coffin level appear unusually low; however, once inside the leaf litter disappears and the coffin level extends up to a maximum height of 2m. Tyler (1999) identified this level as being located at OD 410ft. He continues to say that 'this level has been driven directly onto where the vein is again exposed at the surface. It is very narrow and superbly hand-chipped, showing the craftsmanship and technique of the miners. After a few yards, the level becomes higher and here, both the roof and the ceiling have been stoped and a pocket of ore has been taken. The level extends for a distance of 26 yards and is 10ft high and no more than 22ins wide, and some mineralisation is still to be seen'. The mineral vein referred to by Tyler appears as a narrow strip of pale quartz rick material in the roof of the level. As with the higher level, a

hanging wall is apparent on the northern side of the level and the distinctive hand-chipped flat ceiling once again apparent. The area surrounding the entrance to this level is so densely planted that identification of other features, such as sorting or dressing floors, was impossible.

5.3.5 Further downslope, a small feature (Site ***53***) appears as a former surface working located directly on the mineral vein (Fig 13). The gap left by the removal of the former veinstone can be clearly seen in the upper part of the workings, which otherwise appear as a shallow scoop roughly 8m in width by about 10m in length.

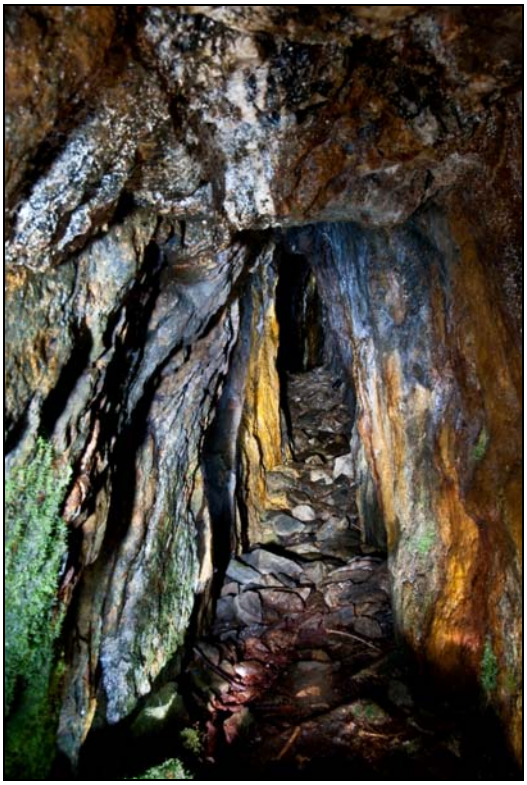


Plate 52: The lower coffin level on Brackenfell, Grasmere ***52***

5.3.6 Tyler reasonably assumed that the works on Brackenfell were opened up during 1564/65 when an expenditure of £116 8s and 3d is recorded in the miners account books for exploration of the area and for the opening of two adits directly onto the vein (*Section 5.1.19*).

6. FAIRFIELD MINE DOCUMENTARY AND SURVEY RESULTS

6.1 FAIRFIELD MINE, GRASMERE

6.1.1 ***Location:*** the Providence and Fairfield iron mines, are both located at the northern end of Grasmere, on either side of the steep ridgeline of Great Tongue (Plate 53). Due to the close proximity of the two, and contemporary exploitation in the late nineteenth century, the mining literature groups both together as the Tongue Gill Mines. Initial prospecting along the streams and their tributaries near Great Tongue determined the location of the mine. Fairfield iron mine (NTSMR 24493, HER 36982) is located near a reservoir at the confluence of Tongue Gill and Little Tongue Gill on the south side of Great Tongue. It exploited a north-west/south-east-orientated haematite ore vein in the Borrowdale volcanic rock that dipped to the south-west, running through the area of Great Tongue on the western flank of Fairfield mountain (Tyler 1999, 47; Adams 1988,139).

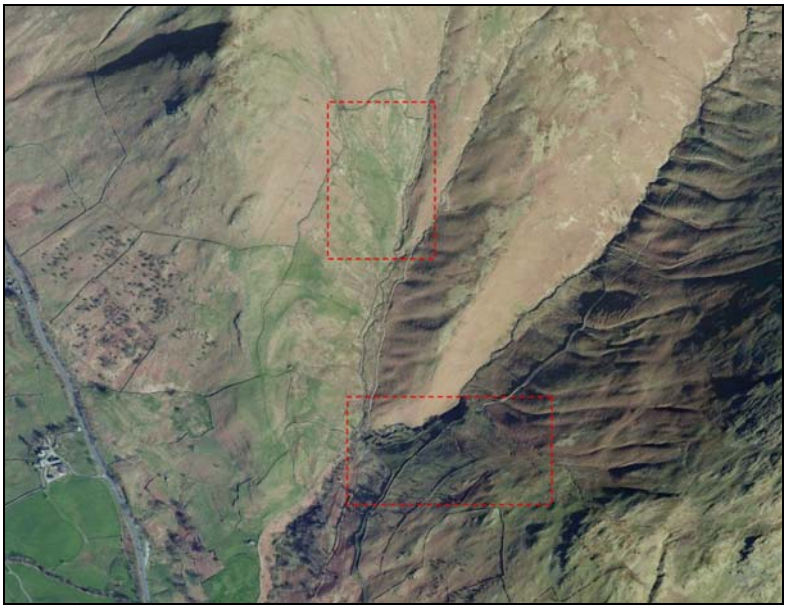


Plate 55: Location of the two mines at Tongue Gill (© Google Earth)

6.1.2 ***Late Seventeenth-Eighteenth Century:*** in the mining literature both Tongue Gill mines were recorded as being worked around 1700 to supply ore to a furnace in Great Langdale (Postlethwaite 1975 127; Tyler 1999, 46; Adams 1988,139), although no specific documents were used as evidence for this. The modern mining literature references Postlethwaite (first published 1877) who in turn expanded upon Thomas Robinson's text (1709) which described the contemporary Lake District mines in general and their relationship to the Langdale furnace. It was Postlethwaite who took this and asserted that the Tongue Gill mines must have been associated with the Langdale furnace, as Robinson does not specifically mention them. The only possible piece of evidence to support this suggestion uncovered so far is an agreement dated 1693 found in the LRO, which detailed Henery Rooper, a miner of Grasmere who was to supply Myles Sandys, of Hawkshead, an individual associated with Cunsey Forge on the southern end of Windermere (Miller 2005, 179), with iron ore for nine years (Plate 54). Unfortunately, translation has not provided recognisable locations for the iron 'pits' in Grasmere. In any case, the agreement was not enacted upon, but

this surviving document may point to other such agreements/leases held in this period by other parties to mine iron ore in Grasmere. In addition, samples of haematite recovered at Cunsey forge during excavations undertaken in 2003 were consistent with known occurrences in the Grasmere area (*ibid*).

Plate 56: Unsigned agreement of Henery Rooper of Grassemeere, co. Westmorland, miner, to Myles Sandys of Hawkshead, esq - to supply iron ore to Myles Sandys for nine years from pits in Grasmere

6.1.3 ***Late Nineteenth Century:*** at Fairfield Mine, the mine layout is more complex than that at Providence mine which suggests some longevity of working, although the documented history of the mine is relatively short-lived. Identifiable documents coincide with the 1870s boom in iron prices (Postlethwaite 1975, 128); in 1872 Thomas Dineen a man of Irish extraction, who was a rivet and bolt manufacturer and iron merchant from Workington (London Gazette, 11th June 1867, 3328), acquired a take note for one year with an option for a 21-year lease for the mine sett (Tyler 1999, 47). His tenure was unsuccessful, indeed when he first visited the site in 1873 it was said that he couldn't even find it.

6.1.4 On the 19th September 1874 the lease was taken up by the newly-formed Lake District Haematite and Mining Co (*ibid*), and was set up by a group of Rotherham and Sheffield businessmen, presumably to feed raw materials for their other ventures. The mine agent 1873-77 was John Hall, a skilled mining engineer from Alston *(ibid*). The directors included an alderman of Rotherham, James Clifford Morgan, and his colleague Francis William Waide, who were partners in the company of Morgan, Macaulay, and Waide a stove grate manufacturers, general iron founders and merchants, located at Baths Foundry in Rotherham (The Engineer, 23rd September, 1904, 303; Plate 55).

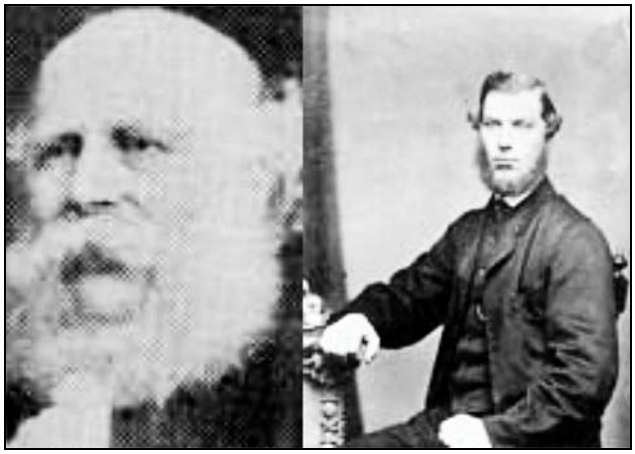


Plate 57: Alderman JC Morgan (left, and FW Waide (© Rotherham Libraries, Museums and Archives)

6.1.5 The mineral statistics of 1874 show that 204 tons of ore had been raised, valued at £350 (along with the ore from Providence mine) but with the slump in the price of iron in the following year the mine was evidently in trouble (Burt *et al* 1983, 45). In total, both Tongue Gill mines together raised 1,300 tons of ore (or 1500 tons in the other later secondary sources) in this short-lived period (Postlethwaite 1975, 128). By at least December 1875 the venture was in trouble and a pleading letter was sent by the company to the mineral agent asking for the unpaid rent on the mine to be waived due to the amount of development the company has undertaken on the mine (Tyler 1999, 47).

6.1.6 The company failed to post accounts and a list of shareholders to the Register of Joint Stock Companies, as required by law (*ibid*). In 1877 the angry and unpaid chief mine agent John Hall took the named directors to court in Rotherham for unpaid wages and other liabilities (*Appendix 5*; Whitehaven News, 4th October, 1877). The directors counter-claimed that they had been conned into investing in a worthless mine, and eventually the company was liquidated. In part, the fiasco eventually led to the financial ruin of Mr Waide (London Gazette, 4th September 1883, 4379) but Alderman Morgan became mayor of Rotherham the following year and had a comfortable retirement (The Engineer, 23rd September, 1904, 303). The mine was recorded in the mineral statistics as being owned by the Lake District Haematite and Mining Co. Ltd from 1877–82 but it was standing idle (Burt *et al* 1983, 45).

6.1.7 ***Map Regression:*** the Ordnance Survey mapping from 1861 predates the documented exploitation of the mine. It potentially shows the steep craggy banks of Tongue Gill in the area where the north-west/south-east haematite vein comes down the hillside. The ore would initially have been prospected where the vein was exposed in the stream bed and eroded banks.

6.1.8 The 1915 Ordnance Survey mapping (Plate 56) post-dates all of the documented exploitation of the mine and also the construction of the reservoir on the site. There are various mining features shown, including the lower western adit, spoil heap, walled yard and possible ore store, bothy and access bridge.

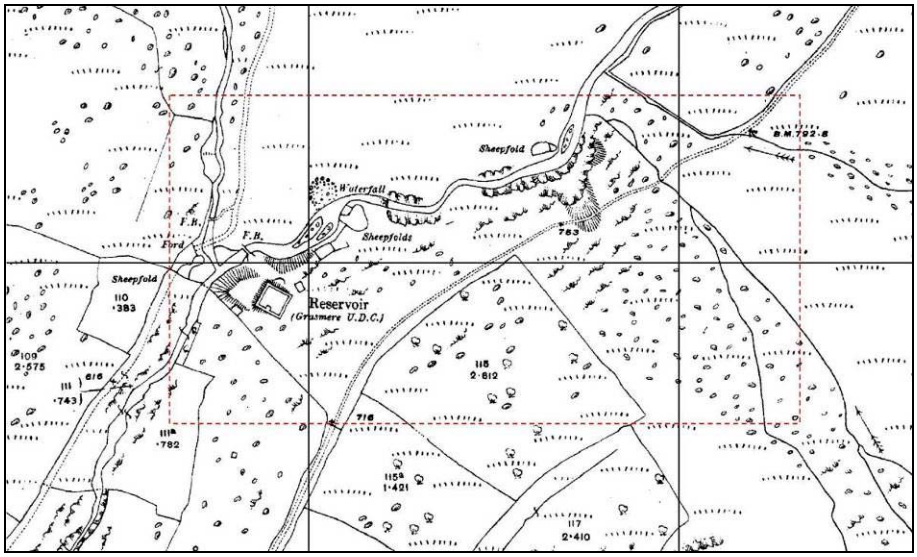


Plate 58: Ordnance Survey 25 inch mapping showing Fairfield Mine area and reservoir (1915)

6.2 THE MINE WORKINGS - DESCRIPTION AND FORM

6.2.1 ***Introduction:*** the survey of the mining site was produced by means of GPS survey, aerial photography and surveys of the processing areas by theodolite and plane table survey (Figs 24-28). These survey drawings are presented below, along with a description of the mines and processing areas, and an assessment of the phasing of the mine's development.

6.2.2 ***Site Development:*** identified features in the area that pre-dated mining are primarily confined to three individual sheepfolds located on and adjacent to the mine ***3***, ***8*** and ***16***. The sheepfolds are located at the interface between the enclosed lowlands and the open fells of Great Tongue and Fairfield. They are clustered on the edge of Tongue Gill and all functioned as washfolds, and the westernmost sheepfold (Site ***16***) straddles the Grisedale Hause packhorse route ***17*** (Plate 57).

Plate 59: Sheepfold ***16*** straddling Grisedale Hause packhorse track (Site ***17***)

6.2.3 The surviving layout of the mine consists of three adits (Sites ***9***, ***4*** and ***19***) driven south-east into the hillside (Shaw 1970, 101-2) that run gently upslope following

the course of the south side of Tongue Gill in a west-south-west/east-north-east orientation for over 150m (Figs 27 and 28; Plate 58). The ruins of mine buildings, and dressing floors/working areas are concentrated around the lowest adit (Site ***9***) on the western end of the site.

Plate 60: General view of Fairfield Mine looking downstream to the west

6.2.4 Some of the earliest mining remains surveyed at Fairfield comprise the series of well-defined earthworks of inter-connected hushes that run downslope from Rydal Fell to Tongue Gill ***1*** (Fig 26) The main hushing runs south-east/north-west down to the gill and is partially overlain by an enclosure wall (Site ***1a***; Plate 59). There is a cross-cutting hush running along the slope (Site ***1d***) that would have channelled water from another hush ***1b*** and at least one hushed tributary stream ***1c***. These hushes would have been used to chase surface evidence of the ore vein and to identify its orientation; it is possible that they predated the 1870s exploitation of the mine.

Plate 61: A linear hushing (Site ***1a***) running across and down the mountainside

6.2.5 On the edge of Tongue Gill, just to the west of the hushings, is a series of shallow surface trial workings running into the stream where ore nodules were visible in the stream bed and banks ***2*** and ***5***. There are two more pronounced deep cuttings (Site ***6***) running into the stream and the westernmost cutting ***6b*** is an almost vertical rectangular cutting which is likely to be the product of surface working to remove the ore body exposed in the steep sides of the gill (Plate 60; Figs 25 and 26).

Plate 62: Near vertical mineral extraction on the southern edge of Tongue Gill (Site ***6b***).

6.2.6 The easternmost trial adit (Site ***19***) is located above a further potentially early area of surface working running down a very steep slope into Tongue Gill (Fig 28; Site ***2***). The trial is potentially late-nineteenth century in origin, and there is a vertical quarried rock face on the footpath west of the trial adit where drill marks show it has been excavated using blasting technology.

6.2.7 The central of the three adits at Fairfield (Site ***4a***) lay above the stopes and surface workings in the centre of the complex (Plate 61). The adit has collapsed and there is a flat-topped spoil heap downslope which is now crossed by an access trackway ***11a***. The size of the spoil heap may point to this adit (Site ***4a***) having been purely a trial level.

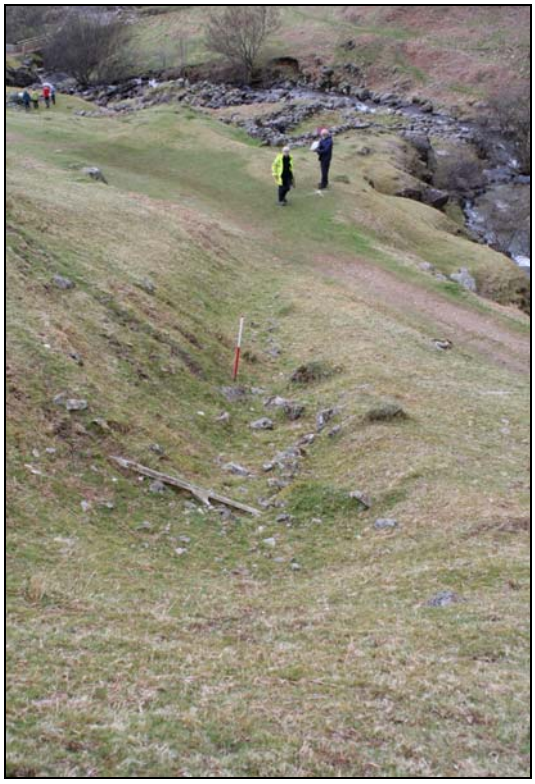


Plate 63: A collapsed trial adit ***4a***

6.2.8 The main focus for Fairfield mine is the lowest adit ***9a*** located on the western end of the complex (Fig 28; Plate 62). There are a series of features surrounding the adit, including a large spoil heap, a yard/working area and a possible ore store which are evidence for this being the main adit (Tyler 1999, 46). The adit itself is partially blocked at the entrance and was not investigated underground. Tyler recorded that the adit was 6ft 6ins high by 4ft 6ins wide and extended into the hillside for over 160 yards before a roof collapse at the start of the stoping had closed it. A small trial of a subsidiary north/south-orientated stringer of ore was recorded 60 yards from the entrance (*ibid*).

Plate 64: The main partially blocked adit ***9a*** at Fairfield Mine with a yard in front (Site ***9c*** and ***9d***)

6.2.9 There is an extensive spoil heap running west from the adit entrance ***9e*** that spills steeply down onto Tongue Gill. The steep-sided spoil heap is constructed of crushed waste rock with deep red-iron staining. At the southern end of the spoil heap are fragmentary remains of a walled loading ramp/bay (Plate 63), similar to that at Providence Mine (Site ***13***), and adjacent to it is a collapsed ore store (Site ***10***).The flat top would have been used for ore dressing and adjacent to the adit mouth is a partially-collapsed rectangular year/storage area (Site ***9f***) consisting of two short sections of walling ***9c*** and ***9d***. This yard has evidently never possessed a permanent or solid roof, the breast high walls providing the only protection from the weather for those working on the surface. There is a small gap between the yard and the retaining wall that define the south side of the working area ***9b***, which would have originally provided a gap for narrow gauge rails to pass onto the spoil heap from the adit.

Plate 65: Loading ramp ***13*** on the southern end of the spoil heap/working floor ***9e***.

6.2.10 On the westernmost edge of the complex is a roofed bothy structure (Site ***20***) located adjacent to an enclosure wall at the entrance where an access trackway would originally have extended up to the mine (Site ***11b***; Fig 28; Plate 64). The bothy should probably be associated with miner's accommodation/shelter as it is not depicted on the 1861 mapping but evidently pre-dated the construction of the nearby reservoir. Other features to note are the trackways running through the complex (Sites ***11a-c***), of which ***11b*** is an early track, but has a later walkers footpath ***11c*** adopting part of its line; these tracks use the large bridge piers constructed across Tongue Gill (Site ***15***).

Plate 66: Miner's bothy at Fairfield Mine ***20***.

6.2.11 The large uncovered reservoir ***12a***, constructed for Grasmere Urban District Council, was constructed on top of the mine complex but apparently does not seem to have done much lasting damage to the site; there is, however, a large flat-topped spoil heap downslope of it that may have impacted upon historic mining features (Site ***12b***). There is a weir located upstream on Tongue Gill ***7a*** where water was piped down to the reservoir. The water take-off is visible on the south side of the weir (Site ***7b***) and water would originally have been piped crossing the adjacent sheepfold (Site ***8***), where rebuilding is evident; however, the route along/around the spoil heap is uncertain.

7. PROVIDENCE DOCUMENTARY AND SURVEY RESULTS

7.1 PROVIDENCE MINE, GRASMERE

7.1.1 ***Location:*** the Providence and Fairfield iron mines, are both located at the northern end of Grasmere, on either side of the steep ridgeline of Great Tongue. Due to the close proximity of the two, their contemporary exploitation in the late nineteenth century, the mining literature typically describes them collectively as the Tongue Gill Mines. Initial prospecting along the streams and their tributaries near Great Tongue determined the location of the mine. Providence Mine (NTSMR 24494, HER 30755) is located on the north-west side of Little Tongue Gill on the hillside west of Great Tongue. It exploited both a north-west/south-east and a north/south-orientated haematite ore vein in the Borrowdale volcanic rock running through the area of Great Tongue on the western flank of Fairfield mountain (Tyler 1999, 47; Adams 1988,139).

7.1.2 ***Late Seventeenth-Eighteenth Century:*** in this period the mining literature has both Tongue Gill mines recorded as being worked around 1700 to supply ore to a furnace in Great Langdale (*Section 6.1.2*).

7.1.3 ***Late Nineteenth Century:*** the relatively brief documented history of the site coincided with a short-lived boom in the value of iron ore in the mid-1870s when the price of iron rocketed from 13s to £1 12s per ton (Postlethwaite 1975, 128). It was shown to have been active from 1873 to 1876. The Providence Mine was opened or reopened by the Providence Iron Co Ltd in 1873 and was worked by them until 1876, with the chief agent being John Muse, a successful miner from Alston (Tyler 1999, 48). The mine was excavated to exploit a 16ft thick vein of solid haematite (*ibid*). The mine posted mineral statistics for 1874 for 300 tonnes of ore extracted which was valued at £350 along with the ore from Fairfield mine (Burt *et al* 1983, 52). The success was short lived due to fractured and unstable ground conditions, high transport costs due to a lack of a nearby railhead, and a declining market for iron from 1875 onwards (Tyler 1999, 48). The mine was acquired by John Muse himself in 1877 as part of John Muse, J Straughton, Ashton and Co. who also ran the successful Force Crag mines, but the mineral statistics show that it stood idle between 1877-82 (Burt *et al* 1983, 52). The brief documented history for Providence Mine in this period is relatively simple, and the straightforward surface layout of the mine would suggest that most features were associated with this short-lived episode of exploitation.

7.1.4 The only other documentary evidence found was a newspaper report for a fatality from a roof collapse, in the Ulverston Mirror, 3rd January 1874 when the mine was in full production. This highlights the danger of the industry but may hint at the inherent instability of the ground that plagued this particular mine.

Mining Accident Near Grassmere

On Tuesday a fatal accident occurred at the iron ore mine now being worked by the Providence Iron Ore Company in the vicinity of Grassmere. A man named Edward Greenlow, was engaged in propping up the roof in the high level working of the mine, which had been observed to require additional props, when it

suddenly gave way, and poor fellow lost his life. The deceased was 40 years of age, and leaves a wife and family.'

7.1.5 ***Map Regression:*** the Ordnance Survey mapping does not show any mine workings or ancillary features in the 1861 Edition but in the 1898 and 1915 editions (Plate 65) a walled loading ramp was depicted at the upper workings, and a drainage adit at the lower workings were depicted. In addition, the Grisedale Hause packhorse route was depicted running south/north to the east of the mine location and leading up over Great tongue from Grasmere to Patterdale.

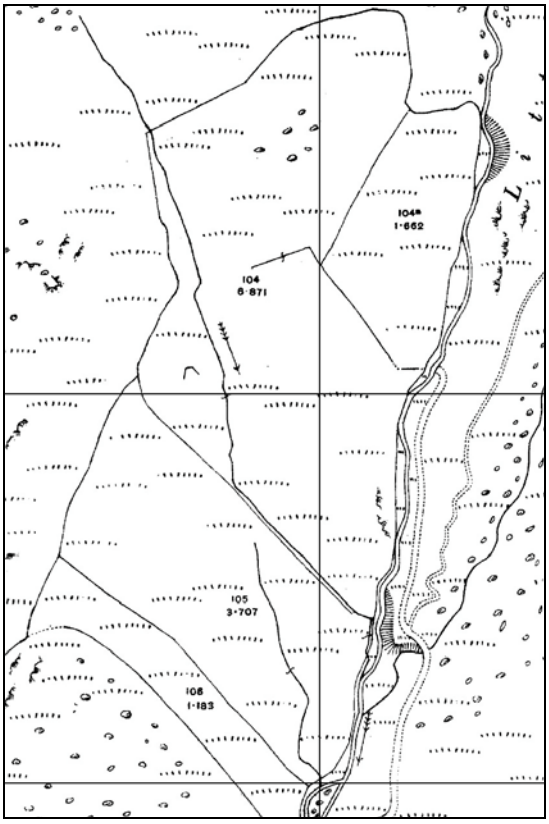


Plate 67: Ordnance Survey 25 inch map of area of Providence Mine on Little Tongue Gill (1915)

7.2 THE MINE WORKINGS - DESCRIPTION AND FORM

7.2.1 ***Introduction:*** the survey of the mining site was produced by means of GPS survey, aerial photography and surveys of the processing areas by theodolite and plane table survey (Figs 31-33). These survey drawings are presented below, along with a description of the mines and processing areas, and an assessment of the phasing of the mines development.

7.2.2 ***Mining Features:*** the surviving surface layout for Providence Mine is relatively simple in plan and reflects a very brief phase of extraction. It is separated into two distinct zones, with evidence for the majority of the features at the upper workings in the north-west (Fig 31). These consist of various workings with spoil heaps straddling the outer enclosure wall and clustering along the course of a small tributary stream of Little Tongue Gill. Separate from this zone, at the lower

workings, is a single drainage adit with large spoil heap located further downslope to the south-east adjacent to the Grisedale Hause packhorse route.

7.2.4 The majority of features associated with the upper workings are located on the western bank of a small tributary stream. This was undoubtedly where the prospecting for an ore vein was undertaken along the stream bed as it climbed upslope and iron staining is visible as far up as 1700ft in the stream bed (Cannell and Cannell 1969a, 65; Fig 31). The workings descend in a north-north-west/south-south-east line running down the west side of the tributary stream. At the summit of the mine is an upcast circular embanked feature with a scooped central depression, ***01*** which may be the collapsed remains of a vertical shaft (Plate 66). To the south of this is a small associated spoil heap, ***02a***, which in turn overlies a pair of overlapping linear spoil heaps, ***02b*** and ***02c***.

Plate 68: Putative shaft located at the summit of Providence Mine ***01***

7.2.5 Further surface mining evidence located outside of the enclosure wall consists of several surface trial scoops ***06***, a larger hushing running downslope ***05a*** (Plate 67), and a collapsed adit entrance ***03***. The spoil heaps for both hush and adit lay beneath the enclosure wall.

Plate 69: Hushing scar located on the steep slope above the upper workings ***05a***

7.2.6 At the southern end of the upper workings and inside of the enclosure wall is a further surface trial scoop ***07***, and a collapsed adit with long north/south linear mouth and spoil heap downslope ***10*** (Plate 68). On the southern end of the spoil heap is the walled loading ramp ***08*** (Plate 69) that was, in turn, depicted upon the 1898 OS mapping. The loading ramp is on the side of an access trackway ***11*** which runs east/west across the enclosed field away from the mine, then turns south along the east side of Little Tongue Gill to the lower workings and a junction with the Grisedale Hause packhorse route ***14***.

Plate 70: An adit with spoil heap ***10*** that has a loading ramp inserted in the southern end ***08***

Plate 71: Detailed view of the loading ramp retaining wall ***8***.

7.2.7 The lower workings (Fig 33) consist of a single collapsed adit ***12*** that has been driven north-north-west into the hillside and is located adjacent to Little Tongue Gill and straddles the lower eastern side of the modern enclosure wall (Plate 70). There is evidence for small retaining walls ***12f*** on either bank of the gill that would have originally held a temporary bridge across to the spoil heap downslope on the other side ***12c*** (Plate 71). The adit may have functioned to drain the upper workings of the mine; it would have provided an easier haulage level to bring ore out rather that winding it up the top shaft ***01***, or transporting it further from the upper workings.

Plate 72: Collapsed drainage adit mouth ***12a*** with part of the spoil heap crossed by the enclosure wall ***12e***

Plate 73: The large spoil heap south of Little Tongue Gill ***12c*** used by the drainage adit ***12a***

7.3 NON-MINING FEATURES

7.3.1 ***Stock Enclosure:*** the most unexpected feature encountered was a large oval scooped stock enclosure ***13a***, which, on morphological grounds, would typically have been prehistoric/Iron Age in date (Fig 33; Plate 72). It has a well-defined kerbed entrance on the east side and would have corralled cattle at the foot of Great Tongue, where trampling and the extraction of manure from the centre has created a scooped effect. The location of any round house within the site would have been in the south-west corner where there is a small flattened area, but there is no other surface evidence for it. There were several other features around the enclosure that may be contemporary to it, with at least one definite small clearance cairn to the east ***13b***, a dubious platform ***13c*** and a blocked stream gully ***13d***.

Plate 74: The scooped prehistoric stock enclosure ***13a***.

8. CONCLUSION

8.1 INTRODUCTION

8.1.1 The Level 3 archaeological survey has identified and recorded a total of 133 built components or other archaeological features associated with the surface workings at the four mineral extraction complexes (Fig 1). There are 46 features at Banks slate quarry (*Section 4.2*; Figs 3-11); 53 at Greenhead Gill lead mine (*Section 4.3*; Figs 14-23); 20 at Fairfield iron mine (*Section 4.4*; Figs 24-28); and 14 at Providence iron mine (*Section 4.5*; Figs 29-33). The identified features within each individual surface complex have been described by location, the evidence for shafts/adits, working floors and buildings, the water-management system and other ancillary features, such as hushings (*Sections 4-7*). This conclusion discusses the surviving archaeological evidence, and presents an interpretative account of the phases of surface layout and operation at each mineral extraction complex.

8.2 BANKS DISCUSSION

8.2.1 Banks Quarry is a representative example of a slate quarry that was prevalent across the Coniston and Langdale valleys, characterised by the outcropping of the Borrowdale Volcanic Series (BVS) rocks that provided the characteristic green slates. These green slates were elegant, hard wearing and, above all, could be cleaved uniformly and evenly, sufficient to be able to create thin roof coverings that were relatively light and required a minimal amount of roof superstructure. Although the Borrowdale Volcanics were formed 450 million years ago during the Ordovician period, it was the subsequent Devensian period when the temperature and pressure of continental collisions altered the rock structure creating consistent cleavage lines, known as bate by the quarrymen (Cameron 1996, 95). While there was considerable amounts of comparable BVS rock slate across the Central Lakes, there was only very rare occurrences of the rock where the bate was sufficiently pronounced and uniform to enable the manual working of rocks into thin slates, and the seams of this rock may be very thin and localised. It was down to the skill of the quarrymen to be able to recognise this special rock and to then be able to economically work it. Once a seam was recognised there was a tendency to intensively exploit and follow the narrow seam to maximise the output. Quality slate readily recognised on the surface would have been worked as a surface, open cast quarry, but as the working of the seam extended further away from the surface then the amount of overburden that needed to be removed to win the slate steadily increased, until there came a point when the working was no longer economic. In this situation, the workings would either have been abandoned or if the seam was of sufficient, then an adit was excavated into it, leaving the poorer quality rocks *in situ.*

8.2.2 At Banks many of the extensive quarry works, such as quarry ***100*** and ***203***, had an outline that did not change significantly between the 1861 and 1915 maps, but yet the spoil heaps in front of them steadily increased over the same period. This demonstrates that the economic limitations of the open cast quarrying was quickly reached and from then on slate was won from an adit. In many instances, there is

little evidence of an adit, which probably reflects that the quality slate is in such a small localised area that other workings were inevitably in close proximity, and their spoil ended up spilling into earlier quarries, covering the entrances to former adits.

8.2.3 The quarry operation at Banks was one of a group of very comparable nineteenth and early twentieth century operations that exploited the Borrowdale Volcanic slates between Coniston and Langdale. During this period there was a universally adopted system in place whereby a price was agreed between a 'Company' of men and the quarry owner for the tonnage of slate that was produced from a face or locale over a specific period of time (Cameron 1996, 100). A company typically comprised two rockhands that worked the rock, two rivers and a dresser, and there could be more than one 'Company' working the quarry at any one time (*ibid*). As such, this explains very effectively why there are so many, seemingly independent, but contemporary, quarry operations in place at Banks Quarry. Hence, the small workings to the west of the main quarry, including Sites ***01***, ***05***, ***07***, and ***209*** would have been operated at various stages by separate companies from those working the larger ***100***, and ***107*** operations. With this system, it encouraged a number of smaller operations at the same quarry, and a need to keep a clear division between the workings of different companies. Hence, at the top quarry site there were three seemingly independent working floors using the same adit (***102f***, ***101b*** and ***100b***) each with separate access routes to the adit and each with their own riving sheds and spoil heaps. Each would have been worked by different companies, but each company may at different stages have worked more than one quarry operation at Banks. As a system it explains the very disparate form of the quarry workings and also explains why there were large boundary walls constructed over the tops of the spoil heaps, as these would have provided the divisions between the workings of different companies. As such, it means that it is very difficult to get a handle on the productivity of a quarry, as the figures available for output would typically relate to that of a single company rather than for the overall quarry. Ted Bowness's description of the quarry operations fits closely with this overarching system and his description of the number of people working at Banks corresponds to the norm of having no more than five people in a Company, but there may have been more than one Company working at Banks during this post First World War period. Ted refers to the 'Bargain' system as being prevalent at Elterwater, but says that it was applied on a more casual basis at Banks Quarry. An arrangement was made on a regular basis with the quarry owner, who was in this instance Pattinson (or Patti) (*Appendix 4*), and a rate was agreed as to how much would be paid to him for the slate over a defined period. The disadvantage of the system was that as there were multiple smaller operations working the quarry, then there was little opportunity for the investment in technology to improve the efficiency of the overall operation, as each 'Company' was too small to provide this investment. The situation at Banks was that they did invest in the use of an air compressor engine to enable the drilling of blast holes, but this was only undertaken at the latest stage of the life of the quarry, shortly before it closed.

8.2.4 The fortunes of Banks Quarry was very comparable to those of other quarries of the Coniston / Langdale group. In the final years of the eighteenth century a tax was levied by government on coastal shipping, which was essential for the movement of the slate, and this meant that it was difficult to compete with the

Welsh operations (Cameron 1996, 19). This precipitated a major decline in slate working operations in the Lake District that was to continue until the tax was repealed in 1830 (*ibid*), and this prompted a resurgence in the slate industry of the Central Lakes. Banks Quarry, formerly Wood / Dales Quarry, which was first documented in 1829, saw a period of significant expansion and was well developed by the time of the OS 1st Edition mapping in 1861. This golden period of slate working, fuelled by the demand for roofing materials for the workers housing in the expanding industrial towns, continued through to the late nineteenth century. In the late 1870s and mid 1880s there was a recession in the industry provoked by over supply by quarries and prices for slate had dropped by as much as a third from those earlier (*op cit*, 23). The recovery from this recession was slow, but towards the end of 1890s prices had recovered and there was a resurgence in the industry. This is reflected in the statistics for Banks where production had increased from 70 tons per annum in 1894 to 150 tons per annum in 1899 and the value of the slate had increased from £3 per ton to £3.5 per ton over the same period.

8.2.5 This boom period had been encouraged by stoppages prompted by strikes at Penrhyn in North Wales, which benefited slate workings from other regions (*op cit*, 41), but this peak was short-lived and by 1906 there was a slump in slate prices, and this caused the closure of some quarries within the region. At Banks this slump is reflected when production was down to 80 tons per annum and did not recover until 1910. However, this resurgence was again short lived, because, as with the rest of the industry, it was severely affected by the onset of the First World War in 1914. Slate working was deemed to be non-essential and the quarry men were called up for the forces. In 1918 there was a renewed demand for slate but a shortage of men to work it, and those that survived the war were changed by the experience and did not necessarily return to the life or the jobs from before the war (*op cit*, 44). At Banks it was not until 1921 that the quarry was able to return back to production levels that were comparable to those prior to the war. Despite a period of prosperity in the 1920s, the years between the wars was a period of restructuring and consolidation with some abandonment of the Company system and investing in infrastructure to improve the efficiency of their operations (*op cit*, 66), so while some quarries prospered, others that were not prepared to seek the challenge of improvement floundered, and many closed. This was the situation also at Banks Quarry, where they sought to bring in new technologies, but it was too little, too late and Banks joined the number of the fallen.

8.3 GREENHEAD GILL DISCUSSION

8.3.1 ***Mines Royal Workings in the Lake District:*** Greenhead Gill mine with it's stamp mill and buildings, along with the nearby Grasmere trials and smithy, form one small facet of the contemporary Elizabethan metalliferous workings undertaken by the Company of Mines Royal in Cumbria in the mid/late-sixteenth century. The Company was incorporated by Royal Charter in 1568 as a new joint stock company after Queen Elizabeth I was victorious in the 'Case of Mines', versus Thomas Percy the 7th Earl of Northumberland. It was agreed '*that by the law all mines of gold and silver within the realm, whether they be in the lands of the Queen, or of subjects, belong to the Queen by prerogative, with liberty to dig and*

carry away the ores thereof, and with other such incidents thereto as are necessary to be used for the getting of the ore'.

8.3.2 The Company operated a smelt house at Brigham, by the River Greta, near Keswick (Holland 1986, 19) and, over the years, had numerous mining interests in the region expanding from the core area around Keswick. The relative scale of the operations can be defined in bald terms by the expenditure at the Cumbrian mines in 1564-8. These record exploration at, Newlands - £4,478; Borrowdale - £1,493; Grasmere - £962; Caldbeck - £203; Fornside (Vale of St John) - £82; Stonycroft (near Stair, Newlands) - £58; and Minersputt - £14 (Donald 1989, 165).

8.3.3 The most important mining enterprise by a long way was that of God's Gift (Goldscope) mine located in the Newlands valley where a good veins of copper was exploited. Prior to the Company taking over, the Earl of Northumberland had extracted 100,000 lbs of ore from the mine, and this mine formed the basis for the 'Case of Mines' in which the Earl was defeated by Queen Elizabeth I (Donald 1989, 165-6).

