



**ARO22: Outside the walls: excavations
within the annexe at Camelon Roman fort**

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ARO22: Outside the walls: excavations within the annexe at Camelon Roman fort

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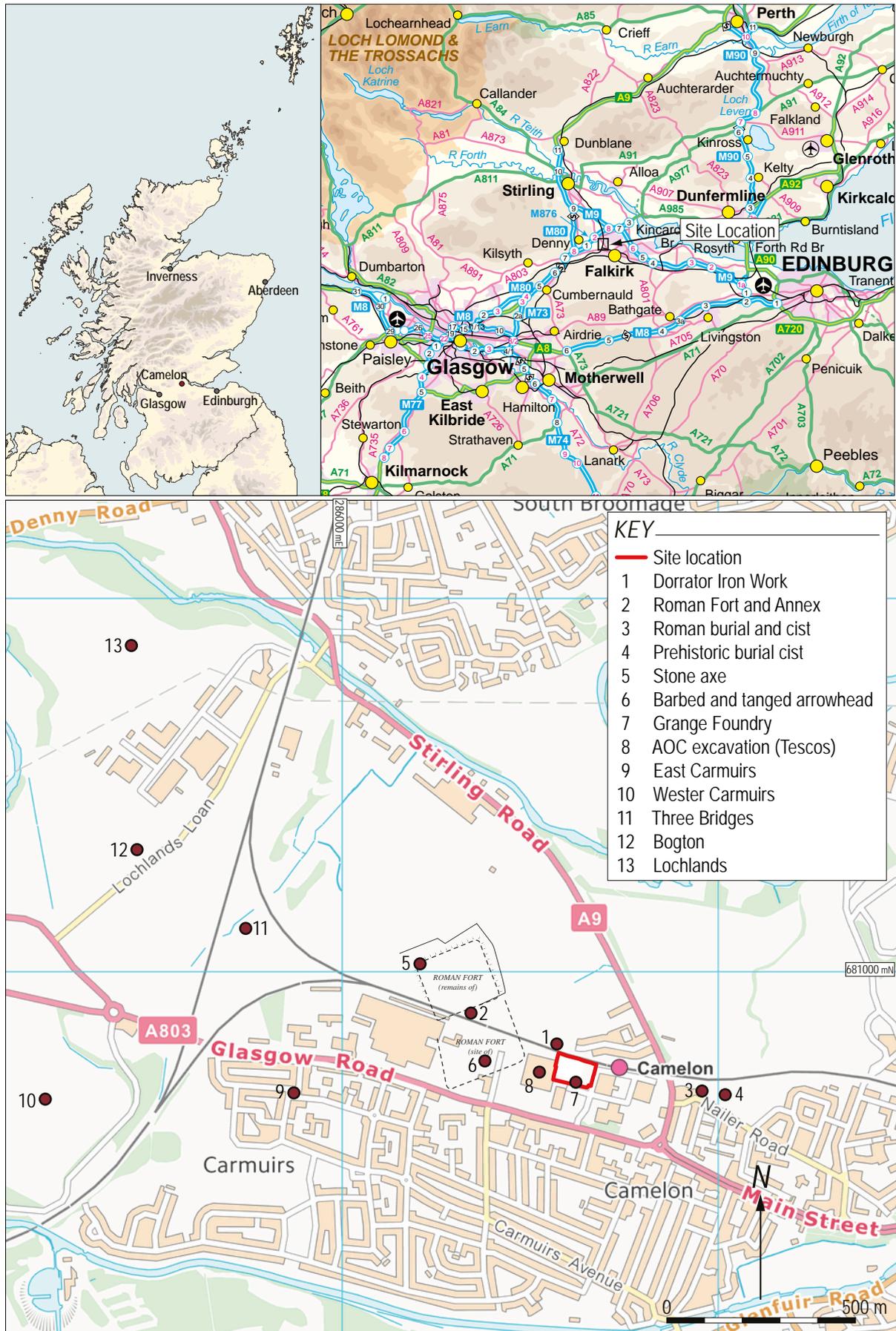
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Figure 1: Location of the site with key sites mentioned in the text.

Summary

Excavations by GUARD Archaeology Limited in advance of a retail development at Redbrae Road, Camelon, near Falkirk. A previous evaluation at the site (Rennie 2014) revealed the presence of potentially significant archaeological remains associated with the annexe of Camelon Roman Fort. The excavation revealed the presence of two steeply U-shaped ditches with later re-cutting, a possible drainage ditch with clay lining, two large pits and several smaller posthole/pit features. Finds of sherds of Roman pottery including samian ware, metal objects and metalworking waste were recovered from several of the features.

Introduction

An archaeological strip, map and record excavation, was undertaken by GUARD Archaeology Ltd in 2014 on behalf Bracewell Stirling Consulting, across an area of ground due to be developed at Redbrae Road, Camelon. This followed a previous archaeological evaluation (Rennie 2014) which first revealed the presence of significant archaeological features surviving in the north-east corner of the development area.

The development area was located on the west side of Redbrae Road in Falkirk (NGR: NS 866 806) at between 26 and 28 m OD, with Camelon railway station to the immediate north, the A803 road to the south, and retail units to the west and the Mariner Centre to the east (Figure 1). It was a gap site of 0.72 hectares in area where previous buildings had been demolished, including the Grange Foundry. The archaeological features were located in the area highlighted in Figure 2 on raised marine deposits accumulated during the Quaternary Period, while the solid geology beneath consists of the Scottish Lower Coal Measures Formation (British Geological Survey 1987).

Archaeological Background

A previous desk-based assessment identified several known archaeological sites in the immediately surrounding area close to the proposed development site (Figure 1, Rennie 2014). These sites were:

1. Excavation on the site of Dorrator Ironworks (Site 1; NMRS: NS88SE 23.02; NGR: NS 866 807);

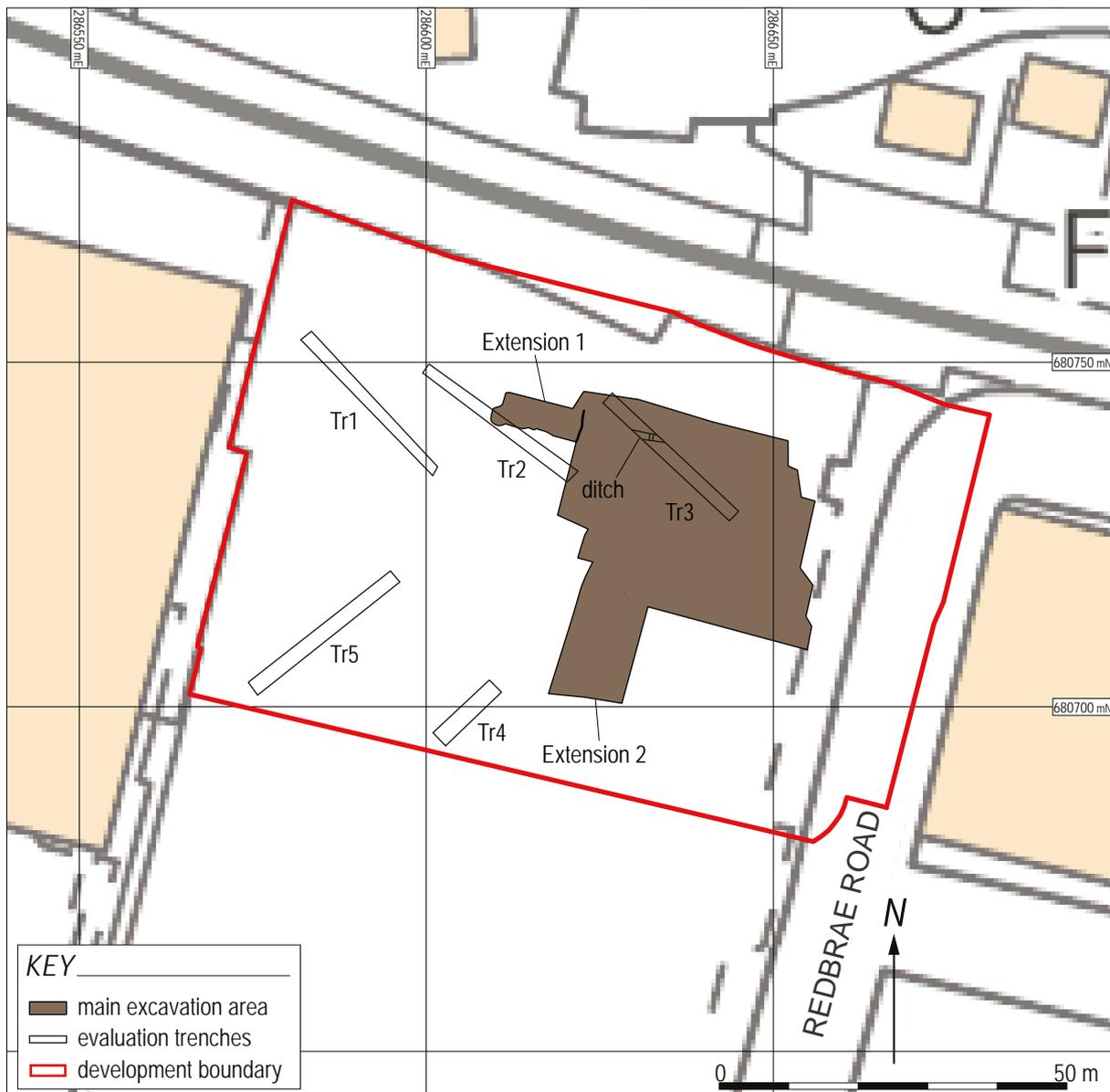
2. Camelon Roman forts (NMRS: NS88SE 23.00; NGR: NS 8630 8097);
3. Camelon Roman burial and cist (NMRS: NS88SE 19; NGR: NS 8717 8055);
4. Camelon prehistoric burial cist (NMRS: NS88SE 14; NGR: NS 8701 8067);
5. Camelon polished stone axe find (NMRS: NS-88SE 23.01; NGR: 862 810);
6. Camelon barbed and tanged flint arrowhead find (NMRS: NS88SE 30; NGR: NS 8637 8078).

Detailed information concerning these sites can be found on the Historic Environment Scotland website: <https://www.historicenvironment.scot/archives-and-research/archives-and-collections/canmore-database/>.

Specific information from another excavation of an area west of the Redbrae Road site, indicated that there could be similar features across the development area, such as first century AD military V-shaped ditches, a later, large ditch used as a rubbish dump and filled in by the second century AD, and further, smaller V-shaped ditches of an agricultural origin (Bailey 1999). Other agricultural ditches were found at the Tesco site to the immediate west (pers. comm. Martin Cook, Director, AOC Archaeology Group).

The development of Camelon in the nineteenth century through the construction of iron foundries and a railway destroyed parts of the Roman forts there (Site 2), but late nineteenth and twentieth century excavations of two camps adjacent to the forts revealed a complexity of structures and artefacts from Flavian and Antonine periods. Defensive ditches, a rampart and berm, postholes from wooden structures and a second century AD road running through the southernmost fort resulted from these excavations.

Close to the development site but east of it were the remains of two stone cists, one of first century AD date, with a separate Roman burial (Site 3), and the other of early to middle Bronze Age date (Site 4). Stray finds of a broken polished stone axe (Site 5) found close to the Camelon Roman fort (Site 2) and a barbed and tanged flint arrowhead (Site 6) found within it suggest widespread prehistoric activity in the area from the late Neolithic period and into the Bronze Age.



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Figure 2: Location of main trench and trial trenches in the north-east part of the development area.

The presence of these known archaeological sites and artefacts close to the development area indicated the potential for further archaeological discoveries.

Excavation Results

The north-east area was stripped of overburden to reveal the sandy subsoil (002) which was cut into by a number of features of archaeological interest. These comprised three linear ditches (two were later re-cut), four large, sub-oval pits and several smaller pits or postholes (Figure 3). A number of modern features, including concrete platforms, areas of blaes, stone filled drains and debris of iron slag, bricks and tile fragments, relate to the twentieth century use of the site as an ironworks (Plate 1).



