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Culduthel Mains Farm, Inverness
Phase 5

Excavation of a Later Prehistoric Settlement: Assessment Report

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Planning Reference 00/00386/OUTIN

HEADLAND ARCHAEOLOGY Ltd

ARCHAEOLOGICAL EXCAVATION CULDUTHEL MAINS FARM

PROJECT SUMMARY SHEET (CDF05)

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Schedule

Fieldwork	20th June 2005 – 24th February 2006
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Summary

This report presents the findings of an archaeological excavation on the site of a housing development at Culduthel Mains Farm, Inverness. The site is on the southern outskirts of Inverness in the Inverness and Bona parish, on the south side of the recently constructed Southern Distributor Road. Tulloch Homes Ltd commissioned Headland Archaeology Ltd to undertake the work, which took place between June 2005 and February 2006, as part of the planning consent for the construction of Phase 5 of a housing development.

The site covers an area of approximately 4.84 ha, is centred on NGR NH 66404140 and occupies undulating ground on the 65 m contour. It commands clear views over present-day Inverness to the north and the head of the Great Glen to the south-west.

The excavation was commissioned following an evaluation in May 2005 that had located an enclosure, visible as a cropmark on aerial photographs, and identified two other areas of archaeological potential. During the excavation it was apparent the archaeological remains continued outside these areas. A watching brief undertaken by Alba Archaeology Ltd uncovered the remaining archaeology, which was subsequently excavated by Headland.

The slightly oval enclosure located first in the evaluation measured 52 by 41m with a south-west-facing entrance. The enclosure had one phase, and while the interior contained a number of truncated pits and postholes no obvious buildings, other than a four-post structure, could be identified. The main settlement activity was to the north-west and north-east of the enclosure. The area to the north-east contained a large cobbled work area from which abundant metalworking debris was recovered. The north-west area contained a total of 19 buildings, 16 of which were roundhouses. Six were situated on flat ground at the top of a small rise; one contained an iron-smelting furnace and was clearly a workshop, another was a substantial roundhouse, some 18m in diameter. At the base of the small rise were a further 11 roundhouses, a stone-built workshop and what has been tentatively interpreted as a Bronze Age ring-ditch house. One roundhouse was extremely large, 19.5 m in diameter, and was situated in an area of deep hillwash. This had been exceptionally well preserved along with an area of industrial deposits with a deep stratigraphic sequence relating to the production of iron, copper alloys, glass and enamel. A total of 9 iron-smelting furnaces were found in this area, with the last firing in situ. All but one were in a roundhouse.

1. INTRODUCTION

1.1 Project background

Tulloch Homes Ltd commissioned Headland Archaeology Ltd to undertake a series of archaeological investigations at Culduthel Mains Farm, Inverness in advance of development for housing. Two evaluations in April and May 2004 established that no archaeological remains were present in Phases 1-4 other than a few undated charcoal rich pits.

The evaluation of Phase 5 took place in May 2005. The main objective was to locate a palisaded enclosure, visible as a cropmark on aerial photographs, and determine the extent of any archaeology associated with this as well as assessing the archaeological potential across the whole development area. Three areas containing archaeology were identified and these were the focus of an excavation that began in June 2005. This uncovered significant archaeological remains in the excavation areas and beyond. Tulloch Homes Ltd commissioned a watching brief, undertaken by Alba Archaeology Ltd, to uncover the full extent of the archaeology on site. Headland subsequently excavated the site.

During the Phase 5 excavation a number of smaller areas in adjacent fields were stripped under archaeological supervision to accommodate compounds and borrow pits. This led to two further small area excavations. An evaluation of Phases 7 and 8 at this time (Jones 2005), and a small excavation in September 2006 (Murray forthcoming), uncovered numerous prehistoric features.

1.2 Site use and location

Phase 5 is on the southern outskirts of Inverness, in the Inverness and Bona parish on the south side of the recently constructed Southern Distributor Road. It covers an area of 4.84 ha centred on NGR NH 6640 4140. Up until the time of excavation the land had been under pasture for approximately three years, and before this it had been under crop. The development at Culduthel is part of a larger scheme of housing development on the south side of the distributor road. This extends from the A9 in the east to Culduthel in the west.

The site is situated on a north-east to south-west oriented terrace along the 65m contour and commands clear views westward to the head of the Great Glen, over Inverness to Craig Phadrig and across the Kessock Narrows to the Black Isle and Ord Hill in the north. The terrace is formed from sand and gravel moraine. The topography of the site is undulating, with two areas of higher ground separated by a depression. The north-west part of site initially sloped downwards from east to west. Once the topsoil had been removed it was clear that in antiquity this area was an area of flat ground at the foot of a small slope. The western fringe sloped sharply down to a small stream that wound its way along the perimeter of the site.

2. ARCHAEOLOGICAL BACKGROUND

The NMRS holds the following records of archaeological sites or investigated areas (excluding listed or standing buildings) in the immediate area (Fig 1).

NMRS ref number	Site type	Description
NH64SE 25	Knocknageal Boar Stone	Pitish Symbol Stone
NH64SE 26	Culduthel	Cairn: ring-cairn Clava-type
NH64SE 29	Holm House	Motte
NH63SE 30	Culduthel	Cist; jet necklace; bronze awl; stone flake; charcoal
NH64SE 33	Culduthel Mains, Knocknagael	Cist
NH64SE 36	Culduthel	Cist; Beaker; flint arrowheads;
NH64SE 37	Lower Slackbuie	Pit circle; ring ditch
NH64SE 48	Inverness, Royal Academy	Flints; bronze
NH64SE 49	Culduthel	Flints; glass; bead
NH64SE 57	Fort William – Fort Augustus	Military road
NH64SE 70	Knocknagael	Ring ditch; barrows and pits
NH64SE 71	Culduthel	Barrow (possible)
NH64SE 72	Castle Heather	Postholes, Charcoal
NH64SE 241	Old Town of Leys	Enclosure; palisaded
NH64SE 247	Drumdevan	Geophysics and excavation
NH64SE 255	Culduthel	Trial excavations
NH64SE 257	Drumdevan	Watching brief
NH64SE 261	Culduthel Mains	Cists; Beaker; flint arrowheads; amber bead; stone bracer; bone toggle
NH64SE 329	Torbeck	Watching brief; cremation, pits

Table 1. Gazetteer of Cultural Heritage Sites near the proposed development area

As the gazetteer shows, Phase 5 lies in a rich archaeological landscape, and substantial numbers of prehistoric features have been uncovered in the vicinity. Limited excavation of a palisaded enclosure at Balloan Park *c* 1.8 km north-east of Culduthel, also visible as a cropmark, identified not only the location of the enclosure but also revealed an extensive settlement to the north (Wordsworth 1999). This settlement probably dated from the Late Bronze Age to the mid Iron Age. This layout, with a simple palisaded enclosure associated with an external settlement, is similar to that at Culduthel.

The ring-cairn NH64SE 26, assumed to be of the Clava type, lies immediately north of the site. It is situated on a natural rise and is now incomplete and ruinous. Much of the damage is thought to be of relatively recent date as evidence from the OS 6" map of 1874 shows the cairn to be largely complete.

Five short cists have been found in the surrounding area. NH63SE 30 was discovered in 1928 to the north of the site and contained a crouched female inhumation with accompanying jet necklace and copper alloy artefacts. NH64SE 33 was found to the west of the site in 1970 containing a crouched inhumation but had no associated artefacts. NH64SE 48 was discovered in 1975 during the construction of the new Inverness Royal Academy and contained a male inhumation. Among the grave goods were a complete Beaker, eight barbed-

and-tanged arrowheads and a stone wristguard on which the four copper alloy rivets had been gilded.

Two cists were uncovered at Culduthel Mains in 2003 (Brown 2003). Both contained Beaker pots, the best preserved of the cists containing an individual male placed in a crouched position accompanied by two barbed-and-tanged arrowheads and ten other lithic artefacts. Other archaeological features at Holm Mains Farm included a number of linear ditches uncovered during an evaluation (Haliday 2000).

Archaeological work along the route of the Southern Distributor Road, to the north of the site, recorded 128 pits, mostly thought to be Neolithic.

The archaeological evaluation of Phase 4 contained five small pits and one hearth pit, but no datable artefacts were recovered (Dutton 2004).

Phases 7 and 8 were found to contain a significant amount of early and later prehistoric features including a small roundhouse and an enclosure (Murray forthcoming). Two areas required for borrow pits in the field to the south of Phase 5 were stripped under archaeological supervision uncovering several features of early prehistoric date (Murray forthcoming).

An excavation by Headland Archaeology at Slackbuie, *c* 500m east of Phase 5, revealed a variety of features presumed to date to the prehistoric period. The site probably contained a burnt mound, although only the central trough had survived later agricultural activity. There were also the truncated remains of numerous small pits or postholes that suggest some form of contemporary associated structure (Dutton, 2006).

An evaluation 500m further east, at Lower Slackbuie, identified two distinct areas containing evidence of significant archaeological remains, also probably prehistoric. An excavation examined these areas in March 2006 (Atkinson, 2006).

3. AIMS AND METHODOLOGY

Following the evaluation, a Written Scheme of Investigation was submitted for approval to Highland Council Archaeology Service.

3.1 Research aims

The objectives of the excavation were:

- To obtain a plan of the enclosures and settlement in all its phases.
- To attempt to identify structures and activity areas.
- To establish the date and duration of this settlement
- To obtain evidence for its economic basis so that its social and economic position in the later prehistoric settlement pattern can be ascertained.
- To obtain environmental (both charred plant remains and animal bone, if present) as well as artefactual evidence for the settlement's environment and economic orientation.

With these objectives it was decided to strip three areas of archaeological potential in Phase 5:

1. Area A in the south-west corner measured 72 by 30m
2. Area B, focusing on the palisaded enclosure, measured 117 x 106m
3. Area C in the north-east corner measured 56 by 48m

These were topsoil stripped with a tracked excavator under archaeological supervision. All features were planned with a robotic Leica TCRA 1105 total station controlled by a field computer running Penmap software to created a geo-referenced digital pre-excavation plan of the site.

The remainder of the site outside these areas was stripped by Alba Archaeology (Fig 2). Areas which contained complex deposits were excavated by Headland Archaeology, with Alba dealing with simple structures or remains.

All structures were fully excavated. Discrete features were half-sectioned or fully excavated for retrieval of environmental evidence or artefacts. A minimum of 10% of all linear features was excavated.

*3.2 R*ecording

The recording was by Headland Archaeology Ltd standard method. All contexts, small finds and environmental samples were given unique numbers. Bulk finds were collected by context. Colour print and slide photographs were taken. An overall site plan was recorded and related to the National Grid. All negative features, deposits and ground surfaces were surveyed in plan, using a mini-prism for increased accuracy. The survey was complemented

by hand-drawn plans at a scale of 1:20 when required. Sections were recorded by survey and hand-drawn at a scale of 1:10. All recording was undertaken on pro forma record cards.

*3.3 A*rtefacts and samples

Any artefacts retrieved during the excavation were bagged, labelled, catalogued on site and their location surveyed when necessary. Archaeological deposits were sampled systematically in accordance with Headland Archaeology Ltd standard environmental sampling practice. Bulk samples were taken for wet sieving and flotation. Kubiena samples were taken from important deposit boundaries.

4. DESCRIPTION OF RESULTS

The prehistoric settlement activity excavated at Culduthel (Fig 2) falls into three broad periods, Iron Age, pre-Iron Age and general prehistoric activity. In the absence of absolute dating evidence at the assessment stage (i.e. radiocarbon dates) archaeological features have been dated by initial artefact evidence, architectural comparisons and where they sit in the stratigraphic sequence.

All features are shown on the accompanying illustrations but not all deposits are labelled to avoid confusion.

4.1 Prehistoric activity

The features described below could not be dated with certainty at this stage. It is assumed that they are prehistoric but it is not clear if they belong to the Iron Age settlement or pre-date this. This especially applies to the palisaded enclosure (Structure 30 – Fig 3), as this type of structure is present in the archaeological record from the Bronze Age to the medieval period.

Structure 30 - Palisaded enclosure (Fig 3)

A large, single-phase enclosure was located on an area of flat ground on top of a rise in the centre of the field. The enclosure consisted of an oval palisade ditch, which would have held upright wooden posts, and measured 52 by 41 m. The narrow entrance was situated on the south-west side and measured 1.75 m.

Three 5m long slots and both entrance terminals were fully excavated, amounting to just over 10% of the palisade ditch. These revealed the palisade ditch (469) to be up to 0.8 m wide and 0.7 m deep, with near-vertical sides breaking sharply to a broad flat base. Along the edges of the cut large stones (467) had been used as packing for the posts. The posts were visible in section, but it was not possible to detect individual post-settings in plan. The fill of the ditch contained frequent large stones, which are presumed to be disturbed packing material.

Where the palisade ditch was situated on a slight down slope it had been more affected by plough truncation. The ditch (457) was 0.3 m wide and survived to a depth of 0.3 m. Its sides were less sheer and the base was narrow and concave. Packing stones (473) were present at the base of the cut. One possible post-setting was visible.

The two terminals (539 and 480), which formed the entrance to the enclosure, were very similar. The palisade ditch widened to 1.15 m where circular cuts were made to accommodate two larger entrance posts. The terminal cuts were lined with two tiers of flat, edge-set packing stones; the south terminal (480) had one stone placed across the ditch to form a distinct footing for the main entrance post.

Structure 30 - Internal Features

There was a total of 30 features in the interior of the enclosure, mostly clustered in the western half, of which 23 were interpreted as postholes. The topsoil covering this area was very shallow and as a result the features were more plough-truncated than in other areas of the site.

A 'four-post' structure, 29, was the only clear structure identified among this cluster of features. The four postholes were arranged in a square, with sides measuring *c*. 2.8 m, and all were *c*. 0.4 m in diameter and 0.2 m deep. The other postholes in this area are evidence of settlement activity, though no other clear structures were present, and many features have probably been lost through plough truncation.

The remaining seven features were pits of unknown function. No artefacts were recovered from these features. Two pits, 586 and 540, contained higher concentrations of charcoal and may have been simple hearths or cooking pits.

It is not clear whether the internal features are contemporary with the enclosure, and while their location may imply this it could also be an accident of preservation.

Group 1 (Fig 3)

To the east of the enclosure lay a group of 12 pits and a three-post structure that had been sealed beneath a layer of hillwash. Five of these pits contained evidence of in situ burning in the form of charcoal. One pit (531) had been re-cut twice for later burning events and was filled by large quantities of charcoal and grey ash. Two pits (520 and 526) contained prehistoric pottery (SF 96) and lacked evidence of burning.

The three postholes formed an isosceles triangle with sides measuring 1.7 x1.7 x 0.9 m. All were *c*. 0.5m in diameter but the post at the head of the triangle was twice the depth. These postholes appear to be the remains of a small structure, probably an A-frame supporting a larger post, which related to ash-filled pit 552.

Structures 24 and 25 (Fig 3)

These structures were formed of four small postholes, in pairs of two, set in a slightly trapezoidal arrangement.

Structure 24 (338, 340, 342 and 352) was situated 28 m west of the enclosure, was oriented north to south and measured 2 m across. One post (340) contained disturbed packing stones, another (342) heat-fractured stone.

Structure 25 was 43 m north-west of the enclosure, oriented north-east to south-west, and measured 2.5 m across. The pairs of posts were spaced further apart than those in Structure 24.

The function of these structures is unclear; it is possible they are the remnants of larger structures or enclosures. Similar posthole arrangements, forming the entrances of roundhouses, were present on site.

Group 2 (Fig 34)

A group of 11 features, consisting of ten pits of varying size and the remnants of a small cairn, were situated to the south and west of the enclosure.

Cairn 295 (Fig 3)

The remains of a thin ground surface (447) survived beneath stone spread 295. This deposit was mottled with dark patches containing small charcoal flecks and unidentified burnt bone. The old ground surface was sealed by a layer of substantial deliberately placed stones (295) which was sealed in turn by an amorphous spread (*c.* 7 x 5 m) of small sub-angular stone in a loose sandy-silt matrix (297). Deposit 297 was almost non-existent on the north side of 295.

This feature is thought to be the remnants of a small cairn that had been robbed rather than plough-truncated. The presence of burnt bone in the preserved ground surface, either from cooking or cremation, suggests the cairn was not modern clearance.

Stone lined pits 354 and 401 (Fig 3)

Pit 354, situated 8 m south-west of Cairn 295, was the largest in Group 2 and measured 1.87 x 1.39 x 0.25 m. The upper fill contained heat-fractured stone, frequent charcoal as well as burnt bone fragments. The northern half of pit 354 was lined with stones of varying size.

Pit 401, approximately 8 m from the enclosure entrance, measured 0.9 x 0.88 x 0.4 m and had stones lining the edge of the cut. Prehistoric pottery was recovered from the fill (SF 87). It is possible this feature was a large isolated posthole.

Other features

Four other features in Group 2 (426, 440, 454 and 465) were similar in size to 401, though depth varied from 0.13 to 0.55 m, but were lacking stone lining or pottery. The remaining features (391, 393, 424 and 438) were also pits but smaller (*c.* 0.5 x 0.4 m). Pit 393 contained one piece of slag.

Area C (Fig 4)

This area, 70 m east of the palisaded enclosure, contained a total of seven features. Two, 419 and 451, were sub-oval shallow pits measuring 0.9 x 0.6 x 0.13 m and 1.21 x 1.07 x 0.12 m. The presence of heat affected natural and concentrations of charcoal in these pits suggest they were the remains of hearths. A small quantity of iron slag was recovered from the fill of pit 451.

Pit 431 was oval and measured 0.75 x 0.68 x 0.28 m. The fill of this pit contained 6 body sherds of prehistoric pottery, and a further 13 fragments were recovered from environmental sampling of this feature.

The other feature of note was a pit, 434, which had a diameter of 0.72 m and a depth of 0.52 m. This had multiple fills and had been re-cut once; a small flint flake was recovered from the basal fill.

Hearths 275 and 673 (Fig 3)

Two features in the north-west corner of Area B were identified as possible hearths. Both were unrelated to any structure but were close to a number of large roundhouses.

Pit 275 was circular, 1.2 x 1.1 x 0.15 m, and lined with large sub-angular stones (281) that had been used as a setting for a fire. Charcoal was abundant in the two fills of the hearth (276 and 277), with a higher concentration on the southern side.

Pit 673 was oval, 1.4 x 0.65 x 0.2 m, and contained an abundance of heat-fractured stone and charcoal; stone lining was absent from this feature.

4.2 Pre-Iron Age activity

Several features were identified as being earlier than the Iron Age settlement and industrial activity. In the case of the platform and cairns, their date has been determined from their place in the stratigraphic sequence. The date of Structure 14 is suggested by comparison with a similar structure found on a Bronze Age site excavated by Headland Archaeology in 2002 (Connolly, forthcoming).

Structure 14 (Fig 5)

Structure 14 was approximately 12 m south of the large roundhouse, Structure 10. It consisted of a group of features interpreted as the truncated remains of a ring-ditch house formed by an arc of five postholes, 4m in length and spaced at intervals ranging from 0.7m to 1.4m. It was partially bounded to the north by a small hollow that may have been the remnants of a ring-ditch. The postholes were sub-circular and measured between 0.31 x 0.26 and 0.46 x 0.41 m, and depth varied from 0.1 m to 0.19 m. The irregular crescent-shaped hollow measured 4.22 x 1.56 m and survived to a depth of 0.16 m. There were two postholes at either end, on the inside edge, though their relationship with the hollow was not clear. Small quantities of iron slag were recovered from the fill of the hollow, 3444, and from one of the postholes though these are likely to have been intrusive.

An arc of nine postholes measuring 7 m and a shallow amorphous pit 3.5 m south-west of Structure 14 may have been the remains of another ring-ditch house.

Platform/Surface 3651 (Fig 5)

This was an amorphous area of rough cobbling at the base of a slope east of Structure 14, between this building and Structure 11. It measured 9.5 x 8.4 m and was oriented north to

south. The small rounded and sub-angular cobbles were supported by loosely compacted dark brown silty sand matrix. This contained some flecks of charcoal and burnt bone as well as 72 sherds of prehistoric coarseware pottery, much of it from one vessel. One possible flint tool (SF 840) was also recovered. Slightly larger stones had been placed around the periphery to form a possible revetment; this was most evident on the north side.

Originally, this was thought to be a truncated cairn similar to 4234 and 2671 (see below). However, 3651 was different, as it was a matrix-supported structure in places. While the cairns were constructed in one event and were surrounded by a matrix that had infiltrated after deposition, these stones seem to have deliberately been set into an existing soil/ground-surface to form a platform or cobbled surface.

Beneath the cobbles was a thin layer of hillwash that sealed a very pale grey palaeosoil. To the east of the surface, at the base of the slope, a deeper band of hillwash had accumulated along with material containing large angular stones that appears to have been transported more rapidly. This may have built up against a raised platform formed by 3651. Stratigraphically, 3651 is earlier than the industrial buildings to the north-east and south and may have been contemporary with two cairns that lie to the north.

Cairns 2671 and 4234 (Fig 5)

There were two small cairns to the east of Structure 10, one of which was sealed beneath a band of hillwash that pre-dated the industrial activity in this area. Both had been disturbed in antiquity, probably by the occupants of the later prehistoric settlement.

Cairn 2671 was less well preserved and was *c*. 5m east of Structure 10, where its remnants had been incorporated into the cobbled yard (1945) associated with this roundhouse. The east side had been truncated by modern disturbance. Despite this it was clear that it had an ovoid ground plan measuring 7.5 x 7 m and was constructed of a mixture of sub-rounded and sub-angular stones that were larger towards the core of the feature. A pit had been cut through the core of the cairn, just off centre to the north-east. This was sub-circular in plan, measured 1.45 x 1.33 m and was up to 0.26 m deep with a black, charcoal-rich fill that contained frequent stones from the surrounding cairn. It transpired that this was a re-cut of a slightly larger pit that was originally sealed by the cairn.

Two small pits 1 m to the north were stratigraphically contemporary with the cairn. Pit 3023 was circular in plan, had a diameter of 0.8m and was up to 0.1m deep. The compact fill contained a piece of worked flint. The pit had been sealed with a capstone measuring 0.68 x 0.63 x 0.09 m. The second pit (3025) truncated this on the northern side, and was oval in plan and up to 0.1m deep. The charcoal-rich fill contained 30 small pieces of flint debitage.

The other cairn (4234) was *c*. 13 m south-east of 2671. It had been sealed by a layer of hillwash (3720), resulting in a higher level of preservation. A roughly circular arrangement of non-uniform sub-angular stones that measured 3.7 m in diameter formed the core of the cairn. This survived to a height of 0.35 m. Light brown silty sand had infiltrated to form a sparse matrix. Around this, and abutting the core, was an amorphous spread of sub-angular stones in a matrix of yellowish-brown silty sand. This measured 7.2 x 5.1 m and differed from the core structure in that the stones were smaller and less frequent within the matrix; this frequency decreased further still towards the edges.

There was a circular pit measuring 1.45 m in diameter in the centre of the cairn. This is thought to have formed when the cairn was robbed out, presumably in antiquity and possibly at the same time as the disturbance of cairn 2671 disturbed. The 0.4 m deep pit contained three fills. The basal fill was a thin pale yellow band of silty sand, and the secondary fill was loose pale grey silty sand with occasional sub- angular stones derived from the cairn. A small piece of red flint and a fragment of iron slag were recovered from the bulk sample. The upper fill consisted of frequent large sub-angular stones, again derived from the cairn structure, in a loose light brown sandy silt matrix.

Cairn 4234 sealed the remains of a thin soil that had developed from the underlying glacial till. Within this, sealed by the cairn, were two possible archaeological features. An amorphous spread of small stones in a firm silty matrix (4381) measuring 3.3 x 2 m was identified as the remnants of a possible surface. This was 1.5m north-east of the cairn core. Adjacent to this was a small charcoal spread (4382) that measured 0.82 x 0.3 m. No artefacts were recovered from these features.

4.3 Iron Age activity

Structure 10 (Fig 5)

In the western half of the preserved ground surface on a flat terrace at the base of a small slope were the remains of a massive and elaborate roundhouse. Like the industrial structures to the east, after having been destroyed and abandoned it had been mostly sealed by hillwash. This resulted in exceptional preservation over most of the building apart from the area to the north, where modern disturbance had resulted in the partial truncation of some internal elements and the complete destruction of some external structural elements.

Although initially thought to be one building, excavation proved that Structure 10 contained the remains of three phases of roundhouses. Though no reliable stratigraphic relationships were established between Phases 1 and 2 it was evident that they pre-dated Phase 3.

Structure 10-Phase 1 (Fig 6)

This building was represented by a ring of 20 postholes with a diameter of 13.3 m and was similar to Structure 9, *c*. 5 m to the west, in scale and construction technique. The postholes were placed at intervals ranging from 1 m to 2.6 m, the majority being *c*. 2 m apart. A 4 m wide entrance faced north-east.

