

Excavations on a late medieval ironworking site at London Road, Crawley, West Sussex, 1997

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Excavations by Wessex Archaeology in advance of redevelopment of land off London Road in Crawley revealed considerable evidence for late medieval ironworking on the northern edge of the town. This included substantial deposits of smelting and forging slag, several ironworking hearths and a sequence of associated clay floors. Sufficient evidence was recovered to suggest a variety of ironworking processes including ore roasting, smelting and forging/smithing took place either on, or in close proximity to, the site. Of particular interest were the remains of a structure, probably a smithy, in one of the properties on the London Road frontage. Archaeomagnetic dating indicates that the main period of ironworking was during the late 14th and early 15th centuries, a date broadly supported by the small quantity of pottery recovered. A series of regular field boundaries to the west of the street frontage appeared to represent a planned medieval field system, probably established in the 13th century. Post-medieval activity, not associated with ironworking, was represented by the remains of a 17th-century building and well, and three 19th-century buildings.

INTRODUCTION

Wessex Archaeology was commissioned by Frogmore Investments Limited to undertake an archaeological evaluation of the site of the proposed Crawley Leisure Park. Following documentary research and a survey of standing buildings prior to demolition, the archaeological potential of the site was evaluated through a programme of trial trenching in November 1997, followed immediately by excavation.

The site is centred on NGR TQ 26753725 and covers approximately 4 hectares. Much of the development area lies on a slight south-east-facing slope, which rises from c. 67.5 m OD in the south-east corner to c. 70.5 m OD in the north-west. This slope is most pronounced in the western third of the site, rising to the west of the former site of the Crawley Town Football Club ground, which may have been artificially levelled in the past.

The underlying geology is Weald Clay, with a small band of alluvium running roughly north-east to south-west in the south-eastern corner of the site. This appears to represent the line of a watercourse associated with a pond known to have existed in the north-east corner of the site in the 18th and

19th centuries. The Weald Clay was generally found to be covered by a thin, loamy topsoil, although in some areas the depth of overlying deposits was much greater.

ARCHAEOLOGICAL AND HISTORICAL BACKGROUND

There is little archaeological and historical evidence relating to the immediate environs of the site itself, although recent work in the surrounding area has begun to shed light on the origins and significance of Crawley and its hinterland.

Evidence for prehistoric activity in the area is sparse, although excavations along the line of Crawley High Street Relief Road (c. 250 m to the south of the site) uncovered a broken Mesolithic flint blade and a Neolithic leaf-shaped arrowhead (Saunders 1998). Recent excavations around Crawley have revealed evidence for Iron Age activity at Goffs Park (TQ 263363) and Broadfield (TQ 263354), largely associated with the smelting of iron, continuing into the Roman period (Cartwright 1992). There is no direct evidence, however, to suggest activity of this early period in close proximity to the site at London Road.

The site lies 200–300 m to the north of the

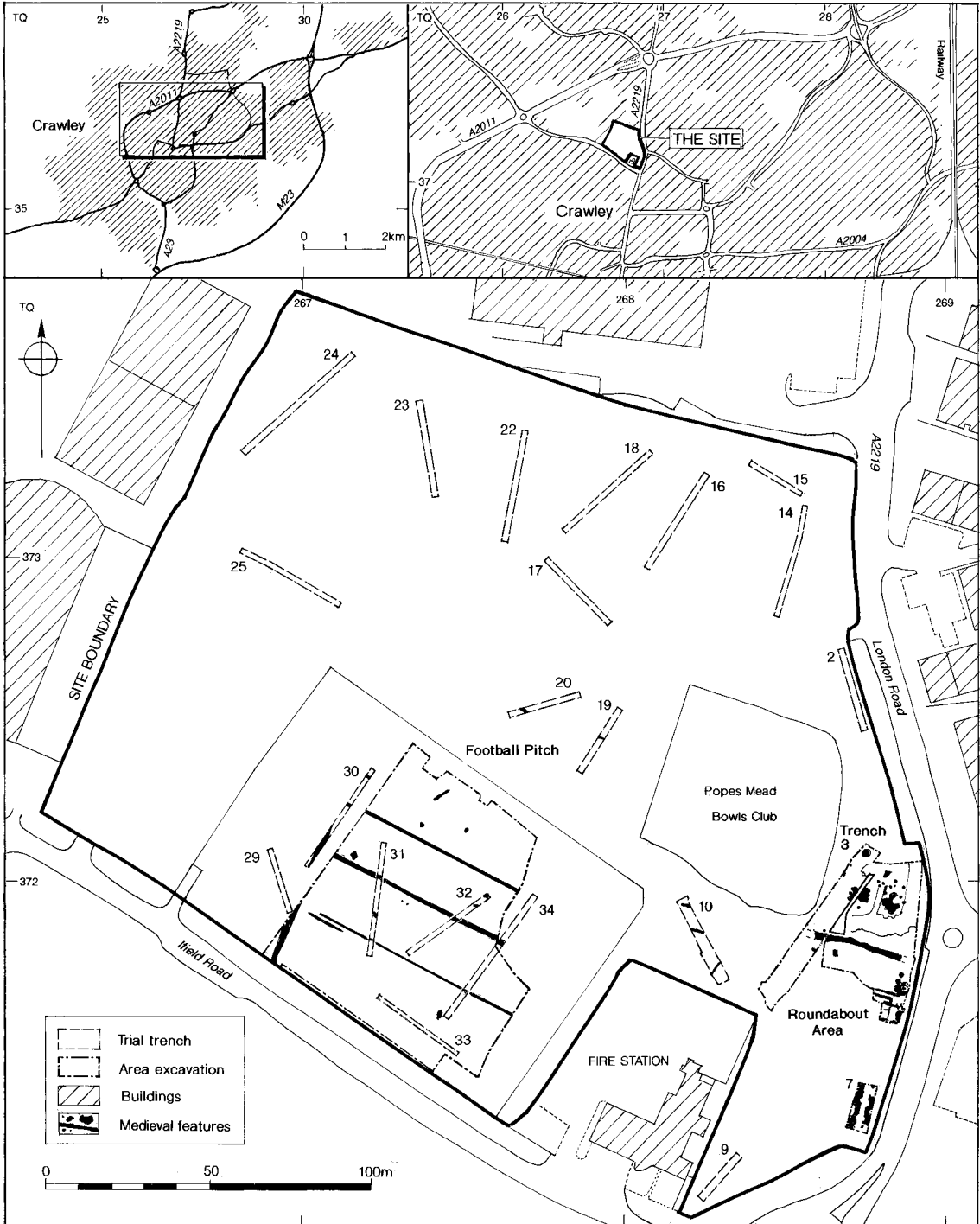


Fig. 1. Site location plan.

presumed extent of medieval Crawley, north of the High Street and immediately east of the main road to London. In the medieval period this route may have run further to the west (Nadine Hygate pers. comm.). It has been suggested that the plan of the medieval market town (with a 'cigar-shaped' market place and well-organized burgage plots) indicates that Crawley was established as a 'new town' in the early 13th century. A market was recorded there in 1202, but the town did not grow to a substantial size until the 19th century. By the late 14th century it is recorded that there were two ironworkers, several tanners and one or more cloth weavers in the town (Gardiner 1997).

Excavations along the line of the Crawley High Street Relief Road in 1995 revealed evidence of medieval occupation in the form of 13th- to 15th-century linear boundaries and pits (Saunders 1998). Similar evidence was recovered from the Old Post Office site at 15–17 High Street (Stevens 1997). Both sites produced relatively large quantities of medieval ironworking slag, supporting the idea that Crawley may have been an important centre for the Wealden iron industry.

Historical records of activity on the site itself appear to be confined to the post-medieval and modern periods. The cartographic information for the site is taken from the Tithe Map of 1839 and the Ordnance Survey maps 1874 (1st ed., 1:25,000), 1910 (1:25,000) and 1932 (1:1:2500). The focus of this article is the important evidence for late medieval ironworking on the site; detail of the post-medieval data recorded is given in the electronic supplement, held on the ADS System ('ADS').

THE EVALUATION

The evaluation specification required the mechanical excavation of 35 trenches, of between 15 m and 45 m in length, and up to 1.2 m deep, across the entire proposed development area. In total, 23 of these evaluation trenches were machined and recorded prior to the decision to implement a programme of excavation. A further two evaluation trenches were excavated as part of this subsequent phase of investigation (Fig. 1).

Evidence for medieval and post-medieval activity was recorded. The features and deposits in evaluation trench 3 are described in detail below, along with the results from the more extensive roundabout area excavation (incorporating trenches 4 and 5) which

lay immediately to the east. Trenches 2, 9, 14, 15, 16, 17, 18, 22, 23, 24, 25, 29 and 33 (Fig. 1) contained no features or deposits of archaeological interest and are not described further.

Medieval features and deposits indicated two areas of activity. Trenches 3, 4, 5 and 7, along the frontage of London Road, contained evidence for late medieval ironworking, while trenches 10, 19, 20, 30, 31, 32 and 34 all contained remains of a medieval field system (Fig. 1).

The evidence for ironworking comprised clay floors, a hearth, layers of slag and slag-filled pits. Patches of clay floor (trench 4a) sealed a grey clay layer containing pottery dating to the 13th or 14th centuries, while a number of the pits contained pottery of a similar date. Trench 3 contained a relatively thick 'carpet' of slag (some 0.10–0.15 m deep) and the remains of a possible ore-roasting hearth. The density of the features in these trenches clearly suggested that evidence for medieval ironworking was likely to survive along the street frontage, and that further excavation could shed light on the nature of this activity.

Traces of a medieval field system were identified further to the west. This consisted of four relatively shallow ditches on a roughly east–west axis, with a large north–south ditch (trench 30) and a smaller north–south ditch (trench 10). These were relatively evenly spaced, and appeared to delineate a system of narrow fields on a north-west to south-east axis. Finds from these ditches included animal bone, small pieces of slag and 13th- to 14th-century pottery.

