SARGILL LEAD SMELT MILL, HIGH ABBOTSIDE, NORTH-EAST OF SEDBUSK, NORTH YORKSHIRE

UPDATED ARCHAEOLOGICAL SURVEY WITH PROPOSED PROTECTION AND MONITORING SCHEME

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EXECUTIVE SUMMARY

In February 2012, Ed Dennison Archaeological Services Ltd (EDAS) were commissioned by Mr Robert White, Senior Conservation Archaeologist of the Yorkshire Dales National Park Authority (YDNPA) to update and enhance an existing 1997 archaeological survey of the remains of Sargill lead smelt mill, on High Abbotside to the north-east of Sedbusk, North Yorkshire (NGR SD 89759 92597 centred). The work was required to document the extent of decay, to identify current and future threats, provide appropriate recommendations to mitigate these threats, and to design a programme of periodic recording which will monitor the gradual decay of the structure.

The survey has uncovered no evidence to suggest that the early to mid 19th century date generally ascribed to the mill is incorrect. It also seems likely, as previously indicated by others, that the roasting or calcining furnace house at the west end was a later addition to the mill, although cartographic evidence shows that it was present by 1857. However, the current survey has allowed the conclusions offered in 1997 to be substantially revised, particularly in relation to the form of the hearths that were present and how they were blown. It is considered most likely that a single ore-hearth and single slag-hearth were present in the mill, but that they were of the more usual design, rather than the nationally very rare shaft-type suggested in 1997. Nevertheless, the hearths remain important regionally, as they could, for example, be compared to part-surviving examples at the Grinton and Cobscar lead smelt mills, and also to published examples in contemporary 19th century literature. In addition, the rare survival of an associated workstone from Sargill (currently privately housed at Bainbridge) increases the importance of the surviving ore hearth remains.

An alternative interpretation of the flue arrangement at Sargill is also proposed by the survey, although it is acknowledged that the exact functioning remains unclear, and it is likely to have been modified at least once during the lifetime of the building. Finally, the current survey proposes that some of the drystone walls around the hearth structures may have been erected by interested amateurs in the 1970s in an attempt to protect the remains from further decay or disturbance.

A series of recommendations to safeguard the archaeological significance of the site from natural erosion and a low level of agricultural grazing and/or visitor activity is proposed, as well as a strategy for future monitoring of the remains so the rate of change and decay can be recorded over time.

1 INTRODUCTION

Reasons and Circumstances for the Project

1.1 In February 2012, Ed Dennison Archaeological Services Ltd (EDAS) were commissioned by Mr Robert White, Senior Conservation Archaeologist of the Yorkshire Dales National Park Authority (YDNPA) to update and enhance an existing 1997 archaeological survey of the remains of Sargill lead smelt mill, on High Abbotside to the north-east of Sedbusk, North Yorkshire (NGR SD 89759 92597 centred). The survey covered an area measuring c.110m by 70m.

1.2 The work was required to document the extent of decay, to identify current and future threats, provide appropriate recommendations to mitigate these threats, and to design a programme of periodic recording which will monitor the gradual decay of the structure. The extent of the project was defined by a brief produced by the YDNPA and a detailed EDAS methods statement (see Appendices 5 and 6).

Site Location and Summary Description

1.3 The Sargill lead smelt mill lies in an isolated position on Sargill Side, Abbotside Common, on the north bank of Sargill Beck, c.2.5km north-east of the hamlet of Sedbusk (see figure 1). It can be approached to within c.200m on a private track from Sedbusk, which is only suitable for four-wheeled drive vehicles. The nearest public right of way is some 800m away but the site is now CRoW Open Access land (Countryside and Rights of Way Act 2000) (see figure 2). The complex and its surroundings are currently rough pasture, subject to limited grazing by sheep; it also lies within an active grouse shooting estate although there are no grouse butts in the immediate area of the site.

1.4 The small and isolated Sargill mill is believed to have been built in the 1840s and it ceased production in 1870. The complex was built c.340m to the south-east of the Sargill Lead Mine which produced the lead ore. The ore from the mine was originally taken to a mill c.8km away at Summerlodge in Swaledale, but the high transport costs meant that it was more cost-effective to built a mill nearer the several mines on Abbotside, including that at Sargill. The mill lay on the track to the Cogill coal pits and there was an abundant supply of peat on Black Band Hags to the north, and both these fuels were used in the mill.

1.5 The smelt mill building is a rectangular structure measuring c.17m by c.9m, partly built into the slope (see plates 1 and 2). Although ruined, the front walls stand to a maximum height of 3.95m. Internally, the mill was divided into two areas - the western end housed a waterwheel and bellows system and the larger eastern part contained two hearths, now obscured by rubble. The 22ft diameter waterwheel stood in a north-south aligned wheel pit and was powered from water taken from Sargill Beck via a c.220m long leat. At the time of the EDAS survey, based on the results of previous works, it was believed that the eastern hearth was also used for re-smelting slag, and that both hearths were of the less common shaft-furnace form, which were introduced during the 1850s. Immediately to the rear of the hearths is a narrow chamber suggested to have housed a condenser, used to extract lead from the exhaust fumes. Attached to the west wall of the mill was a lean-to building measuring 6.70m by 5.25m with a brick chimney, containing a roasting furnace which heated the ore prior to smelting.

1.6 To the rear of the mill are the remains of a stone-built flue extending in a straight line directly up the hillside for c.19m. This comprises a stone-lined vertical sided

trench 0.8m wide which is now open, the original roof covering having collapsed. At the north end of the flue are the remains of a rectangular chimney stack which survives up to 2.4m high (at NGR SD 89768 92624). Immediately north of the chimney is a substantial 'V' shaped zig-zag ditch extending north for a further 73m with shallow banks formed from spoil alongside the ditch; this is suggested to represent an uncompleted extension to the flue.

1.7 Despite its small size and isolated position, the complex has been the subject of a number of previous investigations. It was surveyed in c.1948 by Robert Clough (1980, 101-102) and was described by Raistrick in 1975 (Raistrick 1975, 95-98). It was re-surveyed in May 1997 by the then Lancaster University Archaeological Unit (LUAU) (Wild & Cranstone 1997). This latter work incorporated a topographical/earthwork survey at 1:500 scale, over an area measuring 110m by 70m (see figure 8). A ground level plan of the buildings was also prepared at 1:100 scale (see figure 9 top) and those wall elevations (23 in all) retaining significant detail were drawn at 1:50 scale. Descriptions of the 52 identified site features and structural components were prepared using a survey proforma and presented as a gazetteer. The project also included black and white and colour photography. The archive relating to this project is held by the YDNPA who commissioned the work.

1.8 The complex was recorded on English Heritage's 'Heritage at Risk' register for 2011, where its condition is described as "generally unsatisfactory with major localised problems" (English Heritage 2011, 99). Despite this, discussion between English Heritage and the YDNPA had considered that the remote location of the site mean that it was not currently a high priority for scarce consolidation resources, and so preservation by record was probably the most cost effective approach.

1.9 The whole of the mill complex, and the short section of flue, is a Scheduled Monument, designated in November 1998 (National Heritage List for England no. 1018338). The complex is also listed on the YDNPA Historic Environment Record (HER) as site MYD3880, and on English Heritage's National Monuments Record (NMR) as site SD 89 SE 3.

Aims and Objectives of the Project

1.10 The aims and objectives of the project were to:

- document the extent of decay at the Sargill smelt mill since 1997;
- identify threats to the archaeological integrity and significance of the monument;
- identify and produce recommendations for any short term measures necessary either to safeguard the archaeological significance or for Health and Safety reasons;
- design a methodology for future periodic recording of the decay process, suitable for adoption by trained Dales Volunteers;
- to produce a survey report and archive .

Survey Methodologies

1.11 As noted above, the scope of the project was defined by a YDNPA project brief and a subsequent EDAS methods statement (see Appendices 5 and 6).

Collation of Documentary Material

1.12 The YDNPA project brief did not require any new detailed documentary research to be undertaken. However, information relating to the smelt mill complex and its surroundings was obtained from the YDNPA and English Heritage's National Monuments Record, namely records/reports of any previous historic research and archaeological activity (including the 1997 LUAU report and accompanying archive), past management and land ownership records, and historic maps and plans. In addition, Richard Lamb, who assisted EDAS with the project, made available his private research and accumulated knowledge based on nearly 30 years experience of researching lead smelting and mining in the Yorkshire Dales; his body of material also included several colour 35mm slides of Sargill taken in June 1984.

Archaeological Survey

1.13 The existing LUAU survey material (comprising the survey report, archive drawings and photographs) was used as a base to measure the extent of decay at the mill since 1997. Full size copies of the archive drawings (topographic survey, ground plans and elevation drawings) were taken into the field, and any changes to the monument noted. This involved annotating the existing plans and elevation drawings, for example to note any changes to the earthworks, the extent of any rubble spreads, or collapse/demolition of some walls.

1.14 Initially, it was not envisaged that any new survey drawings would need to be produced. However, when checking the 1997 1:100 scale survey plan in the field, it became clear that, not only had the extent of visible masonry changed significantly to that shown previously, but also that some of the details were depicted incorrectly. Therefore, a new ground plan of the smelt mill was constructed at a scale of 1:50, using the previous LUAU survey as a base. In addition, in the course of walking to and from the mill, the area between the vehicle track and the mill on both sides of the Sargill Beck was subject to a rapid inspection, primarily to search for remains of the leats and watercourses shown on the Ordnance Survey 1st edition 1857 map (sheet 51).

1.15 The existing LUAU gazetteer of features and structural components was examined in detail, and any changes visible in the field since May 1997 were noted and the LUAU descriptions updated (see Appendix 1). The existing LUAU site numbering system (numbers prefixed with 'SAR') was retained for ease of comparison and description.

1.16 A new photographic survey of the site complex was also undertaken. As far as possible, this survey duplicated the LUAU photographic record, to enable a comparison to be made between the current and the 1997 condition. Additional photographs were also taken of features and components within the LUAU survey area not previously photographed, as well as illustrating specific well-preserved components and/or areas of erosion etc. Finally, more general photographs were taken showing the landscape context of the site/area and of specific elements. The colour photographs were produced using a digital camera with 10m megapixel resolution. English Heritage photographic guidelines were followed (English Heritage 2007, 14; 2006, 10-12), and each photograph was normally provided with a scale. All photographs were clearly numbered and labelled with the subject, orientation, date taken and photographer's name, and were cross-referenced to a catalogue of digital files etc (see Appendix 2).

1.17 The initial site visit was undertaken by EDAS on 20th June 2012, when the bulk of the fieldwork was completed. An additional visit was made on 5th July 2012 to produce the new 1:50 scale ground plan of the mill building.

Survey Products

Archaeological Survey Report

1.18 An EDAS archive survey report has been produced, based on the results of the documentary collation, the information obtained during the field visits, and the structured gazetteer of identified numbered components. The report assembles and summarises the available evidence for the survey area in an ordered form, synthesises the data, comments on the quality and reliability of the evidence, and how it might need to be supplemented by further fieldwork or desk-based research. For the most part, the report has been illustrated by reproducing and annotating the existing LUAU survey drawings. However, the new 1:50 scale ground floor plan of the mill conforms to English Heritage standards (English Heritage 1999; 2002, 14; 2007, 31-35). Smaller scale plans, at 1:10,000 and 1:2,500 scale, have been used to put the survey area into context.

1.19 As required by the project brief (see Appendix 6), the report also contains a series of short-term management recommendations, with the aim of safeguarding the archaeological resource or for Health and Safety reasons, based on the information gathered in the field. Proposals for protecting and securing the site to withstand natural erosion and a low level of agricultural grazing and/or visitor activity have been produced. These recommendations would lead to the 'ideal management' of the complex. The report also proposes a methodology for the future recording of the decay process at the complex, through periodic monitoring visits, suitable for adoption by trained Dales Volunteers.

Archaeological Survey Archive

1.20 A properly ordered and indexed project archive (composed of paper, magnetic and plastic media) was deposited with the YDNPA at the end of the project (EDAS site code SSM 12).

2 ARCHAEOLOGICAL AND HISTORICAL BACKGROUND

Sargill Lead Mine

2.1 Raistrick notes that the Sargill mine, to the north-west of the smelt mill, is located on the southern extremity of the Glover Gill (or Lover Gill) Vein, which runs south-south-east out of Swaledale (Raistrick 1975, 95). However, this is not the case, and the mine actually worked the Sargill-Providence Vein which was crossed by the Lover Gill Vein some distance to the north. The main level at Sargill, at NGR SD 8953 9295, was driven at the base of the Main Limestone at 494m OD. At 198m from the portal the drive turned north-north-east for 61m, perhaps to cross through a fault zone, before resuming its north-north-west course on the vein. At 457m from the portal a string in the footwall nearly at right angles to the vein was discovered and this was followed for 323m west-south-west until it reached a fault. The main forehead on the Sargill Vein was driven for a further 808m prior to abandonment (Dunham & Wilson 1985, 163).

2.2 The vein was being mined in Swaledale before 1715 and proved to be moderately rich in parts. The southernmost part of the vein, on Staggs Fell to the north of the Sargill Beck, was discovered and exploited on a small scale, and then subsequently from a level (Stags Fell Groove Mine at NGR SD 8649 9471 on the east bank of Fossdale Gill). In 1734, the London Lead Company leased the mines of Abbotside, including the Staggs Fell area, for 21 years, and in 1736 there are records of a 'Staggs Fell Mine' being at work. Raistrick (1975, 95-96) suggests that ore from the Abbotside mines would have been taken to Grinton smelt mill for smelting but, when the London Lead Company's lease there was terminated in 1750, it could be sent to Marrick. However, although the London Lead Company agreed a purchase price, they never actually held the lease at the Grinton mill; it remained part of Hugh Marriott's estate until 1756 when it passed to Caleb Readshaw of Richmond (Gill 2004, 124-125).

2.3 It is not known precisely when Sargill mine was started, but at the very beginning of the 19th century, a rent was paid for Sargill mine by William Balderstone, who was described as 'of the late London Lead Company'. Local tradition holds that part of the vein exploited from the level at Sargill was rich for approximately ten years in the early 19th century. However, documentary references are scarce; there is a single surviving note of output for the Sargill mine for the year 1813, which records a payment for millage to Messrs Hopper and Hutchinson for 24 pigs smelted. The next known reference occurs in 1845 when a new lease of the mine was agreed, and some production figures survive from between 1852 and 1863 (Raistrick 1975, 95-97). These were described by Raistrick as being 'pitiably small', the largest annual output being less than six tons of smelted lead, leading him to suggest that the locally attested rich working period must have occurred before 1845 (Raistrick 1975, 97). Gill and Burt (2003, 321-322) do not record any output from the mine before 1864.

2.4 From 1860 to 1868 the mine was in the possession of the Sargill Mines Company, with Lord Wharncliffe as lessor. In 1866 Lord Wharcliffe's agent advised him that "the lease of the lead mine at Sargill is run out. It would be to Lord Wharncliffe's interest to advertise it unless a better arrangement can be made with the old parties who seem to have no spirit towards developing the resources" (quoted by Raistrick 1975, 97). In 1869 the lease passed to Henry Pearse Esq, and on his death in 1881 until 1884 to Mr F H Pearse (Dunham & Wilson 1985, 163). In 1864 11.9 tons of ore was mined, producing 8.3 tons of lead, and between 1867 and 1885 142 tons of ore produced 85 tons of lead; 1883 was the most productive year

with 40 tons of lead being produced at a value of £392; between 1877 and 1880 between six and eight men were employed at the mine, all underground (Gill & Burt 2003, 321-322). A plan and section of the mine dating to 1886 is held in the North Yorkshire County Archives (NYCRO NG/MP/26 (1899); MIC 2472/450-458). The above figures and plan suggest that Raistrick's comment that the mine was closed by 1870 is erroneous (Raistrick 1975, 98).

2.5 The mine is marked on the 1857 Ordnance Survey 6" to 1 mile map (surveyed 1854) (see figure 3 top), named as 'Sargill Lead Mine'. A triangular arrangement of narrow tips (labelled as 'Refuse') is shown, with tracks converging on the assumed position of the level to the immediate north. A watercourse runs due south from the level, with others to east and west of the tops. The 1914 edition names the complex as 'Sargill Lead Mine (Disused)' (see figure 3 bottom). At the north end of the mine area, there appears to be a small sub-rectangular pond, with a large sub-oval area of spoil to the south. To the west side of the spoil, there is a four bay structure open to the west probably representing bouse teams, with further structures to the south perhaps associated with former dressing floors. A pair of small sub-square structures, one larger than the other, are shown mid-way between the mine and the mill, just to the north of the track shown in 1857. Raistrick notes that a "triple bouse team in which the well flagged floor of each compartment slopes to a centre line which in turn slopes to the front" survives at the mine, as well as the remains of a dressing floor (Raistrick 1975, 98).

Sargill Smelt Mill

2.6 In the absence of any firm documentary evidence, the smelt mill at Sargill is traditionally ascribed an early to mid 19th century date. Raistrick suggested that the mill had been built during Sargill Mine's 'rich period', while it was leased by the local Winn brothers, and this must have been prior to or perhaps just after 1845 (Raistrick 1975, 97). Dunham and Wilson (1985, 163) say the mill was erected in 1840, and Clough infers that the mill is broadly of mid 19th century date (Clough 1980, 102). The mill had a direct track to Cogill Head coal pits and access to peat on Black Band Hags (Raistrick 1975, 98).

2.7 The complex is marked on the 1857 Ordnance Survey 6" to 1 mile map (surveyed 1854) (see figure 3 top). The mill is named as 'Smelting Mill' and depicted as a rectangular roofed structure with a smaller rectangular roofed projection to the west end. There are three conjoined open structures to the north side of the main part of the mill. The flue leaves the central of these structures and runs north as an underground feature (depicted by pecked lines) for a short distance towards a 'Chimney'. The main access to and from the mill appears to have been from the south-east, with a 'Ford' across the Sargill Beck shown close-by to the south-east. There was also another track running north-west from the mill towards the mine. The headrace for the waterwheel was taken off the north side of the beck some distance to the west, opposite a semi-circular scarp created by an earlier meander. The race ran east, following a contour, and was also fed by several drains or watercourses running south down the valley side. After crossing the easternmost of these drains, the headrace was apparently taken underground in the form of a culvert, beneath the track leading to the mine, as it is not shown on the map.

2.8 The earliest known image of the mill is a photograph, taken by Backhouse in 1905-06 (Richard Lamb, *pers. comm.*) and reproduced by both Clough (1980, 102) and Raistrick (1975, 96) (see figure 4 top). This photograph shows the building viewed from the west, looking east. What appears to be a trackway is visible in the foreground, being undercut by the north side of the beck, with the earthwork of the

headrace seen above. The smaller rectangular structure shown at the end of the main mill building in 1857 had a single pitch roof, sloping down from north to south, although the roof covering had been removed by 1905-06. A substantial detached chimney stood close to the north-west corner, while there was a window in the west gable and a doorway in the south wall. The main mill building appears to have been of a tall single storey, with a pitched roof, although the roof covering and timbers had also gone by the time the photograph was taken. The surviving gables shown on the photograph suggest that the roof may have been unevenly pitched, with the south roof slope being somewhat wider and shallower than the north slope, although this is not certain. Two doorways, with a raised window between, are just visible in the south elevation. The flue running north from the mill can just be seen, with the ruin of the chimney more prominent; at this date, the chimney appears to have still survived to a height of several metres.

2.9 The derelict state of the mill on the early photograph is confirmed by the 1914 Ordnance Survey 6" to 1 mile map (Wild & Cranstone 1997, 44) (see figure 3 bottom). By this date, the mill is marked as 'Smelting Mill (Disused)', although it has the same general plan form as shown in 1857. The track between the mine and the mill is no longer shown and, as noted above, the lead mine is also indicated to be disused. At the north end of the mine area, there appears to be a small sub-rectangular pond, with a large sub-oval area of spoil to the south. To the west side of the spoil, there is a four bay structure probably representing bouse teams, with further structures to the south perhaps associated with former dressing floors. A pair of small sub-square structures, one larger than the other, are shown mid-way between the mine and the mill, just to the north of the track shown in 1857; the larger may represent a small mineshop or shelter for the lead workers.

2.10 The first known detailed survey of the mill was made by Clough and Wells in 1948, but apparently not drawn up until 1955 (Clough 1980, 101) (see figure 5). Although an invaluable source of information, like many of Clough's other drawings, it is not certain to what extent he was depicting what survived or reconstructing elements from earlier sources, presumably including Backhouse's photograph. Clough also included two photographs of a cast-iron lead pig mould on wheels, marked 'SAR GILL'; each pig was stated to weigh 13 stones (Clough 1980, 102). In 1975, Raistrick noted of the same that 'a pig mould with SARGILL was in existence in Askrigg recently, but has not been seen for a few years' (Raistrick 1975, 98); it may be the same SARGILL mould which is on display at the Dales Countryside Museum in Hawes (Robert White, YDNPA, *pers. comm.*).

2.11 An *ex situ* cast-iron 'workstone' and base from one of the hearths was formerly dumped to the east of the mill; a slide taken by Lawrence Barker (copy provided to EDAS by Robert White, YDNPA; see figure 7 bottom) shows the workstone where it was then resting. The slide must have been taken prior to c.1975, as at that date Raistrick described it as having been formerly 'partly buried in the small slag heap' but removed for safety (Raistrick 1975, 98). The workstone is currently in the possession of Mr L M Scarr at Cravenholme Farm, Bainbridge, where it is safely stored in a garage; Mr Scarr is also believed to have photographs taken of the mill during the 1970s, as well as several structures at the mine (Richard Lamb, *pers. comm.*). Raistrick (1975, 97) included a photograph of the upper part of the flue and chimney, taken before 1975 and presumably during the 1950s or 1960s (see figure 4 bottom). Finally, Richard Lamb kindly made available three colour slides of Sargill Mill taken by himself in June 1984 (see figures 6 and 7).

2.12 As previously noted, in May 1997, Lancaster University Archaeological Unit (LUAU) were commissioned by the YDNPA to survey the complex (Wild & Cranstone

1997). This work produced a topographical/earthwork survey at 1:500 scale (see figure 8), a ground level plan of the buildings at 1:100 scale and 1:50 scale drawn elevations (see figure 9), descriptions of 52 identified site features and structural components, and photographic record.

3 DESCRIPTION OF THE SURVEY AREA

Introduction

3.1 The Sargill smelt mill complex is described below in a logical sequence. However, rather than repeating the descriptions given by LUAU in 1997, the following text concentrates on how what was observed in 2012 differs from what was recorded in 1997, based on a summarised version of the information contained within the revised gazetteer of components (see Appendix 1). Following on from this is a discussion of the results of the survey, together with a revision of some of the findings presented by LUAU. Reference should be made to the floor plans and plates, and the photographic record which appears as Appendix 2; digital photographs are referenced in the following text in italic type and square brackets, the numbers before the stroke representing the film number and the number after indicating the frame e.g. [*5/32*].

3.2 The mill building is set on a very slight north-west /south-east alignment but, for ease of description, its long axis is considered to be aligned east-west. Where possible, specific architectural terms used in the text are as defined by Curl (1977). Finally, in the following text, 'modern' is taken to mean dating to after c.1945. Reference is also made to the existing LUAU gazetteer of features and structural components, and this numbering system (numbers prefixed with 'SAR') is retained for ease of comparison and description (e.g. **SAR 21**).

Setting and Surroundings

3.3 The mill is located towards the base of the steep south-facing slope forming the north side of the valley of the Sargill Beck [*1/352; 1/353; 1/358; 1/359; 1/361 to 1/365; 1/370*] (see plates 1 and 2). The principal approach to the mill, as shown on the 1857 Ordnance Survey and later maps (see figures 3), always appears to have been from the south-east along the beck (**SAR 21**) [*1/369*]. A flat surface running parallel to the trackway (**SAR 20**) at a lower level probably results from erosion by the beck [*1/409*]. The main track continued west past the mill for a short distance in 1857, and this route (**SAR 14**) survives as an earthwork [*1/403*]. It can in fact be traced somewhat further than shown on the map, as much as 100m west of the mill [*1/401*] and, to the immediate west of the of the survey area, it is supported by a slightly battered retaining wall built of roughly coursed stone, standing up to 1.0m in height (**SAR 16**) [*1/404* to *1/406*]. As it moves west, the track becomes narrower, and eventually resembles something like a leat rather than a trackway. Its destination is unknown, but it may have been providing access to the headrace and the point where it was taken off the beck.

3.4 To the west of the LUAU survey area, the headrace for the mill (**SAR 12**) is not particularly well-preserved. In 1857, the headrace was taken off the north side of the Sargill Beck c.220m to the west, opposite a semi-circular scarp created by an earlier meander. The race ran east, following a contour, and was also fed by several drains or watercourses running south down the valley side [*1/360*]. After crossing the easternmost of these drains, the headrace was apparently taken underground in a culvert, beneath the track leading to the mine, as it is not shown on the 1857 map. Examination of the section of the beck where the headrace is shown to start in 1857 revealed no surviving evidence; it is clear that the route of the beck has changed somewhat since the mid 19th century, and so any evidence for a weir, sluice and the other features that might be expected here has disappeared, presumably due to erosion. The headrace cannot be seen to the west of a modern shooting track, but to the east, there are fragmentary traces. Its

line is then lost, re-emerging clearly c.150m to the west of the mill. From here, it can be traced as a well-preserved earthwork, sometimes with evidence for rough stone revetting to the downslope embankment [*1/396; 1/397*]. In 1857 it is not shown extending further east beyond a drain or watercourse (**SAR 15**), perhaps suggesting that it was culverted, but it can now be traced for 10m beyond the former drain towards the rear of the smelt mill [*1/395*; *1/399*] (see plate 3). The LUAU gazetteer suggests that the headrace was carried on a small aqueduct over the watercourse nearest the mill, with the latter being culverted down to the beck. As reported in 1997, most of the roof slabs of the culvert have now collapsed [*1/398; 1/402*].

3.5 On the 1857 Ordnance Survey map, the mill was linked to Sargill Mine by a track, which survives as an earthwork (**SAR 52**). Within the LUAU survey area, the earthwork remains as previously described [*1/472; 1/479*]. At the mine itself (outside the LUAU survey area), a single level [*1/482; 1/483*], partly collapsed and with water issuing from it, is visible at the north end of the complex. There are six substantial lobed spoil tips radiating out (south) from the level [*1/484*]. There is no apparent sign of any gangue minerals within the heaps, and they are composed almost entirely of limestone with some evidence for sandstone. As mentioned above, Raistrick (1975, 98) noted a triple bouse team near the spoil heaps, and these may well be the structure with four conjoined compartments shown on the west side of the spoil heaps on the Ordnance Survey 1914 map (see figure 3 bottom). These bouse teams are still shown on an aerial photograph dating to March 1972 (MAL 16.72.017), and one may still have been visible in 1984 (Richard Lamb, *pers. comm.*), but they have since been demolished, perhaps for their building stone. Surviving wastes clearly indicate that dressing activity was taking place to the south of the mine, although again it is difficult to trace any of the structures shown in 1914, beyond the occasional rubble wall alignment. The structures shown between the mill and the mine in 1914, close to the former line of the track (SAR 52), survive as very slight platforms with some rubble edging, but their original function is unknown.

Features adjacent to the Mill

3.6 Field inspection showed that the majority of the features adjacent to the mill were much as described in 1997. However, some significant differences were noted.

3.7 To the east of the mill in 1997, two shallow depressions (**SAR 24** and **SAR 25**) survive [*1/412*] (see figure 8). However, they were suggested to possibly be the remains of circular buddles (Wild & Cranstone 1997, 19-20). This is considered highly unlikely, as they are not large enough, there is no apparent water supply for washing, no provision for power, and they bear no resemblance to other known examples such as those which survive at Grassington. Furthermore, there is no evidence for the finer dressing wastes that would have been expected to remain in the vicinity, and which can be observed to the south of Sargill Mine, where, as noted above, dressing activity did take place. The function of these two depressions could only be proven through archaeological excavation.

3.8 Close to the north-west corner of the mill, very little of an L-shaped structure (**SAR 46**) cut into the hillside and shown in 1997 remained visible, the majority now formed by steep south or west-facing scarps containing a high proportion of stone rubble (see figure 10) [*1/471; 1/475*]. To the east of this, a substantial ruinous north-south wall (**SAR 47**) now survives only approximately half the length shown in 1997, and cannot now be traced as far as the mill [*1/469*]. In the same area, a retaining wall (**SAR 49**), suggested as possibly relating to a former headrace

culvert in 1997, is now difficult to discern as previously described due to collapse [*1/470; 1/474*].

3.9 Further north, the earthworks of a suggested possible peat storage area (**SAR 07**) are less regular in form than described in 1997 and seem more likely to be a small natural landslip (see figure 8) [*1/385*]. To the west, another earthwork of a possible structure (**SAR 08**) is more convincing as an artificial platform than SAR 07, although it is not certain. This part of the site is damp and, to judge by the vegetation to the immediate south, water appears to issue regularly from this general area. However, a slight south-facing scarp runs east from this feature towards SAR 07, and there is another shallow south-facing scarp on the same alignment some 3m to the south [*1/384*]. Neither of these east-west earthworks were shown in 1997, but both are approximately perpendicular to the line of the flue. Their function is unclear - together, they may represent a possible east-west aligned platform measuring c.15m by c.3m, perhaps for storing peat or other materials, but it is not clear by any means - again limited archaeological excavation would possibly resolve this question. The size and output of the mill is probably the reason for their not being an actual peat store building at the site.

The Mill Complex (see figure 10)

3.10 The mill complex essentially comprises four elements, described below from west to east as the roasting or calcining furnace house, the blowing room, the smelting room and the flue [*1/354; 1/358*].

The roasting or calcining furnace house (SAR 43)

3.11 This forms the westernmost part of the mill complex. The earliest known image of the mill, a photograph, taken by Backhouse in 1905-06 (Raistrick 1975, 96; see figure 4 top) shows the building to have a single pitch roof, sloping down from north to south, although the roof covering had been removed by the time of the photograph. A substantial detached chimney stood close to the north-west corner, while there was a window in the west gable and a doorway in the south wall. In 1948, Clough marks a calcining hearth aligned east-west across the north side of the interior of this space, with a detached brick chimney to the external north-west corner (Clough 1980, 101) (see figure 5). Raistrick (1975, 98) states that the building in which the roasting furnace is housed is less well-built than the main mill building, raising the possibility that it may be a later addition; this was repeated in by LUAU in 1997, when the building was described as ‘structurally secondary’ (Wild & Cranstone 1997, 11). If it is a later addition to the main mill building, then it was clearly present by 1857.

