Proc Soc Antiq Scot, 132 (2002), 139–192

Excavation of a Neolithic occupation site at Chapelfield, Cowie, Stirling

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ABSTRACT

The prehistoric occupation site at Chapelfield, Cowie, Stirlingshire had three phases of use, radiocarbon-dated to the Mesolithic, early Neolithic and middle Neolithic periods. The earliest phase was represented by three pits, which contained carbonized remains, dated to between the seventh and fifth millennium BC*. The second phase of occupation was marked by a further group of pits with structured deposition of artefacts, including carinated bowls and pitchstone blades. This phase may also have seen the occupation of a series of small oval structures which post-date the phase one pits. The oval structures were constructed of stakes with no marked entrance and few internal features. The final phase of activity was marked by one pit (IV), which contained Beaker pottery and carbonized material which gave a radiocarbon date of 3050–2450 cal* BC*. This pit was accompanied by two circular structures with double walls constructed of stakes, central posts and east facing entrances.*

INTRODUCTION

Between July and August 1995 Ogilvie Builders Ltd commissioned Glasgow University Archaeological Research Division to carry out an archaeological investigation of a possible Iron Age site in Chapelfield, Cowie, Stirlingshire. The site (NGR NS 8363 8957) was thought to include a c 80m long stretch of a possible truncated palisade ditch identified during the assessment phase (Banks 1994). This feature proved to be a modern land division boundary ditch. However, more extensive work revealed a series of structures defined by stake-holes and a number of pits containing Neolithic pottery and a longer excavation than originally planned was carried out; this further phase of work was jointly funded by Ogilvie Builders Ltd, Historic Scotland and the then Central Regional Council.

The site lies in a large field to the north-west of the village of Cowie (illus 1). Lying close to the '25m raised beach' above the Carse of the Forth valley, the site had probably always suffered from poor drainage, as evidenced by 'extensive efforts to drain the field' (Banks 1994, 5). There had been two or possibly three phases of 20th-century drain-digging and a substantial culvert had been built during the 19th century: all had caused considerable damage (illus 2). The site lay at the point where a natural slope began to level out, where there was a natural break in the subsoil geology; the north-west portion of the

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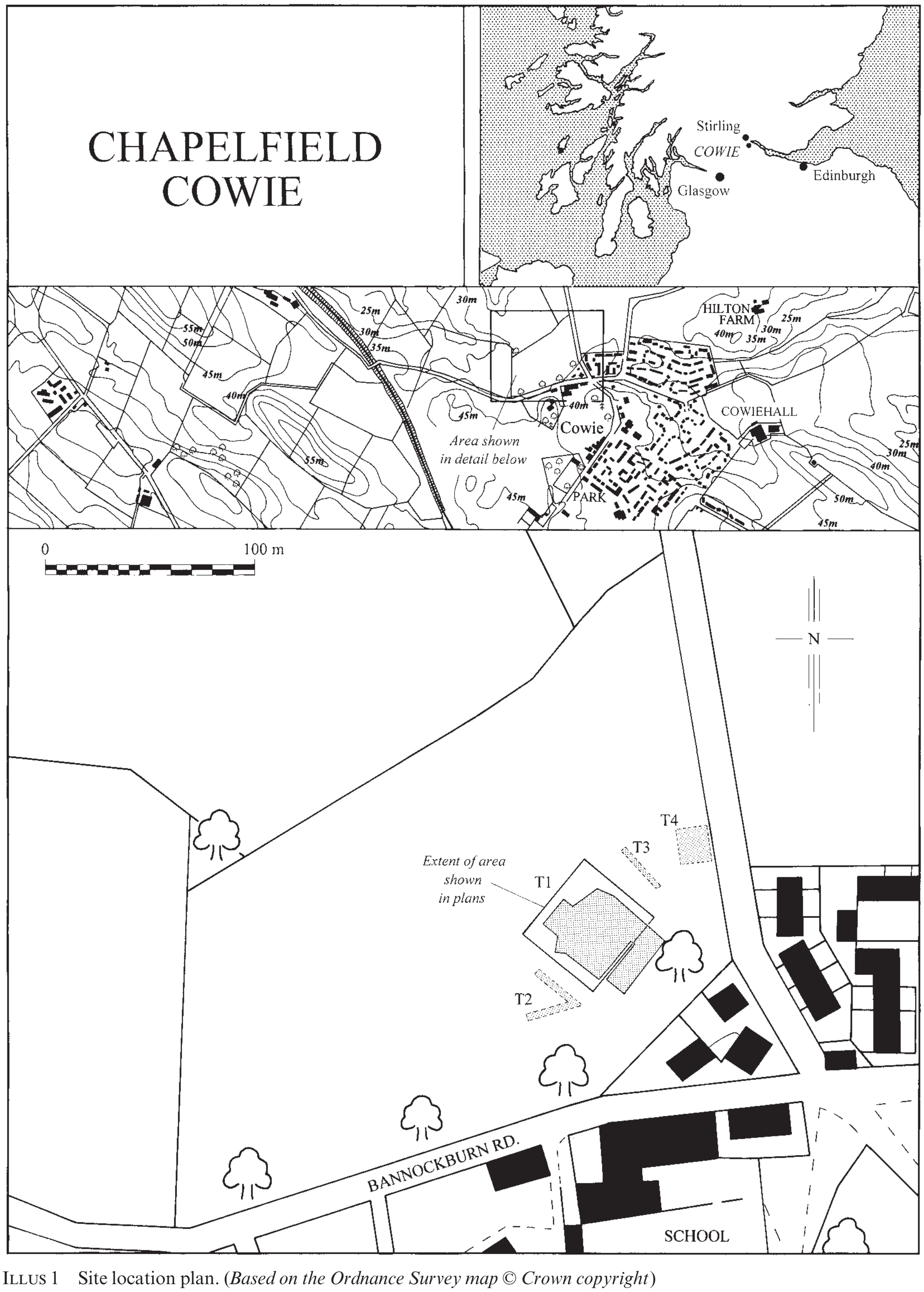
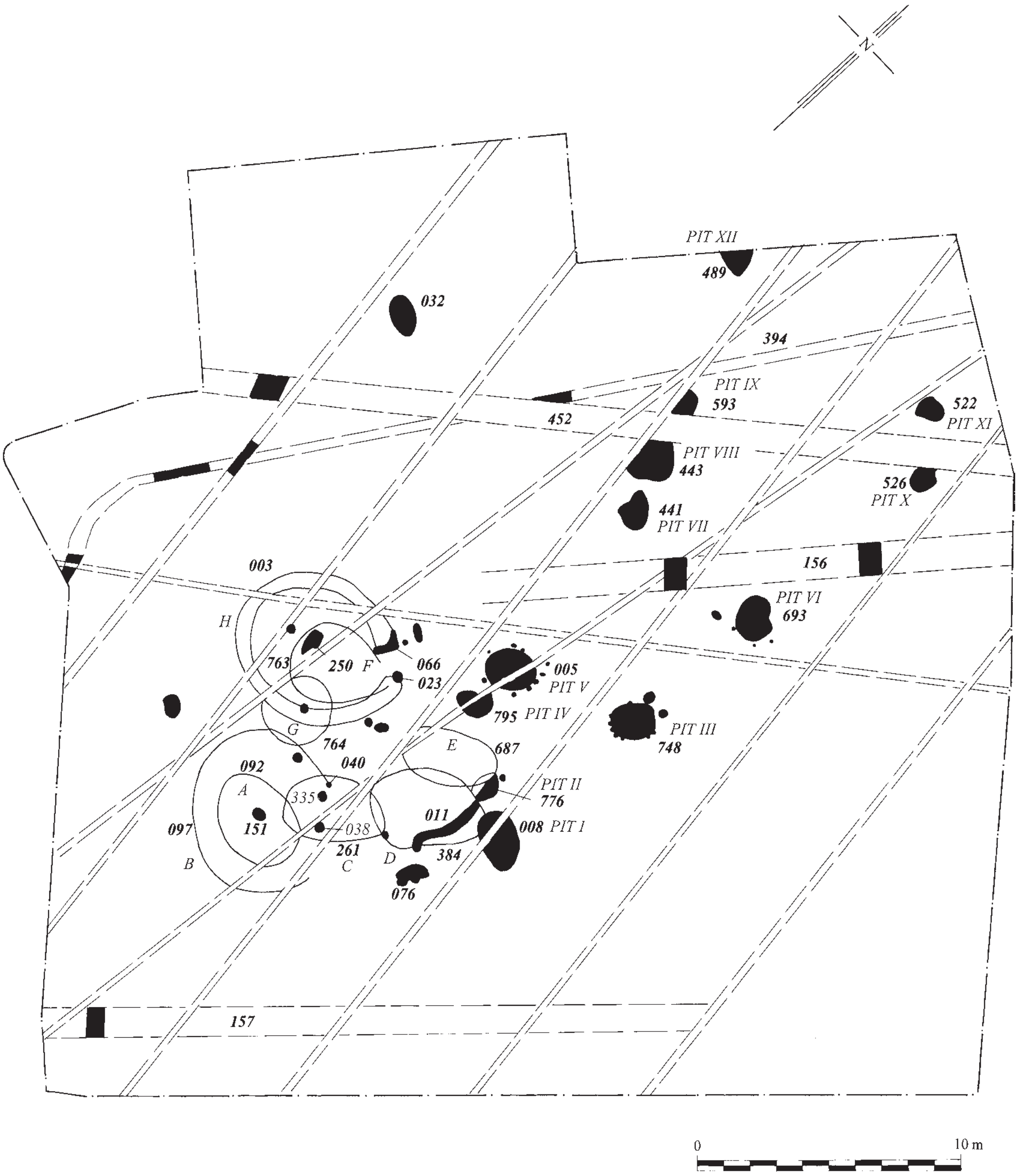


Illus 1 Site location plan. (*Based on the Ordnance Survey map © Crown copyright*)



Illus 2 Plan of the main trench

site lay on alluvial estuarine beach silts and clays which developed into poorly drained gley warp soils (Carbrook Association). The south-east of the site, in contrast, lay on fluvio-glacial sands and gravels (Darvel Association). The reports on the excavated features and the material from them are summarized for publication; full versions have been deposited with the site archive in the National Monuments Record of Scotland.

ILLUS 3 View of the site under excavation showing structures C & H and pits I & II

THE EXCAVATION

There were three types of archaeological structure/feature: the structures relating to the occupation area; the features in the area of the pits; a group of linear features either cutting E/W across the site, or located within an area to the south-east of the site which was very disturbed. This paper focuses on the first two groups; see Atkinson 1995 for further discussion of the third (which were modern in date).

THE STRUCTURES

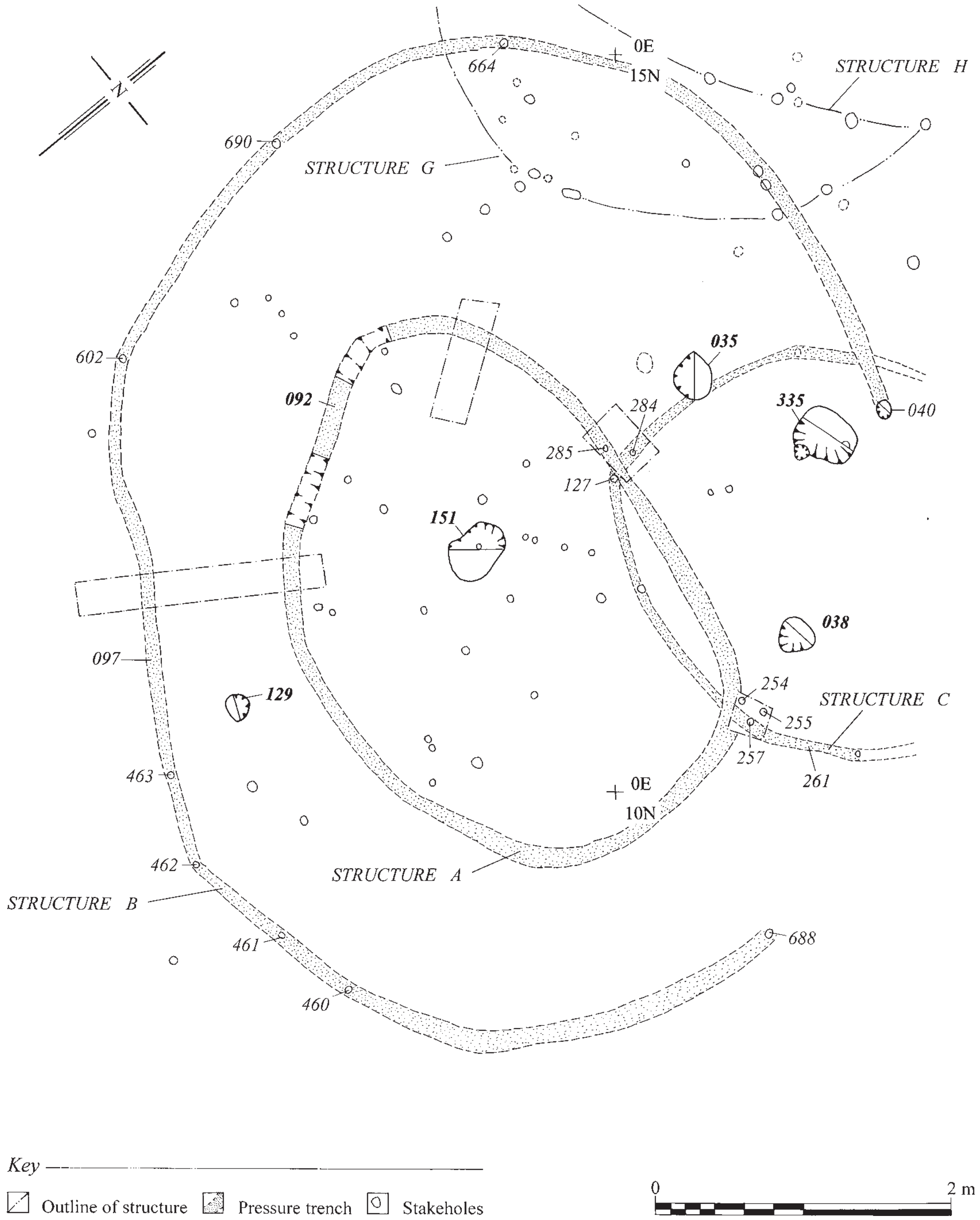
The southern part of the site was dominated by a series of eight superimposed ephemeral structures covering an area measuring about 15m across (illus 3). In the following description of the structures the term 'fence slot' means a type of shallow trench, which contained stake-holes in its base, and appeared to constitute the walling of the structures. See Barclay (1993) and Atkinson (2000) for other examples of this form of construction.

Structure A

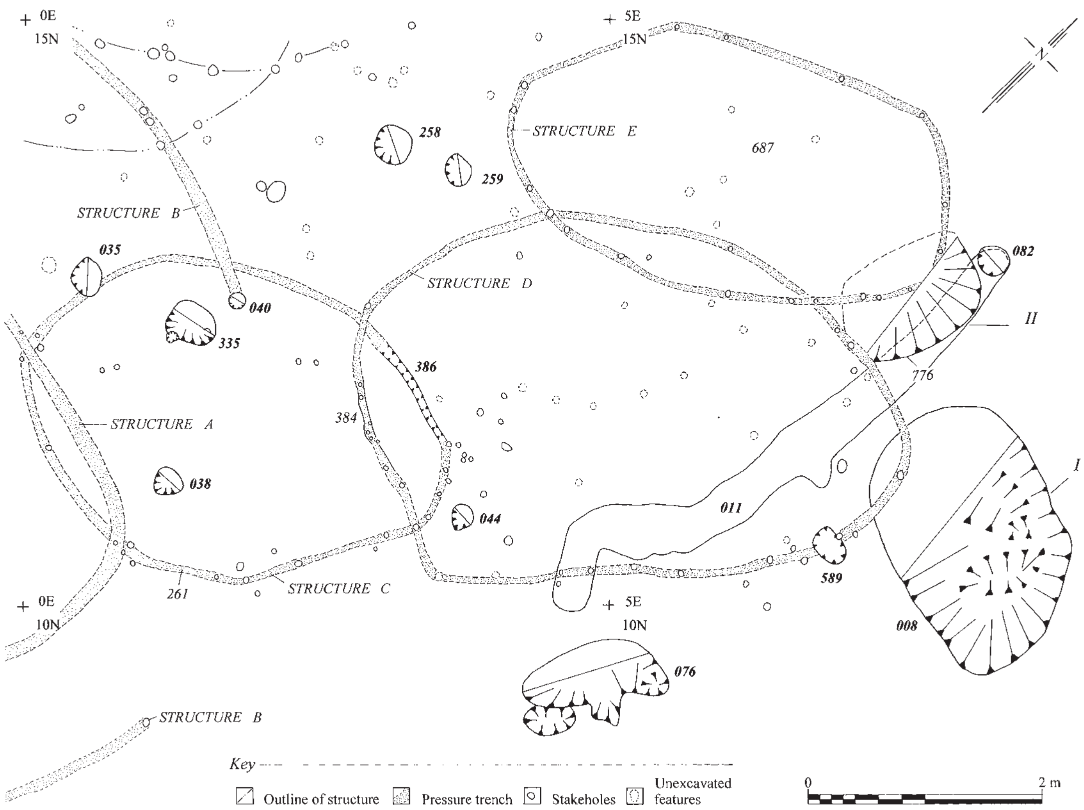
Structure A was defined by a fence slot some 0.12m wide (illus 4) defining an oval structure 3.6m long by 2.4m wide, aligned NW/SE, with no identifiable entrance. The stake-holes in the interior may indicate the existence of partitions, but we cannot be sure that they were associated with the structure. The stake-holes, which were associated with the structure (254 & 285), ranged in size from 60–90mm in depth and 50–70mm in diameter. They had vertical profiles and a very uniform fill of mid-brown sandy silt, as had the fence slot which overlay them.

Structure B

Structure B was more ephemeral, consisting of a large oval stain defining a structure 6.6m long by 5.1m broad, aligned NW/SE. A possible entrance was noted along its NE-facing side where a group of posts (040, 335 & 038) was recognized, two to



Illus 4 Structures A & B



ILLUS 5 Structures C, D, E and pits I & II

the north and one to the south. Later truncation of the entrance by modern drainage may have damaged this feature. The excavation of the stain revealed that the feature had no cut and appeared instead to be a very fugitive mark only visible during certain times of the day depending on the soil conditions. However, a series of stake-holes was clearly visible and excavated from within it. A shallow pit (151) in the centre of Structure B may instead be related to Structure A.

There was no stratigraphic relationship between Structures A and B; however, the sedimentological analysis (Duncan, below) suggests that they may be contemporary and therefore two parts of a single building.

Structure C

Structure C lay along the south-western edge of the settlement area. Structure C predated both Structure A and Structure D (illus 5). Structure C was very similar to Structure A – oval on plan and delineated by a series of stake-holes and an unbroken fence slot. It was 3.6m long by 2.6m wide, aligned E/W.

Structure D

Structure D was similar, although somewhat larger (illus 5). As with the other structures it comprised a series of stakes lying within a fence slot, with no evidence of an entrance. It was oval on plan, measuring 4.7m by 2.9m, aligned E/W. Its interior contained many stake-holes. A dug channel (with a light grey ashy sand fill (797) containing a number of flat stones lying at an angle along its cut (011)) began slightly to the south of the structure's southern wall, entered the building and followed the wall round to the north-east from where it continued in a north-eastern direction. It may have been a drain. This channel had no stratigraphic relationship with

Structure D, but both cut (and therefore post-dated) pit II. Structure D also cut pit I, post-dated Structure C and pre-dated Structure E. Carbonized material from pit I may provide a terminus post quem of 4540–4330 cal BC for the building of the structure.

Structure E

Structure E was similar to Structure C: it was oval, aligned E/W and measured 3.7m by 2.1m with no visible entrance. It was defined by a series of stake-holes filled with a mid-brown sandy silt, within a narrow fence slot with a similar fill.

A floor (687; not marked on illus 5) survived, represented by a spread of fine greyish-orange sand, some 0.1m thick. Structure E post-dated both Structure D and pit II. Carbonized material from pit II may provide a terminus post quem of 3980–3780 cal BC for the construction of building E.

Structure F

Feature F was one of three structures (F, G & H) at the north of the site, that appeared to inter-cut each other (illus 6). It is defined by a hypothetical line on illus 6 based on observations in the field, which seem to suggest a correlation between stake-holes. Although they intersected, no stratigraphic relationship could be established. However, sedimentological analysis suggests Structure F is a separate construction (Duncan, below). Structure F was sub-circular in plan and may have had an entrance to the east defined by two small posts (226 & 140), which interfered with the entrance to Structure H. It measured 3.8m E/W by 3.3m N/S, defined by a series of stake-holes starting at the interior wall of H and arcing round to its entrance. All the stake-holes were cut through a clay layer (762), also present beneath Structures G and H, and were c 60mm in depth with a relatively homogeneous fill of mid-brown silt.

