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Herne Bay, Kent, and a Model for Habitat Use
in the British Early Postglacial

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A LONG BLADE SITE AT UNDERDOWN LANE, HERNE BAY, KENT, AND A MODEL FOR HABITAT USE IN THE BRITISH EARLY POSTGLACIAL

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Summary

A Long Blade assemblage, with affinities of this technology including Long Blades, a microlith, burins, lames mâchurées (Bruised Blades) and débitage was recovered during routine excavations at Herne Bay, Kent. The assemblage was contained from within a series of natural hollows in London Clay. This paper describes the assemblage but also considers results of geoarchaeological analysis which place the worked flints in their geological context. This study shows that the assemblage was deposited in a period of warming when cold stage deposits were eroding in and into the hollows. Soil micromorphology revealed the contemporaneous occurrence of charcoal and animal/raptor scat. The locational and possible economic aspects of the site are considered in the wider context of other Long Blade assemblages in England and north-west Europe and an outline model proposed for habitat use and resource exploitation in the early Postglacial period.

Introduction

Underdown Lane, Eddington (NGR 618000 166935; Wessex Archaeology 2003) lies 1.5 km south of Herne Bay, Kent (Fig. 1). It occupies a gentle eastern slope at 13–14 m aOD, towards the eastern edge of a wide, shallow, north-draining basin that reaches the present coast between Reculver and Swalecliff. This basin is set into the northern edge of a low ridge of London Clay (the Blean) (BGS sheet 272) that runs roughly east–west, forming the northern side of the Stour valley. To the south, the ground rises steeply up to the Blean ridge with a small knoll to the south-east supporting localised patches of Brickearth and Head. Thanet Beds are mapped to the north of Herne Bay. The geology of the area between the present shoreline and the Thames at the Pleistocene/Holocene boundary was probably London Clay with exposures of Thanet, Woolwich, and Oldhaven Beds where rivers had cut through the capping clay.

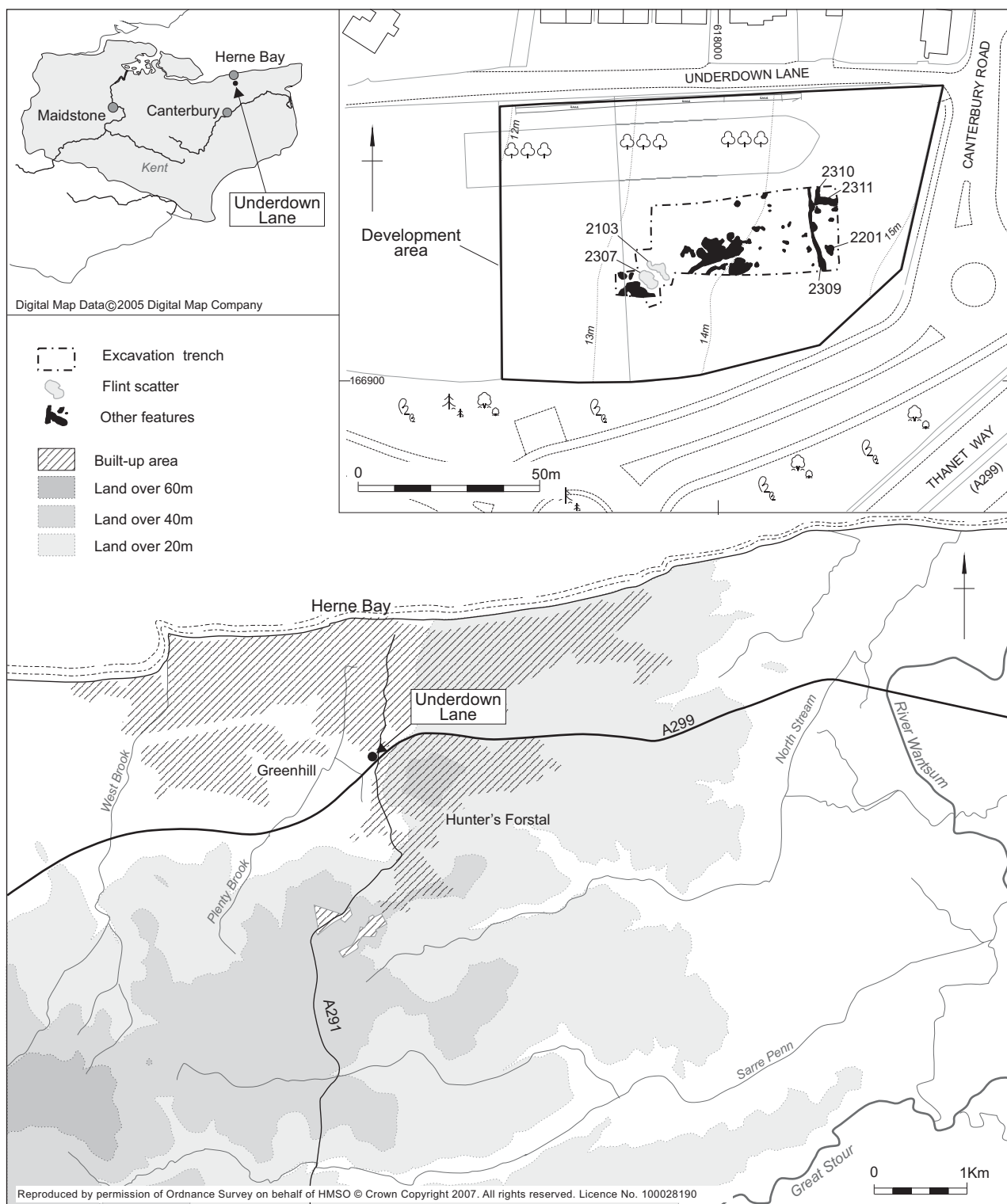


Figure 1 Underdown Lane, Herne Bay, site location plan and plan

Excavation of the long blade assemblage

During routine excavations 15 curvilinear hollows (Figs 1 and 2), with ill-defined edges, were revealed in the western half of the excavation area beneath deposits of silty clay colluvium (upper ‘brickearth’, 2317a; see below). The ‘brickearth’ within the hollows showed no obvious evidence of an *in situ* buried soil. Hollows 2103 and 2307 contained worked flint including traces of a Long Blade assemblage, material of early Postglacial date (c. 10,200–9300 cal BC). These areas were hand-excavated in 40 mm spits, with all artefacts individually numbered, bagged, and 3-dimensionally recorded. An undisturbed sample (monolith 509) for soil micromorphology and pollen analysis was taken through the complete sequence of hollow 2103 into the top of the London Clay (Fig. 2), and a bulk sample from each level was retained.

