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CAWTHORNE PARK WOOD, SOUTH YORKSHIRE



SURVEY REPORT

Report Number 2013/04 September 2013

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NON-TECHNICAL SUMMARY

In January, February and June 2013, ArcHeritage and Trent & Peak Archaeology conducted desk-based research, a walkover survey and a Level 2 measured earthwork survey on land at Cawthorne Park woods, Cawthorne, South Yorkshire. The surveys were undertaken to record the extent of survival of features relating to Cawthorne Upper and Lower Smithies, their spoilheaps, water-management systems and associated iron ore mining areas. ArcHeritage were commissioned by W.O.L.F. (Woodland Outreach Learning Foundation) to undertake the project, which was funded as part of the East Peak Industrial Heritage Support Programme (with funding from English Heritage and the East Peak Leader Programme)

The results of the desk-based assessment demonstrate that ironworking was being carried out in Cawthorne during the medieval period, with two smiths, one with the surname 'Blomer', being recorded in the area in 1379. While there is no evidence to show that the smiths were based in Cawthorne Park, the range of resources – including ironstone for iron ore, coppiced wood for charcoal manufacture and access to a water supply – made the wood a prime location for ironworking during this period.

Should the Park wood bloomery have been active prior to the 15th century, it is likely to have possessed features similar to those that were discovered through archaeological excavation at a medieval bloomery at Myers Wood, Kirkburton, Huddersfield. These include bloomery furnaces, a smithing hearth, an ore-roasting hearth and working floors.

There is no direct evidence to show when the Cawthorne Park bloomery began operating. While a charcoal sample produced a date of between 1480 and 1540 and the site is likely to have been the 'Calwathine Smithies' that were recorded in 1558, the earliest clear documentary evidence dates from 1608.

Bloomery sites were not static and were redeveloped periodically, with key features being relocated within the complex. From the 15th century, the greatest impact on existing sites is likely to have been the introduction of water power. Documentary evidence shows that the Cawthorne bloomery possessed a full water-management system by 1608, but the extent to which the construction of features such as dams, waterwheels, goits or launders may have damaged or destroyed any earlier structures is unknown. The site's 17th-century water-management features may resemble those that were excavated at Rockley Smithies, South Yorkshire, the final phases of which appear to have been contemporary with those at Cawthorne Park.

A gap in the type of ceramics deposited at Rockley Smithies corresponded approximately with a break in the documentary evidence for that site, suggesting that those works may have been inactive for several decades. At Cawthorne Park, there is no evidence to show that a 1558 lease to bring ironstone to the bloomery was renewed after it expired in 1579, while the bulk of the documentary evidence for the site dates from 1608, the year after it was inherited by its new owner. This suggests that the Cawthorne bloomery may have closed in the late 16th century before being re-opened early in the 17th.

Recorded as 'Cawthorne Smithies' in 1608, the site possessed a bloomery and a smithy, each with its own waterwheel, two dams, a 'Smythee House' and a 'Coall House'. Due to the paucity

of archaeological evidence, relatively little can be said currently about the layout of the site or the form of the structures within it. Tap slag demonstrates that at least one tapping furnace was present. The number and locations of the furnaces, the positions of the various water-management features, and the locations of the respective bloomery and smithing areas cannot be determined on the basis of the current evidence.

The last known lease on Cawthorne Smithies was taken out in 1630 and expired in 1680. It is not known if the bloomery continued to be worked throughout this period. The site may have closed by 1657, when the Park's coppiced wood was sold to an ironworking partnership with interests at nearby Barnby and a right of way that ran past the bloomery was used to remove wood from the Park. The date at which Cawthorne Smithies had become disused is unknown.

While the cause of the Smithies' closure is unclear, the establishment of a blast furnace at Barnby between 1635 and 1648 may have rendered local bloomeries economically unviable. This is supported by a 1714 survey, which listed ironworking at Barnby but did not mention similar activity in Cawthorne Park wood.

Cawthorne Park is depicted on historic maps and plans from c.1660. None of the known surviving cartographic sources marks the location of the bloomery or any of its associated features, such as the dams. Several historic maps show a track that entered the wood at High Hoyland and ran to the west of the likely bloomery site before leaving the wood at Cinder Hill to the south-east. This may be the right of way that was recorded in 1657.

The walkover and measured surveys within Cawthorne Park woods revealed a predominantly industrial landscape, with the likely bloomery site, several substantial slag dumps and areas that have been mined extensively through the use of bell pits.

Archaeological investigations undertaken on the site of the bloomeries at Myers Wood and Rockley Smithies may provide models for potential future work at Cawthorne Park wood. At Myers Wood, geophysical survey revealed anomalies that could be targeted directly through archaeological evaluation trenching. This revealed ironworking features such as bloomery furnaces, ore-roasting hearths and smithing hearths. Similar features, along with later water-management systems, were excavated at Rockley Smithies.

At Myers Wood, a magnetic susceptibility survey identified separate bloomery and smithing areas through concentrations of slag produced by the respective ironworking processes. Dating evidence was retrieved from a variety of sources, including ceramics, the radiocarbon testing of charcoal samples and the archaeomagnetic testing of vitrified clay furnace lining. Similar techniques are likely to produce similar results at the Cawthorne Park site.

No known redevelopment has taken place at the likely site of the Cawthorne Park bloomery since its closure, probably in the mid-17th century. This suggests that any sub-surface archaeological deposits may be preserved in good condition. Given the site's location within a heavily-wooded landscape, however, archaeological features are likely to have been impacted by tree root action. This is demonstrated by evidence from Myers Wood, where key features had been damaged by tree roots. In addition to identifying archaeological deposits, future evaluation and excavation at Cawthorne Park would enable any surviving features to be recorded before further damage can occur while mitigating any damage that has occurred to date.

Prior to archaeological excavation, the extent of Rockley Smithies was unclear and very little was known about the Myers Wood bloomery. Documentary sources shed little light on the latter's history and its location was suggested largely by its proximity to natural resources within the wood. This is similar to our current understanding of the Cawthorne Park bloomery. Following archaeological investigations, Myers Wood has been classed as an 'exceptional' bloomery and smithing site, currently the most complete in the north of England (Clay *et al* 2004, 31). The Cawthorne Park wood site has the potential to produce results of a similar Regional or even National significance.

KEY PROJECT INFORMATION

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1 INTRODUCTION

This report presents the results of an archaeological survey of Cawthorne Park wood, Cawthorne, South Yorkshire. The survey was required to identify and establish the location and extent of former industrial processes and the presence, condition or absence, of any archaeological and historic features and deposits. The results of the desk-based assessment and site survey will be used to inform future project work, community heritage activities and management plans.

Desk-based research was followed by a detailed survey of the features relating to the ironworking areas and the ironstone mining in the Park wood. The initial survey was undertaken by Peter Webb, Richard Parker and Glen McCormack of Trent & Peak Archaeology. The woodland was subdivided into smaller areas, of which 10 were targeted for walkover and measured survey (Areas 1e, 1f, 1h; Areas 2a, 2c, 2g; 3a, 3e, 3f; and 4a; Figures 8-10). These comprised a total area of approximately 18.7 hectares. Marcus Abbot and David Aspden of ArcHeritage carried out a further survey to English Heritage Level 2 standard, in line with a brief provided by the East Peak Innovation Partnership (see Appendix 5). This additional survey had limited success in identifying and surveying the bloomery site due to the density of trees and undergrowth.

The project was commissioned by W.O.L.F. (Woodland Outreach Learning Foundation) and was managed by Simon Lee of W.O.L.F. and Sally Rodgers, Community Heritage Officer, Heeley City Farm. The survey was funded as part of the East Peak Industrial Heritage Support Programme, which is a partnership project between Leader and English Heritage (with funding from English Heritage, Defra and the European Union). The site is owned by Mr. Len Batty of Cawthorne Park Woodlands Ltd. The woodland is private and there is currently no public access, except by prior arrangement with the land owner.

2 LOCATION, GEOLOGY AND TOPOGRAPHY

Cawthorne Park wood is situated approximately 1.6km to the north of Cawthorne and 5km north-west of Barnsley, South Yorkshire (Figure 1). The site, centred on SE 2850 0950, is located within mixed woodland and comprises the remains of ironworking sites, including a bloomery and smithy, their water management systems, spoilheaps and associated ironstone pits. Much of the woodland covering the site is a post-Second World War conifer plantation (Lodge 1990, 1), although elements of the ancient, formerly coppiced, woodland remain. Ground level within the site is uneven and slopes, sometimes steeply, down to a stream.

The wood is currently being managed for the growing of coniferous trees for timber. The woodland also contains interspersed areas of deciduous woodland. Within some of the deciduous woodland areas are fenced pens for the breeding and raising of game birds. The conifer plantation is dense with trees, without any significant undergrowth. By comparison the deciduous woodland has considerable undergrowth except for the clearings within the game bird pens. The site conditions present unique challenges to the identification and survey of archaeological features within this woodland environment.

The underlying geology is Pennine Lower Middle Coal Measures, on mudstone, siltstone and sandstone bedrock, with no recorded superficial geology (British Geological Survey).

3 METHODOLOGY

3.1 Aims

The aim of the project was to gather sufficient information to establish the presence or absence, character, extent, state of preservation and date of archaeological and historical features and deposits within the development area. Specific objectives of the surveys were:

- To provide a Level 2 archaeological survey and investigation of the woodland and related features, comprising a metrically accurate topographical plan and accompanying descriptive and interpretative report;
- To provide information that could inform future project work, community heritage activities and management plans.

The scope of the survey was the area outlined on Figure 1 and included all historic features associated with the bloomery site and its operation within the immediate surrounding area.

3.2 Methodology

Prior to the commencement of fieldwork, information was collected from the South Yorkshire Sites and Monuments Record (SMR) on the archaeological and historic background of the survey area. This included a search for all recorded archaeological sites and findspots and historic buildings within a 1km radius of the site. This information is presented in a gazetteer in Appendix 2, with locations shown on Figure 2. The desk-based research was carried out by Mark Stenton.

Information on the historic background of Cawthorne Park wood was also provided by Sally Rodgers of Heeley City Farm, Sheffield; Christine Ball and Derek Bayliss of the South Yorkshire Industrial History Society; Roger Doonan of the University of Sheffield ; John Goodchild; and Jim Ritchie and Colin Bowers of the Roggins Local History group. Information on bloomery production and its associated archaeological record was provided by Dr. Rod Mackenzie of the University of Sheffield. Visits to Sheffield Archives to examine original documents were also undertaken. Several items held by Sheffield Archives could not be located by staff or could not be located during the timescale of the report. While Barnsley Archives were closed during the timescale of this report, material was kindly made available for consultation by Paul Stebbing, the Chief Archivist.

Features identified during the survey were given individual record numbers and notes were made on their nature, form and condition and any visible threats. A gazetteer of all features identified is included in Appendix 3. This includes the feature identifier, description, interpretation, NGR, assessment of significance, current condition, a description of known or potential threats to the feature, and the photo viewpoint number. For consistency, the interpretation categories relate to the RCHME's Thesaurus of Monument Types. A copy of the feature gazetteer is included as an Excel spreadsheet in the project archive; this version also records the dimensions of each feature and the digital photograph number.

3.3 Walkover Survey

An initial walkover survey of the areas of interest (Figure 1) was undertaken on foot to identify the archaeological features present on the site. This was carried out in approximately 10m grids, although the dense nature of the woodland and recent land and tree management made the identification of features difficult. Where features of a possible archaeological

nature were identified, these were noted on a sketch plan identifying the location. A digital and black and white film photographic record was also kept of all features.

3.4 Measured Survey

A measured survey of the features identified during the walkover survey was subsequently carried out using a Leica TCR705 total station from base stations set out by Leica CS15/GS15 RTK Differential GNSS. 4.4. Where features had been identified during the walkover survey the total station was set up with a line of sight covering the entire feature and points were measured at intervals of no more than 1m. Where tree coverage obstructed the view, however, the point interval was extended as necessary. Outlines of the features and their bases were surveyed along with profiles across them.

The survey was undertaken between 4th and 8th February 2013.

4 ARCHAEOLOGICAL AND HISTORICAL BACKGROUND

4.1 Local area context

Prehistoric activity within the 1km search area is indicated by Mesolithic surface finds from within Cannon Hall country park (Site 20) and a possible early Bronze Age thumb scraper (Site 10) that was found at an unspecified location in Cawthorne Park. There are no known Roman or early medieval sites or findspots within the search area, although early medieval activity is indicated by place-name evidence. Recorded as 'Caltorn' in the 1086 Domesday survey, Cawthorne includes the Old English elements 'cald' or 'calu' and the Old Norse 'porn', and may mean 'cold, bare thorn-tree' (Smith 1961, 323).

Medieval activity within the 1km search area is indicated by ironstone mining spoilheaps (Site 1) at High Wood, near Kexborough, and the Old Golden Cross (Site 21), a timber-framed house. Two silver pennies of Edward I have also been recovered from within the 1km search area; the locations of their findspots are protected under the Portable Antiquities Scheme and are not shown on Figure 2.

Johannes Blomer and Robertus Smyth were recorded as 'smyths' in Cawthorne's 1379 Poll Tax return. Ironstone workings and bell pits in Cawthorne Park wood (Site 6) and Margery Wood (Site 7) may also date from this period. The latter was recorded as 'Meriorrepark' in 1448 and as a coppiced woodland in 1597 (SA SpSt/183/3; YAS DD70 (BEA)/C2/B4/63; Latham 1992, 4).

Early post-medieval activity within the 1km search area is demonstrated by Cawthorne Upper and Lower Smithies (Site 9), the bloomery site in the Park. Further activity within the 1km search area during this period is shown by bell pits (Sites 8 and 11) in Cawthorne Park wood; Cawthorne Park saw mill (Site 14); Low Mill (Site 16); and Clay Hall farmhouse (Site 19).

Ironstone mining (Sites 1, 5, 8 and 11) took place in High Wood, Margery Wood and Cawthorne Park wood during this period. A track (Site 12) that led from the Park to Cinder Hill may be part of a route that was recorded as a right of way in 1657. Cinder Hill Farm (Site 18) is a Grade II listed building, the earliest phase of which was constructed in the 17th century.

Cannon Hall Country Park (Site 20), a Registered Park and Garden, was designed by Richard Woods in 1761. While a Cannon Hall was recorded at Cawthorne in the 14th century, it is not clear if that building occupied the same site as its successor. The 17th-century estate included a

deer park that may have been enclosed from Cawthorne's medieval open fields (Lines *et al* 2008). Hoyland Hall (Site 3), an L-shaped range at Squirrel Hall Farm (Site 4) and Kexbrough Bridge (Site 17) also date from the early post-medieval period.

4.2 Cawthorne Park

Cawthorne Park wood (Site 6) is an ancient woodland with areas of mid-20th-century replanting (Lines *et al* 2008). While recorded as 'Calthornepark' in 1448, the earliest surviving plan of the Park is an uncredited sketch dating from c.1660 that showed the boundaries of three coppice compartments within the wood (SA SpSt/183/3; JGC, no catalogue number). Despite the planting of extensive plantations in the mid-20th century, former coppicing activity remains visible in several areas within the Park (CPW/FT n.d., 8).

Coppiced woods were used to produce charcoal during the medieval and early post-medieval periods. Terence Gladman's analysis of charcoal recovered from Cawthorne Park indicated that it derived from a 10 year-old tree that had been felled between AD 1450 and 1540 (Gladman 1996, 3). Charcoal was used extensively in ironworking and, given its fragility, was often consumed close to the source of its production. The charcoal recovered by Gladman may therefore have been made in the Park and used at Cawthorne Smithies.

While the last known lease on Cawthorne Smithies expired in 1680, wood from the Park was sold specifically 'for coaling' in 1681 and 1703 (Umpleby 2000, 96; YAS DD70/54). As the Smithies are not known to have been worked at that date, this charcoal is likely to have been made and used elsewhere, perhaps at the blast furnace at Barnby.

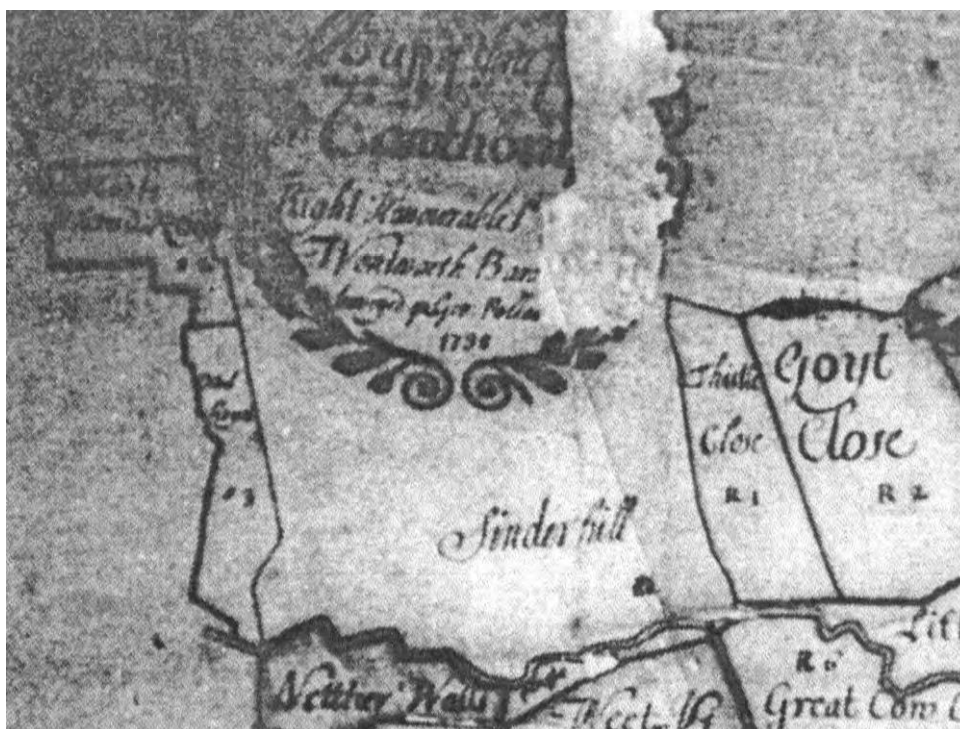


Plate 1: 1738 George Pollard map
(© Yorkshire Archaeological Society)

Cawthorne Park wood was not shown on George Pollard's 1738 map as the area was obscured by the cartographer's cartouche (Plate 1), but was shown on Thomas Jefferys' 1771 map of Yorkshire (Plate 2) and a map of north-west Cawthorne that was produced prior to 1806 (Figure 4).

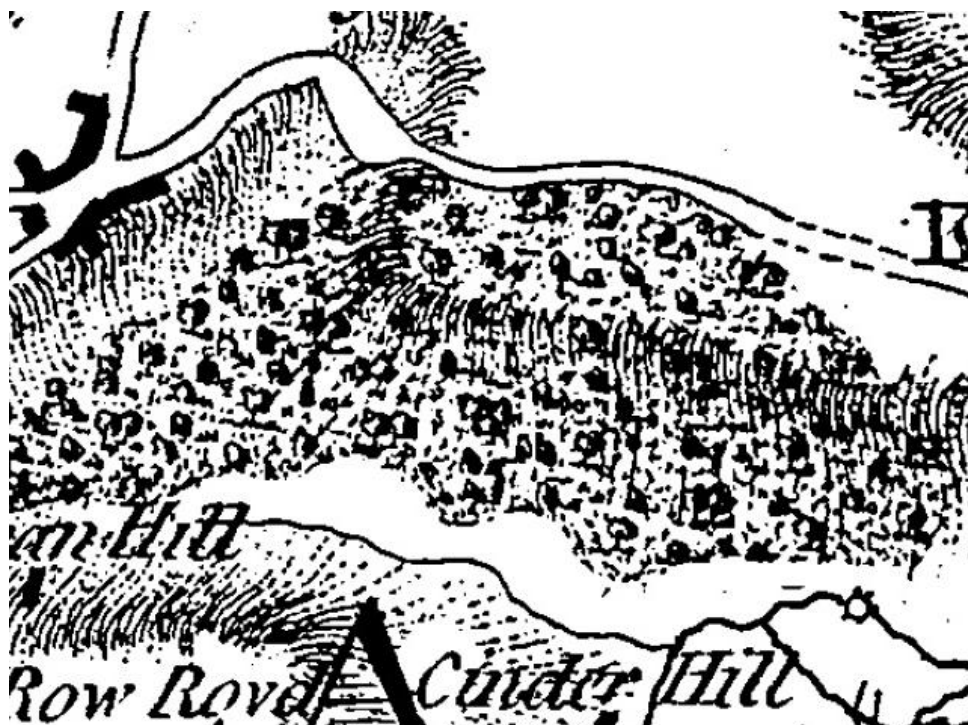


Plate 2: 1771 Thomas Jefferys map

Cawthorne Park Upper and Lower Smithies (Site 9), a water-powered bloomery and smithing site in Cawthorne Park wood, were extant by 1558. It is not known if this was the site that had been worked by Johannes Blomer and Robertus Smyth in 1379.

While several slag dumps remain extant in the wood, the precise locations of the former ironworking areas themselves are unclear. A raised, level plateau on the west side of the stream is thought to be the likeliest site for the bloomery (Plate 3), although a similar level platform at Myers Wood, near Huddersfield, was interpreted as a charcoal platform (Clay *et al* 2004, 15).

Cawthorne Smithies are discussed in detail in Section 5, below.

With the exception of an area at the north-east, the boundary of the wood remains largely unchanged at the present day. In 1989, Cawthorne Park wood was purchased by the BSB Group and was granted 'Linkwood' status by the Royal Forestry Society's Forestry Trust in 1992.



Plate 3: Possible bloomery site, looking north-west

4.3 The bloomery process

Cawthorne Park contained all the elements necessary for medieval and early post-medieval ironworking: access to iron ore from an outcrop of Tankersley ironstone, wood for charcoal to provide fuel and a water supply that could be dammed to provide power. Similar resources led to the construction of the bloomery at Rockley Smithies, 'in the alluvial valley of the Rockley Dike' (Crossley 1968, 11; Umpleby 2000, 110).

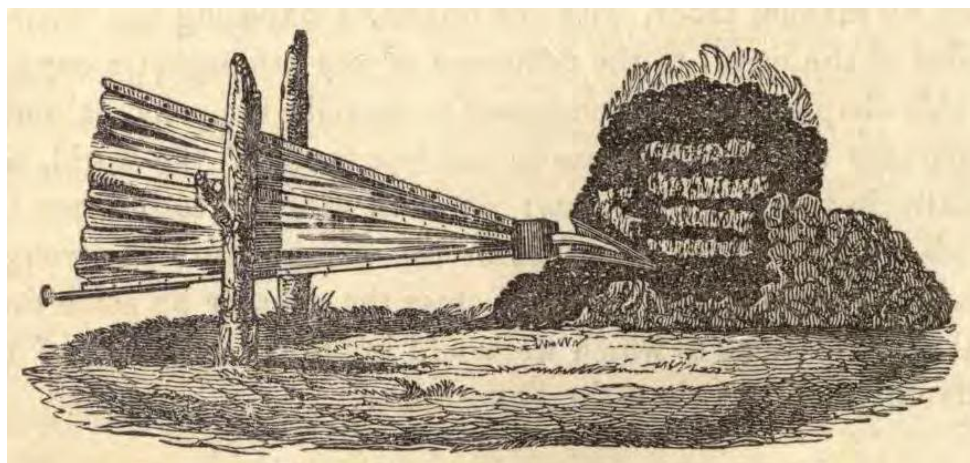


Plate 4: Medieval bloomery and bellows

(Reproduced from Overman 1851, 244)

Bloomeries were small, charcoal-fuelled furnaces, typically comprising a sub-circular clay shaft supported on a stone base (Plate 4). While furnaces of this type had been used to smelt iron since approximately 600 BC, the name was recorded as 'blomerian' from the 12th century AD (Salzmann 1913, 29; Belford *et al*, forthcoming). This name is derived from the 'bloom' itself, a mass of iron that formed within the furnace as the iron oxides in the ore were reduced during

smelting. In the medieval period, bloomeries typically produced one bloom per smelt, during which the iron ore was heated to approximately 1200°C (Blakelock *et al* 2009, 1745). At Bedburn in the early 15th century, the average production was six blooms per week, for which the bloomer received 6d per bloom (Salzmann 1913, 32).

While the number of British bloomeries declined substantially during the 17th century, Scandinavian bloomery furnaces remained in use until the early 19th century. Ironworkers who had seen the process performed conducted a reconstruction for the Swedish Ironmasters' Association at Nornas in 1851 (Wagner and Needham 1988, 90). While this may not have reflected the precise techniques that were in use at Cawthorne Park, many of the basic practices are likely to have been similar.

Prior to smelting, the Swedish ironworkers placed iron ore in pits to be 'roasted and pulverised' (Wagner and Needham 1988, 90; Plate 5). This made the ore easier to smelt by removing elements such as sulphur and carbonate and is likely to have been the process that was recorded as 'breaking up the ore' at Bedburn in 1408 (Salzmann 1913, 32). As this activity was undertaken by the wives of the Bedburn ironworkers (Salzmann 1913, 32), it may have been carried out at Cawthorne by Robertus Smyth's wife, Agnes, who was also listed in the 1379 Poll Tax return.

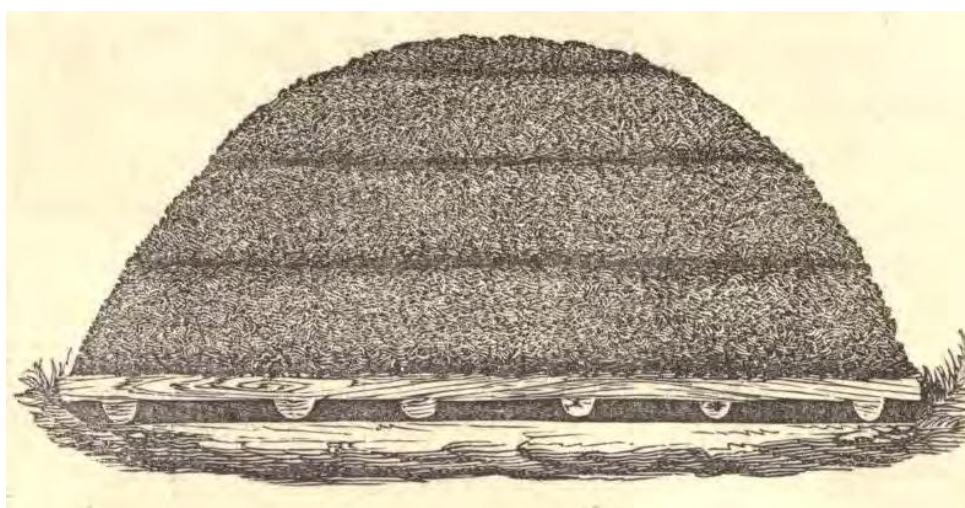


Plate 5: Section through a bloomery ore-roasting pit

(Reproduced from Overman 1851, 46)

In the Swedish reconstruction, the bloomery was filled with dry wood and ignited from below. 'A few shovelfuls' of ore were added after approximately 30 minutes, while bellows were used to blow air into the interior of the furnace through an aperture near its base (Wagner and Needham 1988, 90). The air supply was 'increased as the process continued and more wood and ore were added.' After an unspecified period, 'charcoal began to be added instead of wood' as this 'burned more quietly and allowed the furnace operator to see what was happening' (Wagner and Needham 1988, 90). After approximately two hours, the bloomer began to form the bloom and to remove a waste product known as 'slag'.

'Tap slag' recovered from Cawthorne Park wood shows that the Cawthorne bloomery used 'tapping furnaces' (Doonan 2013, pers. comm.). Tap slag was produced when enough waste material flowed into the bottom of the furnace and sufficient heat was transferred for the slag

to remain liquid (Crew 1995, 3). The slag eventually flowed out of the furnace through an aperture known as the 'tap hole'.

At Myers Wood, at least two of the furnaces also had associated tapping channels along which the molten slag ran to slag dumps (Clay *et al* 2004, 9). It is not known if this arrangement was used during the early phases at Cawthorne or if the slag was allowed to cool and was then dumped manually. The site's visible slag dumps appear to have been produced while the site was water-powered, although earlier slag may survive in the lower levels (MacKenzie 2013, pers. comm.).

During the Swedish reconstruction, the air supply 'was carefully regulated to avoid oxidising the iron' while the slag was being removed and the bloom was being formed (Wagner and Needham 1990, 90). At Bedburn in 1408, 'attending to the bellows' was the responsibility of the ironworkers' wives (Salzmann 1913, 32) and this may have been another task performed at Cawthorne by Agnes Smyth.

Prior to the introduction of water power in the 15th century, bloomeries used hand- or foot-operated bellows, which directed air into the furnace through the tuyere, an aperture above the level of the tap hole. Bloomery bellows do not survive in the archaeological record, although the remnants of one such pair were represented by 'small fragments of leather' that were recovered from the bellows house at Rockley Smithies, South Yorkshire (Crossley 1968, 29). Bloomery bellows are known from post-medieval documentary accounts and illustrations (Plate 6) but are unlikely to have been standardised and the form of the bellows in use at Cawthorne is unknown.



Plate 6: Foot-operated bloomery bellows

The Nornas reconstruction of 1851 demonstrated the ways in which particular tools were used in the bloomery process. A 'pointed rod' was used to form the bloom, with a spade used to separate the iron from the slag. Tongs were then used to remove the bloom from the furnace, prior to it being placed on an anvil and broken with an axe (Wagner and Needham 1988, 90; Plate 7).

The use of basic implements and techniques such as these is likely to have remained largely unchanged from the medieval period and the iron shaft, spade, pair of tongs and two 'bloome axes' that were recorded in a 1608 inventory of Cawthorne Smithies are likely to have been used for these tasks (YAS DD70/55).



Plate 7: Cleaving a bloom

4.2 Bloomsmiting

Cawthorne Smithies possessed both a bloomery and a smithy by 1608 (YAS DD70/55), which indicates that both the manufacture and the refining of iron took place at the site. Both of these stages in the ironworking process are also likely to have occurred prior to the 17th century, as a smithy 'invariably accompanied the bloomery', and the site appears to have been recorded as 'Calwathine Smithies' in 1558 (Salzmann 1913, 29; Umpleby 2000, 96). Should the bloomery have been that operated by Johannes Blomer and Robertus Smyth, both processes may have taken place at the site since at least the 14th century.