Structure G

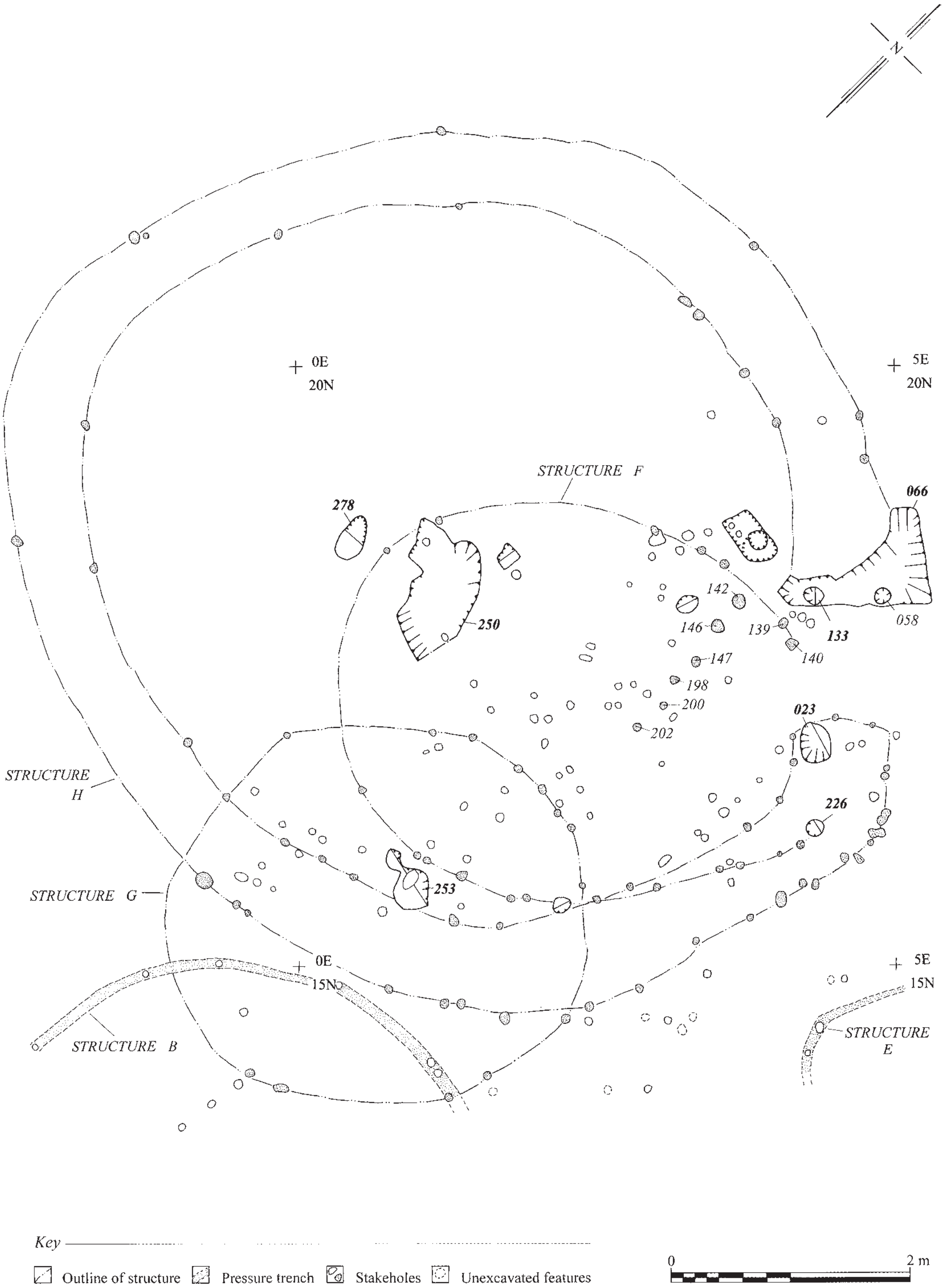
Structure G was similar to Structures A, C, D, E and F. It linked the southern and northern groups of buildings. Although it intersected Structures A, F and H no stratigraphic relationships could be established. It was sub-circular, 3.4m E/W by 3.1m N/S, the long axis SW/NE, and was defined by a series of stake-holes, with no evidence of an entrance. As elsewhere on site, the stake-holes were usually 60–90mm deep and 50–70mm in diameter, and cut vertically. A fragment of a shafthole adze (SF183) was recovered within clay layer 762, but this may have been associated with Structure H (below).

Structure H

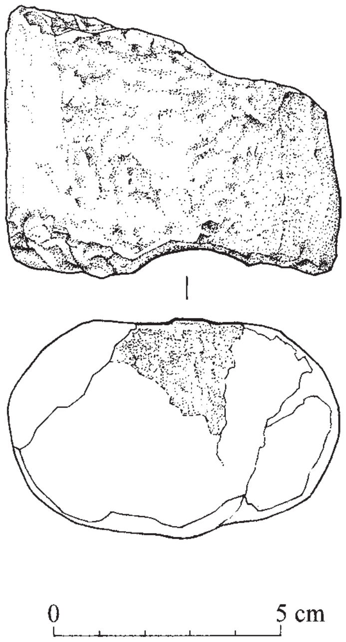
This was the largest and most impressive of all the structures encountered at Chapelfield. It was positioned at the north of the structural group and was aligned so that its entrance faced due east. The building itself was badly truncated on its north-west side, but it was clearly circular in shape, comprising two concentric rings of stakes, some 6m across internally and 7.2m externally. The construction was more substantial at the entrance, with two main posts on either side of the entrance (133 & 023) and a third noted on the north side (058). These posts are interpreted as anchors for the rings of stakes and may have also supported a gate or door. The northern post-holes were filled with greyish-brown silty clay and were located within an L-shaped slot (066) which had in turn been filled with a light grey ashy silt (059) (illus 6). Radiocarbon dating of Scots pine charcoal from this feature provided a calibrated range of 5900–5610 cal BC.

The wall stake-holes were c 60mm deep by 50mm in diameter, with a homogenous fill of mid-brown silt. The analysis of the sediments within the stake-holes confirms that they were contemporary (Duncan, below). Positioned centrally within the structure was a large pit (250) that had a fill (251) of brown sandy silt with a number of large stones, which may imply the presence of a central post.

Little of the stone assemblage from this post-hole can be described as artefactual. SF109 is a small hammerstone pecked on both ends to produce opposing flattened facets, while SF105 consisted of two parts of the same artefact found at different levels in the pit, which conjoin to form a hammerstone or grinder worn to an uneven yet generally concave face. Perhaps the two most striking objects are the large banded cobble (SF104: illus 18)) and the small flake (SF103: illus 19). SF104 is a visually striking rounded boulder of greenish sandstone covered in brown quartz bands, placed on a ‘shelf’ cut into the natural clay at the northern side of the post-hole (250) and may represent a intentional



Illus 6 Structures F, G & H



Illus 7 Shafthole adze fragment

deposit, rather than a packing stone. SF103 is a small flake of purple stone with fossil inclusions, shaped like a hollow-based leaf-shaped arrowhead. It is unclear whether this was intentionally shaped or naturally formed. The object was thoroughly abraded though and could never have actually been used as a functional arrowhead. Its deposition at the base of the post-hole may be significant. A shale artefact reminiscent of a barbed and tanged arrowhead, which likewise could never have been used, was recovered from Stoneyburn (Banks 1995, 314). Two pebbles and one flake, also bearing banded inclusions, were recovered from this feature. One of the pebbles, SF110, was intermittently banded with an iron-based compound similar to red ochre. The flake (SF106) was geologically similar to the banded cobble SF104.

The interior of the structure was a mass of stake-holes, with one particular line indicating the line of a possible partition running SW from the north side of the inside of the entrance. A clay layer (762) appears to have been formed prior to the construction of Structures H, G and F; on excavation it proved to be approximately 50mm deep, spreading well beyond the limits defined by the double-skinned stake walls of Structure H.

Amongst the finds from the clay layer were three objects identified as rubbers (SF243 (illus 19), SF244) and a borer (SF245). The first two may suggest leather or textile working close to the building. The borer's relationship to the shafthole adze fragment (SF183) recovered from between the double-skinned walls (illus 7) may be significant. A very worn sherd of possibly Beaker fabric (Squair & Jones, below) was also recovered from this layer.

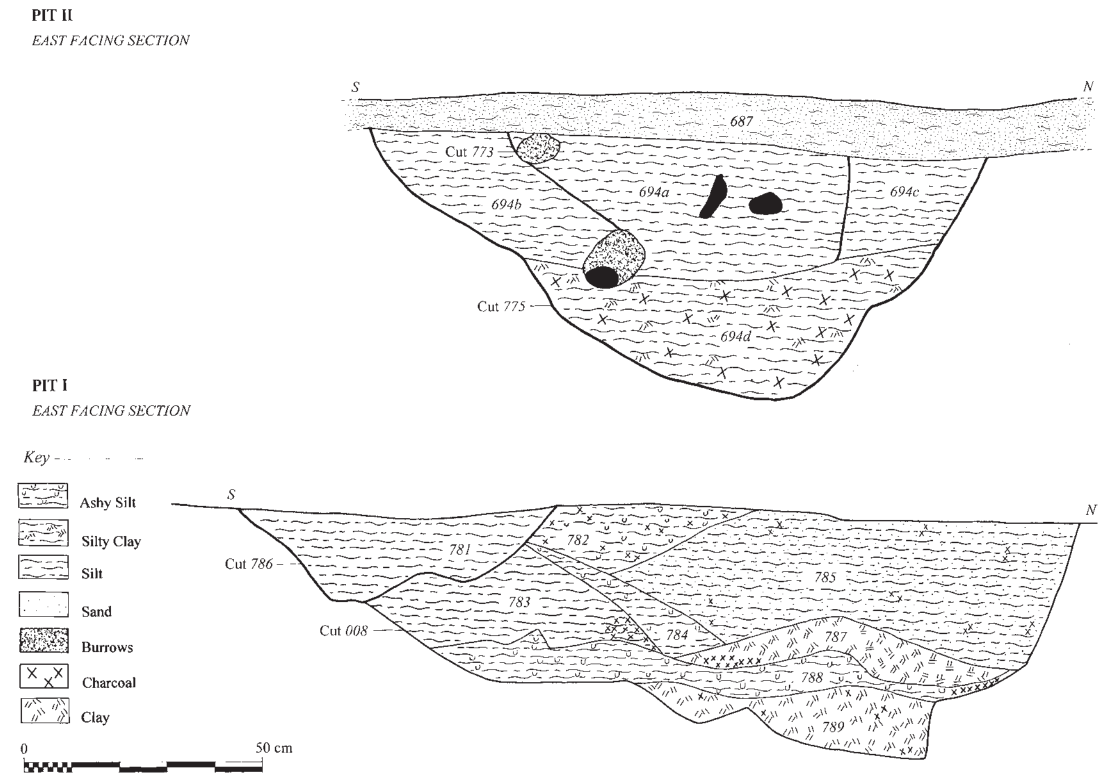
THE PITS

Thirteen large pits were excavated along the eastern and northern fringes of the settlement (illus 2). Only pits which contained datable material or artefactual or botanical information will be discussed in detail; the remaining pits are described briefly.

Pit I

This enigmatic pit was oval, orientated N/S, and measured 1.75m by 1.2m and 0.5m deep; it had been truncated by a later tile drain. Excavation revealed a complex sequence of deposition (illus 8). A small pit (786) was dug into the southern edge of the feature, which appears to have silted up. Both Neolithic pottery (SF205 & 207) and pitchstone (SF139 (retouched blade) & SF199) were recovered from the pit's upper layers. In contrast, the majority of worked stone (SF173, 174, 206, 238 & 239) and carbonized material came from the lower deposits of the pit. The results of the sediment analysis supports the interpretation that the upper layers within this pit represent household domestic refuse (Duncan, below), which may have been introduced from the structures above.

Pit I contained various field weed indicator species and crop contaminants, representing a group of plants which has grown within the same field boundaries as a cereal crop. These species from context 008 included abundant *Chenopodium album* (fat hen), and lesser amounts of *Persicaria maculosa* (redshank) and *Fallopia convolvulus* (black bindweed). Only two *Hordeum vulgare* sp (hulled barley) carbonized cereal grains were present. Large amounts of *Quercus* (oak) were found as charcoal in all three contexts. The presence of carbonized cereal grain and field crop weeds suggested the presence of plant husbandry; however, radiocarbon dating of a *Hordeum vulgare* grain from a bulk sample of the upper fill indicated that this was



ILLUS 8 Sections of pits I & II

residual material (see radiocarbon section). The evidence from the more secure lower fills seems to suggest that deliberate deposition of specific carbonized waste was occurring in this pit.

Some correlation between the artefactual materials in pit I and the other pit assemblages was evident, for example group B pitchstone (three pieces in pit I) was also noted in pit VIII (Donnelly). Two sherds of pottery recovered from pit I were also attributable to vessels 1B and 2A in pit VII (Squair & Jones, below), which seems to imply deposition in the early Neolithic period. On the other hand, radiocarbon assays for the pit from oak charcoal recovered from the basal layer and hazel nutshell produced date ranges (4960–4520 & 4540–4330 cal BC respectively) which suggest late Mesolithic deposition rather than early Neolithic use (see main site discussion).

Few coarse stone objects were recovered from pit I. Of particular significance was the unusual arrangement of SF174.1 (a decortical flake – a flake from the outer weathered surface – resembling a Skaill knife), a sandstone borer (SF174.3: illus 19) and hammerstone bearing striae across a raised ridge (SF174.2). These objects had been laid out together in a row beneath the handful of embers (SF146) appearing as a charred wooden branch/haft broken into several pieces) and it seems very likely that this was more than a simple act of careless deposition. Indeed the three objects could easily be interpreted as wood-working implements.

Pit I produced four pieces of pitchstone, three from group B and one from group C and also a piece of chert. All of these pieces were related to blade and bladelet production. There were three snapped bladelets of pitchstone, one snapped blade of chert and a pitchstone spall.

Pit II

This pit was located close to, but slightly north of pit I. Limited excavation was undertaken along its N/S axis, where the pit intersected Structure E (illus 8). Apparently sub-circular in shape, it seemed to be c 1.3m in diameter (although the exact extent of its E/W axis was never resolved) and was 0.65m in depth. The sequence after digging was: fairly rapidly, partial backfilling (694d) (illus 8); further backfilling (fills 694b & identical fills probably later truncated); digging of new cut (773/774); fairly rapid backfilling (fill 694a). This rapid sequence of filling events is confirmed by the sedimentological analysis of the pit's contents (Duncan, below). The final event in the pit's sequence was the build-up of the sealing layer (687), prior to which the pit was probably completely backfilled. This has implications for the dating of the site as layer 687 is interpreted as Structure E's flooring.

Pit II contained large quantities of charcoal of pine, oak and hazel. There were also various carbonized weed species present including fat hen, redshank and black bindweed. These species are indicators of cultivated ground and waste places. The single carbonized cereal grain of hulled barley was shown by radiocarbon dating to be a modern intrusion into the pit. The plant macrofossils from the pit could be interpreted as a deposit of household refuse, which included food waste and the sweepings from a hearth. Local woodland in the form of oak and Scots pine may have been collected for fuel and probably to provide further clearance areas for crops and/or animals. Alternatively, the organic-based contents of this pit may support an interpretation of deliberate deposition of carbonized material for other purposes.

Pit IV

Positioned directly to the south-west of pit V, this sub-circular, round-bottomed pit measured 1.3m E/W by 1.3m N/S and 0.1m deep (illus 9). It had been lined with clay (447), which had become very mixed with the natural sand in places. There were two fills. The pit had been disrupted considerably by a 20th-century tile drain, although fragments of comb-impressed Beaker (vessel 4A – SF134, 135, 136) were recovered from the feature during excavation. Material from the feature was radiocarbon dated to 3050–2450 cal BC, which may imply that vessel 4A is an early example of this form of Beaker.

Pit IV contained carbonized weeds of crop fields and waste places, for instance fat hen, redshank, and *Polygonum aviculare* (knotgrass), together with a few fragments of carbonized hazel nutshell. The charcoal was identified as predominantly oak with lesser amounts of hazel and Scots pine present. The pit therefore contained predominantly wild plants and revealed extensive exploitation of the woodland resource, including a widening of the resource base into the native Scots pine woodland. Although no cereal waste products were deposited in this pit, various field weeds were found which could represent the sieving debris from cereal processing.

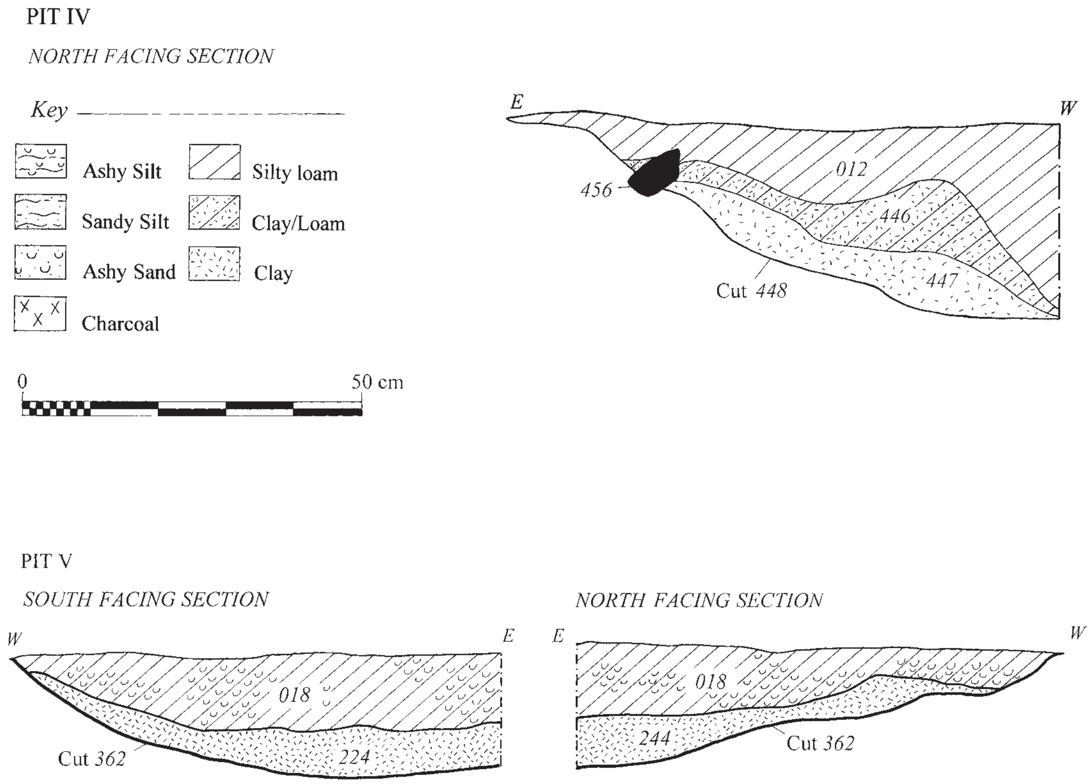
Pit V

The pit, although similar to pits III and VI, was very clearly marked by its close association with a ring of stake-holes around it and by its heavily sooted fill (illus 9). The pit was oval, c 1.6m N/S by 2m E/W and 0.11m deep (illus 9 & 10). A modern drain had truncated its south-east edge, but much of the feature was still intact. It had a bowl-shaped profile (362) and had been lined with a compact, if somewhat plastic grey clay (244), which varied in thickness from 80mm at the bottom to 30mm at the break of slope. The feature had then been filled with a single fill containing much burnt material. No artefacts were recovered from this pit and magnetic susceptibility readings from its base also suggested that no burning event had occurred within it. Thirteen stake-holes encircled the feature (illus 10: four of them lay inside the lip of the pit). Material from this pit was radiocarbon-dated, producing calibrated ranges of 5720–5480 cal BC and 6240–5970 cal BC, which may imply that while it was latterly used at the same time as pit II, it had also been used considerably earlier, in the Mesolithic.

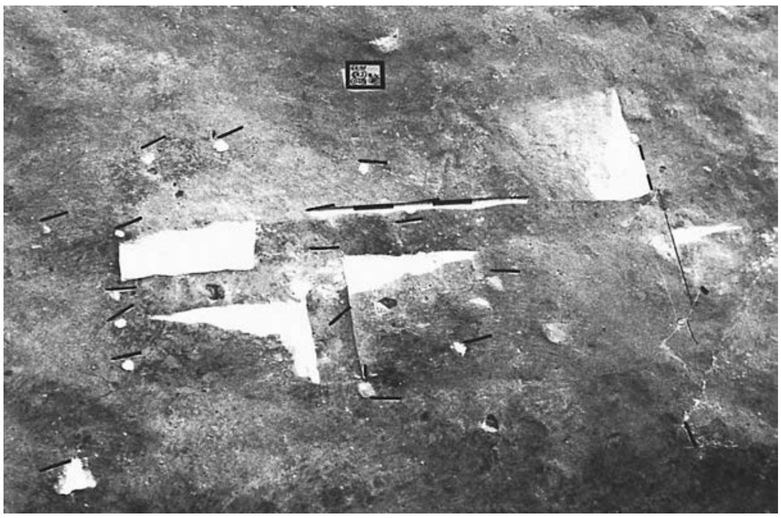
Only small quantities of identifiable charcoal were recovered from pit V. The most important element was 4.3g of Scots pine together with four tentatively identified *Pinus* sp buds that had been carbonized. This reinforces the evidence for the presence of pine in the Stirlingshire area of Scotland in the early prehistoric period. Small quantities of hazel wood were also recovered.

Pit VII

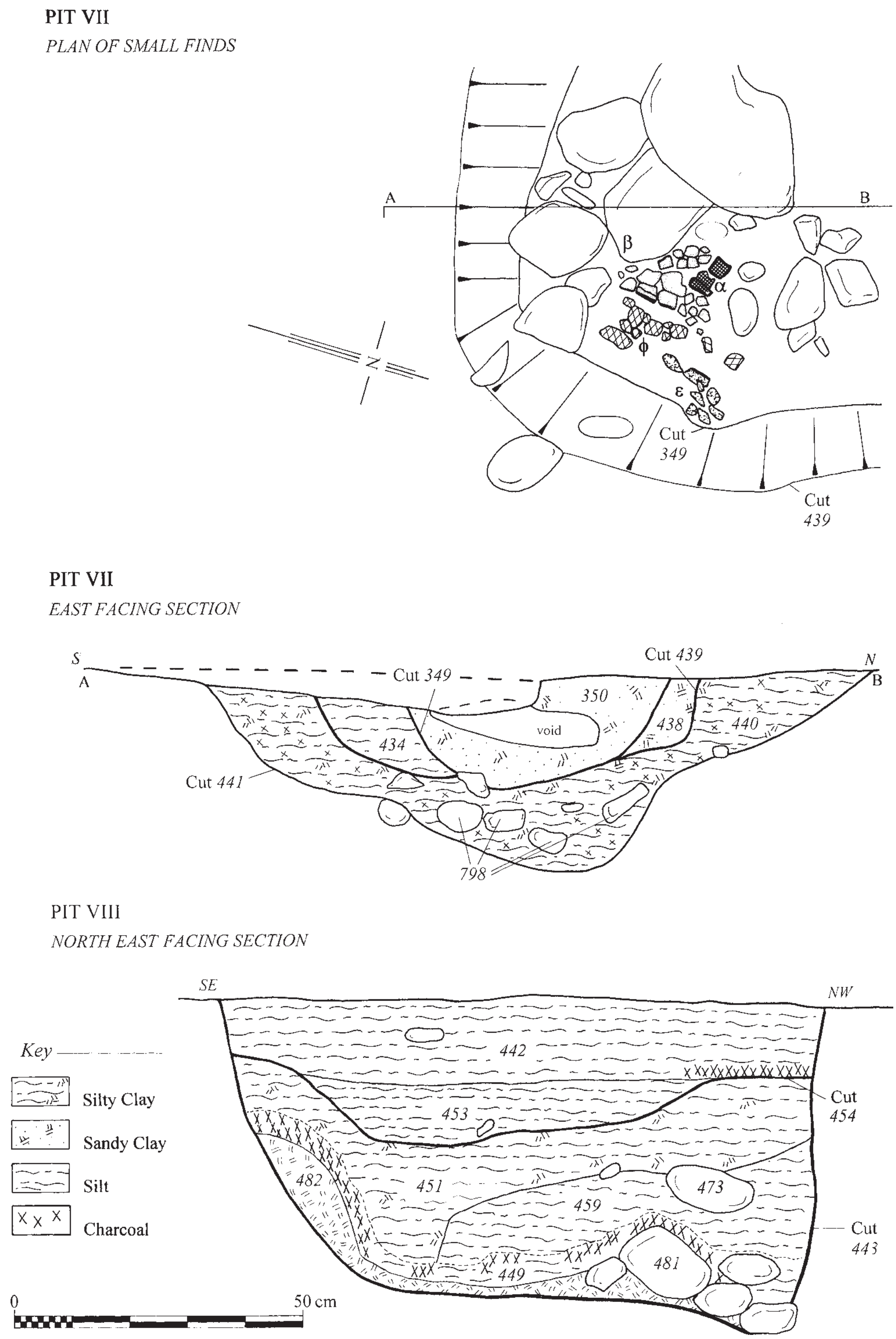
Pit VII was the most remarkable in terms of its content. Measuring c 1.4m N/S by 1.2m E/W, this oval pit was 0.34m deep with a cut (441) which had shallow sides in the upper part, steepening in the lower part, to give it a 'soup-bowl' profile. There appeared to have been three main depositional events (illus 11). Initially the pit had been dug and



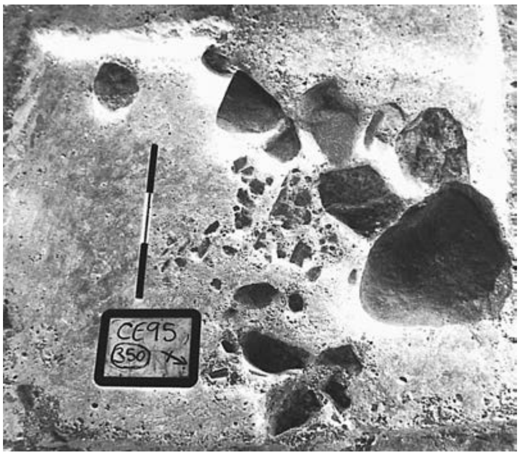
Illus 9 Section of pits IV & V



Illus 10 Pit V and surrounding stake-holes



ILLUS 11 Plan and section of pit VII and section of pit VIII



ILLUS 12 Smashed Neolithic vessels in pit VII

backfilled. Shortly after backfilling began a large amount of worked and damaged stone (798) was introduced into the pit and rapidly covered over with the same silty clay. Sometime after this event the pit was re-opened; this cut (439) was much shallower, c 0.2m deep and about 0.65m across (N/S). It was then backfilled (438 & 434). Subsequently the pit was re-opened again, cutting through the base of the first re-cut and removing some of the initial stone deposit (798). It is likely that the tertiary opening and backfilling of the pit occurred as one single event. As soon as it was opened a ring of stones was created in the pit and portions of three early Neolithic vessels (1A: 55 sherds; 1B: 93 sherds; 2A: 55 sherds) were introduced into the centre of it (illus 12). At this stage, the vessels appear to have been deliberately smashed by the introduction of a large boulder and the pit was once again backfilled (350). A substantial fragment of broken quern (SF169.10) from the upper fill above the pottery matched perfectly with a conjoining fragment from the initial stone layer (798) supporting the theory that the tertiary cutting and filling of the pit happened as one single event.

