4 LOW FORGE, WORTLEY, SOUTH YORKSHIRE: AN ARCHAEOLOGICAL EVALUATION

CS Archaeology
November 2009

On behalf of:	Mr A Grace 4 Low Forge Wortley South Yorkshire
National Grid Reference (NGR):	SK 4291 3995
CSA Report Number:	039
Report and Fieldwork by:	Mr. C. Scurfield
Pottery Assessment:	Dr. C. G. Cumberpatch
Slag Assessment:	Dr. R. Mackenzie
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Project Timing:	Fieldwork August 2009 Report November 2009

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1. SUMMARY

1.1 This represents a pre-determination evaluation for Scheduled Monument Consent. This relates to the proposed development of an extension to 4 Low Forge ,Wortley, Barnsley, South Yorkshire, which lies within the Low Forge Scheduled Monument (No. 34714).

1.2 The evaluation featured relatively undisturbed deposits. The lower deposits featured a medieval slag heap, which probably relates to a water powered bloomery. The slag heap was then overlaid by 17th century charcoal deposits that were, in turn, overlain by 19th century and modern levelling deposits.

1.3 No further site work is recommended but further analysis of the slag and charcoal samples is recommended to provide a fuller and more definitive understanding of the site.

2. INTRODUCTION

2.1 The Proposed Development Area (PDA) lies on the left bank of the River Don, on gradually sloping ground on the inside of a meander of the Don, west of Wortley, Barnsley (**Figure 1**). The PDA consists of a small rectangle, 4m x 4m in extent which abutts the rear wall of 4 Low Forge (SK 4291 3995: **Figure 2**).

2.2 The evaluation was undertaken over 5 days between the 31st July and the 5th August 2009 in response to a condition placed on Scheduled Monument Consent by English Heritage.

3. ARCHAEOLOGICAL AND HISTORICAL BACKGROUND

3.1 This has been extensively referred to in the Written Scheme of Investigation (Appendix 1).

3.2 Historic maps have been consulted (**Figure 7**) but do not provide a detailed enough context for the results below. Low Forge is well represented in the 1916 plan and on the Ordnance Survey map of 1855 where the dwelling house, which was subsequently subdivided, is depicted. Unfortunately the tithe map of 1840 shows a cluster of buildings on a less detail scale than the Ordnance Survey map.

3.3 No previous archaeological work has been carried out at Low Forge **or** within its Secluded Monument area (**Figure 2**).

4. AIMS AND OBJECTIVES

4.1 In the application site, any ground disturbance would potentially impact on nationally important archaeological remains, and any new-built structures would occupy a site regarded as of national importance. Below-ground works associated with the development might entail damage to, or destruction of, any archaeological deposits which survive within and below the topsoil cover. These remains and deposits form part of Low Wortley Forge, a site of national significance, designated as a Scheduled Ancient Monument.

4.2 The aim of archaeological evaluation is to gather sufficient information to establish the presence/absence, nature, date, quality of survival and importance of any archaeological remains to enable an assessment of the potential and significance of the site to be made. When all stages of evaluation are completed, an informed decision can be taken as to whether any development within the Scheduled Ancient Monument should be permitted, and on any appropriate future treatment of the remains and any mitigatory measures, such as sympathetic foundation design, incorporation within areas of open space and/or further archaeological work, in advance of, or during, any permitted development.

4.3 As the buried archaeological remains form part of a site of national importance, there is a strong presumption in favour of their physical preservation, and of maintaining future access to the archaeological resource for future investigation, site display etc. Wherever possible, the preferred option will be the preservation of significant archaeological remains *in situ* and the maintenance of access to the remains. The potential for reconciling the needs of preservation with those of development will be fully explored, and will be assessed by English Heritage in conjunction with the County SMR. The results of the evaluations will enable the impact of the proposals on the archaeological resource to be assessed, and thereby enable informed decisions to be taken on the proposed development, and the need for any design amendments and/or mitigation strategies for management of the archaeological resource, including physical *in situ* preservation of archaeological remains, and excavation and preservation 'by record'.

4.4 If human remains are encountered during the course of this evaluation, it may be necessary to remove these, under the conditions of a Home Office burial licence, to ensure that they are treated with due dignity. The preferred option would be for them to be adequately recorded before lifting, and then carefully removed for scientific study, and long-term storage with an appropriate museum; however, the burial licence may specify reburial or cremation as a requirement.

5. METHODOLOGY

5.1 This has been carried out in accordance with the WSI (Appendix 1) issued by CS Archaeology (6/2009).

5.2 A metal detecting survey was carried out across all exposed trench surfaces and resultant spoil heaps. The results were negative for metal artefacts, frequent positive signals were noted but these reflected the high quantities of iron slag throughout the deposits in trench 1.

5.3 The foundation trench was recorded (**Figures 4 & 5**: **Plates 2-8**) and written records of the contexts were made on *pro-forma* recording cards summarised in Appendix 2. A photographic record was made of all deposits with a 35mm SLR camera using silver based film, digital shots, with an 8 mega-pixel resolution, were also taken to illustrate this report and supplement the archive. All photographs have been included in the site archive (Appendix 2) in print and digital formats.

5.4 Datum levels were provided via spot heights from the OS digital site plans, and were transferred via calibrated dumpy level.

5.5 Mr. K. Miller (English Heritage) and Mr. A. Lines (SYAS) were kept fully informed of the progress of the work.

6. RESULTS

6.1 The Evaluation

6.1.1 *Introduction*, the evaluation trench was 1.2m wide and 4.8m long and abutted the centre of the southwest elevation of 4 Low Forge, Wortley (**Figure 3**: **Plates 1-2**). This evaluation has been able to confirm the depth and sequence of industrial activities, which appears to be relatively undisturbed from as early as the late 13th century (below Section 6.2).

6.1.2 From the bottom of trench 1 upwards (**Figure 5**), the deposits can be broadly classified a lower slag heap [120 & 118]. This was overlain by charcoal deposits [102, 108 & 104] interrupted by an intervening deposit [103] which included large iron slag fragments (**Plates 3-4**). These upper deposits were overlain by modern levelling deposits [100 & 105].

6.1.3 Natural deposits were reached at the base of trench 1, a buff coloured glacial clay with large rounded stone [121]. There was a notable absence of subsoil/topsoil above this natural clay [121], which suggests the area had been levelled prior to the deposition of the iron slag heap [120 & 118], which indicates a deliberate delineation and preparation of the area as a spoil heap.

6.1.4 The interleaved slag deposit [118] within the larger slag body [120] suggests a slightly staggered sequence of deposition, within a narrow time period. Deposits at this level were devoid of charcoal and contrasts with the upper deposits.

6.1.5 The slag heap [120 & 118] is characterised by a undulating northeast slope typically settled at a 5º angle and continues up until the foundation cut [110] (**Plates 7-8**) for what was an extension to what is now 4 Low Forge. At the northeast end of the trench, adjacent to the house wall, are two further deposits [117] and [116] which overlie the slag heap [120]. Overlying these deposits was a thin deposit [109], characterised by compacted and worn fragments of slag, indicates that this layer represents the exposed top of a slag heap, which had been exposed, and walked over, for a prolonged period of time. A general date for this deposit [120 & 118] comes from the pottery assessment below, confirming that iron working was taking place during the later Medieval period (later 13th to mid 16th centuries), and was associated with domestic activity.

6.1.6 After a prolonged period of time, possibly up to 300 years, deposition within the PDA/trench resumed. The slag heap could have been exposed from the medieval period up until sometime in the 17th century when the charcoal [108 and 104] was deposited. Close examination and testing of the charcoal has confirmed the presence of hammerscale. Hammerscale is a result of macroscopic shrapnel from iron forging and indicates that the charcoal [102, 104, 105 & 107] was waste deposits from smithing activity. The smithing site is unlikely to have been too far away (pers. comm. Dr J Wheeler). Indeed,

because of the charcoal depth, up to 0.46m, the smithy must have been very close to the PDA/evaluation trench. In the trench section (**Figure 5**) the apparent migration of the charcoal heap to the northeast may suggest dumping from the northeast. This could indicate that the site of the Smithy lies on or near the present 18/19th century house.

6.1.7 The evaluation has also confirmed that the present ground surface lies 1.76m higher than the natural ground surface (**Plate 5**). This is the result of centuries of ironworking with an accumulation of iron slag and then charcoal topped by levelling deposits. There was no evidence for structures within the evaluation trench or as could be extrapolated, within the PDA.

6.2 The Pottery Assessment (Dr. C. Cumberpatch)

6.2.1 *Introduction*. The pottery assemblage from 4 Low Forge, Wortley was examined by the author on 28th August 2009. The assemblage consisted of twenty-two sherds of pottery weighing 328 grams and represented a maximum of twenty vessels. The details are summarised in Table 1.

6.2.2 *Discussion.* Context [118] produced the earliest pottery from the site, two sherds of later medieval Coal Measures Purple ware. Coal Measures wares were manufactured in the Don Valley between the later 13th and early to mid 16th century and are particularly associated with potteries in Green Lane, Rawmarsh and at Firsby Hall Farm as detailed elsewhere (Cumberpatch 2004). The purple glazed wares date to the period between the mid to late 15th century and the mid to late 16th century and are part of the wider move away from traditional medieval wares towards the post-medieval pottery tradition (Cumberpatch 2003).

Contexts [100, 102, 103 and 108] all produced small groups of early modern pottery with small quantities of later pottery in context [102]. Context [108] produced a sherd of probable Blackware of 17th century date and the single sherd from context [100] may also date to the 17th century. The majority of sherds were of locally produced vernacular tableware type (Slipware, Slip Coated ware and Late Blackware) and context [108] also produced a sherd of 18th or early 19th century Creamware (c.1740 – c.1820). The sherd of transfer printed (TP) Whiteware from context [102] appeared anomalous in what is otherwise a relatively homogeneous assemblage and may indicate a later date for this context unless it can be shown to be intrusive in an earlier context.

6.2.3 *Conclusion***.** Although small in size, the assemblage is not without interest, particularly as it indicates activity on or close to the site in the later medieval period as well as the early modern period. It is difficult to draw any further conclusions from such a small group of pottery, but it is certainly indicative of domestic activity on the site and as such should be deposited with the appropriate local museum where it will be available for examination by future researchers.

6.4 Archaeometallurgical Assessment (Dr. R. Mackenzie)

6.4.1 The following report is an assessment of possible industrial process residues recovered during archaeological fieldwork at Low Forge, Wortley. The material assessed is a representative sub-sample of the slag residues recovered from context [120] and one fragment from context [103].

6.4.2 A basic visual examination of the material in the sample has been carried out and it has been assessed for archaeological potential; the results of the assessment are summarised below.

6.4.3 *Results:* the sample from context [120] is predominantly composed of fragments of a low density slag that is black to dark graphite grey in colour. The surface texture of many pieces has a ropey flow like appearance and most fragments have an abundance of holes left by gas bubbles. Some fragments have a comparatively homogenous highly vesicular 'crunchie bar' like texture; the vesicules in these pieces are approximately 1mm in diameter. One fragmented lump of slag is denser than others from the same context, and it has a more defined flow pattern on its upper surface.

The material from context [103] consists of a fragment of refractory stone or brick with a lump of slag attached to it. The slag is a rough agglomerate containing fragments of charcoal and possibly coal. The slag partially covers the fracture surface of the brick/stone fragment.

6.4.5 *Interpretation:* the distinctive appearance and texture of the slag from context [120] suggests that it probably relates to water-powered bloomery iron smelting *(Vernon et al. 1998)*. The dating evidence for context [120] and history of the site supports this hypothesis.

The fragment of slagged stone/brick from context [103] is more undiagnostic in nature and it cannot be related to a specific production process.

6.4.6 *Discussion & Recommendations: v*ery few sites of known water powered bloomeries have been excavated and slag from this type of bloomery is rare. (Bayley *et al* 2008) Knowledge of slags from water-powered bloomery sites is currently almost non-existent and it is a current area of research interest. Water powered bloomeries are thought to represent an important technological stepping stone between 'normal' bloomeries and later blast furnaces.

6.4.7 The nature of the Low Forge site and the archaeological context of the slag from context [120] mean that the slag is of National significance (pers. comm. D. Dungworth, English Heritage).

6.4.8 Given the importance of the slag and potential for its analysis to increase knowledge in this area, it is recommended that metallographic and chemical

analysis is carried out on slag from context [120]. It is also recommended that, if possible, the results of analysis be disseminated through a relevant publication, such as the Newsletter or Journal of the Historical Metallurgy Society.