It is not known if the iron-refining process at Cawthorne Park consisted of primary smithing, with the blooms simply being reworked to remove further impurities, or also included secondary smithing, 'where the resulting metal billet or bar is shaped into a finished product'

(Blakelock *et al* 2009, 1746). At Bedburn in 1408, the smith received 6d for refining the bloom and an additional 1d for cutting it into bars (Salzmann 1913, 32).

The locations of the separate bloomery and smithing areas at Cawthorne Park wood are currently unknown. The smithy's position within the ironworking complex at Myers Wood was identified through a magnetic susceptibility survey, which revealed concentrations of hammerscale and smithing slag tubes produced by smithing activity (Clay *et al* 2004, 19). A similar survey may therefore lead to the discovery of the respective smithing and bloomery areas at Cawthorne Park.

5 CAWTHORNE PARK UPPER AND LOWER SMITHIES

5.1 Blomer, Smyth and Calwathine Smithies, 1379-1558

Johannes Blomer and Robertus Smyth were the only people recorded as smiths in the Cawthorne area in 1379 (Pratt 1892, 50). While there is no evidence to show that either man was based in Cawthorne Park wood, this is possible as they are likely to have operated the area's only ironworking sites and the availability of wood, water and ironstone made the Park a key location for such activity.

There is no archaeological or documentary evidence to show that the bloomery and smithy in Cawthorne Park wood was active in the medieval period. This is suggested indirectly, however, as radiocarbon testing of a charcoal sample from the Park showed that it had been produced from a tree felled between AD 1480 and 1540 (Gladman 1996, 3). Charcoal was used as bloomery fuel and, as its production was not recorded in the Park during this period, this suggests that the charcoal may have been brought into the wood for use in ironworking in the late 15th century.

As noted above, the majority of the visible slag in the dumps at Cawthorne Park is likely to have been produced by a water-powered bloomery, although earlier slag may survive in the lower levels (MacKenzie 2013, pers. comm.). The recovery of medieval slag may help to locate the positions of the site's early furnaces and working areas, as early slag is likely to have been moved in barrows and dumped only a short distance from the bloomery furnace and smithing hearth (MacKenzie 2013, pers. comm.).

While bloomeries were not water-powered prior to the 15th century (Salzmann 1913, 27), archaeological and documentary evidence indicates that water supplies were still required on ironworking sites of this period. A charter granted by Furness Abbey in 1240 gave a bloomer the right to use a stream in order to wash the iron ore prior to smelting (Salzmann 1913, 27), while smithing sites often included large water-filled pots or tanks for quenching or cooling metal (Paynter 2011, 4). At Rockley Smithies, a wooden barrel had been placed in an irregular hollow on the bloomery's working platform to hold water 'either for damping down the top layer of charcoal in the hearth to prevent it burning away, or for cooling of tools' (Crossley 1968, 25). Water may also have been used for puddling the clay that was used to construct the bloomery furnaces themselves.

Should Blomer and Smyth have worked the site in Cawthorne Park wood, it is likely to have been redeveloped substantially following the introduction of water power. Given the need to construct waterwheels, dams, goits or launders at their optimum locations, even key features

such as the bloomery furnaces and the smithy hearth may have been relocated within the ironworking complex (Salzmann 1913, 27).

Waterwheels and ‘waters greater and lesser’ were recorded at Cawthorne Smithies in 1608 but the date of their construction is unknown (YAS DD70/55). Rod MacKenzie has suggested that the date range of 1480 to 1540 that was produced by a charcoal sample taken from the Park is also likely to have been the period in which an existing bloomery would have been converted for use with water power (MacKenzie 2013, pers. comm.).

At Rockley Smithies, ‘much of the dam and the retaining banks of the pond’ were constructed from gravel found in the immediate vicinity of the stream, with clay added subsequently to raise the height of the dam and increase the head of water (Crossley 1968, 11, 23). The corresponding features at Cawthorne Park may also have been built from natural materials available in the wood. At Rockley, the gravel and clay features had been revetted by a dry stone wall (Crossley 1968, 23) and a similar feature is also likely to have been present at Cawthorne. In addition to bellows, water power could be used to operate hammers but it is not known if this was the case at Cawthorne.

Given the extent of the slag dumps at Cawthorne Park, ‘high shaft’ bloomery furnaces may have been used in the site’s water-powered phase (MacKenzie 2013, pers. comm.). These furnaces, which were taller than their predecessors, were introduced during the later medieval period and may have replaced any earlier medieval furnaces that stood on the site. Evidence from Myers Wood suggests that new furnaces could be constructed over the demolished remains of their predecessors (Clay *et al* 2004, 15, 23).

Ironstone mining provides the earliest surviving documentary reference to Cawthorne Smithies. A 1558 lease stated that Matthew More of High Hoyland had taken land for 21 years ‘to leade XV dozen ironstones’ to three bloomeries, including ‘Calwathine Smithies’ (cited in Umpleby 2000, 96). Place-name evidence suggests that ‘Calwathine’ was a simple variant of ‘Cawthorne’: the village had been recorded as ‘Caletorn’ in 1246, with the first element perhaps deriving from the Old English term ‘cale’ (Smith 1961, 323). This became ‘calwe’ in Middle English (Smith 1961, 323) and is likely to have formed the initial element of ‘Calwathine’.

More’s 1558 lease provides the only known documentary reference to ‘Calwathine Smithies’. The lease did not give the location of the site and there is no direct evidence to show that the Smithies were situated in Cawthorne Park wood or how long the site had been operating prior to 1558. There is also no evidence to indicate whether this was the same site that had been worked by Blomer and Smyth in 1379 or if it was an unrelated, later development. While the lease was granted by Thomas Burdett of Birthwaite, this appears to have been for the land on which the ironstone mining took place rather than for the Smithies and More is unlikely to have been operating the bloomery itself.

In addition to supplying the ironstone, Matthew More is likely to have been responsible for mining the ore. Ironstone was mined through the excavation of ‘bell pits’ (Plate 8). In 1809, J.C. Nattes drew a working bell pit in one of Cawthorne’s woods. This depicted a wooden-framed windlass or winch with a bar and hooks for attaching a coal bucket that could be

lowered into a timber-lined shaft. The extent to which this 19th-century drawing accurately reflected the ironstone mining techniques of the 16th century is unknown.

T.J. Lodge has stated that the numerous bell pits in Cawthorne Park wood were ‘probably the source of the ironstone consumed by the bloomery’ (Lodge 1990, 1). The location of the land being mined by More was not stated in the 1558 lease, however, and ironstone may also have been brought into the site from elsewhere during this period. Numerous bell pits are recorded in Margery Wood (Site 7), immediately to the west, and High Wood (Site 1), to the north-east, of the Park and these may have been the source of additional supplies to Calwathine Smithies.



Plate 8: Infilled bell pit, Cawthorne Park wood

Local production and consumption of ironworking materials in the 16th century is also suggested by Charles Scorer, a Cawthorne ‘wod coloyer’ or charcoal manufacturer who leased a property from Thomas Waterton, the manorial lord of Cawthorne, in 1579 (YAS DD70/55). Waterton’s son, also called Thomas, was the owner of Cawthorne Smithies in 1608 (YAS DD70/55).

Thomas Waterton junior inherited his father’s lands in 1607 and had leased the Smithies within a year (YAS DD70/53, 55). Waterton may therefore have inherited the bloomery from his father, in which case Charles Scorer could have been employed to supply charcoal to the Smithies in 1579. There is no direct evidence to demonstrate this, however, or to show that Matthew More’s 21-year lease to supply ironstone to Calwathine Smithies was renewed at the end of its term in 1579 (Umpleby 2000, 9). It is possible that the bloomery became disused around that time before being re-opened in 1608 (see Section 5.2.1, below).

‘Charkcoyll’ was produced from a coppice fall in Margery Wood in 1597 (YAS DD70 (BEA)/C2/B4/63) and, given the typical use of charcoal close to the source of its manufacture, this may imply that Calwathine Smithies remained in use at that date. Margery Wood was not

owned by the Watertons, however, and the bloomery may not have been supplied from this source (SA SpSt/141/10).

5.2 Cawthorne Smithies, 1608

5.2.1 *Continuity or renewal?*

While there is very little documentary evidence for Cawthorne Smithies prior to the 17th century, several detailed sources survive from the period 1608-1630. It is not known if earlier documentary evidence has simply not been preserved or if the Smithies had been inactive in the late 16th century, with the surviving sources being produced following the site's re-opening or redevelopment in 1608.

It may be significant that the surviving documentation dates from the period in which Thomas Waterton inherited the manor of Cawthorne in 1607 and the manor's subsequent acquisition by the Wentworth family of Bretton (YAS DD70.53). Any earlier documentation may simply have been dispersed and ultimately lost following the death of Waterton's father.

As noted in Section 5.1, above, there is no evidence to show that Matthew More's 21-year lease to supply ironstone to Calwathine Smithies was renewed at the end of its term in 1579 and it is possible that the bloomery had become disused by that date. While Thomas Waterton senior leased property to a Cawthorne charcoal manufacturer in 1579, there is no evidence to suggest that the latter supplied charcoal to Cawthorne Smithies.

Thomas Waterton junior inherited his father's Cawthorne estates in 1607 and had leased the bloomery to a tenant by 1608 (YAS DD70/53, 55). While this lease may simply have been a new agreement, it is also possible that Waterton re-opened the Smithies in 1608 following a period of disuse in the late 16th century.

Indications that bloomery sites could indeed be disused for decades before being re-opened was discovered at Rockley Smithies, where 'the apparent break in documentary references between 1535 and 1604' was paralleled by a gap in the dates of the pottery that was recovered from the site's smelting area (Crossley 1968, 24). This suggested that Rockley Smithies had undergone 'a period of abandonment' in the 16th century before being reopened in the early 17th century (Crossley 1968, 24).

Indications of a similar renewal of activity at the Cawthorne Park bloomery may be suggested by several new fixtures and fittings, including a 'payre of bloome bellis, being newe' and 'six payre of newe banisters' that were recorded in 1608 (YAS DD70/55). Against this, it should be noted that fixtures and fittings such as bellows and banisters were replaced periodically as a matter of course and the 'newe' items may merely have been recent purchases at the time of the 1608 inventory. This issue cannot be resolved on the basis of the current evidence.

5.2.2 *Waterton's lease and inventory*

In 1608, Thomas Waterton leased the 'Smythye House called Cawthorne Smythies' to Thomas Barnby of Barnby Hall for 11 years (YAS DD70/55). The Watertons had been the manorial lords of Cawthorne since at least 1522 and had been related to the Barnby family by marriage since 1532 (YAS DD70/53; SA SpSt 74/3) but, in the absence of earlier records, it is not known if the 1608 lease was a new agreement or a renewal of an earlier lease.

A 'note of Cawthorne smythies' appears to have been produced in conjunction with Thomas Barnby's lease of 1608 and provides the earliest surviving detailed account of the bloomery. The site contained a bloomery and a smithy at this date, each of which had its own 'whee' (YAS DD70/55). Fixtures associated with the waterwheels included 'guggins', the gudgeons that were used to support the wheel shafts (YAS DD70/55).

Fixtures and 'tool'es used by 'the blomer' included 'one payre of bloome bellis, being newe'; a 'bloome loome', a variety of rakes, axes, tongs and hammers, and 'blome tuirones' (YAS DD70/55). The latter were the tuyeres through which the bellows directed the air supply into the interior of the furnace.

Tuyeres were 'sometimes ceramic tubes' or 'separate circular blocks of clay, with a blowing hole...set in place in a prepared cavity in the furnace wall' (Paynter 2011, 2; Crew 1995, 2). This feature would have been set in the part of the bloomery wall that faced the bellows house.

Among the items used by the smith were the 'smyth tuirones', a 'smyth loome' and 'one payre of smyth lowis' (YAS DD70/55). The use of tuyeres in smithing suggests that blooms were not always taken directly to the smithy for refining whilst hot, but were allowed to cool before being reheated at the smithy. It is not known if this was an occasional or standard practice at Cawthorne.

It is not clear if the term 'Smythye House' indicates that a domestic property formed part of the Cawthorne Park site in 1608 or if the smithing facility was housed in a superstructure at the time of the 1608 lease. Domestic pottery was recovered from the bloomery at Myers Wood, but this appeared to be residual material from settlement activity concentrated higher up the valley side, away from the ironworking areas (Clay *et al* 2004, 23).

'Outbuildings' recorded at Cawthorne in 1608 are likely to have included charcoal and ironstone stores (YAS DD70/55). While the form of these buildings and their placement around the site is unknown, a 'stake hole' suggested that a building had stood on the Myers Wood charcoal platform (Clay *et al* 2004, 15). A similar arrangement may have been in place at the Cawthorne Park bloomery.

A plot named 'Smithie Leyes' was included in Thomas Barnby's 1608 lease. This includes the place-name element 'ley', meaning a cleared area. While set within a wood, the ironworking areas will have been clear of trees at this date. Unspecified 'land' was also included in the lease, which shows that the bloomery may not have been confined to a single plot.

5.3 Cawthorne Smithies and Cawthorne Park, 1610-1714

5.3.1 Further documentary evidence

In addition to the 1608 lease and inventory, Cawthorne Smithies were recorded in several further early 18th-century documentary sources. Although Thomas Barnby had leased the site for a period of 11 years in 1608, he surrendered the lease after less than two years. Thomas Waterton subsequently sold the 'house called Smythee and Smithie Coall house' to George Greene of Cawthorne in 1610 (SA SpSt/93/4). As coal was not used in the bloomery or smithing process, the 'Coall house' is likely to have been a charcoal store. An indication of the arrangement of these buildings was given in 1621, when 'le Coal house' was said to be 'adjoining Le Smythie' (SA SpSt/185/15).

Thomas Wallshawe was listed as the ‘occupier’ or tenant of Cawthorne Smithies at the time of its sale to Greene but appears to have purchased the site at a later date. By 1621, Wallshawe had sold ‘Le Smythie at Cawthorne’ to Thomas Wainwrighte (SA SpSt/185/15). While the site was ‘in the tenure of widow Wainwrighte’ at that date, it appears to have been acquired subsequently by George Wentworth of Bretton. The Wentworths had bought the manor of Cawthorne from Thomas Waterton in the early 18th century (Smith 1988, 6) and ‘Smythies or Iron Forges called Cawthorne Smythies’ were recorded in George Wentworth’s will of 1628 (SA SpSt/185/15; YAS DD70/53). Wentworth’s use of the term ‘forges’ is potentially problematic but may simply have been used inaccurately, as the site was recorded as ‘the iron smithies of Cawthorne’ when it was leased to Matthew Wentworth in 1630 (YAS DD70/54).

None of the early 18th-century documentary sources give the location of Cawthorne Smithies and there is therefore no direct evidence to demonstrate that they refer to the bloomery in Cawthorne Park wood. Dennis Smith argued that these sources in fact refer to a separate ironworking site on Cinder Hill, to the south (Smith 1988, 22; Lodge 1990, 3). Cawthorne Park, ‘the iron smithies of Cawthorne’ and their ‘Smithy waters’ were all included in a single lease of 1630 (YAS DD70/54), however, which suggests that the site was indeed that in Cawthorne Park wood.

The early 18th-century documentary sources do not provide a complete, unbroken record of Cawthorne Smithies in this period. Particular owners, leasees and tenants do recur in the documentation, however, and the Smithies that were recorded in the 1608, 1610 and 1621 sources are likely to be the same site. Similarly, the Cawthorne Smithies that were recorded in 1628 and 1630 were owned by George Wentworth and are also likely to be a single site.

The Wentworths are likely to have acquired the site as part of their purchase of the manor of Cawthorne from the Watertons. There is no direct evidence to demonstrate this, however, and it is possible that the groups of documents from 1608-1621 and those from 1628-1630 refer to two different sites. This may support Dennis Smith’s suggestion that bloomeries were situated at both Cawthorne Park wood and Cinder Hill (Smith 1988, 22). Against this, it should be noted that the periods covered by the two groups of documents do not overlap and there is therefore no evidence to show that two bloomeries were operating at the same time.

5.3.2 Cawthorne Smithies in the mid-17th century

In 1630, Matthew Wentworth of Bretton leased ‘all that wood ground called Cawthorne Park and the iron smithies of Cawthorne’ for a period of 50 years (YAS DD70/54). This is the last lease known to have been taken out on the site. The Smithies do not appear to have been worked throughout the full term of the lease, but the date at which the site closed is unknown.

Several valuations of lands in Cawthorne were produced between 1638 and 1689 (SA SpSt/60305/120). While none of these recorded the Smithies, they typically listed landowners and total acreage, but not the names of particular plots or areas, and it is possible that the bloomery remained active but was simply not recorded. A separate 1648 survey of Cawthorne also survives (SA SpSt/60347/165) but could not be located by the staff of Sheffield Archives during the timescale of this report.

A 1657 confirmation of a right of way 'past Cawthorne Smithy' (cited in Umpleby 2000, 96) suggests that the site remained upstanding at that date but need not indicate that the bloomery was in use. Dennis Smith has argued that the 1657 account refers to the site at Cinder Hill rather than the bloomery in Cawthorne Park wood (Smith 1988, 22; Lodge 1990, 6), although cartographic evidence suggests that this route may actually have passed both Cinder Hill and the bloomery in the wood.

While the 1657 agreement referred to a track that was used to 'take wood out of Cawthorne Park', its proximity to the bloomery suggests that the route may also have been used to bring in charcoal and ironstone supplies to the Smithies and also to remove refined iron. Should that be the case, the right of way is likely to have been extant long before 1657, as logistical operations such as these would have required at least one substantial access route through the Park throughout the Smithies' working life.

It is therefore possible that the right of way agreement represented a change of use and that Cawthorne Smithies had closed by 1657. This may be supported by the conveyance 'of the Spring Woods in Cawthorne Park' to William Cotton of Sheffield, which also took place in 1657 (YAS DD70/54). Cotton acquired the coppiced wood within the Park on behalf of John Spencer of London, who was related to the Spencer ironworking partnership of Barnby, Rockley and Chapelton. This suggests that wood from Cawthorne Park was no longer being used to manufacture charcoal for use at Cawthorne Smithies by 1657.

Early maps of the area do not show any tracks through the wood and the course of the mid-17th-century right of way is unclear. Given that the 1657 right of way was to be used specifically to take wood 'out' of the Park, its course is likely to have continued beyond the wood itself. An undated, but probably late 18th-century, map of north-west Cawthorne depicts a substantial track (Site 12) leading out of the wood and continuing through the fields to Cinder Hill (Plate 9).



Plate 9: Undated map of north-west Cawthorne, showing track leading from the Park to Cinder Hill

(© Sheffield Archives)

Later maps indicate that this was the south-eastern part of a substantial route that led through the wood from Cinder Hill and ran past the bloomery site to leave the Park at High Hoyland to the north-west (Plate 10). It may be relevant that the 1558 lease allowing ironstone to be 'leade...to' Calwathine Smithies was granted to Matthew More of High Hoyland.

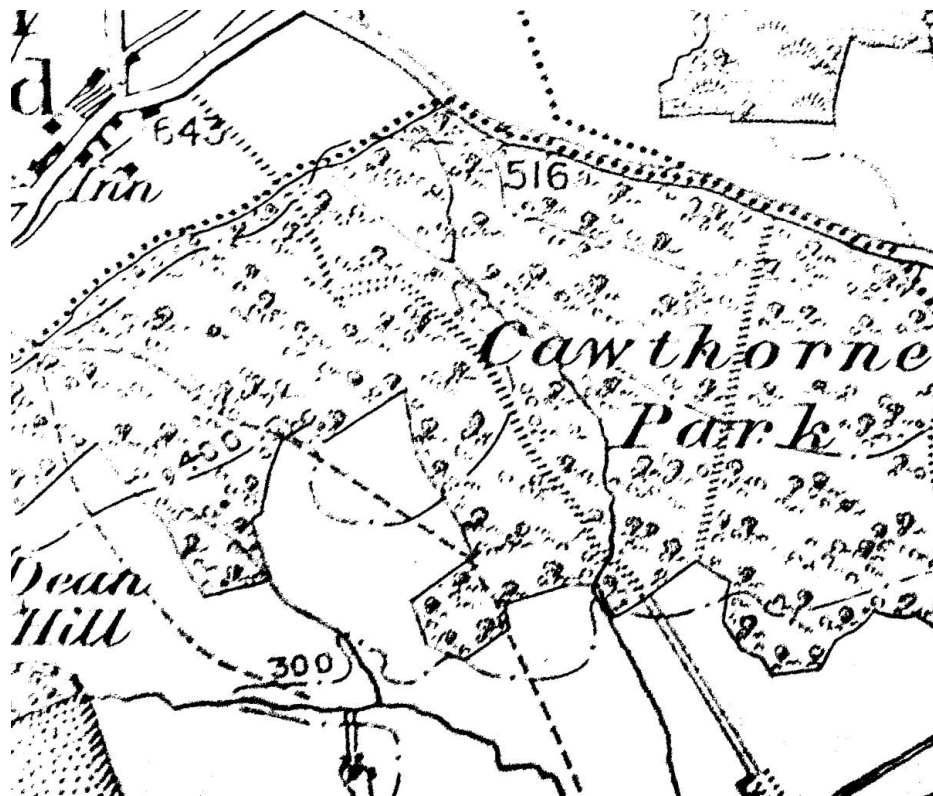


Plate 10: 1851 OS map showing track through wood from High Hoyland to Cinder Hill

(© Barnsley Archives)

Following relatively level ground for much of its route, the track ran to the west of the stream, thereby avoiding features such as the bloomery dam, which appears to have been situated on the east side of the watercourse (Lodge 1990, 2). This is in contrast to a second major track that was shown in the wood on the 1841 Ordnance Survey first series map. The latter route entered the Park at the site of the present-day compound on Upper Field Lane and ran through the wood on the east side of the stream. This track was not shown on the 1851 map (Plate 10) and, given the steepness of the incline from Upper Field Lane, is perhaps less likely than the western route to have been used to transport heavy materials into and out of the Park.

Both routes converge approximately 0.15km from the southern edge of the wood. Having done so, the track crosses the stream before leaving the wood at the point shown on the undated map of north-west Cawthorne (Plate 9). A modern culvert carries the track over the stream (Plate 11).

Should this route have formed part of the 1657 right of way, it is also likely to have crossed the stream in this area. Given the need to transport relatively heavy materials, a 17th-century culvert, small bridge or stone-paved ford may have been situated in the vicinity of the modern culvert. It is not clear if the latter contains re-used stone from a historic predecessor.



Plate 11: Stream culverted beneath present-day track

Cawthorne Smithies are not mentioned in surviving documentation produced after 1657 and the site was not shown on the c.1660 plan of Cawthorne Park. This need not indicate that the Smithies were disused or demolished by that date, however, as the plan was produced specifically to record coppice falls and would not have included features such as the Smithies that were incidental to its purpose.

Matthew Wentworth's lease on Cawthorne Smithies expired in 1680. The following year, Wentworth sold over 1780 trees from Cawthorne Park to a group headed by George Bamforth of Sheffield (Smith 1988, 7; YAS DD70/54). Bamforth was given permission to manufacture charcoal within the Park for seven years and to bring in waggons to remove the charcoal during that period (Smith 1988, 7). This suggests that Cawthorne Smithies did not require a charcoal supply in 1681 and had closed by that date. The conveyance of the 'Spring Woods in Cawthorne Park' to William Cotton and John Spencer in 1657 suggests that the bloomery may even have become disused by the 1650s (YAS DD70/54).

Following the site's closure, the ironworking areas are likely to have been stripped of any re-usable fixtures and the buildings would have fallen into a state of disrepair. Archaeological evidence from Rockley Smithies indicates that the buildings at that site were subjected to a 'thorough robbing' of stone within two decades of the site's closure (Crossley 1968, 32).

Cawthorne's dam and back-up pond may have remained extant for some time, but this is not certain as the dam wall may have included dressed stone that would have been a ready source of material for new construction projects. At Rockley Smithies, 'the upper parts of the dam' had been removed as part of a 'thorough demolition' around 1650 (Crossley 1968, 29, 32). Again, this appears to have been within two decades of the site's closure. If not purposely dismantled, the dam wall at Cawthorne is likely to have been robbed periodically until the dam

was unable to retain water. Once drained, the removal of stone from the wall is likely to have accelerated.

5.3.3 Cawthorne Park after the closure of the Smithies

While Cawthorne Smithies were operating, they are likely to have taken much of the charcoal that was produced in the Park. The conveyance of the 'Spring Woods in Cawthorne Park' to William Cotton and John Spencer in 1657 suggest that the bloomery may not have been operating by that date, while the 1681 sale of over 1780 trees and an agreement to manufacture and remove charcoal from the Park suggests strongly that the bloomery was closed by that date (YAS DD70/54; Smith 1988, 7).

Several developments may have contributed to the closure of Cawthorne Smithies, including the depletion of local iron ore deposits and a consequent increase in the costs of raw materials (Lodge 1990, 22). The key development may have been the proliferation of blast furnaces in this period (Belford *et al*, forthcoming). A bloomery at Chapelton had been replaced by a blast furnace by 1635; Rockley Smithies appears to have closed by 1650, with a blast furnace being constructed in a different part of the Rockley estate in 1652 (Crossley 1968, 29, 34).

Operations at the Cawthorne Park bloomery may have been impacted by the development of a blast furnace at Barnby, approximately 2.7km to the south-east. 'Barneby Smythies' remained a bloomery in 1633 but had been converted into a blast furnace by 1648 (SA SpSt/189/2-3; Umpleby 2000, 118). While bloomeries and blast furnaces produced different types of iron, Barnby Furnace may have taken the bulk of the local iron ore and charcoal supplies and rendered the Cawthorne bloomery economically unviable (MacKenzie 2013, pers. comm.).

Rod Mackenzie has suggested that this may have occurred around a decade after the establishment of Barnby Furnace (MacKenzie 2013, pers. comm.). Should that be the case, this would support the suggestion that Cawthorne Smithies had closed by the time of the conveyance of the Park's coppice woods to William Cotton and John Spencer in 1657 and the contemporary agreement to use a right of way past the bloomery.

The development of a secondary ironworking process that removed further carbon subsequently allowed blast furnaces to produce a product with similar qualities to bloomery iron in that it could be forged easily (MacKenzie 2013, pers. comm.). This may have led to the final closure of the Cawthorne Park bloomery. In that case, the timescale would be consistent with other developments in the region, such as the closure of the bloomery at Barnby and its redevelopment as a blast furnace and the construction of a blast furnace at Rockley following the closure of Rockley Smithies.

While other bloomeries were converted into fineries during this period, Cawthorne Smithies did not follow suit. Pig iron from Barnby Furnace was sent to fineries in Silkstone in 1712 (Smith 1988, 23), which suggests that such facilities were not available at Cawthorne Park. A 1714 valuation rated Barnby's 'land, furnaces and woods' at £8. 5s. 11d, while Cawthorne Park was valued at only £3. 2s (SA SpSt/60305/120). The disparity between these respective values, and the reference to ironworking at Barnby alone, suggests that Cawthorne Smithies had indeed closed by that date.

While the Park was not shown on George Pollard's 1738 map of the area (Plate 1), the Smithies may have been disused for several decades and few upstanding remains may have survived at the site by that date. Slag from the 'Old Bloomery' dumps was removed and used to repair the highway in Cawthorne Parish in 1753 (Umpleby 2000, 96).

Staff at Sheffield Archives were unable to locate the 1745-1771 account book of the Overseers of the Highways for Cawthorne (SA SpSt/60306/121) during the timescale of this report and it was therefore not possible to determine if the Overseers recorded any further details associated with the site.



Plate 12: Site of slag removal

5.5 Historic map evidence

Cawthorne Smithies are not depicted on any surviving historic maps. The uncredited, c.1660 plan of Cawthorne Park (John Goodchild Collection, no catalogue number) showed the locations of three coppice falls within the wood, while the area was omitted from George Pollard's 1738 map (Plate 1).

Several subsequent maps marked the boundaries of the Park but did not show any features within the wood. These include Thomas Jefferys' 1771 map of Yorkshire (Plate 2), an undated map of north-west Cawthorne (Figure 3), a c.1806 map of the area (Figure 4) and the 1851 Cawthorne manorial map (Figure 5).

Two mid-19th-century maps of Cawthorne could not be consulted for this report. John Walker's 1839 manorial map (SA SpSt/6027/Add 124R) could not be located by the staff of Sheffield Archives, while the 1851 Cawthorne tithe map (BA 92/1) was inaccessible due to the reorganisation of Barnsley Archives. As the bloomery was not shown on maps that both pre- and post-date these periods, however, the 1839 and 1851 maps are unlikely to have marked the site.

No features were shown in the vicinity of the bloomery or along the course of the stream on the 1854 Ordnance Survey map (Figure 6). While various disused industrial sites were elsewhere marked as 'old' on this map, these typically possessed upstanding remains at the time of the survey. This suggests that the dam had been dismantled and none of the bloomery buildings or working areas remained extant by the mid-19th century.

Archaeological evidence from Rockley Smithies suggests that this may have occurred relatively shortly after the site's closure, as 'a thorough demolition' and the 'robbing of the upper parts of the dam and buildings' occurred within two decades of Rockley becoming disused (Crossley 1968, 32).

While further tracks were marked within the wood on the 1894 Ordnance Survey map (Figure 7), no features were shown in the vicinity of the bloomery.

6 POTENTIAL ARCHAEOLOGICAL REMAINS

Bloomeries 'leave only subtle traceable surface remains' and their sites can therefore be 'difficult to reconstruct precisely' without archaeological excavations (Latham 1992, 3; Paynter 2011, 4). Should the Cawthorne Park bloomery have been extant during the medieval period, it is likely to have included many of the features that were revealed by excavations at the site of the bloomery at Myers Wood. These include the remains of bloomery furnaces, a smithing hearth, working floors, an ore-roasting pit and a charcoal platform (Clay *et al* 2004).

A major contrast between the Cawthorne Park and Myers Wood bloomeries is the latter's lack of water-management features (Clayton *et al* 2004, 29). Cawthorne Smithies included two dams and waterwheels by 1608. As the introduction of water-management systems may have necessitated the relocation of key features such as the bloomery furnaces and the smithy hearth, medieval features such as those that survived at Myers Wood may therefore have been destroyed when water power was introduced at Cawthorne. The site is therefore likely to contain post-medieval features similar to those that were excavated at Rockley Smithies, including a dam, waterwheels and wheel pits, in addition to the furnaces, smithing hearth and bellows house (Crossley 1968).

