Report on an Archaeological Survey of Medieval Iron Smelting remains near Castleshaw Upper Reservoir in Saddleworth

1st to 3rd October 2012

Volunteers from the Friends of Castleshaw Roman Forts with Charlotte Valance (with height staff) of the Centre for Applied Archaeology at Salford University

Report written by Norman Redhead
Heritage Management Director (Archaeology)
Greater Manchester Archaeological Advisory Service

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Background

This report details the results of an earthwork and test pitting survey undertaken at the head of Castleshaw Valley from 1st to 3rd October 2012. The investigations were led by archaeologists from the Centre of Applied Archaeology, University of Salford, supported by United Utilities and 13 volunteers from the Friends of Castleshaw Roman Forts.

The survey was undertaken to build on current understanding of the extent of medieval iron smelting activity in the Castleshaw Valley. In 1992-4 the Greater Manchester Archaeological Unit (GMAU), directed by Norman Redhead, undertook three seasons of investigations on two medieval furnace sites (Redhead 1992, 1993, 1994). One of these was beside Spa Clough at SD99921039 adjacent to the area studied in the recent survey, whilst the other was on Cudworth Pasture at SD99731056 on the hill slopes on the northern side of the Upper Reservoir. The archaeology reports for this work can be found on the Friends of Castleshaw Roman Forts website: www.castleshawarchaeology.co.uk.

Excavations at Spa Clough in 1993 uncovered the bases of two iron smelting shaft, or bloomery, furnaces. One was cut into and replaced the other. The furnace bases were well preserved and it could be seen that the internal shaft diameter was 40 cm surrounded by a 30 cm wall of clay and stone. Each furnace had a tapping arch and slag run-off channel, with a slag collection pit surviving for the early furnace. One post hole was found and, in an adjacent trench, a possible charcoal clamp base. It was also noticeable that there had been a lot of disturbance arising from navvies working on construction of the Castleshaw Reservoirs 1987-91. This included digging out boulders across the hillside to dress for stone walls.

At Cudworth Pasture, the furnace site had previously been exposed by the local poet and antiquarian Ammon Wrigley in 1897 and again by Saddleworth Historical Society in the 1970s. GMAU were more interested in the survival of ancillary features as the furnace based was found to have been removed. Several features of note came to light. There was a large slag spoil mound close to the furnace base which was sectioned and calculated to contain c 29 metric tons of slag. There was also a charcoal roasting bed for drying out the iron ore prior to smelting and a cache of the raw material, iron stone. The latter had probably been extracted from thin bands within the lower coal measure on this side of the valley, exposed in stream beds. However, it is possible that the iron stone was mined, as shaft mounds do exist on the west side of the valley above Castleshaw Lower Reservoir.

As the technology is similar for Roman and medieval iron smelting, it was clearly important to secure accurate dates for the smelting activity. There was a sparsity of pottery finds during the excavations, with only a handful of medieval Pennine Gritty Ware fragments and these from poorly stratified deposits. Therefore scientific techniques were used in the form of radio carbon dating and archaeo-magnetic dating. These produced a fairly tightly clustered set of dates which give us the late 12th or 13th century. The Cistercian Abbey of Roche (near Doncaster) were granted the land of Friarmere in Castleshaw Valley from 1199. The Cistercians are known to have carried out iron working on a number of their estates. Their landholdings at Friarmere included the area of the iron smelting furnaces so it seems reasonable to assign a 13th century date to the iron working at Castleshaw.

During construction of the reservoirs at the end of the 19th century Wrigley noted several areas of slag debris. It seems likely that the upper part of the Castleshaw Valley saw regular smelting activity, perhaps on a seasonal basis and by itinerant smelters using the essential raw materials of ironstone and wood for charcoal. The resulting product was a

spongy mass of pure iron called a ‘bloom’. This would have weighed perhaps 12-15 kg and was the result of a one day smelt. The bloom would then need primary smithing on an anvil to remove air pockets and any remnant slag adhering to it; this process probably took place at a smithy nearby, either on site (no evidence for this yet) or perhaps at Grange further down the valley where the lay brothers who managed the estate had their base.