THE EXCAVATION

With the exception of a putative pond (trenches 14 & 16), virtually all of the archaeological features appeared along the frontage of London Road in the area proposed for the construction of a new roundabout (formerly occupied by The Sun Inn and Nos 1–3 London Road), and in the vicinity of the former football pitch off Ifield Road.

THE ROUNDABOUT AREA (INCLUDING EVALUATION TRENCHES 3, 4, 5 & 7)

Phase I. Medieval: 13th–14th century (Fig. 2)

The earliest dated feature was a shallow gully (7294), 0.80 m wide and 0.28 m deep, running roughly west–east across the area for an indeterminate distance. The fill contained sherds of 13th- to 14th-century date, as did the soil horizon through which

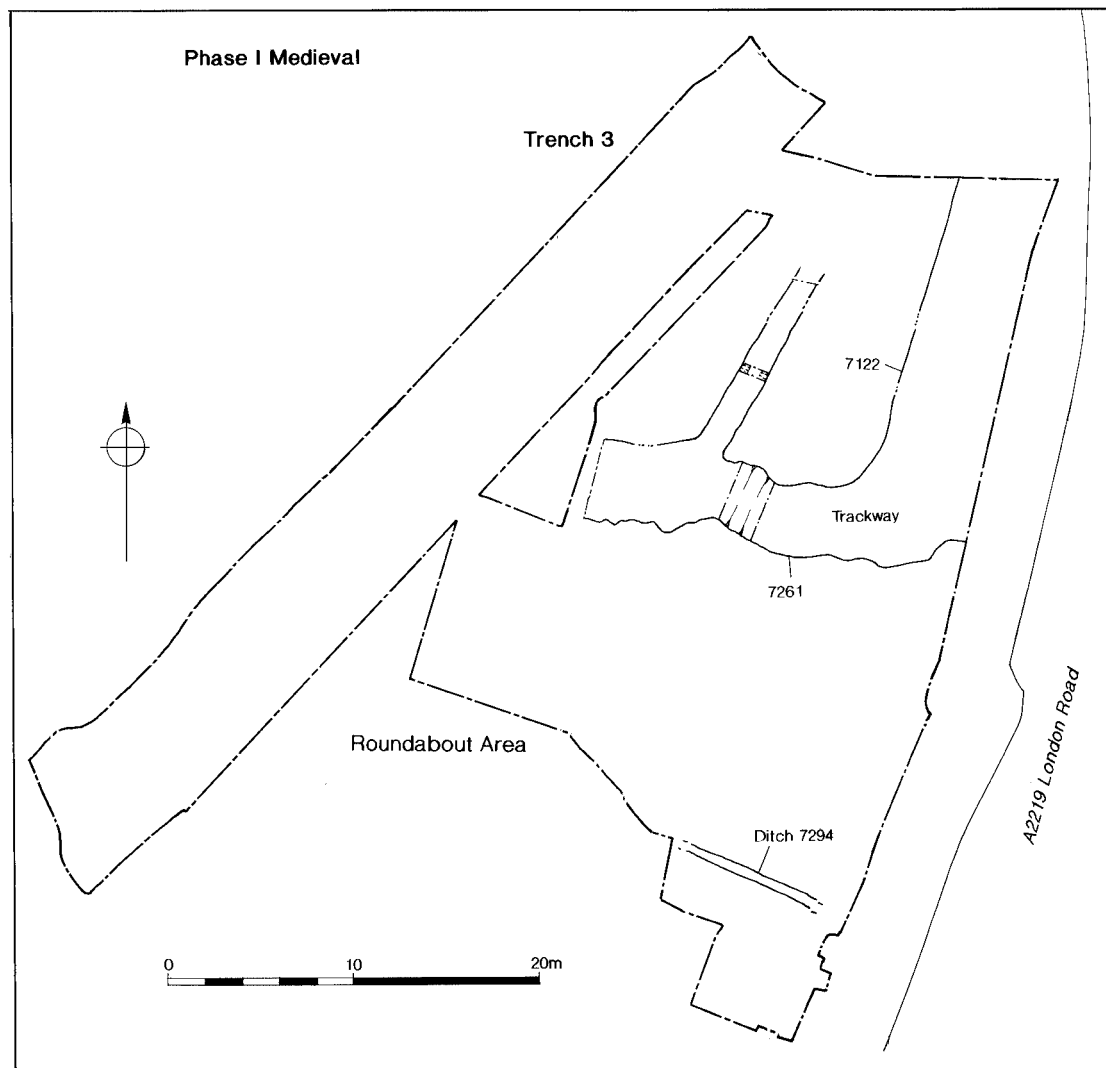


Fig. 2. Plan, roundabout area and trench 3: Phase I features.

the gully was cut. This gully may have been dug as a boundary between two plots of land, lying roughly at right angles to the present course of London Road.

Trackways 7122 and 7261

From the western limit of the excavation area trackway 7261 ran in an easterly direction before curving to the north. It was 3–4 m wide in places and some 0.30 m deep in the centre. It had a shallow U-shaped profile and a single fill. A second, less substantial trackway (7122) joined 7261 from the north. This was very shallow, although a pair of wheel ruts were identified, some 1.3 m apart. The

larger trackway either terminated or petered out to the east of trench 3. No datable finds were recovered from either, and their phasing is based on their stratigraphic relationships. Small quantities of slag were recovered from 7122 suggesting that the use of this trackway extended into Phase II.

Phase II. Medieval: 14th–15th century (Fig. 3)

Substantial remains of late medieval ironworking survived, with archaeomagnetic dates suggesting that much of this activity took place during the late 14th and early 15th centuries. The remains included clay floors, pits, ditches and hearths as well as large

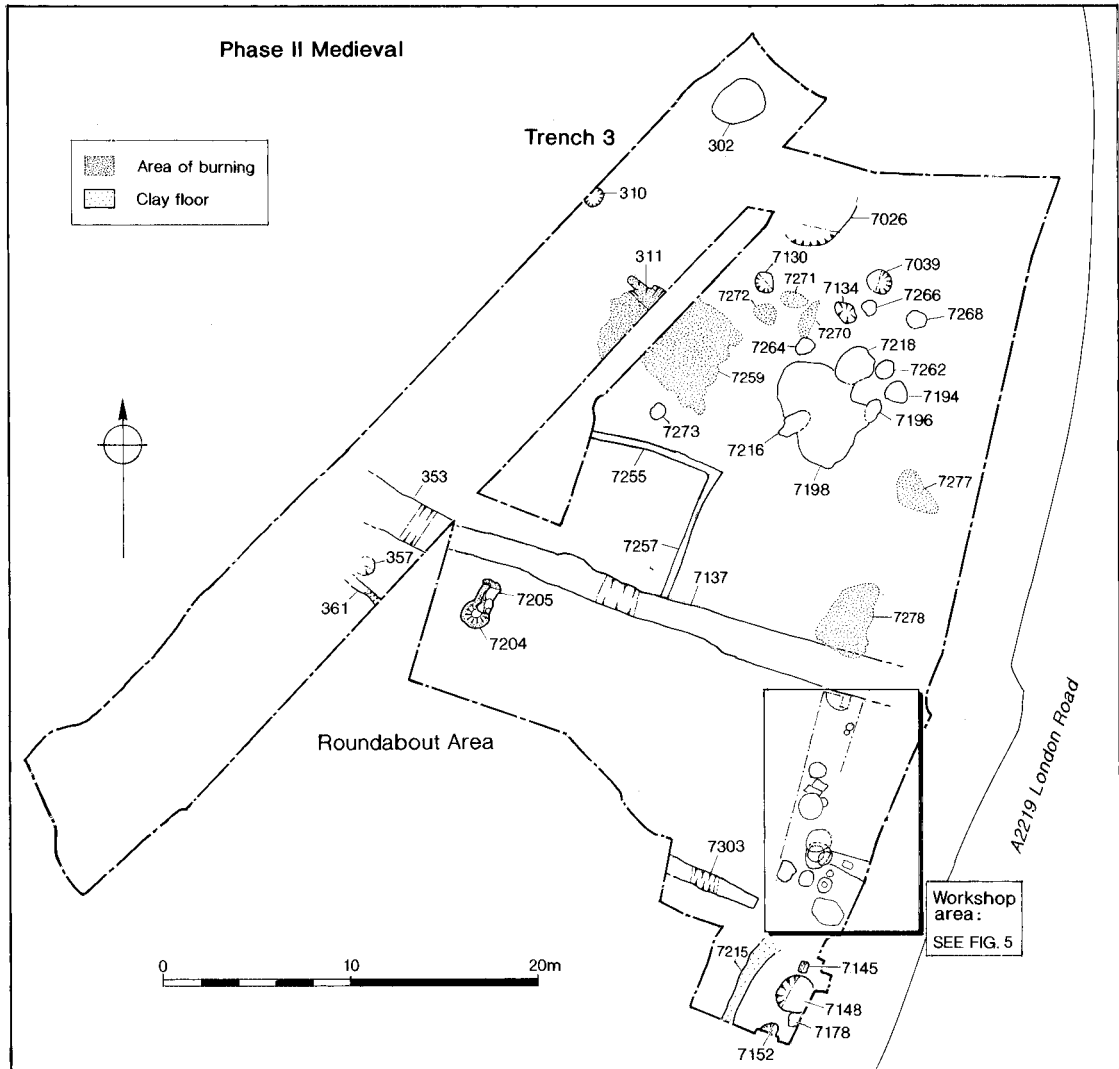


Fig. 3. Plan, roundabout area and trench 3: Phase II features.

deposits of smelting slag, smithing/forging slag and hammerscale, and small quantities of roasted ore.

