

Excavation of a cropmark enclosure at Brixwold (Dalhousie Mains), Bonnyrigg, Midlothian

A Crone* & J O'Sullivan†

with contributions by J Carrott, A Duffy, T Holden, M Issitt,
H Kenward, F Large, T O'Sullivan & T Rees

ABSTRACT

Excavation at Brixwold recorded a large, sub-rectangular, ditched enclosure, previously identified from aerial photographic evidence as a cropmark. The deep U-shaped ditch contained waterlogged deposits with preserved organic materials. The radiocarbon dates obtained from waterlogged seeds in the ditch indicate two phases of activity, one in the 4th–2nd centuries BC and one in the 1st–2nd centuries AD. Analyses of the macroplant and insect assemblages from these deposits have provided evidence on the environment within, and immediately surrounding, the ditch, as well as some slight evidence of human activity. No significant features or artefacts were recorded in the interior, probably as a result of extensive plough damage. A hollow feature with possible floor layers and a hearth was excavated outwith the south-west perimeter of the enclosure and is tentatively identified as a remnant sunken house floor. The excavation was funded by Walker Group (Scotland) Ltd, in advance of a housing development.

INTRODUCTION

Excavation of a large, sub-rectangular cropmark enclosure at Brixwold, near Bonnyrigg, Midlothian, was commissioned by Walker Group (Scotland) Ltd, in advance of a proposed housing development on the site. A preliminary assessment (Carter 1994) confirmed the presence of the ditched enclosure and a more comprehensive investigation was undertaken in October 1994.

The site is located on a gentle, south-west slope, close to the summit of a low ridge at 85 m OD lying between the Dalhousie Burn to the south-east and the Pittendreich Burn to the south-west (NGR: NT 318 645). It straddles two large tillage fields and is traversed, in the south-east corner, by the farm track which separates them (illus 1). The local soil parent material is a clay-textured till derived from Carboniferous sedimentary rocks and the current landuse is tillage of cereals and root crops.

The cropmark has been recorded on two occasions by aerial photography: in 1972 by the Cambridge University Committee for Aerial Photography (CUCAP negative no BKD 31) and in 1976 by the Royal Commission on the Ancient and Historical Monuments of Scotland

* AOC Archaeology, The Schoolhouse, 4 Lochend Road, Leith, Edinburgh EH6 8BR

† 5 Bellevue Road, Edinburgh EH7 4DA

(RCAHMS negative no ML 2529). It appears as a dark, rectilinear mark in ripening cereal crops and is particularly well defined on the 1972 photograph. There are no visible breaks in the cropmark and the position of an entrance has not been determined. No significant cropmark features are visible within the enclosure, but on both sets of photographs, modern cultivation is represented by a regular series of parallel, narrow, linear cropmarks which may be seen to traverse the site from south-east to north-west.

Brixwold lies in an area rich in cropmark sites. Some 3 km to the north is the complex of cropmarks centred on Melville Nurseries. These include pit alignments (NT 36 NW 72, 76, 77, 99, 108 & 153), enclosures (NT 36 NW 55, 56 & 127), ring-ditches (NT 36 NW 102 & 156) and palisaded homesteads (NT 36 NW 10, 60 & 105). A possible rectilinear enclosure (NT 36 SW 55) lies only 500 m to the north-east of the Brixwold enclosure. Several of these sites have been excavated, producing evidence of activity spanning the Bronze Age through to the Roman period. The palisaded enclosure at Melville Nurseries was dated to 3230 ± 90 BP while the ring-ditch house on the same site produced a date of 2500 ± 50 BP (Raisen & Rees 1996). The pit alignment at Eskbank was dated to 2060 ± 70 BP (Barber 1985). Continuing activity at Melville Nurseries was represented by two large pits, thought to be cooking pits, which were dated to the early centuries AD (Raisen & Rees 1996). The area was also the focus of much activity during the Roman period, with Dere Street passing some 2 km to the east of the site *en route* to the fort at Elginhaugh, 3 km to the north (Hanson & Yeoman 1988).

THE EXCAVATION

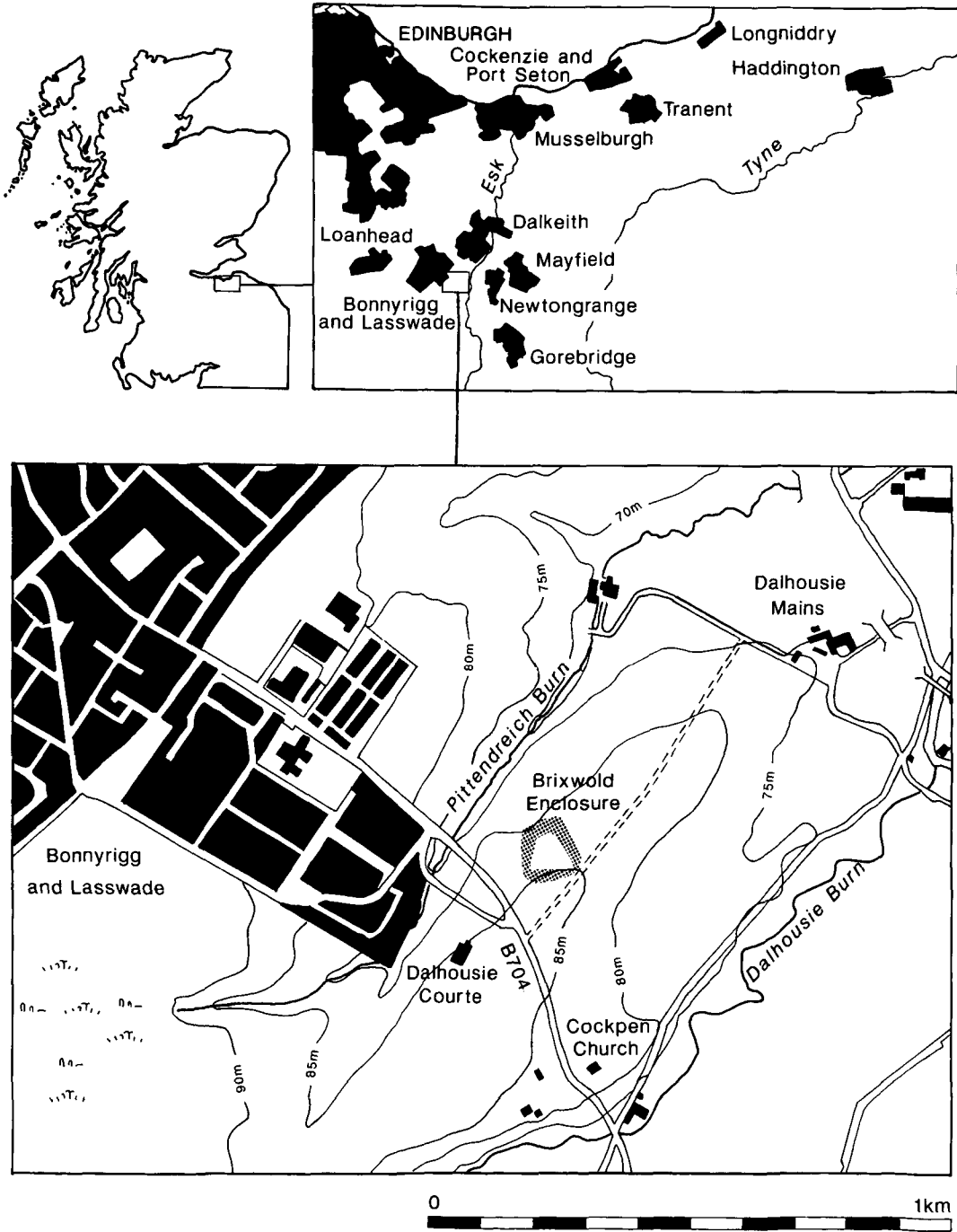
METHODS

The entire area of the site, north of the farm track, was machine-stripped under archaeological supervision to the base of the ploughsoil. The surface of the subsoil was hand-cleaned to determine the presence of features and the limits of the enclosing ditch. The ditch was investigated via machine-cut section trenches recorded at five points (illus 2 & 3). Samples retained from the excavated features included (a) standard bulk samples for wet-sieving; (b) smaller samples for characterization of soil type by standard laboratory tests; (c) selected samples for radiocarbon dating; and (d) soil monolith tins of the ditch fills in Section Trench IV.