The survey which is the subject of this report was undertaken to determine the relative significance of a series of mounds and other earthworks located adjacent to the north east corner of Castleshaw Upper Reservoir (see Figure 1). The objective was to record and assess the potential for medieval iron smelting activity and differentiate this from later earthworks associated with reservoir construction and maintenance. The potential for medieval activity had been previously noted because slag was visible in an eroding section of a mound close to the reservoir wall.

Methodology

The archaeological investigation comprised two main elements:

- an interpretive, mapped earthwork survey

- selective test pitting/trenching across anomalies and other potential features to determine presence, age, depth, extent and character of archaeological remains

The results of the test pitting exercise are presented below. Figures 2 and 3 show the earthwork survey plans, one with test pit locations the other overlaid onto an aerial photograph (Cities Revealed *c*1997). Originally, it was intended to carry out a magnetometer survey of the area, but the uneven landscape made this a difficult proposition. In hindsight the technique would have provided little useful information due to extensive upcast/disturbance from late19th century reservoir construction activity. Instead it was decided to try out a laser scan survey. The results of this are presented in Figures 4 and 5. The laser survey involved setting up 4 survey points which cross-referenced to map the study area, generating thousands of point data. The benefit of this survey technique is that it is a rapid technique (it took only a few hours on site) which makes an accurate record of the landscape, producing data that can be manipulated in various ways. View points and colour settings can be easily altered to highlight certain features or points of interest.

Test Pit results (refer to Figure 2 for location)

Test Pit 1

Located on the edge of a large mound on its west side and about 5 metres from the exposed slag section recorded in Test Pit 5. Excavated 20cm of black humic soil containing lots of stone fragments and grit, which came off onto natural subsoil made up of a light brown silty clay free of stones. The test pit was stopped at this level. No iron smelting waste present, even though it was so close to a known slag deposit. A sondage was excavated in the corner and the subsoil was found to be very clean and at least 40cm deep.

Test Pit 1 being excavated by Nora and Ruth

Test Pit 2

Located against south edge of large man-made mound. Mixed black humic deposit of 30cm depth with small to large gritstones overlay a deposit of very loose, finer gritstone. This had voids and appeared to be of considerable depth. It was not excavated as it was clearly re-deposited, representing upcast from adjacent reservoir ground works. No finds. Identified as late 19th or 20th century reservoir construction or maintenance activity.

Test Pit 2 in foreground being excavated by John and Sue

Test Pit 2 looking east

Test Pit 3

Located in depression on mound near east side of Spa Clough. There was about 10cm depth of topsoil onto natural grey and yellow clay. No evidence of smelting activity and it suggests the mound is a natural feature in the landscape.

Test Pit 3 looking north

Test Pit 4

Sited on boulder area with voids and clear evidence of fire-reddening of some boulders. Charred bits of wood including metal fittings from a door were found. It would appear the door had been place on a fire here, causing the fire reddening of the gritstone boulders. The boulders sit in depression and a soft black silt deposit existed beside them. Further excavation revealed a gritty sandy material under the black silt. It is suggested that the boulders form the upper part of a soak away connected with drainage feeding into the reservoir. This activity dates to the reservoir construction period.

Test Pit 4 looking north, showing boulders and black silt deposit. Below shows the gritty material under the silt.

Test Pit 5

This test pit involved cleaning back and straightening an already exposed section of slag spoil heap and examining the base of the spoil mound. The section showed a dense concentration of loose iron smelting tap slag, with lumps of yellow clay. There was some banding in so far as the uppermost part of the deposit had larger pieces of slag, whilst the yellow clay inclusions were more profilic towards the base where the slag was finer in nature. The slag mound at this point was c 50cm deep. It was noted that the natural light yellow clay base had orange brown mottling; this is put down to the effect of heat from slag still being warm when cast onto the spoil heap but could also be due to leaching of iron from the slag waste.