6.4.9 The main aim of the analysis should be to determine/confirm whether the slag does originate from water powered bloomery iron smelting. Given the relatively small scale of the excavation, it is recommended that the analysis be limited to a small number of fragments of slag that represent the main types present i.e. one fragment each of the low density vesicular slag and dense tap slag. All of the assessed slag should be retained as part of the site archive.

6.5 Charcoal Assessment (Dr J Wheeler)

6.5.1 *Introduction*, 20 preliminary samples were examined for this assessment from context [104]: 70 % of species type is Oak (Quercus sp.), 25% hazel (Corylus sp.), and 5% birch (Betula cf.). Context [104] can by default be dated via pottery within [108] to the 17th century.

6.5.2 *Interpretation,* oak appears to have been sourced from both branchwood and stemwood, most probably as a result of trimming and pruning management of the branchwood - thus also included smaller stems in the process, whereas hazel and birch appear to come from stemwood sources - which is typical of coppicing. Growth stresses in these species also show a greater proportion of growth stress which is indicative of stems growing out at an angle from the boll, i.e. a coppice stool. One sample (6) has a 45 degree cut mark that indicates the stem was growing at an angle out of a main stem. The annual growth ring width variation sequences in this sample suggest that a mean interval of 5 years in cutting - thus indicating a 5 year cutting cycle that is typical of hazel coppicing and cutting practices - even as late as the 19th century. This cutting trend is seen in other hazel fragments.

6.5.3 *Discussion & Recommendations*, the analysis of even this small sample set of charcoal fragments from context [104] indicates that oak appears to have been trimmed and pruned, probably pollarded. The underwood, particularly hazel, appears to have been cut on a mean 5 year cycle, which is a standard cutting regime for this species. The wide growth ring width sequences in the majority of oak samples indicate a relatively open environment with no obvious environmental stresses. It is possible that the woodland, if both oak and hazel were sourced from the same site, was managed hazel dominated coppice with the timber stands (the oaks) providing addition fuelwood for the specific process being undertaken at Low Forge and reflected in the upper deposits of Trench 1.

6.5.4 Further documentary and excavation work is recommended in order to determine the location of the possible smithy and its relationship to the wider complex.

7. CONCLUSIONS

7.1 The remains of the former iron-working complex at Low Forge are particularly significant for their range and extent, their long time-period, and their good preservation, and for the large amounts of industrial waste accumulated over many centuries of iron-working. The waste dumps, as well as providing graphic physical evidence of the extent of former industrial activity, also represent a valuable resource for the understanding of the sequence of industrial activities and technological processes here. The site is also significant for the documentary evidence that compliments the diversity of the physical archaeological remains, and together these provide a rare and important record of the historical development of a water-powered ironworking complex and an insight into its operations (Appendix 1).

7.2 The evaluation has demonstrated that the archaeology beneath the PDA is of high importance and significance. In order to fully appreciate these results the scheduled monument requires further work in order to provide a definitive context not only for this evaluation but for future work in the area.

7.3 The deposits encountered probably relate to the presence of a medieval, water-powered iron-working bloomery. Because analyses from water-powered bloomery slags are *'almost non-existent'* further pioneering work is needed in order in order to fully appreciate these deposits.

7.4 This evaluation helped to confirm the Scheduled Monument's potential, and has made a significant preliminary contribution to our understanding of the medieval and post medieval iron industry not only in South Yorkshire but nationally.

8. RECOMMENDATIONS

8.1 Because the deposits were consistent throughout trench 1 which has provided a good insight into the PDA's archaeological resource, no further site work is recommended.

8.2 More detailed environmental analyses (charcoal and slag) are recommended to unlock the archaeological potential highlighted in the initial assessments. This will contribute to a greater understanding of the processes involved with water powered bloomeries and offer specific insights into 19th century smithing practices and in woodland management regimes in the wider geographical area. Because analyses from water-powered bloomery slags are rare further pioneering work is needed in order maximize the information from this evaluation.

8.3 In order to provide a context for these analyses more detailed documentary research is recommended to provide a basis for future archaeological work and management of the monument.

8.3 Because of the excessive financial pressure on the client it is recommended that alternative funding sources should be investigated in order properly secure these recommendations. Especially since the results will benefit archaeology on a regional and national scale.

8. REFERENCES

8.1 Bibliography

Bayley, J., Crossley, D. and Ponting, M. (Eds) 2008 *Metals and Metalworking. A research framework for archaeometallurgy*. London: Historical Metallurgy Society.

Cumberpatch, C.G. 2003 *The transformation of tradition; the origins of the post-medieval ceramic tradition in Yorkshire*. Assemblage http://www.shef.ac.uk/assem/issue7/cumberpatch.html

Cumberpatch, C.G. 2004 *Medieval and post-medieval pottery production in the Rotherham area* http://ads.ahds.ac.uk/catalogue/specColl/ceramics_eh_2003/

English Heritage, 2009 *Scheduled Monument Data Sheet No. 34714*, (http://www.magic.gov.uk,)

CS Archaeology, 2009 *Written Scheme of Investigation for an Archaeological Evaluation at 4 Low Forge, Wortley, South Yorkshire.* Unpublished contractors report.

Vernon R., McDonnell G., and Schmidt 1998 *An integrated geophysical and analytical appraisal of early iron-working: three case studies.* Historical Metallurgy Vol. 32 67-81.

8.2 Cartographic Sources

1840 Plan of the Township of Tankersley and Wortley and the District of Pilley all in the parish of Tankersley and the County of York.

1855 6 inch Ordnance Survey Map, sheet 282.

1916 A Tracing by Mr. J. Shore of a Plan by Mr. F. Whitman of Low Forge.

9. ACKNOWLEGEMENTS

Thank you to Mr. A. Grace and Mille Design for commissioning the archaeological work and to Mr. K. Miller, not only for his help and advice but for his considerable input into the WSI**.** Many thanks to Dr. C. Cumberpatch for dating the pottery which has providing such a valuable time line for the site stratigraphy and to Dr. R. Mackenzie and Dr. J. Wheeler for their significant contributions to this small but revealing evaluation.

FIGURES

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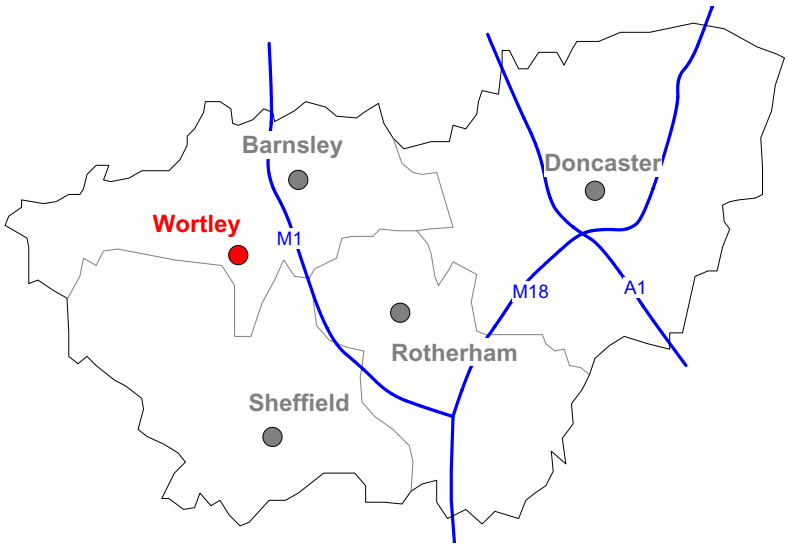
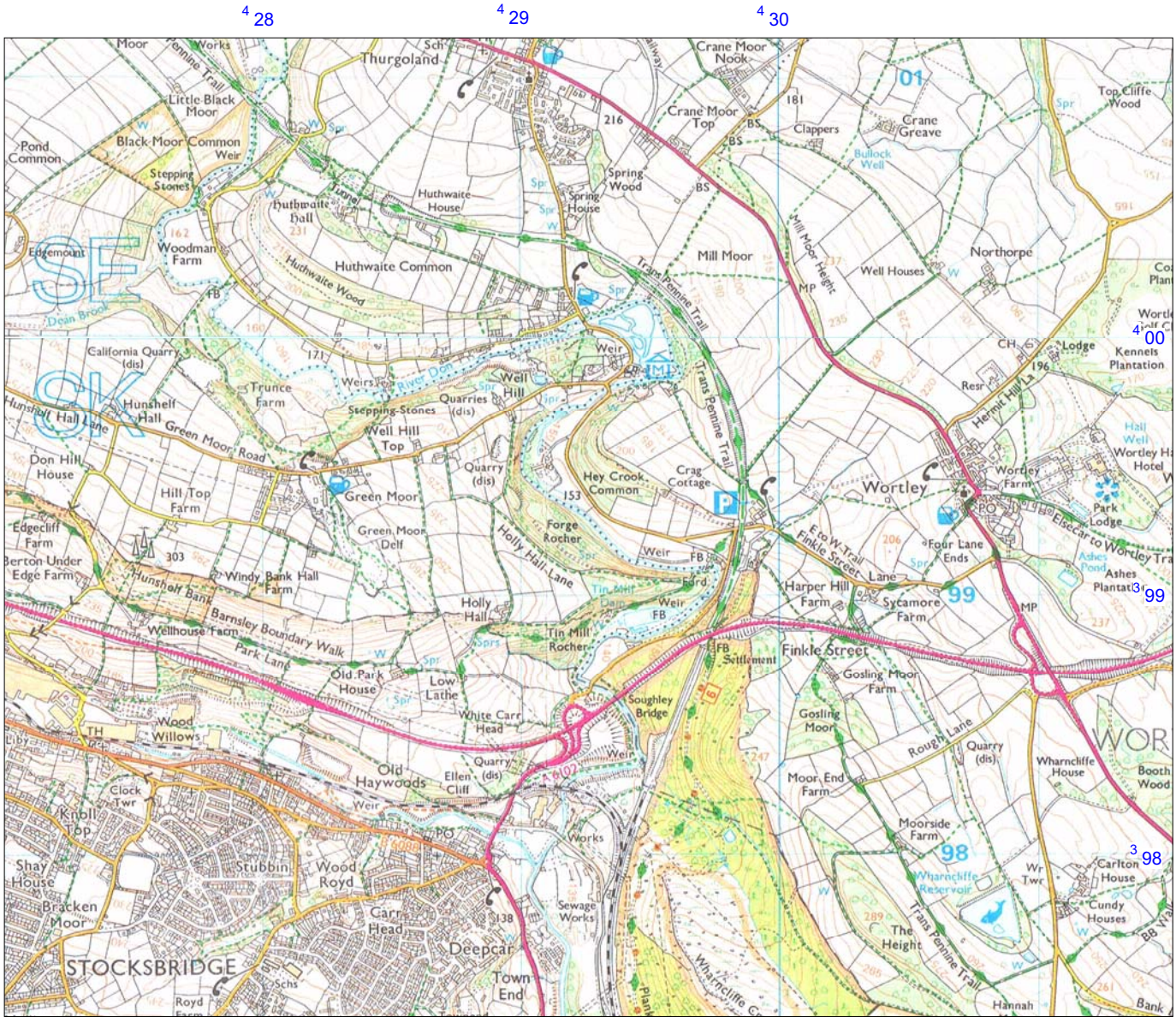
November 2009