Very few of these deposits could be closely dated, although there was clearly a complex stratigraphic sequence associated with this activity. In addition, there appears to have been a clear spatial differentiation between the ironworking processes of smelting and forging. The site was neatly divided into three areas by two, east-west aligned, slag-filled ditches (7137 & 7303). Ditch 7303 followed a similar line to the Phase I ditch 7294 which lay a short distance to the north, although ditch 7137 appears to have been the more significant of the two in

separating specific areas of activity and may have been a property boundary.

Features north of ditch 7137

To the north of ditch 7137, the excavated evidence suggests ore preparation and, especially, smelting. The stratigraphic sequence indicates that there were two main phases of activity. The earlier includes the possible roasting of ore and the digging of several pits, which were subsequently back-filled with large quantities of smelting slag (Fig. 3).

Small quantities of iron slag recovered from trackway 7122 suggest that it may have continued

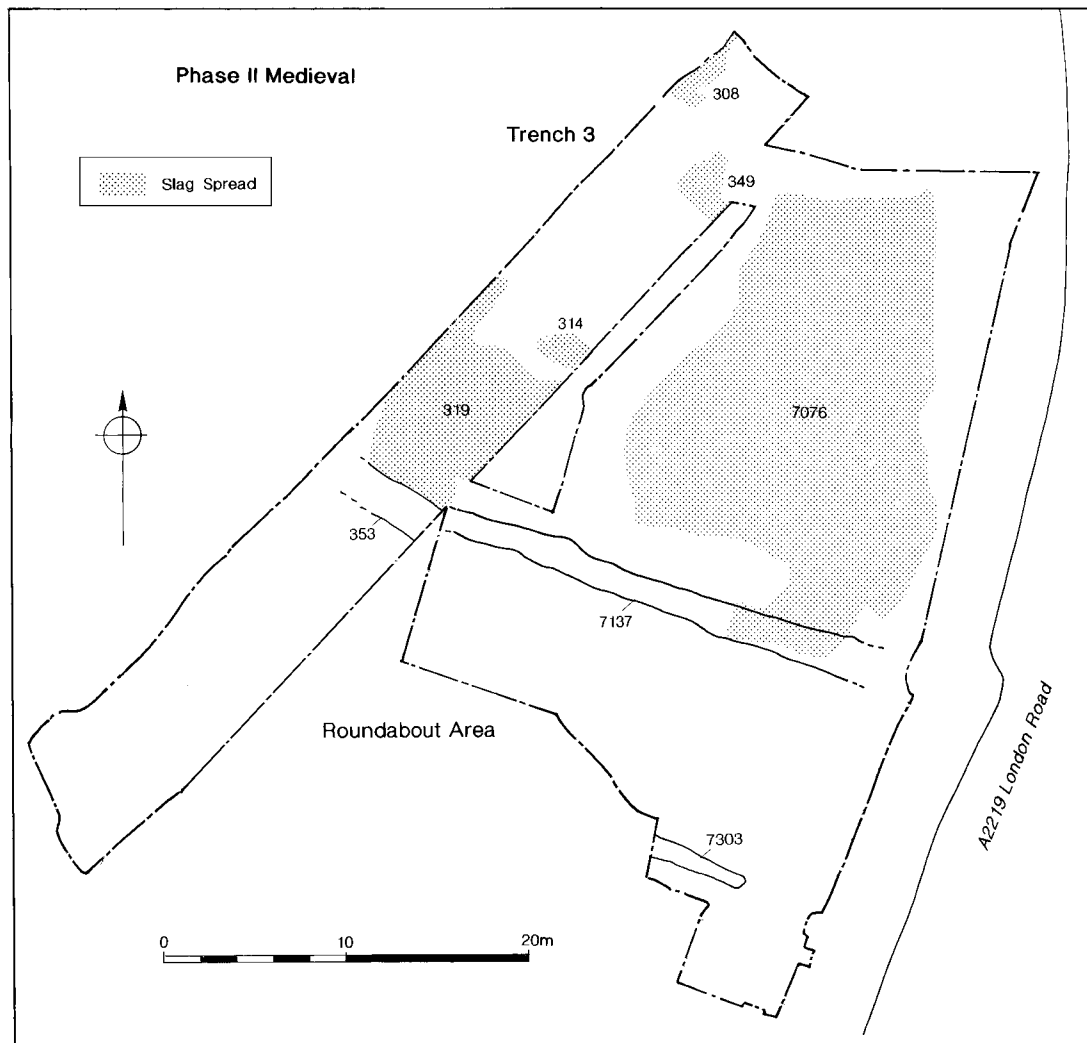


Fig. 4. Plan, roundabout area and trench 3: Phase II slag spread and boundary ditches.

in use for a short time during Phase II. Its purpose may have been to facilitate the delivery of iron ore for smelting. It may also have been used for the transport of clay extracted from the several large pits dug on the site. At some stage, however, this trackway also appears to have fallen into disuse, probably in the late 14th century.

Trackway 7261 was cut by the shallow foundation trenches for a possible structure (7255 & 7257). The trenches met at an approximate right angle, and were 6.5 m and 7 m long respectively. Both were 0.32 m wide and 0.12 m deep with concave profiles, and appear to represent the remains of beam slots.

Small amounts of slag were recovered from their fills, suggesting that the structure was at least contemporary and possibly associated with the ironworking; a burnt area (7259), possibly used for roasting ore, lay a short distance to the north.

Iron ore was roasted prior to smelting. Possible evidence for ore preparation was found in the form of a small quantity of roasted ore associated with a large area of burning or hearth (recorded as 311 in trench 3 and 7259 in the roundabout area), and a few pieces of probable roasted ore recovered from the base of a small, heavily truncated, bowl-shaped hearth (386 – not on plan), south of the line of ditch

7137. Several discrete oval areas of burning (features 7270, 7271, 7272, 7277 & 7278) were identified to the north of ditch 7137, although none of these was associated with roasted ore.

Although no smelting furnaces were certainly identified, nor any associated structural debris recovered, there is good evidence for smelting activity nearby as a large number of pits (features 302, 310, 7026, 7039, 7130, 7134, 7194, 7196, 7198, 7216, 7218, 7262, 7264, 7266, 7268 & 7273) north of ditch 7137 contained tap slag.

These pits containing slag may have been dug initially for the extraction of clay, possibly for use in the construction or lining of furnaces, and subsequently been back-filled with smelting debris. Pottery from pit 7026 dates from the 13th–14th century, and suggests that the pits (and, therefore, the smelting) were broadly contemporary with the area of forging and smithing to the south of ditch 7137 (see below). This suggestion is supported by the presence of small quantities of hammerscale and forging slag in some of the pits containing large amounts of tap slag.

The final phase of late medieval activity to the north of ditch 7137 consisted of the deposition of a thick ‘carpet’ of slag extending over much of the northern half of the excavation area (variously recorded as 308, 314 & 319 in trench 3, and 7061, 7076, 7104 & 7111 in the roundabout area) of which 7076 was the upper layer (Fig. 4). Excavated sections indicated that it was up to 0.30 m deep and consisted of numerous individual deposits of slag, occasionally separated by dumps of other material, including redeposited clay.

The deposition of slag across this area, sealing earlier pits, may indicate that clay extraction had ceased, and that there was a need to provide an area of ‘hard standing’ in the northern half of the site. This layer of slag closely respected the line of ditch 353/7137, which clearly still functioned as a boundary at this time.

Features south of ditch 7137

There was further evidence of ironworking to the south of ditch 7137, representing forging/smithing (bloom consolidation) rather than smelting. As in the northern half of the site, there was a considerable complexity to the sequence of activity, notably in the area of clay floors along the street frontage on London Road which are thought to represent a workshop, probably a smithy (Fig. 3). The phasing is insufficiently precise to enable specific dates to

be given to each sub-phase, but all can be broadly ascribed to the 14th or 15th centuries, with most activity probably belonging to the late 14th and early 15th centuries.

Workshop phase 1 (Figs 5 & 6)

The earliest phase was heavily truncated by later activity. The surviving remains included a small bowl hearth (7083), two small pits (7247 & 7315) and an area of clay flooring (7245) associated with a small post-hole or pit (7249). The clay floor and hearth were not directly associated, but both were sealed by a later phase of activity. The small hearth consisted of a shallow clay-lined pit, with the exposed surface of the clay burnt a deep red. This was sealed by a very shallow lens of burnt material (7319). No slag was associated with this feature, although the clay base to the hearth (7083) sealed a small pit (7113) containing smithing slag and hammerscale.

The reddened area of burnt clay at the base of the hearth (7083) was sampled for archaeomagnetic dating. This gave ‘a date range of AD 1370–90 at the 68% confidence level and AD 1350–1400 at the 95% confidence level’ (MoLAS 1998, 2). That dating is supported by the only pottery recovered from the hearth, namely a fragment of a West Sussex Ware jug base dating from the 14th or 15th century. That evidence suggests a fixed *terminus post quem* for the later phases of workshop activity and also indicates that the use of the large hearth to the east (7204, see below) was broadly contemporaneous with the ironworking in the workshop along the street frontage, and also with the roasting and smelting activity in the northern half of the site.

Workshop phase 2 (Figs 5 & 6)

The second phase of workshop activity was the best preserved, and consisted of areas of clay flooring containing several patches of burnt reddened clay, possibly the remains of small hearths (7074, 7174, 7175, 7176, 7187, 7298 & 7299).

Although later truncation meant that the full extent of the clay floor could not be established, the surviving fragments of flooring and associated spreads of material provide minimum dimensions of 10 m by 5 m for the workshop. There were no surviving structural remains associated with these clay floors, and it is assumed that the superstructure was supported on ground beams which had left no trace.