The coarse stone assemblage from the pit included quern rubbers, stone knives, an anvil, hammerstones and pounders. The association between fragments of a possible saucer quern (SF169.1: illus 17) and a saddle quern broken in preparation (SF169.10) may imply contemporaneity between quern technologies previously thought discrete. The radiocarbon dating of material from the pit tends to confirm the early Neolithic provenance of both the primary fill (3720–3360 cal BC) and the tertiary fill (3950–3350 cal BC), although it could be argued that the dated material in the tertiary fill was residual. It is suggestive of a single phase of excavation and backfilling around the middle of the fourth millennium, rather than a series of separate events.

This pit, like the lower levels of pit VIII, contained a wide range of coarse stone artefacts, including quern rubbers, stone knives, an anvil, hammerstones and pounders, which generally seem to reflect domestic waste. Some were clearly discarded due to breakage (eg SF169.17, 169.10 and 169.1) while the reason for the deposition of some of the others remains more enigmatic (eg quern rubbers SF169.3 (illus 18) and 369.4).

Only very few carbonized weeds were present within fill 350 of the pit. The gathering of wild resources is, however, attested by the samples, with the discovery of carbonized hazelnut shell fragments and one carbonized *Prunus spinosa* type fruit stone (blackthorn). The berries produced by *P spinosa* are commonly known as sloes, which can be eaten raw or in more recent times have been used for making sloe-gin (Mabey 1996). Blackthorn is found throughout Britain in hedges, scrub, and open woodland areas. Its prickly spines are particularly useful for keeping out animals when it is employed as a hedge. Charcoal from this context was identified as pine, oak and hazel, revealing that a wide range of woodland species was being exploited.

Fill 440 was located below context 350 within the pit. The majority of the macrofossils from this context again indicates the use of wild plant resources, such as hazel nutshell, and provides few indications of any cereal processing waste being deposited in this pit. The pit does not seem to be associated with any household or agricultural refuse, and from the general lack of background plant remains it is unlikely that it was left to fill naturally. The deposit of oak and hazel charcoal represents a deliberate and discrete inclusion of material.

Pit VIII

Lying directly to the north of pit VII, this pit (illus 11) measured 1.9m E/W by 1.3m N/S. Given that this feature was badly truncated on its northern side by the introduction of a 19th-century culvert (452) and on its north-west side by a tile drain (796), its actual dimensions may have been considerably larger. Even taking truncation into account, pit VIII was the largest of the pits on the site and also one of the deepest at 0.6m. Once again a structured sequence of deposition was noted within the pit which had a steep sided cut (443) and a flat bottom. The primary fill was a hard-packed bluish clay layer (482) in which a series of large stones (481) was set. Layer 481 also acted as a lining for the base of the pit and contained many pieces of pitchstone (SF143–145, 147 (illus 22), 152–156 & 225) and one piece of flint (SF157) (Donnelly, below, for further description). Lying directly over the stone layer was a layer of silt and carbonized burnt material (449); this was in turn sealed by the partial backfilling of the pit (459) on its northern side. To the north end of the pit a new stone layer (similar in location and form to the primary stone layer) was introduced (473) and in turn sealed by layer 451. This did not entirely seal the pit. The pit was then re-cut (454); there were two fills (453 & 442). The final events within the pit are interpreted as organic in nature and likely to represent the deposition of human waste (Duncan, below). Material from the last fill was radiocarbon dated, giving a calibrated range of 3650–3050 cal BC.

Although the spits in pit VIII represent contextually discrete events, two of the objects recovered from layer 473 (SF171.4 & 171.8) can be shown to refit with smaller fragments from the lowest deposit of stone (481) (SF172.1 and 172.7) which suggest that these represent almost contemporaneous events – this is significant chronologically as it links the pitchstone artefacts recovered from the base of this pit with the stone artefacts from both these levels (Donnelly, below, for further discussion). As in pit VII the objects recovered from this pit represent a similar range of domestic artefacts many of which may have been discarded due to breakage (eg SF171.1; 171.2; 171.3; 171.4). Hammerstones are significant by their absence in this pitchstone-rich level and possibly confirm that they were not used in the preparation of flint/pitchstone. The recovery of two quern stones from the middle deposit (473) is significant – one is part of a saddle quern, the other part of a trough quern. Thus, as in Pit VII, evidence of contemporaneity between different quern technologies is apparent. The assemblage of stone from the upper fill of this pit includes three objects identifiable as rubbing stones (SF170.1; 170.2; 170.3) and a hammerstone bearing an intermittent gloss (SF170.4: illus 19). This may be significant considering the presence of six tabular flakes of stone amongst the general lithic debitage recovered from this level (SF170.5). The saddle quern detail is significant because it is stratigraphically later that the trough quern fragment (SF171.2).

Pit VIII, with the two pieces from pit IX, which may be the tail of pit VIII, produced 70.8% of the site lithic assemblage. The distribution of flint from within the pit is unusual, with much of the material apparently from the same source if not the same core. The upper fill of the pit (455), contained the two large snapped flint flakes as well as some pieces of burnt debitage. A single flake was discovered from within the matrix of stone dump (481). The majority of the flint was recovered from the basal layer (482), where several pieces of flint debitage, exhibiting evidence of narrow and parallel bladelet scars, were recovered. This is particularly interesting in that no blades or bladelets of flint were recovered even though the material extracted suggests that flint bladelets were being produced. Pitchstone was recovered from several deposits within pit VIII. Interestingly the solitary piece recovered from the upper fill (455) was the core (SF142: illus 22). This core has been designated as parent core A (group A). Below this a secondary fill (453) contained three pieces of pitchstone (SF139, 140 (illus 22) & 145), two of which (SF139 & 140) represent two retouched blades originating from parent group A and B respectively. SF145 is a complete bladelet originating from group B. As with the flint, a single piece of pitchstone was discovered in amongst the matrix of stone dump 481 (group A). The majority of the pitchstone (like the flint) was recovered from the basal layer (482). These include seven from group A and a single piece (SF147; illus 22) from group B, evidently from the same core as SF145. This can be proven by the match in surface markings between the two pieces suggesting that SF147 represents a blade removed a very short time before SF145. The material from group A includes a blade, bladelets and a flake, with one of the bladelets refitting directly on to the core. This bladelet (SF154) has been carefully retouched and represents one of the two final removals from the core (illus 22).

Pit VIII contained very few carbonized plant remains, generally with only one or two fat hen and a few other weeds of waste places and cultivated land, such as knotgrass, and black bindweed. Carbonized hazel nutshell fragments and small quantities of oak, hazel and alder charcoal, were found throughout the samples.

This pit was heavily sampled throughout the various layers in the complex sequence of deposition. The layers contained very few carbonized plant remains and provide little environmental information. Most of these contexts seem to be the result of rapid deposition – probably deliberate backfilling – with little or no household debris being incorporated. The exception to this is context 442, which included small quantities of carbonized hazel nutshell, and charcoal from oak, hazel, and alder and may represent the sweepings from a domestic hearth area.

Pit IX

Lying directly to the north of pit VIII (443) on the opposite side of culvert 452, this pit was assumed at first to be a continuation of pit VIII. Although the profile of both pits would seem to indicate that this was unlikely, the analysis of the pitchstone artefacts (Donnelly, below) may support this interpretation. This pit had also been truncated by the 19th-century culvert (452) and the modern tile drain (796), but leaving most of the feature intact. Excavation revealed the cut (593) to have a shallow-sided bowl profile, which was only partially truncated by the culvert on its southern edge. A N/S section through the feature indicated that it was 0.9m across (probably greater than 1m in diameter prior to truncation). The first fill of the pit (592, from which two pieces of pitchstone were recovered (SF175 & 176)), had been truncated by a partial re-cut for the insertion of a small post (790). There was also some evidence of associated stake-holes within the upper portions of the primary cut (593) along its western flank. Three stake-holes were identified: a feature that was noted elsewhere on the site (eg pits V & VI).

Summary of pits III, VI, X, XI, XII and XIII

Six further pits were located and excavated at Chapelfield, none of which revealed any artefactual or substantial botanical evidence, and are therefore only described briefly (illus 2).

Only two artefacts of stone were identified from pit XII, a saddle quern (SF160) and a trough quern rubber (SF159). This is significant because both were recovered from the same fill, the saddle quern stratigraphically above the trough quern rubber. The size and corresponding use-wear on the saddle quern (SF160) matches perfectly with the rubber from pit VII, thus potentially linking the pits chronologically, a feature which is broadly suggested by the analysis of the struck stone (Donnelly, below) and radiocarbon dates.

Pits III (748), VI (693), X (526) and XI (522) were very similar in form and execution. All four cases had shallow-sided and flat-bottomed cuts and a range of surface dimensions from 0.8m by 1.3m (pit X) to 1.8m by 1.5m (pit III) and were 0.1–0.2m deep. Most of the pits displayed the re-cutting of the initial fill, usually silty ash or ashy clay. Pits III and VI were, like pits V and IX, associated with stake-holes.

Pits XII (489) and XIII (032) were located at the extreme north of the site and, like pits IV and V, had been lined with grey clay prior to backfilling. They were 0.2–0.28m deep with more of a bowl-shaped profile. Once again there was clear evidence of re-cutting of both pits after their initial use. A saddle quern (SF160) and a trough quern rubber (SF159) were recovered from the same context in pit XII, implying contemporaneity of these two forms of technology (Taylor, below).

Stratigraphic relationship between structures and with pits

The relationships between Structures A, C, D, E and pits I and II were understood during excavation; although the relationships between Structures B, F, G, H and pits III to XIII could not be inferred from the fieldwork results, the sediment analysis results provide clues.

It is possible to provide a stratigraphic sequence for the structures along the southern edge of the settlement. The earliest structure within the southern group was C, which was overlain by Structures A/B and D. Whether A/B and D were contemporary is unclear, however Structure D was abandoned at some stage and partly overlain by Structure E. Structure D superseded pit I and II and Structure E post-dated pit II. As the dates for material from both the pits may provide termini post quos for D and E it is likely that these structure were built sometime after 3780 BC. This evidence, combined with the recovery of early Neolithic ceramics and pitchstone blades in the upper fills of the pits, seems to confirm that the oval structures were in use during the fourth millennium BC.

Post-holes 058 and 133 on the northern side of the entrance of Structure H were dug into feature 066, interpreted as an L-shaped construction slot during excavation. The dating of Scots pine from this feature to the Mesolithic may imply that the slot itself is an earlier feature unrelated to the roundhouse structure, or it may simply reflect residual material being introduced into the feature. The slot contexts contained small quantities of Scots pine and oak charcoal, as well as numerous carbonized Scots pine buds. There could be some element of ritual in the deliberate deposition of a cluster of charcoal and charred (but very well preserved) bud remains within the L-shaped slot trench.

PREHISTORIC POTTERY

R Squair with A Jones

In total 1709 sherds, fragments and crumbs, weighing some 1.283kg, were recovered from five different contexts. The remnants of six vessels, datable in stylistic terms to the early Neolithic or late Neolithic/Early Bronze Age, are identifiable

FABRICS

Five different fabrics were recognized in the prehistoric assemblage. A provisional fabric series, based on macroscopic identification using a hand lens at x20 magnification, was further investigated by a selective thin-section analysis. The fabric classification, adapted from Orton et al (1993, 231–42), focuses on the nature of the inclusions and the handling qualities of the exposed ceramic surface to characterize each fabric.

Fabrics 1 and 2, despite the differential proportion of inclusions in each, were frequently indistinguishable on macroscopic criteria alone. It proved difficult to separate the sherds from context 350 in pit VII into discrete fabric groups (fabrics 1 & 2). Thin-section analysis of selected sherds from context 350 was conducted to elucidate further compositional detail and to refine the macroscopic series. All classifiable sherds from context 350 were sorted into groups on the basis of superficial and macroscopic appearance. Thin-section analysis of a single sherd from each of these groups confirmed the macroscopic fabric series. The initial sherd groups were subsequently amalgamated to form three distinct vessel groups on the basis of the thin-section analysis. In an attempt to investigate differences between Neolithic and Beaker fabrics, a sherd from the putative Beaker, vessel 4A, from context 012, was thin-sectioned for comparison with the Neolithic samples.

PETROLOGICAL THIN-SECTIONS OF SELECTED SHERDS

A Jones

On the petrological characterization of these sherds, only two distinct fabric groups were identified from context 350, with a third from context 012 (Table 1).

Petrologically the three fabric groups appeared distinctive in the way material was used to temper the pottery. Fabric 1 (Table 2) contained fragments of undifferentiated igneous rock, while in Fabric 2 selected components of that rock were used. Fabric 3, on the other hand, used rock fragments so highly crushed that only the individual phenocrysts

TABLE 1
Pottery fabrics

Fabric 1	contains moderate amount of unsorted rock, quartz and feldspar inclusions, both angular and rounded, size from 1–8mm; fabric has a soapy feel and laminar texture
Fabric 2	contains profuse amount of unsorted rock, quartz and feldspar inclusions, mostly angular in shape, size 1–8mm; fabric has rough feel and hackly texture
Fabric 3	contains minimal amount of unsorted rock, quartz and feldspar inclusions, both angular and rounded, size 1–7mm; fabric has rough feel and fine texture
Fabric 4	contains minimal amount of unsorted rock and quartz inclusions, both angular and rounded, size 1–10mm; fabric has abrasive feel and fine texture
Fabric 5	contains moderate amount of sorted rock and quartz inclusions, both angular and rounded in shape, <1mm in size; fabric has smooth feel; texture, evinced on the fracture edge, is indeterminate, because only sherd to survive in this fabric is too severely abraded

TABLE 2
Pottery fabric tempers

Fabric 1	tempered with angular pyroxene-andesite with plagioclase feldspar phenocrysts around 10% frequency
Fabric 2	tempered with angular free plagioclase feldspar and a small amount of pyroxene-andesite around 30% frequency
Fabric 3	(single sherd) tempered with angular well crushed fragments of both free plagioclase feldspars and pyroxenes with around 50% frequency

remained. The material used is of local origin. The pyroxene-andesite used to temper vessels from context 012 and 350 may be obtained from outcrops of solid geology within 7km of the site, although small rounded pebbles of this material were found on site during excavation. The clay would, of course, be easily accessible due to the location of the site on boulder clay, which, on levigation, would be adequate for the production of fairly coarse vessels of this type.

VESSEL RECONSTRUCTIONS

The macroscopic fabric series was developed to identify the different vessels represented in the assemblage. Each sherd was assigned, on the basis of macroscopic fabric identification, morphology, surface appearance, colour, and firing profile, to an appropriate sherd family. Numerous sherds were unclassifiable or indeterminate in terms of fabric identification. Two vessels, 1A and 1B, were identifiable in fabric 1, and four single vessels, 2A, 3A, 4A, and 5A, were discernible in Fabrics 2, 3, 4 and 5 respectively. Table 3 summarizes the quantitative and contextual characteristics of the assemblage.

The vast majority of sherds (vessels 1A, 1B & 2A) derived from context 350 in pit VII. The few sherds representing vessels 3A, 4A, and 5A were recovered from the topsoil, pit IV and the floor of Structure H, respectively.

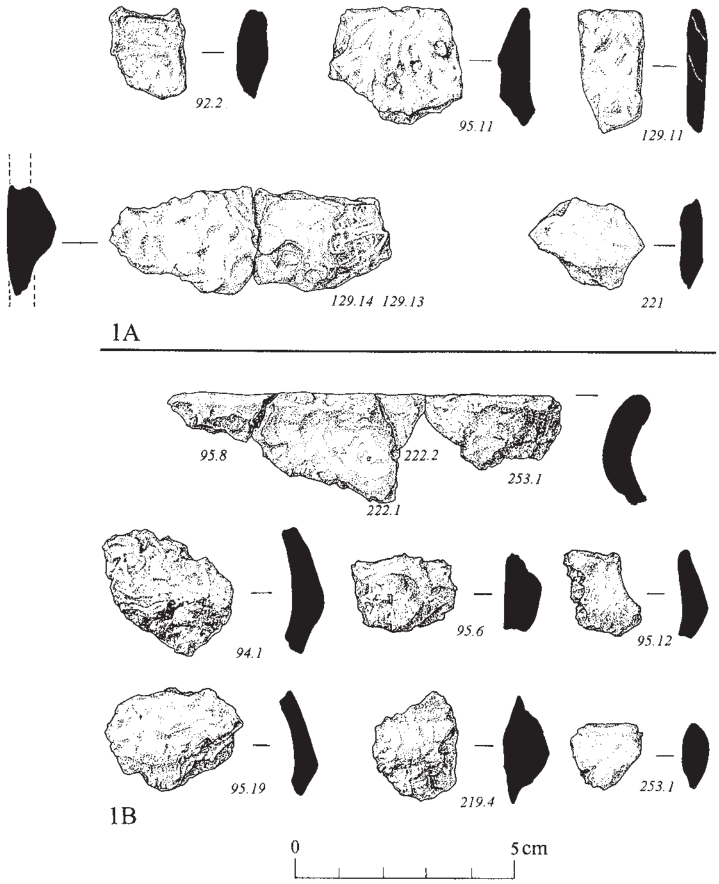
Vessels 1A, 1B, and 2A

The sherds from pit VII lay beneath a large stone; their coherent contextual arrangements suggest the deposition, and then comminution, of substantial fragments of different vessels, prior to immediate backfilling (Atkinson 1995, 21–2), and thus provides evidence for the controlled deposition, and perhaps the deliberate destruction, of early Neolithic ceramics. The presence of a probable animal burrow, recorded on the original plan, may imply considerable disturbance of the pottery within this context.

Vessel 1A (illus 13) The presence of an exposed coil join, in which the remnants of one coil adhere to the remains of another, on sherd SF129.11 indicate that this vessel was coil built. Other possible examples were also noted (SF129.13 & 95.11). The firing profile colours, which comprise a buff interior with an abrupt change to orange on the exterior surfaces, suggest the vessel was removed from an open firing while the vessel was still hot. Although the overall morphology of the vessel remains obscure, since no rim or base sherds survive, two sherds (SF94.2 & 221.12) exhibit an extremely subtle, but nonetheless similar, alteration in the orientation of the wall. If this feature, replicated on both sherds, is indeed evidence of a carination, it indicates a vessel with an almost biconical profile. The wall thickness on SF94.1 and SF129.13, sherds on which the original surfaces are perhaps preserved, is approximately 7mm, but exceeds 11mm elsewhere on the vessel. The surfaces where extant are smoothed. A distinctive feature of this vessel is the presence of a possible unperforated internal lug on body sherd SF129.13. This minor plastic

TABLE 3
Summary of the characteristics of the assemblage

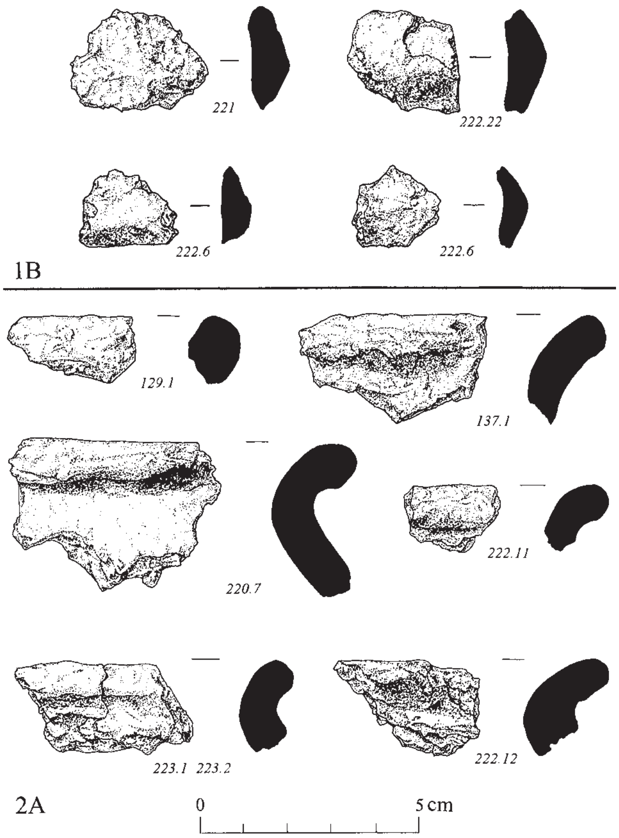
Context	Location	Total sherd quantity	Total sherd weight	Vessels definitely represented	Vessel styles
008	pit I	8	9	–	–
001	topsoil	2	27	3A	Neolithic(?)
012	pit IV	6	24	4A	Beaker
350	pit VII	1692	1221	1A, 1B, 2A	early Neolithic
762	floor of structure H	1	2	5A	Beaker(?)