8.3.4 Other mines worked by the Mines Royal Company include the 'Copper Plate mine' in Borrowdale, about a mile east of Goldscope mine at a place called Ellers, near Grange (Donald 1989, 165). On the Caldbeck Fells there were a series of lead mines although copper was present there too (Donald 1989, 165); the Fornside mine was located to the south-east of Keswick, while the workings at Minersputt have never been positively located (Donald 1989, 165).

8.3.5 Subsequent to these early workings there was a strike on a rich copper vein at Coniston (then just in Lancashire), near Levers Water (Donald 1989, 165). The main Bonsor copper vein at Coniston averaged one and a half to two feet wide (Donald 1989, 175). The Company of Mines Royal worked the Coniston mines about 1599 (Donald 1999), although the present traces of activity are those left mainly by the intensive nineteenth century activities. Other mines had also been opened up in Tilberthwaite to extract copper and lead, which proved promising at first inspection, but after expensive outlay on infrastructure and exploration, the veins eventually gave a poor return and incurred a great loss to the Company (Donald 1989, 180; Holland 1986, 31). Before the end of the Elizabethan period of working the chief mines of the Company in the region were Goldscope, Caldbeck and Coniston (Donald 1989, 165)

8.3.6 ***Comparative Infrastructure:*** several of the contemporary mine sites mentioned in the Company records have similar infrastructure to that at Greenhead Gill, and may provide an insight into the elements of the surface layout at Greenhead Gill that is not recorded in the accounts and inventories of the Company. There was an extensive leat system driving the great waterwheel (16ft high) that powered the pumping system at Goldscope mine; it travelled for 1200 yards via a wooden troughed launder from a beck (Donald 1989, 166). Two boys were charged with drawing water from the foot of the mine in continuous shifts where it was set in a cistern to be used by an engine to winch material from the mine (*op cit*, 169). The Newland mines had both a stamp house of 16 stamps (61ft x 33ft) and a smithy (30ft x 22ft), five pumps to draw water, four washing tables and 24 troughs (buddles). Two of these were inside the stamp mill, which accords with the two putative buddles (Sites ***40e*** and ***40c***) within the southern part of the stamp mill platform at Greenhead Gill (*op cit*, 170). The Caldbeck mines had a bracken

thatched dwelling house for the men and a stamp house (decayed) for 12 stamps, with a great wheel, axle tree and other necessities and seven washing tables inside. There were 20 troughs (buddles) located outside and set on either end of the stamp house (*op cit*, 175).

8.3.9 ***Summary:*** Greenhead Gill is one of the most noted of the early lead working sites in Cumbria with well-documented sixteenth-century evidence of Mines Royal extraction, albeit with some later activity. The workings were relatively short lived but form an important facet of the Company's exploration and subsequent exploitation of various metalliferous ores of the region during the Elizabethan era. The relatively untouched nature of the main mine complex and the surviving extant surface remains for both extraction and processing contemporary with the earliest working of the site demonstrate a very rare survival of comparable remains for both the region and nationally. This reflects that later industrial-scale extraction methods have most often obscured or obliterated these earlier remains.

8.4 PROVIDENCE AND FAIRFIELD DISCUSSION

8.4.1 In Cumbria substantial concentrations of iron ore deposits are to be found along the west coast, near Whitehaven, in Eskdale, in Low Furness and also in the central Lake District at Langdale and Grasmere (Bowden 2000). The exploitation of these deposits dates back to the Iron Age or Roman periods, although the abundance of iron-ore surface deposits across the region has meant that the early limited surface scrapings of the ore deposits rarely shows up in the archaeological record. Instead, iron working is more typically represented by bloomeries and slag deposits. Through the medieval period and into the post-medieval period extraction of ore intensified, but outside a limited number of sites around the Dalton area, rarely shows up in the archaeological record in part because the early workings have often been obscured or removed by later workings (*op cit,* 15). This is typified by the historical records which indicate that there was iron ore extracted from the Tongue Gill area of Grasmere (Postlethwaite 1975, 127; Tyler 1999, 46; Adams 1988,139), but to date little physical evidence of working that can be linked to this early date. The extensive hushes, along with some of the surface workings at Fairfield mine may, however, have been undertaken in an earlier undocumented period of activity. In the eighteenth century, most of the iron production was in the Furness peninsula, particularly along the Duddon and around Askam and these fed the blast furnaces of Newlands, Duddon and Backbarrow (Bowden 2000, 15). There was some working in other areas, such as Eskdale, from the mid nineteenth century notably at mine sites, such as Bangarth and Nab Gill mines (Adams 1988; OA North 2012c). However, it was the short lived boom in the early to mid-1870s that prompted the opening (or re-opening) of many mines across the region and saw a massive, and very intensive period of iron extraction. This was fuelled by an increase in the value of iron ore from 13s to £1 12s per ton (Postlethwaite 1975, 128), and many entrepreneurs across Eskdale and Grasmere were keen to take advantage of this opportunity. In Eskdale, the mines of Bangarth, Blea Tarn and Nab Gill saw a massive resurgence of activity from 1871, although some of this activity was short lived, as by 1874 the vein at Bangarth had narrowed to such an extent that it became uneconomic and the mine was abandoned (OA North 2012c). The productivity of this area was

sufficient though to prompt the construction from 1873 of the Ravenglass and Eskdale Railway to take the ore to the coast; this was financed by the Whitehaven Iron Mines company and was opened in 1875 (Adams 1988, 123).

8.4.2 It is within this context, that we see the documented short-lived but intensive activity at the Tongue Gill mines of Grasmere. Fairfield was active from 1874-7 and Providence was worked from 1873-6; the decline in both cases was prompted by the slump in iron ore prices in 1875, and that was in itself prompted by the over production of iron ore across the region.

8.4.3 While the scale of the working at Fairfield and Providence seems considerable, given the short period of operation; however, when compared to the Eskdale workings that were being operated during a similar period these Grasmere operations were fairly modest (Bowden 2000; OA North 2012c). There were, though some similarities of approach; at Bangarth there was a large open quarry at the top of the valley side, and was linked by a series of horizontal adits set into the steep sloped valley side and there were extensive spoil mounds out from the entrances of the adits. The largest of the Eskdale workings was Nab Gill (near Boot) where there were five adits and two further internal levels, of which Adit 1 was over 400m long (Bowden 2000, 17). However, it was evidently a much larger operation than either of the Grasmere mines reflected in the massive spoil mounds extending out from the adits. The ore was removed by large, well engineered inclined planes down to the valley floor, where subsequently (after 1875) it was transported to the port of Ravenglass by the Ravenglass and Eskdale railway (*ibid*). The whole operation was on a much more intensive scale than the Tongue Gill operations, which ultimately were demonstrated to be uneconomic because of the quality of the ore and the costs of transporting the product.

8.4.4 Although the iron workings in Grasmere were on a much smaller scale than those of Eskdale, the character of the working at Fairfield and Providence is comparable to the other boom period mining sites. At Providence there was a single vertical shaft linked to horizontal adits from which the spoil and ore was extracted, with large spoil mounds extending out from the adit entrances. This is comparable to the situation particularly at Nab Gill and Bangarth, the principal difference being the level of infrastructure employed to remove the ore. At Bangarth there was a complicated loading platform to take the ore onto a large, engineered inclined plane. Whereas the most that Providence had was a ramp to load the ore onto horse-drawn carts.

8.4.5 ***Summary:*** Providence and Fairfield mines mostly reflect a brief period of intense mining activity fuelled by high prices for ore, and accord with a number of other operations elsewhere in Cumbria. Being operational for only a few years, they demonstrate single phase integrated workings and, as such, provide an opportunity to examine the working process of late nineteenth century iron ore mines.

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BD HJ Hart Jackson and Son, Ulverston, solicitors

BD HJ PRECEDENT BOOK 7/Page 257-260

Including: Articles of agreement for working slate quarries: between William Rigge of Walkerground, Hawkshead, John Atkinson of Broughton-in-Furness and Edward Jackson of Yewdale in Conistone, all in Lancashire, slate merchants; George Wallace and John Jackson of Patterdale in Westmorland, slate getters, re slate from a quarry at Baysbrown in Langdale, Westmorland 1771.

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WPR 91/I/4/1 Tithe maps and apportionments for Grasmere, Langdale, Rydal and Loughrigg, and Ambleside above Stock, dated 1838-1839

WD RC/8/238 Tithe Map of Langdale, dated 1844

WD RC/8/293 Tithe Map of Grasmere, dated 1843

WD RY Fleming family, Baronets, of Rydal Hall

WD RY/4/4/4/10 Temp Ref: BOX 28/7 Wallet of documents ref. Fleming pedigree (mainly Sir Daniel). Including: Sir Daniel's notebook containing: pp 125-169 "Concerning copper-mines, &c" (also lead working) MS (R) (1616) *Refers to Elizabethan copper works AD 1567 not contemporary working*

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APPENDIX 1: PROJECT BRIEF

Invitation to Tender: Community based survey and investigation of Mines and Quarries in the Windermere Catchment, Cumbria

1 Introduction

The Lake District National Park Authority is inviting tenders that will facilitate the survey, investigation and recording of the remains of mining and quarrying in the Windermere Lake Catchment. The first site is Banks Quarry located in Langdale at NY 3147 0432. The second site is Greenhead Gill Mine located between the confluences of Grains Gill and Rowantree Gill at NY 3497 0864. The third site is the Tongue Gill Iron Mines complex, including Fairfield Mine (NY 3400 0980) and Providence Mine (NY 3390 1050).

The locations of these sites are highlighted on the attached maps in Appendix 1.

The contractor will be required to approach and undertake the specified program of archaeological services as a 'community engagement' focused event, providing support and training in archaeological skills to groups of volunteers. The initial recruitment of volunteers falls outside the contractors brief, although the management and supervision of volunteers, along with a responsibility for their safety and welfare while on-site, is the responsibility of the contractor.

2 Project background

This campaign of survey forms the final third of the 'Reflections on History' project, which will deliver community focused archaeological events on the themes of woodland, water and minerals during 2012 and 2013. 'Reflections on History' is part of the larger 'Windermere Catchment Restoration Program' which has secured a grant from the Heritage Lottery Fund to run 'Windermere Reflections', a catchment wide project that will improve water quality and bring environmental and economic benefits to the area. 'Reflections on History' is one of seventeen conservation and community focused projects to be delivered under the banner of 'Windermere Reflections'.

The stated aims of this project as stated in the application to the Heritage Lottery Fund are twofold:

- The aim of the project is to encourage local volunteers to gain an understanding of the history of the catchment through surveying and researching their local history. The volunteers will learn techniques of surveying that they will be able to continue to use beyond the life of the project.
- The information collated will be able to be used for interpretation purposes, in all the Windermere Reflections projects, to inform local communities and visitors in the catchment.

The final project bid accepted by the Heritage Lottery Fund included a target that the project would utilise a minimum of 120 volunteer days. The means by which this figure is reached is flexible, however this brief has been based on using a team of six volunteers on-site each day for a total of 20 days in order to complete the survey of the mining and quarrying sites. Any additional volunteer days collected during the subsequent archive research phase would take the project above and beyond the minimum target set down in the final project brief accepted by the Heritage Lottery Fund.

3 Site background

3.1 Banks Quarry, Langdale

Banks Quarry, known as Dale End Quarry on the OS 1st and 2nd Edition maps for Westmorland (dated 1862 and 1899 respectively), is a redundant slate quarry, known to have stopped working in 1934 (NY 3147 0432).

We have very little documentary information about the quarry, the remains of which include spoil heaps, riving sheds, buildings, walls and a sledway.

The site is accessed by a well-engineered and gently sloping track, thought to have been built in 1875 for access to the quarries.

The site appears on the Lake District National Park Authority Historic Environment Record (HER 17214). The site is not designated.

3.2 Greenhead Gill, Grasmere

The monument includes the remains of a 16th century lead mine located in the narrow valley of Greenhead Gill between the confluences of Grains Gill and Rowantree Gill with Greenhead Gill (NY 3497 0864). Documentary sources indicate that German miners and engineers began work at Grasmere in 1564, however, this may relate to a smithy nearby rather than at the mines themselves where work may not have started until later in the decade. Lead ore (galena) was mined here until 1573 when the mine closed down.

There are two areas about 140 metres apart on the east side of Greenhead Gill where the ground is relatively flat. Here there are remains of stone buildings and walls. Associated with these structures are a leat, washing floor, a mine shaft, an adit, two bridge abutments, and a number of square depressions in the ground which are thought to be the site of box buddles which housed apparatus for separating ore from the veinstone. On the west side of the gill opposite the northern buildings are some small open cast workings and two shafts one of which, St Benedict's, is mentioned in company account books for 1569.

The site appears on the Lake District National Park Authority Historic Environment Record (HER 1891) and on the National Trust Sites and Monuments Record (NTSMR 20326). The site is designated as a scheduled monument (SM 27748).

Greenhead Gill Mine can be accessed via a combination of tarmac path and upland footpaths which are steep in places. As such it is anticipated that only those volunteers who are fit and confident enough to undertake the walk would be invited to participate. The route to Greenhead Gill lead mines starts from a side road at a point close to NY341 083.

3.3 Fairfield and Providence Mines, Grasmere

Fairfield iron mine is situated on the fell side near Great Tongue. This mine is a part of the Tongue Gill Iron Mines complex. Fairfield mine exploited a NW-SE haematite vein and is located near a reservoir at the confluence of the two Tongue Gills (NY340 098). Both mines, Providence and Fairfield, are said to have been worked c1700 supplying ore to a furnace in Langdale, and official mineral statistics show them to have been active from 1873 to 1876. In the latter period Fairfield was worked by the Lake District Mining Company (204 tons of ore raised) (Adams, J. 1988).

The site appears on the Lake District National Park Authority Historic Environment Record (HER 36982) and on the National Trust Sites and Monuments Record (NTSMR 24493). The site is not designated.

Providence mine is to the N of Little Tongue Gill (NY339 105) and exploited two haematite bearing veins, one N-S the other NW-SE. In the latter period Providence was worked by the Providence Iron Company Ltd (300 tons ore raised) (Adams, J. 1988).

The site appears on the Lake District National Park Authority Historic Environment Record (HER 30755) and on the National Trust Sites and Monuments Record (NTSMR 24494). The site is not designated.

The remains at each site are similar, with collapsed adits located above numerous spoil heaps, access tracks, sorting and crushing areas along with the odd ruinous building. Impacts resulting from the creation of the Thirlmere Aqueduct has had some impact on Fairfield Mine, although thankfully the key elements remain intact. The task of disentangling the archaeology of Fairfield Mine from that of the Thirlmere Aqueduct will itself be an interesting challenge for the volunteers.

The most impressive remains in this local complex are associated with the Providence Mine, with numerous collapsed levels visible, each accompanied by a sub-circular spoil heap and hand sorting area. One of these spoil heaps in located along the inner edge of a high intake field and permission will be needed to access this area, all other remains are located on the common.

Fairfield and Providence Mines can be accessed via a very well-engineered and gently sloping miners track, now a designated bridleway starting from the roadside at NY336 091.

4 Project methodology

The different components and methodology for the survey and investigation are set out below:

4.1 Banks Quarry, Langdale

The proposed survey and investigation of Banks slate quarry will include the following:

- Survey of the extent of spoil tips, tracks, walls and natural features using GPS technology.
- Survey of the quarry and associated features using high level digital photography (use of a quadracopter or similar would be acceptable).
- Detailed building surveys of individual buildings on site, including elevations and internal detail.
- Survey of the appropriate quarry features using a plane table and alidade.
- Creation of a site grid using a combination of EDM and GPS technologies.
- Creation of a written gazetteer based on the collection of information in the field using a standard site record form. The gazetteer should include information to be incorporated into the final site report and entry on the Lake District National Park Authority Historic Environment Record (HER). The gazetteer should include the following mandatory description fields: site number, site name, NGR, site description, monument type (using the English Heritage site thesaurus), period, condition, threats, management recommendations and photo reference.
- Understanding the sequence and development of the quarrying on site.
- A standard digital photographic record of all sites and features identified during the survey.

4.2 Greenhead Gill, Fairfield and Providence Mines, Grasmere

The proposed survey and investigation of the Grasmere mines will include the following at each site:

- Survey of the background topography/ natural features using GPS technology.
- Survey of the mine and associated features using a plane table and disto mounted alidade or disto mounted theodolite survey.
- Survey of the mine and associated features using high level digital photography (use of a quadracopter or similar would be acceptable).
- Creation of a written gazetteer based on the collection of information in the field using a standard site record form. The gazetteer should include information to be incorporated into the final site report and entry on the National Trust Sites and Monuments Record (NTSMR)/ Lake District National Park Authority Historic Environment Record (HER). The gazetteer should include the following mandatory description fields: site number, site name, NGR, site description, monument type (using the English Heritage site thesaurus), period, condition, threats, management recommendations and photo reference.
- A standard digital photographic record of all sites and features identified during the survey.

4.2 Archive and documentary research

There is a wealth of documentary and cartographic information available for quarrying and mining sites which would add a great deal to our understanding and interpretation of the sites under investigation.

While there is no scope within the current project for detailed investigation of primary source material, some assessment of the readily available secondary source material should be undertaken.

The contractor should anticipate visiting the following local archives in the company of a small group of volunteers to make an assessment of material relating to the sites under investigation:

- *Kendal Records Office – 1 day.*
- *Armitt Library – 1 day.*

In addition to these accompanied visits, the contractor while working independently should seek to obtain good copies (or photographs of relevant parts) of all historic maps and other documents considered particularly important to the project and reproduce them within the final report. A thorough search of all on-line archive resources should be undertaken, together with a comprehensive assessment of all available secondary sources.

4.3 Report writing

After the completion of the fieldwork and documentary research, the contractor should use the information generated to produce a comprehensive and well illustrated report that brings together and presents the results of the investigations. The report should include the following:

- a description of the project and its methodology,
- an outline of the history of mining and quarrying in the region,
- a summary of the known historical and social history of the mines and quarries investigated based upon secondary source material,
- a detailed and annotated survey drawing of each site along with a survey map showing other recorded sites in the vicinity if appropriate,
- a complete photographic record of all sites,
- a complete gazetteer of all sites recording during the project at the three locations.
- an interpretation of the functioning of each of the sites including relative chronology of extant features and general phasing.

4.4 Presentation of results

In addition to the work described above, the contractor will be required to prepare and deliver a presentation on the results of the site survey and documentary research at a to an audience of project volunteers shortly after the completion of the report. The responsibility for booking a venue and advertising the event will fall to the National Park Archaeology and Heritage Assistant.

5 Survey outputs

On completion of the program of archaeological works listed above a draft report containing the results of the investigations at both sites should be completed and passed to the National Park Senior Archaeology and Heritage Adviser and National Trust Archaeologist for comment and review. The draft report should include copies of all maps, photographs and other illustrations that will appear in the final report.

The draft report will then be examined and any comments returned to the contractor along with any suggested amendments within two weeks.

After reviewing comments on the draft report the contractor will provide the following to the Windermere Reflections partnership.

Six bound paper copies of the report. Each copy should be accompanied by a set of paper plans if not included in the bound report.

Three separate digital copies of the complete report (including all digital mapping information in formats compatible with both MapInfo and AutoCAD packages). The digital media should also include complete and 'ready to print' copies of the project report in both Word and PDF formats.

A series of files that contain hard copies (or digital folders containing digital copies) of all archive and documentary information examined as part of the project.

6 Site conditions

We have permission from a private landowner to survey Banks Quarry. The meeting point for volunteers will be the National Trust car park in Elterwater (NY 3279 0475) and from there, two cars will proceed to park adjacent to Cross Gates in Baysbrown Wood (NY 3215 0458). The quarry is accessed via a well-engineered gently sloping quarry track, it is an approximate 10 minute walk to the foot of the quarry. Access to the foot of the quarry is possible using a 4x4 vehicle to transport equipment if required.

Parking for all the Grasmere Mine sites will be in the lay-bys on the left hand side of the A591 at the northern end of Grasmere at approximately NY 3375 0857. Access to Greenhead Gill is via a tarmac track and upland footpath, while to Fairfield and Providence Mines is via a well-engineered gently sloping miners track.

By the very nature of these sites there are health and safety implications with working on mines and quarries, particularly in wet and poor visibility weather. It is therefore important that the contractor visits each site with the National Park Archaeology and Heritage Assistant (for Banks Quarry) and the National Trust Archaeologist (for the Grasmere mining sites) and exchange risk assessments before the commencement of any fieldwork on site. This will also provide the contractor an opportunity to ensure that there is mobile signal available for the GPS technologies on site and establish survey control prior to the start of the project.

In particular the contractor should be aware that the risk assessment for the survey of Greenhead Gill Mine is likely to suggest that project participants do not carry survey equipment to or from site as this is likely to increase the risks of trips and slips. As such the contractor should assume that they will have the responsibility to transport survey equipment to and from site at the start and completion of the survey.

A member of National Park staff will be available on each of the survey days at Banks Quarry to assist the contractor on site (10 days) and the National Trust Archaeologist will be available for 8 days of the survey at the Grasmere mines complex. A National Park member of staff will be available for the remaining 2 days at Grasmere.

7 General terms

The Windermere Reflections partner organisations will retain copyright over the resulting report and all associated archival material (including all digital maps and photographic material), and shall have absolute control over the use and dissemination of that information. The Windermere Reflections partnership fully recognises the originator's moral right to suitable accreditation in any publication of the results.

The survey results will be incorporated in the Lake District National Park Historic Environment Record and the National Trust Sites and Monuments Record.

The project will be undertaken by the contractor acting on an independent basis. Staff working on the project will not be deemed employees of the National Park Authority. Tenders should reflect this fact and more specifically the Contractor will take sole responsibility for the payment of tax, National Insurance contributions, etc. If VAT is payable, this too should be indicated in the bid.

8 Timescale

Given the 'community engagement' focus of this project it is critical that the professional contractor can commit to delivering this project to a fixed timetable. A proposed timetable (to be discussed with the contractor as part of the tendering process) appears below.

A welcome and training day for volunteers be held at Ambleside or Grasmere on a Saturday or Sunday in March 2013, which the contractor must attend and provide training in survey techniques.

Survey and investigation of the Banks Quarry site will take place over two weeks, working from the 8th to the 19th April 2013 inclusive (not including weekends).

Survey and investigation of the mining sites near Grasmere will take place over the following two weeks, working from the 22nd April 2013 to the 3rd May 2013 inclusive (not including weekends).

A short campaign of archive research and volunteer training will then take place during the week of 6th May 2013.

The contractor should then produce a draft report by the end of June and a final report by the middle of July.

The contractor should then allow time for the production of an attractive and thoroughly prepared presentation on the results of the survey by the end of August/ start of September.

The contractor should indicate their availability for carrying out this work within the timescale indicated above as part of their bid.

9 Costing

We ask that contractors provide the client with a detailed break down of costs as part of the tender including travel, accommodation, report writing and production etc. Specific costs will be needed for all elements of the work program (on-site staffing, materials, documentary research, report writing, preparation for presentation etc).

The contractor should feel free to add in costs for any other task that they believe might be useful or add value to the project in order to create a 'shopping list' of items that can then be incorporated into the project if the required.

10 Contacts

Please send tenders by 24 January 2013 to:

Eleanor Kingston
Archaeology and Heritage Adviser
Lake District National Park Authority
Murley Moss
Kendal
Cumbria
LA9 7RL

Tel: 01539 792712

Email: Eleanor.Kingston@lakedistrict.gov.uk

APPENDIX 2: PROJECT DESIGN

1.1 INTRODUCTION TO THE PROJECT

1.1.1 Oxford Archaeology North (OA North) has been invited to provide supervision and enablement for a community archaeology project of a series of mines and quarries in the Central Lake District at Grasmere, and Elterwater, NY 3147 0432, NY 3497 0864, NY 3400 0980, NY 3390 1050; this is to be undertaken on behalf of the Lake District National Park Authority and the National Trust and financed by Heritage Lottery Fund, and is a part of the wider Windermere Reflections project. OA North will provide supervision and guidance for a survey of the mines and quarries.

1.1.2 This is one of three community survey projects being undertaken as part of the Reflections on History, project which is part of the larger Windermere Catchment Restoration Program. The aim of the project is to improve water quality and to bring environmental and economic benefits to the area. The first stage of the project was a GIS based study examining the woodland, water and mineral based heritage of the catchment of Lake Windermere undertaken by OA North (2010). This made recommendations for a series of community projects based around each of the three themes, and the present study is intended to develop the minerals theme. Previous surveys led by OA North had examined the water and woodlands themes (OA North 2012a and b). The present survey will look at the remains from the exploitation of the natural resources of the Lake District to produce slate, lead ore and iron ore, and will record four mines / quarries within the Windermere catchment.

1.1.3 OA North is required to provide training and supervision to undertake a desk top historical survey of information pertinent to each site, and will include historical maps, the database compiled as part of Stage 1, records held in the Armitt Library and Kendal Record Office, and also aerial photographic plotting. Field surveys will entail detailed Level 3 surveys of four sites:

- Banks Quarry, near Elterwater (NY 3147 0432)
- Greenhead Gill Mine, Grasmere, (NY 3497 0864)
- Fairfield Mine, Grasmere (NY 3400 0980)
- Providence Mine, Grasmere (NY 3390 1050)

1.1.3 A principle aim of the project is to involve the local community as widely as possible, and to provide new information on the wealth of archaeological remains in the area. This will entail providing a presentation of the results and guided walks to the volunteers which will make them aware of the rich heritage in the region. It will entail getting them directly involved in undertaking field surveys, the identification of historical records and to ultimately disseminate that information in reports, and updated records for the Lake District Historic Environment Record and the National Trust SMR.

1.2 BACKGROUND

1.2.1 *Mineral Working in the Windermere Catchment*: the Lake District consists of a mass of ancient rocks, in three major bands running east-north-east to west-south-west, surrounded by a rim of appreciably newer rocks. The oldest are the Skiddaw Slates (Skiddaw Group) in the north of the area (Pickering 2001). To the south is a broad band of hard rocks with a very different origin - the Borrowdale Volcanic Series (BVS), formed in the late Ordovician, some 450-410 million years ago. At the southern edge of the Borrowdale Volcanic Series is a very narrow band of Coniston Limestone, older than much of the Carboniferous limestone surrounding much of the Lake District. This broad geological variance of the Lake District has provided considerable variety of minerals and rocks for winning and these have been worked to various extents since the Neolithic period.

1.2.2 *Quarrying:* it is likely that slate has been worked and used in Cumbria since the prehistoric period. There is evidence of its use by the Romans - at their fort at Hardknott for example (Bidwell *et al* 1999). Workable slate is obtained from a number of geological deposits but includes the cleaved tuffs of the Borrowdale Volcanic Group and which was exploited by Banks Quarry. The massive expansion of the industry through the eighteenth and nineteenth centuries was in response to the demand for slate roofing as a result of the growth of industrial towns in Northern England. The slate was originally won by hand, and then gunpowder was introduced from 1800 and compressed air

drills from 1910. Diamond-tipped saws replaced the cutting of blocks by hammer and chisel from the 1930's. Railways provided a great stimulus to quarrying and, in particular, the opening of the Coniston branch of the Furness railway (1859) (OA North 2010). Banks Slate Quarry, was shown on the OS 1st and Second edition maps, but had gone out of use by the late 1940s.

1.2.3 *Greenhead Gill Lead Mine:* Greenhead Gill Mine, Grasmere mine began as a Company of Mines Royal operation in 1564 and closed *c* 1573. Documentary sources indicate that German miners and engineers began work at Grasmere in 1564; however, this may relate to a smithy nearby rather than at the mines themselves where work may not have started until later in the decade (Donald 1989). Galena and gangue were mined here until 1573 when the mine closed down. An inventory of all property at Grasmere drawn up by the Company of Mines Royal in 1586 indicates that the main building was a stamphouse measuring 36 ft x 31 ft with a waterwheel, 12 stamps, and a loft for the workmen to sleep in. There was also a small room behind the loft, which was possibly sleeping quarters or an office. Another small building with a slated roof was also mentioned at the complex. Other features described include 11 square box buddles that were sunk into the ground, with three supports for the launder to the waterwheel, and a 'rowle wagon servinge for within the Mynes' which suggests use of an underground wagonway by the German miners. The drilled level at the southern end of the complex indicates that some work has been carried out here since the sixteenth-century and the second building at the northern end of the complex may belong to an unrecorded mining venture possibly undertaken in the early years of the nineteenth-century (Donald 1989).

1.2.4 *Iron Mining:* the nineteenth-century iron mining industry was conducted on a large scale and one of the main distinguishing features between early and later mines was the use of gunpowder for driving shafts and levels, prior to this date the mines were hand-worked limiting their extent (Marshall and Davis-Shiel 1977, 135). The iron mines in the volcanic rocks of the Lake District were at one time of importance, although inferior to those in the Skiddaw Slates (Postlethwaite 1975, 127). Robinson (1709), cited in Postlethwaite (1975, 127), stated that 'Langdale and Coniston mountains do abound most with iron veins, which supplies with ore and keeps constantly going a furnace in Langdale, where great plenty of good and malleable iron is made'. The ore which supplied this furnace was in part raised from Tongue Gill, at the foot of Fairfield. Both Providence and Fairfield Mines were potentially being worked in *c* 1700; in the nineteenth century Fairfield was worked by the Lake District Mining Company and Providence by the Providence Iron Company Ltd. They both have collapsed adits, spoil mounds, crushing areas, and ruinous buildings.

1.3 OXFORD ARCHAEOLOGY NORTH

1.3.1 *Outreach:* OA is committed to outreach. As an educational charity, OA seeks to promote an active public relations policy in relation to archaeology, and has a publications department that is experienced and fully equipped to provide general interest text and graphics for release to the press and general public in a wide variety of forms including display boards, leaflets and popular books. In certain circumstances it is possible to hold open days or install public viewing galleries on major sites. OA has considerable experience in the establishment of community based projects, and includes numerous training surveys and excavations. OA North has been providing the professional support for a programme of archaeological investigation into Lathom Park, nr Ormskirk, funded by Local Heritage Initiative. This involved the provision of expertise, training, and resources for surveys, excavations and documentary studies into the landscape associated with the major fourteenth century palace Lathom House. OA North has also been involved providing the consultancy and supervision for the excavation and survey of a complex enclosed settlement at Ingleton in conjunction with the Ingleborough Archaeology Group, and the supervision and of a survey of a nineteenth century designed landscape at St Catherine's Park, Windermere, on behalf of the National Trust, and the local community (See also Appendix 3 on OA North Community projects). OA North completed a community excavation of a nineteenth century church, that was demolished when Stocks Reservoir was constructed in the early part of the twentieth century, and is being undertaken on behalf of United Utilities and the Forest of Bowland AONB.

1.3.2 *Windermere Reflections Surveys:* OA North provided the supervision of the fulling mills and woodland community surveys, that were the first two phases of the Windermere Reflections project (OA North 2012a and b). These entailed detailed surveys of the fulling mills and the woodlands surveys and entailed the development of plane table and theodolite survey techniques using a disto mounted on the respective telescopes. The technique proved very successful and allowed the volunteers to undertake the recording using basic and affordable survey techniques. In addition the landscapes were photogrammetrically recorded using photographs taken from a small helicopter.

1.3.3 *Holwick:* OA North is involved in a long term community survey of Holwick village and the valley landscape in the North Pennines on behalf of the AONB and also Natural England. The survey work entails a broad range of survey techniques from specially flown oblique aerial photography, LiDAR, Documentary Studies, Identification Surveys, detailed surveys using a theodolite and Disto. The latter technique was designed to allow cheap, but efficient survey techniques that would be within the pocket of amateur groups (the maximum budget for equipment was £300.00) and which would result in the plotting / draughting of the survey drawings on site.

OA North employs an experienced and qualified archaeological land surveyor, Jamie Quartermaine, who has considerable experiencing in training survey techniques. He has the expertise to train local teams in a broad and diverse range of low tech survey techniques that will be appropriate for the volunteers who do not have access to modern equipment.

Landscape Archaeology: OA North has considerable experience in the field of landscape survey work, particularly in the uplands of Northern England and Wales. Numerous surveys have been undertaken across the region and North Wales, and has taken the form of rapid identification surveys of large areas of unimproved land as well as detailed surveys of specific landscapes.

2. AIMS

2.1 AIMS OF THE PROGRAMME

2.1.1 The primary aims of the project are as defined within the project brief and are as follows:

- To encourage local volunteers to gain an understanding of the history of catchment through surveying and researching their local history. The volunteers will learn techniques of surveying that they will be able to continue beyond the life of the project.
- The information collated will be able to be used for interpretation purposes, in all the Windermere Reflections projects to inform local communities and visitors in the catchment.

2.1.2 The objectives of the project are as follows:

- To undertake outline documentary research into the mines and quarries
- To map the selected mines and quarries
- To undertake survey work in the environs of each site
- To provide training for community volunteers in archaeological survey techniques

2.1.2 *Community Aims:* the project aims to seek a wide community involvement in the research and investigation of areas within the Lake District National Park, and to foster a wider community awareness of the rich cultural heritage in the local landscapes. It is intended to use the present project as a means of training volunteers, and others in the wider community, in archaeological recording techniques. Great emphasis will be placed on the virtue of survey techniques and to encourage a legacy of skills within the community. The project will therefore provide a capacity for further archaeological and historical research in the area.

3. METHODOLOGY

3.1 PROJECT PREPARATION

3.1.1 At the outset there will be a process of liaison between OA North, The National Trust, and the Lake District National Park Authority staff. This will entail defining the output formats for incorporation into the HER, and having two field visits to examine the known archaeology and refine the project methodology. In addition a project surveyor will establishing survey control across the respective sites in advance of the main survey. OA North will liase with the Natural Trust and the LDNPA to enable a close co-operation with all the land owners to minimise impact on agricultural operations.

3.2 SURVEY TRAINING / OUTREACH

3.2.1 It is proposed to undertake a programme of survey training for members of the public at each of the four mines and quarries. This would entail detailed field surveys followed by a desk-based study.

3.2.2 The first stage of the project will be a general, widely publicised, launch event in Grasmere or Ambleside at a weekend in March 2013. This would provide a general introduction, and would include a localised walk around the more visible archaeological remains. It would also introduce a broad range of survey and recording techniques, which would range from basic techniques to the more advanced. It would include tapes, theodolites, plane tables, a total station with pen computer (to display the results), survey grade GPS, and a UAV (small model helicopter capable of carrying a light weight camera). The aim would be to introduce the volunteers to the proposed programme but also to raise interest. Experience of previous launch events (from the earlier phase of Windermere Reflections) was that these attract lots of people, lots of interest and set the project off to a good start.

3.2.3 In the course of the documentary and survey work the volunteers would work closely with professional archaeologists, who would provide training and on-the-job experience. The volunteers would undertake survey work under close supervision from the OA North project supervisor, and learn how to identify documentary sources, and how to use the survey instruments and the general principles of survey. The character and significance of the archaeological landscape will be explained.

3.2.4 On completion of the project a final presentation will be established for all the volunteers and land managers, and dissemination to the community will be through an evening talk.

3.3 FIELD SURVEY

3.3.1 It is proposed that a detailed topographic survey be undertaken of the four mining / quarry sites at EH Level 3 (Ainsworth *et al* 2007).

3.3.1 *Banks Quarry near Elterwater (NY 3147 0432):* the survey will entail the recording of the spoil tips, tracks, quarry faces, and quarry buildings. It is proposed that the wider elements of the site, such as quarries, and field boundaries be recorded by GPS, and will be undertaken by volunteers under archaeological supervision. The quarry and associated features will be mapped by photogrammetry using photographs taken from a UAV (quadcopter). The buildings, including elevations will be recorded using a plane table and disto and again by the volunteers. A process of analysis, in conjunction with the volunteers to examine the sequence of working and development of the site will be undertaken, which will be presented graphically on the site drawings and also within the site descriptions.

3.3.2 *Greenhead Gill Mine, Grasmere, (NY 3497 0864):* the survey will entail the recording of the adits, mine buildings and buddles / lead processing remains at Greenhead Gill. The background topography will be recorded using a survey grade GPS. The mine adits and associated features will be recorded using a theodolite / disto, which is preferable to using a plane table as it is less prone to wind and rain. In addition the site will be surveyed by photogrammetry using photographs from a UAV (quadcopter). The remote and high nature of the Greenhead Gill mines means that it is not suitable for working in bad weather, so on days when poor weather conditions are predicted then the surveys will be undertaken at the Fairfield / Providence mines instead.

3.3.3 *Fairfield / Providence Mines, Grasmere (NY 3400 0980 and 3390 1050):* the survey will entail the recording of the adits, spoil heaps, ore processing areas. The background topography will be recorded using a survey grade GPS. The mine adits and ore processing areas will be recorded using a theodolite / disto and plane table / disto. In addition the site will be surveyed by photogrammetry using photographs from a UAV (quadcopter). A process of analysis, in conjunction with the volunteers, will be undertaken to examine the complexity of working and the extent to which the Fairfield mines have been disturbed by the Thirlmere Aqueduct and the development of both sites; this will be presented graphically on the site drawings and also within the site descriptions.

3.3.4 *Survey Methods:* it is intended that this primarily serve as a training exercise for the volunteers, so the survey techniques will be devised to be easy to understand, and will allow for plotting in the field, and is easily affordable by volunteers. This will inevitably mean the use of more outdated technologies, and will have a significant impact on productivity. There is a broad range of survey options that can be achieved by volunteers with access to non-expensive equipment, and it is proposed to introduce the volunteers to a range of techniques and then concentrate the survey using the plane table / theodolite. In addition all four sites will be surveyed using high level photography, with respect to survey control established by GPS / total station. Similarly a gazetteer and photographic record will be compiled. Details of these techniques are outlined below.

3.3.5 *Plane Table / Alidade / Disto:* the technique has the advantage that it produces the drawing in the field and can cope with sloping sites. The use of a plane table is effective in allowing volunteers to understand the principles of surveying. Using stadia tacheometry an alidade has an effective distance measurement capability of 150m (assuming moderate accuracy), but it is difficult to train volunteers in this technique. The proposed alternative is to bring the technique up to date by mounting a cheap Leica Disto on top of the telescope of the alidade. This provides accurate distance measurement up to a distance of 100m and significantly eases the use of the equipment, and therefore makes it more productive. The application of a disto on both a theodolite and an alidade on the fulling mills Windermere Reflections project was found to be a very successful approach.

3.3.6 *Theodolite / Disto Survey:* the use of a theodolite / disto was found to be very effective during the fulling mills survey and can be used alongside the plane table. The theodolite measures angles and the disto measures the distances and then the data is drawn up in the field by volunteers using an accurate film based protractor and ruler.

3.3.7 *GPS Survey:* a Satellite Global Positioning System (GPS) will be utilised to record the general background topography. The survey grade GPS is a Leica 1200 differential system and uses Ordnance Survey base stations in conjunction with a roving station to correct the raw data with corrections transmitted by mobile phone. The accuracy of the OA North GPS system is capable of +- 0.03m and provides for a quick and effective means of recording the detail of the features.