All of the small hearths were of a similar form:

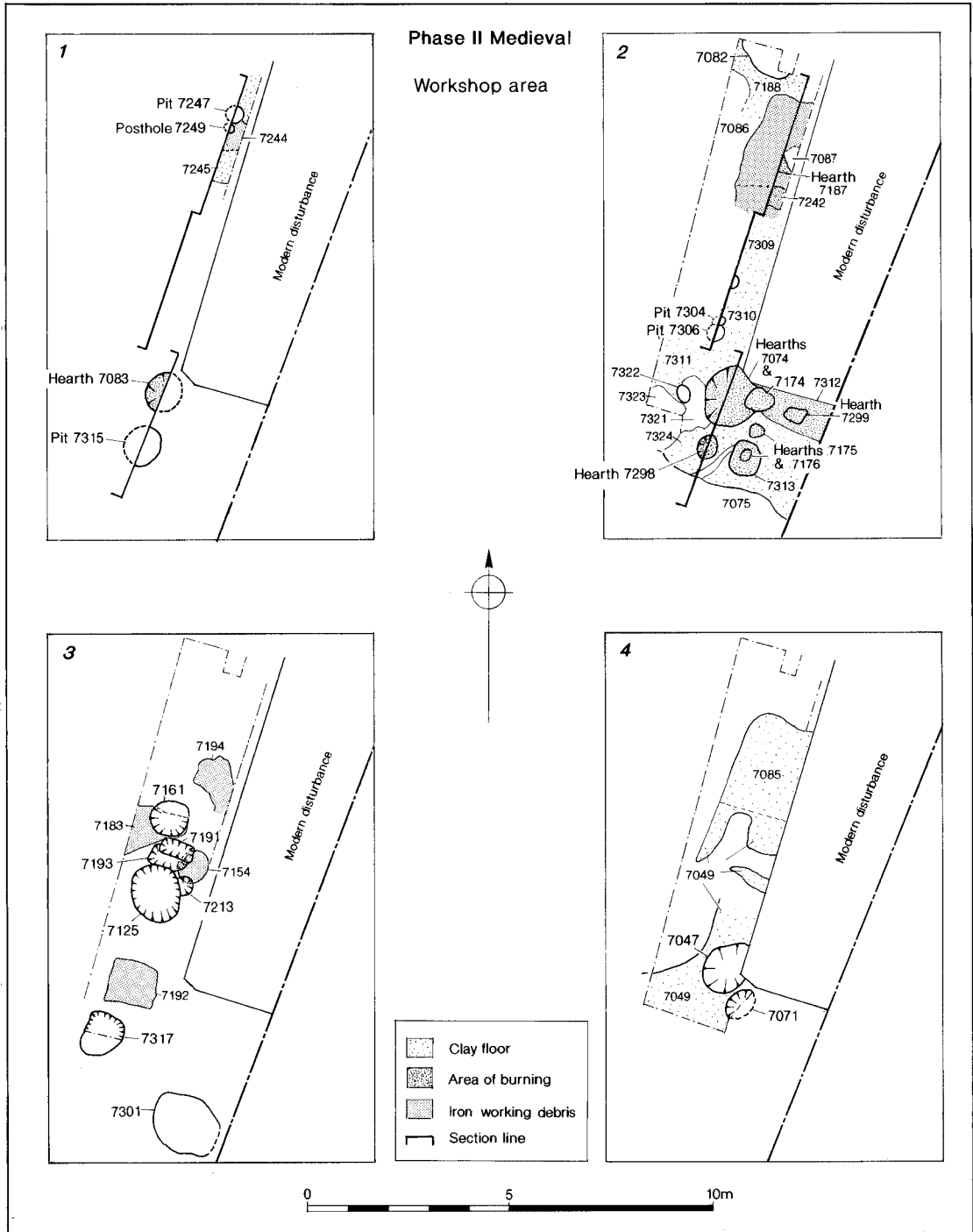


Fig. 5. Plan, roundabout area and trench 3: Phase II workshop and related features (phases 1 & 2.).

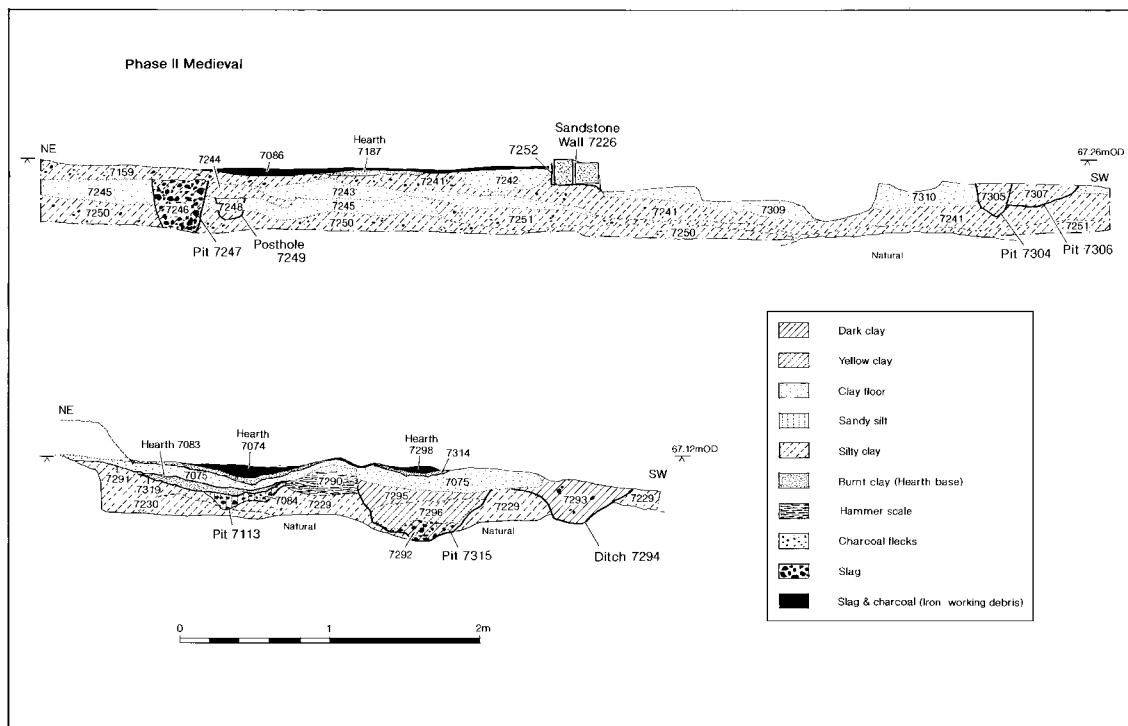


Fig. 6. Section, roundabout area and trench 3: Phase II workshop and related features (phases 1 & 2).

small, shallow, bowl-shaped pits set within the clay floor. One (7174) retained a substantial *in situ* accretion of slag, perhaps representing one or more hearth bottoms (see Fig. 14), and all contained forging slag and relatively substantial deposits of hammer scale indicative of the forging process. All but one of these hearths lay in the southern half of the workshop area. Much of the surviving extent of the clay floor in the northern half of the workshop was covered by a spread of charcoal (7086), perhaps indicating that charcoal was stored here prior to its use in the hearths. A single slag-filled pit (7082) cut the northernmost fragment of clay floor. The fill of this pit consisted of smelting slag, and represents one of the few deposits of smelting slag to the south of ditch 7137.

A number of small features also cut this clay floor, including two possible post-holes (7304 & 7322). Neither of these is obviously related to either the workshop structure, or to the ironworking.

Workshop phase 3 (Fig. 5)

The third phase of workshop activity consisted of a number of pits and spreads of ironworking debris

apparently not associated with any areas of flooring. The greatest concentration of these features occurred in the central portion of the workshop area. Of the spreads, three (7183, 7192 & 7194) appear to have been dumps of burnt material, including charcoal and burnt clay, which may represent hearth debris. Pottery recovered from spread 7192 dated from the 14th or 15th century. The fourth spread, layer 7154, consisted almost entirely of a layer of hammer scale. The amount of hammer scale present suggests that this may have been an *in situ* deposit directly associated with the forging of blooms. This layer lay in close proximity to a number of shallow features, two of which were roughly rectangular in form (7191 & 7193). Of these, 7191 was dug later than, and possibly as a replacement for, 7193, and it is possible that these two cuts represent successive positions of an anvil, with spread 7154 representing the debris from forging.

Two slightly larger circular pits (7125 & 7161) were excavated on either side of rectangular cuts 7191 and 7193. Pit 7125 was relatively deep, and contained a single silty fill from which substantial quantities of hammer scale and finely-crushed

forging slag were recovered. Small fragments of pottery recovered from this feature have a date range of 13th–14th century and were possibly residual. Pit 7161 was shallower, but contained similar deposits of hammerscale and crushed forging slag. Two pits to the south of this area, pits 7301 and 7317, both contained slag, but neither were fully excavated or sampled.

Workshop phase 4 (Fig. 5)

The final phase of ironworking activity in the workshop area was represented by a truncated area of clay flooring (7049 & 7085) and two small pits. Both pits lay in the southern half of the clay floor. The larger (7047) contained both forging and smelting slag, the other (7071) contained tap slag from smelting. No evidence was recovered for continued forging within the workshop area during this period, but much of the area has been truncated more recently, and such evidence may have been lost.

Hearth 7204 (Figs 3 & 7)

A single large hearth lay towards the western edge of the roundabout area (hearth 7204). This feature, measuring c. 2.8 m by 1.4 m, was roughly keyhole-shaped in plan and the natural clay into which it was dug had been burnt a deep red. This burnt clay was sampled for archaeomagnetic dating and this

gave ‘a date range of AD 1390–1410 at the 68% confidence level and AD 1375–1425 at the 95% confidence level’. It should be noted, however, that the date range for this feature occurs at a crossover point on the calibration curve and as such, provides two date ranges. The alternative date range is AD 240–60 at the 68% confidence level and AD 215–75 at the 95% confidence level. On site observations indicate that the later date range corresponds more closely to the site stratigraphy (MoLAS 1998, 1) and the earlier date range can therefore be discounted.