The postholes were circular or slightly sub-circular in plan with diameters varying between 0.3 m and 0.9 m; the larger diameter postholes were located in the south and west areas of the building. Depth also varied, ranging from 0.08 m to 0.6 m, with the deeper postholes again in the south and west areas. This was unexpected, because this area had been truncated by the Phase 3 ring-ditch. Six postholes in the south-west half had been recut, indicating post-replacement. Post-pipes were visible in seven postholes and displayed a degree of uniformity; three were between 0.17m and 0.19m in diameter and four were between 0.3m and 0.34 m. Artefactual evidence recovered from the posthole fills consisted of small quantities of iron slag, present in eight postholes, and burnt clay. Two flint flakes, one burnt, were present in two other postholes.

Structure 10-Phase 2 (Fig 9)

A partial post-ring of 14 postholes with a diameter of 11 m formed the second phase of Structure 10. This was located within and was concentric with the Phase 1 post-ring.

The postholes were sub-circular in plan with diameters ranging from 0.35 m to 1.2 m and depth between 0.2 and 0.5 m. These had been placed at intervals between 1.9 and 2 m. The diameter of posts varied between *c*. 0.2 to 0.4 m. Unlike the postholes of Phase 1, no clear post-pipes were visible in section, so post diameters were determined from the four postholes containing undisturbed post-packing. The eastern side of the post-ring had been all but destroyed by the construction of Phase 3 and as a result no entrance was observed. However, like Phases 1 and 3, it probably faced north-east.

Artefactual evidence from the postholes was, as in Phase 1, almost exclusively confined to small pieces of iron slag and daub, as well as small quantities of magnetic residue. However,

in one a piece of rotary quern (SF 685) had been incorporated into the packing material close to the base of posthole 3549.

Structure 10 - Phase 3 (Fig 9)

The final phase of Structure 10 saw a shift in the scale and grandeur of the roundhouse as it evolved into a building similar to, but larger than, Structure 4, with a narrow ring-groove enclosing a broad, penannular ring-ditch and internal post-ring. Several stone structures were present both internally and externally. Given the similarities in architectural style it is possible that Structures 4 and 10.3 are contemporary.

The internal post-ring was 9 m in diameter and contained 14 postholes. These were placed at intervals between 1.5 and 2.1 m, with the majority being 1.9 m apart. The entrance into the interior of the post-ring faced north-east; here the postholes were 3.5 m apart. The postholes in the western half were mostly sub-circular in plan with diameters ranging between 0.95 and 1.6 m; the others had an amorphous shape in plan as several had been re-cut. These were larger with lengths of 1.15 to 2.3 m and widths of 1.15 to 2 m. Depths varied from 0.23 to 1.2 m with the majority being between 0.7 and 1 m.

It was apparent from their size and depth that the postholes were designed to accommodate massive upright timbers. The diameter of these was discernible in 10 of the 14 postholes by the layout of packing stones (where present) and/or from observing the dimensions of post-pipes. These, like those in Phase 1, were charcoal rich and remarkably consistent in their size; seven were 0.5-0.55m wide and three were 0.4 m. Three of the wider posts tapered to 0.35-0.4m at the base. The posts had been set at fairly consistent depths, with the wider posts having depths of between 0.7 and 0.8m below the level of the natural geology. The three narrower posts had been set 0.55 m, 0.65 m and 0.8 m deep.

The method used to hold the posts in place varied. Most of the postholes contained large packing stones between 0.3 and 0.6 m in length, with the voids between them filled with smaller stones. Redeposited natural had then been used to seal those in the eastern half of the building. Those to the west had been packed with redeposited natural. In one case (2209) this was *c*. 1m thick and 0.72 m deep. This posthole was elongated, measuring 2.55 x 0.88 m and had truncated a posthole belonging to Phase 2. Though no post-pipe was visible the remains of a partially carbonised/preserved post (SF 451) was recovered from the post-setting.

The elongation of posthole 2209 could be attributed to the replacement of this post once the roundhouse was in use. More substantial evidence for post replacement was present in a number of the postholes, especially those in the south-west and the north, including one of the entrance posts, where excavation showed multiple post settings. It is these recutting events that accounted for the size in plan of the larger postholes.

Several significant artefacts were recovered from the posthole fills, including some that appear to have been deliberately deposited, specifically quernstones and the hilt of an iron sword. The upper part of a rotary quern (SF 324) had been placed grinding face down on the boundary between postholes 1881 and 1882. The adjacent posthole (2209) had three pieces of an upper rotary quern (SF 654) incorporated into the packing material; these joined to form half a complete quern. The other half was recovered in two pieces (SF 328 and 365) from the ring-ditch fill next to the posthole. The iron sword hilt (SF 683) was recovered from the post-

pipe of posthole 3632, suggesting parallels with the sword in posthole 2416 (SF 476) and continuing the trend of deliberately placed iron weapons in post-settings.

The other artefacts present within the postholes were mostly residual. Iron slag was present in varying quantities in almost all, both in post-pipes and packing material; some contained small quantities of burnt clay. Several pieces of flint including two scrapers (SF 655 and 662), a fragment of stone disc (SF 747) and an unfinished stone spindle whorl were the other finds of note.

The penannular ring-ditch (2719) enclosed the post-ring and had an external diameter of 17.6 m; internally it measured 9.8 m. The entrance was in the south of the building and curved round for half the circumference of roundhouse, terminating with a low drystone wall 1.3 m in from the main north-east facing entrance. It was relatively shallow, with a maximum depth of 0.4 m, and was between 3.6 and 4.2 m wide. The sides sloped at an angle of between 10° and 20° before gently breaking to a broad, flat base. It is assumed that the ring-ditch was a cut feature rather than an eroded one due to the nature of the glacial sub-soil, which was well consolidated by numerous rounded stones. This cut truncated the postholes belonging to Phases 1 and 2 as well the edges of the internal post-ring. Modern disturbance had unfortunately removed a 4 by 4 m area in the north-west part of the ring-ditch.

The stratigraphic sequence in the ring- ditch was relatively simple. At the base was softly compacted black silty sand (2179, 2553, 2686 and 2687), up to 0.1 m deep, within which was numerous patches yellow/orange ash that contained abundant fragments of charcoal and burnt bone. This deposit was not present across the whole area of the ring-ditch. Small patches were found at the entrance while a larger spread, 4.8 by 2.8 m in size, was present in association with the remains of a possible collapsed wall structure (2850). This was located in the eastern area and was reminiscent of the collapsed wall in Structure 4. In this instance the wall appears to be located along the inside edge of the ring-ditch, the ash-rich spread could be the remains of turf used in the construction of the wall.

These deposits were sealed by dark grey silty sand (2155) up to 0.4 m deep that was present across the whole ring-ditch. This too had an abundance of charcoal and pockets of burnt bone throughout, as well as occasional patches of yellow/orange ash. Stone tumble was present where this deposit overlay wall 2850.

The artefacts recovered from this deposit were unusual as very little domestic debris was present. The most notable finds were an iron sickle (SF 510), which was missing its tip, a copper alloy Roman coin (SF 503) minted during the reign of the emperor Trajan (AD98-117) and an almost blank sub-circular disc (SF401) that could be a reworked coin (Nick Holmes pers comm). The sickle and the coin were found in the ring-ditch entrance, 1.7m apart, and may have been deliberately deposited prior to the building's destruction. The other metal finds were a probable shank of a copper alloy ring-headed pin (SF 368), a possible iron nail (SF 497), an iron blade tip (SF367) and three iron objects (SF 366), two of which may be pin shanks, the other a small iron bar. Stone objects were limited to the two quern fragments mentioned above (SF 328 and 365) and a rubbing/hammer stone (SF 477). Iron slag was also recovered (approx 0.3kg) as well as very small quantities of magnetic residue, burnt clay and prill.

The uppermost deposit within the ring-ditch (1671) was 0.05 m deep and consisted of almost black sandy silt with frequent burnt clay, iron slag and burnt bone. It is interpreted as the

interface between the final abandonment deposit and the overlying hillwash. Heat fractured stone was also present but was more concentrated around the entrance.

The northern terminal of the ring-ditch consisted of a low drystone wall (2204), that was probably a continuation of wall 2850. Wall 2204 was U-shaped in plan and was constructed with of a mixture of large (0.4 x 0.4 x 0.2 m) and medium (0.2 x 0.2 x 0.1 m) sub-rounded stone, this was mostly one course high, though in some places two were identified. The wall was up to 0.6 m wide and 0.25 m high, the total structure measured 2.7 by 2.5 m. This wall had been placed on a rough cobbled surface (3569) of small, sub-angular stones that were laid onto the natural sub-soil. This was one of three surfaces identified inside the ring-ditch, which had become shallower at the terminal to the point that it was no longer a 'ditch', though its full extent was unknown due to the modern disturbance in this part of the building.

Another surface was represented by six pieces of burnt timber (3568) found lying on top of the cobbled surface; these are thought to be the remains of a wooden floor. They were aligned north north-west to south south-east and appear to be small planks. They were consistently 0.07m wide and 0.03 m thick with lengths varying between 0.13 and 0.3 m. A patchy ash-rich deposit (3566), which is likely to be same as contexts 2179, 2553, 2686 and 2687, covered the timbers and is interpreted as turf ash. The preservation of structural timbers in this way is similar to those in Structure 4 (see below).

The ring-groove enclosing the post-ring and ring-ditch was circular and had a diameter of 19.5 m. The width was fairly consistent, varying between 0.55 and 0.65m, while the depth ranged from 0.2m on the west side to 0.6m in the east, close to the entrance porch. The cut had near vertical sides that broke sharply to a slightly concave base. In the eastern half of the building a dark band on the inside edge indicated that the posts had been set here with redeposited natural and stones used to hold them in place. These posts were mostly 0.23 m wide and had been set up to 0.6 m below the level of the subsoil. It terminated at a sequence of postholes that formed the north-east facing porch

The porch had been placed 4.5 m from the internal post-ring and formed a 3.2 m wide entrance into the roundhouse. Four pairs of postholes were present demonstrating that the porch had been altered; this was similar to Structures 13, 15, 16 and 17. The outermost pair formed the earliest phase with each subsequent replacement being placed closer to the roundhouse. All the postholes were *c.* 1 m in diameter with depths varying between 0.23 and 0.97 m. The penultimate phase had been joined by a 0.9 m wide gully. This had a broad U-shape profile and was 0.3 m deep. The gully appears to have been out of use by the final phase and a 3.8 m long, 0.6 m wide stone threshold had been partially inserted into the upper fill. Also present in the gully was a small posthole (3935). It was identified by an arrangement of packing stones and the presence of several pieces of carbonised timber. One of the timbers was the in-situ remains of a post (3953), which had been braced with a small wooden wedge. The post measured 0.2 x 0.2 x 0.13 m and was not completely preserved though what remained indicated that it was roughly circular. The wedge (3952) was triangular in section and measured 0.1 x 0.1 x 0.07 m. The other timbers were the fragmented remains of planking (3849), roughly 0.5 x 0.1 x 0.05 m in size, similar to those present in the ring-ditch terminal. The majority of these were aligned north to south.

The space between the porch and the internal ring-groove had been paved with large stone slabs up to 0.9 x 0.65 x 0.07 m in size with the gaps between these filled with smaller angular

stones. This paved entrance measured 5.4 x 4.7 m and was roughly rectangular in plan. An unfinished rotary quern (Sf725) had been incorporated into this surface; a sharpening stone (SF 329) was found lying on it.

The paving sealed a line of small postholes that would have blocked access to the right-hand side of the roundhouse and formed a small rectangular cell between the ring ditch terminal and the entrance porch. This cell had been formalised by a linear extension (4082) of the curvilinear wall (2204), partitioning the space between the paving and ring-ditch.

The paved area was sealed by deposit 1671, described above in association with the ring ditch, which contained a number of high status and unusual artefacts. A copper alloy Romano-British brooch decorated with inlaid rings of blue, red and yellow enamel (SF 278) was recovered just outside the roundhouse, adjacent to the entrance. This is a well-known type dating to the late 1st/early 2nd century AD (Fraser Hunter *pers. comm*.). A copper alloy cross with relief decoration (SF 318) was recovered 3 m south-west of the brooch. This has been identified as a horse strap mount, also dated to the 1st/2nd century AD, and is likely to be exotic to the area (Fraser Hunter *pers. comm*.). Among the other artefacts were eight lead objects; seven of which were tightly coiled strips (SF 280, 281, 354 386, 403 and 511), the other object was a folded and hammered bar (SF 1000). The coiled strips were found in close proximity to each other just south of the paved entrance and they are provisionally interpreted as weights, possibly attached to a hide or cloth curtain that was used to partition off the area containing the ring-ditch.

As well as the artefacts described above a large number of other finds were recovered from the entrance area of Structure 10.3 including several iron objects, *c*. 3.5kg of iron slag, burnt clay/daub fragments, hammer/rubbing stones and a rotary quern fragment. Several flint flakes and two possible flint tools were also present around the entrance that is likely to have derived from earlier prehistoric activity.

Along the east side of Structure 10 were two stone structures (1853 and 1854) that are interpreted as wall bases for a stone and turf façade. Between them they formed a small annex that had a 2 m wide east facing entrance, the northernmost structure had a small cell within it near the main entrance. Both structures had been placed directly on the cobbled surface (1945) associated with Structure 10.

They were constructed with sub-angular stones up to 0.5 x 0.4 m in size. The southern wall base (1854) was curvilinear in plan, was 9.5 m long, 0.7 m wide and 0.4 m high. No distinct courses were identified. It respected the line of the ring-groove, which it is adjacent to at the southern end. The northern end was 1.4 m away from the ring-groove and this formed the southern part of the annex. A fragment of rotary quern (SF 653) had been incorporated into this structure.

The northern wall base (1853) formed part of the entrance to the roundhouse and the northern half of the annex. It was located 2 m from the ring-groove. It was triangular in plan, 5 m long and 4.2 m wide. A semi-circular cell was present in the north end; this recess was 2.2 m wide and 2 m deep. A flat stone with sharpening grooves (SF519) was present within this structure.

These walls are likely to have been mirrored on Structure 10's northern side.

Structure 10-Phase 3- other features (Fig 9)

Within Structure 10 were several features that can be associated with the roundhouse. Three lines of postholes were present within the interior. Each line was 2 to 3 m long and contained four postholes *c*. 0.4m in diameter and between 0.1 and 0.35 m deep. These were too small to hold load-bearing posts and could be the remains of small partitions used to divide up the internal space. Several larger postholes/pits of unknown function were also present.

A small four-post structure was present in the south between the internal post-ring and the ring-groove next to the start of the ring ditch. The sides were irregular, measuring from 1.3m to 1.9 m, giving it a skewed rectangular shape in plan. It was not clear which phase, if any, of Structure 10 this belonged to.

To the east were three pits all measuring *c*. 1 m in diameter. Two contained *c*. 0.3 kg of iron slag. The other (2539) also contained small quantities of iron slag as well as two small sherds of clear glass (SF 533), both slightly curving and beginning to crystallise. A further 19 fragments were recovered from the bulk sample. The glass is provisionally interpreted as the remains of a Roman vessel. Additional glass fragments (approximately 50) were found in the deposit sealing these pits (2198).

Cobbled yard 1945 (Fig 8)

A large cobbled surface (1945 and 2130) had been laid to the east of Structure 10. This was contemporary with the final phase of this roundhouse. It was amorphous in plan and measured 28 m north to south and up to 17.5 m east to west. The original north to south extent would have been greater but, like parts of Structure 10, it had been removed by modern disturbance. The cobbles were fairly small, sub-angular and tightly packed within a black, charcoal rich matrix; this formed a fairly uniform, even surface. Two layers were identified in places, with the lower one suspended in a lighter grey matrix. The cobbled yard respects not only Structure 10 but also the industrial features to the east suggesting they are broadly contemporaneous. A likely scenario for the construction of 1945 is that the heavy use of this area, due to the industrial activity, churned up the ground necessitating consolidation through the spreading of cobbles. The fact that there appears to be two layers suggests that this process was ongoing.

The artefactual evidence confirmed the association of 1945 with industrial activity. A total of 8kg of iron slag was recovered from on or within the cobbles as well as large fragments of burnt clay with slag adhered. The iron artefacts recovered included a possible offcut (SF 562), a lozenge shaped rove (SF 454) and a nail (SF 719). The most unusual artefact was a copper alloy Campanulate sword hilt guard (SF 483). This would have been part of a larger, organic hilt guard and is dated to the 2nd/1st century BC (Fraser Hunter *pers comm*). It was found on the north-east fringe of 1945.

The cobbled yard had been laid onto a large area of hillwash (3720). Once it had been removed, several clusters of stakeholes were found. These were concentrated around the eastern fringe of Structure 10 and were present internally and externally. Two groups of stakeholes formed structures. One was present near the entrance of Structure 10, which it also appears to respect. The other arc was located internally in the south-east part of Structure 10.

Also beneath the cobbled yard were a group of thin ephemeral linear features thought to be ardmarks. These were located just outside Structure 10 to the south-east. Some were oriented southwest to northeast and measured 2.7-2.9 m in length. Several other shorter ardmarks crossed these at right angles.

Structure 15 (Fig 8)

Structure 15 was a substantial roundhouse situated at, and cut into, the southern tip of a large spread of hillwash (3720). This structure consisted of an internal post-ring with an entrance porch facing, unusually, north-west.

The internal post-ring consisted of 13 postholes placed at 1.8 to 2 m intervals and had a diameter of 9 m. The entrance to the internal post-ring was 3.5m wide. The postholes were mostly sub-circular in plan with a two on the north side being more ovoid. The diameter of the sub-circular postholes ranged from 0.7 to 1 m and depth between 0.25 and 0.65 m. The ovoid postholes, 3558 and 4270, measured 1.49 x 0.91 m and 1.35 x 1.16 m; these were also deeper at 1.24 and 0.85 m. Of the thirteen postholes, four on the east side had clear post-pipes, three of which were 0.4 m wide with one measuring 0.37 m. One posthole, 3945, contained the carbonised remains of the post within the post-pipe. Metalworking debris was present in the majority of the postholes while a small, yellow glass bead was recovered from the sample of the upper fill of posthole 3492.

The porch was placed 4.4 m to the north-west of the internal post-ring and was formed by two large postholes, 4306 and 4341. The southern posthole, 4341, was oval in plan and measured 1.3 x 1.2 m and had a depth of 0.68 m. A copper alloy pin shaft (SF 844) and a large quantity of dense iron slag (SF 845) were recovered from the single fill. The other porch posthole also measured 1.3 x 1.2 m and had a similar shape in plan. However, a more substantial post-setting was present in the form of a single course of large packing stones into which two rotary quern fragments (SF 835 and 836) and two joining pieces of a rubbing stone (SF 837) had been incorporated. The packing stones indicate the post would have been *c*. 0.4 m in diameter. A narrow gully protruded 1.2 m from posthole 4306 across the entrance to Structure 15. This was 0.6m wide and 0.12 m deep.

Both of these postholes had been slightly truncated by shallower negative features that may have been small pits or postholes.

Structure 15- internal features

A number of small pits or postholes were present within the interior. Three features located just inside the entrance were identified as the well-preserved bases of iron-smelting furnaces, of a similar order of size to the furnace present in Structure 2. The close proximity of the furnaces to each other made it unlikely they were contemporary and excavation identified one as stratigraphically earlier than the other two.

Three large sub-rounded edge-set stones arranged in horseshoe shape (4175), placed in a circular cut measuring 0.9 m in diameter and 0.2 m deep, formed the earliest furnace. Externally, this measured 0.83 x 0.64 x 0.26 m; internal dimensions were 0.64 x 0.5 m. These stones were fused together by a ring of iron slag. Two stones had been placed at the open end to form a blockage. The stones on the south and east side were very fragile due to heat exposure and had been damaged by the construction of the two adjacent, later furnaces. A

thin deposit of pinkish brown sandy clay, 4217, lined the interior of the stones. The basal fill, 4218, was 0.04 m thick and rich in charcoal and pieces of 'dripped' slag. Over this was a 0.26 m thick deposit, 4148, containing burnt clay and iron slag as well as large quantities of charcoal; this was found in higher concentrations towards the open end of the furnace. The uppermost fill, 4121, appears to a deliberate backfill containing abundant burnt clay and iron slag.

The furnace to the east, 4145, was larger and better preserved. It too measured 0.8 x 0.6 m externally but had a depth of 0.47 m. It was horseshoe-shaped and formed by three large stones set on edge in a pit at an angle of approximately 60 °. A 0.12 m thick and 0.24 m high crust of iron slag had fused the stones together. Loose stones, set upright and lower down than the side stones, had blocked the open end and lay over the construction cut of furnace 4175. The remains of the furnace superstructure were present as a ring of burnt clay, 4144, on the top of the stones and in some places this was spread over the external face. The clay on the top had been grogged with small angular stones and fragments of quartz. On the outside face, the clay had fewer inclusions and in several places wattle/finger impressions were noted.

The lowest fill was a 0.04 m thick layer of charcoal and 'dripped' slag. A 0.27 m deep layer containing abundant iron slag, burnt clay and charcoal sealed the lowest deposit. As in furnace 4175 the charcoal was more concentrated towards the open end. The upper fill, 4121, of this furnace spread across to furnace 4175 and is described above. The deposit between the outer face of the furnace and the edge of the construction cut, 4146, contained a large amount of burnt clay and small pieces of quartz from the superstructure.

The third furnace was closest to the entrance and also post-dated 4175. This was formed by four large sub-rounded stones set on edge in a pit at an angle of approximately 60°. These were also arranged in a horseshoe shape and were fused together by two tiers of iron slag. The remains of the furnace superstructure were found on the stones upper surface as patches of burnt clay and small, decayed stones. The deposits in this furnace were the same as the two others in most respects, however the basal deposit of charcoal and slag was 0.26m deep. The upper fill contained many pieces of burnt clay with finger/hand impressions.

A circular pit, 4369, was immediately to the east of the three furnaces and appears to be related to the metalworking process. It measured 1 m in diameter and was 0.16 m deep. The top edge was lined by well-fired clay that varied in colour from light grey to bright pink/orange. The single fill contained large quantities of burnt clay, clay fused to slag and iron slag.

The remaining features were small postholes that may form a rectilinear structural component of Structure 15, though this is a tentative interpretation. One posthole outwith the central area, between two postholes in the post-ring, contained a small toggle, made from two conjoined spheres, in very dark blue glass, with yellow stripes and patches (SF 938).

A large number of stakeholes, approximately 160, were located in the eastern half though they formed no coherent structures and it is not clear if they were contemporary with Structure 15.

Contexts 798 and 1681- Industrial waste (Fig 5)

The uppermost deposit in the industrial area between Structure 10 and 13 was a vast spread of black, humic silty loam with very abundant fire-cracked cobbles. This measured 27.4 by 24 m and was up to 0.4 m deep. The scale of this deposit meant that a series of test pits were excavated in order to determine its nature and depth. Metal detectors were used to retrieve metal finds. Following this a mechanical mini-digger was used to remove the bulk of the deposit. A 0.7 m wide north-west to south-east aligned baulk was left at the centre of the deposit. Two context numbers were assigned, one (798) was given during the test pitting and the second (1681) was given to the remnants left by the mini-digger; this was removed by hand.

As well as the abundant fire-cracked cobbles, 798 and 1681 contain large quantities of iron slag and other metalworking debris. A significant amount, over 40kg, of iron slag was recovered by hand from test pits and cleaning, though this was only a sample of the total iron slag contained within these deposits, as well as many fragments of burnt clay tentatively identified as waste from furnace structures. Non-ferrous metalworking debris was less common. Two sherds of crucible (SF 351), a flawed casting of a ring-shaped copper alloy object (SF 333), an unidentified cast object (SF180) and a lump of casting waste (SF288) were recovered.

This spread of industrial waste also contained a total of 29 iron objects including an iron bar (SF 1017), decorative objects such as a projecting ring-headed pin (SF 181), several tools including a punch (SF 289) and tracer or awl (SF 326), possible iron offcuts (SF 177, 203 and 291), strap fittings (SF285 and 185), nails and a complete clench bolt (SF 183). A small grey metal bar with three transverse grooves at one end (SF 309) has been provisionally identified as silver.

Structure 13 (Fig 5)

This building was 1 m south of Structure 26 on ground that sloped gently down from east to west. Two phases were identified each with an associated iron-smelting furnace.

Structure 13- Phase 1

Phase 1 was a small building consisting of a 4.1 m diameter post-ring of 11 postholes placed at 1.1 m intervals, a 1.85 m wide entrance faced north-east. The postholes were mostly sub-circular with diameters ranging between 0.4 and 0.6 m. The depths varied between 0.35 and 0.41 m on the building's west side. Those on the east were deeper with depth varying between 0.57 and 0.7 m. Packing stones had been used in four postholes; one had an ovoid rubbing stone (SF 598) incorporated into the post-packing and another contained a pivot stone (SF 599). The posthole fills all contained varying amounts of iron slag, up to 1kg in one case; small quantities of burnt clay were also present.