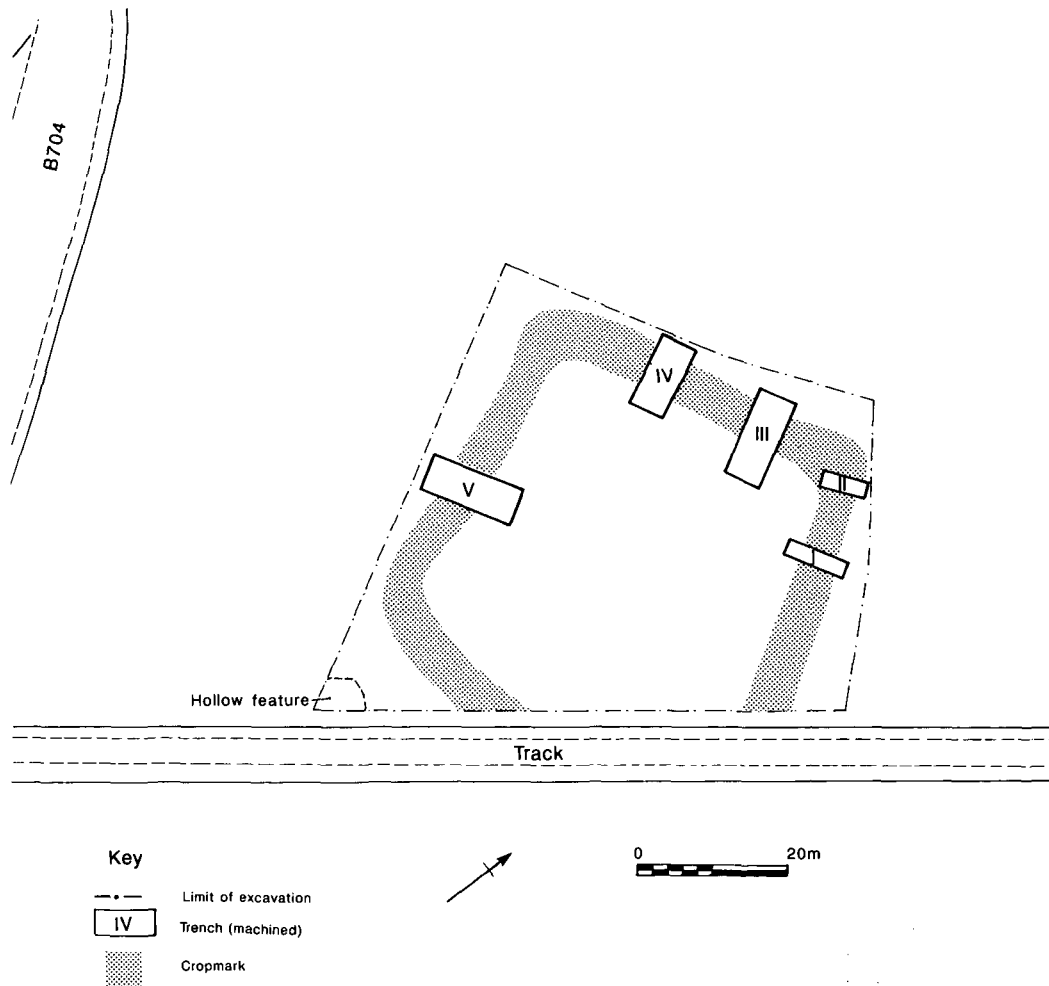
THE ENCLOSURE DITCH

Five ditch sections were recorded, in the east, north and west sectors of the enclosure (I–V, illus 2). In general, the fills of the ditch had suffered extensively from gleying and, consequently, visibility of stratigraphic boundaries was poor. Ditch Section IV proved to have somewhat clearer stratigraphic boundaries than elsewhere and was also distinctive in having quantities of well-preserved organic materials in its fills (illus 4 & 5). The context numbers in the following description of the ditch and its fills refer to this section.

In profile, the ditch consisted of two main parts: a wider, dish-shaped upper section over a narrower, steep-sided, U-shaped lower section. In Sections I, II and V the boundaries of the lower section were very difficult to define, but in Sections III and IV its profile could be clearly seen, dug to depths of 2.5 m and 3 m, respectively, below the stripped subsoil surface. The basal fill (Context 5023) was a deposit, 0.4 m thick, of compact, dark brown clay-silt with frequent small stones and coal flecks. In Section III this basal deposit was a grey clay with yellow streaks up to 0.7 m deep. In both sections the basal fill was overlain by a series of grey, relatively stone-free silty clays



ILLUS 1 Site location map. (Based on the Ordnance Survey © Crown copyright)

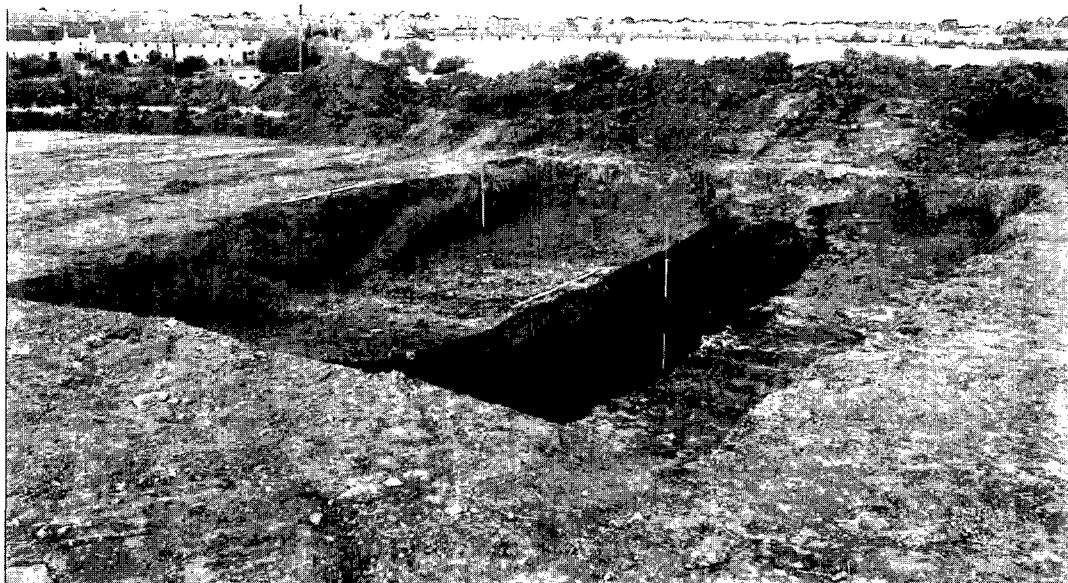


ILLUS 2 General site plan showing extent of excavated area and locations of Ditch Sections I-V

(Contexts 5005, 5009-11, 5013-16), variably 0.1 m to 0.3 m thick. In Section IV these deposits were interleaved with two darker layers (Contexts 5008 & 5012), which were slightly peaty or organic in texture. With the exception of the uppermost clay layers, these deposits were characterized by frequent flecks of bright blue vivianite, a mineral which is associated with the decay of organic materials in anaerobic conditions. Waterlogged organic materials were preserved in these deposits and discrete fragments of bone and wood were recovered during excavation (below). Coal was present in Contexts 5012 and 5013.

In Section IV the lower ditch fills were cut by a narrow feature (Context 5007) with steep sides and a flat base, 0.6 m wide and 0.65 m deep, and filled with a stiff, creamy, stone-free clay-silt (Context 5006). As the feature was identified in both faces of the machine-cut trench, it was clearly a linear cut; however, it did not appear in any other section trench.