Plate 1: General view of the site with linear ditch context 016 running obliquely through the stripped area. From the south. Scales 1 m in length.

Ditches

Six linear features were uncovered. Feature 016 at the western end of the site was a round-bottomed, steep-sided ditch of 11.58 m in length and was orientated east/west (extension 1; Plate 1). It was 0.7 m wide, but shallow with a depth of only 0.2 m, and filled with sandy silt/silty sand (010, Plate 2). Its south-west terminal was rounded, but its north-eastern terminal was irregularly shaped due to truncation by a modern blaes deposit 024 (Figure 3). Finds included six sherds of pottery of possible Roman date (SFs 4 and 6 to 8). A modern service trench disturbed its south-western end.



Plate 2: Section through ditch 016. From the north-west.
Scale 1 m in length.

Another ditch (049) was located in extension 2. It was 11 m in length, although its full extent is unknown as it was truncated by a modern feature (036) at its south-western end (Figures 3 and 4). It was 1.45 - 1.6 m in width with a depth of between 0.55 m and 0.68 m. Its profile was steeply U-shaped with a roughly squared slot (0.20 by 0.22 m) in its base filled with light sand clay (048) which might be remnants of a clay lining (Figure 5, Plate 3). The lower fill of the ditch comprised orange sand with occasional pebbles (047) c. 0.29 m in depth, and contained a possible iron nail fragment.

The upper fill (011) was similar to the lower but was redder in colour and only 0.19 m in depth. Finds included five sherds of pottery (SFs 5 and 13). The upper fill was associated with a later re-digging (012) of the exposed length of the ditch, which changed the earlier profile to a rounded base with less steep sides (Figures 4 and 5, Plate 4).

The third ditch (003/067) was located within the main trench (Figure 3, Plate 5) and was orientated east/west in the northern part of the site to turn in a north/south direction along the eastern side

of the site. Its exposed north-east corner was curvilinear in shape. Its north-western extent is unknown as it was truncated by several modern deposits including iron work waste (005). The south-eastern end of the ditch appeared to terminate without any formal end. Its length was 21.5 m (east/west) and 11.46 m (north/south) with a width of 1.08 m, and a depth between 0.6 m and 0.73 m. Its profile was steeply U-shaped with a flattish/slightly rounded base. The base appeared widest at the north-western end of the ditch (Plate 6) and narrower towards its south-eastern end (Figure 6). It was filled with firm bands of mottled silty-sand and some pebbles/gravel (066) suggesting that it filled in naturally. It too had been shallowly re-cut (as 003) along all its exposed length at a later date (Figure 6). Within its fill (004) of silty-sand were two fragments of pottery (SFs 26 and 27), a small sherd of Roman mortarium (SF 27), and fragments of corroded and unidentified iron objects (SFs 20-22 and 28). This fill was more homogenous suggesting that the ditch had been rapidly backfilled. It was truncated in several areas by modern linear features (073) and areas of modern industrial waste (005).



Plate 3: SE-facing section through ditch 049/012, slot 1.
From the north-east. Scales 1 m in length.



Plate 4: Sections through ditch 067/003.
From the east.



Plate 5: NE corner of ditch 067/003 viewed from the southwest. Scales 1 m in length.



Plate 6: Section through the NW end of ditch 067/003. From the east. Scale 1 m in length.

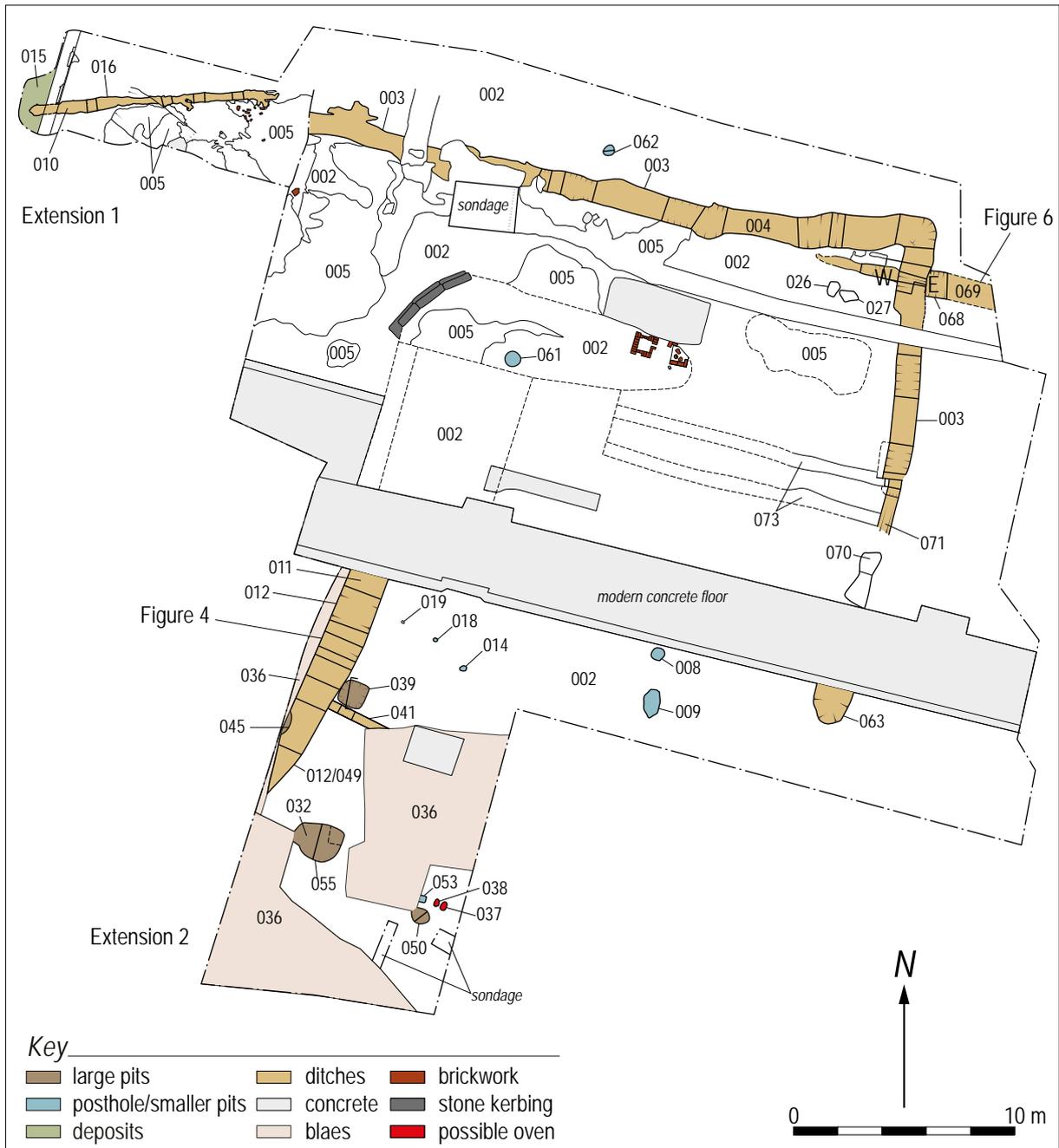


Figure 3: Plan of the archaeological features.

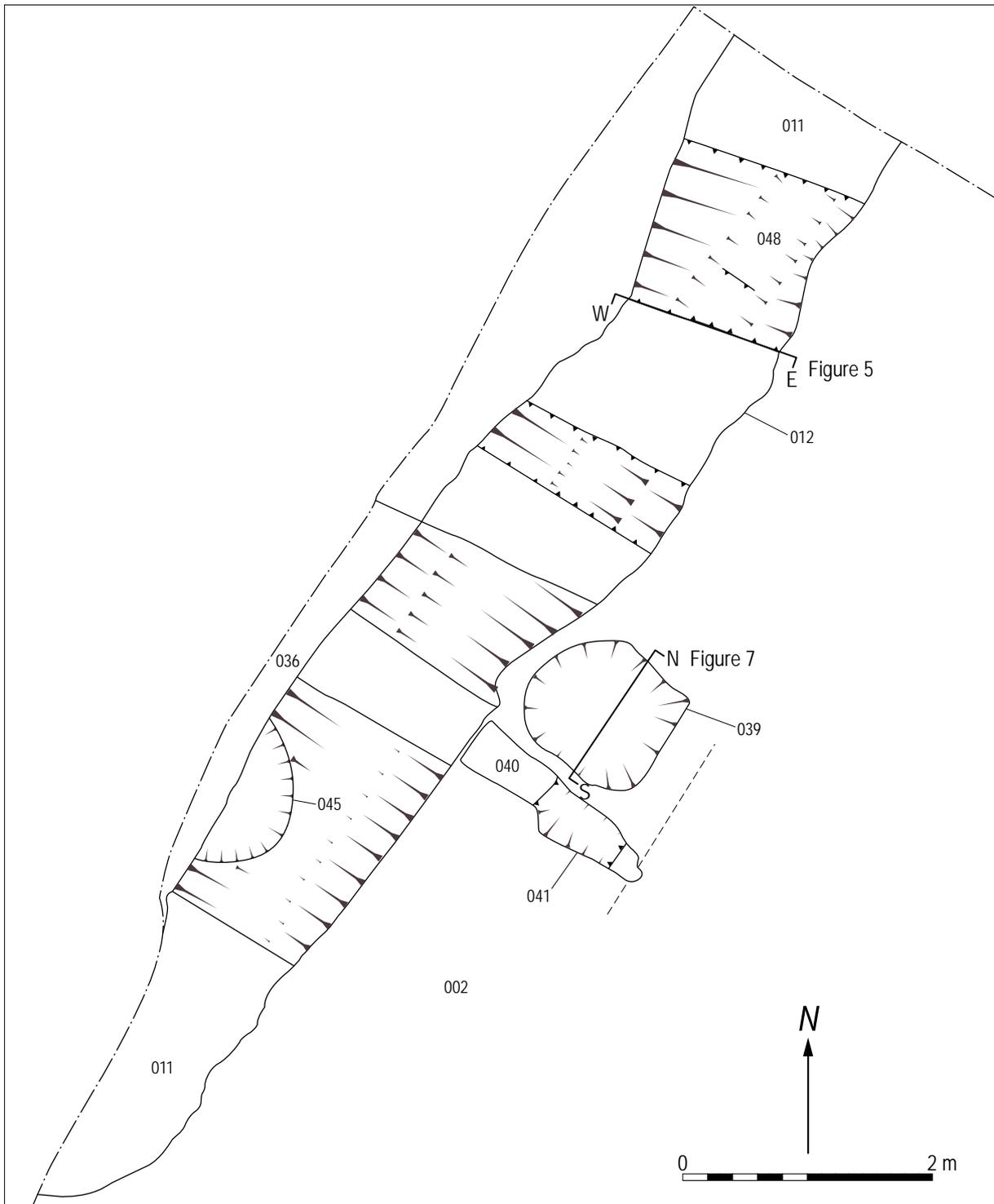


Figure 4: Plan of ditch 012/049, pit 039 and linear feature 041.

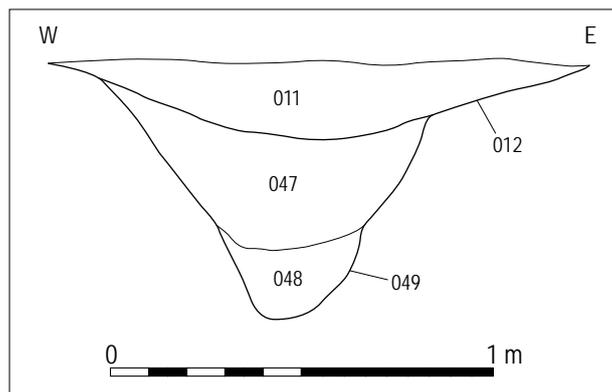


Figure 5: South-east facing section through ditch 012/049.