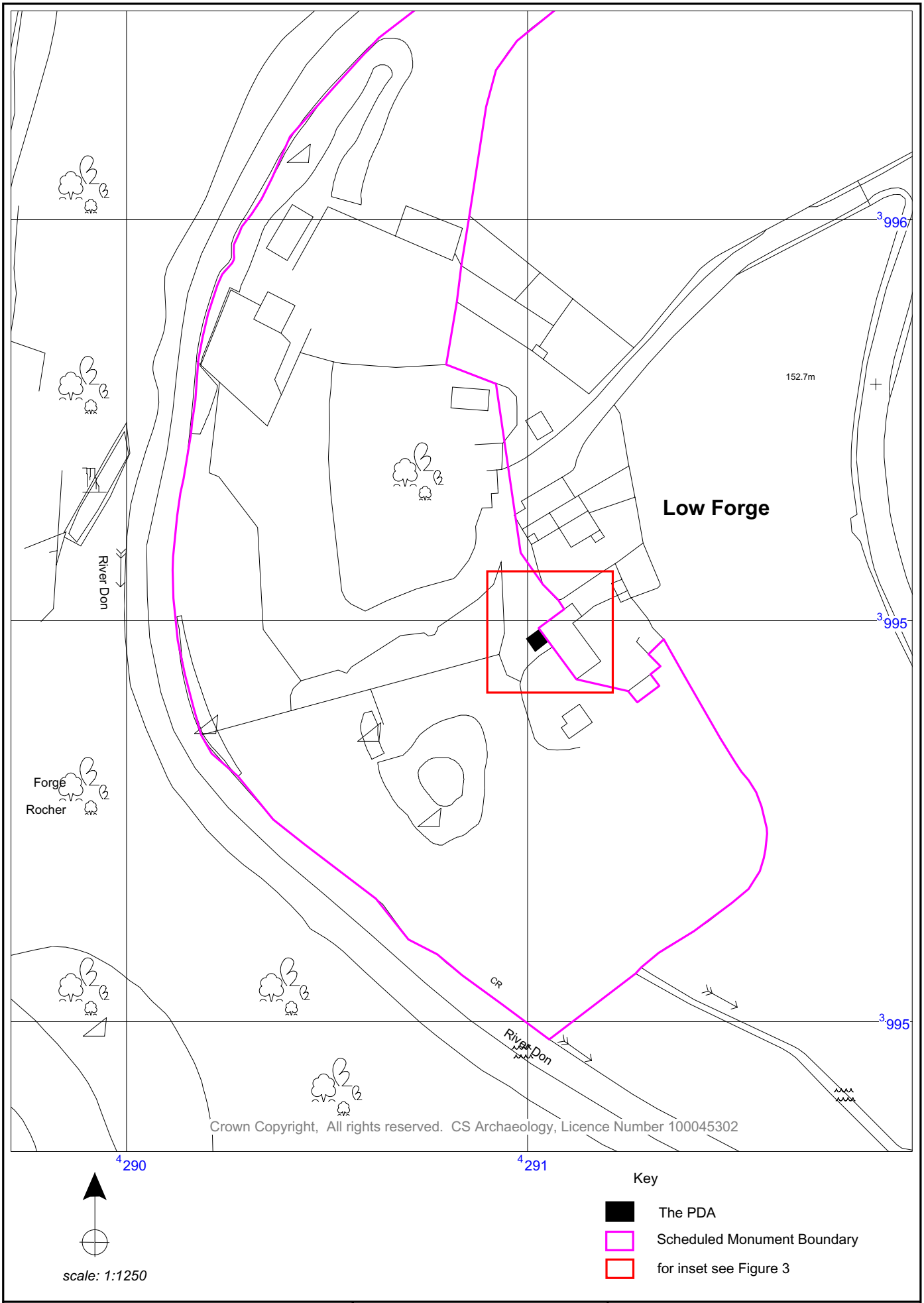




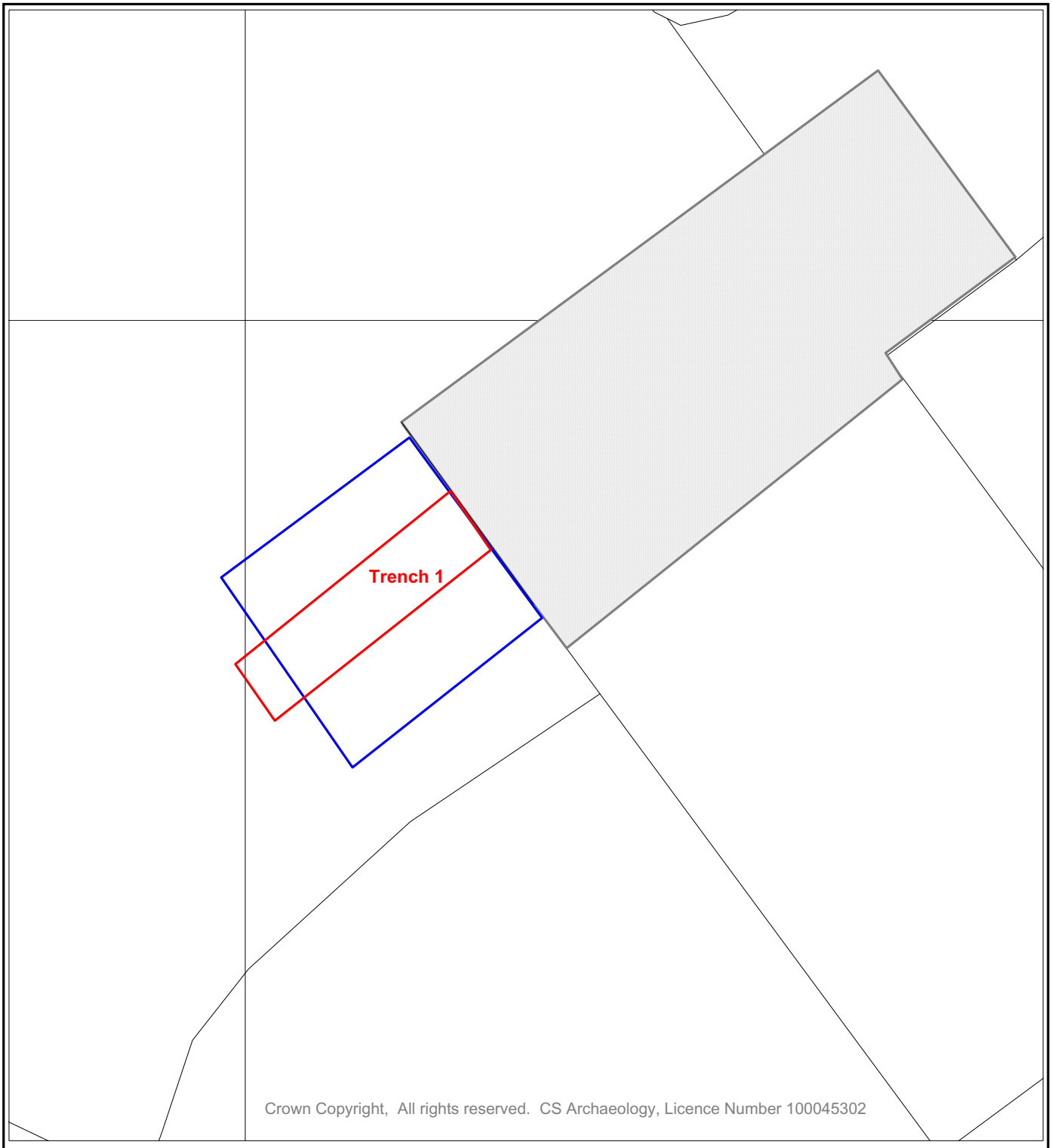
for inset see Figure 2

scale: 1:25000

4 Low Forge, Wortley, Barnsley: An Archaeological Evaluation	CS Archaeology November 2009	Figure 1: Location Map



4 Low Forge, Wortley, Barnsley: An Archaeological Evaluation	CS Archaeology November 2009	Figure 2: Site Location



Key

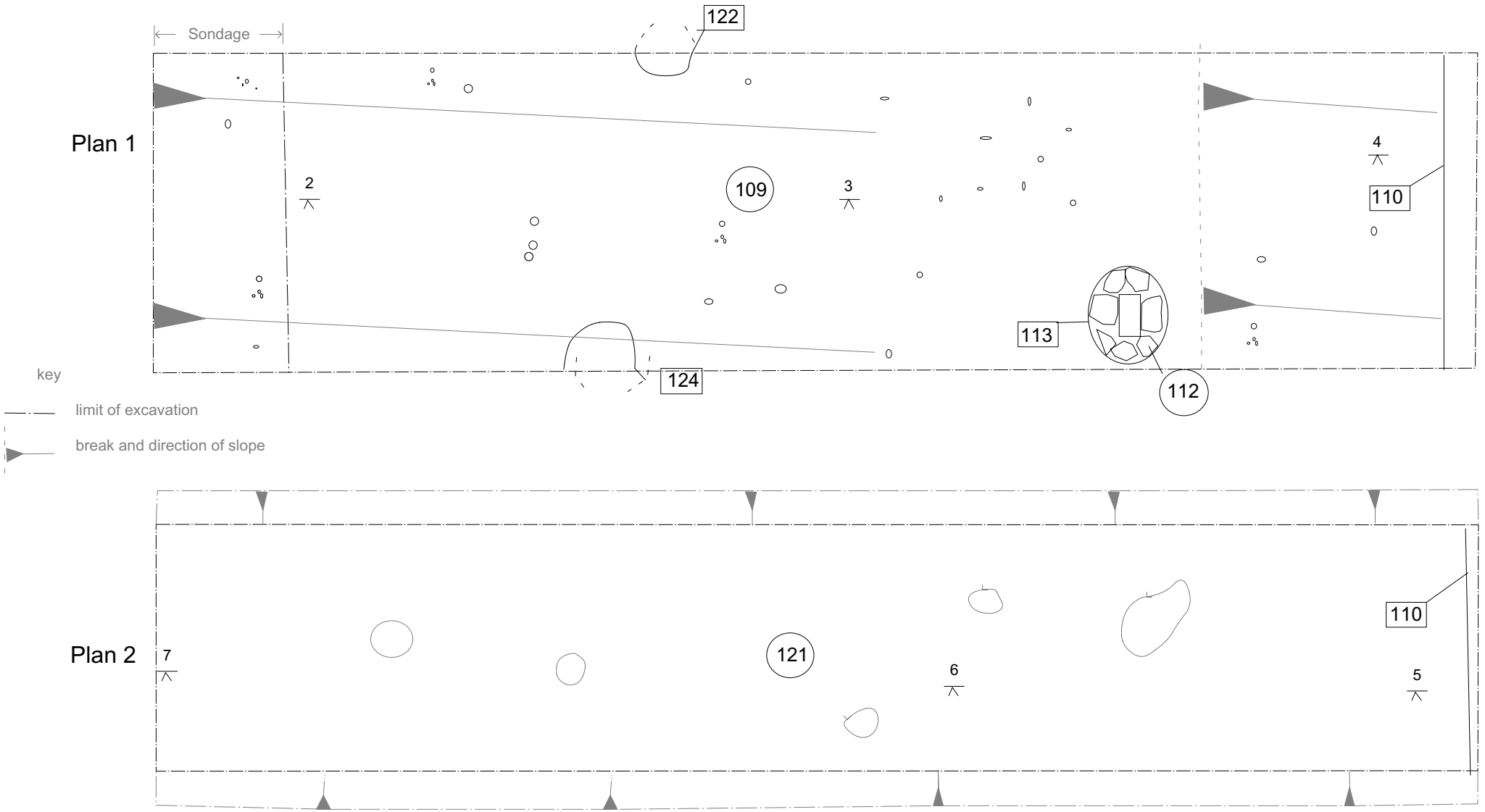
PDA Boundary

Evaluation Trench (1.2m x 4.8m)

4 Low Forge

scale: 1:100

4 Low Forge, Wortley, Barnsley: An Archaeological Evaluation	CS Archaeology November 2009	Figure 3: The PDA with the Evaluation Trench 1