Rod MacKenzie has suggested that the Cawthorne bloomery contained 'at least two distinct furnaces' and that, given the pattern of slag dumping around the site, their positions should be relatively easy to locate (MacKenzie 2013, pers. comm.). Excavation demonstrated that the Myers Wood bloomery contained several furnaces, some of which were individual features while others appeared to be arranged in a linear grouping. Rockley Smithies (Plate 13) contained three 'bloomhearth', each with a wheelpit, bellows house and a working hearth (Crossley 1968, 24). Sub-surface furnace deposits such as these may also survive in Cawthorne Park wood and archaeological investigation may determine their numbers and locations.

The Myers Wood excavations demonstrated that bloomery furnaces were rebuilt, periodically. While this often included the re-use of any stone supporting structure, old furnaces were also abandoned and replacements built elsewhere within the same ironworking complex (Clay *et al* 2004, 9). At Myers Wood, the 13th-century ore-roasting pit had been constructed over the sites of two earlier bloomery furnaces (Clay *et al* 2004, 15). This shows that the areas in which

particular ironworking processes took place need not be fixed and that the layout of sites could change over time.

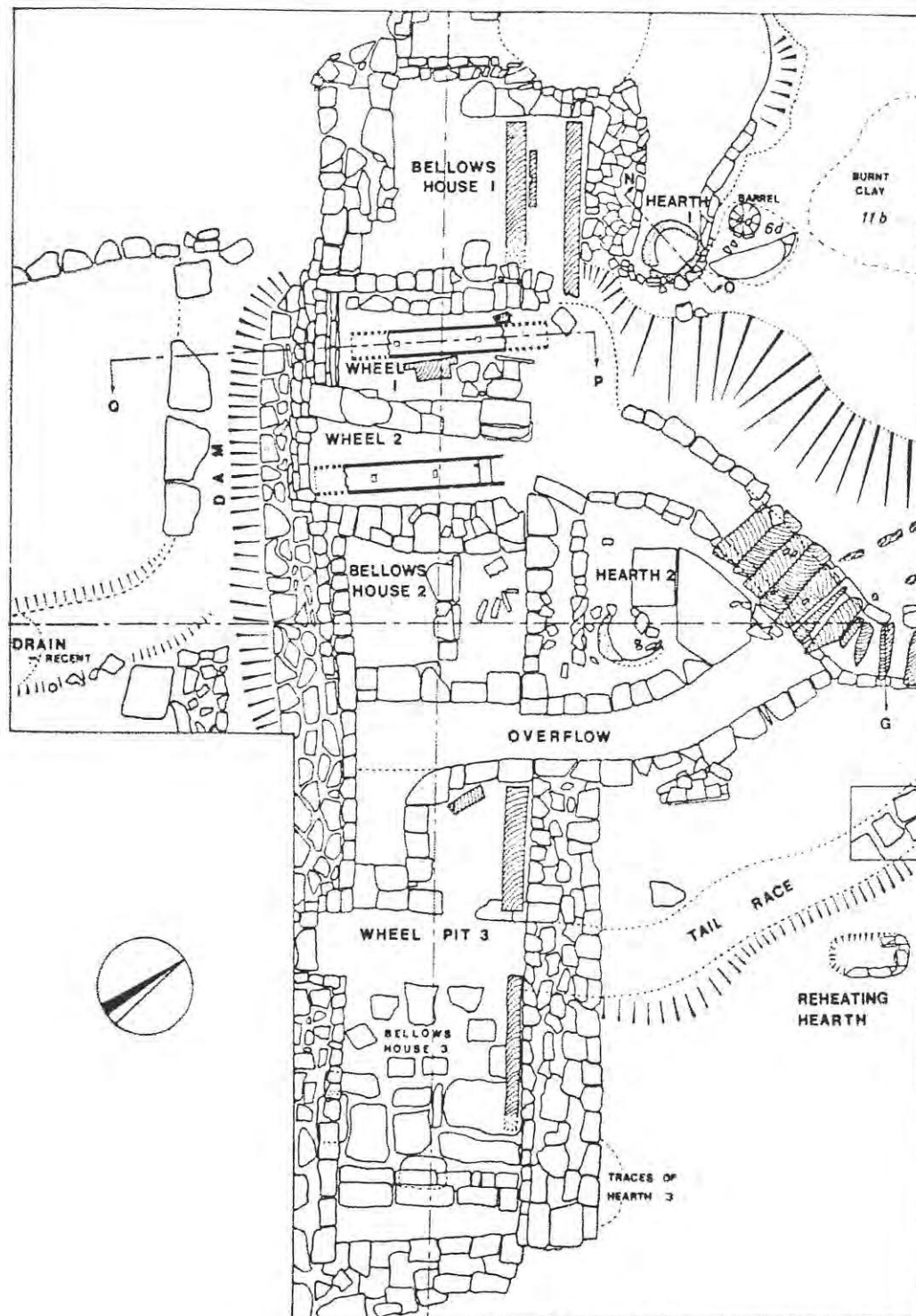


Plate 13: The smelting complex excavated at Rockley Smithies

(Reproduced from Crossley 1968, 22)

Evidence for the redevelopment of bloomeries was also recovered from Jernvirke, Tvaaker, Halland, where early furnaces were buried beneath the slag dumps of their successors (Buchwald 2005, 134). Former working floors were also identified beneath the slag dumps at

Myers Wood. Should similar evidence be present at Cawthorne, this could help to determine the phasing of the site.

Tap slag demonstrates that the Cawthorne Park bloomery furnaces included an aperture or 'tap-hole'. While these features were situated above ground level and so rarely survive as *in situ* archaeological features, the Myers Wood excavations produced an intact tap hole, preserved within a piece of heavily-vitrified clay furnace lining (Clay *et al* 2004, 21).

Excavations at Myers Wood and Rockley Smithies suggest that archaeological evidence may also indicate the particular ironworking practices that were being carried out at Cawthorne. Three of the Myers Wood furnaces had associated tapping channels, one of which still contained *in situ* slag, while only one of the three bloomhearthths at Rockley Smithies had a 'tapping hollow' (Clay *et al* 2004, 21; Crossley 1968, 24). The absence of such a feature on the remaining hearths led to their identification as stringhearthths for reheating blooms or removing any remaining slag (Crossley 1968, 24). The Rockley stringhearthths included hearths set on a 'dry-stone plinth, standing on a bed of cinder...with a core of cinder and capped by substantial stone slabs' (Crossley 1968, 26). Similar structures may be present at Cawthorne Park.

While one of the tapping channels at Myers Wood directed the slag into a pit, two others led away from the furnaces towards particular slag dumps (Clay *et al* 2004, 18). Should this be the case at Cawthorne, the slag dumps within the wood (Plates 12 and 16) may indicate the general locations of at least some of the bloomery furnaces.

Gladman's analysis of bloomery slag from the Park showed that these particular samples contained lime that had been used as a fluxing agent, a process that was thought to have developed in the 17th century (Gladman 1996, 2). Trial pits or sections excavated through the dumps may recover earlier slag from the lower levels or the base of the slag dumps (MacKenzie 2013, pers. comm.), thereby providing evidence for the range of the site's working life.

Archaeological investigations at Myers Wood and Rockley Smithies indicate that excavation is likely to identify evidence for both the iron-manufacturing and the iron-refining areas at Cawthorne. At Myers Wood, the smithing area was discovered following a magnetic susceptibility survey that identified concentrations of hammerscale and smithing slag tubes (Clay *et al* 2004, 19). Excavation subsequently revealed a stone-paved area that contained the smithing hearth and a working floor.

At Rockley Smithies, the smithing area was indicated by two working floors containing hammerscale, a stone-lined hollow and a pit containing a timber-frame and a tree-stump that formed the base for an anvil, while a wall suggested the site of a building in which 'planking had once been present' as flooring (Crossley 1968, 28).

In order to reduce the time taken between the two processes, Cawthorne's primary smithing hearth and anvil is likely to have been situated within 7 to 10m of the bloomery furnaces and may be identifiable as a relatively flat, trodden area with hammerscale and micro-residual material in the ground (MacKenzie 2013, pers. comm.).

The two 'waters greater and lesser' that formed part of Cawthorne Smithies in 1608 are likely to have been the dam and the 'back-up' pond that were identified 'above the bloomery' by T.J. Lodge in 1990 (YAS DD70/55; Lodge 1990, 2). Dressed stone was recovered from the lower

levels of the dam wall at Rockley Smithies, while several stones from the Cawthorne dam wall were observed by Lodge immediately upstream from the bloomery site and the keyed corners of further stones in the streambed may have been former dam wall ties (Crossley 1968, 32; Lodge 1990, 2). Similar material may remain in the streambed, although it should be noted that many of the suggested dam stones could not be traced in 1992 (Latham 1992, 3).

It is currently not known if the bloomery and smithing waterwheels at Cawthorne were supplied with water through artificial channels known locally as 'goits' or, given the sloping terrain in the Park (Plate 14), along an above-ground wooden channel called a 'launder'. Archaeological excavation may resolve this issue, as a 'dried-up channel' and a 'depression' at Rockley Smithies proved to be a timber- and stone-lined goit, part of which had been capped by a timber and stone roof and then covered with gravel to allow access over it (Crossley 1968,13-14, 27-28). Should goits have been used at Cawthorne, similar sub-surface channels may survive in the Park.



Plate 14: Looking towards stream from probable bloomery site, showing difference in elevation

While the bloomery and the smithy at Cawthorne had their own waterwheels by 1608, the size and form of these features is unknown. Umpleby suggested that the wheels may have been the overshot or pitchback types, in which the water supply ran onto the top of the wheel (Umpleby 2000, 96). Both of these types of waterwheel would be effective with a relatively small water supply such as the stream that runs through the Park.

Archaeological investigations at Rockley Smithies recovered evidence of wooden waterwheels that had been left to decay *in situ* before the wheelpits were infilled (Crossley 1968, 26). This demonstrated that one of the Rockley wheels was overshot, 3.35m in diameter, and would have been used with a pen trough (Crossley 1968, 26). Similar deposits may also be preserved at Cawthorne Smithies.

Excavation also showed that one of Rockley's stone-lined wheelpits originally held a breast or pitch-back wheel but had been narrowed subsequently in order to accommodate an overshot wheel (Crossley 1968, 26). Should Cawthorne's wheelpits survive as sub-surface features, similar evidence may be recoverable. This would also help to illustrate the phasing of the site.

Archaeological evidence suggests that 'large square post-built shelters' (Crew 1995, 4) were present on medieval ironworking sites. These may have been the 'sheds' or superstructures associated with both bloomeries and smithies that were recorded in ironworking leases from at least the 13th century (Salzmann 1913, 29; Crew 1995, 4). Stone structures were present at Rockley Smithies during the post-medieval period and similar features are likely to have been present at Cawthorne Smithies, such as the 'Smythe House' that was recorded in 1608.

Early 17th-century 'outbuildings' are likely to have included ironstone and charcoal stores. While the form of these buildings and their placement around the site is unknown, archaeological evidence for the positions of former buildings at Myers Wood were suggested by patches of yellow clay in the smithing area and a 'stake-hole' on the charcoal platform, while the foundations of a rectangular stone building were discovered at Rockley Smithies (Crossley 1968, 21).

Ore-roasting pits were identified in the archaeological record as depressions in the vicinity of medieval bloomeries at Jernvirke, Tvaaker, Halland (Buchwald 2005, 135) and at Myers Wood, Kirkburton (Clay *et al* 2004, 17). A U-shaped, stone-built ore-roasting hearth, approximately 1m square, was also discovered at Myers Wood (Plate 15).



Plate 15: Medieval ore-roasting hearth, Myers Wood

(© HDAS)

Radiocarbon dating indicated that that this feature had been in use during the 13th century (Clay *et al* 2004, 29). Similar ore-roasting features were found at Rockley Smithies, where this

activity had taken place within a walled area (Crossley 1968, 20), and are also likely to be present at the site of the Cawthorne Park bloomery.

Archaeological evidence may reveal the site of the Cawthorne Park bellows house, structural remains and floors associated with the building and, possibly, remnants of the bellows themselves. Excavation at a site in the Forest of Dean suggested that a 'large raised platform in front of the furnace...was probably a base for the bellows' used in a medieval bloomery (Crew 1995, 4). At Myers Wood, the excavation of a furnace base revealed an adjacent area of flat stones that were also interpreted as the base of a bellows platform (Clay *et al* 2004, 21).

Rockley Smithies produced more substantial evidence, with 'dry-stone foundations' and 'numerous fragments of roofing slabs' indicating that the bellows house was a roofed stone building (Crossley 1968, 26). Irregular paving slabs formed part of the floor, while 'substantial timbers' containing two mortices and 'rotted tenons' indicated that the bellows themselves had been supported by 'vertical frame-members' (Crossley 1968, 26). As the Rockley features were contemporary with the documentary evidence for early 17th-century activity at Cawthorne Smithies, similar evidence may also survive within the Park.

Several types of dating evidence were recovered during the Myers Wood excavations, including ceramics indicating that the site had been operating in the 13th and 14th centuries (Clay *et al* 2004, 27). Dating evidence from Rockley Smithies included a coin that was issued between 1500 and 1507, while the silts of the pond produced ceramic 'covering the whole known occupation of the site' (Crossley 1968, 21, 29, 32). This included pottery showing that the site's demolition layers dated to the mid-17th century (Crossley 1968, 21, 29, 32). Similar material is likely to be present at the Cawthorne bloomery and may reveal the range of the site's working life.

Late medieval or early post-medieval charcoal is present in Cawthorne Park wood. Further samples may be relatively plentiful as simple ground clearance works conducted prior to the Myers Wood excavations produced 'abundant charcoal fragments' that could be dated through radiocarbon testing (Clayton *et al* 2004, 15, 29). The testing of further charcoal samples from Cawthorne may demonstrate other periods in which the site was active.

Charcoal samples can also reveal aspects of the ironworking process that may not be readily apparent through structural remains. At Myers Wood, particular species of tree were used for specific processes, with charcoal from immature coppiced oak being used in the bloomery furnaces and other species being used for smithing activity (Clay *et al* 2004, 28). Partially-burnt charcoal also appears to have been re-used during the ore-roasting process, where precise temperature control was not required (Clay *et al* 2004, 28). Charcoal-testing could therefore illustrate several aspects of the ironworking practices that were employed at the Cawthorne Park bloomery.

Bloomery furnaces were lined with clay. This material was repaired or replaced relatively frequently, as the clay could adhere to the bloom when the latter was removed and could crack due to the post-smelt cooling process (Clay *et al* 2004, 9). Several examples of clay lining were recovered from Myers Wood, along with a discrete clay dump. This material was subjected to archaeomagnetic testing which showed that it came from furnaces that had last been fired in the 12th to 14th centuries (Clay *et al* 2004, 29). Should clay furnace lining be

recovered at Cawthorne, it could also be tested to show the period in which the bloomery was active.

While slag was removed from the Cawthorne dumps in the mid-18th and late 20th centuries, the majority of the dumps appear to remain *in situ*. Given the extent of the slag dumps, the majority of the visible material is likely to have been produced by a water-powered bloomery, with the upper levels containing slag from the site's later phases (MacKenzie 2013, pers. comm.). Pre-17th-century slag is unlikely to have been re-used on-site to any great extent and so may survive at the base and in the lower levels of the dumps (MacKenzie 2013, pers. comm.).



Plate 16: Slag dump to north of probable bloomery site

The stream that runs through the wood has been culverted at several points to allow access over the watercourse from a path that runs along its eastern bank. The culverts are situated along the courses of old tracks that were present within the wood prior to outcropping and replanting in the 1950s (Batty 2013, pers. comm.). At least one of these features has been constructed from unmortared sandstone blocks, with a stone flag base (Plate 17). The date of this culvert is unclear and it is not known if it is a historic feature or was constructed with materials that were re-used from a historic predecessor.

A further large stone flag has been discarded in the streambed. Historic stoneworking is not recorded in Cawthorne Park wood and this flag may also have formed part of a now-lost historic feature similar to the existing culvert.



Plate 17: Unmortared sandstone culvert with stone flag base

7 RESULTS

This report applies the term ‘bell pits’ in reference to the surveyed remains of probable ironstone extraction sites. None of these features have been excavated and their status as ‘bell pits’ has therefore not been ascertained precisely. The features are located in an area of documented medieval and post-medieval ironstone mining, however, and the current evidence suggests that they are indeed bell pits. This term will therefore be used in the report.

Area 1e (Figure 8)

Area 1e, located towards the north-west corner of the survey area, was quadrilateral in shape, measuring 60m north-west/south-east x 45m north-east/south-west (18m north-west/south-east on eastern edge). It was predominantly flat in profile but covered in dense undergrowth, making the identification of archaeological features difficult.

Area 1f (Figure 8)

Area 1f, located immediately to the east of Area 1e in the north-western corner of the site, was quadrilateral in shape and measured 105m north-west/south-east x 65m north-east/south-west (18m north-west/south-east on western edge). It was predominantly flat in profile, but its southern edge rose towards the north before forming the plateau.

An irregularly shaped vertical rock face, 106m north-west/south-east x 28m north-east/south-west (Plate 20) was evident along the northern edge of Area 1f. This appeared to have been quarried to a depth of approximately 3m. This feature is situated in an area marked on Ordnance Survey maps as ‘The Knoll’ (Site 5).

Area 1h (Figure 8)

Area 1h, located immediately to the south of Area 1e and aligned along the western side of Area 1a, was linear in form and measured 200m north-east/south-west x 3.5m wide. Its profile rose steeply from its southern end (145m OD) to its northern limits (170m OD). The nature of the make-up of the track suggested that this feature had been constructed recently and no archaeological features were identified within the area.

Area 2a (Figures 9, 11)

Area 2a was located towards the eastern end of the woodland, on the northern side of the main stream bisecting the survey area. It was polygonal in shape and measured approximately 150m north-west/south-east x 120m north-east/south-west. It had an undulating profile and was fairly densely wooded.

Seven possible bell pits (Survey Features 1-7; Plates 21-27) were identified along the southern edge of the area.

Area 2c (Figures 16, 17)

Area 2c was located immediately to the south-east of Area 2a, and was irregular in plan, following the line of the stream on its south-west edge. It measured 475m north-west/south-east x 108m north-east/south-west before turning towards its southern end and extending 335m north-south x 95m east-west. The profile from the south-west side of this area sloped steeply uphill to the north-east before sloping more gently. The area was heavily wooded and several land drains had been excavated during recent land management activity. Tree management had covered the ground in branches and leaves.

A total of 18 bell pits (Survey Features 8-25; Plates 28-35) and three slag dumps/cinder spreads (Survey Features 26-28; Plates 36, 38) had been identified during a previous earthwork survey (Latham 1992). While these were not surveyed again, their details are included here.

Area 2g (Figure 9)

Area 2g was located along the southern edge of Cawthorne Park Woods, at the southern limit of Area 2c. It was rectangular in plan, measuring 118m north-west/south-east x 67m north-east/south-west. The profile of Area 2g was level, but sloping down towards its southern limits. The area was fairly densely covered in trees and recent woodland management had resulted in the ground being covered in branches, making it difficult to identify features.

Area 3a (Figures 9, 8)

Area 3a was located at the north-west corner of the survey area, on the opposite side of the stream to Area 2a. It was polygonal in shape and measured 140m north-west/south-east x 86m north-east/south-west. The profile of the area was slightly undulating, sloping down to the north-east. The area was fairly densely wooded.

Fourteen possible bell pits (Survey Features 29-42) were identified towards the south-west corner of Area 3a.

Area 3e (Figures 9, 23)

Area 3e was located immediately to the south-east of Area 3a, on the opposite side of the stream to Area 2c. The area was irregular in plan, with maximum dimensions 660m north-west/south-east x 160m north-east/south-west. Its profile formed the reverse of Area 2c, sloping steeply up towards the centre from its north-eastern limits. The profile then tapered, to slope more gently towards the south-west boundary. It was densely wooded, with recent land and tree management making the identification of features on the ground difficult.

Two features of archaeological interest were identified within Area 3e: a bell pit (Survey Feature 43; Plate 51) and a slag dump/cinder spread (Survey Feature 44).

Area 3f (Figures 9 and 36)

Area 3f was located within Area 3e, centrally along its north-eastern edge. It was rectangular in plan and measured 95m north-east/south-west x 130m north-west/south-east. It was predominantly flat, although its north-eastern edge rose to the south-west from the river bank before forming a plateau (Plate 56). The area had been partially cleared of trees, although no above-ground archaeological features were identified in the initial survey. However during the subsequent field visit survey a number of features were noted, including a small slag heap, a possible pit feature and a trackway (see figure 36).

Area 4a (Figure 10)

Area 4a was located centrally along the northern limit of the site. It was irregular in plan, with maximum dimensions 250m north-west/south-east x 175m north-east/south-west. The southern limit of the area was situated on a natural terrace in landscape, which rose steeply to the north, approximately 35m from its southern limit. The area was densely wooded.

Within Area 4a, a single brick built structure (Survey Feature 45; Plates 52, 53) was located towards its south-west corner.

8 DISCUSSION**8.1 The survey**

The results of the walkover and measured surveys revealed five main concentrations of activity within Cawthorne Park woods. In the first of these, in the northern corner of the survey area (Area 1f), the natural sandstone has been quarried.

In the second zone of activity, located in the north-west corner of the woodland, 22 possible bell pits were identified. These were found predominantly within Areas 2a and 3a and can be augmented by a more extensive series of bell pits that lie outside of the survey area, to the west of Area 1h (Plate 54) and to the south of Area 3a (Plate 55).

A further focus of activity was situated towards the centre of the survey area. Here, a further cluster of 18 bell pits were located within Area 2c. To the north-west and south-west of these, a series of slag heaps/cinder spreads were also identified. It is likely that only the three larger spreads are archaeologically important, as the mounded nature of spread 0028 (Survey Feature 28) suggests that it may be the result of disturbance to spread 0027 (Survey Feature 27) during the construction of the track alongside the stream. Similarly, the hollows within

0044 (Survey Feature 44) are likely to be the result of the slag being used to pack around the modern fencing in Area 3f.

The number of possible bell pits identified within the survey, even discounting some of the shallower features that may be tree boles, suggests that the area was used extensively for mining ironstone or coal. No dating evidence was recovered from the pits to indicate when they were in use. The individual features in zones 1-4 can be ascribed to Significance Level 2b. The features in zone 5 are of potentially higher significance (see Section 9.3, below).

The fourth zone of activity was situated towards the northern boundary of the site, and contained the brick-built structure in Area 4a (Survey Feature 45). The hand-made bricks used to construct this building appear to date from the first half of the 18th century. Without excavation, it is difficult to ascertain the full extent and function of this structure, although any surviving sub-surface deposits are likely to be limited to foundation walls.

The final zone of activity, zone five, is centred in area 3f and is the likely location of the Cawthorne Smithies bloomery. It includes a number of large cinder/slag heaps, a water course and a visible plateau adjacent to the stream within area 3f itself. As discussed previously, the presence of the large slag dumps/cinder spreads suggests that a substantial amount of ironworking took place on the site, although the exact location of the furnaces themselves is currently unclear. It is probable; however, that production took place in the near vicinity of the slag spreads as the waste is unlikely to have been dumped far from the production sites, and the slight plateau within Area 3f would have been an ideal location for a working platform, particularly with the stream nearby. A number of other related features were also observed within this zone, including a smaller slag heap within the area of the plateau, a pit-type feature and a track-way (possibly associated with recent tree work).

The dense nature of the woodland breaks up the observation of linear earthwork features and, while it might be possible to identify parts of individual earthwork features, it becomes increasingly difficult to trace them through the woodland. Dense ground vegetation obscures all but the largest of features. The logging operation has created avenues of wheel rutting which may also obscure or interrupt smaller earthwork features.

Accurately plotting visible features was difficult within the woodland plantation. GPS signal was ineffective due to the dense tree canopy and total station survey was hindered by the lack of clear sightlines. It was therefore only possible for the surveyors to accurately locate smaller distinct self-contained features such as bell pit workings. A larger sense and understanding of the landscape was obscured by the environmental conditions.

A sketch plan of significant visible features in zone 5, the suspected bloomery site, has also been included in this report (Figure 36), despite the practical difficulties in conducting the survey in this part of the wood. The survey demonstrates that within the survey area archaeology is present and widespread. Cawthorne wood therefore has the potential of being a significant heritage asset. There are numerous large spoil heaps associated with a bloomery site, an ancient track way and areas of the water course having potential for features indicating the application of water power.

8.2 Future archaeological investigations

Archaeological investigations on the site of a medieval bloomery at Myers Wood, Kirkburton, Huddersfield, South Yorkshire (Clay *et al* 2004) identified evidence of furnaces, smithing, ore-roasting and charcoal-manufacture. Many of these processes were also found at Rockley Smithies, South Yorkshire (Crossley 1968), which also produced evidence of water-management systems and post-medieval structures.

Like the Cawthorne Park site, the Myers Wood bloomery was situated in a wooded area containing ironstone working and coppicing, with the ironworking areas located on the side of a valley, adjacent to a stream (Clay *et al* 2004, 5). Rockley Smithies was also constructed in the valley of a dike that ran through a woodland (Crossley 1968, 11). Given these similarities, the archaeological investigations at Myers Wood and Rockley may provide models for potential future work at the site of the Cawthorne Park bloomery.

Investigation at Myers Wood commenced with geophysical survey using a fluxgate gradiometer. This revealed anomalies within the slag dumps which, when resurveyed at a higher resolution, appeared to be the sites of bloomery furnaces and associated features such as tapping channels. Preliminary surveys such as this enabled the subsequent archaeological excavations to be targeted on potential features. Given the similar environment, this technique may be suitable for use in Cawthorne Park, although the extent of the slag dumps may make geophysical survey less effective at Cawthorne (MacKenzie 2013, pers. comm.).

Preparatory ground clearance at Myers Wood produced numerous charcoal fragments. Similar deposits are likely to be recoverable from any ground-clearance work carried out at Cawthorne. Charcoal can provide dating evidence through radiocarbon testing and can illustrate various aspects of the ironworking process. Ceramics also provided dating evidence at both Myers Wood and Rockley Smithies, with a coin being found at the latter.

Following the removal of topsoil at Myers Wood, areas of natural clay sub-soil were found to be heavily burnt. Samples of this material were subjected to archaeomagnetic testing, which indicated when the area had last been fired. Samples of vitrified clay lining from the interior of bloomery furnaces were also tested in this way. This technique is also likely to be applicable at Cawthorne.

Comparisons with similar sites may also illustrate the types of archaeological features and deposits that may survive at Cawthorne Park, along with indications of their possible locations. At Myers Wood, medieval bloomery furnaces were discovered in association with particular slag dumps, which suggests that any early furnaces at the Park site may be situated in close proximity to the various slag dumps.

Information about the development of the Cawthorne site may also be recovered through archaeological excavation. At Myers Wood, an excavated ore-roasting hearth was found to have been built over the remains of two earlier bloomery furnaces, while the digging of slag sample pits revealed that the slag dumps had been established over earlier clay working floors. Excavation revealed modifications to the water-management system at Rockley Smithies, which also demonstrated that the site had been redeveloped over time.

Early slag is likely to have been dumped only a short distance from the bloomery furnace and smithing hearth and the recovery of this material may help to locate the positions of any

medieval furnaces and working areas. The excavation of trial pits or sections through the slag dumps would allow the recovery of a range of slag, including potentially early material, that would demonstrate the periods in which the site was worked.

Bloomery and smithing slag were clearly differentiated at Myers Wood. Concentrations of hammerscale and smithing slag were mapped by magnetic susceptibility survey, thereby allowed the separate ironworking areas to be identified. Should this be the case at Cawthorne Park, the identification of concentrations of bloomery and smithing slag may therefore indicate the general locations of the respective iron production and iron refining areas.

This is not certain, however, as the extent of the slag dumps at Cawthorne suggest that bloomery and smithing slag may have been mixed, rather than dumped in discrete areas (MacKenzie 2013, pers. comm.). Excavation at Myers Wood revealed a stone paved area that contained the smithing hearth and a working floor, while similar features and the base for an anvil were found at Rockley Smithies (Plate 18). Similar results may be achievable at Cawthorne.

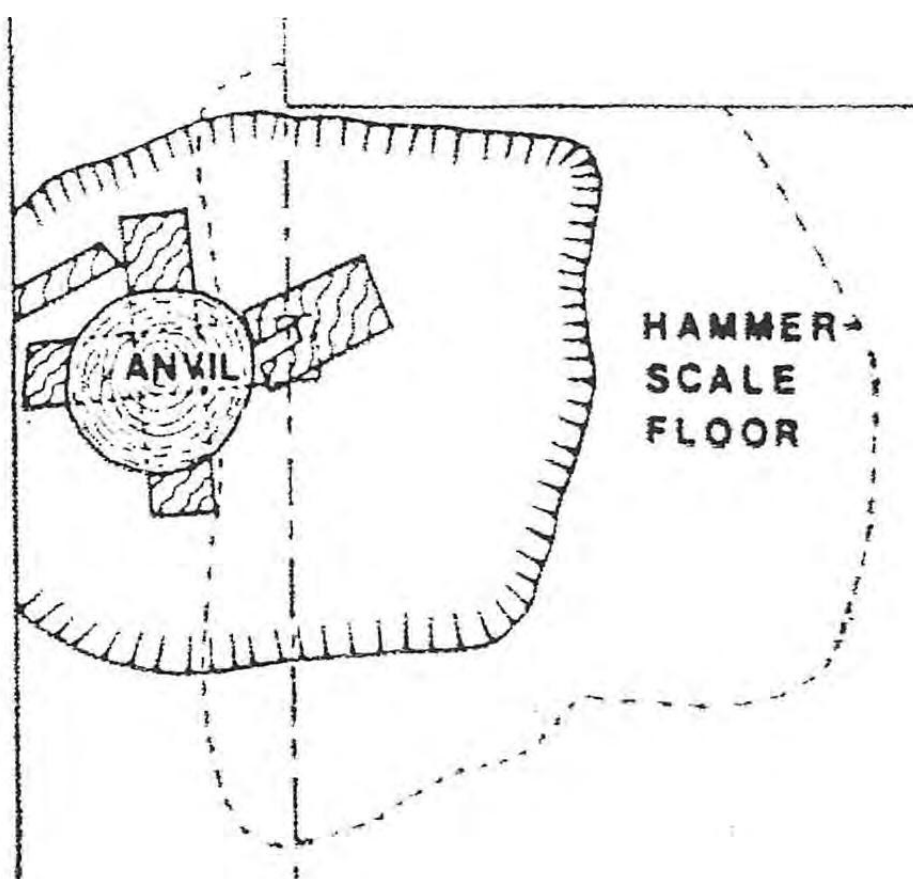


Plate 18: The anvil and a smithing floor excavated at Rockley Smithies

(Reproduced from Crossley 1968, 22)

Archaeological investigations at Myers Wood also highlighted several issues that may be relevant during any future works at the Cawthorne Park site. Although geophysical survey of a slag dump produced anomalies that appeared to be potential furnace sites, these were revealed by excavation to be 'pockets of roasted iron ore resting on burnt surfaces' (Clay *et al* 2004, 18). While over 40 pieces of medieval pottery were recovered from the vicinity of a

damaged furnace base, the ceramic proved to be residual material deposited from further up the slope by natural hill-wash and could not be used to date the furnace itself.