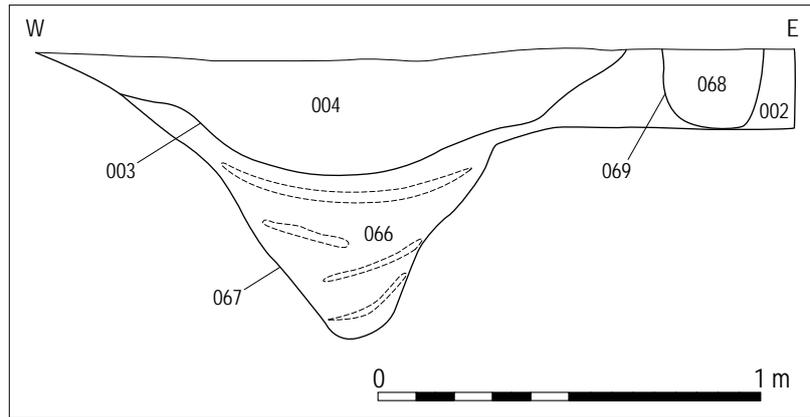


Figure 6: South-facing section through ditch 003/067 and linear feature 069.

Located to the immediate south of the concrete floor, and truncated by it, was a steep sided, possible pit (063) (Figure 3). As excavated it attained only 2.03 m in length, with a width of 1.9 m and a depth of 0.45 m. Its orientation was in direct alignment with the north/south portion of ditch 003/067. It was filled with silty-sand (063) but no datable finds were recovered from it.

Three smaller linear features were also located during the excavation (Figures 3 and 4). Feature 041, orientated east/west, was located to the immediate east of ditch 049 in extension 2. It measured 1.93 m in length as excavated, 0.39 m in width and depth of 90 mm to its flat base. Its fill was mixed clayey-sand with inclusions of charcoal and coal. A deposit of modern blaes (036) truncated the feature at its eastern end. A possible Roman pottery sherd was located within its fill (SF 11).

Linear features 069 and 071 were located within the main trench, the former abutted ditch 003/067 at its north-east corner. Its exposed length of 1.29 m was truncated by the trench edge at its eastern side (Figures 3 and 6), but its width was 0.99 m and its depth was 0.22 m. The fill (068) of the feature comprised silty-sand and occasional pebbles.

Possible linear feature 071 appeared to be truncated by ditch 003/067 and also by a modern drain 073 (Figure 3). It measured 0.9 m by 0.45 m by 0.25 m and was filled with sand (072). Finds were not recovered from either 069 or 071.

Large pits

Four large pits were identified and excavated in extension 2. Pit 039 was located to the immediate east of ditch 049 (Figures 3 and 5). It was a sub-

oval, steep sided and flat based feature, which measured 1.2 m by 1.05 m by 0.75 m. It had four separate fills (028 and 042 to 044; Figure 7) - black, grey-brown, yellow-brown and dark-brown sand. The lowest (044) contained two sherds of Roman samian ware (SF 16). The layer above (043) included a small fragment of chert (SF 18), two samian ware decorated rim sherds (SF 19) and three other sherds of pottery (SF 15). Above, fill 042, contained no finds. The upper fill (028) included 10 fragments of samian ware, and two fragments of iron (SF 14). Interestingly, all the pottery fragments appeared to be located towards the southern side of the pit.

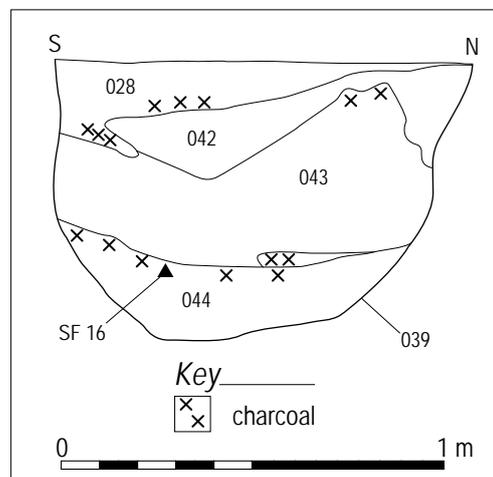


Figure 7: East-facing section through pit 039.

Pit 055 was located c. 3 m south of pit 039. Although similar in shape and form to pit 039 it was slightly larger measuring 2.4 m by 1.3 m by 0.8 m. Its single silty-sand fill (032) (Plate 7) contained no finds.

South-east of pit 055 was a much smaller one (050) measuring 1.65 m by 0.2 m by 0.6 m with again a single fill of clayey-silt and without artefacts (Figures 3 and 8). Both this and pit 055, were truncated by a modern blaes deposit (036).

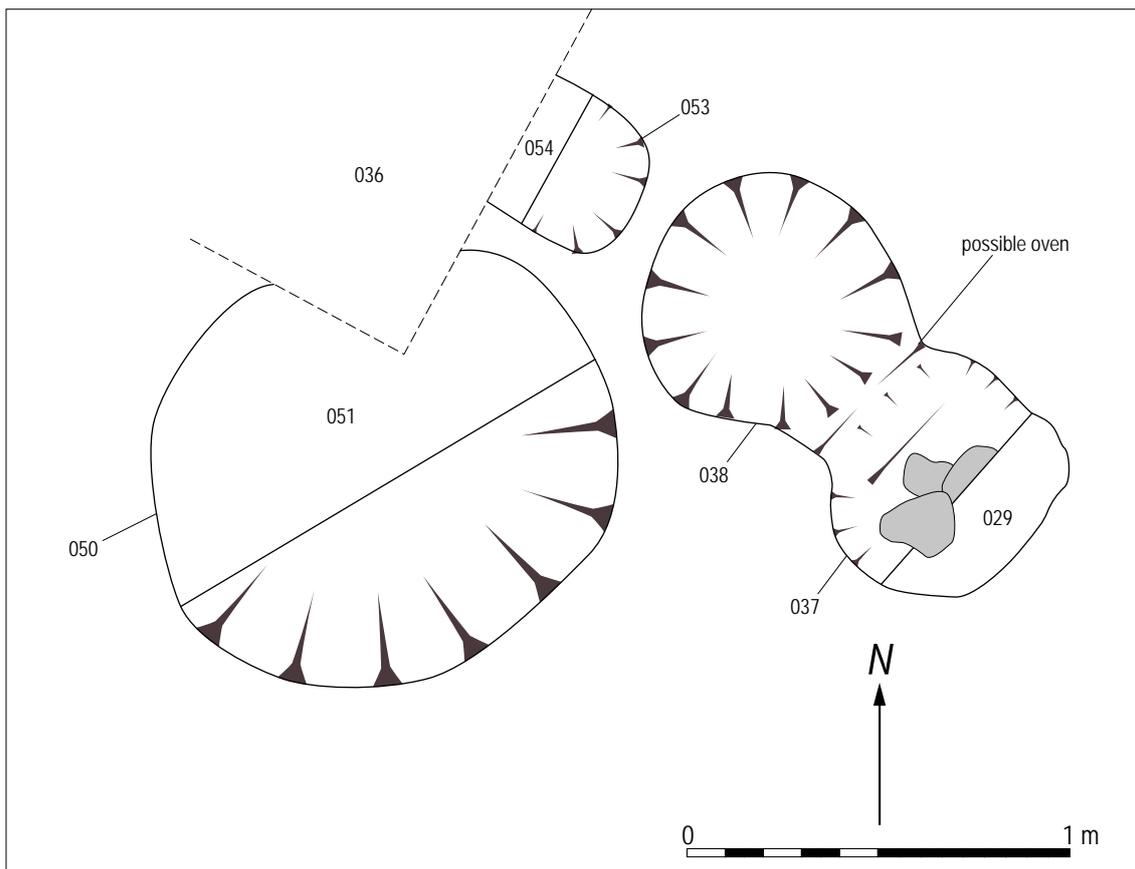


Figure 8: Plan of features 037, 038, 050 and 053.



Plate 7: Section through pit 055 viewed from the east.
Scales 1 m in length.



Plate 8: Section through pit 045 viewed from the east.
Scales 1 m in length.

The final pit, 045, was only partially exposed and excavated due to its location in the western trench side of extension 2, where it was positioned below ditch 049 and also whitish sand 065 (Plate 8; Figures 3 and 4). Although, similar to pits 050 and 055 in its form, its dark clayey-sand fill (046) included two pottery sherds from different vessels (SF 24 and 30), several fragments of hearth lining material (SF 23), some slag (SF 25) and a degraded animal tooth (SF 29).

Postholes or smaller pits

Posthole/pit (061) was located within the central area of the site (Figure 3, Plate 9). This straight-sided feature measured 0.86 m by 0.74 m and was 0.49 m deep but no artefacts were found in its sandy-silty and stony fill (056).

Close to the northern trench edge was another small pit or posthole (062). It was smaller than the previously described feature, and had a single silty-sand fill (057) and was also devoid of artefacts.



Plate 9: Posthole/pit 061 after excavation. From the south-east. Scales 1 m in length.

Situated close to the northern edge of large pit 050 in extension 2 were three postholes, 037/029, 038/052, 053/054 (Figures 3 and 8) containing silty-sand fills with no datable finds. The largest (037) measured 0.7 m by 0.53 m by 0.27m and the smallest (053), 0.38 m by 0.31 m by 0.11m

Posthole 018 (Figure 3) in the northern half of extension 2 was sub-circular measuring 0.5 m by 0.4 m by 0.23 m. It was filled with sandy-silt (017). South-west of posthole 018 was another but slightly larger sub-circular feature (014) (0.87 m by 0.73 m by 0.13 m), with a fill (013) of clayey-sand. Neither feature contained finds. Further to the east were two other possible posthole/pits, 009/006 and 008. Both were sub-circular in shape and c. 0.7 m by 0.7 m by 14-25 m, with silty-clay or sandy silt fills and both were devoid of finds.

Deposits

Several deposits of possible archaeological origin were noted across the site. East of ditch 049 in extension 2, was a shallow, limited, rectangular deposit, 019, of sandy silt with charcoal. Another, irregular deposit (015) of sandy-silt was located in the western part of extension 1, comprising mottled patches of sandy silt with charcoal and one fragment of iron (SF 9).

Modern debris

Across the excavated area was a large amount of modern debris (005), which truncated and overlay archaeological features and the subsoil (Plates 1 and 10). These deposits probably relate to the previous use of the site as an iron foundry and included a concrete pad, brick foundations, ceramic drainage pipes, iron slag waste (023/024) and rubble. Several service trenches (073) were

also present as well as large areas of blaes (036) in extensions 1 and 2.



Plate 10: General view across the site from the north, with modern deposits of red blaes and concrete. Scales 1 m in length.

In the central part of the main trench was a large area of fused iron slag waste (4.5 m by 2.5 m). Excavation revealed this material to be c. 0.84 m in depth and contained two lower sand deposits (074 and 075), with fragments of modern glass and sherds of pottery (SFs 31-34).

The area had been levelled by a c. 0.4 m depth rubble and tarmac either side of a re-enforced concrete floor (001).

The Artefacts

The full specialists' reports including methodologies and catalogues can be found in the site archive.

The lithic assemblage

by Torben Bjarke Ballin

Summary

A small assemblage of lithic artefacts was recovered (13 pieces) from the excavation. The analysis and evaluation of the lithic material is based upon a detailed catalogue (see below), where the artefacts are referred to by their catalogue number (CAT no.).

Discussion

As shown in Table 1, the assemblage includes nine chips, one flake, one thermal flake, and two scalene triangles (CAT 2, 10), a total of 13 pieces of worked lithic material. Nine pieces are flint, one is chert, and three are quartz. As the various contexts are generally likely to be either Roman

or later, the assemblage is treated as residual material with little research potential.