4 Low Forge, Wortley: An Archaeological Evaluation

Levels AOD (metres)
2. 49.97
3. 49.71
4. 49.64
5. 48.84
6. 48.82
7. 48.83

Figure 4: Trench 1 Plans

scale 1:20

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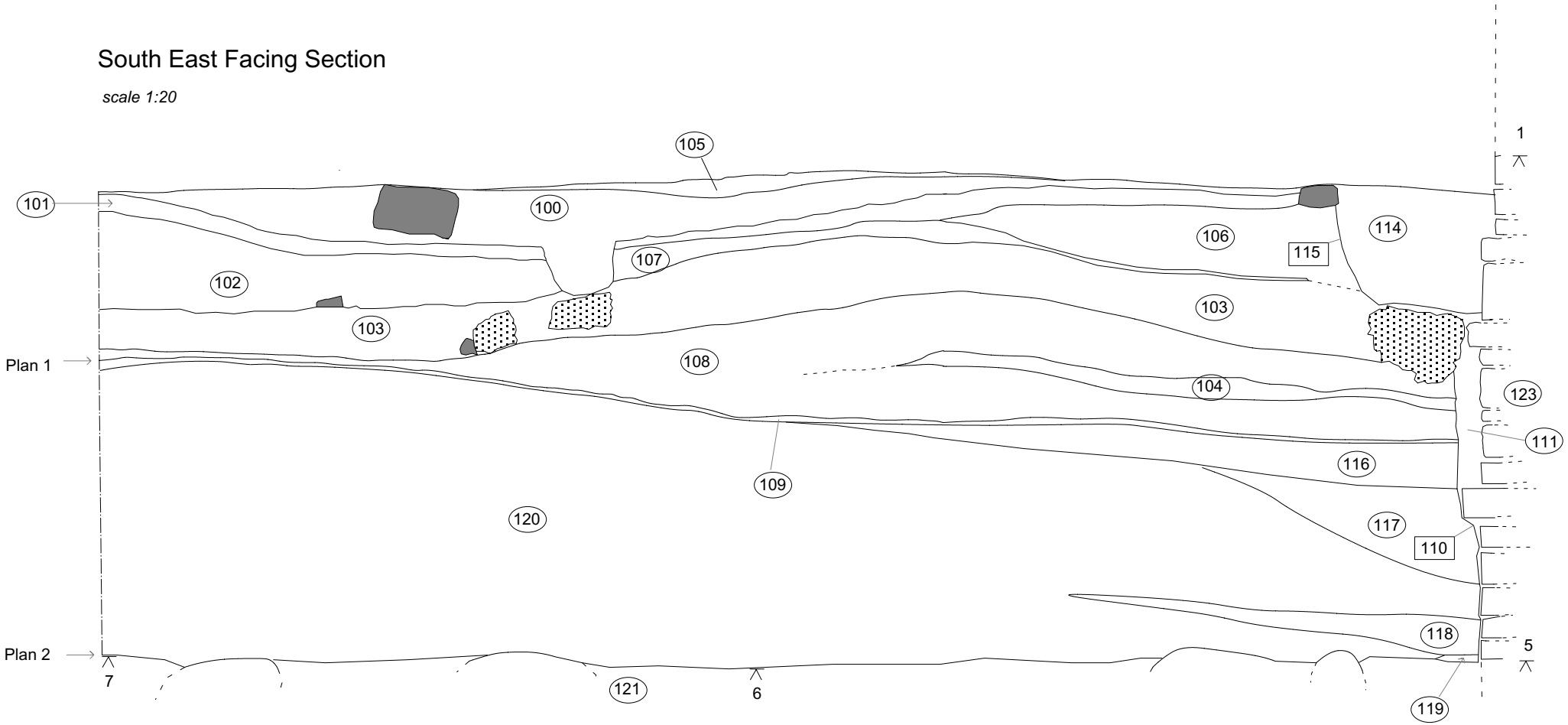
South East Facing Section

scale 1:20



Levels AOD (metres)
1. 50.59
5. 48.84
6. 58.82
7. 48.83

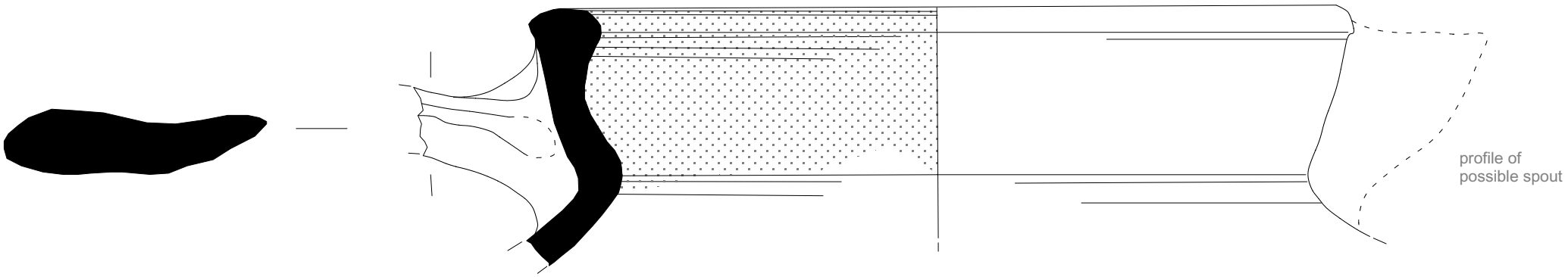
Dating from pottery assessment

102 Upper Charcoal Deposit, c. early Modern
108 & 104 Lower Charcoal, c C17th
(109) 118 & 120 Later C13th to mid C16th

Key

limit of excavation
iron slag
sandstone

4 Low Forge, Wortley: An Archaeological Evaluation	Figure 5: Section 1	CS Archaeology November 2009

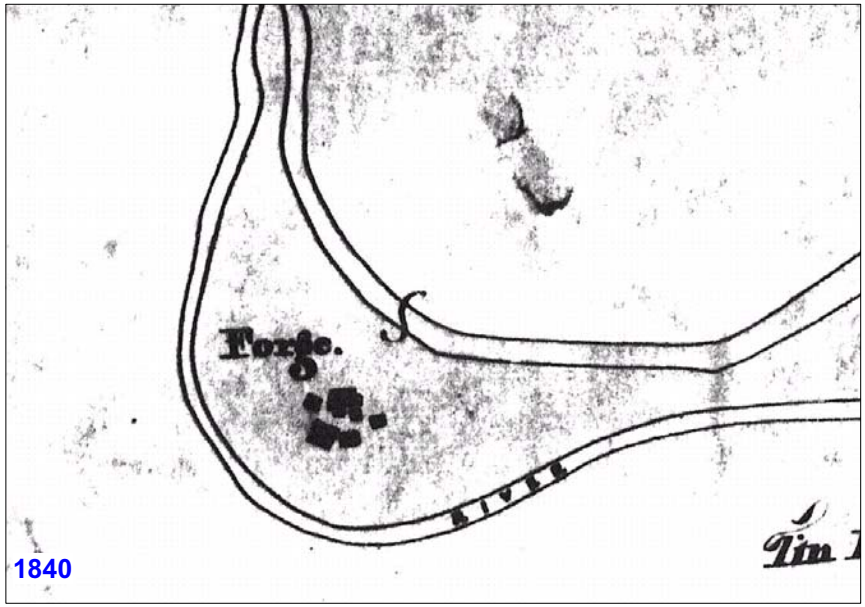


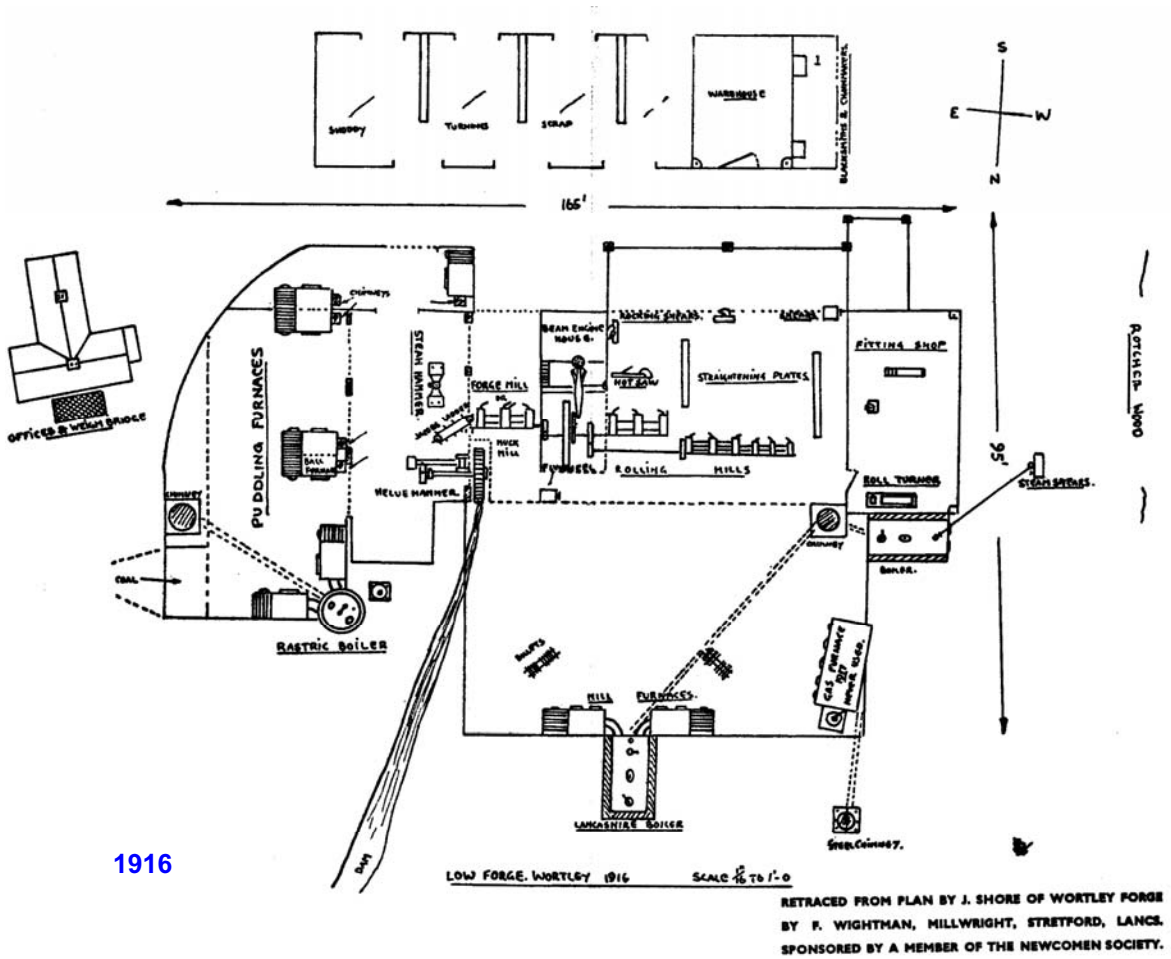
LF09/1

scale 1:1

internal glaze

4 Low Forge, Wortley: An Archaeological Evaluation	Figure 6: Finds Drawing, Medieval Pottery	CS Archaeology November 2009





4 Low Forge, Wortley: An Archaeological Evaluation	Figure 7: Historic Maps and Plans *not to scale*	CS Archaeology November 2009

PLATES

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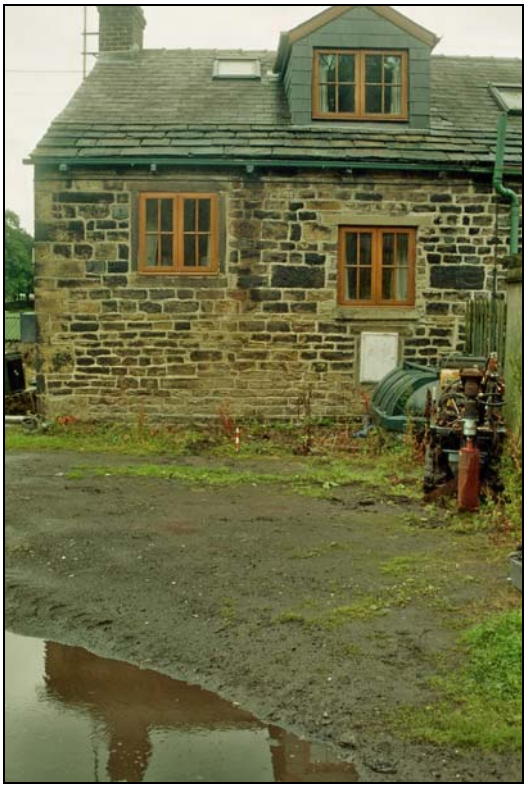

Plate 1: pre-excavation view of trench 1, looking northeast

Plate 2: trench 1 during excavation of the upper level, looking northeast

Plate 3: detail of the upper deposits to the centre of the southeast facing section, looking northwest

Plate 4: detail of the upper and lower charcoal deposits, looking northwest

Plate 5: post-excavation view of trench 1, looking northeast

Plate 6: view of the northwest facing section, looking east

Plate 7: detail of the lower wall [123] and SE facing section, looking north

Plate 8: detail of the lower wall and northwest facing section, looking east

APPENDIX 1

WRITTEN SCHEME OF INVESTIGATION FOR AN ARCHAEOLOGICAL EVALUATION AT 4 LOW FORGE, WORTLEY, SOUTH YORKSHIRE

CS Archaeology

May 2009 (rev June 2009)

0 SUMMARY

0.1 The archaeological evaluation proposal relates to the proposed development of an extension to a dwelling within the Scheduled Monument of (monument number 34714; monument name: 'Water-powered bloomery, iron forge and rolling mill at Low Forge, Barnsley'), henceforth referred to as Wortley Low Forge.