Several sub-surface archaeological features at Myers Wood were found to have been impacted substantially by tree roots, including significant features in the smithing area (Plate 19). Given the heavily-wooded landscape at Cawthorne, similar damage is also likely to have occurred at the Park bloomery.

Future archaeological investigations at the Cawthorne Park wood site have the potential not only to record potential archaeological deposits and features before further damage can occur but any programme of archaeological works could also be designed to mitigate damage that may already have occurred.



Plate 19: Myers Wood bloomery excavation, showing tree root damage
(© HDAS)

At the turn of the century, Myers Wood was barely known through documentary sources and its location was suggested largely by its proximity to natural resources within the wood. Following the site's archaeological excavation, the Myers Wood bloomery was classed as 'an exceptional site' which allows the identification of 'the various stages in the iron-working process' (Clay *et al* 2004, 31). Rockley Smithies was known from documentary sources but the extent of the site and the quality of the surviving archaeological remains was demonstrated only through excavation.

Given the similarities between the Myers Wood and Rockley Smithies sites and Cawthorne Park wood, the site of the Cawthorne bloomery has the potential to produce similar results. The bloomery in Cawthorne Park can be considered to be an important site of Regional significance and potentially a site of National significance, depending on the results of future investigations.

It should be emphasised, however, that the majority of the archaeological evidence from Myers Wood suggested that the site had been worked between the 12th and 14th centuries. While the charcoal platform appeared to be later and may have been constructed in association with a water-powered phase, Myers Wood did not produce any direct, clear evidence that the site had been converted for use with water power.

This contrasts strongly with the Cawthorne Park wood site which appears to have had a full water-management system by 1608. The type of medieval features that survived as sub-surface archaeological deposits at Myers Wood may therefore have been damaged or destroyed when water power was introduced at Cawthorne Park. The 17th-century features at Cawthorne are likely to resemble those that were excavated at Rockley Smithies, which had a contemporary water-management system. This cannot be determined on the basis of the current evidence.

9 CONCLUSION

9.1 Desk based assessment

The results of the desk-based assessment demonstrate that ironworking was being carried out in Cawthorne during the medieval period, with two smiths, one with the surname 'Blomer', being recorded in the area in 1379. While there is no evidence to show that these men were based in Cawthorne Park, the range of resources – including ironstone for iron ore, coppiced wood for charcoal manufacture and access to a water supply – made the wood a prime location for ironworking during this period.

Should the Park wood bloomery have been active prior to the 15th century, it is likely to have possessed features similar to those that were discovered through archaeological excavation at a medieval bloomery in Myers Wood, Kirkburton, Huddersfield. These include bloomery furnaces, a smithing hearth, an ore-roasting hearth and working floors.

Bloomery sites were not static and were redeveloped periodically, with key features being relocated within the complex. Water power was introduced at British bloomeries from the 15th century and the construction of features such as dams, waterwheels, goits or launders is likely to have impacted substantially on the layout of an existing medieval site. Documentary evidence shows that Cawthorne Smithies possessed a full water-management system by 1608, but the extent to which its introduction may have damaged or destroyed any earlier structures cannot be determined on the basis of the current evidence. Any surviving water-management systems at Cawthorne may resemble those that were excavated at the contemporary Rockley Smithies.

There is no direct evidence to show when the Park wood bloomery began operating. While a charcoal sample produced a date of between 1480 and 1540 and the site is likely to have been the 'Calwathine Smithies' that were recorded in 1558, the earliest clear documentary evidence dates from 1608. Recorded as 'Cawthorne Smithies', the site possessed a bloomery and a smithy, each with its own waterwheel, two dams, a 'Smythee House' and a 'Coall House'.

Due to the paucity of archaeological evidence, relatively little can be said about the layout of the site or the form of the structures within it. Tap slag demonstrates that the site contained at least one tapping furnace. The number of furnaces, their positions and those of the various

water-management features, along with the locations of the respective bloomery and smithing areas, cannot be determined on the basis of the current evidence.

The last known lease on Cawthorne Smithies was taken out in 1630 and expired in 1680. The bloomery appears to have become disused during this period and may have been disused by 1657, when the Park's coppiced wood was sold to an ironworking partnership with interests at Barnby. A right of way ran past the bloomery in 1657 but was used to remove wood from the Park at that date.

While the cause of the Smithies' closure is unclear, the establishment of a blast furnace at Barnby between 1635 and 1648 may have rendered local bloomeries economically unviable. Over 1780 trees from the Park were sold to a Sheffield partnership in 1681, along with the right to manufacture and remove charcoal from the wood. This suggests that the bloomery did not require a charcoal supply by that date and so is likely to have closed.

Cawthorne Park is depicted on historic maps and plans from c.1660. None of the known surviving cartographic sources marks the location of the bloomery or any of its associated features, such as the dams. Several historic maps show a track that entered the wood at High Hoyland, ran to the west of the likely bloomery site and on to Cinder Hill at the south-east. While it cannot be demonstrated directly, this may be the right of way that was recorded in 1657.

9.2 Walkover Survey and Measured Survey

The walkover and measured surveys within Cawthorne Park woods revealed a predominantly industrial landscape, with the likely bloomery site, several substantial slag dumps and areas that have been mined extensively through the use of bell pits. The measured survey produced varied results due to the vegetation and tree cover concealing subtle earthwork features, breaking sight lines and making it impossible to get an accurate and consistent GPS signal in. The measured survey therefore only achieved accurate results when surveying bell pits.

Archaeological investigations undertaken on the site of the medieval bloomery at Myers Wood may provide a model for potential future work at Cawthorne Park wood. Geophysical survey conducted using a fluxgate gradiometer revealed anomalies that could be targeted directly through archaeological evaluation trenching. This revealed ironworking features such as bloomery furnaces, ore-roasting hearths and smithing hearths. A magnetic susceptibility survey identified separate bloomery and smithing areas through concentrations of slag produced by the respective ironworking processes. Dating evidence was retrieved from a variety of sources, ceramics, the radiocarbon testing of charcoal samples and the archaeomagnetic testing of vitrified clay furnace lining. Similar techniques are likely to produce similar results at Cawthorne Park wood.

No known redevelopment has taken place at the likely site of the Cawthorne Park bloomery since its closure, probably in the second half of the 17th century. This suggests that any sub-surface archaeological deposits may be preserved in good condition. Given the site's location within a heavily-wooded landscape, however, archaeological features are likely to have been impacted by tree root action. This is demonstrated by evidence from Myers Wood, where key features had been damaged by tree roots. In addition to identifying archaeological deposits, future evaluation and excavation at Cawthorne Park would enable any surviving features to be

recorded before further damage can occur while mitigating any damage that has occurred to date.

Prior to archaeological excavation, very little was known about the Myers Wood bloomery. Documentary sources shed little light on the site's history and its location was suggested largely by its proximity to natural resources within the wood. This is similar to our current understanding of the Cawthorne Park bloomery. Following archaeological investigations, Myers Wood has been classed as an 'exceptional' bloomery and smithing site, currently the most complete in the north of England (Clay *et al* 2004, 31). The Cawthorne Park wood site has the potential to produce results of a similar Regional significance.

9.3 Assessment of significance

The criteria used to assess the significance of each feature are modified from the categories used by Keen and Carreck (1987). An assessment of the national, regional and local significance of the features has also been included. The significance rating of each feature is listed in the gazetteer of features (Appendix 3). Specific details relating to the significance criteria used for this assessment are provided in Table 1, which also provides a summary of the features included in each category. It should be noted that the significance assessment reflects the current state of knowledge of the archaeological resource but that there is always the potential for new archaeological discoveries to be made that may alter the perceived significance of these features.

Table 1: Summary of significance assessment

Significance Level	Significance statement
Level 1 Archaeological and historical features of special (i.e. national/regional) importance.	No features have been confirmed associated with this category.
Level 2 Archaeological and historical features of lesser (i.e. local) importance.	The bloomery site is considered to be of local significance at present given the unknown state of preservation of the archaeological remains. The bloomery site has the potential to be of level 1 significance if further investigation demonstrates that it is well preserved. The industrial landscape within Cawthorne Woods as a whole falls within this category and would be of level 1 significance if the bloomery site is relatively well preserved.
Level 2b Level II monuments that appear to have been badly damaged This includes features associated with post-medieval (and possibly medieval) ironstone mining and slag/cinder dumps associated with ironworking. It also includes the remains of a building constructed from handmade bricks.	Individually bell pits and cinder/slag heaps within Cawthorne Woods fall in to this category.
Level 3 Former archaeological and historical features of importance for which there is confidence that no coherent archaeological remains (including buried features) are recoverable.	No features have been identified associated with this category.

The industrial landscape associated with iron smelting at Cawthorne Woods demonstrates generally good preservation and coherence. The remains include evidence for extraction through to smelting with the remains of associated infrastructure in the form of water management and track ways being present. The remains at the site also have considerable associated documentary evidence. The site as a whole is clearly locally significant. If preservation of the bloomery site is demonstrated to be good, the industrial landscape within Cawthorne Woods would be of regional significance.

9.4 Potential threats to the site and management options

The management of the site is hindered by the lack of a comprehensive survey. Not having accurate plans of archaeologically sensitive areas will pose a problem with identification and direct management of those areas. Understanding and protecting the site as a whole is not necessarily hindered by the lack of accurate mapping. However archaeological features may still be unintentionally damaged without notice or record because of a lack in knowledge of their existence. Monitoring the extent of any damage becomes problematic without clearly defined reference points.

The current logging activity will have an effect on the preservation of the archaeology. A tree plantation on any earthwork causes root damage to the structure of the earthwork. The continuous harvesting and replanting of trees might hasten this damage, albeit over several decades. Other threats are from the maintenance of the infrastructure for the logging activity. Again without clear and concise mapping archaeology may suffer unintentional damage through the clearing of areas, resurfacing of compounds and track ways. It is clear that the significance of the site can be assessed and that certain visible features can be monitored and managed within a frame work that considers the heritage context. The exact boundaries of archaeologically sensitive areas cannot be defined using the information currently available. However a management strategy that considers specific areas to have potential archaeology could be implemented. Avoiding invasive works within a certain distance from the water course and where archaeological features have been noted might be one option to consider.

In managing and conserving the site it is acknowledge that community involvement can play a significant role. This is also true for community projects that will further understanding of the site and hence its significance. It is crucial in conserving the site that community projects do not introduce modern elements, intrusions or activity that would detract from the significance or potential to understand the site until its features and potential are more fully understood.

9.5 Recommendations for recording

Alternative methods of recording this landscape have been considered. The use of airborne Lidar to penetrate tree canopies and reveal earthwork features within woodlands is a well proven and documented method of revealing historic earthworks. A notable example of this is the Welshbury Hill fort case study in the English Heritage guide 3D Laser Scanning for Heritage 2007. The use of airborne Lidar data to enhance the Cawthorne wood survey was investigated, but unfortunately the Environment agency data stops short of the site area. Lidar data is still an option to gaining an understanding of the spatial relationship of the earthworks within the woodland, but doing so would require the expense of a special commissioned flight.

Terrestrial laser scanning might also be able to provide a useful data set. If a suitable instrument (Leica C10 or equivalent) was traversed through the woodland the scans would

capture elements of the ground surface; this data could then be processed to reveal the underlying topography of the woodland and help accurately plot the earthworks.

The key methodology in any future survey is the creation of control stations within the woodland to accurately locate surveyed areas and features. A control network could be set up during the winter, when ground cover is lowest. Using a combination of GPS and Total station survey a network of accurate OS referenced stations could be set out within the woodland. Any future archaeological intervention or study will need to be accurately located on the OS grid, and a control network would facilitate this.

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1597 Bond between George Hewett and Matthew Wentworth allowing him to cut down and take away the fall of Spring Woods called Margerie Park and to cart away the charcoal (YAS DD70 (BEA)/C2/B4/63)

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1608 Lease for 11 years from Thomas Waterton of Waterton Hall to Thomas Barneby of all the Smythe House called Cawthorne Smythies, watercourses, tools, etc and closes called Great meadow, Thistle Close, Smithie Leyes, Windye bank and two waters greater and lesser in Cawthorne (YAS DD70/55)

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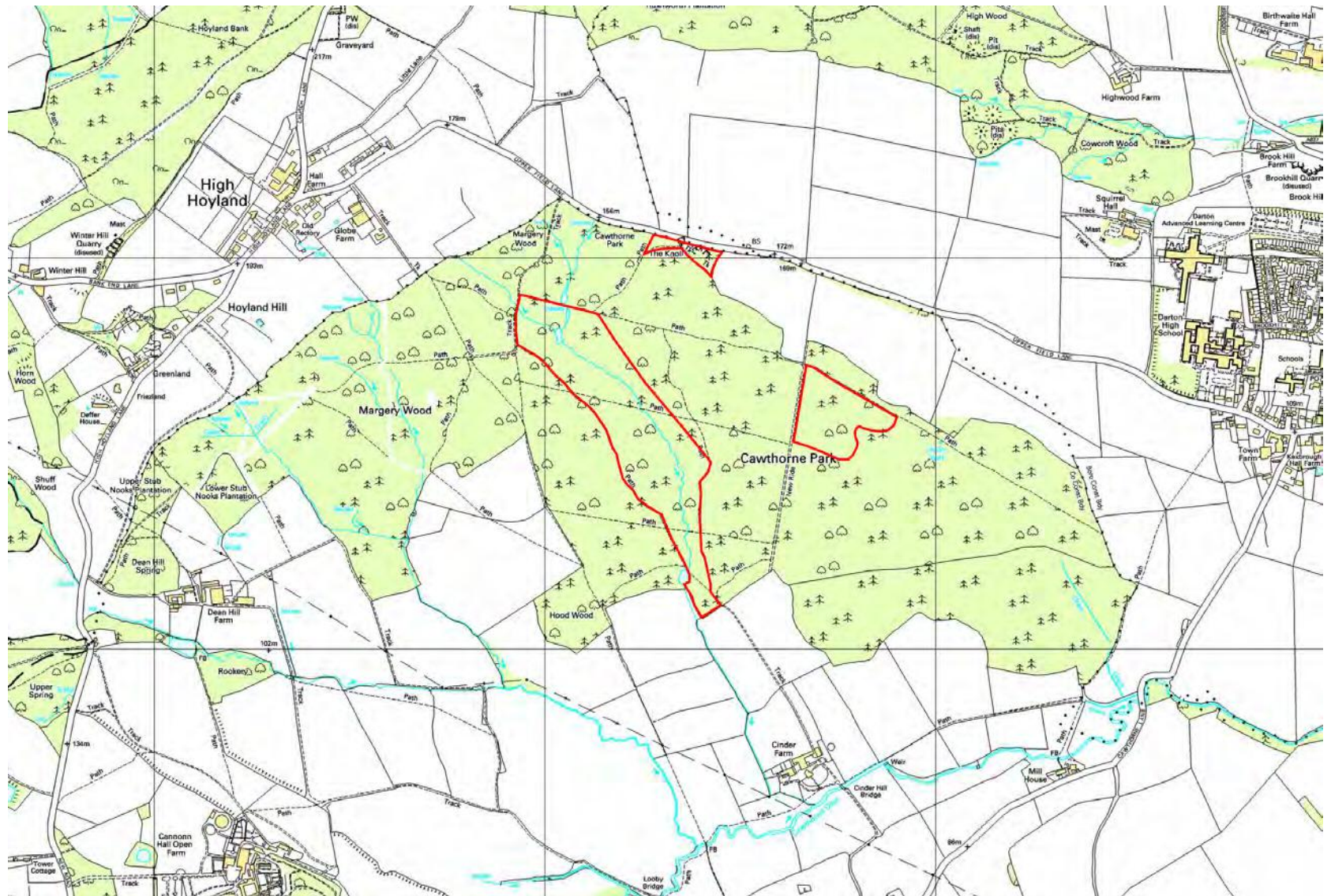
1851 Cawthorne tithe map

1851 Cawthorne tithe apportionment

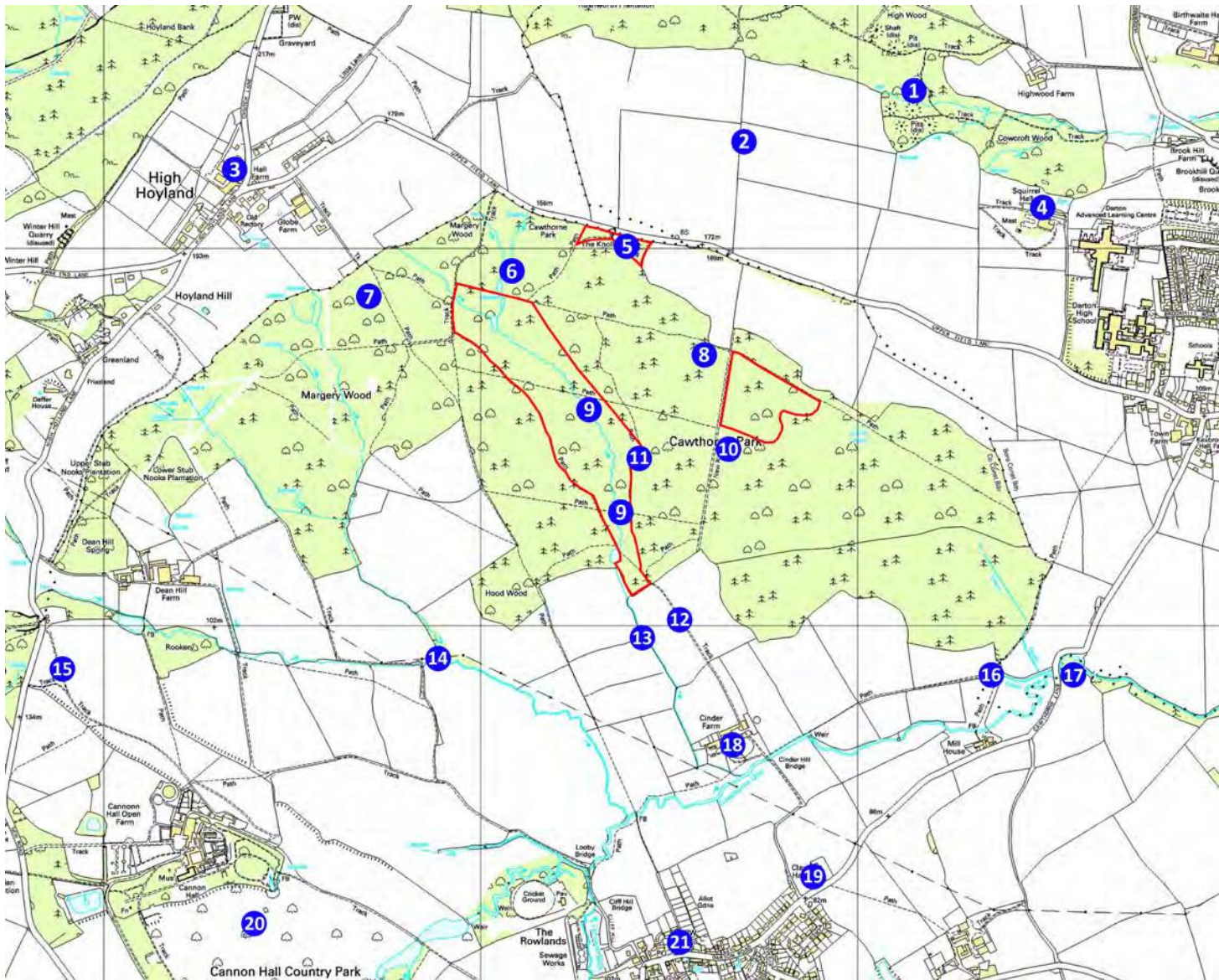
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12 FIGURES

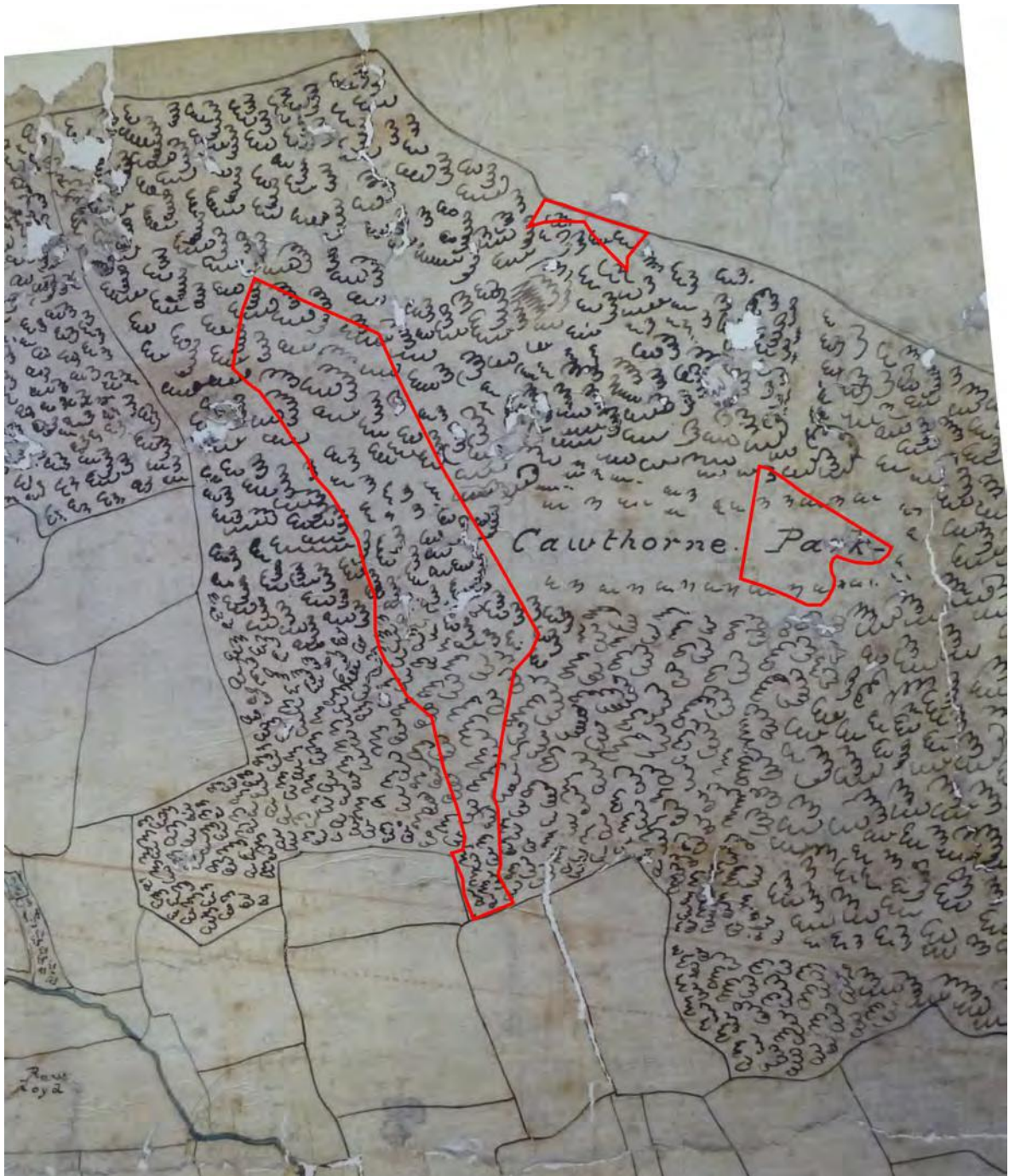


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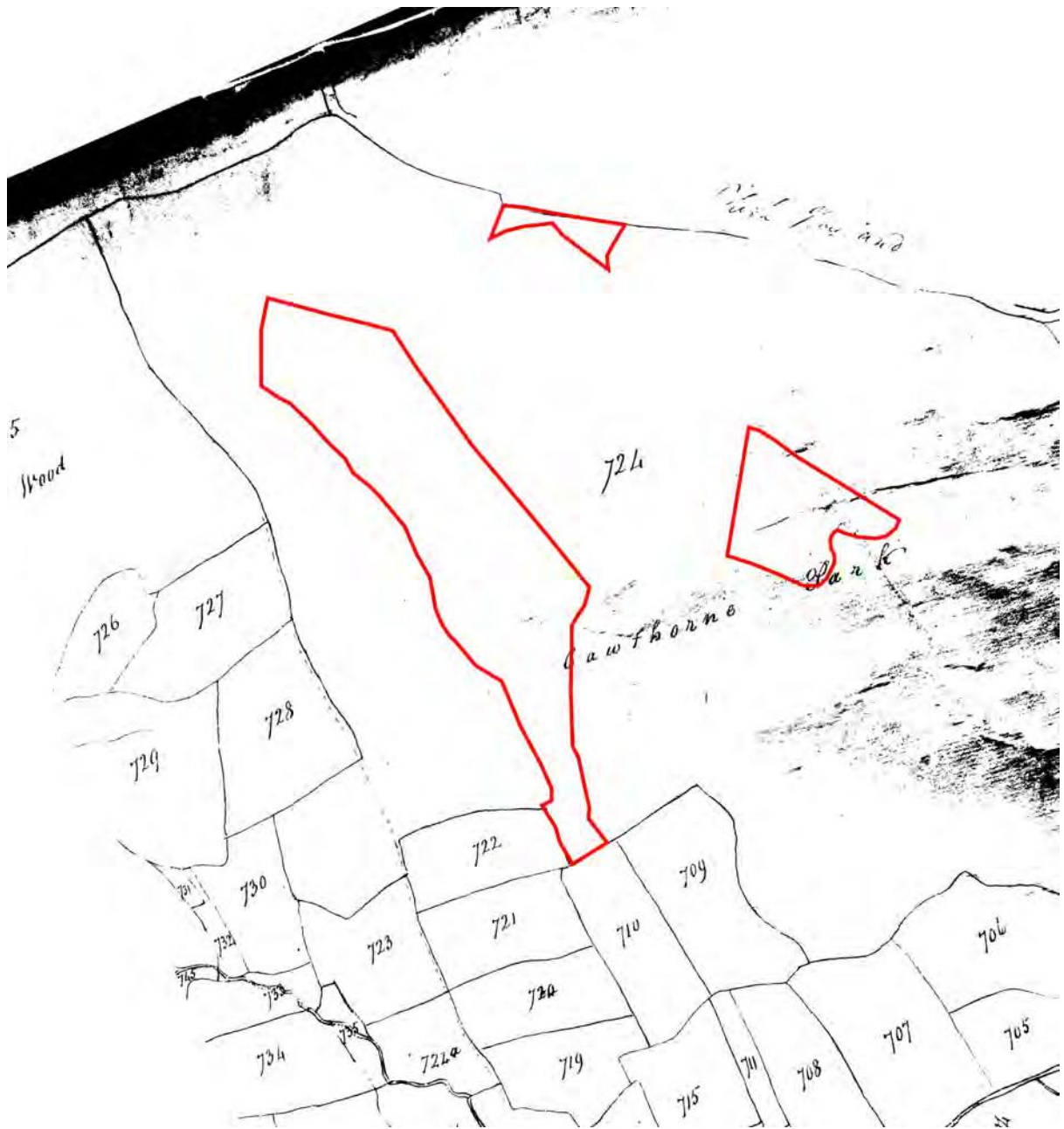