3.12 The building measured 6.61m long by 5.24m wide, but only the north-west and south-west corners now survive to any degree (**SAR 43.1**) [*1/436 to 1/438*] (see plate 4). It was formerly entered by a 1.28m wide doorway in the south wall, positioned to the centre of the wall, although Clough erroneously shows it to be at the east end (Clough 1980, 101). Confusingly (and incorrectly), the LUAU 1997 report states that ‘entrances were observed at the south-west and south-east corners’ while their gazetteer states that there were doorways in the south and west walls (Wild & Cranstone 1997, 12 & 28). There appears to have been no direct internal connection between the building and the mill proper to the east. The building was lit by a window in the west wall (**SAR 43.2**), still extant when the early 20th century photograph was taken. Internally, the above-ground remains of the furnace itself are very slight, comprising only four iron bars (**SAR 45**) at the north-east corner. These bars are called ‘beams’ in the 1997 report (Wild & Cranstone

1997, 12 & 28) but, given that they are set vertically, they are better described as standards [*1/439; 1/440*] (see plate 5). They are unlikely to have been associated with the transfer of ore into the furnace as suggested in the LUAU 1997 gazetteer, as ore was normally fed in by a suitable hopper mounted on the roof. Instead, they may represent part of the firebox; the furnace would have been tied together using numerous upright iron standards set deep into the ground, linked with tie-bars and wedges (Richard Lamb, *pers. comm.*) - they are described as 'strapping beams' in the main body of the 1997 report (Wild & Cranstone 1997, 12).

3.13 The detached chimney stack (**SAR 44**) at the external north-west corner of the building was much taller when Backhouse took his photograph in 1905-06 (Raistrick 1975, 96) and it appears to have been largely of stone, with perhaps one or two courses of bricks around the top [*1/441; 1/477*] (see figure 4 top). The 'pot' may have been formed by the large diameter ceramic pipes that can now be seen scattered around the main mill building, including within the blocking of the original doorway at the south end of the east wall (SAR 31.2) (Richard Lamb, *pers. comm.*) (see below). Clough (1980, 102) refers to a detached brick chimney, and Raistrick (1975, 98) also states that it is built of brick. Given that the complex was clearly derelict by the early 20th century, there is no reason why a stone chimney should have been rebuilt in brick by the 1940s. Perhaps it was lined with brick, and this was what Clough and Raistrick were referring to, although the only bricks noted around the complex by the current survey were a few vitrified examples close to the hearths.

The blowing room (part of SAR 31)

3.14 The blowing room occupies the western part of the main mill building (**SAR 31**), housing a north-south aligned waterwheel (**SAR 32**) against the west side and the blowing apparatus, a single pair of bellows. The LUAU 1997 survey report uses a number of different terms in relation to the blowing apparatus, for example, 'air blower' and 'a piston or a fan blower' (Wild & Cranstone 1997, 11 & 32) but Clough (1948, 101) shows a single bellows. In 1948, Clough indicates a leat entering through the west end of the mill's north wall, driving a wheel that must have been either overshot or breastshot. The diameter of the wheel was given as 22 feet (c.7.30m) and the width as indicated by the scale on the plan is less than 5 feet (1.6m). Raistrick (1975, 98) stated that the wheelpit could have accommodated a wheel of between 18 to 20 feet in diameter (i.e. less than c.6.60m). The surviving visible sections of the ledges at the north and south ends of the wheelpit are set c.7m apart, giving a slightly greater length than indicated in 1997 (6.8m), but less than that indicated by Clough. The estimated width given in 1997 (1.8m) appears to be approximately correct, although it is not clear on what evidence this measurement was based. By using the height datums given on the 1997 drawings, it is possible to estimate the height of the headrace as being c.437m AOD or slightly higher, and the internal floor level at 433.50m AOD. The beck is set c.4m below the level of the floor, and together these measurements indicate that there is sufficient fall for an overshot wheel (Richard Lamb, *pers. comm.*).

3.15 The disposition of rubble as currently exists, compared to that in 1997, appears to be different over the former wheelpit, and to the north of the centre is a curious structure, not shown in 1997. It takes the form of an opening, 0.20m wide and 0.30m high, set within a roughly stepped pile of stone which has a 'beehive' or 'igloo' profile [*1/443*] (see plate 6). The opening leads into a buried passage of similarly dimensions, equipped with a roughly constructed slab roof and floor [*1/445*]. The passage extends at least 1.40m to the north-west of the opening, curving very slightly around to the west as it does so. It is presumably a relatively

recent construction, having been built from the surrounding rubble, as it obviously cannot have been present when the waterwheel was in place. Its function is not known - it might represent a form of rabbit-type/trap or vermin trap.

3.16 In 1997, it was stated that 'the bellows or pump' were housed over a low dividing north-south wall (**SAR 33** and **SAR 34**) in the south-east corner of the room (Wild & Cranstone 1997, 21). This would not have been the case, as the bellows would have had to have been held between uprights and also fixed firmly to the floor; the bellows are also shown towards the north-east corner of the room by Clough (1980, 101). Similarly, in 1997 it was suggested of the south wall (**SAR 31.1**) of the blowing room that 'Holes and orange lichen on the north (internal) face suggest some sort of beamed machinery' (Wild & Cranstone 1997, 21), but it is not certain if all of the 'holes' referred to represent sockets or simply fallen masonry, and any case, 'beamed machinery' would not have been housed here.

3.17 In 1948, Clough (1980, 101) showed a wall on the east side of the bellows room with an opening for the air pipe to run from the bellows into the back of the hearths. This wall (**SAR 37.3**) still survives [*1/454; 1/455*] (see plate 8). The lower part, said to be tied in to an east-west wall **SAR 40** to the north in 1997 (Wild & Cranstone 1997, 25), is actually formed by the flat lintel of the opening indicated by Clough. The opening is now very low, but it can be seen to open out into a small chamber, which extends perhaps 1m back from the opening [*1/426*]. The walls of the chamber are all well built, and the north wall is continuous with the south face of wall SAR 40. At its east end, the chamber drops down, and appears to have a cast-iron firebar, presumably taken from the roasting furnace, at the base (see plate 9). There is also a low opening at the base of the south wall, which would have opened into the area of ore hearth SAR 37. Neither the opening nor the chamber was noted in the LUAU 1997 report. Instead, it was suggested that a, east-west passage (partly defined by walls SAR 40 and 50.1) to the north of the hearths carried the air-pipes (Wild & Cranstone 1997, 12). Much of this passage is now choked with rubble but there is an opening (**SAR 42**) at the western end, described as a 'tuyere hole' in 1997 (Wild & Cranstone 1997, 27) [*1/449*] (see plate 10). Detailed inspection shows that the passage or chamber extends back at least 1.70m to the east [*1/429*]. The north wall is rather crudely constructed and appears partly collapsed, but the south wall (continuous with SAR 40?) is much better built. The space between the walls appears to have a flag roof. Towards the end of the visible east part, the space is choked with fallen stone [*1/453*]. Amongst the stone however is an interesting item, set approximately horizontal, apparently of cast-iron, and resembling a pronounced fish-bellied rail in form (see plate 11). This appears to be an *ex situ* bearer from the roasting furnace - the bearers were substantial castings which supported the much more slender firebars at intervals along the grate (Richard Lamb, *pers. comm.*). It is possible that the hole or passage is another crudely constructed rabbit type, built within the part-backfilled east-west passage defined by walls SAR 40 and 50, but this cannot be confirmed at present.

3.18 The north, west and south walls of the blowing room are largely as previously described in 1997 (**SAR 31.4**, **SAR 31.3** and part of **SAR 31.1**) [*1/422* to *1/425; 1/442; 1/446; 1/447*], with the opening in the south wall only partly blocked with well-constructed masonry [*1/421*] (see plate 7).

The smelting room (part of SAR 31)

3.19 The smelting room, housing the two hearths, occupies the larger, eastern part of the smelt mill building (**SAR 31**). In 1948, Clough shows the smelting room to be

separated from the blowing room by a north-south wall with a doorway, set at a right angle to the south wall (**SAR 31.1**) of the mill. There is a 0.46m long wall stub (**SAR 35**) in just this position, and in 1997 it was noted to have a return at the south end where Clough showed a doorway; it is likely to be a remnant of this wall, and suggests that Clough's prediction is broadly accurate. However, on the south side of this area, there are two further walls (**SAR 33** and **SAR 34**) set at an angle to the south wall. Only the east face of the former was clearly visible at the time of the EDAS survey. It was not well bonded into the south wall of the mill, and there is no evidence that it ever rose any higher than its current c.0.50m height, so the extent to that it actually 'divided' one area from another is uncertain. The other wall to the west was not visible at the time of the survey. It seems likely that both are later insertions, or possibly rebuildings of an earlier partition, although there is little evidence for one on the mill's south wall.

3.20 The east wall of the room (**SAR 31.2**) has a door at the south end, with one pintle and a latch surviving internally; as noted by LUAU, this doorway has been partly blocked with two large diameter ceramic pipes (probably the pot from the detached chimney to the north-west - SAR 44), and a gap left at the base of the blocking on the north side of the lower upright pipe, which itself has been crudely blocked, may form a sheep creep [*1/430; 1/431*] (see plate 12). The south wall of the room (part of **SAR 31.1**) contains a doorway in the centre and a window to the west, both blocked [1/427; 1/428] (see plate 13); the doorway has lost its timber lintel since 1997 while the internal lintel to the window in the process of collapse (see Chapter 4 below).

3.21 There are the remains of two hearths in the smelting room. The western hearth (**SAR 37**) was an ore hearth. Clough indicates an ore hearth in this position in 1948, but the accompanying text suggests that the remains may not have been as clear as in his drawing, as he refers to there being ' two or possibly three hearths' (Clough 1980, 102) in the smelting room. Raistrick (1975, 98) referred only to a single ore hearth, but stated that the structure was still visible and referred to the former workstone of the ore hearth as lying outside of the mill. Today, the most visible remaining elements of the ore hearth are two corbel-like projections (**SAR 37.1** and **SAR 37.2**) [*1/456; 1/457; 1/459*] (see plate 14). These were described as being 'supports for workstone' or 'worked stone supports' in 1997 (Wild & Cranstone 1997, 12 & 24) but are actually the springers for the shallow arch over the hearth. The 'slot' and 'chamfer' referred to in 1997 are to key in the voussoir above the springer. The height of the springers above the estimated ground level is very similar to 19th century illustrations of ore hearths, for example that depicted by Percy (1870, 278-282). The sloping part of the cast-iron workstone would have been placed beneath the arch, with a sumpter pot beneath the central groove of the workstone (Richard Lamb, *pers. comm.*). Both corbel-like projections were marked by Clough in 1948. A 'rod' is indicated running back (north) from each projection (Clough 1980, 101), perhaps the equivalent of those surviving to wall SAR 39.2 (see below), but there is now no trace of such a feature and it is possible that Clough had transposed those surviving in the hearth to the east (Richard Lamb, *pers. comm.*). As has already been noted, an *ex situ* workstone and hearth base was formerly dumped outside to the east of the mill (see figure 7 bottom), but it was removed before 1975 and is currently stored in a private structure in Bainbridge. A wall (**SAR 37.4**) suggested to form the back of the hearth in 1997 was not visible at the time of the EDAS survey. The east wall of the hearth (**SAR 38**) is of at least two phases, including a rather crudely built upper part that might be a modern addition [*1/458*]. Similarly, the hearth itself was later blocked by a drystone wall (**SAR 36**), which might also be a relatively recent addition (see plate 13). Reference is made in 1997 to a fine brown or chocolate covered dust

surviving in several places around the hearth remains (Wild & Cranstone 1997, 12); on close examination, this is thought most likely to be a lichen, rather than peat (Wild & Cranstone 1997, 33) or another industrial residue (Richard Lamb, *pers. comm.*).

3.22 The eastern hearth (**SAR 39**) was also indicated by Clough in this position in 1948 and named as an 'ore hearth', but it was of different form to that to the west, and Clough's depiction differs from the surviving remains. Raistrick (1975, 98) referred only to a single ore hearth but also to a slag hearth in the mill; his reference to the latter appears to have been the first mention of such a structure. Its identification as a slag hearth was presumably based either on the then surviving form, or the presence of certain slags in the vicinity. Black vitreous vesicular slag, albeit only in small quantities, is still visible to the east of the smelt mill (see SAR 28). Its presence, and also the coke that was noted in 1997, suggest that either a slag hearth was in use or that an ore hearth had been converted to run on coke at a much higher temperature. There is a lack of visible grey slag from primary smelting at Sargill, and indeed a lack of slag generally. This may reflect disposal into the beck; Grinton Mill, for example, retains very little slag despite a long period of use (Richard Lamb, *pers. comm.*). The structure of the eastern hearth appears to have been partly affected and obscured by later additions (see plate 15). Two walls (**SAR 39.1** and **SAR 39.2**) were suggested in 1997 to perhaps indicate a 'semi-circular hearth construction' (Wild & Cranstone 1997, 12). However, they are clearly later additions to the hearth area, and comprise little more than crude drystone blockings [*1/460; 1/461*]; they may be relatively recent in date. Two iron straps project from wall SAR 39.2. These were not drawn correctly in plan in 1997, actually being set further apart. This means that, while the western strap does extend back through SAR 39.2 into an earlier wall SAR 39.3 as stated in 1997, the eastern strap is actually set into the south end of another earlier wall (**SAR 39.4**). The former north wall of the hearth (**SAR 39.5**) also remains visible [*1/464*].

The flue and chimney (SAR 01; SAR 04; SAR 09; SAR 50)

3.23 As has already been noted above, to the rear (north) of the furnaces there is a rubble-choked east-west aligned passage partly defined by wall **SAR 40** to the south and wall **SAR 50.1** to the north, that was mistakenly interpreted in 1997 as formerly housing the air-pipes from the bellows. In 1857, three conjoined sub-square structures are shown in this general location, outside the main body of the mill, and with the flue running north from the central structure. Clough shows the south wall here in 1948, pierced by two openings, each positioned behind one of the two ore hearths. The passage is divided into two parts of equal size, the east part labelled as a condenser, while the west part is shown as being flagged over (Clough 1980, 101). Interestingly, a small aperture with a flag roof may just be visible in this position on a slide taken in 1984 (Richard Lamb collection, 84031; see figure 7 top). Raistrick (1975, 98) stated that the structures shown by Clough were 'two small condenser chambers'. It is possible that the passage is a later addition to the mill, and it might have functioned as a dust chamber to help allow the settling out of particles of fume, replacing an earlier arrangement. Clearly, whatever arrangement existed latterly was thought to be inadequate in some way, as work was clearly started on a northern extension to the flue, although the structure was never built (see below; Richard Lamb, *pers. comm.).*

3.24 The north wall of the east-west passage (**SAR 50.1**) forms the south side of the southern end of the flue [*1/465*] (see plate 16). The trapezoidal-shaped space is described as a possible 'condensing chamber' in 1997 (**SAR 50**) (Wild & Cranstone 1997, 12), and both Clough and Raistrick refer to structures in this area

as condensers or condensing chambers (see above), this being described as part of the flue. The 'condensing chamber' lacks the size, obvious water supply, the drive mechanism to work apparatus, or the associated settling pond/s that might be expected with any sort of condensing activity. Alternatively, and more probably, it was a settling chamber, where flue dust could accumulate due to a sudden reduction in velocity (Richard Lamb, *pers. comm.*). This might explain why Clough labelled an opening, which still survives, in the east wall as a 'Cleaning Door' (Clough 1980, 101) [*1/467; 1/468*] (see plate 17); it was shown in plan but not in section by LUAU. The southern end of this chamber preserves the remains of a sub wall (**SAR 50.2**) noted by both Clough (1980, 101) and Raistrick (1975, 98) which formed a 'mid-feather'. This mid-feather would have separated the flow of gases from the two hearths and prevented backflow (Richard Lamb, *pers. comm.*).

3.25 Beyond the mid-feather, the flue (**SAR 09**) runs north for c.19m up the hillside [*1/386* to *1/390; 1/462*] (see plates 16 and 18). Comparison of the surviving ruins with the photograph published by Raistrick (1975, 97) and one taken in 1984 (Richard Lamb collection, 84031) (see figures 4 top and 7 bottom) shows that the fallen and *in situ* stonework of the flue have undergone little change in the almost 40 years. The flue terminates at a c.2m square chimney (**SAR 04**) (see plates 19 and 20). In the photograph taken by Backhouse in 1905-06 (Raistrick 1975, 96; see figure 4 top), all four external elevations of the chimney survived to a considerably greater height than at present [*1/377* to *1/381*]. A further undated photograph published by Raistrick (1975, 97) (see figure 4 bottom), but which must have been taken at least 30 to 40 years after Backhouse's, shows that substantial collapse had taken place to the north and west sides in the intervening period. However, the flat-headed opening at the base of the internal south elevation still survives [*1/382*]; this was not apparently noted by LUAU.

3.26 There were clearly once plans to extend the flue further northwards but although the 73.5m long zig-zag construction trench (**SAR 01**) was completed, the actual structure was never built [*1/371; 1/372*] (see plate 21). The trench does not appear on the 1857 Ordnance Survey map, suggesting that it may have been added after this date. However, neither is it shown on the 1914 edition, and so its omission in 1857 may not be significant; it is not mentioned by either Clough or Raistrick; it is possible that an earthwork less than 1m deep might not have been recorded by the Ordnance Survey. This form of 'zig-zag' flue, which was used to create turbulence to encourage deposition of exhaust fumes, is not common in Yorkshire, and is more usually associated with smelt mills in Derbyshire, for example (Richard Lamb, *pers. comm.*). However, ongoing survey work at New Mill in Arkengarthdale has uncovered evidence for a flue system that may in part incorporate a similar angled form, albeit on a much larger scale (Richardson & Dennison, forthcoming).

Discussion of the Survey Results

3.27 The current survey has uncovered no evidence to suggest that the early to mid 19th century date generally ascribed to the mill is incorrect. It also seems likely, as previously indicated by both Raistrick (1975, 98) and LUAU (1997, 11), that the roasting or calcining furnace house was a later addition to the mill, although cartographic evidence shows that it was present by 1857.

3.28 However, the current survey has allowed the conclusions offered in 1997 to be substantially revised. In 1997, it was stated that "*The smelt mill building, as would be expected given its late date of foundation, differs from the traditional Yorkshire smelt mill in that its layout does not permit the hearths to be blown directly by bellows coupled to a waterwheel. Instead, the blowing mechanism was*

presumably housed in the western cell of the building, adjacent to the wheelpit, and the air conducted by blast pipes through aperture SAR 42 and along the passageway north of wall SAR 40, to be fed into the rear of the two hearths" (Wild & Cranstone 1997, 32). In fact, very few Yorkshire smelt mills did have hearths that were blown directly, and most were equipped with pipes conveying air from the blowing apparatus to the hearths, exactly the arrangement shown at Sargill by Clough in 1948 (Richard Lamb, *pers. comm.*). The air pipes to the hearths in the smelting room at Sargill were not carried through aperture SAR 42 and the east-west passage, but through the previously unrecorded opening in wall SAR 37.3 and then along the rear of the hearths (see plates 8 and 9). Interestingly, when the dimensions of the smelting room, bellows room and roasting or calcining house at Sargill are compared to other Yorkshire examples (scaled approximately from Clough's drawings), they are in fact (with the exception of Grinton) very similar (Richard Lamb, *pers. comm.*; see Appendix 3). This suggests that, although Sargill may have been a relatively late foundation, its layout reflected well-established proportions and principles. The waterwheel driving the bellows in the blowing room is most likely to have been overshot.

3.29 Close examination of the remains of the western hearth (SAR 37) in the smelting room has established that it is more likely to have been of a traditional ore hearth (Richard Lamb, *pers. comm.*) (see plate 14), rather than the shaft-furnace form suggested in 1997 (Wild & Cranstone 1997, 32). The lack of primary slags at Sargill, together with the presence of coke and secondary slags, all suggest that a slag hearth was also in use, although again this is more likely to have been of the more usual design than the shaft-furnace form previously suggested (SAR 39) (see plate 15). The inference in 1997 was that the slag hearth remains represented the Spanish type depicted by Percy (1870, 419 & 420) to be of circular construction and high enough to link directly into the flue system. The fact that the more or less square foundations are still *in situ*, and the presence of the iron bars or straps, which may be compared directly to those remaining at Grinton and those shown on Percy's drawings of the Keld Heads slag hearth (1870, 413-415), implies its interpretation as a conventional slag hearth built of stone which conforms to Percy's general form. The Spanish slag hearth was invented prior to 1861 specifically for the treatment of Roman slags. According to Percy, it was tried at various works "in recent years" and had been abandoned by "some of our largest and most experienced lead-smelters"; it seems unlikely that such a furnace would in any case have been erected at Sargill during a period when little ore was apparently being smelted.

3.30 The previously suggested survival of nationally very rare shaft-type ore and slag hearths at Sargill was highlighted as being the main importance of the mill (Wild & Cranstone 1997, 32-34), a fact repeated in the 1998 Scheduled Monument description. However, their re-interpretation as more traditional types of hearths does not diminish their importance regionally. They could, for example, be compared to part-surviving examples at Grinton and Cobscar mills, and also to published examples in contemporary 19th century literature. It is interesting that when the currently visible remains and those recorded in 1997 are combined, both hearths appear to have been angular U-shaped structures, open to the south and broadly similar in size, the western perhaps slightly larger than the eastern. This apparent similarity is in marked contrast to what is shown by Clough in 1948 (Clough 1980, 101; see figure 5). The fact that all three north-south walls (SAR 37.3, SAR 38 and SAR 39.4) flanking and between the hearths butt the passage wall SAR 40 to the north is also of interest. Is this merely a constructional feature (the hearths being added to the main body of the building once this was nearing completion), or does it infer some subsequent remodelling of either the hearths or

their flue system? The rare survival of an associated workstone from Sargill increases the importance of the surviving ore hearth remains.

3.31 As a result of the current survey, an alternative interpretation of the flue system at Sargill can also be proposed. The east-west passage to the immediate north of the hearths may have comprised one or more dust chambers, allowing the particles of fume to settle out (Richard Lamb, *pers. comm.*). Beyond the passage, the southern end of the flue (SAR 50), although described as a possible 'condensing chamber' in 1997 (Wild & Cranstone 1997, 12), lacks the necessary associated features and it too may have been some form of settling chamber, where flue dust could accumulate due to a sudden reduction in velocity (Richard Lamb, *pers. comm.*). However, it is acknowledged that the exact functioning of the flue arrangement at Sargill remains unclear, and it is also likely to have been modified at least once during the lifetime of the building. As suggested above, it is possible that such modification was undertaken because of changes to the hearths themselves. There were also clearly plans to extend the flue further northwards up the hillside which, although the alignment was dug out, the flue structure was never completed.

3.32 Finally, the current survey has proposed that the drystone walls around the hearths are not indicative of any former process (in the case of hearth SAR 39), and that all are later, perhaps relatively recent, additions (see plates 14 and 15). It remains puzzling as to why such substantial drystone structures should have been built here after the mill had clearly gone out of use. If there was a concern about stock accessing these areas, then the same result could have been achieved more easily by completely blocking or boarding the doorways in the south wall. A possible answer lies in the removal of the *ex situ* workstone from the mill at some point prior to 1975. The current keeper of the workstone, Mr Scarr of Bainbridge, states that it was removed from the mill for safekeeping by the Yoredale Mine and Cave Group; might they have added some of the drystone structures to the hearths at around the same time, in an attempt to protect or stabilise the remains from further decay or disturbance? The conservation works carried out by interested amateur groups during the 1960s-1980s, and even more recently, are unfortunately often not well documented; for example, at Beever's Shaft at Grassington, the substantial retaining wall to the front of the bouse teams associated with the shaft is thought to have been rebuilt by the Earby Mines Research Group during the 1970s, although this is not as well known as their work on the nearby Cockber powder house (Dennison & Richardson, forthcoming). It is possible that the 1970s photographs of the mill believed to be held by Mr Scarr would confirm if such works took place at Sargill. It is hoped to visit Mr Scarr in the near future to clarify this, and to record the workstone in detail.

4 PROPOSED PROTECTION AND MONITORING SCHEME

Introduction

4.1 The amount of decay and collapse that has taken place at the mill complex since May 1997 is summarised below, based on the information contained within the gazetteer of components (Appendix 1). Where this information can be supplemented from earlier sources to give an idea of decay over a longer period, this is also given below. As with Chapter 3 above, reference should be made to the new ground plan of the mill complex (figure 10) and the photographic record (Appendix 2).

4.2 A decision has already been made in principle to allow the smelt mill complex to gradually decay over time, and a crucial part of the current project, as defined by the YDNPA brief (see Appendix 6), was to identify and produce recommendations for any short term measures necessary either to safeguard the archaeological significance or for Health and Safety reasons, to identify and produce any proposals for protecting and securing the site to withstand natural erosion and a low level of agricultural grazing and/or visitor activity, and to design a methodology for future periodic recording of the decay process, suitable for adoption by trained Dales Volunteers.

Decay and Collapse since 1997

The surrounding area

4.3 Within the wider survey area, there are several features recorded in 1997 which can either no longer be seen or which are no longer clearly visible. To the south and south-west of the mill, in the north bank of the Sargill Beck, a culvert outlet (**SAR 17**) and the possible wheelpit tailrace (**SAR 19**) could not be identified, and both may have been destroyed by slumping and/or water erosion since 1997 [*1/407; 1/408*]. Further north, earthworks previously thought to represent a possible peat storage area (**SAR 07**) are more likely to be a small natural landslip [*1/385*]. To the east of the mill, a retaining wall (**SAR 22**) preserves less visible detail than was described in 1997 and is significantly more tumbled [*1/410; 1/411*], while three culverts (**SAR 26**, **SAR 27** and **SAR 30**) have now become difficult to trace amongst long grass and other vegetation [*1/415; 1/414; 1/418*].

The mill complex

4.4 Comparison of the ground floor plan of the mill (**SAR 31**) made in 1997 with that made for the current survey (see figures 9 top and 10) indicates that considerably more features and wall faces were then visible than are now. This is presumably the result of weathering causing localised decay and collapse, as there is no clear evidence for deliberate damage having taken place since 1997. For example, in the blowing room at the west end of the mill building, rubble apparently fallen since 1997 now hides the ledge or step of the wheelpit along the internal face of the west wall (**SAR 31.3**; elevation 9), although that on the north and south internal faces is still visible [*1/442*]. There also appears to have been some re-distribution of rubble over the former wheelpit area since 1991 (**SAR 32**), and a possible vermin trap or rabbit type has been created inside a mound of rubble in the north-west corner of the room (see plate 6). Considerably less of two walls running north from the south side of the blowing room (**SAR 33** and **SAR 34**) are now visible.

4.5 The current survey has also confirmed that both hearths in the smelting room have drystone wall additions (**SAR 36** and **SAR 39.1/39.2**) to their fronts which are not part of the original structure [*1/457; 1/460*] (see plates 14 and 15); both were present in 1997 but are likely to have been created relatively recently, possibly the c.1970s, in an attempt to protect or stabilise the remains of the hearths (see Chapter 4 below). Some parts of these drystone constructions have collapsed slightly since 1997.

4.6 The area of the mill complex that has undergone the greatest decay between May 1997 and June/July 2012 is the south wall of the mill building (**SAR 31.1**). The 1905-06 photograph taken by Backhouse (Raistrick 1975, 96; see figure 4 top) shows the south elevation of the mill surviving to what was probably its approximate full height. The building was a tall single storey, and there were two doorways in the south elevation, flanking a raised window. Several courses of projecting throughstones are also visible. By June 1984 (Richard Lamb collection, 84029 & 84030; see figure 6), the upper parts of the south-east and north-east corners of the elevation had partially collapsed, almost certainly brought down by the collapse of the respective gables at either end. There had been some loss of walling to the top of the central part of the elevation as well, although both doorways and the central window remained intact, although by now partially blocked. The LUAU survey photographs and drawings (elevations 5 and 14) show that there was apparently little further collapse between 1984 and 1997. However, between 1997 and 2012, the timber lintel and the 0.6m height of masonry it supported over the eastern doorway has collapsed [*1/366; 1/419*] (see plate 22), and the internal lintel of the window to the west and the masonry above has also collapsed [*1/367; 1/420*], leaving the surviving external lintel in a precarious state (see plate 23); there is no external lintel and only a thin surviving central lintel which, when this collapses, will bring down the masonry above the west side of the window (see plate 24). The western doorway remains as recorded in 1997. There has also been some minor collapse at the very east end of the external elevation. Similarly, the upper northern end of the east wall of the mill (**SAR 31.2**; elevation 15) has collapsed since 1997 [*1/432*]. Finally, other walls to the rear of the smelt mill (**SAR 46** to **SAR 49**) are also now either much reduced in size or missing completely since 1997, possibly due to natural erosion and slumping caused by rabbit activity [*1/470; 1/475*].

4.7 Moving north, since 1997, a vermin trap has been created across the lower (southern) end of the flue (**SAR 09**) [*1/388; 1/389*] (see plate 18); a photograph on the internet (*www.flickr.com/photos/bohagan/6014077005*) shows that this trap was built before September 2004. To secure the east end of the timber supporting the trap, a small number of stones around the top of the flue side have been moved [*1/391; 1/392*]. The chimney (**SAR 04**) at the north end of the flue has also undergone some further collapse since 1997, particularly to the east (internal and external) and north (external) sides and north-east corner [*1/380; 1/381*] - the whole structure now looks rather precarious, with significant cracks running through the masonry on the east and south elevations [*1/378*] (see plate 19). There is also some rabbit activity around the chimney, at the head of the zig-zag flue (**SAR 1**) (see plate 21) and below the route of the headrace (**SAR 12**) [*1/383; 1/375; 1/360*].

Recommendations to Protect and Safeguard the Site

4.8 Over the last 15 years, the collapse and deterioration of the smelt mill complex has been fairly limited, and that which has occurred seems to result from natural decay or erosion rather than deliberate interference (see above). It also appears that the

majority of the mill complex has achieved a state of equilibrium, with extensive spreads of rubble now protecting structural elements below and to some extent buttressing the higher of the upstanding walls. Those elements currently most at risk are the highest walls at the mill, namely the south and east walls (**SAR 31.1**; elevations 5 and 14; **SAR 31.2**; elevations 13 and 15).