0.2 Because the site is within the scheduled area, any ground-works or proposed development will require Scheduled Monument Consent, irrespective of any planning permission that may be granted; this includes any intrusive archaeological evaluation.

0.3 As the archaeological implications of the proposals cannot be adequately assessed on the basis of currently available information, in accordance with provisions of the Ancient Monuments and Archaeological Areas Act 1979 (as amended), and the recommendations of Planning Policy Guidance note 16 on 'Archaeology and Planning', issued by the Department of the Environment in November 1990, a scheme of archaeological field evaluation has been proposed. The first stage of this scheme would be evaluation by limited trial trenching of a sample of the proposed development area, in order to establish the presence/absence of archaeological remains.

0.4 Accordingly, this specification for trial trenching has been prepared by CS Archaeology with the help of English Heritage in consultation with South Yorkshire Archaeology Service on behalf of the developer. The results of this trial trenching will enable the impact of the proposals on the archaeological resource to be assessed, and thereby enable informed decisions to be taken on the feasibility of the proposed development, and whether mitigatory actions may be appropriate, and if so, what these will comprise. Will the evaluation show that the site contains significant archaeological features, mitigation measures would need to be explored to assess whether physical or *in situ* preservation of the remains could be achieved, or whether detailed excavation of selected areas will take place in order to achieve preservation 'by record'. This assessment will thus enable the development proposals to be amended if necessary, and enable final decisions to be made on the applications for planning permission and Scheduled Monument Consent.

1 INTRODUCTION

1.1 Details

1.1.1 *Site Name:* Land to the rear of 4 Low Forge, Low Forge Lane, Wortley, South Yorkshire

1.1.2 *Location:* 4 Low Forge, Low Forge Lane, Wortley, South Yorkshire

1.1.3 *Status:* Scheduled Monument No. 34714

1.1.4 *Grid reference:* SK 4291 3995

1.1.5 *Area of site:* *c*.0. 0016 ha

1.1.6 *Purpose of the work:* The proposed development area (PDA) involves the erection of a single storey kitchen extension to the present house situated within the nationally important historic site of the former iron works at Low Forge, the remains of which survive as buried deposits, earthworks and the standing remains of buildings and machinery. A large part of the historic site is designated as a Scheduled Ancient Monument, and whilst the site of the dwelling at no. 4 Low Forge lies in an area excluded from the scheduled monument (but still within an area of potential national importance), the proposed building extension would extend onto the Scheduled Ancient Monument (SAM: **Figures 1 and 2**).

The evaluation will establish the presence/absence, character, extent, state of preservation and date of any archaeological deposits within the site outlined in **Figure 2**, and if suitable, samples will be collected for palaeoenvironmental research.

1.2 Planning Background

1.2.1 The archaeological implications of the development will be identified and addressed in order to inform decisions on the acceptability of the proposals which may form the basis of applications for planning permission and for Scheduled Monument Consent (SMC). Because the proposal directly affects a Scheduled Ancient Monument, any intrusive archaeological evaluations will need SMC from the Secretary of State. The proposed development will also require Scheduled Monument Consent (SMC) from the Department of Culture, Media and Sport, in addition to planning permission from the local authority.

1.2.2 Because of the location of the site within a Scheduled Ancient Monument, this evaluation is a pre-determination one, in order to demonstrate the impact of the proposals on the scheduled site and its remains, and to inform future decisions on their conservation management.

1.3 Archaeological Background

1.3.1 The proposed development site lies within the nationally important site of Wortley Low Forge, within that part of the site designated as a Scheduled Monument ('Water powered bloomery, iron forge and rolling mill at Low Forge', national number 34714). The historic site includes standing remains of buildings and machinery, earthworks, and buried remains beneath the open ground and also extending beneath present buildings.

1.3.2 The monument includes the standing, earthwork and associated buried remains of an iron forge which operated from the mid-17th century until final closure in 1929. It also includes the buried remains of an earlier iron works that predated the forge which included bloomeries, (furnaces used for smelting iron from ore). Wortley Low Forge is sited on a river terrace within a loop of the River Don, which lies to the west. It was operated as part of a wider complex of forges and plants built along the upper River Don. One of these, Wortley Top Forge, 550m to the north east, is scheduled as a separate monument (SM 29920).

1.3.3 Medieval records suggest that iron was worked in Wortley from at least the 14th century. A surviving deed dated to 1621 documents a long established iron works at Low Forge. It records a complex water powered works with both bloomery and string hearths, furnaces for smelting iron from ore and for reheating the metal respectively, which annually consumed 200 tons 204 tonnes) of charcoal from local woods. During the English Civil War, Wortley was in Royalist hands and is believed to have produced canon balls, three of which were found at Low Forge in 1868. By 1658 the bloomeries had been rebuilt as a forge, with a second forge also in operation at Top Forge. From this date until the mid-18th century, the Wortley forges were operated by the Spencer Syndicate, a complex network of partnerships which monopolised the iron trade in Derbyshire, Southern Yorkshire and Lancashire with controlling interests in at least 10 smelting works and 17 forges. Surviving accounts between 1695 and 1702 show that Top Forge operated as a finery, reworking pig iron from blast furnaces. The resulting part-worked blooms of wrought iron were then reworked in chaferies at Low Forge to produce bar iron, typically producing 3 tons (3.05 tonnes) a week. Most of this was then taken half a mile (800m) upstream of Top Forge to the Slitting Mill where the bars were converted into rods which were mainly sold to nail makers in Mortomley.

1.3.4 In 1713 there was extensive rebuilding at both Low and Top Forges, with the installation of a new water powered hammer at Low Forge. In the mid-18th century the Spencer Syndicate broke up and the Wortley forges became an independent concern known as Wortley Ironworks in the control of the Cockshutt family which also had interests in the South Wales iron industry. Around this time the works extended up and down the River Don, with the Old and New Wire Mills and the Tilt Mill (the old Slitting Mill) upstream from Top Forge and the Tin Mill downstream from Low Forge. Bar iron from Low Forge either went upstream to become rods or wire or downstream to the Tin Mill to be rolled into thin plates which were used to make items such as shovel blades. Sometime after 1787, Low Forge was equipped with puddling furnaces which, by keeping the furnace fire and iron separate, allowed the production of high quality wrought iron using coke instead of charcoal.

1.3.5 In 1825 there was a further extension at Low Forge with the installation of a new rolling mill. Ownership of Wortley Ironworks changed again in 1849 and, soon after, a beam steam engine was installed at Low Forge to power the rolling mills and other equipment, although the tilt hammer used with the puddling furnaces remained water powered. The works contracted down to just the Low and Top Forges in the ate 19th century with Low Forge specialising in producing relatively small quantities of high quality bar iron. The market for wrought iron contracted from the late 19th century onwards with the rise in the use of mild steel. Top Forge, which had specialised in producing railway axles, closed in 1908, but Low Forge continued until 1929, with the last bar being rolled on the 29th November.

1.3.6 The most obvious remains of Low Forge are that of the water powered tilt hammer installed in 1713. This used a waterwheel to turn a cam shaft which repeatedly lifted and dropped a large weighted iron hammer against an anvil. Although the massive timber work of the hammer beam is much decayed, the water wheel, hammer and mechanism all still survive in situ along with the massive stone weights. These remains all lie within a hollow some 30m west of the former forge office. Partly exposed in the eastern side of this hollow are parts of at least two puddling furnaces that appear to extensively survive as buried remains. To the west of the hammer there are further structural remains of the forge including mountings for the beam engine installed in the mid-19th century and the pit for the water wheel that it replaced. A plan of the forge in 1916 shows that immediately west of the beam engine was the rolling mill with a pair of furnaces to the north and a powered saw and shears to the south. Beyond this, close to the riverbank, was the fitting shop where equipment, including rollers, was produced and maintained. Just north of this was a gas powered furnace which was installed in 1917 but never used. Water for the forge was taken from the Don some 230m north east of the hammer. The southern half of the stone built weir still survives, its northern end having been washed away by the river. Water was fed from the upstream side of the weir via a leat, known as a head goit, into a millpond which by 1916 was about 100m long by up to 20m wide. This millpond has been subsequently infilled following the levelling of spoil tips to the north of the forge. It is believed that the millpond would have originally been wider than 20m and elsewhere it has been that such ponds were frequently used for dumping old equipment, tools and other items. To the south of the hammer there are the partly demolished remains of a building which was some 50m by 10m. This mainly functioned as a store but also included blacksmith's and chain maker's workshops.

1.3.7 To the south of this the land has been extensively built up with spoil heaps from the forge and the earlier bloomery. These spoil tips will retain technological information about the workings of the site and will overlie earlier features and so are included in the monument. To the east of the hammer there is the former office for the forge with a set of workers' cottages to the south (which form part of the historic site but are not included in the monument, due to their use as dwellings). To the north west of the office there is a brick built workshop which was a late addition to the industrial complex. The building (which is included in the scheduling) still retains some fittings for a line shaft for powering machinery.

1.3.8 The modern land surface of the monument is significantly higher than would the riverbank or Forge Lane. It also explains why the fields immediately to the east of the

monument tend to flood whereas the forge site does not. This raised land surface is a result of centuries of ironworking with continuous dumping of slag and other waste. Across large areas of the monument this build-up of deposits appears to be at least 2m deep. Remains of earlier structures, such as those mentioned in the 1621 deed as well as earlier medieval furnaces, will survive buried in these later deposits. Exposed in the trackway immediately to the west of the workers cottages, are two stone wall lines which do not relate to any structures on the 1916 plan and are thus interpreted as an earlier part of the forge complex, the majority of which is no longer visible on the surface.

1.3.9 The remains of the former iron-working complex at Low Forge are particularly significant for their range and extent, their long-time period, and their good preservation, and for the large amounts of industrial waste accumulated over many centuries of iron-working. The waste dumps, as well as providing graphic physical evidence of the extent of former industrial activity, also represent a valuable resource for the understanding of the sequence of industrial activities and technological processes here. It is believed that the remains of the earliest, medieval, iron-working complex may underlie the waste dumps and buildings of the later works. The site is also significant for the documentary evidence that compliments the diversity of the physical archaeological remains, and together these provide a rare and important record of the historical development of a water-powered ironworking complex and an insight into its operations. Taken as a whole the site contributes considerably to our understanding of the pre-modern iron industry.

1.3.10 It is known that the application site occupies part of the historic forge complex. The remains of ironworking, in the form of waste dumps, are visible in the area of the proposed development, and there is the potential for any such remains on the application site to be encountered and damaged by the proposal development. As mentioned above, the waste dumps are an important archaeological resource, and may overlie remains from earlier phases.

1.3.11 It is highly likely, therefore, that any ground-works in this area would entail damage or disturbance to below-ground deposits relating to the occupation and use of the site in the medieval and/or post-medieval periods, and that these would include remains of national importance.

2 OBJECTIVES

2.1 In the application site, any ground disturbance would potentially impact on nationally important archaeological remains, and any new-built structures would occupy a site regarded as of national importance. Below-ground works associated with the development might entail damage to, or destruction of, any archaeological deposits which survive within and below the topsoil cover. These remains and deposits form part of Low Wortley Forge a site of national significance, designated as a Scheduled Ancient Monument.

2.2 The aim of archaeological evaluation is to gather sufficient information to establish the presence/absence, nature, date, quality of survival and importance of any archaeological remains to enable an assessment of the potential and significance of the archaeology of the site to be made. When all stages of evaluation are completed, an informed decision can be taken as to whether any development within the Scheduled Ancient Monument may be permitted, and on appropriate future treatment of the remains and any mitigatory measures, such as sympathetic foundation design, incorporation within areas of open space and/or further archaeological work, in advance of, or during, any permitted development.

2.3 As the buried archaeological remains form part of a site of national importance, there is a strong presumption in favour of their physical preservation, and of maintaining future access to the archaeological resource for future investigation, site display etc. Wherever possible, the preferred option will be the preservation of significant archaeological remains *in situ* and the maintenance of access to the remains. The potential for reconciling the needs of preservation with those of development will be fully explored, and will be assessed by English Heritage in conjunction with the County SMR. The results of the evaluations will enable the impact of the proposals on the archaeological resource to be assessed, and thereby enable informed decisions to be taken on the proposed development, and the need for any design amendments and/or mitigation strategies for management of the archaeological resource, including physical *in situ* preservation of archaeological remains, and excavation and preservation 'by record'.