Two postholes on the eastern side had been truncated by pit 3217. This was sub-oval, measured 1.7 x 1.3 m and was 0.7 m deep. Unusually, this feature had been under-cut on the west side x 0.15 m and on the east x 0.3 m. A large quantity on iron slag (2kg) was recovered

from the fill, including a possible furnace/hearth base, as well as fragments of burnt clay. A small opaque, amber-yellow glass bead was recovered from the sample.

Structure 13- Phase 1 internal features

The interior of Structure 13 contained a number of features; the most prominent was an iron-smelting furnace found in the centre of the post-ring.

The furnace was set into a sub-oval pit (3050) measuring 1.2 x 0.97m and 0.25m deep, which had steep sides breaking to a broad undulating base. The stone setting that formed the furnace structure (3458) had been placed into this to form a box. Externally this measured 1.1 x 0.76 m, internally 0.64 x 0.54 m and rose to a height of 0.3 m. Two slabs of sandstone, set on edge, formed the northwest and southeast sides. These had a thickness of between 0.11 m and 0.08 m and were angled inwards at 70° on the SE side and 60° on the north-west. Both had been heavily heat-affected and had fractured into several pieces. The rear was formed by a sub-angular piece of granite and two smaller sandstone blocks. The front was similarly constructed with a sub-rounded piece of granite and three pieces of sandstone forming a removable blockage.

The furnace interior contained three fills relating to the final use. The basal fill (3204) was fine black silt that was very rich in charcoal and iron slag (approximately 2.7kg). Small pieces of burnt clay and flecks of burnt bone were also present. A clear interface existed with the middle deposit (3147). This 0.08 m deep, mottled brown sandy silt had large concentrations of charcoal and iron slag (approximately 5kg) throughout. However, a greater concentration of iron slag was noted in the northern half of the furnace and up against the side slabs. The upper fill (3064) was softly compacted, dark grey sandy silt. This 0.13 m thick deposit contained occasional fire cracked stones, whereas the lower fills were largely stone free, and 'ashy' patches that suggest a mixed deposit of furnace debris and backfill. A large quantity of iron slag (approximately 9kg) was recovered as well as greater amounts of burnt clay, most likely from the furnace superstructure. The space between the outer face of the furnace stones and the edge of the cut was also filled with dark grey sandy silt (3458) that contained, in relation to the interior fills, small quantities of iron slag and charcoal. Prill and a small yellow glass bead were recovered from the sample.

The other internal features were small postholes that could not be directly related to Structure 13 or furnace 3050.

Structure 13-Phase 2

The second phase saw major alterations to Structure 13 with the addition of a south-west facing entrance porch, the construction of another iron-smelting furnace and a possible anvil setting both of which truncated the earlier post-ring.

The porch was placed 3.4 m south-west of the post-ring and was formed by two roughly parallel lines of re-cut postholes joined by a narrow gully. The entrance was 1.2 m wide. The postholes on the northern side were more substantial than those to the south with the largest, and latest, measuring 0.6 x 0.46 m and being 0.42 m deep. This posthole (3807) was the only one that contained a recognisable post-pipe; this was surrounded with packing stones and redeposited natural. The gully (3866) formed a threshold to the building and was 0.3 m wide,

0.1 m deep with shallow sides and a concave base. A small amount of iron slag and nine fragments of coarseware pottery were recovered from the bulk sample.

Structure 13-phase 2-internal features

Furnace 3790

Located 3 m south-west of furnace 3050, truncating the post-ring of Structure 13, was a solidly constructed iron-smelting furnace similar to those found in Structures 2 and 15. This was located slightly outside the internal post-ring in what was the new entrance to the building.

Furnace 3790 supersedes a possible earlier phase of furnace formed by an oval pit (4179) that measured 1.0 x 0.8m and had a depth of 0.18 m. An arrangement of sub-angular stones and burnt clay towards the north-east end, similar to the blocked end of the later furnace, and a very high concentration of iron slag and burnt clay suggest an earlier stone-built structure was dismantled to accommodate the later furnace. It is possible the stones were re-used to construct the later phase, though this is conjectural.

The next phase saw the construction of another stone-built furnace to the south-west of the first. The cut (3790) was oval in plan, measured 0.96 x 0.94m and had a depth of 0.5 m. The sides had a slight revetment into which seven stones of varying size, between 0.36 x 0.3m and 0.17 x 0.17m, had been set to form U-shape in plan. This overlapped the cut of the previous furnace. The open end faced north-east and had been blocked by a line of removable stones and lumps of burnt clay. This stone setting (3401) measured 0.86 x 0.98 m externally, 0.6 x 0.44 m internally and rose to a height of 0.32 m. As with previously described furnaces, the stones were massively heat-affected and had been set tilting inward at an angle of approximately 60°. They had been fused together by a crust of iron slag; this was thicker (up to 0.18m) on the north-west side.

The slightly concave base of the furnace had been lined with a thin layer of clay over which a deposit of unspent fuel (charcoal) and iron slag (6.46kg) had formed (4182). The interface between this and the deposit above (3467) was not clear due to the density of large pieces of iron slag, which made excavation difficult. However, the upper deposit differed as it contained larger pieces of iron slag and abundant lumps of burnt clay. The density of slag made it difficult to determine where this deposit ended and the one outwith the furnace, filling the old furnace cut, began. It is possible the whole deposit represents a spread of material from the final use of the furnace. Towards the north-west limit of 3476, within cut 4179, small angular stones were concentrated suggesting a crude surface or deliberate levelling of the area adjacent to, and possibly contemporary with, the final phase of the furnace.

A total of 25.7 kg of iron slag, 1.2 kg magnetic residue, 0.031 kg of prill, 6 kg of burnt clay and a large lump of iron (SF 728) was recovered by hand and from the bulk sample of 3467. However, the artefacts recovered from this context were not confined to metalworking debris. A small piece of copper alloy (SF696), three small custard yellow glass beads, a black (or very dark blue) opaque glass or fine stone bead and a small ball of clear glass (possibly waste from bead manufacture) was also recovered.

Anvil setting 3792

Adjacent to the furnace 3790 was a small pit (3792) that also truncated the post-ring of Structure 13. This oval pit measured 0.8 x 0.6m and was 0.25m deep. The top edge of the cut had been lined on the north side by five angular stones. These formed a setting for a larger stone that was discovered after the topsoil strip. After a visual inspection revealed no obvious markings the large stone was removed and interpreted as natural. Further excavation revealed the deliberate setting of this stone next to an iron-smelting furnace and suggests that it may have been an anvil.

Pits 3756 and 3835

Clustered around the phase 2 entrance of Structure 13 were a number of pits and postholes. Two pits in particular were of note as they contained an abundance of metalworking debris that may be from furnaces within Structure 13.

Pit 3756 was sub-oval in plan, measured 2 x 1.4 m and had a depth of 0.2 m. The single fill contained abundant heat-fractured cobbles and charcoal as well as iron slag (0.7 kg), burnt clay and magnetic residue. This had cut an earlier, smaller pit that also contained burnt clay and iron slag as well as small amounts of hammerscale.

Pit 3835 was also sub-oval in plan, measured 0.8 x 0.52 m and had a depth of 0.2 m. This too had heat-fractured stone, charcoal and iron slag in the fill. A flat iron object (SF 717) was also recovered.

Structure 13- Associated features

The area to the east and north-east of Structure 13 contained several small clusters of pits and postholes that despite forming no discernable structures are associated with the adjacent metalworking activity due to the artefactual evidence. Most contained metalworking debris in varying quantities.

Of note was a pit (3744) situated 4 m north-east from the post-ring of Structure 13 that contained abundant iron slag (1.9 kg) and magnetic residue as well as a small quantity of prill. A posthole (2835) contained both ferrous and non-ferrous metalworking debris in the form of iron slag, prill and a small piece of copper alloy slag.

Pit/Furnace 3811 (Fig 5)

This pit was 1 m north-east of the post-ring of Structure 13 and may be contemporary. It was sub-oval in plan, measured 0.9 x 0.8 m and was 0.35 m deep. Sub-angular stones had been placed around the base of the cut, presumably as post-packing. The deposit above these stones was rich in industrial debris. An abundance of heat-fractured cobbles, burnt clay and iron slag as well as small quantities of burnt bone, magnetic residue and prill indicate the re-use of a post-setting as a waste pit.

Two flat stones had been placed at the top, sealing the back-filled posthole. These stones appeared heat-affected and what remained of the deposit over them contained numerous pieces of burnt clay and light bubbly slag. It is possible this represents the remains of a collapsed furnace constructed over the waste-pit or that a nearby furnace had been dismantled and placed in the pit with other metalworking debris. A posthole/small pit on the

southwest side contained similar artefacts, iron slag, burnt clay, prill and magnetic residue, as well as two possible tuyere fragments.

Structure 26 (Fig 5)

This structure was situated in an area of industrial activity near the eastern fringe of the hillwash deposit 3720 and consisted of ten closely spaced postholes forming a U-shape in plan 2 m wide and 1.15 m deep. The eight postholes that formed the two arms of the structure were typically ovoid and measured *c*. 0.4 x 0.3 m with a depth between 0.05 and 0.17 m. These were placed either side of two more substantial postholes measuring 0.52 x 0.41 x 0.44 m and 0.6 x 0.53 x 0.1 m. The former contained packing stones. Most of the fills contained metalworking debris in the form of iron slag and burnt clay. One posthole contained two crucible sherds (SF 629) and an iron nail; another contained a small piece of copper alloy slag. It is possible the postholes did not contain wooden uprights but were settings for edge-set stones. Two structures similar to this (2166 and 2434) were found *c*. 12m to the south-west.

A circular pit/posthole placed 1.5 m north-west of the open end, and equidistant between the two arms, is thought to relate to Structure 26. This had a diameter of 0.68 m, vertical sides and a depth of 0.57 m. Both the upper and lower fills of this feature contained approximately 1 kg of iron slag, with the lower fill accounting for the majority. A small strip of iron was also found in the lower fill.

Furnace 4273 (Fig 5)

Situated *c*. 7.5 m south-west of Structure 10 was the base of a collapsed clay-built iron smelting/smithing furnace. This structure had been placed in a shallow sub-oval cut measuring 0.82 x 0.76 m. The western half had been lined with a clay structure, measuring 0.6 x 0.4 and 0.15 m deep, that had a thickness of 0.14 m to the rear and 0.08 m on the north and south sides. This left a cavity measuring 0.25 x 0.25 m in the interior of the furnace. The clay around these three sides (4309) was a pale grey-green colour with a 0.01 m thick dark grey horseshoe-shaped band on the inside face suggesting that it was relatively undisturbed at this level. A 0.2 m thick mixture of pinkish-orange clay, light pink clay and charcoal flecked dark brown silty sand (4251) formed the east side, it is likely that this was derived from the destruction of this part of the furnace during the removal of the contents of last firing. This deposit also filled the cavity in the centre of the furnace and sealed a deposit (4317) that contained small fragments of unspent fuel.

The deposits present in the furnace interior contained just over 1 kg of iron slag as well as 0.2 kg of magnetic residue and 1.1 kg of burnt clay.

Structure 11 (Fig 5)

Situated *c*. 3m west of Structure 13 was the remains of a building *c*. 4.5 m across. Though fragmented, it appears it was constructed with flat stones that may have been the lower course of a stone wall or the base for a turf-built structure. No entrance could be identified.

The stones remained in two locations. A 2 m long curvilinear section to the north (1949) indicated the building might have been circular. This single course was 0.56 m wide and had three large pieces (up to 4 kg) of iron slag/furnace base incorporated into the structure. The other surviving area of wall base (2456) would have formed the southern and western part of the building. This had a length of *c*. 4.5m and was up to 1.48 m wide, though some stone is

likely to be collapse. Two joining pieces of a trough quern (SF 505 and 506) and two fragments of rotary querns (SF 507 and 508) had been incorporated into this part of the building.

Several deposits that respected the wall bases were identified as possible compacted earth floors relating to Structure 11's function. A 3 by 2.5 m spread of compacted black silt (1952) was present in the southern half. This was up to 0.2 m deep and contained large quantities of burnt clay and iron slag (over 10 kg). A crucible rim sherd and a rotary quern that had been re-used as an ingot mould (SF 339) provided evidence for non-ferrous metalworking. The re-used quern had a dish and bar mould on one side and on the grinding face a 'fish'-shaped mould had been carved around the central feeder pipe. In the northern half a similar deposit (2191) was present though this contained more frequent fire-cracked stones and less iron slag. A possible iron pinhead (SF 451) was recovered.

Another deposit rich in charcoal and industrial debris (2100) sealed these possible surfaces and partially covered Structure 11's wall bases. This amorphous spread measured 6.2 by 2.3 m and varied in depth from 0.1 to 0.2 m. The remains of three industrial processes were present. A total of 18 crucible fragments were indicative of non-ferrous metalworking/glass working; the presence of a small piece of red glassy material (SF 355) is interpreted as either enamelling or glass making waste and large lumps of iron slag, totalling 6.5 kg, and burnt clay represent ferrous metalworking. In addition to the industrial waste, eight iron objects were recovered including two possible punches/tracers (SF 372 and 407), a tooth-ended tool (SF 371) and two fragments of finger rings (SF 379 and 409).

The uppermost, and latest, deposit within Structure 11 (1978) yielded six more fragments of crucible as well as a very corroded piece of iron plate (SF 361).

Industrial features 2166 and 2434 (Fig 5)

West of, and adjacent to, Structure 11 were two industrial features of, as yet, unknown function. Both were of similar construction.

The closest to Structure 11 was 2434; this was formed by a roughly oval arrangement of small flagstones, covering an area of 0.8 x 0.75 m, bounded on the north-west side by five closely spaced edge-set stones laid out in a C-shape spanning 1.1 m. These protruded between 0.1 and 0.15 m from the ground, a gap was present on the south-west edge where a stone appeared to have been removed.

An arc of four small postholes on the south side curved round the flagstones and slightly overlapped the edge-set stone structure on the west side. These were sub-circular, between 0.25 m and 0.45 m in diameter and 0.1 to 0.2 m deep. It is thought they were a component of the structure formed by the flagstones and edge-set stones.

These postholes were remarkably rich in artefactual evidence relative to their size. In total they contained 13 crucible sherds, fragments of a ceramic mould, 26 fragments of glass/enamel working debris (red, blue/yellow, blue and clear), a lump of copper alloy casting waste (SF 535), a possible iron file (SF 534) found at the base of a posthole as well as small pieces of iron slag and magnetic residue. Based on this, it is evident this feature was related to the smelting/working of copper alloy and/or glass and enamel.

Contained within the edge-set stones and spreading eastwards over the flagstones was a charcoal rich spread of black sandy silt measuring 2.5 by 2 m (2677). Industrial waste, similar to that present in the postholes, was recovered from this deposit including nine crucible rim, body and base sherds, two fragments of a ring mould, three red and one pale green/blue fragments of glass working waste. In addition to these were small quantities of iron slag and prill and a large amount of hammerscale. Burnt clay was abundant and included one finger-impressed piece (SF 558).

Situated *c.* 2 m to the west was feature 2166. This also had a sub-oval arrangement of flat flagstones, the largest measured 1 x 0.4 x 0.08 m and was heat-fractured into many pieces, surrounded by the remains of cobbling. Placed 0.6 m to the south-west was eight closely spaced edge-set stones, again C-shaped in plan measuring 1.6 m across. The second stone in from the north was *c.* 45% of bun-shaped upper rotary quern stone with a decorated collar (SF 631); this may have been re-used in this instance as a tuyere. Curiously this quern fragment fits neatly into the gap in the edge-set stones in 2434, though this may be coincidence. Other finds recovered in association with this feature were a strip of iron (SF 414), a crucible rim and body sherd (SF 415) and another fragment of a rotary quern (SF 630).

An oval pit was present next to the flagstones of 2434 and is assumed to be associated. This measured 1.35 x 0.7 m and was 0.25 m deep. The black charcoal rich sandy fill contained frequent fire-cracked stones as well as larger sub-angular stones measuring c0.25 x 0.2 x 0.2 m. Again, artefacts indicative of non-ferrous metalworking/glass working were present in the form of four crucible sherds and a piece of melted blue-green glass. Small quantities of iron slag and magnetic residue were also present.

A spread of silty material (2187) was present between feature 2166 and Structure 11, sealing 2434. This measured 9.5 by 4.3 m and contained abundant industrial debris including 1.6 kg of iron slag, two small pieces of copper alloy casting waste (SF 433 and 445), two crucible rim sherds (SF 447 and 481, the latter had an adhering copper alloy fragment). Nine iron objects were also recovered. These were; a small V-shaped object and a possible punch (SF 434); a U-shaped shaft, possibly part of a chain link, staple or bent nail (SF 435); a small round ball (SF 438); a probable nail (SF 487); a tool blade with toothed tip-blunt teeth (SF 1002); a strip of iron, possibly an offcut (SF 1018); and part of a blade (SF 1019).

Structure 7 (Fig 7)

Structure 7, situated on the north-west edge of excavation, was half a roundhouse. The other half was outwith the limit of excavation. The visible part of Structure 7 consisted of a ring of postholes measuring 10.5 m across. The nine postholes excavated were positioned at intervals varying between 1.7-2.3 m and were between 0.3 to 1.1 m in diameter and 0.25 to 0.62 m in depth. The postholes alternated in size, every second posthole was larger and around 1 m in diameter. The majority of the postholes contained small quantities of iron slag. Posthole 1834 contained a small iron plate (SF 330) and a small, translucent, blue glass bead was found in posthole 1778.

A number of postholes were present in the interior of but formed no clear structure and is not clear if they are contemporary with the roundhouse. An iron dagger or spearhead (SF 363) was recovered from posthole 1898.

Structure 8 (Fig 7)

Situated 2.5 m north-east of Structure 7 was a small post-built roundhouse with an internal ring of 11 posts; a further two post formed a porch. The internal post-ring measured 5.8 m in diameter with the posts placed at 1.4 m intervals; the two posts forming the entrance (1748 and 1774) were 1.8 m apart. The postholes were mostly oval in plan between 1.33 to 0.43 m long, 0.9 to 0.6 m wide and up to 0.43 m deep. Three postholes in the southern half of Structure 8 had been re-cut once. One posthole, 1991, truncated another belonging to Structure 9.

The porch, which formed the entrance to the roundhouse, was positioned facing north-east and formed by two large postholes (1736 and 2345) measuring 1 x 0.85 x 0.3 m and 1 x 0.95 x 0.42 m respectively. The porch was 3 m distant from the internal post-ring.

No evidence for an outer wall was found, though it is assumed it did exist and using the porch as a guide Structure 8 would have been *c*. 13-14m in diameter.

Small quantities of iron slag were recovered from two postholes, 1774 and 2345.

Structure 9 (Fig 7)

Structure 9 was a ring of postholes adjacent to Structure 10 that partially overlapped the eastern side of Structure 8. Fifteen postholes, placed at 2.5 m intervals, were arranged in a circle measuring 12.7 m in diameter. The postholes varied in size from 0.92 x 0.86 m to 0.4 x 0.4 m, depth varied from 0.19 to 0.52 m. A possible entrance, formed by postholes 2113 and 2127, was present on the south side; however, there was no change in the spacing of these posts. Structure 9 is earlier than Structure 8 and pit 1893 based on their stratigraphic relationships though it is not obvious if it was a roofed structure or a simpler timber circle.

The majority of the postholes in Structure 9 contained small amounts of iron slag and several contained other artefacts. A small square sectioned iron rod (SF 425) was recovered from posthole 2151; a small flat iron object with two bulbous ends (SF343), two very small iron nails or pins (SF342) and a possible crucible sherd (SF 344) were recovered from posthole 1860; a small yellow glass bead was recovered from a sample of posthole 1887.
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Pit 1863 (Fig 7)

A large oval pit measuring 2.8 by 2.4 x 0.65 m was situated between Structures 7 and 9. This had fairly steep sloping sides, a broad flat base and contained 4 clearly stratified fills. The basal fill (1884) was compact orange/grey clay, with moderate charcoal inclusions, up to 0.05 m deep. This had been spread over the base of the pit and burnt in situ. Over this was a black silty deposit (1865) 0.15m deep containing a large amount of charcoal, lumps of burnt clay and a lesser amount of burnt bone. Above this was a 0.35m deep, mottled yellow/brown, compact silty clay (1864) with frequent inclusions of burnt clay and charcoal. The upper fill (1862) was a brown topsoil derived deposit 0.2 m deep with charcoal flecks and small pieces of burnt clay. A hammer/rubbing stone (SF323) was recovered from this fill.

Two shallow pits had been cut at both ends of pit 1863 and measured 1.8 x 1.5 x 0.1 m. Pit 1932 contained small amounts of burnt clay. The relationship between the three pits could not

be seen in section. However two pits, 1863 and 1934, truncated a posthole, 1860, belonging to Structure 9.

Structure 16 (Fig 7)

Situated immediately north-east of Structure 8 was post-built roundhouse with an internal ring of ten posts; a further two post formed a porch. The internal post-ring measured 7.25 m in diameter with the posts placed at 1.7 m intervals; the two posts forming the entrance (2303 and 2306) were 3.4 m apart. The majority of the postholes were between 0.7 to 1 m in diameter and 0.3 and 0.7 m deep. The postholes on the south side were smaller and less deep with a diameter of *c*. 0.4m and a maximum depth of 0.15 m. One posthole was outwith the limit of excavation. Packing stones were present in two postholes. Posthole 2253 had a quarter of a rotary quern (SF 471) re-used as a packing stone. This had been placed with the central hole to the top and the worn side up against the cut. A pivot stone (SF464) was found in the base of posthole 2306 with the worn surface face up. A small yellow glass bead was recovered from a sample taken the upper fill (2285) of posthole 2284. Iron slag and prill were recovered from the sample of the lower fill (2286). Small quantities of iron slag were present in a total of six postholes.

The porch, which formed the entrance to the roundhouse, was positioned facing north-east and formed by two large postholes joined by a shallow gully. The porch was 4.2 m distant from the internal post-ring. Posthole 2236 was a 'figure 8' shape in plan, measured 2.06 x 1.15 x 0.73 m and had near vertical sides. The north-east and south-west sides were stepped to accommodate two tiers of large packing stones; these surrounded a clear post-pipe with a width of 0.7 m. A possible sharpening stone (SF 456) was present among the packing stones. It is possible the step on the north-east side was an earlier posthole that had been re-cut.

The southern part of the porch comprised three postholes in a line, the earliest of which was 2234. This measured 0.65 x 0.9 x 0.58 m and was clearly truncated by 2392. This posthole was larger, measuring 1.4 x 1.3 x 0.75 m, and was contemporary with 2236. No obvious stone packing was present. The relationship with posthole 2394 was not clear. A shallow gully (2240) measuring 1.8 x 0.4 x 0.1 m between posthole 2236 and 2392 formed a threshold to the building. This gully was a later addition and truncated the packing material in posthole 2236 but not the post-pipe.

Structure 16- internal features

A furnace (2246) was present in the interior of Structure 16, just inside the internal post-ring. It was similar to the furnace present in Structure 2 but not as large or well preserved. Sub-rounded stones were placed in a rectangular cut measuring 1.3 x 1.08 x 0.23 m. Two stones, one on the west edge (SF457) and the other on the south (SF458), were both halves of a broken rotary quern set on edge with the central hole at the top; the worn side was facing inwards. Both were heat affected and extremely fragile. It is possible they were used as bellow holes for the furnace.

The basal fill (2288) of furnace 2246 was the *in-situ* remains of the last firing and was a black, compact amalgam of gravel, burnt clay, iron slag and charcoal 0.15 m deep. The upper fill was lighter in colour with small fragments of burnt clay, iron slag and charcoal and probably derived from topsoil post-abandonment.

A shallow circular pit was located 1m to the southwest and measured 1.2 m in diameter and was 0.15 m deep. Half a rotary quern (SF 465) had been placed, with the central hole upwards, up against the cut. The worn side faced outwards.

The remaining internal features were small shallow postholes. Three were in the vicinity of furnace 2246 but are not clearly related. The remaining three were in the southern half, a pair of two may be structural.

Structure 17 (Fig 7)

Situated 2 m north-east of Structure 16 was half of a post-built roundhouse; the other half was outwith the limit of excavation. Structure 17 consisted of concentric inner and outer post-rings, a sunken floor, and a porch. The outer post-ring was 10.4 m in diameter and contained seven sub-circular postholes measuring between 1.7 x 1 x 0.7 m and 0.75 x 0.6 x 0.4 m placed at 2.1 m intervals. Three postholes, 2263, 2377 and 2440, contained sub-rounded packing stones. One posthole, 2440, contained a 0.35 m wide post-pipe.