Both hollows were oriented north-west to south-east. Hollow 2103, which produced most of the flint, measured c. 4.0 m by 2.2 m and was at least 0.35 m deep below the base of the topsoil. Its base graded imperceptibly into the surface of the weathered London Clay bedrock. Hollow 2307 lay 1.0 m south-west of 2103 and measured c. 6.0 m by 4.4 m by at least 0.35 m. Small quantities of medieval and post-medieval pottery were recovered from the hollows.

Geoarchaeology: site sediment history and taphonomy

The excavated area was located at the footslope of the knoll where the London Clay was capped by a thin veneer of ‘brickearth’ *sensu lato*. Aeolian silty drift, termed brickearth in south-east England, is a wind-blown fine deposit laid down in periglacial cold periods during the Pleistocene (Jarvis *et al.* 1984, see also Weir *et al.* 1971) and sometimes can be difficult to distinguish from the London Clay (Gallois 1992, 62).

The sediments surviving in hollow 2103 (Fig. 2), which produced most of the flints, were examined in detail, including soil micromorphology analysis (Macphail 2004) using standard methods (Bullock *et al.* 1985; Courty *et al.* 1989; Goldberg and Macphail 2006; Macphail and Cruise 2001; Stoops 2003). This detailed examination (monolith 509) showed that the ‘brickearth’ which covered the site (2317) extended into the hollows and could be divided into three parts. Soil micromorphology confirmed a bipartite division of the lower part within the hollow (Table 1). Detailed description and soil micromorphological analysis indicate that this is not a simple argillic gley soil or brickearth, but a complex soil-sediment, or palimpsest, with origins in both the Late Glacial and Holocene periods (see Appendix).

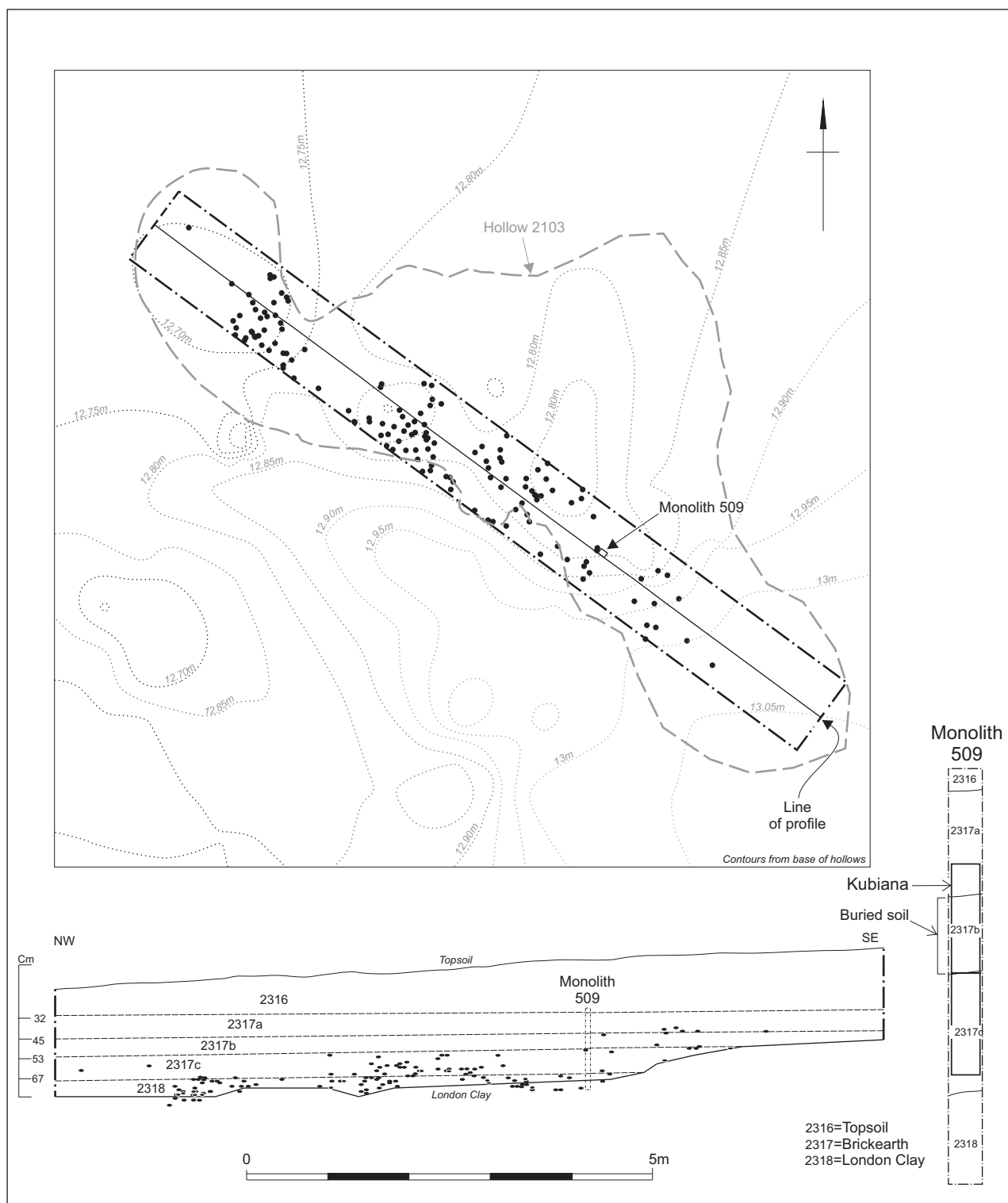


Figure 2 Projected profile of soil and artefacts in hollow 2103 projected onto centre line from a 1 m corridor across flint distribution. As no actual section was drawn in the field, the layers are stippled as horizontal bands purely for ease of reference

The basal geology comprised deeply weathered London Clay (Rw; 2318) which was visually a structureless dense clay. The deposits (2317c and 2317b) within the hollows contained two material types: a matrix soil and soil inclusions (including ferri-manganiferous soil and ferruginised soil) (see Figs 2 and 3a–b).