2.4 If human remains are encountered during the course of this evaluation, it may be necessary to remove these, under the conditions of a Home Office burial licence, to ensure that they are treated with due dignity. The preferred option would be for them to be adequately recorded before lifting, and then carefully removed for scientific study, and long-term storage with an appropriate museum; however, the burial licence may specify reburial or cremation as a requirement.

3 METHODOLOGY

3.1 Evaluation

3.1.1 An evaluation will consist of a single evaluation trench running centrally in a NE-SW direction across the site of the proposed extension (PDA. The proposed extension measures approximately 16.5m², and lies on the SW side of the house (**Figure 2**).

3.1.2 Trench 1 (**Figure 2**) is a linear evaluation cutting, measuring 1.5m by 4.5m in extent. Contingency will be made for the possibility that the trench may need to be extended in order to clarify findings within the area affected by the proposed extension. The aims of this trench are to determine the extent, nature and quality of survival of deposits which are likely to be affected by the proposed new extension.

3.1.3 The excavation will be undertaken by hand, as it is anticipated that the PDA in question, from the surface down to an as yet undetermined depth, is comprised of archaeological deposits consisting primarily of waste material from the previous industrial activities at Low Forge, and that the waste material my overlie remains of earlier activity on the site. In some situations, the use of mechanical equipment may be appropriate and will be agreed with the Inspector of Ancient Monuments in advance (see 3.1.5 below).

3.1.4 A sufficient sample of any archaeological features and deposits revealed will be excavated in an archaeologically controlled and stratigraphic manner, in order to fulfil the aims of the evaluation (see 5 above). The site monitors will be consulted on the treatment of significant features that may merit full preservation *in situ*. The complete excavation of features is not regarded as necessary; a sufficient sample will be investigated to understand the full stratigraphic sequence in each trench, down to naturally occurring deposits. The sampling policy is as follows:

a) A 100% sample will be taken of all stake-holes.
b) A 50% sample will be taken of all post-holes, and of pits with a diameter of up to 1.5m.
c) A minimum 25% sample will be taken of pits with a diameter of over 1.5m; but this will include a complete section across the pit to recover its full profile.
d) A minimum 20% sample will be taken of all linear features, up to 5m in length; for features greater than this, a 10% sample would suffice.

3.1.5 In certain cases, the use of mechanical excavation equipment may be appropriate (e.g. for removing deep intrusions such as modern brick and concrete floors or footings), or for putting sections through major features after partial excavation (e.g. ditches), or through deposits to check that they are of natural origin.

3.1.6 A full written, drawn and photographic record will be made of **all material** revealed during the course of the trial excavation. All archaeological features and deposits, and all sections, will be drawn and fully recorded for archival purposes. Plans will be completed at a scale of 1:50 or 1:20 (as appropriate), whilst section drawings will be at a scale of 1:10. A minimum 35mm format for photography is required (in monochrome and colour).

3.1.7 Where industrial activity is detected, material will be retained from each spatially and chronologically distinct deposit to ensure that any chronological or spatial changes in the use of the site can be investigated. A specialist will be consulted to advise on the specifics, but a rapid visual examination will be sufficient to determine how many types of material are present in a particular deposit (black slag, green slag, magnetic lumps, etc, for example), and specimens of each will be retained. The amount retained will be sufficient for any analysis required and will include examples that show distinctive features, such as details and marks, dimensions, fabrics and forms. Frequently the most informative examples show how different categories of waste were associated in the process (a ceramic fragment with adhering black and green slag, for example). It is not generally necessary to retain all the industrial residues from a deposit, and specialist advice will be sought. Where doubt exists, and only small quantities are present, all the material will be kept; where large quantities are present (more than one tonne), a proportion will be kept and the amount discarded recorded. Refer to section 3.7 of the 'Science for Historic Industries' (English Heritage, 2006) guidelines.

3.1.8 Where industrial activity is detected, samples will be collected (in conjunction with hand-retrieved material, see 3.1.7 above). Separate samples (0.2 litres in volume) will be collected for micro-slags (hammer-scale and spherical droplets). When working areas are identified multiple samples will be taken at regular 0.2-0.5m intervals (e.g. a grid pattern to look at spatial distributions). Refer to page 6 of the 'Metallurgy' (English Heritage, 2001) guidelines.

3.1.9 Deposits will be sampled for retrieval and assessment of the preservation conditions and potential for analysis of all biological remains. A strategy for the recovery and sampling of environmental remains from the site will be agreed with an environmental consultancy, in advance of the project (Appendix 1). The sampling strategy will include a reasoned justification for selection of deposits for sampling, and has been developed in collaboration with a recognised bioarchaeologist. This WSI and sampling strategy has been submitted to English Heritage Regional Science Advisor (Dr Andy Hammon) at the York Office (email: andy.hammon@english-heritage.org.uk), prior to commencement of site works. Opportunity will be afforded for an environmental specialist to visit the site during the evaluation and to discuss the strategy. In keeping with the EH guidelines, all securely stratified deposits considered suitable for environmental analysis (i.e. those not consisting of building debris, rubble mortar etc.) will be sampled (40-60 litres in volume, where deposits allow) in order that their potential can be fully assessed, and a suitable sampling strategy can be formulated in case of further mitigation. Refer to the '*Environmental Archaeology'* (English Heritage, 2002) guidelines.

3.1.10 Other samples will be taken, as appropriate, in consultation with specialists and the English Heritage Regional Science Advisor, as appropriate (e.g. dendrochronology, soil micromorphology, monolith samples, C14, etc.). Samples will be taken for scientific dating where necessary for the development of subsequent mitigation strategies.

3.1.11 Lifting of human skeletal remains will be kept to the minimum which is compatible with an adequate evaluation. At sites known in advance to be cemeteries, provision will be made for site-inspection by a recognised specialist. Excavators will be aware of, and comply with,

provisions of Section 25 of the Burial Act of 1857, and pay due attention to requirements of Health and Safety.

3.1.12 A finds recovery and conservation strategy will be discussed with the County Archaeologist and the recipient museum in advance of the project commencing, and a policy for finds recording will be agreed and submitted to the County Archaeologist, before commencement of site works (see *Selection, Retention and Dispersal of Archaeological Collections, Guidelines for use in England, Northern Ireland, Scotland and Wales*: Society of Museum Archaeologists 1993). Any recording, marking and storage materials will be of archive quality, and recording systems will be compatible with the recipient museum (see 9 below). Copies of all recording forms and manuals will be submitted to the County Archaeologist, prior to the commencement of site works, if these have not been supplied previously. Allowance will be made for preliminary conservation and stabilisation of all objects and an assessment of long-term conservation and storage needs. Contractors will make an allowance for a **minimum of four boxes** in calculating estimates for museum's storage grant.

3.1.13 All finds (artefacts and ecofacts) visible during excavation **will** be collected, processed and assessed (by a suitably qualified and experienced specialist), unless variations in this principle are agreed with English Heritage and the South Yorkshire Archaeology Service. Finds **will** be appropriately packaged and stored under optimum conditions, as detailed in the RESCUE/UKIC publication *First Aid for Finds*. In accordance with the procedures outlined in MAP2, all iron objects, a selection of non-ferrous artefacts (including all coins), and a sample of any industrial debris relating to metallurgy will be X-radiographed before assessment. On large post-medieval or other metalworking sites, or sites yielding structural metalwork, there may be a need to vary this strategy, and the need and use of X-radiography will be established by the specialist in conjunction with the project monitors.

3.1.14 The following categories of artefacts may be predicted: pottery, ferrous and non-ferrous metalwork, glass, ceramic building materials, worked bone, flint and/or worked stone.

3.1.15 Metalworking finds and metalworking residues will normally be washed, but some materials, however, are delicate and may be damaged; any cleaning procedures will be agreed with the metalworking specialist and / or conservator. Materials that will not be washed (except by, or under the supervision of, the metalworking specialist include crucibles, moulds, hearth and furnace linings. Refer to page 6 of the 'Metallurgy' (English Heritage, 2001) guidelines.

3.1.16 CS Archaeology has direct experience of carrying out work in south Yorkshire and has used specialist subcontractors such as Dr Chris Cumberpath (Sheffield) and Dr J Wheeler (Aberdeen University) to clarify and augment the archaeological interpretation and archive. CS Archaeology will also ensure that local museum's are visited to update artefact recognition particularly from the medieval and post-medieval periods within the region. CS Archaeology will ensure that the pottery report, if require, will use the fabric classifications which have been published in the reports for other recently published medieval and post-medieval sites from the county, for the sake of consistency: access to the fabric series will be freely granted to pottery researchers.

3.1.17 This WSI will be agreed with the regional Inspector of Ancient Monuments and the County Archaeologist at the outset of the project.

3.1.18 CS Archaeology will make provision for the use of shoring, pumps, or artificial lighting. Such strategies will also allow for sampling for radiocarbon, archaeomagnetic and/or dendrochronological determinations, as appropriate: where *in situ* timbers are found to survive in good condition, samples will be taken for dendrochronological assay.

3.1.19 Arrangements for site access and reinstatement are to be agreed with the commissioning body. [For the requirements for the **display of public information notices**, please see paragraph 5.4 below.]

3.1.20 Should CS Archaeology or the client wish to vary the survey strategy, if, for example, a part or the whole of the site is not amenable to evaluation as outlined above, or trench positions conflict with development proposals; or an alternative evaluation technique may be more appropriate or likely to produce more informative results, a proposal for amended/additional work will be drafted by CS Archaeology, and discussed urgently with the English Heritage Regional Inspector of Ancient Monuments and the County Archaeologist.

4 REPORT PREPARATION, CONTENTS AND DISTRIBUTION

4.1 Upon completion of the evaluation, the artefacts, soil samples and stratigraphic information shall be assessed as to their potential and significance for further analysis.

4.2 A report will be prepared which will provide the results of the fieldwork and assessment and will place the results in a contextual and historical framework. The project report will be produced in accordance with English Heritage guidelines as outlined in MoRPHE (2006), and IFA guidance for evaluations (2008). It will synthesise all elements of the evaluation work.

The report will include the following:

a) A non-technical summary of the results of the work, introduction and aims and objectives.

b) An introduction which will include
* the site code/project number
* planning reference number and SMR Casework number
* dates when the fieldwork took place
* grid reference
* author of report and report date

c) An account of the methods employed during the project, and any constraints.

d) An account of the results of the fieldwork, describing both structural data and associated finds and/or environmental data recovered, and with a quantification of artefacts, ecofacts, contexts and other primary records and registers.

e) Interpretation, including phasing of the site sequence and spot dating of artefactual and environmental material recovered (including type series & fabric codes for local pottery groups, as appropriate). Descriptive material will be clearly separated from interpretative statements. This shall be supported by the use of **photographs and drawings**, to include an overall plan of the site accurately identifying the location of trenches, related to fixed points shown on current OS data, geo-referenced to National Grid; individual trench plans as excavated indicating the location of archaeological features with at least one section detailing the stratigraphic sequence of deposits within each trench; illustration of significant archaeological features with appropriately scaled plans and sections, with heights relative to Ordnance Datum.

f) A specialist assessment of the artefacts recovered with a view to their potential for further study. Allowance will be made for preliminary conservation and stabilization of all objects and an assessment of long-term conservation and storage needs.

Assessment of artefacts will normally include inspection of X-radiographs of all iron objects, a selection of non-ferrous artefacts (including coins), and a sample of any industrial debris relating to metallurgy. However, on large post-medieval or other metalworking sites, or sites yielding structural metalwork this may not always be appropriate, and the need and use of X-radiography will be established by the specialist.

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A rapid scan of all excavated material will be undertaken by conservators and finds researchers in collaboration. Material considered vulnerable will be selected for stabilisation after specialist recording. Where intervention is necessary, consideration will be given to possible investigative procedures (e.g. glass composition studies, residues in or on pottery, and mineral-preserved organic material). Once assessed, all material will be packed and stored in optimum conditions, as described in *First Aid for Finds*. Waterlogged organic materials will be dealt with, following the English Heritage documents, *Guidelines for the care of waterlogged archaeological leather*, and *Guidelines on the recording, sampling, conservation and curation of waterlogged wood*.

g) A specialist assessment of environmental samples taken, with a view to their potential for subsequent study.