The dish-shaped upper part of the ditch was c 7 m wide, between 0.9 and 1.2 m deep, and was filled with layers of compact grey or mottled grey/brown silty clays containing small stones



ILLUS 3 General view of Ditch Section IV looking west

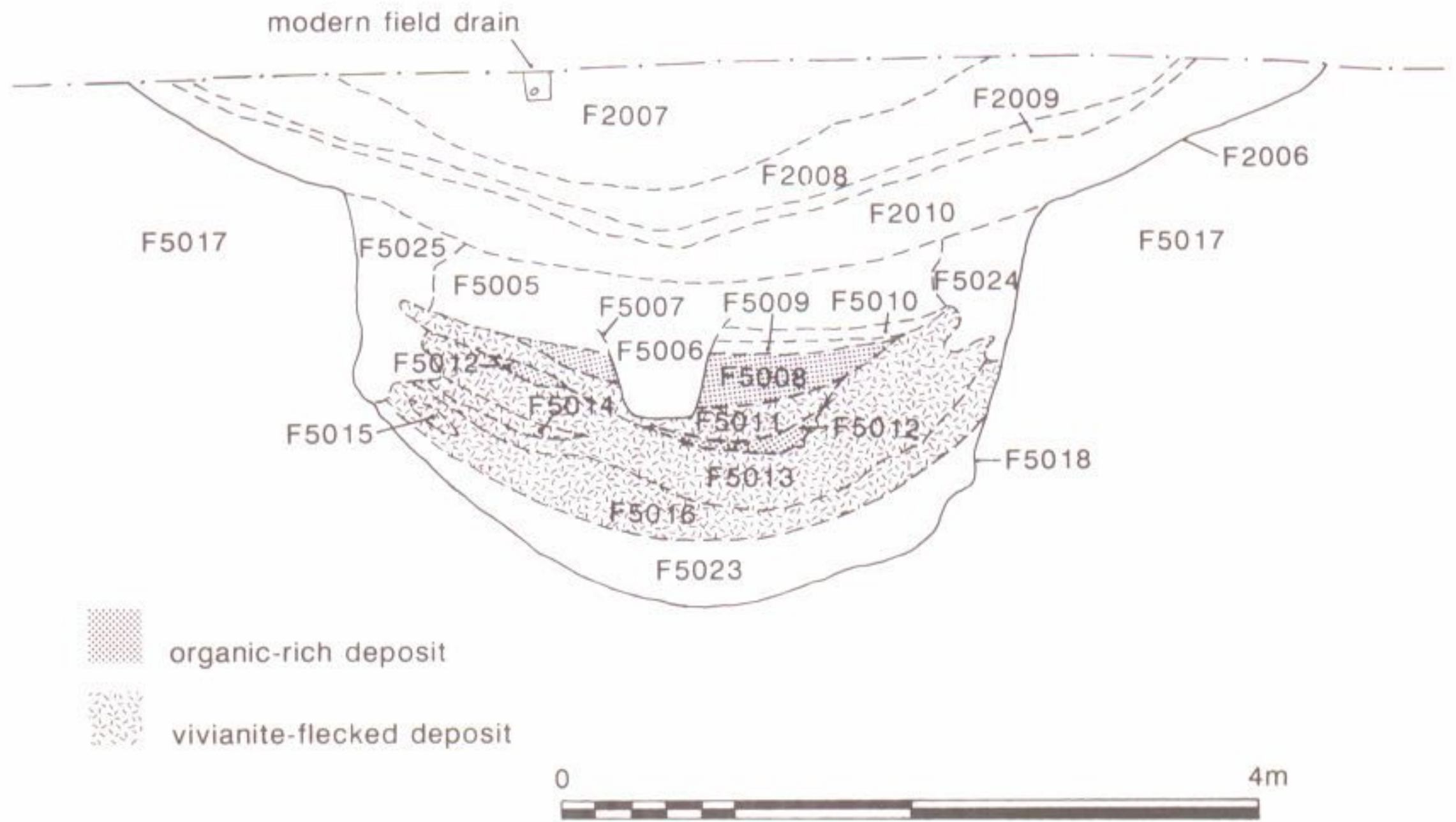
and occasional flecks of coal (Contexts 2007, 2008 & 2010). These layers were occasionally iron-stained, particularly towards the base of the 'dish'. A layer of stone-free grey clay, 0.10 m thick, was observed in Sections III and IV (Context 2009), but was not found in the other sections. A single flint scraper was recovered from the upper ditch fill (Context 4000) in the south-east quadrant.

THE INTERIOR OF THE ENCLOSURE

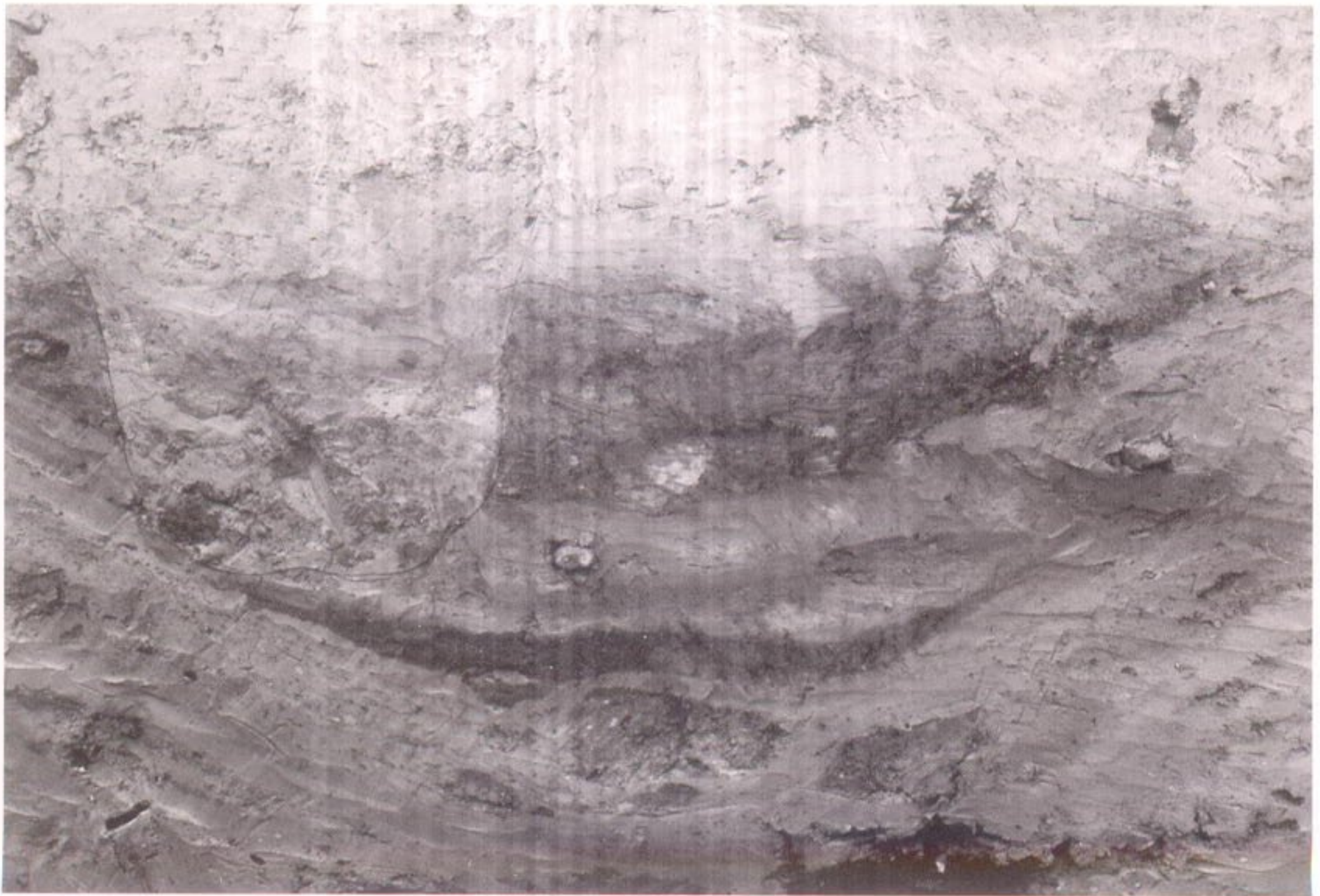
No significant features were recorded within the enclosure. Numerous possible features were investigated in the interior, but these invariably proved to be topsoil remnants or natural stone-holes.