Hearth 7204 was the largest of the hearths excavated and lay some 20 m to the west of the forging hearths in the workshop on the street frontage. Bulk samples taken from the fill produced over 8 kg of broken, blocky slag, probably redeposited and therefore not associated with the feature, and some hearth lining including fragments that were grey in colour as a result of reduction.

The function of hearth 7204 is uncertain. However, its plan, the extent of the heat-reddened clay, and the paucity of reduced and vitrified material which might be furnace lining, suggest that it is more likely to have been utilized in an oxidizing process (i.e. forging/smithing) rather than in a high temperature, reducing process (i.e. smelting). A small pit (7205) cut the fill of this feature, and contained slag and some lightly concreted ‘ferrous dust’ with charcoal inclusions (possibly fines from roasted ore or debris from smithing) together with 13th- to 14th-century pottery.

Boundary ditches and other features (Fig. 3)

Two slag-filled linear ditches (7137 & 7303) ran east-west across the area. Ditch 7137 demarcated different areas of ironworking activity, and may have also marked a property boundary. Its upper fill consisted almost entirely of slag, including both forging and smelting debris, above a primary fill of clay. Ditch 7303 lay a short distance to the north of the earlier (phase 1) ditch 7294, and may have replaced it as a boundary feature. Slag recovered from the fill consisted largely of forging waste and a small quantity of hammerscale. These boundaries appear to have survived into the 17th century, when they were respected by a new building (6004).

A further, heavily truncated area of clay flooring (7215) lay to the south of ditch 7303. Three pits to the east of it (7146, 7148 & 7152) all contained forging slag, while one also contained small amounts of hammerscale.

Trench 7 to the south of the roundabout area /

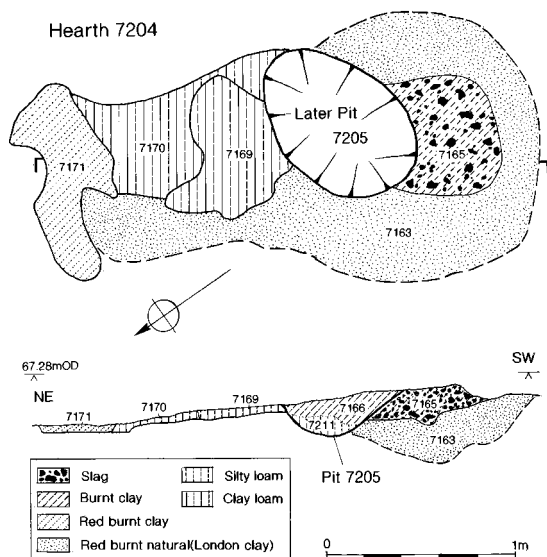


Fig. 7. Plan and section, hearth 7204.

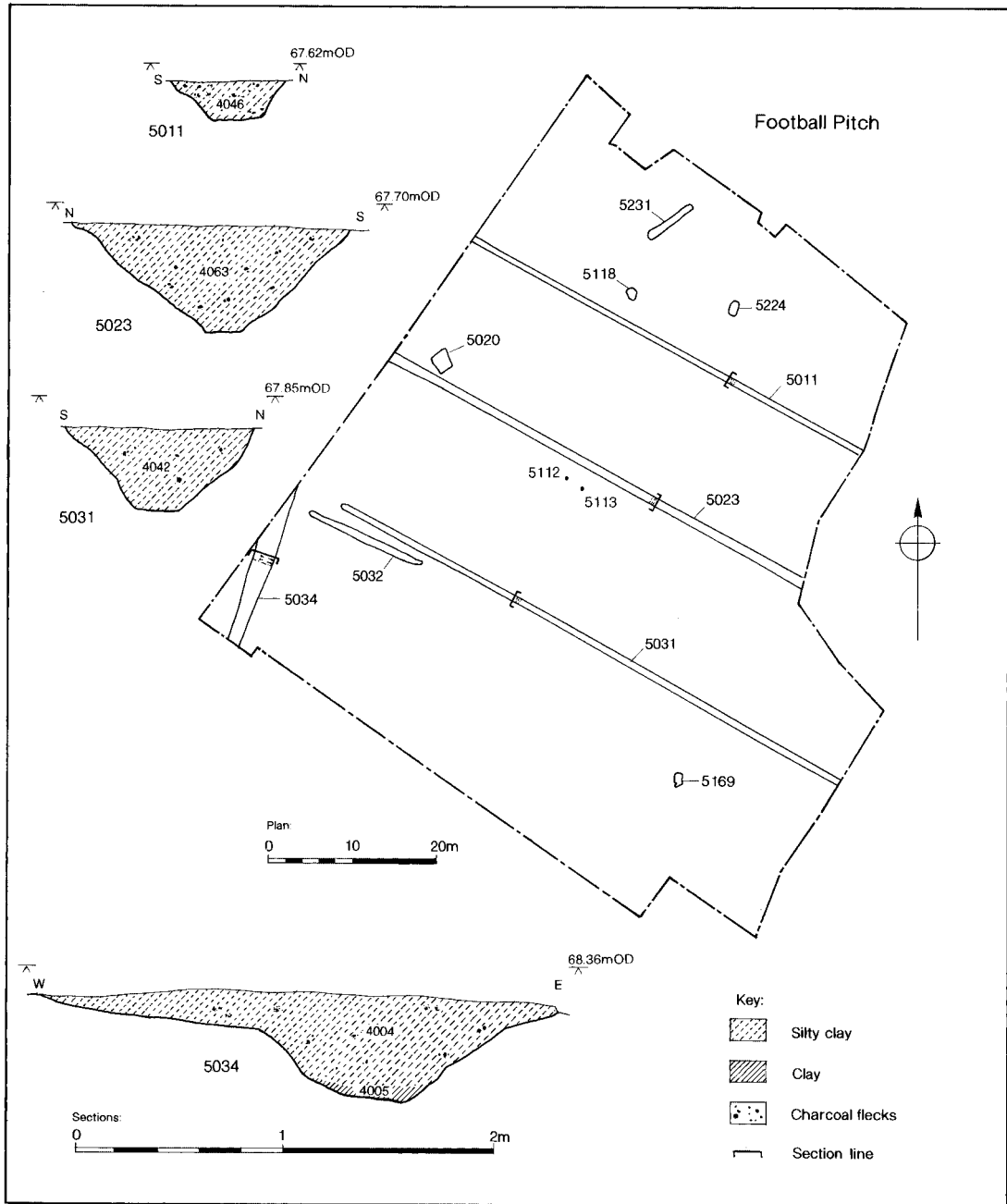


Fig. 9. Plan, football pitch area: all features and ditch sections.

trench 3 covered an area of approximately 100 m² (Fig. 1). A number of archaeological features were revealed, but the central part of the trench had been heavily truncated by a modern ditch alongside the

road. Almost permanent flooding of the trench meant that it was virtually impossible to excavate any of these features which appeared to comprise several possible pits and ditches. Finds recovered

from sample excavation included ironworking slag and a small quantity of pottery of 13th- to 14th-century date.

There is no evidence for the continuation of ironworking on the site into the post-medieval period, and it seems likely that this activity was confined to a relatively short period in the 14th and 15th centuries.

THE FOOTBALL PITCH AREA

Approximately 4500 m² of the former football pitch was stripped by machine. The topsoil was removed to reveal the underlying clay, cut by a number of features of possible archaeological interest all of which may have suffered a degree of truncation as a result of levelling.

Medieval: 13th–15th century (Fig. 9)

Only a few features excavated were shown to be of archaeological significance. These included three north-west to south-east ditches (5011, 5023 & 5031) and a north–south ditch (feature 5034) identified in the evaluation trenches. The ditches aligned north-west–south-east lay approximately 17–18 m apart and contained 13th- to 14th-century pottery. All were relatively shallow and had U-

shaped profiles. A short stretch of gully (5032) ran parallel to, and slightly to the south of feature 5031; its fill also contained pottery of 13th- or 14th-century date.

The nature of this boundary system and its alignment suggests a planned field system some distance away from the road, but roughly at right angles to it. The alignment of this system differs slightly from the medieval and late medieval ditches on the roundabout area, which are more closely aligned east–west. No evidence for such a system was recovered from the northern half of the site and its full extent cannot be closely defined, although further elements were recorded in evaluation trenches 10, 19 and 20 (Fig. 1).

Undated and modern features (Fig. 9)

The undated features included a large, shallow, sub-rectangular pit (5020), two smaller pits (5118 & 5224), a pit containing evidence for *in situ* burning (5169), two small post-holes (5112 & 5113) and a short ditch aligned roughly south-west to north-east (5231). One of the two post-holes (5112) contained a substantial mass of iron nails in its fill. Several modern drainage features and tree throws were also recorded.

FINDS

IRONWORKING EVIDENCE By Phil Andrews

A considerable amount of evidence for ironworking was recovered. Most if not all can probably be assigned to the late 14th to early 15th century. This included the remains of a probable workshop/smithy, several hearths, and various spreads and dumps of slag and other debris which indicate that ore roasting, smelting (bloomery iron making) and forging (bloom consolidation) took place on the site or in its immediate vicinity.

Distribution

The distribution of slag and other debris across the site as a whole, including material from the evaluation trenches, clearly demonstrates that the focus of ironworking activity lay within a comparatively restricted area, possibly within a single property, adjacent to the London Road frontage (Fig. 10). This concentration of slag is also reflected in the distribution of medieval features and deposits (other than field boundary ditches) which were closely grouped in the same area immediately to the west of London Road (see Fig. 1: the roundabout area).

Sampling and recording

The substantial quantities of slag present required that an appropriate sampling strategy be implemented. This entailed keeping 100% of the debris from hearths and other small features which appeared to have metallurgical functions, and taking bulk samples. Bulk samples of 15 litres or more from

larger features (mainly pits and ditches) and spreads of debris provided a representative collection of material and enabled hammerscale to be recovered by wet-sieving. As a result, approximately 320 kg of slag and other debris was retained by total recovery and bulk sampling of a range of features and deposits. Other, diagnostic pieces of slag were kept where these provided potentially useful information or were good examples of their type.