Table 1: General artefact list.

	Flint	Chert	Quartz	Total
Chips	7	-	2	9
Flakes		-	1	1
Thermal flakes	1	-	-	1
Scalene triangles	1	1	-	2
Total	9	1	3	13

The flint is generally fine-grained, and at the site it occurs in a number of different colours. The cortex is abraded, suggesting that this raw material was collected at a pebble source, most likely beach walls along the shores of the nearby Firth estuary or North Sea basin (Ballin and Barrowman 2013a). The chert is fine-grained, grey material that may have been procured from pebble sources or through mining (Ballin and Ward 2013b). However, it is probably local, and could have been obtained in the immediate vicinity of the site. The quartz is white milky (Ballin 2008), and one piece has abraded cortex, suggesting that it was collected from a pebble source, such as the banks of the nearby River Carron, which flows into the Forth a few hundred metres north of the site.

The collection includes two modified pieces, both scalene triangles. One (CAT 2) is flint and one (CAT 10) is chert. Both have the shortest of the triangle's two short sides at the proximal end, and both have the two shortest legs of the triangle at the right lateral side. In addition, CAT 2 has some ancillary very fine retouch along the left lateral sides. Both microliths are broken, as they are missing their distal ends. CAT 2 measures 9.7 by 3.9 by 1.6 mm, and CAT 10 measures 12.2 by 4.3 by 2.1 mm.

The two microliths are the only diagnostic lithics recovered at Redbrae Road, and they indicate that the site was visited at some stage during the Late Mesolithic period c. 8,500-4,000 cal BC (Saville 2008).

The main locational factor for the site may be the position of River Carron, which would have provided fresh water for Mesolithic hunter-gatherers, as well as fish, and water for the local fauna (attracting game, other animals, birds, etc.). The river and its surrounding floodplain would also have offered passage through the densely

forested landscape either by canoe or on foot. The chips are evidence of primary or secondary production taking place at the site, but the fact that the only two modified lithics found at the location are microliths, may indicate that the assemblage represents one or more brief (overnight?) visits to the area, probably in connection with retooling of the visitors' tool kits (Keeley 1982).

Catalogue (sequenced according to context)

Context 006 (possibly posthole/possibly non-archaeological)

CAT 1 Secondary chip (≤ 10 mm); yellow, fine-grained flint.

Context 010 (linear feature, possibly Roman; also included pottery)

CAT 2 Tertiary scalene triangle, based on indeterminate microblade (9.7 by 3.9 by 1.6 mm); light-grey, fine-grained flint. The shortest leg of the triangle is proximal. The two shortest legs are at the right-hand side. Some ancillary retouch along the left-hand side. A likely original microburin facet has been removed by the lateral modification.

CAT 3 Secondary chip (≤ 10 mm); honey-brown, fine-grained flint.

CAT 4 Secondary chip (≤ 10 mm); light-grey, fine-grained flint.

CAT 5 Tertiary chip (≤ 10 mm); cream, fine-grained flint.

CAT 6 Tertiary chip (≤ 10 mm); light-grey, fine-grained flint.

CAT 7 Tertiary chip (≤ 10 mm); light-grey, fine-grained flint.

Context 011 (probably top fill of drainage ditch, which also contained Roman pottery)

CAT 8 Tertiary chip (≤ 10 mm); light-grey, fine-grained flint.

CAT 9 Tertiary chip (≤ 10 mm); white milky quartz.

Context 029 (fill of possible posthole 37)

CAT 10 Tertiary scalene triangle, based on indeterminate microblade (12.2 by 4.3 by 2.1 mm); grey, fine-grained chert. The shortest leg of the triangle is proximal. The two shortest legs are at the right-hand side. No ancillary retouch along the left-hand side. A likely original microburin facet has been removed by the lateral modification.

Context 043 (fill of pit 39, which also contained Roman samian ware)

CAT 11 Secondary thermal flake (ML = 25 mm); light-grey, mottled, fine-grained flint. Although the surfaces appear to have been shaped by frost rather than fire, this piece is important to the interpretation of pre-historic activity at the site, as the flint must have been procured from Scottish shores, most likely towards the east.

Context 068 (probably modern debris)

CAT 12 Tertiary chip (≤ 10 mm); white milky quartz.

CAT 13 Primary bipolar flake (11.8 by 6.3 by 2.8 mm); white milky quartz.

The ironwork *(see Appendix 1 for Catalogue)* by Gemma Cruickshanks and Fraser Hunter

Summary

Twenty-one iron artefacts, including an ox-goad, a socketed bolt-head (probably an artillery weapon) and hobnails were recovered from Redbrae Road (summarised in Table 2). Fragments of ironworking slag were also recovered. The assemblage was predominantly recovered from secondary contexts such as ditch and pit fills but the ox-goad, socketed bolt-head and hobnails are all typical Roman artefacts, reflecting the site's proximity to Camelon Roman fort. All the objects were X-radiographed, which greatly aided their identification prior to conservation.

Discussion

The numbers [] refer to the archive catalogue

The ox-goad [3] is Rees's type 1 (1979, 75-9),

comprising a spiralled strip with a protruding point at one end (Plate 11b). Such artefacts are thought to have been used on the end of a wooden shaft to control oxen pulling a plough. They tend to be Roman in date, though isolated Iron Age examples are also known in southern Britain (Rees 1979, 75). Similar artefacts are also known from the medieval period, though these tend to be a simple collar rather than a spiral (Goodall 2011, 82 and fig.7.11, F131 and F133). Comparable items from Vindolanda were interpreted as pen nibs due to their association with writing tablets (Birley 2002, 35), and it is possible similar but finer objects may have this function, but the larger size of the Redbrae find is more in keeping with an ox-goad.



Plate 11: a) socketed bolt-head, b) ox-goad.

The socketed bolt-head [6] is a type commonly recovered from Roman military sites (Plate 11a). It has previously received various interpretations, including ferrules for the butts of a ballista bolts (e.g. Curle 1911, 189) and arrowheads (Birley 1996, 23). However, Manning (forthcoming)

Table 2: Summary of Redbrae Road ironwork assemblage by context.

Object	Context									Total
	004	007	010	015	028	040	046	047	066	
Ox-goad	-	-	-	-	1	-	-	-	-	1
Socketed bolt-head	1	-	-	-	-	-	-	-	-	1
Nail	-	-	-	-	-	-	-	1	-	1
Hobnail	7	1	3	-	-	-	-	-	1	12
Bar	2	-	-	-	-	-	-	-	-	2
Rim mount	-	-	-	-	-	-	1	-	-	1
Slag	-	-	-	1	-	-	-	-	-	1
Nodule/ unidentified	-	-	1	1	-	1	-	-	-	3
Total	10	1	4	2	1	1	1	1	1	22

argues that their differing diameters and lighter weights than ballista bolt heads (based on the Newstead assemblage) make a role as a ferrule unlikely, while their blunt heads would have made them an unnecessarily inefficient weapon compared to more pointed versions. He proposes that they may have been practice ballista bolt heads as their blunt head would have made them easier to extract from targets and reuse during the frequent training which must have taken place (and also less deadly should they miss the target).

Half of the twelve hobnails have traces of mineralised leather layers preserved in the iron corrosion, indicating they were still within leather when deposited. However, none of the hobnails are corroded together, suggesting they are isolated finds from casual losses rather than the result of whole sandals or boots being deposited. Hobnails are ubiquitous in and around Roman sites and are usually by far the most common iron artefact type.

The single nail [2] could date from the Iron Age onwards, as handmade nails did not change in form until modern times. Its curved shank indicates it had been removed from wood prior to deposition. The two bar fragments [4a and 5] are missing both ends, inhibiting closer identification, while the undiagnostic rim mount [7] could have been attached to a wide range of objects.

A lump of iron slag [1] is evidence of ironworking in the vicinity but it is not diagnostic of a particular part of the process, while two tiny nodules of iron [11 and 14] may also be debris from the ironworking process, possibly bloom-smithing (see below) due to their high magnetic attraction. All three were recovered from secondary contexts, as the location of the ironworking activity was not identified. Ironworking is commonly found in and around Roman forts e.g. Rough Castle (MacIvor, Thomas and Breeze 1978, 271) and Newstead (Jones and Gillings 1987, 1) as the many iron tools, weapons and fittings would have required regular replacement and repair.

Industrial waste

by Christine Rennie

Summary

In total, 51 pieces of industrial waste were

examined using a hand lens at x10 magnification. The visible characteristics of the waste, principally texture, composition and porosity, were noted, and comparison was made with examples from the National Slag Collection held at Ironbridge Museum.

Results

The overwhelming majority of the industrial waste was retrieved from context 046, and comprised furnace lining and tap slag (Table 3). Fragments of vitrified material and silver coloured porous material were recovered during post-excavation analysis of environmental samples. The industrial process that created this waste could not be identified through visual inspection alone.

The types of metalworking waste within the assemblage are indicative of bloomery smelting, whereby a lump or bloom of iron, and an iron-rich fluid slag were produced. Within single-use furnaces, smelting took place below the melting temperature of iron, and the iron formed in the solid state as a spongy mass, or bloom (Historic England 2015, 21). Impurities within the ore reacted to form a fluid slag that required to be tapped-off periodically before the accumulation could block the air-flow through the furnace tuyere.

Table 3: Industrial waste by volume and weight.

Material	No of pieces	Combined weight (g)	Contexts (# of pieces)	Activity
Frothy tap slag	16	334	46	Bloomery iron smelting
Furnace lining	4	124	46	Bloomery iron smelting
Vitrified material	28	22.4	010 (13), 015 (9), 066 (5)	Unidentified
Silver, porous material 3	0.1	10	010	Unidentified
Tap slag	1	<0.1	46	Bloomery iron smelting

Tap slag

The largest quantity of the industrial waste was tap slag, a waste material that is tapped from the furnace during smelting. The upper surface of the tap slag had the characteristic 'lava-flow' appearance, while small stones and coarse sand

were fused to the rougher lower surface. Most of the tap slag had a frothy, porous structure, and was at least partially vitrified. The weight and magnetic properties of the tap slag indicates that, having been through the smelting process, the waste material has retained some iron. All this material was recovered from fill 045 of pit 046.

Furnace lining

Material that had formed the furnace(s) was found to comprise orange clay, with a partially vitrified interior surface which had porous slag adhering to it. All of the furnace lining was found in fill 045 of pit 046.

Other industrial waste

A small quantity of slightly magnetic, vitrified material was retrieved from fill 010 of ditch 016, deposit 015, and fill 066 of ditch 003/067.

Three small pieces of an unidentified silver coloured porous material was recovered from fill 010 of ditch 016.

Discussion

From the types of waste recovered from the site, it is most probable that bloomery smelting of iron was carried out there. The smelting furnace would have been a single-use structure, the walls of the furnace being demolished in order to extract the raw bloom. The quantity and type of waste material recovered from the fill of pit 045 suggests that the furnace was in that vicinity and, while dumping of slag in pits and ditches is far from unusual, it is reasonable to assume that the waste would not be carried too far from the smelting area (Crew 1995, 2).

The highly vesicular, almost frothy texture of the tap slag could be the result of high air pressure inside the furnace when the slag was liquid, combined with a relatively rapid solidification of the waste after it was tapped, thus preventing the escape of gases trapped within the fluid slag (Historic England 2015, 23). Frothy tap slags have been associated with the use of water power-driven bloomery furnaces, although conclusive evidence for this association is lacking, and frothy slag has also been found on sites where water power was not used. It is interesting to note that pit 045 also contained Roman pottery, and lay below a clay-lined ditch (049).

Conclusions

The bloomery furnace is the earliest form of smelting, and was in use from c. the eighth century BC until c. the sixteenth century AD (Historic England 2015, 18). The industrial waste from Redbrae Road indicates that bloomery smelting of iron was carried out, probably on a relatively small-scale, within or close to the area excavated, and that waste material is likely to have been dumped in a pit. No evidence for smithing, including primary smithing of the iron bloom, was recovered.