EXTERNAL FEATURE

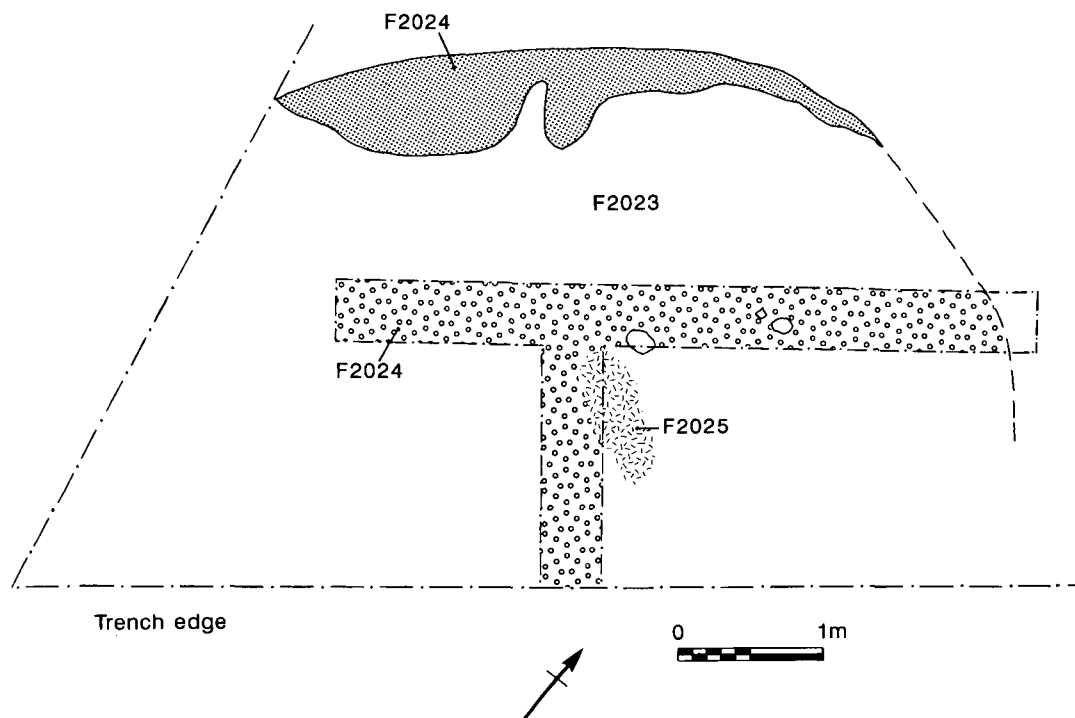
The only other feature of any significance, apart from the ditch, was recorded in the south-west corner of the excavation area some 5.5 m outside the enclosure (illus 2). The feature consisted of an oval hollow, or sunken area, at least 5.7 m along its west/east axis and at least 3.5 m along its north/south axis. The feature extended south and west beyond the limits of the excavation area and, consequently, its full extent remains unknown. The hollow was less than 0.15 m deep and was lined with a compact layer of small, rounded pebbles (Context 2024) (illus 6 & 7). A light brown clay-silt with frequent small stones (Contexts 2023 & 2026) filled the hollow almost to its



ILLUS 4 The west face of Ditch Section IV



ILLUS 5 Detail of Ditch Section IV, showing Context 5007 cutting through the vivianite-stained clay layers and organic deposits



ILLUS 6 Plan of the hollow feature

edges. In the centre of the hollow an amorphous patch of these deposits, approximately 1 m by 0.3 m in area, had been scorched red by fire and contained flecks of charcoal (Context 2025).

ANALYSES OF THE DITCH FILLS

SAMPLE SELECTION AND PROCESSING

The waterlogged deposits in the ditches raised the likelihood that macroplant and invertebrate assemblages might be preserved, the analysis of which would allow aspects of the environment and economy of the site to be investigated. Samples were selected for assessment from two excavated areas, Ditch Section IV and the remnant floor layers in the south-west quadrant. Treatment of samples was appropriate to conditions in each area.

Eleven bulk soil samples (c 10 kg each) from the partly waterlogged fills in Ditch Section IV were selected for analysis following assessment. Half of each sample was processed for the recovery of organic remains. The other half was processed for the recovery of insect remains. Because of the clay-rich soil matrix, the samples were soaked for several days in calgon solution before being wet-sieved through a 0.3 mm mesh. Each sample was sorted using a binocular microscope and any items of archaeological importance removed for identification.

Three bulk samples were also processed from the group of remnant floor layers found in the hollow feature. These were from above the water table and did not offer good preservation of organic inclusions. The samples were subjected to flotation and wet-sieving for the recovery of charred macroscopic plant remains and other archaeological inclusions. The flots were sorted using a binocular microscope and the retents sorted by eye.



ILLUS 7 General view of the sunken house floor, showing the cobbled layer (Context 2024) in the base of the small trench; the 'hearth' (Context 2025) is visible at the junction of the two trenches

RADIOCARBON DATES

Samples of waterlogged seeds from three of the ditch fills recorded in Section IV were submitted for radiocarbon dating. The samples were processed at the Scottish Universities Research Reactor Centre (SURRC) and sent to the University of Arizona for accelerator dating. The results are presented below. The dates were calibrated using CALIB.

Sample	Context	BP	$\delta^{13}\text{C}$	SCR Probability	LCR Probability
AA-18519	5012	1895 \pm 60	-24.6‰	AD 54-AD 144	30 BC-AD 240
AA-18520	5013	1880 \pm 60	-22.2‰	AD 65-AD 215	AD 0-AD 250
AA-18521	5016	2190 \pm 60	-22.4‰	375 BC-176 BC	390 BC-100 BC

The two 'upper' dates from Contexts 5012 and 5013 are statistically indistinguishable from each other. In other words, although Context 5012 may have been deposited quite rapidly after the deposition of Context 5013, this sequence could also have occurred over a matter of decades. As radiocarbon analysis cannot distinguish such a time lapse, the two dates must, therefore, be interpreted as representing the same phase of deposition. In contrast, the stratigraphically lower date from Context 5016 is significantly different from the two 'upper' dates with an interval of c 300 radiocarbon years between the two phases of deposition. The calibrated ranges of the two phases, even the LCR ranges, are mutually exclusive. The sequence of these fills within the ditch is represented by Section IV (illus 4).

THE MACROPLANT ASSEMBLAGE

T Holden with wood charcoal identifications by Alan Duffy

Identification of seeds (used throughout to include fruits and parts of fruits) was made by reference to the modern comparative collection of AOC (Scotland) Ltd. Botanical nomenclature follows Tutin *et al* (1964).

Results

Throughout most of the lower layers of the ditch the preservation of botanical remains is primarily through waterlogging. The lower fills of the ditch comprise a number of sediments rich in clay/clay-silt with other minor inclusions. The botanical component within the basal fill (Context 5023) is present in low concentrations and is characterized by taxa of disturbed ground. These observations are consistent with a rapid rate of sediment accumulation as a result of sediments being washed from ditch sides upon which no stable plant community had been able to establish itself.

The sediments directly above the basal layer, distinguished by increasing quantities of fine organic material (Contexts 5013 & 5016), show slight increases in the concentration of identifiable plant components, but the botanical signal is still one of disturbed ground. This is likely to have derived from the exposed ditch sides with nitrophiles such as chickweed (*Stellaria media*) and small nettle (*Urtica urens*; see Hanf 1983) finding a suitable niche in the organic-rich sediments of the ditch bottom. These sediments must have been dry for several months on at least one occasion for these to have grown in the ditch bottom. It is also possible that seeds from surrounding agricultural soils, into which the ditch may have been cut, could have provided a source for some of the species preferring disturbed ground. There is no evidence for the establishment of a stable plant community within the environs of the ditch during the period in which this deposit was formed.

Context F5012, the deposit with the peaty texture, was interpreted in the field as a dump of organic material in the ditch. The plant remains also highlight the differences between this deposit and those beneath it. In addition to an increased concentration of nitrophilous species, such as the small nettle and chickweed, and other taxa of disturbed places, evidence for anthropogenic material was also present in the form of two charred barley grains and species of acid heath and woodland/scrub. These new elements, the charred grain, woodland/scrub and acid heath taxa, are also noted in Contexts 5011 and 5008, with over 300 flowers of heather/ling being recovered from the latter. Given that there were no previous acid heath signals from the lower sediments it is unlikely that this vegetation type was growing in the immediate vicinity. These additional elements may have derived instead from dumping of domestic, byre or construction waste in a part of the ditch. Alternatively they could represent material that had been blown out, or washed, into the ditch from occupation deposits. They could, for example, have blown from the roofs of nearby buildings thatched in heather or washed from turves that had been cut from heathland and used in the construction of buildings or in repairs to the enclosure bank itself.