4.9 It is clear that the site does not attract a significant number of visitors. Although within CRoW land and not far from an established shooting track on Abbotside Common, the site is some distance away from habitation and the track is only suitable for four wheeled drive vehicles. There are no definitive public rights of way in the vicinity and the mill is not on any obvious route linking walking destinations. The site is likely therefore only to be visited by very small numbers of serious walkers or those with an interest in lead mining remains. Some of the upstanding and unstable walls of the mill, for example the c.2m high south wall (**SAR 31.1**) may well present some Health and Safety concerns to the landowners, the Stagsfell Estate although, as noted above, it is only likely to be accessed by those experienced in remote upland locations or visiting ruins. Health and Safety issues are clearly not a reason for any demolition of the complex but, if this is considered to be a problem, an appropriate sign could be erected on the approach to the mill warning visitors of the potential risks.

4.10 The other threats identified at the site include natural agencies such as localised water erosion along the north side of the beck (the mill does not appear to have been directly affected, to date) and slumping of the steeper slopes to the rear (north) of the mill. In some cases, slumping has been exacerbated by rabbit activity which is present over most of the area around the complex. Possible attempts to control rabbit and other vermin populations, presumably to protect breeding grouse colonies, have resulted in the creation of a trap across the lower part of the flue and perhaps a rabbit-type trap in rubble in the west side of the blowing room. The area around the mill is also used for sheep grazing, although none were seen at the time of the 2012 survey. The ruins do not appear to be currently used as part of any stock management regime (although sheep may enter to gain shelter), but they may have been in the past. For example, the blocking to the openings in the south wall (**SAR 31.1**) of the mill, which appear to have originated before 1984, may have been an attempt to control sheep access into the interior of the ruins; the possible sheep creep at the south end of the east wall (**SAR 31.2**) may also be related to the use of this part of the mill as a collecting area.

4.11 Given that it has been decided in principle to allow the smelt mill complex to naturally decay over time, it is not appropriate to make any significant recommendations to safeguard the archaeological significance of the site, or to identify and produce any proposals for protecting and securing the site to withstand natural erosion. Such recommendations, for example, consolidation/stabilisation of major parts of the structure, limited and localised strengthening of the beck side, and/or selected archaeological excavation/exposure of the most important areas of the mill (i.e. the hearths and the blowing arrangements), would not be cost-effective given the current state of the monument, the very low level of visitor activity and limited agricultural grazing use. Nevertheless, it would be highly desirable for the remains of both hearths to be subject to archaeological excavation (or more likely controlled dismantling) and more detailed recording in order to establish their exact form before further collapse occurs. As part of this recording, the *ex situ* workstone, currently stored privately at Bainbridge, should also be subject to a detailed measured and photographic survey, and if possible made publicly accessible, perhaps at the Dales Countryside Museum where it

could be reunited with the SARGILL lead mould. It is hoped to record the workstone in the near future.

4.12 Despite the above, it might be considered appropriate to undertake a number of limited interventions to help stabilise the building in the short term and prevent imminent collapse. These inventions could include, for example:

- the renewal or replacement of the timber lintels over the window in the south wall (**SAR 31.1**) (see plates 23 and 24);
- slight rebuilding of unsupported masonry around the east doorway in the south wall (**SAR 31.1**) (see plate 22);
- the rebuilding or reforming of the walls and drystone interventions around the hearths (**SAR 38**, **SAR 39.1** and **SAR 39.2**) (see plates 14 and 15).

Strategy for Future Monitoring

4.13 It would be a useful exercise to monitor the further gradual deterioration of the smelt mill ruins over time. This would serve two important functions. Firstly, it would produce a record of any collapses which might reveal additional structural or technological evidence for the development and function at the mill. Secondly, it would measure how fast such structures do actually decay over time due to natural causes, information which would be useful when assessing conservation and consolidation priorities for other similar sites in the Yorkshire Dales and elsewhere.

4.14 Given the current timescale for decay, as evidenced by the two surveys undertaken in 1997 and 2012, it is recommended that the future monitoring is done once every five to seven years; this time frame could be extended once the south wall of the mill and the chimney has undergone significant collapse, as subsequent decay is likely to be more limited. It might also be appropriate to carry out informal visits, for example every two years, which could then trigger a formal visit and assessment if necessary. In terms of the monitoring records, it would be appropriate to annotate the most recent plan of the mill (see figure 10) (amending over years where necessary), and taking colour digital photographs of the main elevations (inside and out). A minimum of 35 photographs should be taken from the same positions as those taken for the current survey, as well an appropriate number of more general shots. Keeping to the same photographic location points will allow for direct comparison between individual survey data sets. A detailed methodology for the monitoring work is presented as Appendix 4.

4.15 It is also important that the monitoring visits and the records they produce are adequately indexed and catalogued (e.g. date, subject and direction of individual photographs), and that all recorded information is deposited with the YDNPA in a site archive.

5 BIBLIOGRAPHY

Primary sources

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1972 Vertical aerial photograph (MAL 16.72.017), taken 21st March 1972 (YDNPA)

1984 Three colour slides of Sargill Mill (Richard Lamb slide collection, nos 84029, 84030 & 84031)

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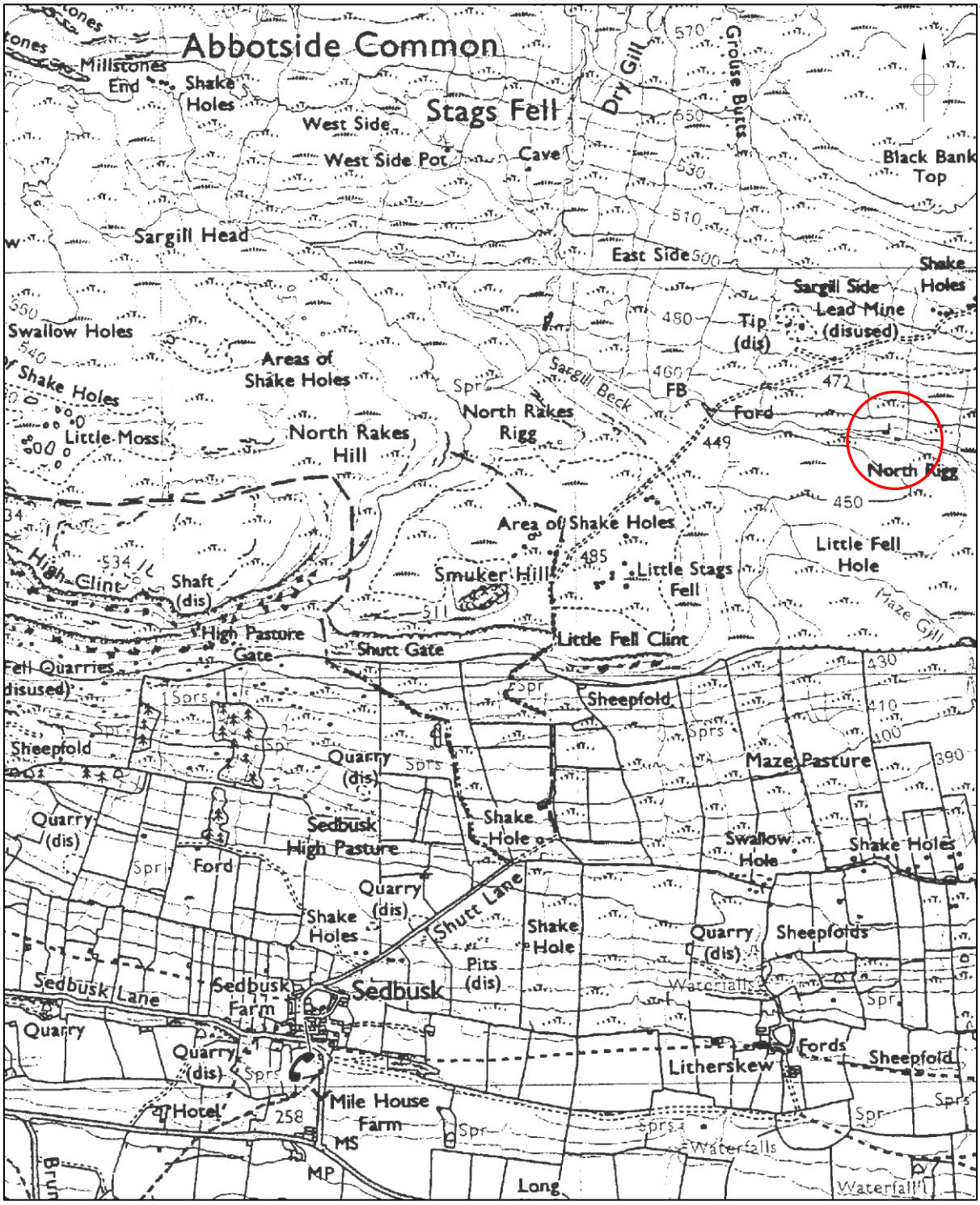
6 ACKNOWLEDGEMENTS

6.1 The updated archaeological survey at the Sargill lead smelt mill complex was commissioned by the Yorkshire Dales National Park Authority, and EDAS would like to thank Robert White, Senior Conservation Archaeologist, for his help and assistance during the project. Thanks are also due to the Stagsfell Estate, and Alex Stott (gamekeeper), for allowing access to the site.

6.2 The archaeological (drawn and photographic) survey was undertaken by Shaun Richardson and Richard Lamb. Richard Lamb also kindly made available his private research and accumulated knowledge based on nearly 30 years experience of researching lead smelting and mining in the Yorkshire Dales. Comments on the draft survey report were kindly provided by Richard Lamb and Robert White. The final report was produced by Ed Dennison, with whom the responsibility for any errors remains.



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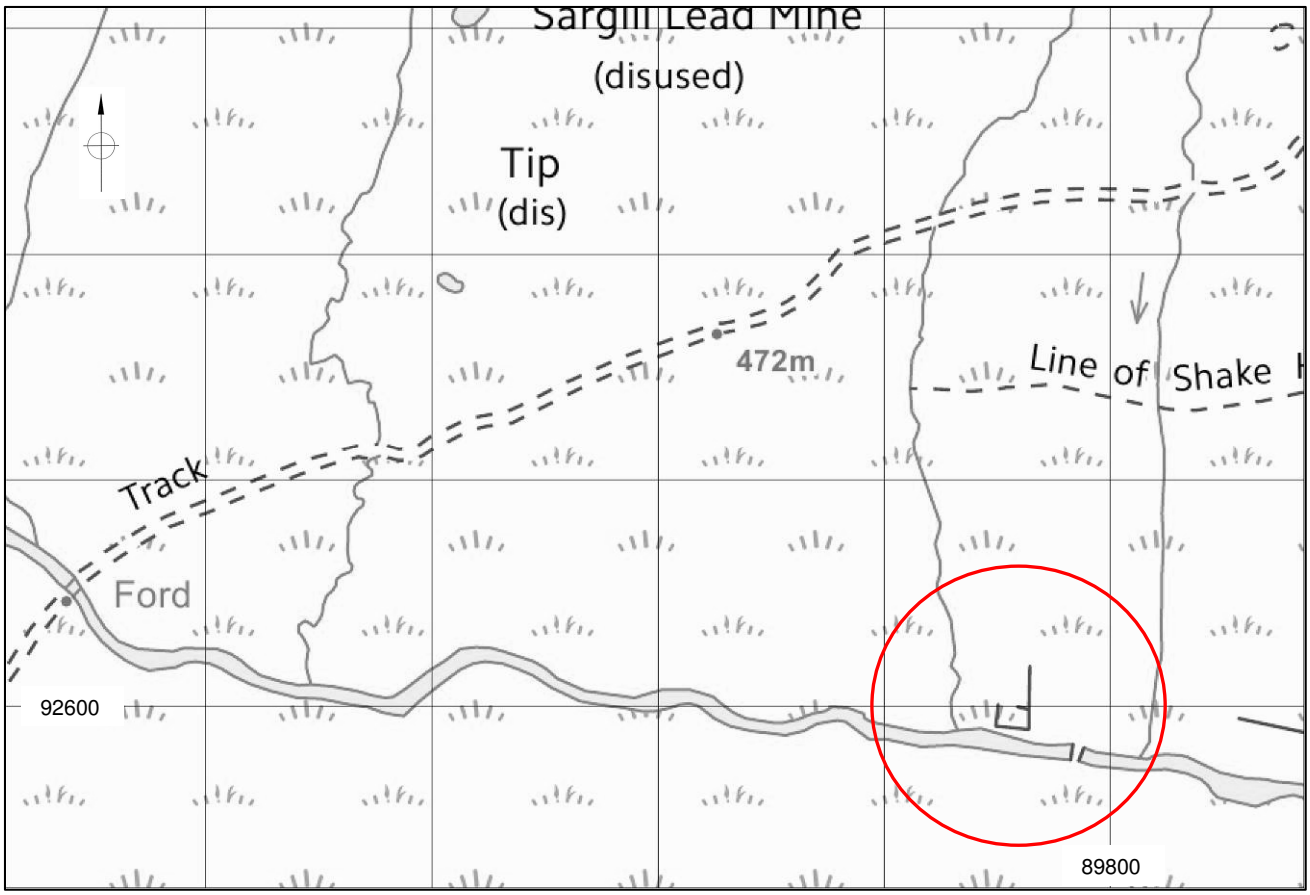
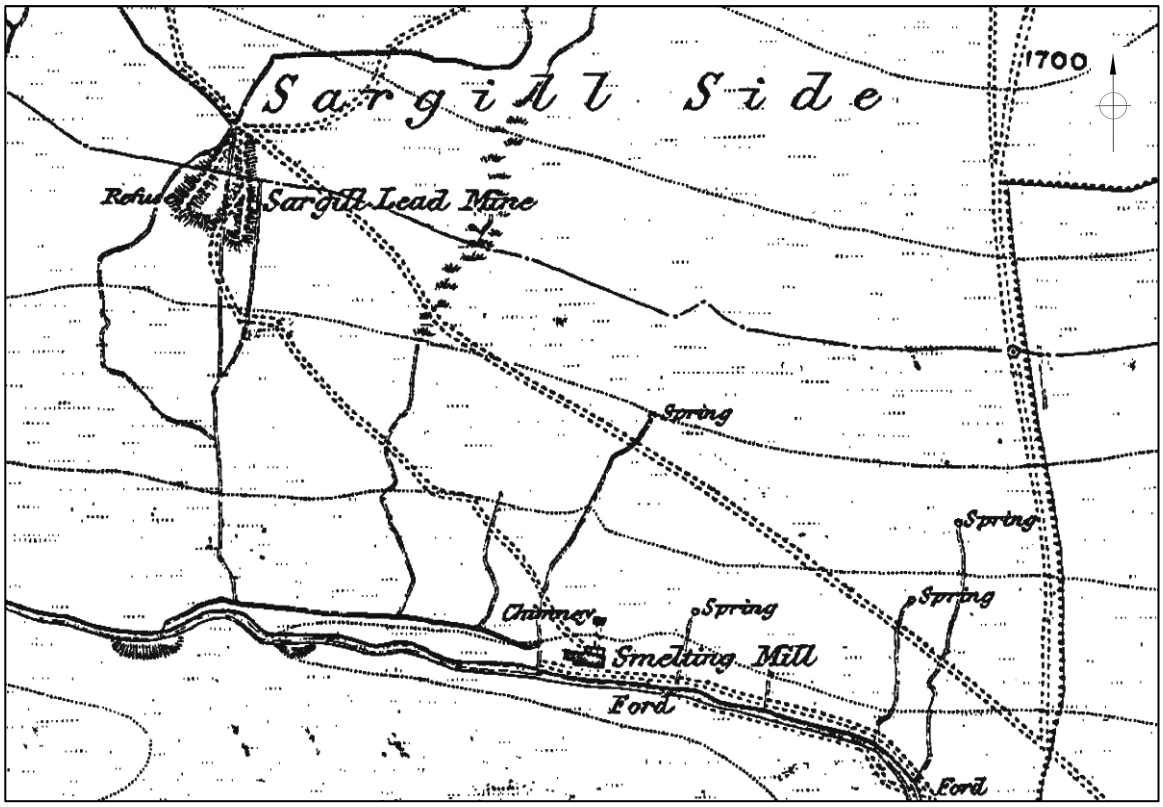
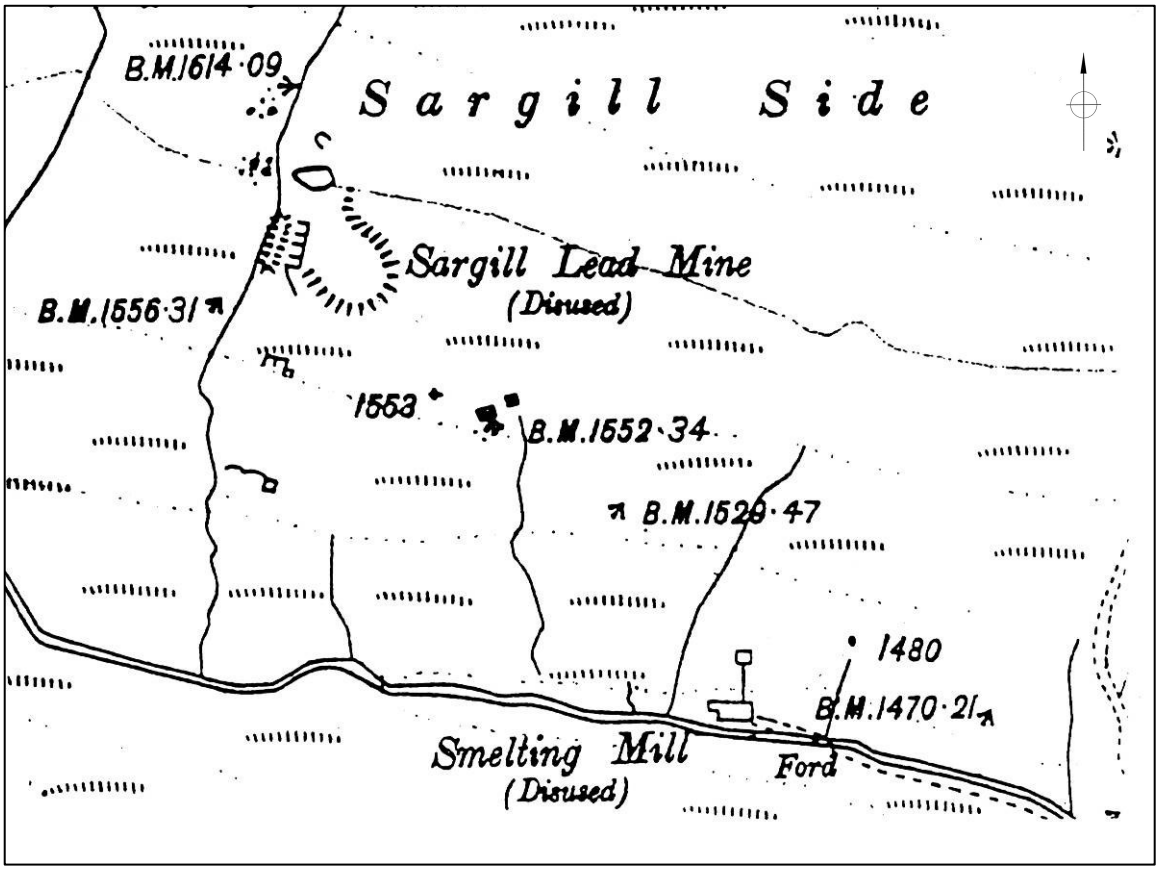
TITLE: GENERAL LOCATION	
SCALE: NTS	DATE: FEB 2013
EDAS	FIGURE: 1



Base plan provided by YDNPA.

PROJECT: SARGILL SMELT MILL	
TITLE: SITE LOCATION	
SCALE: NTS	DATE: FEB 2013
EDAS	FIGURE: 2





Top: Ordnance Survey 1857 6" map (sheet 51), surveyed 1854.

Bottom: Ordnance Survey 1914 6" map (sheet NY 51 SW).

PROJECT	
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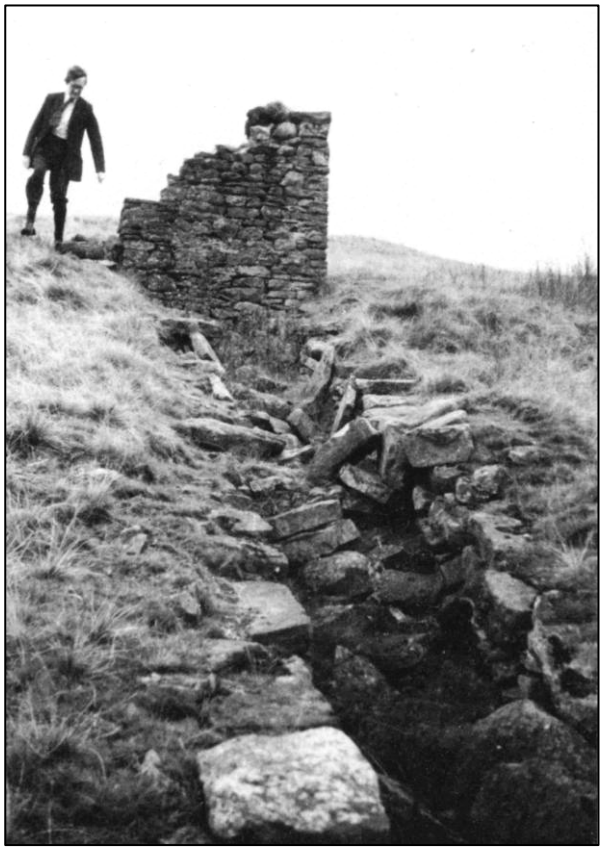
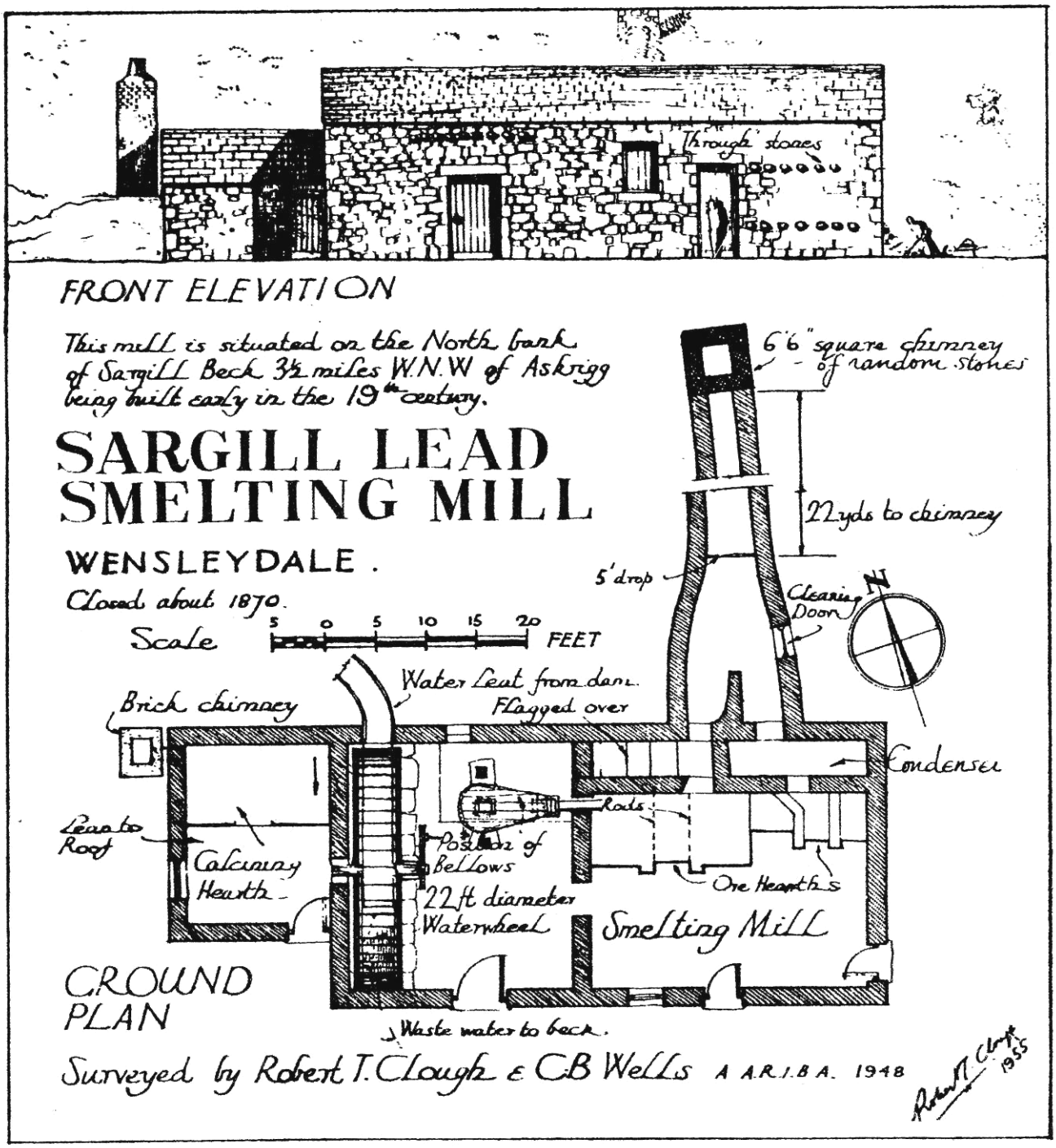
TITLE	
HISTORIC ORDNANCE SURVEY MAPS	
SCALE	DATE
NTS	FEB 2013
EDAS	FIGURE 3



Top: View of smelt mill and chimney, looking NE, taken in 1905-06 by Backhouse (Raistrick 1975, 96).

Bottom: View of chimney and flue, looking N, taken c.1950s-60s (Raistrick 1975, 97).

PROJECT	
SARGILL SMELT MILL	
TITLE	
EARLY PHOTOGRAPHS	
SCALE	DATE
NTS	FEB 2013
EDAS	FIGURE 4



Source: Clough, R T 1980 *The Lead Smelting Mills of the Yorkshire Dales and Northern Pennines*, 101.

PROJECT: SARGILL SMELT MILL	
TITLE: CLOUGH & WELLS' 1948 SURVEY	
SCALE: NTS	DATE: FEB 2013
EDAS	FIGURE: 5

Top: Smelt mill looking NE, taken June 1984 (Richard Lamb slide collection, 84029).

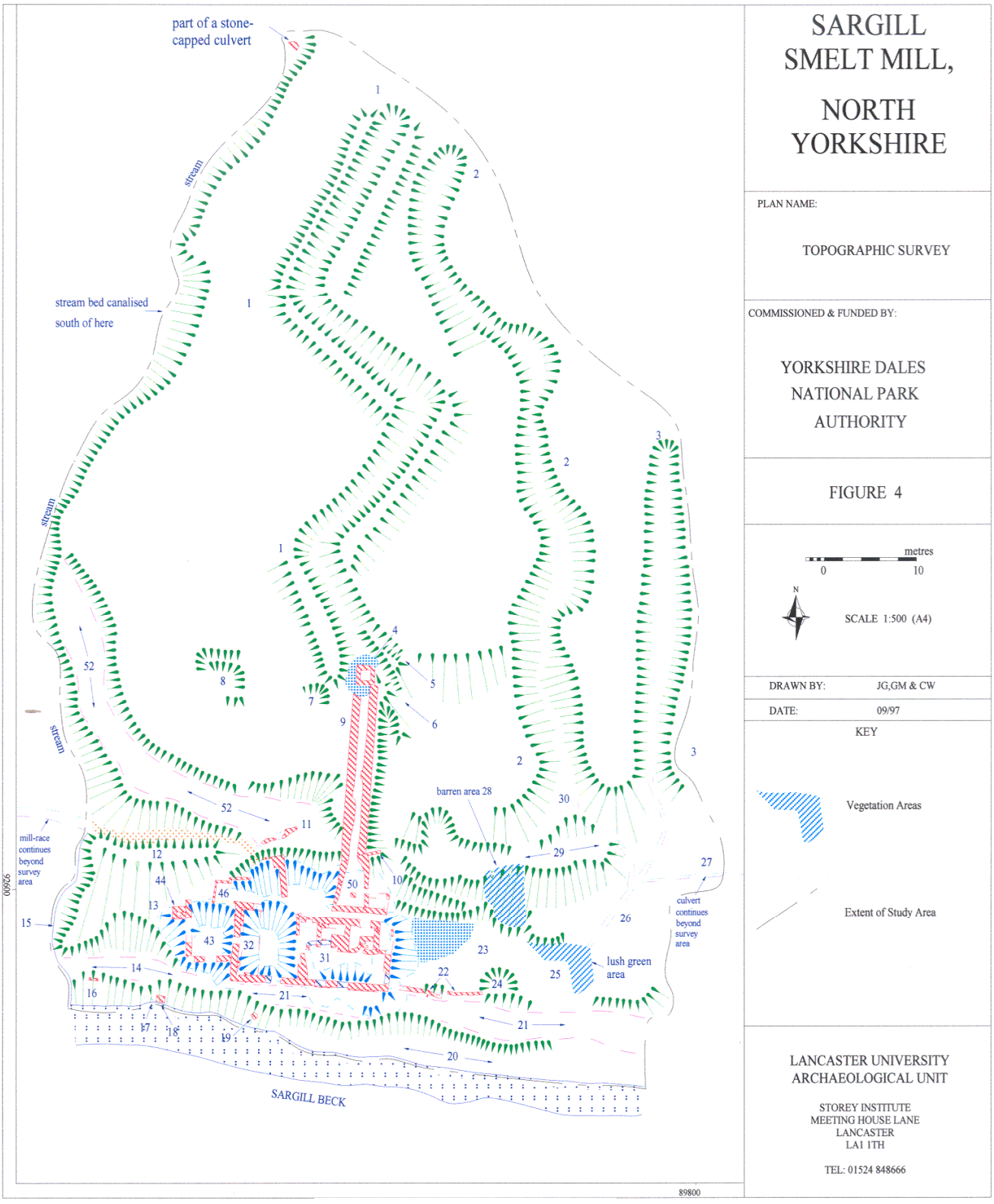
Bottom: Smelt mill looking SE, taken June 1984 (Richard Lamb slide collection, 84030).

PROJECT	
SARGILL SMELT MILL	
TITLE	
HISTORIC PHOTOGRAPHS	
SCALE	DATE
NTS	FEB 2013
EDAS	FIGURE 6

Top: Smelt mill looking S, taken June 1984 (Richard Lamb slide collection, 84031).