Test Pit 5 looking east, showing a rich slag deposit overlying mottled natural clay

Jayne excavating Test Pit 5

Test Pit 6

This was located one metre to the east of TP5 and was designed to examine the extent of the slag spoil seen in TP5. It was that most of the spoil here was of a very different nature to the slag spoil. There was a deposit of loose brown gritty soil and stones which was dug to a depth of 80cm at the east side of the test pit, but which was found to be tapering at the western side and overlying a very different deposit of black slag spoil. The latter was the tail end of the medieval slag spoil heap, which could be seen to be dropping away to the east but rising up in the north west corner of the test pit. It was overlaid by more spoil but this was from a late 19th or 20th century context and has its origin in reservoir construction and maintenance. It was therefore possible to determine that we have two phases of spoil heap, a medieval one underlying a more recent one, and that the medieval spoil extends back from the exposed section seen in TP5 a distance of only c 2 metres. The western extent of the slag spoil is not known as it has been cut away to form a path next to the reservoir wall.

Test Pit 6 showing the late 19th century brown spoil overlying the black medieval iron smelting spoil mound

Test Pit 6 looking west, with TP5 in the background

Test Pit 6 being excavated by Sue

Test Pit 7

This was aimed at locating the south side of the slag spoil heap and was positioned 5 metres south of TP6. The eastern section revealed 58 cm depth of loose brown soil with lots of loose shale fragments, overlying a thin layer of black decayed turf, under which was a 9 cm deep deposit of mid-brown compact silty clay with lots of slag fragments. This in turn overlaid a 9 cm deep darker grey-brown looser silty clay deposit with lots of slag. At the base was natural yellow clay with orange-brown mottling. In the south west corner was a large round boulder, sat on natural clay. It is clear that we have the same arrangement of two phases of spoil heap evident in TP6. However, here the spoil depth is much reduced giving the impression that we are close to the edge of the medieval slag mound.

Test Pit 7 looking east, showing the top of the black slag spoil mound and exposed natural clay. Below is a view of the east section through the slag deposits.

Test Pit 8

This was located over a cluster of gritstone boulders set in a depression. The stones descended to a depth of 40 cm onto natural clay which quickly filled with water. These might be a cache of stones discarded from Reservoir wall construction. There was no indication of medieval activity.

Test Pit 8 showing cluster of gritstone rocks, looking north east

Test Pit 8 with section cut through stones to reveal natural (waterlogged) clay

Test Pit 9

This was located over what seemed to be a shallow spread of material on the hillside to the north east of the main test pit area. Excavation revealed natural clay occurring at shallow depth, with a large boulder set into the clay. It was clear that there was no human activity at this location. The test pit is not shown on the earthwork plan but is roughly in the area of the north sign.

Test Pit 9 showing boulder and natural clay at shallow depth

Test Pit 10

Located on top of a well defined spoil mound. Lenses of dark grey silty clay, mixed with gritstones and a gravelly, gritty material, were excavated to a depth of 50 cm at which point the excavation was abandoned. It was clear that this was similar to material encountered in TP2 which had been dug near the base of the mound. This spoil heap is probably late 19th or 20th century and related to the Upper Reservoir construction and maintenance.

Test Pit 10

Andrew excavating Test Pit 10 on top of the spoil mound

Test Pit 11

Due to time constraints this was excavated as a half by one metre square test pit. It was located about 4 metres south east of TP5 and was designed to further define the extent of medieval slag spoil. Under 27 cm depth of topsoil and late 19th century loose brown soil upcast was a black deposit 13 cm deep. This came off onto a very thin grey silt

containing lots of charcoal flecks which in turn overlay natural clay. There were a few fragments of slag. This appears to represent the edge of the slag spoil mound on its southern side. It is therefore quite possible that an actual 13th century furnace is nearby.