Processing of all samples collected for biological assessment, (or sub-samples of them, in the case of heavy clay for instance) will be completed. Bulk and site-riddled samples from dry deposits will have been processed during the excavation, where possible. The preservation state, density and significance of material retrieved will be assessed, following methods presented in *Environmental Archaeology: a Guide to the theory and practice of methods from sampling and recovery to post-excavation*. Unprocessed sub-samples will be stored in conditions specified by the appropriate specialists.

Assessments for any technological residues will be undertaken. Samples for dating will be submitted to laboratories promptly, so as to ensure that results are available to aid development of specifications for subsequent mitigation strategies.

h) The results from investigations in Archaeological Sciences **will** be included in the Site Archive and presented in the Evaluation Report. Reports will include sufficient detail to permit assessment of potential for analysis. They will include tabulation of data in relation to site phasing and contexts, and will include non-technical summaries. The objective presentation of data will be clearly separated from interpretation. Recommendations for further investigations (both on samples already collected, and at future excavations) will be clearly separated from the results and interpretation, and will be incorporated into the Specifications/Project Design for any future intervention or mitigation strategy.

i) An assessment of the archaeological significance of the deposits identified, in relation to other sites in the region.

j) A conclusion with recommendations for further post-excavation work, if required.

k) Details of archive location and destination (with accession number, where known), together with a catalogue of what is contained in that archive.

l) Appendices and figures, as appropriate, including a copy of the specification and/or WSI/Project Design.

m) References and bibliography of all sources used.

4.3 Copies of the report will be submitted to the commissioning body, the English Heritage regional Inspector of Ancient Monuments (Keith Miller, Inspector of Ancient Monuments, English Heritage, 37 Tanner Row, York, YO1 6W), and Dinah Saich or Andy Lines, South Yorkshire Archaeology Service, Sheffield City Council, Howden House, 1 Union Street, Sheffield S1 2H, within an agreed timetable and subject to any contractual requirements on confidentiality (see 5.4 below). A copy of the Evaluation Report will also be sent to the English Heritage Regional Advisor for Archaeological Sciences: Dr Andy Hammon, English Heritage, 37 Tanner Row, York, YO1 6WP. The usual requirement for reporting on archaeological evaluations on Scheduled Ancient Monuments is for a written, illustrated report to be provided within 3 months (or shorter period by mutual agreement) following completion of fieldwork.

4.4 A brief, Interim Report will be prepared during or shortly after the completion of fieldwork, to assist in making decisions on development proposals.

4.5 As well as a printed copy of the report, an electronic copy of the report will also be supplied in PDF format to the South Yorkshire SMR. This will allow a text summary to be incorporated by the SMR into any review or synthetic documents.

4.6 An on-line OASIS form will also be completed at http://ads.ahds.ac.uk/project/oasis/, for inclusion in the ADS database.

5 COPYRIGHT, CONFIDENTIALITY AND PUBLICITY

5.1 Unless the individual/organisation commissioning the project wishes to state otherwise, the copyright of any written, graphic or photographic records and reports rests with the originating body (the archaeological organisation undertaking the fieldwork and analysis). Agreements on copyright will be agreed with the commissioning body at the outset of the project.

5.2 The circumstances under which the report or records can be used by other parties will be identified at the commencement of the project, as will the proposals for distribution of the report (see 7 above). All archaeologists undertaking work will respect the commissioning body's requirements over confidentiality, but the archaeologist will endeavour to emphasise their professional obligation to make the results of archaeological work available to the wider archaeological community within a reasonable time.

5.3 The archaeologist undertaking the evaluation has a duty of confidence to the client commissioning the work. All aspects of publicity will be agreed at the outset of the project between the commissioning body and the archaeological organisation or individual undertaking the project.

5.4 During the evaluation, illustrated notices will be displayed on site, with the client's agreement, explaining what work is actually in progress and why the work is taking place. Will the evaluation last for longer than two weeks, the notices will be updated regularly during the on-site works.

6 ARCHIVE PREPARATION & DEPOSITION

6.1 The requirements for archive preparation and deposition will be addressed and undertaken in a manner agreed with the recipient museum. The recipient museum **will** be contacted at an early stage, before submission of the project design and before commencement of fieldwork.

6.2 A site archive will be prepared in accordance with English Heritage MoRPHE guidelines (English Heritage 2006). See also *Towards an Accessible Archaeological Archive, the Transfer of Archaeological Archives to Museums: Guidelines for use in England, Northern Ireland, Scotland and Wales* Society of Museum Archaeologists 1995.

6.3 The site archive, including finds and environmental material, subject to the permission of the relevant landowners, will be labelled, conserved and stored according to the United Kingdom Institute for Conservation (UKIC)'s *Guidelines for the Preparation of Excavation Archives for Long-term Storage* (Walker 1990) and the Museums and Galleries Commission's *Standards in the Museum Care of Archaeological Collections*, 1992. Provision will be made for the stable storage of paper records and their long-term storage on a suitable medium, such as microfilm, a copy of which will be deposited with the NMR (English Heritage). An index to the contents of the archive, together with details of its date and place of deposition will be lodged with the SMR.

6.4 Will no further archaeological work be initiated, the archive will be deposited with a suitable repository which meets the criteria for the storage of archaeological material. An agreed allowance will be made for a contribution to the recipient museum towards the curation and storage of material. If previous archaeological evaluation by desk-based survey has taken place on this site, arrangements will be made for both the site survey archive and that from the current evaluation to be stored within the same institution - for the benefit of future researchers.

6.5 If further archaeological evaluation be initiated and additional archaeological work undertaken, the evaluation archive will be prepared accordingly for incorporation into the final archive.

6.6 Archive deposition will be arranged in consultation with the recipient museum and the County Archaeologist, and will take account of the requirements of the recipient museum and the relevant guidelines (see above) relating to the preparation and transfer of archives. The timetable for deposition shall be agreed on completion of the site archive and narrative.

6.7 CS Archaeology will also supply a representative selection, in colour slide format, of images of key features, deposits and artefacts, encountered during the evaluation, to the South Yorkshire Archaeology Service, for incorporation within the SMR slide collection, and for the benefit of future researchers; these slides can be copy slides.

7 POST EXCAVATION ANALYSIS, PUBLICATION & DISSEMINATION

7.1 The information contained within the assessment report will enable decisions to be taken regarding the future treatment of the archaeology of the site and any material recovered during the evaluation.

7.2 If further archaeological investigations take place, either as evaluation or mitigation, any further analyses (as recommended by the specialists, and following agreement with the curator) will be incorporated into the post-excavation stage of the archaeological programme.

7.3 If further site works do not take place, it will be appreciated that assessment may produce results of sufficient significance to merit publication in their own right, and allowance will be made for the preparation and publication in a local and/or national journal of a short summary on the results of the evaluation and of the location and material held within the site archive.

7.4 Will further archaeological excavation be undertaken, a synopsis of the results of the assessment will be prepared for publication with the final results of any further fieldwork.

8 MONITORING, HEALTH AND SAFETY, STAFFING & INSURANCE

8.1 The archaeological work will be monitored under the auspices of the English Heritage Regional Inspector of Ancient Monuments and County Archaeologist Dinah Saich of the South Yorkshire Archaeology Service. The archaeological scientific aspects of this project will also be monitored by the English Heritage Regional Advisor on Archaeological Sciences.

8.2 CS Archaeology will ensure that arrangements are made for monitoring visits and meetings before, during and after the archaeological site work, as appropriate.

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

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

8.5 Necessary precautions will be taken over underground services and overhead lines.

8.6 CS Archaeology will ensure that they, or any proposed sub-contractors, are appropriately qualified to undertake such projects.

8.7 CS Archaeology has ensured that they are adequately insured, to cover all eventualities, including risks to third parties.

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Institute for Archaeologists. 2008. *Standard and Guidance for Archaeological Field Evaluation*

Acknowledgements: To Keith Miller (English Heritage) for issuing the Archaeological Brief upon which this WSI was largely based

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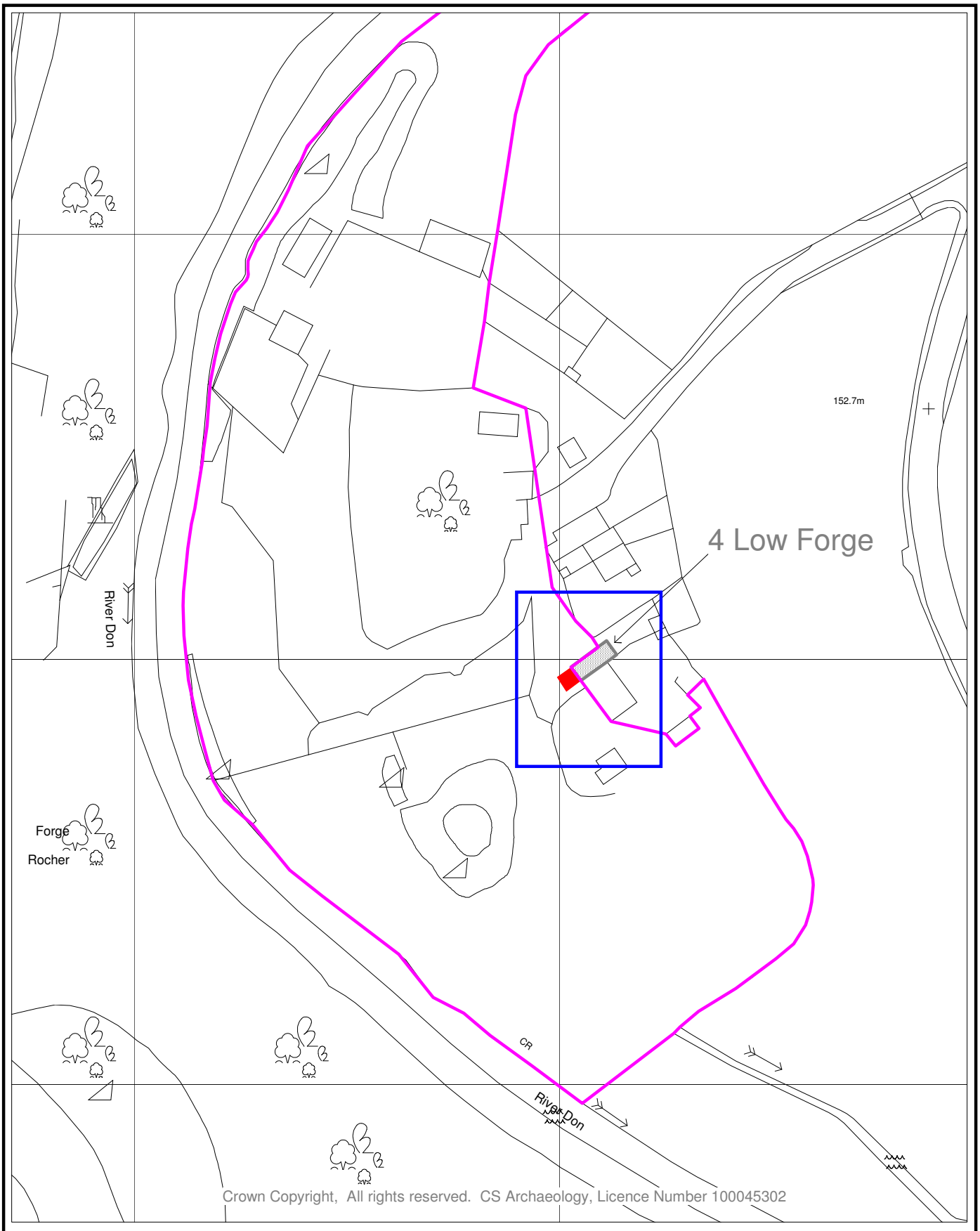