3.3.8 *Photogrammetric Recording:* it is proposed to record the sites and immediate environs by means of high altitude photography, which, using specialist photogrammetric software, can be used to create accurate three dimensional models of the site and topographic surfaces. For large landscapes there are two methods available, the first is to use a UAV, which is a small multi-engined model helicopter and provides photography from any altitude up to approximately 100m height. The alternative is to use a kite/balloon with a light weight camera mounted beneath. The advantage of the balloon is that the photography can be undertaken by one of the volunteers, and allows them to get involved in the photogrammetric process. In practice it is proposed to use both techniques. Survey control is introduced to the photographs by the placement of survey control targets across the site which are located by means of survey grade GPS.

3.3.9 The photogrammetric processing is undertaken using Agisoft software which provides detailed modelling using the overlap of up to 120 photographs, and creates a very detailed DTM (Digital Terrain Model) across the site. The photographs are then digitally draped over the model to create an accurate three dimensional model of the ground surface. The primary output, however, is an accurate two dimensional image which can be used to generate accurate plans or profiles.

3.3.10 *Building Survey:* it is proposed to undertake building survey recording of a number of the quarry buildings a Banks Quarry, and this will be again be undertaken by basic manual or plane table techniques that can be undertaken by the volunteers. The internal plan of the buildings will be created using the plane table / disto and then this basic outline will be enhanced on site by manual survey using distances measured using the disto. The elevations will be undertaken by photogrammetry, the volunteers will take multiple photographs of the elevations from different positions using control established on the walls established with the disto. These photographs will be combined within the Agisoft photogrammetric software to generate precise elevations. For those elevations that have uniform 2D vertical planes it will be possible to undertake semi-rectified photography and guidance will be given to the volunteers to enable them to undertake this photography.

3.3.11 *Survey Control:* it is proposed that survey control be introduced to the sites by means of a high accuracy survey type differential GPS where possible. This can achieve accuracies of +- 20mm, and will ensure that the survey is accurately located onto the Ordnance Survey National Grid. If at any of the sites there is no mobile reception (necessary to provide corrections for the GPS) then the control will be established by means of a total station.

3.3.12 *Detail Survey Overview:* the detail survey by plane table / tape will record all structural and earthwork components, which will be drawn by hachure survey. Survey points will be marked on the ground using spray paint and the survey drawing will be manually drawn up with respect to them. On completion of the survey the field drawings will be digitised into a CAD system. The survey will record all archaeological features, earthworks and elements. The survey will aim to identify, locate and record all built elements of the landscape.

3.3.13 *Gazetteer:* a descriptive record of all features will be compiled using a standard proforma, which will incorporate a provisional interpretation of the function of the site / feature, where possible, and similarly will provide a provisional interpretation of the site's chronology where possible. Once the digital gazetteer has been collated and edited, it will be output as an Access Report and input directly into a Microsoft Word format. The gazetteer output will be compatible with the NT SMR and the LDNPA HER. This data will be formatted and topped and tailed within word to produce the gazetteer volume for the survey project. The description will include the following fields:

- NTSMR Number
- LDNP HER number
- Site Number
- Form
- Site Name
- NGR
- Site Description
- Monument Type
- Period
- Interpretation
- Dimensions
- Threats
- Management
- Photo reference
- Condition
- Surveyor
- Date of survey

3.3.14 *Photographic Record:* a photographic archive will be generated in the course of the field project, comprising landscape and detailed photography. Detailed photographs will be taken of the archaeological features using a scale bar. All photography will be recorded on photographic pro-forma sheets which will show the subject, orientation and date. The photography will typically be undertaken using a digital SLR camera with 12 megapixel resolution.

3.4 DESK-BASED STUDY

3.4.1 A desk-based study will be undertaken by volunteers and members of the wider community, but will be directly supervised and guided by staff of OA North. It is intended that training be provided for those members of the public who are particularly interested in this aspect, and it should be recognised that there is only limited space available at both the Kendal record office and the Armitt Library, so it may be necessary to restrict the numbers of volunteers. The study will provide training in the use of desk-based techniques, and how and where to obtain documentary sources pertinent to the study.

3.4.2 The documentary study will seek archaeological information pertinent to the study area, such as earlier investigations of the site or aerial photography that may provide a valuable insight into the character of the study area. It will seek to reconstruct, primarily through mapping sources, how the landscape has developed within the last two or three hundred years. The data generated during the desk-based study will provide the basis for an assessment of the nature and significance of the known surface and subsurface remains. It will also serve as a guide to the archaeological potential of the study area. This work will obtain background information pertinent to the present study, and will draw upon historical mapping and database sources. It will include an appraisal of County histories, early maps, and such primary documentation (tithe and estate plans etc.) as may be reasonably available. Published documentary sources will also be examined and assessed and any potential transcribed early documents will be examined This work will access the following repositories: Cumbria Record Office (Kendal), Armitt library (Ambleside), Lancaster University Library and the OA North library. It is anticipated that the study will entail two days spent in the record office and Armitt library. Good scanned and photographic copies will be obtained of maps and illustrations where possible.

3.4.3 *Aerial Photography:* oblique aerial photography is a valuable tool for examining and assessing the sites, so long as there is not a thick bracken vegetation cover across the ground. Where there is not thick vegetation cover it is proposed to undertake targeted oblique photography using a small UAV (Unmanned Aerial Vehicle). This is a small electrically powered model helicopter which has the

ability to carry a light weight camera up to altitudes of 250 feet. The advantage of the UAV is that it can take photographs from much lower altitudes than can legally be achieved with a light aircraft, but it is not easily targetable, so it typically provides blanket photographic coverage across the area. As far as possible the transcription of photographs will be undertaken by volunteers and the information will be superimposed on the modern and historic mapping within a CAD system.

3.5 REPORT PRODUCTION

3.5.1 *Archive:* the results of the management programme will form the basis of a full archive to professional standards, in accordance with current English Heritage guidelines (*The Management of Archaeological Projects, 2nd edition, 1991*). The project archive represents the collation and indexing of all the data and material gathered during the course of the project. This archive will be provided in the English Heritage Central Archaeological Services format. A synopsis (normally the index to the archive and the report) should be placed in the Lake District Historic Environment Record and National Trust SMR. The archive will include the raw survey digital data in AutoCAD format. A copy of the revised SMR will be deposited with the ADS.

3.5.2 *Report:* the report will present, summarise, and interpret the results of the programme detailed in Stages 3.1-3.5 above, and will include the following:

- a front cover to include the NGR and the client;
- the dates on which the fieldwork was undertaken;
- a concise, non-technical summary of the results;
- acknowledgements and the names of all contributors to the project, including all the volunteers;
- contents list;
- a description of the project and methodology;
- an outline of mining and quarrying in the region;
- a summary of the historical and social history of the mines and quarries;
- results of the survey, presented in conjunction with survey mapping of the mines and quarries mills and environs;
- assessment of the significance of the historic environment remains;
- a discussion presenting an interpretative account of the mines and quarries, and their context within the landscape and an interpretation of how the site functioned and would include a general phasing of the sites.
- a complete bibliography of sources from which data has been derived;
- a copy of this project design, and indications of any agreed departure from that design;
- a gazetteer of all identified monuments and historic features;
- a photographic catalogue;
- a list of the archive contents;

3.5.3 The report will incorporate appropriate illustrations, including copies of the site plans, detailed survey plans of each mine / quarry, maps of the wider landscape, all reduced to an appropriate scale. The site mapping will be based upon the CAD base. The report will be accompanied by photographs and historic illustrations illustrating the principal elements of the landscape.

3.5.4 *Editing and submission:* the report will be subject to the OA North's stringent editing procedure; then a draft will be submitted to the Lake District National Park for consultation. Following acceptance of the report, six bound copies of the report (and digital copy) will be submitted to the National Trust and to the LDNPS HER. A summary of the work will be provided for OASIS.

3.6 OTHER MATTERS

3.6.1 *Access:* access for the sites will be negotiated with the land owners by LDNPA. Access to Banks quarry will be to Cross Gates in Baysbrown Woods in two vehicles (limited parking), and then there is a relatively short walk to the site. Access to Greenhead Gill is via a long, and high altitude upland

footpath; it would take about 45 minutes and is appropriate only for volunteers who are fit and used to upland walking. Access to the Providence mine is along a well engineered track, but is about 1.5km from the road.

3.6.2 *Health and Safety:* full regard will be given to all constraints during the survey, as well as to all Health and Safety considerations. The OA North Health and Safety Statement conforms to all the provisions of the SCAUM (Standing Conference of Unit Managers) Health and Safety manual. Risk assessments are undertaken as a matter of course for all projects, and will anticipate the potential hazards arising from the project. There are considerable concerns with regard health and safety because of the remote location of the Greenhead Gill site and because of the unstable surfaces on the spoil heaps of the Banks slate quarry. A very careful risk assessment will be undertaken in conjunction with the LDNPA and the National Trust.

3.6.3 *Insurance:* insurance in respect of claims for personal injury to or the death of any members of the public in the course of the project will be covered by OA North, who has insurance cover which complies with the employers' liability (Compulsory Insurance) Act 1969 and any statutory orders made there under. For all other claims to cover the liability of OA North in respect of personal injury or damage to property by negligence of OA North. The insurance cover is as follows:

- £10 million public liability
- £10 million employers liability
- £5 million professional indemnity

4. WORK TIMETABLE

4.1.1 The proposed timetable is defined in the brief and is reproduced below:

- March Opening Field Meeting
- 8th – 19th April Banks Quarry Survey
- 22nd April– 3rd May Grasmere Surveys
- 6th May to 10th May Documentary Research
- The submission for the draft report is mid July 2013

4.2 OA North can undertake the work to the defined timetable and the defined deadlines.

5. RESOURCES

5.1 *OA North Project Team*

5.1.1 The survey will be led by Peter Schofield (Project Officer), and will be on site every day for the duration of the project, although cover will be provided as required for a select number of days by Jamie Quartermaine. The documentary work will be undertaken by Alastair Vannan, under the guidance of the project manager, Jamie Quartermaine. The reports will be by staff of OA North. The OA North element of report production will be split between Peter and Alastair.

5.1.2 *Project Management:* the project will be under the project management of Jamie Quartermaine, BA Surv Dip MIFA (OA North Project Manager) to whom all correspondence should be addressed. Jamie is a very experienced landscape surveyor, who has undertaken or managed literally hundreds of surveys throughout Northern England since 1984, and has considerable experience of working on similar projects to that proposed. He has managed a major recording programme of Lyme Park, Cheshire, and very detailed surveys of the South West Fells including areas such as Barnscar and Burnmoor. He has also undertaken surveys of Lowther Park, Cumbria, Rufford Park, Lancashire and has also managed the recording programme of Lathom Hall and Park, Lancashire and the survey of the Forest of Bowland for United Utilities. He has been a project manager since 1995 and has managed over 300 very diverse projects since then, which are predominantly survey orientated, but of all periods from the Palaeolithic to the twentieth century.

5.1.3 Jamie is a qualified land surveyor (Topographic Sciences Diploma Glasgow University) and has an exhaustive knowledge and understanding of surveying techniques. He regularly runs training

courses in survey techniques and has the expertise to devise a variety of low tech survey techniques for training volunteers.

5.1.4 *Project Surveyors:* the survey will be led by Peter Schofield (OA North Project Officer). Peter works full time on landscape surveys across the north-west. He has undertaken surveys at Hardknott Forest, Cumbria, Hartley Fold Estate, Cumbria, Ennerdale Valley, West Cumbria, a major programme of landscape survey across nine upland areas in North Wales, Little Asby Common for the Friends of the Lake District, and the Holwick and Force Garth surveys, Teesdale. With the exception of Jamie Quartermaine, he is our most experienced landscape archaeologist.

5.1.5 *Alastair Vannan:* Alastair Vannan has considerable experience in documentary studies and the survey of upland landscapes. For example he undertook with Peter the surveys of Buttermere and Nether Wasdale on behalf of the National Trust. He also has considerable experience of documentary work and undertook both the documentary study for the recent Holwick community survey, but also supervised the field teams. Alastair would undertake the documentary study for the proposed quarry and mine survey. Alastair has been leading a number of community excavations, which included the major excavation of Lathom House (nr Ormskirk), and also the excavations of Stocks Church, Forest of Bowland.

5.1.6 *Karl Taylor:* support for the surveyors will be provided by Karl Taylor, who has considerable experience of undertaking geophysical surveys, building surveys and topographic surveys from all across the country. He has also considerable experience of working with volunteers on various projects.

APPENDIX 3: SURVEY GAZETTEER

BANKS QUARRY SITES

All individual Banks Quarry sites (**BQ01 - 216**) are part of HER no **17214**

Site Number **BQ01**
Site Name Slate Quarry, Banks Quarry, Elterwater
NGR NY 31510 04423
Type Slate Quarry
Period Late Nineteenth Century
Description A long thin slate quarry, orientated roughly north-north-west/south-south-east and cut 21m by 5.5m into the hillside (***1c***); there is an adit entrance at the southern end of the cut Downslope there is a relatively large spoilheap (***1d***) containing two buildings located on either side of the entrance, and there is a small linear revetted wagonway exiting the mouth of the quarry. The eastern building (***1a***) is a single celled unroofed rectangular structure that is open-sided on the west side. The structure measures 3.5m by 3m and survives up to 1.5m high. The roof would have originally sloped to the east and internally there is a fragmentary flagged slate floor. The western building (***1b***) is a single celled rectangular structure measuring 3.5m by 3m and surviving up to 1.5m high. There are some partial wooden joists that are vestiges of a slate roof that slopes to the north. There is a doorway on the east elevation with wooden lintel and externally there is a small annex/store hole on the south side. The spoilheap is crossed from west to east by a trackway (***3a*** and ***2***).

Site Number **BQ02**
Site Name Trackway, Banks Quarry, Elterwater
NGR NY 31521 04424 to NY 31544 04365
Type Trackway
Period Late Nineteenth Century
Description A linear trackway running upslope through the quarry complex. It is a continuation of trackway ***3a*** on the north-western end where it crosses a spoil heap (***1d***). It runs diagonally north-west/south-east upslope for 38.5m, where it is cut by a later quarry (***212b***), then turns south running directly upslope for over 36.5m. Where the trackway turns has been truncated by the very large quarry hole of the latest slate workings (***214a***), and the trackway runs up the sides of two large spoil heaps giving access to three different working levels (***100-102***). The latter extends vertically down the slope and may have been a former sledway.

Site Number **BQ03**
Site Name Trackway, Banks Quarry, Elterwater
NGR NY 31463 04452 to NY 31523 04384
Type Trackway
Period Late Nineteenth Century
Description A sinuous trackway zig-zagging upslope through the quarry complex. It zig-zags north-west/south-east for 47m (***3a***), then north-east/south-west for 25.5m (***3b***, with a short 10.5m spur (***3d***) and finally north-west/south-east for 45m (***3c***). The bottom end of the trackway continues on the other side of the later Miner's Road which passes on the north end of the complex and descends out of the study area.

Site Number **BQ04**
Site Name Quarry Scoop, Banks Quarry, Elterwater

LDNPHER -
NGR NY 31483 04440
Type Slate Quarry
Period Late Nineteenth / Early Twentieth Centuries
Description A small sub-rectangular quarry scoop/surface working. It measures approximately 11m by 4m and is up to 0.7m deep.

Site Number **BQ05**
Site Name Slate Quarry, Banks Quarry, Elterwater
NGR NY 31472 04411
Type Slate Quarry
Period Late Nineteenth / Early Twentieth Centuries
Description The lowest working of a north-east/south-west orientated slate quarry. The evidence consists of a flat-topped spoil heap (***5a***) that probably overlies an earlier trackway (***6*** and ***3c***). South of the spoil heap there is one working face/crag with a small store structure set against it (***5b***). The quarry has been successively worked upslope on slightly higher levels (***204*** and ***205***) which masks the earlier workings.

Site Number **BQ06**
Site Name Trackway, Banks Quarry, Elterwater
NGR NY 31435 04449 to NY 31460 04423
Type Trackway
Period Late Nineteenth Century
Description A linear section of trackway running north-west/south-east up onto the complex from the Miner's Road. It is well-defined, is sunken with an upcast bank on the downslope side, and measures 36.5m long. The south-eastern end is probably overlain by a later spoil heap (***5a***) and the trackway would have continued further on (***3c***). A short spur runs south to a small slate quarry (***7***).

Site Number **BQ07**
Site Name Slate Quarry, Banks Quarry, Elterwater
NGR NY 31429 04417
Type Slate Quarry
Period Late Nineteenth / Early Twentieth Centuries
Description A north/south orientated linear slate quarry with vertical face on the south end (***7c***). It measures approximately17m by 15.5m. The associated spoil heap (***7a***) is located on the north-east side with a single building atop of it (***7b***). The structure is a single celled rectangular building that is open-sided on the north end. It measures 6m by 4m and survives up to 2m high. The roof originally sloped to the south but the covering slates have been removed and are stacked end-on in side the structure. Internally there is a slab seat on the west elevation and a niche in the south elevation. The quarry has truncated an earlier trial working (***7d***) whose spoil heap survives downslope to the north, which in turn is partially overlain by spoil heap ***7a***..

Site Number **BQ08**
Site Name Trial Working, Banks Quarry, Elterwater
NGR NY 31526 04234
Type Slate Quarry
Period Late Nineteenth Century
Description The southern-most slate workings c70m south of the main Banks Quarry complex. It consists of the trial working of an east-facing craggy outcrop. There is a deep cutting into the knoll with a spoil heap running downslope to the north-east. A small trackway runs onto the spoil heap from the south. There is a small unroofed shelter attached to the crag face (***8a***); it measures 3.5m by 2.5m and survives up to 1.5m high. There is a small internal niche in the northern wall and en external stone seat on the south side of the southern wall.

Site Number **BQ09**
Site Name Mine Building, Banks Quarry, Elterwater
NGR NY 31629 04439
Type Mine Building
Period Late Nineteenth / Early Twentieth Centuries
Description An unroofed single celled rectangular building located on the working level (***103e***) near the entrance to the largest modern workings at the slate mining complex (***215***). The structure measures 6m by 3.5m and survives up to 1.5m high with the roof originally sloping to the south-west. The south-west end of the structure is partially subsumed within slippage of the spoil heap from the working level above (***201b***). Fragments of the slate roof and wooden joists and linear holes are evident in the rear south-west wall elevation. There is a doorway on the north end of the north-east wall elevation and two stone seats are external to the south side of the structure A retaining wall curves around to the quarry entrance from the north of the structure (***12***).

Site Number **BQ10**
Site Name Mine Building, Banks Quarry, Elterwater
NGR NY 31622 04452
Type Mine Building
Period Late Nineteenth / Early Twentieth Centuries
Description An unroofed two celled rectangular building located on the working level (***103e***) near the entrance to the largest modern workings at the slate mining complex (215). The structure measures 9m by 4m and survives up to 0.8m high in places. The north-west end of the structure is partially subsumed within slippage of the spoil heap for the working level above (***214e***). There is a doorway on the west end of the south elevation of the eastern cell and the western cell is open ended on the south side. There is a narrow stepped bench, or an earlier wall foundation, located on the western side of the central sub-dividing wall of the structure.

Site Number **BQ11**
Site Name Mine Building, Banks Quarry, Elterwater
NGR NY 31616 04447
Type Mine Building
Period Late Nineteenth / Early Twentieth Centuries
Description A partially roofed single celled rectangular building located on the working level (***103e***) near the entrance to the largest modern workings at the slate mining complex (***215***). The structure measures 3m by 2.5m and survives up to 1.8m high with the roof originally sloping to the north. The north end of the structure is partially subsumed within slippage of the spoil heap for the working level above (***214e***). The south side of the structure is open-ended and fragments of the slate roof with wooden joists are evident collapsed into the centre of the structure. There is an internal stone seat on the north-east wall elevation

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Site Number **BQ12**
Site Name Slate Quarry, Banks Quarry, Elterwater
NGR NY 31587 04403
Type Slate Quarry
Period Late Nineteenth / Early Twentieth Centuries
Description A series of retaining walls defining the edge of a narrow gully between spoil heaps leading out of the big pit 215. They have enabled the working of the large pit despite encroachment of the spoil heaps ***103*** and ***216***.

Site Number **BQ13**
Site Name Trackway, Banks Quarry, Elterwater

NGR NY 31629 04456
Type Trackway
Period Late Nineteenth Century
Description Two sections of trackway ascending from the Miner's Road up to the first working floor above it (***103***). The western trackway (***13a***) is a small sinuous route that runs north-west/south-east for over 26m up the spoil heap (***216***). A spur runs north-east/south-west for 36m up to the next working floor (***214***). The eastern trackway (***111***) is a steep, narrow linear section running north-east/south-west for 21m up from a platform (***113***) to the working floor adjacent to mine building ***10*** and an old tree.

Site Number **BQ100**
Site Name Slate Quarry, Banks Quarry, Elterwater
NGR NY 31497 04322
Type Slate Quarry
Period Late Nineteenth / Early Twentieth Century
Description The uppermost slate quarry, spoil heap and working area on the south end of the main Banks Quarry complex. The slate quarry, orientated north-east/south-west has been worked on three levels, along with ***101*** and ***102*** beneath it. The quarry has a well-defined southern face but has been undercut on the north side by the lower working (***101***). The spoil heap at this level (***100b***) runs to the east of the quarry and has subsumed a smaller spoil heap associated with a small trial mine (***100c***). There are fragmentary remains of a small shelter and retaining wall near the western end of the quarry (***100d***) and a narrow ledged entrance leading onto the spoil heap to the east of it.

`There is an unroofed two-celled rectangular riving shed (***100a***) with a rounded end on the north elevation. It is located on the western edge of the spoil heap (***100b***). Overall the shed measures 9.8m by 4.2m. The southern rectangular cell is the largest, it has two doorways (one blocked) on the west elevation, there is a stone seat adjacent to a collapsed window on the east elevation with an external spread of riving waste outside of it. The roof of the southern cell would have originally sloped down to the east.. The smaller D-shaped annex cell on the north end of the structure is more roughly constructed. It has a blocked doorway on the west side and a doorway leading between the two cells. There are a series of small window slits running through the curving wall and two large pillars were built inside the annex at a later date. This would suggest that the annex was originally an open walled yard but a roof was later put over with help of the pillars. One quoin stone and one door lintel are re-used stones with quarry tally marks upon them.

Site Number **BQ101**
Site Name Slate Quarry, Banks Quarry, Elterwater
NGR NY 31532 04353
Type Slate Quarry
Period Late Nineteenth Century
Description The uppermost slate quarry, spoil heap and working area on the south end of the main Banks Quarry complex. The slate quarry, orientated north-east/south-west, has been worked on three levels, along with ***100*** above and ***102*** beneath it. Where the quarry has been worked on this level it has undercut the working level to the south (***100***), but has itself been undercut by the lower working area (***102***). This working level is thus poorly-defined except for a narrow entrance passage of revetment walls (***101c***), and a spoil heap to the east (***101b***) with a riving shed on top (***101a)***).

The riving shed is an unroofed two-celled rectangular structure measuring 7m by 4.8m. There are two (one blocked) doorway on the south elevation and the eastern cell is partially open-ended. There is a curving sub-dividing wall in the structure with narrow bench slabs built into it on the west side. The western cell has a window on the west elevation. The larger eastern cell has two stone seats on the south and east elevations. The north wall of the structure is largely collapsed and the north-eastern corner has collapsed outwards. There is a linear retaining wall running parallel to the south side of the structure containing the spoil heap above (***100b***).

Site Number **BQ102**
Site Name Slate Quarry, Banks Quarry, Elterwater
NGR NY 31531 04384
Type Riving Shed
Period Late Nineteenth Century
Description A rectangular building with a semi-circular annexe. There are two doorways extending from the southern elevation, and even possibly a third, into the large main rectangular cell. There is a single doorway to the eastern semi-circular cell. There is a single window in the northern wall of the rectangular cell and a hole in the western wall. There is a square, built feature set into the eastern wall of the rectangular cell. In the semi-circular annex, the north wall has collapsed and the north-eastern corner has similarly collapsed, and the collapsed rubble extends to the north of the structure.

The riving shed is set at the northern edge of the spoil heap and its apertures face south to the centre of the working platform. The implication is that it could only have been built when the spoil heap was almost completed, and raises the question is where they were doing the riving when the spoil heap was in a less developed state.

There is a further riving shed (***102f***) which has an opening on its north facing wall and a possible window on its eastern wall. The south facing wall is a dividing wall, with a possible extension to the west. There are three square niches set into the end of the entrance of the northern wall, and there is a possible seat against the south wall. The extension has a square feature with a hole above the south-west corner.

Site Number **BQ103**
Site Name Slate Quarry, Banks Quarry, Elterwater
NGR NY 31665 04405
Type Slate processing area and engine shed
Period Early Twentieth Century
Description A rectangular building (***103a***) with a single doorway leading through the south-eastern elevation, and a window through the north-eastern wall, which has a single timber remaining. Also in the eastern external wall there are four iron protuberances, three of which had rusted iron cable attached; these were used to tie down the corrugated iron roof. The north-western wall of the building has a partly collapsed eastern corner and a more complete western corner. There is a hole in the north-western wall with a built ramp extending out from the wall to the ground, for about 0.5m; the ramp begins from the hole in the wall. The south-western wall has a window with spoil, from the adjacent spoil heap, piled against it. It has a depression with a built platform that extends out from the southern corner (the southern corner has collapsed). The interior contains a square feature protruding from the north-eastern wall, which is then attached to the north-western wall by a shallower built wall.

There are two concrete engine mounting bases; each is rectangular with four iron bolts from each corner. The larger concrete base is close to the south-eastern doorway. In the south-western wall is an opening which correlates with a depression in the external face, and is 0.14m x 0.13m. The stones in the internal face near to the engine base are marked by an oil-based substance which is coloured red. There are iron protuberances extending from the internal face of the south-western wall.

Near to the engine shed, and extending out from a wall that extends up the spoil heap (***103c***), is a small, square slate constructed hut (***103b***). It has an entrance in its southern wall. The eastern wall has a filled in section adjacent to the large boundary wall (***103c***). It has a sloping roof made of slates, which is partially collapsed in the centre. The western wall is partly obscured by spoil overburden. It was possibly a store house.

The large boundary wall (***103c***) is orientated north/south and may have served to define land occupied between two spoil heaps, or mineral stakes. It is of dry-stone construction. The stones are pitched horizontally despite the fact that it extends up a steep slope and has an unusual appearance as a consequence.

Around the base of the adjacent spoil heap is a retaining wall (***103d***) and extends for approximately 10m. The base, free standing course extends for a height of 1m, and then is

topped by a revetment wall to a height of 3m, and there is a considerable deposit of spoil behind it.
The main platform for the processing area is the top of a large flat topped spoil heap, with a series of trackways leading to finger spoil mounds to the east. The lines of former tramways survives as lines of turfed strips extending towards the finger mounds.

Site Number **BQ104**
Site Name Slate Quarry, Banks Quarry, Elterwater
NGR NY 31571 04464
Type Slate Quarry Entrance / Revetment Wall
Period Late Nineteenth Century
Description This is the entrance to adit ***107***, and is set within the space of an open quarry with exposed working to the north-west, retained by a section of revetment walling, and on the opposite side is a further, very large retaining wall preventing the spread of the large ***216*** spoil heap. The eastern retaining wall has extant sections 1.5m long with collapse in the middle.

Site Number **BQ105**
Site Name Slate Quarry, Banks Quarry, Elterwater
NGR NY 31575 04464
Type Spoil Retaining Wall
Period Late Nineteenth Century
Description This is the western retaining wall of a large spoil heap, that was allowed to encroach into a former open quarry; however the adit ***107*** was in use at the time that the spoil heap was being expanded so the retaining wall serves to allow an access route through to the adit. It extends for 11m, and there is some spillage over the wall near to the adit. It is *c* 1.75m high.

Site Number **BQ106**
Site Name Slate Quarry, Banks Quarry, Elterwater
NGR NY 31606 04480
Type Spoil Retaining Wall
Period Late Nineteenth Century
Description This is the northern retaining wall of a large spoil heap (***216***), that was allowed to encroach towards the main access track for the quarry. The retaining wall prevented the spread of the spoil heap. It may be a continuation of the ***105*** retaining wall. Collapse and encroachment of spoil has obscured the section of walling in between. It is *c* 1.25m high.

Site Number **BQ107**
Site Name Slate Quarry, Banks Quarry, Elterwater
NGR NY 31566 04453
Type Adit
Period Late Nineteenth Century
Description This an adit entrance approximately 1.8m wide and high, and is set into the base of an open cast quarry. It extends for about 20m and is blocked by collapse. It is a rock cut passage leading horizontally into the quarry face, and the surface outside is levelled.

Site Number **BQ108**
Site Name Slate Quarry, Banks Quarry, Elterwater
NGR NY 31636 04474
Type Retaining Wall
Period Late Nineteenth / Early Twentieth Centuries

Description A length of retaining wall defining the northern edge of the ***216*** spoil heap. It limits of the spread of the spoil heap away from the main access track. It is a part of the ***106*** spoil heap. There are only limited sections of wall visible because of spill over of the spoil. At its highest it is 1m high.

Site Number **BQ109**
Site Name Slate Quarry, Banks Quarry, Elterwater
NGR NY 31660 04467
Type Slate Quarry
Period Early Twentieth Century
Description A bridge construction at the base of the spoil heap, which allowed the movement of spoil from a working floor that is now under the large spoil heap, to the northern spoil heap and thereby not restricting the movement along the miners road that passes underneath. One side of the structure is a retaining wall, holding back the spoil and the northern side is the vertical side of the bridge forming a ramp leading north to the spoil heap. The span across the bridge abutments is missing; to judge by the amount of spoil in this section of the spoil heap the bridge, was used for an extended period.

Site Number **BQ110**
Site Name Slate Quarry, Banks Quarry, Elterwater
NGR NY 31612 04494
Type Slate Quarry
Period Late Nineteenth Century
Description A finger spoil heap that is located on the north side of the miners road. It is orientated on the entrance from the ***107*** adit and, to judge by the narrow top, would have had tracks running along the top. It is on top of, and at the edge of, a much larger spoil heap that extends north from the complex, and in effect the finger spoil mound is the latest phase of spoil features here.

Site Number **BQ111**
Site Name Slate Quarry, Banks Quarry, Elterwater
NGR NY 31640 04454
Type sledge way
Period Late Nineteenth / Early Twentieth Centuries
Description A sledgeway extending down from a hazel tree between banks of slate, terminating at the main dressing floor and the bridge abutment (***109***). It is c 24m long and extends down at an angle of 45 degrees, reducing as it approaches the dressing floor. Mr Bowness recalls that the hazel tree was used as an anchoring point for a pulley system in the 1930s to raise heavy machinery for the engine house compressor.

Site Number **BQ112**
Site Name Slate Quarry, Banks Quarry, Elterwater
NGR NY 31653 04462
Type Retaining Wall
Period Late Nineteenth / Early Twentieth Centuries
Description A section of retaining wall, against the main spoil heap ***216***. It is in places obscured by spill over of the spoil. It is 1m wide and is in places 1.5m high. It is an eastern extension of the ***114*** retaining wall.

Site Number **BQ113**
Site Name Slate Quarry, Banks Quarry, Elterwater
NGR NY 31647 04464

Type Loading Ramp
Period Late Nineteenth / Early Twentieth Centuries
Description The base of the sledgeway (***111***) extends down onto a constructed ramp that was used to transfer materials from the sledge way onto carts, that could take the final product to the market. It is about 1.5m from the processing floor surface, and was 2m wide, the sloping ramp section led for a distance of 5m down to the level of the dressing floor. It is flanked by a retaining wall (***112***) on its north-eastern side.
There is a piece of slate on the edge of the platform / ramp, directly opposite the base of the sledgeway; it is 0.5m x 0.4m and has three drilled holes.

Site Number **BQ114**
Site Name Slate Quarry, Banks Quarry, Elterwater
NGR NY 31669 04452
Type Retaining Wall
Period Late Nineteenth / Early Twentieth Centuries
Description A section of retaining wall, against the main spoil heap ***216*** and forms the south-western side of the bridge abutment (***109***), and from there continues down to edge the main miners road. It is 1m wide and is in places 5m high. It is a western extension of the ***112*** retaining wall.

Site Number **BQ115**
Site Name Slate Quarry, Banks Quarry, Elterwater
NGR NY 31666 04470
Type Spoil Heap
Period Late Nineteenth / Early Twentieth Centuries
Description A small spoil heap that extends around the northern end of the ***109*** bridge abutment. This in itself is located on the much larger spoil heap that extends from the northern side of the miners road.

Site Number **BQ200**
Site Name Slate Quarry, Banks Quarry, Elterwater
NGR NY 31635 04369
Type Riving Shed
Period Late Nineteenth / Early Twentieth Centuries
Description A sub-square riving shed at the lower level of the spoil heap at the base of the opencast quarry ***201***. It is a single celled building, and is 3m x 4m and stands to 2m high. It extends out from a spoil heap and has an entrance facing east.

Site Number **BQ201**
Site Name Slate Quarry, Banks Quarry, Elterwater
LDNPHER -
NGR NY 31639 04368
Type Processing Floor and Quarry
Period Early Twentieth Century
Description A large processing floor on top of a substantial spoil heap, which extends out from a large quarry (***201a/203***). The quarry is split into two areas, a higher platform, occupied by riving sheds (***203***) and the lower area (***201a***) occupied by a single small shed (***200***). An enclosure wall crosses over the processing floor and seemingly post-dates the workings as it blocks the quarry from the spoil heap. This is one of the original quarries shown on the OS 1st Edition mapping. Its outline has not changed significantly but the associated spoil heap has become enlarged and implies that there is an adit at the back of the quarry supplying the spoil; however, none was observed.

Site Number	**BQ202**
Site Name	Slate Quarry, Banks Quarry, Elterwater
NGR	NY 31612 04368
Type	Riving sheds
Period	Early Twentieth Century
Description	A series of riving sheds and store houses set at the base of a former quarry, and comprises a riving shed (***202a***), a yard area (***202b***) and a shelter (***202c***). The riving building is a sub-rectangular building *c* 5m x 4m and 2m high. There is a small annex to the north of the building, which is of a similar height. Within the building, on the west facing wall, is the remains of a seat 1m x 0.5m, and 0.5m high. The yard is approximately 8m x 1m. To the south of the yard are the remains of a collapsed structure (***202c***), of which only the foundations survive.

Site Number	**BQ203**
Site Name	Slate Quarry, Banks Quarry, Elterwater
NGR	NY 31615 04350
Type	Slate Quarry
Period	Late Nineteenth Century
Description	A quarry which was first shown on the 1861 OS mapping with spoil heaps, working floors (***201a***) and two buildings, one at the lower level (***200***) and a higher series of buildings (***202***) at the higher level. The quarry has had a lot of spoil from higher quarries deposited into it and this has in part overlain the riving sheds, and has evidently obscured the adit at the back of the quarry.

Site Number	**BQ204**
Site Name	Slate Quarry, Banks Quarry, Elterwater
NGR	NY 31465 04405
Type	Slate Quarry and Processing Area
Period	Late Nineteenth Century
Description	An open cast quarry and processing area at the western end of the complex; it comprises spoil heaps, retaining walls (***204d*** and ***204a***), and a small shed (***204e***). At the western edge of the processing platform is a small section of retaining wall (***204a***) which marks the base of the quarry. It has a single small building 1m x 1m and 1.5m high, and is set against a larger retaining wall section which is 3m long and 2m high. The shed is too small to have been a riving shed and may have been a store, adjacent to this is a section of retaining wall (***204d***) which has prevented the spread of spoil heaps from site ***205*** impacting onto the shed. The implication is that ***204*** is earlier than ***205***, but was still in use when ***205*** was operating. Further down the quarry are the remains of a possible shelter, made up of two blocks of slate, each one 1m x 1m high; its exact function is uncertain. The spoil heap has extended over the line of the former quarry processing area (***05***), and was clearly the later.

Site Number	**BQ205**
Site Name	Slate Quarry, Banks Quarry, Elterwater
NGR	NY 31451 04392
Type	Slate Quarry
Period	Early Twentieth Century
Description	A quarry (***205a***), processing floor (***205c***), and a riving shed (***205b***). The quarry (***205a***) is approximately 10m x 10m, and its floor is partly cut away by the quarry of site ***204***. The spoil heap (***205c***) has expanded onto the working floor of site ***204***. Built on to the processing floor is a substantial riving shed (***205b***) which is *c* 4m x 4m and is up to 2m high. There are two entrances to the building, one through the eastern wall, and the other through the northern wall. Inside the building are internal walls, and various niches and

voids set into the walls. On the southern wall are the remains of two voids / niches for storage, each 0.5m x 0.25m, each with lintels over the voids. On the south-west facing wall are two cupboards / niches each on top of each other, and again 0.5m x 0.25m in size. On the east facing wall is another cupboard and there is the remains of a piece of slate sticking out of the wall, and is 0.5m above the ground, which may have served as a storage space. Finally there is a piece of upstanding slate in the interior that may have served to cut slate slabs.

Site Number **BQ206**
Site Name Slate Quarry, Banks Quarry, Elterwater
NGR NY 31445 04379
Type Slate Quarry
Period Late Nineteenth / Early Twentieth Centuries
Description A small spoil mound with associated trial workings. The remains of the quarry have been destroyed as a result of the later, and adjacent, Site ***205*** quarry workings. There are the remains of a possible shelter associated with the quarry, but are small scale foundations surviving.

Site Number **BQ207**
Site Name Slate Quarry, Banks Quarry, Elterwater
NGR NY 31439 04363
Type Slate Quarry
Period Late Nineteenth / Early Twentieth Centuries
Description A small, trial working with a small cut into the slope and an associated spoil heap. The quarry is only 8m x 6m and the spoil heap is 4m x 9m.

Site Number **BQ208**
Site Name Slate Quarry, Banks Quarry, Elterwater
NGR NY 31465 04331
Type Slate Quarry
Period Late Nineteenth / Early Twentieth Centuries
Description A small trial quarry cutting and two associated spoil heaps.

Site Number **BQ209**
Site Name Slate Quarry, Banks Quarry, Elterwater
NGR NY 31484 04371
Type Slate Quarry
Period Late Nineteenth Century
Description A substantial quarry and associated spoil heap, with associated processing area. The north-western edge of the spoil heap is constrained by a section of retaining wall to prevent its encroachment into quarry ***204***, and indicates that they were in contemporary use. On the eastern edge of the processing area are the remains of a small shelter. The quarry cut is a long narrow one, following the line of a seam and may have had an adit at the far end, but one was not identified during the survey.

Site Number **BQ210**
Site Name Slate Quarry, Banks Quarry, Elterwater
NGR NY 31466 04416 - 31507 04388
Type Boundary Markers
Period Late Nineteenth Century
Description A series of five boundary markers extending along the south side of trackway **3c**. One of these (**5c**) is on the edge of the site ***5a*** spoil heap and indicates that the markers, though not necessarily the trackway, post-dates the production of the spoil mound.