The botanical component from Context 5006, the fill of the linear cut (Context 5007), includes taxa of disturbed ground, heathland and also contains a single charred barley grain. The dominant feature is the aquatic element which comprises flote grass (*Glyceria fluitans*) and marsh fox-tail (*Alopecurus geniculatus*) together with other species commonly associated with damp ground, such as forget-me-not (*Myosotis cf. laxa*) and lesser spearwort (*Ranunculus flammula*). The nature of this feature is unclear but it is very likely that it contained standing water for most

of the year and long enough for a stable flora to establish itself within it and on its banks. It is probable from both the preservation of the plant remains and the taxa present in Context 5006 that the bottom of this feature lay below the water-table on the site.

Most of the fills above this would appear to have been above the water-table, since preservation of all but the most robust seeds is very poor. Contexts 2009 and 2010 show vestiges of an aquatic flora indicating the persistence of the wet environment demonstrated in Context 5006. The number of identifiable elements from these and the upper fills of the ditch is such however, that they preclude any useful interpretation.

Samples taken from the remnant floor surfaces (Contexts 2023, 2025 & 2026) outside the main enclosure were investigated but contained nothing other than small fragments of wood charcoal and, in the case of Context 2026, coal. The wood charcoal was identified as oak (*Quercus* sp) in Context 2025, a single fragment of hazel (*Corylus avellana*) in Context 2026 and oak, hazel and alder (*Alnus glutinosa*) in Context 2023.

Summary

The waterlogged remains highlight the rapidity with which the basal layers of the ditch accumulated. No stable plant communities were able to colonize the sides of the ditch but it is possible that the base was periodically exposed, such that fast-growing nitrophilous species were able to colonize parts of it on at least one occasion. Some time in the early part of the first millennium AD material from beyond the immediately local environment of the ditch became incorporated into the ditch sediments. This included taxa from acid heath land and two charred barley grains. This may have occurred by deliberate dumping or as a result of casual accumulations of anthropogenically derived material. The presence of hulled barley grains would be compatible with the Iron Age radiocarbon dates derived from the lower sediments.

A small undated cut in the ditch sediments evidently contained standing water long enough for it to become the focal point of a semi-aquatic flora. This wet environment would appear to have continued to characterize the accumulating ditch sediments, although it is suggested that a fluctuating water-table was probably responsible for the poor preservation of plant remains in the upper sediments.

THE INVERTEBRATE ASSEMBLAGE

H Kenward, F Large, J Carrott & M Issitt

During August 1995 11 samples of sediment ('GBAs' sensu Dobney *et al* 1992) were submitted to the Environmental Archaeology Unit (EAU), York, for an assessment of their invertebrate remains; five were assigned high priority for further work. All of the samples were from Ditch Section IV. The archaeological questions addressed throughout the analysis of invertebrate remains relate to the use of the enclosure, conditions in the ditch, local ecology, economic activities in the environs of the site, and degree of interchange with other occupation sites. A full report (Kenward *et al* 1996) has been deposited with the archive of the project records at the National Monuments Record of Scotland (RCAHMS). The following is a summary only.

Methods

Sample numbers and sediment descriptions follow those originally assigned by the EAU during the assessment (Large *et al* 1995). All material remaining from assessment was processed for

three of the samples, and sediment from a monolith tin was provided in one case. One sample had been processed in its entirety and was studied using the flot from assessment. Recording methods followed those outlined by Kenward (1992). The interpretative methods employed in this study were essentially as employed in work on a variety of sites by Kenward and co-workers (see Kenward 1978, with modifications outlined by, for example, Kenward 1982 & 1988; Hall & Kenward 1990; Kenward & Hall 1995). Thus, interpretation rests primarily on a number of 'main statistics' of whole assemblages of adult beetles and bugs, and on the recognition of ecologically related groups of species.

Results

Invertebrate fossils were present in only moderate concentrations, necessitating the processing of quite large subsamples to recover useful assemblages of adult beetles and bugs. Preservation of insect remains was generally rather good, although the remains of some species from some samples showed a substantial degree of fragmentation, reflected in the number of taxa which could not be specifically identified reasonably quickly. A wide range of invertebrates was noted, including (in one or more samples) numerous mites, spiders, cladocerans, fly larvae, pupae, puparia and adults, ants, beetle larvae, scale insects and fleas.

The contexts are considered from lowest to highest through the stratigraphic sequence. The weight of the subsample processed for insect remains is given.

Context 5023 (1.0 kg) A small washover resulted from processing during assessment; it was mainly charcoal (to 7 mm) and some sand, with a trace of plant detritus (including moss). No invertebrates were recovered. Bearing in mind the stratigraphic position of this layer, the absence of fossils suggests an origin through redeposition of the glacial subsoil deposits.

Context 5016 (1.0 kg) The flot from processing at assessment was tiny and contained a few seeds and a little plant debris. There were only traces of invertebrate remains, including two *Daphnia* sp ephippia (water flea resting eggs) and two terrestrial beetles. These fossils were of no substantial interpretative value; there was no evidence from them for dumping of occupation material.

Context 5013 (5 kg) The concentration of macro-invertebrate remains was not as high as in some of the samples higher in the sequence (31/kg for the adult beetles and bugs), but the large subsample processed provided a very substantial assemblage. For the adult beetles and bugs, whole-assemblage diversity was quite high, but probably in the normal range for deposits formed in the open with a substantial component from natural or semi-natural habitats. These habitats contributed over half of the individuals and species, with aquatics very significantly represented (over a fifth of the individuals). The most abundant species was a water beetle (*Helophorus* sp, 13 individuals), and in total there were 16 aquatic taxa, all of which might be found in still water with at least some aquatic vegetation and not too much pollution, indicating the conditions within the ditch at this stage. *Daphnia* ephippia were extremely abundant. Damp-ground forms, likely to have lived at the edge of the water, were not present in significant numbers.

Among the terrestrial 'outdoor' species were phytophages suggesting the presence of herbaceous vegetation including crucifers, rushes (*Juncus* spp), docks (*Rumex* spp), knotgrasses (*Polygonum* spp) and vetches or clovers. Some degree of disturbance was thus indicated. There were a few dung beetles, perhaps indicating grazing nearby but not necessarily immediately adjacent to the ditch: three individuals of *Aphodius contaminatus* and a second *Aphodius*, two of *A ?prodromus*, and single specimens of *A ?ater*, another *Aphodius*, and a *Geotrupes* sp. This group of species, together with the plant-feeders, strongly

suggests human dominance over the landscape, and no insects indicative of unmodified 'natural' habitats were found.

Other decomposers were present in rather limited numbers, and (together with the dung beetles) accounted for less than a fifth of the assemblage of adult beetles and bugs. Species typically associated with fairly dry decaying matter were rare (only 3% of the individuals), and foul-matter taxa other than true dung beetles almost absent. Synanthropes (ie species favoured by human activity) typical of occupation sites were rare.

Overall, it appears that this deposit formed in fairly clean water with some aquatic vegetation, in an area which was strongly modified by human activity and which included grazing land, but no evidence of intensive occupation was obtained from the insect remains.

Context 5012 (270 g) No further material was available. The sample processed at the assessment stage did not produce enough remains to merit further, detailed analysis. The material was described at assessment as producing a small flot, consisting mostly of plant detritus, including moss and many seeds. There was an insect assemblage of modest size, dominated by aquatics, but with a few decomposers. It was suggested that the remains indicated natural aquatic deposition with a small input from dung, perhaps in grazing land, in the surroundings. There was nothing (from the insect remains) to suggest dumped material from occupation.

Context 5011 (3.45 kg) The concentration of remains was a little higher than in the sample from Context 5013 (46.4/kg for adult beetles and bugs). Outdoor taxa were predominant (over half of the species and two-thirds of the individuals falling in this category). Whole-assemblage diversity was not significantly different from the value for Context 5013. The dominant community was an aquatic one, over a fifth of the beetle and bug individuals belonging to aquatic taxa; there were also numerous *Daphnia ephippia*. The aquatic invertebrates suggested conditions as for Context 5013.

The terrestrial insects included a substantial proportion of plant feeders (accounting for almost a quarter of the assemblage). These phytophages mostly occurred in small numbers but the froghopper *Conomelus anceps* was abundant; with 17 individuals it was the commonest of the taxa contributing to the main statistics. *C. anceps* is associated with *Juncus* (rushes) and doubtless lived close to the ditch. Among the remaining terrestrial forms there were a few ground beetles and decomposers. The latter contributed only 9% of the assemblage, half of this component being associated with foul matter, including dung. Synanthropes were present in insignificant quantities, and all were regarded as facultative.