Illus 13 Vessel 1A and 1B sherds

elevation on the interior of the sherd appears to have been pinched out rather than luted on. The lug, elevated some 5mm from the interior surface, has an elongated shape with horizontal orientation, and measures approximately 15mm long by 10mm wide. It is conceivable that the smooth surface and distinctive lug on the interior of this sherd are spurious features, a consequence of post-depositional processes.

Vessel 1B (illus 13 & 14) A possible coil on one sherd, exposed by fracture along the coil join, suggests coil manufacture (SF129.22). The sherd surfaces are smoothed around the rim, and undecorated. The colours of the firing profile, which consist of a grey interior with an abrupt colour change to orange or brown on the exterior surfaces, recall that of vessel 1A. The two-tone firing profile on sherd SF1246.1 suggests the vessel was fired in an inverted position. Possible firecracks are apparent on at least two sherds (SF91.1 & 221.9). A number of rim sherds (SF95.8; 222.1; 222.2; 253.1), and carinated sherds (SF94.1; 95.6; 95.12; 95.19; 219.4; 221.11; 222.6; 222.20; 222.22), indicate a necked vessel, with everted rim and bipartite profile. The majority of sherds are missing at least one original surface. The wall thickness, on sherds with both surfaces extant, varies between 7mm (SF1246.1) and 10mm (SF222.22), but exceeds 14mm (SF129.15) on occasion. It is possible that some of these sherds, (SF219.4 & SF222.6) are detached lugs, or similar plastic applications, subsequently dislodged from the original surface of the vessel. A notable feature on the exterior surface of the carinated sherd (SF95.6) is an unperforated lug, or plastic elevation. This lug, positioned on the carination, appears to



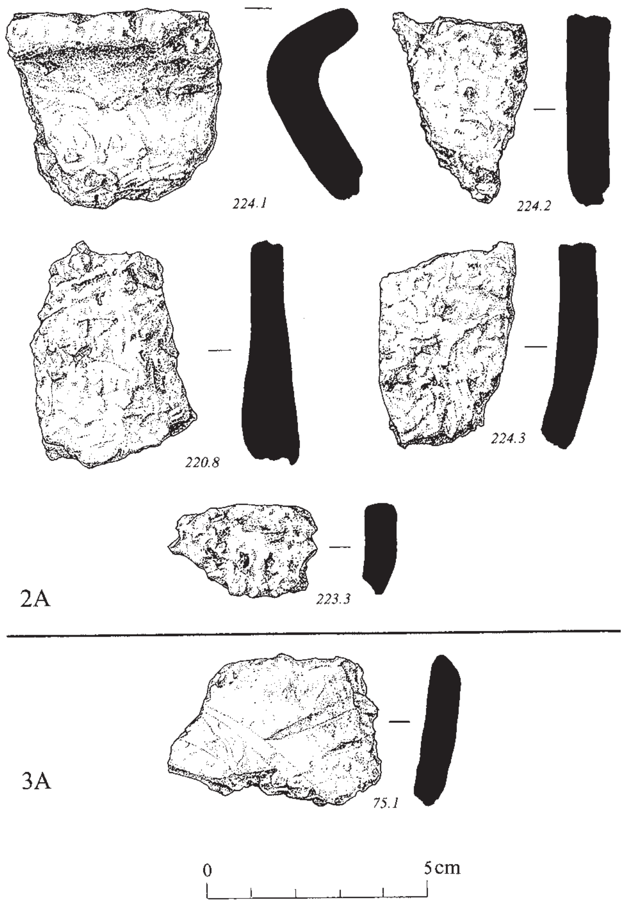
ILLUS 14 Vessel 1B and 2A sherds

have been pinched out rather than luted on. No base sherds are represented. A dark layer, interpreted as the vestiges of charred residues, is visible beneath the concretion on the interior of some sherds (SF222.20; 222.22; 1246.1).

Vessel 2A (illus 14 & 15) The corrugations on two substantial body sherds (SF224.2 & 224.3) suggest coil manufacture. The interior and exterior surfaces are either wiped or smoothed. A number of rim (SF137.1; 220.7; 222.11; 222.12; 223.1; 223.2; 224.1), neck (SF90.1; 219.7; 221.1; 221.2), shoulder (SF220.8), and body sherds indicate a shouldered, necked vessel with a substantial, externally extended rim form. The wall thickness varies between 10 and 14mm. The morphology of the rim on the rim sherds is sufficiently variable to query their assignation to the same vessel. Yet the curvature of the rim, and the use alteration patterns, suggest they may derive from the same parent vessel. Blackened deposits, apparent on both the interior and exterior surfaces around the rim and neck of the vessel, are best interpreted as either sooting residues or charred remains. Several sherds exhibit discrete patches of abrasion, indicating use alteration.

Vessels 3A, 4A and 5A

Vessel 3A (illus 15) The horizontal surface of an exposed coil was visible on sherd SF75.1. The interior and exterior surfaces on both SF75.1 and SF43.1 are smoothed, with a two tone firing profile. An orange exterior and a black interior surface suggest an inverted firing. The slight curvature of these sherds suggests a substantial vessel, with vertical (neutral) sides. The wall thickness varies between 8 and 11mm. Remnants of possible decoration are evident on the exterior surface of sherd (SF75.1). The pattern applied by shallow incision, is slight, and comprises opposing sets of diagonal lines or concentric arcs. Charred residues visible on



Illus 15 Vessel 2A and 3A sherd

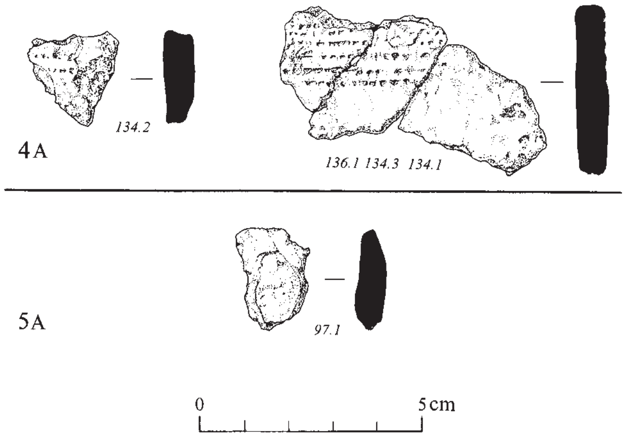
the interior surfaces of sherds SF75.1 and SF43.1 indicate that the vessel was employed for cooking.

Vessel 4A (illus 16) The stepped fracture profile on sherd SF134.3 and the corrugation on the interior surface of sherd SF134.1 indicate coil manufacture. A notable feature of fabric 4 is the considerable size range of the inclusions, with dimensions in excess of 10mm. The two-tone colour pattern, evident on sherd SF136.1, indicates an inverted firing. The sherds indicate a vessel with vertical sides and a slight shoulder, consistent with that of a Beaker with a pronounced neck. The wall thickness is a constant 8mm. Both horizontal and diagonal bands of parallel, linear comb-impressed decoration are discernible on the exterior surface.

Vessel 5A (illus 16) A solitary shoulder or body sherd of amorphous shape and no original surface (SF97.1) from context 762 on the floor of Structure H; much abraded, possibly reburnt, and almost certainly residual.

DISCUSSION

The group of carinated sherds attributable to vessel 1A has thin walls and an obtuse angle of carination, whereas the sherds attributable to vessel 1B have thicker walls and a more acute angle of carination. It is possible that these sherds exemplify the morphological variation typical of hand-built pottery and originate from a single vessel. The absence of rim sherds from vessels 1A, 3A, 4A and 5A, and the fragmentary nature, or inconsistent morphology, of



ILLUS 16 Vessel 4A and 5A sherds

rim sherds from vessels 1B and 2A, frustrated attempts to determine the rim circumference of each vessel.

Depositional practices in pit VII

The sherds in context 350 are assignable to either Fabric 1 or 2, and represent the remains of at least three early Neolithic vessels. Table 4 indicates the proportion of each vessel represented in context 350. Indeterminate sherds of diminutive size predominate in pit VII and attest to the thoroughness with which the original vessels were broken. The presence of body and carinated sherds, and the absence of rim or base sherds, suggests that the middle portion of vessel 1A was deposited. The presence of only rim, body, and carinated sherds of vessel 1B suggests the upper and middle portion were deposited. That all five rim sherds refit suggests that a substantial proportion of the rim was involved. The presence of rim, shoulder and body sherds of vessel 2A suggests that the upper portion was deposited. The absence of any definite base sherds amongst the material from pit VII is notable.

TABLE 4
Vessel composition in pit VII

Vessel	Total sherd quantity	Total sherd weight	Average sherd size ratio
–	1489	514	0.35
1a	55	157	2.85
1b	93	249	2.68
2a	55	300	5.45

Only two sherds (SF129.15 & 222.7), both attributable to vessel 1B, are identifiable as possible body-base fragments, from the lower regions of round-based vessels. The sherds from pit VII have suffered considerable post-depositional alteration. Approximately 98% of these sherds have evidence of abrasion and concretions extending across the sherd edges. The almost total absence of sherds from any vessel represented in pit VII assemblage elsewhere on the site, seems to suggest deliberate depositional practice.

Two unrelated sherds, both from context 008 in pit I, are the only sherds of fabric 1 or 2 from elsewhere on the site. Both are best interpreted as inadvertent, perhaps residual, deposits. The first of these, a rim fragment (SF253.1), is consistent in terms of morphology (rim type 2) and appearance (fabric 1) with vessel 1B rim sherds from context 350 in pit VII, and probably derives from this vessel. The second, a probable body sherd (SF207.1), seems to represent fabric 2 and, as such, is attributable to vessel 2A, again from context 350 in pit VII.

Other contexts

Three of the six sherds that represent vessel 4A refit to form a substantial portion of the vessel shoulder. Pit IV, from which these sherds derive, was later disturbed by the insertion of a modern field drain, but the sherds may have formed a single fragment at the time of deposition.

Stylistic parallels

The search for material comparable to the Chapelfield assemblage relies to a considerable extent upon the work of Kinnes (1985) and Cowie (1992; 1993a; 1993b); however, the fragmentary nature of the Chapelfield assemblage severely limits any attempt to identify comparable material.

The angle of carination on vessel 1A is similar to that of a solitary carinated sherd from Barbush Quarry in Dunblane, Stirling (Cowie 1992, 278 cat no 3, 277 illus 20.3), and that of a single carinated sherd from area A to the west of Balfarg henge, Fife (Cowie 1993b, 65–9 vessel P8, 68 illus 12). It is notable that the carinations on some vessels recovered during excavations at Biggar Common, N Lanarkshire, are almost imperceptible (Barrowman, pers comm). The possible internal lug on vessel 1A is unparalleled elsewhere. The rim profile of vessel 1B recalls that of a carinated bowl from the old land surface beneath the barrow at Pitnacree, Perth & Kinross (Coles & Simpson 1965, 42 cat no 1, illus 4.1). The unperforated external lug on the carination of vessel 1B finds parallels on two vessels (SF1 & SF3), from residual contexts in the barrow at North Mains, Perth & Kinross (Cowie 1983, 210–11 illus 53; Cowie 1993a, 16), on a vessel represented in the Boghead assemblage in Morayshire (Henshall 1984, 64–5 cat no 11, illus 10), on a vessel represented at Midtown of Pitglassie, Aberdeenshire (Henshall 1991, 84; 1996), and on vessel P39, in a coarser fabric, from area A to the west of Balfarg henge (Cowie 1993b, 75–6, illus 17). Horizontal perforated lugs, unknown at Chapelfield, but similarly located on the external carination, occur on vessels from Pitnacree (Coles & Simpson 1965, 42 cat no 3, illus 4.2; Cowie 1993a, 33) and North Mains (Cowie 1983, 245–6 SF7, illus 63). No aspect of either carinated vessel in the Chapelfield assemblage is typical of the supposedly archetypal early Neolithic carinated bowl.

Vessel 2A finds parallels with material that Cowie identifies as heavy bowls (1992, 281–2; 1993a, 16–7), instances of which also occur at, for example, Barbush Quarry (Cowie 1992, 278), in area A to the west of Balfarg henge (Cowie 1993b, 69–75), Knappers Farm in Dumbartonshire (Mackay 1948, 234–5; Henshall 1981, 184–7), Oatslie Sandpit near Roslin in Midlothian (Stevenson 1948, 294–5), Catstane in Midlothian (Henshall 1978, 187–8 cat no 3), Inveresk in E Lothian (Henshall 1988: fiche G10–11), and at Luce Sands in Dumfries & Galloway (McInnes 1964, 42, cat nos 34–53, 63 illus 2). Deep profiles, coarse but robust fabrics, and minimal surface treatments, with manufacturing marks still apparent through the negligible surface finish, are features characteristic of these heavy bowls (Cowie 1993a, 16). In particular, the relatively coarse fabric of vessel 2A is similar to that of two vessels represented in the Barbush Quarry assemblage (Cowie 1992, 281 cat nos 12 & 13, 277 illus 20.3; 1993a, 16), and amongst group 2 pottery from area A to the west of Balfarg henge (Cowie 1993b, 69–75). It is notable that one of the vessels from Knappers Farm exhibits a variation of rim design (Mackay 1948, 236–7 cat nos 4 & 5, 235 illus 1; Henshall 1981, 184–5 cat no 2, 186 illus 5) similar to that evident on vessel 2A.

Cowie (1992, 281; 1993a, 17,19) considers this category of heavy bowls as a northern equivalent of Towthorpe ware (Manby 1964, 200–1; 1975, 50–1; 1988, 48–52). This suggestion echoes earlier attempts to explain the perceived similarities between Towthorpe ware in Yorkshire and various heavy bowls in the west of Scotland (Manby 1975, 51). Cowie further contends that these heavy bowls anticipate, in terms of fabric and rim design, the more familiar late Neolithic coarse wares (1992, 281; 1993a, 17; 1993b, 69). It is significant, in this respect, that the rim form of vessel 2A recalls that of an allegedly late Neolithic vessel also from Barbush Quarry (Cowie 1992, 278–9 cat no 23, 277 illus 20.3).

The putative decoration on one of the vessel 3A body sherds (SF75.1), previously described above, is unparalleled amongst decorated early Neolithic pottery. The repeated vertical incisions on two sherds from pit FAC at Douglasmuir (Cowie 1993a, 24 cat nos 1 &2, 25 illus 2, nos 2.1 & 2.2), and the hatched incisions on a single sherd from F4, a small pit, beside Ring Ditch 2 at North Mains (Cowie 1992, 246 cat no SF8, 245 illus 63, no 8; 1993a, 33, 25 illus 2, no 22.8:), are unlike the possible decoration on the vessel 3A sherd. The motifs, if not the morphology, of the decorated material at Douglasmuir and North Mains find more suitable parallels amongst similar material from the cairn at Lyles Hill (Evans 1953, illus 15, nos 59 & 60). It is possible, given the apparently unique nature of the decoration on body sherd (SF75.1), that the arcane motifs discernible on its surface are nothing more than residual tooling marks (Cowie, pers comm).

Contextual parallels

The majority of early Neolithic pottery in central Scotland, given the diminutive sherd size, abraded condition, and presence in disturbed contexts on sites with evidence of later activity, is best interpreted as residual (Cowie 1993a, 22). The exceptions are discrete concentrations of early Neolithic pottery known from pit contexts at Balfarg Riding School, areas A and C (Barclay & Russell-White 1993, 166–9; Cowie 1993a, 26), Bannockburn (Cowie 1993a, 35), Douglasmuir (Cowie 1993a, 24), and Machrie Moor (Haggarty 1991, 57–8). The pits and pottery at the aforementioned sites are best interpreted as evidence of intentional depositional practices (Cowie 1993a, 18). Barclay and Russell-White provide a review of Neolithic depositional practices in pit contexts similar to those encountered at Chapelfield (1993, 166–9). It seems that the deliberate deposition of pottery in pit contexts continued into the later Neolithic. It is possible to interpret the ceramics from pit contexts at Grandtully in Perthshire (Simpson & Coles 1990, 33–8) and, for example, at Brackmont Mill in Fife (Longworth 1967, 67–75), as deliberate deposits. Coles and Simpson argue (1990, 34) that the pits in which the (admittedly later) Neolithic pottery was deposited at Grandtully in Perthshire did not remain open for prolonged periods of time. This perhaps recalls the immediate backfilling of pit VII at Chapelfield.

The inclusion of specific parts of different vessels in depositional practices is attested at Chapelfield. The comparative absence of base sherds, and relative abundance of rim and shoulder sherds, in the assemblage from Lyles Hill, in Co Antrim in Northern Ireland (Evans 1953, 32), and a similar predominance of rim sherds amongst the aforementioned later Neolithic ceramics from a pit context at Brackmont Mill in Fife (Longworth 1967, 74), suggest selective inclusion of pottery into depositional practices.

It is apparent that many vessels were actively used, at some indeterminate point, prior to their inclusion into pit deposits. Cowie observed heat-induced spalling scars on several vessels from east and central Scotland (1993a, 15). It is clear that the early Neolithic carinated bowls and plain bowls from Machrie Moor had been used at some point prior to deposition (Haggarty 1991, 60). Evidence of use at Chapelfield consists of either sooting or charred food residues on the surfaces of vessels 1B, 2A, and 3A, and abrasion above the shoulder and on the interior rim edge of vessel 2A.

Dating

Cowie provides a convenient summary of the radiocarbon dating of Neolithic pottery in lowland Scotland (1993a, 20 Table 1). It is apparent that carinated bowls have calibrated date ranges in the first half of the fourth millennium BC (Cowie 1993a, 19), and heavy bowls to the middle of the fourth millennium BC, the latter possibly remaining current into the third millennium BC (Cowie 1993a, 19). Dates derived from material in contexts where pottery is present at Balfarg Riding School (Dalland 1993, 161), North Mains (Barclay 1983, 243), Pitnacree (Coles & Simpson 1965, 46), Machrie Moor (Haggarty 1991, 58), and Newton on Islay (Henshall 1989, 37) do not substantially alter this chronological range. In the case of Chapelfield, the dates for pit VII (440/350) are closely comparable with those obtained from Balfarg, Pitnacree and Machrie Moor in particular.

With respect to vessel 4A, the British Museum radiocarbon dating programme of Beaker pottery precipitated the collapse of the various typological schemes applicable to this contentious category of ceramic (Ambers et al 1992; Kinnes et al 1991). According to the BM programme, the chronological currency of Beaker pottery extends from 2600 BC to 1800 BC (Kinnes et al 1991, 39). At Chapelfield vessel 4A, dated by association with carbonized remains from the fill of pit IV, seems to imply a slightly earlier date for this form of decorated vessel. However, the dating relationship is tenuous and it may be best to view the vessel as falling in the range 2600–1800 BC.

COARSE STONE TOOLS

K J Taylor

ON-SITE METHODOLOGY

A liberal attitude was taken toward the general collection of the stone assemblage on site. Due to an awareness of the difficulties of on-site identification, any stone that appeared *possibly* artefactual (or stone that appeared geologically interesting) was collected for analysis. A representative sample of stone that did not fit into either of the above categories from two of the largest pits (VII & VIII) was also recovered. This accounts for the size of the assemblage. Although much of the assemblage can consequently be assigned as non-artefactual, this strategy led to the recovery of a wide range and quantity of coarse stone artefacts which might have gone unnoticed if standard recovery procedures had been followed.

Finds were given a three-dimensional grid reference where possible. However, due to the problems of on-site identification on initial recovery, this was not always the case, and these have simply been assigned context numbers. In the two large pits (VII & VIII) the sheer quantity of lithic material prevented this. In the case of pit VII every stone was given a general finds number assigning it to this context, while in pit VIII the stone was recovered in three spits which represented discrete groups.

QUERNS

Perhaps one of the most significant aspects of the assemblage is the group of six artefacts identified as querns (or parts thereof). The term quern is here taken to refer to the object that formed the grinding surface, or base, on which seeds would have been ground. These are three distinct classes:

Saddle Querns

This type of quern was identified by Curwen (1937, 187) as a flat or, more typically, longitudinally concave, sub-rectangular stone slab over which a bolster-shaped upper rubbing stone was drawn in a single direction to grind seed. The artefacts belonging to this category from the site differ from one another and do not exactly match the description given above, but they clearly belong to this class of artefact. All have been made from laminated stone, which was ideal for their production.

SF171.1 (not illus) is a tabular slab of medium-grained sandstone that narrows to a pointed tip at one edge. It had been ground to a concave surface. Before deposition a large tabular flake had been removed from its grinding surface. The remaining grinding surface had been pecked to maintain this roughened surface after it had been worn down. This roughened surface had subsequently become ground in patches by the rubbing stone.

SF160 (not illus) had been prepared from a large boulder of laminated sandstone, with cortex intact around the edges of the flake. Although geologically similar to SF171.1, its surface has been worn flat rather than concave. In addition, the grinding axis runs obliquely across the surface of the slab. The extreme edges of the quern base rise slightly on three sides to prevent the loss of the material being ground – one edge remains flattened to facilitate its removal after grinding. The grinding surface is artificially ridged, indicating abrasion by a large-grained rock such as the conglomerate rubbing stone (SF169.4: illus 19).

Two refitting pieces of a tabular slab of schist (SF169.10 & 169.11), artificially shaped by flaking to a longitudinally concave surface and showing evidence of smoothed facets on their edges, may suggest the object was broken while having its face re-dressed. This may imply that saddle-querns were being prepared and/or re-dressed on site.

Trough Quern

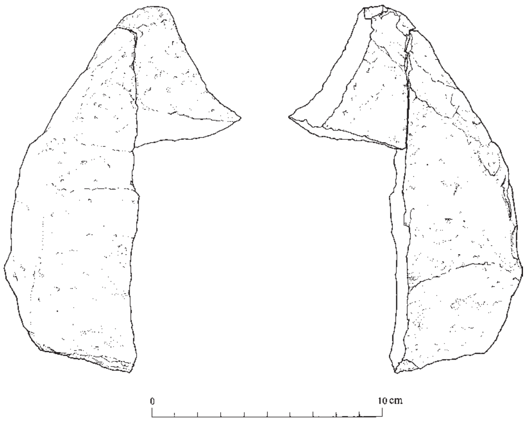
This type of artefact is distinguished from the saddle quern by the presence of a central depression or trough on the grinding surface in which the upper rubbing stone sat (Curle 1934, 301). Only one fragmentary object, SF171.2, can be attributed to this class of quern. Of a medium to coarse sandstone its upper surface was smoothed while the intact part of the central trough was roughened. Its recovery from the same context as the saddle quern SF171.1 (pit VIII) may have typological/chronological implications.

Saucer Querns

Saucer querns represent a similar technology. However, the upper rubbing stone is generally in the form of a bun-shaped disc (Curwen 1937, 87–8). This would have been rotated creating a saucer-shaped dished base. Two conjoining fragments (SF169.1: illus 17) can be tentatively attributed to this class of artefact. Although they form a small part of the edge of a much larger artefact it is clear that on both its upper and lower faces it has become ground to a circular dish or saucer-shaped concave surface consistent with wear in a rotating plane.