Site Number	**BQ211**
Site Name	Slate Quarry, Banks Quarry, Elterwater
NGR	NY 31503 04388
Type	Slate Quarry
Period	Late Nineteenth / Early Twentieth Centuries
Description	A small trial quarry cut and associated shelter adjacent to miners track Site ***3c***. The shelter is 1.6m x 1.8m in size, and has only two walls visible. There is a small cut but very little sign of an adit.

Site Number	**BQ212**
Site Name	Slate Quarry, Banks Quarry, Elterwater
NGR	NY 31540 04429
Type	Slate Quarry
Period	Late Nineteenth / Early Twentieth Centuries
Description	A sizeable quarry cut, with a processing area, and spoil heap in front of it. It is adjacent to the larger ***01*** quarry workings. There is no riving shed or structure associated with it. The quarry appears to have cut a track extending south-east from Site ***01***, and there is a possibility that it is slightly later in the sequence. The quarry is 12m x 9m in size and the spoil heap is 12m x 12m in extent.

Site Number	**BQ213**
Site Name	Slate Quarry, Banks Quarry, Elterwater
NGR	NY 31535 04466 – 31535 04436
Type	Culvert
Period	Late Nineteenth / Early Twentieth Centuries
Description	An artificial gully excavated in a straight line down the slope, culminating in a culvert under the miners track. It is 28m long and 3.2m wide. While it presently is serving as a water course / drain it was not necessarily always so. It is overlain at its southern end by the spoil from ***212***, and there is a possibility that it was formerly a sledgeway before being expanded by water action.

Site Number	**BQ214**
Site Name	Slate Quarry, Banks Quarry, Elterwater
NGR	NY 31576 04432
Type	Slate Quarry
Period	Late Nineteenth Century
Description	A large and early quarry at the site, and is shown in a reduced state on the OS 1st Edition map. It developed in scale through the nineteenth century and the southern section was not depicted on the OS 1915 map and was evidently worked after the First World War. Its south-western side has been cut back by the very much larger big pit (Site ***215***). There is a small shelter which is 2.5m x 2.3m in size (***215b***). Adjacent to this is a retaining wall which is retaining a small deposit of spoil. The main spoil heap is Site ***216*** which has spilled into the area of the ***107*** quarry and evidently continued for an extensive period. An enclosure wall (***214d***) has been constructed on top of the spoil mound and restricts access to the spoil mound; as with that on the ***201*** spoil mound, the purpose of this is uncertain.

Site Number	**BQ215**
Site Name	Slate Quarry, Banks Quarry, Elterwater
NGR	NY 31592 04409 (centred)
Type	Slate Quarry
Period	Late Nineteenth / Early Twentieth Centuries

Description An extremely large opencast quarry which has steadily expanded since the 1898 mapping. In the latter days of the Banks Quarry operation it was the principal working site and expanded significantly after the end of the First World War. This was last worked in the 1930s by pneumatic power served from the engine shed (***103a***). It has cut back into the earlier ***214*** extraction site. The spoil was output through a narrow gully, that was in part encroached upon by a spoil heap. The spoil was ultimately dispersed along rail lines onto the large spoil heap ***103e***. It is 84m x 38m in extent and has a narrow entrance on the northern flanked by retaining walls (***12b***). There are three mine buildings (***9-11***) near the entrance, and also a working floor containing a large spoil heap (***103e***).

Site Number **BQ216**
Site Name Slate Quarry, Banks Quarry, Elterwater
NGR NY 31599 04409
Type Spoil Heap
Period Late Nineteenth Century
Description A large spoil heap that was generated from material from the ***214*** quarry. The spoil mound steadily increased through the later nineteenth century and the early twentieth century. The spoil heap has part filled the ***107*** open cast quarry and its spread has been constrained by the ***105*** retaining wall. The spoil has also overlain onto the sheds of the ***215*** quarry demonstrating that they were in contemporary use.

GREENHEAD GILL MINE SITES

The individual Greenhead Gill sites (GG01-53) are part of HER **1891** and NTSMR **20326**

Site Number	**GG01**
Site Name	Crushing Floor, Greenhead Gill Mine, Grasmere
NGR	NY 35165 08791
Type	Crushing Floor
Period	Post-medieval
Description	A sub-rectangular platformed area located on the south side of the deep stream gully at Grains Gill and upslope to the east of the main mining complex. The area measures 24m long north/south by 8m wide and is contained downslope on the west side by a retaining wall up to 1m high. The platform is internally sub-divided and there is a turf-covered mound in the northern cell. The structure is probably a working floor to sort ore gathered out of nearby Grains Gill.

Site Number	**GG02**
Site Name	Peat Trackways, Greenhead Gill Mine, Grasmere
NGR	NY 35202 08875 to NY 35049 08775
Type	Trackway
Period	Post-medieval
Description	A series of ribbon-like peat trackways running south-west/north-east upslope on the north side of Grains Gill.

Site Number	**GG03**
Site Name	Leat, Greenhead Gill Mine, Grasmere
NGR	NY 34990 08692 to NY 35020 08541
Type	Leat
Period	Post-medieval
Description	A linear leat running roughly south-south-east/north-north-west from Rowantree Gill north towards the mine complex. It measures approximately 155m long. There is no obvious take-off point surviving on the stream but the northern end of the leat has a possible stone founded take-off for a wooden launder which would have travelled west towards a waterwheel at the crushing mill.

Site Number	**GG04**
Site Name	Ore Store, Greenhead Gill Mine, Grasmere
NGR	NY 34987 08707
Type	Ore Store
Period	Post-medieval
Description	A small unroofed square, stone-built structure resting on top of the eastern retaining wall of the main working floor of the mine. It measures 4.75m square and the walls survive up to 1.2m high on the downslope western side. There is a probable entrance on the east side. Internally the floor appears higher than would be anticipated, a possible indication that the structure contains a supply of ore.

Site Number	**GG05**
Site Name	Working Floor, Greenhead Gill Mine, Grasmere
NGR	NY 34979 08700
Type	Working Floor
Period	Post-medieval
Description	This is the main trapezoidal-shaped working floor of the mine complex, which is just above the stamping mill and adjacent to it is the ore bin, and within it is a large spread of bucking

material – crushed ore. It is orientated roughly north-west/south-east and measures approximately 19m x 9.5m. It is defined on all but the north side by retaining walls; it is terraced into the steep hillslope on the east side and edged by wall ***8c*** and it is platformed to the west adjacent to Greenhead Gill and edged by retaining walls ***8a*** and ***8b***.
Site ***5a***: In the centre of the floor is a large sloping patch of ground with a slightly domed deposit of broken veinstone exposed, comprising fragments of irregular size. This spread of crushed ore or bucking material measures 6m x 4m and its exposure reflects the toxicity of the lead ore that has discouraged the growth of grass on top. Shaw (1939) sampled the material: 'On the floor above the stamp house is a small pile of low grade ore, a sample of which gave: Lead 2.65 per cent; Zinc 10.65 per cent; Manganese Trace; Copper 0.2 per cent and Silver 0.3 ozs. per ton. The ancients apparently worked for the lead and silver, as the copper content was much too low to be of value, and zinc was of no importance in those days'.

Site Number **GG06**
Site Name Worked Stone, Greenhead Gill Mine, Grasmere
NGR NY 34980 08705
Type Stone
Period Post-medieval
Description A small rectangular flat faced stone located in the centre of the working floor ***5***. It has a circular drill hole in its centre and is evidence for post-Elizabethan working at the main mine complex.

Site Number **GG07**
Site Name Leat?, Greenhead Gill Mine, Grasmere
NGR NY 34987 08715
Type Leat
Period Post-medieval
Description A short linear fragmentary section of sunken leat located on the north side of the putative ore bin ***4***. It is orientated roughly north-east/south-west and measures 10.3m by 1.2m and 0.2m deep. The feature may have taken water from of a small tributary stream off Grains Gill to feed water to buddles or other processes on the northern end of the main working floor ***5***.

Site Number **GG08**
Site Name Retaining Walls, Greenhead Gill Mine, Grasmere
NGR NY 34965 08684, NY 34975 08704 and NY 34985 08708
Type Wall
Period Post-medieval
Description A series of extant sections of retaining wall surrounding the main working floor at mine ***5***. On the west side of the floor, adjacent to Greenhead Gill, there are two sections ***8a*** and ***8b***. The southernmost section is best preserved and it dog-legged to the south-east on the south end to define the southern extent of the working floor. There are fragmentary remains of walling on the east side of the floor ***8c*** running beneath the ore store ***4***.

Site Number **GG09**
Site Name Stony Bank, Greenhead Gill Mine, Grasmere
NGR NY 34982 08722
Type Earth and Stone Bank
Period Post-medieval
Description An irregular earth and stone bank defining the east side of the main working floor ***5*** at its northern end adjacent to two possible buddles ***17*** and ***18***. It measures over 10m long by 1m wide and is 0.5m high.

Site Number	**GG10**
Site Name	Scoop, Greenhead Gill Mine, Grasmere
NGR	NY 34978 08710
Type	Scoop
Period	Post-Medieval
Description	A small scooped area on the west side of the main working floor ***5***. It measures 6m by 4m and 0.4m deep. It may be the site of a buddle?

Site Number	**GG11**
Site Name	Stony Bank, Greenhead Gill Mine, Grasmere
NGR	NY 34983 08727
Type	Earth and Stone Bank
Period	Post-medieval
Description	A small linear section of earth and stone bank located on the west side of a possible buddle ***17***. It measures 2m by 0.8m.

Site Number	**GG12**
Site Name	Stoney Bank, Greenhead Gill Mine, Grasmere
NGR	NY 34984 08734
Type	Earth and Stone Bank
Period	Post-medieval
Description	A small linear section of earth and stone bank located at the very northern end of the main processing site adjacent to Greenhead Gill. It measures 6m by 1m and is 0.3m high.

Site Number	**GG13**
Site Name	Buddle, Greenhead Gill Mine, Grasmere
NGR	NY 34966 08670
Type	Buddle
Period	Post-medieval
Description	A rectangular buddle with well-defined edges located on the eastern bank of Greenhead Gill. It measures 1.8m by 1.2m and is up to 0.7m deep. It lies on the southern end of a stony banked feature ***44***.

Site Number	**GG14**
Site Name	Bridge Abutment Greenhead Gill Mine, Grasmere
NGR	NY 34973 08697
Type	Bridge
Period	Post-medieval
Description	The easternmost of a pair of well-preserved stone bridge abutments located adjacent to the site of the main stamp mill **40** and providing access to St Benedict's Shaft ***16***. It measures 2.3m by 1.3m and survives up to 1.5m high. It is attached to the retaining wall on the west side of the main working floor ***8a*** and ***8b***. Shaw (1939) was under the impression that this feature, along with ***15***, held the bearing for the water wheel

Site Number	**GG15**
Site Name	Bridge Abutment Greenhead Gill Mine, Grasmere
NGR	NY 34966 08701
Type	Bridge
Period	Post-medieval
Description	The westernmost of a pair of well-preserved stone bridge abutments located adjacent to the site of the main stamp mill **40** and leading to St Benedict's Shaft ***16***. It measures 1.5m by 1m and survives up to 0.7m high. Shaw (1939) was under the impression that this feature, along with ***14***, held the bearing for the water wheel

Site Number	**GG16**
Site Name	Shaft, Greenhead Gill Mine, Grasmere
NGR	NY 35165 08791
Type	Shaft
Period	Post-medieval
Description	One of the original pair of vertical shafts of the Elizabethan mine. This shaft is located adjacent to bridge abutments ***14*** and ***15*** near to the site of the stamp mill ***40***. This shaft was named as St Benedict's shaft in the early mine documents. The 2m square vertical-cut shaft has been mostly infilled and is at the base of a vertical cut working face measuring 7m long by 3m high. There is a small protruding lip on the east side of the shaft with a small rock-cut channel measuring 1m by 0.3m and 0.4m deep. The channel was possibly used for drainage of the shaft when water filled kibbles were raised and tipped out of the shaft. On his visit Shaw (1939) described the shaft as being mostly filled in and he recorded the drainage channel: 'An interesting feature at this shaft, is the water channel, 12 by 6 in., cut out of the solid rock to drain away the kibbled water into the stream'.

Site Number	**GG17**
Site Name	Buddle?, Greenhead Gill Mine, Grasmere
NGR	NY 34984 08726
Type	Buddle
Period	Post-medieval
Description	A sub-rectangular sunken area on the northern end of the main working floor. It measures approximately 2.7m by 2.4m and is 0.4m deep. There are possible fragments of a stone-lined edge on the east side.

Site Number	**GG18**
Site Name	Buddle?, Greenhead Gill Mine, Grasmere
NGR	NY 34979 08719
Type	Buddle
Period	Post-medieval
Description	A rectangular sunken area located at the northern end of the main working floor ***5***. It measures 3m by 2m and is 0.3m deep. There is a small spring running through the area which contains tall grass. There are well-defined rock-cut edges on the north and east sides.

Site Number	**GG19**
Site Name	Leat, Greenhead Gill Mine, Grasmere
NGR	NY 35002 08744 to NY 34985 08728
Type	Leat
Period	Post-medieval
Description	A roughly linear sunken cutting orientated north-east/south-west and measuring over 23m long by 0.6m wide and 0.25m deep. It is a possible leat feeding water from a feeder stream for Grains Gill downslope into two possible buddles ***17*** and ***18***.

Site Number	**GG20**
Site Name	Mine Building and Working floor(s), Greenhead Gill Mine, Grasmere
NGR	NY 34926 08568
Type	Mine Building
Period	Post-medieval
Description	The foundations of a rectilinear single celled building ***20a*** that has been platformed up to 0.5m high downslope on the west side adjacent to Greenhead Gill. The structure is orientated roughly east/west perpendicular to the hillslope and it measures approximately 11m by 6m with wall foundations up to 0.6m wide. The eastern gable end survives up to

0.5m high. The structure is contained within a small D-shaped yard with a curtain wall on the south side ***20b***. There are drilled triangular holes in various stones on the western side of the yard where there is a revetted wall; there are similar stones on the opposite bank of Greenhead Gill and one in the fabric of the west end of the mine building.
North of the mine building there are two levelled areas ***20c*** and ***20d***, the former of which may overly the mine building foundations. These may have been small working floors at differing heights contained on the north side by a boulder and a revetted wall on the south bank of Greenhead Gill. The working areas are clearly associated with the nineteenth century mine adit (***21***) that is located on the opposite bank of the stream.

Site Number **GG21**
Site Name Adit, Greenhead Gill Mine, Grasmere
NGR NY 34930 08605
Type Adit
Period Post-medieval
Description A linear powder-blasted, rock-cut adit ***21a*** running north/south into the hillside to the south of the Elizabethan mining complex. The adit is clearly a nineteenth century addition to the mine and is not an expanded Elizabethan coffin level. The water-filled entrance aperture is part blocked but survives up to 1.5m wide by 1m high. There is a sunken channel running south from the adit to Greenhead Gill used to lower the water level in the adit and this has an upcast bank on the eastern side. On his visit Shaw (1939) described the adit: 'About 150 yd. below the mill, an adit has been driven North to tap the shaft workings, but although from the appearance of the dumps it has reached the ore bearing zone, it has not drained the shafts'. A series of one and a quarter inch drill holes are visible internally for much of the length of the adit but not near the adit mouth (Bridge and Matheson 1994, 114).

In 1870 Benson Harrison and W Bowness of Ambleside were given a take note on the mine from the Earl of Lonsdale. They drove this adit beneath the earlier workings for just over 100 yards into the rock but they found the individual thin quartz veins to be pinched out beneath the earlier workings with no ore evident (Tyler 1999, 43).

Tyler recorded a visit to the site in 1983 when the adit was reopened which drained some of the water away and it was explored up to the full length of 166 yards.

There is a small sub-rectangular yard ***21b*** on the south-eastern side of the adit adjacent to Greenhead Gill. This measures 9m by 5m internally. There are the remains of a possible sub-triangular shelter to the east of the adit constructed of tumbled boulders and large stones ***21c***.

Site Number **GG22**
Site Name Dam and Launder Base, Greenhead Gill Mine, Grasmere
NGR NY 34963 08663 and NY 34964 08653
Type Dam
Period Post-medieval
Description A possible rock-cut and stone constructed dam ***22b*** located in Greenhead Gill. This would potentially have been a take-off point for a launder running south into an area of buddles ***24-29***. The dam has a possible bypass channel on the west side. To the east of the dam is a north/south aligned linear earth and stone bank located on the eastern bank of Greenhead Gill ***22a***. This could have been a launder base running towards the buddles and measures 3m by 1m and is 0.3m high.

Site Number **GG23**
Site Name Buddle, Greenhead Gill Mine, Grasmere
NGR NY 34961 08650
Type Buddle

Period Post-medieval
Description A rectangular buddle located in a dried up stream gully on the eastern flank of Greenhead Gill. This is the northernmost buddle and is adjacent to a stone-packed area which would have diverted water away from this relict channel. The feature measures 2m by 1.5m and is mostly infilled but some edges are visible.

Site Number **GG24**
Site Name Buddle, Greenhead Gill Mine, Grasmere
NGR NY 34962 08643
Type Buddle
Period Post-medieval
Description A rectangular buddle located in a dried up stream gully on the eastern flank of Greenhead Gill. It measures 3.5m by 3m and is 0.75m deep and is set into the bed of the dried up watercourse. There are well-defined edges on the eastern side with some foundation stones evident. It is open on the south side.

Site Number **GG25**
Site Name Stony Bank, Greenhead Gill Mine, Grasmere
NGR NY 34957 08641
Type Earth and Stone Bank
Period Post-medieval
Description A small linear section of earth and stone bank measuring 3.5m by 2m and 0.3m high. It is possibly a launder base sat above a buddle ***28***.

Site Number **GG26**
Site Name Buddle?, Greenhead Gill Mine, Grasmere
NGR NY 34960 08636
Type Buddle
Period Post-medieval
Description A partially infilled sub-rectangular buddle located in a dried up stream gully on the eastern flank of Greenhead Gill. It measures 4.5m by 3m and is 0.3m deep. It is set into the bed of the dried up watercourse. It is open on the south side.

Site Number **GG27**
Site Name Buddles, Greenhead Gill Mine, Grasmere
NGR NY 34956 08631
Type Buddle
Period Post-medieval
Description A series of up to four interlinked sub-rectangular buddles located in a dried up stream gully on the eastern flank of Greenhead Gill ***27a-27d***. They each measure 5m by 2.5m, 4.5m by 4.9m and 2.4m by 2.2m respectively. They are all set into the bed of the dried up watercourse and are each infilled up to a slightly different height.

Site Number **GG28**
Site Name Buddle / Shelter, Greenhead Gill Mine, Grasmere
NGR NY 34954 08636
Type Buddle / shelter
Period Post-medieval
Description A square collapsed stone structure located on a raised area between Greenhead Gill and a dried up stream gully containing buddles. The structure measures 3.9m square with collapsed foundations 0.9m wide by 0.3m high. The structure is possibly a buddle fed by a launder base to the north ***25***, or, alternatively, it is a collapsed shelter.

Site Number **GG29**
Site Name Buddle, Greenhead Gill Mine, Grasmere
NGR NY 34953 08627
Type Buddle
Period Post-medieval
Description A partially infilled sub-rectangular buddle located in a dried up stream gully on the eastern flank of Greenhead Gill. It measures 4.4m by 3.8m and is 0.6m deep. It is set into the bed of the dried up watercourse and is the southernmost buddle in the channel located near the outflow back into Greenhead Gill. It has a rough stone revetted edge on the east side and has a well-defined straight edge on the south side.

Site Number **GG30**
Site Name Platform, Greenhead Gill Mine, Grasmere
NGR NY 34953 08613
Type Platform
Period Unknown
Description A possible earthen platform located south of the main mining complex. There is a well-defined embanked scarp edge on the eastern flank of Greenhead Gill. The scarp is over 1m high and in the centre of the section there is a flat-topped protrusion measuring up to 5m by 3m. The feature may have been some sort of loading platform. The miner's track runs immediately to the east of the earthwork.

Site Number **GG31**
Site Name Shaft, Greenhead Gill Mine, Grasmere
NGR NY 34985 08755
Type Shaft
Period Post-medieval
Description One of the original pair of vertical shafts of the Elizabethan mine. This shaft is located south of possible bridge abutments ***43*** crossing Greenhead Gill. The shaft was not named in the early mine documents. The 1.5m square vertical-cut shaft is filled with water but has been mostly infilled but is now extant to 0.7m deep. It is sat at the base of a vertical cut working face measuring 5m long by up to 3m high. There is an upcast earth and stone bank on the east side of the shaft measuring 8m by 3m which would have protected the shaft from flooding from the adjacent gill. In 1939 Shaw described the shaft: 'The North shaft, which measures 6 by 4 ft., is still 20 ft. deep. It has been cut very square and sinking without the aid of explosives must have been a slow, laborious task in such hard rock'.

Site Number **GG32**
Site Name Adit/Open Working, Greenhead Gill Mine, Grasmere
NGR NY 34976 08745
Type Adit
Period Post-medieval
Description A sub-oval sunken open working or collapsed adit mouth located on the western bank of Greenhead Gill. It measures 12m by 6m and is 3m deep. There is an exposed working face on the north-west side. The site is almost definitely associated with the Elizabethan working of the mine and could be a collapsed adit mouth.

Site Number **GG33**
Site Name Open Working, Greenhead Gill Mine, Grasmere
NGR NY 34972 08731
Type Open Working
Period Post-medieval
Description A roughly linear open working located on the western bank of Greenhead Gill. It consists of a vertical face/cliff edge measuring 10m long by 2.5m high. The site is almost definitely associated with Elizabethan working of the mine.

Site Number	**GG34**
Site Name	Adit/Open Working, Greenhead Gill Mine, Grasmere
NGR	NY 34961 08715
Type	Adit
Period	Post-medieval
Description	A curvilinear sunken open working or collapsed adit mouth located on the western bank of Greenhead Gill. It measures 16m by 3.5m has vertical crock-cut working faces on the north and south sides and is over 3m deep on the west end. The site is almost definitely associated with Elizabethan working of the mine and could be a collapsed adit mouth as there is a slumped pit located upslope that is indicative of collapsed sub-surface workings ***36***.

Site Number	**GG35**
Site Name	Surface Working, Greenhead Gill Mine, Grasmere
NGR	NY 35141 08812
Type	Trial Mine
Period	Post-medieval
Description	A series of craggy outcrops on the deeply cut sides of Gains Gill have been surface worked on the north side of the gill adjacent to a revetted working floor ***1***.

Site Number	**GG36**
Site Name	Sub-oval depression on fellside/ possible collapse, Greenhead Gill Mine, Grasmere
NGR	NY 34934 08732
Type	Mining Industry Site
Period	Post-Medieval
Description	A sub-oval depression located upslope above the main extraction areas of the Elizabethan Mines ***16*** and ***34***. The depression measures approximately 27m by 12.5m and is up to 0.7m-1m deep upslope to the west. The site is indicative of surface slumping caused by the collapse of mine workings beneath and would lend credence to the hypothesis that sites ***34*** was a collapsed adit mouth. The feature is not associated with surface hushing.

Site Number	**GG37**
Site Name	Platform, Greenhead Gill Mine, Grasmere
NGR	NY 35000 08712
Type	Platform
Period	Unknown
Description	A possible sub-circular turf-covered mounded platform ***37a*** located upslope to the east of the ore store ***4*** on the main working floor ***5***. Overall the platform measures approximately 13m by 10m with a flat top that is up to 6m by 5m in extent. It has been cut into the slope on the east side and is platformed up to 1m high on the north and west sides. There is a set of three shallow scoops located downslope to the west of the platform ***37b***. Each measures between 1m and 0.6m in diameter and they are very shallow. They are possible water erosion features. There is a small ring of eight placed stones ***37c*** located south of the scoops of unknown date and function.

Site Number	**GG38**
Site Name	Hush, Greenhead Gill Mine, Grasmere
NGR	NY 34805 08618 to NY 34890 08513
Type	Hush
Period	Post-Medieval
Description	A large curvilinear hush scar orientated east/west then north-west up the steep hillside on the western side of Greenhead Gill. In places the excavated scar measures over 11m wide

where it has cut into two adjacent channels, but elsewhere it is up to 6m wide by over 1.5m deep; it is over 180m long.

Site Number **GG39**
Site Name Trackway, Greenhead Gill Mine, Grasmere
NGR NY 34784 08613 to NY 34942 08615
Type Trackway
Period Post-Medieval
Description A sinuous section of trackway running downslope on the steep hillside flanking the west side of Greenhead Gill. Overall it measures over 150m long. On the western end it crosses a hush ***38*** and it descends to Greenhead Gill opposite the southern end of the row of putative buddles ***23-29***.

Site Number **GG40**
Site Name Bothy/Stamp Mill, Greenhead Gill Mine, Grasmere
NGR NY 34975 08692
Type Bothy
Period Post-Medieval
Description The site consists of the unroofed walls of a single celled rectangular bothy building located on the main working floor of the mine complex ***5***. It measures 7m by 4.6m with walls surviving to 0.6m wide by 0.7m high. There is an entrance on the south end of the east wall elevation with a pair of steps external to it. Several stone roofing slates with peg holes were previously identified in the debris surrounding the structure (Bridge and Matheson 1994, 112). The bothy structure is attached to a large well-founded wall on the north end ***40a*** which it uses as the northern gable end. This wall clearly pre-dates the bothy structure and may be a significant structural component of the Elizabethan processing area. The wall measures 4.8m by 1.5m and is up to 1.5m high on the south side and it is probable that this is the axle foundation of a water wheel in order to power the original stamp mill on the working floor. The wall is at the end of the leat feeding down from Rowantree Gill ***3***. There is no evidence for any other wheel pit or anchoring point on the working floor or into Greenhead Gill.
There are a series of four fragmentary wall foundations located south of the bothy and on the southern end of the working floor. At least two of these Sites 40e and 40c are square areas that may be the locations of troughs, sorting tables or primary buddles for separating ore from the veinstone immediately adjacent to the stamp mill. The others Sites ***40b*** and ***40d*** perhaps more likely related to the bothy and the nineteenth century phase of working.

Site Number **GG41**
Site Name Site of building?, Greenhead Gill Mine, Grasmere
NGR NY 34980 08695
Type Building?
Period Post-Medieval
Description The very fragmentary foundation remains of a possible small, rectangular building located beneath the spread of crushed stone material associated with the main working floor ***5*** and just to the north side of the north-east corner of the bothy ***40***. The feature measures approximately 6m long north-west/south-east by 5m wide. There is at least one well-defined wall footing at ground level on the western end.

Site Number **GG42**
Site Name Bridge Abutment, Greenhead Gill Mine, Grasmere
NGR NY 34999 08763
Type Bridge
Period Post-Medieval

Description Possible bridge abutments located on Greenhead Gill and to the north of one of the Elizabethan-era shafts ***31***. It consists of a levelled platforms on the both bank. The stony core of the revetments are visible in the gill sides. The western platform is 3m by 1.5m and the eastern platform is 2.5m by 1.5m. Slight evidence of a trackway can be seen to the east of the gill running 3m south towards the mine buildings. There is no evidence for a trackway on the shaft side of the gill.

Site Number **GG43**
Site Name Bridge Abutment, Greenhead Gill Mine, Grasmere
NGR NY 34975 08724
Type Bridge
Period Post-Medieval
Description Possible stubs of bridge abutments surviving exposed on both banks of Greenhead Gill adjacent to an area of surface working and putative adits ***33*** and ***34***. On the western bank of the gill there is an obvious flattened platform adjacent to the western footings and leading to the putative adit entrance ***34***.

Site Number **GG44**
Site Name Stony Bank, Greenhead Gill Mine, Grasmere
NGR NY 34967 08676
Type Earth and Stone Bank
Period Post-Medieval
Description A linear embanked lynchet on the eastern side of Greenhead Gill. It runs parallel to the gill in a north-north-west/south-south-east direction from the south-west corner of the main working floor retaining wall ***8b***. The bank may have been an original continuation of the working floor, but was more likely formed as a launder base taking water down to at least one of the buddles located downstream (***13***).

Site Number **GG45**
Site Name Adit, Greenhead Gill Mine, Grasmere
NGR NY 34561 08509
Type Adit
Period Post-medieval
Description A linear square-cut powder blasted rock-cut trial adit running north/south into the hillside well to the south of the Elizabethan mining complex. The adit is clearly a nineteenth century addition to the mine and is not an expanded Elizabethan coffin level. The level has a cross cut located around 8m in from the entrance and terminates in a blind header or collapse after 15m. The cross cut excavated one of two parallel WNW/ESE orientated quartz stringers for 10ft to the east and 6ft to the west and up to a width of 12ins in the east cavity (Cannell and Cannell 1969b). The thinner other quartz vein was identified at the end of the blind header (ibid). There are lots of circular drill holes suggesting nineteenth century workings. The entrance aperture survives up to 1.5m wide by 1.5m high and is located near the northern bank of Greenhead Gill.

Site Number **GG46**
Site Name Trackway, Greenhead Gill Mine, Grasmere
NGR NY 34792 08398 to NY 34956 08616
Type Trackway
Period Post-Medieval

Description A well preserved miner's track leading up the narrow valley containing Greenhead Gill from the enclosed lands below. It survives as a well-defined east/west section of track cut into the hillslope on the south side of the gill before becoming more fragmentary as the gill turns more to the north nearer to the mine complex. Shaw (1939) described that: 'It has been carefully graded and, where rocks have been crossed, has been laboriously chiselled

out. It seems to have been no more than 4 ft. wide, and would therefore be only a pack-horse track'.

Site Number **GG47**
Site Name Ore Vein, Greenhead Gill Mine, Grasmere
NGR NY 34993 08756
Type Surface Workings
Period Post-Medieval
Description The ore vein is exposed in the base of Greenhead Gill near to the outflow of Grains Gill and approximately 10m east of the northernmost shaft ***31***.

Site Number **GG48**
Site Name Possible surface trial 50m south west of Alcock Tarn, Grasmere
NGR NY 34835 07816
Type Trial Mine
Period Post-medieval
Description Possible surface trial located 50m south west of Alcock Tarn identified by Ian Tyler in his book' The Mines of Thirlmere, 1999' and described within his summary of the Grasmere mines. Tyler describes the feature as 'another possible trial, directly west of the tarn at OD 1100 ft, near an old ruined building. There is a small spoil heap and nearby, much rock debris containing pyrite'. Tyler assumes that this possible trial is the work of the Elizabethan miners who are also responsible for the two coffin levels to the south-west and the workings in Greenhead Gill to the north.
The possible trial is located close to a ruined building attached to the nearby fell wall to the north. The feature itself appears as a grassy scoop surround by a grassy bank on three sides. It is likely that the scoop represents the actual trial excavation to test for the mineral vein and that the upcast banks to the south and east are spoil heaps resulting from this activity.
The scoop is roughly 2m in width across the scope and 1.2m in length, with the scoop have a depth of around 0.25m.
A short distance down slope from this feature is a second, almost identical possible trial, consisting of a shallow scoop surrounded by grassy banking on three sides. This scoop is once again roughly 2m in width across the scope and 1.2m in length, with the scoop have a depth of around 0.25m.
There was no sign of any 'rock debris containing pyrite' as described by Tyler at either site.

Site Number **GG49**
Site Name Trial or short level located on Brackenfell, Grasmere
NGR NY 34468 07121
Type Trial Mine
Period Post-medieval
Description The trial or short level located on Brackfell is the highest of the Elizabethan mine workings described as the 'Grasmere set' by Ian Tyler in his book 'The Mines of Thirlmere 1999'.
The entrance to the level is very narrow, typical of Elizabethan workings of the period, and gives access to a short 'coffin' level around 10 meters in length. The coffin level is less than 0.5m in width, with a sloping hanging wall on the north side of the level. The coffin level is nearly 2m in height in places and has a distinctive flattened roof some 0.3m in width. The workings are clearly hand cut, with no sign of any drilling or blasting marks. There is some evidence of secondary mineralisation at the head of the level, although there is no sign of any significant mineral vein.
Around 7m below the entrance to the level is a small spoil heap. The mound is roughly crescent shaped and is 7m in length and around 5m in width across the slope. It stands up to 1m in height at its centre. The mound is grassed over and therefore it was impossible to look for evidence of mineralisation amongst the waste.
Running in a roughly north-west to south-east direction is a presumably nineteenth century trackway that cuts the site into two parts, separating the entrance of the level from the spoil heap. This trackway is around 2m in width and is revetted to a considerable height to the

north-west, while material appears to have been quarried out to accommodate it to the south-east. This trackway clearly forms part of a former 'pleasure garden' for one of the large, nineteenth century villas in the vicinity of Brackenfell. Other trackways, along with ornamental ponds, rock piles and step-bridges were noted in the area, along with significant numbers of exotic conifer species. It is possible that the incorporation of the level entrance was not accidental and was intended to be a feature of interest along the route.
This level is the one described by Ian Tyler in his book 'The Mines of Thirlmere 1999, 38' as being 'at around OD 600ft, another coffin level has been driven on what appears to be a parallel vein. This is much shorter being only 11 yards long and, as with all the workings, it has been painstakingly handworked prior to the use of gunpowder'. Tyler reasonably assumes that the works on Brackenfell were opened up during 1564/65 when an expenditure of £116 8s and 3d is recorded in the miners account books for exploration of the area and for the opening of two adits directly onto the vein.

Site Number **GG50**
Site Name Possible trial or surface working located on Brackenfell, Grasmere
NGR NY 34402 07114
Type Trial Mine
Period Post-medieval
Description Located just above the public footfall through Brackenfell, and below the second iron gateway travelling north-west, is a possible small surface trial. The feature appear as a linear scoop aligned roughly north-south and is roughly 7m in length and 2.3 in width, with a maximum depth of 1m. There is some fractured stone in the area and the shape and profile of the scoop seems to suggest mining activity as opposed to water erosion or the result of a tree throw.
This feature is not referred to by Tyler in his book 'The Mines of Thirlmere 1999'.

Site Number **GG51**
Site Name Possible trial or surface working located on land to the west of Brackenfell, Grasmere
NGR NY 34379 07118
Type Trail Mine
Period Post-medieval
Description Located just below the public footpath through Brackenfell as it reaches the second iron gateway travelling north-west is a possible former trial or surface working. The feature is partly hidden by vegetation and is shaded below a dense canopy of conifer and beech trees making close inspection difficult.
The feature appears as linear extraction pit or trench roughly 10m in length and up to 2m in width. The trench is infilled with a considerable depth of leaf litter, although it is likely the trench is at least 0.8m in depth.
From the evidence visible it seems likely that this feature is the one described by Ian Tyler in his book 'The Mines of Thirlmere, 1999 p38' as being 'at around OD 440ft, is what could be another surface trial or possible adit, and again, this has been worked directly on where the vein is exposed'.

Site Number **GG52**
Site Name Level located on land to the west of Brackenfell, Grasmere
NGR NY 34312 07085
Type Adit
Period Post-medieval
Description Located on land to the west of Brackenfell is a second, lower mine level. This feature is very difficult to locate, being in an area of soft ground, overplanted by dense conifer and beech woodland. A group of around six conifers have taken hold just below the mouth of the level making inspection and recording of this feature very difficult due to low light.
The entrance to the level is very modest in scale, appearing as a narrow portal cut directly into the rock face some 0.6m in width. The floor of the level contains a considerable depth

of leaf litter making the roof of the coffin level appear unusually low, however once inside the leaf litter disappears and the coffin level is visible up to a maximum height of 2m.
Ian Tyler in his book 'The Mines of Thirlmere, 1999, 36' identified this level as being located at OD 410ft. He continues to say that 'this level has been driven directly onto where the vein is again exposed at the surface. It is very narrow and superbly hand-chipped, showing the craftsmanship and technique of the miners. After a few yards, the level becomes higher and here, both the roof and the ceiling have been stoped and a pocket of ore has been taken. The level extends for a distance of 26 yards and is 10ft high and no more than 22ins wide, and some mineralisation is still to be seen'.
The mineral vein referred to by Tyler appears as a narrow strip of pale quartz rick material in the roof of the level. The interior of this level was not explored to any significant extent given Tyler's mention of stopes. However, as with the higher level, a hanging wall is apparent on the northern side of the level and the distinctive hand chipped flat ceiling once again apparent.
The area surrounding the entrance to this level is so densely planted that identification of other features such as sorting or dressing floors was impossible.

Site Number	**GG53**
Site Name	Former surface working located on land to the west of Brackfell, Grasmere
NGR	NY 34270 07117
Type	Surface Working
Period	Post-medieval
Description	This surface working located on land to the west of Brackfell is the lowest of the Elizabethan mine workings described as the 'Grasmere set' by Ian Tyler in his book 'The Mines of Thirlmere, 1999'. This feature appears as a former open or surface working located directly on the mineral vein. The gap left by the removal of the former veinstone can be clearly seen in the upper part of the workings, which otherwise appear as a shallow scoop roughly 8m in width by about 10m in length. The depth of leaf litter infill has only be guessed given the considerable age of this feature. This surface working is described by Ian Tyler in his book 'The Mines of Thirlmere, 1999 36' as being located at 'OD 350ft' and appears as an openwork directly on the back of the vein, although a level could lay covered under the tones of earth which now fill the cut'.

FAIRFIELD MINE SITES

The individual Fairfield sites (FF01-20) are part of HER **36982** and NTSMR **24493**

Site Number **FF01**
Site Name Hushing, Fairfield Mine, Grasmere
NGR NY 34090 09842 to NY 34314 09578
Type Hush
Period Post-medieval
Description A series of well-defined hushed gullies located on the north-west flank of Brackenwife Knotts that descend south-east/north-west to Tongue Gill. The lower end consists of a linear hush running along the east side of the walled enclosed land (***1a***), and in places it underlies the enclosure wall. The hush also runs through a small culvert beneath a trackway (***11***). The upper end is excavated into the natural stream gullies (***1d***) but with a take-off channel running parallel downslope (***1c***) and a cross-cutting leat-like channel (***1b***).

Site Number **FF02**
Site Name Surface Working, Fairfield Mine, Grasmere
NGR NY 34134 09843
Type Trial Level
Period Post-medieval
Description An extensive area of surface trial working located on the steep southern bank above Tongue Gill. The area measures over 50m in length with several exposures where the bedrock has been quarried leaving a spread of spoil downslope into the gill. Ore fragments are present in the Gill at this point. The westernmost part of the site (***2a***) consists of a vertical worked face 6m long by 3m high that has several round drill holes (*c* 0.02m) upon it. The easternmost parts of the working (***2b***) are downslope of a trial adit (***19***) and follow the ore vein down to Tongue Gill (***2b***).