The Roman pottery

by Alex Croom, with a contribution by Felicity Wild

The site produced 35 sherds of pottery, weighing 0.185 kg, consisting of 13 samian sherds, one mortarium sherd, 21 coarse wares, and no amphorae or other fine wares.

The samian ware

by Felicity Wild

Pit 039 produced 13 fragments of samian ware, all South Gaulish and of Flavian date. With the exception of a small scrap of uncertain form from sample 36 from the lower fill (044) of pit 039, it is likely that only two vessels are represented.

In the description below, potter numbers in lower case numerals are quoted from Hartley and Dickinson 2008-12 and the figure type from Oswald 1936-37 (O).

1. Form 37, South Gaulish (Figure 9). Four decorated sherds from the same small bowl, two from the upper fill (028, SF 10 and 17) of pit 039, each joining one of the two sherds from the lower fill (043, SF 19). A further three small chips from SF 17 probably belong to the same bowl. Panel decoration shows a small medallion containing a rosette (?) with upper corner tendrils ending in a heart-shaped leaf and lower tendrils with a forked end, and a small dog (O.2034) over a panel of leaf-tips. Traces of a chevron wreath are just visible below. The ovolo with trident tongue was used by various potters at La Graufesenque, including Pontius or Pontus i and Severus iii. A bowl from Cardean shows the ovolo, a medallion with similar corner tendril with heart-shaped leaf and a panel of leaf-tips (Wild 2012, 244, fig. 5, 18), c. AD 70-90.

2. Form 18, South Gaulish. Three small sherds from the upper fill (028, SF 17) of pit 039, two conjoining, probably from the same dish as the two larger base sherds from the lower fill (044, SF 16). The stamp is missing, though the edge of the frame is visible on one of the sherds. Flavian.

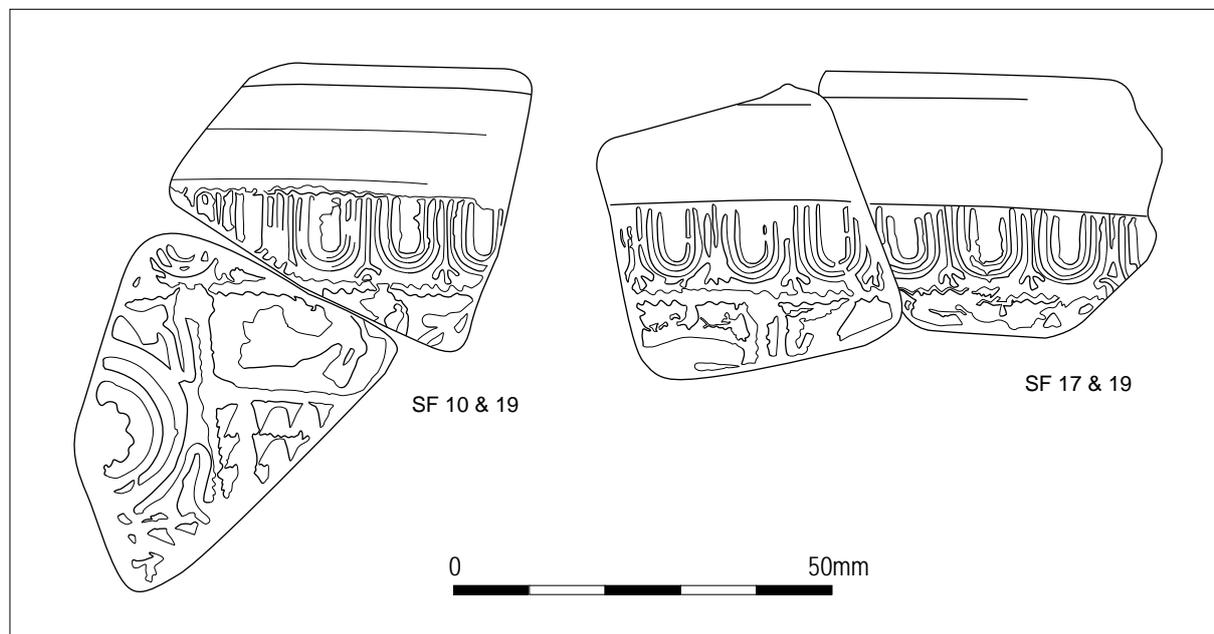


Figure 9: South Gaulish samian ware.

The coarse wares

Table 4: the pottery assemblage by fabric.

Fabric	NRFC	Weight (g)	Number	EVE (%)
Samian	-	101	13	9
Mortaria (Oise/Somme)	NOG WH 4	12	1	-
Coarse wares	-	-	-	-
Flagon fabric A	-	4	2	-
Fine buff	-	19	9	5
Burnished grey	-	2	3	17
North Gaulish reduced	NOG RE	17	1	-
Unsources wares	-	30	6	-
Totals	-	185	35	31

Fabrics

Descriptions for the fabrics with National Reference Collection codes in Table 4 can be found in Tomber and Dore 1998. Other fabrics are described below (from Bidwell and Croom forthcoming); fabric numbers relate to King and Swan forthcoming.

Oise/Somme (NOG WH4)

This is represented by a single incomplete rim sherd SF 027 from context 004. At the Glasgow

Road site, Camelon, Oise/Somme was the most common source for mortaria in the Flavian period (Bidwell and Croom forthcoming).

Flagon Fabric A

Hard, fine orange fabric, slightly sandy feel, but few visible inclusions. White slip on exterior, usually thick, with sparse, very small silver mica plates. Represented by two sherds SF 004 and 008 from the same context (010), although the slip is not the same colour on both sherds.

Fine buff (cf fabric 7)

Oxidised version of 'fine grey' (cf fabrics 2 and 61), but paler in colour than 'fine oxidised' ware (Bidwell and Croom forthcoming). Generally soft, with abundant silver mica plates visible on the surface, and a few fine, rare black or brown inclusions.

Represented by four vessels including a probable lid SF 015, a closed vessel with heavy sooting on the exterior SF 006 and SF 007 and a sherd SF 030, (context 046) from the neck of a small jar or flagon with a piecrust flange (cf King and Swan forthcoming P2, although much smaller in size).

Burnished grey (variant)

Burnished grey ware is a fine, hard mid-grey fabric with few visible inclusions, but with silver mica plates visible on the surfaces (Bidwell and Croom forthcoming). The variant has a much paler core, ranging from buff to a very pale grey. Represented by the rim of a single vessel, a small beaker with a everted rim and two grooves on the shoulder SF 005 and SF 011).

North Gaulish reduced (NOG RE)

Represented by a single vessel with burnished bands, probably a vase troconique SF 024. Small quantities of North Gaulish coarse wares have been found in previous excavations (McCord and Tait 1978, fig. 4, no. 2, King and Swan forthcoming P113; Bidwell and Croom forthcoming, cat. no. 11).

Un sourced reduced wares

There were body sherds from four vessels in a range of reduced wares, and a small scrap in a buff fabric, which could possibly just be a bit of fired clay Sample 067.

Conclusions

The three samian vessels and the single mortarium sherd are Flavian in date, as are the majority of the identifiable coarse wares. There were a few sherds of Antonine pottery present: a burnished grey ware beaker (context 011) came from the fill of the re-cut ditch 049, and two sherds of Flagon Fabric A (context 010) from ditch 016, that had possibly been cut at the same time.

Carbonised plant macrofossils and charcoal

by Diane Alldritt

Summary

The environmental sampling has provided both economic and environmental data potentially related to pre-Roman Iron Age settlement in the area and to Roman period activities at Camelon Fort, and may provide information about the types of day to day activity taking place in the 'extra-mural' fort setting of the southern annexe, such as storage, cereal processing and cooking, along with industrial activities such as smithing.

Introduction and background

A total of fifty bulk environmental samples ('GBA' sensu Dobney et al 1992) taken during the archaeological interventions were fully analysed for carbonised plant macrofossils and charcoal.

The excavated archaeological features probably related to activity taking place around the Southern annexe of Camelon Roman Fort but previous excavation has suggested both earlier Flavian and later Antonine periods of use at the site. Excavation during the 1960s and 70s proposed the Flavian fort to be in the southern part of the site and the Antonine fort to the north, whilst the southern annexe perhaps housed temporary sheds or storage facilities, with structures built of timber rather than the more substantial stone seen in the main part of the fort (McCord and Tait 1980). Interestingly, the 1970s excavations found a well-constructed E/W aligned road possibly of second century date, whilst to the south of this was an industrial area with four substantial furnaces and numerous pits interpreted as 'rubbish' pits (Maxwell 1984). Charcoal identified by Tylecote was found to include willow/poplar type, hazel, birch, oak, conifer ash and elm in small amounts (McCord and Tait 1980 164). Other than these few identifications there is a general lack of environmental evidence available from the early archaeological work at Camelon, perhaps a reflection of a time before systematic environmental sampling had widely become standard practice during excavation.

At the possible 'native' site just above the North fort at Camelon, Dimpleby and Sheldon identified hazel, willow/ poplar and oak charcoal, plus some hulled barley grain (Proudfoot 1978), but with no reasonable dating evidence this could broadly reflect Iron Age or Roman activity. Excavations at the Roman temporary camps at Three Bridges, Camelon produced pits containing alder, oak, heather and willow charcoal (Dickson and Miller 2000), but the grain found in the pits and in a Roman oven at the site does not appear to have been identified as part of the work. More recent excavations at Camelon Fort in 2010 by AOC Archaeology found several buildings, bread ovens, field systems and rubbish pits, plus waterlogged remains from the enclosure ditch of the fort (pers. comm. Martin Cook). The plant remains have not yet been published, but should provide an interesting comparison with the

material identified as part of this current work when they become available.

Camilla Dickson wrote extensively on the Roman military diet in Scotland and carried out numerous experiments on hyohen bread-making using various types of grain, largely based upon evidence from Bearsden Roman Fort (Dickson et al 1979 and Dickson in Breeze 2016) with the work summarized in Dickson and Dickson (2000, 119). Both emmer and spelt wheat types were identified from Bearsden and were considered as imported, whilst barley was most likely locally grown (ibid, 121). This largely follows a similar pattern across Northern Britain, with Greig's earlier (1991) survey suggesting spelt wheat and barley were the most commonly recorded cereal types during the Roman occupation. Bread wheat is an interesting find for this period and most likely transported to the more northerly regions of Britain as part of the Roman military network, from such forts as South Shields (van der Veen 1988). Large amounts of raw materials and consumer goods were regularly transported across the Roman Empire and dried cereal grain would have formed part of this trade and supply network, in particular to meet the food requirements of the army. In turn, local agricultural production often increased as a result of Roman demand with mass production of spelt wheat and increases in barley and oats during the later Roman phases at rural sites, such as Wattle Syke in the North of England, effectively producing a surplus for export to towns and military bases (Alldritt 2013, 263).

The environmental samples from Redbrae Road produced a fairly small assemblage of well-preserved carbonised plant remains, with the largest concentrations of burnt material recovered from some of the pits and postholes, and generally fewer remains present in the ditch fills. A range of wood charcoal types were recorded, including hazel, willow, alder, birch, oak and cherry type, largely indicative of open areas of scrub woodland with potential for some wetter and boggy areas in the vicinity. Four samples of suitable short-lived charcoal types were selected and submitted for radiocarbon dating and the results are incorporated here. The samples also produced concentrations of carbonised cereal grain mainly located in the pits and occasionally as stray finds in some of the postholes and ditch fills. A few samples produced evidence for industrial

activity, possibly related to the Roman presence, although some may reflect more recent post-medieval activity in the vicinity.