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Figure 2: Known cultural heritage sites



site boundaries are approximate

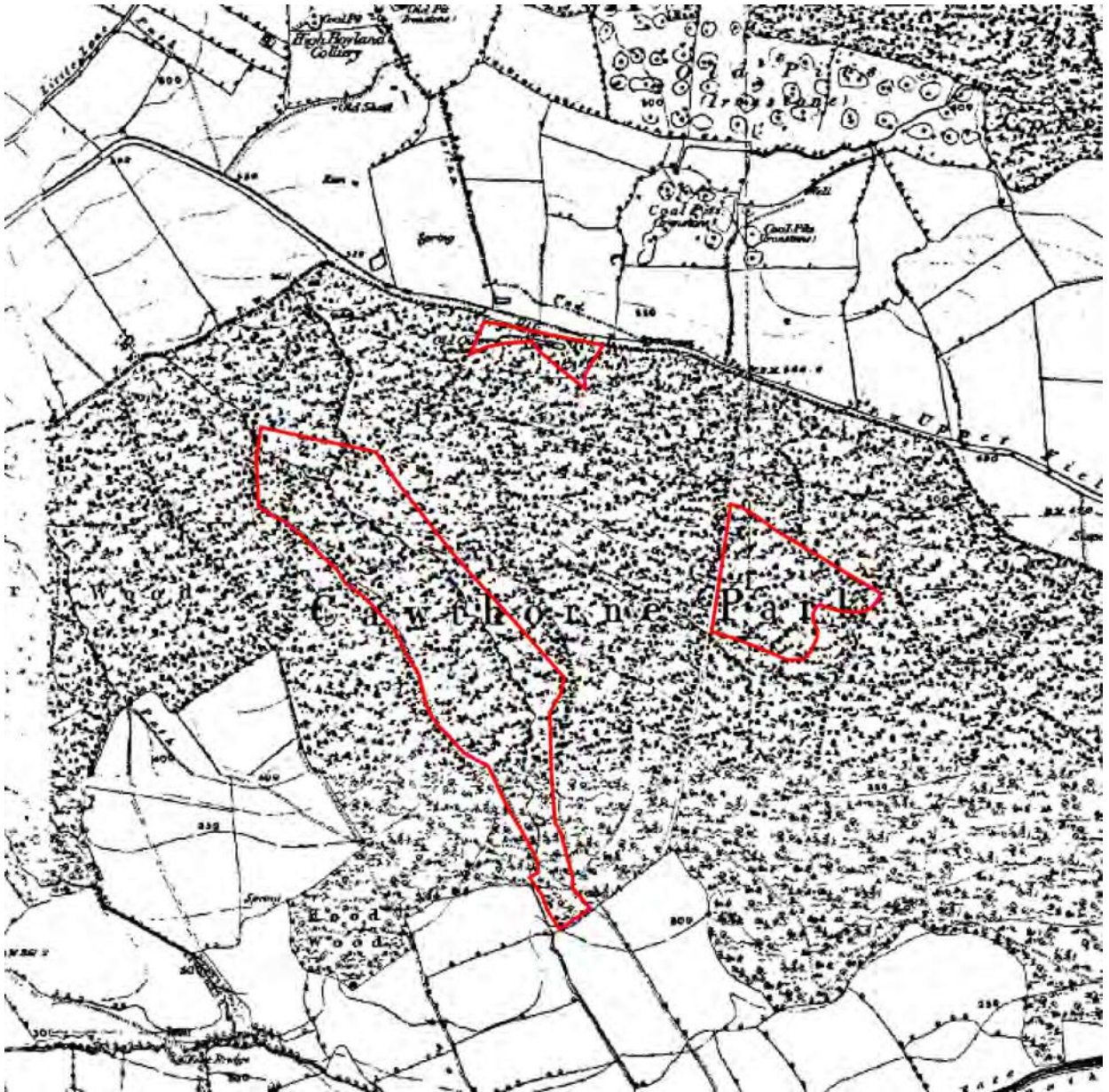


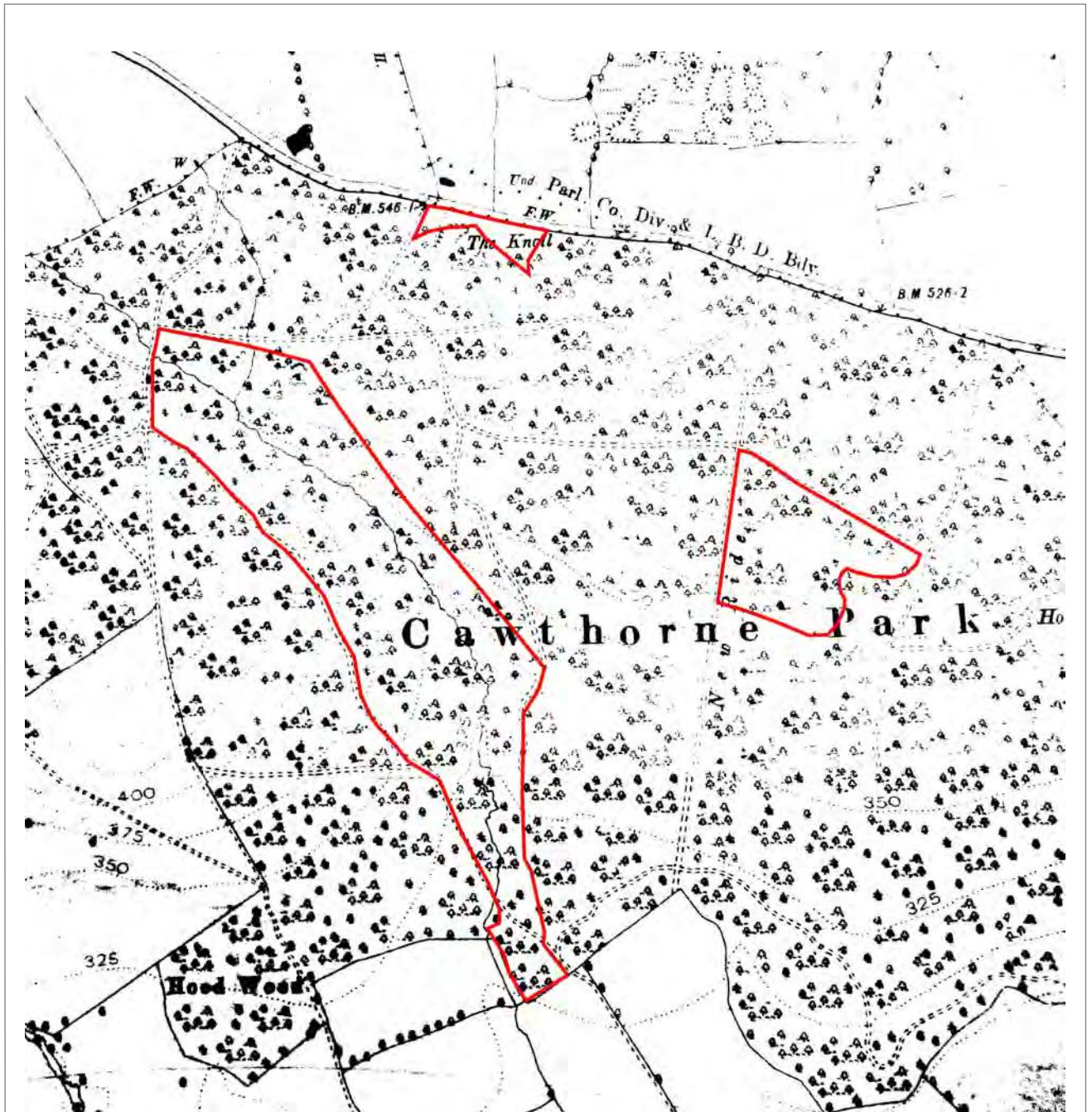
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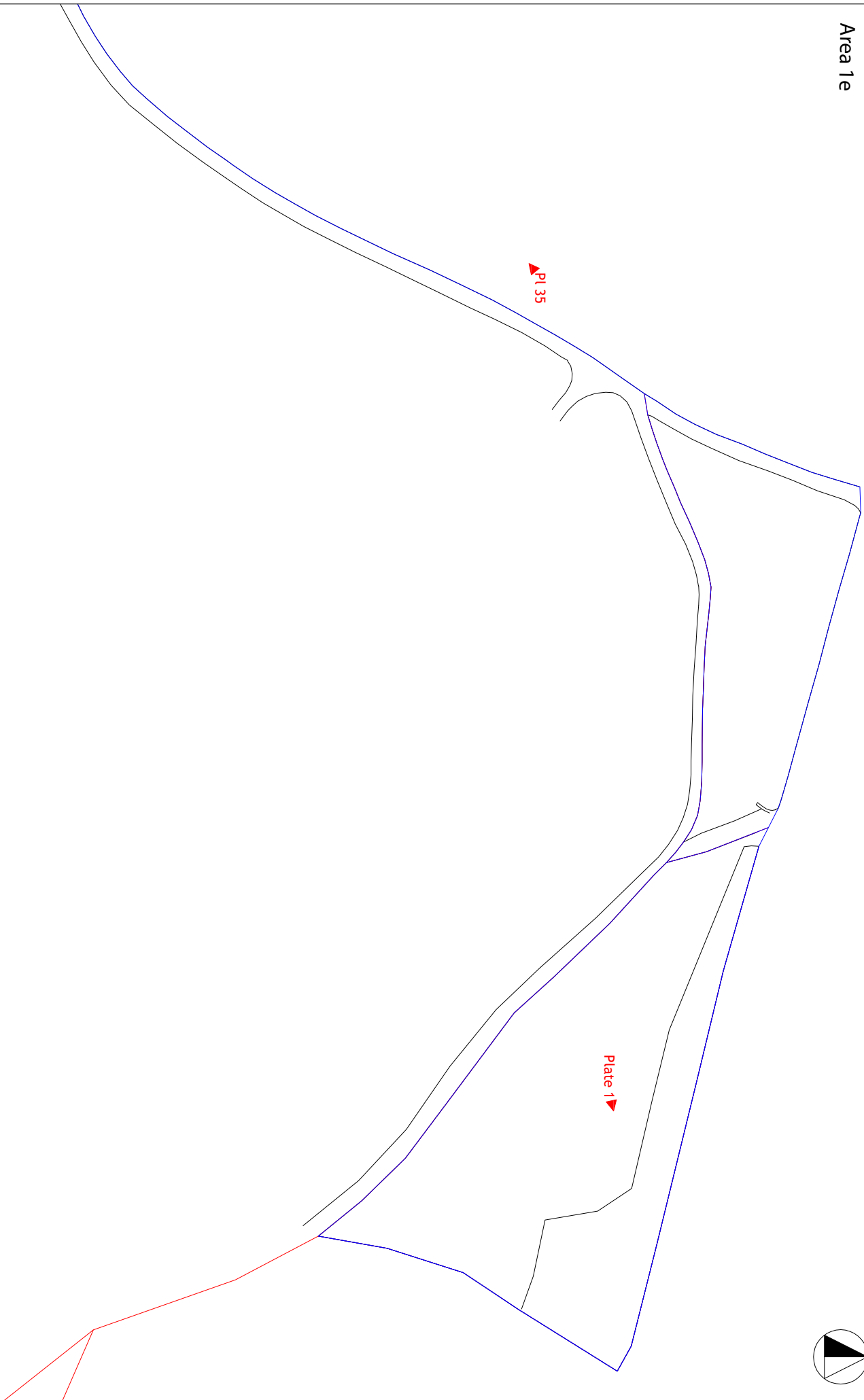
Figure 5: 1851 map of the manor of Cawthorne





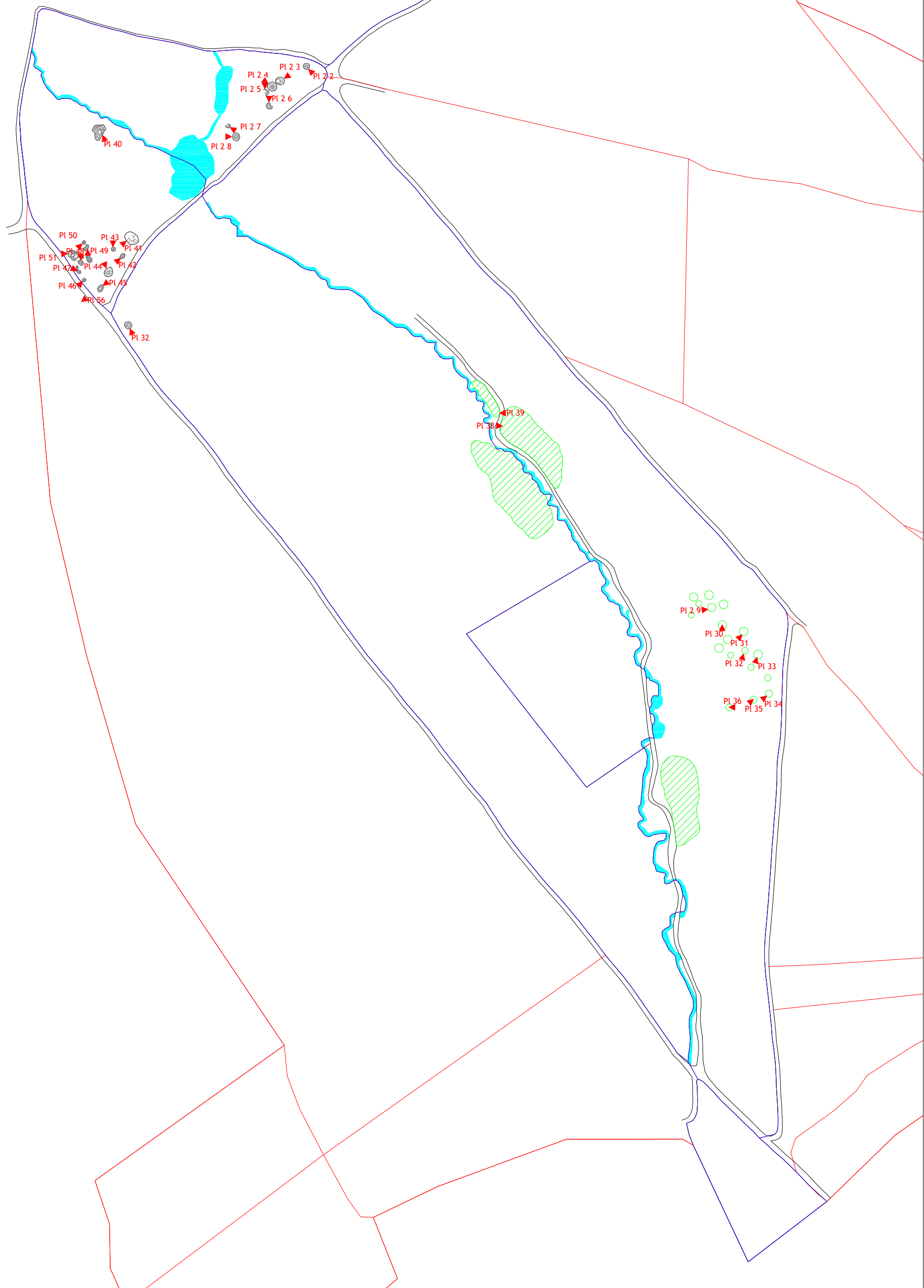
site boundaries are approximate

Area 1e

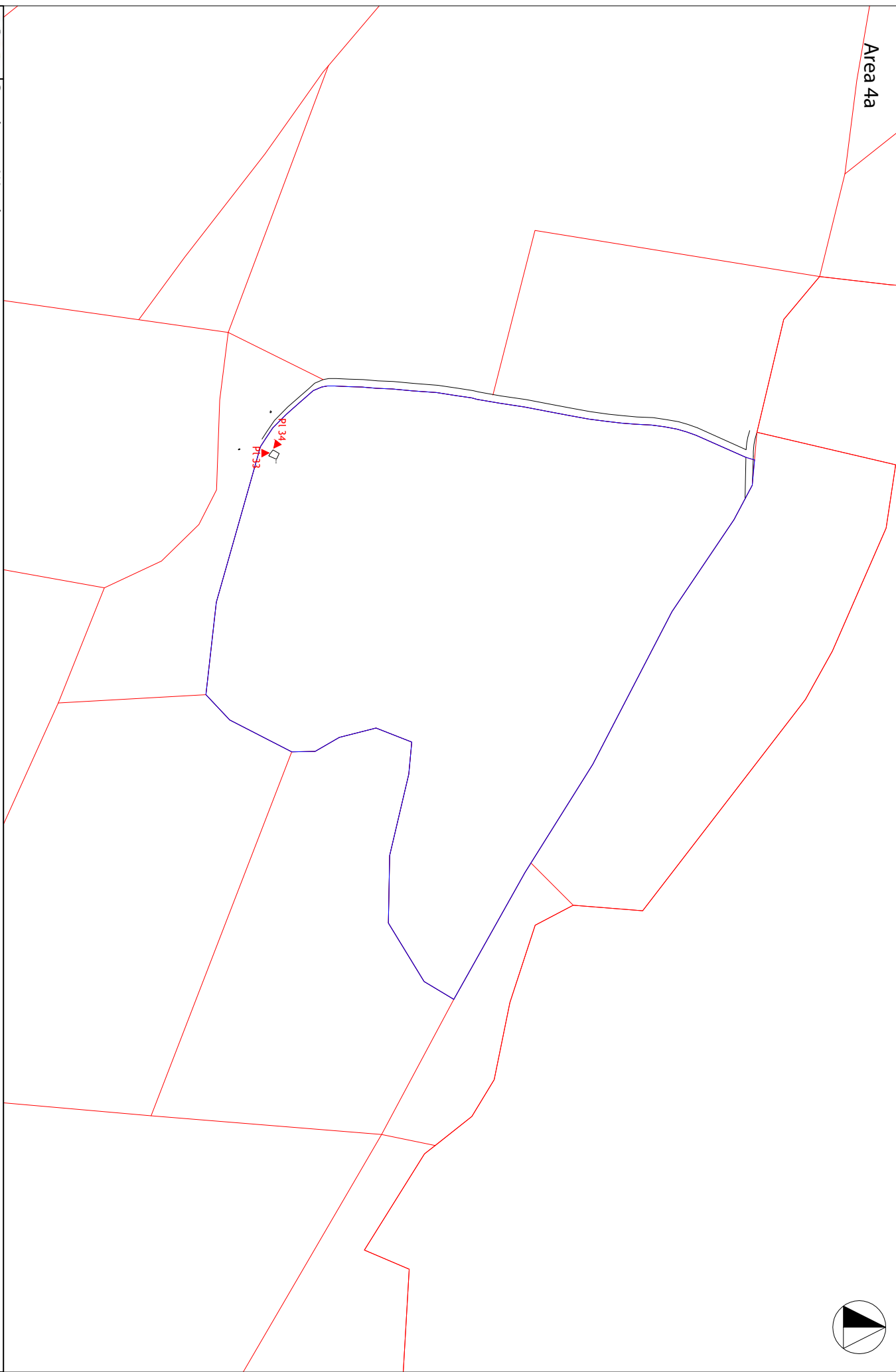


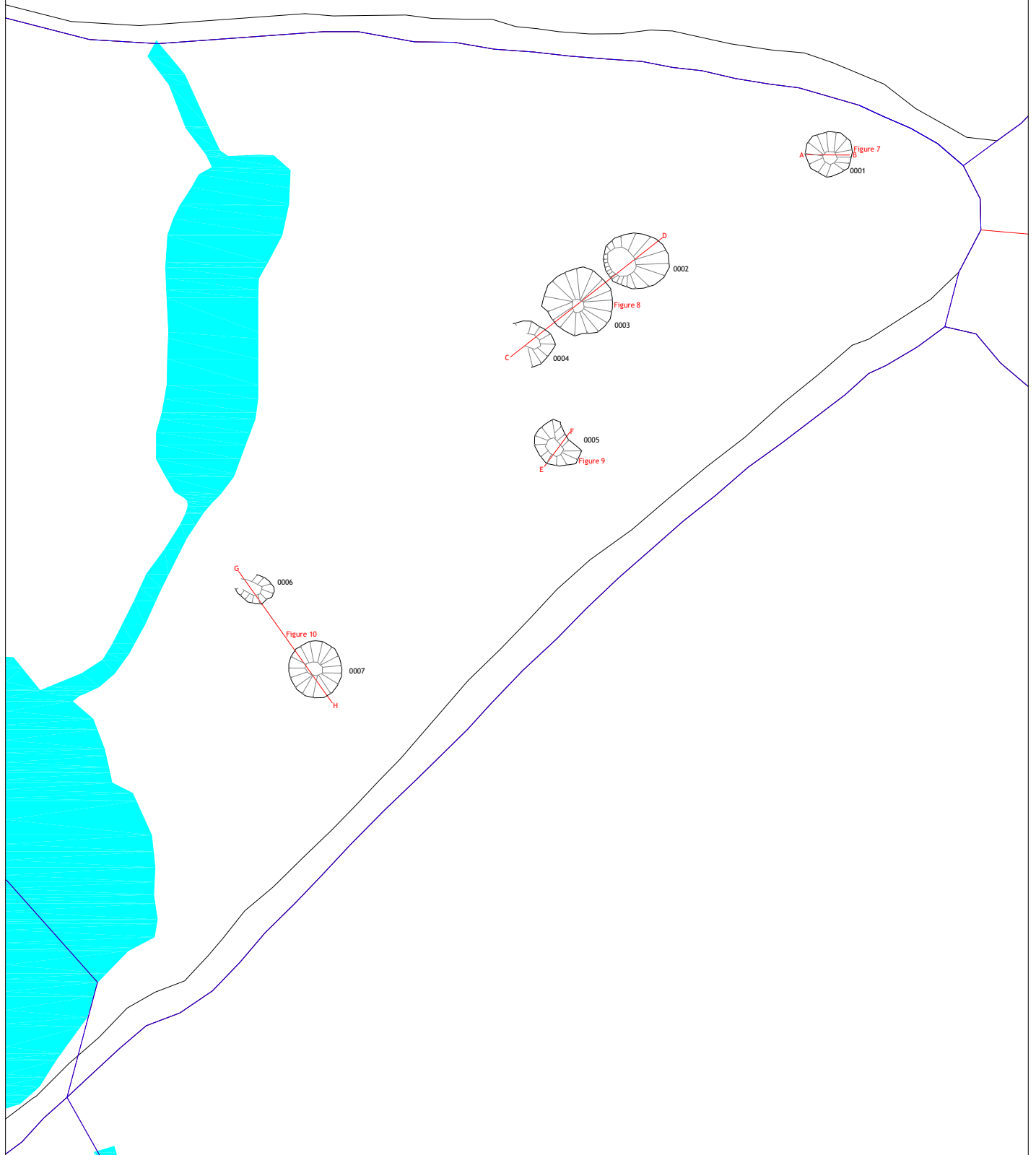
Cawthorpe Woods
Figure 8 Plan of Areas 1e, 1f and 1h showing location of plates
Scale at A4 1:1000

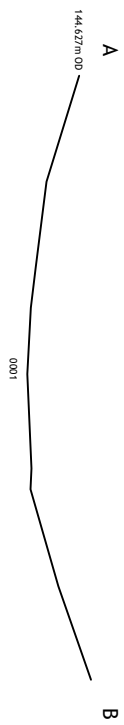




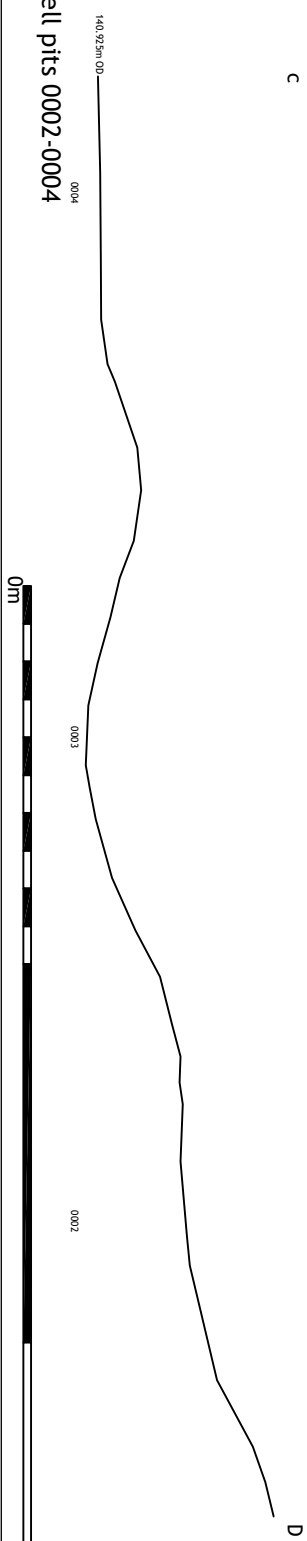
Area 4a



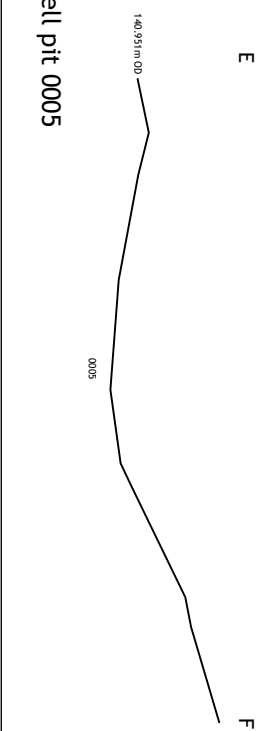




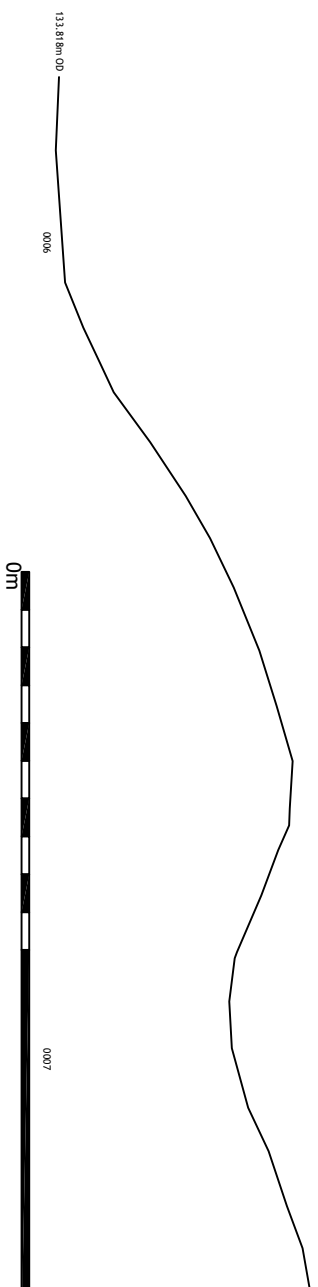
Cawthorne Woods
 Figure 12 Profile of bell pit 0001
 Scale at A4 1:50



Cawthorne Woods
 Figure 13 Profile of bell pits 0002-0004
 Scale at A4 1:100



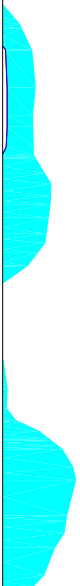
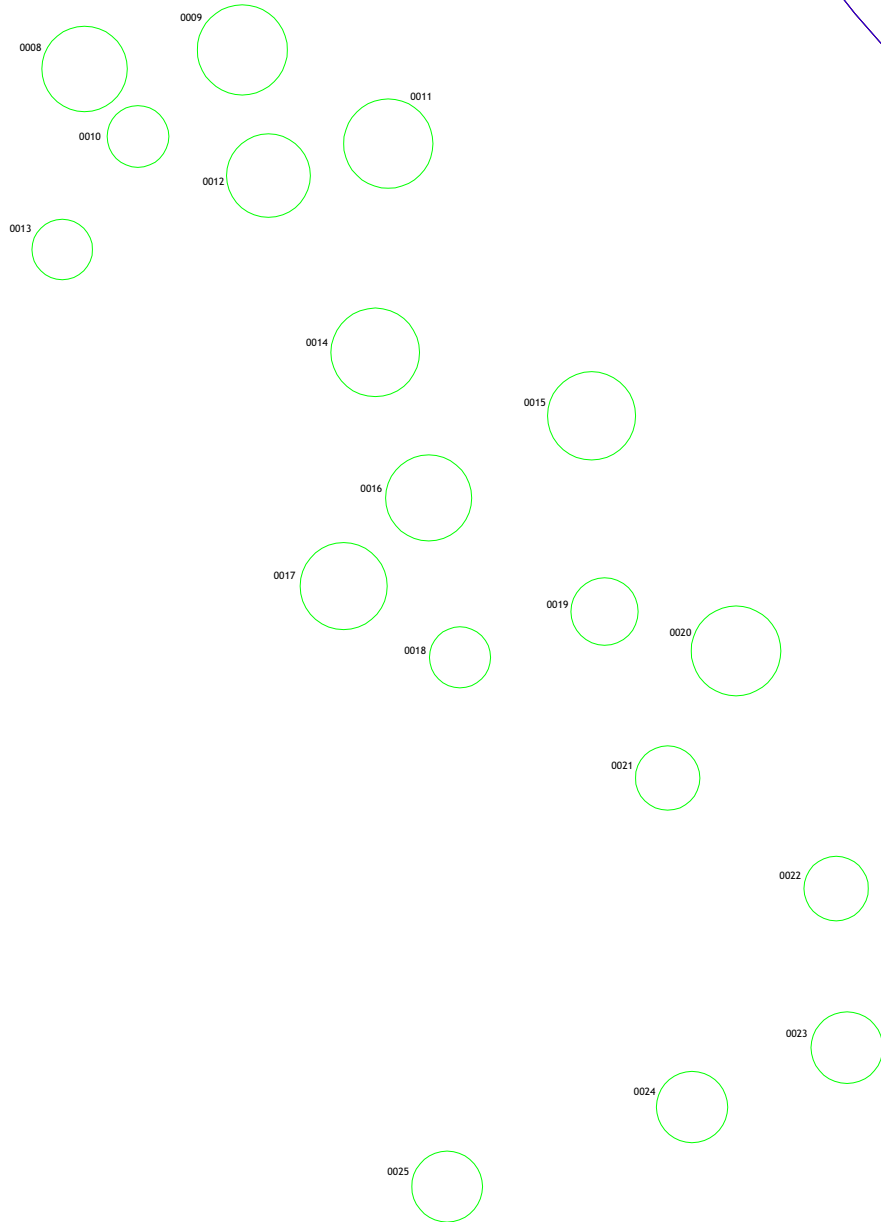
Cawthorne Woods
 Figure 14 Profile of bell pit 0005
 Scale at A4 1:100