No attempt has been made to calculate accurately the total quantity of slag present on the site. This is because of the differing percentages of features and deposits excavated and because an unknown quantity of debris is likely to have been removed or redeposited during the construction of buildings along the London Road frontage from the 17th century onwards. However, it can roughly be estimated that the overall quantity of slag amounted to several tonnes, if not tens of tonnes, all probably of late 14th- to 15th-century date, a large proportion of which derived from iron smelting.

The slag and other debris recovered has not been scientifically analyzed. It has been classified according to visual characteristics (both externally and in section) and, where possible, a likely source has been assigned (e.g. smelting or forging/smithing waste). The distribution of the differing types of debris identified (roasted ore, smelting slag, forging slag and hammerscale) and the associated hearths within the principal area of ironworking activity (the roundabout area and trench 3 contiguous with it) are shown in Figure 11. A complete list of the features and deposits containing slag and other ironworking debris is contained in the archive, where weights and types of material are listed by context.

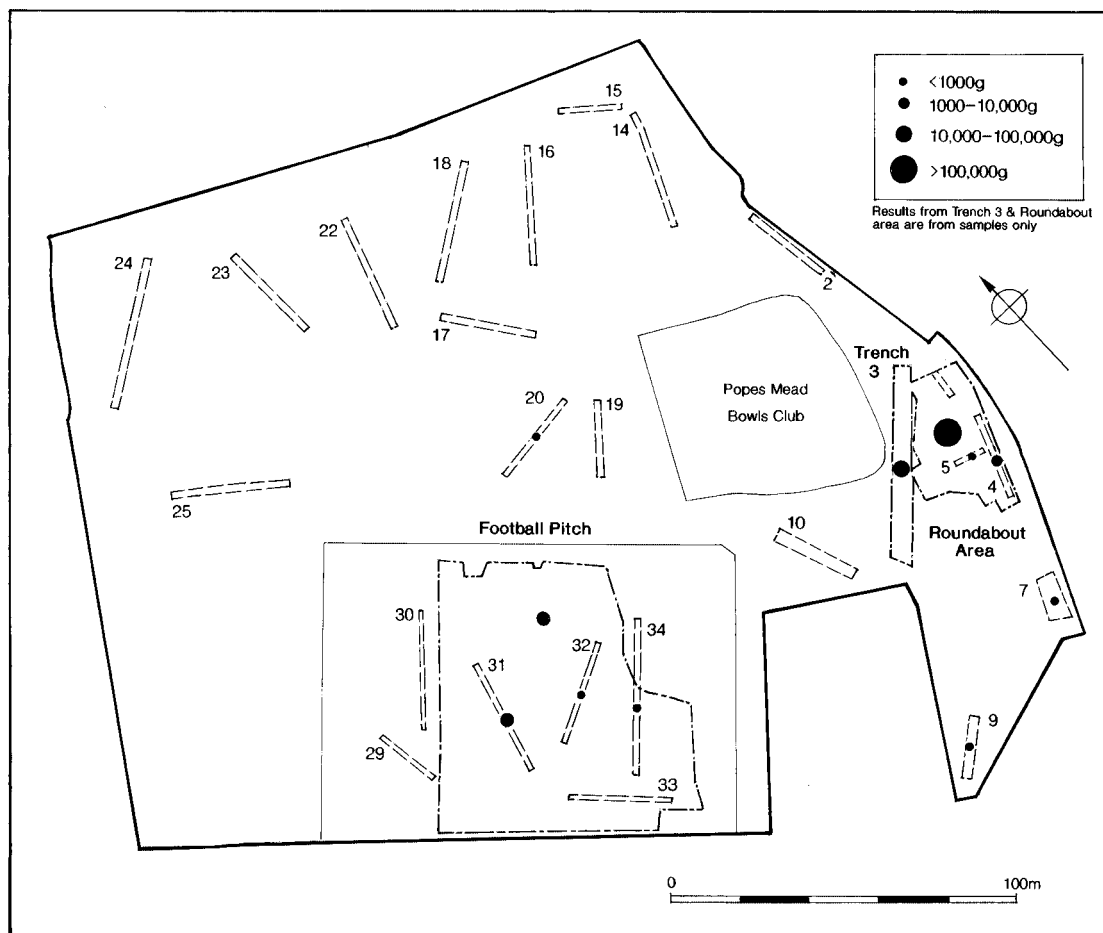


Fig. 10. Slag totals from area excavations and evaluation trenches.

Ore roasting

There is some, albeit relatively slight, evidence to indicate that ore roasting was undertaken on the site. Roasting or calcining was carried out prior to smelting in order to oxidize the ore, remove water, and break it down into smaller pieces. This process increased the surface area, thereby improving both the effectiveness of the roasting process and the efficiency of the smelting operation.

Hearth 311, partly exposed towards the north-west corner of the main excavated area (Figs 3 & 11), comprised a possibly sub-circular or oval area of burnt *in situ* 'natural' clay. This clay area, measuring up to 3 m across, was generally dark-reddish-brown in colour, with localized light-reddish-yellow patches, becoming greyer with depth. No heavily burnt or vitrified material was present and there was no evidence for any form of additional lining or any superstructure surviving above ground level. Some charcoal and a single piece of burnt timber lay on the surface of the burnt clay along with approximately 2.5 kg of walnut-sized pieces of roasted ore (siderite mudstone). This roasted ore was of a consistent maroon colour throughout,

which suggests that it may have remained in the bottom of the hearth for more than a single roasting operation.

No other evidence for possible ore-roasting hearths was present (with the possible exception of feature 386 to the south of ditch 7137). Occasional pieces of roasted ore were recovered from elsewhere on the site, and a few fragments of ore which had not been roasted were also collected, the latter being grey in colour with a characteristic weathered outer layer of reddish-grey limonite.

Iron smelting

Substantial quantities of tap (smelting) slag were present, occurring either as spreads or as dumps in pits and ditches, in some cases almost entirely filling these features. This slag generally had a 'ropey' surface, which formed as it flowed out of the furnace and cooled. The slag sometimes occurred in large plates, was often very porous and bloated, and included at least one large, complete, hemispherical lump which had been tapped into a small pit adjacent to a furnace (this example retains the shape of the pit and the channel which ran from

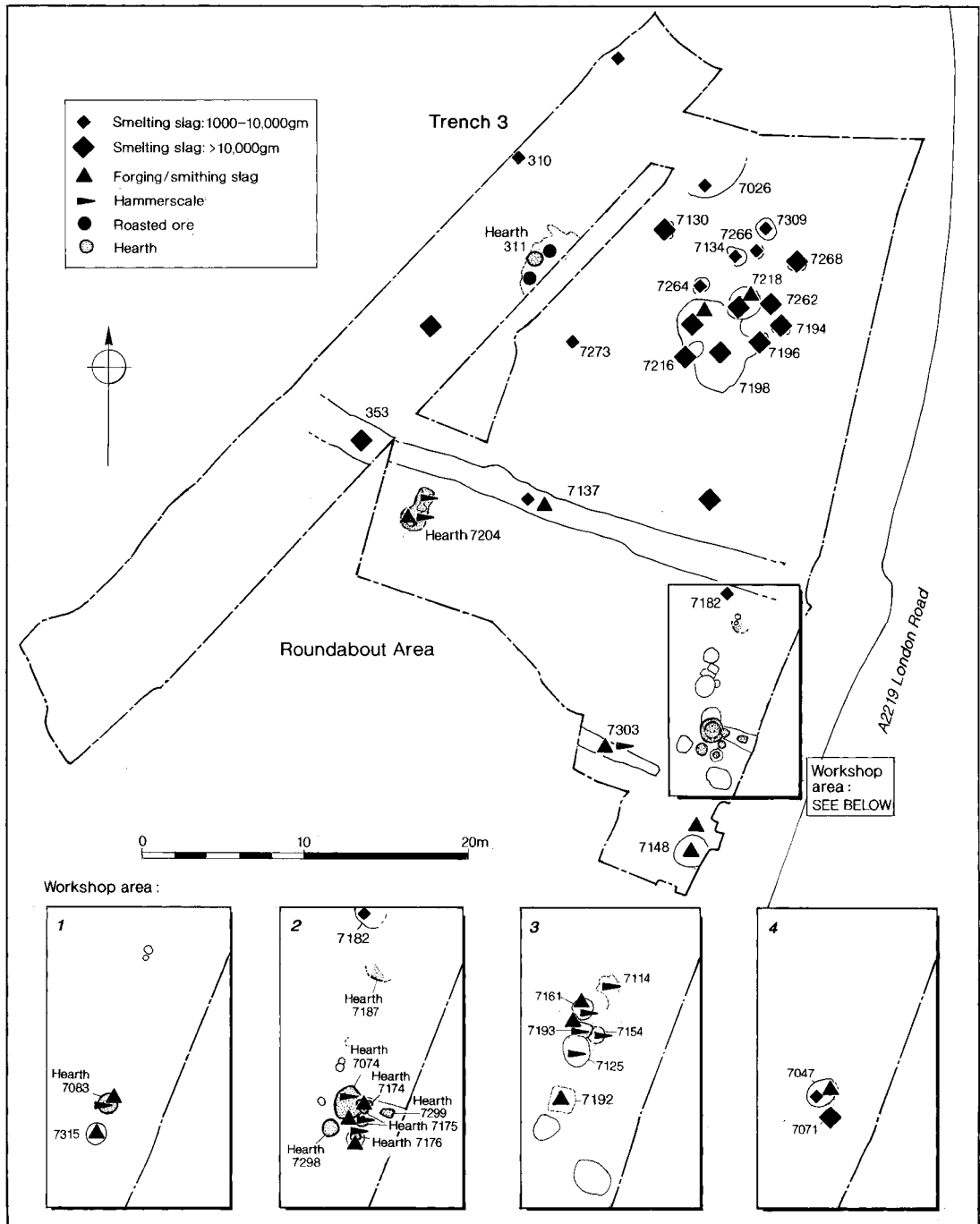


Fig. 11. Plan, roundabout area and trench 3: distribution of ironworking debris from phase II features.

the furnace; Fig. 12). There was also a considerable quantity of fragmentary, platy tap slag, which is likely to have been broken up when it was removed from around the furnaces

and redeposited. Occasional pieces of dense slag may also have been tap slag or fragments of furnace bottoms which remained in the furnaces following smelting, although some may

possibly have derived from the consolidation of iron blooms (bloom or primary smithing).