Deposition at this stage of the infilling of the ditch remained aquatic, and the surroundings were essentially as when Context 5013 was being laid down; evidence for grazing in the immediate surroundings was, however, considerably weaker.

Context 5008 (3.33 kg) The concentration of adult beetles and bugs was again higher in the subsample from this layer (58/kg). The proportion of aquatics (4%) was dramatically lower than in the rest of the sequence, and *Daphnia ephippia* were rare, but there were just enough water beetles to suggest at least temporary water. There was a much smaller component of plant feeders than in other samples from the site, and a notable feature of the 'outdoor' component was a group of species from moorland/heathland habitats (*Bradycellus ruficollis*, *Micreus ericae* and *Ulopa reticulata*). These may have arrived as 'background fauna', but importation with plant resources is a strong possibility.

The most striking feature of this assemblage was the presence of (relatively) abundant decomposers: 44% of the individuals fell in this category, as did 15 of the 17 taxa represented by three or more individuals. The most abundant taxa were a *Ptenidium* species (17 individuals), *Carpelimus bilineatus* (15), *Platystethus arenarius* (9), *Anotylus tetracarinatus* (7), *Cercyon analis* (6), and an *Atomaria* species (5). Some of these and some of the rarer decomposer taxa are regarded as at least facultative synanthropes, and there were 20 coded synanthropic taxa, contributing over a fifth of the assemblage. It appears likely that these either bred in some material in the dried-up ditch, or (more probably) entered with dumped refuse resulting from

human activity of some kind. The records of *Crataraea suturalis* and *Cryptophagus scutellatus* are regarded as quite strong evidence for artificial habitats. There were no strong synanthropes, however, and no clear evidence from the beetles for a fauna from within a structure. This may simply reflect the failure of such species to arrive at the site, rather than the lack of buildings contemporary with deposition — the rate of arrival of synanthropes at isolated rural sites is still a matter for speculation (Kenward, in press).

In strong contrast to this evidence is the record of seven human fleas, *Pulex irritans*. While this insect has occasionally been recorded on other hosts, it is reasonable to assume that the present specimens came from within a building *used* by humans (not necessarily a dwelling, however, since fleas breed in litter). A second significant record is that of very large numbers of scale insects (Coccidoidea). Although these have not been identified to species (thus giving a host range), it is most probable that they originated on plant material (such as brushwood), this or its decay products having been dumped into the ditch. Perhaps this material was a component of litter from the floor of a building. If this was the case, it seems as likely that the dumped layer included byre or stable litter as that it came from a house.

Context 5006 (3.27 kg) Although of lower diversity, the assemblage of beetles and bugs from this deposit was broadly like those from Contexts 5013 and 5011, with a large proportion of ‘outdoor’ forms and a very large aquatic component (there were also numerous *Daphnia ephippia*), indicating conditions much as lower in the sequence. Clearly the deposits accumulated in water, and probably fairly slowly. There was a very modest decomposer group (only a fifth of the individuals). Half of the latter were probably associated with foul matter, but dung beetles (*Aphodius*) were not quite sufficiently numerous to indicate very local grazing. Synanthropes were rather rare and over half categorised as ‘facultative’, so that there was no clear evidence of adjacent human occupation from the insect remains.

Interpretation of the invertebrate remains

The massive ditch at Brixwold appears to have infilled gradually in its early stages by a combination of sedimentation from the steep unstable sides and deposition of organic matter through natural vegetational development. There is no evidence from the invertebrate remains for the introduction of any material by dumping at this stage. Indeed, and perhaps remarkably, there is no evidence for any human activity from the lower contexts (5023–5011) or from the fill of the secondary cut (5006), apart from modification of the landscape resulting from agricultural use. There was probably grazing land around the site, although the evidence from dung beetles does not indicate the immediate presence of livestock in the ditch. The insects indicate that the water in the ditch was not seriously polluted (by dung or human waste), that it carried an aquatic flora including some emergent or waterside plants, and that its immediate surroundings probably had a vegetation limited to typical taxa of grazing land or disturbed ground. Grassland is suggested by the records of *Phyllopertha horticola* (larvae on the roots of grasses and herbs, often in poor pasture in hill areas) and *Dascillus cervinus* (larvae on plant roots, typically grasses).

The steepness of the cut sides at the earlier stages of infill may be responsible for the remarkably small proportion of species (1.5–5.2%) associated with damp ground and water margins in the lower three contexts. Perhaps there were effectively no ‘marginal’ habitats at this stage. The proportion is rather higher (at 8%) in the uppermost context (5006). By this stage the cut sides may have collapsed to become shallower, allowing invasion of marginal vegetation and exposing bare mud for insect colonization.

Trees were represented by only a single insect: the tiny weevil *Rhamphus pulicarius*, found on various tree and shrub species. Only one deadwood insect was recorded: a woodworm, *Anobium ?punctatum*, represented by a minute elytral fragment from Context 5013. While *A*

punctatum is typical of structural timber, it is common in the wild too; it is also possible that the specimen belongs to *A inexpectatum*, found in ivy.

The contrast between the assemblages from Context 5008 and those from the remaining contexts is striking, and most likely to be the result of dumping of litter by humans. The material may have come from a stable or byre; even this layer gives no definitive indications of human habitation, however.

At first sight, it seems unlikely that occupation contemporary with the earlier stages of infilling of the ditch would not have left some evidence in the insect assemblages. It must be said, however, that the relationship between the distance from buildings and the numbers of synanthropic insects likely to enter the deposits examined for insects is uncertain (Kenward, in press).

An impoverished synanthropic fauna at Brixwold may have been a result of the small size and isolation of the site, or of the early date of the deposits, perhaps prior to the arrival of many typical synanthropes in the area. Although more densely occupied sites of the late first to third centuries AD in England often had rich synanthropic faunas, some more isolated ones had a very restricted range of such species. Southern Scotland may have seen too little Roman military and economic influence for colonization by a rich synanthropic fauna to be inevitable. Examination of the insects in Roman military sites in the area would be most instructive in this respect.

On the other hand, is it possible that the Brixwold site was abandoned during an early stage of construction, when the ditch was dug but before any occupation which left clear traces? If this was so, perhaps the evidence for synanthropes, and thus for human use of the site in the later part of the ditch sequence, is completely unrelated to the initial construction, and perhaps this stage was one of very low-grade secondary use as an animal enclosure with some kind of shed to protect stock and perhaps provide shelter for their human minder.

FLINT

Thomas Rees

Although four lithic objects were recovered in the course of excavation, only one, Find 9, was worked flint. The other three are stones which have suffered plough damage (see archive).

Find 9 is a regular flake, of secondary material, of an orange/brown flint (27 mm by 25 mm by 20 mm). A pronounced bulb of percussion can be identified on the ventral surface. Sub-parallel removals have created an abrupt edge at its distal end. The retouched edge continues, shallowing to semi-abrupt, down the left side of the flake to the proximal end. This form of the retouch indicates that the piece is a thumbnail scraper which could be classified as an Angled II Scraper (Wickham-Jones 1990, 91).

A single lithic can never be used to provide a date. However, Find 9 is probably more from the Neolithic or early Bronze Age than any other period. Its presence upon an Iron Age site would, therefore, suggest that it was a residual or chance find.

ANIMAL BONE

Tanya O'Sullivan

Two samples of animal bone (Finds 1 & 2) were retrieved from Context 5008 in Ditch Section IV. Find 1 contained 26.61 g of small unidentifiable fragments in poor condition. Find 2 consisted of

a well-preserved sheep mandible from an animal under 20 months old (the third molar was unerupted).

DISCUSSION

THE ENCLOSURE: FORM, USE AND DURATION

The excavated enclosure was defined only by the ditch but its original perimeter probably consisted of a bank, ditch and, possibly, a counterscarp bank, with upcast soil from the ditch being used to construct the banks. The ditch defines a roughly square area with internal dimensions of c 40 m by 42 m, or c 1700 sq m (0.16 ha). The bank is likely to have been at least 5 m wide and may have been separated from the ditch by a berm. Thus, the available surface area within the enclosure was probably not more than c 850 sq m (0.085 ha). No entrance was identified, either from aerial photographic evidence or during excavation. It seems most likely, therefore, that the entrance was located somewhere along that portion of the enclosure boundary which is now masked by the modern farm track (illus 2).