Others

Two fragments of a small quern-type artefact (SF182), with a concave ground surface, were recovered from pit X. Its small size combined with



ILLUS 17 Conjoining pieces of Saucer Quern 169.1

its apparent fragility suggests that it may have been more suitable for the crushing/grinding of small quantities of material, such as pigments or herbs.

RUBBING STONES

This group is by far the largest category of artefacts on site. They are distinguished by the presence of artificially smoothed and flattened surfaces and facets. There are two distinct sub-categories.

Quern Rubbers/Mullers

These rubbing stones are generally large elongated cobbles and have at least one surface ground to a flat or convex surface through use in conjunction with a quern.

Three different types of rubbing stone, corresponding to three quern types, can be identified. Many seem to have been employed with saddle-type querns (SF151: illus 18; 169.4: illus 19; 171.4; 172.4; and possibly 171.3) and are worn to a convex face due to the repetitive back and forth movement in one plane. Rubbing stones, such as SF169.3 (illus 18) (and possibly the large fragments SF253, 172.3 & 171.7), would have been free to move rotationally in any direction and may have been used in conjunction with a saucer quern. Indeed SF169.3 is virtually identical in both shape and size to a rubber, S19, recovered from the primary levels of one of the ditches at Windmill Hill (Smith 1965).

Hand-held rubbing stones

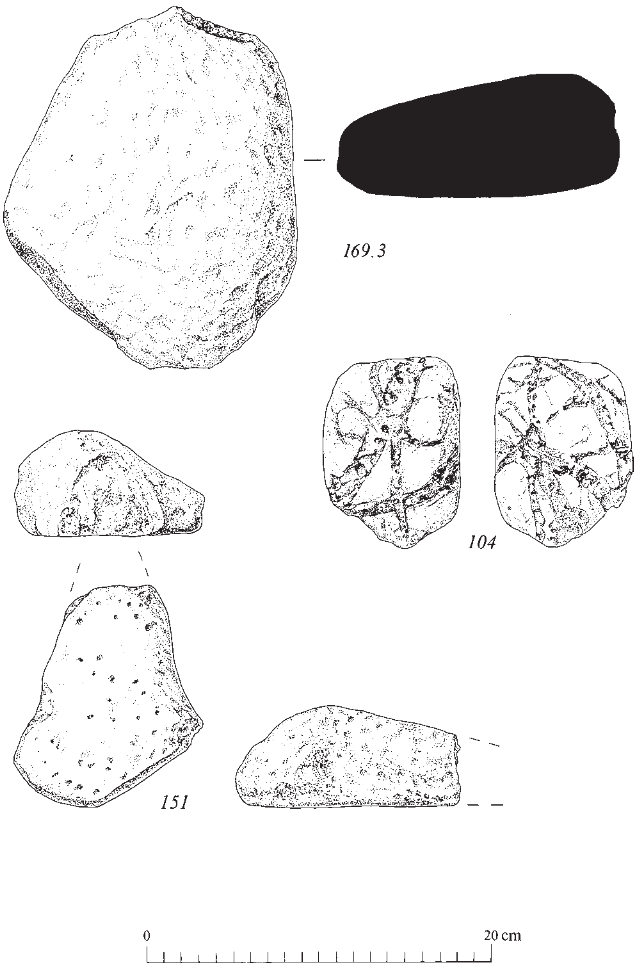
This group can be broken down into three sub-groups based on the nature of the worn surface:

Convex SF243 (illus 19), 244 & 170.1 all display faces worn to a convex surface. All three are of particularly fine stone (two of a fine-grained sandstone) and were intended for very fine work, perhaps the dressing of leather or the beetling of textiles (Ramsey 1995). All three appear to represent task-specific objects, implied by their careful shaping to fit the user's hand. The two sandstone pebbles bear evidence of patches of fine smoothing from abrasion of the user's fingers. Significantly, two of the pebbles were recovered from the floor of Structure H (762).

Concave SF169.5 (illus 19) & 239 represent typologically identical sub-rectangular artefacts worn to a concave surface on one face. They vary only in size and the choice of stone and by the fact that they are effectively in reverse (potentially reflecting left and right-handed users). The smaller (SF169.5) is of a fine sandstone, its edge facets worn smooth by shaping and abrasion caused by gripping during use. The larger (SF239) is of a much harder rock shaped by pecking on one end and bearing scarring from use on its concave face. The difference in size, geology, and use-wear on the concave surface suggests that although both may have served similar functions, one was clearly designed for much 'heavier' work. Significantly, similar forms of artefact have been found in pits forming the Neolithic enclosures at Bannockburn (Clarke 1997, 49–50).

SF171.6, of a medium-grained sandstone, is typologically identical to the two objects described above and may represent a similar implement in preparation. Likewise, SF165, with a concave face and worn and discoloured grip-facets, was recovered from the topsoil and may also belong to this class of artefact.

Flat SF172.5 was a medium grained sandstone bearing smoothed gripping facets, while SF188 was formed of part of a laminated sandstone boulder which has subsequently been smoothed through use (illus 20). An elongated hollow had been pecked along one edge to facilitate the grip. Neither artefact appears to have been used as a quern rubber, although this cannot be completely ruled out. Instead, it seems likely that they may have been used as planes for smoothing 'planks' of wood. Two smaller examples SF171.9 and 170.2 suggest a similar use, perhaps on a smaller scale.



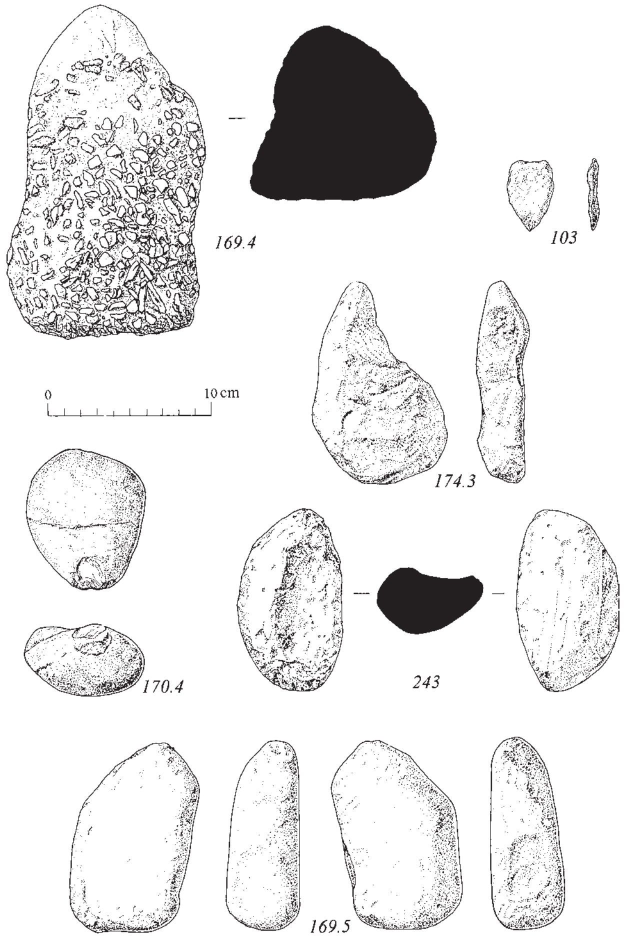
Illus 18 Selected coarse stone tools

Miscellaneous SF217 is a small pebble of quartz worn to a concave facet on one end. Like others it bears pecked finger holes to facilitate gripping during use. The presence of gloss on its worn surface, combined with the choice of a particularly hard, non-abrasive, stone suggests this may have been employed in the finer polishing of other stone artefacts.

SF170.3 is a small cobble ground to a smooth facet on one edge, a small hollow on the opposite edge has been pecked for, and subsequently worn by, the index finger to strengthen the grip during use – it may have been used for a variety of purposes.

BORERS

Three stones fit this category. They resemble similar objects recovered from Papa Westray (Ritchie 1983; Clarke 1992). However, the point is not as finely accentuated as in those examples, but a similar function can be suggested; that is, the perforating of wood or bone, or possibly even stone. Indeed pecking damage on the hard stone tip of SF172.9 would tend to suggest the latter – as pecking is a technique commonly employed in the perforating of stone (Fenton 1984). It is perhaps significant therefore that SF245 was recovered from the floor of Structure H (762), from where the fragment of a



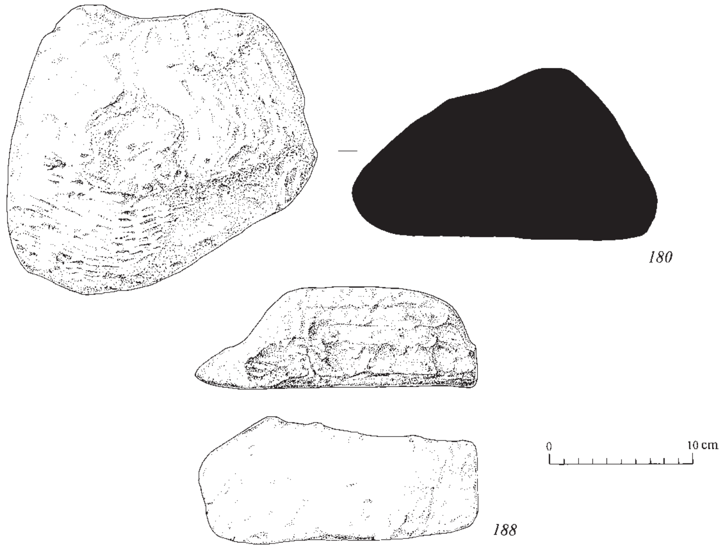
Illus 19 Quern Rubbers/Mullers

shafthole adze (below) was also recovered. The example of sandstone, SF174.3, is more likely, due to its inherent softness, to have been used on wood (illus 19).

STONE KNIVES

Two stone flakes appear to have been employed as knives. They are reminiscent of Skaill knives recovered from sites in Orkney, which are thought to have been employed in butchery (Clarke 1989; 1992). One, a decortical flake of Cowie quartz, SF169.13 (illus 21), displays a point of percussion perpendicular to the angle of its removal from a large cobble, creating a sharp-edged flake which appears abraded by use. The other (SF169.18: illus 21), of a slightly softer stone, although not displaying an obvious point of percussion, has become abraded around its edges by use. Both were recovered from pit VII.

SF174.1 is a similar decortical flake, its sharp edge has been abraded and notched in the centre as if through cutting/incising rounded objects such as bone or wood. Skaill knives are generally attributed to the Orcadian Neolithic alone. It is hardly surprising, however, that such a simple technology should not be confined to Orkney. Given that these implements are generally associated with butchery (Clarke 1989), very few are present relative to what may be expected from an economy potentially dependent on animal husbandry/hunting. This suggests two possibilities: first that butchery was



ILLUS 20 Flat hand-held rubbing stone and anvil

undertaken outwith the domestic arena (or simply outwith the area excavated) or second that gathering/arable agriculture was far more important, as implied by the relatively large number of querns.

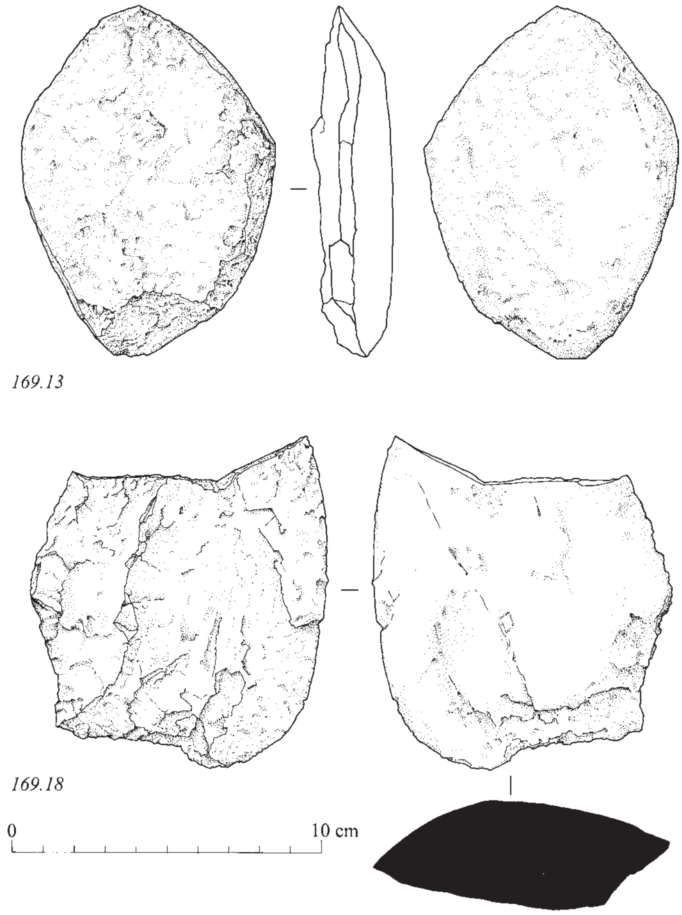
ANVILS

Four objects can be assigned to this category with certainty SF169.14, 180 (illus 20), 141 and 172.2 are all large boulders bearing depressed pecked zones from such use. Saddle quern SF160, also bears a large oval depression on its underside from this use. It would seem that the actual geology of the anvil was not so important as the size and shape of the working surface.

Two of the anvils (SF172.2 & 180) bear smoothed facets potentially where artefacts were ground after initial shaping. Another two objects (SF171.5 & 172.3) can be tentatively attributed to this group on the basis of shape, general size, and evidence of possible use-wear.

HAMMERSTONES

None of the hammerstones recovered from Chapelfield bears evidence of persistent pecking, of the kind generally associated with flint-working. This may be due to the fact that antler or bone was used for direct percussion or simply due to a lack of suitable flint. Much of the assemblage suggests a fairly ad hoc utilization of materials as hammers, for example, SF181 and SF170.4 (illus 19). Only SF169.8 bears evidence of deliberate shaping to the user's hand in the form of a pecked thumbhole. Unlike the others it is accompanied by extensive pecking damage on the anterior surface. Another two objects (SF171.5 & 172.3) can tentatively be attributed to this group on the basis of shape, general size and evidence of possible use-wear. At least four of the hammerstones (SF169.8; 170.4 (illus 19); 174.2; 249) also bear evidence of an intermittent gloss on parts of their surfaces. The hammerstones are reminiscent of a quartzite pebble recovered from Broomheath (Wainwright 1972) which, it was suggested, was possibly used as a leather or skin dresser. However, it seems probable, bearing in mind the occasional recovery of polished stone axes with polished quartz pebbles (eg Neish 1871), that both the hammerstones were employed in the primary shaping of other coarse stone artefacts either by pecking or flaking. The hammerstone (174.2) bore tiny linear chiselled pecks (c 1–2mm across) suggesting it may have been used in combination with an awl to produce incised decoration potentially similar to that recorded on the axe haft recovered from Ehenside Tarn (Darbishire 1872).



ILLUS 21 Knives reminiscent of Skaill Knives

POUNDERS/MAULS

This term refers to the larger stones used in more 'heavy duty' hammering. Three can be identified. The largest, SF184, is of quartz and bears pecking and flaked scars on both ends. Another of a white quartz (SF169.17) has been hammered to a flattened facet on one end. Unlike the hammerstones it is likely that these were used in heavier constructional work, for example splitting laminated boulders for the preparation of querns.

THE PERFORATED STONE FRAGMENT

A fragment of a perforated stone implement (SF183) was recovered from a small charcoal-rich context (762) cut into the floor of Structure H and located between its walls (illus 7). The technology of its production, that is, the selection of a suitable pebble, close in shape to the intended design, followed by the rough pecking of surfaces to shape it crudely before drilling/pecking a perforation, fits closely with the current understanding of how shafthole implements were prepared (Fenton 1984; Ransom 1994). While the perforation was being made, the implement split. Pecking marks on the exposed surface, combined with the general abrasion of other surfaces, suggests that it continued in use as a hammerstone before its final deposition. Although the fragment is relatively small (55mm long by 70mm broad and 44mm thick), its general size and the use of quartzite as a raw material suggests that this is a fragment of a shafthole adze (Roe 1979, 36).

TABLE 5
Types of artefact distribution by context

Tool Type	Pit I (008)	Pit 250	Pit VII (350/440)	Pit VIII (453/455)	Pit VIII (473/481)	Pit XII (479)	Structure H Floor (762)	Other
Quern Rubbers	–	–	2	–	3 & 2 (?)	1	–	1 & 1 (?)
Rubbing Stones	1	–	2	3	3 & 1 (?)	–	2	3
Borers	1	–	–	–	1	–	1	–
Stone Knives	1	1 (?)	1 & 1 (?)	–	–	–	–	–
Anvils	–	–	1	–	1 & 1 (?)	–	–	2
Hammerstones	2	2	3	–	–	–	–	3
Pounders	–	–	1 & 1 (?)	–	–	–	–	2
Skeuomorphs	–	1	–	–	–	–	1	–

Curwen (1928) first identified shafthole adzes as a discrete category type. The sides can either be straight or taper slightly towards the butt. At one end the facets meet at a cutting edge which rarely seems used. These are often made of quartzite (Roe 1979). Only one has been recovered from an archaeological context, from the upper fill of the ditch of Windmill Hill (Smith 1965). They have generally been attributed to the Bronze Age (Smith 1979); however, their typological similarities to cushion maceheads, which have been recovered from early Neolithic contexts, is worth noting.

GENERAL DISCUSSION

Taken as a whole, the coarse stone tool assemblage appears to suggest that a wide range of domestic activities took place on-site. There are also indications of ritual activity in the form of structured deposits.

As to the economy as a whole, the quern assemblage seems to suggest an emphasis on arable produce, although it should be emphasized that there was no indication of the presence of typical agricultural equipment such as ards, adzes (the shafthole adze may not have been intended to serve a strictly functional role), axes, and mattocks. However, like the relative absence of butchering tools this may merely be due to a combination of contemporary depositional practices and the relatively small area excavated.

As to chronology, the saucer rubber in association with the pottery may suggest an early Neolithic date. However, the possible intrusive nature of some quern fragments and the current typologies associated with their form is suggestive of late Neolithic/Bronze Age date. Given that the latest event witnessed on site has been dated to the end of the third millennium this would seem to contradict current typologies and may suggest an earlier date for the use of this sort of coarse stone tool assemblage. Similarly, excavation of a hut-circle at Tormore, Arran, produced a saddle quern incorporated into an internal post-hole (Barber 1997, 25), suggesting a currency of use beginning before the second millennium BC.

Pit I is particularly notable as a borer, 'Skaill' knife and hammerstone had been deposited on the base of the pit and sealed by burnt oak, which produced a radiocarbon date from the first half of the fifth millennium BC. Hammerstones, clearly, form a component of Mesolithic assemblages (eg Wickham-Jones 1990).

STRUCK STONE

M Donnelly

The excavations at Chapelfield, Cowie recovered a small assemblage of 18 pieces of struck stone. A further 30 pieces were recovered during an extensive post-excavation sieving programme. This limited assemblage showed marked peculiarities in the choice of raw materials and in the morphology of the produced pieces.

RAW MATERIALS

The most striking aspect of the raw materials chosen by the knappers at Chapelfield is the dominance in the assemblage of pitchstone from Arran. Twenty of the 48 pieces were of pitchstone (Table 6), originating from at least three different cores. Macroscopic observation of the pitchstone identified three main groupings: group A, a glassy dark green matrix with noticeable starry microphenocrysts; group B, also dark green but more matt and with occasional phenocrysts; group C (only one

TABLE 6
Lithic tools distributed by raw material

Sub-type	Pitchstone	Flint	Chert	Quartz	Agate
core	1	–	–	–	–
blade	6	–	1	–	–
bladelet	10	–	–	–	–
regular flake	2	4	–	1	–
irregular flake	–	3	–	–	–
spall	1	2	–	–	–
debris	–	5	1	–	–
debitage	–	5	1	4?	1

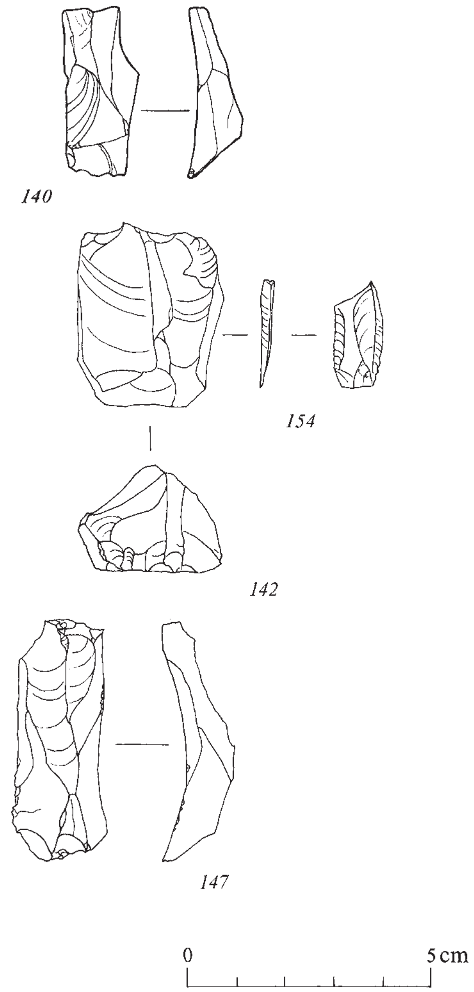
piece) had an olive green matrix with no visible phenocrysts. All three groups exhibited conchoidal fracture and because of this and coupled with their colour and noted inclusions, have been tentatively identified as originating from the Corygill source (Thorpe & Thorpe 1984).

Flint was almost as common as the pitchstone and was a transparent light/mid brown colour. The cortex appeared fairly fresh and un-battered, although very thin. This suggests that perhaps only one source and possibly only one core was represented. Quartz was also present, but only five pieces were recovered with the majority being small pieces of debris. This form of lithic debris is often difficult to identify unambiguously as originating from human activity. Chert and agate were also recovered at Chapelfield, although only in very small amounts. Apart from a single snapped blade of chert, the rest of the chert and the single piece of agate represent waste material.

It would appear that the flint had been obtained either from secondary river gravel deposits or from beach-pebble deposits although there is too little cortex present to determine which. Chert outcrops throughout much of central Scotland (Wickham-Jones & Collins 1978) and the material from Chapelfield may have originated here or been obtained from river gravel deposits. Agate can also be obtained in a similar manner to chert. Sites rich in agate are known from the Ochils in Fife, close to Chapelfield (C Barrowman, pers comm). Quartz is readily obtainable throughout Scotland.

MORPHOLOGY

The dominant form is the blade, in most cases narrow enough to be considered bladelets (ie less than 8mm thick) (Table 6). With the exception of one snapped blade of chert, all of these pieces were of pitchstone. Although pitchstone is particularly suitable for blade production (Wickham-Jones 1986), the correct reduction strategy must still be employed in order to generate an assemblage dominated by blade removals. All four pitchstone blades are complete, two of which are refits, and there are five complete bladelets, one of which is a refit. These averaged 25mm and 13.5mm in length with little variation. In width the blades averaged 9.25mm, varying from 7 to 11mm and the bladelets averaged 5.6mm varying from 4 to 7mm.