By far the greater proportion of the smelting slag recovered came from features or layers in the northern part of the main excavated area, to the north of ditch 7137 (Fig. 11). Although all of this slag was redeposited, it is unlikely that it had been moved far and this suggests that smelting took place in the immediate vicinity of the site, perhaps in the uninvestigated area to the north-west (the former site of the Popes Mead Bowls Club which was not available for excavation; see Fig. 1).

No furnace remains were positively identified within the excavated area. Although it is possible that furnace traces had been entirely destroyed, this is considered improbable as the remains of several forging/smithing hearths were present and these are likely to have been less substantial than smelting furnaces. Furthermore, no fragments of vitrified clay or less heavily burnt, grey, reduced furnace lining were recovered. These would have provided positive evidence for the existence of smelting furnaces on the site.

Several of the larger pits may have been dug initially to extract clay for furnace/hearth linings (and also perhaps for building material), and it is possible that some were subsequently utilized as small ponds to provide water for quenching. The main group of larger pits, comprising pit 7198 and surrounding features, lay in the central northern part of the site and contained the greatest quantities of smelting slag (Fig. 11). To the south and west of this pit group there were several extensive, though truncated, spreads of broken-up smelting slag (e.g. layers 7076 & 319/350). These were of fairly even thickness and appear to have been part of one or more deliberately laid surfaces covering much of the area to the north of ditch 7137 (see Fig. 4). It seems that the majority, if not virtually all, of this debris was deposited in the medieval period, whereas the smaller quantities of smelting slag to the south of ditch 7137 appear to have been in features or deposits associated with the post-medieval buildings later built there, and with a late (19th-century) recut of ditch 377 to the west. It is possible, therefore, that this debris had been redeposited from elsewhere, most probably from the area to the north of ditch 7137, and need not indicate that smelting activity took place to the south of ditch 7137, an area which otherwise seems to have been given over exclusively to forging.

Iron forging

In contrast to the distribution of smelting slag, the evidence for forging, comprising principally slag and hammerscale, came almost exclusively from the southern half of the main excavated area, to the south of ditch 7137 (Fig. 11). The slag was characterized by a somewhat amorphous, sometimes cindery, appearance with no obvious flow structure, although some pieces had 'dribbles' on their upper surface. Plate hammerscale (recovered from the 0.5 mm sieved fraction) was present in large quantities in several of the samples taken from this area, as well as from two of the pits to the north of ditch 7137. Lesser amounts of prills of slag expelled during hammering were also noted. It is considered most likely that this debris derived from forging or bloom consolidation (primary smithing) rather than the manufacture of finished objects (secondary smithing). Bloom consolidation involved repeated heating and hammering of the 'spongy' iron bloom produced in the smelting furnace, in order to expel slag entrapped in it. This process resulted in a denser, relatively pure bloom of iron.



Fig. 12. Complete 'cake' of tap slag (scale = 0.2 mm).

The most significant feature revealed by the excavations was a probable workshop site. This was represented by the fragmentary remains of several hearths and an associated sequence of two or more superimposed clay floor surfaces mottled with dark, charcoal-rich soil, orange/red (oxidized) clay, and yellow/grey (reduced) clay (see Figs 3, 5 & 6). Although this area had suffered a considerable degree of post-medieval disturbance as a result of building development from the 17th century onwards, sufficient survived to indicate that it had probably been the site of a forge or smithy set within a rectangular timber building or shelter lying adjacent and parallel to London Road. The remains of several probable hearths were identified, each represented by several shallow, intercutting pits containing discontinuous layers of burnt clay, broken slag, and concentrations of hammerscale (Fig. 11). These are likely to have been string-hearths in which the iron blooms were heated repeatedly as part of the consolidation process. An archaeomagnetic date of AD 1350–1400 was obtained from one of the burnt surfaces in hearth 7083. Embedded in the uppermost floor surface immediately to the east of this hearth was what appeared to be an agglomeration of two or three slightly hemispherical forging or smithing hearth bottoms (7174; Fig. 13), one of which had a shallow elongated depression in the top perhaps created by the air blast from a set of bellows. This agglomeration of slag, the hearths, and the large quantity of hammerscale also recovered from this area, suggest that an anvil lay in the immediate vicinity. Two possible anvil sites have been identified (7191 & 7193).



Fig. 13. Forging/smithing hearth bottom (scale = 0.2 m).

At least one other probable hearth was identified, lying to the west of the probable workshop and south of ditch 7137. Hearth 7204 comprised a sub-circular, clay-lined hollow approximately 1m in diameter and 0.1 m deep (Figs 3, 7 & 11). The clay lining was burnt red and provided an archaeomagnetic date of AD 1375–1425. This feature contained probable forging slag, a considerable quantity of hammerscale, and some burnt hearth lining. Nothing survived to indicate that this hearth lay within any form of structure, but it is probable that this was also associated with the consolidation of iron blooms.

METAL OBJECTS By Emma Loader

All metal finds were post-medieval. They are detailed in the ADS supplement.

POTTERY By Lorraine Mephram

The pottery assemblage amounts to 626 sherds (12,455 g), of

which 336 sherds (2881 g) are of medieval date and the remainder post-medieval. Only the medieval assemblage will be discussed in detail here. Medieval pottery was recovered from evaluation trenches 3, 4, 5, 7, 20, 31, 32, and 40 and from the roundabout area. The general condition of the assemblage is relatively poor: sherds are small, with rolled edges and abraded surfaces; there are no reconstructable profiles.

Methods, forms and fabric are detailed in the ADS supplement. The examination of this small assemblage has confirmed patterns observed within other medieval assemblages from Crawley, in the identification of wares from at least four potential sources or source areas (Earlswood, Surrey/Hampshire, West Sussex and Limsfield). Of these the Earlswood types are predominant.

The small size of the assemblage and the lack of a well-stratified ceramic sequence means that the overall dating of this assemblage is still somewhat uncertain, although the archaeomagnetic dates obtained from hearths 7083 and 7204 do help to date at least part of the ceramic sequence. Potentially the earliest pottery here, on both ceramic and stratigraphic grounds, is the single shelly sherd from clay floor layer 7245. Most of the rest of the assemblage would on ceramic grounds fit within a 13th- to 14th-century date range, and this includes the Earlswood-type wares and the Limsfield-type wares. There is insufficient evidence to suggest any chronological sequence within this group, or to refine the dating more closely. However, the association of Earlswood-type wares with West Sussex wares in several contexts suggests that these contexts at least (concentrated in the roundabout excavation area) fall towards the end of this sequence in the 14th century or even early 15th century, a time when the Earlswood type wares were being replaced by West Sussex wares (Barber 1997b). This is confirmed by the of later 14th-century archaeomagnetic date from hearth 7083 and the later 14th- to early 15th-century one from hearth 7204.

CERAMIC BUILDING MATERIAL By Emma Loader

The assemblage of ceramic building material finds is entirely post-medieval in date. It is detailed in the ADS supplement.

ENVIRONMENTAL EVIDENCE

Charred plant remains and charcoal were analyzed in detail by Pat Hinton and Rowena Gale respectively. Their findings are recorded in the ADS supplement.

DISCUSSION

By Phil Andrews, Nicholas Cooke and Rowena Gale

Archaeological survey and excavation in the Weald, much of it undertaken by the Wealden Iron Research Group, have revealed a large number of ironworking sites which have been catalogued in some detail (Straker 1931; Crossley 1975; Wealden Iron 1973; 1988; 1989; 1990; 1995; 1996; Cleere & Crossley 1995, 288–93). However, many of these sites are represented only by slag. Of those which have been

dated or further investigated, only a small number have been demonstrated to be of medieval date, with the vast majority being either Romano-British or post-medieval. A dozen or so sites are listed where the presence of medieval pottery (of 12th-/13th- to 15th-century date) has been found in apparent association with ironworking slag, but the excavated evidence for bloomery and forging sites remains relatively slight. Only two excavations, at Minepit Wood and Alsted, have produced substantial evidence for medieval ironworking, and to their evidence should be added the Tudeley accounts (*see* below). These provide the best documentary evidence for medieval ironworking in the Weald.

The important excavations at Minepit Wood, Rotherfield, Sussex, revealed a relatively complete and undisturbed ironworking site of the 14th–15th

century. It comprised a roasting furnace, a smelting furnace, a timber-framed building enclosing the furnace, and substantial dumps of ore (both unroasted and roasted), charcoal and smelting slag (Money 1971). No evidence for forging was found at Minepit Wood, and the accounts for Tudeley, near Tonbridge in Kent, mention four bloomeries, but give no indication that forging was undertaken on the site (Giuseppi 1912–13). Alsted in Surrey is the only site where, in the 13th century, both smelting and forging is known to have taken place, although by the 14th century smelting appears to have ceased and only forging continued (Ketteringham 1976).

The 1997 excavations at London Road, Crawley have added significantly to the evidence for medieval ironworking in the Weald, and have served to emphasize the growing awareness that Crawley may have been an important centre for iron production between the 13th and 15th centuries.