Bottom: Ex situ workstone and hearth base (Lawrence Barker slide collection via YDNPA).

PROJECT	
SARGILL SMELT MILL	
TITLE	
HISTORIC PHOTOGRAPHS	
SCALE	DATE
NTS	FEB 2013
EDAS	FIGURE 7



SARGILL SMELT MILL, NORTH YORKSHIRE

PLAN NAME:

TOPOGRAPHIC SURVEY

COMMISSIONED & FUNDED BY:

YORKSHIRE DALES NATIONAL PARK AUTHORITY

FIGURE 4

metres 0 10

N

SCALE 1:500 (A4)

DRAWN BY: JG,GM & CW

DATE: 09/97

KEY

Vegetation Areas

Extent of Study Area

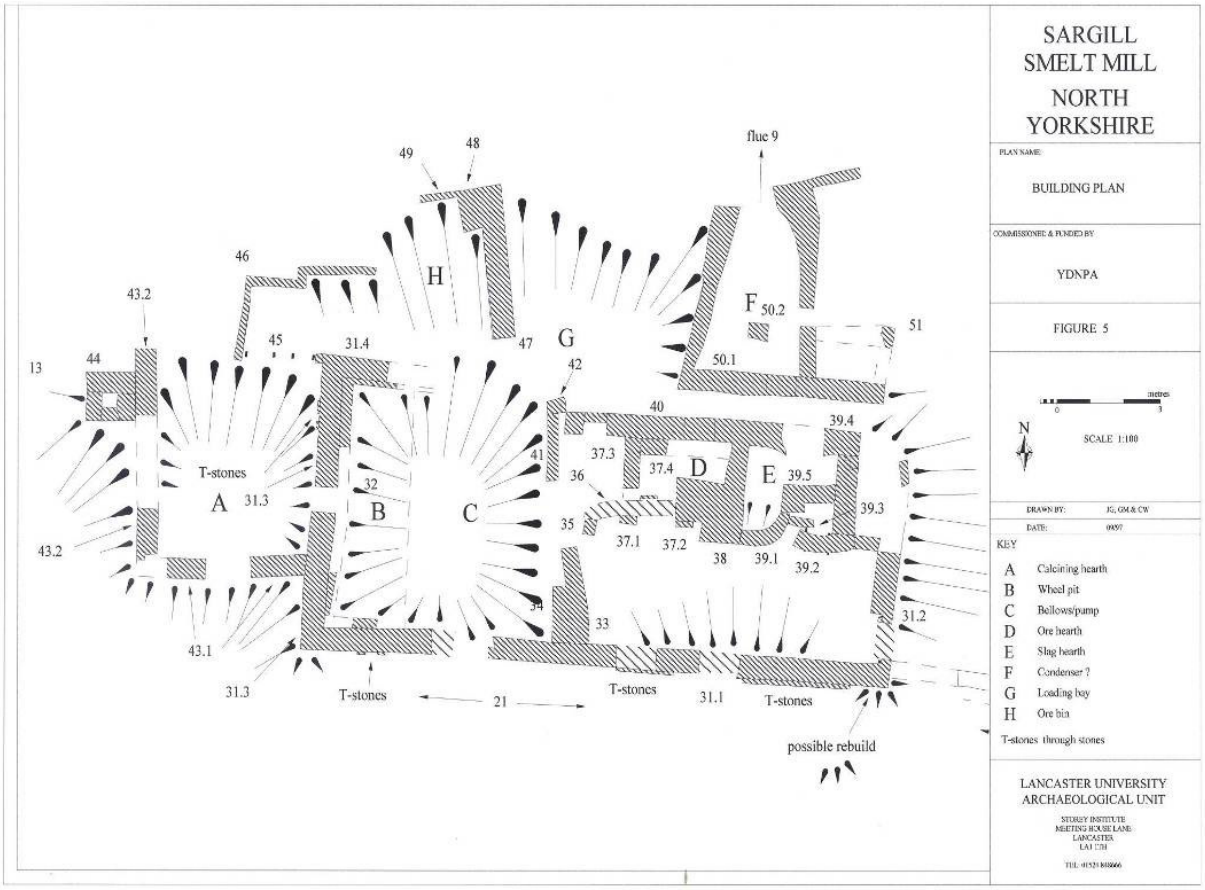
LANCASTER UNIVERSITY ARCHAEOLOGICAL UNIT

STOREY INSTITUTE
MEETING HOUSE LANE
LANCASTER
LA1 1TH

TEL: 01524 848666

Source: Wild, C & Cranstone, D 1997 *Sargill Lead Smelting Site, North Yorkshire*, figure 4.

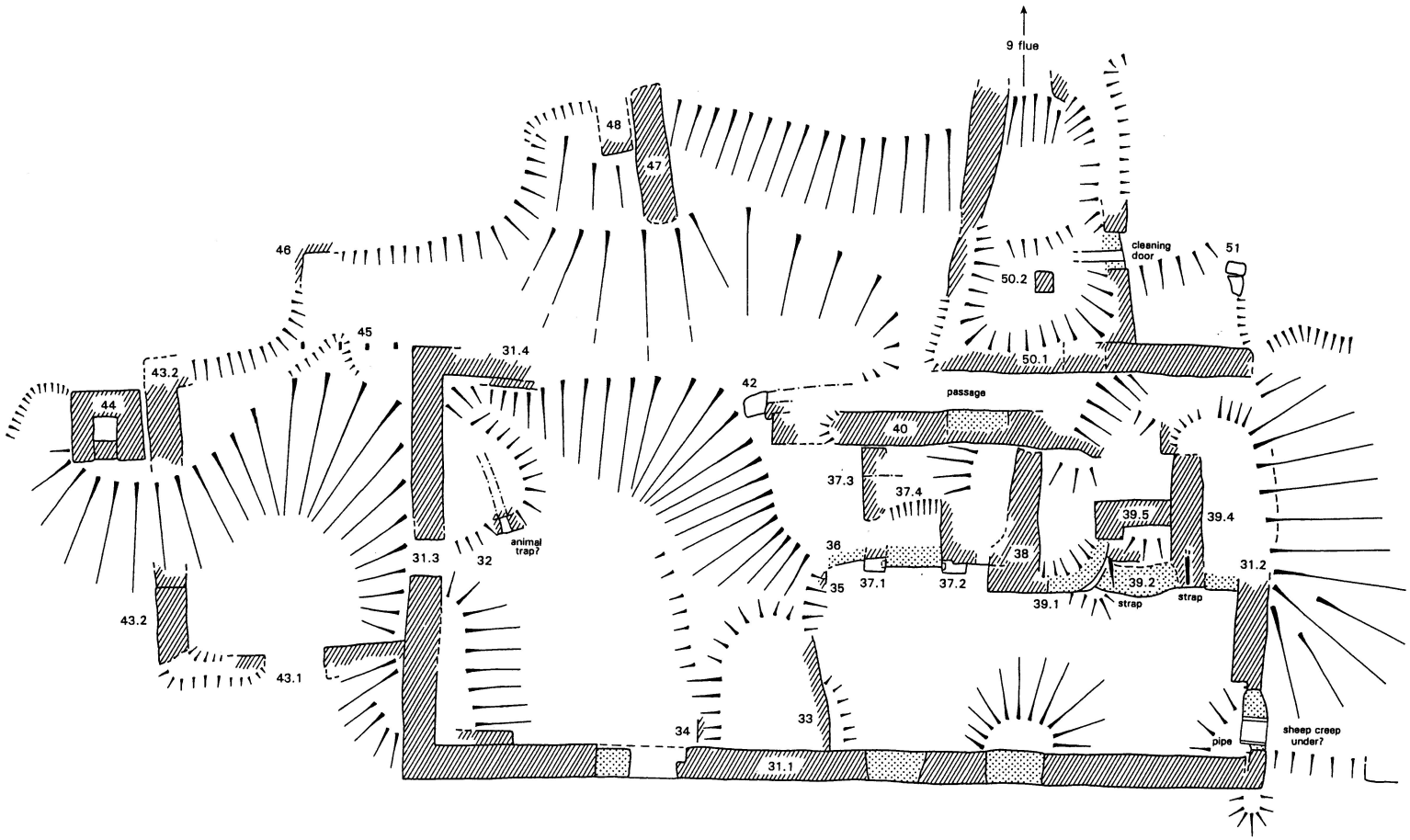
PROJECT: SARGILL SMELT MILL	
TITLE: LUAU EARTHWORK PLAN	
SCALE: AS SHOWN	DATE: FEB 2013
EDAS	FIGURE: 8



Source: Wild, C & Cranstone, D 1997 *Sargill Lead Smelting Site, North Yorkshire*, figures 5 and 6.

PROJECT: SARGILL SMELT MILL	
TITLE: LUAU PLANS OF SMELT MILL	
SCALE: AS SHOWN	DATE: FEB 2013
EDAS	FIGURE: 9

PROJECT	
SARGILL SMELT MILL	
TOITLE	
GROUND PLAN	
SCALE	DATE
AS SHOWN	FEB 2013
EDAS	FIGURE 10



31.2 LUAU IDENTIFIERS

LATER BLOCKING/INFILL

July 2012 survey, based on LUAU 1997 plan

0 10m

Plate 1: General view of Sargill smelt mill complex, with spoil heaps of Sargill Lead mine above, looking NW (photo 1/361).

Plate 2: General view of Sargill smelt mill complex, looking N (photo 1/352).

Plate 3: Mill race to west of flue, looking W (photo 1/395).

Plate 4: South end of west wall (internal face) of roasting house (SAR 43.2, elevation 8), looking W (photo 1/437).

Plate 5: Upright iron standards (SAR 45) in north side of roasting house, looking NE (photo 1/439).

Plate 6: Possible animal trap or rabbit type over wheelpit (SAR 32) in blowing room, looking N (photo 1/443).

Plate 7: Opening in south wall of blowing room (SAR 31.1, elevation 5), looking S (photo 1/421).

Plate 8: Opening at base of wall (SAR 37.3, elevation 23) on west side of ore hearth, looking W (photo 1/454).

Plate 9: Interior of chamber at back of ore hearth (SAR 37), looking E (photo 1/426).

Plate 10: Opening (SAR 42) in west end of passage behind hearths (elevation 10), looking E (photo 1/449).

Plate 11: Interior of opening (SAR 42), looking E (photo 1/453).

Plate 12: East external elevation of smelting mill (SAR 31.2, elevation 15), looking W (photo 1/430).

Plate 13: Internal elevation of south wall of smelting room (part of SAR 31.1, elevation 14), looking SW (photo 1/428).

Plate 14: View of ore hearth (SAR 37) with drystone blocking on north side of smelting room (elevation 12), looking N (photo 1/457).

Plate 15: View of slag hearth (SAR 39) with drystone blocking on the side of smelting room (elevation 12), looking N (photo 1/461).

Plate 16: North wall of east-west passage (SAR 50.1, elevation 18), looking N (photo 1/465).

Plate 17: 'Cleaning door' opening in east side of possible settling chamber (SAR 50, elevation 17), looking W (photo 1/467).

Plate 18: View up flue (SAR 9), looking N (photo 1/389).

Plate 19: East side of chimney (SAR 04, elevation 2), looking W (photo 1/380).

Plate 20: Chimney (SAR 04) at north end of flue (SAR 09), looking SE (photo 1/377).

Plate 21: North end of zig-zag flue extension (SAR 01), looking S (photo 1/371).

Plate 22: Door at east end of south external wall of smelt mill (SAR 31.1, elevation 5), looking N - in May 1997 (left) and June 2012 (right).

Plate 23: Window in centre of south external wall of smelt mill (SAR 31.1, elevation 5), looking N - in May 1997 (left) and June 2012 (right).

Plate 24: Window in centre of south internal wall of smelt mill (SAR 31.1, elevation 14), looking S (photo 1/427).

APPENDIX 1

APPENDIX 1: GAZETTEER OF COMPONENTS

Introduction

The gazetteer of sites or components compiled by LUAU in 1997 is reproduced verbatim below, apart from the NGRs (National Grid References) which have been corrected from NY to SD for the prefixes. Any new text or information gathered as a result of the 2012 EDAS survey work, and any differences in interpretation, are highlighted as an addition. The relevant 2012 photographs are also detailed against each gazetteer entry. See main report for bibliographic references.

Site Number	SAR 01
NGR	SD 89767 92683 - 89764 92625
Site type	Trench
Period	Nineteenth Century
Condition	Good
Dimensions	73.50m long, 5m wide at top, 0.85m wide at base, 0.80m deep
Description	'V'-section trench, zigzag in plan, running north up the hillside from chimney SAR 04. It has shallow banks of spoil to either side of the trench. It widens slightly at the northern end probably for a chimney base. It was the construction trench for an extension to the flue, which was never completed.
EDAS additions	The feature is still largely as previously described. The profile, rather than being 'V-section', is more a relatively level base with a short vertical section to either side, which then angle backwards towards the banks running parallel to the sides. There is no evidence for stone lining or any other construction within the trench. There is a very slight bank running parallel to the top eastern edge of the northernmost north-west/south-east aligned section of the trench, which is not shown on the 1997 survey. This is the reverse of the section to the north, where the narrower bank is to the western side and the wider bank to the eastern. The feature does not appear on the 1857 Ordnance Survey map, suggesting that it may have been added after this date. However, neither is it shown on the 1914 edition, and so its omission in 1857 may not be significant. It is not mentioned by either Clough or Raistrick. This form of 'zig-zag' flue is not common in Yorkshire, and is more usually associated with smelt mills in Derbyshire, for example (Richard Lamb, *pers. comm.*). Photos 1/371; 1/372.

Site Number	SAR 02
NGR	SD 89783 92680 - 89785 92612
Site type	Gully
Period	N/A
Condition	Good
Dimensions	79.50m long, 5-7m wide, 0.70m deep
Description	A meandering gully, which is damp in the bottom. It starts to the north of the survey area and runs down the hillside parallel to flue trench SAR 01. It is infilled where it passes the northern end of SAR 01, and it fans out onto the terraced platform SAR 29 at its southern end, where any water was culverted away to the Sargill Beck. The water was possibly used to wash materials near the beck.
EDAS additions	The feature is still largely as previously described. It can be traced north beyond the survey area, becoming fainter and fainter, and eventually petering out within a marshy area. Water appears to be seeping out of and entering the gully from a lobed depression to the north, perhaps a former quarry. It seems unlikely that the gully was being used to carry water for washing materials near the beck, and is most probably a natural feature. It is not shown on either the 1857 or 1914 Ordnance Survey maps. Photo 1/375.

Site Number	SAR 03
NGR	SD 89796 92647 - 89796 92609

Site type Gully
Period N/A
Condition Good
Dimensions 37.60m long, *c*6m wide, 0.60m deep
Description A straight, shallow, wide gully, which runs down slope to the east of terraced area SAR 29 and smelt mill buildings SAR 31. There is presently running water in the bottom. It was culverted around a terraced area (see SAR 26). It was possibly used for washing materials.
EDAS additions The feature is still as previously described. It seems unlikely that the gully was being used to carry water for washing materials near the beck, and is most probably a natural feature. It may be depicted in part on the 1914 Ordnance Survey map. Photo 1/376.

Site Number SAR 04
NGR SD 89764 92623
Site type Chimney
Period Nineteenth Century
Condition Fair
Dimensions 2.16m long, 2.00m wide, 2.40m high on east side
Description The remains of an almost square-plan chimney stack situated at the north end of flue SAR 09. It is constructed of mortared stone; there is a course of through-stones at the top of the east wall, although these may be a ledge or baffle. The west wall does not survive.
EDAS additions In the photograph taken by Backhouse in 1905/06 (Raistrick 1975, 96), all four external elevations of the chimney survived to a considerably greater height than they do currently. The undated photograph published by Raistrick (1975, 97) but which must have been taken at least 30-40 years after Backhouse's) shows that substantial collapse had taken place to the north and west sides in the intervening period.
The chimney has undergone some further minor collapse since 1997. To the east side of the south external elevation (Elevation 1) [1/379], stone facing survives to 1.38m above ground level (AGL), but above this (to 2.15m) is exposed corework; the corework is not shown in 1997, although overall the elevation is little different than in the photograph published by Raistrick (1975, 97). A short distance to the west of the east side of the same elevation, a ragged joint may rise vertically for a short distance, although this may be no more than a crack. On the east external elevation (Elevation 2) [1/380], there appears to have been some collapse at the upper north end; it is not easy to reconcile a line of through-stones marked in 1997 with the existing structure. The uppermost part of the elevation is unmortared, covered in moss and quite loose, and gives the impression of having been piled on top, rather than being a remnant of a mortared wall; it is arguably not present in the photograph published by Raistrick (1975, 97). On the north external elevation (Elevation 3) [1/381] only a small part of the original stone facing survives; the majority of the elevation is exposed corework, and a small section at the west end appears to comprise loose stones which have been piled there relatively recently, although they are differentiated in 1997. A step to the internal east elevation (Elevation 4) can be seen in profile in the external north elevation (Elevation 3). The west external elevation, as reported in 1997, barely survives AGL.
The upper north and south ends of the internal east elevation (Elevation 4) [1/377] have undergone minor collapse since 1997. Towards the top of the remaining part, the face of the elevation steps outwards by 0.20m; it is not known if all four internal sides once did this. There is a flat-headed opening at the base of the internal south elevation [1/382] where the flue enters the chimney. Photos 1/377 to 1/382.

Site Number SAR 05
NGR SD 89767 92625
Site type Ditch

Period	Nineteenth Century
Condition	Fair
Dimensions	6.50m long, 1.10m wide, 0.20m deep
Description	A shallow ditch running parallel to SAR 06. It runs south from the end of flue trench SAR 01 and to the east of chimney SAR 04. It was possibly an outlet ditch for the zigzag flue SAR 01 to avoid washing away the foundations of chimney SAR 04.
EDAS additions	The feature is still as previously described. It is considered that this feature, rather than being a ditch, is more likely to have formed between two separate banks of soil upcast from excavations either around the chimney (SAR 04) or the zig-zag flue (SAR 01). The base is also set well above the level of the base of the zig-zag flue. Photo 1/383.

Site Number	SAR 06
NGR	SD 89767 92622
Site type	Ditch
Period	Nineteenth Century
Condition	Fair
Dimensions	4.90m long, 1.20m wide, 0.30m deep
Description	A shallow ditch running parallel to SAR 05. It runs south from the end of the flue trench SAR 01 and to the east of chimney SAR 04. It was possibly an outlet ditch for the zigzag flue SAR 01 to avoid washing away the foundations of the chimney SAR 04.
EDAS additions	The feature is still as previously described, and is more likely to have fulfilled the function ascribed to it than SAR 05. Photo 1/383.

Site Number	SAR 07
NGR	SD 89759 92621
Site type	Structure
Period	Eighteenth/Nineteenth Century?
Condition	Poor
Dimensions	2.30m long, 1.90m wide, 0.20m deep
Description	A sub-rectangular sunken area, which has a principal axis that is perpendicular to flue SAR 09. It has a flat floor area. It was possibly a storage area for peat or other fuel or materials.
EDAS additions	The feature is less regular in form than described in 1997 and appears more likely to be a small natural landslip than a storage area. Photo 1/384.

Site Number	SAR 08
NGR	SD 89748 92623
Site type	Structure?
Period	Eighteenth/Nineteenth Century?
Condition	Poor
Dimensions	3.30m long, 2.50m wide, 0.35m deep
Description	A rectangular sunken area with a flat floor; its principal axis is aligned with SAR 07 which is immediately to the east. Some squared stones survive in the edges. It was possibly a storage area for peat or other fuel or materials.
EDAS additions	The feature is still as previously described. It is more convincing as an artificial structure or platform than SAR 07, although this is not certain. It is damp and, to judge by the vegetation to the immediate south, water appears to issue regularly from this general area. A slight south-facing scarp runs east from the feature towards SAR 07. There is another shallow south-facing scarp on the same alignment some 3m to the south. Do these earthworks depict an east-west building? Neither of these earthworks is shown in 1997, but both are approximately perpendicular to the line of the flue SAR 09. Photo 1/385.

Site Number	SAR 09
NGR	SD 89763 92603 - 89764 92622
Site type	Flue
Period	Nineteenth Century
Condition	Good
Dimensions	18.80m long, 0.80m wide, 0.50m deep at north, 0.80m deep at south
Description	A straight flue running north from possible condensing chamber SAR 50 to chimney SAR 04. The flue is a vertical straight-sided trench, lined on both sides with mortared stone walls 0.45m thick. The top is flush with the ground surface, suggesting that it survives to original height. There is no sign of vaulting; the top was probably stone flagged, although the apparent lack of slab-sized stone on the site suggests otherwise. Alternatively the top could have been wooden.
EDAS additions	The feature is still as previously described. Comparison with the photograph published by Raistrick (1975, 97) and one taken by Lamb in 1984 (RL 84031) show that the fallen and *in situ* stonework of the flue have undergone little change in the past c.40 years. The sides of the flue survive up to 1m in height internally. Since 1997, a vermin trap has been created across the lower (southern) end of the flue. To secure the east end of the timber supporting the trap, a small number of stones around the top of the flue have been moved. Photos 1/386 to 1/392.

Site Number	SAR 10
NGR	SD 89765 92604
Site type	Retaining Wall
Period	Nineteenth Century
Condition	Poor
Dimensions	1.40m long, 0.30m+ wide, 0.60m high
Description	A retaining wall at the south end of flue SAR 09. Its purpose is unclear.
EDAS additions	The feature is still as previously described. It is only roughly keyed into the east wall of the flue, and may therefore be a later addition to the structure. It appears to line up approximately with the '5ft drop' from north to south to the interior of the flue shown by Clough (1980, 101). Within the flue line, c.1m to the south of this feature, there is a substantial fall in the level of the rubble within the flue, and also the possible remains of a cross-structure; again, these may relate to the drop indicated by Clough. Photo 1/393.

Site Number	SAR 11
NGR	SD 89754 92606
Site type	Culvert
Period	Nineteenth Century
Condition	Fair
Dimensions	5.85m long, 0.70m wide
Description	A stone-capped culvert (small, roughly shaped stones not slabs), which is mostly grassed over. It joins mill-race SAR 12 at its east end before entering the back of the mill. It is not clear where the culvert starts.
EDAS additions	It is not certain if this feature is a culvert, and may be no more than a slight depression filled with stone. However, trackway SAR 52 does cross this alignment, and so if a watercourse came through here then it would need to be culverted beneath the trackway. Photo 1/394.

Site Number	SAR 12
NGR	SD 89726 92608 - 89751 92604
Site type	Mill-race
Period	Nineteenth Century

Condition	Fair
Dimensions	19.10m+ long, 0.85m wide
Description	A boggy, narrow channel running east/west, following the contours of the valley. It starts *c*220m to the west of the mill and is sourced from the Sargill Beck. Immediately to the west of the site, it crosses a small culverted stream (SAR 15) on a small aqueduct, which is now caved-in and overgrown. At its eastern end it turns sharply south after meeting culvert SAR 11 and there enters the back of the mill.
EDAS additions	The feature is still as previously described. In 1857, the headrace for the waterwheel was taken off the north side of the Sargill beck some distance to the west, opposite a semi-circular scarp created by an earlier meander. It ran east, following a contour, and was also fed by several drains or watercourses running south down the valley side. After crossing the easternmost of these drains, the headrace was apparently taken underground in a culvert, beneath the trackway leading to the mine, as it is not shown on the 1857 map. Examination of the section of the beck where the headrace begins in 1857 revealed no surviving evidence; it is clear that the route of the beck has changed somewhat since the mid 19th century, and so any evidence for a weir, sluice and the other features that might be expected here has disappeared, presumably due to erosion. The headrace cannot be seen to the west of the modern shooting track, but to the east, there are fragmentary traces. Its line is then lost, re-emerging clearly c.150m to the west of the mill. From here, it can be traced as a well-preserved earthwork, sometimes with evidence for rough stone revetting to the downslope embankment. Whereas in 1857 it is not shown extending further east than a drain or watercourse (SAR 15), perhaps suggesting that it was culverted, it can now be traced for c.10m beyond the former towards the rear of the smelt mill. Photos 1/360; 1/395 to 1/397; 1/399].

Site Number	SAR 13
NGR	SD 89741 92597
Site type	Ditch?
Period	Nineteenth Century
Condition	Poor
Dimensions	2.60m long, 0.20m wide
Description	A possible ditch. It was possibly used to channel water around the mill buildings to stop undermining and damp.
EDAS additions	The feature is still as previously described. However, it is probably the result of the original terracing of the building into a natural slope, or sheep walking around this corner, rather than being a ditch to channel water. Photo 1/400.

Site Number	SAR 14
NGR	SD 89731 92592 - 89744 92591
Site type	Trackway
Period	Nineteenth Century?
Condition	Fair
Dimensions	15.70m+ long, average 2.20m wide
Description	A probable trackway, which enters the survey area from the west. It is covered by lush grass. It has a retaining wall (SAR 16) along its southern edge, and ends at the southwest corner of the smelt mill where the stream has eroded the bank almost up to the corner of the building. It probably continued around the smelt mill to join SAR 21. It can be identified as the trackway on the OS 2nd edition map.
EDAS additions	The feature is still as previously described. It is not shown on either the 1857 or 1914 Ordnance Survey maps. It is difficult to trace anymore than 100m to the west of the smelt mill, and may have been eroded by movement of the Sargill Beck; as it moves west, it narrows and eventually resembles something closer to a second leat than a trackway. It may have been providing access to the sluice at the west end of the mill's headrace. Photos 1/401; 1/403.

Site Number	SAR 15
NGR	SD 89737 92606 - 89731 92594
Site type	Culverted Stream
Period	Nineteenth Century?
Condition	Very Poor
Dimensions	20.20m long, 0.90m wide internally
Description	The southern culverted end of a stream that forms the western edge of the survey area. It is culverted from the mill-race aqueduct to its junction with Sargill Beck. Most of the roof slabs have collapsed allowing the stream to flow over the top of the remains of the culvert.
EDAS additions	The feature is still as previously described. It is shown on both the 1857 and 1914 Ordnance Survey maps. Photos 1/398; 1/402.

Site Number	SAR 16
NGR	SD 89734 92590
Site type	Retaining Wall
Period	Nineteenth Century
Condition	Poor
Dimensions	1.00m long, 0.40m+ wide, 0.30m high
Description	The remains of a retaining wall for trackway SAR 14. More of this wall survives in much better condition to the west of the survey area.
EDAS additions	The feature is still as previously described. To the immediate west of the survey area, it stands to almost 1m in height, and survives as a slightly battered wall built of roughly coursed stone, including some large flat slabs. Photos 1/404 to 1/406.

Site Number	SAR 17
NGR	SD 89740 92588
Site type	Culvert Outlet
Period	Nineteenth Century
Condition	Poor
Dimensions	0.20m wide internally
Description	A culvert outlet into Sargill Beck. It was not possible to trace the culvert any further back.
EDAS additions	The feature is no longer clearly visible. Photo 1/407.

Site Number	SAR 18
NGR	SD 89742 92588
Site type	Retaining Wall?
Period	Nineteenth Century
Condition	Poor
Dimensions	1.00m long, 0.35m+ wide, 0.40m high
Description	A probable retaining wall immediately to the east of culvert SAR 17. There is one large block visible, set at a slight angle to the present line of the beck.
EDAS additions	The feature is still as previously described. However, the large visible block may form part of a natural outcrop, rather than being an artificial feature. If so, there is little other evidence for a retaining wall here, although one might be expected given the proximity of trackway SAR 14 to the Sargill Beck. Photo 1/407.

Site Number	SAR 19
NGR	SD 89752 92586
Site type	Tail-race Outlet?
Period	Nineteenth Century
Condition	Poor

Dimensions	1.00m+ long, 0.65m wide, 0.15m+ high
Description	This is an opening in the bank of Sargill Beck below smelt mill SAR 31. It has a slabbed top, and the interior is filled with collapse debris; a trickle of water flows from it. The outlet is aligned at 45º to the front wall of the building and points upstream. It was probably the tail-race from wheel pit SAR 32. Because the beck has shifted its course since the 1890 OS map, the end visible is almost certainly not the original terminal of the outlet.
EDAS additions	The feature is no longer clearly visible. Photo 1/408.

Site Number	SAR 20
NGR	SD 89754 92585 - 89794 92580
Site type	Trackway?
Period	Nineteenth Century?
Condition	Fair
Dimensions	40.50m long, 2.80m wide
Description	A flat surface covered by lush grass running parallel to Sargill Beck at a lower level than trackway SAR 21. It was possibly a trackway, but more probably a natural feature. It fades away at its eastern end.
EDAS additions	The feature is still as previously described, but may well originate as erosion from the adjacent beck rather than being a trackway, as the1997 survey notes. Photo 1/409.

Site Number	SAR 21
NGR	SD 89749 92590 - 89786 92586
Site type	Trackway
Period	Nineteenth Century
Condition	Good
Dimensions	26.30m long, 2.93m wide
Description	A flat surface covered by lush grass running east from the south-west corner of smelt mill building SAR 31. It is wide enough for a cart, and was probably a continuation of trackway SAR 14. It can be identified as a trackway on both the 2nd and 3rd edition OS maps.
EDAS additions	The feature is still as previously described. The feature is shown as a trackway on both the 1857 and 1914 Ordnance Survey maps. It seems more likely that trackway SAR 14 is a continuation of this feature, rather than the reverse, as is suggested in 1997. Photo 1/369.

Site Number	SAR 22
NGR	SD 89772 92588
Site type	Retaining Wall
Period	Nineteenth Century
Condition	Poor
Dimensions	8.20m long, 0.50m+ wide, 0.60m high
Description	A retaining wall immediately to the north of trackway SAR 21 and also retaining the southern edge of platform SAR 23. The western part has a small return near its eastern end, and there is a single stone measuring 0.35m x 0.08m in plan. The eastern part has a return at the eastern end. The two parts were probably a single stretch of wall with a dog-leg in it, running from the south-east corner of smelt mill building SAR 31.
EDAS additions	The feature is largely as previously described, although it is in very poor condition and tumbled, and the returns noted in 1997 are no longer absolutely clear. It is partly visible on the pre-1975 slide of the *ex situ* workstone. Photo 1/410; 1/411.