ILLUS 22 Pitchstone blades & cores

Interestingly, there is no continuum from bladelets to blades. In this case blades are on average almost twice as long as bladelets. This suggests that these pieces had served different functions within the overall assemblage.

The pitchstone core had been discarded at a length of 17mm and exhibits mostly bladelet scars, along with one truncated blade scar. The core appears to exhibit a single platform and one bladelet refits directly onto it and represents one of the final removals. Two flakes and a waste spall complete the pitchstone assemblage. The flint assemblage consists mainly of waste, 12 pieces, although flakes, both regular and irregular, account for seven of the 19 pieces of flint. Although four of the seven flakes are regular, they barely fall into this category, averaging only 11mm in length and 9.5mm in breadth (two are incomplete having snapped distally), and are more likely to represent larger knapping debris or core trimming flakes (Table 6).

PRIMARY TECHNOLOGY

Bulbs of percussion

The majority of the bulbs are diffuse in character although there are some prominent examples. It is not clear if the conventions applied to bulb characteristics in flint can be applied without modification to pitchstone, but it has been assumed here that patterns in the bulbs on pitchstone and flint pieces are equivalent. The diffuse bulbs are suggestive of indirect percussion with an organic punch such as antler or bone. The prominent bulbs relate to direct hard hammer percussion. The core exhibits negative bulb impressions that imply fairly prominent bulbs on the initial platform, used with diffuse bulbs dominating the removals from the second platform. Prominent bulbs occur mostly on flakes although there is one example on a blade. This is suggestive of the initial preparation or re-shaping of the core (if it arrived in a pre-prepared form). The blade with the prominent bulb is one of the largest examples in the assemblage and exhibits a large flat platform.

Platform types

Remaining platform margins are either wide and flat, or more commonly, vestigial with abraded platform margins. Again this can be seen to represent a limited hard hammer application (the wide, flat examples) with the application of a mostly punch-struck technology (vestigial). The abrasion of the platform margins suggests that the core platform was frequently pre-treated by abrading it with a hard stone. This removes projections and other irregularities and thus allows the knapper to regulate blade removals. This technique has also been observed on pitchstone blades from Stoneyburn (Pollard 1995).

Overall strategy

The strategy employed is identical to that used during the Scottish late Mesolithic and in those blade assemblages identified as early Neolithic (Wickham-Jones & Mackenzie 1996). The large, wide platform margins and prominent bulbs on some of the larger blades are reminiscent of the type of blade reduction seen in the Irish late Mesolithic (Woodman 1978). Initial reduction of the cores must have occurred elsewhere as there is no decortical material within the assemblage. The presence of quantities of flint debris without any corresponding tools or blanks of flint may be by chance. However, selective deposition of specific components of the complete reduction sequence of flint and pitchstone is unusual and may highlight an aspect of how this material was valued by the occupants of early Neolithic Chapelfield.

Secondary technology

Secondary working was a rarity at Chapelfield, although this was to be expected bearing in mind the nature of the assemblage. Pitchstone is usually infrequently retouched but here there are four retouched pieces of pitchstone: three retouched blades and one retouched bladelet. Two of the blades have regular retouch along their proximal right dorsal shoulder. The third blade has irregular retouch along its dorsal distal left edge. The bladelet has had medium retouch along its entire right dorsal edge. This tiny bladelet represents one of the final removals from the core after which further attempts to reuse this narrow platform edge were unsuccessful. None of the flint pieces is retouched.

DISTRIBUTION

The distribution of struck stone at Chapelfield is far from regular (Table 7). Thirty-two pieces originated from within pit VIII, with two more being derived from pit IX, which probably represents the tail end of pit VIII, lying directly beyond the culvert that cut both these features. Thus, 70.8% of the assemblage was found in one feature. The majority of the remainder of the struck stone was also derived from

TABLE 7
Lithic Tools distributed by feature

Context	Location	total lithic quantity
694	pit I	5
008	pit II	5
448	pit IV	1
439	pit VII	1
443	pit VIII	32
593	pit IX	2
–	other features	2

pit deposits with material being recovered from pits I, II, IV and VII. Of these, only pit I produced any material of interest. Only two pieces, both unremarkable, were recovered from outwith these pit groups.

Perhaps one of the most striking aspects of the distribution of struck stone is the apparent mutual exclusivity of certain raw materials. All the flint, and the majority of the pitchstone from groups A and B, originated within pits VIII and IX. Here, the majority of the flint consisted of debris from possible bladelet production whereas the pitchstone consisted of the blades and bladelets, some debris and a core. Some of these blade forms, particularly the complete retouched examples, appear entirely suitable for use. These pits were located close to pit VII, which contained the majority of the pottery (Squair & Jones, above). Pit I contained quantities of burnt organic material, some pottery, the only piece of chert, and the only piece of group C pitchstone.

It is suggested that there was a careful and selective deposition of various materials, including not only flint and pitchstone, but also pottery of differing styles and carbonized organic remains. With respect to the flint and pitchstone, this appears to have involved the careful separation of complete and broken tools from minor waste products such as debris and debitage. Had this not been the case, larger quantities of pitchstone debris would have been recovered from pit VIII.

There would also appear to be a separation of material by a combination of type and colour. The lack of further material originating from the (olive green) pitchstone group C is problematic. The occurrence of a core of pitchstone militates against the theory that the material was transported already struck. It would therefore appear to be the case that the green and black examples of complete pitchstone blade forms are exclusive.

COMPARATIVE DISCUSSION

Pitchstone occurs commonly in the early Neolithic, particularly on sites in central or southern Scotland (Mann 1918; Ritchie 1968; 1981; Thorpe & Thorpe 1984). Some of the early Neolithic finds were from isolated pits with few pieces of pitchstone. At Ratho in East Lothian (Smith 1995), a pitchstone medial blade segment was found in association with the remains of two early Neolithic bowls, much charcoal and a single grain of wheat (*Triticum*). Beneath the large Roman Fort at Elginhaugh, pitchstone blades were recovered from two of four early Neolithic pits associated with flint, carinated bowl pottery and carbonized remains including cereals. At Carzfield in Dumfries & Galloway (Maynard 1993), pitchstone bladelets were recovered from a large pit, associated with flakes from a Group VI axe, flint waste flakes, early Neolithic bowl pottery and abundant carbonized remains, including emmer and hulled barley. In these cases, the pits were not directly associated with settlement remains dating to the early Neolithic.

Pitchstone in larger quantities was recovered at Biggar Common and Melbourne, S Lanarkshire (Ward 1993; 1997). At Biggar, while the pitchstone did not dominate the assemblage (local chert did) it was more common than flint. The material was discovered as a surface scatter associated with pits, with many sherds of early Neolithic bowl pottery. At Melbourne, the pitchstone was recovered as a surface scatter with a marked concentration suggestive of knapping, and early Neolithic pottery was again recovered although not securely contexted. Blades, flakes and small cores were prominent within the concentration, with larger flakes and scrapers common beyond it (Ward 1997). The pitchstone ($n = 120$) was far more numerous than chert (37) or flint (29). Unfortunately, no features were recognized relating to the surface scatter.

The site of the Bannockburn enclosures (Tavener 1987; Rideout 1997) is close to Chapelfield. Within two of the pits, pitchstone blades were recovered, a feature which led Clarke to conclude that the inclusion of pitchstone 'clearly has an invested meaning and their deposition, together with blades of chert, in pits from this site [Bannockburn] was most likely deliberate' (Clarke 1997, 50).

While rarely the dominant raw material in any struck stone assemblage, pitchstone does occur in small amounts on many sites from northern England (Burgess 1972) and the Scottish Borders (Mulholland 1970) to Highland, as at Ord North (Thorpe & Thorpe 1984), and has also been discovered at Barnhouse, Orkney (Richards 2000). On many sites the pitchstone usually occupies a niche related to size and shape; that is, the pieces are smaller than the site average for all stone types, and often occurs as blades or regular flakes (blade-like). Sites dominated by pitchstone outwith Arran are rare but do occur (eg Melbourne, above).

CONCLUSION

The assemblage from Chapelfield, while initially seen as unusual, can now be seen to be typical of early Neolithic assemblages.

PLANT REMAINS

D M Alldritt

Fifty-eight bulk soil samples were processed using a water flotation machine, and carbonized plant material was extracted and identified. A further 20 charcoal spot finds (representing six different contexts) were selected for hand washing under laboratory conditions, and were then identified to species. The charcoal remains revealed the exploitation of a mixed *Quercus* (oak) woodland, which included *Pinus sylvestris* (Scots pine), with *Corylus* (Hazel) and *Alnus* (Alder) perhaps growing at the woodland edge. The plant macrofossils represented a range of habitats, including cultivated and waste ground, heathland and woodland edge taxa. The charcoal identification results are listed in Table 8 and the plant macrofossils are grouped by context in Table 9. The plant remains and charcoal present in the main features are listed in the individual feature descriptions (above). Unfortunately the evidence for the mixing of feature stratigraphy and incorporation of residual material must make the conclusions tentative.

THE ECONOMY OF THE SITE

Cultivated plants

Evidence for cereal cultivation was present at the site, although the actual numbers of cereal grains are very low and would appear to be later than the occupation of the site. Pits I and II contained traces of domestic refuse which was accompanied by the deposition of charcoal taken from a range of woodland sources, including scrub taxa such as hazel, in addition to the more substantial areas of oak and pine forest that were being utilized at this time.

The material submitted for radiocarbon dating from pits I and II places these features in the Mesolithic period (dates above). It also confirmed that the very small quantities of battered and degraded *Hordeum Vulgare* (hulled barley) cereal grains were intrusive.

Wild plant resources

The plant macrofossil evidence from the pits revealed the exploitation of wild resources during specific periods of occupation at the site. In particular hazelnut shells were abundant in pits VII and VIII and as mentioned previously, pit VII also contained a single *Prunus* sp fruit stone. These woodland edge taxa (*Corylus* & *Prunus*) would have flourished during the clearance of more substantial oak and pine forests to make way for agriculture. Both hazel and blackthorn are light-loving species and prefer more open woodland.

Woodland exploitation

In Scotland as a whole pine is seen to dominate the pollen record in the Cairngorms, on Speyside, and in the area north-west of the Great Glen from approximately 7000 BP to 5500 BP (Price 1983). There are regional variations in these dates and in the proportions of tree species present. Birks et al (1975) recorded the dominance of pine and birch pollen in the north and north-east, and of oak and hazel in the west and south of Scotland at around 5000 BP. Birks's maps do not show pine forest extending any further south than Perthshire at this time. More recently, however, Dickson (1993) has described the extremely complex history of Scots pine, with evidence for the presence of *Pinus* in Central Scotland at 3000, 4000, and approximately 5000 years ago. Notably from Lochend Loch, two stumps have been dated to 4995 ± 45 BP and 5285 ± 45 BP (Ramsay 1991). Although Dickson (1993) states that pine never formed large woodlands in central Scotland, the evidence for its presence is undeniable.

The charcoal identified from Chapelfield represents a range of species preferring varied habitats,

Table 8

Charcoal identifications

	Pinus sylvestris	cf *P sylvestris*	Coniferous Type	*Quercus*	cf *Quercus*	*Corylus*	cf *Corylus*	*Alnus*	cf *Alnus*	Indeterminate
(694) 441	3.5g			1.55g			0.25g			1.55g
(694) 437	1.35g			1.0g						0.35g
(694) 432 Res.	5.7g		1.25g	0.25g						0.15g
(694) 432 Flot			<0.05g	0.25g		0.05g				
(694) 445	2.0g			0.25g						0.45g
(694) 443	2.65g			0.45g						0.45g
(694) 438	3.55g			1.5g	0.3g					3.05g
(694) Totals:	18.75g		1.25g	5.25g	0.3g	0.05g	0.25g			5.8g
(442) 264				0.25g		0.85g		0.05g		
(442) 261				2.45g		0.05g				1.25g
(442) 250				2.5g		0.35g		0.55g		1.2g
(442) 257				1.25g		1.35g			0.75g	
(442) 259				1.35g		0.45g				
(442) 263				1.7g		0.45g		0.2g		0.25g
(442) Totals:				9.5g		3.5g		0.8g	0.75g	2.7g
(505) 234				4.3g						
(505) 233				8.35g						
(505) Totals:				12.65g						
(008) 146				19.4g						
(008) 284				4.9g						
(008) Totals:				24.3g						
(440) 228				0.85g		2.95g				0.25g
(440) 230				1.45g		5.4g	0.7g			
(440) 1237–40 + 27				3.05g		3.15g	1.0g			5.0g
(440) Totals:				5.35g		12.5g	1.7g			5.25g
D on plan 231				2.35g						
D Total:				2.35g						
(350) 1247			0.1g	0.2g		3.75g				3.45g
(350) 1236				0.9g		4.05g				1.05g
(350) 199		<0.05g		0.65g		1.65g				0.55g
(350) 1226	0.3g		0.35g	1.05g		2.55g				1.25g
(350) 1225				0.9g		0.35g				0.85g
(350) Total:	0.3g	<0.05g	0.45g	3.7g		12.35g				7.15g
(506) 230				1.45g						
(506) 231				2.35g						
(506) 229				1.1g						
(506) Total:				4.9g						
(012) 1234				0.95g		0.15g				
(012) 1233	0.2g			0.65g						0.15g
(012) 1232			0.1g	5.85g		0.25g				
(012) Total:	0.2g		0.1g	7.45g		0.4g				0.15g
(087) 244	3.65g			0.8g						0.1g
(087) Total:	3.65g			0.8g						0.1g
(350/440) 235				3.7g		0.25g				0.45g
(350/440) Total:				3.7g		0.25g				0.45g
(018) 235	4.3g			0.65g		0.25g				0.6g
(018) Total:	4.3g			0.65g		0.25g				0.6g
(449/475) 310 Res.	0.05g			2.3g					0.05g	0.45g
(449/475) Total:	0.05g			2.3g					0.05g	0.45g
(449/475) 310 Flot								0.15g		
(449/475) Total:								0.15g		

TABLE 9
Plant remains by context

Sample	253	254	256	256	262	267	268	1232	1233	1234	235	1	10	12	244	111	133	199	1220
Context	8	8	8	8	8	8	8	12	12	12	18	39	57	59	87	244	251	350	350
Macrofossils:																			
Chenopodium album	54	52	9	7	17		7	6	6	1	10	11			1	1	2	4	
Chenopodium sp		2 half																	
Atriplex sp											7								
Persicaria maculosa	2		2					1								1			
Polygonum aviculare								1											
Fallopia convolvulus	2			2							1								
Calluna vulgaris																			
cf *Vaccinium myrtillus*																			
Lathyrus pratensis																			
Polygala vulgaris																			
Hordeum vulgare s l	1					1													
cf *Hordeum* sp												1							
cf *Danthonia decumbens*					1														
Other plant remains:																			
Pinus spbuds and scales											4				9		5		
Corylus nut shell					4	4	6	4		2							5	4	
Prunus spinosa fruit stone																			
cf *Crataegus* fruit stone											1								
Indet nut shell																			
Indet Carb weed						1													
Modern seeds	1	3			3		1				1					yes	2		
Non-plant:																			
Beetle body parts		1		1			1	3											
Insect eggs (Carb)																			
Earthworm Egg caps	4					1		4	3	2	4		1			1	3	10	
Fungal spores	2		1												yes			yes	yes

TABLE 9 continued

Sample	1225	1226	1236	1241	1243	1244	1245	1246	1247	1248	1227+1237–40	250	251	257	258	259	261
Context	350	350	350	350	350	350	350	350	350	350	440	442	442	442	442	442	442
Macrofossils:																	
Chenopodium album			4	2				6			11	3	1	2	3		1
Chenopodium sp											half						
Atriplex sp																	
Persicaria maculosa								1									
Polygonum aviculare											1						1
Fallopia convolvulus								1			1		1		1		
Calluna vulgaris												1					
cf *Vaccinium myrtillus*																	
Lathyrus pratensis																	
Polygala vulgaris																	
Hordeum vulgare s l																	
cf *Hordeum* sp																	
cf *Danthonia decumbens*																	
Other plant remains:																	
Pinus spbuds and scales																	
Corylus nut shell	3	7	8	5		8		2	1	1	12	1					7
Prunus spinosa fruit stone		1															
cf *Crataegus* fruit stone																	
Indet nut shell																	
Indet Carb weed				1													1
Modern seeds						1			yes								
Non-plant:																	
Beetle body parts																	
Insect eggs (Carb)																	1
Earthworm Egg caps	2		1	4		3	1				3	2	1	5	2	2	
Fungal spores	yes				yes			1			3						

TABLE 9 continued

Sample	263	264	301	310	271	293	294	309	302	312	340	431	432	435	437	438	441	443	445
Context	442	442	473/ 450	449/ 475	453	459	459	482	483	490	592	694	694	694	694	694	694	694	694
Macrofossils:																			
Chenopodium album	4		3		1			1	1	1	1	35	14	12	31	7	9		
Chenopodium sp																			
Atriplex sp																			
Persicaria maculosa													1						
Polygonum aviculare																			
Fallopia convolvulus										1		2			2	1			1
Calluna vulgari																			
cf *Vaccinium myrtillus*															1				
Lathyrus pratensis														1					
Polygala vulgaris					1														
Hordeum vulgare s l															1				
cf *Hordeum* sp																			
cf *Danthonia decumbens*																			
Other plant remains:																			
Pinus spbuds and scales					1								2	2					1
Corylus nut shell	1	1	2	1				1		2			1		5	2	1		3
Prunus spinosa fruit stone																			
cf *Crataegus* fruit stone																			
Indet nut shell											1								
Indet Carb weed																			
Modern seeds										1		1	2	2					
Non-plant:																			
Beetle body parts																			
Insect eggs (Carb)		1																	
Earthworm Egg caps	1	2		1	3					3	1		5						
Fungal spores					yes		yes			1							1	yes	

including *Quercus, Corylus, Alnus* and *Pinus sylvestris*. These woodland resources were brought onto site by people and could therefore represent collection from a wide area. The site lies within an area surrounded by the remnants of ancient peat bogs, with Flanders Moss to the north-west, Dunmore Moss directly to the east and Letham Moss to the south. These bogs were undoubtedly far more extensive during prehistory than the few areas remaining today. The radiocarbon dates produced for the Scots pine charcoal found at Chapelfield, have provided some of the earliest dated Scots pine to be found in central Scotland. Scots pine woodland may have been growing locally or may have been recovered from peat bog for use as fuel, due to its good burning qualities.

CONCLUSIONS

The environmental samples taken from the site yielded a significant amount of data concerning the use of woodland resources, wild plant foods and the presence of cereal grains on an early prehistoric site. The differing spatial distribution of crop plants and wild plants within the pit deposits suggests some degree of separation of activities, with pits I and II containing processing/domestic debris such as cereals and crop weeds, whereas pits VII and VIII contained woodland and wild resources. Paradoxically this does not reflect the formation of the deposits within pits VII and VIII, as representing the initial colonization of the site, but clearly implies the importance of wild resources in the early Neolithic period. The fact that pits I and II contained a thin scatter of carbonized cereal and crop weeds should be interpreted as activity unrelated to their primary use in the Mesolithic period (see below for further discussion). The dating of the Scots pine charcoal to the Mesolithic period represents an important and significant find in the archaeobotany of central Scotland.

THE GEOARCHAEOLOGICAL INVESTIGATION

J S Duncan

INTRODUCTION

Sediments from stake-holes and pits at Chapelfield were analysed for a number of chemical and physical attributes, and the results were subjected to cluster analysis with the aim of assisting the identification of different site formation processes and assessing the validity of site phasing and structural interpretation. The following report represents a summary of the results of the sedimentological work relevant to interpretation. The full report on the results of the programme of work in currently in preparation and will be published separately (Duncan, in prep).

The following attributes of the sediments were investigated, measurements of: colour; magnetic properties; phosphate levels; organic matter (loss-on-ignition); and particle size.

THE PITS

Forty-seven samples from pits were investigated and intra-site comparisons and interpretations were produced. In addition cluster analysis was undertaken on all the pit fills with the aims of grouping together fills with similar attributes, thus allowing comment upon depositional history; and investigation of the variation of fills within individual pits. The results produced a number of clusters (Table 10).

Pit I

The samples (9) from pit I were from the upper fill (785) and all were placed within a similar cluster indicating that they most probably represent a single phase of deposition (Table 11). In comparison to the other fills, they were darker in colour and contained higher levels of organic matter and phosphate. These attributes would normally be associated with a deposit of household domestic waste; however, the recovery of pottery, abundant carbonized botanical material and a number of pitchstone blades may indicate that this deposit has a more sophisticated meaning.

Pit II

Eight samples were analysed from pit II, five from 694d and three from the upper fill (694a) (Table 12). Cluster analysis of the fills divided the samples into two meaningful groups (with a residue of unclustered samples: context 694a contains a higher percentage of sand than the rest of the samples; context 694di returned high magnetic susceptibility values.

Table 10
Pit clusters

Cluster	Pits fills (samples)
1	Pit I (samples 253, 254, 255, 256, 262, 267, 268, 269, 423); pit IV (1234, 1232); pit VII (1244); pit VIII (251, 257, 258, 261, 263, 264)
2	Pit II (432, 435, 441, 443, 445); pit VIII (293, 294, 309, 301); Slot 66 (245)
3	Pit II (431); pit IV (1233); pit VII (1236, 1239); pit VIII (250, 259); pit IX (340); Slot 66 (10, 243, 12, 244);
4	Pit II (437, 438); pit VII (199, 1225, 1243, 1245, 1246, 1248);

Table 11
Pit I sediments; attributes and interpretations

Attribute	Comments	Interpretation
Colour	Low chroma, low value	Dark in colour
Magnetic susceptibility	No enhancement	No burning/burnt material
Loss on ignition	High loss on ignition values	Organic fill
Phosphate	Moderate quantities, context 785 (upper) high	Could relate to relatively high quantities of charcoal retrieved from context 008
Particle size	Context 785 (upper) higher sand content	

Table 12
Pit II sediments; attributes and interpretations

Attribute	Comments	Interpretation
Colour	Relatively high values	Colour lightened with ash?
Magnetic susceptibility	Spits 4 (N & S) show enhancement in magnetic susceptibility	Dump of ash?
Loss on ignition	All similar and low	Low quantities of organic matter
Phosphate	The phosphate levels decrease as the depth of sample increases	?
Particle size	All very similar apart from upper spit (sample 431) which contains substantially more sand than the rest of the samples	Mixing, truncation

Phosphate levels, which would be expected to be high in domestic refuse, were generally low and decreased as the depth of the sample position increased. This could be interpreted as suggesting that greater quantities of hearth material may have been deposited in the upper fill (694a) of the pit. Alternatively, and perhaps more likely, the phosphate levels of the lower fill have been depleted (as is suggested by the results of the phosphate grid samples across the site). In addition, the presence of Structure E's flooring (687) above the pit has probably altered the phosphate concentration within the pit. The light colour of the samples was probably affected by the quantities of ash present.