Site Number **FF03**
Site Name Sheepfold, Great Tongue, Grasmere
LDNPHER -
NGR NY 34125 09861
Type Sheepfold
Period Post-medieval
Description A two-celled sheepfold located on the northern bank of Tongue Gill. It consists of a large D-shaped cell with a smaller rectangular cell on the east side, and overall it measures 16m by 9m with the walls surviving up to 1.5m high in places.

Site Number **FF04**
Site Name Upper Adit, Fairfield Mine, Grasmere
NGR NY 34073 09814
Type Adit
Period Post-medieval
Description A collapsed north-west/south-east orientated adit located on the open fell near the external north corner of enclosed fields. It consists of a 25m long by 7.5m wide scoop at the masked adit entrance with a steep-sided and flat-topped spoil heap downslope of it. The spoil heap, measuring approximately 17m by 12m, is crossed by a footpath (***11***).

Site Number **FF05**
Site Name Surface Working, Fairfield Mine, Grasmere
NGR NY 34085 09833
Type Trial Level
Period Post-medieval

Description A small scooped area of surface working located near the southern bank of Tongue Gill. It is sandwiched between a hush (***1***) and a pair of open stoped workings (***6***). Overall it measures approximately 8m in diameter.

Site Number **FF06**
Site Name Open Cut, Fairfield Mine, Grasmere
NGR NY 34068 09826
Type Open Cut
Period Post-medieval
Description An adjoining pair of open cut workings exploring the ore load on a steep north-facing crag face located on the south bank of Tongue Gill. The north/south orientated eastern cut (***6a***) is a steep sloped linear feature measuring 10m by 6m. The small western cut is a vertical feature measuring 1.5m square by 8m deep.

Site Number **FF07**
Site Name Weir, Fairfield Mine, Grasmere
NGR NY 34054 09830
Type Weir
Period Post-Medieval to Modern
Description A weir constructed on Tongue Gill at some point between the 1898 and 1915 OS mapping and used as a take-off point for the reservoir located downslope to the south-west (***12***). It consists of a relatively shallow-angled stone weir bank measuring 4m long by 2m wide with an iron pipe protruding near the base of the centre of the slope. There are retaining walls on either bank of the gill (***7b***). The retaining wall on the south bank contains piping to take water from the weir and has a pair of manhole covers with one at either end of the 30m long section. There are a flight of rock-cut steps constructed to give access to the south side of the weir (***7c***).

Site Number **FF08**
Site Name Sheepfold, Tongue Gill, Grasmere
NGR NY 34025 09828
Type Sheepfold
Period Post-medieval
Description A two-celled D-shaped sheepfold located on the southern bank of Tongue Gill. Overall the site measures approximately 18m long by 14m wide with drystone-constructed walls surviving up to over 1.5m high on the east side. The smaller of the two cells located on the western end of the structure and adjacent to the gill has collapsed, probably due to flood damage. There is an entrance on the south side of the larger cell with a collapsed quoin stone internally on the east side that has a triangular drill hole upon it. The north corner of the fold has a large consumption bank of stones on either side, that probably relates to the construction of the nearby weir (***7***). There is a small section of rebuilt wall constructed using more angular stones that was probably associated with the water pipes running through the fold between the weir and the reservoir (***12***).

Site Number **FF09**
Site Name Lower Adit, Fairfield Mine, Grasmere
NGR NY 34025 09809
Type Adit
Period Post-medieval
Description The lower of the two main levels identified at Fairfield Mine, and which was considered to have been open *c*1874. Tyler recorded that the adit was 6ft 6ins high by 4ft 6ins wide and extended into the hillside for over 160 yards before a roof collapse had closed it. A small trial of a subsidiary north/south orientated stringer of ore was recorded 60 yards from the entrance.

The adit may have been deliberately blocked but a small opening of the adit entrance is still visible as a 1m long by 0.95m wide aperture. The opening is (***9a***) is within a sunken bowl of fragmented bedrock and no drill marks can be seen on the rock surfaces.
The adit is served by a working area located on the west side, this has a slightly curving, east/west orientated and 13.5m long retaining wall on the south side (***9b***). The working area has two sections of wall that probably define a walled yard or sorting area, and is unlikely to have been a building as the partially collapsed walls do not seem to have originally been more substantial in height. The working area is set away from the large retaining wall (***9b***) leaving a 1.65m wide gap probably for a railed wagon way to take spoil out of the adit to the spoil heap to the west (***9e***). The eastern section (***9c***) is an L-shaped wall measuring 5.25m by 5.8m and 1.3m high. The western section (***9d***) is a linear free-standing wall measuring 4.25m long by 0.85m wide and up to 0.95m high with a quoin stack on the south end. Two stones in the wall section also have drill holes.
The steep-sided and flat-topped spoilheap associated with the adit curls around the southern bank of tongue-gill. It measures 32m long by 8.7m wide and is up to 4.5m-6m in height. The heap contains both grey barren rock and pink iron-rich rock. The southern end has a potential loading area built it (***13***). There are two depressions in the top of the spoil heap to the west of wall section ***9d***; one is an oval scoop and the other has been backfilled with angular rocks.

Site Number **FF10**
Site Name Ore Store, Fairfield Mine, Grasmere
NGR NY 33997 09788
Type Ore Store
Period Post-medieval
Description A single-celled rectangular building foundation located to the south of the spoil heap for the lower adit of the mine (***9e***). It measures 5.2m by 4.5m and the walls survive up to 0.5m high in places. The south-east elevation is best preserved as it is cut into the hillslope and the opposite side may have been open-ended. There is stone tumble internally which slopes down to the north-west. Given its position on the site the structure may have functioned as an ore store.

Site Number **FF11**
Site Name Trackway, Fairfield Mine, Grasmere
NGR NY 33965 09768 to NY 34188 09843
Type Trackway
Period Post-medieval
Description A roughly linear and embanked 2m wide trackway, that is orientated west-south-west/east-north-east and running through the main area of Fairfield Mine. The trackway (***11***) enters the area of the mine via a gate in the enclosure wall, with a short section of trackway (***11b***) located at the west end of the complex, which is cut by the construction scoop excavated for the reservoir (***12a***). The trackway, however, continues to the north-east as a well defined feature (***11a***). A more sinuous section of trackway (***11c***) adjoins the track from the bridge abutment downslope to the north-west. The main trackway crosses the spoil mound for the upper adit (***4b***). It crosses a hush (***1a***) via a culvert and runs along the top of a spoil heap of a trial adit on the eastern end (***20***).

Site Number **FF12**
Site Name Reservoir, Tongue Gill, Grasmere
NGR NY 33983 09783
Type Reservoir
Period Post-medieval to Modern
Description A reservoir constructed adjacent Tongue Gill at some point between the 1898 and 1915 OS mapping and using water from a take-off point on a weir upslope to the north-east (***7***). The approximately 21m square reservoir structure (***12a***) has near-vertical concrete-lined sides

with various inlet and outlets within it. It is surrounded by iron railings and has a gate on the south-west side. The structure has been excavated into the hillside on the east side, and has truncated a trackway running through the complex (***11b***). To the immediate west is an upcast bund bank, and further out a very large trapezoidal flat-topped embankment (***12b***) The turf-covered embankment measures 27m long by 10m wide and is up to 4m high where it runs downslope to the eastern bank of Tongue Gill. It is unclear if all of the material within the embankment has been excavated from the reservoir, or if there are parts of an extended spoil heap within the construction that would have run out from the lower adit spoil heap located adjacent to it (***9e***).

Site Number **FF13**
Site Name Loading Bay, Fairfield Mine, Grasmere
NGR NY 33987 09794
Type Ramp
Period Post-medieval
Description A ruinous L-shaped retaining wall structure located on the southern end of the spoil heap associated with the lower adit of the mine (***9e***). Overall it measures 3.9m by 1.85m with the 0.4m wide wall surviving up to 0.7m high. There are possible foundation remains on the south side of the structure but this area has been truncated by trackway ***11c*** and groundworks at the reservoir (***12a***). The east/west orientated wall section of the structure is masked by an area of ore rich material. It is likely that this site functioned as a loading bay or bagging area.

Site Number **FF14**
Site Name Wall Foundation, Fairfield Mine, Grasmere
NGR NY 33967 09817 to 34001 09816
Type Wall
Period Post-medieval?
Description Two short sections of boundary wall foundation. The first section (***14a***) is located on an island within Tongue Gill. It is constructed of large stones and measures 3.2m by 0.5m and is 0.7m high. There is a line of boulders running parallel to it to the north that may be associated with it, but the site is heavily eroded. The second section (***14b***) is located on the north bank of Tongue Gill; it is constructed of very slight foundation stones possibly forming an L-shape measuring 25m long then turning south for 6.5m on the eastern end.

Site Number **FF15**
Site Name Bridge Abutments, Fairfield Mine, Grasmere
NGR NY 33969 09806
Type Bridge
Period Post-medieval
Description A pair of large, well-defined, sub-rectangular stone bridge abutments located on Tongue Gill to the west of the mining complex. They each measure a maximum of 5m by 2m and are up to 3m high. They carry a modern wooden footbridge across the stream but originally would have clearly taken a more substantial superstructure. The northern abutment has a stone retaining wall running west to a sheepfold (***16***).

Site Number **FF16**
Site Name Sheepfold, Tongue Gill, Grasmere
NGR NY 33935 09803
Type Sheepfold
Period Post-medieval
Description A two-celled sub-square sheepfold/washfold located on the west bank of Tongue Gill on the outer edge of enclosed land. The Grisedale Hause packhorse route passes through it and carries on up onto the open fells (***17***). Overall the fold measures 17.5m square with walls

surviving up to 1.8m high in places. It has a large retaining wall on the west side where the fold is cut into the hillside and has an external platform on the east side where sheep were sent for washing. The stream bank may have been modified to form a wider pool at this location.

Site Number	**FF17**
Site Name	Grisedale Hause, Packhorse Route, Grasmere
NGR	NY 33965 09832
Type	Packhorse Route
Period	Post-medieval
Description	Grisedale Hause packhorse track, connecting Grasmere to Ullswater, one section passes up Little Tongue, to the west of Fairfield Mine

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Site Number	**FF18**
Site Name	Wall, Fairfield Mine, Grasmere
NGR	NY 34035 09839
Type	Wall
Period	Post-medieval
Description	A fragmentary retaining wall located on the steep northern bank of Tongue Gill opposite a large sheepfold (***8***). Its eastern end is linked to large boulders immediately west of the weir (***7***) and the wall becomes more fragmentary before disappearing as the stream curves around to the south on its western end. The visible section measures at least 25m in length.

Site Number	**FF19**
Site Name	adit/Trial Level, Fairfield Mine, Grasmere
NGR	NY 34178 09841
Type	Trial Level
Period	Post-medieval
Description	The easternmost trial level at Fairfield Mine located on the west bank of a stream gully. It consists of a sunken scoop measuring 24m by 9m and 0.6m deep with a slight bank on the east side. It has a linear spoilheap on the downslope side that is crossed by a modern footpath. The footpath has exposed fragments of ore and reddened soil within the spoil heap. Upslope the stream may have been diverted in order to hush into the adit depression. Downslope of the feature the rocky outcrops have been exploited for surface workings to follow the ore vein down to Tongue Gill (***2b***).

Site Number	**FF20**
Site Name	Bothy, Fairfield Mine, Grasmere
NGR	NY 33962 09776
Type	Bothy
Period	Post-medieval
Description	An intact roofed bothy building located on the edge of a spoil heap at the reservoir south side of the mining complex (***12b***). It is most likely that the building was related to the mining at the complex. The 3.8m square, single storey structure clearly predated the construction of the reservoir as it is depicted on the 1898 OS mapping. The bothy is stone-constructed with lime mortar and has a slate roof with ceramic roof tiles. There is an iron-framed skylight in the roof and it has a wooden door on the north-west wall elevation.

PROVIDENCE IRON MINE SITES

The individual Providence sites (PR01-14) are part of HER **24494** and NTSMR **30755**

Site Number **PR01**
Site Name Shaft, Providence Iron Mine, Grasmere
NGR NY 33906 10538
Type Mine Shaft
Period Post-medieval
Description Sub-circular scoop or depression with upcast bank on the south and east side, and is located above the fell wall and alongside a minor beck. The feature measures 3m in diameter by up to 0.6m in depth. Its location at the head of several large spoil heaps (***2***) would suggest that this was a mine shaft.

Site Number **PR02**
Site Name Trial Level/Spoil Heaps, Providence Iron Mine, Grasmere
NGR NY 33910 10505
Type Trial Mine
Period Post-medieval
Description This feature appears as a shallow area of mineral trialling which has been partially in-filled by spoil mound ***2b***. It is likely to have been more extensive than it appears today, being now only 6m x 4m in size.
A small up cast mound or spoil heap (***2b***) is located approximately 4m down slope of ***1***. This mound is likely to have been created, at least in part, by the excavation of ***1***, along with other shallow trials nearby. The spoil mound is approximately 14m in length and 3m wide, and is up to 0.5m in height. An erosion scar shows the spoil heap to comprise soil and stone of a deep red colour and relates to iron working. Extending from this smaller mound is a larger one that is 41m x 11m in extent; it in part overlies spoil heap ***2c***. Spoil mound ***2b***, like ***2c***, is a product of surface trialling and the shaft (**1**) further up the slope, it is likely that the northern end of ***2b*** has in-filled some former trial workings.
Spoil heap ***2c*** is an up cast mound of indeterminate size. Its position on a sloping hillside, partially hidden below a second spoil heap of similar proportions (***2b***) makes interpretation difficult. However the spoil heap is clearly defined at its southern end where it occupies an area of approximately 12m east to west down the slope and 16m across the slope. The material to create this mound has clearly been brought down from above during working of a shaft (***1***).
There are a series of three short stone revetments (***2d***), each roughly 1.5m in width and 1.03m in height located at the base of the field wall. Their function is unknown but is likely to be associated with controlling water flow and avoiding erosion at the base of the wall.

Site Number **PR03**
Site Name Adit, Providence Iron Mine, Grasmere
NGR NY 33923 10454
Type Adit
Period Post-medieval
Description Site ***3a*** is an in-filled or collapsed adit located just above the fell wall. The adit is visible as a narrow depression some 2m wide running up the hillside for a distance of 15m. The base of this depression is a level platform some 6m x 8m in size, which appears very wet today. There is no visible sign of an open adit here, although the volume of material seen below the fell wall suggests an adit, rather than a surface working.

Site ***3b*** is a sub-circular spoil heap located alongside, and immediately to the north-east, of the former level entrance (***3e***). The spoil heap is approximately 6m in width across the slope and 7m in length down the slope. It reaches a maximum height of 1.65m from top to base. It is likely to be an up cast mound resulting from excavations around the mouth of the former level entrance.

Site ***3c*** is a sub-oval shaped low spoil heap located approximately 6m to the east of the former level entrance. The spoil heap is grassed over with no stone visible. The mound is approximately 5.5m in length down the slope and 2.5m in width across the slope. The mound is likely to be an up cast mound created as a result of excavations around the mouth of the former level entrance.

Alongside the mouth of the former level ***3a*** is a mound of apparently water washed stone material (***3d***) dumped on the upper edge of the platform. The source of this material is likely to be the beck running to the west of the field wall.

Site Number **PR04**
Site Name Platform/made ground, Providence Iron Mine, Grasmere
NGR NY 33920 10443
Type Retaining Wall
Period Post-medieval
Description An area of made ground to the rear of the fell wall. There is a considerable difference in height between the higher, western side of the wall and the lower eastern side, of around 2.5-3.0m. This helps to highlight the volume of material trapped behind the fell wall that must function as a retaining wall. The made ground is likely to be the result of material being washed down the slope and becoming trapped behind the wall, rather than an attempt to create a working platform or track way.

Site Number **PR05**
Site Name Hush , Providence Iron Mine, Grasmere
NGR NY 33906 10436
Type Hush
Period Post-medieval
Description This is a larger shallow scoop (***5a***), and is probably the result of shallow working of an area close to the mineral vein. The shallow scoop measures some 15m in width across the slope and around 23m down the slope. The scoop is never more than 1m in depth. Just to the north-west of the centre point inside the scoop is a mound, presumably an up cast mound of spoil that was formed during trialling inside the scoop. It is possible that material from this shallow scoop has accumulated as ***5d*** on the south-east side of the fell wall.
This is a linear mound (***5b***) comprising a mixture of crushed stone and soil. It is roughly 8m in length running down the slope and 3.5m in width across the slope. There is a large boulder located at its lowest, south easternmost point. This feature is located just below the fell wall only a short distance from a small beck. The wall directly above it shows clear evidence of having been rebuilt after a collapse, and the lower section still appears to bulge outwards. It is possible that this mound is a result of water borne material coming to rest behind a large stone after a small landslip that also affected the wall. It is not likely to be mine-related
This is a small sub-circular spoil heap (***5c***) located approximately 7m north-west of the loading ramp (***8***) and about 12m below the fell wall. The spoil heap is grassed over but there is now stone visible. The spoil heap is approximately 6m in width east to west and 5m in length north to south; it is roughly 0.75m high.

Site Number **PR06**
Site Name Surface Working, Providence Iron Mine, Grasmere
NGR NY 33898 10415
Type Trial Mine
Period Post-medieval
Description Three small shallow scoops located in a line running north to south, presumably in an attempt to locate the mineral vein. Each scoop is roughly 5m across the slope and forms a platform roughly 2m wide across the slope. Each one is now covered by turf.

Site Number **PR07**
Site Name Trial Mine, Providence Iron Mine, Grasmere
NGR NY 33899 10366
Type Trial Mine
Period Post-medieval
Description This is a surface trial working which appears as a shallow scoop on the sloping hillside approximately 10m below the fell wall. The scoop measures approximately 18m in length along the slope and 8-9m down-slope, creating a gently sloping platform some 7m in width. The rear face of the scoop is roughly 1m in height. The scoop is littered with broken local stone, although it is not clear if this is tumble from the wall above or a result of trialling.

Site Number **PR08**
Site Name Loading Platform, Providence Iron Mine, Grasmere
NGR NY 33932 10413
Type Loading Platform
Period Post-medieval
Description This feature appears as a retaining wall constructed into the side of platform (***10a***). The wall stands up to 1.4m at its full height, although is on average around 0.9m in height. The wall has three clear sides, which create an inverted U-shape. The wall appears to be a single course thick, even when built as a free stand wall rather than a revetment wall. At the northern end of the western wall the outflow from the collapsed level cascades over the wall. The flow appears to be accommodated by the shape of the wall suggesting it might be part of the original design, with the water possibly being used for washing the ore. The western wall of the structure has been reduced down to foundation level, although it extends for a distance of approximately 9m. It is not known if this wall ever stood to a greater height. The platform created with the retaining wall is level and was probably used to undertake washing and sorting of the ore. However, the platform is covered by turf and there is no evidence of processed ore visible on site. The close relationship between platform (***8***) and the track way (***11***) suggest that this platform might have also been used as a loading area with the ore being stored on the platform above (***10a***).

Site Number **PR09**
Site Name Wall foundation, Providence Iron Mine, Grasmere
NGR NY 33919 10434
Type Wall Foundation
Period Post-medieval
Description A short section of retaining wall foundation located beneath the current enclosure wall running over the upper workings at Providence Mine. The structure may relate to an earlier structure/platform associated with the mine workings and is adjacent to the hush (***5***).

Site Number **PR10**
Site Name Adit, Providence Iron Mine, Grasmere
NGR NY 33930 10429
Type Adit
Period Post-medieval
Description This feature is seemingly the collapsed mouth of the second lower level at Providence Iron Mine. However, the current appearance of the level, being totally filled in, makes conclusive identification impossible. The feature is located just below the fell wall, indeed, it appears that the fell wall truncated the collapsed level entrance, although there is no sign of the feature continuing above the wall. The collapsed level entrance appears as a funnel shaped depression some 5.5m in width at its upper point, and just 4m in width at its lowest point. The depression is up to 0.8m in depth at its maximum. While there is no remaining evidence of an adit entrance or portal, there is an abundance of fractured and chipped boulders around the base of the linear depression which might be evidence of mining. The linear depression runs roughly north-west / south-east. The level platform recorded as (**10a**)

is located at its south-eastern extremity. Significantly there is a strong flow of water issuing from the collapsed level entrance, which has a source not evident on the surface, suggesting that it might be draining from an underground level.
A large platform (***10a***) is roughly 14m east to west and 12m north to south. It is located immediately below the collapsed level entrance (***10***). The platform is a prominent feature and rises to a height of over 2m above the natural slope of the hillside. The platform is made of crushed ore rich rock stained with iron ore as revealed by erosion scars on its eastern side. It is likely that this feature originated as a spoil heap and then was afterwards modified to create a level working area and loading platform (***8***).

Site Number **PR11**
Site Name Trackway, Providence Iron Mine, Grasmere
NGR NY 33902 10326 to NY 34047 10276
Type trackways/
Period Post-medieval
Description This feature is a trackway (***11a***) constructed to link the Grisedale Hause packhorse route with the Providence Iron Ore Mines. It can be described in two sections. The first section forms an L-shape and runs for approximately 225m linking the Grisedale Hause packhorse route (***14***) with the loading platform (***8***). This section includes the bridge recorded here as (***11b***) along its route. This first section is well constructed being levelled and around 4m in width at its maximum. The metalling of the track was provided by several small semi-circular quarries cut into the hillside the eastern side. The second section of the trackway which runs southwards along the contour from loading platform (***8***) past surface trial (***7***) and away from the iron mines, the trackway is revetted in some parts. This second section is approximately 150m in length and appears on the ground as a slight earthwork barely visible in some areas. The function of this second section of track way is not clear from the survey. There does not seem to be any gap in the wall to accommodate the track way which adds support to the theory that this feature is only a sheep-trod.
Site ***11b*** is a crossing point or revetted ford created along the route of trackway ***11***. It is located immediately to the west of the gateway into the uppermost fell side intake. The revetted face stands to a height of 1.75m.

Site Number **PR12**
Site Name Drainage Adit, Providence Iron Mine, Grasmere
NGR NY 34038 10304
Type Adit
Period Post-medieval
Description This is the collapsed entrance (***12a***) to the lower drainage level at Providence Mine; there is, however, no evidence of the portal or mine entrance visible today. The former level entrance is, though, visible as a linear depression located below a sub-circular area of sunken ground. Separate from this by a modern stock fence is a flat-bottomed linear route formed by low stone walls on either side, approximately 1.5m in width; this is likely to be the floor of the drainage level. A blocked gap is clearly visible in the stone walls immediate south of the collapsed level, indicating where the flow of water issuing out for the mine would have originally passed.
An oval spoil heap (***12b***) or up cast mound located alongside the miners trackway and on top of the larger spoil heap recorded here as ***12c***. The spoil heap is roughly 2m in width and 4m in length, being just 0.2m in height at the centre.
A large spoil heap (***12c***) located on the opposite side of the beck from the collapsed level entrance. The spoil heap has the characteristics of a 'finger mound, being slender in width and extending for a considerable distance, creating a steep sided linear spoil heap. Where the mound has been eroded by stock erosion, red soil and crushed stone can be seen suggesting iron ore rich material. The spoil heap is characterised by the slender finger mound of spoil at its southern end which is roughly 7m in width, including the sloping sides and flat top, which is in itself around 1m in width. This slender finger mound is roughly 12m in length and stands to a maximum height of 4.5m above the natural ground level alongside the beck. The northern part of the spoil heap can be characterised as a

flattened platform created by the levelling of spoil material to form a useful area for working. This northern part of the spoil heap is roughly 8m in width, including the slope and level platform which is itself approximately 6m in width and 14m in length.
An up cast mound or spoil heap (***12d***) located immediately north-east of the collapsed former level entrance. The spoil heap is approximately 8m in length north to south down the slope and 4m in width east to west across the slope. The spoil heap is up to 0.75m in height. The mound is entirely grassed over and no crushed stone is visible.
An area of made ground (***12e***) arranged to form a platform outside the collapsed level entrance. The platform is approximately 6m in width east to west and 4m front to back, north to south. The platform appears to have been accessible by bridge, the footings of which are visible and recorded here as (***12f***).
Two short section of revetment (***12f***) on either side of the beck. The northern section is single course and roughly 4m in length, while the longer southern section is around 8m in length. Evidence of a bridging point, visible as a new level course of neat stonework on either side of the beck, can be seen.

Site Number **PR13**
Site Name Stock Enclosure and ancillary features, east of Providence Iron Mine, Grasmere
NGR NY 34043 10457
Type Stock Enclosure
Period Prehistoric
Description A globular shaped embanked enclosure (***13a***) located 30m north of the gateway into the intake field containing the mining set. The enclosure measures approximately 18m east to west across the slope and 28m north to south down the slope. The interior of the enclosure is clearly cut or scooped into the hillslope on the west side and has a gentle slope down to the south-east where it platforms slightly on the eastern side. The perimeter bank appears as a low stone and earth bank that ranges in width from 4m to 2m, although rarely above 0.25m in height. A very clear entrance is visible on its eastern side, highlighted by a pair of large stones acting as terminal stones for the bank. There is a possible house platform in the south-western corner, visible as a sub-circular platform roughly 5.5m in diameter around which the perimeter bank appears to curve to accommodate. The entire site occupies an area of around 20m x 30m. It has many features in common with prehistoric stock enclosures, many of which are located in upland areas and include house platforms with their perimeter banks.
A small sub-circular raised mound (***13b***) created by the accumulation of medium sized rounded stones. It is likely to be a clearance cairn resulting from an early phase of land improvement. The grassy mound is roughly 2.5m in diameter and 0.2m in height.
This is a slight ovoid raised platformed area (***13c***) but has no stones within the mound. It may be natural in origin. The grassy mound is roughly 6m by 5m and 0.2m in height.
This is a possible dry beck gully created by water erosion (***13d***). The gully runs in a north to south direction and is approximately 25m in length. The gully has no clear start or end point, which again suggests its origins are related to water erosion. The gully is around 2m in width and has a maximum depth of 0.4m.

Site Number **PR14**
Site Name Grisedale Hause, Packhorse Route, Grasmere
NGR NY 34096 10416
Type Packhorse Route
Period Post-medieval
Description Grisedale Hause packhorse track, connecting Grasmere to Ullswater, one section passes up Little Tongue, to the east of Providence Mine.

APPENDIX 4: EXCERPTS OF INTERVIEW WITH TED BOWNESS

KENDAL ORAL HISTORY GROUP INTERVIEW 0236

Male born 1928

Interviewed June 2013

Track 1

I. So can you explain who in your family worked at Banks Quarry, and where they were working.

R. My grandfather worked at Banks Quarry, and my father in turn. They were working round about the turn of the century; my father would be working there until the start of the First World War when he went into the army and served in Afghanistan. During the war years – First World War – the quarry would virtually come to a standstill. I've got a graph of the production of slate, and it plummeted and never really recovered.

I. Do we think they stopped using it because the war – there were no men?

R. There were no men; anyone who had been working there – and I don't know how many people they had – I'm guessing five or six at the best – any of the young men would go into the forces, and beyond that the older men would not be available. There was very little demand for slate during the war, because house building had virtually ceased. And you didn't produce it to store on the bank, you produced it to sell, as far as possible.

I. So when did production start again after the war?

R. It would start...1914, 1918...in the 1919, 1920 period – within a year, two years afterwards, and there was a tremendous production in the first year or two, the peak they ever had, if the figures are correct that I have in the book of sales, and so on. And then after that it just deteriorated with the odd minor blip. By 1933, '34 it had ceased.

I. And when did your father start working there then?

R. He was born in 1890. He left school when he was 14 – no, he left school when he was 13, correction – because he passed what they called the labour exam; anyone who was intelligent enough to pass the labour exam could leave school at 13. So he left at 13 and he would go to work in the quarry then. So that would be 1903.

I. So what would they do about lunch – did they come home for lunch, did they take lunch into the quarry with them?

R. No, they didn't come home. It was three-quarters of an hour's walk from home, and about three or four hundred feet up a mountainside. So they took sandwiches – I remember sandwiches being made every morning, made the night before in fact, made the night before. And I don't know what they took in winter, but in summer they took a bottle of cold tea, and cold tea – I don't know whether you've ever had it – cold tea without any sugar or milk is one of the glorious drinks you ever have. Yes, cold tea bottles – and a thermos latterly in winter, I think.

I. So whereabouts did they live then? What was the village?

R. The village in Great Langdale was – the village is Chapel Stile, and my father lived at a house called Fir Garth. I've got a photograph I can let you see later. About a quarter-of-a-mile out of the village; you had to come across the river, then walk through woodland and then up the mountainside. Hard work before you did a day's work.

I.2 How long did they work; what are their hours like?

R. It would be long hours in summer, with daylight, and short hours in winter. It would be dark to nine in the morning virtually in winter, and it would be dark by four in the afternoon. But in summer the hours would be long hours, I think. If you didn't produce anything, you didn't have any money.

I. And were they paid a wage, or were they done on a bargain system. How did it work?

R. How they worked there, was my father – my grandfather had the lease of the quarry – so he would be the man holding the purse-strings. He would pay any other men who worked there. I think they would just be paid on a one-off casual basis almost. Later in the quarries where more men worked,

in Elterwater quarry for example, they used to be formed into teams of three or four. One man would be the rockhand, whose job it was to get the stone off the mountainside, off the rocks. Another would be the river, whose job it was to split it into slate, thin slate. Another would be the dresser who had to shape it to a shape of a slate, and they would have a weigh-lad or an apprentice – probably teams of four – and they would do what they called a 'bargain'. They would agree with the quarry owner how much slate they expected to produce, and what price they would receive in return for getting that. But at Banks Quarry it would be on a much more casual basis. My grandfather obviously paid my father – not very much I don't think – and he would pay the other men, and he would have any profits that were made.

I. And did he have to pay the mineral right owner?

R. That's a good question. I don't know who the mineral right owners were. He used to always talk about going to see 'Patti'. Patti was Pattinson of Windermere, who were big builders, and they used to buy all the slate, I think, or most of the slate because Windermere was a thriving, growing town. Pattinson must have had the mineral rights from Muncaster Estates or Lowther Estates – I don't know which of the two covered that area; I suspect it would be Muncaster, but I have tried to find out and neither Muncaster nor Lowther Estates know or want to know, as far as I could discover.

I. So there's a question here about the parts of the quarry that were being worked. It's quite a big site. Were there just small parts of it being worked as you remember?

R. When I knew it there was only one part being worked; that was the main quarry face, for lack of a better name, the main rock. There had been a second one worked, but that was never worked after 1912, when my father's uncle – that's right – was killed in an accident there and they never returned to work that particular piece again. So there was only one quarry face being worked. It was a very small scale enterprise.

I. Modernisation.....

R. Well, it's a family habit – we don't modernise very rapidly! It was too small to mechanise; we had trucks to push along the...they had wheels like a railway track which I discovered one piece of, when we were there. Mechanisation in the 1930s, it would be, the early '30s – not long before it closed – and they had a compressor to produce compressed air to drive the drills that they had to bore into the rock before they blasted. And I remember vividly hearing about that being...it was very heavy piece of machinery, an extremely steep slope to get up to the working part of the quarry, and they had an engineer from the Elterwater slate quarry - which was much bigger – a man called Charlie Peebles, a Scottish engineer, and he organised a system; there's a hazel bush growing in the side of the track up to the quarry, and he organised a pulley system around this hazel tree – which is still there – to haul the huge piece of machinery up. And of course, they had to build a machine-house an engine-house as it was termed, but I think that might have been one of the things that helped the quarry come to an end, because the finance involved in that was never repaid by increased production as expected.

I. So you mentioned the processes that people did – the dressing and the finishing them off – whereabouts did they do that?

R. They had one, two, three - three sheds on the quarry bank, as they would term it. The first was where my father worked all his working...well, not all his working life, but when he was at the quarry, one shed. He was the river, so he was the first man to receive the stone after it was brought out from the quarry. Second man was the dresser who had to shape the slate into the shape of a slate. In between I suspect was the apprentice who would be learning both trades or any trade that he happened to have, and he was the weigh-lad – his job was to weigh the produced slate each day, and I suppose they had to know how much they'd produced. The three sheds are tumbled down now, but I identified to within a yard where my father sat working, and I have a lovely photograph of him working in that quarry shed. That was interesting; we identified it from the shape of one stone in the wall – it's a drystone wall – and there's a lozenge-shaped stone, not a rectangular one, it's on the photograph, we went up there and we found it – there it is, still in place.

I. Wonderful! How was it taken down then to be used, because obviously you said the men walked up the mountain? So how did they get the slate down?

R. Well, there was first a sledge; rough, just a wooden base, and it must have been lowered on a rope. I never saw this happening but there couldn't have been any other method of getting it down the very steep bank of broken slate rubbish. And again this could be found, but I've never discovered it, a

firm from Windermere – I think by the name of John West – was a haulage firm and they could get a lorry (the road was better than it is now) they could get a lorry right up to the bottom there where the slate came down. It would be loaded by hand, driven off to wherever. John West must be findable – a trade directory of Windermere of that period would identify him (and was identified during the documentary study).

I. That's right. And you mentioned Pattinson's – did you say they were the people who bought the slate, or did he sell it to other people?

R. Pattinson must have had the mineral rights, because they negotiated with Pattinson frequently, "We're going down to see Patti," as they termed it was rather bad news, because it was probably going to mean an increase in the rent they had to pay him. So in turn Pattinson may even have owned the piece of - I can't see the Lowther or Muncaster Estates selling a piece of land, but Baysbrown Farm nearby I think is now owned by Pattinson, or a Pattinson trust, so I never knew how the finances worked; I was only seven at the time.

I. So presumably the slate went elsewhere. Was it used locally, or did it go further afield?

R. Well, Windermere was the primary buyer. It would go to wherever there was a market; if there was a good market somewhere else and it could be distributed successfully – although transport would be a huge item in the cost – they would obviously sell. I have the account book of sorts, and it lists one or two other slate buyers as far afield as Manchester, I think it was. They would get it to Windermere; if they could get it to Windermere Station then there was a railway link.

I And just a last question on here – what happened when it rained? Did that affect it, or did work continue in the rain.

R. No work, no pay. So work continued in the rain, work continued in the snow - unless it was unbelievably deep. Work just continued full stop. They didn't have any oilskins very much, or waterproofs, but they had as they used to term it, an 'owld seck' round their shoulders; translated, that's an old sack round their shoulders, a good hemp sack, jute, hemp, whatever, was quite a good waterproof. Yes, it was a hard life. It was very, very physical because there was scarcely any machinery in use. Hard work.

Track 2

I. Do you know anything about the earlier workings, or the earlier parts of the quarry?

R. I don't know anything about time prior to 1912, when I have the account books, when they started. They never purchased the quarry obviously, they rented, they leased, rented, whatever. And in the account book it says each time, "Royalty paid" – so they much have paid a percentage of whatever the production was to either Pattinson or Muncaster or Lowther Estate – whoever had the royalty for the mineral rights. 1912 is the only date I have.

I. We were looking at a photograph just before of your father, who got to a great age, so tell me about the health. These miners obviously worked in poor conditions.

R. Yes, these weren't miners...

I. Oh sorry, quarrymen.

R. ...they were never underground as such. They were obviously in the open air, liable to dust, if they were drilling into the rock there'd be a lot of dust coming out from the drill. But since mostly it was a hand-drill with a hammer and a jumper as they called it – a long sharpened chisel – there wouldn't be very much dust. The hazards were accidents in the quarry, more than any health hazard; a piece of rock falling from above, and that was everything. And my uncle who died – my great-uncle, rather – had fallen. Why he was at the quarry on his own, I don't know, at night – it all seemed very strange but apparently it was quite legitimate; he'd gone there to do some...finishing off some work that he hadn't done during the day, and fell and died. That was the greatest hazard: accidents – the stone falling on your foot, would crush your foot – you didn't have safety boots, I don't think - never saw safety boots. I saw 'wark' boots, and Sunday boots – I never saw safety boots.

I. And presumably there wouldn't be a telephone up there, was there?

R. No! There wasn't a telephone in Langdale in 1912. Might have been, but no telephone. No.

I. So when accidents happen they're happening...there's nobody there to help.

R. They happened.

I. Was there medical help? Was there a doctor in the valley.

R. There was a doctor in Ambleside – Dr. Johnson, Paddy Johnson. Well, I suppose he was a good doctor in those days. I remember many of his treatments; I remember him removing a double tooth of mine as a child, without any anaesthetic. It was pretty good, he'd a strong wrist! But medical help, you paid to the doctor's club. There was a lady from Elterwater – Mrs. Gaskell, that's right – they had the post office and the shop in Elterwater – she collected once a week I imagine, a shilling – I don't know how much my mother paid – to be in the doctor's club and this must have been tied to treatment by that particular doctor. It was long before the National Health Service was thought of. So that was your treatment. I remember when this accident happened to my father's uncle, it quoted the doctor coming out from Ambleside to treat him when they got him down into the village. But, yes, it was pretty rough and ready. You usually had the old lady in the village who knew about all these things; she would be there at births and at deaths and everything connected with it.

I. And would they smoke. Would the quarrymen smoke?

R. My father smoked. As I say, he smoked 30 Woodbine cigarettes per day, from being in the army in 1918 until he died in 19...well he stopped in the last six years of his life, in 1986 I think it was he died. '76, '76 sorry – get it right. Some would smoke a pipe – pipes were quite common, but cigarettes, it was the done thing; everybody smoked. If you didn't smoke you were exceptional. 200 Woodbines, the first thing on the order for the grocer's, every week, first item – 200 Woodbines. Cost more than the rest of the food probably!

I. You showed us some pictures of the house where you were born, and you were saying that your grandfather, who was the lessee – lease-holder of the quarry – actually owned quite a few houses.

R. Yes, he had a row of ten plus Fir Garth, which had four, so that was fourteen houses he owned. How he got his money I don't know, but he was obviously quite a wealthy man. It never passed any further! [laughs]

I. Did the houses stay in the family, or were they all sold eventually?

R. It was a mixed-up affair, really. They stayed in the family; they were bequeathed to his eldest daughter, who had been looking after him and her mother – the two of them as they were old. And so Auntie Annie got all of the property – ten houses, fourteen houses – and in turn they passed to her nephew, her sister's son, John, who died about three months ago. So it stayed in the family in that sense, and now belongs to...John was my cousin, so his daughter, Heather, who lives at Langdale now, is a very wealthy lady. Except all the houses have been sold. They're all holiday cottages – a row of ten. They were quarrymen's, joiners' – you name it – when I was there. Everyone is now a second home or a holiday cottage. Lovely houses. The council didn't want them; they were offered to South Lakeland Council for council houses. "No, we won't have them. They need too much work to bring them up to date." And truthfully, there's no jobs in Langdale, so they all became holiday homes.

I. And just out of interest – you did say how much he paid for them.

R. I've got the account book – I can check that. I think it was probably £1200, but I'm not sure. And it quotes every repair that had to be done: '7/6d to Backhouse' – that was a builder in Ambleside. '2/6½d to somebody for plumbing work'. 'New window in such-and-such'. It's all there. It's amazing. And the increase in rent – the rent was often about two or three shillings a week – and it was a very big event if the rent was put up by a penny a week; instead of 2/6d it went up to 2/7d a week, and that's recorded in the account book. Yes, it was a different world.