The inner post-ring was 7.6 m in diameter and contained seven circular postholes measuring between 0.77 to 0.46 m in diameter and 0.59 to 0.23 m deep. These were placed at 1.6 m intervals. Three postholes, 2385, 2349 and 2420, contained sub-rounded packing stones. Two postholes had been re-cut once.

The porch was placed 3.8 m to the north-east of the two post-rings, one half was outside the limit of excavation. The exposed half was formed by a series of three inter-cutting postholes, similar to a number of roundhouses on site. An adjacent posthole may have also belonged to the porch. The porch truncated a narrow curvilinear feature, 2468, which appears to be an earlier enclosure.

The sunken floor (2403) was sub-oval, 7.2 m long, had an exposed width of 2.5 m and was up to 0.2 m deep. Approximately half of this feature was present in the excavation area, mostly within the confines of the inner post-ring. However, the sunken floor truncated the two southernmost postholes of the inner post-ring suggesting they may not be contemporary. A spread of stones (up to 0.3 x 0.3 x 0.15 m in size) was present across the base of 2403. Though they formed no obvious structure there was a concentration in the southern half. A broken rotary quern (SF 476) had been placed at the base of the cut, worn side down.

Two pits, 2411 and 2409, were present within sunken floor 2403. Pit 2411 was partially outside the limit of excavation; the visible part measured 1.02 x 0.5 x 0.35m and contained small fragments of burnt clay and iron slag. This was truncated by pit 2409 that was also partially exposed. This shallow, sub-circular pit measured 1.75 by 2.2 x 0.25 m.

A small rectangular structure measuring 3.2 x 1.2 m and formed by postholes 2266, 2271, 2317 and 2328 straddled the outer post-ring. It is not clear if this is a structural component of Structure 17 or belongs to another phase.

Structure 12 (Fig 7)

Situated 6 m north-east of Structure 10 was the remains of a large post-built roundhouse containing an internal post-ring of 13 posts and a northeast facing porch. This structure was cut into a thin band of pale grey hillwash that had accumulated at the base of the terrace.

Headland Archaeology excavated 5 postholes belonging to the internal post-ring as well as the two postholes that formed the porch; Alba Archaeology excavated the remaining part of this building during their watching brief.

The internal post-ring measured 8.7 m in diameter with the posts placed at 2 m intervals; the two posts forming the entrance were 3.5 m apart. The sub-circular postholes measured 0.9 to 1.25 m in diameter and were 0.5 to 0.73 m deep. All had very steep sides and broad flat bases. Re-deposited natural had been used a packing material for the posts, the width of which could be seen in section as a post-pipe, which were *c*. 0.4 m in diameter. The upper fills contained many heat-fractured stones, lumps of iron slag and burnt clay. Metalworking debris was also present in a number of basal fills and packing material.

The porch was placed 4.6 m away from the internal post-ring and was formed by two large postholes 3.2 m apart. These were circular, measured 1.4 and 1.2 m in diameter, were 0.6 m deep and also had vertical sides and broad flat bases. The northernmost posthole had been packed with large sub-rounded stones and re-deposited natural.

The remains of a ground surface or occupation deposit (2225) lay within the entrance and eastern part of the internal post-ring of Structure 12. Approximately half of this surface was truncated by machine during the watching brief. The surviving half was sub-oval spread of compact brown silt that measured 4.9 x 1.8 m and was up to 0.1 m deep, most likely formed by erosion (i.e. trampling) during the buildings use. A small, shallow pit (2226) truncated this deposit. This contained frequent pieces of charcoal and heat-fractured stone and was identified as a potential domestic hearth. Though no artefacts were retrieved by hand from this pit the bulk soil sample contained small quantities of iron slag and magnetic residue. This may be indicative of the function of the pit or could be intrusive from the metalworking areas to the west and north. A fragment of green glass and two small flint flakes were also recovered from the sample.

A total of 48 stakeholes were present around the porch and to the west of surface 2225. A sample number of the stakeholes were excavated to test their authenticity and were typically 0.05 to 0.1 m in diameter and up to 0.1 m deep. Three larger stakeholes/postholes between the internal post-ring and the porch formed a triangle and may be structural. It is possible that the stakeholes are not contemporary with Structure 12, as they were common in this area of site.

A large oval pit (3595) was present within the interior of Structure 12 and was truncated by posthole 2444. The sub-oval pit, not visible in plan, was discovered during the excavation of posthole 2444 and measured 3 x 1.6 x 0.4 m. This was filled with a light grey/brown sandy silt similar to the hillwash but with a greater frequency of sub-angular stones. Occasional flecks of charcoal and flint debitage were present; as well as small quantities of iron slag, though the slag is likely to be intrusive. It is thought this feature pre-dated the deposition of the hillwash and is therefore much earlier in date than Structure 12.

Structure 18 (Fig 7)

Structure 18 was a small roundhouse located 6 m north-east of Structure 12 constructed with an internal post-ring containing nine postholes; a further four postholes formed a northeast facing porch.

The internal post-ring measured 4.3 m in diameter with posts placed at 1.1 m intervals, the entrance to the post-ring measured 2.1 m. The postholes were circular and measured 0.2 to 0.35 m in diameter, depth varied from 0.09 to 0.28 m. One posthole appears to be missing on the south side.

The porch was 2.3 m distant from the internal post ring and formed by four postholes, in pairs of two. These postholes were more substantial than those belonging to the internal post-ring with the two innermost measuring 0.7 x 0.57 x 0.33 and 0.57 x 0.55 x 0.3 m and containing packing stones. The majority of the postholes contained small quantities of iron slag.

An oval pit (3599) measuring 1 x 0.7 x 0.4 m was present inside the porch area. This contained large pieces of charcoal, some possibly structural timbers, as well as small fragments of burnt bone (SF 689), iron slag (SF687) and a hammer/rubbing stone (SF 658).

Four small postholes within the internal post-ring may be structural, though this is not certain.

Structure 19, 20 and 21 (Fig 7)

To the north of Structure 12, along the northern limit of excavation, were the partially exposed remains of at least three structures. The density and level of preservation of these structures led to a slight alteration of the development plan allowing them to preserved *in-situ*. However, limited excavation was undertaken to determine their nature.

Structure 20 was the remnants of a narrow curvilinear ditch that formed, approximately, the southern third of a small enclosure. The ditch was up to 0.4 m wide and 0.2 m deep with an exposed length of *c*. 20 m. A 0.4 m wide gap in the ditch is thought to be due to variable preservation rather than an entrance.

Structure 21 was a small circular post-built building that spatially overlies Structure 20 and was, tentatively, later. This structure was formed by a roughly circular arrangement of postholes with non-uniform spacing measuring 6.5 m in diameter. No features belonging to this structure were investigated.

Structure 19 was a large roundhouse with an internal post-ring measuring 10 m in diameter. A total of 9 postholes were visible in the area of excavation placed at 2.5 m intervals. The postholes were an amorphous shape in plan, suggesting several recuts, and measured up to 2.5 x 1.5 m. A possible cobbled area on the eastern side obscured one or two postholes. This area also contained a line of flat paving stones along its southern edge. Though unexcavated, this area may form the entrance to Structure 19.

Two postholes from the internal post-ring were excavated. Posthole 2713 was sub-oval and measured 1.2 x 1.1 m and was 0.94 m deep. The section revealed a 0.7 m wide deposit of redeposited natural packing material abutting a clear 0.4 m post-pipe that tapered slightly towards the base. This posthole truncated the ring groove of Structure 20. The other excavated posthole was in fact six inter-cutting features. The largest posthole, 2535, measured 1.04 x 1 m and was 0.72 m deep. Packing stones had been placed along its southern edge; these and the post-pipe suggested a post width of *c*. 0.4 m. A small pit, 2457, truncated this posthole. An iron object (SF504), possibly a strap fitting, and small quantities of iron slag and

prill were recovered from the fill. Adjacent to 2535 was another posthole of a similar size that may represent replacement of a structural timber.

An iron-smelting furnace was located in the north-east quadrant of Structure 19. Though unexcavated, it was similar to the furnace found in Structure 16 and may account for the presence of metalworking debris in most of the excavated features in this area.

Posthole 2416 (Fig 7)

This circular posthole was situated immediately to the west of Structure 19's internal post-ring, up against the edge of excavation. It had a diameter of 0.65 m and a depth of 0.35 m. Packing stones, some of which were heat-fractured, surrounded a 0.35 m post-pipe. Incorporated into the packing material, up against the post-pipe, was an iron sword blade (SF 479) that had been placed vertically, point down with the post when it had been originally set. The sword was 0.28 m in length and had a maximum width of 0.037 m. The lentoid-sectioned blade had a stump of a tang measuring 0.02 m and, while it had been deposited whole, had fractured into three fragments during antiquity. A small opaque green glass bead (SF 486), found when cleaning the section around the posthole, is also thought to have come from this feature.

Structure 2 (Fig 8)

In the north-west fringe of Area B was a large post-built roundhouse with an internal ring of 13 posts; a further four post formed a porch. An iron-smelting furnace was present just inside the entrance of the internal post-ring.

The internal post-ring measured 8.5 m in diameter with the posts placed at 2 m intervals; the two posts forming the entrance (605 and 704) were 2.8 m apart. The majority of the postholes had a small shelf on one side that gave them an oval shape in plan. Length varied from 1.5 m to 1.06m, width from 0.64 m to 1.23 m and depth from 0.35 m to 0.74 m. All postholes contained packing material in the form of large sub-angular stones; the gaps had been filled with smaller, more fractured stone. In almost all cases the packing had been positioned on the outside edge of the posthole.

The porch, which formed the entrance to the roundhouse, was positioned facing north-east and was formed by two large postholes (143 and 400) measuring 1.3 x 1.1 x 0.4 m and 1.27 x 1.23 x 0.4 m respectively. The porch was 3.5 m distant from the internal post-ring. Two posts (145 and 398), measuring *c*. 0.3 x 0.3 x 0.15 m, were positioned just inside the larger postholes and may be the footings for a door. Posthole 145 had neatly arranged packing stones around the lip of the cut.

Several artefacts were recovered from the posthole fills. A pink glass bead (SF 156) was recovered from the upper fill (595) of posthole 596; this was found along the northeast edge where this fill abutted the packing stones and may have been deliberately deposited when the post was placed. An iron object (SF 1006) was recovered from the basal fill (633) of posthole 637.

The remaining finds all related to metalworking activity and included charcoal, heat-fractured stones, burnt clay and slag. These were mostly found in the upper fills of the

postholes. In two postholes (613 and 634) the basal fills contained burnt clay and slag, the replacement of a post may account for this.

Structure 2 – Furnace 681

The remains of a well-preserved iron-smelting furnace were situated just inside the post-ring of Structure 2. It was constructed of four large edge-set stones in a 'horseshoe' shaped arrangement (681) placed in a sub-rounded cut (686) measuring 1.12 x 1.1 x 0.15 m. Two stones were used to form the back of the structure with two more forming the other sides. The thickness of the stones varied between 0.14 and 0.17 m, all were angled inwards at approximately 40 ° and rose to a height of 0.4 m from the base of cut 686. These heat-fractured stones were fused together at the top internal edge by a crust of slag up to 0.1 m thick. Smaller angular stones had temporarily blocked the open fourth side.

The furnace contained three fills that related to the last firing. The basal fill (677) was moderately compact black silty sand that covered the base to a depth of 0.12 m. Small pieces of dripped slag and lumps of charcoal were abundant; the charcoal increased in size towards the base. Above this, sandy clay (675) had been placed up against the inside of the stone structure as lining, this did not cover the whole internal area and was present up to 0.07 m from the stones and had a maximum depth of 0.26 m. This deposit contained few stone inclusions and had very fine flecks of charcoal and charcoal dust. A fragment of burnt clay and slag formed round a cylindrical object, thought to be a tuyere (SF 166), was recovered.

The remaining internal space was taken up by two large pieces of slag (SF 131 and 132) that were slightly pressed into the clay lining and sat directly on the basal deposit (677) towards the back of the furnace. This slag was an amalgam of smaller droplets and had a large amount of mineralised charcoal attached to it. Sealing this was another black deposit (676) that contained less charcoal and more slag than the basal deposit. Frequent fragments of burnt clay were recovered and are likely to have originated from the superstructure of the furnace.

The external space between the stone structure 681 and the edge of cut 686, which was up to 0.14 m wide and 0.1 m deep, was filled with a moderately compact dark brown sandy silt containing charcoal, slag and burnt clay. Another fragment of tuyere (SF 133) was recovered; it is possible this relates to the one found in the interior of the furnace.

A sub oval, shallow cut (679) was present at the open end of the furnace and measured 0.7 x 0.5 x 0.18 m. The fill (678) was relatively stony and contained frequent charcoal flecks and pieces of slag. Its position in relation to the furnace would suggest this feature had something to do with the removal of waste or control of air.

Surrounding the furnace was an amorphous spread (674) that was thought to be the remains of a ground surface. This was a light brownish-grey sandy silty measuring 2.7 x 1.84 x 0.06 m that contained frequent small stones and occasional lumps of charcoal. Three small postholes (690 and 692 to the north and 688 to the west) were situated close to the furnace and may have related to the superstructure.

Structure 4 (Fig8)

Situated 8 m north of Structure 2 was a large roundhouse measuring 18 m in diameter. It was constructed of a narrow ring-groove surrounding a broad, penanular ring ditch and internal

post-ring. The ground sloped slightly downwards from south to north resulting in better preservation in the southern half. Provisionally, two phases of construction were identified. The final phase had been destroyed by fire.

Structure 4- Phase 1 (Fig 9)

The first phase of Structure 4 consisted of an internal post-ring and a ring groove that terminated with two posts forming a porch. The internal post-ring of 13 postholes measured 8.8 m in diameter with the posts placed at 2 m intervals; the two posts forming the entrance (1709 and 1814) were 3.6 m apart. Length varied from 1.4 m to 0.9 m, width from 0.56 m to 1.2 m and depth from 0.36 m to 0.75 m. Two postholes (765 and 2244) contained packing material in the form of large sub-angular stones; the gaps had been filled with smaller, more fractured stone.

The porch, which formed the entrance to the roundhouse, was positioned facing north east and was formed by two large postholes (1635 and 1661) measuring 1.25 x 1.25 x 0.42 m and 1.7 x 1.45 x 0.7 m respectively. An iron object, SF 245 (possibly the tip of a blade), was recovered from the packing material (1636) of posthole 1635. The porch was 4.7 m distant from the internal post-ring. These postholes formed the terminals of a circular ring-groove that measured 17.9 m in diameter, was up to 0.9 m wide and 0.4 m deep. The ring-groove had been recut, in most areas, on the inside edge. Near the southern terminal the recut was present on the outside edge. This suggests the outer wall had been repaired or replaced in stages rather than in a single event.

Structure 4- Phase 2 (Fig 9)

The later, second phase of Structure 4 retained most of the structural elements of the first phase, including the internal post-ring, the porch and part of the ring-groove, with the addition of a penanular ring-ditch that enclosed the internal post-ring and truncated the ring-groove on the western side. The remains of several stone structures were present within the ring-ditch.

The ring-ditch of Structure 4 was curvilinear in plan with rounded terminals, 6.4 m apart, on the northeast side. The sides sloped at angle of up to 30 ° breaking to a broad, slightly concave base. It had an external diameter of 16.5m, an internal diameter of 9.8 m and varied in width between 2.25 m at the southern terminal to 5.3 m on the western side. A greater degree of truncation had occurred in the northern half of the ring-ditch where depth was between 0.3-0.25 m. The ring ditch had a shallow depth, 0.26m, at the southern terminal that increased gradually to a maximum depth of 0.65 m; this occurred in the southwest area. A narrow curvilinear gully was present along the inside edge of the ring-ditch beginning 3.4 m from the northern terminal. This ran for *c*. 8.6m, had a width of 0.5 m and a depth of 0.1 m. Three small postholes were present near the gully. A shallow oval pit (993) measuring 1.26 x 0.84 x 0.11 m was present inside the ring-ditch near the southern terminal. The basal fill (1825) was predominately small charcoal pieces that may be the remains of a burnt wicker vessel.

Three stone-built structures were present within the ring-ditch. A slightly curved arrangement of sub-angular stone (1703) measuring 1.62 x 1.58 x 0.35 m had been placed on natural subsoil *c*. 9.7 m from the southern terminal forming a step or threshold into the deepest part of the ring-ditch. Adjacent to this a small foundation trench contained a short length of wall measuring 0.9 x 0.25 m. A large amount of tumbled stone (1677) was present

lying on the outside edge and base of the ring-ditch just beyond the step and small wall. This stone curved round the western half of the ring-ditch and was placed roughly equidistant from both terminals. The stone on the outside edge was a more coherent structure and was set into a slight revetment, only present in the southwest part, in the slope of the ring-ditch. It is thought this was an external stone and turf wall that partially or completely replaced the ring-groove of the first phase of Structure 4.

A large amount of sizeable charcoal fragments were present in the basal fills of the ring-ditch. The majority of the carbonised timbers were found in the deepest part where conditions for their preservation were most favourable. In most cases these timbers lay over a thin layer of soft sandy silt that had a slightly pink hue (767), most likely caused by ash deposition. This deposit could also have related to the occupation of Structure 4. A few of the timbers lay over or within the stone tumble (1677) and it is probable these were part of the wooden superstructure that collapsed into the ditch during destruction. Two groups of timbers were identified as possible *in situ* structures. One timber, 977, was a large fragment (0.37 x 0.13 x 0.03 m) with a roughly circular cross-section oriented perpendicular to the ring-ditch. This timber had two fragmented planks protruding at right angles from either side. One lay on top, the other under the larger timber. Another long timber, 985, lay on the same orientation as 977 and had a similar width. It was broken into four pieces measuring 0.66 m in total. These could be the remains of joists for a decked area within the ring ditch.

A patchy ash-rich layer of bright orange sandy silt (1624) up to 0.18 m thick sealed the carbonised timbers and is thought to be the burnt remains of a collapsed turf wall. This was visible, to a lesser degree, in shallower areas of the ring-ditch where contemporary deposits (1715) were very dark and charcoal rich with lighter brown and orange patches and are also thought to represent a collapsed turf wall. A long iron tool, with a rectangular section that curved up at one end to a possible straight tang (SF 512), was recovered at the base of 1715. It is due to the presence of this deposit the carbonised timbers remain; a collapsing turf structure would have smothered the burning wood preventing the charcoal turning to ash. Above this ash-rich deposit was a thick layer (up to 0.33 m) of dark brown slightly sandy silt (766) with frequent large pieces of charcoal. The uppermost fill of the ring-ditch was a deposit with abundant heat-fractured stone and charcoal. This layer (775) was confined to an area starting at the southern ring-ditch terminal and had a length of c9 m. Several artefacts were recovered from this deposit; burnt animal bone and teeth (SF 186 and 187), iron slag (SF 172 and 240), four copper alloy objects (SF 173, 231, 232, and 241) that were mainly plate or sheet. SF 173 was a thin folded copper alloy sheet; two fragments of this had rivets in place. A small lump of unworked coal (SF 227), possibly cannel coal, and burnt clay fragments (SF 242) were the remaining hand retrieved finds.

Structure 4- Internal features (Fig 9)

A number of postholes were present within the internal post-ring and the porch area of Structure 4, most of which form small structures. It is not clear to which phase these belonged.

A rectangular structure consisting of six postholes, located slightly off-centre to the south, was present in the interior of Structure 4. This measured 2.4 by 4.1 m and was oriented northeast to southwest. Within this was a smaller rectangular structure built with four postholes in pairs of two, this measured 1.9 x 0.6 m and was oriented north to south. This was similar in form to Structures 24 and 25.

Two pairs of small postholes, one located inside the porch and the other just inside the internal post-ring, with the post were identified as possible footings for a ladder. Five other postholes were located in the porch area. One (1816) was placed centrally in the entrance to the internal post-ring.

A pit (2172) was present in the northern half of Structure 4's interior next to the internal post-ring. This was oval in plan, measured 0.98 x 0.66 x 0.09 m and had stone lining (2171) placed around the lip of the pit. This lining abutted an erratic (SF 420) measuring 0.66 x 0.66 x 0.34 m with incised markings, especially on one side and corner. Most appear to be plough markings but an by and some dashes seem to be deliberate. Eight sherds of prehistoric pottery (SF 191 and 421) were found in the upper fill of pit 2172 near to the incised boulder. The pottery was joining rim and body sherds forming the upper profile of a vessel with a broad everted rim and suspension holes.

Pit 1615 (Fig 8)

A large oval pit measuring 3.45 x 1.95 x 0.5 m and oriented north to south was situated 3 m west of Structure 4. The upper fill (1616) was up to 0.3 m deep and contained small amounts of iron slag, a small, rectangular sectioned whetstone with a pendant hole drilled at one end (SF 247), and an iron nail (SF 262). The fill below (1617) was 0.07 m thick and rich in charcoal. The basal deposit fills a small hollow at the base of the pit, was 0.12 m thick and contained small fragments of iron slag. The function of this pit is not known.

Structure 5 (Fig 8)

Immediately south of Structure 4, the remnants of a circular fence enclosed a centrally placed post-built building. The enclosure fence was formed of a series of small postholes, each on average 0.3 m in diameter and 0.1 m deep, and spaced 0.15 m apart. There was a 1.7 m wide entrance on the northeast side formed by two larger postholes. Another possible entrance was present 3.3 m NW and measured 1.7 m wide. The northernmost posthole, 1698, was truncated by the outer ring-groove of Structure 4. The northeast quarter of the enclosure fence was all that survived.

The post-built building had a diameter of 5.3 m and contained 11 postholes, between 0.3 to 0.6 m in diameter and up to 0.43 m deep, spaced 1.6 m apart. Three postholes had been re-cut once and two contained packing stones. No entrance was visible.

Structure 3 (Fig 8)

Structure 3 was situated within the confines of Structure 5 and was composed of a partial ring-groove and a series of internal postholes. The ring-groove was semi-circular measured 12.68 in length and was up to 1 m wide and 0.25 m deep. It was oriented northeast to southwest. The ring-groove narrowed towards the northeast end before widening 4.6 m from the northeast terminal. A slightly curvilinear extension, measuring 1.4 x 0.6 m, protruded perpendicular to the ring-groove at what is assumed to be the entrance to Structure 3 forming a small porch. A post-setting was present at the end of this extension.

Packing stones were placed along the outside of the ring-groove cut and would have held upright timbers. The stones were sub-rounded, up to 0.15 m long and common throughout

the fills of the ring-groove. More substantial stones were present at the entrance. This part was more shallow and wider than the rest of the ring-groove and may be a foundation cut for a low wall. It is not clear if the ring-groove would have been a more complete circle. The ground slopes downward slightly after the terminals and the 'missing' half may not have been cut through natural subsoil. Structure 3 was slightly revetted into this slope.

The internal features of Structure 3 consisted of postholes and two pits. The postholes were not in a post-ring and formed no obvious coherent structure. Several postholes were arranged in linear groups of three. Stone packing was used in some postholes. Three internal postholes (962, 950 and 1646) had rubbing stones (SF 235, 234 and 428) incorporated in the packing material. One posthole situated just outside the ring-groove entrance also contained a rubbing stone (SF233). In all cases the rubbing stones had been placed with their worn side facing into the posthole.

The pits, 918 and 1654, were sub-oval and located in the central area of Structure 3. They measured 1.25 x 1 x 0.25 m and 1.3 x 1.35 x 0.3 m respectively. Both contained small quantities of charcoal and burnt bone. A chert flake (SF 243) and a whetstone (SF 244) were recovered from the fill of pit 918.

Overlying the upper fill of the ring-grove was a stony spread (793) and the remains of what is either a rough cobbled surface or collapsed wall (796). The stony spread consisted of abundant small sub-rounded stone in a sandy silt matrix and had a similar shape in plan to the ring-groove beneath. It was confined to the narrower part of the ring-groove and was absent from the entrance area and is thought to represent the remains of a collapsed bank. Two fragments of a large rubbing stone (SF 204 and 205) and one complete one (SF206) were recovered.

The stones over the entrance formed an uneven surface made up of large sub-angular stones and measured 3 x 1.6 m. Two circular arrangements of stones may be settings for posts. A well-worn trough quern (SF147) had been placed worn side up and oriented N-S over the stones. A hammerstone (SF207), a fragment of a saddle quern (SF 222) and part of a possible stone vessel (SF 209) were also recovered. A deposit of small angular stones in a dark brown silty sand matrix (695), similar to 793, abutted 796. Two postholes (639 and 637) belonging to Structure 2 truncated deposit 695.