The basal brickearth *sensu lato* (2317c) was light greyish brown massive silty clay. Soil micromorphology (see Appendix) showed that within it were ferruginised soil clasts (often including fine bone) characterised by textural pedofeatures (Fig. 3e–f) of soil collapse and mass-movement generally associated with cold climates (Fedoroff *et al.* 1990; Mùcher 1974; Van Vliet-Lanoë 1985; 1998). This had formed as a water-saturated mass-movement deposit as evidenced by the ‘embedded’ grains coated by pedotextural features (Bullock and Murphy 1979) (see Fig. 3c–f). This deposit also contained fine bone (possible raptor pellets or scats) and fewer artefacts than the deposit above, confirming that this was essentially a cold climate deposit of Younger Dryas/Late Glacial (Loch Lomond) stages; ie, before, or immediately after, the Windermere (Allerød-Bølling in UK) interstadial. Some later rooting and biological reworking was present (see Appendix).

The main horizon within the hollow (2317b) was distinguished visually by a well-defined blocky structure and many fine mottles. In thin section eroded soil clasts from a relict humic and rooted topsoil (Fig. 4c–d) were present. This soil contained small amounts of microscopic charcoal and burnt flint chips (Fig. 4a–b). The eroded humic topsoil, which post-dates the flint assemblage, probably dates to a period of climatic warming when humic rankers (on acid substrates) and rendzinas (on chalk) are known to have developed, either in the Windermere Interstadial (eg, Preece and Bridgland 1998; Preece *et al.* 1995; Van Vliet-Lanoë *et al.* 1992), or the early Postglacial (pre-Boreal) period.

The upper ‘brickearth’ (2317a) was largely colluvial and extended across the site, sealing Late Bronze Age features. It comprised silty clay with weak prismatic/columnar structure, and displayed a clear to sharp (?erosive) contact within the ‘brickearth’ (2317b) in the hollows. The deposit itself may have been instigated, in part, by the Bronze Age activity recorded on the site.

Soil micromorphology

This study produced strong corroborative evidence of human and animal activity in the two deposits described above, as well as evidence of the pre-Long Blade environment.

The lower fill of hollow 2103 (context 2317c), comprised a cold stage, mass-movement, water-lubricated, colluvial deposit, contained a quantity of fine (50–200 µm) bone, both in the iron-depleted matrix and more commonly in the ferruginised soil clasts. More than 70 individual microscopic bone fragments were identified in the soil thin section (see Appendix). These occur as

fragments and as eight concentrations (one 700 μm ferruginised concentration contains >25 bone fragments, the largest fragment being 200 μm , Fig. 3c–d). Fine bone fragments occur in a band at *c.* 520–540 mm depth in layer 2317c (Fig. 3b). The bone has clearly undergone a number of transformations, as at Westbury-sub-Mendip cave, Somerset (Andrews 1990; Andrews *et al.* 1999), and may represent owl pellets (Macphail and Goldberg 1999) or animal scat, such as mustelids (eg, wolverine) (Roberts and Parfitt 1999). Fragmentation may be caused by mastication, ingestion, and defecation. It could also result from human trampling on site, however the bone concentrations in this sample more commonly contain small bones, rather than small bone fragments. Regurgitation pellets of raptor have been found in occupied caves, for example Middle Pleistocene Westbury-sub-Mendip and Late Pleistocene Arene Candide, Liguria, Italy (Macphail *et al.* 1994) and on other Late Glacial sites including Gough's Cave, Cheddar, Somerset (Goldberg and Macphail 2006; Macphail and Goldberg 2003), but not in such high concentrations as at Underdown Lane.

Significantly traces of very fine charcoal, rare fine charcoal (1 mm) and a sand-sized, burnt flint chip (Fig. 4a–b), together with other burned mineral grains were found in the thin section which are not associated with recent rooting. These occur predominantly in the upper deposit (2317b, Table 3) at 320–450 mm and with a band of fine bone fragment at 520–530 mm depth. Unfortunately most, if not all, of the identifiable and identified *macroscopic* charcoal is likely to be intrusive, down recent root and other macropores. Significantly, however, the *microscopic* charcoal, burnt soil grains, and burnt flint chip are intrinsic within the matrix of the deposit and indicate fires and burning associated with the Long Blade assemblage. Further, the disrupted and fragmented nature of this evidence confirms that the former humic soil and Long Blade assemblage had largely eroded into the hollows/undulations.