Cawthorne Woods
 Figure 15 Profile of bell pits 0006-0007
 Scale at A4 1:100



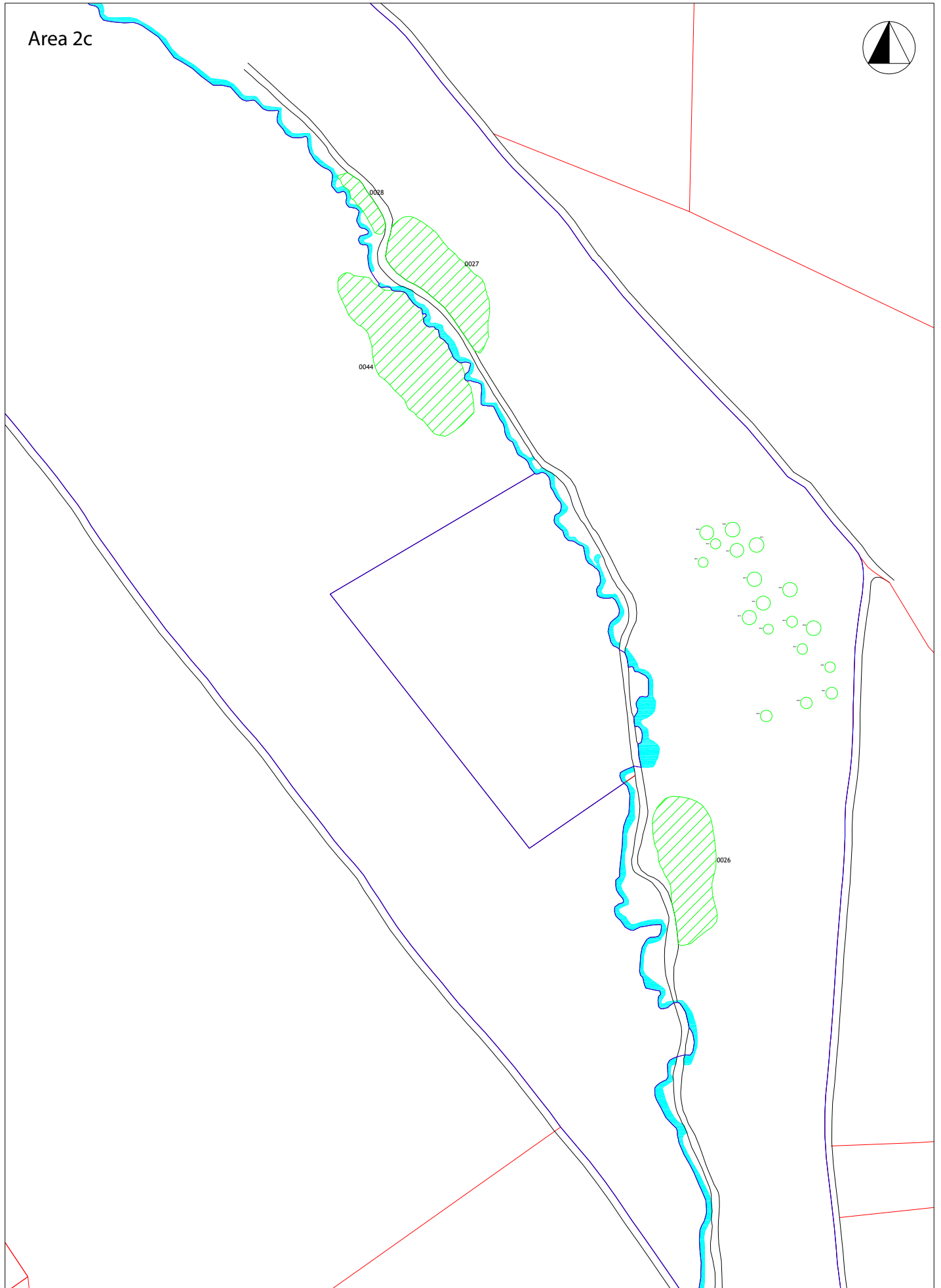
Area 2c



Cawthorne Woods
Figure 16 Plan of bell pits within Area 2c
Scale at A4 1:500



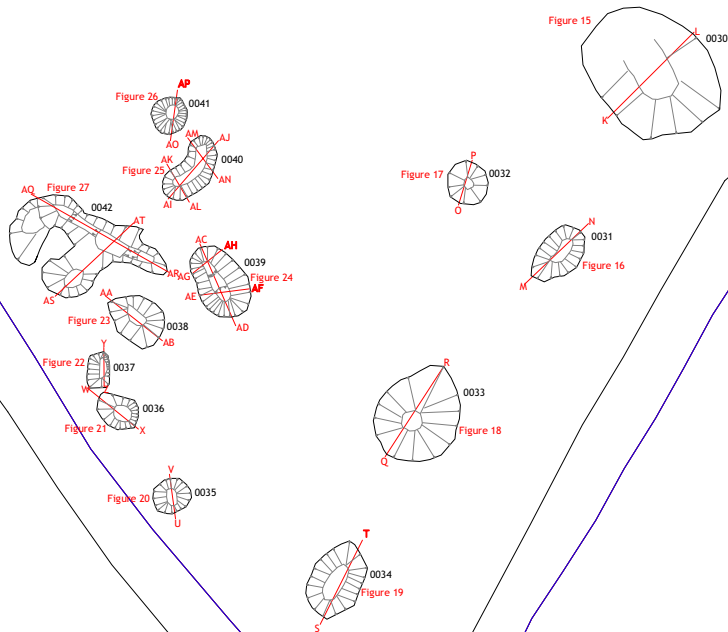
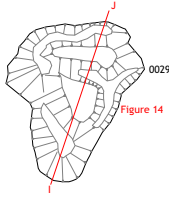
Area 2c

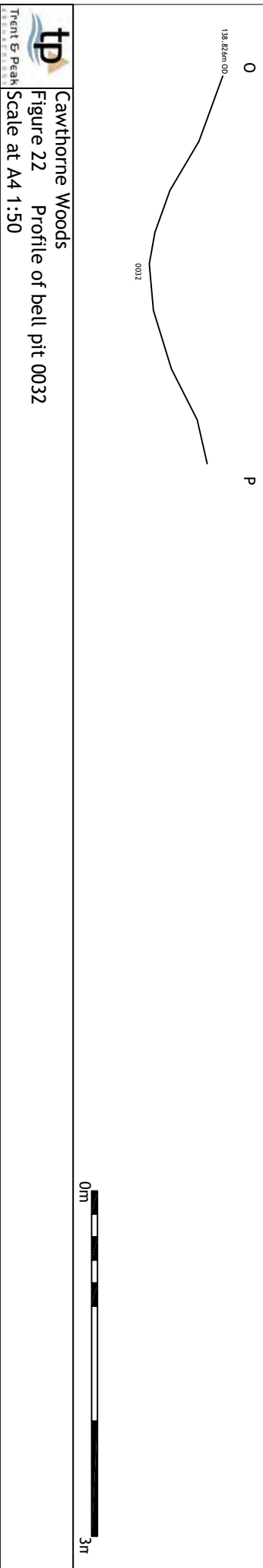
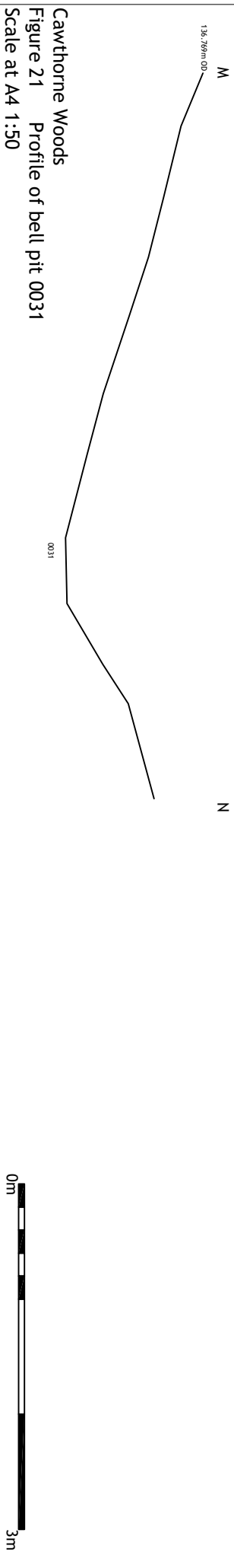
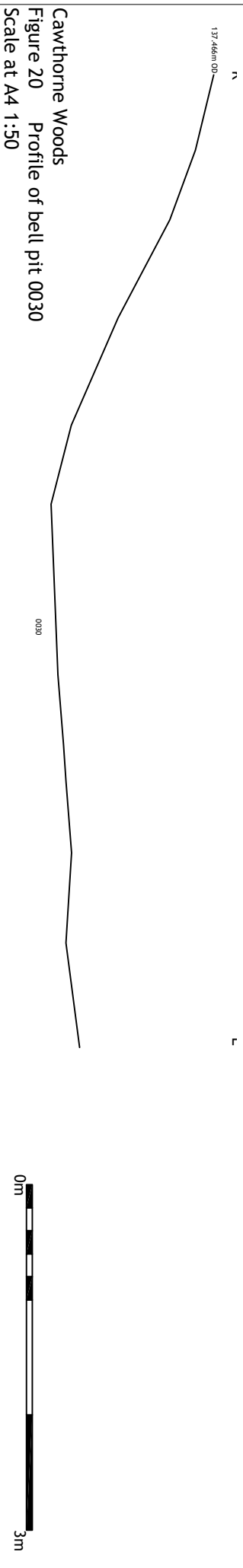
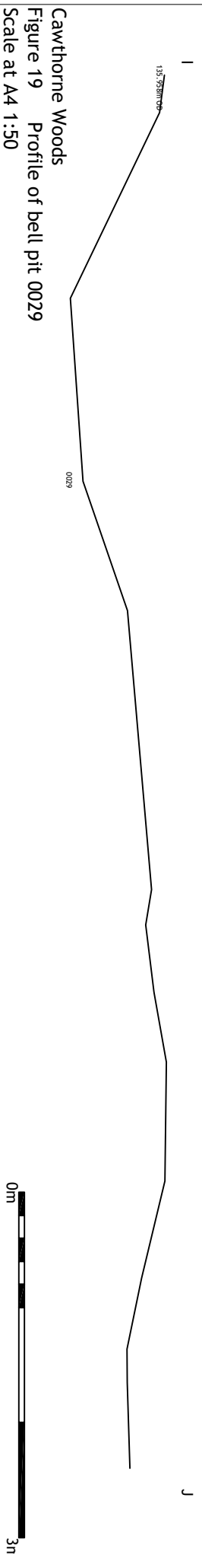


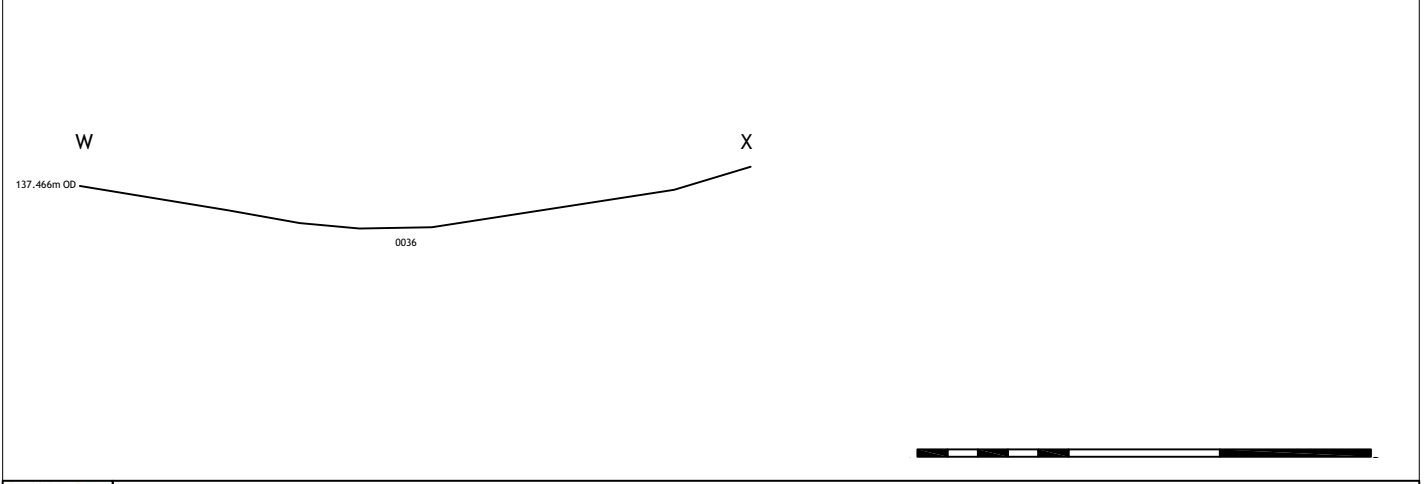
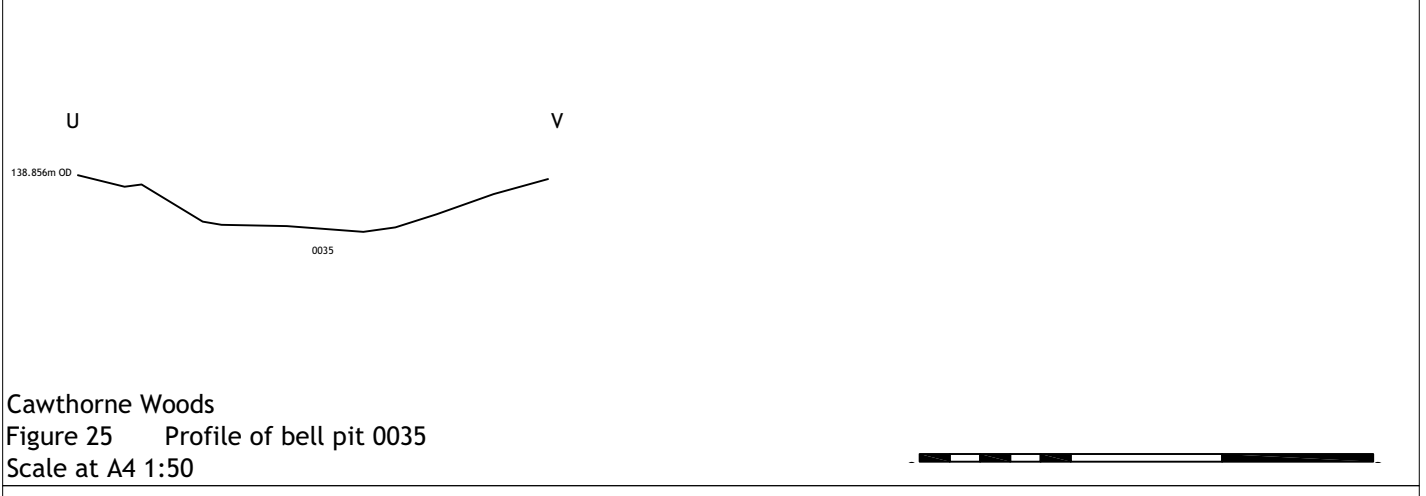
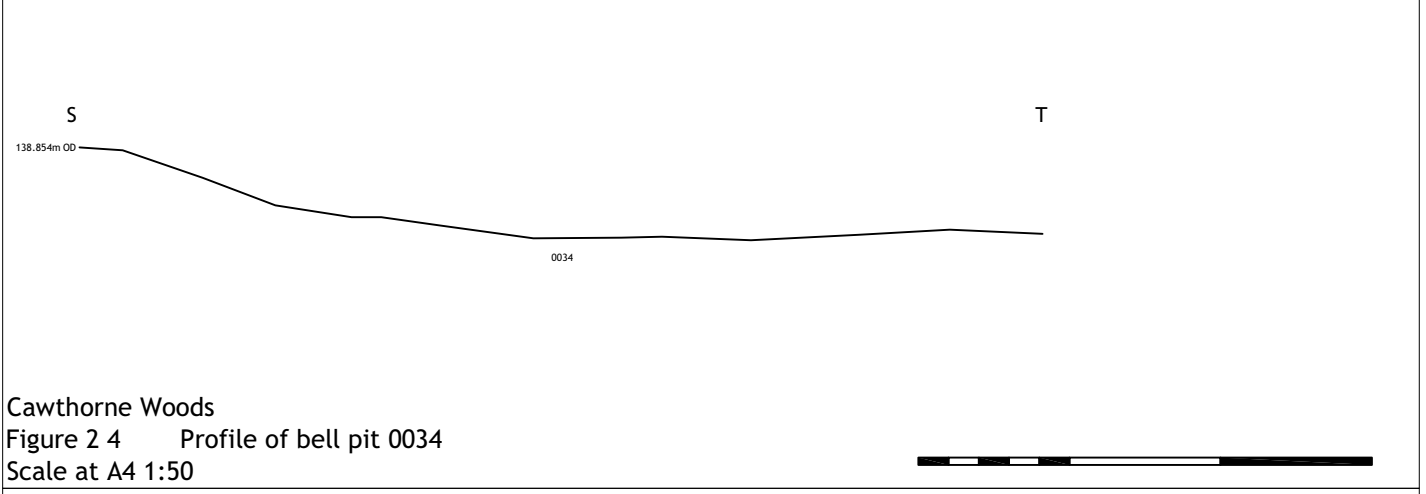
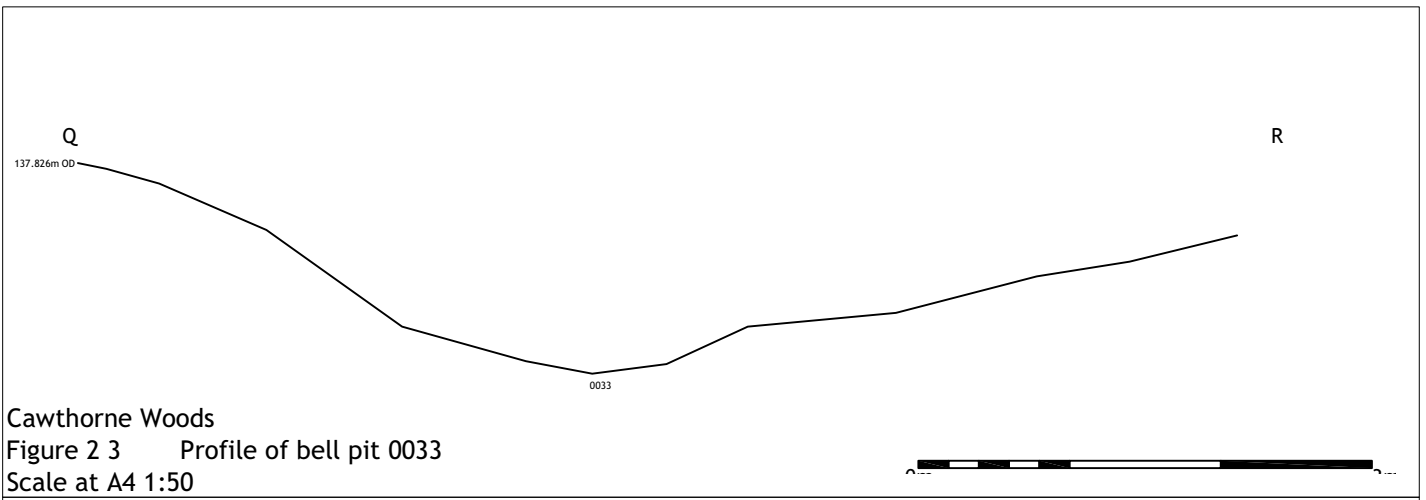
Cawthorne Woods
Figure 17 Plan of slag/cinder spreads within Area 2c
Scale at A4 1:2000

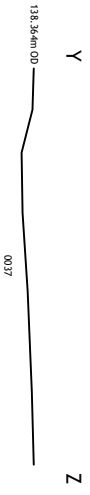


Area 3a





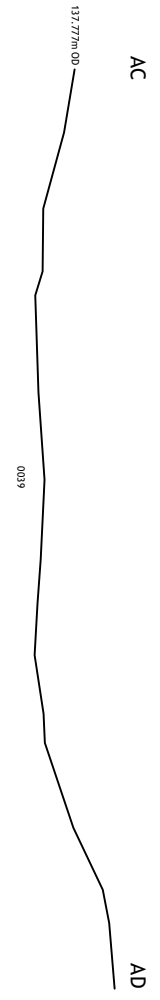
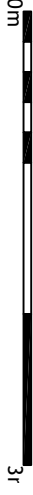




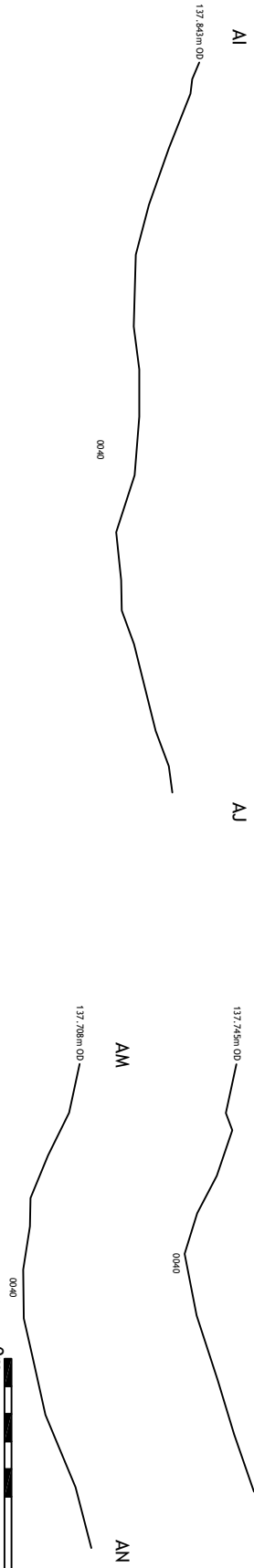
Cawthorne Woods
Figure 27 Profile of bell pit 0037
 Scale at A4 1:50



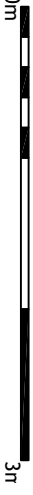
Cawthorne Woods
Figure 28 Profile of bell pit 0038
 Scale at A4 1:50

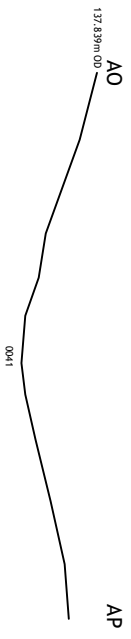


Cawthorne Woods
Figure 29 Profiles of bell pit 0039
 Scale at A4 1:50

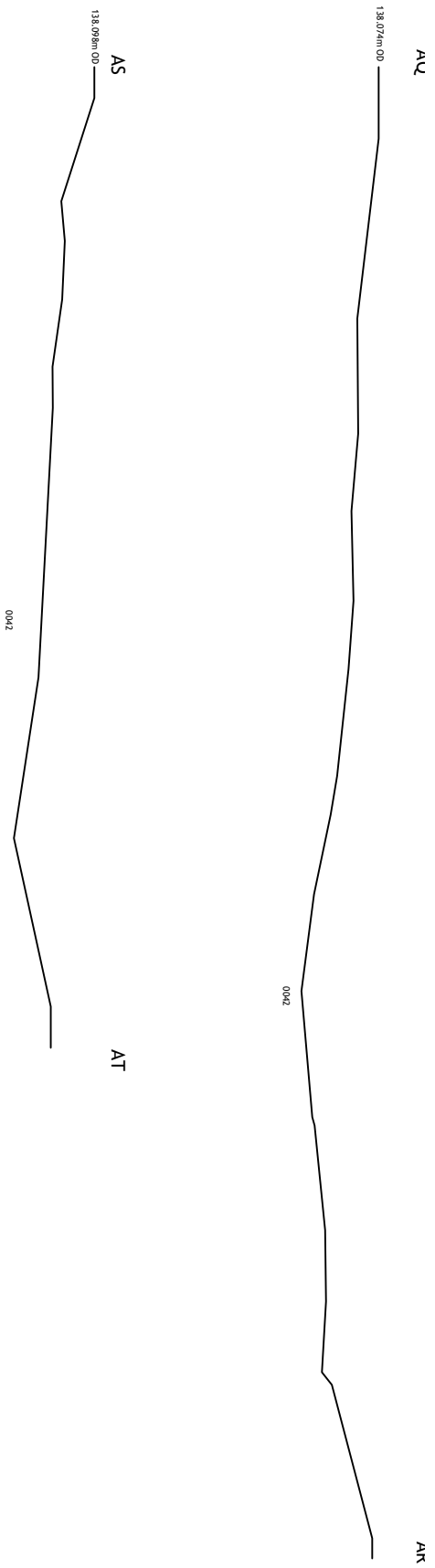


Cawthorne Woods
Figure 30 Profiles of bell pit 0040
 Scale at A4 1:50

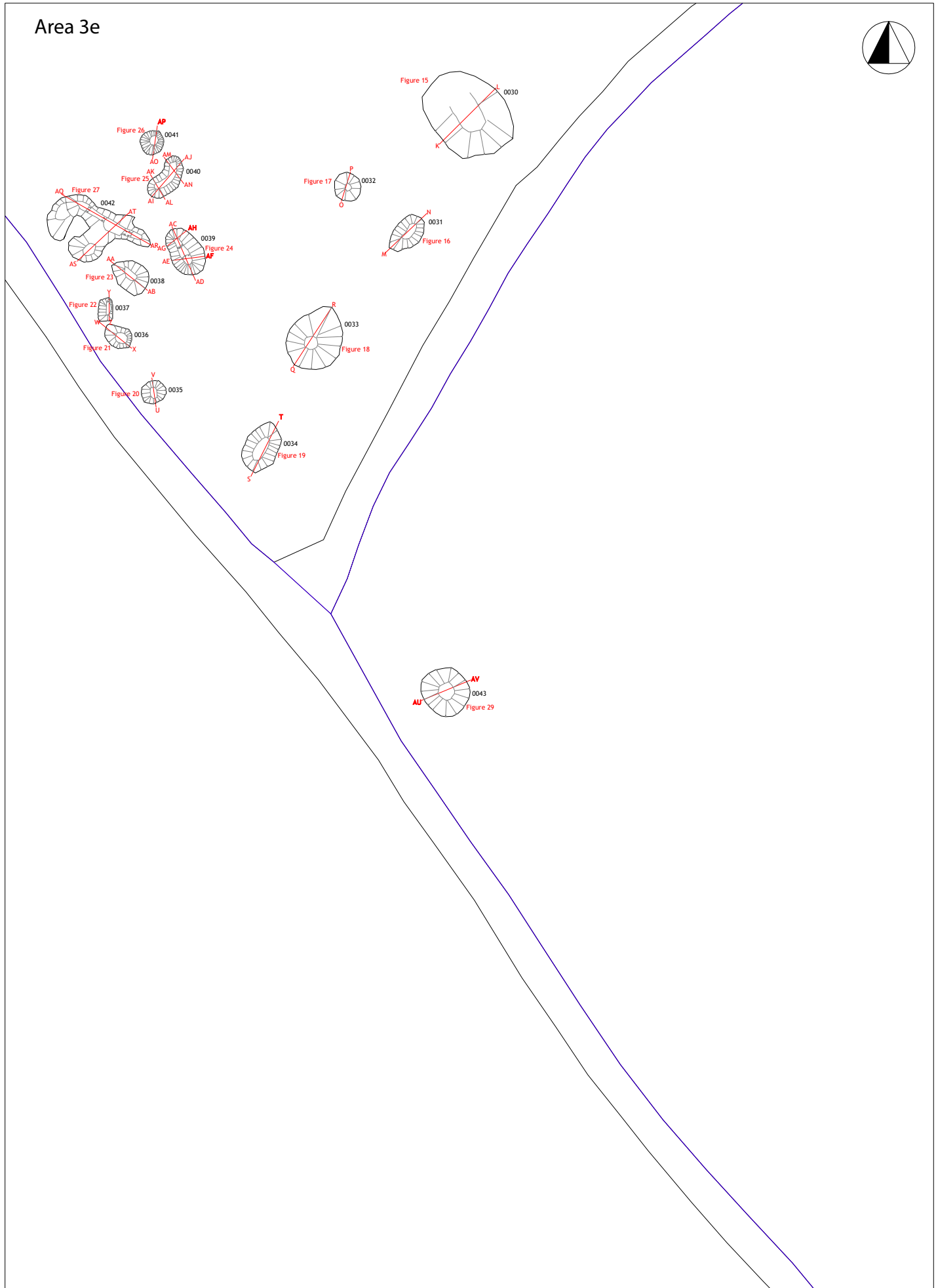


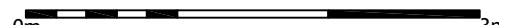
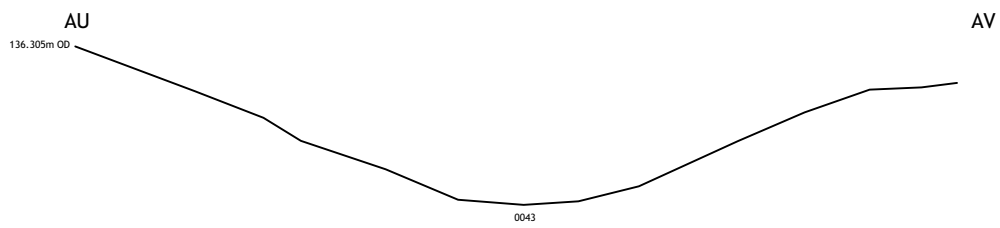


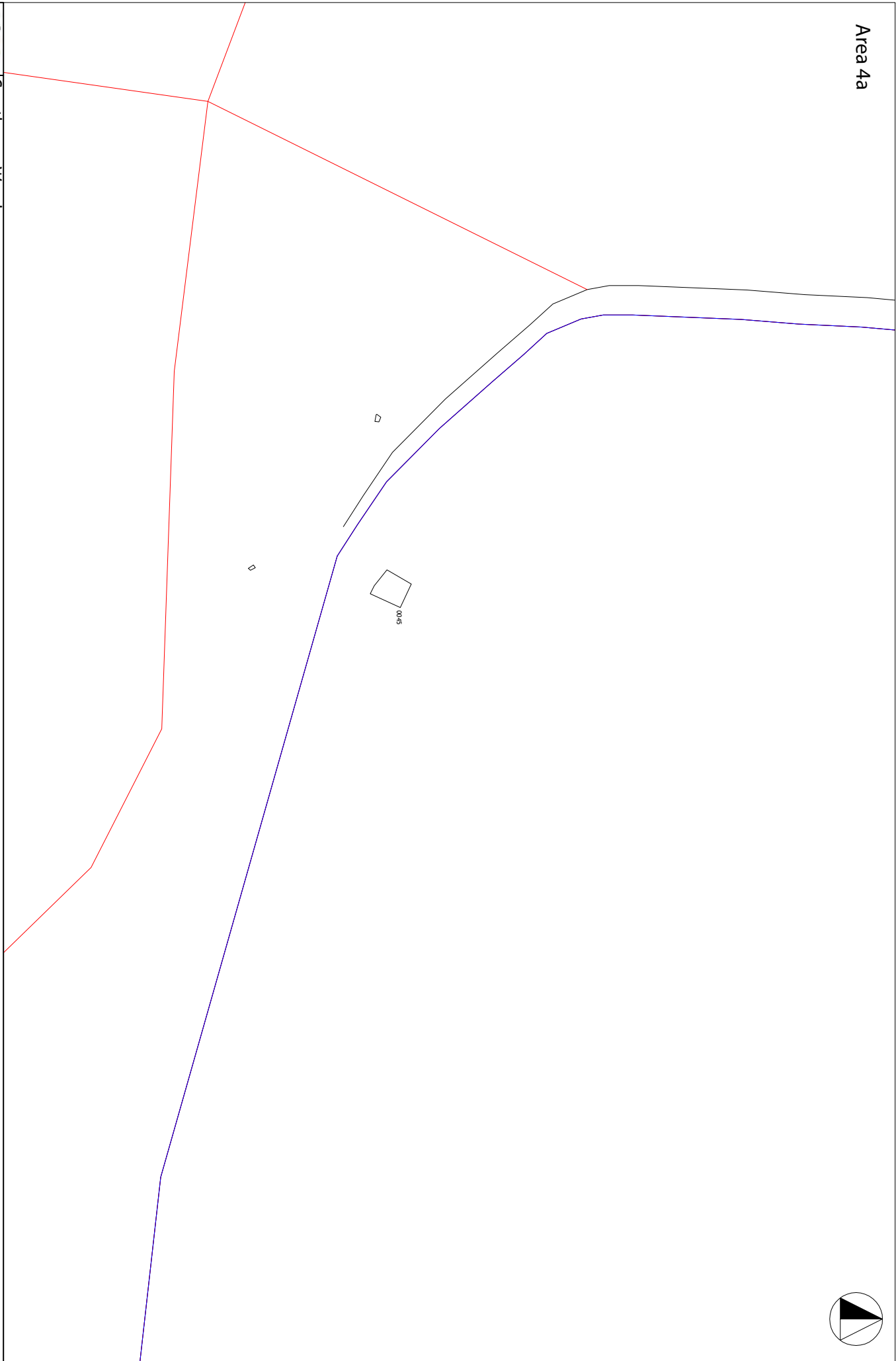
Cawthorne Woods
 Figure 31 Profile of bell pit 0041
 Scale at A4 1:50