Structure 6 (Fig 8)

To the west of Structure 4 was a group of postholes that contained the southern half of a circular post-built roundhouse, Structure 6, and a small rectangular structure. The roundhouse was 8.4 m in diameter and contained 8 postholes between 0.8 to 0.44 m in diameter and 0.16 to 0.61 m deep with postholes were placed at 1.8 m intervals. The northern half of the roundhouse was beyond the limit of excavation. Artefacts were recovered from two postholes. A large piece of burnt clay adhered to slag (SF 208) was found in the upper fill of posthole 889 and a small, lozenge-shaped iron spearhead (SF1026) was found in the upper fill of posthole 1607. A deposit rich in metalworking debris (1632) was present just off centre to the west and was truncated by another posthole

Structure 31 (Fig 3)

Structure 31 was in a long hollow along the edge of Area B, approximately 35 m northeast of the enclosure. The ground was much wetter here and a number of field drains were present. Structure 31 was a large, roughly cobbled surface (227) measuring *c*. 50 m by *c*. 12 m with a spread of pale grey ash (226) along its western edge; very dark (almost black) sandy silt (225) sealed both these contexts.

Two slots were excavated across this surface to determine its nature and function. The first slot was 7 m across and positioned where Structure 31 was best preserved. The cobbles were up to two layers of sub-angular stones, with smaller stones and fragments packed into gaps to create a more even surface. Towards the western limit of excavation, large flat stones (*c*. 0.7 x 0.4 x 0.2 m) were laid in two roughly linear, parallel arrangements, possibly the remains of drystone walls. A large number of finds were recovered from context 225, many lying directly on the cobbles. Iron slag was abundant, some appeared to have been dropped then incorporated into the cobbled surface, as was burnt clay. A few iron objects and furnace bases were also recovered along with several flint flakes. A section excavated through the surface showed it to be up to 0.25 m deep and that it was lying directly over the natural subsoil.

The second slot was 16 m south of the first and measured 2 m. The overlying deposit (225) was less deep and almost devoid of any metalworking debris. However, small quantities of charcoal were spread over the cobbles.

Structure 31- Associated features

A number of pits present immediately to the west of Structure 31 appeared to be associated with the industrial activity in this area. A total of eight pits, between 0.6 and 1.5 m across and up to 0.2 m deep, contained large quantities of heat-shattered stone and charcoal. A further six, up to 2 m across, had an abundance of large charcoal pieces and ash; some had a spread of ash surrounding them similar to deposit 226. Small quantities of iron slag were recovered from several of these pits.

Furnace/pits 185 and 200 (Fig 3)

Two features 27 m north of the enclosure contained an abundance of metalworking debris. Both were rough 'keyhole' shaped, shallow pits of similar dimensions on the same north to south alignment. It is thought they are contemporary and possibly relate to the cobbled work area (ST 27), which lay 40 m east.

Pit 185 was 2 x 1.3 x 0.15 m and had been truncated by ploughing. It contained large quantities of iron slag and burnt clay. A large, dense piece of slag (SF 15) situated at the base of 185 suggests it could have been the remains of an iron-smelting furnace.

Situated 4 m south of 185 and measuring 2.7 x 0.9 x 0.15 m pit 200 also contained an abundance of iron slag and burnt clay.

Structure 1 (Fig 4)

Structure 1 was a rectangular four-post structure towards the southern fringe of Area A. It measured 1.4 x 1.7 m and was oriented northeast to southwest. The two postholes on the southwest side were slightly larger measuring 0.8 and 0.98 m in diameter; the others were 0.64 and 0.57 m in diameter. All contained sub-rounded packing stones with smaller stone

fragments filling the gaps. A hammerstone (SF 9) was incorporated into the packing stone of posthole 85. Two fragments of prehistoric pottery, from different vessels, were recovered from the fill.

In addition, Area A contained a total of 24 features the majority of which were isolated shallow pits. Two pits, 97 and 140, contained fragments of prehistoric pottery.

Structure 23 (Fig 3)

Structure 23 was on the western edge of Area B and 3 m south of a large post-built roundhouse (Structure 2). It was formed of four postholes arranged in a square (similar to Structures 1 and 23) with sides measuring 2.7 m. Each posthole had been re-cut once indicating post-replacement or a second phase.

Structure 28 (Fig 7)

This was situated 3 m north of Structure 12 and was formed by four postholes arranged in a rectangle measuring 2.6 x 1.5 m. These were circular in plan and measured between 0.2 and 0.3 m in diameter, depth varied from 0.04 to 0.13 m.

Structure 27 (Fig 7)

This was situated 7 m north of Structure 13 and was formed by four postholes arranged in a square with sides measuring 2.45 m. The postholes were sub-circular in plan and measured between 0.3 and 0.4 m in diameter, depth varied from 0.15 to 0.26 m. One had a post-pipe visible as a dark, charcoal rich patch. Iron slag was present in all the posthole fills.

Pit 153 (Fig 3)

Pit 153 differed from the majority of isolated pits in area B in that it had multiple fills, rich in charcoal, and a number of small finds. The upper fill (156) contained frequent charcoal and ten prehistoric pottery sherds (SF 2 and 8). The middle fill (155) contained four pottery sherds (SF 4, 5 and 7) and one iron object (SF 6). The lower fill (154) was artefact free but contained a number of heat-fractured stones.

5. ASSESSMENT OF THE ARTEFACT ASSEMBLAGE

Fraser Hunter & Dawn McLaren (National Museum of Scotland)- with contributions from various specialists

5.1 Overview

The Culduthel excavations have produced an assemblage of primary significance for the study of the Scottish Iron Age. It is rare to find such a productive site in the cropmark zone of Scotland; the range of material has the potential both to paint a detailed picture of activities at the site and to impact on much wider research topics. We have drawn together a team of specialists who will maximise the considerable potential of this assemblage.

Area	Material	Specialist
Metal	Iron	Dr Fraser Hunter (NMS)
	Iron metallography	Dr David Dungworth (English Heritage)
	Non-ferrous metals	Dr Fraser Hunter (NMS)
	Coins	Nick Holmes (NMS)
	Copper alloy analysis	Dr Jim Tate (NMS)
	Lead isotope analysis	Dr Rob Ellam (SUERC)
Ceramics	Domestic pottery	Dr Ann McSween (independent)
	Crucibles & moulds	Dr Andrew Heald (NMS)
	XRF analysis of crucibles	Dr Jim Tate (NMS)
	Petrology of ceramics	Daniel Sahlén (Univ Glasgow)
	Daub & other fired clay	Dawn McLaren (NMS)
Glass	Glass artefacts & waste	Dr Fraser Hunter (NMS)
	Glass analysis	Prof Ian Freestone (Univ Cardiff)
		& Mary Davis (National Museum Wales)
	Vessel glass	Dr Dominic Ingemark (Univ Lund)
Stone	Coarse stone	Dawn McLaren (NMS)
	Geological identifications	Fiona McGibbon (Univ Edinburgh)
	Struck lithics	Dr Torben Bjarke Ballin (independent)
Slag	Macroscopic identification	Dr Andrew Heald & Dawn McLaren (NMS)
	Scientific analysis	Dr David Dungworth (English Heritage)

Table 1: specialists involved in work on the Culduthel assemblage

5.2 Iron
Fraser Hunter

The iron is a substantial and important assemblage, totalling 171 objects. This makes it one of the three largest assemblages from Iron Age Scotland, second only to Traprain Law and Fairy Knowe. As such, given the rarity of Iron Age iron, it is of prime importance. An initial functional assessment of the assemblage is given in table 2 below.

Category	Number	Notes
Weapons	4	Short sword, sword hilt, dagger, spearhead
Tools	19 + 9?	Includes two sickles; one or two files; a knife; a wedge or blacksmith's set; several fine tools, either punches, tracers or awls; and an unusual toothed tool, perhaps for decorating leather
Fixings & fastenings	27	
Nails, bolts & tacks	17	
Offcuts & part-worked items	11	
Ornaments	3 +5?	Projecting ring-headed pin & other possible fragments; strap fittings
More work required	56	
Unidentifiable fragments	18	
Modern	2	
TOTAL	**171**	

Table 2: composition of the Culduthel iron assemblage from the initial assessment. Two objects were listed but not found: c.2759 / sf 1451 and c.2435 / sf 491.

Before commenting on individual categories, a number of general points merit attention. The high percentage of unidentified fragments is typical at this stage of analysis; further conservation is required to allow this more fragmentary material to be identified. Conservation is also required to clarify details of many of the items. This will undoubtedly have sizeable resource implications but is imperative both to allow full study of this important assemblage and to ensure its long-term survival.

The small percentage of nails is increasingly recognised as typical for the Iron Age; the nail was not a major element in woodworking technologies. Of prime importance is the wide range of tools. Initial inspection reveals types otherwise unknown in Scotland, such as files and an unusual tanged toothed implement, perhaps for decorating leather. Crafts represented by the tools are woodworking, metalworking, agriculture and probably leather-working. Once conserved, the tools should reveal considerable information on the craft processes at the site. The evidence for iron-smelting and smithing is confirmed by a number of offcuts and part-worked objects. Metallographic study of these will be of considerable importance in enhancing our understanding of iron technology in the Iron Age; a programme of analysis of the offcuts and other material is detailed below.

Another area of note is the presence of four weapons – two swords, a dagger and a spearhead (there is also a copper alloy sword hilt guard, discussed below). Weapons are very rare on Iron Age sites, particularly in northern Scotland, and the variety of forms represented here will markedly advance our understanding of weaponry at this period.

The fixings and fastenings are a diverse category covering everything from mounts to clamps; detailed study should clarify the functions and range of uses represented.

There is a small but significant range of ornaments, complementing the ornaments of copper alloy, glass and shale. Most notable is a projecting ring-headed pin, of which a copper alloy example was also found.

Conclusions

The Culduthel assemblage is sizeable and highly significant. On the one hand it will provide a nationally important ironwork assemblage to enhance our understanding of this key material in the Iron Age. On the other, the objects stand at the end of a production sequence that is represented at Culduthel in every stage. Scientific analysis of the material has the potential to provide an unmatched insight into the technology of iron procurement and production.

Method statement

- A substantial programme of conservation to reveal details and stabilise the material
- Production of a full catalogue of the material with parallels where appropriate
- Metallographic study of selected items

5.3 Non-Ferrous Metals
Fraser Hunter

The bulk of the non-ferrous assemblage is copper alloy; there is a small but significant lead assemblage and a single fragment provisionally identified as silver. Initial assessment shows that the assemblage contains a number of items of considerable individual significance, and detailed analysis and scientific study may be expected to expand greatly the information available. Table 3 summarises the assemblage.

Material	Category	Number	Notes
Copper alloy (35)	Ornaments	5	Romano-British brooch; harness mount; dumb-bell toggle; projecting ring-headed pin; pin shank
	Weapon	1	Campanulate sword hilt guard
	Roman coins	2	Both late first-early second century AD bronzes
	Fittings	7	
	Casting waste	9	
	Flawed casting	1	
	Ingots & raw materials	2	Fine bar ingot & folded strip
	More work required	3	
	Unidentifiable	2	
	Modern	3	
Silver (1)	Bar	1	
Lead (9)	Coiled strip	6	
	Bar ingot	1	
	Unidentified	2	
TOTAL		**45**	

Table 3: assessment of the assemblage of non-ferrous metals from Culduthel

A number of points mark this out as an important assemblage. There are individual items of note, especially the ornaments and the sword hilt. The hilt is the first of its type from northern Scotland, and is a valuable indicator that the area was drawing on wider styles of Iron Age equipment. This is true also of many of the ornaments: while the pin types are common across Scotland, the harness mount is of a type generally attributed to central Britain. Does its presence here indicate exchange, or is there evidence of the production of such items locally?

A full study will scrutinise the item to ascertain whether it has been finished – the absence of any surviving enamel is surprising.

The evidence of Roman contact finds local parallels, with several recent excavations along the Moray littoral producing Roman items, notably Seafield West (Inverness) and Birnie (Moray). Brooches are one of the typical Roman imports, especially more ornate varieties as with this one. More unusual are Roman bronze coins: coins are generally rare on Iron Age sites, and when present tend to be silver. Full study will compare this to other site finds from Scotland.

The other striking feature is the evidence for on-site production: to the evidence of the moulds and crucibles (discussed below) can be added the lumps of casting waste and, most importantly, a failed casting of a ring-shaped object. This conjunction of moulds and debris is a rare one, and scientific analysis of the alloys will greatly improve our understanding of the range of alloys in use at the time. Qualititative (non-destructive) characterisation of all the copper alloys is recommended, along with fully quantitative analysis of a selection of the casting waste and selected other items. This area of Scotland has never seen a detailed study of alloying traditions, and the results will be a valuable first step to defining patterns of alloy use in comparison to southern Scotland, where the reuse of Roman alloys played a major role (Dungworth 1996).

Of the other items, the probable silver fragment is extremely rare on an Iron Age site; the integrity of its context needs examination, but if secure it is of considerable interest. Lead is also unusual, coming to prominence only in the Roman Iron Age, probably due to contacts with the Roman world, and the Culduthel material appears to support this: most comes from the same context as the Roman brooch. The bulk of the assemblage is pieces of raw material prepared for use, either as coiled strips or as a bar ingot; their actual use is opaque, and the two possible artefacts from the site require conservation before any full identification is possible. The geological source of the lead is of importance, in defining whether it is indeed imported Roman material, and a programme of lead isotope analysis is suggested to define this.

Method statement

- Full catalogue and discussion, with wider parallels where appropriate
- Qualitative XRF analysis of all copper alloys to allow assessment of the range of alloys used and how they changed through time
- Quantitative XRF analysis of casting debris to supplement the information from analysis of moulds
- Lead isotope analysis of the lead to clarify its likely source

5.4 Glass
Fraser Hunter

Three categories of material are represented in the Culduthel glass assemblage: vessel glass, artefacts and glass-working debris (table 4). Of these, the last is of prime importance as this is the first secure evidence of Iron Age glass-working from any Scottish site. The evidence comprises offcuts from glass rods and a range of molten waste. The colours represented are opaque red and yellow, opaque sky blue, clear and translucent blue-green, the latter two perhaps stemming from remelting glass. The products are not certain; red is rarely used in Iron Age beads but is more common in enamels, and it may be the latter process that is represented here. Detailed visual and scientific analysis is required to clarify the nature of the materials, their technical properties (and thus likely uses) and their composition compared to other Iron Age glass. This represents an assemblage of key importance to the study of Iron Age glass. Within this material is a fragment that appears to be a mineral pigment, perhaps a colorant, and characterisation of this too (by XRF, XRD and SEM) is key.

The artefact assemblage is less remarkable, but contains its own surprises. There is a single dumb-bell toggle, a well-known type (represented in the assemblage also by a copper alloy example), and a selection of beads. Most are the typical Iron Age ones for the region: 14 yellow annular ones and three Guido type 13 with spiral decoration, all probably made locally (one of the Guido 13s is notably ornate, with a cable trail round the faces); two translucent blue and two small 'black' ones (the latter probably very deep blue, as black glass was not available in the Iron Age). More unusual are a two-tone green annular bead and a bright pink globular one. Parallels can be found for the former but not easily for the latter, and it is noticeably fresh; despite its apparently secure context, it may be intrusive and a key task is to establish its antiquity through detailed study and analytical work. A number of the yellow beads were made by coating a different-coloured core with yellow glass; this has not received any detailed study in the literature, and this assemblage provides an ideal opportunity for it. A likely interpretation is that yellow glass was more technically complex and thus used more sparingly.

The bulk of the vessel glass is clearly or most probably modern, with only two possible exceptions which are the typical blue-green of Roman glass. However this colour is not uniquely Roman, and with such small fragments it will be near impossible to confirm a Roman origin. Specialist advice on these fragments is recommended.

Category	Object	Number	Notes
Glass-working	Rods & canes	5	Red; red with yellow trail
	Molten waste	15	Red; pink-red; opaque yellow; clear; translucent blue-green with yellow trail; opaque bright blue
Artefacts: beads	Yellow annular	14	

Category	Object	Number	Notes
	Translucent blue	2	
	'Black'	2	
	Guido 13	3	
	Other	3	Pink; two-tone green; pale blue with yellow trail (?not a bead)
Artefacts: other	Dumb-bell toggle	1	
Vessel glass	Modern	11	
	Probably modern	10	
	Potentially Roman	2	
Other		2	Opaque white chunk, probably modern; piece of blue plastic
TOTAL		**47 + 23 ?modern**	

Table 4: assessment of the glass assemblage from Culduthel. Note that for working debris, the quantity is the number of bags, not fragments; some bags contain several fragments.

Method statement

- The glass-working debris in particular is of national importance, and requires thorough scientific study.
- For the artefacts, a detailed catalogue with parallels and some scientific analysis is required.
- There will be a need for colour photographs in the publication to convey the nature of the material.

5.5 Non-Ferrous Metalworking
Andrew Heald

The non-ferrous metalworking assemblage comprises 77 crucible fragments, 27 mould fragments (almost all undiagnostic) and 15 objects that appear to be related to non-ferrous metalworking activity (droplets, slag etc). In the absence of radiocarbon dates the material is assumed to date to the later / Roman Iron Age. It would be one of the largest non-ferrous metalworking assemblages in northern Britain of this date.

Initial assessment suggests that all of the crucibles were of the open variety (i.e. not lidded), which fits with the suggested date. As the majority are fragmentary, reconstructing shape and size is difficult. That said, where discernible, most appear to be of the triangular variety – the most common type used throughout the Scottish Iron Age. In broad terms, two types can be characterised by thickness, which are likely to relate either to size and/or function (the types co-occur in the same context, suggesting the differences are not chronological). A few vessels appear to be of a shallow triangular type. This type, although common in England, is uncommon on Scottish sites, but there are parallels from sites in and around the Inverness and Moray area; this may suggest a regional type.

The moulds are largely undiagnostic. Even when the casting surface survives, this is usually too fragmentary to ascertain the product. Only one mould is clearly recognisable – a ring, probably a finger ring. One reused rotary quern stone has a disc and a bar ingot mould carved into one face and a 'fish'-shaped mould around the central feeder pipe on the grinding face. Parallels for this have not yet been found.

To extract the maximum information from the assemblage, a programme of scientific analysis is strongly recommended. Given that crucibles were used for melting metals, it is common for residues to survive either on or in the fabric. XRF analysis will provide gain insights into the different alloys used. Key questions include: was the smith using copper alloy or precious metals; where did they get the metal from; was some of it derived from Roman metal pools; and what does this tell us about the standing of the smith and the Culduthel inhabitants? Certain alloy types can also be used as a proxy dating tool. XRF will also help to highlight any crucibles used for glass or enamel production.

Previous analyses of crucibles using non-destructive XRF suggests that to get a rounded view of the alloys used on the site every crucible fragment should be analysed. It is generally necessary to undertake multiple analyses on each fragment. The work has been costed on the basis of 120 analyses.

Unlike crucibles, moulds very rarely have any metal traces. XRF analyses of moulds is, therefore, extremely variable. Even when readings are forthcoming, interpretation is fraught with difficulties. That said, the diagnostic moulds should be subjected to XRF analysis. Recommendation: six diagnostic ceramic moulds, and one stone example; two analyses per mould.

There are 15 objects that may relate non-ferrous metalworking activity; XRF analysis is required to confirm this.

A programme of petrological analysis is also recommended (see below) to cast further light on the technology of the moulds and crucibles. This would also be vital to confirm the

identification of any suggested glass-working residues by thin-section analysis and SEM inspection.

Method statement

- Full cataloguing of all material and discussion with wider parallels
- XRF analysis as discussed above
- Petrological study of crucible and mould fabrics (see below)
- All fragments should be marked with finds numbers prior to specialist examination.

5.6 Ferrous Metalworking
Dawn McLaren & Andrew Heald

The ironworking debris is a substantial and important assemblage, comprising over 250kg of material. This is the largest Iron Age slag assemblage from mainland Scotland. In addition to this are 16 stones associated with furnace structures, one bag of possible iron ore and approximately 7kg of daub with adhering vitrified material. This assemblage is significant due to the stratified nature of the majority of the material, particularly as quantities were recovered in association with recognisable hearths or furnaces. In the absence of radiocarbon dating it is assumed that the majority of these features are Iron Age in date. Given the rarity of stratified ironworking deposits from later prehistoric Scottish sites, this assemblage has great potential.

PROCESS	
Smelting	Large, charcoal rich, plano-convex slag cakes
	Runned or 'tapped' slag
Smithing	Small, dense, plano-convex slag cakes
	Slag spheres
	Hammerscale
Non-diagnostic	Unclassified slag
	Vitrified ceramics (e.g. hearth lining)
	Fuel ash slag
	Magnetic residues
	Non-magnetic residues

Table 5: range of slag types present.

A 10% sample of the assemblage was visually examined to provide a basic guide to the range of material recovered. As with most slag assemblages, a significant amount of material is unclassifiable, making the allocation of individual pieces – particularly small samples – to specific types and processes difficult (Crew & Rehren 2002, 84). However, large amounts of diagnostic material have been identified; each diagnostic slag type that can be expected in association with ironworking processes appears to be present within the assemblage. Plano-convex slag cakes of varying sizes were identified. These hearth bottoms include large, vesicular, charcoal-rich smelting cakes and small dense cakes likely to be the result of smithing activities. Large quantities of runned slag are present, some preserving large charcoal impressions, also indicating smelting activities. It is hoped that metallurgical analysis of a sample of this material will reveal any difference in composition between these two processes.

Just as significant are the large amounts of diagnostic micro-debris present. This is particularly relevant due to their association in some cases with hearth features, suggesting in situ ironworking activities. Slag spheres (formed as spherical globules of molten slag ejected during smithing) and hammerscale (small flakes of iron produced by the impact of hammers on hot iron during either the refining of iron blooms or the working of wrought iron) are present in large quantities, as are large quantities of magnetic residue and metallic flakes.

There is also a suite of non-diagnostic material, comprising vitrified ceramics, hearth lining, fuel ash slag and non-magnetic vitrified residues. These materials form when material such as earth, clay, stones or ceramics is subjected to high temperatures, as in a hearth. During heating these materials react, melt or fuse with alkali in ash, producing glassy (vitreous) and porous materials. These can be formed during any high temperature pyrotechnic process and are not necessarily indicative of deliberate industrial activity. Study of their contexts and relationship to other debris should clarify their origin.

During the examination of the sample several fragments of iron were recovered. It is expected that further iron will be recovered from the assemblage and will require X-raying to facilitate identification. Some fragments may also require conservation.

Contextual analysis is essential to understanding the processes involved in ironworking at Culduthel and the relationship of these activities to the settlement itself. Concentrations of ironworking debris have been noted, and although further analysis is required, there appears to be an association of debris from both smelting and smithing activities. It is unclear at this stage whether or not this mixture of material originated from a secondary context such as a dump of waste material, but it holds the possibility of allowing a greater understanding of how the two processes may relate. Were the hearths/furnaces used for only one process, or is there evidence of reuse? Is there evidence that both smelting and smithing activities took place in the same area or is there a spatial difference?

Discussions with the excavator have suggested that three different furnace types may be present at Culduthel: simple bowl, simple stone-built and more substantial stone-built furnaces. It is recommended that scientific analysis should target samples from each furnace type to try to determine whether any difference in processes can be detected between the different structures.

One of the questions posed by the presence of ironworking debris on any later prehistoric site is the scale of production. In most cases it is difficult to determine whether or not the activities can be attributed to occasional manufacture, repair of everyday objects or the large-scale production of iron and/or iron objects. The scale and range of material from Culduthel is important in this light, as the presence of several furnaces associated with ironworking debris within a settlement context suggests a considerable scale of production. The large scale of the slag assemblage suggests that Culduthel was a significant centre for ironworking, and it will be important to examine the role of this site within its wider regional setting.

Conclusions

The quantity of the material, the stratified recovery and potential evidence of in situ metalworking in association with a later prehistoric settlement complex makes this the largest and potentially most significant assemblage of ironworking debris yet known from Iron Age Scotland. This suite of material, with evidence of both smelting and smithing activities, has the potential to provide answers to many of the questions in our understanding of ironworking processes in later prehistoric Scotland.

Method statement

- Production of a full archive catalogue of material, and a condensed publication synthesis with parallels where appropriate.
- All bulk slag samples will require washing prior to visual analysis. All loose residues within each bulk sample should be retained for further analysis prior to washing as these may contain micro-debris. Once washed, the slag will be divided up by classification type, rebagged and given a new catalogue number or sub-number.
- Metallurgical analysis of a sample of diagnostic materials (plano-convex slag cakes & runned slag) and unclassified slag is recommended to determine whether any differences in composition can be detected between the two processes. Although differences in the amount of manganese between smelting and smithing slags has been noted previously (McDonnell 1994, 233), the significance of this and its implications for the ironworking process itself are not clearly understood. This assemblage may allow us to rectify this problem.
- Comparison of the metallurgical analysis of the iron objects and ironworking debris is recommended to understand whether the iron being produced at Culduthel was for local use.
- Large wood impressions have been noted on many of the slag samples, and species identification may be possible; this is not costed for in the attached quote, and is best performed by specialists at Headland.
- It is expected that during sorting of the slag, further fragments of iron objects will be recovered. It will be necessary for these to be x-rayed and provision should be made for this and any conservation that may be required.