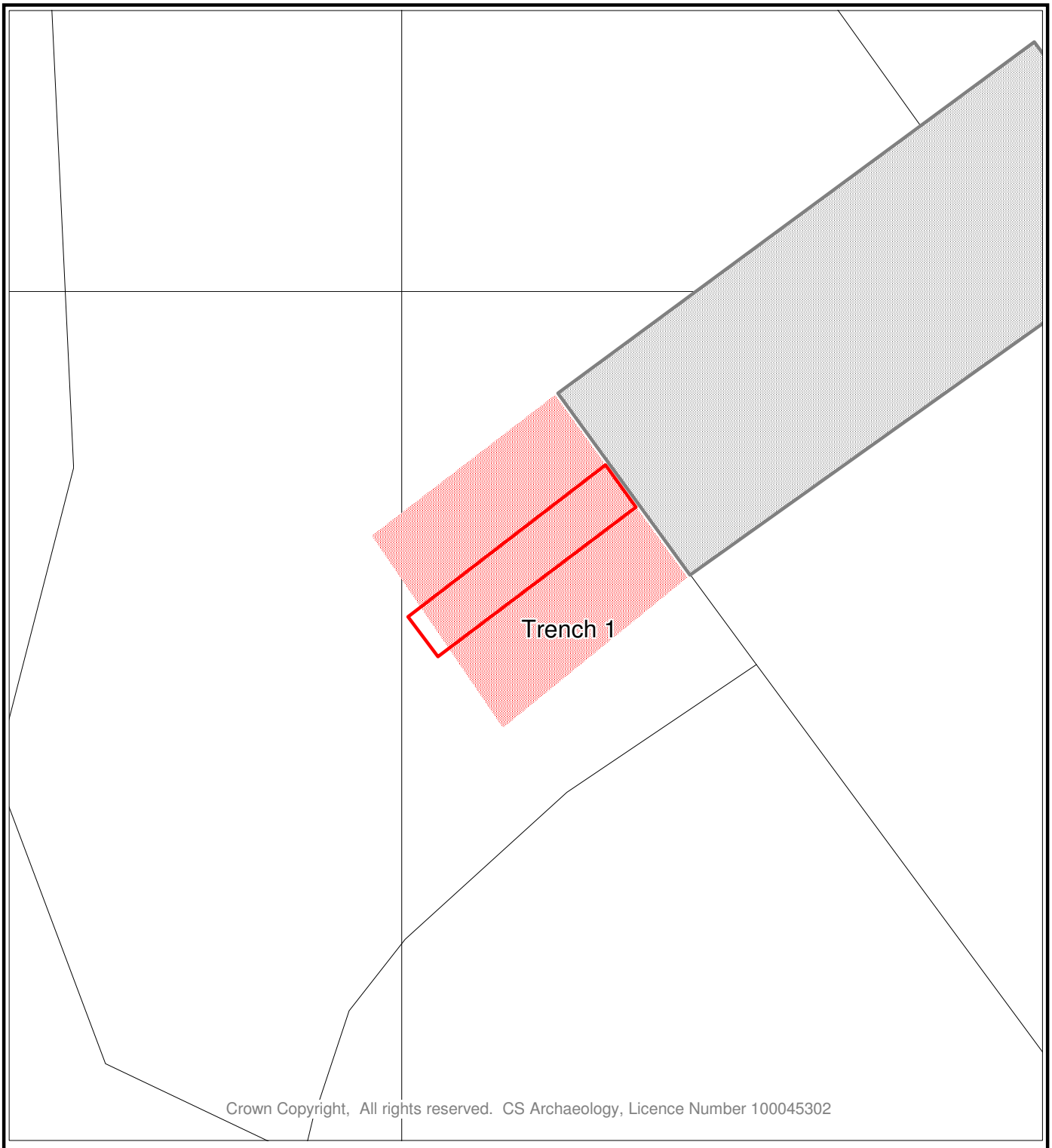
scale: 1:1250

The PDA

Scheduled Monument Boundary

insert see Figure 2

4 Low Forge, Wortley: WSI for an Archaeological Evaluation	CS Archaeology May 2009	Figure 1: Site Location



proposed site

proposed evaluation trench (1.5m x 4.5m)

scale: 1:100

4 Low Forge, Wortley: WSI for an Archaeological Evaluation	CS Archaeology May 2009 (rev.6/2009)	Figure 2: Site Plan

APPENDIX 2: ARCHIVE INVENTORY

A: Context Descriptions

Context	Cut	Description
100	F	Sandy loam, mixed levelling deposit with occasional large sub-angular stone up to 0.35m diam. Regular sharp context boundary change with 1101] base of the deposit dish shaped cross-section interrupted by modern post hole [122]. Represents the surface context recently used for the storage of machinery. This context lies above [101], and below [105].
101	F	Light purple silt, representing a levelling ash layer which has subsided post depositionally. It represents a continuous deposit across the trench, interrupted by modern post holes e. [122 & 115]. Below [100], above [102].
102	F	Dark grey sandy silt up to 0.6m deep. Represents a charcoal rich deposit, with charcoal lumps of cut round wood (birch and hazel) still evident. Finds include half brick and iron waste and on a micro level the deposit was found to contain hammer scale – a smithing residue. Finds included modern pottery decorative slipware and earthen wares. Below [101], above [103].
103	F	Light brown silt with large iron slag nodules, up to 0.25m diam. With iron lag runlets, up to 0.025m in length and a fragment of fire brick with adhering fe slag, representing a dump of furnace slag. Overlies [108] underlies [102]. NB a fragment from this context was subject to archaeometallurgical assessment
104	F	Dark grey silt with charcoal lumps, representing a charcoal lens within [108] with much larger charcoal. Below and above [108].
105	F	Cream gravel, recent levelling deposit. Above [100] .
106	F	Mid brown silt with thin interleaved layers of charcoal and clay. Above [102] below [101].
107	F	Very similar to [102]. Above [103] below [101] & [106].
108	F	Dark grey, consisting of 70% charcoal from crowns and branches of hazel and birch with 5% rounded and angular stone, all were heat affected. Tested positive for hammerscale. Represents a charcoal dump from a smithy. Above [111] below [103].
109	F	Dark brown silt, representing a thin continuous deposit up to 0.02m deep, which has been compacted with frequent charcoal. Close examination of the upper surface revealed that many of the stones had been worn smooth indicative of a long exposed surface. Below [108] above [120].
110	C	Linear in plan parallel to the house wall, with a 0.1m separation. Representing the foundation cut for the house extension [123]. NB the original house is believed to be 230 years old (pers comm. Mr Grace). Below [115] above [103] etc.
111	F	Purple/brown silt. A mixed deposit containing 50% purple ash [101] 25% stone and a sandy silt matrix. The stone consists of flagstone and sandstone fragments in broken chips associated with the construction of 4 Low Forge, wall [123]. Represents back fill material, post wall [123] construction. Finds included pottery and heat affected stone.
112	C	Circular in plan, 0.32m diameter and at least 0.3m deep. Below [100 & 105] **Figure 4**, Plan 1.
113	F	Stone and brick packing with a central void with decayed wood adhering to the vertical sides. Above [112], below [100 & 105].
114	F	Mid brown sandy silt with modern finds: plastic and glass. Above [115].
115	C	Linear in plan parallel to the house wall. Below [114].
116	F	Brown silty clay. Below [109], above [120 & 117].
117	F	Reddish brown silty clay. Above [120], below [116 & 110].
118	F	Reddish brown iron slag with reddish brow clay. Finds included Medieval purple ware pottery (early 13th to mid 16th century: (**Figure 6**).
119	F	Buff clay with charcoal inclusions. Above [121] below [118].
120	F	Greenish brown iron slag continuous deposit up to 1.1m in depth. Interpreted as a Medieval spoil heap from the dating evidence in [118]. No finds. Above natural [121 and 118] below [109, 116 & 118]. NB This context was subject to archaeometallurgical assessment.
121	F	Buff clay with large rounded stones up to 0.3 diameter. Below [120].

122	C	Modern cut for small post, diameter 0.22m. Cuts [101] & [103] probably cuts [100] but fill [100] undistinguishable.
123	S	Wall apparently of drystone construction, but the mortar has probably been eroded away. Irregular face. Above [110], below [115 & 114].
124		Modern cut for small post, diameter 0.24m. Cuts [101] & [103] probably cuts [100] filled by [100] (undistinguishable).

B: Samples

Context No.	Volume	Description
102	60 Litres	Upper Charcoal
104	25 Litres	Within Lower Charcoal
108	60 Litres	Lower Charcoal
120	60 Litres	Iron Slag

C: Photographic Register: B&W and Colour digital images

No.	Plate	Trench	Description	From
1/30	**1**	1	Pre-excavation view of Trench 1 to the rear of 4 Low Forge	SW
1/29		1	Pre-excavation view of Trench 1 to the rear of 4 Low Forge	SW
1/28	**2**	1	Trench 1 during excavation of the upper level	SW
1/27		1	View of partially half sectioned trench	SW
1/26		1	View of partially half sectioned trench	SW
1/25		1	View of partially half sectioned trench	SW
1/24		1	View of the southeast facing section (upper levels)	SE
1/23		1	View of the southeast facing section (upper levels)	SE
1/22		1	View of the southeast facing section (upper levels)	SE
1/21		1	View of the southeast facing section, south end, (upper levels)	SE
1/20		1	View of the southeast facing section (upper levels)	NE
1/19		1	View of partially half sectioned trench	NE
1/18		1	View of the southeast facing section, south end, (upper levels)	SE
1/17		1	View of the house wall, with half sectioned trench	SW
1/16		1	View of the house wall, NE end of half sectioned trench	SW
1/15		1	Excavated view with upper levels (0.95m) removed	SW
1/14		1	View of the northwest facing section (upper levels)	W
1/13	**3**	1	View of the southeast facing section (upper levels)	E
1/12	**4**	1	View of the upper deposits to the centre of the southeast facing section	SE
1/11		1	Excavated view of the sondage, southwest end of the trench	NE
1/10		1	View of the trench in context	SW
2/36-5	**5**	1	Post excavation view of the fully excavated trench	SW
2/34		1	View of the section 1 (SE facing)	S
2/33	**6**	1	View of the northwest facing section	W
2/32-1		1	Detail of the house's lower wall [123]	SW
2/30	**8**	1	Detail of the lower wall [123] and NW facing section	W
2/29-8	**7**	1	Detail of the lower wall [123] and SE facing section	S
2/27		1	View of the section 1 (SE facing)	E
2/26		1	Detail of the lower wall and NW facing section	W

D: Drawing Register

Drawing No.	Trench	Description
1	1	Southeast facing section
2	1	Intermediate plan of trench 1
3	1	Post excavation plan of trench 1

E: Finds Register

No	Context	Type	No	Wt	ENV	Part	Form	Decoration	Date range	Notes
20	100	Redware	1	26	1	Rim	Dish	Clear glaze int only; clubbed rim	C17th - EC18th	
19	102	Brown Glazed Fineware	1	4	1	BS	Hollow ware	Metallic brown glaze int & ext	C18th - C19th	Fine red fabric
710-15, 16	102	Redware	7	131	7	Base & BS	Dish	Clear glaze int only; knife trimmed bases ext	C17th - EC18th	Abraded with chipped and flaked glaze
9	102	Slip Coated ware	1	6	1	Rim	Hollow ware	Thin red slip coating ext on a fine red body under clear glaze	C18th	Plain, slightly everted rim
7	102	Slip Coated ware	1	5	1	Rim	Hollow ware	Thin red slip coating int & ext under clear glaze on a fine red body	C18th	Plain slightly everted rim
5	102	Slipware	1	12	1	Rim	Dish	Tri-coloured feathered slip w/ pie-crust rim	C18th	Red-brown, dark-brown and white slip int; press-moulded vessel in a dark red fabric
8	102	Slipware	1	7	1	Rim	Dish	White slip int w/ dark glazed line inside rim; pie-crust rim	C18th	Pale orange fabric w/ occasional white streaks
18	102	TP Whiteware	1	9	1	BS	Plate	Floral design int; blurred print	M - LC19th	Anomalous in a generally early context
21	103	Late Blackware	1	22	1	Base & BS	Hollow ware	Black glaze int & partially ext	C18th	Fine bright orange fabric
22	103	Slipware	1	13	1	BS	Dish	White on red slip giving a pattern of broad yellow & thin red lines ext	C18th	Fine buff fabric; press moulded
3, 5 & 6	108	Blackware type	3	6	1	BS	Hollow ware	Black glaze int & ext	C17th	Hard, dense dark red fabric
4	108	Creamware	1	1	1	BS	Flatware	U/Dec	c.1740 - c.1820	
1	118	Coal Measures Purple ware	1	79	1	Rim & handle	Jug/jar	Sparse purple glaze int & ext w/ glaze fumed body	LC15th - C16th	Typical CMP
2	118	Coal Measures Purple ware	1	7	1	BS	Hollow ware	Sparse purple glaze int & ext w/ glaze fumed body	LC15th - C16th	Typical CMP
		Total	**22**	**328**	**20**					