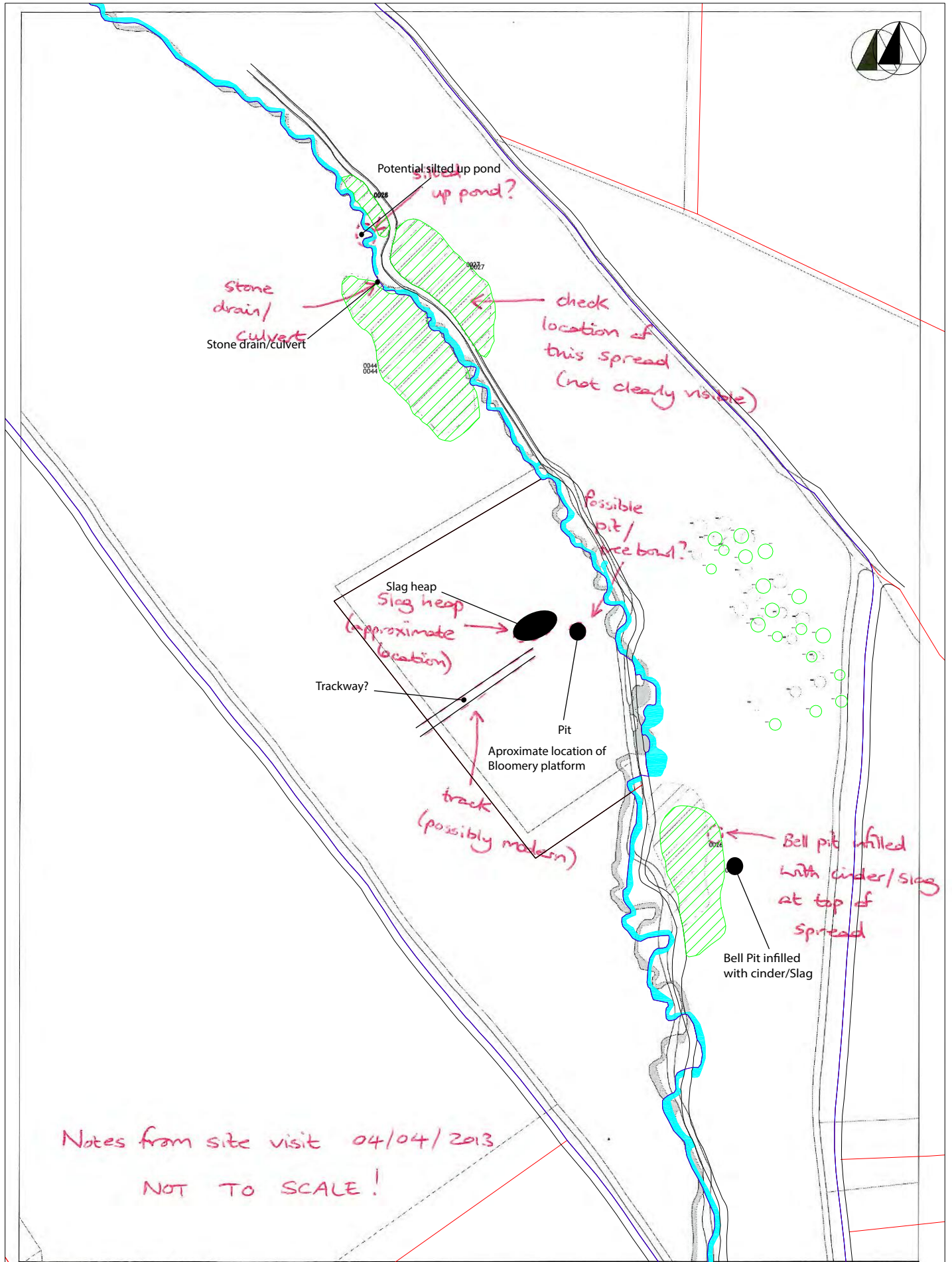


Area 3e









Notes from site visit 04/04/2013
 NOT TO SCALE!

13 PLATES



Plate 20: 'The Knoll', quarried rock face in Area 1f



Plate 21: Bell pit (Survey Feature 1)



Plate 22: Bell pit (Survey Feature 2)



Plate 23: Bell pit (Survey Feature 3)



Plate 24: Bell pit (Survey Feature 4)



Plate 25: Bell pit (Survey Feature 5)



Plate 26: Bell pit (Survey Feature 6)



Plate 27: Bell pit (Survey Feature 7)



Plate 28: Bell pit (Survey Feature 12)



Plate 29: Bell pit (Survey Feature 14)



Plate 30: Bell pit (Survey Feature 15)



Plate 31: Bell pit (Survey Feature 19)



Plate 32: Bell pit (Survey Feature 20)



Plate 33: Bell pit (Survey Feature 23)



Plate 34: Bell pit (Survey Feature 24)



Plate 35: Bell pit (Survey Feature 25)



Plate 36: Slag dump/cinder spread (Survey Feature 26)



Plate 37: Slag dump/cinder spread (Survey Feature 27)



Plate 38: Slag dump/cinder spread (Survey Feature 28)



Plate 39: Bell pit (Survey Feature 29)



Plate 40: Bell pit (Survey Feature 30)



Plate 41: Bell pit (Survey Feature 31)



Plate 42: Bell pit (Survey Feature 32)



Plate 43: Bell pit (Survey Feature 33)



Plate 44: Bell pit (Survey Feature 34)



Plate 45: Bell pit (Survey Feature 35)



Plate 46: Bell pit (Survey Features 36/37)



Plate 47: Bell pit (Survey Feature 38)



Plate 48: Bell pit (Survey Feature 40)



Plate 49: Bell pit (Survey Feature 41)



Plate 50: Bell pit (Survey Feature 42)



Plate 51: Bell pit (Survey Feature 43)



Plate 52: Brick structure (Survey Feature 45)



Plate 53: Detail of brick structure (Survey Feature 45)



Plate 54: Bell pits outside survey area, extending south-west along side of Area 1h



Plate 55: Bell pits outside survey area, extending to south-west of Area 3a



Plate 56: Plateau in Area 3f, possible site of bloomery



Plate 57: Stream, formerly providing water power for Cawthorne Smithies



Plate 58: Slag dump at north-east of bloomery area



Plate 59: Slag on east bank of stream, cut by 20th-century path



Plate 60: Slag dump and stream to north-east of bloomery site



Plate 61: Slag dump to south-east of bloomery site

APPENDIX 1 – INDEX TO ARCHIVE

Item	Number of items
Photographic register	5
Survey data on disc	1
Digital photographs	306
Written Scheme of Investigation/Brief	1
Report	1

APPENDIX 2 – KNOWN CULTURAL HERITAGE ASSETS

SMR – Sites and Monuments Record

LBUID – Listed Building

SA – Sheffield Archives

PAS – Portable Antiquities Scheme

Site no	Description	NGR	Reference
1	Ironstone mineworkings, High Wood, nr Kexborough. Area of closely grouped spoilheaps deriving from ironstone working, averaging 2-3m in height. Medieval.	SE 2880 1040	SMR 01724
2	'Coal pits' shown on 1854 Ordnance Survey map.	SE 2868 1032	1854 OS map
3	Hoyland Hall, Church Lane, High Hoyland. Constructed c.1720, probably for Sir Henry Wentworth. Three-storey, double pile, five bays. Grade II listed building.	SE 27359 10239	LBUID 1193138
4	Squirrel Hall Farm. Grade II listed L-shaped range of farm buildings and barn. Probably constructed 1733-1766.	SE 29481 10100	LBUID 1192912
5	Ironstone workings, Cawthorne Park Wood. Small ironstone quarry on edge of woodland, now partially infilled. Some dumped quarry waste. This area marked on Ordnance Survey maps as 'The Knoll'.	SE 2842 1001	SMR 04180
6	Cawthorne Park wood. Former ancient woodland with areas of mid-20 th -century replanting. Recorded as 'Calthornepark' in 1448. Spring Woods' were recorded in the Park in 1657 and charcoal was made here in 1681 and 1703.	SE 2809 0991	SA SpSt/183/3
7	Margery Wood. Recorded as 'Meriorrepark' in 1448 and listed as a spring wood called 'Margerie Park' in 1597. Charcoal was produced in the wood at that date and numerous ironstone pits have been observed in the area.	SE 2759 0975	SA SpSt/183/3
8	Bell pit, Cawthorne Park Woods. Roughly circular feature c.8m in diameter. Comprises a waterlogged depression with a low earth bank (1m in height) to the south. Post-medieval to Industrial periods.	SE 2860 0970	SMR 04181
9	Cawthorne Park Smithies (Upper and Lower). Bloomery. Early 14 th century to c.1680. Cawthorne Park Smithies (Upper and Lower). Bloomery. Possibly 14 th century to c.1680. Dam and possible 'back-up' dam identified through SYAS site visit in 1990, along with the remains of the bloomery, 'large concentrations of very fine bell pits' and two large piles of cinder and a cinder bank.	SE 2830 0948	SMR 03518
10	Thumb scraper. Possibly Early Bronze Age. Found in Cawthorne Park, now in Wakefield Museum. Exact findspot unknown.	SE 2860 0950	SMR 00575
11	Bell pits, Cawthorne Park Woods. Large concentration of bell pits evident as shallow depressions with associated shaley mounds. These appeared to be undisturbed at the time of a Sheffield Trades Historical Society visit in 1990. Post-medieval to Industrial periods.	SE 2837 0948	SMR 03517
12	Track running from Cawthorne Park wood towards Cinder Hill. Possibly the right of way for the removal of wood from Cawthorne Park that ran 'by Cawthorne Smithy' in 1657. Shown on an undated map of Cawthorne but had been reduced to a field boundary by the time of a c.1806 map of the area. Area opencasted in mid-20 th century. Continuation of track shown running north-west through wood before veering north-east to Upper Field Lane on 1840 OS map.	SE 2852 0903	Undated map of Cawthorne (SA SpSt/Add Maps/1/118)

Site no	Description	NGR	Reference
13	Artificial watercourse carrying stream from Cawthorne Park wood through Cinder Hill fields. Not shown prior to 1851 map of Cawthorne Manor.		1851 map of Cawthorne manor (SA SpSt/60727/110)
14	Saw mill, Cawthorne Park. Water-powered. Documentary evidence suggests there was a sawmill in Cawthorne Park in the mid-17 th century; during that period millwrights, woodcutters and basket makers were listed in the parish register. An 1803 estate plan names 'Miller Close' on the east side of the stream opposite Raw Royd Farm.	SE 2790 0889	SMR 04747
15	Earthwork. Undated linear bank, intersected by Cawthorne to High Hayland Road, followed by footpath. Upper Spring, Cawthorne.	SE 269 088	SMR 02213
16	Low Mill. Water-powered corn mill with goit channelling water from the River Dearne near Cinder Hill Bridge. The first documented lease date for a mill on the edge of Cawthorne and Kexbrough is 1609. This is mentioned as a corn mill in 1619 (Umpleby 2000, 98). Goit and adjacent plot 'Goyt Close' shown on 1738 George Pollard map. Marked 'Old Mill' on 1841 OS map, with the goit extant. The site is still labelled as a corn mill on the 1855 map. After this date the mill was used for wire-drawing possibly till 1890 (Umpleby 2000, 99) after which point the site is marked as disused. The mill building had been demolished by 1931 mapping but it is not until 1965 maps that the mill race is diverted along new field boundaries, at this point there remains only fragmentary legibility of the mill with the weir remaining. Prior to the mills construction this was probably an area of assarts. There is no legibility of them in the current landscape as many field boundaries have been straightened in recent years.	SE 2938 0888	1738 George Pollard map (YAS DD70 (BEA)/C2/MPD16)
17	Kexbrough Bridge, over Cawthorpe Dike. Probable 18 th -century road bridge. Ashlar, single span, round-arched, formerly humpbacked. Grade II listed.	SE 29528 08861	LBUID 1314702
18	Tannery at Cinder Hill Farm. Post-medieval to Industrial periods. Core of farm constructed in 17 th century on a large slag dump or cinder bank. Area marked 'Sinderhill' on 1738 George Pollard map. The farmhouse and an 18 th -century ha ha and garden wall are Grade II listed structures.	SE 2869 0869	SMR 04182 LBUID 1286832 LBUID 1151783
19	Clay Hall farmhouse, Cawthorne. Stone house of 2.5 bays, with rear outshut and internal timber arcade. 17 th century.	SE 288 083	SMR 01196
20	Cannon Hall country park. Registered Park and Garden. House, deer park, kitchen garden, serpentine lakes with artificial river, cascade and bridge, ha ha, orangery, park, tree avenue. Deer park designed and implemented in 1761 by Richard Woods, probably on land enclosed from medieval open fields. Mesolithic flint surface finds from park; medieval carved stone; undated earthwork bank. Cannon Hall itself is a Grade II listed building.	SE 2766 0793	SMR 02938 LBUID 1001159
21	The Old Golden Cross. H-plan, timber-framed house, Cawthorne. Original timbers exposed at the north gable and the west cross wing. Medieval. Grade II listed building.	SE 284 081	SMR 01493 LBUID 1151781
-	Silver penny of Edward I, London mint probably AD 1297. Found within 1km search area and recorded by Portable Antiquities Scheme.	NGR of findspot protected-	PAS SWYOR-9DFOC7
-	Silver penny of Edward I, London mint probably AD 1300-1302. Found within 1km search area and recorded by Portable Antiquities Scheme.	NGR of findspot protected.	PAS SWYOR-9DFOC7

APPENDIX 3 – SURVEY GAZETTEER

ID no	Description	Interpretation	Significance	Condition	Threats	NGR	Plate no. & Viewpoint
1	Bell Pit 0001. Located towards the north-east corner of Area 2a. Circular, with a diameter of 4.2m x depth 0.4m. Its sides sloped at approximately 40° to a flat base, 1.1m wide.	Bell pit	2b: Local	Poor	Tree root and vegetation	428113, 409869	Pl. 21 - NW
2	Bell Pit 0002. Located 15m south-west of 0001. Circular, with diameter 6m x depth 1.2m. Its north-east edge sloped at approximately 45° to a flat base, 2.7m wide. Its south-west edge appeared to have been quarried away by Bell Pit 0003.	Bell pit	2b: Local	Poor	Tree root and vegetation	428095, 409860	Pl. 22 - W
3	Bell Pit 0003. Located immediately to the south-west of 0002. Circular, with a diameter of 7m x depth 1.1m. Its sides sloped at approximately 45° to a rounded base 2.3m wide.	Bell pit	2b: Local	Poor	Tree root and vegetation	428090, 409856	Pl. 23 - SE
4	Bell Pit 0004. Located immediately to the south-west of 0003. Circular, with a diameter of 5m x depth 0.5m. Its north-east side sloped at approximately 60° to a flat base, 3.2m wide. There was no evidence of the south-west side due to the topography of the landscape.	Bell pit	2b: Local	Poor	Tree root and vegetation	428085, 409852	Pl. 24 - S
5	Bell Pit 0005. Located 5.6m to the south of 0004. Sub-oval in shape, measuring 4.7m north-west/south-east x 3.2m north-east/south-west x depth 0.7m, with sides sloping at approximately 60° to a rounded base, 1.3m wide.	Bell pit	2b: Local	Poor	Tree root and vegetation	428088, 409842	Pl. 25 - S
6	Bell Pit 0006. Located 27m south-west of 0005. Sub-oval in shape, measuring 3.6m north-west/south-east x 2.7m north-east/south-west x depth 2.6m. Its south-east side sloped at approximately 65° to a flat base, 2.6m wide. There was no evidence of the north-west side due to the topography of the landscape.	Bell pit	2b: Local	Poor	Tree root and vegetation	428060, 409830	Pl. 26 - NW

ID no	Description	Interpretation	Significance	Condition	Threats	NGR	Plate no. & Viewpoint
7	Bell Pit 0007. Located 5m south-east of 0006. Circular in plan with a diameter of 6.9m x depth 1m. Sides sloping at approximately 65° to a rounded base, 1.4m wide.	Bell pit	2b: Local	Poor	Tree root and vegetation	428066, 409822	Pl. 27 - E
8	Bell Pit 0008. Located approximately centrally within Area 2c. Circular in plan with a diameter of 5.6m.	Bell pit	2b: Local	Poor	Tree root and vegetation	428371, 409514	
9	Bell Pit 0009. Located 5m east of 0008. Circular in plan with a diameter of 5.8m.	Bell pit	2b: Local	Poor	Tree root and vegetation	428382, 409516	
10	Bell Pit 0010. Located 4m south-west of 0009. Circular in plan with a diameter of 4.1m.	Bell pit	2b: Local	Poor	Tree root and vegetation	428375, 409510	
11	Bell Pit 0011. Located 5.5m south-east of 0009. Circular in plan with a diameter of 6m.	Bell pit	2b: Local	Poor	Tree root and vegetation	428392, 409509	
12	Bell Pit 0012. Located 3m south of 0009. Circular in plan with a diameter of 5.5m.	Bell pit	2b: Local	Poor	Tree root and vegetation	428384, 409507	Pl. 28 - E
13	Bell pit 0013. Located 5m south-west of 0010. Circular in plan with a diameter of 3.9m.	Bell pit	2b: Local	Poor	Tree root and vegetation	428370, 409502	
14	Bell Pit 0014. Located 8m south of 0011. Circular in plan with a diameter of 5.7m.	Bell pit	2b: Local	Poor	Tree root and vegetation	428391, 409495	Pl. 29 - N
15	Bell Pit 0015. Located 9m south-east of 0014. Circular in plan with a diameter of 5.8m.	Bell pit	2b: Local	Poor	Tree root and vegetation	428405, 409491	Pl. 30 - NE
16	Bell Pit 0016. Located 5m south of 0014. Circular in plan with a diameter of 5.6m.	Bell pit	2b: Local	Poor	Tree root and vegetation	428394, 409486	
17	Bell pit 0017. Located 2.2m south-west of 0016. Circular in plan with a diameter of 5.6m.	Bell pit	2b: Local	Poor	Tree root and vegetation	428389, 409480	

ID no	Description	Interpretation	Significance	Condition	Threats	NGR	Plate no. & Viewpoint
18	Bell Pit 0018. Located 4.2m south-east of 0017. Circular in plan with a diameter of 4.1m.	Bell pit	2b: Local	Poor	Tree root and vegetation	428396, 409475	
19	Bell Pit 0019. Located 8m south of 0015. Circular in plan with a diameter of 4.4m.	Bell pit	2b: Local	Poor	Tree root and vegetation	428406, 409478	Pl. 31 - NNE
20	Bell Pit 0020. Located 4m south-east of 0019. Circular in plan with a diameter of 6m.	Bell pit	2b: Local	Poor	Tree root and vegetation	428415, 409476	Pl. 32 - NNE
21	Bell Pit 0022. Located 9.2m south-east of 0021. Circular in plan with a diameter of 4.2m.	Bell pit	2b: Local	Poor	Tree root and vegetation	428410, 409467	
22	Bell Pit 0022. Located 9.2m south-east of 0021. Circular in plan with a diameter of 4.2m.	Bell pit	2b: Local	Poor	Tree root and vegetation	428421, 409460	
23	Bell Pit 0023. Located 6.1m south of 0022. Circular in plan with a diameter of 4.7m.	Bell pit	2b: Local	Poor	Tree root and vegetation	428422, 409450	Pl. 33 - NE
24	Bell Pit 0024. Located 6.4m south-west of 0023. Circular in plan with a diameter of 4.7m.	Bell pit	2b: Local	Poor	Tree root and vegetation	428412, 409446	Pl. 34 - NE
25	Bell Pit 0025. Located 12.5m south-west of 0024. Circular in plan with a diameter of 4.6m.	Bell pit	2b: Local	Poor	Tree root and vegetation	428395, 409440	Pl. 35 - W
26	Slag/cinder spread 0026. Located towards the southern end of Area 2c, adjacent to the stream defining the western edge. Sub-rectangular in shape and measured 60m north-south x 25m east-west. The spread followed the natural contours of the landscape, rising to the north, and did not appear to have any significant depth above ground level.	Slag heap	2b: Local	Poor	Tree root and vegetation	428364, 409382 428356, 409408 428367, 409349	Pl. 36 - SE

ID no	Description	Interpretation	Significance	Condition	Threats	NGR	Plate no. & Viewpoint
27	Slag/cinder spread 0027. Located 200m north-west of slag/cinder spread 0026, still adjacent to the stream forming the western boundary of Area 2c. Sub-rectangular in shape and measured 61m north-west/south-east x 22m north-east/south-west. The spread followed the natural contours of the landscape, rising to the north, and did not appear to have any significant depth above ground level.	Slag heap	2b: Local	Poor	Tree root and vegetation	428265, 409618 428245, 409639 428283, 409592	
28	Slag/cinder spread 0028. Located immediately to the north-west of 0027, adjacent to the stream forming the western boundary of Area 2c. Sub-rectangular in plan and measured 29m north-west/south-east x 6.5m north-east/south-west. The profile of 0028 was much more undulating than 0026 and 0027, and it appeared to take the form of a series of mounds rather than a single spread.	Slag heap	2b: Local	Poor		428233,4096 48 428224,4096 59 428241,4096 35	Pl. 38 - W
29	Bell Pit 0029. Located centrally along the north-east edge of Area 3a. Irregular in plan, measuring 11m north-east/south-west x 7.6m north-west/south-east. It appeared to be a collection of inter-cutting pits with depth up to 0.5m.	Bell pit	2b: Local	Poor	Tree root and vegetation	427974, 409826	Pl. 39 - W
30	Bell Pit 0030. Located centrally along the south-east edge of the area. Circular in plan with a diameter of 8.4m x depth 1.4m with southern side sloping at approximately 70° to a flat base, 4.7m wide. No evidence of the northern side was visible due to the topography of the landscape.	Bell pit	2b: Local	Poor	Tree root and vegetation	427996, 409754	Pl. 40 - NE
31	Bell Pit 0031. Located 7.3m south-west of 0030. Oval in plan measuring 4.3m northeast/south-west x 2.7m north-west/south-east x depth 1.2m with sides sloping at approximately 45° to a flat base 0.6m wide.	Bell pit	2b: Local	Poor	Tree root and vegetation	427990, 409742	Pl. 41 - NE

ID no	Description	Interpretation	Significance	Condition	Threats	NGR	Plate no. & Viewpoint
32	Bell Pit 0032. Located 5m north-west of 0031. Circular in plan with a diameter of 3.4m x depth 0.6m with sides sloping at approximately 45° to a slightly rounded base, 0.7m wide.	Bell pit	2b: Local	Poor	Tree root and vegetation	427983, 409747	Pl. 42 - S
33	Bell Pit 0033. Located 8.5m south-west of 0032. Sub-circular in plan with a diameter of 7.1m x depth 1.2m with south-west side sloping at approximately 65° and north-east side sloping at approximately 30° to a rounded base, 2.3m wide.	Bell pit	2b: Local	Poor	Tree root and vegetation	427980, 409731	Pl. 43 - SSE
34	Bell Pit 0034. Located 6.5m south-west of 0033. Oval in plan, measuring 5.4m north-east/south-west x 3.3m north-west/south-east x depth 0.6m with south-west side sloping at approximately 40° to a flat base, 3.35m wide.	Bell pit	2b: Local	Poor	Tree root and vegetation	427975, 409721	Pl. 44 - SW
35	Bell Pit 0035. Located 9.5m north-west of 0034. Circular in plan with a diameter of 3.1m x depth 0.3m with sides sloping at approximately 50° to a flat base, 1.3m wide.	Bell pit	2b: Local	Poor	Tree root and vegetation	427964, 409726	Pl. 45 - NE
36	Bell Pit 0036. Located 4m north-west of 0035. Oval in plan measuring 3.1m north-west/south-east x 2.4m north-east/south-west x depth 0.4m with sides sloping at approximately 40° to a slightly rounded base, 0.9m wide.	Bell pit	2b: Local	Poor	Tree root and vegetation	427960, 409732	Pl. 46 - SE
37	Bell Pit 0037. Located immediately north-west of 0036. Oval in plan, measuring 2.3m north-south x 1.4m east-west x depth 0.07m with sides sloping at approximately 25° to a flat base, 0.5m wide.	Bell pit	2b: Local	Poor	Tree root and vegetation	427959, 409735	
38	Bell Pit 0038. Located 2m north-east of 0037. Oval in plan measuring 4m north-west/south-east x 3m north-east/south-west x depth 0.4m with sides sloping at approximately 40° to a slightly rounded base, 2.6m wide.	Bell pit	2b: Local	Poor	Tree root and vegetation	427962, 409738	Pl. 47 - S
39	Bell Pit 0039. Located 2.5m north-east of 0038. Oval in plan measuring 5.2m north-west/south-east x 3.1m north-east/south-west x depth 0.5m with sides sloping at approximately 50° to a slightly undulating base, 3.5m wide.	Bell pit	2b: Local	Poor	Tree root and vegetation	427967, 409741	

ID no	Description	Interpretation	Significance	Condition	Threats	NGR	Plate no. & Viewpoint
40	Bell pit 0040. Located 3m north of 0039. Sub-oval in plan measuring 4.7m north-east/south-west x 2.2m north-west/south-east x depth 0.6m with sides sloping at approximately 45° to an undulating base, 2.8m wide.	Bell pit	2b: Local		Tree root and vegetation	427965, 409748	Pl. 48 - N
41	Bell Pit 0041. Located 2m north of 0040. Circular in plan with a diameter of 3.6m x depth 0.5m. Sides sloping at approximately 50° to a rounded base, 1.7m wide.	Bell pit	2b: Local	Poor	Tree root and vegetation	427964, 409751	Pl. 49 - NE
42	Bell Pit 0042. Located 3m south-west of 0040, against the south-west boundary of the area. Irregular in plan with maximum dimensions 9.9m north-west/south-east x 6.3m north-east/south-west x depth 0.5m. It appeared to comprise a series of smaller intercutting pits.	Bell pit	2b: Local	Poor	Tree root and vegetation	427958, 409743	Pl. 50 - E
43	Bell Pit 0043. Located in the north-east corner of Area 3e. Circular in plan with a diameter of 5m x depth 1m with sides sloping at approximately 70° to a slightly rounded base, 1.6m wide.	Bell pit	2b: Local	Poor	Tree root and vegetation	427993, 409696	Pl. 51 - NNW
44	Slag/cinder spread 0044. Located centrally along the north-east edge of Area 3e, along the stream bank opposite slag/cinder spread 0027. Sub-rectangular in shape and measured 77.8m north-west/south-east x 27.8m north-east/south-west. The spread followed the natural contours of the landscape, rising to the south-west, and did not appear to have any significant depth above ground level. Slight hollows were identified at several locations within the spread.	Slag heap	2b: Local	Poor	Tree root and vegetation	428253, 409588 428224, 409618 428273, 409558	
45	Brick built structure 0045. Rectangular in plan. Measured 3.3m north-east/south-west x 2.5m north-west/south-east. Constructed from hand-made bricks (measuring approximately 245mm x 120mm x 60mm) and bonded by a light whitish-brown lime mortar. The visible extent of the structure stood three courses high.	Structure	2b: Local	Poor	Tree root and vegetation	428667, 409540	Pl. 52 - NNE Pl. 53 - ESE

APPENDIX 4 – SURVEY PHOTOGRAPH VIEWPOINT REGISTER

Viewpoint	Description	Direction facing
1	Bell pits in area to west of Area 3a.	W
2	Bell pits in area to west of Area 3a	W
3	Bell pits in area to west of Area 3a	W
4	Bell pits in area to west of Area 3a	W
5	Double bell pit within Area 3a - 0040	NE
6	Double bell pit within Area 3a - 0040	NE
7	Bell pit 0040 and 0041	N
8	Bell pit 0040 and 0041	N
9	Bell pit 0033	SSE
10	Bell pit 0033	SSE
11	Bell pit 0031	SE
12	Bell pit 0031	NE
13	Bell pit 0031	NE
14	Bell pit 0034	SW
15	Bell pit 0034	SW
16	General view of bell pits in Area 3a	N
17	General view of bell pits in Area 3a	N
18	Bell pit in 0043 Area 3e	NNW
19	Bell pit in 0043 Area 3e	NNW
20	General shot of Area 3e showing clearing	E
21	General shot of Area 3e showing clearing	E
22	Bell pit 0030 within Area 3a	NE
23	Bell pit 0030 within Area 3a	NE
24	General view Area 3a showing dense tree coverage and natural undulations	N
25	General view Area 3a showing dense tree coverage and natural undulations	NW
26	Area 3a showing streams from heavy rain/melting snow	W
27	Area 3a showing streams from heavy rain/melting snow	W
28	View of steep sided valley cut by stream	SSE
29	View of steep sided valley cut by stream	SSE
30	Man made pond created by track construction	NNW
31	Man made pond created by track construction	NNW
32	Bell pit 0007 in Area 2a	E
33	Bell pit 0007 in Area 2a	E
34	Bell pit 0006	NW
35	Bell pit 0006	NW
36	Bell pit 0002	W
37	Bell pit 0002	W
38	Bell pit 0001	NW
39	Bell pit 0001	NW
40	General view Area 2a showing topography	NW
41	General view Area 2a showing topography	N
42	General view Area 2a showing topography	SW