5.7 Metallurgy of Slags and Iron Objects
David Dungworth

This proposal sets out the aims and methods for the scientific examination of a range of ironworking materials recovered during the archaeological recording of the late prehistoric settlement at Culduthel. The manufacture and use of iron objects was an important activity in late prehistory but stratified evidence for iron manufacture is rare in Scotland. The assemblage of material recovered from Culduthel is of national significance and deserves to be examined in considerable detail.

A range of scientific techniques will be used to pursue the following aims:

- Confirm the range of processes that took place on site
- Determine the source(s) of the raw material(s) used.
- Investigate the iron smelting technology (iron, phosphoric iron and/or steel).
- Estimate the output of the iron smelting (weight of iron produced).
- Examine the relationship(s) between smelting and smithing slags
- Examine the similarities and differences between the iron produced and the iron worked (was all the iron recovered from Culduthel made there).
- Investigate the technological skills involved in the iron tools and other objects.

Samples of material from each category (and separate archaeological phases) identified from macroscopic inspection will be selected for scientific examination. Samples will be examined and photographed using optical and scanning electron microscopes. The chemical composition of the samples (and in some cases individual crystals or phases within samples) will be determined using an X-ray spectrometer attached to the scanning electron microscope. Metallic samples will be subjected to micro-hardness testing. Ore samples will be analysed using X-ray diffraction to confirm mineral species present. The scientific equipment used would be that of the English Heritage Archaeological Science team. Permission to use the facilities for this purpose has been granted.

The results of the chemical analysis and metallographic examination will be related to local geological maps, relevant phase diagrams and comparative published material from throughout the United Kingdom (and mainland Europe if necessary). Mass balance calculations (using the chemical compositions of the ore, furnace lining and slag) will be undertaken to estimate the amount of iron produced.

It is important that the scientific examination of the ironworking materials is closely linked to the examination of the stratigraphic record and the visual examination of the excavated artefacts. The scientific examination will require information on the extent of the site excavated (and an estimate of the area unexcavated) and phasing information for each of the contexts that have yielded metallic iron and iron working slags. The report on the visual examination will form an essential starting point for the scientific examination of a selection of samples. The interpretation of the results of the scientific examination will be greatly facilitated by continuing dialogue between the various parties.

Method statement

Analysis of 70 samples of ore, various slags and artefacts (table 6). The slag samples will be chosen to reflect different phasing or locations of iron-working on the site.

Material	Samples	Methods
Ore	7	XRD/SEM/EDS
Furnace bottom	8	SEM/EDS
Run slag	8	SEM/EDS
Non-diagnostic slag	7	SEM/EDS
Smithing hearth bottom	6	SEM/EDS
Vitrified furnace/hearth lining	6	SEM/EDS
Slag spheres	7	SEM/EDS
Hammerscale	7	SEM/EDS
Iron off-cuts	7	OM/hard
Iron artefacts	7	OM/hard
Total	**70**	

Table 6: metallurgical samples proposed for the Culduthel assemblage. XRD, X-ray diffraction; SEM, scanning electron microscopy; EDS, energy-dispersive spectrometer; OM, optical microscopy; hard, hardness testing

5.8 Pottery
Ann MacSween

Approximately 200 sherds of pottery were recovered from the excavations at Culduthel. Most of these are small sherds or fragments. They were recovered from contexts across the site.

The material comprises mainly rim and body sherds, with one basal sherd. The lack of basal sherds is due in part to some of the sherds deriving from carinated round-based vessels dating to the Neolithic. Some thicker, more straight-sided vessels are probably Bronze Age or Iron Age in date. An initial scan gave the impression that there are groups of sherds from the same vessel. Many of the sherds are small and/or abraded but in some instances it may be possible to suggest vessel forms.

The current packing is sufficient and any repacking can be carried out after the pottery has been recorded.

Method statement

Visual examination and analysis will seek:

- to determine the date of the pottery (from comparison with other assemblages)
- to provide an analysis of the fabrics for spatial analysis
- to determine the means of deposition of the pottery
- to place the pottery within a broader context
- The production of a catalogue describing the sherds along with a discussion of the material within the site and in its wider context is recommended. Given the number of small sherds, it is recommended that the catalogue takes the form of full written entries detailing form, fabric, surface finish, decoration, abrasion, etc for illustrated material (c. 10 rim sherds) and a spreadsheet catalogue for the full assemblage. The pottery typology may be of use in indicating broad dates, and analysis of the fabrics and their spatial distribution may provide indications of chronological and/or functional variation across the site.
- Marking of the pottery sherds is required prior to further analysis.

- A number of fabrics were identified by eye, and thin section analysis would be useful in looking at variations across the site and also in trying to identify the source of the clays and tempers. The main fabrics identified were – untempered sandy clay; coarse sandy clay; fine sandy clay with c.20% crushed white/gold rock fragments; sandy clay with 40-50% of mixed rock temper.

5.9 Daub
Dawn McLaren

Approximately 17kg of burnt clay was recovered from the site. All bags were visually examined, allowing some crucible/mould fragments to be extracted. The burnt clay appears to be linked with three processes:

- furnace lining associated with metalworking debris
- hearth lining associated with high temperature pyrotechnic processes, but not necessarily related to metalworking activities
- daub associated with wattle fences

The material comes in a range of conditions. The majority are small abraded fragments from which little further information can be determined, whilst many larger fragments (48 bags) preserve finger and/or wattle impressions which are worthy of further examination. It may not be possible in all cases to assign the burnt clay to specific processes; however, contextual analysis may prove fruitful. Despite the small and abraded condition of much of the assemblage, investigation of fragmentation patterns should provide useful information regarding site formation processes and depositional conditions.

Method statement

- Production of a full archive catalogue of the material, and a synthesis for publication
- Analysis of possible wattle/finger impressions
- Contextual analysis and investigation of fragmentation patterns
- Illustration of a small selection of diagnostic fragments (c.5)

5.10 Petrology
Daniel Sahlén

The discovery of a wide range of domestic pottery wares and ceramic metalworking debris at Culduthel provides a tremendous opportunity to study variation in ceramic production over time and for different functions. The pottery spans the Neolithic to the Iron Age, with four main fabrics identified; the metalworking debris (crucibles and moulds) shows a broad variety in shapes and fabrics. It is anticipated that a thorough investigation focused on ceramic technology and the use of raw materials would provide important evidence of production and industrial activities at Culduthel and in the broader area in the prehistoric period. This would be vital for our understanding of the socio-economic background of the site and the region.

Method statement

- A combination of thin section analysis and scanning electron microscopy would be used to inform on methods of ceramic manufacture and the diversity and sources of clay material used at the site. The examination of different types of ceramic materials would provide the chance to consider choices and tradition in relation to different types of production systems.
- It is suggested that 16 samples in total, taken from the main ceramic groups (pottery, crucibles, moulds, daub and furnace lining) should be investigated through thin section and scanning electron microscopy (SEM); eight samples from the main pottery fabrics wares and eight samples of metalworking/industrial ceramics.
- Thin section analysis will allow the identification of shaping/forming techniques and the nature of inclusion/temper materials, as well as clarifying the mineral background of the material.
- SEM analysis would investigate the microstructure of the fired clay, supplying crucial information regarding firing and vitrification processes. The use of SEM would also provide analytical data (through SEM-EDAX analysis) of the chemical properties of the ceramic material.
- In addition, fieldwork to identify and sample local clay sources is recommended. This would be vital for the identification of local and imported ceramics, and would give us the opportunity to reconstruct prehistoric production patterns.

5.11 Stone
Dawn McLaren & Fraser Hunter

Of the 109 coarse stone items initially submitted, 59 fragments were worked (representing 53 objects), 14 may be worked, and 36 are natural. Also submitted were three boxes of fire-cracked stones and one bag of possible iron ore. During this assessment, each fragment was visually examined for evidence of use. This large assemblage contains a wide range of tools. Most are quern stone fragments with a range of types represented; saddle querns (with rubbers), trough querns, and both bun and disc rotary querns (table 7).

Category	Object	Quantity
Personal & Leisure	bead	1
	disc (palette)	1
Tools	grinders	2
	pounders	2
	hammerstones	1
	smoothers (from textile/leather production)	4
	Whetstones	2
	Multi-function tools	2
	Sharpening stone	1
	Spindle whorl	1
Food processing	Saddle querns	2
	Rubbing stones	7 (6)
	Trough querns	3 (2)
	Rotary querns	24 (19)*
Miscellaneous	Hollowed stones	2
	Perforated stones (?weights)	4 (2)
	Working surface	1
Total no of fragments		59
(Total no of objects)		(53)

Table 7: assessment of the worked stone from Culduthel. The numbers in brackets denotes the number of objects (as some are fragmented). Note: *one quern reused as ingot mould; one ?unfinished; two fragments reused as tuyères.

Four further aspects of the quern assemblage stand out for comment at this stage. One is the mixture of different quern types. Although saddle and disc querns are not unexpected on an Iron Age site, the presence of several bun querns, a type more common in southern Scotland (MacKie 1971, 52-55, fig 5), and possible bun/disc-hybrids alongside the disc querns is worthy of further investigation. Secondly, although it is not uncommon for querns to be recovered in a fragmentary state, the consistent fragmentation of the rotary querns in particular will benefit from further analysis. It is not possible at this stage to show that this was a deliberate, votive process. However only three rotary querns were recovered intact; one of these had been reused and no longer functioned as a quern stone. During the initial visual examination, several fragments of the same querns were identified; therefore the total number of quern fragments is an overestimate of the number of querns represented in the assemblage. Some of these fragments had been recovered from different contexts and further contextual analysis is required to determine the cause of this deposition pattern; this will be of importance in

assessing whether there is evidence of structured deposition, with the burial of querns or quern fragments for votive rather than practical purposes. Thirdly, three querns are decorated with simple collars around the feeder pipe. A recent study of Scottish querns (McLaren & Hunter forthcoming) has identified several other querns decorated in this manner and it will be of value to see how these examples fit within the wider picture. Finally, one stone from Culduthel has been tentatively identified as an unfinished rotary quern stone. Although the local manufacture of quern stones on Iron Age sites would be expected, evidence of on-site manufacture is surprisingly limited. In addition, several quern stones appear to have been reused as a structural component within furnaces/hearths, with the tentative suggestion of some feeder pipes being used as make-shift tuyères. Investigation of the relationship between the broken up quernstones and the furnaces/hearths associated with metalworking would be beneficial.

The coarse stone assemblage also includes a small group of cobble tools, including grinders, pounders, hammerstones, smoothers and whetstones. The small size of this assemblage (only thirteen cobble tools and six possible further examples) is surprising in comparison to the large quantity of quern stone fragments recovered from the site. Some of the cobble tools appear to be multi-functional, often with signs of significant use; unfortunately, in the absence of experimental studies, the detailed function of such tools is uncertain. The prominence of smoothers amongst the cobble tool assemblage is noteworthy. These objects, characterised by areas of polish often associated with dark red-brown staining, are thought to have functioned as tools used in the processing and preparation of hides.

There were also four personal or decorative items, including a small oval shale bead, a fragment of a well-shaped stone disc, and a perforated whetstone fragment. Although not primarily decorative, a spindle whorl rough-out has a series of incised scratch marks (possible graffiti) on both faces. Although most of the stone objects from Culduthel appear to have originated from local sources (see below), the shale bead hints at wider contacts, perhaps across the Moray Firth to Golspie. Further analysis is required to confirm the likely source of this material.

Amongst the common types of stone tools are a few more unusual objects. Three stand out in particular. The reuse of a rotary quern stone as an ingot mould is noteworthy. In this instance, both sides have been reused to carve moulds. One face has a shallow disc and an elongated bar ingot mould carved into it, both well-paralleled forms. The other face has a large ‘fish’ shaped mould carved around the central perforation of the quern stone, which would have been masked by the other half of the mould. This object is unparalleled, and further work is required to understand it. XRF analysis of the interior surfaces of the moulds is recommended.

Also submitted for analysis was a bag of possible iron ore fragments. These show no obvious signs of working, but it is recommended that these samples be examined by a geologist to confirm their identification. It would also be beneficial to submit these samples for metallurgical analysis to determine if this material is the source of iron used by the Culduthel metalworkers.

Three boxes of fire-cracked stones from context 3467 were submitted in an unwashed, unsorted condition. Each fragment was visually examined in its present condition to determine whether any fragmentary worked stone was amongst the assemblage. Two possible cobble tool fragments were extracted for further analysis.

Conclusions

Although not a large assemblage for the size of site excavated, the large number of rotary quern stone fragments is of interest. Many aspects of the deposition of the quern stones may be significant, as many of them are in a fragmentary condition and some have been reused as structural components of furnaces. The presence of both bun- and disc-shaped quern stones, two with decoration, is of particular interest.

Method statement

- Production of a full catalogue of the material with parallels where appropriate.
- Many of the stone tools require cleaning prior to further analysis.
- Marking of all worked and possibly worked stones is recommended.
- Geological identification of the worked stone assemblage is recommended; a wide range of stone types has been utilised, and specialist study will allow a better understanding of sources and motives behind their selection.
- Mineralogical study of the ore samples would be of considerable value.
- XRF analysis of the interior surfaces of the stone moulds is required.

5.12 Geology
Fiona McGibbon

75 stone artefacts were examined briefly in order to assess rock type and any trends in usage of particular rock types for particular purposes. Rock types seen include a range of biotite and muscovite schists, psammitic (more quartz rich) schist, granite, diorite, siltstone and quartzite. The schists are texturally and mineralogically very variable. Artefacts of schist are usually slab-like whereas those of quartzite or psammitic schist are more cobble-shaped.

Inspection of the 1:625,000 geological map shows the Culduthel site to be in an area of outcropping Devonian sedimentary rocks (Middle Old Red Sandstone) with outcrops of Moinian metamorphic rocks (schists etc.) with associated granite and diorite intrusives in the vicinity. Inspection of the 1:63,360 series solid and drift maps show the area to be covered in boulder clay and undifferentiated drift, and to be near the present course of the River Ness. It is likely that the raw materials used to manufacture most artefacts were sourced from these drift and alluvial deposits very near the site, although the quern stones are very large for such deposits.

Most querns were made of various schists, sometimes of surprisingly coarse grain size. These require large slabs of rock and these might have been sourced from drift deposits. All the suggested whetstones were made of Devonian siltstone. The hand tools such as rubbing stones, pounders, smoothers and grinders were usually of natural water-worn cobbles predominantly comprised of quartzite with subordinate granite, diorite and psammitic schist. The quartzite pebbles were probably ultimately derived from Devonian conglomerates, but all the cobbles could have come from the local glacial drift deposits most likely reworked by postglacial river processes. As with other sites the assemblage shows an astute use of different lithologies and shapes for different purposes, making best use of locally sourced materials. The schists used for quernstones are likely to have shed great quantities of mica into foodstuffs though, and this is certainly not the preferred rock type at other sites.

Method statement

- The artefacts require more detailed inspection to give more specific lithological descriptions. This will produce a detailed archive catalogue and a synthesis for publication.
- These identifications will then be more thoroughly considered in the context of local geology, and analysed more rigorously in terms of choices of materials for specific purposes.
- The quernstones need to be looked at further in order to assess whether they show any signs of having been quarried from rock outcrops rather than found as blocks in the local landscape.
- It would be valuable and useful to investigate the environs of the actual site to examine the boulder clay and alluvial deposits; a short field trip is proposed.

5.13 Lithics
Torben Bjarke Ballin

As part of the assessment, the assemblage was divided into two sub-assemblages, namely larger finds recovered in the field (c. 150 pieces), and mostly diminutive finds recovered in the laboratory in connection with the sieving of samples (c. 350 pieces). The former were examined individually with the consistent use of a magnifying glass (x8 and x15), whereas the latter were examined in a more cursory fashion. The purpose of this report is to briefly assess the lithic finds, and give a summary of the character and date range of the material. On the basis of this assessment, a statement is produced on the potential for further analysis and reporting.

From the archaeological investigations at Culduthel, 493 lithic artefacts were recovered. The field-collected finds are listed in Table 8. In addition to these finds, the collection also includes a small bag with possibly burnt quartz chips (93g). Apart from small chips, the sieved material also embraces two regular thumbnail scrapers, bringing the number of thumbnail scrapers to six.

The definitions of the main lithic categories are as follows:
Chips: All flakes and indeterminate pieces the greatest dimension (GD) of which is £ 10 mm.
Flakes: All lithic artefacts with one identifiable ventral (positive or convex) surface, GD > 10 mm and L < 2W (L = length; W = width).
Indeterminate pieces: Lithic artefacts that cannot be unequivocally identified as either flakes or cores. Generally the problem of identification is due to irregular breaks, frost-shattering or fire-crazing. Chunks are larger indeterminate pieces, and in, for example, the case of quartz, the problem of identification usually originates from a piece flaking along natural planes of weakness rather than flaking in the usual conchoidal way.
Blades and microblades: Flakes where L ³ 2W. In the case of blades W > 8 mm, in the case of microblades W £ 8 mm.
Cores: Artefacts with only dorsal (negative or concave) surfaces – if three or more flakes have been detached, the piece is a core, if fewer than three flakes have been detached, the piece is a split or flaked pebble.
Tools: Artefacts with secondary retouch (modification).

Debitage	*Flint*	*Quartz / quartzite*	*Other*	*Total*
Chips	9		2	11
Flakes	79	7	6	92
Blades	5			5
Indeterminate pieces	5	7		12
Total debitage	*98*	*14*	*8*	*120*
Cores				
Possible frags of bipolar cores	5			5
Other cores	2			2
Total cores	*7*			*7*
Tools				
Thumbnail scrapers	4			4
Other scrapers (mostly end-scrapers)	13	1		14
Backed blades	1			1
Pieces w edge-retouch	9			9
Pieces w invasive retouch	1			1
Total tools	*28*			*28*
TOTAL	**135**	**15**	**8**	**156**

Table 8: field-collected struck lithics from Culduthel

Raw materials

As shown in Table 7, the assemblage consists mainly of flint (86%), supplemented by some quartz and quartzite (9%), and eight pieces in other raw materials (5%). It is possible to sub-divide the flint into three categories, namely 1) traditional East of Scotland brown flint, 2) flint resembling Aberdeenshire Buchan Ridge flint, and 3) exotic dark flint. The Category 1 flints are generally relatively small, whereas the Category 2 flints are somewhat larger. These pieces were not quantified. Thirteen (from both sub-assemblages) grey to black pieces were classified as probably having been imported from Yorkshire. The category 'other raw materials' includes, inter alia, fine sandstone and chalcedony. A total of 31 pieces of flint and quartz (almost 20% of the field collection) have been characterised as burnt and, amongst the flint, several pieces are clearly patinated.

If the Category 2 flints are truly of Buchan Ridge type, then a substantial proportion of the total assemblage is based on imported (exotic) material. The definition of the dark grey to black flint as exotic is based on the frequently soft, powdery cortex of this material, and the assumption of this resource as deriving from NE England (Saville 2003) is, admittedly, somewhat conjectural. The darkest of this form of chalk flint is of superb quality, resembling the material used in the SE English gunflint industry.

Nine small chips listed as possible pitchstone (the sieved material) are most likely glassy slag. The sieved sub-assemblage includes two bags with numerous small chips, possibly relating to separate knapping floors. The fact that the two scatters seem to consist of two different forms of flint suggests different knappers/?dates.

Typo-technological characterisation

Debitage: The field assemblage includes 120 pieces of debitage (87%), 11 of which are chips, supplemented by 92 flakes, five blades, and 12 indeterminate pieces. Approximately one-tenth is in quartz or quartzite, and one-twentieth in 'other' raw materials, with the vast majority being in flint. The blades are relatively robust specimens, and practically all blades and flakes appear to have been produced by the application of hard percussion.

Cores: Only seven cores were identified (12%), all of which are in flint. Five mostly burnt pieces were defined as the likely fragments of bipolar cores, and two were classified as an irregular flat core and a small Levallois-like core.

Tools: Twenty-eight tools were recovered and, apart from one, all are in flint. They include four thumbnail-scrapers (six, with the two specimens from the sieved material), 14 other scrapers, one backed blade, nine pieces with edge-retouch, and one piece with invasive retouch. The 'other' scrapers are mainly larger end-scrapers, but side-scrapers are also present; one of the end-scrapers is a particularly large elongated implement with full double-sided lateral blunting. The thumbnail-scrapers are small almost circular specimens, modified by the application of neat pressure-flaking. The backed blade is probably a small knife.

Technology: As the assemblage is clearly dominated by the application of platform technique, the composition of the core group is somewhat surprising – five fragments of bipolar cores against two platform cores. This suggests that either the site was not fully excavated, or parts of the assemblage was manufactured outside the site. One core is an obvious Levallois-like core, and the other (flat) platform core may be the totally exhausted remnant of a similar core. These cores are waste products of Late Neolithic blank production, where flakes and blades were produced from the same specialised cores (see Ballin forthcoming a).

The finds include very few diagnostic elements, but a small Levallois-like core and a series of diminutive thumbnail scrapers indicate that the assemblage may include Late Neolithic and Early Bronze Age components. A small number of hard-hammer blades are likely to form part of the former sub-assemblage, as is an impressively large and neat end-scraper. In Scotland, Yorkshire flint has been found throughout eastern Scotland, with Urquhart Castle being one of the northernmost find-spots (Ballin 2005). This flint type is mostly associated with Late Neolithic activity, as for example at East Lochside in Angus (Ballin forthcoming b). If the site's Category 2 flint is actually from Buchan in Aberdeenshire, this also supports the Late Neolithic date, as the only diagnostic type found at the flint mines of that area is a chisel-shaped arrowhead (albeit from surface contexts; Saville 1995).

Method statement

- Classification and cataloguing will be carried as one coherent process. The first part of the specialist analysis is the classification of all lithic material directly into a computer database (Access 2000). The database includes standardised schemas for debitage, cores and tools. An archive database ('hard copy') is also produced, containing all the information from the database; the catalogue will be printed out directly from Access. The next step is the actual analysis, which to a large extent makes the information in the database visual, partly in text, but also in tables, diagrams, and distribution maps (where relevant). The final stage is the production of the actual report.
- It has not been possible to assess the artefacts' contextual situation. This means that it is uncertain whether the two main elements of the collection, the Late Neolithic finds and the Early Bronze Age finds, can be separated spatially. However, it is the analyst's impression, that the different chronological elements may be associated with different flint categories (the Early Bronze Age finds possibly relating to the local brown flint, and the Late Neolithic finds mainly with the possible Buchan Ridge flint and the Yorkshire flint), and an attempt at 'dissecting' the assemblage into its chronological constituents should be made. If successful, this may provide two separate sub-assemblages, each with considerable research potential. The excavating unit's database (finds, contexts, and features) suggests that the site includes a large number of contexts and features, and it may be possible to link the Late Neolithic and Bronze Age lithics to different contexts/features via vertical and/or horizontal stratigraphy.
- The two potential sub-assemblages may provide information on matters such as technology and settlement organisation / on-site activities during the two periods. The Late Neolithic sub-assemblage may be particularly interesting and topical, as this industry is presently being discussed in relation to its specialised Levallois-like reduction technique (Ballin forthcoming a; forthcoming c), and this technique's presence at East of Scotland settlement sites (eg, East Lochside; Ballin forthcoming b) and flint mines (the Buchan Ridge prehistoric mining complex; Saville 2005). Subjects such as prehistoric territorial structures and exchange (particularly relating to the so-called Yorkshire flint) are also highly relevant. It may also be possible to link the burnt lithics, and the two bags of flint chips with specific contexts/features and thereby provide information pertinent to the understanding of site activities.

6. ASSESSMENT OF ENVIRONMENTAL SAMPLES

Dr S. Timpany

6.1 Introduction

A total of 1719 samples were collected from a series of features during the excavation, including the interiors of roundhouses and the fills of pits and postholes associated with a large Iron Age settlement. Samples ranged in size from 0.25 to 135 litres.

6.2 Method

Samples were processed in laboratory conditions using a standard floatation method (cf. Kenward et al, 1980). All plant macrofossil samples were analysed using a stereomicroscope at magnifications of x10 and up to x100 where necessary to aid identification. Identifications were confirmed using modern reference material and seed atlases including Cappers et al (2006).

Faunal remains were identified from hand recovered material and from processed samples.

6.3 Results

The results are presented in Tables 1 (retent samples) and 2 (floatation samples) below.

Charred cereal grain

A suite of charred cereal grain is present within the samples. Grains present within the assemblage include, primarily, barley (Hordeum vulgare), club/bread wheat (Triticum aestivo-compactum) and oats (Avena sp.) with lesser amounts of emmer wheat (Triticum dicoccum), rye (Secale cereale) and spelt wheat (Triticum spelta) (see Table 2).