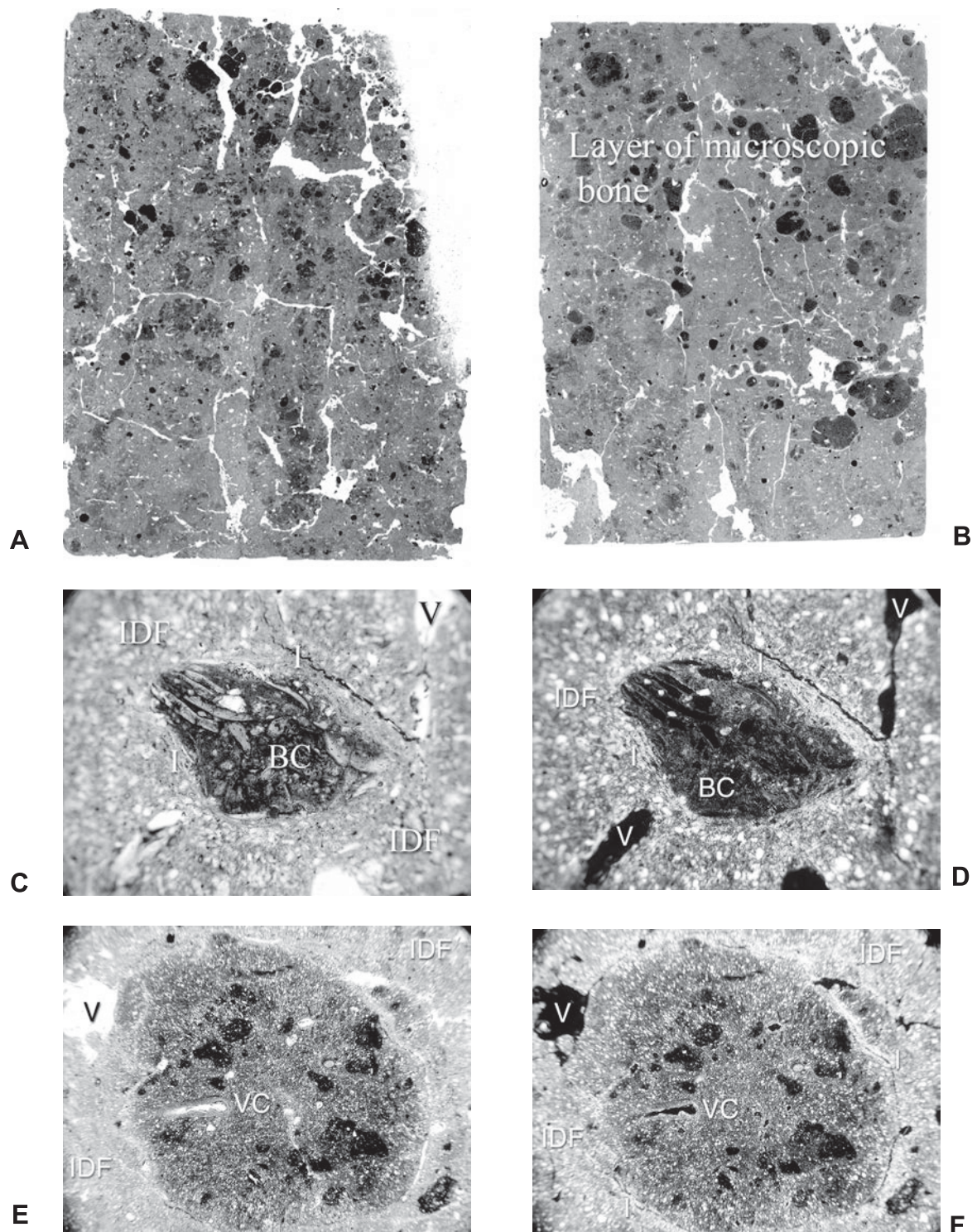


Figure 3 Soil micromorphology. A) Scan of 2317-1 showing iron depleted matrix and included iron and manganese stained relict topsoil clasts (width: ~55 mm); B) Scan of 2317-2, illustrating location of some 70 microscopic bone fragments and ferruginised relict cold climate soil fragments (width ~ 55 mm); C–D) 2317-2 microphotographs in plane polarised (PPL) and crossed polarised (XPL) light of ferruginous bone cluster (BC), voids (V), iron depleted fabric (IDF) and intercalatory textural features (I) surrounding 'embedded' bone cluster (width ~ 1.75 mm); E) 2317-2, PPL micrograph of ferruginised soil clast with laminated void coatings (VC). Clast 'embedded' in iron-depleted fabric (IDF) (width ~4.4 mm); F) as (E) showing clast surrounded by intercalations (I)

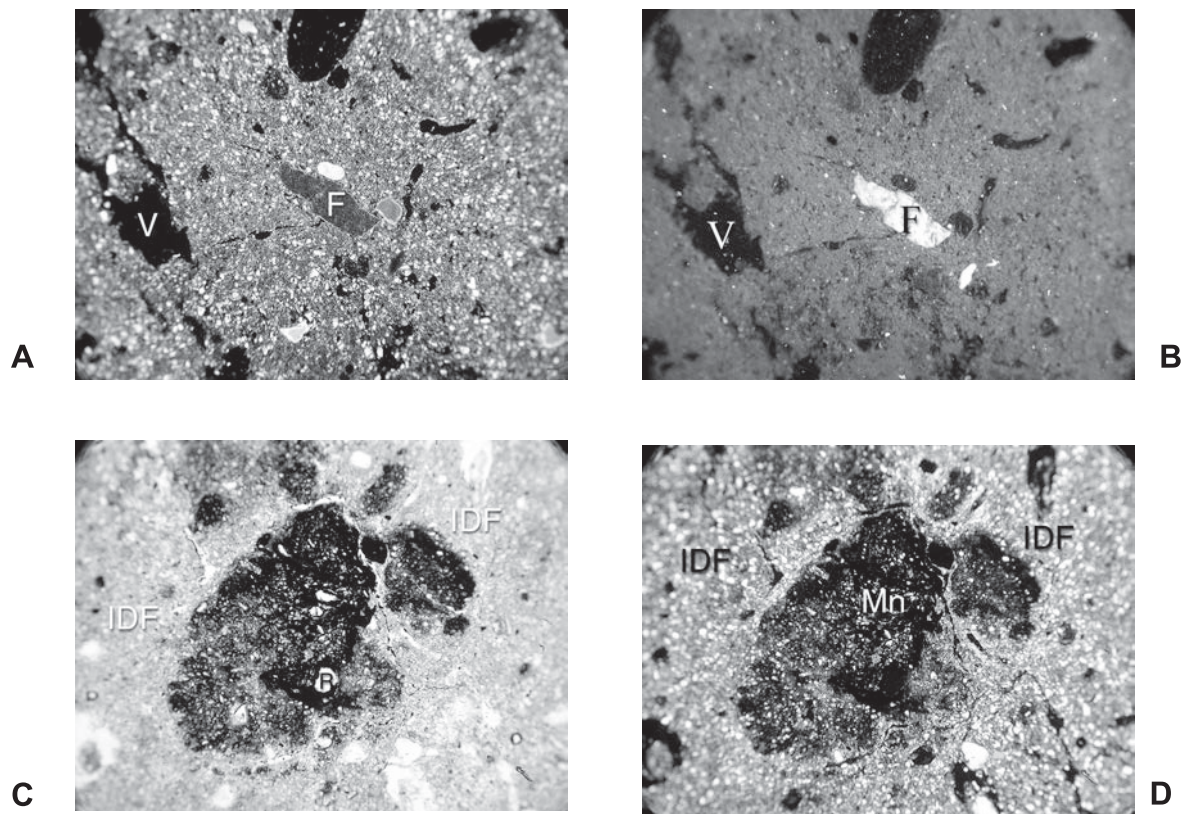


Figure 4 Soil micromorphology. A–B) 2317-1 microphotographs in PPL and oblique incident light (OIL) of soil containing burnt flint flake (F) and voids (V) (width ~7 mm); C–D) 2317-1, PPL microphotographs of soil containing clasts of iron and manganese impregnated 'topsoil', preserving several root (R) pseudomorphs; clast is surrounded by iron-depleted soil (width ~4.4 mm)

The flint assemblage

The stratified flint assemblage (Table 2) comprised 212 pieces and contained elements of the entire core reduction process, including several Long Blades and ‘Bruised Blades’. These are typical of assemblages belonging to the Late Glacial–Early Postglacial period which marks the transition between Late Upper Palaeolithic and Mesolithic industries.