Results

The environmental samples produced a fairly small assemblage of generally well-preserved carbonised material, in the main consisting of wood charcoal, with occasional small concentrations of cereal grain found in certain features, such as some of the pit fills. In addition, the samples also produced a few weeds indicative of agricultural land, which probably arrived at the site along with cereal grain, plus some fragments of burnt peat and heather stem suggesting peat or heath lands were being cut for fuel. Clinker-type burnt vesicular material together with slag and hammerscale could suggest some Roman metalworking activity such as smithing taking place, or may reflect post-medieval industrial use of the area.

Linear features

Three samples were taken during the evaluation phase of the project, all from possibly ditch or drainage features. Sample 1 (2006) from a possible drainage ditch in trench 2 produced a small amount of *Alnus* (alder) charcoal in reasonable condition. Sample 2 (3005) from the fill of ditch 3004 in trench 3 produced poorly preserved charcoal, with both alder and *Corylus* (hazel) identified. Sample 3 (5005) a possible drain fill in trench 5, contained some trace remains of charcoal and cereal grain. The charcoal was too poorly preserved to identify, whilst the single grain of *Hordeum vulgare* sl. (barley) was rolled and degraded. One fragment of *Corylus avellana* (hazel) nutshell was also found.

It is probable that the material (3005) in the ditch reflected nearby burning activity but was possibly re-deposited. The material in the two possible drainage ditch fills (2006 and 5005) had probably also been moved around from nearby. The condition of material in context 5005 in particular suggested the burnt remains could have been water transported.

A total of forty-seven samples were examined from the excavation. Seven were taken from various slot trenches through the field boundary 003/067, with mixed results and varied preservation perhaps reflecting location and a degree of

modern intrusion. Sample 60 (004) contained traces of very poorly preserved charcoal, some coal fragments and a single *Triticum* spp. (wheat) grain, possibly bread wheat type but too poor to accurately identify. Sample 62 (004) produced traces of *Alnus* (alder) charcoal along with occasional coal and modern seeds. Sample 63 (004) produced some clinker like material along with very cindery damaged charcoal fragments, a few pieces could be identified as *Quercus* (oak), but generally not in very good condition. This could represent deposition of some industrial related waste. Samples 66, 68 and 70 (004) were all sterile of identifiable material, producing coal only. This group of samples contains some burnt material possibly related to Roman activity, such as the wheat grain and alder charcoal, but has probably been disturbed at some point by post-medieval intrusion or mixed through by re-cutting of the earlier ditch.

Context 011, a possible Roman drainage ditch, produced small amounts of oak, hazel, alder and *Prunoideae* (cherry) type charcoal, probably reflecting accumulation from nearby burning. Linear feature 040 was similar but with only hazel charcoal found in small amounts. Sample 50 (047) from a stepped drainage ditch containing Roman pottery produced traces of hazel and *Betula* (birch) charcoal.

The possible pit 063 possibly acted as a 'trap' to capture small concentrations of charcoal, with sample 59 containing mainly oak with a little birch, whilst sample 73 had oak only, probably reflecting general burning in the vicinity.

Sample 72 (072) from linear feature 071 contained crushed or trampled cindery charcoal, with oak identified, plus some coal. A stray piece of hazel nutshell was also recovered, but it is possibly intrusive. The date for this feature is unknown but it might be related to the railway or other post-medieval activity.

Hazel charcoal from sample 51 (048) from the clay lining at the base of the ditch (049) was submitted for radiocarbon dating and returned a broad Roman date range of 54-215 cal AD (SUERC-62356 at 2 sigma), for the activity. The charcoal was preserved in good condition and, in addition to hazel, a mixture of *Salix* (willow), oak and cherry type was also present. A single grain of poorly preserved *Avena* sp. (oat) was

the only cereal found in the sample. Overall, the remains reflected a mixed fuel ash waste deposit, possibly swept or dumped into the feature from a nearby hearth, or more likely accumulated in the drainage ditch sediment over a period of time.

Sample 61 (066) from a possible Roman or pre-Roman ditch 003/067 produced a small amount of charred remains, with a mixture of alder, oak and hazel charcoal identified. Cereal grain from the fill (066) was mostly vesicular and poorly preserved, but it was possible to identify single grains of *Hordeum vulgare* sl. (barley) and *Triticum* spp. (wheat). Context 066 consisted of layers of wind-blown sand filling the ditch (003/067), which was subsequently re-cut (003), and therefore there was a high possibility of mixed or intrusive material being present. A fragment of hazel charcoal in reasonable condition was submitted for radiocarbon dating from this sample and returned a date of 803 - 551 cal BC (SUERC-62358 at 2 sigma) placing the material in the latter part of the Bronze Age and into the early Iron Age. This is an interesting result providing evidence for pre-Roman burning and settlement activity in this vicinity at quite an early date.

Pits

Nine samples were examined from pit fills that produced some good concentrations of cereal grain and charcoal, indicating deposition of mixed fuel waste together with cereal processing or cooking waste. This material probably reflects multiple dumping episodes of burnt material including sweepings from nearby hearths or ovens. Charcoal from two of the pit fills was submitted for radiocarbon dating.

Four samples were taken from the fills of pit 039. One large fragment of willow charcoal from sample 36 from the lower fill (044) of the pit, was submitted for radiocarbon dating and returned at 157 cal BC - 54 cal AD (SUERC-62359). The sample contained a mixed fuel deposit of hazel, birch, alder and willow mostly in good condition and probably reflecting multiple burning episodes. The cereal grain was found to be poor and vesicular, although *Hordeum vulgare* sl. (barley) and *Triticum* spp. (wheat) could be identified. The feature could be a pit oven with material burnt in-situ or the remains were cleared out of a corn drying kiln, oven or similar before deposition there (see Discussion, below). The

dating suggested pre-Roman Iron Age activity but interestingly Roman pottery recovered from the lower fill could suggest early contacts, trading, or be mixed in from later activity in this area.

Sample 34 from the upper fill 028 of pit 039 had a similar range of mixed charcoal to the lower fill (044), but the cereal grain in this deposit was better preserved and included a small concentration of *Hordeum vulgare* var. *vulgare* (six row hulled barley) as well as indeterminate material. Burnt peat and heather stems were also present in the sample (028) and were probably remains of fuel waste used for cereal drying. The other two samples from the pit contained less, with fill 043 producing degraded barley grain and small amounts of alder and hazel charcoal, whilst another fill (042) also had barley, with one piece of hazel charcoal.

Two samples from pit 045 contained fuel waste in the form of charcoal, but no cereal grain, and were probably dumps of hearth waste. This pit was excavated from below the ditch (049) and therefore possibly reflected quite early activity. Sample 46 (046) held a mixture of hazel, birch, alder and oak, all in small amounts. Sample 39 (046) had only oak and coal. Carbonised remains therefore did not form a particularly significant component of this pit (045) compared to the amounts found in pit 039. A radiocarbon date was taken from hazel charcoal from sample 46 (046), which was returned as 41 cal BC - 86 cal AD (SUERC-62357)(Table 5). This date is in general agreement with an early phase of activity, indicating a pre-Roman Iron Age / early first century AD rubbish pit, possibly related to native settlement or the construction of the Flavian fort.

Pit 050 was similar to pit 045, with sample 52 (051) containing only a small amount of hazel charcoal, whilst sample 56 (056) had both oak and hazel in small amounts.

Pit sample 37 (032) from a large pit in the SW corner of extension 2 was probably fairly modern as it produced only coal.

Postholes

Six samples from postholes and possible postholes produced generally well-preserved specimens of cereal grain plus some charcoal fragments, probably representing general domestic hearth or oven waste that accumulated in and around the features. None of the material was particularly indicative of posts being burnt in-situ.

Sample 1 (006) from a possible posthole contained oak and hazel charcoal along with a small amount of very well-preserved oat grain and *Hordeum vulgare* var. *vulgare* (six row hulled barley) grain. This feature might possibly have been a scoop hearth or area for cereal drying or cooking rather than a posthole. Sample 2 (007) at its base produced small amounts of crushed oak and birch charcoal, identified as probably fuel waste. Similarly sample 3 (013) from a possible posthole with a very mixed fill, might have been a temporary hearth or a scoop hearth where cooking took place, or perhaps was a small deposit of waste material. The sample produced a mixed deposit of degraded and vesicular cereal grain with quite a high concentration of indeterminate grain, some *Triticum spelta* (spelt wheat) and a few oat grains. Charcoal from this feature was too poorly preserved to identify. The remains indicated cereal processing waste or cooking activities occurring either nearby or directly in the feature.

Table 5: Radiocarbon dates from the site.

Sample	Material	Sample	Context	Description	Uncalibrated	Calibrated 2-sigma	Delta 13C
SUERC 62356 (GU 38460)	Charcoal: Corylus	51	048	Fill of ditch 049	1893±30	54-215 cal AD	24.3‰
SUERC 62357 (GU 38461)	Charcoal: Corylus	46	046	Fill of pit 045	1964±30	41 cal BC - 116 cal AD	26.3‰
SUERC 62358 (GU 38462)	Charcoal: Corylus	61	066	Fill of ditch 067	2553±30	803-551 cal BC	28.1‰
SUERC 62359 (GU 38463)	Charcoal: Salix	36	044	Lowest fill of pit 039	2028±33	157 cal BC-54 cal AD	26.4‰

Sample 7 (017) was different in that it contained no cereal grain, but did produce some fuel evidence in the form of burnt peat, with a single fragment of hazel charcoal. Sample 33 (029) had only one piece of oak in amongst some modern material and is probably not significant. Posthole fill 052 was sterile, possibly the post had been removed, as were pit/posthole fills 054 and 057 containing only coal fragments.

Other features

Possible structural feature

Seven samples from fill 010 were taken from various slot trenches through a possible structure within the Roman boundary. Most of these samples were sterile or produced only trace evidence for burning activity in the vicinity, with coal found in five samples. Small amounts of hazel charcoal were found in samples 19, 22 and 27 (010) with oak in sample 21 (010), perhaps representing remains of a burnt structure or fuel waste.

Deposits

Sample 18 (015) was from a deposit of material containing corroded slag, clinker type burnt material, slag and hammerscale. This deposit could possibly be related to modern activity, or reflect Roman industry such as smithing taking place in the annexe. Similarly, metalworking deposit sample 58 (035) contained burnt vesicular material and very silvery-looking slag. Modern deposit sample 65 (068) also had clinker plus a very small fragment of hazel nutshell which was probably mixed in from earlier activity and not significant. These three samples could be analysed by a metalworking specialist if required in order to ascertain if they are Roman or modern.

Sample 5 (019), possibly re-deposited, was sterile. Three samples from wind-blown sand deposit (066) were largely sterile apart from sample 76 (066) which contained one fragment of birch, probably intrusive from nearby activity.

Discussion

The agricultural economy

Small amounts of cereal grain were recovered from the samples with the main concentrations recorded in pit fills (028, 042, 043 and 044) from pit 039, posthole fills (006 and 013), and

with lesser amounts from ditch fills/linear deposits (004, 048 and 066). Posthole fill 013 could possibly be a scoop hearth or discrete cooking pit, or deposit of burnt waste rather than structural. The cereal grain identification indicated a mixed arable economy with barley and spelt wheat the main types recorded, with much lesser amounts of oats present. All of the barley that was sufficiently well-preserved to be fully identified was found to be hulled type, with no naked barley present. It is possible one sample from ditch fill 004 contained bread wheat but this was very poorly preserved and had probably been mixed or re-deposited during the ditch re-cutting. The types of cereal grain recorded fit the general pattern seen elsewhere in pre-Roman Iron Age and Roman Scotland (Dickson and Dickson 2000). Both barley and oat were probably already being locally grown in the area when the Romans arrived and this continued throughout the occupation. Spelt wheat could have been grown locally also, perhaps only on a small scale, but it is likely the arrival of the army increased demand that it was necessary to transport food from further south as part of the military supply network. Radiocarbon dating from ditch fill 003/067 suggested the presence of both barley and wheat in the area prior to the Roman occupation.