Track 3

I. Quarries in Langdale.

R. Elterwater, Greenslate Quarry (the big one near Elterwater), then at different times, one called How Bank, then Banks, then one called Coulter, then Spout Crag. If you come to the other side of the river – across the valley – there's Thrang Quarry, which was a huge one in its time, and the only one that had a vertical shaft, which was I think the only one in the Lake District that mined with a shaft, and men going down, and a small one beside that behind the church called Dulcanter . So there would be six or seven at varying times; they would never all be working together. But the main

Thrang Quarry was a huge, huge quarry; it was very big indeed, and it had a shaft going down, which is still there.

I. In the time you can remember, were many of the children you knew, did they have parents working in the quarries?

R. Oh yes, well, there wasn't a lot of choice. The gunpowder works at Elterwater had closed in 1928 so there was either quarrying or farming or working in hotels, whatever. But very little choice, and getting to Ambleside was very dodgy because there would be two buses a day, I think, a morning and an evening, so you were extremely limited in what you could do; it was farm work or quarrying largely, so that might have been my fate.

I. So presumably the valley must have lost some population when the gunpowder works closed; some people must have moved out?

R. Probably, probably. It would have been quite a big employer. Primarily the Elterwater people would be gunpowder works employees 'cause it was absolutely on their doorstep. Yes, I don't know the numbers. I mean, this is all documented.

Transcribed by AC July 2013

APPENDIX 5: ARTICLE FROM THE WHITEHAVEN NEWS, 4TH OCTOBER 1877

THE LAKE DISTRICT HEMATITE AND MINING COMPANY

At the Rotherham police court, on Thursday, Alderman J. C. Morgan and Mr. Francis W. Waide, his partner, stove grate manufacturers, Rotherham, were summoned by Mr. John Hale, of Wythburn, Cumberland (formerly manager of the Company),

"for that on the 30th August 1877, at the township of Rotherham, the Lake District Hematite and Mining Company Limited, being a company under the Companies' Act of 1862, and having a capital divided into shares, unlawfully did make default in forwarding and did not forward to the Registrar of Joint-stock Companies, a copy of the list of persons who on the 14th day succeeding the day on which the ordinary general meeting was held were members of the said Company, with their names, addresses, and occupations, the number of shares held by each, with a summary specifying certain particulars, as required in section 26 of the said Act, and the said default continued for a space of fifteen days down to and including the 14th of September, and being directors of the said Company — unlawfully, knowingly, and wilfully did authorise or permit such default."

The Company referred to was formed in Rotherham, and with one or two exceptions the directors are residents of that town. The object was to work the hematite and lead ore in a mountain near Helvellyn, but up to the present the success had not been so great as had been anticipated. Mr. Middlebrook, of Leeds, appeared for Mr. Hall; and Mr. Rhodes for the defendant. — Mr. Middlebrook said Mr. Hall had been the manager for the Company for four or five years, but the Company had got into difficulties, and a large sum was owing to him for the wages of himself and workmen amounting to upwards of £200. He had never been able to get that money, and there appeared no probability of his getting it, as the Company apparently had collapsed. Nothing had been done in connection with it, and since the early part of November 1876, no list of members had been sent to the registrar as required by the Act.

A discussion followed between the solicitors and Mr. Rhodes said that if anyone would petition to wind up the Company, he might have all there was, and so he could get the unpaid calls from the shareholders if an official liquidator were appointed. — Mr. Middlebrook said that he had no objections, but this amount was due to him for wages and what he had paid; and if the concern was wound up, the assets were said to be only £30. — Mr. Rhodes said that Mr. Hall had valued the assets much higher than that. He had written, "Let me have this mine; put the other creditors on one side, and I will pay every farthing you owe besides mine." He had letters in his hand about which he would examine Mr. Hall, if he were only put in the box. There was something behind this action; there was the West Cumberland Consols. His clients would not consent to pay on a criminal information like this. The complainant might take the assets of the Company, and call up the unpaid capital. His clients had been led to spend their money in this rotten mine to a great extent by the inducements held out by the person they put there to manage it, and they had lost altogether £3,000. Now, because they would not turn the place over to the man who had led them to work it, they were to be dragged into a Court, and made to pay a penalty. He would say that they would not pay him a shilling.

Mr. Middlebrook asked how much capital had not been called up, and Mr. Rhodes stated that it was £170, the greater part of which might be enforced, if there were an official liquidation. — The Bench suggested that the case should be compromised by the defendants paying £10, which was ultimately agreed to, and the case was then withdrawn, it being understood that proceedings would be taken to wind up the Company.

Newspaper transcribed by West Cumbria Mines Research.

ILLUSTRATIONS

FIGURES

PLATES

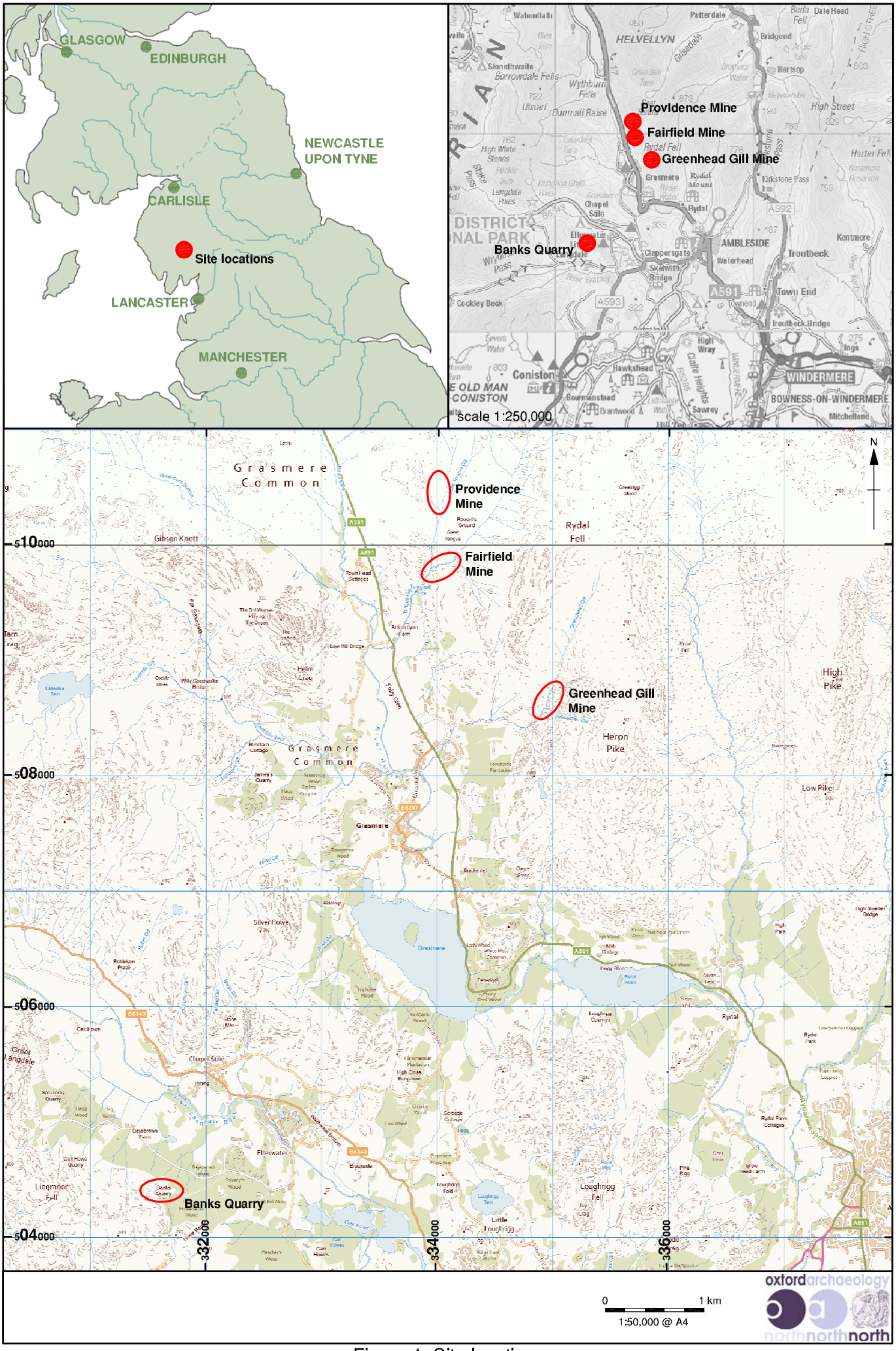

Figure 1: Site locations

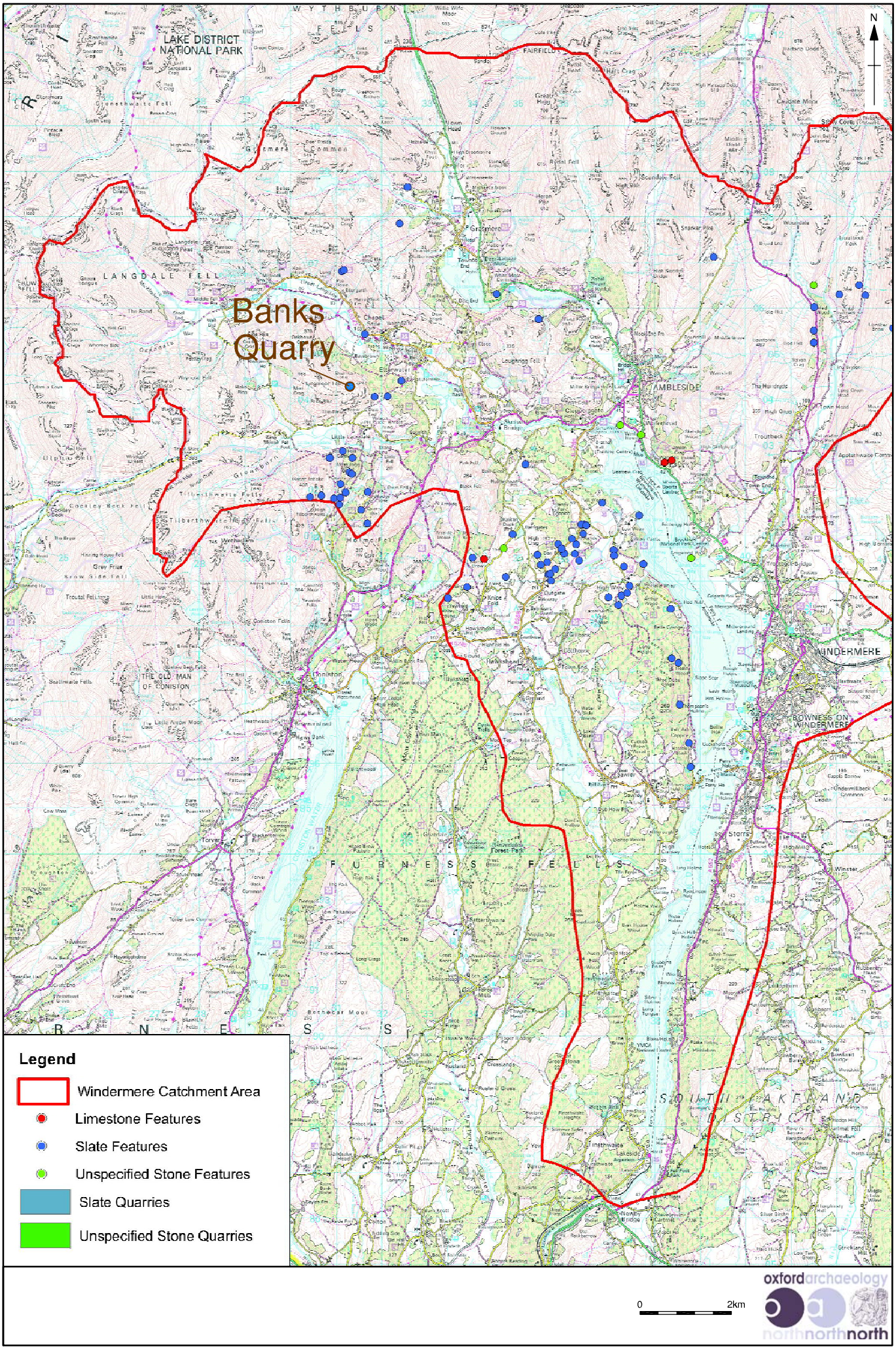

Figure 2: Distribution of Stone working Sites in the Windermere Catchment

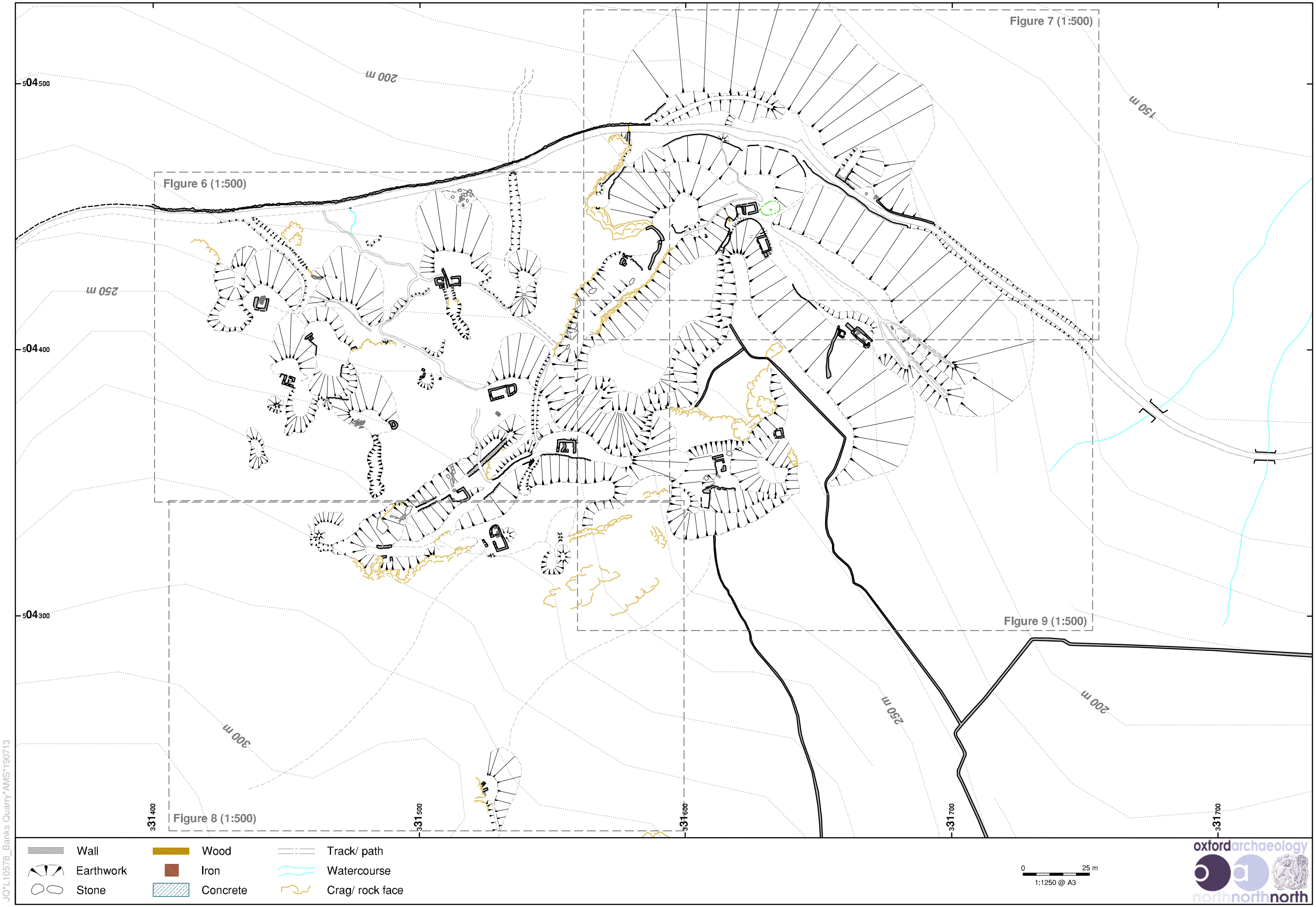

Figure 3: Banks Quarry topographic survey, overall site location plan

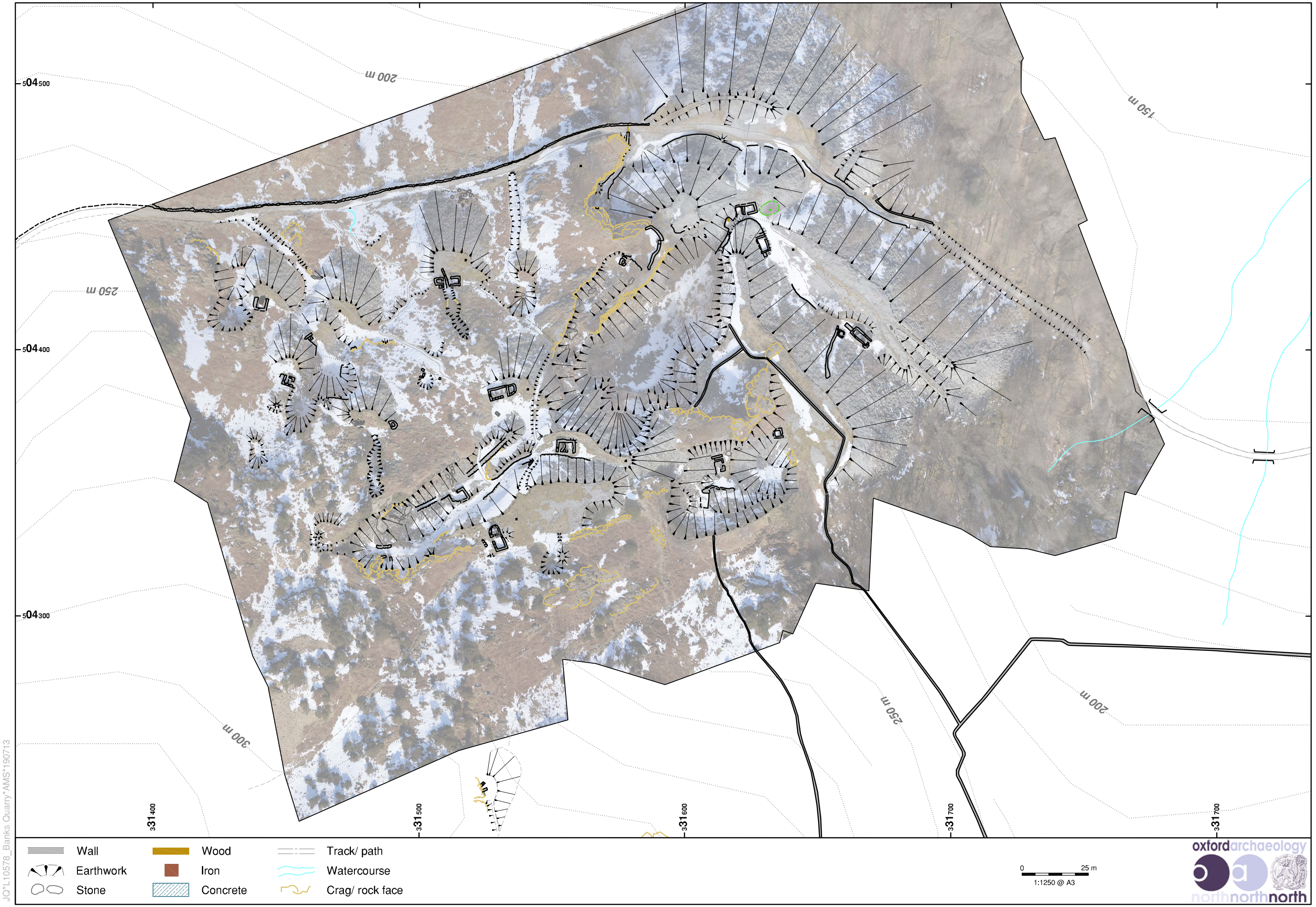

Figure 4: Banks Quarry topographic survey; overall site location plan overlain on the aerial photography

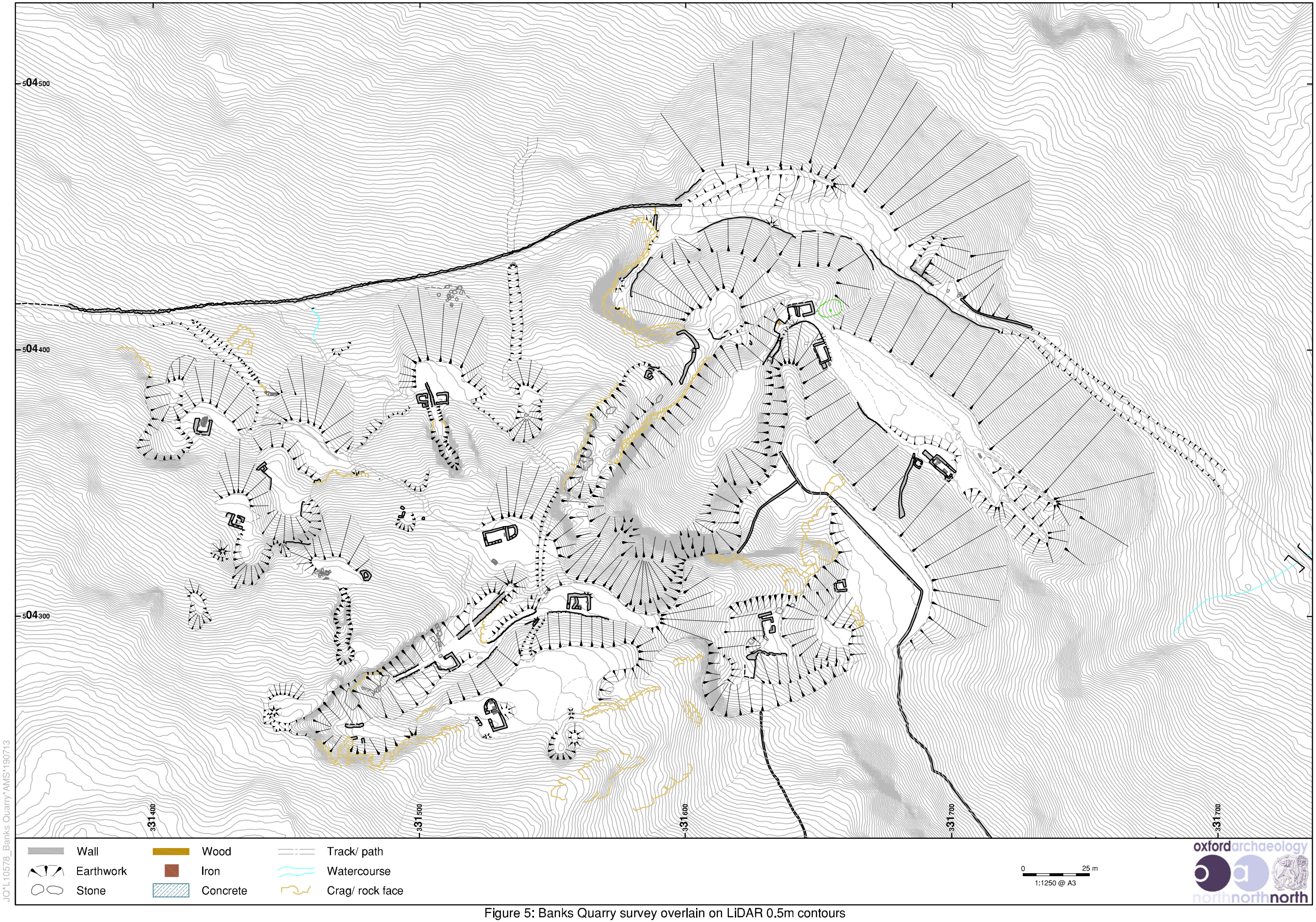

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Figure 5: Banks Quarry survey overlain on LiDAR 0.5m contours

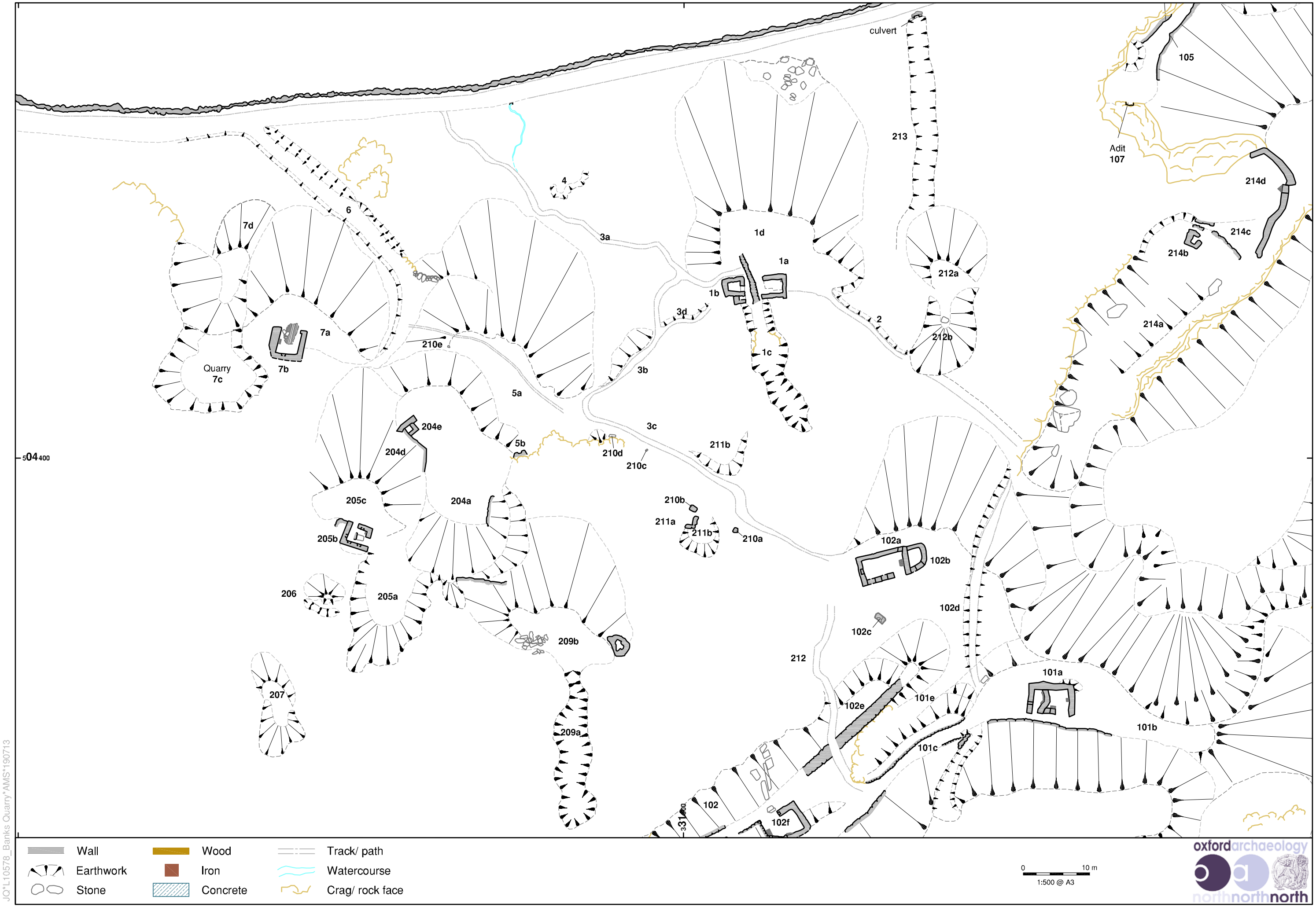


Figure 6: Banks Quarry topographic survey, detail plan of north-west of the site

Figure 7: Banks Quarry topographic survey; detail plan of the north-east of the site

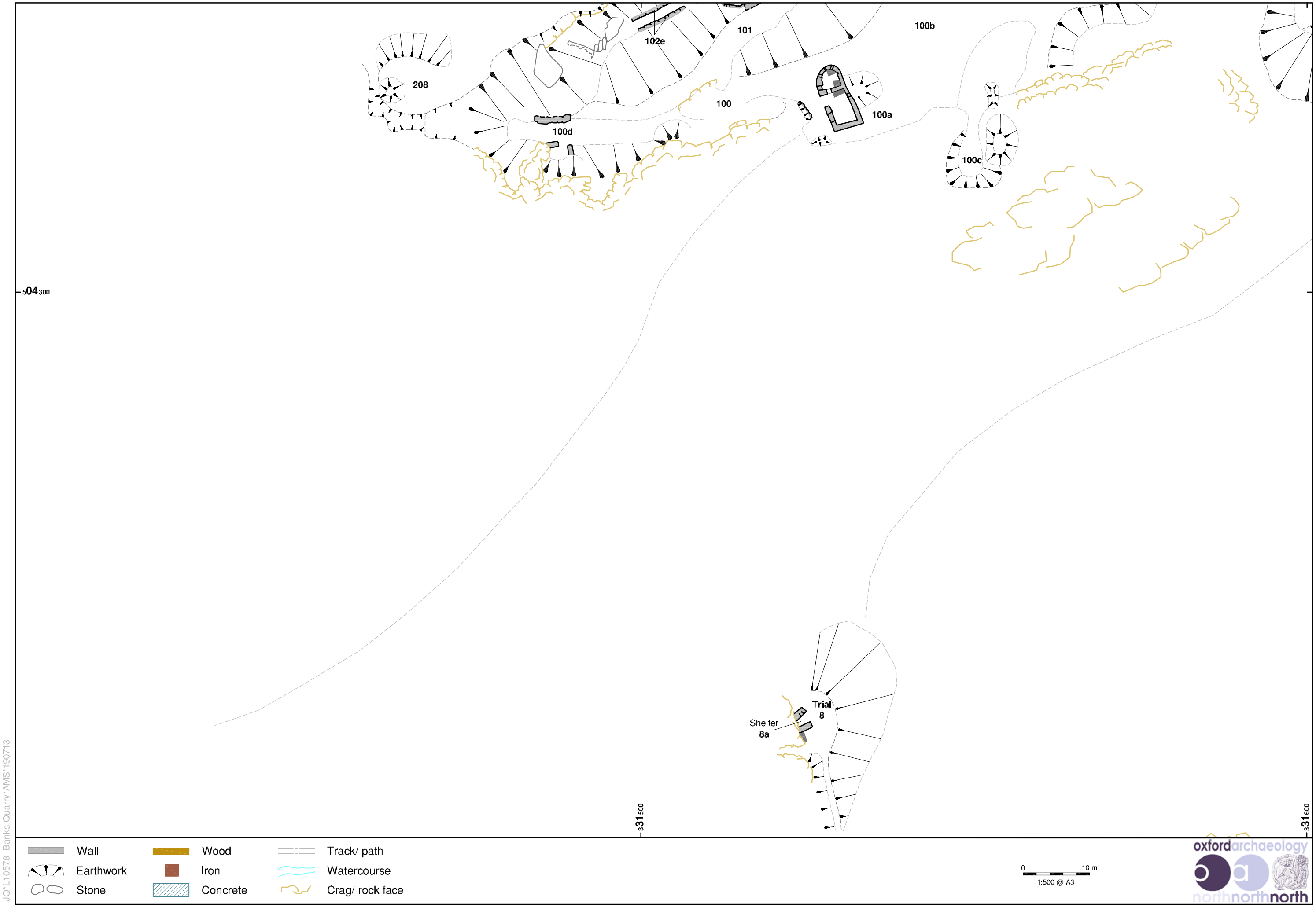


Figure 8: Banks Quarry topographic survey, detail plan of the south-west of the site

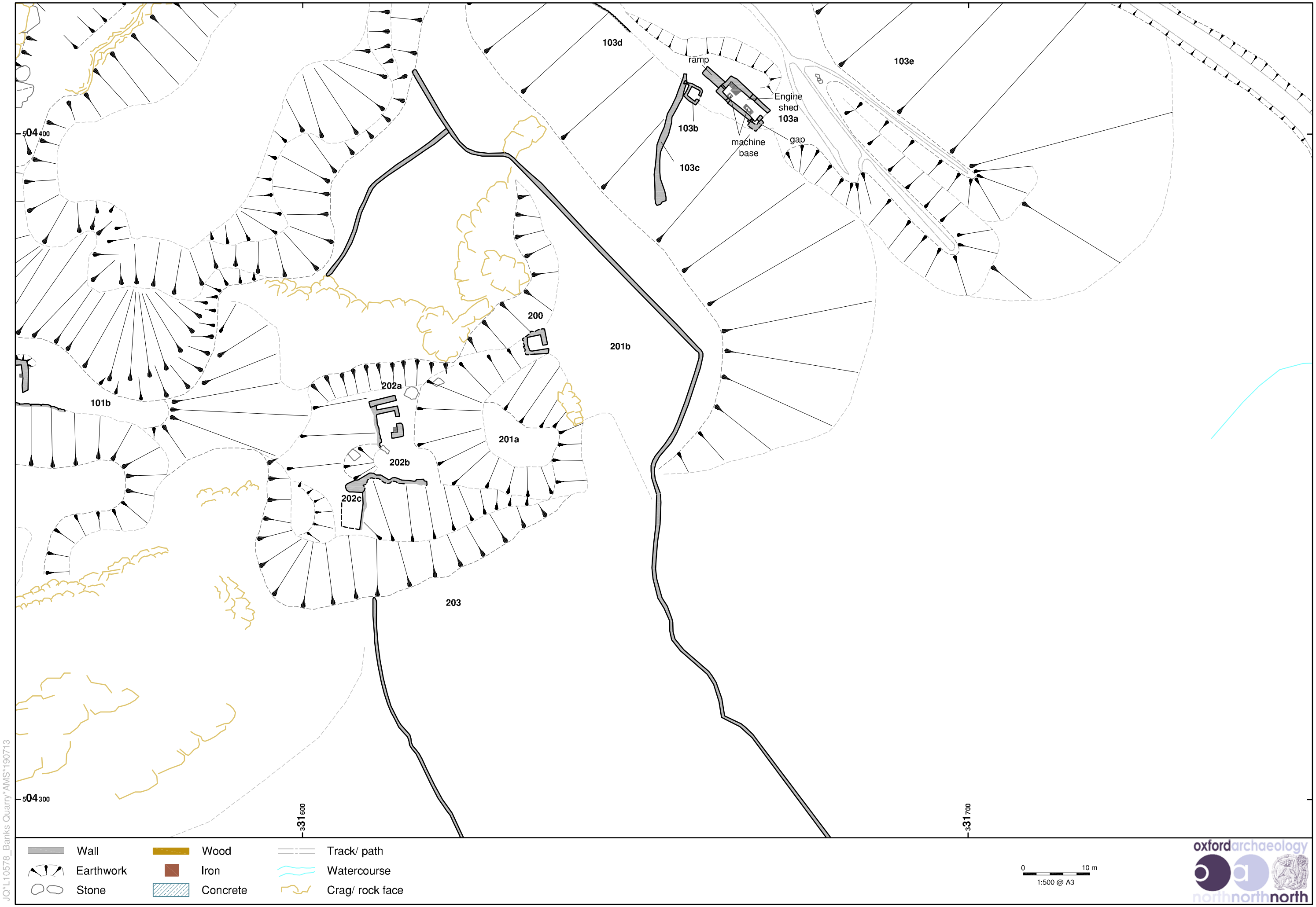


Figure 9: Banks Quarry topographic survey, detail plan of the south-east of the site

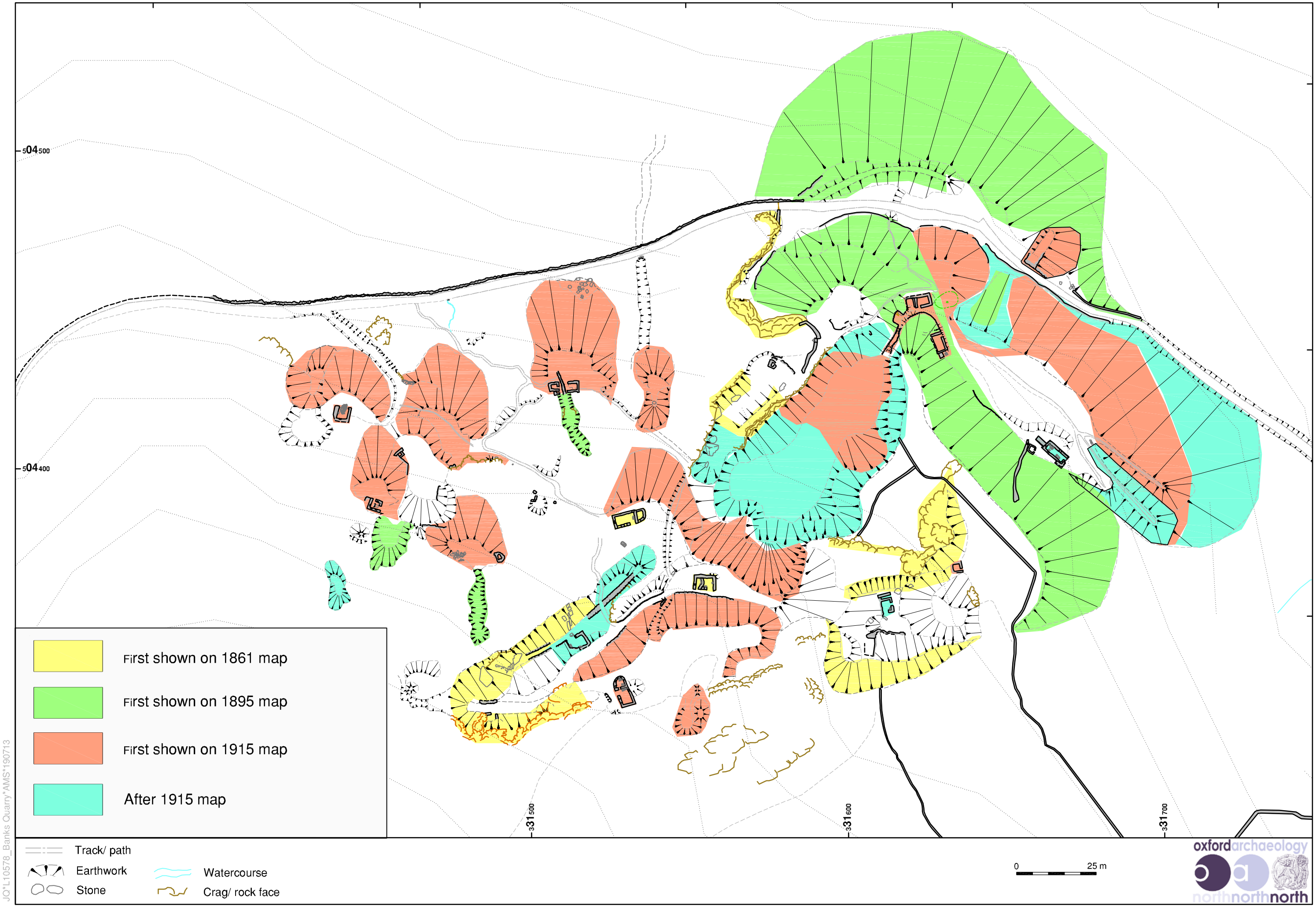
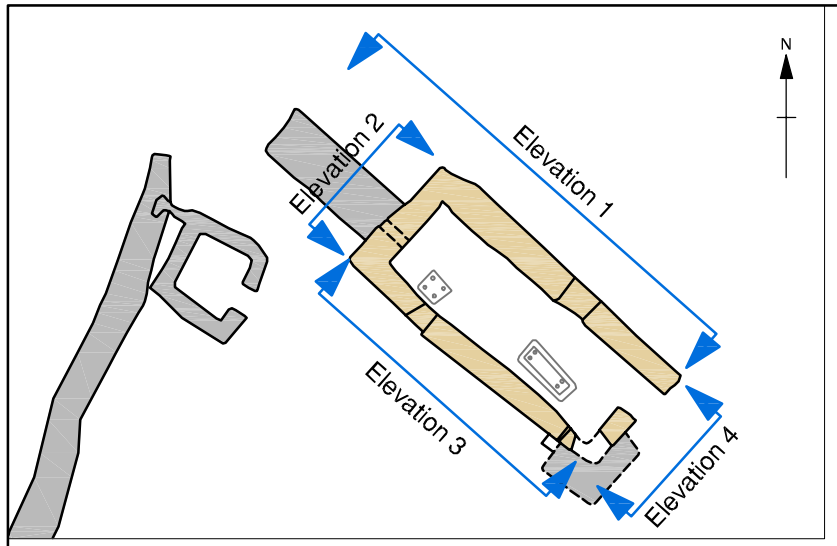
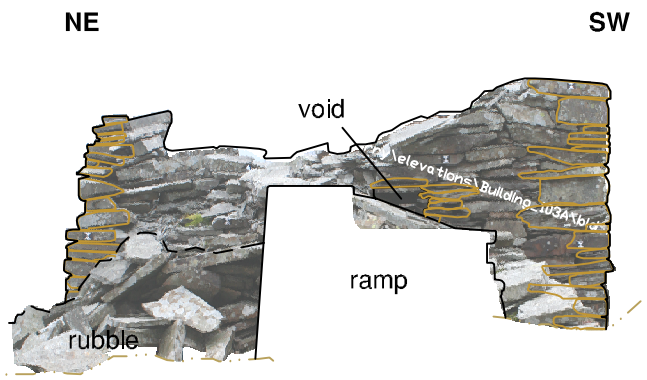