Test Pit 11

Discussion

The survey recorded three mounds and a number of depressions (Figure 2). It was found that the most westerly mound, examined by TP 3, was natural, that the middle and most pronounced mound, examined by TPs 1 and 2, was the result of upcast from reservoir construction or maintenance operations in the late 19th/20th centuries, and that the most southerly mound, looked at by TPs 1,5,6,7, and 11, was actually two spoil mounds – an in situ medieval slag spoil heap overlain by reservoir related upcast.

The slag spoil mound is associated with a series of iron furnaces that were operated in the upper Castleshaw Valley in the 13th century. The extent of the mound has been defined by test pitting on the south side (TP 11) and west side (TP 5 and TP 7). However, the west side has been truncated by the cut of the footpath. The north and east sides are obscured by spoil deposited at a later date when the reservoir was constructed. The slag material within the mound varied, showing evidence of gradation through the section, with finer slag towards the base mixed with lumps of yellow clay which might have been used in furnace construction. To the south, where the slag spoil petered out, the slag was associated with a more compact, mid-brown silty clay. This type of material has been encountered at the Spa Clough site in close proximity to the two furnace bases. It is likely therefore that another medieval furnace base survives nearby.

Examples of tap slag from the medieval furnace spoil mound. The upper surfaces exhibit the characteristic ropey morphology associated with the flow of the molten slag

Recommendations

1) For management purposes, the mound defined by TPs 1, 5, 6, and 7 and depicted as a hachured plan in Figure 2 should be preserved from any reservoir operation ground works.
2) Further archaeological investigation could be undertaken to define the shape and extent of the slag mound, and to locate the furnace base.
3) The laser scan survey has produced good results and it is recommended as a technique to be used on the Castleshaw Roman Fort site as an effective tool for recording the earthworks. It will help identify spoil mounds and former exaction trenches which will aid the investigation and restoration strategy for the fort. However, long grass and rushes should be removed prior to such a survey as they will mask detail.