Although the ditch, in its present condition, is c 7 m wide, it was probably somewhat narrower when first dug out. The dish-shaped profile of the upper section was probably created by erosion of the ditch edges, causing a gradual splay to develop over the steep-sided profile of the lower section. Thus, if the profile of the lower section is projected to the stripped subsoil surface, the original width of the ditch can be estimated at c 4.5 m.

The basal deposit (Context 5023) in the ditch was very similar to the natural subsoil from which the ditch was quarried and is interpreted as construction-spoil or primary erosion from the newly built earthwork. The radiocarbon date from the layer immediately above the primary infill, Context 5016, indicates deposition some time between 390–100 cal BC and provides a *terminus ante quem* for the construction of the ditch and bank. The radiocarbon dates from Contexts 5012 and 5013 indicate that a significant duration of time elapsed before further deposits were allowed to accumulate in the ditch. This gap of nearly 300 radiocarbon years presents some interpretative problems, mainly because there is no evidence of any anthropic activity between the two phases. It is possible that the ditch was abandoned and then re-cut in the early centuries AD. However, there is no evidence for a re-cut separating the dated deposits, although it is possible that post-depositional soil changes may have obscured such detail. An alternative interpretation is that, for three centuries, the ditch was regularly cleaned out, presumably to maintain its effectiveness as a defensive perimeter, thereby removing all evidence of anthropic activity and preventing the establishment of a stable plant community in the immediate vicinity (Holden, above). In this scenario maintenance of the ditch ceased sometime in the early centuries AD and deposits begin to accumulate in semi-waterlogged conditions.

There is, however, no unequivocal evidence to support either interpretation and it is concluded here that it is not possible to determine whether activity on the site was continuous from its initial construction through to the early centuries AD, or whether there were two distinct phases of activity separated by a hiatus of up to 300 years.

As both the plant and invertebrate assemblages demonstrate, conditions in and around the ditch became considerably wetter in this interval. Rainwater and accompanying debris probably collected along the northern circuit of the ditch because it lay on the downslope side of the site. It is possible that the linear feature (Context 5007) was dug to capture the ponded rainwater and acted as a small water reservoir for some agricultural/industrial process. As this appeared in no other section trench, it is unlikely to represent a re-cut of the enclosure ditch. Its date is uncertain but it clearly post-dates substantial infilling of the ditch.

The ditch profile above this linear cut changes dramatically in shape and content. The deposits in the upper half of the ditch are much stonier and are interpreted here as a mixture of ploughsoils derived from adjacent surfaces and subsoil deriving from the gradual destruction of the earthwork by tillage and livestock erosion. The movement of livestock would also have eroded the ditch edge, eventually producing the wide, dish-shaped profile visible in section. These deposits signal the abandonment of the bank and ditch as a defensive or settlement enclosure. The upper ditch fills probably accumulated quite rapidly, although sandwiched between them is one unusually thin layer of grey clay (Context 2009) which spans the entire ditch. This may represent a stable period when a topsoil layer developed *in situ* within the partly infilled ditch.

The evidence for human activity in the ditch deposits comes almost exclusively from Contexts 5008, 5011 and 5012, dated to the 1st–2nd century AD and later. Analyses of the plant and invertebrate assemblages from these deposits concur in interpreting them either as waste from a dwelling house or byre waste dumped into the ditch. A sheep's jawbone and three charred barley grains provide the only evidence for economic activities, although the presence of dung beetles is thought to indicate grazing nearby.

Although the sparse evidence for human occupation gleaned from the ditch deposits may not necessarily relate to occupation within the enclosure at all, it seems highly improbable that the enclosure was never occupied. The absence of recorded features in the interior is probably due to the severe plough-truncation observed at the site. The rate of soil loss can be assessed by comparing the relative levels of the farm track which forms the south boundary of the excavated area and the tilled field on the north, or downslope side of the track. The farm track does not appear on the first edition of the Ordnance Survey (OS 1852) and was, therefore, built sometime during or after the 1850s. As it is approximately 0.4 m higher than the surrounding fields, this indicates that an equivalent depth of soil has been lost over the area of the site within the last 140 years or so. The consequences, in terms of truncation of features within the enclosure (eg the foundation trenches of earth-fast, timbered house walls, paved and metalled areas or spreads of occupation debris) have evidently been severe. Should any remnant features have survived truncation, gleying of the upper zone of the subsoil will have obscured them by eliminating the colour differences by which these could have been recognized in the field.

THE EXTERNAL FEATURE: A POSSIBLE HOUSE REMNANT?

The nature of this feature remains enigmatic. It is not clear, for instance, whether the hollow is a remnant of a much larger, natural depression, subsequently used by man, or whether it was deliberately quarried out. The original depth of the hollow may be estimated as at least 0.85 m, being the sum of its present depth (0.15 m), the depth of overlying ploughsoil (c 0.3 m) and the depth of soil loss indicated by the present level of the farm track relative to the excavated area (0.4 m). The pebbled layer, Context 2024, has all the appearance of a floor surface while the scorched area, Context 2025, produced a small quantity of wood charcoal and may have been the site of a hearth. The identification of these features as remnants of a house was too tentative to justify further investigation by radiocarbon dating.

EARTHWORK ENCLOSURES IN THE TYNE/FORTH PROVINCE

Rectilinear enclosures have become a familiar feature of settlement evidence throughout that area defined by prehistorians as the Tyne/Forth province (Jobey 1982a, Fig 8). There are now 30 known examples in Midlothian (RCAHMS 1988) and 53 in East Lothian (Jarron 1995). The great majority survive as cropmark features, but upstanding examples are known in Eastern

Dumfriesshire (RCAHMS 1997) and in Tynedale (Jobey 1982b). Despite their widespread occurrence, very few have been excavated and, with a ground-plan as the only attribute available for analysis, an assortment of shapes and sizes of enclosure has been ascribed to this category simply because there is some angularity to their layout. In East Lothian, shapes range from the precisely square or rectangular (Long Yester 4 & 6; NT 56 NE 19 & NT 56 NW 18) to the octagonal (Waughton; NT 57 NE 22) and sizes vary from 0.06 ha at Myreside (NT 56 NW 20) to 0.9 ha at East Mains (NT 46 NE 17). These are differences which, at present, can only hint at varying function and possibly a wide chronological spread.

Within this category one group has become much more well defined as a result of the work of George Jobey in two areas: North Tynedale and the coastal plains of south-eastern Northumberland. These are his Type 1 settlements, square or rectangular, single-ditched enclosures with a single entrance, enclosing an average area of 0.13–0.15 ha, and containing one or two roundhouses (Jobey 1970a). Excavation at three sites in the upper valley of the Tyne has consistently recorded the replacement of an early rectilinear timber palisade by a more substantial perimeter; these being a stone wall at Tower Knowe (Jobey 1973b) and a ditch, bank and counterscarp bank at Belling Law (Jobey 1977) and Kennel Hall Knowe (Jobey 1978). The ditched enclosure at Belling Law was no earlier than the second century AD and at Tower Knowe no earlier than the first century AD.

A similar sequence of events was revealed at West Brandon (Jobey 1962) where an early palisade was replaced by a ditched enclosure, but at other excavations of rectilinear cropmarks on the Northumbrian coastal plain, evidence for an early timber palisade phase has not been found. At Burradon (Jobey 1970b) a rectilinear ditched enclosure possibly dating to as early as the 5th–6th centuries BC was replaced by a smaller ditched enclosure in the second century AD. At Hartburn (Jobey 1973a) a ditched enclosure was occupied from as early as the 5th–6th centuries BC to the 2nd–3rd centuries AD while at Doubtstead a ditched enclosure was occupied during the 1st–2nd centuries AD (Jobey 1982a).

This corpus of excavations has provided the framework for any subsequent discussion of rectilinear enclosures in the Tyne/Forth province (eg Macinnes 1984). When first discussing the growing number of rectilinear enclosures appearing in the Lothians, Maxwell (1970, 87) conjectured that ‘although they were in use during the Roman period, their first appearance may antedate the Roman occupation by several centuries’. Brixwold is the first of these types of enclosure on the Lothian plain to be dated and the results confirm Maxwell’s early conjectures. The dates from Brixwold are also comparable with the dates from the Northumbrian sites, indicating initial construction in the 2nd–3rd centuries BC and a change in the nature of the settlement in the 1st–2nd centuries AD. In Northumberland this change is signalled by the construction of a more substantial perimeter; at Brixwold this change is possibly signalled by either re-fortification of the defensive perimeter or abandonment of the ditch.