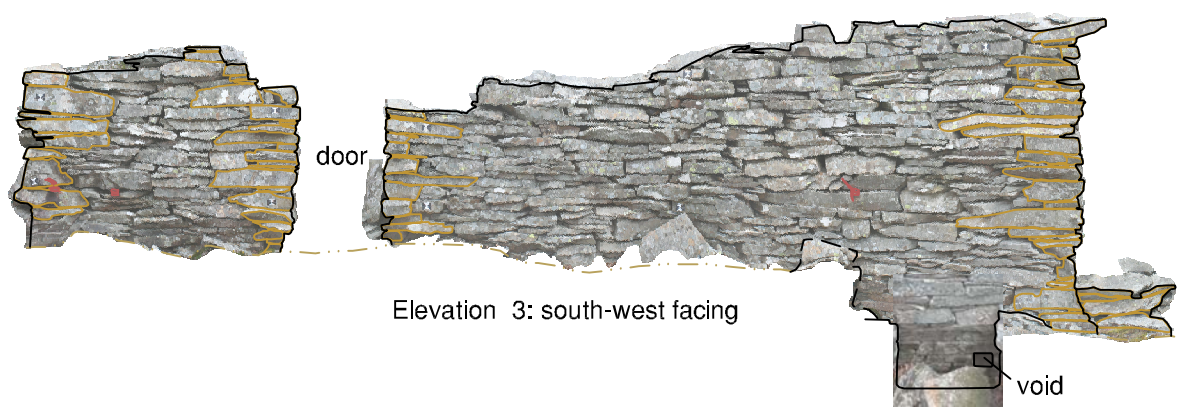
Figure 10: Phasing of Banks Quarry workings



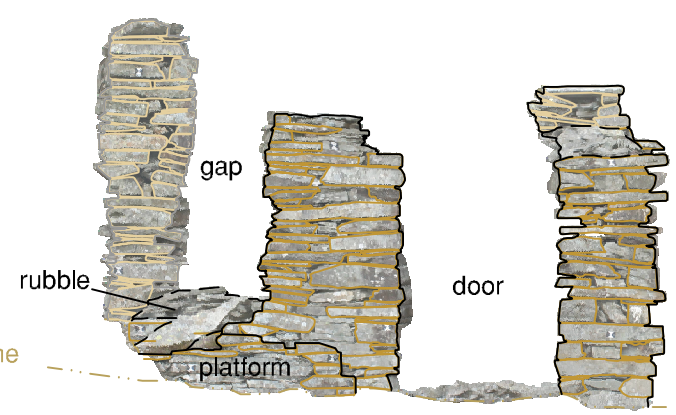
Elevation 1: north-east facing



Elevation 2: north-west facing



Elevation 3: south-west facing



Elevation 4: south-east facing

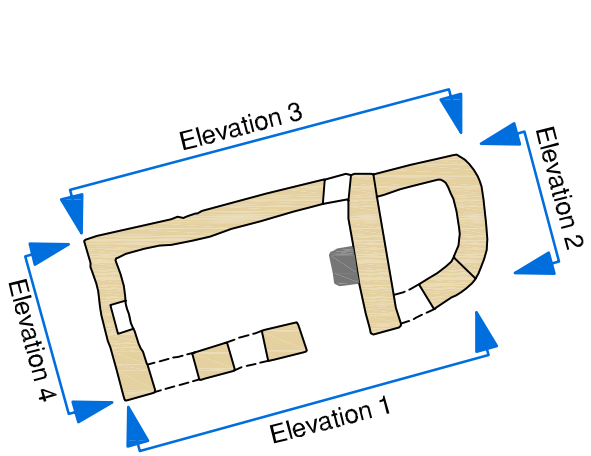
Stone
Metal
Wood

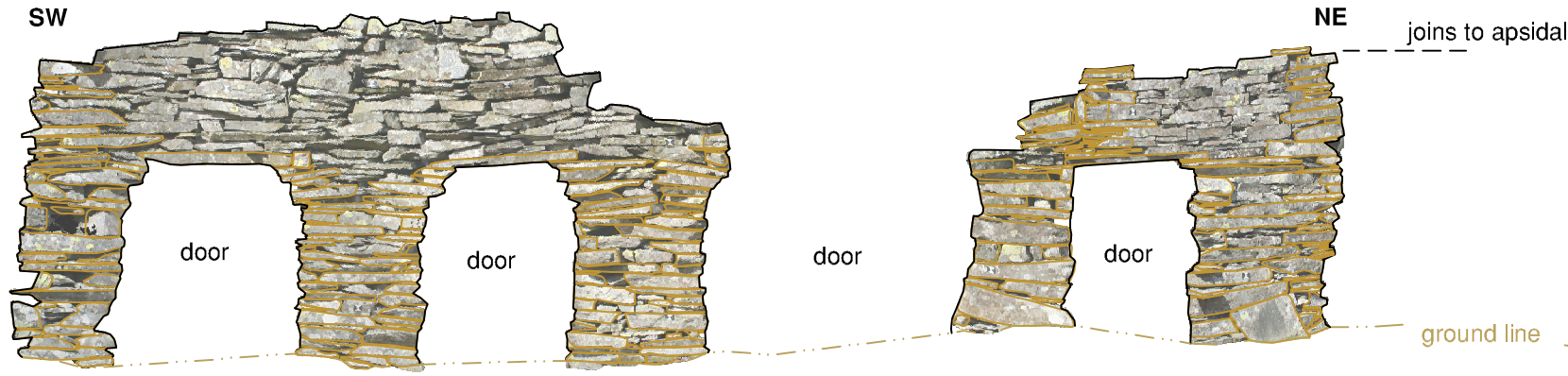
0 1 m
1:50 @ A3

oxfordarchaeology northnorthnorth

JQ*L10578*AMS*081013

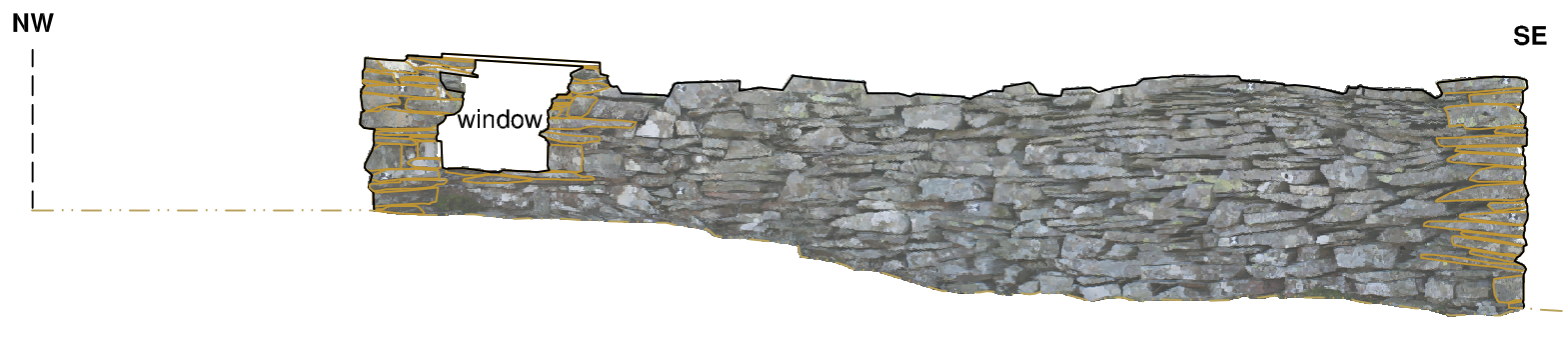
Figure11: Elevation drawings of the Engine House, Building ***103***



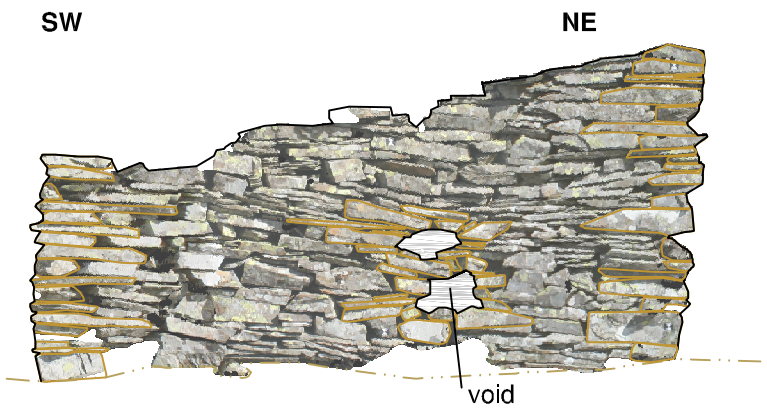


Elevation 1: south-east facing

Elevation 2: South-east to East-facing apsidal elevation



Elevation 3: north-west facing



Elevation 4: south-west facing

Stone
Metal
Wood

0 1 m
1:50 @ A3

oxfordarchaeology northnorthnorth

JQ*L10578*AMS*111213

Figure12: Elevation drawings of Building ***102***

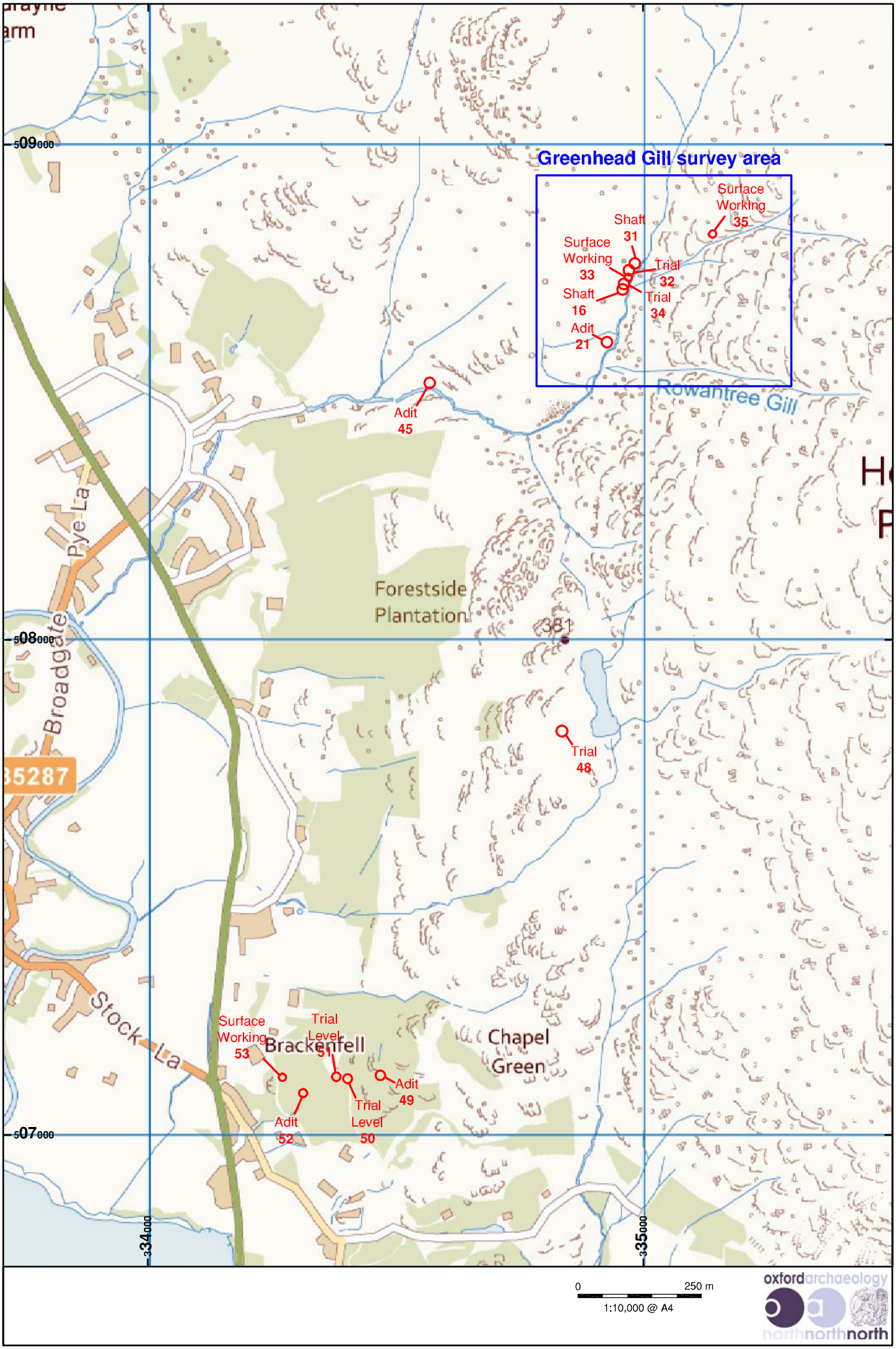


Figure 13: Location of lead workings around Grasmere area

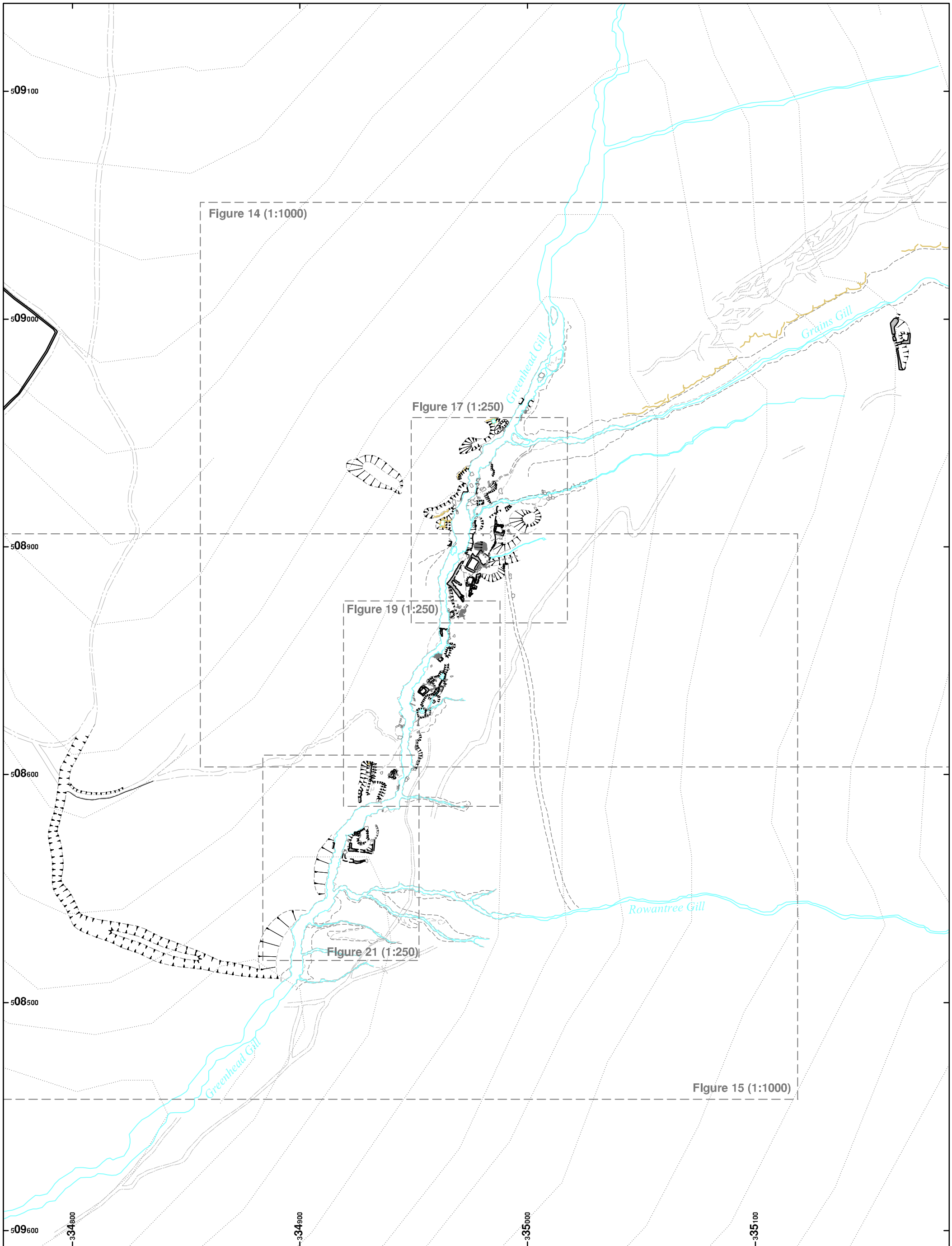


Figure 14: Greenhead Gill Mine topographic survey; overall site plan

Figure 15: Greenhead Gill Mine topographic survey; overall site plan overlain on the aerial photography

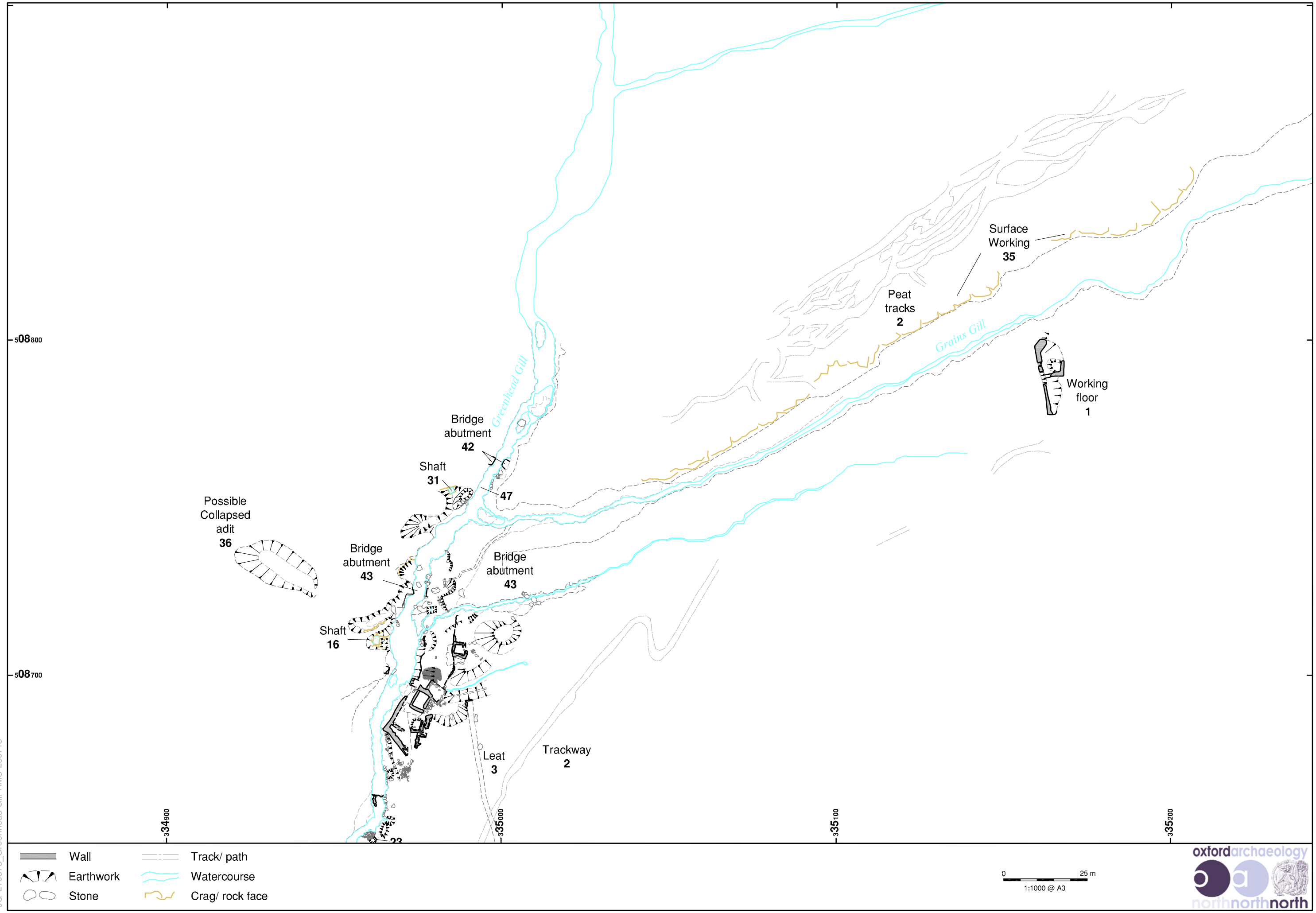


Figure 16: Greenhead Gill topographic survey; north of the main complex

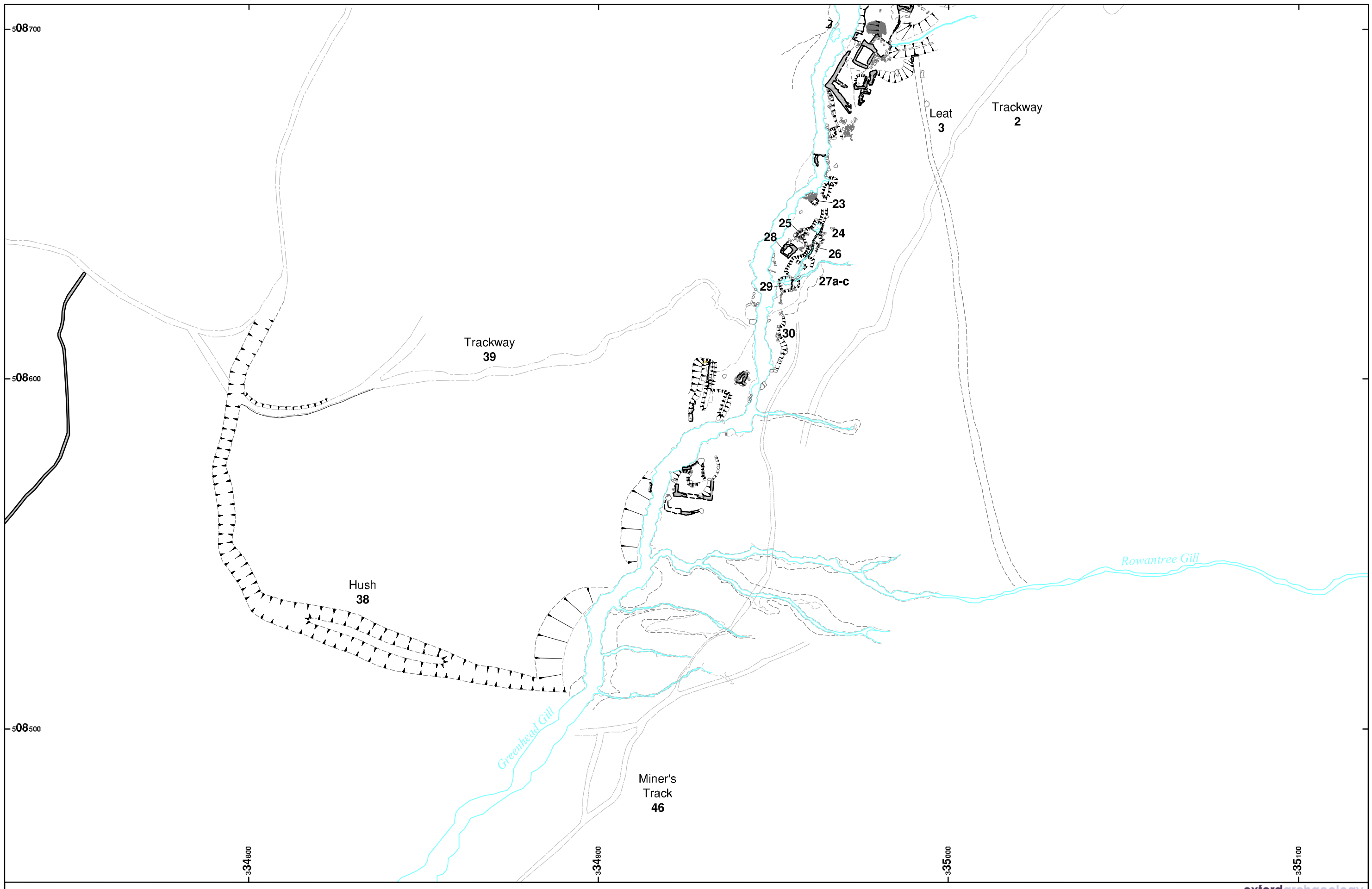


Figure 17: Greenhead Gill topographic survey; south of the main complex

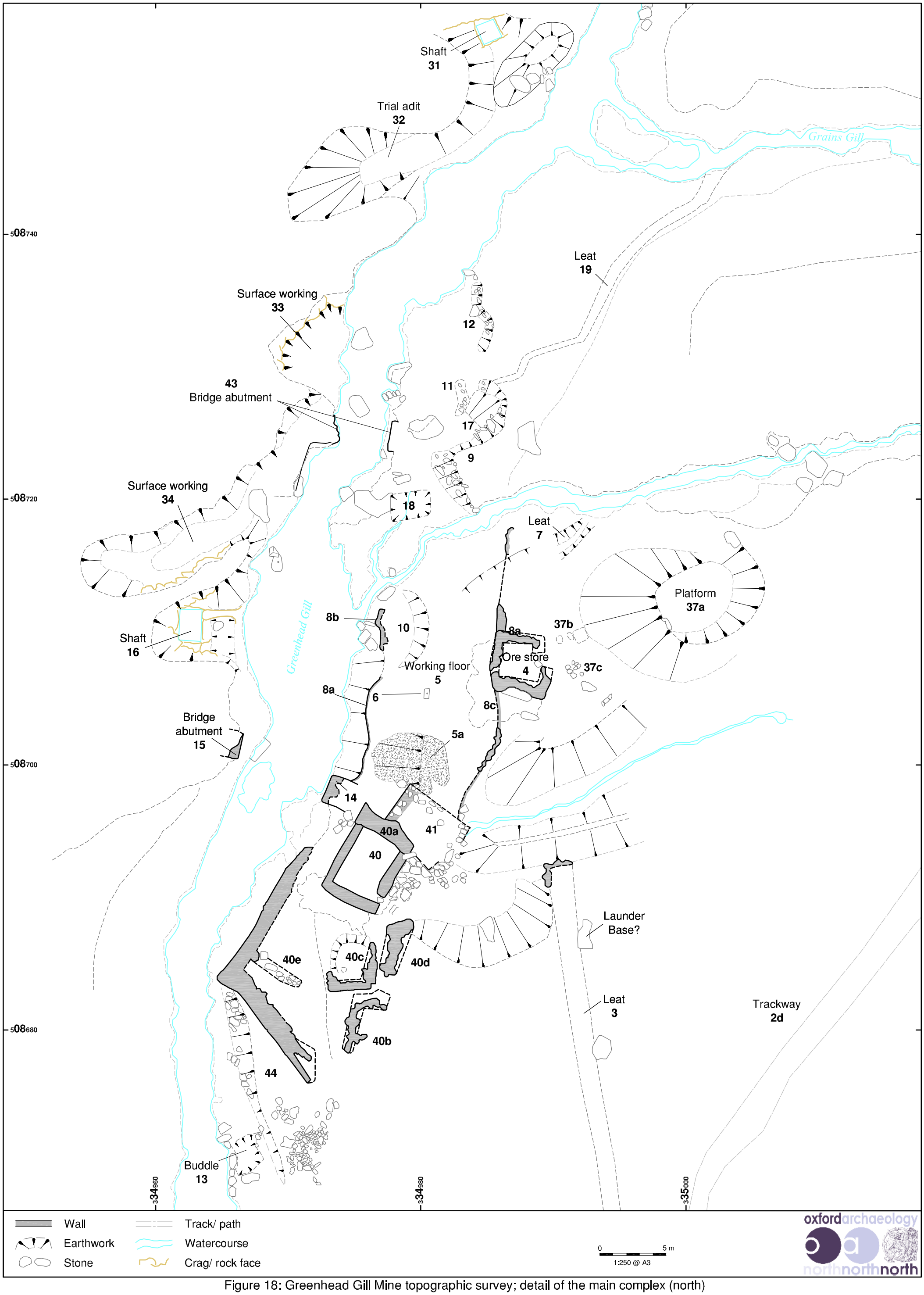


Figure 18: Greenhead Gill Mine topographic survey; detail of the main complex (north)

Figure 19: Greenhead Gill Mine topographic survey; detail of the main complex overlain on the aerial photography

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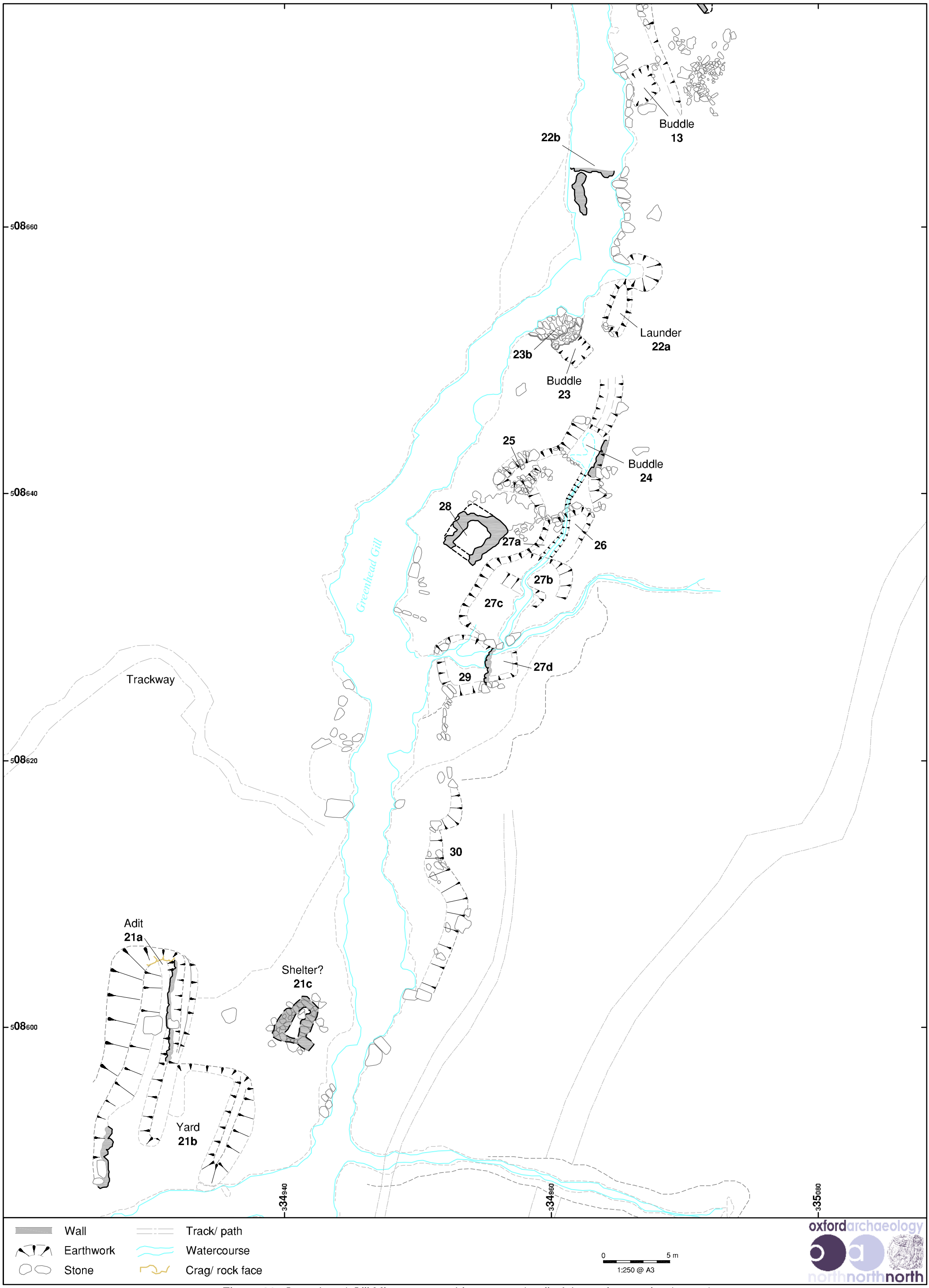

Figure 20: Greenhead Gill Mine topographic survey; detail of the main complex (centre)

JQ*L10578_Greenhead Gill*AMS*260713

Buddle
13
22b
Launder
22a
23b
Buddle
23a
25
Buddle
24
28
27a
26
27b
27c
27d
29
30
Trackway
Greenhead Gill
Adit
21a
Shelter?
21c
Yard
21b
508660
508640
508620
508600
334940
334960
335080
Wall
Earthwork
Stone
Track/ path
Watercourse
Crag/ rock face
0
5 m
1:250 @ A3
oxfordarchaeology
northnorthnorth

Figure 21: Greenhead Gill Mine topographic survey; detail of the main complex (centre), overlain on the aerial photography

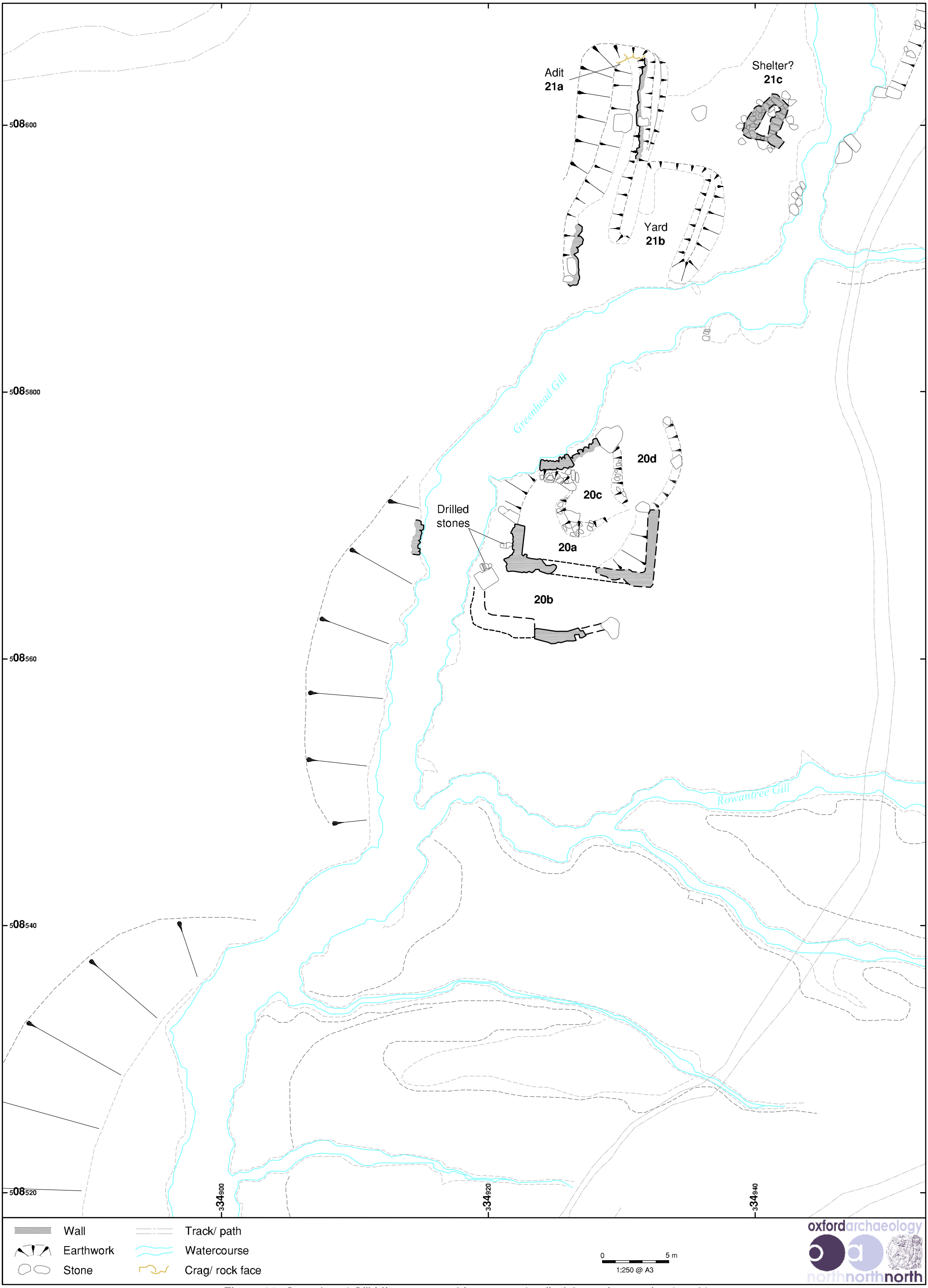

Figure 22: Greenhead Gill Mine topographic survey; detail of the main complex (south)