Site Number SAR 23
NGR SD 89775 92593
Site type Platform
Period Nineteenth Century
Condition Fair
Dimensions 11.50m long, 7.50m wide
Description A flat platform lying immediately to the east of a door in the mill. This area, like the trackways, but nowhere else in the survey area, is covered by lush green grass. There is a shallow ditch along the north edge, and the north-east corner is covered by rougher grass, probably concealing tumble. It was probably a storage and/or loading area for processed material.
EDAS additions The feature is still as previously described. Photo 1/413.

Site Number SAR 24
NGR SD 89778 92590
Site type Hollow
Period Nineteenth Century?
Condition Fair
Dimensions 4.20m external diam., 2.40 internal diam., max. 0.30m deep
Description A horse-shoe-shaped scoop at the eastern end of retaining wall SAR 22. It was possibly a circular buddle. Two large pieces of glassy black slag were found immediately to the west. The slag was slightly vesicular with occasional prills of corroded lead.
EDAS additions The feature is still as previously described in terms of overall form, but it is highly unlikely to be a circular buddle. It is not large enough, there is no apparent water supply for washing, no provision for power, and it bears no resemblance to other known examples such as those at Grassington. Furthermore, there is no evidence for the finer dressing wastes that would have been expected to remain in the vicinity, and which can be observed to the south of Sargill Mine, where dressing activity did take place (Richard Lamb, *pers. comm.*). No slags were visible at the time of survey. The function of this feature therefore remains unknown, but could presumably be proved by limited excavation. Photo 1/412.

Site Number SAR 25
NGR SD 89785 92590
Site type Hollow
Period Nineteenth Century?
Condition Poor
Dimensions 4.90m long, 5.20m wide, max. 0.30m deep
Description A horse-shoe-shaped scoop to the east of SAR 24. It is very similar to SAR 24 but larger and more indistinct. It was possibly a circular buddle.
EDAS additions The feature is still as previously described in terms of overall form. However, it is highly unlikely to be a circular buddle, for the reasons outlined for feature SAR 24. The function of this feature therefore remains unknown, but could presumably be proved by limited excavation. Photographs: [1/412].

Site Number SAR 26
NGR SD 89786 92593 - 89798 92609
Site type Culvert
Period Nineteenth Century
Condition Good
Dimensions 21.30m long, 0.55m wide
Description A stone-lined and capped (small roughly shaped stones not flags) culvert running from the south end of gully SAR 03 and disappearing below hollow SAR 25. Culverts SAR 27 and 30 run into it. No outflow from it into the beck was visible, but

	the area immediately south of its southern-most visible part is very marshy. It was apparently used for water diversion, although it may have supplied buddles SAR 24 and 25.
EDAS additions	The feature is still as previously described, although it is now very faint and overgrown. It is unlikely to have supplied SAR 24 and SAR 25, as these are highly unlikely to have formed circular buddles. Photo 1/415.

Site Number	SAR 27
NGR	SD 89808 92602 - 89795 92601
Site type	Culvert
Period	Nineteenth Century
Condition	Good
Dimensions	8.80m+ long, 0.36m wide
Description	A stone-lined and capped culvert. It is very similar to SAR 26, which it runs into. The culvert starts to the east of the survey area and is made of rough stones. It is capped with the same material, rather than flags. It appears to be bringing water into the site rather than simply diverting it.
EDAS additions	The feature is no longer clearly visible. Photo 1/414.

Site Number	SAR 28
NGR	SD 89779 92599
Site type	Barren Area
Period	Nineteenth/Twentieth Century?
Condition	Poor
Dimensions	6.70m long, 4.30m wide
Description	This is the only barren area within the survey area, and may have been cleared quite recently. The surface is covered with small pieces of sandstone and occasional small pieces of black slag and coke, suggesting the presence of a slag hearth in the mill. The only similarly barren areas lie to the west of the survey area near the mill-race.
EDAS additions	The feature is still as previously described. The black vitreous vesicular slag, albeit only in small quantities, is still visible. Its presence, and also the coke that was noted in 1997 (see SAR 24), suggest that either a slag hearth was in use or that an ore hearth had been converted to run on coke at a much higher temperature. Although no coke was seen here, it was noted immediately to the south of the mill. There is a lack of visible grey slag from primary smelting at Sargill, and indeed a lack of slag generally. This may reflect disposal into the beck; Grinton Mill, for example, retains very little slag despite a long period of use (Richard Lamb, *pers. comm*.). Interestingly, Raistrick (1975, 98) makes reference to the 'small slag heap' but is clearly referring to a feature in the vicinity of the existing SAR 22, rather than SAR 28. Photo 1/416.

Site Number	SAR 29
NGR	SD 89778 92603 - 89791 92605
Site type	Platform
Period	Nineteenth Century
Condition	Fair
Dimensions	12.90m long, average 2.90m wide
Description	A flat narrow platform, which was possibly terraced out of the hillside to the north or alternatively was spoil from the construction of flue SAR 09. Culvert SAR 30 directs water from gully SAR 02 around it.
EDAS additions	The feature is still as previously described. Photo 1/417.

Site Number	SAR 30
NGR	SD 89785 92612 - 89794 92604
Site type	Culvert
Period	Nineteenth Century
Condition	Fair
Dimensions	13.10m long, 0.34m wide
Description	A stone-lined and capped culvert which is very similar to SAR 26 and 27. It diverts water from gully SAR 02 around the north-east corner of platform SAR 29 and into culvert SAR 26.
EDAS additions	The feature is still as previously described, but is now very faint and only intermittently visible. Photo 1/418.

Site Number	SAR 31
NGR	SD 89758 92593
Site type	Smelt mill building
Period	Nineteenth Century
Condition	Poor to Moderate
Dimensions	17.25m long, 8.70m wide, 3.95m high
Description	A rectangular building containing wheel pit, bellows or pump room, an ore hearth and a slag hearth. It was constructed from roughly coursed local stone. This is the main smelt mill building.
EDAS additions	See entries below (SAR 31.1-31.4).

Site Number	SAR 31.1
Site type	Wall
Period	Nineteenth Century
Condition	Moderate
Dimensions	17.25m long, 0.60m wide, 3.95m high
Description	The south wall of smelt mill SAR 31. It contains one cart-width doorway, one person-width doorway and one window. The window and smaller doorway are both fully blocked, while the cart doorway is half blocked. All the openings have rough wooden lintels. The lintel for the cart door has sockets for a pair of barn doors on its underside. Holes and orange lichen on the north (internal) face suggest some sort of beamed machinery; the bellows or pump were housed here over a low dividing wall SAR 33 and SAR 34. The quoins at the western end of this wall are "long-and-shorts". The eastern end of the wall has much smaller quoins, and a subtle change in the masonry *c*1m from the eastern end suggests either a re-build or an extension here. Through stones are visible at lintel height on the external face only. They are also visible intermittently lower down the wall and run as far east as the line of the suspected rebuild. The jambs to the cart door are well finished but only the eastern one is rebated. Apart from the through stones, the outer and inner skins of the walls are apparently not tied together and may be of different builds. All mortar on the external face of the wall appears to have been eroded.
EDAS additions	The 1905-06 photograph taken by Backhouse (Raistrick 1975, 96) shows the south elevation surviving to what was probably its approximate full height. The building was a tall single storey, and there were two doorways in the south elevation, flanking a raised window. Several courses of projecting throughstones are also visible. By 1984 (RL 84030), the upper parts of the south-east and north-east corners of the elevation had partially collapsed, almost certainly brought down by the collapse of the respective gables. There had been some loss of walling to the top of the central part of the elevation as well, although both doorways and the window remained intact. There was apparently little further collapse between 1984 and 1997. Commencing with the external (south) face (Elevation 5) [photos 1/354 to 1/357; 1/366 to 1/368], there may indeed be an area of rebuilding or alteration at the very east end, although there is a lesser height of fallen material above the uppermost

visible *in situ* stone than shown in 1997. A blocked socket indicated above one of the upper course of throughstones here (LUAU figure 8) may simply be a stone. Both the timber lintel and the masonry it supported above the east doorway have collapsed since 1997 [photo 1/419], removing evidence for a socket shown in 1997 (LUAU figure 8). To the west, the timber lintel of the window is in two parts [photo 1/420]. The rear (north) part has partly collapsed, bringing down the masonry above shown in 1997, particularly on the east side of the window. The front part remains *in situ*, but is in very poor condition; when this eventually collapses, it will bring down the masonry above the west side of the window. The sockets to the soffit of the wider 'cart-door' lintel [photo 1/421] are mortices formerly housing the vertical elements of the doorway frame. The doorway was apparently divided into two parts, and was presumably fitted with a two-leaf door. To the east of the doorway, two sockets or openings are indicated in 1997 (LUAU figure 8). The lowest, above the lower course of throughstones, is probably a stone set on edge, rather than a blocked socket. However, the upper example is more convincing as a decayed socket, although its function is not certain. A third example, to the east of the upper socket, was shown in 1997 but not labelled (LUAU figure 8); it too appears to be real.

Commencing at the west end of the internal (north) face (Elevation 14) [photo 1/422], a block of masonry projecting from the base of the elevation, on the line of the former wheelpit, remains visible but is not as extensive as marked in 1997 (LUAU figure 11). To the east of the wider doorway [photos 1/423 to 1/425], in 1997 'holes and orange lichen' were suggested as evidence for the possible presence of 'beamed machinery', although this is considered unlikely. Four features were marked, of which three resembled sockets with either lintels or sills. The uppermost has partly collapsed and is now leaning inwards, but may be real and appears to be in the same position as one indicated externally, suggesting that a timber passed through the thickness of the wall. The two central examples are less convincing, and one is almost certainly just collapse of the wall face. The lowest example may represent a blocked socket. All of these features are visible on a slide taken in 1984 (RL 84030-84031). Further east, as already noted above, there have been substantial collapses above both the window and the narrower doorway [photos 1/427 to 1/429]. It is not clear why a single stone was shown to the east of the narrower doorway in 1997, and it is difficult to match what is shown with the surviving masonry. Photos 1/354 to 1/357; 1/366 to 1/368; 1/419 to 1/425; 1/427 to 1/429].

Site Number SAR 31.2
Site type Wall
Period Nineteenth Century
Condition Moderate
Dimensions 3.95m long, 0.62m wide, 1.90m high
Description The east wall of the smelt mill. There is a person-sized doorway by the south end, which is blocked by two large (0.46m) diameter ceramic salt-glazed pipes, and has iron door fittings *in situ* on the outer skin, as well as a rebate. The lower pipe rests on the threshold. The northern end of the wall has collapsed and is hidden behind rubble. The inner face of the wall bows out at its northern end, where it is butted by the slag hearth. There are no through stones visible in the wall, and the inner and outer skins are apparently not tied together, suggesting a different, later, build for this part of the smelt mill. All mortar has been eroded on the external face of the wall.

EDAS additions The wall is largely as described in 1997. Clough (1980, 101) indicates that in 1948 the door was hinged on the south side, and the surviving evidence supports this, with a pintle surviving to the south jamb of the doorway opening and a latch fitting to the north; 'iron hinges' are marked to the north jamb in 1997 (LUAU figure 11). The blocking of the doorway is not clearly visible on the pre-1975 slide of the *ex situ* workstone, and although the photograph is admittedly very dark here, this may indicate that the blocking took place during the 1970s; it was definitely present by 1984 (RL 84030). The ceramic pipes partly blocking this doorway are probably the

pot from the detached chimney to the north-west (SAR 44), and a hole through the base of the wall on the north side of the lower upright pipe, which has been crudely blocked, may form a sheep creep [*1/431*]. To the north of the doorway, there is not the height of fallen material to the rear indicated in 1997, while the uppermost part of the wall appears to be a rough, and perhaps recent, rebuild. Photos 1/430; 1/431.

Site Number SAR 31.3
Site type Wall
Period Nineteenth Century
Condition Poor
Dimensions 8.67m long, 0.64m wide, *c* 2.1m high
Description The west wall of structure SAR 31. The wall survives in two parts, north and south, separated by a dressed stone, 0.76m wide opening at the point where the water wheel axle would be in plan. Long and short quoins survive well at the south end where it joins SAR 31.1, but not so well at the north end where the wall has collapsed. There are reddened areas at the bottom of the external face of the northern part of this wall, and also at the northern end of the southern part of the wall. There are two through stones visible in the northern part of the wall; the southern part does not survive to the height of the through stones. The opening in the middle of the wall is 0.75m wide and is filled with rubble. It was not possible to confirm the position of its base, but it is at least 0.20m below the present rubble-filled bottom. The purpose of the opening is not clear, although it could be a second power take-off from the wheel to power another fan/bellows in the roasting hearth building (Fig 5 (A)) or simply access to the waterwheel bearing. Rubble is stacked up against the internal face of the southern part, which thus could not be examined. The rubble appears to have been cleared into the wheelpit from the rest of the building, probably to avoid accidents by sheep. The internal face of the northern part of the wall has a ledge, 0.33m wide, running around it. All mortar has been eroded on the external face of the wall.
EDAS additions The wall is still largely as previously described. The photograph taken by Backhouse in 1905-06 (Raistrick 1975, 96) shows the west wall or gable to survive to near full height; no windows or other openings are visible. By 1984 (RL 84030, 84031), the wall or gable had been reduced to something very close to its current height. Externally, an upright feature shown at the very north end of the north external face (Elevation 6) in 1997 can no longer be seen. The ledge referred to in 1997 along the internal face (Elevation 9) and shown in plan (but not in elevation) is no longer visible; however, a possible blocked socket indicated to the north end of the internal face in 1997 can still be discerned (LUAU figure 10). Regarding the opening to the middle of the wall, the second suggestion (that it gave access to the waterwheel bearing) is the correct one; calcining or roasting furnaces were of the reverberatory type and so did not need forced draught (Richard Lamb, *pers. comm.*) Photos 1/434; 1/435; 1/442; 1/446].

Site Number SAR 31.4
Site type Wall
Period Nineteenth Century
Condition Very Poor
Dimensions 1.95m long, 0.60m wide
Description The north wall of structure SAR 31. Only the quoins shared with SAR 31.3 and the south edge of the western end are visible. The ledge of SAR 31.3 is continued along the southern edge of this wall but is only 0.15m wide. More of the wall may survive further to the east, below the rubble.
EDAS additions The wall is still largely as previously described. Although Clough (1980, 101) shows the north wall here as being intact in 1948, by 1975, Raistrick (1975, 98) noted that the 'back wall has collapsed'. Only c.1.60m in length remains visible above ground level, and the majority of this is very low; to the east, there is a steeply sloping spread of rubble, sloping down from north to south. A ledge is partly visible to the

south of the wall as described in 1997, but it is not as extensive as shown on the 1997 plan. A feature at the very west end resembles a socket, but is more likely to derive from collapse. Photos 1/447; 1/448.

Site Number SAR 32
NGR SD 89752 92595
Site type Wheel Pit
Period Nineteenth Century
Condition Poor
Dimensions 6.8m long, *c* 1.80m wide, unknown depth
Description The wheelpit is filled with rubble from the collapse of wall SAR 31.3 immediately to west. The rubble is graded and a cleared area lies immediately to the east of the pit; both of these are probably a result of clearance to reduce sheep injuries. The head race is not visible but was probably entered at the northern end at *c*0.70m above the ledge in wall SAR 31.4. The gap in the wall immediately to the west (SAR 31.3) is covered by rustcoloured lichen as far west as 0.08m from the external face of wall SAR 31.3. It is not possible to determine whether the wheel was overshot or undershot due to disturbance to the leat at this point.
EDAS additions The feature is still largely as previously described. In 1948, Clough indicates a leat entering through the north wall of the mill, driving a wheel that must have been either overshot or breastshot. The diameter of the wheel was given as 22 feet (c.7.30m) and the width indicated by the scale on the plan is less than 5 feet (1.6m). The wheel drove a single bellows (Clough 1980, 101). Raistrick (1975, 98) stated that the wheelpit could have accommodated a wheel of between 18 to 20 feet in diameter (i.e. less than c.6.60m).
The surviving visible sections of the ledges at the north and south ends of the wheelpit are set c.7m apart, giving a slightly greater length than indicated in 1997, but less than that indicated by Clough. The estimated width given in 1997 appears to be approximately correct, although it is not clear what evidence this measurement was based on. By using the height datums given on the 1997 drawings, it is possible to estimate the height of the head-race as c.437m AOD or slightly higher, and the floor level at 433.50m AOD. The beck is set c.4m below the level of the floor, and together these measurements indicate that there is sufficient fall for an overshot wheel (Richard Lamb, *pers. comm*.).
To the north of centre of the former wheelpit area, there is a curious structure, which is not shown in 1997. It takes the form of an opening, 0.20m wide and 0.30m high, set within a roughly stepped pile of stone which has a 'beehive' or 'igloo' profile. The opening leads into a buried passage of similarly dimensions, equipped with a roughly constructed slab roof and floor. The passage extends at least 1.40m to the north-west of the opening, curving very slightly around to the west as it does so. It is presumably a relatively recent construction, as it obviously cannot have been present when the waterwheel was in place. Its function is not known, although it might be some form of rabbit type or vermin trap. Photos 1/443; 1/445.

Site Number SAR 33
NGR SD 89757 92592
Site type Wall
Period Nineteenth Century
Condition Poor
Dimensions 2.82m long, 0.50m wide at north, 0.46m wide at south, *c*1.1m high
Description A low wall running from external building wall SAR 31.1 north towards ore hearth SAR 37. This wall divides the wheel pit and bellows/pump area of the main mill building from the hearth area. The uppermost surviving course of this wall is bonded into wall SAR 31.1. Much rubble lies to the west and east of this wall, as well as over its top. Possible socket or beam holes lie directly above this wall in SAR 31.1.
EDAS additions A wall is shown in this approximate position by Clough in 1948 (1980, 101), although at that date it was set at a right angle to the south wall of the mill, rather

than on the alignment indicated in 1997. Only the east face of the wall (Elevation 11) marked in 1997 is now clearly visible. The east face survives to a height of c.0.50m above ground level. The wall is not well bonded into the south wall of the mill, and there is no evidence that it ever rose any higher, so to that extent is actually 'divided' one area from another is uncertain. Photo 1/425.

Site Number SAR 34
NGR SD 89757 92591
Site type Wall
Period Nineteenth Century
Condition Poor
Dimensions 1.62m long, 0.44m wide, 1.1m high
Description A low wall running parallel to and apparently butting wall SAR 33. It disappears below rubble.
EDAS additions The wall is no longer visible, although part of the west face can be seen on a slide taken in 1984 (RL 84030). However, to the west of where it is shown in plan in 1997, there is a very low and short section of wall facing on the same alignment, which butts the south wall of the mill. This was not shown in 1997, and is not clearly visible in 1984. Photo 1/425.

Site Number SAR 35
NGR SD 89758 92594
Site type Wall
Period Nineteenth Century
Condition Moderate
Dimensions 0.46m long, 0.35m wide, 1.05m high
Description A wall stub with a return on the southern end. It butts on to curved blocking SAR 36 of ore hearth SAR 37 at the north. There are no signs of reddening due to burning.
EDAS additions The wall is still largely as previously described, but the south return described in 1997 is no longer clearly visible. The position of the wall is much closer to that shown by Clough in 1948 (1980, 101) than either of the walls to the west (SAR 33 and SAR 34). The south return at the end of the wall noted in 1997 may be one side of the doorway marked here by Clough, linking the east and west rooms of the main mill building.

Site Number SAR 36
NGR SD 89759 92594
Site type Blocking
Period Nineteenth/Twentieth Century?
Condition Moderate, poor at top
Dimensions 2.25m long, 0.45m+ deep, 1.45m high
Description The dry-stone blocking of the ore hearth. Supports for the workstone protrude *c*0.30m from it and these pillars are flush with the blocking. The western end curves outwards to meet stub wall SAR 35. Much collapse and rubble covers the top of this blocking. The lower parts of the blocking contain large pieces of ceramic salt-glazed pipe. A further wall, possibly the original front of the ore hearth, is visible 0.50m behind the front of the blocking by the western support for the workstone.
EDAS additions The feature is a later blocking of the ore hearth, as correctly previously described (Elevation 12). However, the corbels projecting from the wall face to either side are not supports for the workstone, but are actually the springers for the shallow arch over the hearth (see SAR 37.1 and SAR 37.2 below) (Richard Lamb, *pers. comm.*). In addition, the pillars beneath them (the original sides of the opening) are not flush with the blocking, but project slightly from it. Finally, the possible original front for the ore hearth noted in 1997 is no longer visible. Photo 1/457.

Site Number SAR 37
NGR SD 89761 92596
Site type Ore Hearth
Period Nineteenth Century
Condition Poor
Dimensions 2.54m long, 2.3m wide
Description The ore hearth, which is much obscured by rubble.
EDAS additions For details of the ore hearth, see SAR 37.1 to 37.4. Clough indicates an ore hearth in this position in 1948, but the accompanying text suggests that the remains may not have been as certain as his drawing, as he refers to there being ' two or possibly three hearths' (Clough 1980, 102). Raistrick (1975, 98) referred only to a single ore hearth, but stated that the structure was still clear and referred to the former workstone of the ore hearth as lying outside of the mill.

Site Number SAR 37.1
Site type Support for Workstone
Period Nineteenth Century
Condition Very Good
Dimensions 0.90+m long, 0.50m wide, 0.25m deep
Description A corbel-like stone support for the workstone of the ore hearth. It is mortared onto a stone pillar. The pillar is as wide as the support but is not reddened by burning. On the top face of the support is a slot running north/south (0.02m by 0.08m by 0.03m deep) and a chamfer on the inside edge (0.23m by 0.06m by 0.04m deep) towards the centre of the workstone.
EDAS additions The corbel-like projection is marked by Clough in 1948 as being on one side of an ore hearth. A 'rod' is indicated running north from the east side of the projection, perhaps the equivalent of those surviving to wall SAR 39.2, but there is now no trace of such a feature (Clough 1980, 101) and it is possible that Clough had transposed those surviving in the hearth to the east (Richard Lamb, *pers. comm.*). The corbel-like projection is not a support for the workstone, but is actually one of the springers for the shallow arch over the hearth. The 'slot' and 'chamfer' are to key in the voussoir above the springer. The height of the springers above the estimated ground level is very similar to 19th century illustrations of ore hearths, such as that depicted by Percy, for example. The sloping part of the cast-iron workstone would have been placed beneath the arch, with a sumpter pot beneath the central groove of the workstone. The pillar or pier beneath would not normally be reddened by heat, but it is possible that corbel-like projection SAR 37.2 would have been reddened if a flue for the sumpter pot were taken this way (Richard Lamb, *pers. comm.*). Photo 1/456.

Site Number SAR 37.2
Site type Support for Workstone
Period Nineteenth Century
Condition Good
Dimensions 0.90+m long, 0.50m wide, 0.25m deep
Description Part of a pair of supports with SAR 37.1. It is a corbel-like stone support for the workstone of the ore hearth. It is mortared onto a stone pillar. The pillar is reddened by burning and is wider than the corbel support (0.68m wide). On the top face of the support is a slot running north/south and a chamfer on the inside edge towards the centre of the workstone.
EDAS additions The corbel-like projection is marked by Clough in 1948 as being on one side of an ore hearth. A 'rod' is indicated running north from the west side of the projection, perhaps the equivalent of those surviving to wall SAR 39.2, but there is now no trace of such a feature (Clough 1980, 101). For SAR 37.2, see the comments above for SAR 37.1. Photos 1/457 to 1/459.

Site Number SAR 37.3
Site type Wall
Period Nineteenth Century
Condition Moderate
Dimensions 1.48m long, 0.46m wide, 0.80m high at north
Description A wall forming the western side of ore hearth SAR 37. It has a mortared construction, and is tied into wall SAR 40 to the north at lower courses but not at the upper courses. The area to the east is covered by rubble and there is a coating of fine, chocolate coloured dust between the stones.
EDAS additions Clough shows a wall in this position in 1948, with an opening for the air pipe from the bellows to run along the back of the furnaces (Clough 1980, 101). The upper part of the wall (Elevation 23) does butt SAR 40 as previously described. The lower part, stated to be tied in to SAR 40 in 1997, is actually formed by the flat lintel of the opening indicated by Clough. The opening is now very low, but it can be seen to open out into a small chamber, which extends perhaps c.1m back from the opening. The walls of the chamber are all well built, and the north wall is continuous with the south face of wall SAR 40. At its east end, the chamber drops down, and appears to have a fitting resembling a cast-iron firebar at the base. There is also a low opening at the base of the south wall, which would have opened into the area of ore hearth SAR 37. Neither the opening nor the chamber was noted in the 1997 report. Photos 1/426; 1/454; 1/455.

Site Number SAR 37.4
Site type Wall
Period Nineteenth Century
Condition Moderate
Dimensions 0.75+m long, 0.46m wide, *c*1.5m high
Description A wall running across the back of the hearth. This wall is not apparently bonded to walls SAR 37.3 or SAR 40. It is of dry-stone construction, with an abundance of fine, chocolate-coloured powder between the stones. It is not reddened by burning and is covered by rubble on its eastern end.
EDAS additions This wall is no longer visible, although it was apparently in approximately the same position as wall 39.5 within the hearth to the east.

Site Number SAR 38
NGR SD 89762 92594
Site type Wall
Period Nineteenth Century
Condition Good at bottom, Poor and unstable at top
Dimensions 0.5m long, 1.22m wide at south, *c* 1.70m high
Description A substantial earth and mortar-bonded wall. Butts against reddened pillar SAR 37.2. The western face of this wall is very reddened from burning and rises directly from the western edge of support SAR 37.2. After *c*1.30m this western face turns a corner to head east, leaving an opening at the back of the hearth for gases to go to the condenser and flue. The east side of the wall is covered with rusty-coloured lichen but is not burnt. It butts to the wall to the north, SAR 40. The southern end of this eastern face starts to curve eastwards at its southern end, probably to form a circular corbelled feature (SAR 39.1).
EDAS additions The wall (Elevation 12) is not correctly drawn in plan in 1997, the gap between the east corbel (SAR 37.2) and the corner of SAR 38 being slightly wider. The visible area of the western face of the wall is less than is shown in 1997, but one part that does survive does butt wall SAR 40 to the north. The 1997 statement that the wall 'butts against reddened pillar SAR 37.2' is confusing. It appears to refer only to the uppermost part of the south face of the wall, which does butt the rather ragged remains of the western face directly above the pier supporting corbel 37.2, thus suggesting that SAR 38 is of at least two phases. However, at a lower level, to the

immediate east of the pier supporting corbel 37.2, there appears to be a narrow gap, choked with rubble; this is marked as a socket in 1997 (LUAU figure 11). The east side of this gap is formed by another wall face, in line with the south face of the pier and apparently passing beneath the western face of wall SAR 38. The latter projects a further 0.50m to the south, and then returns to the east to form the south face. The lower c.0.60m of the south face is better built than the upper part, noted to butt the western face above. The east face of the wall (Elevation 20) appears to survive largely as shown in 1997, and also butts wall SAR 40 to the north. However, it does not begin to curve eastwards at its southern end as described in 1997, and has no demonstrable relationship to 'circular corbelled feature SAR 39.1'. It is difficult to discern whether the 'Support hole for Slag Hearth Fixing' indicated to the centre of the east face (LUAU figure 13) is socket or merely formed by a fallen stone. Photos 1/458; 1/463.

Site Number SAR 39
NGR SD 89764 92595
Site type Slag Hearth
Period Nineteenth Century
Condition Poor
Dimensions 3.76m long, 2.62m wide
Description A presumed slag hearth, which is much collapsed and rubble covered.
EDAS additions For details of the presumed slag hearth, see SAR 39.1 to 39.5. Clough indicates an ore hearth in this position in 1948, but of a different form to that to the west (SAR 37) and differing from the surviving remains. However, the accompanying text suggests that the remains may not have been as clear as his drawing, as he refers to there being ' two or possibly three hearths' (Clough 1980, 102). Raistrick (1975, 98) referred only to a single ore hearth and a slag hearth; his reference to the latter appears to have been the first mention of such a structure. Its identification as such was presumably based either on the then surviving form, or the presence of certain slags in the vicinity.

Site Number SAR 39.1
Site type Wall
Period Nineteenth Century
Condition Poor
Dimensions 1.68m long, 0.45+m wide, 1.07m high
Description A curved dry-stone wall forming the southern half of a semi-circular chamber with SAR 40. Rubble behind wall obscures the back edge of a wall, which shows no signs of reddening caused by heat.
EDAS additions The wall (Elevation 12) clearly post-dates wall SAR 38 to the immediate west, and appears to be little more than a rough blocking; it may be visible on a slide taken in 1984 (RL 84030). It does not form part of a semi-circular chamber as described in 1997. The 1997 statement that 'rubble behind wall obscures back edge of wall' contradicts what is shown on the plan of that date, where a back edge is indicated. Photos 1/460; 1/461.

Site Number SAR 39.2
Site type Wall
Period Nineteenth Century
Condition Poor
Dimensions 1.70m long, 0.50m wide, *c* 1.4m high
Description A wall forming the south-eastern side of slag hearth SAR 39. The wall is of dry-stone construction and contains chocolate-coloured dust between the stones. Two iron straps protrude from the front of the wall and extend back into wall SAR 39.3. The straps are initially rectangular in section (40mm x 15mm), then square (25mm x

25mm x 180mm long) and finally round and threaded (25mm diameter x 70mm long) where they protrude.

EDAS additions The wall (Elevation 12) is clearly a later addition to the complex, and appears to be little more than a rough blocking; it does not form a part of a slag hearth, as stated in 1997. In contrast to the 1997 description, only the east rod has the variations in section and threading described, the west rod having a flattened rectangular profile throughout. In addition, the straps are not correctly drawn in plan in 1997, actually being set further apart. This means that while the western strap does extend back into wall SAR 39.3, the eastern strap is actually set into the south end of wall SAR 39.4. Photos 1/460; 1/461.

Site Number SAR 39.3
Site type Wall
Period Nineteenth Century
Condition Poor
Dimensions 0.71m long, 0.26m wide
Description An indistinct dry-stone wall with much chocolate-coloured dust between the stones. The iron straps associated with SAR 39.2 continue into this wall.
EDAS additions The wall is largely as described, although only the south face is now clearly visible, rather than the plan form shown in 1997. The eastern iron strap continues into the south end of wall SAR 39.4, not SAR 39.3 as stated in 1997. Photos 1/460; 1/461.