Other charred plant remains

Wood charcoal fragments were present in the majority of both floatation and retent samples often of a size suitable for identification and radiocarbon dating (see Tables 1 and 2). There are also a number of agricultural weed species present, including: pale persicaria (Persicaria lapithifolia), knotgrass (Polygonum aviculare), sun spurge (Euphorbia helioscopia) and hemp-nettles (Galeopsis sp.). Other charred plant remains found of interest include: crab apple pips (Malus sylvestris), blackthorn (Prunus spinosa) fruit stones and hazel (Corylus avellana) nutshell fragments.

Other finds

There is evidence for metalworking taking place at Culduthel with the finding of metal waste within retent samples (see Table 1), such as slag, hammerscale and prill adding to the bulk samples recovered from observable deposits during excavation. Finds such as glass beads, glass shards, pottery fragments and metal objects were recovered within the retent samples. For more information on these, please refer to the finds report. Many samples contained burnt bone, while unburnt bone appeared more sporadically. Daub was recovered frequently from samples, lithics were also recovered and are discussed elsewhere, while occasional marine shell fragments were also found (see Table 1).

Faunal remains

Faunal remains at Culduthel came from 1,143 samples in 1,013 contexts (one sample of less than 5g calcined material was unstratified). Some were collected on site and the remainder process as above. Over 98% of the remains were fully calcined; thus they were in poor condition for examination, and the minority which were not calcined were often far too fragmented for identification. Futhermore 1,033 of the samples (90.4%) were less than 5g in weight.

Identification was also hindered by the burning of the material which caused shrinkage and twisting of the bone. These distortions made smaller fragments from animals of similar size and proportion (e.g. pig and sheep) difficult to distinguish from each other, and fragments of larger animals (e.g. bovids) more easily distinguished from the rest of the assemblage. Thus cattle may appear overrepresented in the sample from other relatively smaller animals, but it is not advisable to accept this at face value.

Dentition was also easily spotted, though in every case only molars or molar fragments were found. The conspicuous absence of canines or incisors in the assemblage suggests that the anterior portion of the mandible was removed or separated from the rest of the remains prior to deposition (Rideout et al 1992: 50).

Taxa identified included sheep, cattle, pig and notably one amphibian tibia and fibula (Context 380, Sample 144). Given the poor taphonomy of the remains these identified pieces are not exclusive of the possibility that other species were also present, such as red deer. Consumption of meat and animal by-products is the most common use for domesticated animals (Raish 1992: 45) and all of the faunal remains are typical of domestic waste.

6.4 Discussion

The charred cereal grain assemblage, dominated by barley, club/bread wheat and oats is similar to other Iron Age assemblages across Scotland (e.g. Pollock et al, 1992; Banks et al, 2001). The presence of a number of arable weed species within samples containing charred grain suggests that these taxa were being accidentally collected with the cereals during harvesting and have then been discarded when the grain is being used for domestic activities, such as baking. No evidence was found for any processing of the cereals (e.g. threshing and winnowing) within the samples suggesting either this material hasn't survived or that only small-scale (domestic) processing was taking place.

Charred hazel nutshell is also present in samples from this assemblage and is an almost ubiquitous find across prehistoric sites in the British Isles. A more rare find in Iron Age sites is the presence of charred crab apple pips and these together with blackthorn and hazel show that a mixture of cultivated and wild food resources were being utilised at Culduthel. The occasional finding of marine shell fragments within the samples also indicates some (limited) exploitation of coastal resources.

Wood charcoal fragments are present of sizes suggestive of in-situ or deliberately dumped deposits. The smaller sized fragments (e.g. less than 1.0cm) may have been transported across the site by mechanisms such as windblow and surface run-off and may originally have been part of the deposits containing the larger fragments. Some charcoal fragments have

been tentatively identified as roundwood and may represent structural material. Further work on the distribution and spread of the fragments is needed to elucidate the potential sources of the charcoal.

Faunal remains

Some of the identifiable remains showed epiphyseal lines, indicating that the animals were juveniles as their bones had not completed fusion. Again, the profile of this assemblage relative to age-at-death may be misleading as burned bones from older individuals tend to survive compressive forces better than those of younger individuals (Lyman 1994: 390). This would be expected of faunal waste from domestic consumption, although no butchering marks were detectable (Lyman 1994: 389).

Even if identifiable, caution is taken that burnt animal remains correspond to such a small proportion of the bone assemblage that information quantified from this data may be misleading (Rideout et al 1992: 50). Without other faunal remains, this prevents any conclusions to be drawn on wider uses of domesticated animals at this site.

Method statement

- All of the charred plant remains information (including charcoal) within Tables 1 and 2 should be plotted on to distribution maps for the site. This will then give precise distribution of charred cereals and charcoal across the site, which will aid in determining samples that are representative of in-situ material from those that are more likely to represent scattered material (e.g. as a result of wind blow). These maps will also help in illustrating the relationship between the charred plant remains and the different areas of activity at the site (e.g. metalworking).
- A selection of charcoal fragments from any features of interest (to be determined) should be identified to investigate the types of arboreal taxa being utilised for fuel etc. This information will also provide data on the woodland types around the site during the period of occupation.
- Samples containing abundant amounts of charred cereals, together with any samples, which are of interest from distribution maps, should be further examined. This will then give actual counts of the numbers of charred cereal grains and other plant remains (e.g. seeds). This will provide information on the agrarian economy of the site together with potential fluctuations in dominant cereal types.
- A review of prehistoric grain found at other Iron Age sites in the UK sites is needed to place the Culduthel site into the known chronometry of agriculture within Scotland and the British Isles. This will also require the radiocarbon dating of a suite of grain, primarily from features of interest (to be identified from distribution maps), from across the site.
- All the environmental data should be integrated with the artefactual material and archaeological features (e.g. prehistoric roundhouses) in any finalised reports for the Culduthel site.

Faunal remains

Although the straightforward conclusion is that the faunal remains are burned post-consumption waste matter, comparison with material from other sites would clarify the context of this data. The presence of other material in domestic context such as pottery would again clarify the nature of the assemblage as domestic or other. Plotting these contexts onto

distribution maps will allow spatial visualisation concerning where waste disposal is taking place (e.g. inside the home or at designated sites elsewhere). Further study may also reveal the reason for the absence of the anterior mandible of animals within this assemblage and other similar assemblages (e.g. Rideout et al 1992: 50). The presence of the amphibian tibia and fibula should be investigated as it serves as an environmental indicator.

7. THIN SECTION ANALYSIS

Archaeological Background

As a result of specialist advisory site visits to the site at Culduthel Mains Farm, nineteen Kubiena tin sediments samples were taken. The samples were taken from a variety of profiles in order to address specific questions concerning the formation of the sampled deposits, both in terms of depositional and post-depositional processes. Specific issues are addressed below in the brief description of the sampled deposit profiles.

The site lies on glacial drifts largely derived from Old Red Sandstone. Across the site processes of hill wash movement have played a key role in the accumulation of deposits. The depth of such deposits varied rapidly over the site, largely being controlled by local topographic variation. The relative depth of the hill wash accumulations played a significant role in determining the survival of the archaeological deposits: thicker deposits of hill wash tended to reduce the impact of ploughing.

The site offers unique opportunities for thin-section analysis, given below. The opportunity for comparison with thin-section work from another Iron Age roundhouse site in the north of Scotland, Birnie, Morayshire, also exists, which would further enhance the value of studying the samples listed below.

Sample Selection

Although nineteen samples were originally taken from the site, this initial group has been examined and the samples for further work have been selected on the basis of a number of criteria. These criteria are the avoidance of unnecessary duplication, the apparent state of preservation of the samples and the probability of recovering evidence that will materially aid understanding of the site. While preservation state of the samples did not affect the final selection, the other application of the other criteria lead to the selection of the twelve samples tabulated below.

Sample	Contexts
4.1	2730
4.2	2370, 1655
4.3	2370, 1655, 776
4.4	776
4.5	776
4.6	776
4.7	776
4.8	776
1139	2878, 2725
1572	1671, 2429
1605	2179
1758	4365

Table Table 1: Contexts sampled at Culduthel Mains Farm.

Context and Purpose of Selected Samples

Samples 4.1-4.8
These samples were taken through the fills of the ring ditch of Structure 4. These fills have been interpreted as relating to the occupation, destruction and post-abandonment phases of Structure 4

Sample 1139
This sample was taken through contexts that may be the remains of turf post pads and overlying turf ash. The purpose of the sample is to check the composition of this material to see if the basic interpretation is correct and to seek further evidence for the function of the turf deposits.

Sample 1572
This sample was taken through the remains of a possible turf wall (Context 2429) and a deposit thought to relate to the abandonment of the site during the 1st century AD (Context 1671). The interpretation of Context 1671 as an abandonment deposit is critical to understanding the archaeological sequence in Structure 10. These interpretations will be checked and enhanced using evidence from the thin-sections of formation processes and composition

Sample 1605
This sample was taken through a possible floor layer (Context 2179) in Structure 10. Such an interpretation is critical to understanding the sequence and use of the structure. Thin-section analysis will check the interpretation and possibly provide evidence for activity on the floor.

Sample 1758
This sample was taken from Context 4365 and the underlying sub-soil. Context 4365 is interpreted as a hill wash. This sample has been taken in order to check that interpretation and to examine the nature of the contact between Context 4365 and the sub-soil. The degree of weathering/ soil formation in the sub-soil will indicate the nature of the surface on which Context 4365 accumulated, which in term will have implications for the formation processes/chronology of hill wash accumulation.

8. STATEMENT OF POTENTIAL

The excavation has revealed multi-period use of the site from the prehistoric through to the ?2nd century AD. The more important element of the site is the Iron Age occupation. There is good evidence for 17 roundhouses, craft and industrial production, and perhaps trade links with parts of Scotland further afield. The range of buildings and their good preservation is unusual.

Many of the research issues will be addressed in conjunction with the artefact analysis as outlined below. However, the structures have the potential to address questions about construction:

- There is evidence for floors - is there any for roof timbers?
- Does the similar size of many of the posts suggest woodland management?
- The construction of some of the walls survives, are they head height or foundation/stub walls?
- Is there evidence for turf construction?
- Are hearths present in all domestic structures?
- Are domestic buildings reused for craft activity or are craft structures purpose-built?
- Are differing construction techniques a chronological indicator?

The use of the site also raises questions:

- Are craft activities carried out in identifiable zones?
- Are there separate zones for occupation, craft/industry and animal husbandry?
- Can food (cereal) processing areas be identified by, for example, plotting charred cereal grains or faunal remains?
- Is there evidence for social hierarchy in the structures?
- What deposition processes are at work on the site, and how does material find its way into negative features?

Artefacts

The Culduthel excavations have produced an assemblage of primary importance for the study of the Scottish Iron Age. It is rare to find such a productive site in the cropmark zone of Scotland; the range of material has the potential both to paint a detailed picture of activities at the site and to impact on much wider research topics. We have drawn together a team of specialists who will maximise the considerable potential of this assemblage.

Among the rich range of material, the following areas are of particular importance:

- The evidence of glass- or enamel-working is unique in Iron Age Scotland, and very rare in Britain as a whole
- The evidence for iron processing offers the chance to follow the material from ore to artefact. This is exceptionally rare, especially in the Iron Age context to which this material appears to date.
- The assemblage of iron objects is one of the largest and most important from Iron Age Scotland, with unusual items such as swords, a dagger and a file.
- The non-ferrous metalworking debris is one of the largest and most important from Iron Age Scotland.

The finds will be studied by different specialists according to material; a number of categories will undergo scientific analysis to extract further information (table 1). The results will then be analysed in tandem with the structural evidence in a synthetic discussion that will address a number of key themes identified in a recent research agenda for the Iron Age (Haselgrove et al 2001, 14-22).

9. PUBLICATION PROPOSAL AND TASK LIST

Dissemination strategy

The excavations have revealed an enormous amount of information about Iron Age culture both locally and nationally. The potential outlined above merits further study and dissemination to a wider audience.

Academic publication

It is proposed that the results of the excavation should be published but whether as a monograph, online or in a number of different places e.g. note in Britannia, a monograph in the PSAS series and/or a popular booklet has yet to be determined.

A task list and proposed contents list for a monograph type report is included in this report. The main element is the work on the artefacts recovered and this may take, overall, between two-and-a-half and three-and-a-half years to complete since many of the staff are engaged in research in museums, universities and other institutions. This element is being co-ordinated by the National Museum of Scotland.

Discussions with Highland Council are to be held to determine the best approach.

Appendix 1. Assessment proposal and tasklist				
Section Heading	**Pages**	**Figures**	**Plates**	**Tables**
Summary	1			
Introduction	3	7	2	1
Background				
Land use, geology and location				
Previous work in the area				
Aims and methodology				
Research aims				
Recording techniques				
Artefacts and Sampling				
Location of archive and finds				
Site Descriptions				
Introduction	0.5	4		
Pre-Iron Age	0.5			
Cairns	1	3	2	
Enclosure	1	2		
Pits	1			1
Iron Age				
Introduction	0.5	1		
Sequence of deposits	2.5	1	1	
Structure 10 and yard	5	6	3	1
Industrial spread 798	0.5	1	1	
Structures with furnaces 2, 13, 15, 16	5	5	3	
Furnaces 3811 and 4273	1	1		
Structure 11 and 2166, 2434	2	1		
Structure 4	1.5	2	3	
Roundhouses ST3, 5, 6, 7, 8, 9, 12, 17, 18 and Alba house.	4	4		
Preserved Houses	1	1	2	
Other features	1	1		
Structure 31-cobbled surface	1	1	1	
Finds Reports				
Introduction				
Iron	5	?	?	1
Non-ferrous objects	3	?	?	1
Glass	2	?	?	11
Non-ferrous metal working				1
Ferrous metalworking	3			1
Metallurgy Iron & slag	4			?
Pottery	4			1
Daub	2			1
Petrology				?
Lithics	3			2
Stone	2			1
Lead Isotope analysis	2			
XRF analysis	3			3
Discussion	3			?
Environmental Reports				
Charred plant remains				2
Animal bone				
thin section				1
Discussion	6	6		2
Deposition and taphonomy				
o Evidence for structured deposits and their interpretation – considering especially querns and metal objects				
o Patterns of deposition and survival – how typical or atypical is Culduthel? There are important methodological points arising from the excavation strategies at the site, which maximised artefact recovery, and with the preservation of the site under hillwash.				
Life at the site; differences between buildings; changes through time				
o Craft processes				
o Technology of iron, from ore to artefact				
o Technology of copper alloy				
o Technology of glass and enamel				
o Location of activities – embedded in the settlement or separate?				
Contacts and networks				
o Sources of raw materials (copper alloy, lead, glass, stone)				
o Sources of exotic artefacts (especially contacts with the Roman world)				
Culduthel in context				
o Comparison with other sites on the Moray Firth littoral; can we define status hierarchies?				
o Patterns of resource procurement and artefact exchange in north-east Scotland				
o Contacts with Rome and with other areas of Iron Age Scotland				
Bibliography				
Totals	75	47	?	31

Culduthel Phase 5, Post-excvation Task List

Task	Staff	Days
Pre-analysis tasks		
Artefact analysis		
Finds and pottery (National Museum)	various	
Bones & shells	Finds specialist	
Editing finds text	Finds specialist	
management (finds)	Finds specialist	
management	Project manager	
Environmental analysis		
AMS dates		30
Charred plants	Environmental specialist	40
Thin section analysis	Environmental specialist	1
Management, monitoring editing	Project manager	1
Report Preparation		
Background research	Project officer	6
introduction	Project officer	2
Stratigraphic consideration	Project officer	5
site descriptions	Project officer	25
discussion and synthesis	Project manager	12
Site Illustrations	Illustrator	47
internal editing, final revisions, proof reading	Project manager	15
Management	Project manager	5

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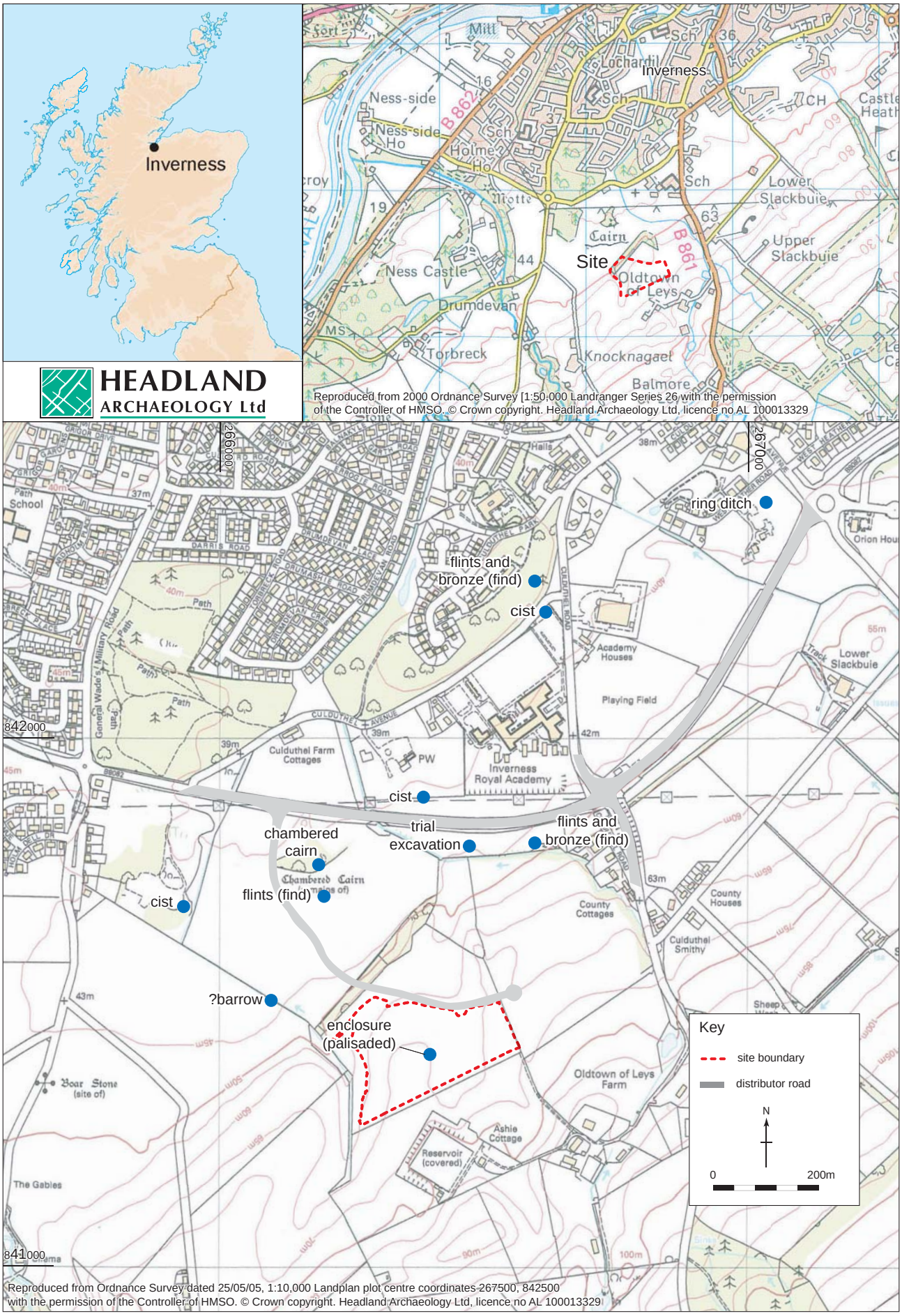


Figure 1: CDF05, Culduthel Farm - site location.

Figure 2: CDF05, Culduthel Farm - Plan of archaeological features within development area