JQ*L10578_Greenhead Gill*AMS*260713

Figure 23: Greenhead Gill Mine topographic survey; detail of the main complex (south), overlain on the aerial photography

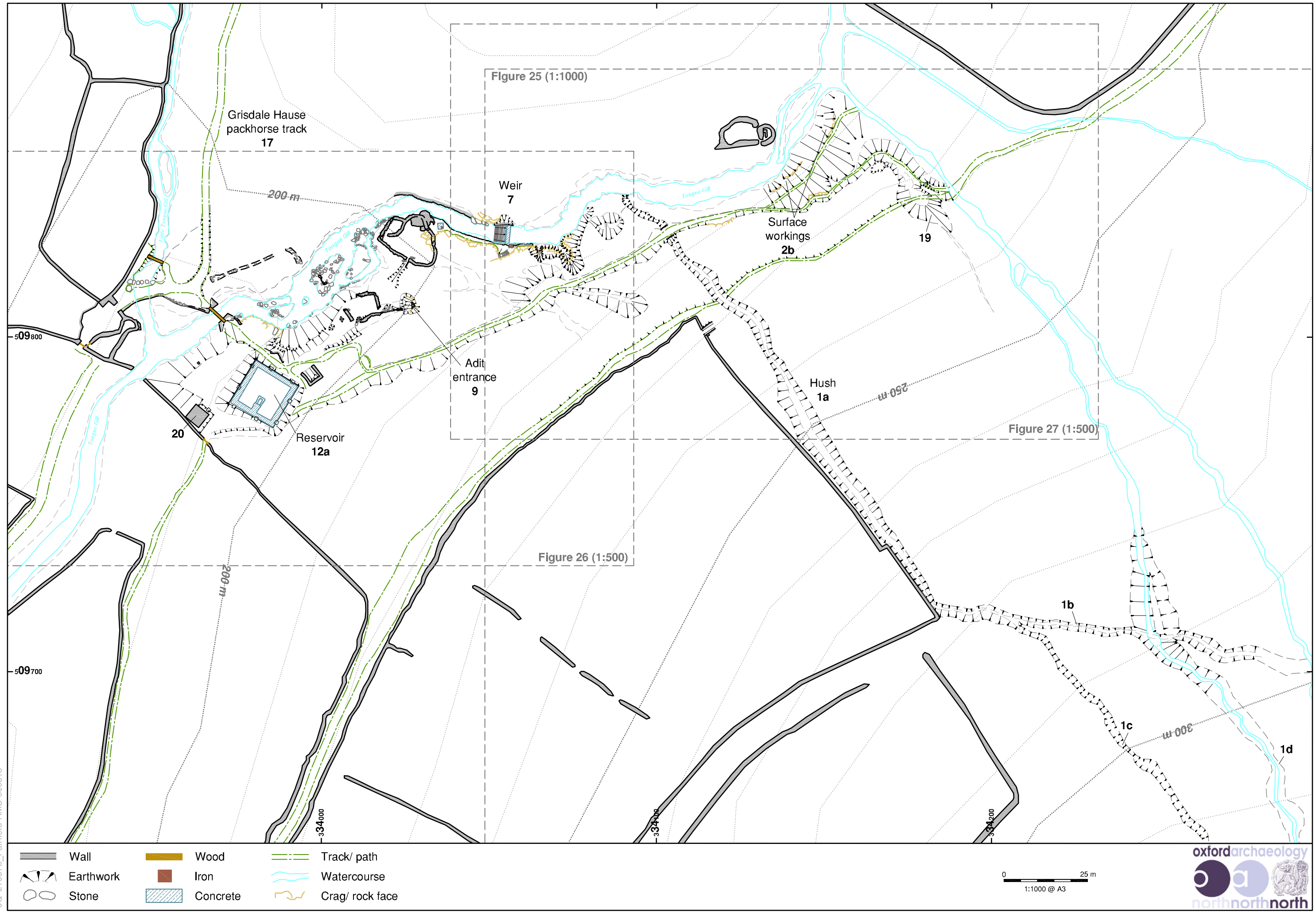

Figure 24: Fairfield Mine topographic survey ;overall site plan

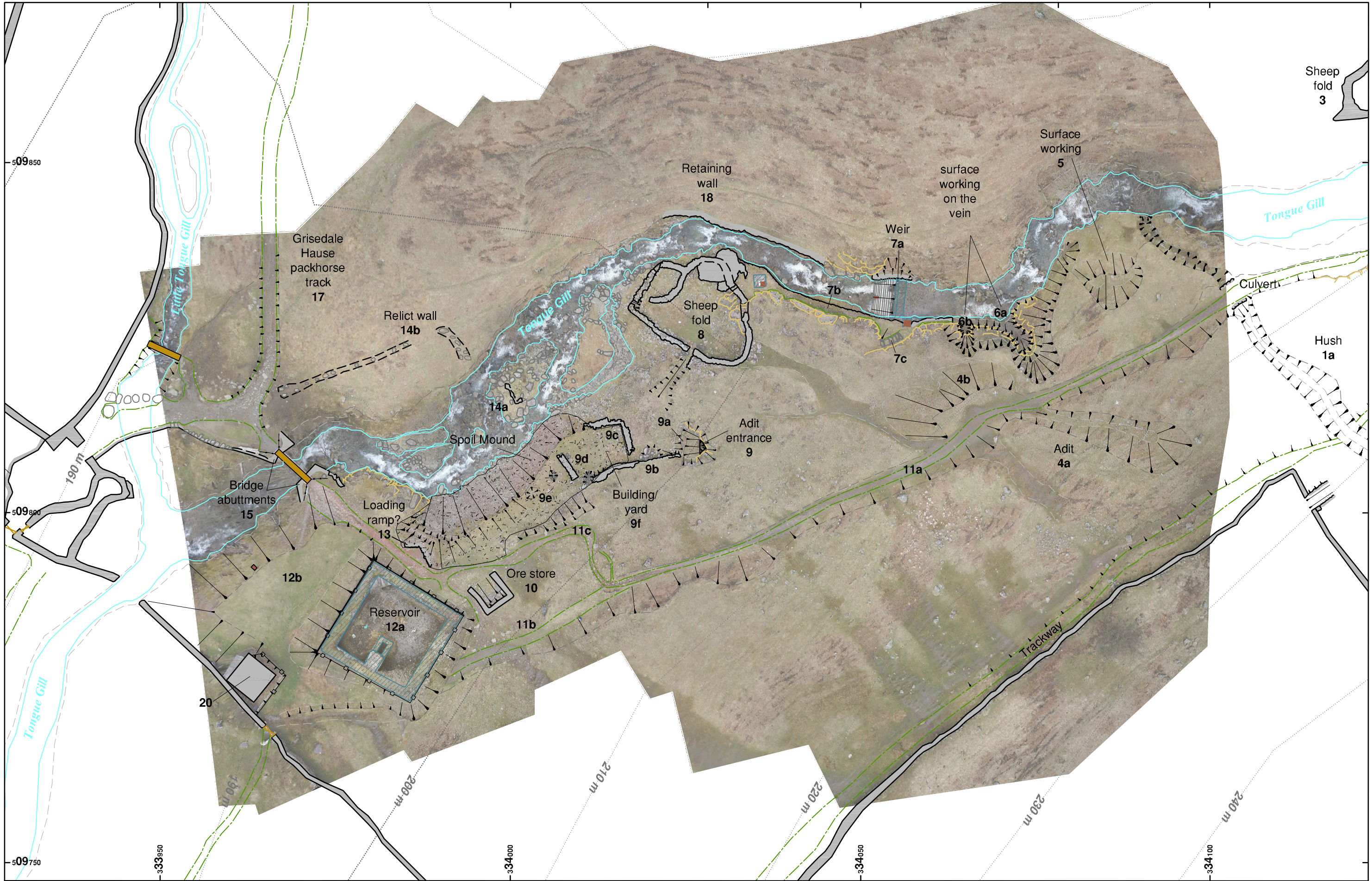

Figure 25: Fairfield Mine topographic survey;overallsite plan overlain on the aerial photography

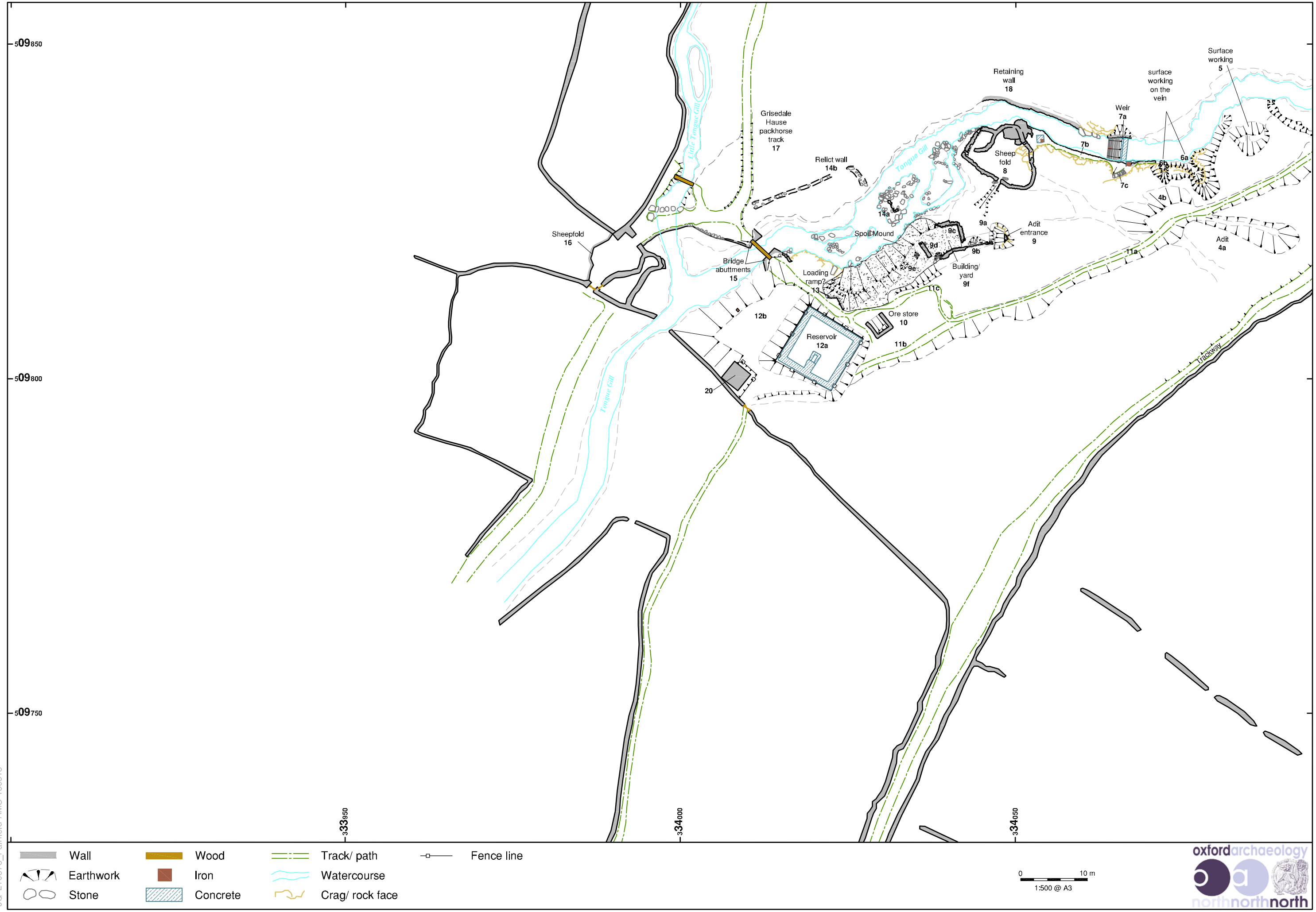

Figure 26: Fairfield Mine topographic survey; south-west of the main complex

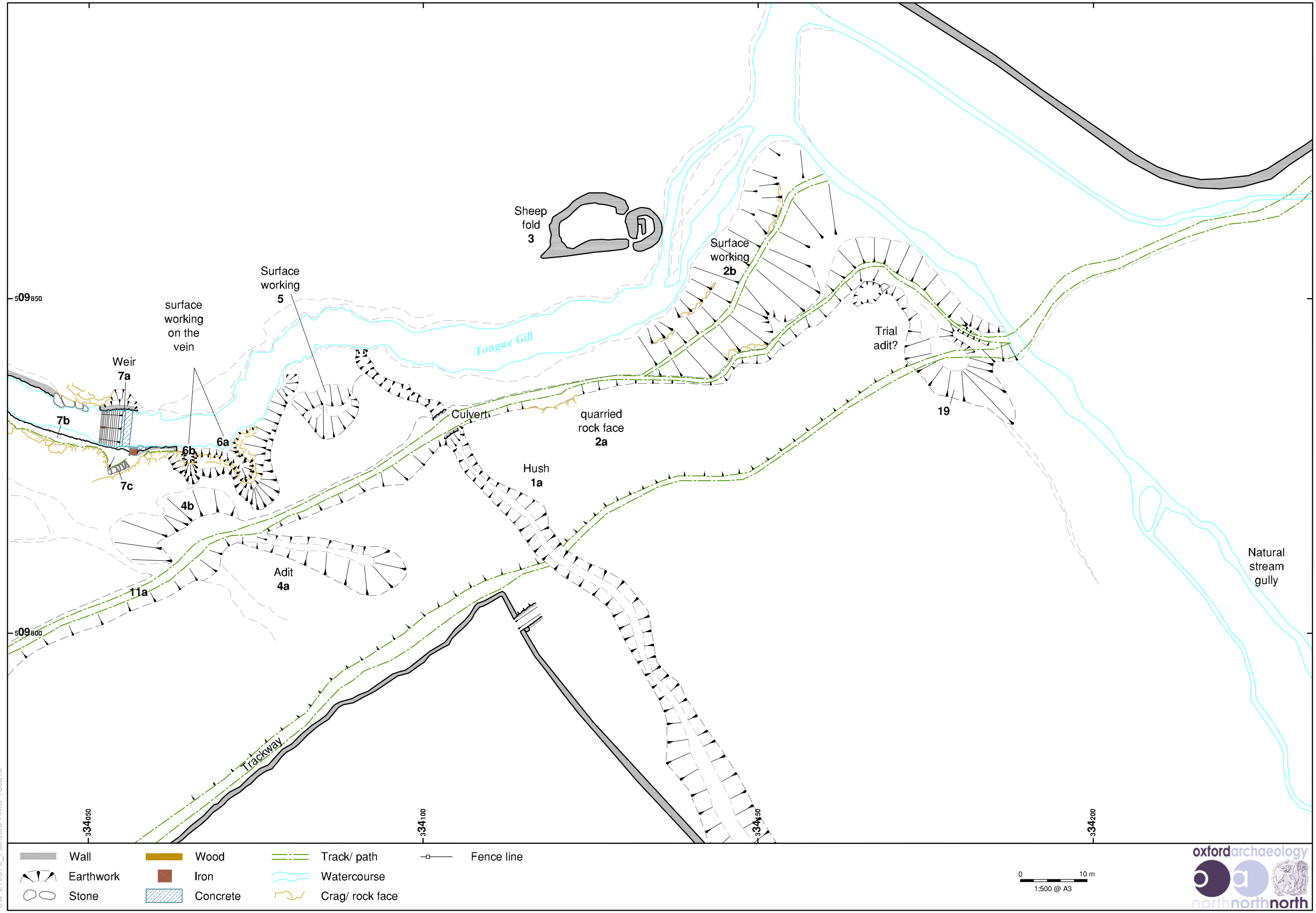

Figure 27: Fairfield Mine topographic survey; north-east of the main complex

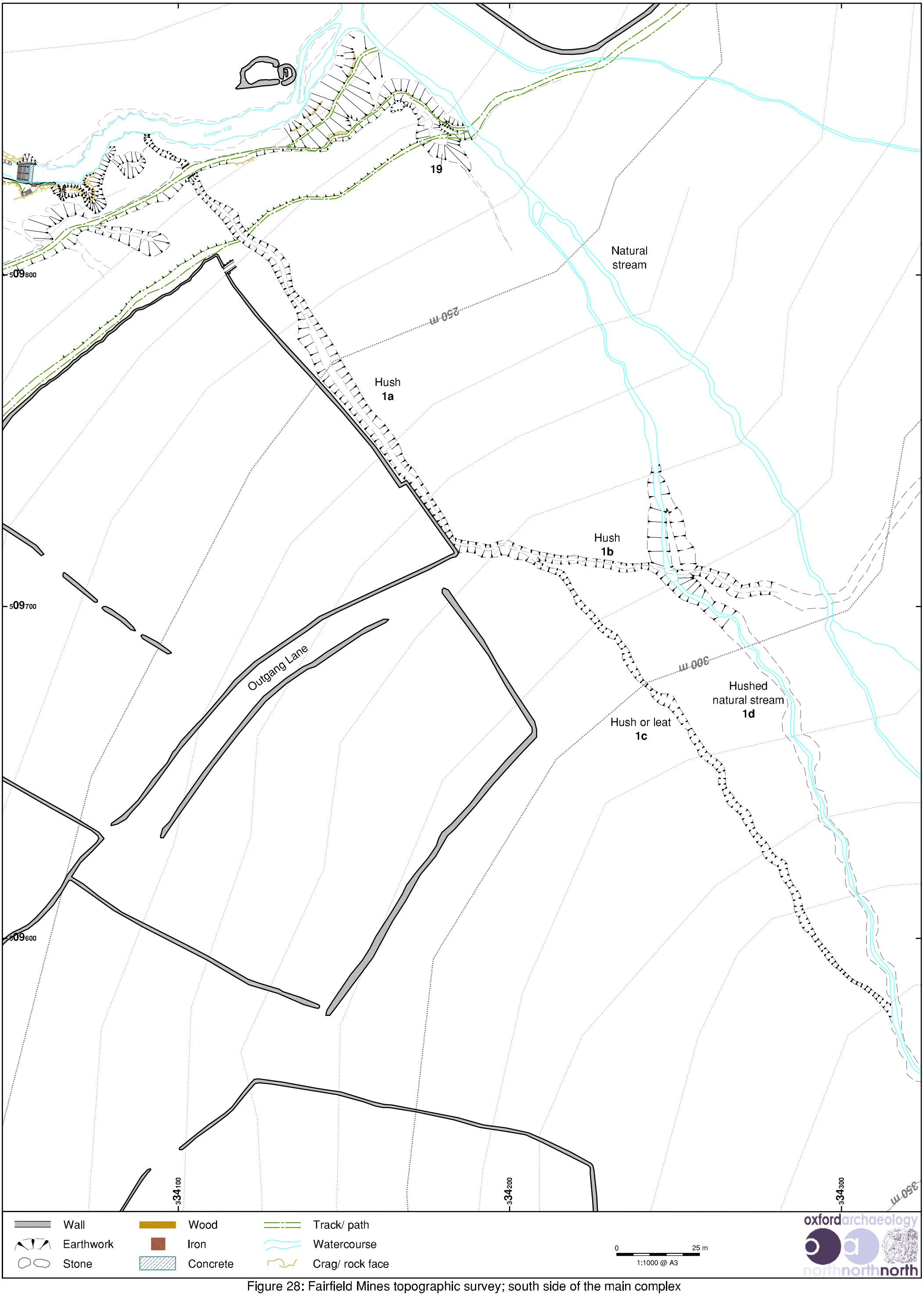

Figure 28: Fairfield Mines topographic survey; south side of the main complex

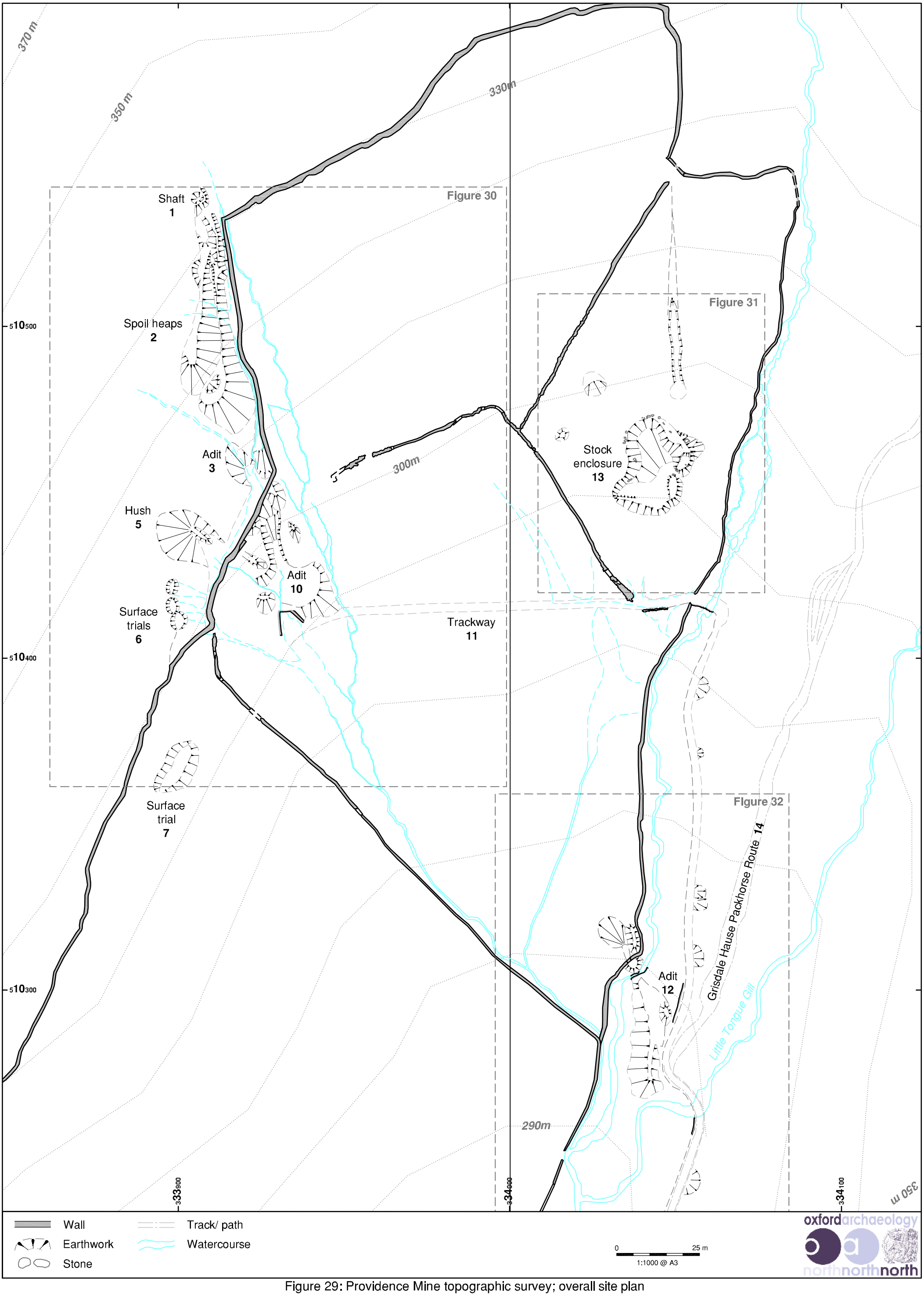

Figure 29: Providence Mine topographic survey; overall site plan

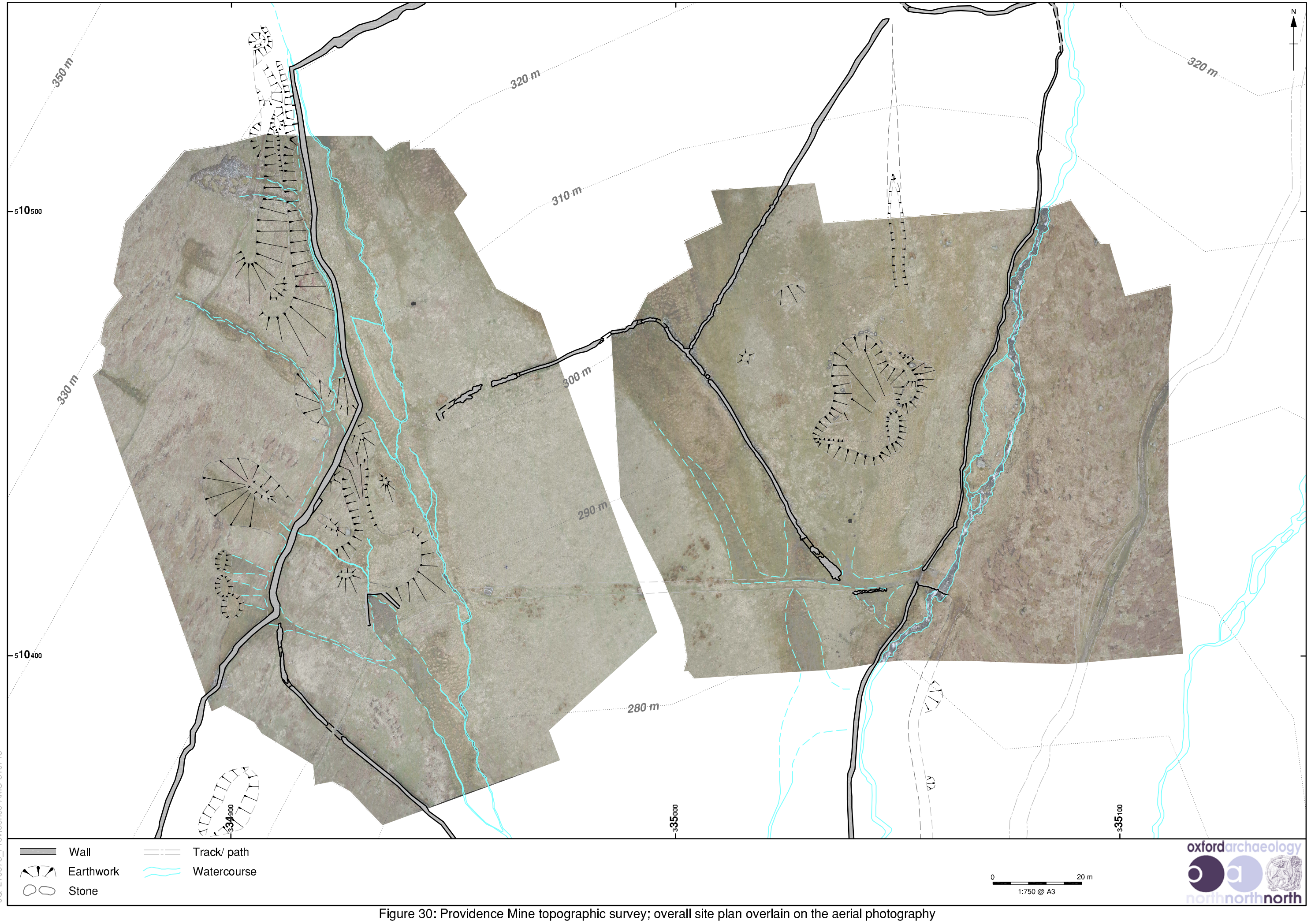

Figure 30: Providence Mine topographic survey; overall site plan overlain on the aerial photography

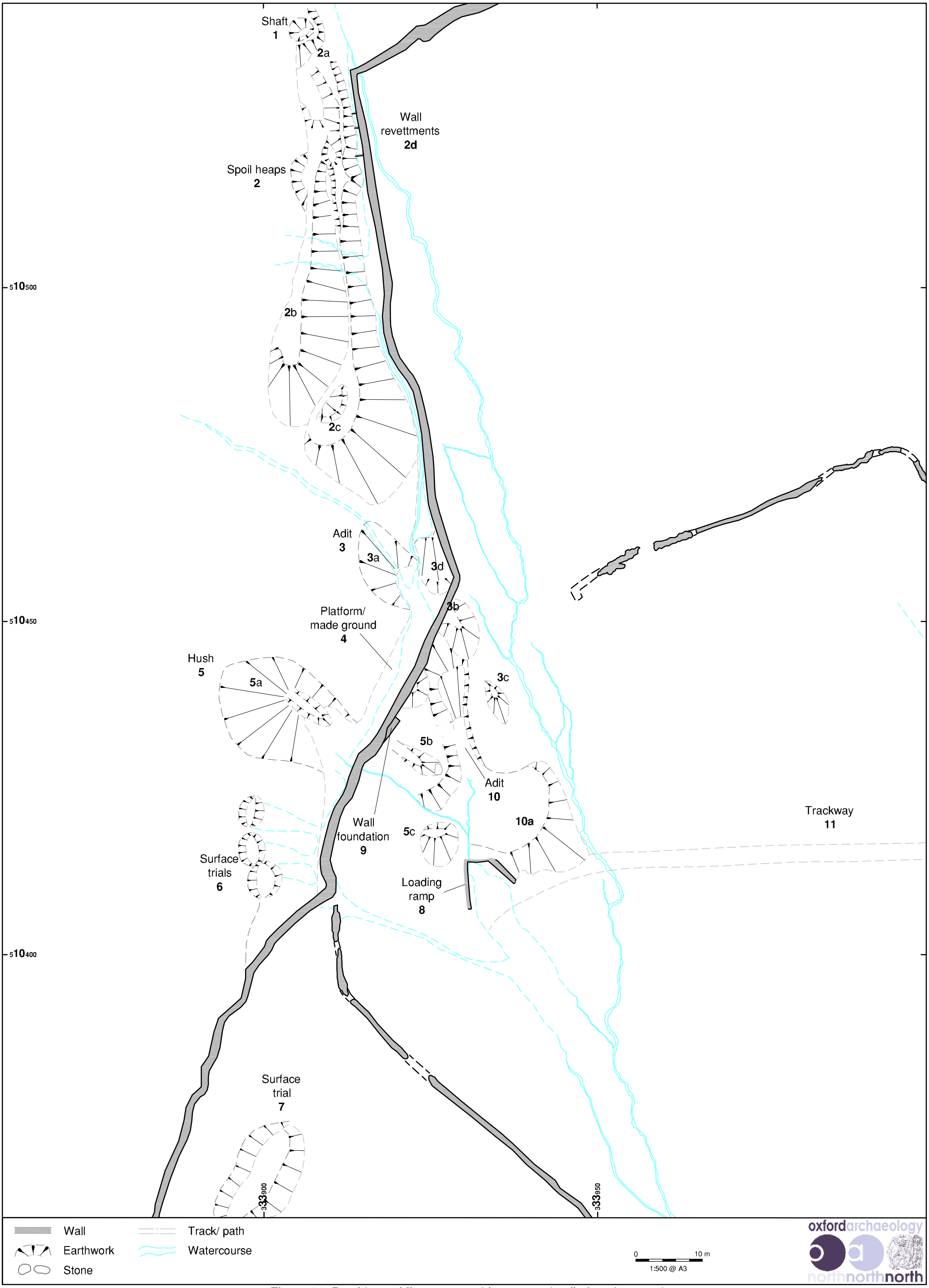

Figure 31: Providence Mine topographic survey; detail of northern end

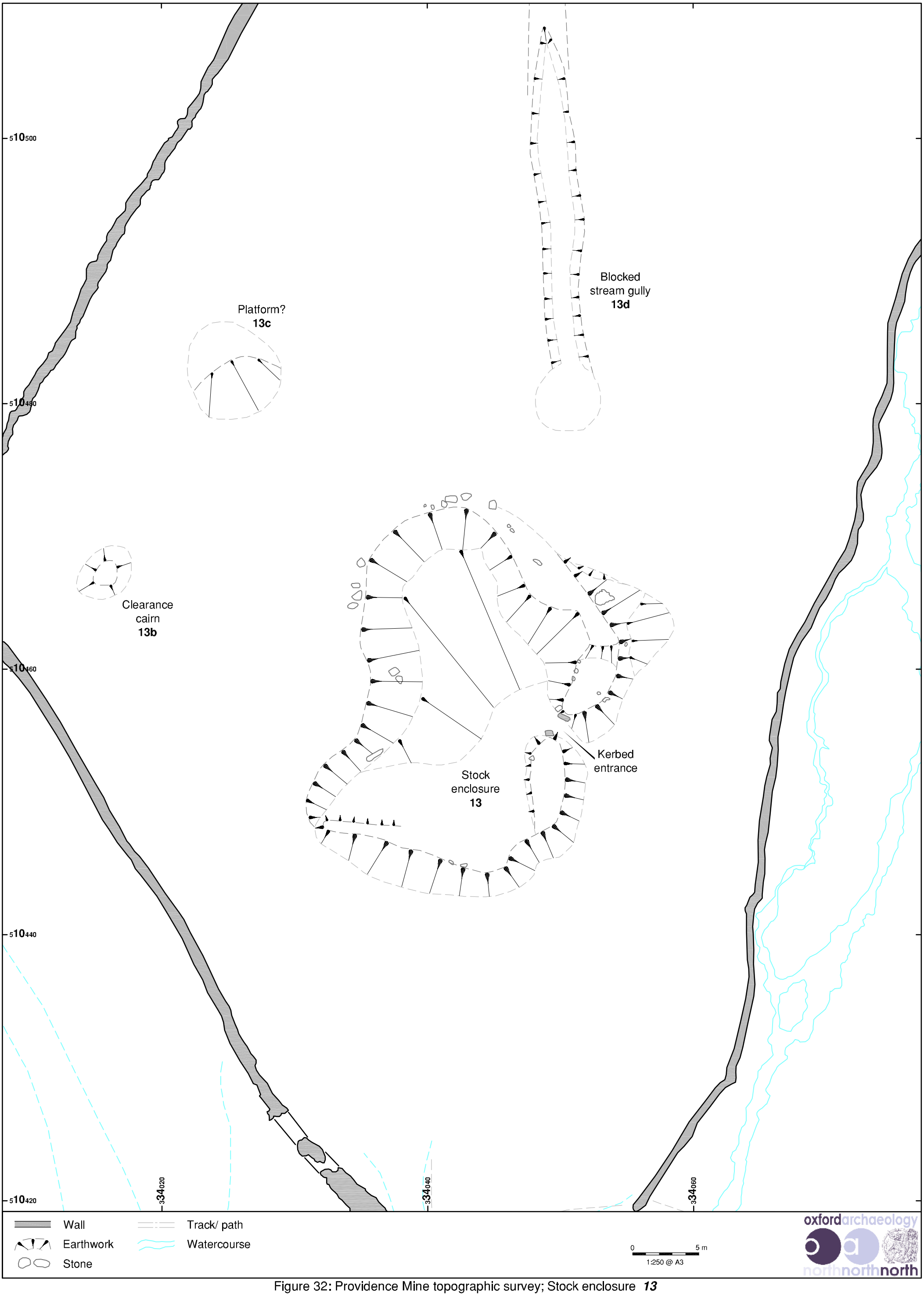

Figure 32: Providence Mine topographic survey; Stock enclosure ***13***

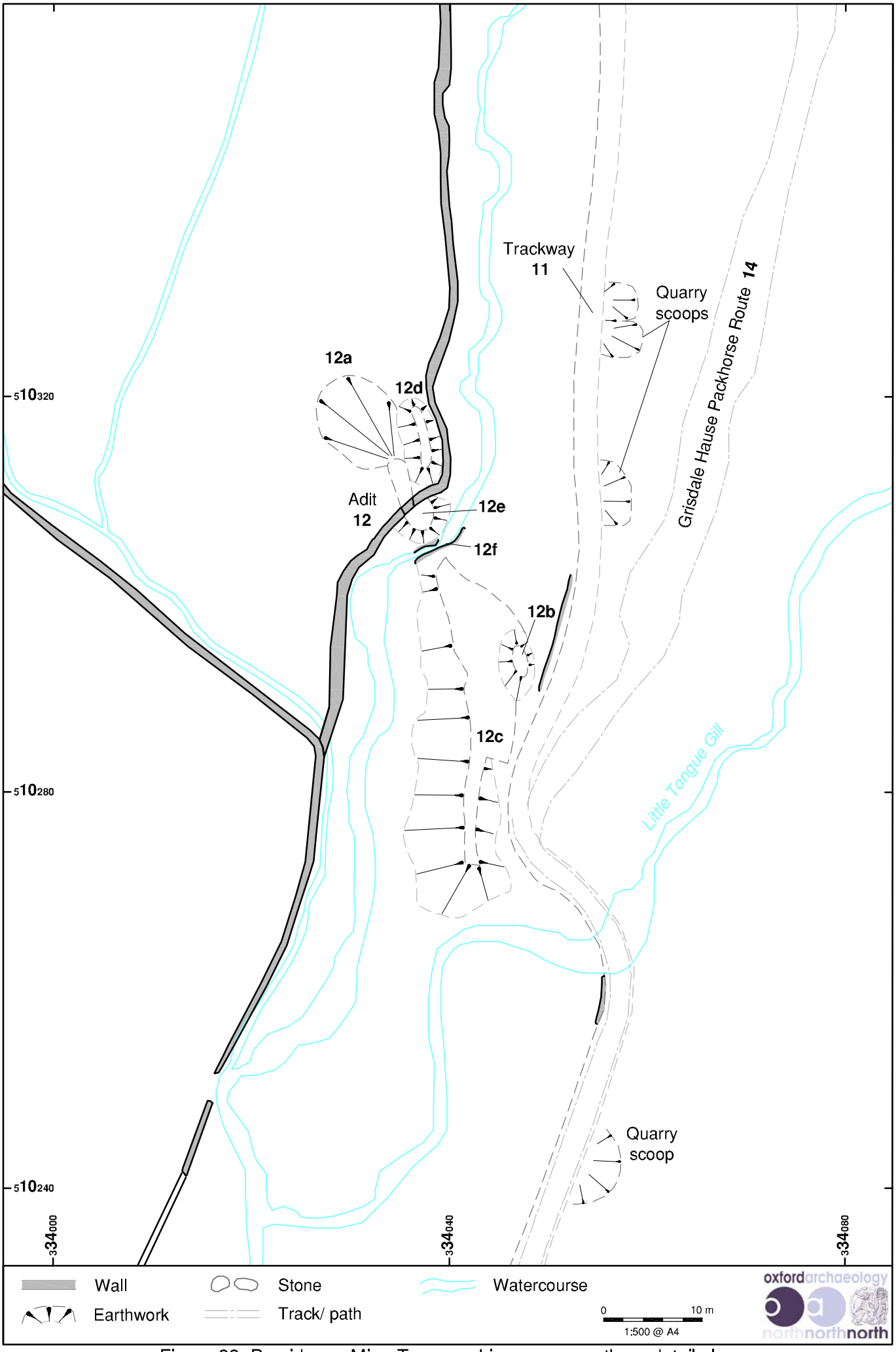

Figure 33: Providence Mine Topographic survey; southern detail plan