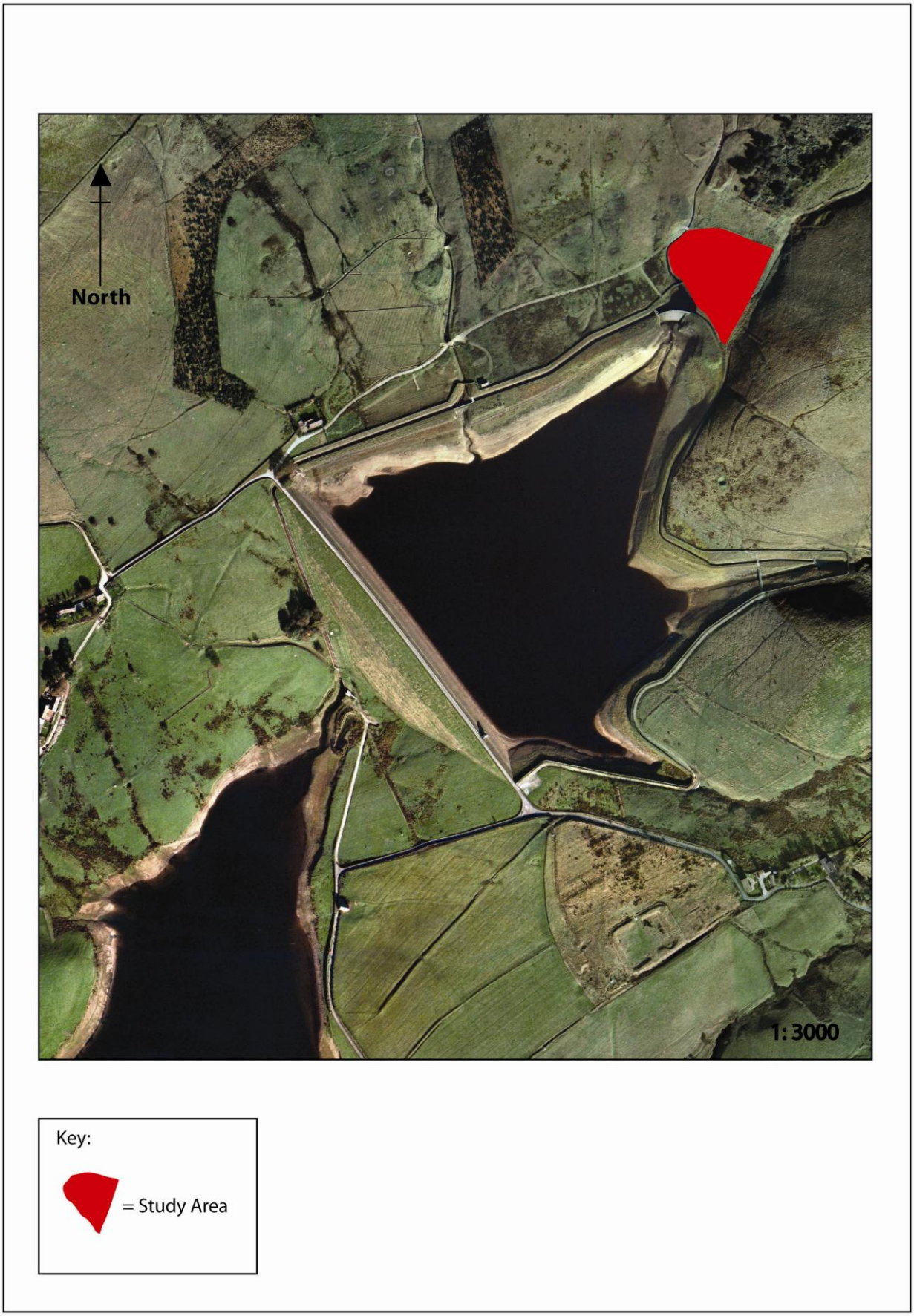

Figure 1: Location of survey area north-east of Castleshaw Upper Reservoir. The Roman forts at Castleshaw can be seen in the bottom right corner