One recurring theme of settlement history in south-eastern Scotland is the perceived move away from defended enclosed settlement during the Romano-British period, possibly reflecting the more peaceful conditions brought about by the Votadinian alliance with Rome (Macinnes 1984). The size of the perimeter at Brixwold suggests that defence was a priority. Although very similar in area, Brixwold differs from the other excavated rectilinear enclosures in the size of its ditch. On the Northumbrian sites the ditches are, on average, 3 m wide by 1.5 m deep, enclosing an area of 0.14 ha. At Brixwold, a ditch 4.5 m wide and at least 3.0 m deep encloses an area of 0.16 ha. Some of the upstanding examples in Eastern Dumfriesshire display similar proportions, with massive ditches around relatively small interiors, such as Laverhay (0.09 ha) and Shielburn (0.14 ha) (RCAHMS 1997). The builders of Brixwold apparently expended almost twice as much

energy to enclose roughly the same area of land. Roughly 2500 tons of soil would have been dug out to create the bank and ditch. At Port Seton West, a defended settlement on the Lothian plain (Haselgrove & McCullagh 1996), a similar tonnage of soil was removed from the ditches but the area enclosed, at 0.33 ha, was almost double that at Brixwold (McCullagh, pers comm). Such comparisons lead one to echo the view of Bowden & McOmish, that enclosure 'may owe less to the demands of physical defensive capability than to the desire for increased prestige and isolation' (1987, 83). Considerations of defence and social status relate directly to the size of the site's resident population and unfortunately, at Brixwold we can do no more than speculate on the domestic arrangements within the enclosure.

ACKNOWLEDGEMENTS

The project was funded by Walker Group (Scotland) Ltd. The archaeological assistants were Brigit McGill, Alan Hunter Blair, Tom Rees, John Duncan and Joseph Kane. Preliminary sorting of the processed samples was conducted at AOC (Scotland) Ltd by Ruby Ceron. The report illustrations were prepared by Emma Hook and Naomi Crowley. Harry Kenward is grateful to English Heritage for allowing him to work on this material.

REFERENCES

- Barber, J 1985 'The pit alignment at Eskbank Nurseries', *Proc Prehist Soc*, 51 (1985) 149–66.
- Bowden, M & McOmish, D 1987 'The required barrier', *Scott Archaeol Forum*, 4(2) (1987), 76–84.
- Carter, S 1994 'Dalhousie Mains, Bonnyrigg: archaeological field evaluation of a cropmark enclosure at Brixwold'. Unpublished report to Walker Group (Scotland) Ltd by AOC (Scotland) Ltd.
- Dobney, K, Hall, A R, Kenward, H K & Milles, A 1992 'A working classification of sample types for environmental archaeology', *Circaea*, 9 (1992), 24–6.
- Hall, A R & Kenward, H K 1990 'Environmental evidence from the Colonia: General Accident and Rougier Street', *The Archaeology of York*, 14(6) (1990), 289–434 + p. II–IX + Fiche 2–11. London.
- Hanf, M 1983 *The Arable Weeds of Europe*. Hadleigh.
- Hanson, W S & Yeoman, P A 1988 *Elginhaugh: a Roman fort and its environs*. Edinburgh.
- Haselgrove, C & McCullagh, R 1996 'Excavations at Fisher's Road, Port Seton, East Lothian, 1994 and 1995', *Trans E Lothian Antiq Fld Natur Soc*, 23 (1996), 1–12.
- Jarron, M H 1995 'A study of rectilinear enclosures in East Lothian'. Unpub BA thesis, Univ Durham.
- Jobey, G 1962 'An Iron Age homestead at West Brandon, Durham', *Archaeologia Aeliana*, 4th ser, 40 (1962), 47–58.
- Jobey, G 1970a 'Early settlement and topography in the Border Counties', *Scott Archaeol Forum*, 2 (1970), 73–84.
- Jobey, G 1970b 'An Iron Age settlement and homestead at Burradon, Northumberland', *Archaeologia Aeliana*, 4th ser, 48 (1970), 51–95.
- Jobey, G 1973a 'A native settlement at Hartburn and the Devil's Causeway, Northumberland', *Archaeologia Aeliana*, 5th ser, 1 (1972), 11–53.
- Jobey, G 1973b, 'A Romano-British settlement at Tower Knowe, Wellhough, Northumberland', *Archaeologia Aeliana*, 5th ser, 1 (1972), 55–85.
- Jobey, G 1977 'Iron Age and later farmsteads on Bellinglaw, Northumberland', *Archaeologia Aeliana*, 5th ser, 5 (1977), 1–38.
- Jobey, G 1978 'Iron Age and Romano-British settlements on Kennel Hall Knowe, North Tynedale, Northumberland', *Archaeologia Aeliana*, 5th ser, 6 (1978), 1–28.
- Jobey, G 1982a 'The settlement at Doubtstead and Romano-British settlement on the coastal plain between Tyne and Forth', *Archaeologia Aeliana*, 5th ser, 10 (1982), 1–23.

- Jobey, G 1982b 'Between Tyne and Forth: some problems', in Clack, P & Haselgrove, S (eds) *Rural Settlement in the Roman North*. Durham.
- Kenward, H K 1978 'The analysis of archaeological insect assemblages: a new approach', *The Archaeology of York*, 19(1), 1–68 + pl I–IV. London.
- Kenward, H K 1982 'Insect communities and death assemblages, past and present', in Hall, A R & Kenward, H K (eds), *Environmental Archaeology in the Urban Context*, 71–8. London.
- Kenward, H K 1988 'Insect remains', in Schia E. (ed) *De arkeologiske utgravninger in Gamlebyen, Oslo. Vol. 5 Mindets Tomt–Sondrefelt*, 115–40. Ovre Ervik: Alvheim and Eide.
- Kenward, H K 1992 'Rapid recording of archaeological insect remains — a reconsideration', *Circaea*, 9 (1992), 81–8.
- Kenward, H (in press) 'Synanthropic decomposer insects and the size, remoteness and longevity of archaeological occupation sites: applying concepts from biogeography to past 'islands' of human occupation', in Buckland, P C (ed), *Quaternary Insects*. Chichester.
- Kenward, H K & Hall, A R 1995 'Biological evidence from Anglo-Scandinavian deposits at 16–22 Coppergate', *The Archaeology of York*, 14(7) (1995), 435–797 + xxii + loose figures. York.
- Kenward, H, Large, F, Carrott, J & Issitt, M 1996 'Invertebrate remains from excavations at Dalhousie Mains, Bonnyrigg, Midlothian (site code: 1140): Technical report', *Reports from the Environmental Archaeology Unit, York*, 96/6.
- Large, F, Kenward, H & Issitt, M 1995 'Assessment of invertebrate remains from excavations at Dalhousie Mains, Bonnyrigg, Midlothian (site code: 1140)', *Reports from the Environmental Archaeology Unit, York*, 95/47.
- Macinnes, L 1984 'Settlement and Economy: East Lothian and the Tyne-Forth Province', in Miket, R & Burgess, C (eds) *Between and Beyond the Walls: essays on the prehistory and history of North Britain*. Edinburgh.
- Maxwell, G 1970 'Early rectilinear enclosures in the Lothians', *Scott Archaeol Forum*, 2 (1970), 86–9. Edinburgh.
- OS 1852 Ordnance Survey (1st edn) 'Edinburghshire'. Sheet 13 (1850–2), 6".
- Raisen, P & Rees, T 1996 'Excavations of three cropmark sites at Melville Nurseries, Dalkeith', *Glasgow Archaeol J*, 19 (1996), 31–50.
- RCAHMS 1988 Royal Commission on the Ancient and Historical Monuments of Scotland. *Archaeological Sites and Monuments of Scotland No 28 — Midlothian (prehistoric to early historic)*, Midlothian District, Lothian Region, Edinburgh.
- RCAHMS 1997 *Eastern Dumfriesshire: an archaeological landscape*. Edinburgh.
- Tutin, T G, Heywood, V H, Burges, N A, Valentine, D H, Walters, S M & Webb, D A 1964 *Flora Europaea*. Cambridge.
- Wickham-Jones, C R 1990 *Rhum, Mesolithic and Later Sites at Kinloch, Excavations 1984–86*. Soc Antiq Scot Monogr Ser, 7.