Site Number SAR 39.4
Site type Wall
Period Nineteenth Century
Condition Poor
Dimensions 1.05m long, 0.70m wide
Description This earth and mortar bonded wall appears to curve inwards (southwards) to form an enclosed area possibly mirroring that formed by SAR 40 and SAR 39.1. It is butted by SAR 39.5 and is covered by rubble to the north, west and east.
EDAS additions The west face of the wall (Elevation 21) does not curve inwards at the south end as stated in 1997; the 'curve' is due to decay, leaning and a decayed junction with later wall SAR 39.2. The surviving parts of the east face are generally much lower than the west face. Photos 1/433; 1/461.

Site Number SAR 39.5
Site type Wall
Period Nineteenth Century
Condition Good
Dimensions 1.52m long, 0.81m wide
Description A wall forming the eastern side of slag hearth SAR 39. The wall is mortared and the dog-leg in the centre of the slag hearth is bonded-in to the rest of the wall. The top of the dog-leg section is *c*1.10m below the surviving top of the main wall. It is surrounded by rubble on all sides, and shows reddening due to burning on the south side only. The main wall is burnt on the west side only, with rusty-coloured lichen on the east side. It butts wall SAR 39.4 to the north.
EDAS additions The description given in 1997 is confusing, as the wall forms the northern side of any structure here, rather than the western side, while the 'dog leg' (the south return at the west end) is not in the centre of a structure, but in the centre of the space between SAR 38 and SAR 39.4. It does however butt wall SAR 39.4 as stated. Photo 1/464.

Site Number SAR 40
NGR SD 89760 92597
Site type Wall
Period Nineteenth Century
Condition Poor
Dimensions 6.30m long, 0.70m wide at east, 0.60m wide at west, *c* 1.43m high
Description This substantial dry-stone wall is shared by both hearths as their back wall. At the western end is an opening, although now rubble filled, which is 0.59m wide by at least 0.40m deep. Above and to the east of this, the eastern end of another opening is visible (at least 0.30m wide and at least 0.46m high). There is no sign of burning on the western half of the wall but there is abundant rusty-coloured lichen. Near the centre of the wall is a blocked opening, the sill of which survives and whose eastern edge is unclear. It is 0.68m high and *c*1.20m wide, with a triangular-section iron tie protruding from the blocking. At the eastern end, the northern face of the wall continues in a straight line, below rubble, for at least 0.90m beyond the junction with SAR 38, while the southern face curves south to form the northern half of a semi-circular chamber. The wall does not continue to the dogleg of SAR 39.5 but stops *c*0.50m short. The southern face of this eastern end of the wall is reddened by heat.
EDAS additions In 1857, three conjoined sub-square structures are shown in this location, outside the main body of the mill, and with the flue running north from the central structure. Clough shows a wall here in 1948, pierced by two openings, each positioned behind one of the ore hearths. The wall forms the south side of an east-west passage, divided into two parts of equal size; the east part was labelled as a condenser, while the west part is shown as being flagged over (Clough 1980, 101). Interestingly, a small aperture with a flag roof may just be visible in this position on a slide taken in 1984 (RL 84031). Raistrick (1975, 98) stated that the structures shown by Clough were 'two small condenser chambers'. It is possible that the passage is a later addition to the mill, and it might have functioned as a dust chamber to help allow the settling out of particles of fume, replacing an earlier arrangement. Clearly, whatever arrangement existed latterly was though to be inadequate in some way, as there were plans to extend the flue further northwards up the hillside (Richard Lamb, *pers. comm.).*
The visible sections of both the north (Elevation 19) and the south (Elevation 22) faces of the wall are apparently less extensive in plan than in 1997. The opening at the west end, described and shown in plan in 1997, is no longer clearly visible, although the top of the wall does step downwards from east to west in the same approximate area. Similarly, the east end of the opening described as being above and to the east of this also cannot be seen. The blocked opening towards the centre does however remain visible, and is 1.20m wide as described; the triangular–section tie could not be seen. The opening is in the same position as the western opening marked by Clough in 1948 (Clough 1980, 101), although he showed the west jamb to be splayed, whereas it now appears to be straight. The northern face of the wall can no longer clearly be seen to continue past SAR 38, while the southern face does not curve southwards to form one half of a semi-circular chamber as described in 1997; the curve is due to the wall having partly collapsed and fallen forwards. Photo 1/473.

Site Number SAR 41
NGR SD 89757 92596
Site type Wall
Period Nineteenth Century
Condition Moderate
Dimensions 1.99m long, 0.35m wide, 0.47m high
Description This mortared wall is the return of SAR 40. Rubble covers the back and the area in front (west). It is slightly curved and butts to wall SAR 42.
EDAS additions This wall is no longer visible.

Site Number	SAR 42
NGR	SD 89757 92597
Site type	Tuyere Hole
Period	Nineteenth Century
Condition	Good
Dimensions	2.00m+ deep, 0.42m wide, 0.25m high
Description	A hole with a dry-stone constructed surround leading into a chamber (at least 2.00m deep) to the east. A lip stone (1.02m long, 0.40m wide) extends 0.60m out of the hole into the area that would have housed the bellows and waterwheel. A low wall to the north butts against the hole surround.
EDAS additions	The nomenclature used in 1997 is incorrect; a 'tuyère' directs air directly into a furnace, whereas an opening here may have housed an air-pipe (Richard Lamb, *pers. comm.*). However, even the latter is unlikely, an opening within SAR 37.3 (not noted in 1997) being far more likely to fulfil this purpose, and indeed is shown as doing so by Clough in 1948 (Clough 1980, 101). The opening is c.0.20m wide and 0.30m deep; the low wall butting to the north described in 1997 is no longer visible. The surround of the opening appears to post-date the west end of wall SAR 40. It can be seen that the passage or chamber extends at least 1.70m to the east. The north wall is rather crudely constructed and appears partly collapsed, but the south wall (continuous with SAR 40?) is much better built. The space between the walls appears to have a flag roof. Towards the end of the visible east part, the space is choked with fallen stone. Amongst the stone, there is an interesting item, set approximately horizontal, apparently of cast-iron, and resembling a pronounced fish-bellied rail in form - it is probably an *ex situ* bearer from the roasting furnace (Richard Lamb, *pers. comm.*). It is possible that this hole or passage is another crudely constructed rabbit type or vermin trap, built within the part-backfilled passage SAR 40. Photos 1/449; 1/453.

Site Number	SAR 43
NGR	SD 89747 92596
Site type	Roasting Hearth
Period	Nineteenth Century
Condition	Poor
Dimensions	6.61m long, 5.24m wide, 1.50m high
Description	This is a rectangular structure apparently tied-in to the main mill building (SAR 31). There are two person-sized doorways, one in the south wall and one in the west wall.
EDAS additions	For the roasting hearth building, see SAR 43.1 to 43.2. In 1948, Clough marks a calcining hearth aligned east-west across the north side of the interior of this space, with a detached brick chimney to the external north-west corner (Clough 1980, 101). Raistrick (1975, 98) states that the building in which the roasting furnace is housed is less well-built than the main mill building, raising the possibility that it may be a later addition, although it was clearly present by 1857.

Site Number	SAR 43.1
Site type	Wall
Period	Nineteenth Century
Condition	Poor
Dimensions	0.59m wide at west, 0.80m high at west
Description	A wall forming structure SAR 43. The south edge is covered by rubble but visible at both ends. There is an opening in the centre (1.28m wide). The western end of the wall has toppled outwards but is on the same alignment.
EDAS additions	The wall is still as previously described, although considerably less is now visible than is shown on plan in 1997. The opening in the centre is a doorway, just visible on Backhouse's 1905/06 photograph (Raistrick 1975, 96); Clough erroneously shows the doorway to be at the east end of this wall (Clough 1980, 101).

Site Number SAR 43.2
Site type Wall
Period Nineteenth Century
Condition Moderate at south, Poor at north
Dimensions 1.60m long, 0.61m wide, 1.46m high
Description Part of a wall with a return at the north end. It has a single through stone at the same height as the lower line of through stones on the main building south facade (SAR 31.1). A threshold or sill is visible to the north of the return, though rubble mostly covers this opening. The wall can be seen again further to the north, where the chimney butts against it. There is one part-vitrified brick and some ironwork near the chimney, and a hole in the building wall allowing access to the base of the chimney stack.
EDAS additions The wall (Elevations 7 and 8) is still largely as previously described. The opening to the south of centre was once a window, and was still complete when Backhouse took his photograph in 1905/06 (Raistrick 1975, 96). The chimney does not butt against the wall, as stated in 1997, but there is an 80mm gap between the two (see also SAR 44). The east face of the wall can be seen to return to the east for a very short distance at its north end; this return is not shown in 1997. The hole in the wall allowing access to the chimney stack is no longer visible. Two sockets shown to the south end of the external face (Elevation 7) (LUAU figure 9) appear to be missing stones rather than built features. Photos 1/436 to 1/438.

Site Number SAR 44
NGR SD 89744 92598
Site type Chimney Stack
Period Nineteenth Century
Condition Moderate
Dimensions 1.40m north-south, 1.40m west-east, 0.42m high
Description A chimney stack for roasting hearth SAR 43, immediately to the west of the hearth. There is an 80mm gap between the stack and roasting hearth. The chimney stack is square, of mortared construction, and the inside is reddened from heat.
EDAS additions The feature is largely as previously described. The chimney stack was much taller when Backhouse took his photograph in 1905/06 (Raistrick 1975, 96) and appears to have been largely of stone, with one or two courses of bricks around the top. The 'pot' may have been formed by the large diameter ceramic pipes that can now be seen scattered around the main mill building, including within the blocking of the doorway in the east wall (SAR 31.2) (Richard Lamb, *pers. comm.*). Clough (1980, 102) refers to a detached brick chimney, and Raistrick (1975, 98) also states that it is built of brick. Given that the complex was clearly derelict by the early 20th century, there is no reason why a stone chimney should have been rebuilt in brick by the 1940s. Perhaps it was lined with brick, and this was what Clough and Raistrick were referring to, or perhaps the references to brick may be poor terminology when referring to the ceramic pipe. The only bricks noted around the complex in 2012 were a few vitrified examples close to the hearths. The 80mm gap noted in 1997 is still visible, but this contradicts the statement made regarding wall SAR 43.2 in 1997 that 'the chimney butts against it'. Photos 1/441; 1/477.

Site Number SAR 45
NGR SD 89749 92599
Site type Iron Beams
Period Nineteenth Century
Condition Moderate
Dimensions 0.10m x 0.025m section, 0.30m+ high

Description	Four iron beams protruding vertically from the ground, all apparently cut down from their original height. They are unevenly spaced and are possibly associated with the transfer of ore into the roasting hearth.
EDAS additions	Clough (1980, 101) shows a solid wall here in 1948. Given that the 'beams' are formed by vertical iron bars, they are better described as standards. They are unlikely to have been associated with the transfer of ore into the furnace as suggested in 1997, as ore was normally fed in by a suitable hopper mounted on the roof. The bars may represent part of the firebox; the furnace would have been tied together using numerous upright iron standards set deep into the ground, linked with tie-bars and wedges (Richard Lamb, *pers. comm.*). Photos 1/439; 1/440.

Site Number	SAR 46
NGR	SD 89750 92600
Site type	Structure
Period	Nineteenth Century
Condition	Poor
Dimensions	3.86m long, 2.55m wide, 0.60m high
Description	An 'L'-shaped structure cut into the hill. It consists of a dry-stone retaining wall at least 0.28m wide.
EDAS additions	Very little of the structure shown in 1997 remains visible. There is a small section of faced wall forming a right-angled return, standing c.0.75m in height, but otherwise the feature survives a steep south or west-facing scarp containing a high proportion of stone rubble. The scarp to the west of the faced wall section is on approximately the same alignment as the east return at the north end of wall SAR 43.2 and the iron bars SAR 45. Photos 1/471; 1/475.

Site Number	SAR 47
NGR	SD 89755 92602
Site type	Wall
Period	Nineteenth Century
Condition	Poor
Dimensions	4.47m long, 0.66m wide, 0.90m+ high
Description	A substantial wall cut into the hillside to the north and running almost to the north wall of the main structure (SAR 31). It is of earth and mortar bonded construction, and contains a large flat stone at its north-west corner. Rubble lies to the west, east and south of the wall, and there is an opening below the large, flat stone mentioned above. This opening is quite large, and possibly allowed water to pass through or under the wall to the condensing chamber to the east.
EDAS additions	The wall is now only approximately half the length shown in 1997, and cannot now be traced as far as the mill (SAR 31). The large flat stone described at the north-west corner is no longer visible. The wall is generally in poor condition, and gives the impression of having collapsed from east to west. Photo 1/469.

Site Number	SAR 48
NGR	SD 89754 92603
Site type	Structure
Period	Nineteenth Century
Condition	Poor
Dimensions	1.00m long, 0.55m wide
Description	A dry-stone structure abutting SAR 47. It is collapsed at the north-west end, and there is much rubble to the west and south. To the north it appears to butt a mortared retaining wall (belonging to the south edge of head-race culvert SAR 49).
EDAS additions	Only the southern-most end of this wall is now visible. Photos 1/470; 1/474.

Site Number	SAR 49
NGR	SD 89754 92603
Site type	Retaining Wall, possibly of head race culvert
Period	Nineteenth Century
Condition	Poor
Dimensions	1.75m long, 0.20m wide
Description	The south side of the head-race culvert. The bottom of the wall has slipped down the slope here. The culvert itself is *c* 0.55m wide at this point and was stone-flag capped, but is now collapsed. The opening to feed the wheel may be 1.40m west of this wall, but is filled with rubble and collapsed. The culvert may have extended further to the east, possibly to wash the condensing chamber.
EDAS additions	The feature is difficult to discern as described in 1997. There is no evidence that it extended further towards the 'condensing chamber' SAR 50. Photos 1/470; 1/474.

Site Number	SAR 50
NGR	SD 89763 92601
Site type	Condensing Chamber
Period	Nineteenth Century
Condition	Moderate
Dimensions	5.53m long, 3.90m wide
Description	A trapezoidally-shaped structure at the base of flue SAR 09. There are openings into it from the backs of the hearths, and also an access door. It has a pillar in its centre. It would appear to have been a condensing chamber.
EDAS additions	For the 'condensing chamber', see SAR 50.1 to 50.2. In 1857, three conjoined sub-square structures are shown in this location, outside of the main body of the mill, and with the flue running north from the central structure. Clough shows a wall here in 1948, pierced by two openings, each serving a part of the condenser chambers (see SAR 40) to the south. The openings lead into the base of the flue (Clough 1980, 101). Although this is described as a 'condensing chamber' in 1997, both Clough and Raistrick refer to structures within the passage (see SAR 40) to the south as condensers or condensing chambers, this being described as part of the flue. The 'condensing chamber' lacks the size, obvious water supply, the drive mechanism to work apparatus or the associated settling pond/s that might be expected with any sort of condensing activity. It may alternatively be a settling chamber, where flue dust could accumulate due to a sudden reduction in velocity (Richard Lamb, *pers. comm.*). This might explain why Clough labelled the doorway in the east wall as a 'Cleaning Door' (Clough 1980, 101).

Site Number	SAR 50.1
Site type	Wall
Period	Nineteenth Century
Condition	Moderate
Dimensions	6.02m long, 0.62m wide, 1.80m high
Description	Substantial wall forming the south side of condensing chamber SAR 50, but it is not quite on the line of wall SAR 31.4. There are no protruding through stones. The east corner is missing and the north side is heavily covered with rust-coloured lichen, and slightly pink from burning. There is one definite and one possible opening to the condensing chamber in this wall; both have thin sandstone sills. The west end of the wall returns to join the condensing chamber wall and is bonded-in. One triangular-section iron tie is located just to the east of the westernmost opening.
EDAS additions	Clough (1980, 101) shows two openings in this wall in 1948. Of the two openings noted in 1997, only one possible opening (the western of the pair shown by Clough), to the approximate centre of the wall (Elevations 16 and 18), is now visible,

but the triangular section tie could not be traced. The west return of the wall is obscured by rubble. Photos 1/465; 1/466.

Site Number	SAR 50.2
Site type	Wall
Period	Nineteenth Century
Condition	Moderate
Dimensions	0.55m long, 0.44m wide, 0.90m high
Description	A stub wall in the centre of the flue chamber; it is surrounded by and slightly covered by rubble. It was previously higher. It has a mortar-bonded construction, and is not tied in to the wall above the surviving height; it is not possible to see if it is tied in below. It was a possible support for the condensing mechanism. It is shown by Clough (1962) as part of the central wall in the structure.
EDAS additions	The feature is as previously described. Clough (1980, 101) shows it to form part of a short mid-feather to the flue, and it is described as such by Raistrick (1975, 98). The mid-feather would have separated the flow of gases from the two hearths and prevented backflow (Richard Lamb, *pers. comm.*). Photo 1/462.

Site Number	SAR 51
NGR	SD 89767 92599
Site type	Wall
Period	Nineteenth Century
Condition	Poor
Dimensions	0.60m long, 0.38m wide, 0.28m high
Description	The surviving corner of a small room or shelter built into the corner of the condensing chamber SAR 50. There is some low rubble inside the presumed structure. There is a beam socket in the centre-top of the wall to the west.
EDAS additions	The structure is not built into the corner of the condensing chamber as stated in 1997, but is actually set on the east side. There are two stones at the north-east 'corner' of the structure which appear to be *in situ*, but other than that it is defined by shallow scarps; it does not have the definite wall lines implied in 1997. Only the west wall, forming the east side of the condensing chamber, can be clearly seen, and this butts the south wall of the chamber SAR 50.1. The 'beam socket' in the west wall is actually a 0.80m wide opening (marked as a 'cleaning door' by Clough (1980, 101)), which has been blocked, and a socket with a stone lintel created within the blocking. The socket is at least 0.80m long. Photos 1/467; 1/468.

Site Number	SAR 52
NGR	SD 89734 92636 - 89756 92607
Site type	Trackway
Period	Eighteenth/Nineteenth Century?
Condition	Good
Dimensions	39.35m+ long, 3.20m wide
Description	The main trackway into the smelt mill complex from Sargill Mine to the northwest. This track can be positively identified with a track shown on the 2nd edition OS map.
EDAS additions	The feature is still as previously described. It is marked on the 1857 Ordnance Survey map, but does not appear on the 1914 edition. Photos 1/472; 1/479.

APPENDIX 2

APPENDIX 2: SARGILL SMELT MILL PHOTOGRAPHIC CATALOGUE

Film 1: Digital colour prints taken 20th June 2012

All elevation numbers (E) and feature numbers are as used in the 1997 LUAU report

Film	Frame	Subject	Scale
1	352	General view of mill (31) and flue (9), looking N	2m
1	353	General view of mill (31) and flue (9), looking N	2m
1	354	Mill, S external elevation (E5) (31.1), looking N	2m
1	355	Mill, W end of S external elevation (E5) (31.1), looking N	2m
1	356	Mill, E end of S external elevation (E5) (31.1), looking N	2m
1	357	Mill, E end of S external elevation (E5) (31.1) and flue (09), looking N	2m
1	358	General view of mill (31) and flue (09), looking NE	2m
1	359	General view of mill (31) and flue (09), looking NE	2m
1	360	Mill race (12), looking NW	-
1	361	General view of mill (31) and flue (09), with spoil tips of mine on horizon, looking NW	2m
1	362	General view of mill (31) and flue (09), with spoil tips of mine on horizon, looking NW	2m
1	363	General view of mill (31) and flue (09), looking NW	2m
1	364	General view of mill (31) and flue (09), with spoil tips of mine on horizon, looking NW	2m
1	365	General view of mill (31) and flue (09), with spoil tips of mine on horizon, looking NW	2m
1	366	Mill, E end of S external elevation (E5) (31.1), looking N	2m
1	367	Mill, W end of S external elevation (E5) (31.1), looking NW	2m
1	368	Mill, W end of S external elevation (E5) (31.1), looking N	2m
1	369	Track 21, looking W	2m
1	370	General view of mill (31) and flue (09), looking NW	2m
1	371	N end of flue extension (01), looking S	2 x 1m
1	372	N end of flue extension (01), looking SE	2 x 1m
1	375	Gully 02, looking SE	2 x 1m
1	376	Gully 03, looking S	2 x 1m
1	377	Chimney (04), looking SE	1m
1	378	Chimney (04), looking NW	1m
1	379	Chimney (04), S external elevation (E1), looking N	1m
1	380	Chimney (04), E external elevation (E2), looking W	1m
1	381	Chimney (04), N external elevation (E3), looking S	1m
1	382	Chimney (04), flue opening in base of S internal wall, looking S	-
1	383	Ditches 05 and 06, looking NW	1m
1	384	Structure 07, looking NE	1m
1	385	Structure 08, looking NW	1m
1	386	Flue (09), looking S	1m
1	387	Flue (09), looking S	1m
1	388	Flue (09), looking N	1m
1	389	Flue (09), looking N	1m
1	390	Flue (09), detail of W wall, looking SW	1m
1	391	Flue (09), detail of W wall showing vermin trap, looking NW	1m
1	392	Flue (09), detail of stones around E end of vermin trap, looking N	1m
1	393	Retaining wall 10, looking N	1m
1	394	Culvert 11, looking NE	1m
1	395	Mill race (12), within survey area, looking W	1m
1	396	Mill race (12), W of stream (15), looking W	1m
1	397	Mill race (12), W of stream (15), looking E	1m
1	398	Culverted stream (15) where crossed by mill race (12), looking NE	1m
1	399	Mill race (12), within survey area, looking E	1m
1	400	Ditch? 13, looking NE	1m
1	401	Track 14, looking W	1m
1	402	Culverted stream (15), where crossed by mill race (12), looking NE	1m
1	403	Track 14, looking E	1m
1	404	Retaining wall 16, looking NW	1m

1	405	Retaining wall 16, W of survey area, looking NW	1m
1	406	Retaining wall 16, W of survey area, looking NW	1m
1	407	Culvert (17) and retaining wall (18), looking N	1m
1	408	Tail-race outlet? (19), looking NW	1m
1	409	Track 20, looking E	1m
1	410	Retaining wall 22, looking NW	1m
1	411	Retaining wall 22, looking E	1m
1	412	Hollows 24 and 25, looking E	1m
1	413	Platform 23, looking W	1m
1	414	Culvert 27, looking NE	1m
1	415	Culvert 26, looking SW	1m
1	416	Barren area (28), looking NE	1m
1	417	Platform 29, looking E	1m
1	418	Culvert 30, looking NE	1m
1	419	Mill, E doorway in S external elevation (E5) (31.1), looking N	2m
1	420	Mill, window in S external elevation (E5) (31.1), looking N	2m
1	421	Mill, W doorway in S external elevation (E5) (31.1), looking N	2m
1	422	Mill, W end of S internal elevation (E14) (31.1), looking S	2m
1	423	Mill, W end of S internal elevation (E14) (31.1), looking S	2m
1	424	Mill, W end of S internal elevation (E14) (31.1), looking S	2m
1	425	Mill, W end of S internal elevation (E14) (31.1), showing walls (33 & 34), looking S	2m
1	426	Mill, interior of chamber accessed from opening (37.3), looking E	-
1	427	Mill, window in S internal elevation (E14) (31.1), looking S	2m
1	428	Mill, E end of S internal elevation (E14) (31.1), looking SW	2m
1	429	Mill, E end of S internal elevation (E14) (31.1), looking SE	2m
1	430	Mill, E external elevation (E15) (31.2), looking W	2m
1	431	Mill, doorway in E external elevation (E15) (31.2), looking W	2m
1	432	Mill, E external elevation (E15) (31.2), looking NW	2m
1	433	Mill, E external elevation of wall 39.4, looking W	-
1	434	Mill, N end of W external elevation (E6) (31.3), looking E	2m
1	435	Mill, S end of W external elevation (E6) (31.3), looking E	2m
1	436	Roasting hearth room, W external elevation (E7) (43.2), looking E	2m
1	437	Roasting hearth room, W internal elevation (E8) (43.2), looking W	1m
1	438	Area of roasting hearth (43), looking N	1m
1	439	Iron standards (45) in roasting hearth room, looking NE	1m
1	440	Iron standards (45) in roasting hearth room, looking NE	1m
1	441	Roasting hearth chimney (44), looking W	1m
1	442	Mill, S end of W internal wall (E9) (31.3), looking W	1m
1	443	Mill, recent structure over wheelpit (32), looking N	1m
1	445	Mill, interior of recent structure over wheelpit (32), looking NW	-
1	446	Mill, N end of W internal wall (E9) (31.3), looking W	1m
1	447	Mill, W end of N internal wall (31.4), looking NW	1m
1	448	Mill (31), general view of blowing room, looking N	1m
1	449	Mill, opening 42 (E10), looking E	1m
1	453	Mill, interior of opening 42, looking E	-
1	454	Mill, opening 37.3 (E23), looking E	1m
1	455	Mill, wall 40 (E22) and opening 37.3 (E23), looking NE	1m
1	456	Mill, corbelled projection 37.1 of ore hearth (E12), looking NW	-
1	457	Mill, corbelled projections 37.1 & 37.2 of ore hearth (E12), looking N	1m
1	458	Mill, corbelled projection (37.2) of ore hearth and wall (38) (E12), looking N	1m
1	459	Mill, corbelled projection (37.2) of ore hearth (E12), looking NE	1m
1	460	Mill, walls 39.1 to 39.5 of slag hearth (E12, 18, 20 & 21), looking N	1m
1	461	Mill, walls 39.1 to 39.5 of slag hearth (E12, 18, 20 & 21), looking NE	1m
1	462	'Condensing chamber' (50) (E18), looking N	1m
1	463	Mill, W wall (38) of slag hearth (E20), looking W	1m
1	464	Mill, wall 39.5 of slag hearth (E21), looking SW	1m
1	465	Mill, N wall of passage (50.1) (E18), looking N	1m
1	466	'Condensing chamber', S and W walls (50.1) (E16), looking SW	1m
1	467	'Condensing chamber', E external wall (E17), looking W	1m
1	468	'Condensing chamber', E external wall (E17), looking W	1m
1	469	Wall 47, looking W	1m
1	470	Walls 47, 48 and 49, looking W	1m
1	471	Wall 46, looking W	1m

1	472	Track 52, looking NW	-
1	473	Mill, S wall of passage (40) (E19), looking S	1m
1	474	Walls 47, 48 and 49, looking E	1m
1	475	Wall 46, looking W	1m
1	477	Roasting hearth chimney (44), looking S	-
1	478	Mill (31), general view over ruin, looking SE	-
1	479	Track (52), looking SE	-
1	482	Sargill mine, level entrance, looking N	-
1	483	Sargill mine, level entrance, looking N	-
1	484	Sargill mine, spoil heaps, looking S	-

PROJECT	
SARGILL SMELT MILL	
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PHOTOGRAPHIC RECORD	
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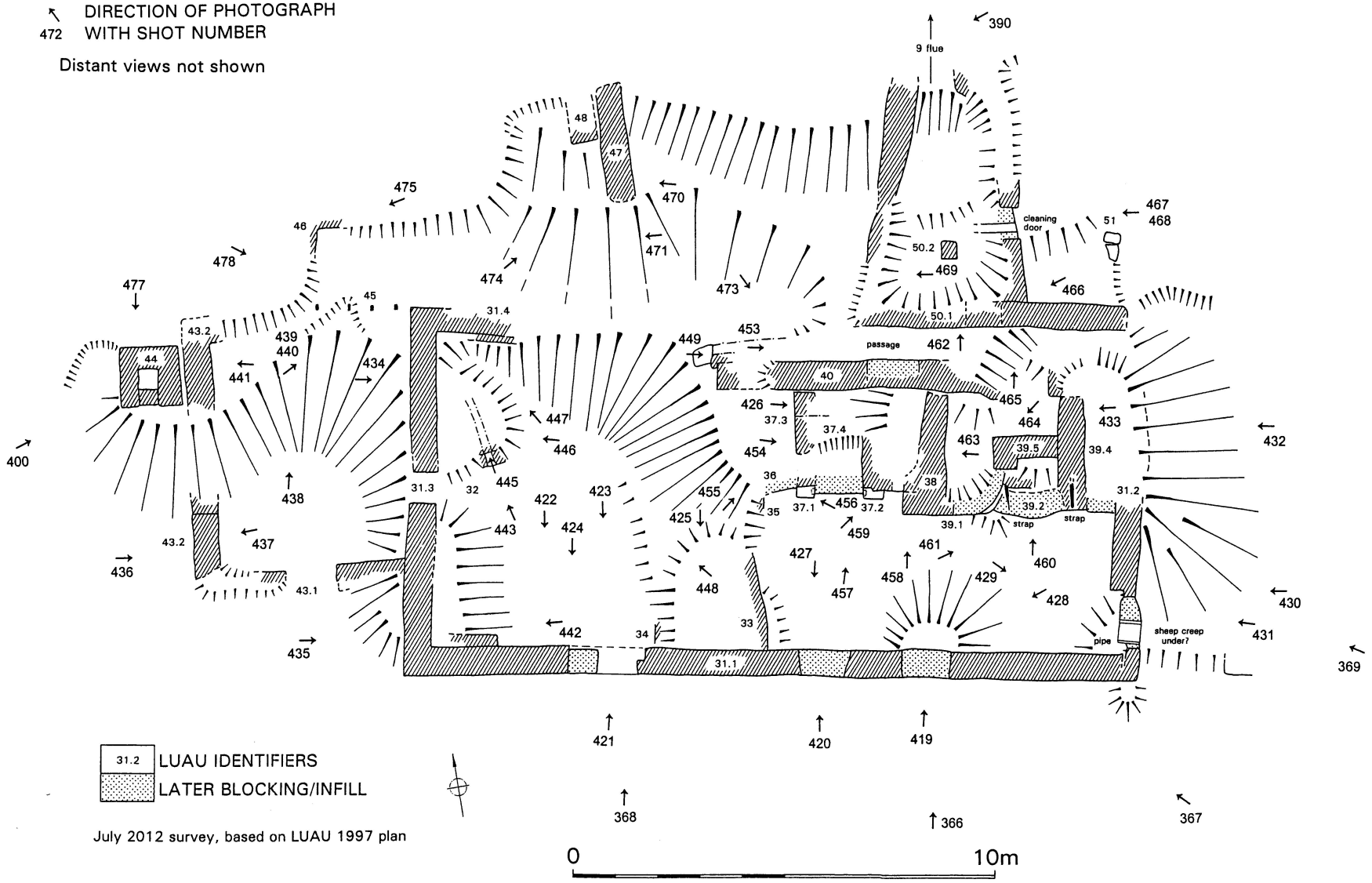
EDAS	FIGURE: A2/1