Method

Each piece of struck flint was examined and classified according to established typologies (Lewis with Rackham 2011; Barton 1992). All securely stratified artefacts from hollows 2103 and 2307 were subjected to full metrical and technological analysis, details of which are retained with the site archive. Qualitative attributes were also recorded included the type of raw material, colour, inclusions, degree of patination, percentage coverage of cortex, completeness, and butt type.

Raw material, colour and patination

The closest Chalk outcrop, which offered the most local source of fresh flint, lies *c.* 7 km to the east although derived material from gravel deposits may have been more readily available during the Late Glacial–Early Postglacial period. Flint quality is relatively poorer than that from a good chalk deposit and nodules were probably obtained from local river gravel or from surface deposits. Artefacts have now developed a post depositional grey-brown stain with shades of yellow also present and milky patination.

Spatial analysis

As the assemblage was not absolutely *in situ* little analysis of the scatter was attempted (Fig. 7). In addition there were insufficient numbers of artefacts to enable any single core reduction sequence to be reconstructed. People removing tools and artefacts to another site could explain some of these missing elements. However, the truncation and disturbance of the ‘brickearth’, described above, indicate that the recovered flints represent the surviving remnants of a previously more extensive deposit containing a much larger assemblage. The study of human activities through the spatial patterning of the assemblage will also have been compromised by the selective preservation of the material within the hollows. The small concentration of burnt flint within hollow 2103 is comparable in quantity with other Long Blade sites but relatively uninformative. The concentration coincided with the greatest density of struck flint, including retouched pieces, cores, and core tablets. This may indicate the former presence of a hearth or, given the evidence for lateral movement and erosion, relate to the microtopography of the hollow.

Taphonomy

The distribution of worked and burnt flint from a 1 m ‘corridor’ across the longest axis of the hollow was projected on to a central line (Fig. 2). The resulting profile demonstrates that nearly all the artefacts were associated with the eroded deposits (2317b and 2317c), and very few are within the Holocene colluvium (2317a). Although there is direct evidence for human activity within the eroded topsoil (B2a), the distribution of artefacts extends into the eroded deposits with cold stage features (B2b), again possibly suggesting that some had eroded into the hollow with the deposit.

Refitting artefacts from the two hollows demonstrate that the material was relatively *in situ* but confirm vertical sorting through the ‘brickearth’ (2317). Refitting Group 8 contained dorso-ventral refits between crested blades with a vertical depth separation of 120 mm, while Refitting Group 9 had a vertical depth separation between two dorso-ventral refits of 70 mm. This phenomenon can be attributed to bioturbation: vertical sorting within a biologically active soil. Later prehistoric pottery, charcoal fragments and pollen had also infiltrated the deposits, confirming biological disturbance and implying that some of the flint assemblage may be of more recent origin.

The material

Flakes and unclassifiable debitage

Flakes from all stages of core reduction were present in the assemblage, of which 29 flakes were complete and 11 were burnt. Flakes ranged in length from 10 mm to 77 mm (av. 25.5 mm), in width 8–78 mm (av. 26.6 mm) and from 2–12 mm thick (av. 5.4 mm). Two broken pieces may originally have been primary flakes (100% dorsal cortication). In addition, three flakes with 75–99% cortex were present and 22 secondary flakes (1–74% cortication). Forty-two tertiary flakes were present, of which only nine were unbroken. Hammer mode included characteristics of both hard and thirteen of soft mode, while butts were predominantly plain (29 examples, none of which showed platform edge abrasion), with only five faceted butts.

Blades

The blades ranged in length from 8 mm to 140 mm, however only 14 examples were unbroken, rendering any quantitative data meaningless. This high breakage rate (79%) can be explained by the relatively poor quality of the raw material, leading to increased breakage during manufacture and the longer, laminar form of blades which make them more susceptible to breakage by post-depositional processes. Several very long blades were present (Fig. 5.1), and other fragments suggest that, originally, the large blade component was very much greater. The size of some of the blades dictates that at least a few large, good quality flint nodules were introduced and exhaustively reduced. Most of the blades and blade fragments (50) were free of cortex, which results from the

anticipated process of blade production, following core preparation involving decortication of the original nodule. Plain butts dominated; one example showed platform edge abrasion. One linear butt was present with ten faceted butts (Fig. 5.2). Soft hammers were preferred for blade production (37 out of 38 classifiable examples). Ten pieces were burnt.

Cores and core preparation pieces

Only one small bipolar, prismatic blade core could be clearly attributed to the assemblage (Fig. 5.4). Both platforms were plain, and the core had been clearly worked until no more blanks could be produced. One other long (103 mm) prismatic, bipolar, blade core (Fig. 5.5) was clearly contemporary with the rest of the assemblage but was unstratified. It is therefore included in this analysis. Both platforms were faceted. The core was abandoned due to the presence of imperfections, which produced hinge-terminated blanks. Two other very small flake cores could be of later prehistoric date.

The absence of ‘giant’ cores often found associated with Long Blade industries can be attributed to the fact that when good quality nodules were discovered, they were fully utilised until no more blanks could be produced (as shown by two cores). Similarities in raw material link several of the large blades to an early stage of the reduction of one core (Fig. 5.5).

There were six core preparation pieces (four pieces with unifacial cresting pieces and two core tablets). Only one of the crested pieces is complete, and two further pieces (refitting Group 8) join to form a further complete example. Two additional large crested blades, one (Fig. 5.3) with bi-directional cresting, have sustained heavy edge damage through use and may be classified as ‘Bruised Pieces’ (see below). Two core tablets are also present in the assemblage and a further example has also suffered notable edge damage.

Partially worked nodules and hammer stones

All the broken nodules comprised poor quality river-gravel flint and may have been broken deliberately to test their suitability for knapping. A flint nodule derived from the gravel showed extensive use as a hammer stone (Fig. 5.6).