A small number of weeds of agricultural and disturbed ground were recorded and probably arrived at the site with the cereal crop. These consisted of *Persicaria lapathifolia* (pale persicaria), present with cereal grain in ditch fill 066, *Fallopia convolvulus* (black bindweed) and *Persicaria maculosa* (redshank) with a large concentration of grain in mixed fill / posthole 013, and a stray *Polygonaceae* (knotweeds) in drainage ditch fill 011. The combination of grain, weeds and fuel waste in feature fills 066 and 013, suggested these were probably cereal drying / processing or cooking related waste deposits.

Gathered resources

Traces of hazel nutshell were recovered from three samples but all were found as single specimens in linear fills 5005 and 072, and in a modern deposit (068). These are possibly chance occurrences, for instance, burnt accidentally with hazel wood cut for fuel and therefore not particularly significant, but they might also represent some disturbance and mixing of earlier material related to prehistoric activity in the area.

Fuel and building resources

Small amounts of charcoal were found throughout the samples, with waste fuel deposits recorded from the ditch fills, pits and postholes, some possibly as stray inclusions or perhaps deliberately deposited as rubbish. Radiocarbon dating of charcoal from drainage ditch 049 provided a very broad Roman date for the activity, possibly reflecting burnt material accumulated in the sediment of the ditch. As with the cereal grain recovery, the largest concentrations of charcoal were found in pit fills, and in particular in pits 039 and 045, as mixed fuel waste deposits, possibly accumulated over a period of time and from numerous burning episodes. Cereal processing, cooking and mixed fuel waste was present in pit 039, possibly from agricultural or domestic activity. Pit 045 contained only fuel waste in the form of charcoal, so the deposition here was possibly from in-situ temporary fires or multiple rubbish sweepings from a nearby hearth with a different purpose. Radiocarbon dates from both pits suggested a degree of contemporaneity placing the activity in the pre-Roman Iron Age or early first century AD. These features therefore probably represent an early phase of activity at the site, related most likely to pre-Roman native settlement in the area, or perhaps an early phase of contact and construction at the fort.

The charcoal from the pit fills was a mixture of hazel, alder, birch, willow and cherry type with low amounts of oak. This indicated exploitation of areas of open mixed deciduous woodland for fuel, with scrub and wetter areas probably also being cut.

Evidence for the use of peat or heath land for fuel in cereal drying processes and cooking or for general heating were found in conjunction with the grain in pit 039 and in possible posthole fill 017. Burnt peat fragments and Calluna (heather) stems recorded in these deposits in small amounts suggested wetter areas were being exploited, and charcoal was not the only source of fuel in use.

Conclusion

The environmental samples from the site produced a small mixed assemblage of wood charcoal and cereal grain associated with both pre-Roman and Roman period activity in the

southern annexe of Camelon fort. Radiocarbon dating of charcoal from two samples indicated pre-Roman Iron Age activity or very early Roman influence in the area, with pits 039 and 045 producing mixed hearth waste including charcoal and cereal grain as well as Roman pottery from 039. Two further samples provided quite different results, with ditch 049 indicating a very broad Roman date range, whilst in contrast, ditch 003/067 suggested much earlier Iron Age burning in the area, although it is possible the material in the fill was wind-blown and intrusive.

The cereal grain was identified as mainly barley and spelt wheat, with slightly more barley recorded. A single grain of bread wheat may also have been present but could not be accurately identified due to the poor preservation of the grain. Oat was found in very low amounts and may have been grown locally as a fodder crop. The main concentrations of grain were recorded from the pit fills, in particular pit 039 where successive accumulations of burnt waste were deposited from numerous burning episodes. Pits 039 and 045 probably reflect an area of native settlement activity that was later subsumed by the Roman fort. Posthole fill 013 could be a small pit with waste deposited near to a processing / cooking area given the number of grains found here.

Charcoal identification suggested mixed deciduous open woodland in the area being exploited for fuel, in particular using hazel, which may also have had a constructional use. Wetter or boggy areas in the vicinity were suggested by alder, birch and willow. Peat and heath land was also being cut for fuel and probably mainly used for drying and cooking cereal grain. Industrial processes were indicated by burnt vesicular clinker-type material in four of the samples together with some cindery damaged charcoal which could indicate high levels of heat. Some of this may have been from more recent iron working disturbance in the area, for instance 068, but slag in 015, 035 and perhaps 004 might be from Roman smithing activity in the annexe.

Bone report

By Maureen C. Kilpatrick

Twelve features from the site produced bone fragments, with most of the bone retrieved

during post-excavation soil analysis due to its very small size.

The bone mainly comprised heat affected, unidentifiable cortical fragments which ranged in size from 3.8 mm to 19.7 mm, with most at the smaller end of the scale. Most of the bone was unidentifiable to species, with only five contexts producing bone which could be identified as animal or possible animal in origin (004, 006, 011, 044 and 046) and none was identified as human. Fragments from a very degraded animal molar were recovered from context 046, the fill of pit 045 which also contained Roman pottery and slag fragments.

All bone fragments had been burnt with most white or a combination of white/grey or white/brown/yellow in colour suggesting that temperatures in excess of 600 degrees centigrade were obtained during firing. Several bone fragments from contexts 006 and 011 also appeared to have white, rolled, chalky surfaces suggesting they had been affected by the weathering process prior to their final deposition. This could suggest that they are residual in nature and were incorporated into these features accidentally, rather than by design. Due to the size and nature of this small bone assemblage further investigative work is unlikely to produce additional data.

Discussion

The features at Redbrae Road, Camelon are situated within an area rich in Roman archaeological remains, including the nearby forts and annexe at Camelon and a series of temporary camps further to the west including Three Bridges I-V, Lochlands I-VI, Bogton and East and West Carmuir (Jones 2013). Investigations by AOC Archaeology in 2010 to the immediate west of the present site uncovered features associated with the fort's annexe including several buildings, bread ovens, rubbish pits, ditches and inter-cutting field systems (pers. comm. Martin Cook, Director, AOC Archaeology Group). The present excavation did not reveal such a density of archaeological remains but several features and finds that were uncovered add to our knowledge of Roman activity within the area. These include a series of linear ditches representing possible field boundaries, postholes, a possible bread oven and several pits containing discarded detritus including pottery and industrial waste (Figure 10).

The radiocarbon dates provided in Table 5 have been compared with dated artefacts from features (Table 6) to produce an overall impression of the range of activities associated with the excavated area during the Roman period. There is generally good correlation between the two which indicate a range of activities from prehistory into history, and the Flavian and Antonine periods of the Roman occupation in particular.

Prehistoric Activity

The earliest evidence of activity on site was late Mesolithic. This is based on two microlith fragments recovered from the fills of two much later dated features. Despite their residual nature, their presence indicates that people visited and exploited the area at this time. Evidence of further prehistoric activity was also recovered from ditch 067 which produced a late Bronze/early Iron Age radiocarbon date from a single fragment of charcoal (see below). Despite its residual nature it further supports pre-Roman activity at this vicinity. This activity is demonstrated further with other known prehistoric sites within the wider locale which includes find spots and burials (Figure 1, sites 4-6).

Roman Activity

The ditch (003/067) in the northern part of the site was the longest in the excavated area but returned a prehistoric radiocarbon date (Table 5) of 803-551cal BC from a piece of hazel charcoal found in its base. The interpretation of the evidence is that the hazel charcoal was possibly a residual piece in the fill of a ditch that was dug during Iron Age/Roman times, but accompanied by contemporary vitrified material and a hobnail. Although the ditch was U-shaped, its course through the excavated area was not regular or as direct as other Roman features. During the recent AOC excavations in 2010 to the immediate west of the present site, a number of inter-cutting field boundaries were uncovered, which could suggest that the ditch was part of this prehistoric system. The occurrence of poorly preserved barley and wheat grains in its fill are not diagnostic of period as both were grown prior to the Roman period (Alldritt above). The interpretation of this ditch is made complicated by its later recutting (003/004), in either the Flavian or the following Antonine period, as a piece of mortarium found in its infilling material was independently dated to AD 60-120 (see Croom above).

Table 6: Dated features.

Feature	Feature fill(s)	Type of Feature	Finds	Radiocarbon dating	Comments
006		Possible posthole	Flint		
12	11	Ditch	2 flints		
037	029	Posthole	1 chert scalene triangle		
068		Modern deposit	2 flints		
067	066	Ditch	Vitrified material	803-551 cal BC	Intrusive?
			Hobnail		
039	044	Pit	2 Roman samian sherds - Flavian	157 cal BC-54 cal AD	
	043		2 Roman samian sherds		
			1 flint		
			9 Roman samian sherds		
			3 pottery sherds - Flavian		
028	Ox goad				
041		Linear feature	Pottery sherd - Flavian		
			Iron nodule		
045	046	Pit	2 x pottery sherds – Flavian	41 cal BC - 116 cal AD	Fits with Flavian dates
			North Gaulish reduced ware – Flavian or Antonine		
			Hearth lining material		
			Bloomery slag		
			Iron rim mount		
			Mammal tooth		
049	048	Ditch	Iron nail fragment	54-215 cal AD	Fits with Anonine
	011	Recut ditch	5 x pottery sherds - Antonine		
003	004	Recut Roman boundary ditch	Oise/Somme mortarium rim AD 60-120		
			2 pottery sherds		
			Socketed bolt head, hobnails and bars		
016	010	Ditch	6 Roman pottery sherds- Flavian and Antonine		
			Vitrified material		
			Hobnail		
			6 flints including a scalene triangle		
007		Possible posthole	Hobnail		
015		Deposit	Slag/vitrified material		
047		Stepped drainage ditch	Iron nail fragment		
041	?	Ditch	? Roman pottery		

Closely associated with these activities was another in the north-western part of the area, where a narrow ditch (016) with Roman pottery sherds identified from its fill, was considered Flavian or Antonine in date.

The other significant U-shaped ditch (049) (Table 7) of the excavation was exposed in the west side of Extension 2. This regular and slightly wider ditch than 003/067 is likely to have been of Flavian date and may relate to the construction of the fort. Its later recutting (012) was dated to the Antonine period (54-215 cal AD, Table 6) and sherds of Roman pottery of the same period were found within it.

Two pits lay either side of this latter ditch. The largest 039, was fully exposed and excavated. It contained the majority of Roman samian pottery, the ox goad, other Roman pottery and a piece of (intrusive) flint. A radiocarbon date from its lower fill produced a date range of 157 cal BC-54 cal AD (Flavian). The second pit (045) on the west side of the ditch contained a variety of cultural evidence in its fill including pottery, some imported from Gaul, evidence of iron smelting, and an iron piece. A radiocarbon date of 41 cal BC - 116 cal AD suggests its origin was native or Flavian (Tables 5 and 6).

A scatter of prehistoric and Roman finds from other features in the southern part of the excavation area do not further aid the interpretation of the ditch and pits already discussed.

The function and extent of these ditches is unknown although they do not appear to be military in width or depth due to their much smaller size and overall shape, despite their closeness to Camelon Roman Fort, and their Flavian or earlier date. However, they could be the remains of boundaries or enclosures associated with additional settlement structures, such as metalworking areas, which were established next to the fort.

The clay lining in ditch 049 was probably used as a means of stabilising the soft, sandy sides from collapse and has only survived at its base. Previous excavations to the west of Camelon North fort in 1974 (Pryce 1974) uncovered several Roman ditches, with one also containing a clay-lined drainage channel at its base, suggesting that it was not an uncommon construction technique.

The absence of a clay-lined drainage slot and an observable terminal in the south-east suggests that the function of ditch 003/067 possibly differed to that of ditch 049.