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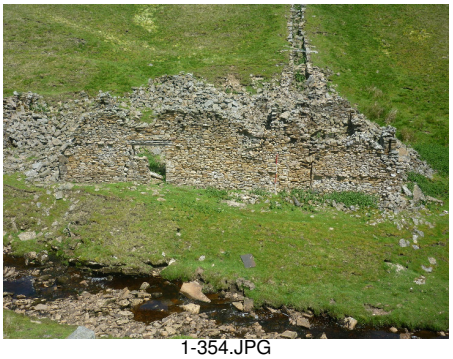
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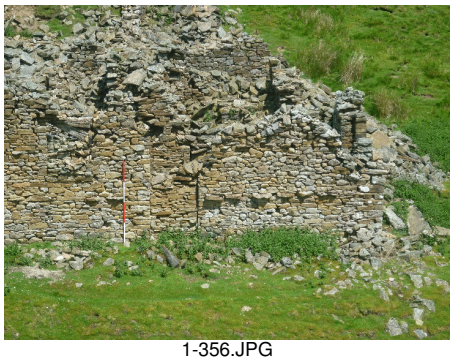
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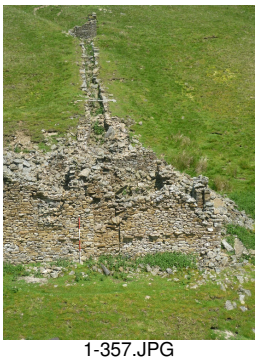
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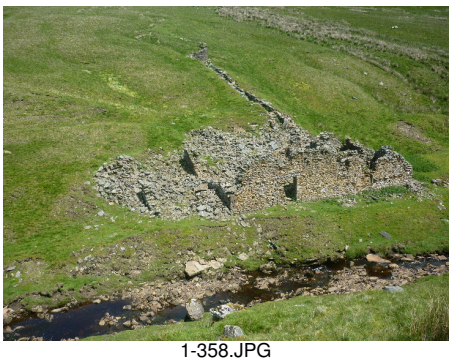
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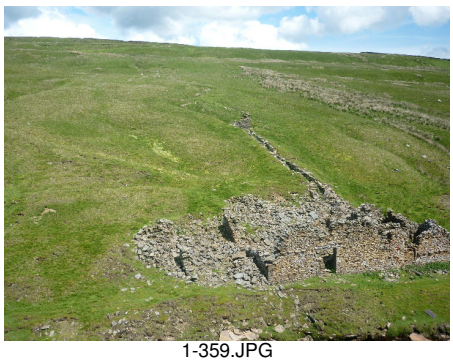
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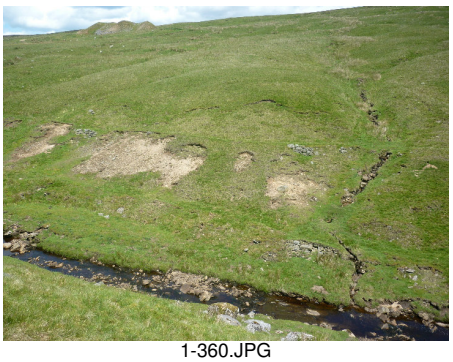
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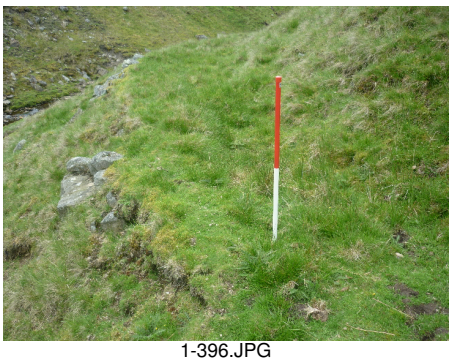
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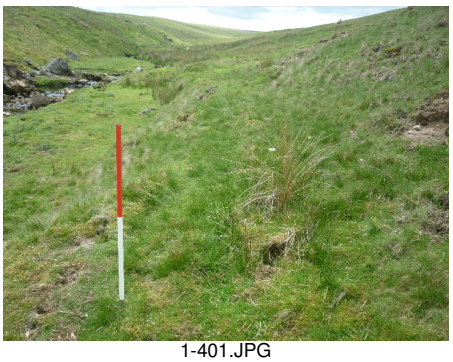
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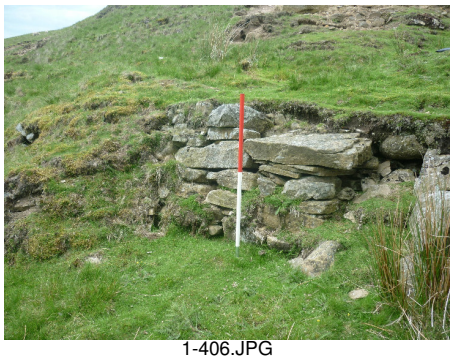
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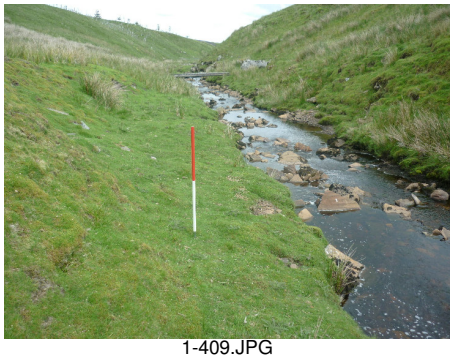
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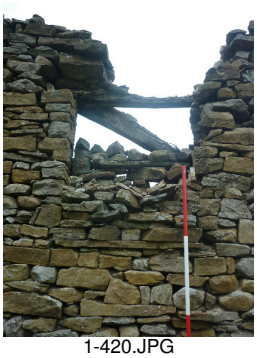
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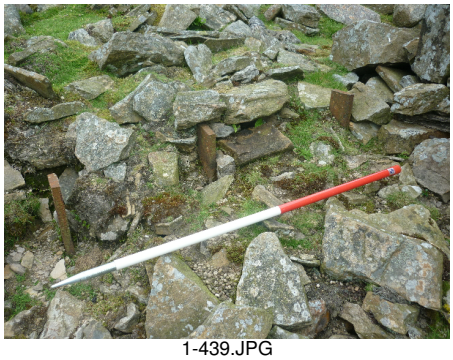
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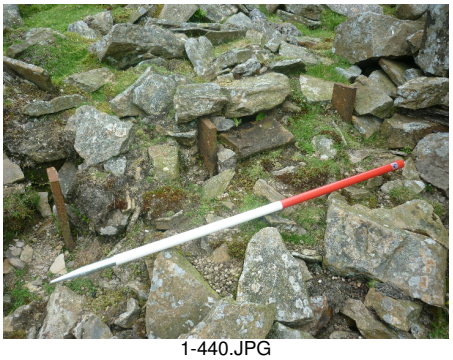
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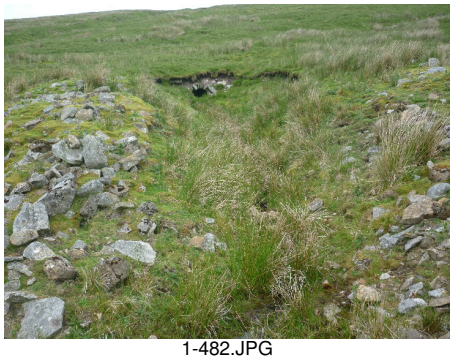
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APPENDIX 3

APPENDIX 3: DIMENSIONS OF COMPARATIVE SMELT MILLS

by Richard Lamb

All measurements are approximate and are given in feet, and all relate to the use of two ore hearths, except Grinton How Mill. Where no dimensions are given, this is due to the design of the building not allowing for a meaningful abstraction of these measurements.

Smelt Mill	*Smelting Room*	*Bellows Room*	*Roasting House*
Sargill	35 x 18 (1)	32 x 30	21 x 17
Cockhill	37 x 28	44 x 23	40 x 20
Prosperous	33 x 24	33 x 18	20 x 20
Kettlewell	37 x 25 (2)		-
Grinton How Mill	54 x 36 (3)	30 x 21	-
Marrick Low	31 x 28		27 x 17
Surrender	32 x 26 (4)	35 x 32	19 x 18
Blakethwaite	35 x 22	33 x 24	-
Swinnergill	33 x 27	33 x 24	-
Beldi Hill			19 x 18

Notes

(1) Excluding ‘passage’ behind furnaces.

(2) This includes the roasting furnace which is located in the same common room.

(3) Grinton mill incorporates three hearths, hence the wide room.

(4) This measures one room for two hearths, although the mill has a total of four plus a roasting furnace. The bellows are therefore capable of supplying four hearths.

APPENDIX 4

APPENDIX 4: METHODOLOGY FOR FUTURE MONITORING

Introduction

It would be a useful exercise to monitor the further gradual deterioration of the Sargill smelt mill ruins over time. This would serve two important functions. Firstly, it would produce a record of any collapses which might reveal additional structural or technological evidence for the development and function at the mill. Secondly, it would measure how fast such structures do actually decay over time due to natural causes, information which would be useful when assessing conservation and consolidation priorities for other similar sites in the Yorkshire Dales and elsewhere.

A monitoring handbook should be prepared, which can be updated with each visit.

It is recommended that the future formal monitoring is done once every five to seven years; this time frame could be extended once the south wall of the mill and the chimney has undergone significant collapse, as subsequent decay is likely to be more limited. However, it might also be appropriate to carry out informal visits, for example every two years, which could then trigger a formal visit with the handbook if necessary.

Contents of Monitoring Handbook/Folder

- Existing EDAS survey plan, LUAU earthwork survey, photographic location plan and key EDAS photographs, in A4 laminated sheets for protection;
- Check list of materials to take on site - digital camera, surveying poles, 50m survey tape, 3m tape measure, note book.

Access Arrangements

- Spring/winter visits are recommended, when vegetation is low, arriving on site mid-day when light conditions are optimal;
- Obtain permission from Stagsfell Estate for impending visit;
- Undertake appropriate Health and Safety checks and Risk Assessments;
- Visits should be undertaken by at least two people;
- Wear stout walking boots, appropriate warm weather clothing, etc.

Monitoring Methodology

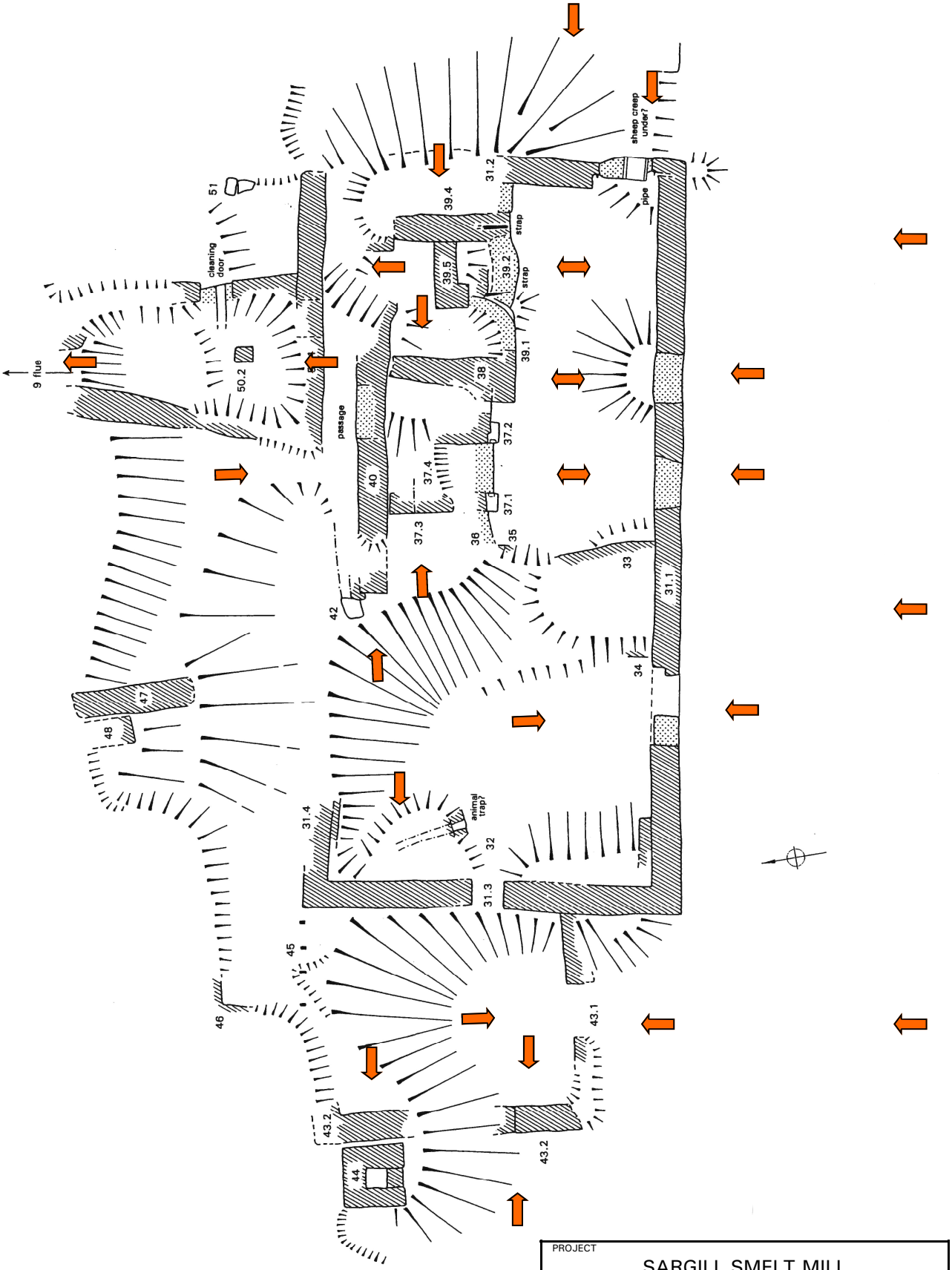
- Take Monitoring Handbook;
- Compare existing survey plans and photographs with current condition;
- Undertake detailed inspection of structural elements (mill, flue and chimney), guided by existing plan and photographs;
- Update existing site plan as appropriate, drawing on or tracing over laminated sheet, and taking new measurements (plans and elevations) where necessary;
- Walkover area surrounding ruins, to check for any new erosion (human, animal and/or natural);
- Take new photographs (minimum 35) using photographic location plan and existing photos as guide (ensure photographs contain discrete scales or surveying rods) - duplicate existing photographs as much as possible (see attached figure);
- Produce notes on ruins and surrounding area, noting any changes in terms of fabric decay, collapse, erosion, alteration, land use etc.

Reporting

- Write up site visit notes;
- Produce new survey report from site notes and photographs, noting any changes to ruins in terms of decay, collapse, erosion, alteration etc;
- Catalogue and print photographs, noting location and direction of individual shots;
- Produce new survey sketch plan if necessary;
- Place new survey information in updated monitoring handbook for next visit;
- Inform YDNPA archaeologist of any significant changes to site conditions;
- Copy new survey report to relevant parties (as pdf file by email) - Stagsfell Estate, YDNPA HER, English Heritage etc;
- Note any suggested changes to monitoring methodology in monitoring handbook;
- Note date for next monitoring visit with YDNPA HER.

Archive

- Prepare site visit archive (including new set or selected photographs, site notes etc) and deposit with YDNPA;
- Update site details on YDNPA HER.



Also all four external elevations of flue chimney and representative sample of flue structure.

PROJECT: SARGILL SMELT MILL	
TITLE: MONITORING PHOTOGRAPHS	
SCALE: NTS	DATE: FEB 2013
EDAS	FIGURE: A4/1

APPENDIX 5

APPENDIX 5: EDAS PROJECT DESIGN

ARCHAEOLOGICAL SURVEY, SARGILL LEAD SMELT MILL, HIGH ABBOTSIDE, NORTH YORKSHIRE

Introduction

An archaeological survey is required of the remains of Sargill lead smelt mill, north-east of Sedbusk, North Yorkshire (NGR SD 8975 9256 centred). The survey area covers an area measuring c.110m by 70m, which includes all of a Scheduled Monument (number 31334). The archaeological survey work is required to update a previous survey carried out in 1997, to document the extent of decay, to identify current and future threats and provide appropriate recommendations to mitigate these threats, and to design a programme of periodic recording which will monitor the gradual decay of the structure. The extent of the project is defined by a brief produced by the Yorkshire Dales National Park Authority (YDNPA), and this detailed costed methods statement defines the work that EDAS will undertake if appointed to the project.

Background Information

Site Location

The survey area is currently rough pasture, subject to limited grazing by sheep; it also lies within an active grouse shooting estate although there are no grouse butts in the immediate area of the site. The survey area lies on North Rigg, on the north side of Sargill Beck, c.2km north-east of the hamlet of Sedbusk. It can be approached to within c.200m on a private track from Sedbusk, which is only suitable for 4WD vehicles. The site lies within Common Right of Way (CROW) access land.

Archaeological Interest

The small and isolated Sargill lead smelt mill is believed to have been built in the 1840s and it ceased production in 1870. The complex was built c.340m to the south-east of the Sargill Lead Mine which produced the lead ore. The ore from the mine was originally taken to a mill at Summerlodge in Swaledale, but the high transport costs meant that it was more cost-effective to built a mill nearer the mine. The mill lay on the track to the Cogill coal pits and there was an abundant supply of peat on Black Band Hags, and both these fuels were used in the mill.

The smelt mill building is a rectangular structure measuring c.17m by c.9m, partly built into the slope. Although ruined, the front walls stand to a maximum height of 3.95m. Internally, the mill was divided into two areas - the western end housed a waterwheel and bellows system and the larger eastern part contained two ore hearths, now obscured by rubble. The 22ft diameter waterwheel stood in a north-south aligned wheel pit and was powered from water taken from Sargill beck via a c.220m long leat.

The two ore hearths were located against the rear wall. As well as smelting ore, it appears that the eastern hearth was also used for re-smelting slag. Both hearths were of a shaft-furnace form, rather than the low hearth type which was more traditional in the area - these furnaces were introduced in the 1850s. Immediately to the rear of the hearths is a narrow chamber which held a condenser, used to extract lead from the exhaust fumes. Attached to the west wall of the mill was a lean to building measuring 6.7m by 5.25m with a brick chimney, containing a roasting furnace which heated the ore prior to smelting. To the east of the mill building are two level platforms which represent processing or storage and loading areas. To the north of these are two natural gullies, the southern ends of which have been modified in order to control water supply into the mill complex.

To the rear of the mill are the remains of a stone built flue extending in a straight line directly up the hillside for c.19m. This comprises a stone-lined vertical sided trench 0.8m wide which is now open, the original roof covering having collapsed. At the north end of the flue are the remains of a rectangular chimney stack which survives up to 2.4m high. Immediately north of the chimney is a substantial 'V' shaped zig-zag ditch extending north for 73m with shallow banks formed from spoil alongside the ditch; this represents an uncompleted extension to the flue.

The complex was surveyed in c.1948 by Robert Clough (1980, 101-102) and was described by Raistrick in 1975 (Raistrick 1975, 95-98). It was resurveyed in 1997 by the Lancaster University Archaeological Unit

(LUAU) (Wild & Cranstone 1997). This latter work incorporated a topographic survey at 1:500 scale, over an area of some 110 by 70m. A ground level plan of the buildings was also prepared at 1:100 scale and those wall elevations (23 in all) retaining significant detail were drawn at 1:50 scale. Descriptions of the 52 identified site features and structural components were prepared using a survey proforma and presented as a gazetteer. The project also included black and white and colour photography. The LUAU survey report, and its copyright, is now held by YDNPA and it is assumed that this will be made fully available to EDAS for the duration of the project.

Aims of the Project

The aims of the project are to:

- document the extent of decay at the Sargill smelt mill since 1997;
- identify threats to the archaeological integrity and significance of the monument;
- identify and produce recommendations for any short term measures necessary either to safeguard the archaeological significance or for Health and Safety reasons;
- design a methodology for future periodic recording of the decay process, suitable for adoption by trained Dales Volunteers;
- to produce a report and archive .

Survey Methodologies

Collation of Documentary Material

The YDNPA project brief does not require any new detailed documentary research to be undertaken. It is assumed that the basic history and development of the complex has already been established, and that this material is contained in the LUAU report.

Information relating to the survey area and the smelt mill complex will be obtained from the YDNPA and English Heritage's National Monuments Record. It is expected that this information will comprise records/reports of any previous historic research and archaeological activity (including the 1997 LUAU report), aerial photographs, past management and land ownership records, and historic maps and plans. It is assumed that these organisations will not charge for any data supply, and that the YDNPA will be able to provide modern Ordnance Survey base maps.

Wherever possible, the above documentary research will be completed in advance of the topographical survey, so that it might inform and enhance the survey work.

Archaeological Survey

The existing LUAU survey (comprising the survey report, archive drawings and photographs) will be used as a base to measure the extent of decay at the site since 1997. Full size copies of the topographic survey, ground plans and elevation drawings will be taken into the field, and any changes to the monument noted. This may involve annotating the existing survey plans and elevation drawings, for example to note any changes to the earthworks, the extent of any rubble spreads, or collapse/demolition of some walls; at this stage, it is not envisaged that any new survey drawings will need to be produced. It is also not envisaged that any new sites will be identified, although erosion and collapse since 1997 may shed light on the interpretation of some previously identified features. Particular attention will be paid to identifying any current or potential threats to the site, for example human and natural erosion.

If required, the ground immediately outside the LUAU survey area would also be subject to a rapid archaeological walkover survey, especially that area to the west of the mill on the north side of the Sargill Beck. This will allow for the identification of any remains associated with the water supply system, for example the leats and canalised natural watercourses shown on the OS 1st edition 1857 map (sheet 51). Identified sites would be included in the written gazetteer of sites and shown on approximate modern OS base maps.

The existing LUAU gazetteer of site features and structural components will be examined in detail, and any changes visible in the field since 1997 will be noted and existing descriptions updated. Assuming that the LUAU gazetteer is transferable, EDAS will use and enhance the LUAU data to produce a new updated

gazetteer of sites as pro forma record sheets compiled from an Access database. It is envisaged that this gazetteer will include a preliminary interpretation of extant remains (e.g. dimensions, plan, form, function, date, sequence of development), locational information (including ten figure grid references obtained from the topographical survey, OS map bases or hand-held GPS systems), mention of relevant documentary, cartographic or other evidence, and management details such as an assessment of current condition and threats (see attached appendix). The existing LUAU site numbering system will be used wherever possible.

A new photographic survey of the site complex will also be undertaken. This survey will duplicate the LUAU photographic record, to allow a comparison between current and 1997 condition. Additional photographs will also be taken of features and components within the survey area not previously photographed, as well as illustrating specific well-preserved components and/or areas of erosion etc. More general digital photographs will also be taken showing the landscape context of the area and of specific sites. The colour photographs will be produced using a digital camera with 10m megapixel resolution. English Heritage photographic guidelines will be followed (English Heritage 2007, 14; 2006, 10-12), and each photograph will normally be provided with a scale and identifier where required. All photographs will be clearly numbered and labelled with the subject, orientation, date taken and photographer's name, and will be cross-referenced to digital files etc.

Survey Products

Archaeological Survey Report

An EDAS archive archaeological survey report for the site will be produced, based on the results of the documentary collation, the information obtained during the site visits, and the structured gazetteer of identified numbered components. The report will be a standard A4 typed and bound document, which will assemble and summarise the available evidence for the survey area in an ordered form, synthesise the data, comment on the quality and reliability of the evidence, and how it might need to be supplemented by further site work or desk-based research.

It is not expected that any significant new survey drawings will need to be produced as a result of this project. Instead, the existing LUAU survey drawings will be reproduced and annotated with new information, for example to show the extent of any structural collapse or earthwork degradation. However, if new survey drawings are required, they will be compatible with the LUAU drawings and will conform to English Heritage standards (English Heritage 1999; 2002, 14; 2007, 31-35). Larger scale plans, at 1:10,000 and 1:2,500 scale, will be used to put the survey area into context (OS map bases to be provided by the YDNPA).

The EDAS report will also contain a series of short-term management recommendations, with the aim of safeguarding the archaeological resource or for Health and Safety reasons, based on the information gathered on site. Proposals for protecting and securing the site to withstand natural erosion and a low level of agricultural grazing and/or visitor activity will be produced. The recommendations would lead to the 'ideal management' of the site complex.

The report will also produce a methodology for the future recording of the decay process at the site, through periodic monitoring visits, suitable for adoption by trained YDNPA volunteers.

It is expected that the report will include (as appropriate):

- a contents list;
- acknowledgements;
- a non-technical executive summary;
- site code/project number;
- dates of fieldwork visits;
- national grid reference and address;
- overall site plan;
- statutory designations;
- a brief account of the project plan, research objectives, survey methodology, procedures and equipment used;
- details of the historical and archaeological background to the site;
- an account of the overall form and development of the site and of the evidence supporting any interpretation;

- a discussion of post 1997 decay, illustrated with photographs and drawings as appropriate;
- preliminary conclusions, including an assessment of the importance of the findings in relation to the other remains on the site and in the region as a whole;
- details of any identified management issues and preliminary recommendations for safeguarding the archaeological resource or for Health and Safety reasons;
- a methodology for future recording of the decay process, suitable to adoption by trained YDNPA volunteers;
- a bibliography and list of sources consulted;
- selected colour digital images, at no less than 6" by 4";
- selected figures e.g. historic maps and plans, reduced to A4 or A3 size;
- final annotated survey drawings, reduced to A4 or A3 size.

The survey report will also contain various appendices, including the structured gazetteer of sites/components, photographic registers and catalogues, and a copy of this project design, together with the details of any departures from that design.

One draft copy of the report will be made available for discussion with the YDNPA prior to completion. Two copies of the final approved survey report will then be provided in hard copy format (comb bound reports) to the YDNPA, no later than eight weeks after the end of the on-site work unless otherwise agreed with the YDNPA. A CD containing an electronic copy of the report (as pdf files) and digital copies of the Access database and photographs will also be provided. There is currently no requirement for the data contained in the survey report or site gazetteer to be entered onto the YDNPA HER.

A summary of the results of the archaeological survey will be prepared for publication in British Mining, CBA Forum or any other appropriate journal or monograph as agreed with the YDNPA. It is also noted that a presentation at a day school on the historic environment of the Yorkshire Dales may also be required.

EDAS will license the YDNPA for unrestricted use of all survey material, drawings, photographs and other products of the project on payment of final invoices. Information and plans etc resulting from the project (suitably acknowledged) may be used by these organisations for research reports, or any similar publications, and for use in any interpretative or publicity material, as well as being made available through the HER and its derivatives.

Archaeological Survey Archive

A properly ordered and indexed project archive (paper, magnetic and plastic media) will be deposited with the YDNPA at the end of the project. It is expected that the archive will contain the following:

- copies of relevant documentary material, bibliographic, cartographic and pictorial sources, arranged in date sequence;
- survey control information, including a diagram showing traverses and control networks, coordinates of control points and survey stations, and digital survey data;
- field and final ink drawings (any drawn records will be presented as wet ink plots on standard "A" size matt surface stable polyester film sheets);
- written accounts and pro forma gazetteers;
- structured catalogues and indices;
- copies of digital photographs on CD, both processed and unedited images, as jpegs and tiff files;
- project management records;
- electronic copies of all reports, as pdf files.

OASIS Compliance

EDAS subscribe to English Heritage's OASIS (Online Access to Index of Archaeological Investigations) project, and all EDAS projects are fully OASIS compliant. Prior to the start of the fieldwork, an OASIS online record will be initiated and key fields completed on Details, Location and Creators forms. All parts of the OASIS online form will be subsequently completed for submission to English Heritage and the YDNPA HER. This will include an uploaded pdf version of the entire report.

Health and Safety, and Insurance

EDAS will comply with the Health and Safety at Work Act of 1974 while undertaking the project. A full copy of their Health and Safety Policy is available on request.

The site is privately owned and EDAS will indemnify the landowners in respect of their legal liability for physical injury to persons or damage to property arising on site in connection with the survey, to the extent of EDAS's Public Liability Insurance Cover (£5,000,000). A risk assessment will also be produced prior to any site work.

Staffing and Experience

The project will be undertaken by EDAS, who are registered as an archaeological organisation with the Institute for Archaeologists. The project will be managed by Ed Dennison, Director of EDAS.

The core staff will be Ed Dennison and Shaun Richardson of EDAS; Ed Dennison's CV is attached to this documentation. Both have some 20 years experience in non-intrusive earthwork and topographical survey, and they have undertaken numerous walkover and detailed surveys of specific monuments and of areas of historic landscape (including lead mining landscapes) throughout the Yorkshire Dales. These surveys have included land uses of all types, and in addition to identifying a wide range of archaeological remains, detailed management strategies and recommendations have been proposed.

A summary of previous EDAS (or predecessors) experience relevant to this project is as follows (all Yorkshire Dales unless stated):

Survey and recording of lead mining remains

- Archaeological survey, Surrender Chimney, Reeth High Moor (1994);
- Slope consolidation proposals, Gunnerside Gill (1995);
- Erosion survey, Gunnerside Gill (1995);
- Draft management plan, Nenthead Lead Mining Complex, Cumbria (1996);
- Archaeological watching brief, Nenthead Lead Mining Complex, Cumbria (1996);
- Phase 2 archaeological survey, Gunnerside Gill (1996);
- Archaeological survey, Keld lead smelt mill (1997);
- Building survey, Grassington Moor (1997);
- Archaeological recording, Grinton lead smelt mill (1998);
- Archaeological survey, Bolton Parks lead mine (site work 1998);
- Archaeological assessment, Augill lead smelt mill, Brough, Cumbria (1998);
- Archaeological assessment, Nenthead tailings dams, Nenthead, Cumbria (1998);
- Photographic survey, Nenthead tailings dams, Nenthead, Cumbria (1998);
- Archaeological recording, Buckden Gavel lead mine (1999);
- Archaeological recording, New Providence lead mine (1999);
- Archaeological observation and recording, Lemon Gill Culvert, Grinton smelt mill complex (2002);
- Archaeological watching brief, exposed culvert, Old Gang smelt mill (2008);
- Erosion survey, Gunnerside Gill (2011);
- Archaeological survey, Beever and Cockber Mines, Grassington (ongoing).

Programming

The archaeological survey work is always best done in winter months when vegetation growth and sunlight is low. However, the YDNPA brief notes that the archaeological fieldwork should avoid the bird nesting season which is 1st March until 31st July. It is therefore proposed that the bulk of the archaeological survey will be undertaken in February 2012 (subject to weather conditions and land management regimes). Final survey reports etc will be produced by the end of March 2012.