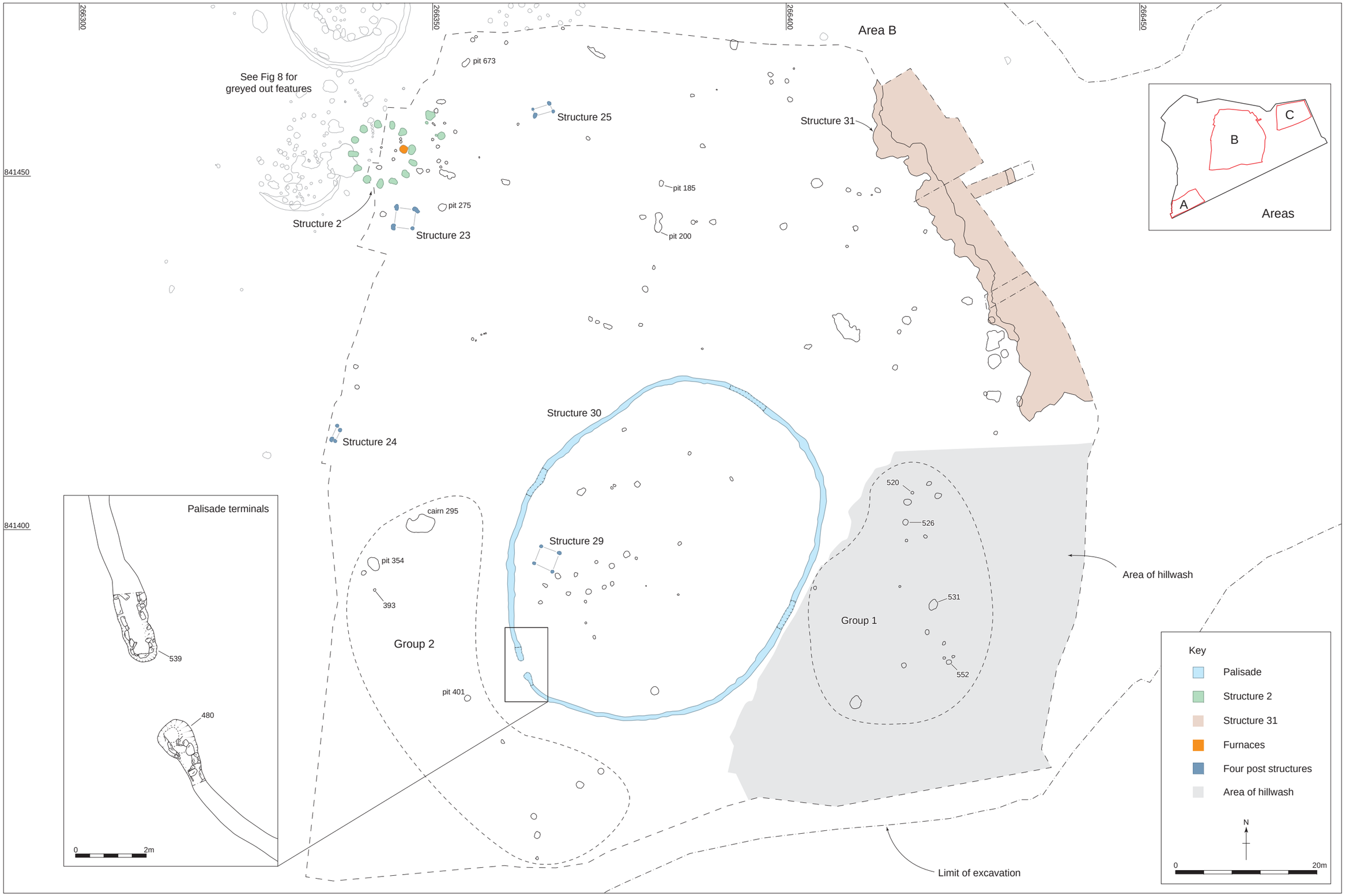


Figure 3: CDF05, Culduthel Farm - Plan of area B

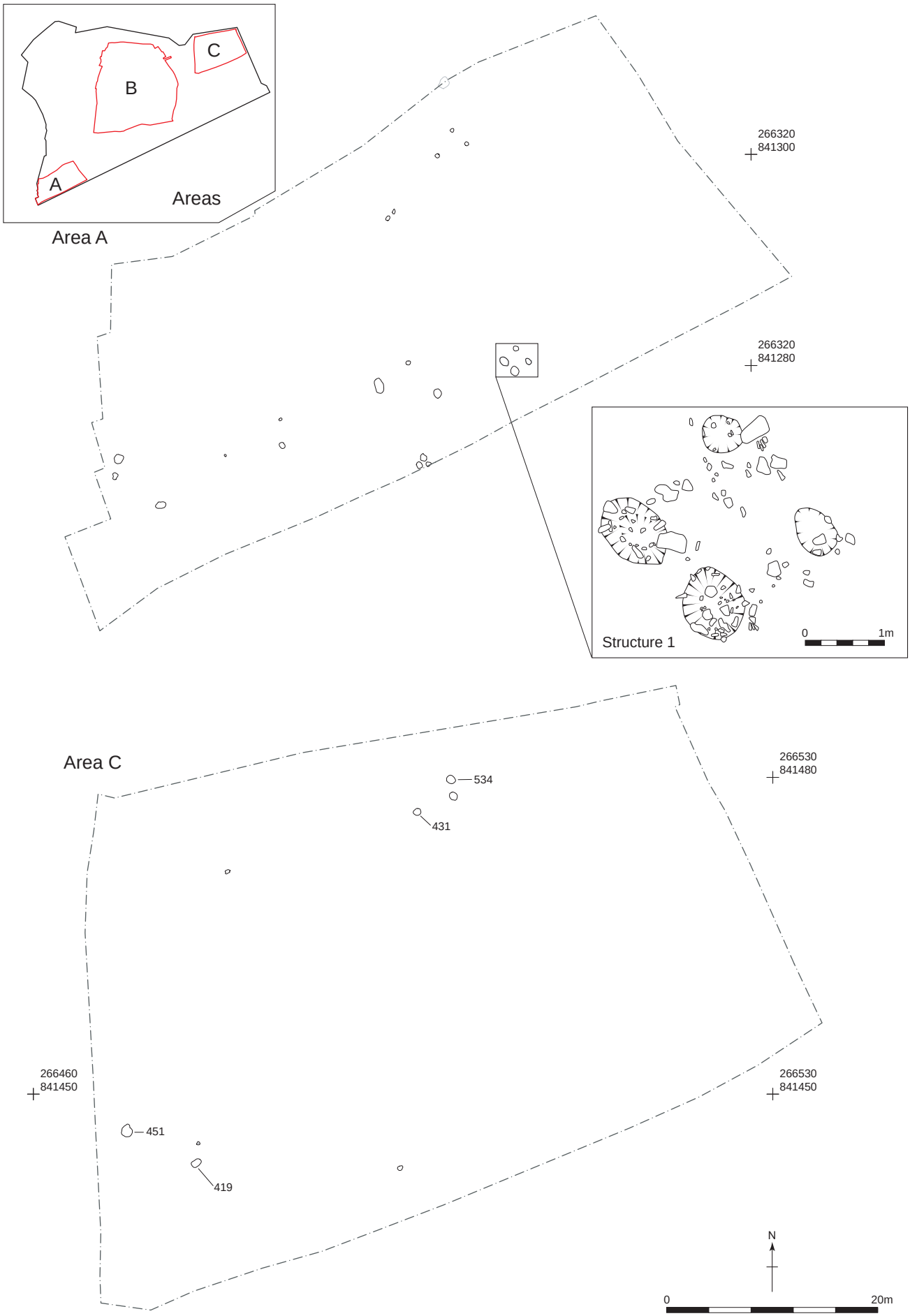


Figure 4: CDF05, Culduthel Farm - Plan of areas A and C

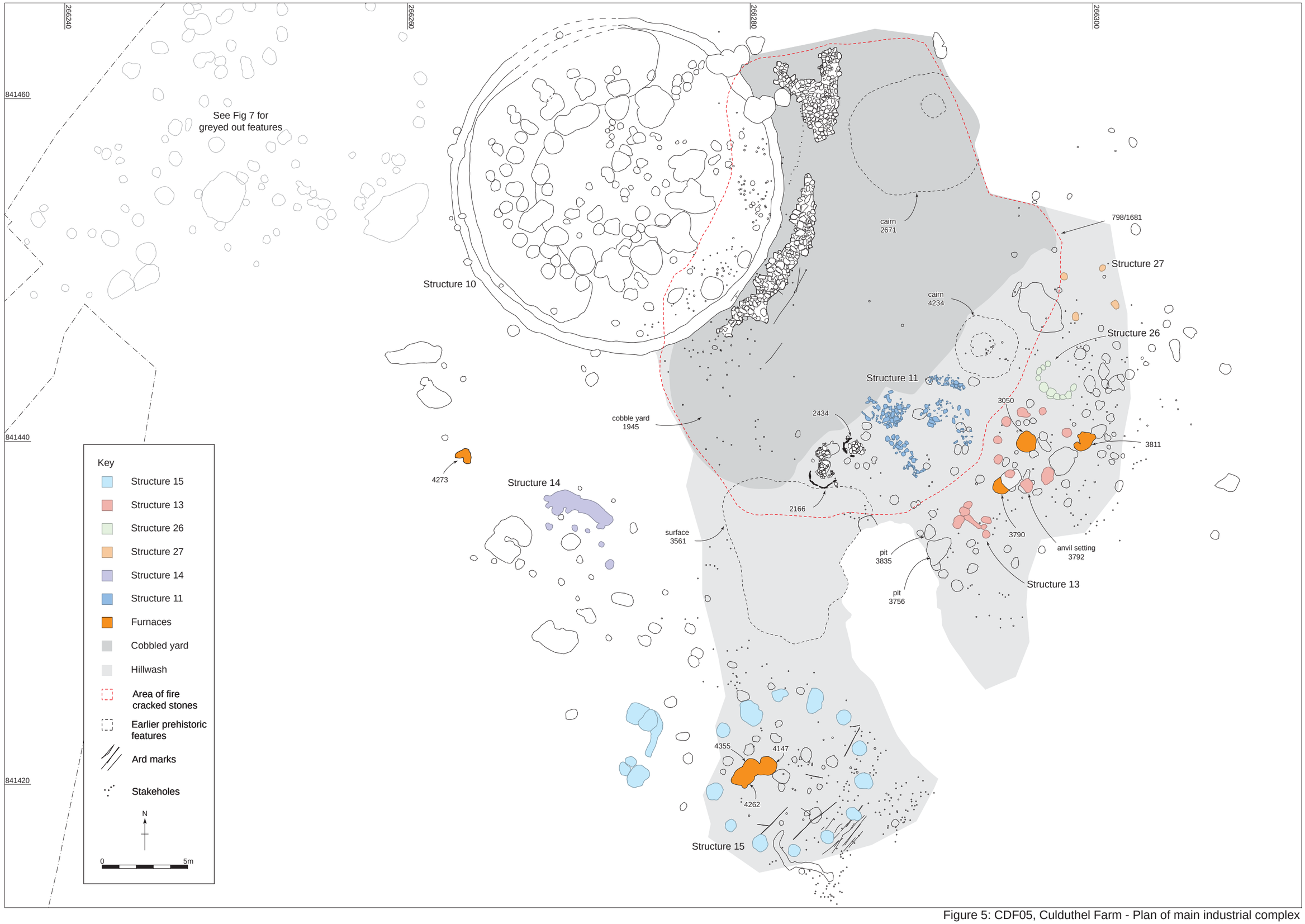
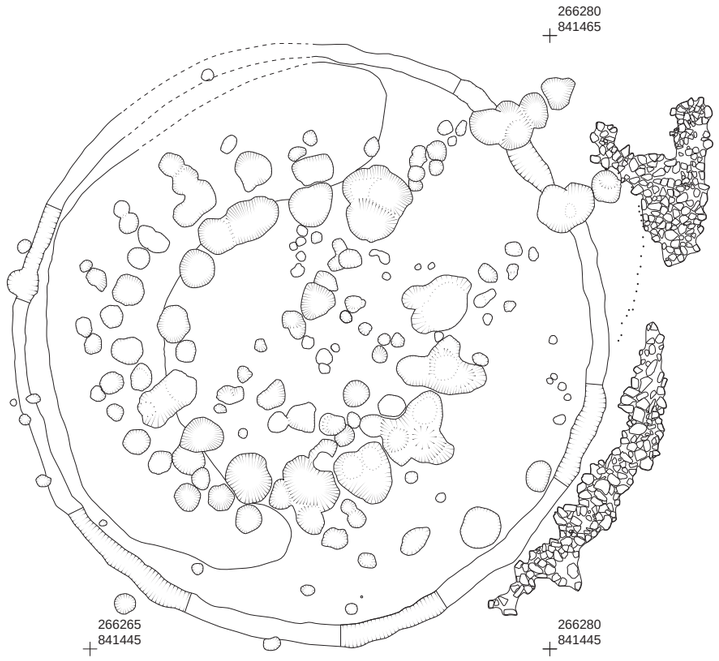
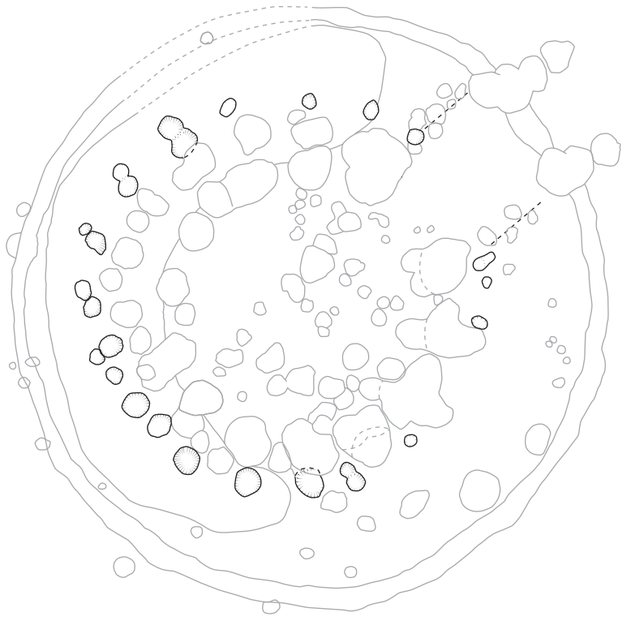


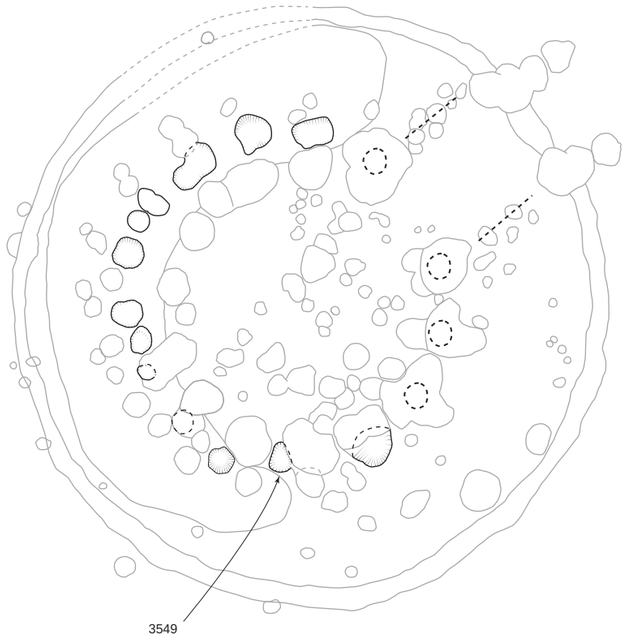
Figure 5: CDF05, Culduthel Farm - Plan of main industrial complex



All phases



Phase 10.1



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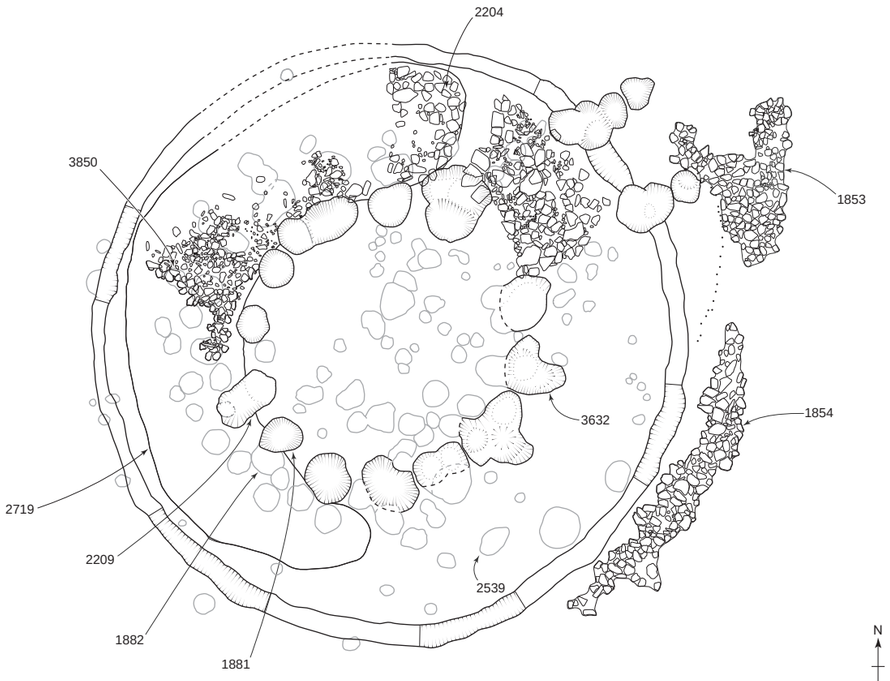


Phase 10.3

Figure 6: CDF05, Culduthel Farm: Plan of structure 10

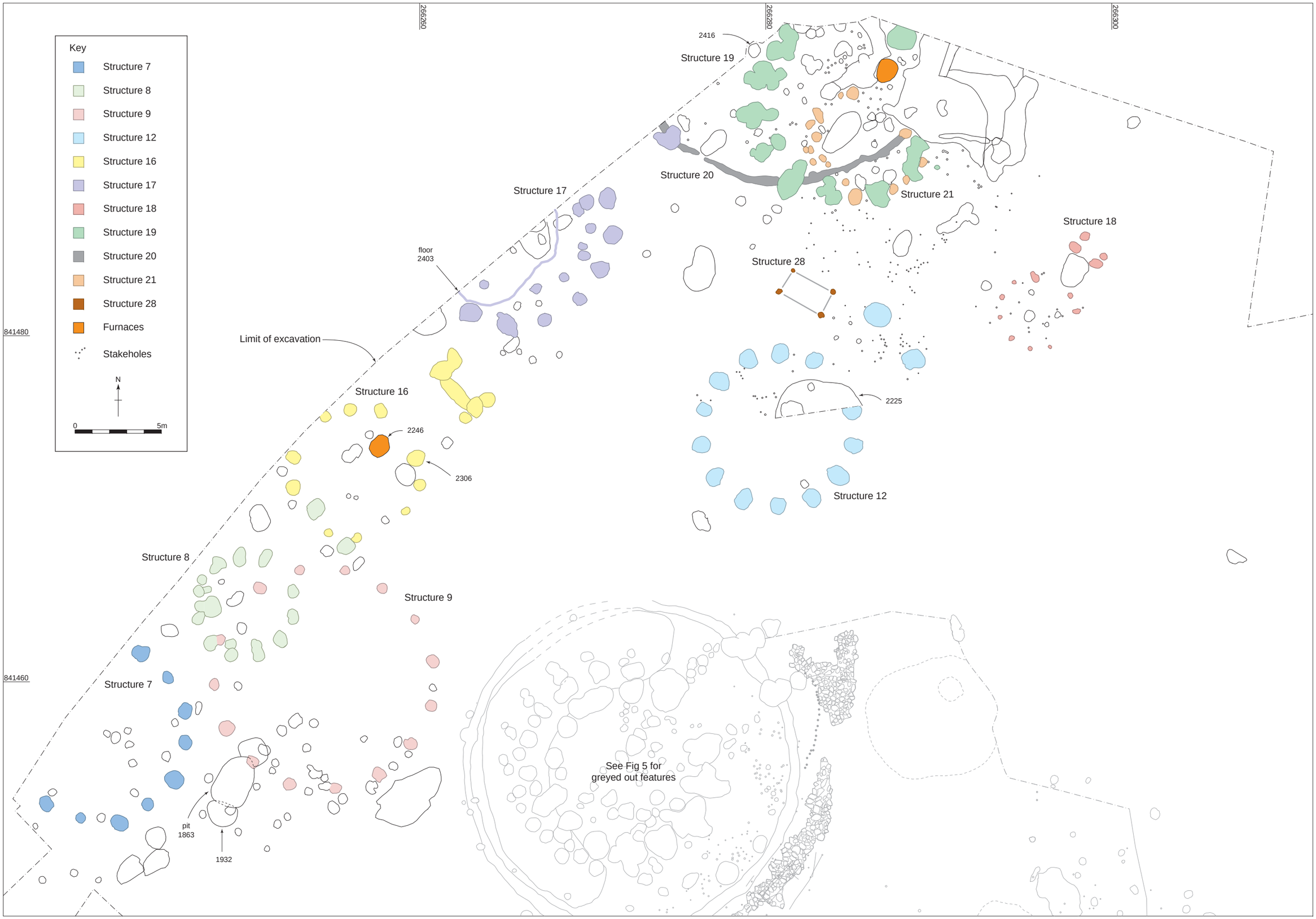


Figure 7: CDF05, plan of area north & west of structure 10.

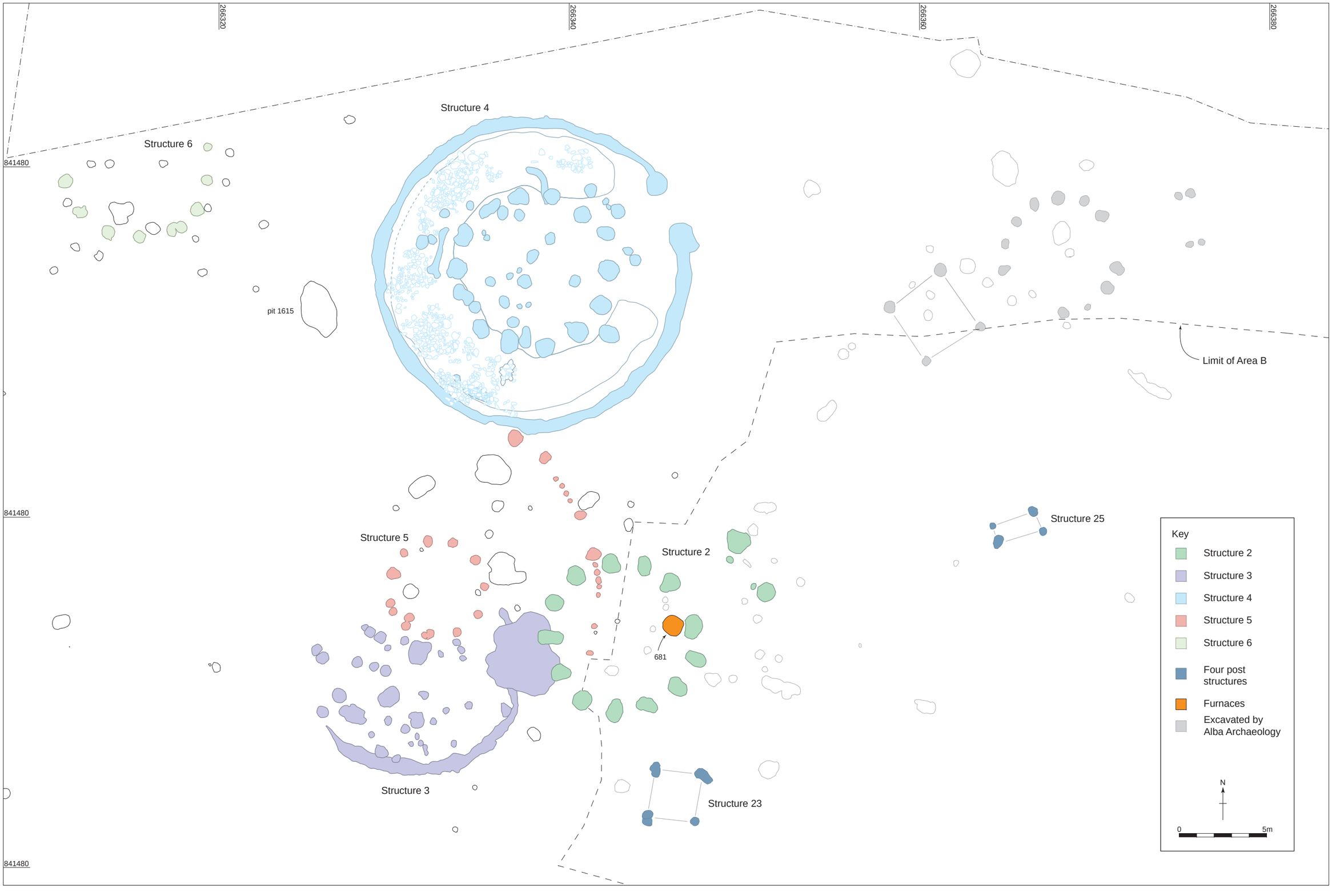
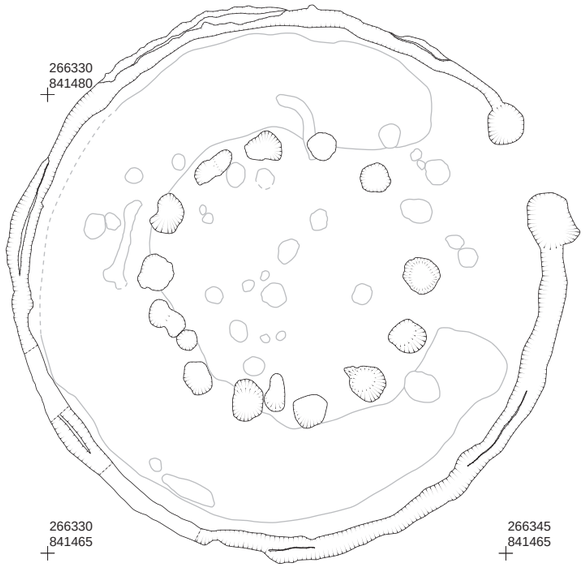
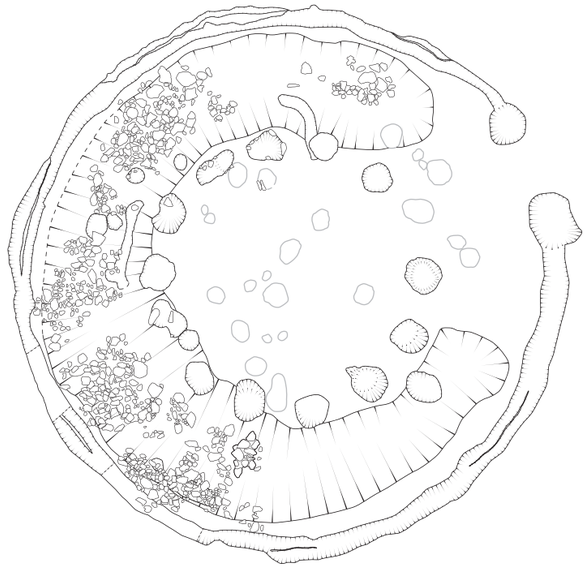


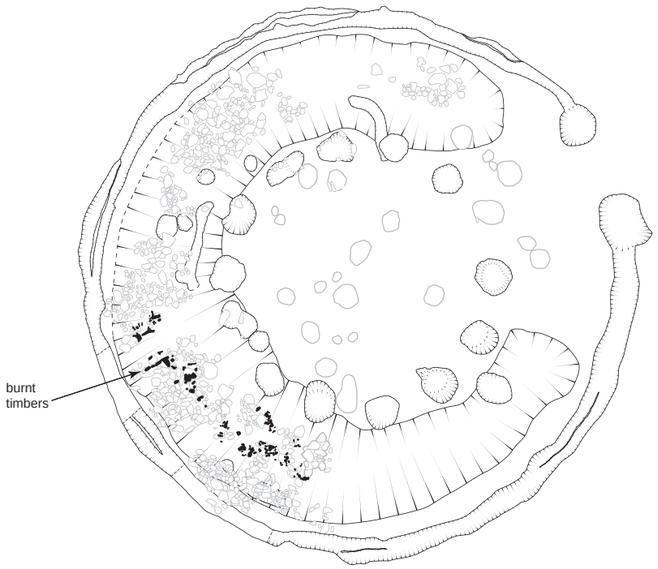
Figure 8: CDF05, Culduthel Farm - Plan of structures 2 - 6



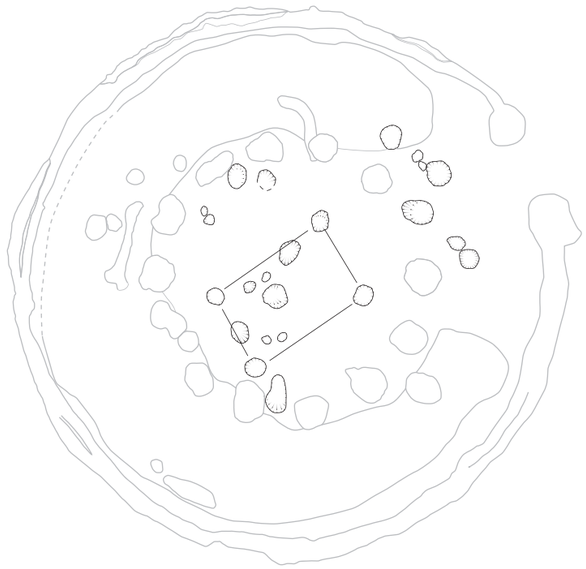
Phase 1



Phase 2



Phase 2
showing burnt timbers



Unknown phase

Figure 9: CDF05, Culduthel Farm - Phase plan of structure 4