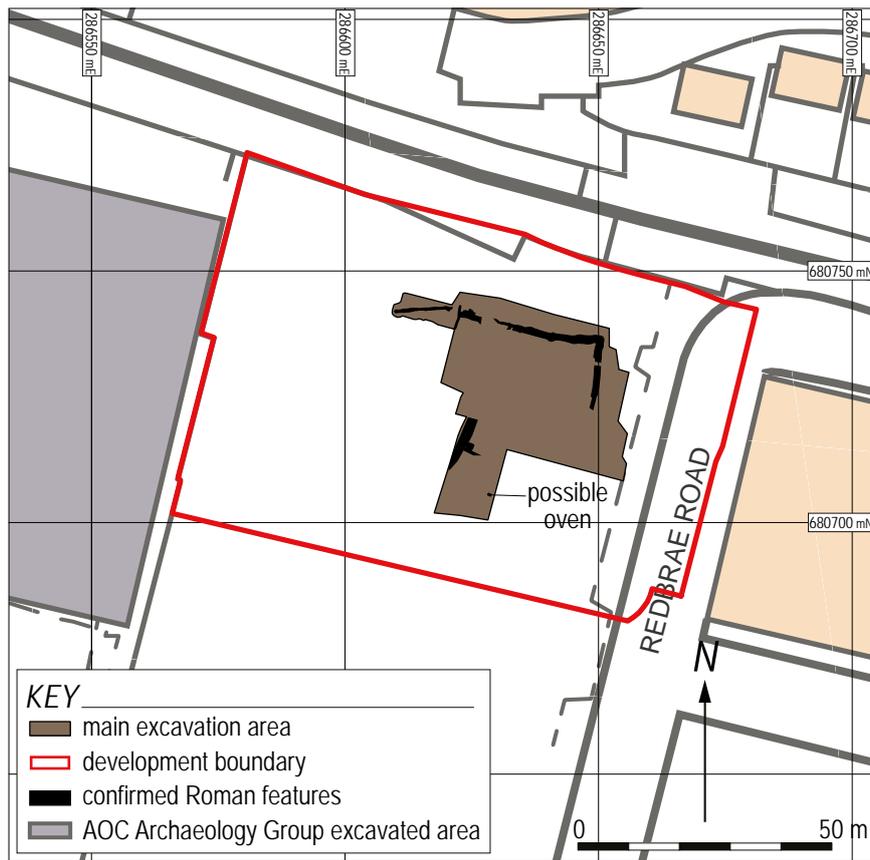
Both ditches (049 and 067) appear to have been allowed to silt up gradually prior to being re-dug during the Antonine period (012 and 003). The re-digging of the ditches appears to have affected their full exposed lengths but created new features that were morphologically different, being more rounded and shallower in depth. The re-dug ditches were also rapidly backfilled once they were no longer required, in contrast to the earlier ditches, which gradually filled in.

Ditch 016 appeared to be a very different feature from ditch 003/067, and the evidence of its fill appearing similar to 004, would suggest that this ditch was dug at the same time as ditch 003/067 was re-cut.

The pits (039 and 045) located in extension 2 of the site were of similar size and contained interesting artefacts. Previous excavation in the southern annexe of the fort also produced pits of similar size to the above, which were interpreted as rubbish pits due to their mixed contents, which included first and second century AD pottery sherds, daub and iron fragments (Maxfield 1975). The remains of four hearths were also uncovered, with one associated with iron working, which could account for the presence of metal waste in pit 045.

Bread Oven

Structural features were more difficult to decipher from the remains encountered although several postholes were present. However, due to the disturbance and truncation of the site by modern features, it was difficult to ascertain any pattern to these features and determine their function. However conjoined pits 037 and 038 might suggest the presence of an oven simply based on its similarity to other previously excavated Roman examples. Most ovens, or fire/cooking-pits as they are also termed, generally comprise two bipartite (figure-of-eight) pits containing layers of charcoal with evidence of in situ scorching of the surrounding soils. Often there is a difference in depth between the two pits and stone or cobble settings have also been found at the base of them. The deeper pit has



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Figure 10: Confirmed Roman features highlighted in the excavated area.

most likely been used as a receptacle for raked-out waste charcoal and ash. These double features are interpreted as bread ovens and have been found in large numbers at other fort and temporary camps sites including Kintore (Cook and Dunbar 2008), the nearby Lochlands Three Bridges (Bailey 2000) and the recently excavated Ayr Academy site, South Ayrshire (Araboalaza 2015, and forthcoming), to list a few. Several were also found during the most recent excavations at Camelon by AOC Archaeology in 2010 (currently unpublished). However, the problem with the interpretation of pits 037 and 038 is that no charcoal layers or scorching were found within them, and no environmental material was recovered during post-excavation analysis. Although morphologically similar in construction to other excavated ovens, the lack of environmental evidence makes their interpretation tentative only.

Much debate has surrounded the function of fort annexes, and whether they were used by military personnel only and/or civilian or part civilian in use. Solomon (1984) suggests that annexes were used by both military and civilian personnel and

could represent the “early stages of the military vici” (1984, 22), such as the one found at Inveresk Roman Fort which had a large vici to its east (Thomas 1988). This was borne out by evidence from excavations at a number of fort annexes, including Balmuldy, Castledykes and Mumrills Roman forts, which although limited uncovered material which could be classed as civilian in use (Steer 1960-61, Thomas 1988, 163). However, evidence of military buildings, bath houses, ovens and industrial activities such as metal working were also present within these spaces suggesting they had multiple uses and were occupied by a variety of different individuals. The recovery of metalworking waste, pottery, agricultural implements and cereal grains and the presence of a possible oven would suggest that the situation was no different at Camelon.

Post-Roman Activity

The actual extent of the southern annexe at Camelon Fort is unknown due to later building works on site and in the surrounding vicinity which has obscured much of the area with post-industrial building works and housing. Much

of the present site was truncated by modern industrial features including brick and concrete foundations and deposits of red blaes and slag from the earlier Foundry works (Figure 1). Recent excavation work by AOC Archeology to the immediate west of the present site will add much to the understanding of the annexe, its function and possible extent.

The results of the present work at Redbrae Road in Camelon has uncovered a number of features of archaeological interest probably relating to the extra-mural structures which became established next to the southern annexe of Camelon Roman Fort. These features date from the late Bronze Age and especially to both the earlier Flavian and the later Antonine periods. This narrow glimpse into the past does not significantly alter our understanding of activities associated with the nearby military structures but adds further detail to the multicultural aspects of the Roman military in Scotland.

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Archive

The site archive will be deposited with Historic Environment Scotland and the finds will be declared to the Treasure Trove Unit.

The fieldwork and the post-excavation were undertaken in line with the code of conduct and standards and guidance documents of the Chartered Institute for Archaeologists (CIfA).

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Appendix 1: Ironwork Catalogue

Catalogue No.	Find No.	Sample No.	Context No.	Context info	No. of Pieces	Type	NMS Identification Sept 2015	Catalogue entry (L length, W width, H height, D diameter, T thickness, all in mm)	Weight (g)
4a	20	-	004	Fill of linear field boundary	1	Fe	Bar	Cat.4a A tapering, square-sectioned bar, broken at both ends. L 28, T 3-7.	4.9
5	21	-	004	Fill of linear field boundary	1	Fe	Bar fragment attached to stone	Cat.5 A small portion of rectangular-sectioned iron bar corroded onto a stone. Probably from a nail shank. L 4, T 3.	-
8a	28	-	004	Fill of linear field boundary	1	Fe	Hobnail	Cat.8a Intact hobnail with circular, domed head and clenched shank. Traces of mineralised leather layers survive around the shank. L 13; head D 11.	1.5
8b	28	-	004	Fill of linear field boundary	1	Fe	Hobnail	Cat.8b Intact hobnail with oval, domed head and clenched shank. Traces of mineralised leather layers survive around the shank. L 14; head 10 x 9.	1.1
8c	28	-	004	Fill of linear field boundary	1	Fe	Hobnail	Cat.8c Intact hobnail with circular, domed head and clenched shank. Traces of mineralised leather layers survive around the shank. L 15; head D 12.	1.5
8d	28	-	004	Fill of linear field boundary	1	Fe	Hobnail	Cat.8d Intact hobnail (now in two refitting pieces) with circular, domed head and clenched, square-sectioned shank. Traces of mineralised leather layers survive around the shank. L 20, D 12.	2.1
17	-	68	004	Fill of linear field boundary	1	Fe	Hobnail	Cat.17 Hobnail with circular domed head and slightly curved, square-sectioned shank, missing tip. There are traces of mineralised leather within the corrosion, showing a thin layer of leather perpendicular to the shank. L 12; head D 10; shank T 2.	1.1
4b	20	-	004	Fill of linear field boundary	1	Fe	Hobnail head	Cat.4b Domed/ almost pyramidal hobnail head with sub-oval-sectioned shank broken flush with head. D 13, H 7; shank D3.	1.2
16	-	63	004	Fill of linear field boundary	1	Fe	Hobnail head	Cat.16 A circular domed head with broken square-sectioned shank. D 10; shank T 3.5.	1.3
6	22	-	004	Fill of linear field boundary	1	Fe	Socketed bolt-head	Cat.6 A circular-sectioned socket, tapering to one end before expanding into a blunt, pyramidal head. L 42; socket external D 8.5, internal D 5, depth 24; head 8 x 9.	11.2
9	-	2	007	Possible post-hole base	1	Fe	Hobnail head	Cat.9 Circular domed head with broken shank. The shape and size is consistent with a hobnail. D 10 x 11, H 9.	1.5
13	-	28	010	Feature belonging to structure within Roman field boundary system?	1	Fe	Hobnail	Cat.13 Hobnail with circular domed head and curved, broken shank. L 13; head D 9; shank T 2.	1.3

Catalogue No.	Find No.	Sample No.	Context No.	Context info	No. of Pieces	Type	NMS Identification Sept 2015	Catalogue entry (L length, W width, H height, D diameter, T thickness, all in mm)	Weight (g)
12	-	27	010	Feature belonging to structure within Roman field boundary system?	2	Fe	Hobnail heads	Cat.12 Two domed fragments, probably hobnail heads lacking their shanks. D 4 and 5.	3.9
11	-	26	010	Feature belonging to structure within Roman field boundary system?	1	Fe	Nodule	Cat.11 Small spherical nodule of iron. Possibly from the manufacturing process? D 9.	0.9
1	9	-	015	Spread	1	Fe	Iron slag or bloom	Cat.1 An amorphous lump of iron. No structure is discernible on the X-ray and it appears poorly consolidated, suggesting it is iron slag or partly refined bloom. 59 x 30 x 29.	24.5
10	-	18	015	Spread	1	Fe	Unidentified	Cat.10 Two flakes of iron, one of which is coated in corrosion. Neither have a clear structure and they are probably fragments spalled from larger objects. 19 x 11 x 4; 10 x 6 x 1.	1.1
3	14	-	028	Upper fill of pit	1	Fe	Ox goad	Cat.3 An ox-goad formed from a coiled strip of iron twisted around twice, terminating in a protruding point at one end. There are traces of mineralised wood within the cylindrical socket. L 38; external D 19; internal D 11; strip W 12.	14.7
14	-	55	040	Fill of linear feature	1	Fe	Nodule	Cat.14 Small spherical nodule of iron. Possibly an offcut from blacksmithing? D 5.	0.3
7	23b	-	046	Pit fill	1	Fe	Rim mount	Cat.7 A sub-square sheet fragment with two edges broken, and one corner curved over. There are two possible small perforations along the long broken edge, only visible on the X-ray, suggesting it had been a mount of some-sort. The bent-over shape suggests it was probably from some form of rim. 32 x 23; sheet T 1.	5.5
2	12	-	047	Stepped drainage ditch	1	Fe	Nail	Cat.2 A disc-headed nail with square-sectioned, slightly curved shank, missing tip. L 42, head D 16, T 5; shank T 6.	16.7
15	-	61	066	Windblown sand lens in ditch	1	Fe	Hobnail	Cat.15 Intact iron hobnail with oval domed head and clenched shank. The corrosion is quite porous in appearance and may also include some mineralised leather. L 15; head W 13 x 9; shank D 3.	1.7

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