The results of the sedimentological work, together with the botanical remains recovered, reinforce the original interpretation that ash and charcoal rich material has been deposited within this pit, probably by relatively rapid backfilling processes. Although, the samples were divided by the cluster analysis, the differences are very evident and do not on the whole change the interpretation. The higher quantity of sand sized particles within the upper sample is interpreted as being the result of mixing/truncation activities perhaps related to the re-cutting of the pit. The lack of pottery and low number of pieces of struck stone (4) recovered from this pit, together with the lack of phosphate enhancement and low organic content may suggest that material deposited within this pit does not represent household 'domestic' waste, but some other form of occupation refuse.

Pit VII

Nine samples from pit VII were analysed (Table 13). The primary fill (440) of the pit was the only sample not to possess enhanced magnetic properties, perhaps suggesting that it is a non-cultural deposit when compared to the enhanced levels of all the other samples. This context contained a noticeably higher concentration of sand-sized particles,

TABLE 13

Pit VII sediments; attributes and interpretations

Attribute	Comments	Interpretation
Colour	–	–
Magnetic susceptibility	Enhanced levels within context 350	–
Loss on ignition	Average levels	–
Phosphate	Enhancement especially samples 1244 & 1245	botanical material?
Particle size	High levels of sand in context 440	

which is characteristic of a primary fill present within a pit dug in a climate of abundant rainfall (Limbrey 1975, 290–9). The shallow shape of the feature could be taken to suggest that substantial erosion has produced it.

The enhancement of phosphates and magnetic values of the other samples (350) together with the retrieval of abundant pottery (1692 sherds) and numerous stone tools suggests that this deposit is different. The nature of the material suggests a rather different deposition history that probably does not relate to everyday disposal of waste. The high phosphate values may be due to the presence of carbonized remains, such as hazelnut shells and a blackthorn fruit stone, within the fill.

The clustering of six of the nine samples analysed confirms that the deposition of (350) was probably a single event. The results from the excavation and artefactual data would seem to conflict with the sedimentological data. If the recutting and refitting of the various artefacts had not been witnessed, then the fills of the pit would almost certainly be consigned to the deposition of occupation 'domestic' refuse based on the high phosphate levels, magnetic levels and the relatively homogeneous clustering of the majority of the samples.

Pit VIII

Twelve samples were collected and analysed from this feature (Table 14). The primary deposit (482) was a mineral dominated deposit and was clustered together with the other lower contexts (473) and (459), all of which had low organic contents. The upper samples contained higher levels of phosphate and organic material, although greater quantities of lithic tools and coarse stone implements were retrieved from the lower layers. It could therefore perhaps be suggested that this pit was used for the deposition of material from artefactual production rather than household refuse or activities related to cereal processing or storage.

The analysis of the sedimentological work identified two main phases of deposition. The upper fills 455 and 453, and the lower 451, 459, 473 and 482. The latter was mineral dominated in nature while the upper deposits where more organic in nature and may represent deposits of human waste.

Slot 066

This L-shaped feature was located at the entrance to Structure H. Cluster analysis grouped the upper four deposits within the same group that contained the ash layers within pit II (Table 15). The lowest context (088) contained a substantially higher quantity of silt, which may relate to the presence of standing water within the slot. As noted with the upper fills of other pits, the upper fills all have a higher percentage of sand-sized particles, which may relate to human disturbance or activity rather than non-cultural factors (below).

TABLE 14

Pit VIII sediments; attributes and interpretations

Attribute	Comments	Interpretation
Colour	–	–
Magnetic Susceptibility	No enhancement	No burning/burnt material
Loss on ignition	Moderate enhancement especially within NW spit samples	
Phosphate	Moderate enhancement especially within NW spit samples	Related to high charcoal content?
Particle size	Uppermost sample has increased sand content	Upper mixing?

TABLE 15
Slot 066 sediments; attributes and interpretations

Attribute	Comments	Interpretation
Colour	Average	–
Magnetic susceptibility	No enhancement	No burning/burnt material
Loss on ignition	Lower than pits	–
Phosphate	Lower than pits	–
Particle size	All fills have high percentages of sand (except context 88 that has a much higher silt content	–

The stake-holes

The analysis of the stake-holes at Chapelfield was undertaken primarily on the Activity Model which conceives of activities as functionally, spatially and temporally discrete tasks, which usually involve the use of a few tools (eg Binford & Binford 1966; Schiffer 1988). Different environmental conditions, such as differing seasons or changing human activity, may affect the type of sediment that is present within the stake-holes. Working on the assumption that stake-holes relating to a similar episode of occupation will have similar fills, it should be possible to see individual clusters having a low diversity relative to the overall site assemblage of samples.

Of the 227 stake-holes recorded during the excavation, only 81, following consultation with the original site plans, were confidently assigned to the various structures at the site (Table 16). The confidently assigned stake-holes formed the basis for the sediment analysis work.

The groupings were tested using cluster analysis to investigate whether the stake-hole fills relating to the structures identified from the original site plans contained similarities. Of the 81 stake-holes an average of 67% were assigned to individual cluster groups. This average is low due to the inclusion of structures which have very few assigned samples, for example, Structure B (2 samples). The structures which have higher numbers of samples in general have a higher percentage success rate, for example, Structure E (14 samples = 93%). It would not be expected that a value of 100% would be returned as the success of this work depends entirely on past depositional conditions which would be to some degree affected by, for example, the reuse of the site over time.

The next stage of data analysis was the clustering of the remaining unassigned stake-holes. This was carried out using hierarchical cluster analysis with standardized variables, squared Euclidean distance similarity matrix and Ward linkage. The resultant groups were plotted onto the site plans and the distributions assessed. This clustering technique was selected, as it exaggerates difference in the data and produces a dendrogram with large changes and clearly identifiable clusters (Entwistle et al 2000).

Structure A and B

The distribution of the clustered stake-holes indicates a very close association between these two structures. This can be explained in two ways. The two structures relate to the same phase of occupation, or secondly all the grouped features relate to the construction of the large Structure B that completely encapsulated Structure A. The former theory is however favoured for several reasons. Firstly, the relatively uniform way that Structure B

TABLE 16
Stake-holes assigned to structures

Structure	Assigned Stakeholes
B	169, 602
C	119, 127, 257, 284, 369, 404, 405, 410, 412, 628
D	567, 582, 583, 586, 587, 798, 500, 501
E	670, 671, 673, 675, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686
F	139, 215, 216, 217, 220, 237, 275, 311, 328, 331, 219
G	210, 218, 222, 223, 224, 268
H	164, 170, 179, 180, 181, 183, 185, 188, 189, 228, 229, 232, 235, 239, 242, 313, 315, 699
Pit III	44, 168, 171, 172, 173, 174, 175, 176, 177, 178, 373, 375

surrounds Structure A could be taken to imply that both structural elements were present at the same time. Secondly, due to the substantial difference in size of the structures, a differing function or building style could be assigned and hence such differences would certainly be present in the sedimentological properties of the various stake-holes.

There are occasional deposits from the other Structures C, D and E, which may suggest that they represent a similar phase of occupation.

Structures C, D and E

Of these structures, Structure E returned the highest clustered grouping of stake-holes. The lower level of structural overlap compared to Structures C and D could explain this. It could also be taken be demonstrate that perhaps this structure is the latest, and therefore least disturbed of the Phase 2 occupation within the site.

The large number of stake-holes located along the southern part of Structure C was clustered into two distinct groups which may suggest that this portion of the wall was rebuilt at some time during the occupation of the structure.

Structures F, G and H

The clusters returned from Structures F and H were very distinct from one another, which could be an indication that they do not represent a similar phase or function. Indeed, these structures are very different in size and design, with F being very similar in size to the southern Structures C, D and E. A very small number of stake-holes from Structure F were from the same cluster of as A and B, which may signify a similar phase of activity.

The results of Structure G were mixed, probably due to the high levels of activity at this location (that is, the remains of Structures B, F & H).

DISCUSSION

The results of the analysis of the sediments are very encouraging. Although the archaeological remains relate to several phases of activity, the analysis of the feature fills successfully grouped together the majority of archaeological remains. These results are important to the integrity of the interpretation of the archaeology encountered at Chapelfield.

Many of the upper fills of the pits contained higher quantities of sand than the lower fills. This may relate to disturbance such as worm action, burrowing or human activity, which could have moved quantities of the sands and gravels from the south-eastern area of the site. Another possible cause of this factor may be the movement of fine material down the soil profile by water that would produce a higher percentage of sand-sized grain in the upper layers.

RADIOCARBON DATES

Initially, eight dates were obtained from single species bulk samples. The results suggested that some of these samples may have included pieces of charcoal of markedly different dates from each other. Subsequently, six further dates were obtained, each from a single piece of carbonized material from short lived parts of plant (eg charred barley, hazel nutshells or hazel charcoal). The 14 dates are listed in Table 17 (dates are presented as 2-sigma calibrated, after Stuiver et al 1993).

The first suite of radiocarbon dates indicated a strong correlation between artefacts and radiocarbon assays from pits IV, VII and VIII during the early and middle Neolithic, but this was not reflected across the entire site. The dating of material within pits I, II and V and slot 066 associated with Structure H returned Mesolithic dates and introduced difficulties in interpretational terms, as these dates were not supported by Mesolithic material culture. In the case of pits I and II and slot 066 this was further compounded by the existence of Neolithic material in the upper fills of the pits and potentially within the floor deposits in Structure H. Alldritt's suggestion that the dated material may have been old (ie bog wood) at time of incorporation into the site, combined with Ashmore's recent assessment of the problems associated with mixed sample radiocarbon dating (1999, 124–30), cast enough doubt to require a second phase of dating.

Following the careful selection of new single species, single entity, samples and their subsequent dates, a different interpretation of events may be suggested. The second series of dates provided supporting evidence of deposition of short-lived carbonized remains within pits I and V during the Mesolithic. The dating of a *Corylus* charcoal sample from pit II to the fourth millennium BC may support the argument that the pitchstone blades recovered from the upper fills of the pit were intrusive from

TABLE 17

Radiocarbon determinations and calibrations

Lab No	Material dated and context	Age BP	Calibrated range (2σ)	Probability
The first group of determinations (see text)				
GU-7201	*Pinus sylvestris* from layer 694d in pit II	6710 ± 70	5730–5510 BC	93.3%
GU-7202	*Quercus* from layer 442 in pit VIII	4640 ± 90	3650–3050 BC	95.4%
GU-7203	*Corylus* from layer 350 in pit VII	4860 ± 100	3950–3350 BC	95.4%
GU-7204	*Quercus* from layer 012 in pit IV	4210 ± 90	3050–2450 BC	95.4%
AA-26226	*Pinus sylvestris* from layer 018 in pit V	6705 ± 60	5720–5510 BC	94.4%
AA-26225	*Pinus sylvestris* from posthole fill 087, structure H	6840 ± 85	5900–5610 BC	93.1%
GU-7207	*Quercus* from layer 505 in pit I (505 = bulk sample from lower fill)	5890 ± 90	4960–4520 BC	95.4%
GU-7208	*Corylus* from layer 440 in pit VII	4800 ± 80	3720–3360 BC	95.4%
The second group of determinations				
OxA-9233	*Hordeum vulgare* charred seed from layer 694d in pit II	136 ± 38	AD 1660–1960	95.4%
OxA-9234	*Corylus* nutshell from layer 694d in pit II	5085 ± 45	3980–3780 BC	95.4%
OxA-9235	*Hordeum vulgare* charred seed from context 008 in pit I (008 = bulk samples from upper fill)	214 ± 38	AD 1720–1820	49.7%
OxA-9298	*Corylus* from Layer 018 in pit V	7220 ± 80	6240–5970 BC	89.8%
OxA-975	*Corylus* nutshell from context 008 in pit I (008 = bulk sample from upper fill)	5590 ± 55	4540–4330 BC	95.4%

the structures above, thus implying that the charcoal sample was also intrusive. The secondary dating sequence was also targeted on two *Hordeum vulgare* samples from pits I and II, however both samples proved to be modern intrusions.

Given that new Mesolithic dates were obtained from two of the three pits re-dated, it may be best to consider this material as reflecting some form of Mesolithic activity, rather than discounting it (together with the original dates) as old wood. Even if the first sequence of dates is excluded, the second sequence requires explanation. It could be argued that the dates obtained for hazel wood and hazel nutshells simply reflect the existence of earlier carbonized remains within the environment being introduced into pits I, II and V during the Neolithic (cf Ashmore 1999, 126–7). This, however, does not aid in interpreting what form that activity took. The possibility that pits I, II and V were utilized between the early seventh and mid-fifth millennium remains a tangible, if somewhat enigmatic possibility.

The final point worthy of comment relates to the Mesolithic date obtained from carbonized Scots pine recovered from slot 066 associated with Structure H. It seems very unlikely that this date reflects an accurate chronology for the construction of this building. The form of the structure, combined with the recovery of a sherd of worn Beaker pottery from its floor, suggests a late Neolithic date for its use. The carbonized material may therefore appear to be residual or potentially related to an earlier feature underlying the structure.

The site phasing can be summarized thus:

Phase 1: Mesolithic

Activity at the site, which includes the deposition of carbonized material in pits I, II, and V between the early seventh millennium and the mid-fifth millennium BC.

Phase 2: Early Neolithic activity

Deposition of pottery, pitchstone and coarse stone tools within pits VII, VIII, IX and XII during the fourth millennium BC. Structures C, D and E may also date from this period.

Phase 3: Middle to late Neolithic activity

Probable period of occupation of Structure H and Structure A/B, together with deposition of pottery within pit IV during the late third millennium BC.

INTERPRETATION AND DISCUSSION

The complicated series of 'domestic' and 'ritual' features discovered (by chance rather than design) at Chapelfield currently has no direct parallel in Scottish prehistory, although sites with clear similarities in construction form and depositional practice are known. The discussion that follows attempts to place the site in its context in central and southern Scotland, as well as beyond.

Barclay has recently concluded that 'the search for settlement is hampered by the limits to our understanding of the guises in which it will appear' (1996, 75). Although he was discussing Neolithic settlement, the point is just as valid in the search for earlier building forms as well. The results from Chapelfield suggest that particularly ephemeral timber structures may have been in use in lowland Scotland during the early and middle Neolithic, a feature which is supported to a degree by the excavations at Beckton Farm, Lockerbie (Pollard 1997). In the light of Gibson's discussion (1996) of slight timber structures and their likely fate, and in view of the lack of surface artefacts and the negative results of both aerial photography and geophysics at Chapelfield, the question of techniques of prospection for further sites of this character is clearly difficult to answer.

THE STRUCTURES: CHRONOLOGY AND COMPARISONS

The form of the structures at Chapelfield was undoubtedly unusual, with two types of building suggesting two phases of occupation: the larger round structure (Structures H and possibly A/B on morphological grounds) with central post and post-defined eastern entrance; and the smaller oval buildings (Structures C, D, E, F & G), with no obvious entrance and few internal features. Comparable material is available, at least for the later Neolithic period in terms of design and construction materials (Pollard 1997), although the concentration and potential date of these structures has no close parallel elsewhere in Scotland. The postulated date of the oval structures in particular is of interest; their very fugitive nature and simple design finds closest parallels with the forms of buildings normally noted on Mesolithic sites. It may be that they represent a progression from the classic wind-break designs seen at Morton (Coles 1971) and Fife Ness (both Fife) (Wickham-Jones & Dalland 1998) or the small rectangular buildings at Newton, Islay (McCullagh 1991) and Kirkhill, Dumfries & Galloway (Pollard & Donnelly, forthcoming). Much of the discussion of these structures has placed them as seasonal exploitation of coastal environments, although the structures at Kirkhill also indicate inland occupation (Pollard & Donnelly, forthcoming). In reality the form of the Chapelfield buildings may imply a form of more settled occupation than those discussed above.

The association between the oval structures and the group of pits aids interpretation. Material from pits I and II provided Mesolithic dates from basal deposits; however, artefactual and botanical information from their upper layers suggests an early Neolithic date. Given that both structures (D & E) postdated the pits, this may imply that the artefactual and botanical materials recovered from the upper layer of pits I and II were extraneous, an idea proposed by both Squair & Jones, and Alldritt (above). If so, then they may be related to the occupation and use of the oval structures, which leads to tentative suggestion that this could place the oval form of structure in the early Neolithic period. In terms of comparable examples, the site at Beckton Farm, Lockerbie, Dumfries & Galloway (Pollard 1997, 110–11) indicates the possibility of early Neolithic sub-circular structures, constructed of stakes and founded upon a clay layer. The earliest date from Beckton, Dumfries & Galloway (3650–3100 cal BC) and the recovery of early Neolithic pottery from within the floor deposits (Pollard 1997; structure F143, illus 2 & 4) sits well with the supposition that the Chapelfield oval structures are early Neolithic in date. Although this is by no means a firm chronology, it is possible to say with some confidence that the oval structures were constructed after the middle of the early fourth millennium BC and may help to elucidate the existence of a substantial domestic assemblage of coarse stone tools at the site (Taylor, above).

Although contemporary parallels for Structure H are lacking, strong comparisons can be drawn in terms of form with structure 111 at Beckton (Pollard 1997, 78, illus 5). Both are formed by a double ring of stakes, both are founded on clay layers, both have small pits close to the centre of the structure and both are roughly comparable in internal dimension (3.5m at Beckton and 4.2m at Chapelfield). Chronologically, the Beckton structure appears to be a late event on the site dated by association with the Grooved Ware vessel recovered from a pit to 2923–2617 cal BC (GU-3534: Pollard 1997, 89), which does not appear to conform strictly to the chronology at Chapelfield. The recovery of a very worn Beaker sherd from the floor within the building seems to suggest that a mid-Neolithic date for occupation is more likely.

Given that Scottish parallels are few and far between, comparison is necessary with evidence for the Neolithic of England and Wales. Darvill's suggestion that buildings in the Neolithic were 'constructed wholly or mainly in stakes . . . most are circular, subcircular and oval in plan' (1996), finds parallels at Chapelfield. From the known information to date they would appear to have currency in the later Neolithic, though at least one example, Carn Brea, Cornwall (Mercer 1981), is known from the earlier Neolithic period.

THE PITS: CHRONOLOGY AND DEPOSITIONAL PRACTICE

The pits at Chapelfield are perhaps the most clearly defined elements of the site. It is from these contexts that we can establish the main phases of occupation.

Material from pits I, II, V and slot 066 provided Mesolithic dates, spanning around 2400 years. The function of these features is unclear, though it is worth commenting on their form and associations. Although all three pits and the slot revealed quantities of carbonized materials, few macrofossils were recovered. The features did not exhibit a consistent suite of carbonized seeds or even tree species indicated by charcoal, although feature 066 and pits II and V contained Scots pine and features 066, pit I and pit II contained oak. The combination of oak and Scots pine during this period is an interesting botanical discovery, which would seem to imply that there was mixed woodland close to the site, although as Alldritt has pointed out (above) the pine in particular may have been recovered from a nearby raised bog for specific use as firewood.

No artefacts were recovered from any of the early features at Chapelfield (excluding the Neolithic material and macrofossils from the upper fills of pits I & II) and the dimensions and fills of the pits varied considerably. The question of form is, however, complicated by the introduction (whether by accident or deliberately) of later material in the case of pits I and II, with only pit V retaining its original form.

Prior to the excavation of pit V, and on removal of its fill, the feature was tested for magnetic susceptibility. The low readings on both occasions would imply that the carbonized material which filled the feature was deposited there after burning, and not burnt in situ. Interestingly, extensive sampling and wet sieving of this feature produced only 4.3g of charcoal, which may suggest that the material deposited in the pit (which had deliberately been lined with clay) was not from the contents of a hearth, and therefore unrelated to disposal of household waste.

Pits are by no means unusual on Mesolithic sites, examples are known from Morton (Coles 1971), Kinloch, Rum (Wickham-Jones 1990) and the recently re-excavated site on Risga (T Pollard, pers comm). Excavations at Tulloch Wood, Moray also revealed cut features from which material provided Mesolithic dates; however, it remains questionable whether these were man-made features or not

(Carter 1993, 231). In contrast the results of excavations at Spurryhillock, Aberdeenshire (Alexander 1997, 20–2) do provide parallels with the Chapelfield evidence. The scale, characteristics and date of pit 619 at Spurryhillock are similar to those of pit I at Chapelfield. Both have a thick band of 100% oak charcoal within their fill. Radiocarbon dating of charcoal from pit 619 at Spurryhillock has produced calibrated ranges of 4720–4370 cal BC and 4910–4540 cal BC (Alexander 1997, 22) compared with charcoal from pit I at Chapelfield, 4540–4330 cal BC and 4960–4520 cal BC.

The second class of pits at Chapelfield comprised those which contained material radiocarbon-dated to the early Neolithic, and represented by pits VII and VIII. Notable was the deliberate and selective deposition of particular artefacts within particular contexts (illus 22); in the case of pit VII pottery and stone tools, and in the case of pit VIII pitchstone and stone tools. The interpretation of the deposits within pit VII suggests that the three-phase sequence of backfills and re-cuts observed during excavation was contemporary. The dated material from lower and upper fills were statistically indistinguishable. Of note here was the recovery of substantial quantities of the upper portions of three early Neolithic vessels (1692 sherds: vessels1a, 1b and 2a) and the recovery of a large coarse stone tool assemblage, which included quern rubbers, stone knives, an anvil, hammerstones and pounders. The stone tool assemblage in particular would appear to support the supposition that the events witnessed in pit VII occurred over a very short period of time, with fragments of the same broken quern in preparation (SF169.10) occurring in the lower and upper fills. Taylor (above) has argued that this assemblage would seem to reflect domestic waste of an essentially arable agricultural society. This was not supported by the botanical evidence, which did not contain any cultivated cereal grains or associated weed seeds. However on reflection the very structured nature of the pottery deposition (the vast majority of sherds were either upper body or neck and rim) and destruction, together with the inclusion of wild plant species including hazelnut shells and blackthorn, is more redolent of a specifically ritual event, rather than the simple discarding of domestic waste.

Although pit VII was the most obvious candidate for a clearly sequenced deposition history, pit VIII followed a similar pattern in relation to its artefactual assemblage. The date ranges of the two pits at the 2 sigma level of confidence overlap and they may be broadly contemporary. Although pit VIII was steeper-sided, deeper and had no evidence of recuts, the artefactual implications were very similar. The pitchstone bladelet (SF154) recovered from the basal fill re-fitted directly on to the core (SF142) from the upper fill, and there are also re-fitting parts of the coarse stone assemblage, implying a very rapid filling of this pit. Like pit VII the stone tool assemblage has a very domestic character, with saddle and trough querns, rubbing stones, borers and anvils.