The earliest archaeological evidence for activity on site comprises a regular field system established across much of the area formerly occupied by the football pitch. This extended some 200 m back from the presumed street frontage, or from a watercourse which formerly crossed the south-eastern corner of the site (*see above*) and perhaps separated the ironworking activity along the street frontage from fields further to the west. The alignment of this system suggests that it may have been laid out at right angles to the contemporary line of the London Road, although this may have differed from the present line, which lies further to the west and on a diverging course (Nadine Hygate *pers. comm.*). Sherds of pottery from the ditches indicates that they were dug in the 13th–14th centuries and the date of this field system compares well with that of the foundation of the town as a whole.

Crawley is likely to have been founded early in the 13th century as a new town on the boundary of the rapes of Bramber and Lewes (Gardiner 1997). Initial development may well have focused around a crossroads between the London to Shoreham road and a road leading from Worth to Ifield. Records indicate that a licence was granted for a market to be held in the town every Friday in 1202–3 (Salzman 1940, 145). The regularity and date of the field system suggests that it may have formed part of a planned field system on the northern periphery of the town.

Clearly, the most significant archaeological evidence from the site are the 14th- and 15th-

century ironworking remains from the roundabout area. A number of recent excavations in Crawley (Stevens 1997; 1998; Saunders 1998) have all produced evidence of ironworking activity during the medieval period, although no evidence for *in situ* ironworking was recovered from any of these sites. There is documentary evidence for ironworking in Crawley contemporary with that recorded at London Road — poll tax rolls for 1379 mention a William Rokenham, a '*factor ferri*' who was assessed for tax at 6s, 8d, a high rate of taxation, whilst William Dancombe, also described as a '*factor ferri*' was taxed at 40d (Page 1903, 242). The tax rolls also mention two smiths and a farrier in the same vill. Unpublished research suggests that the site at London Road was occupied by 'Smiths' for 200 years or more from the first half of the 14th century to perhaps the mid-16th century (Nadine Hygate *pers. comm.*).

The excavated evidence from London Road is significant not only in providing evidence for both smelting and forging (bloom smithing), probably in the later 14th and early 15th centuries, but also in showing that these operations were apparently taking place side-by-side, possibly within a single property. No evidence for blacksmithing (secondary smithing) was identified.

Numerous minepits have been recorded in the Crawley area, at the western end of the High Weald. They were dug to obtain iron ore from the Upper Tunbridge Wells Sand and the lower part of the Weald Clay (Cleere & Crossley 1995, fig. 7). These would have provided a readily available local source of ore, and there is slight evidence from the London Road site to suggest that some ore was roasted there. Only a small quantity of roasted ore, however, was recovered, and no fine material characteristic of roasting activity was identified. On this basis, the single possible roasting-hearth might best be interpreted as having been constructed as part of a short-lived operation, perhaps to dry already roasted ore prior to smelting.

Large quantities of tap (smelting) slag were present on the site, and its distribution suggests that smelting activity was confined to the northern part of the main excavated area, to the north of ditch 7137 (Fig. 11). However, no furnace remains were found, and it has been suggested (*above*) that these may have been located immediately to the north-west, as at least some traces would be expected to have survived had they lain within the area excavated.

Evidence for iron smelting represented by tap slag has been recovered from several other sites in Crawley, mostly from the High Street area to the south of London Road, and where pottery was present, it has also been assigned to the 13th and 14th centuries (Wealden Iron 1973, 14–15; 1988, 8–9; 1990, 2–3; 1995, 2; 1996, 2–3; Barber 1997a; 1998; Hodgkinson 1998). The quantities of slag from these other sites have been much smaller than at London Road, with comparatively little tap slag and larger amounts of forging slag. The generally small quantities of debris are usually a reflection of the relatively small areas investigated or recorded, although recent excavations on the east side of London Road, directly opposite the site, revealed several pits filled with slag (Stevens 1998). The slag recovered from these excavations consisted of both bloomery and forge slag (Barber 1998), although the exact distribution of this material is not detailed. None of these other sites have revealed any structural remains of smelting furnaces.

The sites in Crawley noted above have, with one exception (that to the east of London Road), produced more forging slag than smelting slag, but no metallurgical features such as hearths have been recorded. The hearths, associated workshop remains, and large quantities of forging slag and hammerscale found in the southern part of the main area excavated at London Road thus represent an important addition to the evidence for medieval ironworking in both Crawley and the Weald as a whole. The significance of this is increased by the fact that two of the hearths produced similar late-14th- to early 15th-century archaeomagnetic dates, thus falling within a period between *c.* 1370 and 1500, when very little is known about the local industry (Cleere & Crossley 1995, 94).

Forging activity seems to have been restricted on the site to an area of approximately 30 m by 15 m, between London Road to the east and ditch 377 to the west, and between ditch 7137 to the north and ditch 7303 to the south. All of the ditches were largely, or partly, filled with slag. It seems most likely that these ditches defined the boundaries to a property, which may have extended further to the north to include the area occupied by the spreads and pits filled with smelting slag. It should be noted, however, that trench 7 to the south also produced ironworking slag, and it is possible that this activity extended along the street frontage beyond the confines of the excavations in the roundabout area/trench 3.

The workshop or smithy at London Road represents only the second such ironworking structure to have been recognized in the Weald on a medieval site, the other example being associated with the smelting furnace at Minepit Wood (Money 1971, fig. 36). Although quite badly damaged by later buildings, the London Road workshop seems to have comprised a rectangular timber building or shelter 10 m or more in length and approximately 5 m wide. This had a clay floor and provided cover for several hearths in which the iron bloom was repeatedly heated and then hammered in order to provide a consolidated bloom. A similar, but better-surviving workshop, of 13th- to 14th-century date, has recently been published from the Isle of Elba, Italy, where a series of as many as five hearths lay along one side of stone building which also contained a water pit and an area apparently used for crushing ore (Martin 1994, 237–44). The evidence from this site indicated that smelting, forging and blacksmithing took place in close proximity.

The location of the workshop to London Road, is comparable to that of a 13th-century ironworking complex excavated in Godmanchester, Cambridgeshire. Two buildings were excavated, one of which was interpreted as a blacksmith's shop, whilst the second contained several small smelting furnaces (Webster & Cherry 1975). Cleere and Crossley (1995, 93) have suggested that ironworking in the Weald was essentially a rural activity, that smelting and smithing were undertaken on separate sites and that only secondary working was undertaken in villages and towns. It is clear from the excavations at London Road, that smelting and forging/smithing on this site were closely integrated, with each activity restricted to separate, but adjacent, areas.

The choice of location for the London Road workshop and smelting area is likely to have been closely linked to a number of factors. The site lies *c.* 200–300 m to the north of the likely extent of the medieval town of Crawley, and west of the main road to London. The proximity of the site to Crawley clearly provided the workshop both with a sizeable potential 'customer base' and a centre for the redistribution of its products. The location of the site close to a main road would have enabled ore and fuel to be brought to the site relatively easily, as well facilitating the distribution of the iron blooms. Other factors may also have influenced the choice of site, including the availability of clay for furnaces,

and the presence of a large pond to the north which would have provided a ready supply of water.

There was no evidence from London Road that blacksmithing (secondary smithing) took place on the site, and the small assemblage of ironwork included no fragments of blooms, rods or bars, and no ironworking tools such as chisels or punches were present. It is perhaps most likely that the consolidated iron blooms were sold-on, to be worked by blacksmiths elsewhere either in Crawley or further afield. It has been noted elsewhere that the division of labour between bloom consolidation and blacksmithing, which produced finished objects from blooms and bars, is generally attested from both archaeological and documentary evidence (Tylecote 1981, 42).

The charcoal from London Road indicated clear evidence for the consistent use of oak (*Quercus*), beech (*Fagus*) and birch (*Betula*), a combination which appears to have been preferred for smithing (forging or bloom consolidation in this case). Poles and cordwood from oak and beech often exceeding 20 years in age had been used to prepare the charcoal, in conjunction with (usually) younger fast-grown birch roundwood. Although there was evidence for the use of coppiced wood, this was not consistent throughout the fuel residues examined, and it is probable that wood from various sources was used.

It seems likely that fuel was supplied from Wealden woodlands, especially bearing in mind the high proportion of beech identified in the charcoal and the importance of beech in the woodland composition. The essential contribution of woodland resources to numerous industries dependent on these supplies during the 14th and 15th centuries ensured that not only were forestry regimes tightly controlled, but probably also that the woodlands were protected against their clearance for agriculture. Extensive coppicing of the predominantly oak/beech woodlands in the medieval period would have presented a landscape dominated by coppiced compartments in various stages of growth.

The ironworking site at London Road, Crawley clearly sheds new light on the form and nature of the Wealden Iron Industry in the medieval period, although it appears to have been confined to a relatively short period of time during the second half of the 14th century and into the 15th century. Cleere and Crossley (1995, 93) have suggested that the greatest period of medieval ironworking in the

Weald was the period prior to the Black Death of 1349. They also suggest that one of the results of the Black Death was to force wages and iron prices higher. It is possible that the ironworking at London Road was started in response to these higher prices, with the location of the smelting and forging/smithing in close proximity to each other, sources of ore and fuel, a main road and a centre for marketing and redistribution making it economically viable.

It is uncertain how long ironworking at London Road continued into the 15th century, but the reasons for its decline are clear. The late 14th and 15th centuries saw the introduction and spread of the more efficient water powered bloomery forge, followed in the late 15th century by the blast furnace (Cleere & Crossley 1995, 104–17). Without a suitable source of water on the site, the smelting and forging operations at London Road would not have been able to compete with these more efficient, water-driven processes, and are likely to have gone into decline.

Following a period of abandonment of approximately 200 years, a building (possibly a farmhouse) was built on the site during the 17th century. However, it was not until the mid- to late 19th century that the site became a focus for further development, in the form of houses and the conversion of the farmhouse into The Sun Inn. Subsequently, the growth of Crawley in the last half century brought the development area well within the town limits.

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