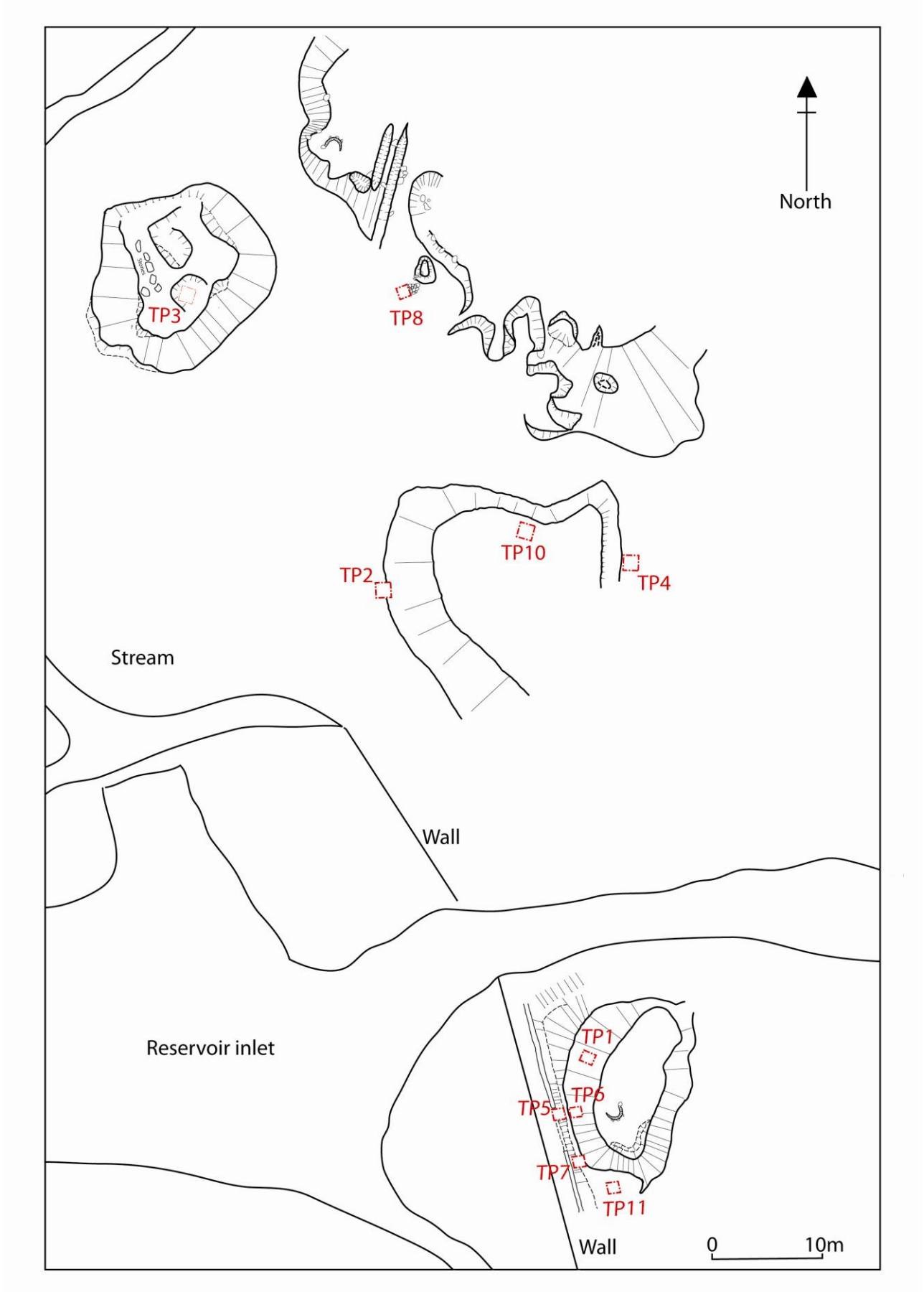

Figure 2: Earthwork survey plan of mounds and depressions, with locations of Test Pits.