Of the other pits excavated at Chapelfield only pits IX and XII had materials worthy of comment within their fills. The two pitchstone artefacts (group A) recovered from pit IX have led Donnelly to suggest (above) that this pit may be part of pit VIII, as group A pitchstone was also recovered from within its fills. Although archaeologically this feature appeared to be a truncated, but separate, event from pit VIII, the presence of pitchstone may imply a chronological link between them. If this is a sustainable argument, then the recovery of group B pitchstone in pit I (also recovered from pit VIII) may support the idea that the oval structures to the south of the settlement area are indeed contemporary with the early Neolithic pits. The chronological relationship between the pits and artefacts is extended further in the case of pit XII, where a saddle quern and trough quern rubber were recovered. Taylor (above) has suggested that both of these finds may be related to material recovered from pits VII and VIII, and therefore contemporaneous. The rest of the pits, although stratigraphically structured for the most part, were unassignable to any period of use at the site.

In Barclay's discussion of the early Neolithic pits at Balfarg, he summarizes the relationship between 'structured deposition' in pits and their existence on later ceremonial sites (1993, 166–8). Although the evidence from Chapelfield would suggest that the site was not purely ceremonial in nature, Barclay's speculation that the digging of pits, which may include ritual depositions, may 'deliberately be placed on the site of particularly early settlement or other activity' (1993, 168), may be relevant. The excavations of the nearby enclosures at Bannockburn (Tavener 1987; Rideout 1997) highlight the nature of structured deposition of artefacts and provide clear parallels with the results from Chapelfield. The alignment of enclosure 1 on the Chapelfield site, some 2km to the ESE, may have more significance than previously thought (cf Rideout 1997, 45); the calibrated radiocarbon ranges are strikingly similar (phase 2 fill of pit P25 at Bannockburn (3778–3384 cal BC (AA-20412)) and pit VII at Chapelfield (3779–3370 cal BC (GU-7208)).

Characteristically, the Neolithic pottery at Chapelfield was also 'found in the uppermost fills of several of the pits' and 'appears to have been associated with their abandonment' (Cowie 1993, 35). Although Chapelfield and Bannockburn should be interpreted as clearly different categories of site, the majority of pottery recovered from both came from a small number of pits, in the case of Chapelfield from pits I, IV and VII and in the case of Bannockburn from pits P40–P47 and P59 (Rideout 1997). The form of earlier Neolithic plain bowls identified at Bannockburn and Chapelfield in the upper fills was also present at Balfarg (Barclay & Russell-White 1993) and North Mains, Perthshire (Barclay 1983).

Although a number of pits at Chapelfield contained pottery, there was also a clear association between other types of material, some of which was specifically confined to particular pits. This was certainly the case with pitchstone in pits I, VIII and IX. Although no direct parallel for this form of mutually exclusive deposition is available, the recovery of pitchstone blades and early Neolithic pottery, often associated with hazel nutshells, is fairly common (eg Maynard 1993; Atkinson 2000).

The latest dated event on site was the deposition of comb-impressed Beaker pottery within pit IV during the second half of the third millennium. The simple nature of this deposit, with no evidence of re-cuts, is noteworthy, in contrast to the heavily structured deposits witnessed during the earlier spells of activity on the site. The botanical evidence from pit IV appeared to suggest that there may have been cereal processing in the vicinity (Alldritt, above), with the recovery of several weed species associated with cultivation. That said, the fill of this pit also contained seeds of species associated with woodland environments and waste places, including carbonized hazel nutshells, which tends to temper any assessment of the economy at Chapelfield during this period. This pit would appear to be a singular deposit, though it may be associated with the construction and use of Structures A/B and H during this period.

FUNCTION AND OCCUPATION

The interpretation of phase 1 on the site is difficult, as it rests upon the radiocarbon assays from pits I, II and V, which appear to suggest activity during different periods of the Mesolithic and Mesolithic/Neolithic transition. There are problems with this view however, not least of which is the absence of artefactual materials and macrofossil evidence to support Mesolithic occupation at the site. Although the contemporary dates obtained from carbonized wood from pits II and V seem to support Mesolithic activity, the possibility that the timber was recovered from an adjacent raised bog (Alldritt, above), because of its good burning qualities, should be considered. Having said that, the close grouping of the early dates, combined with the number of samples and species dated lends credence to the view that at the very least this site had been a focus of activity during the Mesolithic. The exact nature of that activity is unclear, but it may well have been associated with the deposition of organic-based materials within pits, but for what purpose is not known.

Certainly, by the early Neolithic period there is clearer evidence to suggest a more settled form of occupation at the site; the coarse stone tool assemblage, in particular, indicates domestic activity. The sequence of overlapping oval structures may date broadly from this period of use. However, it can be said with certainty only that they post-date pits I and II, although the inclusion of early Neolithic artefacts in their upper fills supports the interpretation that they were occupied during that period. Clear evidence exists, in pits VII and VIII (and possibly IX & XII) for a non-domestic aspect to the occupation. The early Neolithic pits to the east of the site indicate a ritualized deposition of artefacts along very structured lines, together with plant macrofossils that imply that wild resources continued to play an important role.

Rideout, in a recent assessment of the function of pits in the early Neolithic in relation to the Bannockburn enclosures (1997), concurs with Kinnes in believing that 'the purpose of the pit. . .appears to be for placement, not for functional storage or tidy-minded refuse disposal' (1994, 96). Given the very structured nature of the deposits in the Neolithic pits at Chapelfield this would appear to be the most appropriate interpretation of these deposits. Barclay and Russell-White's use of the term 'minor ritual activity' (1993, 167) may accurately describe the pits at Chapelfield. The existence of one pit dated to the middle Neolithic within the site is suggestive of a continuation in practices, even though the form of deposition was markedly different from pits VII and VIII.

CONCLUSION

The radiocarbon dates and material evidence indicate a location which was re-used as a focus of activity from the Mesolithic to the later Neolithic. What is unclear from the excavation results is whether that use was continuous or sporadic.

The location of the site, the fact that it had been consistently ploughed since the period of the agricultural improvements, and the ephemeral nature of the construction techniques used to form the buildings, make Chapelfield an exceptional survival. Its discovery and uncommon survival were a matter of chance.

ACKNOWLEDGEMENTS

There are many people and organizations to thank, without whom the excavations at Chapelfield, Cowie would not have been as successful as they were. For their understanding and financial support I am extremely grateful to Ogilvie Builders Ltd, in particular David Baker. I am also indebted to Historic Scotland and the then Central Regional Council for their financial support during the final phase of work; both Gordon Barclay and Lorna Main deserve thanks for their part in ensuring the excavation received a financial boost during that period. My thanks are also extended to Patrick Ashmore and Historic Scotland for supporting the additional post-excavation programme. The core excavation team of Kevin Taylor, Mike Donnelly, John Duncan, Ruth Kelly and Chris Barrowman ensured that the highest quality of work was undertaken on the site. I am grateful to them and the large number of students and excavators who spent varying amounts of time with us. I am also indebted to Jim Rideout and Tony Pollard for providing copies of the Bannockburn enclosures and Beckton Farm reports in advance of publication. Thanks are also due to Gordon Barclay, Patrick Ashmore and Gavin MacGregor for commenting on earlier drafts of the report and to Tony Pollard and Mike Donnelly for additional comments.

Robert Squair would also like to thank Trevor Cowie for his invaluable advice on the prehistoric ceramics and Chris Barrowman for a copy of his report on the Biggar Common assemblage prior to publication. John Duncan would like to thank Lesley Farrell and Chris Conner for their technical assistance in the laboratory and Peter Chung and Alan Jones (Department of Geography and Topographic Science at Glasgow) are thanked for undertaking the particle size analysis labwork.

REFERENCES

Alexander, D 1997 'Excavation of pits containing decorated Neolithic pottery and early lithic material of possible Mesolithic date at Spurryhillock, Stonehaven, Aberdeenshire', *Proc Soc Antiq Scot*, 127, 17–28.

Ambers, J, Bowman, S, Gibson, A & Kinnes, I 1992 'Radiocarbon results for the British Beakers', *Radiocarbon,* 34, 916–27.

Ashmore, P J 1999 'Radiocarbon dating: avoiding errors by avoiding mixed samples', *Antiquity,* 73, 124–30.

Atkinson, J A 1995 *Excavations at Chapelfield, Cowie,* unpubl report.

Atkinson, J A 2000 'Excavations on the Leven, Loudoun Hill, Ayrshire, 1993', *Scott Archaeol J*, 22.1, 31–68.

Banks, I 1994 *Cowie Archaeological Assessment,* unpubl report.

Banks I 1995 'The excavation of three cairns at Stoneyburn Farm, Crawford, Lanarkshire, 1991', *Proc Soc Antiq Scot*, 125, 289–343.

Barber, J 1997 *The Archaeological investigation of a prehistoric landscape: excavations on Arran 1978–1981*. Edinburgh.

Barclay, G J 1983 'Sites of the third millennium BC to the first millennium AD at North Mains, Strathallan, Perthshire', *Proc Soc Antiq Scot*, 113, 122–281.

Barclay, G J 1993 'The excavation of pit circles at Romancamp Gate, Fochabers, Moray, 1990', *Proc Soc Antiq Scot,* 123, 255–68.

Barclay, G J 1996 'Neolithic buildings in Scotland', *in* Darvill, T & Thomas, J (eds), 61–76.

Barclay, G J & Russell-White, C J 1993 'Excavations in the ceremonial complex of the fourth to second millennium BC at Balfarg/Balbirnie, Glenrothes, Fife', *Proc Soc Antiq Scot*, 123, 43–210.

Binford, L R & Binford, S R 1966 'A preliminary analysis of functional variability in the Mousterian of Levallois facies' *in* Clarke, J D & Clark Howell, F (eds) *Recent Studies in Paleoanthropology*, 238–95 (= *American Anthropologist* 68.2)).

Birks, H J B et al 1975 'Pollen maps for the British Isles 5000 years ago', *Proc Roy Soc Lond* (B), 189, 87–105

Burgess, C B 1972 'Goatscrag: a Bronze Age rock shelter cemetery in North Northumberland. With notes on other rock shelters and Crag Lines in the region', *Archaeologia Aeliana* (4th ser), 50, 67–76

Carter, S 1993 'Tulloch Wood, Forres, Moray: the survey and dating of prehistoric landscape' *Proc Soc Antiq Scot,* 123, 211–13.

Clarke, A 1989 'The Skaill Knife as a butchery tool', *Lithics*, 10, 16–27.

Clarke, A, 1992 'Artefacts of coarse stone from Neolithic Orkney' *in* Sharples, N & Sheridan, A (eds) *Vessels for the Ancestors*, 244–58. Edinburgh.

Clarke, A 1997 'Stone Artefacts', *in* Rideout, J S, 'Excavation of Neolithic enclosures at Cowie Road, Bannockburn, Stirling, 1984–5', *Proc Soc Antiq Scot*, 127, 48–51.

Coles, J M 1971 'The early settlement of Scotland: excavations at Morton, Fife', *Proc Prehist Soc*, 37, 284–366.

Coles, J M & Simpson, D D A 1965 'The excavation of a Neolithic round barrow at Pitnacree, Perthshire, Scotland', *Proc Prehist Soc*, 31, 34–57.

Cowie, T G 1983 'The pottery from the henge monument at North Mains', *in* Barclay, G J, 1983, 122–281.

Cowie, T G 1992 'Neolithic pottery from Barbush Quarry, Dunblane, Perthshire, with notes on the earlier Neolithic pottery of eastern and central Scotland', *in* Sharples, N & Sheridan, A (eds) *Vessels for the Ancestors*, 272–85. Edinburgh.

Cowie, T G 1993a 'A survey of the Neolithic pottery of eastern and central Scotland', *Proc Soc Antiq Scot,* 123, 13–41.

Cowie, T G 1993b 'The Neolithic pottery', *in* Barclay, G J & Russell-White, C J, 65–76.

Curle, A O 1934 'An account of further excavation at Jarlshof, Sumburgh, Shetland, in 1932 and 1933, on behalf of HM Office of Works', *Proc Soc Antiq Scot,* 58 (1933–4), 224–319.

Curwen, E 1928 'Notes on some uncommon types of stone implements found in Sussex', *Sussex Archaeol Coll,* 69, 77–91.

Curwen, E 1937 *The Archaeology of Sussex*. London.

Dalland, M 1993 'The calibration of the radiocarbon dates', *in* Barclay, G J & Russell-White, C J, 161.

Darbishire, R D 1872 'Notes on Discoveries in Ehenside Tarn, Cumberland', *Archaeologia,* 44, 273–92.

Darvill, T 1996 'Neolithic buildings in England, Wales and the Isle of Man', *in* Darvill, T & Thomas, J (eds), 77–112.

Darvill, T & Thomas, J (eds) 1996 *Neolithic Houses in North-West Europe and Beyond*. Oxford.

Dickson, J H 1993 'Scottish woodlands: their ancient past and precarious present', *Scott Forestry,* 47.3 (July 1993), 73–8.

Duncan, J S in prep 'Sediments, Stake-holes and Statistics: an issue of early Neolithic site formation processes'.

Entwistle, J A, Abrahams, P W & Dodgshon, R A 2000 'The geoarchaeological significance and spatial variability of a range of physical and chemical soil properties from a former habitation site, Isle of Skye', *J Archaeol Sci*, 27, 287–303.

Evans, E E 1953 *Lyles Hill: a late Neolithic site in County Antrim*. Belfast.

Everitt, B 1980 *Cluster Analysis*, 2nd edn, London.

Fenton, M B 1984 'The nature of the source and manufacture of Scottish Battle-axes and Axe-hammers', *Proc Soc Antiq Scot*, 50, 217–43.

Gibson, A 1996 'The Later Neolithic Structures at Trelystan, Powys, Wales: ten years on', *in* Darvill, T & Thomas, J (eds), 133–142.

Haggarty, A 1991 'Machrie Moor, Arran: recent excavations at two stone circles', *Proc Soc Antiq Scot*, 121, 51–94.

Henshall, A S 1978 'The pottery', *in* Cowie, T G, 'Excavations at the Catstane, Midlothian 1977', *Proc Soc Antiq Scot,* 109 (1977–8), 166–201.

Henshall, A S 1981 'Pottery in the 'Western' tradition', *in* Ritchie, J N G & Adamson, H C, 'Knappers, Dumbartonshire: a reassessment', *Proc Soc Antiq Scot*, 111, 184–7.

Henshall, A S 1984 'The pottery', *in* Burl, H A W, 'Report on the excavation of a Neolithic mound at Boghead, Speymouth Forest, Fochabers, Moray, 1972 and 1974', *Proc Soc Antiq Scot,* 114, 59–66.

Henshall, A S 1988 'The pottery', *in* Thomas, G D, 'Excavations at the Roman civil settlement at Inveresk, 1976–7', *Proc Soc Antiq Scot,* 118, fiche A4–2.

Henshall, A S 1989 'The pottery', *in* McCullagh, R, 'Excavations at Newton, Islay', *Glasgow Archaeol J*, 15, 37–8.

Henshall, A S 1991 'The pottery', *in* Haggarty, A, 'Machrie Moor, Arran: recent excavations at two stone circles', *Proc Soc Antiq Scot*, 121, 51–94.

Henshall, A S 1996 'The pottery', *in* Shepherd, A N, 'A Neolithic ring-mound at Midtown of Pitglassie, Auchterless, Aberdeenshire', *Proc Soc Antiq Scot*, 126, 17–51.

Kinnes, I A 1985 'Circumstance not context: the Neolithic of Scotland as seen from outside', *Proc Soc Antiq Scot,* 115, 15–57.

Kinnes, I A 1994 'The Neolithic in Britain', *in* Vyner, B (ed) *Building on the Past,* 90–102. London.

Kinnes, I, Gibson, A, Ambers, J, Bowman, S, Leese, M & Boast, R 1991 'Radiocarbon dating and British Beakers: the British Museum dating programme', *Scott Archaeol Rev*, 8, 35–68.

Limbrey, S 1975 *Soil Science and Archaeology*. London.

Longworth, I H 1967 'Further discoveries at Brackmont Mill, Brackmont Farm and Tentsmuir, Fife', *Proc Soc Antiq Scot,* 99, 60–92.

Mabey, R 1996 *Flora Britannica*. London.

McInnes, I J 1964 'The Neolithic and Early Bronze Age pottery from Luce Sands, Wigtownshire', *Proc Soc Antiq Scot,* 97, 40–81.

Mackay, R R 1948 'Neolithic pottery from Knappers Farm, near Glasgow', *Proc Soc Antiq Scot,* 82, 234–7.

McCullagh, R 1991 'Excavations at Newton, Islay', *Glasgow Archaeol J*, 15, 23–52.

Manby, T G 1964 'The pottery', *in* Moore, J W, 'Excavations at Beacon Hill, Flamborough Head, East Yorkshire', *Yorkshire Archaeol J,* 41, 191–202.

Manby, T G 1975 'Neolithic occupation sites on the Yorkshire Wolds', *Yorkshire Archaeol J*, 47, 23–59.

Manby, T G 1988 'The Neolithic in Eastern Yorkshire', *in* Manby, T G (ed) *Archaeology in Eastern Yorkshire: essays in honour of T C M Brewster*, 35–88. Sheffield.

Mann, L M 1918 'The prehistoric and early use of pitchstone and obsidian', *Proc Soc Antiq Scot*, 4, 140–9.

Maynard, D 1993 'Neolithic Pit at Carzfield, Kirkton, Dumfriesshire', *Trans Dumfries Galloway Nat Hist Antiq Soc,* 68, 25–32.

Mercer, R J 1981 'Excavations at Carn Brea, Illogan, Cornwell, 1970–3. A Neolithic fortified complex of the third millennium BC', *Cornish Archaeol,* 20, 1–204.

Mulholland, H 1970 'The microlithic industries of the Tweed Valley', *Trans Dumfries Galloway Nat Hist Antiq Soc*, 47, 81–110.

Neish, J 1871 'Notes of stone celt found in Glenshee, Forfarshire, 1870', *Proc Soc Antiq Scot,* 9 (1870–1), 174–6.

Orton, C Tyers, P & Vince, A 1993 *Pottery in Archaeology*. Cambridge.

Pollard, T 1995 'The lithics', *in* Banks, I, 'The excavation of three cairns at Stoneyburn Farm, Crawford, Lanarkshire, 1991', *Proc Soc Antiq Scot*, 125, 309–21.

Pollard, A J 1997 'Excavation of a Neolithic settlement complex at Beckton Farm, Lockerbie', *Proc Soc Antiq Scot*, 127, 69–121.

Pollard A J & Donnelly M forthcoming 'A Neolithic burnt mound and Mesolithic settlement at Kirkhill Farm, Johnstonebridge, Dumfriesshire'.

Price, R J 1983 *Scotland's Environment During the Last 30,000 Years*. Edinburgh.

Ramsay, S 1991 *Palaeoecology of Ancient Pine stumps in Central Scotland*, BSc dissertation, Univ Glasgow.

Ramsey, G 1995 'Rubbing Stones, Raths and Polished Axes', *Archaeol Ireland*, 9.2, 9–10.

Ransom, R 1994 'The Technology of the perforated Mace-heads of Orkney', *in* Aston, N & David, A (eds) *Stories in Stone*. London (= Lithic Stud Group Occ Pap).

Rideout, J S 1997 'Excavation of Neolithic enclosures at Cowie Road, Bannockburn, Stirling, 1984–5', *Proc Soc Antiq Scot*, 127, 29–68.

Richards, C forthcoming *Dwelling Amongst the Monuments: Excavations at Barnhouse and Maes Howe, Orkney*.

Ritchie, A 1983 'Excavation of a Neolithic farmstead at Knap of Howar, Papa Westray, Orkney', *Proc Soc Antiq Scot*, 113, 40–121.

Ritchie, P R 1968 'The stone implement trade in third-millennium Scotland', *in* Coles, J M & Simpson, D D A (eds) *Studies in Ancient Europe: essays presented to Stuart Piggott*, 117–36. Leicester.

Ritchie, P R 1981 'Rock as raw material for early Scottish settlers', *Scott Archaeol Forum*, 11, 7–14.

Roe, F E S 1979 'Typology of stone implements with shaftholes', *in* Clough, T H (ed) *Stone Axes Studies Vol I,* 23–48. London.

Schiffer, M B 1988 'Formation processes of Broken K Pueblo: some hypotheses', *in* Leonard, R D & Jones, G T (eds) *Quantifying diversity in archaeology*, 37–58. Cambridge.

Simpson, D D A & Coles, J M 1990 'Excavations at Grandtully, Perthshire', *Proc Soc Antiq Scot,* 120, 33–44.

Smith, I F (ed) 1965 *Excavations at Windmill Hill and Avebury by Alexander Keiller*. Oxford.

Smith, I F 1979 'The chronology of British stone implements' *in* Clough, T H (ed) *Stone Axe Studies Vol I*, 13–22. London.

Smith, A N 1995 'The excavation of Neolithic, Bronze Age and Early Historic features near Ratho, Edinburgh', *Proc Soc Antiq Scot*, 125, 69–138.

Stevenson, R B K 1948 'Notes on some prehistoric objects', *Proc Soc Antiq Scot,* 82, 292–5.

Stuiver, M, Long, A, Kra, R S & Devine, J M 1993 'University of Washington Quarternary Isotope Lab Radiocarbon Calibration Programme, rev. 3.0.3', *Radiocarbon*, 35.1, 215–30.

Tavener, N 1987 'Bannockburn: the pit and post alignments excavated in 1984 and 1985', *Central Excavation Unit and Ancient Monuments Laboratory Annual Report (1987)*, 71–6. Edinburgh.

Thorpe, O W & Thorpe, R S 1984 'The distribution and sources of archaeological pitchstone in Britain', *J Archaeol Sci*, 11, 1–34.

Wainwright, G J 1972 'The Excavation of a Neolithic Settlement at Broomheath, Norfolk', *Proc Prehist Soc,* 38, 68–69.

Ward, T 1993 ‘Excavations at Biggar Common’, *Discovery Excav Scot 1993*, 87.

Ward, T 1997 *Excavations at Melbourne 1997, prehistory north of Biggar Project, third Interim Report*. Biggar.

Wickham-Jones, C R 1986 ‘The procurement and use of flaked stone tools in prehistoric Scotland’, *Proc Soc Antiq Scot*, 116, 1–10.

Wickham-Jones, C R 1990 *Rhum: Mesolithic and Later Sites at Kinloch, Excavations 1984–86*. Edinburgh (=Soc Antiq Scot, Mongr Ser, 7).

Wickham-Jones, C R & Collins, G H 1978 ‘The sources of flint and chert in Northern Britain’, *Proc Soc Antiq Scot*, 109 (1977–8), 7–21.

Wickham-Jones, C R &Mackenzie, J R 1996 ‘An unusual lithic assemblage from Lunanhead, Angus’, *Proc Soc Antiq Scot*, 126, 1–16.

Wickham-Jones, C R & Dalland, M 1998 ‘A small Mesolithic site at Craighead Golf Course, Fife Ness, Fife’, *Tayside Fife Archaeol J*, 4, 1–19.

This paper is published with the aid of a grant from Historic Scotland