Viewpoint	Description	Direction facing
43	Area 2c heavily wooded with machine clearance in evidence	SW
44	Area 2c heavily wooded with machine clearance in evidence	S
45	Area 2c heavily wooded with machine clearance in evidence	E
46	Small bloomery slag heap 0028 in Area 2c	W
47	Small bloomery slag heap 0028 in Area 2c	W
48	Small bloomery slag heap 0028 in Area 2c	NW
49	Small bloomery slag heap 0028 in Area 2c	NW
50	Spread of bloomery slag/cinders	E
51	Spread of bloomery slag/cinders	E
52	Clearance/ground coverage of Area 3e	SW
53	Clearance/ground coverage of Area 3e	SW
54	Detail of cinder spread in Area 3e	N
55	Detail of cinder spread in Area 3e	N
56	General view from cinder spread to stream	NNE
57	General view from cinder spread to stream	NNE
58	Possible scoop for removal of slag to pack fence	N
59	Possible scoop for removal of slag to pack fence	N
60	Slag packing around fence - probably from nearby scoop	W
61	Slag packing around fence - probably from nearby scoop	W
62	Scoop from removal of slag	NW
63	Scoop from removal of slag	NW
64	Detail of bloomery slag	NW
65	Detail of bloomery slag	NW
66	Section cut by stream showing stratigraphy	NE
67	Section cut by stream showing stratigraphy	NE
68	Section cut by stream showing stratigraphy	NE
69	Section cut by stream showing stratigraphy	NE
70	Bell pit 0025 from previous survey	W
71	Bell pit 0025 from previous survey	W
72	Bell pit 0024 from previous survey	NE
73	Bell pit 0024 from previous survey	NE
74	Bell pit 0023 from previous survey	NE
75	Bell pit 0023 from previous survey	NE
76	Bell pit 0020 from previous survey	NE
77	Bell pit 0020 from previous survey	NE
78	Bell pit 0019 from previous survey	NNE
79	Bell pit 0019 from previous survey	NNE
80	Bell pit 0015 from previous survey	NE
81	Bell pit 0015 from previous survey	NE
82	Bell pit 0014 from previous survey	N
83	Bell pit 0014 from previous survey	N
84	Bell pit 0012 from previous survey	E
85	Bell pit 0012 from previous survey	E

Viewpoint	Description	Direction facing
86	Slag/cinder spread 0026	S
87	Slag/cinder spread 0026	S
88	Slag/cinder spread 0026	S
89	Slag/cinder spread 0026	S
90	Area 3f showing level platform and lower density of trees	NW
91	Area 3f showing level platform and lower density of trees	NW
92	Remains of modern re-creation of bloomery furnace	NW
93	Remains of modern re-creation of bloomery furnace	NW
94	Area 3e showing branch coverage on ground and machine track	W
95	Area 3e showing branch coverage on ground and machine track	W
96	Slightly clearer area of 3e but still heavily overgrown	S
97	Slightly clearer area of 3e but still heavily overgrown	S
98	Dry stone wall in corner of Area 2g	NW
99	Dry stone wall in corner of Area 2g	NW
100	Stone collection for use on dry stone wall	W
101	Stone collection for use on dry stone wall	W
102	General view of Area 2g showing density of trees	N
103	General view of Area 2g showing density of trees	N
104	Area 2c general view	N
105	Area 2c general view	N
106	Brick-lined drain to SW of Area 4b	SE
107	Brick-lined drain to SW of Area 4b	SE
108	Brick-lined drain to SW of Area 4b	S
109	Brick-lined drain to SW of Area 4b	S
110	Brick-lined drain to SW of Area 4b (east end)	NW
111	Brick-lined drain to SW of Area 4b (east end)	NW
112	Brick-lined drain to SW of Area 4b (east end)	N
113	Brick-lined drain to SW of Area 4b (east end)	N
114	Brick structure 0045 Area 4b	N
115	Brick structure 0045 Area 4b	N
116	Detail of brick from Area 4b	-
117	Detail of brick from Area 4b	-
118	General view of Area 4b	S
119	General view of Area 4b	S
120	General view of Area 4b	S
121	General view of Area 4b from within fenced off former pig pen	NNE
122	General view of Area 4b from within fenced off former pig pen	NNE
123	General view of Area 4b from within fenced off former pig pen	W
124	General view of Area 4b from within fenced off former pig pen	W
125	General view of stone around Area 1f	NNE
126	General view of stone around Area 1f	NNE
127	General view of rock face Area 1f	NE
128	General view of rock face Area 1f	NE

Viewpoint	Description	Direction facing
129	General view of rock face Area 1f	NE
130	General view of rock face Area 1f	NE
131	General view of rock face Area 1f	ENE
132	General view of rock face Area 1f	ENE
133	General view Area 1f	S
134	General view Area 1f	S
135	Recent track heading S from Area 1e	SWW
136	Recent track heading S from Area 1e	SWW
137	Bell pits to west of modern track (outside survey area)	SW
138	Bell pits to west of modern track (outside survey area)	SW
139	Bell pits to west of modern track (outside survey area)	W
140	Bell pits to west of modern track (outside survey area)	W
141	Bell pits to west of modern track (outside survey area)	SW
142	Bell pits to west of modern track (outside survey area)	SW
143	Bell pits to west of modern track (outside survey area)	SW
144	General view Area 2a	SW
145	Bell pit 0042 Area 3a	E
146	Bell pit 0042 Area 3a	E
147	Bell pit 0038	S
148	Bell pit 0038	S
149	Bell pit 0036	SE
150	Bell pit 0036	SE
151	Bell pit 0035	NE
152	Bell pit 0035	NE
153	Bell pit 0041	NE
154	Bell pit 0041	NE
155	Bell pit 0032	S
156	Bell pit 0032	S
157	Area 3a showing 'ploughing of land' for linear tree alignment	NW
158	Area 3a showing 'ploughing of land' for linear tree alignment	NW
159	Bell pit 0029	NNW
160	Bell pit 0029	NNW
161	Bell pit 0029	W
162	Bell pit 0029	W
163	Bell pit 0003	SE
164	Bell pit 0003	SE
165	Bell pit 0004	S
166	Bell pit 0004	S
167	Bell pit 0005	S
168	Bell pit 0005	S
169	Brick structure 0045	NNE
170	Brick structure 0045	NNE
171	Brick structure 0045	ESE

Viewpoint	Description	Direction facing
172	Brick structure 0045	ESE
173	Brick structure 0045	E
174	Brick structure 0045	E
175	Detail of brickwork of structure 0045	ESE
176	Detail of brickwork of structure 0045	ESE
177	Detail of brickwork of structure 0045	ESE
178	Detail of brickwork of structure 0045	ESE
179	Brick drain south of Area 4b - west end	SE
180	Brick drain south of Area 4b - west end	SE
181	Brick drain south of Area 4b - west end	SSW
182	Brick drain south of Area 4b - west end	SSW
183	Brick drain south of Area 4b - east end	NE
184	Brick drain south of Area 4b - east end	NE
185	General view Area 2a	SE
186	General view Area 2a	SE
187	General view Area 2a	SE
188	General view along northern edge of Area 2a	ESE
189	General view along northern edge of Area 2a	ESE
190	Dry stone wall in north-east corner Area 1e	W
191	Dry stone wall in north-east corner Area 1e	W
192	Dry stone wall in north-east corner Area 1e	N
193	Dry stone wall in north-east corner Area 1e	N
194	View of mound behind dry stone wall	N
195	View of mound behind dry stone wall	N
196	View of mound behind dry stone wall	W
197	View of mound behind dry stone wall	W
198	View of mound behind dry stone wall	NE
199	View of mound behind dry stone wall	NE
200	Dry stone wall Area 1e - no scale	N
201	Dry stone wall Area 1e - no scale	N
202	Dry stone wall Area 1e - no scale	W
203	Dry stone wall Area 1e - no scale	W

APPENDIX 5 – BRIEF

W.O.L.F & Heeley City Farm November 2012

SPECIFICATION FOR AN ARCHAEOLOGICAL DESK BASED ASSESMENT AND LEVEL 2 EARTHWORK SURVEY AT CAWTHORNE PARK WOODS, CAWTHORNE, BARNSELY

Summary

Cawthorne Park Woods (Cawthorne), Barnsley is a private woodland owned by Cawthorne Park Woodlands Ltd. There is some limited access permitted for educational purposes by W.O.L.F (Woodland Outreach Learning Foundation www.wolf-charity.blogspot.co.uk)

The wood contains known medieval industrial features in the form of iron and coal workings. The site has numerous examples of bell pits, slag & cinder heaps and working platforms suggesting the site was used for pre-industrial iron working.

The South Yorkshire Archaeology Service carried out an initial survey of the woods in 1992 in connection with the Link Wood Scheme for South Yorkshire's Environmental Education. The survey covered three areas. Areas 1 & 2 were considered not to be archaeologically sensitive despite containing bell-pits (although this should be reviewed). Area 3 was considered of greater interest containing bell-pits and about 3,000sq meters of slag & cinder concentrations.

In 1996 two pieces of slag and a piece of charcoal were collected from Area 3 and later analysed by Mr T. Gladman M.B.E. F. Eng. the slag indicated pre 17th Century production. Analysis of the charcoal showed that it was 10 years old when cut, this "may have some significance in that the woodlands were often coppiced" (Gladman 1996). The charcoal sample was submitted to the radiocarbon laboratory at the University of Glasgow where it was dated to between 1450AD and 1540AD the arithmetically determined date being 1495AD (Laboratory code SRR-6118).

The East Peak Industrial Heritage Support Programme has agreed to fund a desk-based assessment and walk-over archaeological earthwork survey of the site to guide the development of these project plans. It is intended that the results of the survey will also help to guide future conservation and management plans for the site. This work will expand upon the initial 1992 survey, to provide historical context and produce an interpretative plan of the site, recording all visible features and assessing their archaeological significance and any current vulnerabilities.

The successful contractor should liaise with W.O.L.F, Mr L. Batty the current landowner and Heeley City Farm throughout the project to keep them updated as work progresses.

W.O.L.F. are currently seeking competitive tenders for this work in the form of a costed project design, with an itemised quotation based on the requirements set out in this specification. The work will be funded by the East Peak Innovation Partnership (EPIP) as part of their Industrial Heritage Support Programme.

1 Site Location and description (see also attached location plan)

The site is located approximately 5km north west of Barnsley and 1.5km north of the village of Cawthorne, South Yorkshire, centred on the grid reference SE2850 0950

The site and the surrounding woodland are owned by Mr L. Batty of Cawthorne Park Woodlands Ltd. They are currently used for game rearing and shooting

The site is located within overgrown woodland which is dense in some places. The ground is uneven and slopes down to a small river.

Initially the survey should focus on areas 1e (at the edge of the wood, currently used for car parking) and areas 2a, 2c, 3a, 3e and 3f (in the middle of the wood) as shown on figure 1. These are the areas in which future community-based activities are likely to take place, and include a number of extensive slag heaps identified in the 1992 survey, as well as two ponds and a central clearing (area 3f). W.O.L.F & Heeley City Farm November 2012

The contractor should also investigate the road that links area 1e with the main survey area (shown as a dotted pink line on figure 1).

The contractor should also provide additional costs and timescales for surveying areas 1f and 4a (also shown on figure 1). This additional work will only be commissioned if budget and timescale allow. Area 1f contains an open quarry face that may have been used for mining iron stone, and area 4a is a possible area of ancient woodland with veteran oak trees and other archaeological features.

The site is not designated, although it is included on the South Yorkshire Sites and monuments Record HER no.03518/01

Any access to the site must be arranged in advance with the site owner as the woodland is managed and used for forestry and game shooting with an on site gamekeeper who needs to be aware of who is in the woodland and when. Access will require a 4-wheel drive vehicle, as the track into the woods is un-surfaced and steep in places.

The main entrance to the site is from the main road and leads into area 1e. There is a secondary entrance close by which gives separate access to area 1f.

2 Aims and Objectives

The aim of the project is to gather sufficient information to establish the location and nature of former industrial processes at the site, and the presence/absence, character, extent, state of preservation and date of any archaeological and historic features and deposits within the survey area (as far as possible within the limits of this specification).

Specific objectives of the survey are to provide:

A desk-based assessment comprising an assessment and synthesis of all relevant archaeological and historical sources relating to Cawthorne Park Woods

A level 2 archaeological survey and investigation (as defined by English Heritage 2007) of the areas of the woodland proposed for future community activities (see attached plan) comprising a metrically accurate topographical plan and accompanying descriptive and interpretative report.

The project should also provide:

Material suitable for potential use in interpretation and display. As well as guiding future project work and management of the site, the results of this survey may be used to guide future site interpretation. Therefore, any illustrative material (including drawn plans of the site

and its major sub-components) must be prepared to publication standard that can be used in educational leaflets, on display panels and in public presentations.

The survey will focus on the area shown on the accompanying site plan, and will, in so far as current land-use and vegetation allows, investigate and record all historic features associated with iron working, within the immediate surrounding area.

It is anticipated that the project will start in January 2012 and that the site work will be completed during January/February 2012, dependent on on-site conditions. The final report should be submitted (in draft form) by the 18th of February 2013.

The area selected covers the part of the wood with the greatest potential for public access. This survey will be used to help access the potential for future community heritage work on site. W.O.L.F & Heeley City Farm November 2012

3 Methodology

The work should take place in two stages:

Stage One: Desk-Based Assessment reviewing the relevant documentary sources and previous archaeological work. **This stage must include at least one visit to the site, and one visit to the South Yorkshire Sites and Monuments Record to review reports of previous work and related reports.**

This should involve an assessment and synthesis of all available sources of archaeological information for the whole woodland (including an area of at least 1km around the main survey area). This will include consultation of:

Archive material held by the South Yorkshire Archaeology Service

Historical documents and photographs held in both the Sheffield and Barnsley Archives

Plans and maps of the site and its environs including historical pictorial and surveyed maps and including all pre and post-war Ordnance Surveys up to the present day.

Woodland and field name evidence (where relevant)

Relevant archaeological materials held by museums.

Appropriate archaeological and historical journals and books

The Sites and Monuments Record (SMR)

The desk based assessment should be written up into a report (see below). Where ever possible all consulted maps should be included in this report in the form of a map regression. All consulted sources (including relevant page numbers) should be referred to in the bibliography of the report, even if the results were negative. If sources are unavailable for consultation the reason for this should be given. The assessment should comment on the reliability of the sources used.

Stage Two: Analytical field survey of the areas of the woodland marked on figure 1. **This must conform to Level 2 standard as defined in *Understanding the Archaeology of Landscapes: a guide to good recording practice* (English Heritage 2007).**

After the completion of Stage 2 the results of both stages should be summarised into a combined written report. **Please note that a separate desk-based report is not required and the results of this stage of work should be incorporated within the final report.**

4 **Field Survey:**

Before undertaking any work on site the contractor should consult the South Yorkshire Archaeology Service and should make at least one visit to the SMR.

The survey should investigate the whole of the area indicated currently estimated to be approximately 15 hectares. The indicated area will be subject to a systematic walk-over survey noting the presence or absence of archaeological 'monuments' (i.e. all archaeological or potentially archaeological sites, if any, in addition to those defined below). This walk over survey should also identify areas that would merit further investigation if more work is to be undertaken in the future.

The detailed survey should be carried out using an electronic total station and should be tied into the national grid and Ordnance Survey datum. Site boundaries should be plotted in order to link the site to the O.S. base map. All identified features should be surveyed. Where earthwork monuments are encountered, observed bank heights and ditch depths should be recorded; profiles across the earthworks should also be provided. The total station data should then be used to produce a hachured earthwork survey plan.

Horizontal survey interval will vary according to the complexity of the earthworks being surveyed, but should be sufficient to recover an accurate record of the character of the earthworks. In areas of particular complexity, hand-drawn detail plans will be produced, to complement the surveyed data.

Each monument is to be given a unique identifier code or number. Each individual monument will be located on an O.S. base map and given a brief text description (including dimensions and a description of the monument's condition and any relationships with associated monuments).

The archaeological monuments are to be sketched on a map base of at least 1:500 (or larger where appropriate); profiles should be produced at a larger scale. Archaeological features, exposed archaeological deposits and finds should also be recorded, with an approximate grid reference, but no attempt should be made to excavate these. In the unlikely event of locating surface finds, these may be collected for dating purposes.

Record photographs should be taken where possible.

5 **Survey Record**

As a minimum the on-site survey record should comprise:

A description and photographic record of all physical remains observed

A grid reference provided by navigation/mapping grade GPS (linear features will normally require more than one grid reference to show length/direction)

An interpretation of each feature /group of features where possible, based on on-site observations and archive material from the desk based assessment

An assessment of the significance of each feature / group of features (local/regional/national)

A description of known or potential vulnerabilities or threats

Earthworks should be represented on interpretive analytical plan by hachures, not contours. The location of all features must be clearly located on a plan at 1:2500 scale, supplied on archive-standard paper or polyester film. Larger scale plans should be used to illustrate areas of particularly complex detail.

It is not anticipated that there will be any archaeological finds (as this is a non-invasive survey) but should any surface finds be identified these should be recorded in situ and not recovered.

6 Photography

Record photographs should be taken of all identified archaeological features along with general photographs of the site and survey work.

Record photographs will be taken using film, or slide film. The medium used for photography and photographic prints should be of archive quality and the archaeological contractor should provide details of the selected format and materials, and obtain confirmation that the method and materials proposed are suitable from the project manager.

Good quality digital photography may also be used to supplement the record photographs; however this format must **not** be used as an alternative to film or slide film. For digital photographs the cameras used should have a minimum resolution of 4 megapixels and each image should be supplied in three file formats (as a RAW data file, a DNG file and as a JPEG file).

Photographs must be accompanied by a plan(s) showing the position from which the photographs were taken and the approximate axis of each shot. Photographs must also be accompanied by a register detailing the subject, the date taken and the name of the photographer.

7 Reporting

The final fieldwork report should include background information on the purpose of the project, a description of the methodology employed, and a full description and interpretation of the results. The report should be produced with sufficient care and attention to detail to be of academic use to future researchers, and for potential publication. As a minimum the report should include: W.O.L.F & Heeley City Farm November 2012

Summary

A short concise (executive) summary of the aims of the project and the main findings, including details of the survey contractor and client, a description of the survey techniques used, the date the work was carried out and under what conditions, and any limitations and/or problems encountered.

Site Location and Description

This section must include a location map of the survey area at a suitable scale to locate the site within the county and a more detailed site location map with surrounding geographic details. A central grid reference to a minimum of 8 figures must be given for the site. A short description of the topography and current land uses must also be included.

Account of survey results

A summary of the archaeological periods and monuments encountered, in chronological order. This should include an interpretation of the monuments, sites and features and any observed relationships and estimates of their dates.

A catalogue that includes the following fields of information: unique site identifier; centred OS national grid reference; monument type; description; condition; cross-references (to field notes/sketch plots, photos & historic maps); photographs.

Note: Where a monument type is given, it should be an approved term, as given in the standard thesaurus of monument types (RCHME 1999). Where a monument type cannot be confidently given, the reasons for this should be given in the accompanying text description. Any other terms used should be clearly defined and use accepted national standards where possible.

Location plans of all recorded features at a scale that enables easy site identification and that depicts the full extent of the site investigated. The plans should clearly and accurately indicate those areas that were difficult to survey or were impenetrable and require further work.

Where appropriate, photographs of all recorded features should also be included in the report, along with general photographs of the survey work in progress. The report should also include relevant information compiled during the desk-based assessment stage.

Analysis

A brief summary of the main types and periods of archaeological feature recorded and their significance. This should be cross referenced with the plans and the inventory and should (as a minimum):

Identify the features most at risk of damage or deterioration and suggest management which would mitigate this

Identify any features or areas of the site for which further archaeological investigation and/or recording is considered desirable.

Inventory

A clear numbered list of primary component sites and features detailing their NGR location to a minimum of 8 figures, description, and interpretation. Where appropriate features in the inventory should be cross referenced with the South Yorkshire Sites and Monuments Record (SMR).

Survey Plans and Diagrams

All plans and diagrams should be clearly readable and produced at an appropriate scale (generally 1:2500, with areas of complex detail produced at a larger scale) and should be cross-referenced against all the features in the inventory. Maps and plans must include geographical details so that locations are easily identifiable. 3D digital versions of all plans must be supplied in AutoCAD 2007 (or earlier) format (*.dwg or *.dxf). Where these are not available digital scans of high-quality hand drawn plans will be acceptable.

Photographs

A photograph must be included for each primary component of the site/ feature described in the report, which must be clearly cross-referenced with the inventory. These should also be submitted in a digital format, e.g. on a CD, accompanying the hard copy report (see section above). W.O.L.F & Heeley City Farm November 2012

Quantified index to the archive and a statement of the archiving arrangements

Bibliography

A copy of this specification (as an appendix)

Methodology statement

This should be included as an appendix and should briefly outline:

the equipment used to compile the earthwork survey plans

the method used to calibrate these surveys to the OS national Grid

a description of the software used to compile the survey and the report including illustrations.

8 Report Deposition

A draft report for both stages of the work should be produced and submitted to W.O.L.F and EPIP for comments by **February 18th 2013**.

Within 1 month (or such other period as may be mutually agreed) of completion of the draft report a full report should be provided (taking into account any comments or amendments required by SYAS, W.O.L.F and EPIP).

6 copies of the final report are required: EPIP, W.O.L.F, Mr. L. Batty, and Barnsley Museum will all require 1 full copy in a bound A4 printed format and a full digital copy of the report in both word and PDF format. 1 additional A4 bound copy of the report and a digital copy in PDF format must be submitted to both the South Yorkshire Archaeology Service (SYAS) and Barnsley Archives on completion of the project.

A database of records must be submitted with the final report to the South Yorkshire SMR (held by SYAS). The Database format should be compatible with MIDAS xml, which forms the industry standard. The data structure of the records should be created according to the latest version of MIDAS, which is MIDAS Heritage available at <http://www.english-heritage.org.uk/publications/midas-heritage/>. This should also include metadata so that they have the background information e.g. scale of data capture.

Acceptable formats for digital survey information are:

MAPINFO Interchange format (*.MIF)

CAD (*.DXF)

The copyright holder must agree a license with SYAS to allow them to give out the data to enquirers once it is in the SMR.

Upon completion of the work, the archaeological contractor should make their work accessible to the wider research community by submitting digital data and copies of reports online to OASIS (the Online Access to Index of Archaeological Investigations (OASIS) Project

using the online form available at <http://ads.ahds.ac.uk/project/oasis/>. 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.

9 Site Archive

Within 6 months of completion of the fieldwork a full site archive comprising the original paper records and plans, photographs, negatives etc, should be deposited with Barnsley Archive Service, **who should be contacted to discuss archiving arrangements at the outset of the project** (contact Paul Stebbing; 01226 773950 PaulStebbing@barnsley.gov.uk).

A copy of the archive index should also be deposited with the South Yorkshire Sites and Monuments Record, together with a selection of images suitable for display or educational purposes. W.O.L.F & Heeley City Farm November 2012

The contractor will either arrange for copyright on the deposited material to be assigned to the archive repository, or will arrange to licence the archive repository to use the material, in perpetuity; this licence would allow the archive repository to reproduce material, including for use by third parties, with the copyright owner and author(s) suitably acknowledged

10 Copyright

The author of the material should give permission for the material presented within any reports, and other documents produced as part of this project, to be used by EPIP, W.O.L.F and Cawthorne Park Woodland Ltd in perpetuity, although the author of the material retains the right to be identified as the author of all project documentation and reports as specified in the *Copyright, Designs and Patents Act 1988* (chapter IV, section 79). The permission will also allow the South Yorkshire Archaeology Service to reproduce material, including for non-commercial use by third parties, with the copyright owner suitably acknowledged.

11 General considerations

The project will be managed by Simon Lee (W.O.L.F) assisted by Sally Rodgers, Community Heritage Officer (Heeley City Farm).

The project will be monitored as necessary and practicable by SYAS, in its role as “curator” of the county’s archaeology, and by Tegwen Roberts from EPIP. The contractor will ensure that arrangements are made for monitoring visits and meetings before, during and after the archaeological site work, as appropriate.

Monitoring meetings will typically involve an initial site visit, a further visit(s) to review findings during or near completion of fieldwork, and a final discussion when the report reaches an advanced draft. Time must be allowed for all staff involved in the fieldwork/report to discuss progress with the monitors.

The archaeological contractor will report any significant or unexpected discoveries immediately to the project monitors.

Cawthorne Park Woodland Ltd. does not accept any liability for any loss or injury sustained as a result of entering the site and persons doing so do so entirely at their own risk.

12 Authorised alterations to Specification by consultant

It should be noted that this specification is based upon a brief examination of the site by W.O.L.F. and EPIP. Archaeological consultants submitting tenders should carry out an

inspection of the site prior to submission. If, on first visiting the site or at any time during the course of the recording exercise, it appears in the archaeologist's professional judgement that:

a part or the whole of the site is not amenable to recording as detailed above, and/or

an alternative approach may be more appropriate or likely to produce more informative results,

it is expected that the archaeologist will contact EPIP as a matter of urgency.

If the consultant has not yet been appointed, any variations that EPIP considers to be justifiable on archaeological grounds will be incorporated into a revised specification, which will then be re-issued to the tendering consultants. If an appointment has already been made and site work is ongoing, W.O.L.F. will resolve the matter in liaison with EPIP (and SYAS).

13 Unauthorised alterations to Specification by consultant

It is the archaeological consultant's responsibility to ensure that they have obtained the consent of EPIP, in writing, to any variation of the specification prior to the commencement of on-site work or (where applicable) prior to the finalisation of the tender. Unauthorised variations will be solely at the risk of the consultant and may result in non-payment if subsequent work is deemed unsatisfactory. W.O.L.F & Heeley City Farm November 2012

14 Technical Queries

Any technical queries arising from the specification detailed above should be addressed to EPIP without delay.

15 Valid Period of Specification

This specification is valid for a period of one year from date of issue.

16 Health and Safety

Contractors are expected to abide by the *1974 Health and Safety Act* and its subsequent amendments as stated in the *Construction and Design Management Regulations 1994*. Appropriate provision of first aid, telephone and safety clothing as described in the *SCAUM* manual on archaeological health and safety must be followed. The project must have a nominated safety officer.

Health and safety will take priority over archaeological matters. All those undertaking fieldwork must comply with all Health and Safety Legislation; this includes the preparation of a Risk Assessment.

Necessary precautions should be taken over underground services and overhead lines.

The archaeologist or archaeological organisation undertaking fieldwork should ensure that they, or any proposed sub-contractors, are appropriately qualified to undertake such projects.

The archaeologist or archaeological organisation undertaking the survey should ensure that they are adequately insured, to cover all eventualities, including risks to third parties.

17 Submitting a Proposal

A detailed project design for the work outlined above should be formulated by potential contractors and submitted to W.O.L.F and Heeley City Farm. for consideration (in consultation with EPIP). The proposal should include:

A description of the proposed fieldwork methods to be used.

A projected timetable for work on the site.

Details of the arrangements made for deposition of the site archive

A breakdown of costs for the proposed work (including, as a minimum, the desk based assessment and survey work, reporting and archiving costs)

The work shall be carried out by appropriately qualified and experienced staff; details of staff numbers and their relative experience should be included, plus their responsibilities in carrying out the work. Staff CVs should be included as supporting documents with the application (unless already supplied to EPIP and/or English Heritage in previous project specifications).

At least three tenders will be sought. All responses will be assessed in terms of cost, quality of project design and timescale.

The successful contractor will be required to enter into a contract with the East Peak Innovation Partnership (EPIP) for the delivery of the work in accordance with this brief and the tender documents submitted.

18 Available guidance

English Heritage's guidance publication *Understanding the Archaeology of Landscapes: a guide to good recording practice* (English Heritage 2007) can be downloaded from the English Heritage website. It provides a set of survey conventions for analytical field survey and offers a number of exemplary case studies. W.O.L.F & Heeley City Farm November 2012

Once a project design has been agreed, any changes to the project design must be discussed and agreed with the East Peak Industrial Heritage Programme before implementation.

Applicants should submit a written copy of their tender, along with the requested project plan and supporting documents no later than 5pm January 15th 2013.

The work must be completed and the final report submitted in draft form no later than **February 18th 2013**.

19 Contact Details

Please submit a written copy of your tender along with any supporting documents by post to:

Simon Lee (W.O.L.F)

2 Tinglebridge Lane

Hemingfield

Barnsley

South Yorkshire

S73 0NP

Mobile:07973 726118

Tel: 01226 784488 (work)

simon@therackgroup.com

Please mark the envelope 'tender submission' and include the name of your organisation on the back of the envelope.

20 List of References

(Many of these documents are published by English Heritage, Swindon, and can be downloaded from the English Heritage website)

English Heritage 2002, *With Alidade and Tape: graphical and plane table survey of archaeological earthworks*).

English Heritage 2003, *Where on Earth Are We? The Global Positioning System (GPS) in archaeological field survey*.

English Heritage 2006, *Management of Research Projects in the Historic Environment: the MoRPHE Project Managers' Guide*.

English Heritage 2007, *Understanding the Archaeology of Landscapes: a guide to good recording practice*.

English Heritage 2008a, *SHAPE: A Strategic Framework of Historic Environment Activities and Programmes in English Heritage*.

Forum for Information Standards in Heritage (FISH) 2007, *MIDAS Heritage – a data standard for the historic environment* <http://www.english-heritage.org.uk/publications/midas-heritage/>

HMSO 1974 *Health and Safety at Work Act*
http://www.opsi.gov.uk/RevisedStatutes/Acts/ukpga/1974/cukpga_19740037_en_1

HMSO 1988 *Copyright, Designs and Patents Act*
http://www.opsi.gov.uk/acts/acts1988/ukpga_19880048_en_1.htm HMSO 1994

Construction (Design and Management) Regulations
http://www.opsi.gov.uk/si/si1994/uksi_19943140_en_1.htm

Institute of Field Archaeologists, 1994, revised September 1999 W.O.L.F & Heeley City Farm November 2012

IFA Standard and Guidance for the archaeological investigation and recording of standing buildings or structures
<http://www.archaeologists.net/modules/icontent/inPages/docs/codes/build2.pdf>

RCHME 1999. *Recording Archaeological Field Monuments a descriptive specification*. RCHME. Swindon

SCAUM 2006 *Health and Safety in Field Archaeology Manual*
<http://www.famearchaeology.co.uk/>

I.D.Latham Oct 1992, *Results of an Archaeological Survey at Cawthorne Woods, South Yorkshire, South Yorkshire Archaeology Service*

T.Glagman M.B.E. F. Eng 1996. *Ironmaking in Cawthorne Park Woods, South Yorkshire Archaeology Service* W.O.L.F & Heeley City Farm November 2012



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