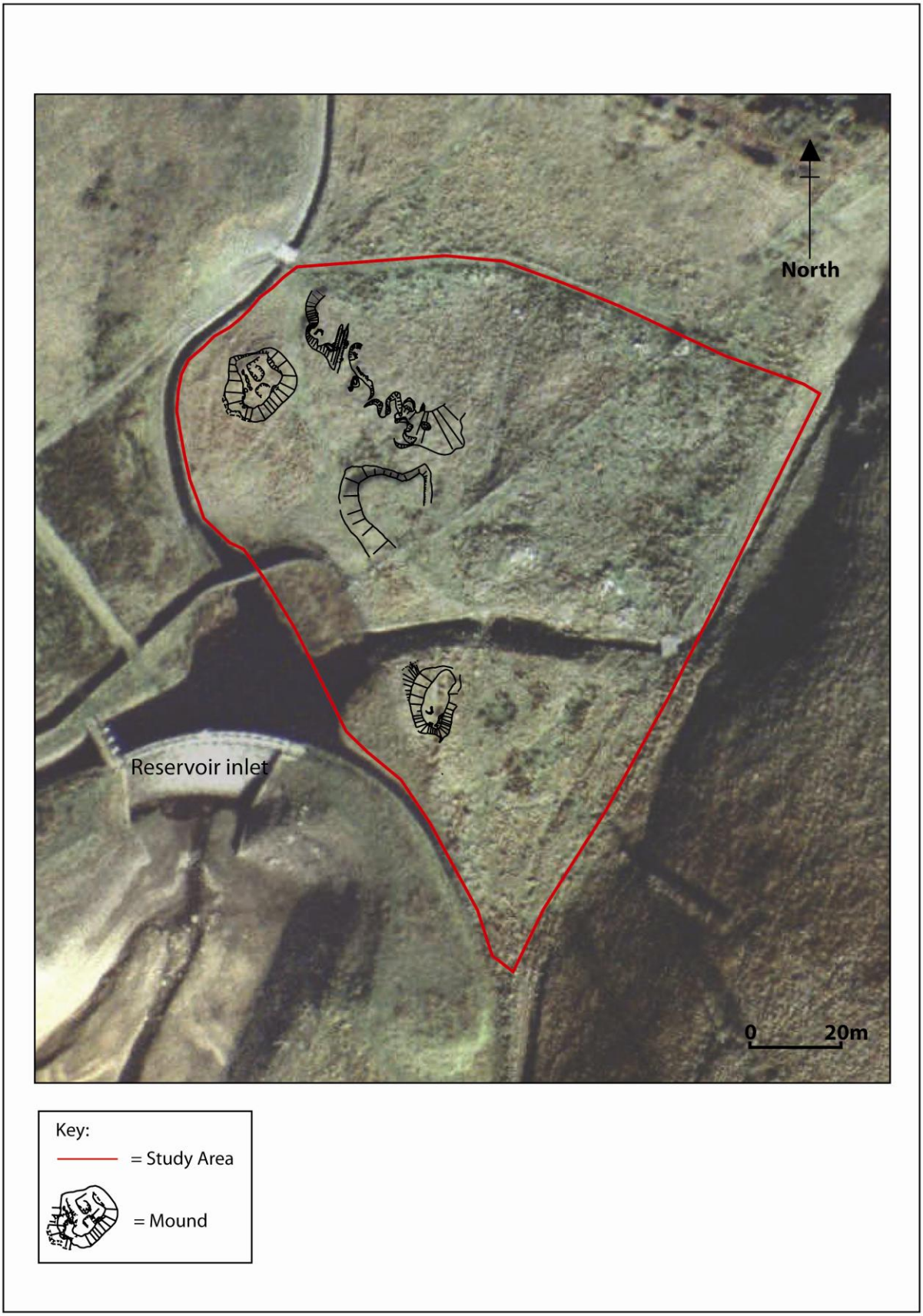

Figure 3: Earthwork survey plot overlaid onto aerial photograph

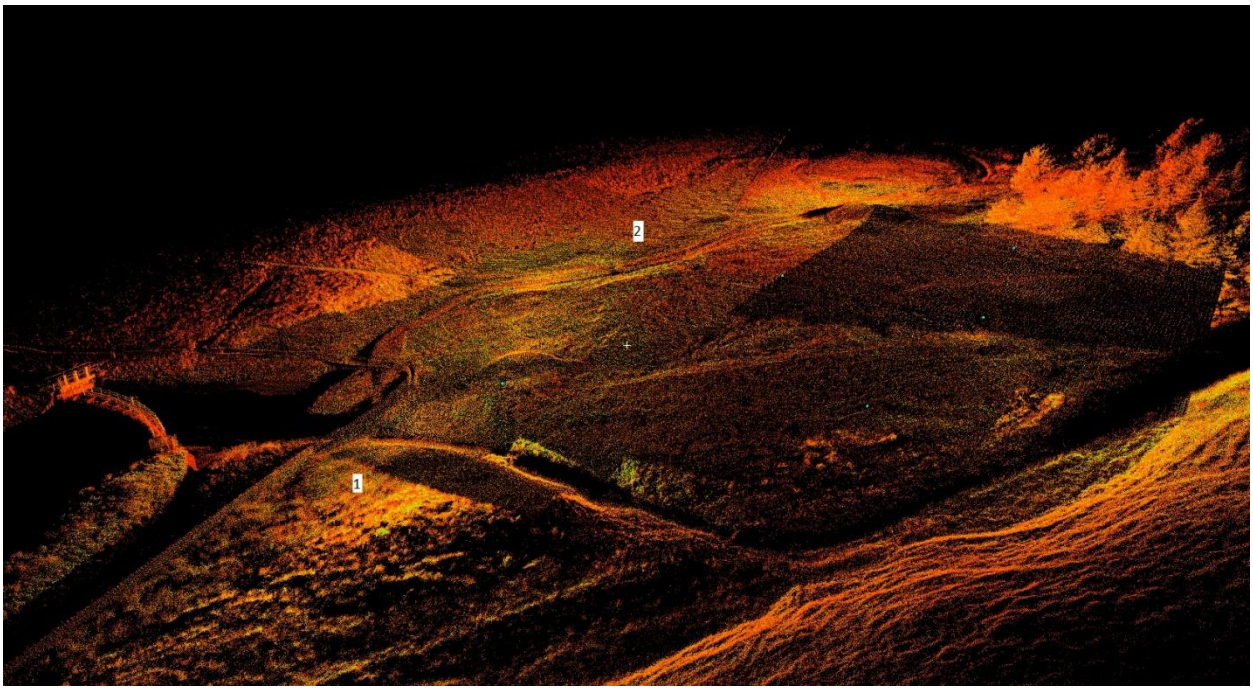

Figure 4: Laser scan survey of study area, looking west. This shows the site of medieval iron smelting slag spoil heap at 1 and