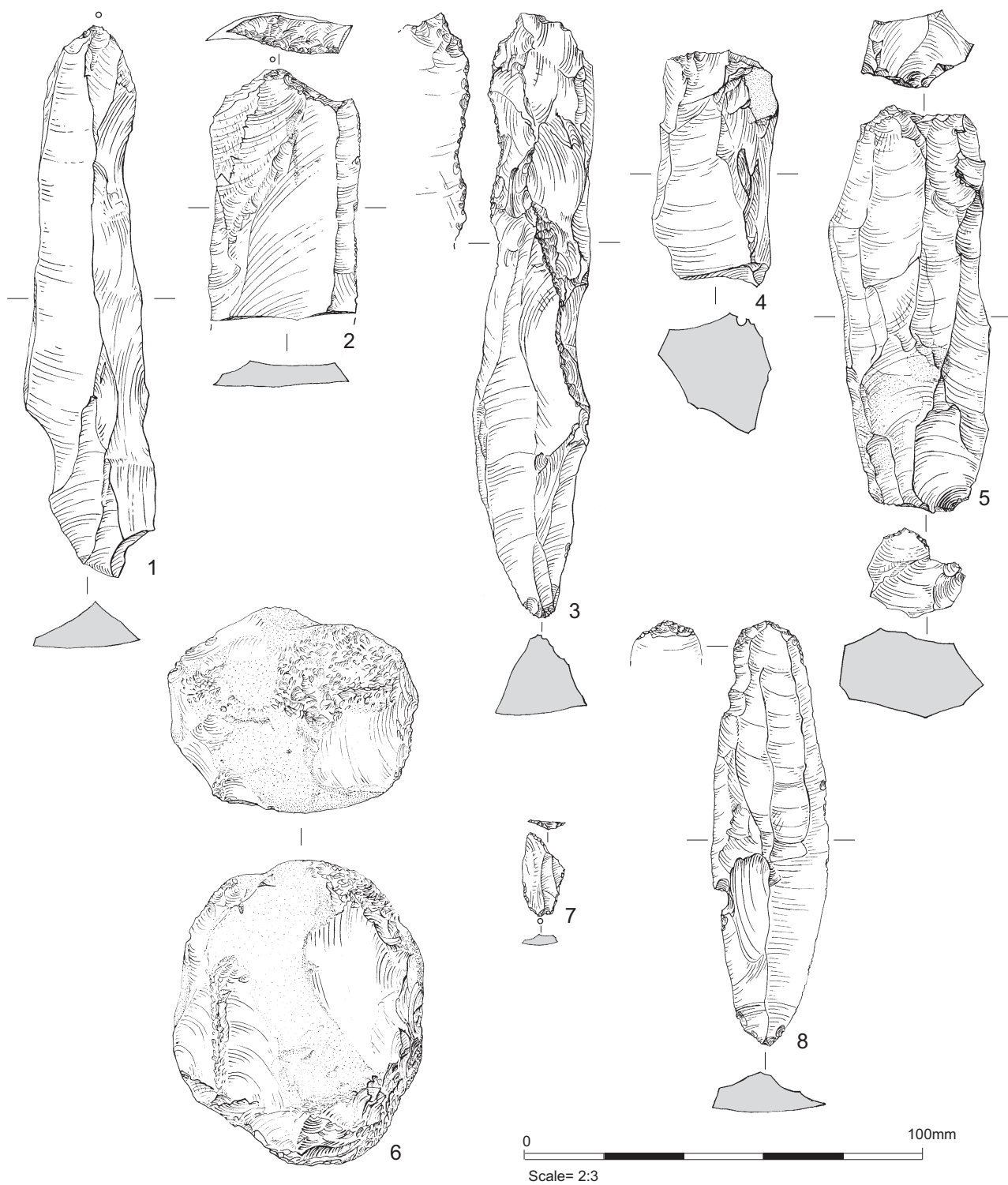


Figure 5 1–2) long blades; 3) crested blade; 4–5) blade cores; 6) hammerstone; 7) microlith; 8) end scraper

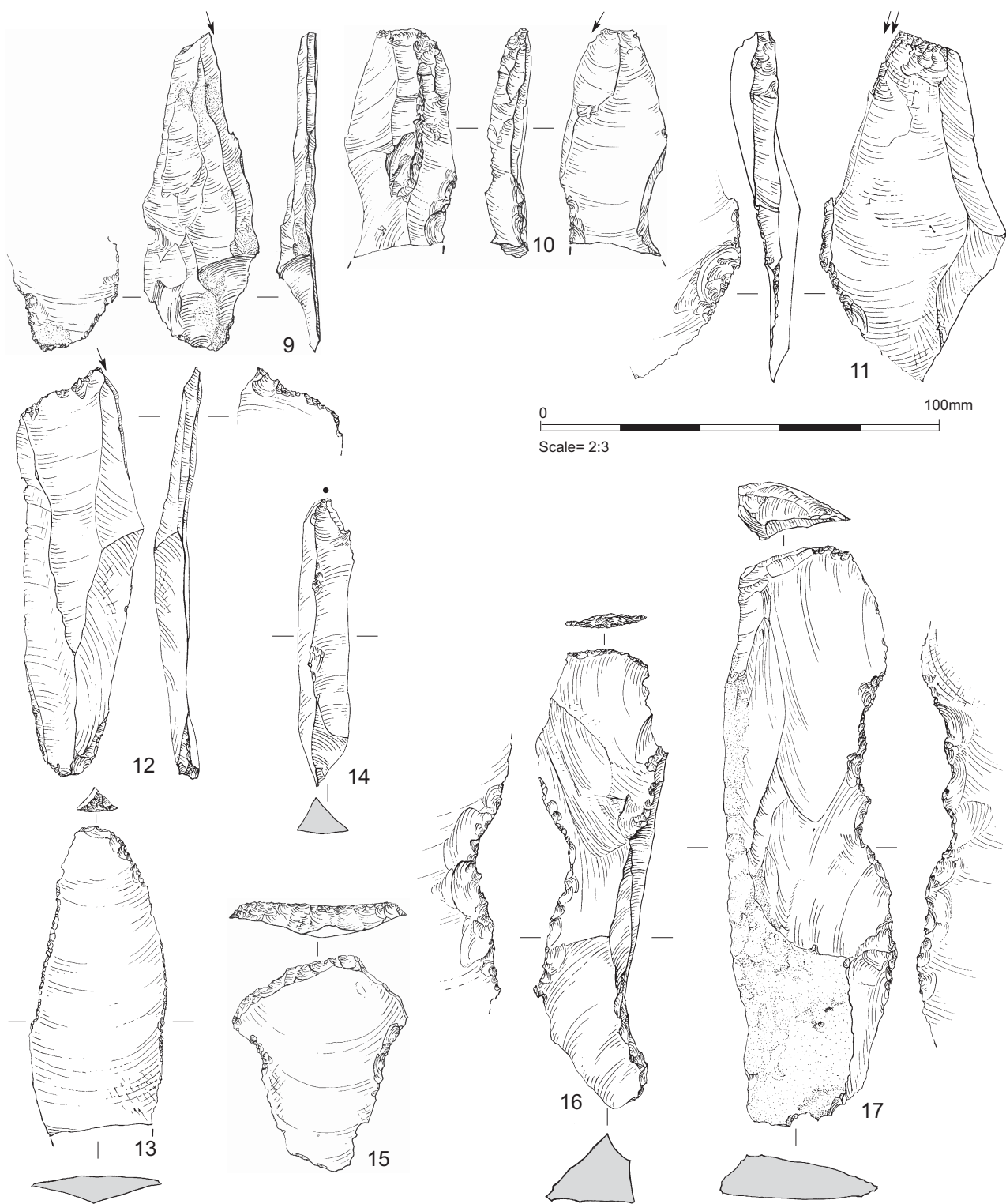


Figure 6 9–12) burins; 13) retouched blade; 14) notched flake; 15) edge damaged core tablet; 16–17) Bruised Blades