The above timescales are all indicative, and could be shortened or expanded if necessary. The precise programme of survey work etc will depend on liaison with the YDNPA.

Monitoring

It is understood that the fieldwork, and the project as a whole, will be monitored at periodic intervals by the archaeological staff of the YDNPA. A preliminary site meeting will be arranged with the Senior Historic Environment Officer at the start of the project, and there will be a further meeting to discuss and agree the draft report and recommendations before final submission.

Modifications

The programme of work outlined may be modified in accordance with the professional judgement of the staff undertaking the work, insofar as the overall provisions and objectives of this methods statement will not be changed. Any variations in the project will be discussed and agreed in advance with the YDNPA.

References

Clough, R T 1980 *The Lead Melting Mills of the Yorkshire Dales and Northern Pennines* (2nd edition)
English Heritage 1999 *Recording Archaeological Field Monuments: A Descriptive Specification*

English Heritage 2002 *With Alidade and Tape: Graphical and Plane Table Survey of Archaeological Earthworks*

English Heritage 2006 *Understanding Historic Buildings: A Guide to Good Recording Practice*

English Heritage 2007 *Understanding the Archaeology of Landscapes: A Guide to Good Recording Practice*

Raistrick, A 1975 *The Lead Industry of Wensleydale and Swaledale: Vol 2 The Smelting Mills*

Wild, C & Cranstone, D 1997 *Sargill Lead Smelting Site, North Yorkshire.* LUAU unpublished report 1997-98(020/7682)

Ed Dennison, EDAS
30th December 2011

APPENDIX 6

YORKSHIRE DALES NATIONAL PARK AUTHORITY

Sargill Smelt Mill, North Yorkshire

SD897925

SURVEY PROJECT BRIEF

YDP077/04

1. SUMMARY

This document provides a specification for the enhancement and updating of an archaeological survey of a scheduled monument, the Sargill Lead Smelt Mill, North Yorkshire.

Contact details for access: Alex Stott Home: 01969 667974 Mobile: 07816 285854 Email: kjstott@aol.com

2. INTRODUCTION

Sargill Lead Smelt Mill, North Yorkshire was surveyed by the then Lancaster University Archaeological Unit in 1997 for the Yorkshire Dales National Park Authority. This was in advance of proposed consolidation works. Funding for these works was subsequently withdrawn and the monument is now identified as at High Risk on English Heritage's Monuments at Risk Survey. Although the site now has public access as a result of the Countryside and Rights of Way Act 2000 it occupies a very isolated location and, given current funding, it is now considered that a large scale consolidation programme is not appropriate. A suitable programme for managed decay however needs to be implemented in order to justify downgrading the At Risk status of the monument. This management programme will incorporate formal monitoring of the decay process at the mill.

3. MONUMENT DESCRIPTION

Sargill smelt mill is believed to have been built in the 1840s and ceased production in 1870. The smelt mill building is a rectangular structure 17 metres by 9 metres, partly built into the slope. Although ruined, the front walls stand to a maximum height of 3.95 metres. In the eastern part of the mill were two ore hearths which are now obscured by rubble. Immediately to the rear of the hearths is a narrow chamber which held a condenser. To the rear of the mill are the remains of a stone built flue extending up the hillside for 19 metres. This comprised a stone lined vertical sided trench 0.8 metres wide which is now open, the original roof covering having collapsed. At the end of the flue are the remains of a rectangular chimney stack which survives up to 2.4 metres high. Immediately north of the chimney is a substantial 'V' shaped zig-zag ditch extending northward for 73 metres, an uncompleted extension to the flue with shallow banks formed from spoil alongside the ditch. Attached to the west wall of the mill was a rectangular room 6.7 metres by 5.25 metres, containing a roasting furnace which heated the ore prior to smelting. To the east of the mill building are two level platforms which represent processing or storage and loading areas. To the north of these are two natural gullies, the southern ends of which have been modified in order to control water supply into the mill complex.

4 PREVIOUS WORK

The complex was surveyed in c1948 by Robert Clough and again in 1997 by the Lancaster University Archaeological Unit. This survey incorporated a topographic survey at 1:500, over an area of some 110 by 70m, undertaken using EDM tacheometry using a total station linked to a data logger with final survey output generated by CAD. A ground level plan of the buildings was prepared at 1:100 scale and elevations of walls retaining significant detail at 1:50 scale. These were prepared to a context outline level of detail using a combination of EDM tacheometry and manual drawing, digitised to provide a CAD record. Descriptions of site features and structural components were prepared using a survey proforma and presented in the form of a gazetteer. It included black and white and colour photography of the complex. The 1997 project brief required that copyright of all survey material passed to the Yorkshire Dales National Park Authority and it will therefore be made freely available for the purpose of this project. The .dxf files from part of the Sargill archive but have not been read for the purpose of this brief.

Some scanned figures (not to scale) from the 1997 survey report are inserted below.

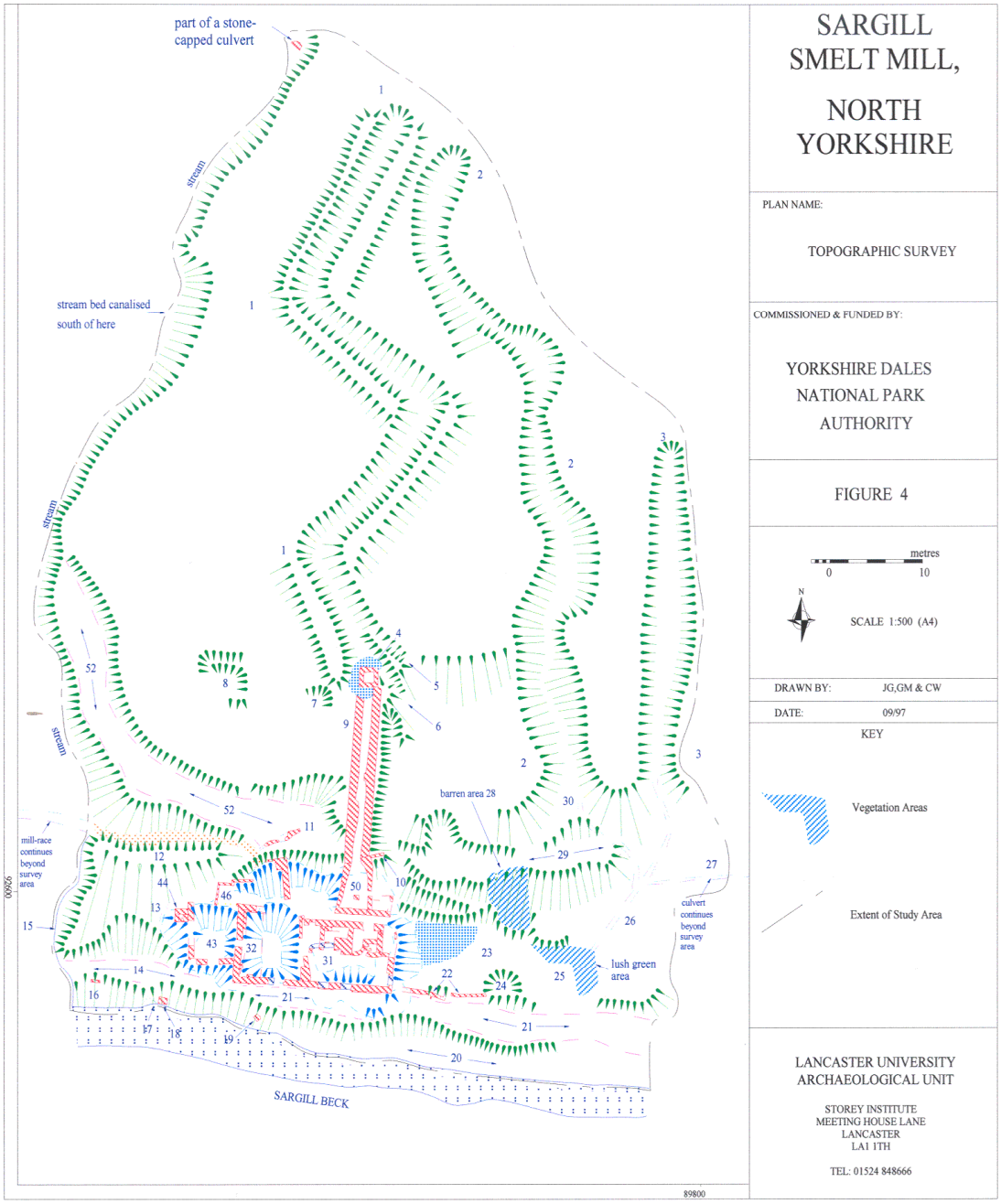
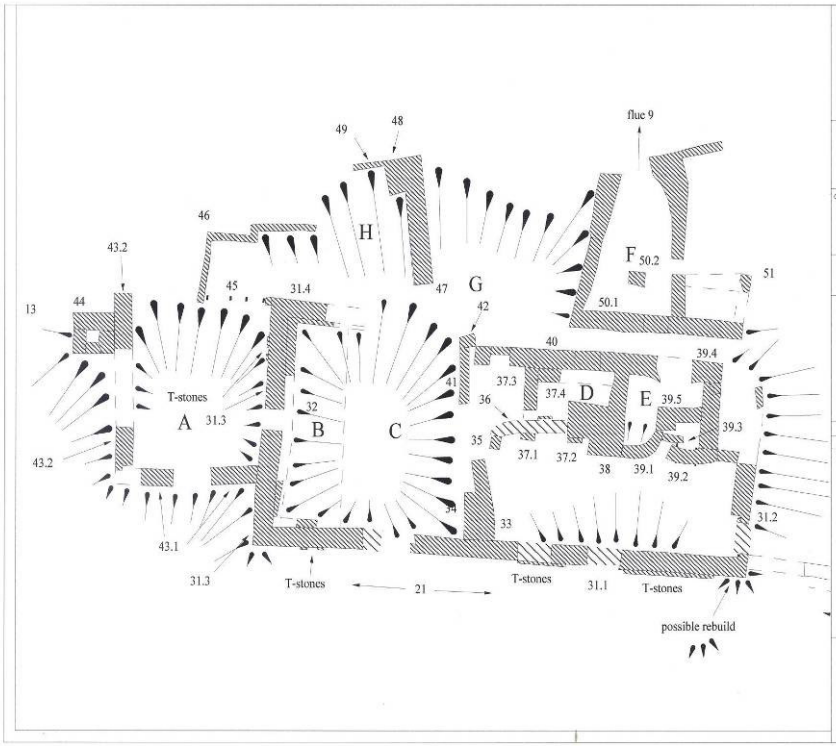


Fig 4 Survey Plan



SARGILL
SMELT MILL
NORTH
YORKSHIRE

PLAN NAME:
BUILDING PLAN

COMMISSIONED & FUNDED BY:
YDNPA

FIGURE 5

metres
0 3

N

SCALE 1:100

DRAWN BY: JG, GM & CW
DATE: 09/97

KEY

A Calcining hearth
B Wheel pit
C Bellows/pump
D Ore hearth
E Slag hearth
F Condenser ?
G Loading bay
H Ore bin

T-stones through stones

LANCASTER UNIVERSITY
ARCHAEOLOGICAL UNIT
STOREY INSTITUTE
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LANCASTER
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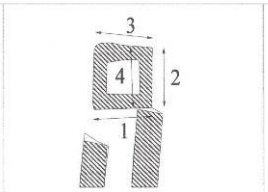
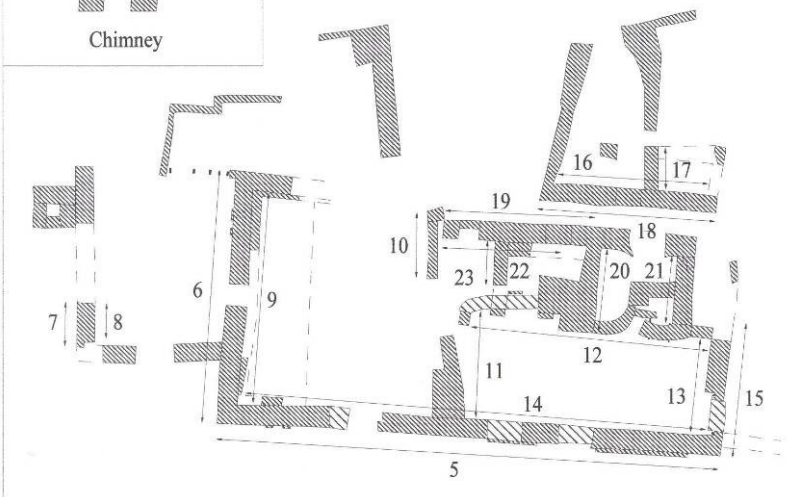
TEL: 01524 848666





SARGILL
SMELT MILL,
NORTH
YORKSHIRE

PLAN NAME:
ELEVATION LOCATION
PLAN

COMMISSIONED & FUNDED BY:
YORKSHIRE DALES
NATIONAL PARK
AUTHORITY

FIGURE 6

metres
0 3

N

SCALE 1:100

DRAWN BY: JG, GM & CW
DATE: 09/97

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LA1 1TH
TEL: 01524 848666

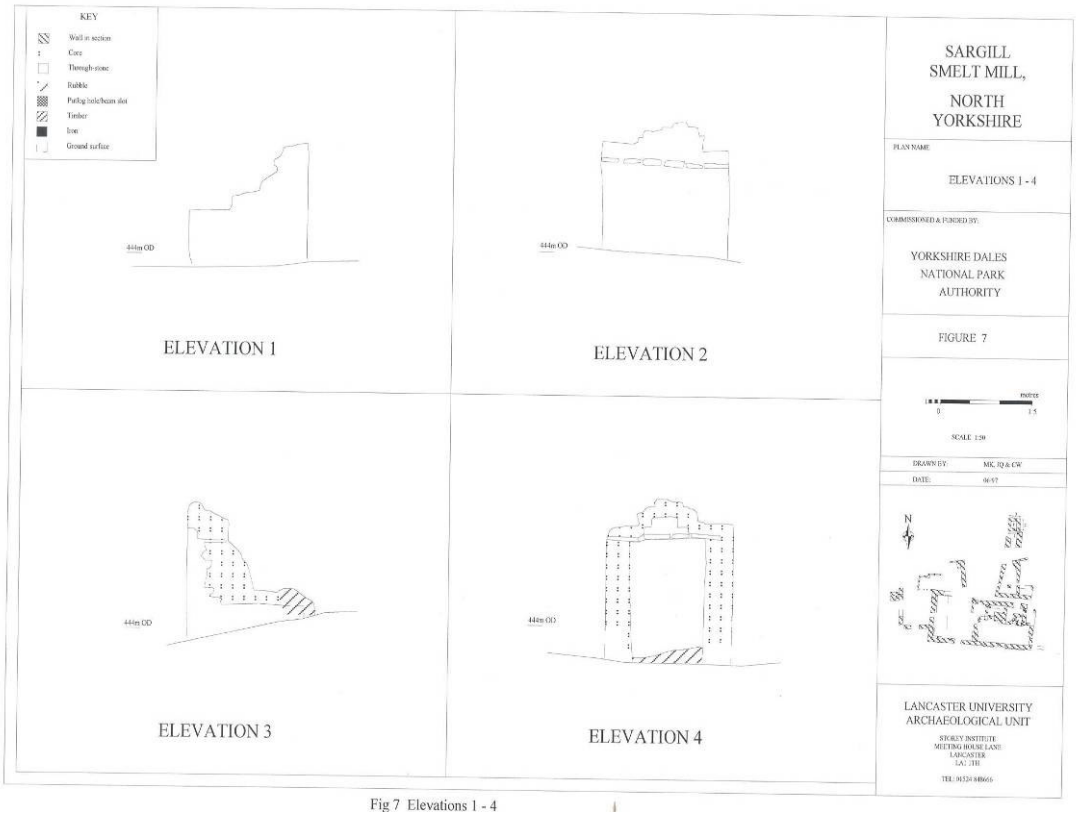


Fig 7 Elevations 1 - 4

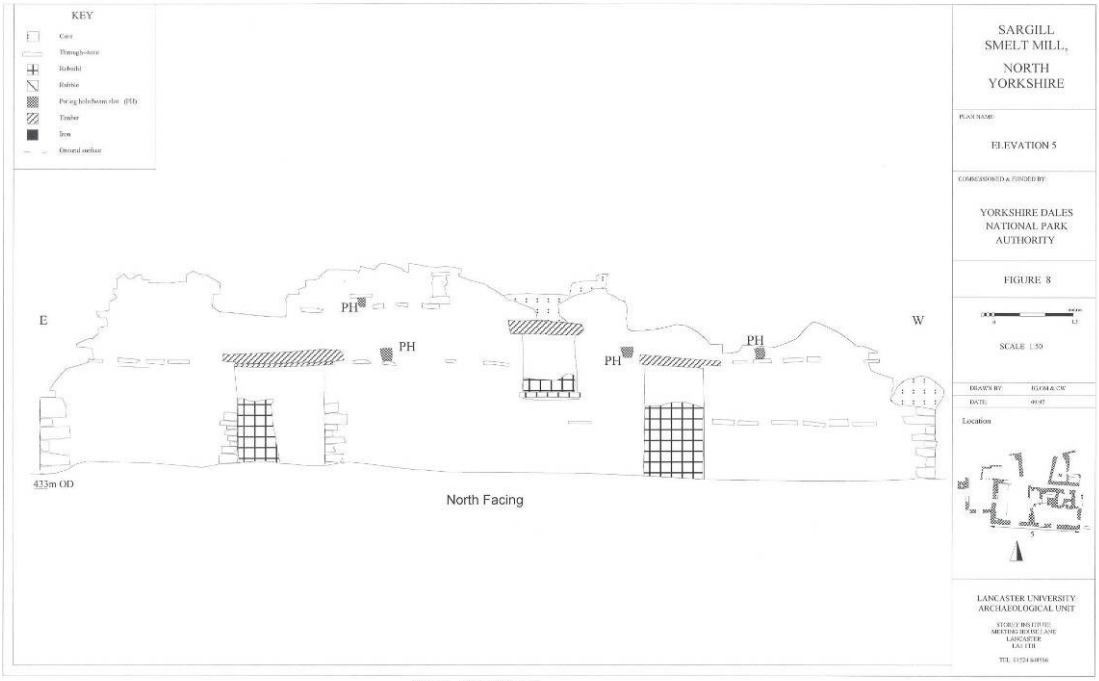


Fig 8 Elevation 5

5. PROPOSED WORK

5.1 Objectives.

Sargill mill has decayed since the 1997 survey was undertaken. The objectives of the proposed work are:

i to document the extent of decay since 1997
ii to identify threats to the archaeological integrity and significance of the monument
iii to identify and produce recommendations for any short term measures necessary either to safeguard the archaeological significance or for H&S reasons
iv to design a methodology for future periodic recording of the decay process, suitable for adoption by trained Dales Volunteers
v to produce a report and archive .

5.2 Methodology

It is for the archeological contractor to devise a methodology for meeting these objectives. It is however anticipated that this will use the 1997 LUAU survey as a base and not involve a full new topographic or building survey and that it will include, as a minimum, a new digital photographic survey and updated description of the 52 gazetteer elements identified in the LUAU survey, incorporating new measurements as appropriate.

A costed method statement for this work is required.

It is recommended that contractors make a preliminary visual inspection of the area to familiarise themselves with the extent of the archaeological remains and the scope of the work.

5.3 Photography

Digital imagery, rather than conventional film photography, is acceptable for the photographic recording although medium resolution images (2mb plus) are required as a minimum. Unedited images should be archived, preferably as tiff files, as well as any processed images. A full image catalogue is required as part of the archive

5.4 Documentary Research

No new documentary research is required as part of this project.

5.5 Wildlife Survey

Not required

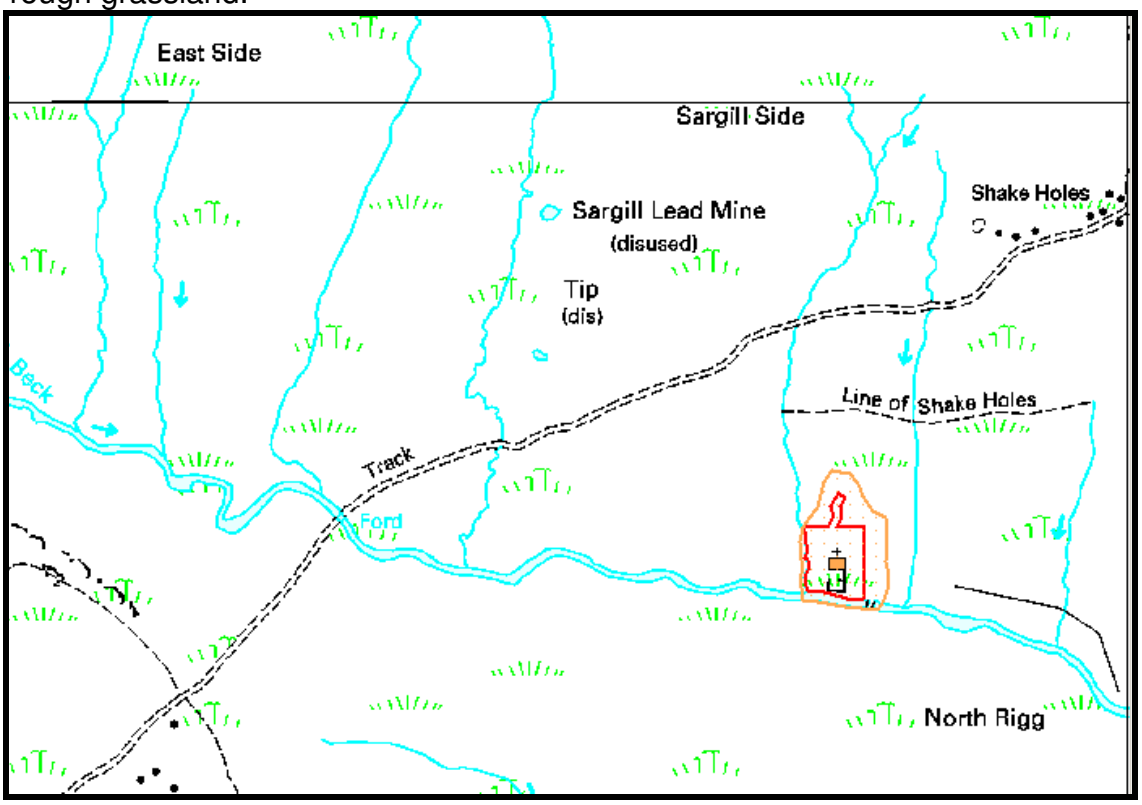
5.6 Samples and Loose Finds

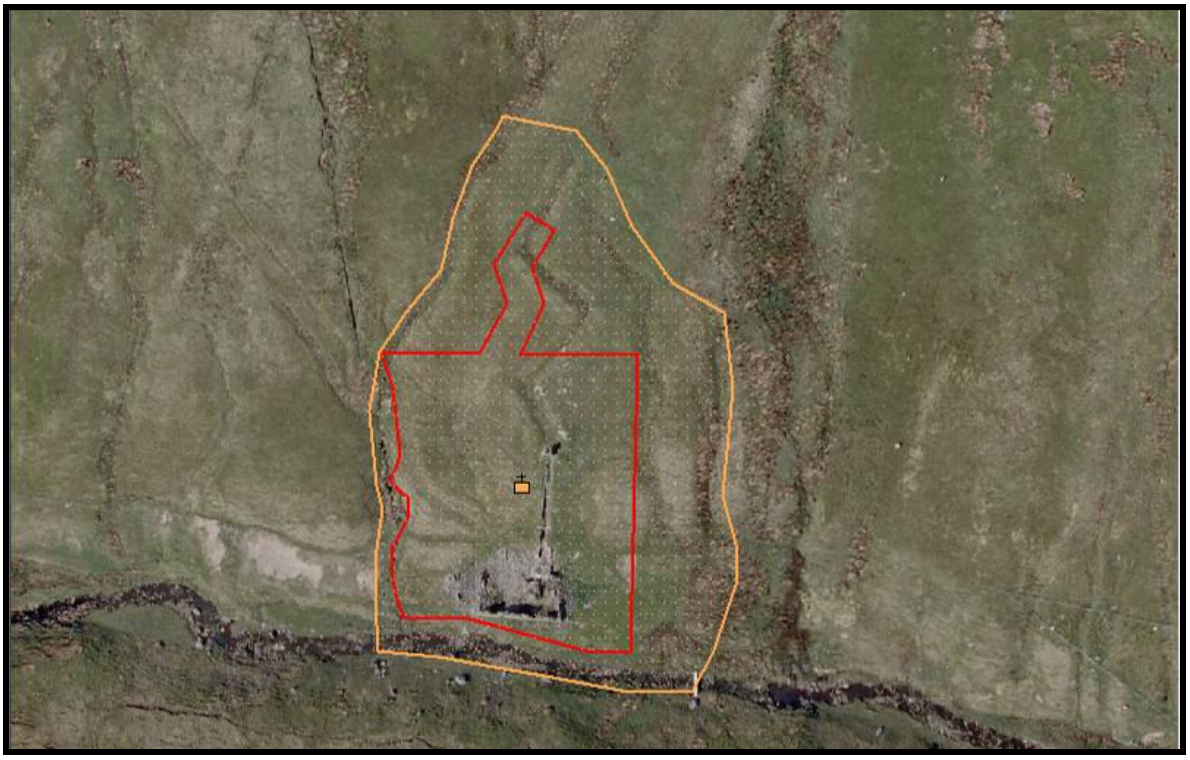
No sampling work is intended as part of this project. Any vulnerable loose finds should be reported to the Senior Historic Environment Officer of the Yorkshire Dales National Park at the earliest opportunity. Any recommendations for sampling and material analysis should be made in the report.

6. LOCATION

The smelt mill is centred at SD897925. The project area is that area surveyed by

LUAU in 1997, which includes all of the scheduled monument. The extent of the project area (approximately 70m by 110m) is shown on the attached HER extracts (Mastermap and 2008 orthophoto), outlined in orange. The red line shows the mapped scheduled monument. The survey area lies on Sargill Side, part of a large grouse moor, approximately 2km north east of the hamlet of Sedbusk (SD883911). It can be approached to within some 200 metres on a private track, only suitable for 4WD vehicles. The vegetation within the project area is mainly rough grassland.





Red –area on schedulig maplet– orange LUAU survey

7. OWNERSHIP

The mining remains and mineral rights are privately owned.

The prospective contractors are required to indemnify the owners and any tenants against any loss, damage or claims which may be made as a result of their entering the complex for survey purposes and accept liability for any personal injury loss or damage sustained due to the state of the complex whether occasioned by negligence or otherwise.

8. ACCESS

The site is on CROW access land but access may be restricted by shooting: prior to and during the survey contractors should liaise with the Stagsfell Estate, via the headkeeper, Alex Stott Home: 01969 667974 Mobile: 07816 285854 Email: kjstott@aol.com to arrange access and ensure that there is no shooting planned on this part of the estate. There are no grouse butts in the immediate vicinity.

Ground nesting birds such as grouse are very vulnerable to disturbance, especially during the breeding season. It is all too easy to inadvertently harm a bird or its young. If an adult bird is disturbed and leaves the nest, especially if it is prevented from returning to the nest, eggs or chicks may quickly chill and die. Field work should therefore avoid the nesting season.

Any vehicles used during the survey must not be driven off the existing track network.

9. PRODUCTS

9.1 Archaeological Survey Report

Two hard copies of an illustrated and typed report should be provided no later than eight weeks after the end of on-site work or such longer period as may be agreed in writing with the National Park Authority. Reports should be bound and A4 in format, unless otherwise agreed. A .pdf copy of the final report should also be supplied. It should include:

Executive summary
Name of client.
Contents list
An outline of the project plan and objectives.
A brief summary of any previous works on the site and immediate background.
A summary account of the overall form and development of the site
A discussion of post 1997 decay, illustrated as appropriate with archive and new imagery
Statement of methods used with reasoned explanation of any departure from standard procedures and details of any particular constraints under which the work was carried out.
Summary of significance of findings.
Notes and bibliography.

List and key to drawings and photographs.
Recommendations for any short term measures necessary either to safeguard the archaeological interest or for H&S reasons
A methodology for future recording of the decay process, suitable for adoption by trained Dales Volunteers
Copy of the brief and the approved method statement as well as an indication of any departure from this.
Names of staff involved and the parts played by each with the dates of fieldwork.
Acknowledgements.

9.2 OASIS

The Yorkshire Dales National Park HER is taking part in the *Online Access to Index of Archaeological Investigations* (OASIS) project. The overall aim of the OASIS project is to provide an online index to the mass of archaeological grey literature that has been produced as a result of the advent of large-scale developer funded fieldwork. The archaeological contractor must therefore complete the online OASIS form at http://ads.ahds.ac.uk/project/oasis/. Contractors are advised to contact the YDNPA HER prior to completing the form.

9.3 Copyright

The successful contractor is to license the Yorkshire Dales National Park Authority for unrestricted use of all survey material, drawings, photographs and other products of the project on payment of the final invoice. Information and plans etc resulting from the project (suitably acknowledged) may be used by in research reports, or any similar publications, for use in any interpretative or publicity material as well as being made available through the HER and its derivatives.

11. METHOD STATEMENT

It is the responsibility of the Contractor to select the most appropriate survey methodologies and equipment to provide the required product.

A detailed costed method statement is required of the Contractor to be accepted in writing before work commences. This should indicate the proposed methodologies to be adopted; the relevant experience of the organisation, key personnel and any sub-contractors, particularly those chosen for the structural analysis; details of manpower resources to be applied to the survey; a breakdown of costs; the proposed timetable for completion of fieldwork and submission of report and archive; and evidence of compliance with the Health and Safety at Work Act 1974. Particular attention should be paid to ensure that the aims and objectives of the project are directly informed by the methodologies employed and that the project team displays the appropriate levels of expertise to carry out the work. The Contractor, his staff and any sub-contractors will be expected to comply with relevant Codes of Practice of the Institute for Archaeologists.

Contractors should note that the Yorkshire Dales National Park Authority's Standard Conditions of Contract apply.

12. MONITORING

Monitoring of the fieldwork will be carried out by the archaeological staff of the Yorkshire Dales National Park Authority. The Contractor is to arrange a preliminary meeting with the Senior Historic Environment Officer at the commencement of the contract or as otherwise agreed, during the fieldwork stage, and at least one meeting to discuss a draft report and proposals before final submission.