the previously excavated medieval bloomeries beside Spa Clough at 2.

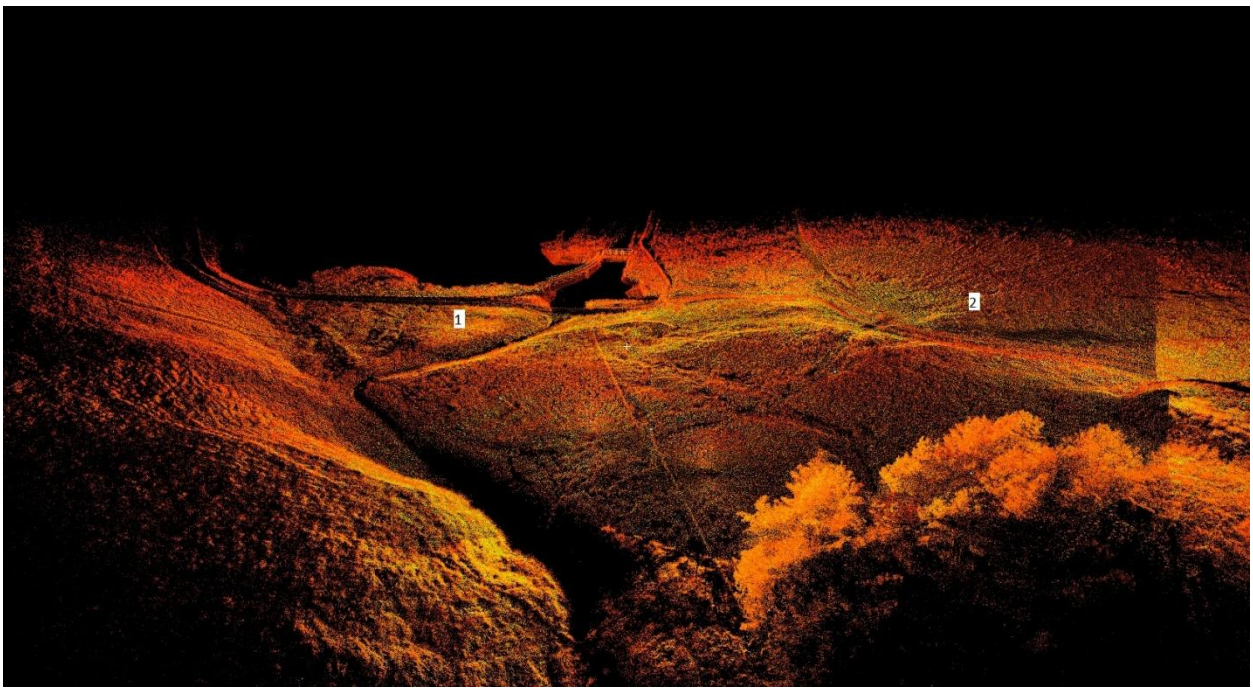

Figure 5: Laser scan survey of study area, looking south west. Numbers as for image above.

Acknowledgements

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