Retouched tools

The single microlith (Fig. 5.7) comprised an oblique truncation on the *distal* end of a small bladelet with additional retouch on both lateral proximal margins. Such pieces are characteristic of Long Blade assemblages in southern Britain, and the Thames Basin in particular. They also have parallels with ‘Zonhoven points’ found on the European mainland (Barton 1991, 239; Gob 1991, 231). The single end scraper was made on a blade (Fig. 5.8). The original abrupt retouch at the proximal end was further modified by inverse retouch or use damage.

Five of the six burins were dihedral as opposed to truncation types. One used a break surface caused by a deliberate ‘Corbiac’ transverse blow (Fig. 6.9). A second was particularly interesting in that the support consisted of the proximal fragment of a crested blade (Fig. 6.10). This piece retained ‘bruised’ edge damage characteristic of a *lame mâchurée* on one lateral margin, and it is possible that the blade broke whilst being used (see below). The butt of the proximal blade section was then used as a burin spall removal surface. The distal margin of a third also displayed the invasive scalar damage associated with bruised flakes and blades (Fig. 6.11). Only one burin could be construed as having a burin removal surface, which was retouched, and even in this case the retouch may have been caused by utilisation (Fig. 6.12).

Miscellaneous retouched pieces were represented by three flake or blade fragments with localised retouch on lateral or distal margins and did not appear to be fragments of formal tool types (Fig. 6.13).

Utilised debitage

A number of pieces showed signs of edge damage or discontinuous retouch that was post-depositional. However, ten pieces were categorised as *a posteriori* tools (*sensu* Bordes 1970); artefacts with no deliberate modification but which show signs of utilisation. One blade mid-segment showed signs of relatively light wear along both margins, whilst another blade was characterised by two notches worn into a lateral margin (Fig. 6.14).

The remaining eight utilised pieces displayed distinctive damage in the form of stepped, invasive scars on the ventral (and sometimes dorsal) surface, and crushing of the lateral margins. This damage was variable, sometimes almost negligible, elsewhere (Fig. 6.15 and 5.3) more substantial and occasionally spectacular (Fig. 6.16 and 6.17). Most of these blades and flakes comprised large robust pieces produced during the early stages of core reduction. ‘Bruised’ blades and flakes such as this have been described as ‘*lames et éclats mâchurés*’ (Bordes 1967, 30), and experimental work (Barton 1986) suggests that this characteristic damage can be produced by heavy chopping of antler or bone. Fromm (2005, 34–8) argues for the bruising to result from the

adjustment of striking platforms on cores and cites Fagnart and Plisson (1997) who have shown that similar damage can result from the action of flint on stone and, by logical extension, possibly flint on flint. Six pieces at Underdown Lane can be truly described as *lames* or *éclats mâchurées* and the two burins mentioned above also have bruised margins.

Site formation and the integrity of the lithic assemblage

The geoarchaeological and assemblage analyses have concurred that neither the deposits within the hollows nor the Long Blade assemblage are *in situ*. The deposits, therefore, represent small relicts that have survived fortuitously within natural undulations and hollows in the surface of the London Clay. Bioturbation within the deposits has vertically displaced some of the flints with the intrusion of later ecofacts. The flint assemblage will not have moved far and provides a representative sample of a Long Blade industry with all aspects of blank production and retouched tools represented. Despite these limitations it is possible to construct a model of site development that satisfies the sedimentological, environmental, and cultural evidence.

This proposes:

1. The surface of the London Clay becomes weathered (2318, Rw).
- 2a. Deposits are eroded into the hollow as unstable mass-movement under cold stage conditions in the Upper/Younger Dryas (deposit 2317c E2b). No human activity (ie, flint discard) or scats are associated with this first phase of mass-movement.
- 2b. During the latter part of the cold stage transition, when some warming occurs, the deposits fine upwards and there is a fine colluvial input (deposit 3317c E2b). The sediments are active, resulting in some lateral movement, and human activity is present possibly within, and certainly in the immediate area of, the hollows. Flints are discarded onto the deposits which are, at this stage, *in situ*. Animals are present as scats are dropped. Fires are set. This, therefore, occurs in the Late Upper/Younger Dryas to the very early Holocene (pre-Boreal) period. The deposits are still actively accreting; the scats and fine charcoal are intercalated with the deposits and the sediment matrix, and flints start to become incorporated within the sediment.
- 2b/3a. As warming continues local pedogenesis (soil forming processes) occur, and humic rankers develop on the weathered natural. Soil formation itself may be suppressed where human activity such as trampling and possible hearths occur.
- 3b. Warming continues, but cool conditions prevail in the pre-Boreal to Early Boreal climatic phases, and unstable conditions lead to localised erosion and colluviation of topsoil material,

incorporating some struck flint, into the hollow (2317b; B2a). There is no direct evidence for human activity in the form of continued discard of knapping waste.

4. Holocene colluviation, possibly in the later Neolithic or more probably mature Bronze Age, strips off and truncates sequences containing Long Blade material elsewhere, and deposits fine colluvium (2317a, B1) into the hollow. Thus the hollows preserve relict patches of the former, wider flint scatter.

All lines of evidence emphasise that the worked flints had been shifted laterally to a limited extent after the deposition of the assemblage. It is difficult to reconstruct their original place of manufacture; however the fact that the flints were recovered only from hollows 2103 and 2307 suggests that knapping probably took in that area, possibly within 3 m of the rim.

Chronology and affinities of the flint assemblage

The term Long Blade industry was first used to describe an assemblage from Sproughton, Suffolk (Wymer 1976) that was assigned on typological and stratigraphical grounds to Pollen Zone IV, the Pre-Boreal. Subsequently a number of Long Blade assemblages and stray finds have been identified in southern England. Few of these have been subjected to controlled excavation and fewer still have been associated with organic materials or provided useful environmental data. Reliable radiocarbon determinations have been obtained from horse fauna at Three Ways Wharf, Uxbridge, Middlesex, of $10,270 \pm 100$ BP (OxA-1788) and $10,010 \pm 120$ BP (OxA-1902). OSL determinations from Avington VI in Berkshire for sediments with Long Blade material to around 10,200 calendar years BP (Barton *et al.* 1998; Barton and Dumont 2000; Lewis with Rackham 2011). Problems with radiocarbon curve calibration at around 10,000 BP (Housley (1991) have restricted the precision with which Long Blade assemblages can be dated to much less than a millennium, from *c.* 10,300 BP to *c.* 9,700 BP (10,200–9200 cal BC).

The Underdown Lane assemblage forms an important addition to a corpus of material from SE England. At least three other Long Blade assemblages are recorded for Kent and the periphery of East London, at North Cray, Bexley (Chandler 1915), Riverdale, near Canterbury (*lame mâchuréé* illustrated in Barton 1991, 238), and the ‘lower floor’ at Springhead West (Jacobi 1982; Burchell’s (1938) ‘Ebbsfleet’ site), as well as more than a dozen stray finds of Long Blades or cores capable of producing them, *Grossklingen*, and *lames mâchurées*. Of these, most details are available for Springhead which, like Underdown Lane, notably included burins on bruised blades. Because of the affinities with both Upper Palaeolithic and Early Mesolithic assemblages, Jacobi remained cautious in his attribution of stray finds (pers. comm.) but did record in his personal archive at least four *lames mâchurées* and a dozen finds of Long Blades or *Grossklingen*.

The technology at Underdown Lane was typical of Long Blade industries. Core preparation and reduction techniques remained essentially Upper Palaeolithic including cresting and blade production from two opposed platforms. Striking platforms were maintained by detaching core tablets and/or partial faceting. Blade blanks were characteristically long, with a high proportion longer than 120 mm. Retouched tools typically formed a low percentage (*c.* 2% or less) of the total assemblage, and the inventory was restricted. Nevertheless at Underdown Lane, typical Long Blade associated tool forms, including scrapers on the ends of large flakes or blades and burins, often of dihedral form were present.

These ‘Upper Palaeolithic’ traits are balanced by the presence in a number of assemblages such as Sproughton, Suffolk (Wymer 1976), Springhead lower floor, Kent (Burchell 1938), Launde (Cooper 2006) and now Underdown Lane, of broad microliths. These are often obliquely truncated and sometimes with additional modification. However, microburins are usually rare or absent, and some microliths and backed pieces retain their proximal ends, again a feature with similarities in the Upper Palaeolithic. Absent also are typically Early Mesolithic forms such as drill bits (*mèches de foret*), microdenticulates, axes, adzes, and core tool debitage. Retouched material at most of the British sites seems to consist of miscellaneous retouched flakes and blades that do not fall within formal tool types.

One of the most distinctive forms of *a posteriori* tools within Long Blade assemblages are the so-called ‘Bruised’ blades and flakes (*lame et éclat mâchuré*; Bordes 1967, 30). These usually consist of large robust flakes and blades (sometimes crested) which display signs of very heavy edge damage in the shape of stepped, invasive scalar scarring, usually confined to the ventral surface. That Underdown Lane retains ten examples (and a burin with similar damage) in a clearly incomplete assemblage suggests that there were originally many more at this location (see below). Among Barton’s (1995) definitions of Long Blade sites was the close availability of good quality flint but this appears to be something of a relative value. Analysis of the Three Ways Wharf scatters, for instance, has shown that one of the most important determining factors in the size of debitage was the relatively poor quality of the locally available flint. It was possible to demonstrate that characteristically Long Blade core reduction strategies and technology were being employed at Three Ways Wharf which, elsewhere with better quality flint, would have resulted in a familiar Long Blade assemblage.

The same is true at Underdown Lane where much of the complete debitage is not noticeably larger than that found in the very Early Mesolithic and there is little, if any, indication of the use of flint nodules from primary sources. The similarities in raw material selection, reduction strategies, and tool types (particularly burins and bruised blades) between Three Ways Wharf and Underdown Lane are striking. The raw material used at Launde, in the East Midlands, also seems to have been

from secondary contexts, in this case most probably from local boulder clay deposits rather than river gravels, and is of variable quality. Although nodules up to 250 mm can be found in the area, the size of debitage again reflects the generally smaller size of the raw material and that of blades (80–120 mm long) is similar to Underdown Lane (80–140 mm). The reduction strategy and restricted range of tool forms are, again, also comparable (Cooper 2006).

Site location, function and economic indicators

Artefact typology and technology at Underdown Lane place the assemblage firmly among other European Long Blade assemblages. Faunal evidence from Three Ways Wharf, Uxbridge (Lewis 1991, 252ff.), Belloy-sur-Somme in France (Fagnart 1991) and Stellmoor, Schleswig-Holstein, Germany (eg, Bratlund 1991), suggest that these sites probably represent seasonal hunting camps exploiting migrating reindeer and/or horse. The precise quarry may have varied greatly. The period in question spans the Younger Dryas to the warmer Mesolithic, a period of quite dramatic changes in climate, fauna, and flora. This includes the behaviour and fluctuating availability of reindeer, which migrate, and horse, which do not and may have been present in favourable areas more or less year-round.

Many of the British and European Long Blade assemblages have been concentrated ‘on or near major rivers’ (Barton 1995). Assemblages from Kent at Springhead and North Cray, Bexley (and probably Riverdale, though its precise location is not clear) similarly lie on gentle slopes running down to a major watercourse. However the picture may be more subtle; Underdown Lane is in an ectonal location on a low plateau overlooking the Thames Valley. When the Long Blade flints were discarded, the sea level would have been at least 30 m and possibly as much 65 m lower than today (Shennan and Horton 2002; Shennan *et al.* 2000; Coles 1998). The River Thames flowed *c.* 15–20 km to the north of the site making this position much more prominent in the landscape. The commanding view, overlooking a wide basin with the Thames beyond, would have been cut by north-east flowing tributaries, the Stour to the east and the Swale to the west (Wilkinson and Murphy 1995), interspersed with ridges, hollows, and hillocks. Launde is in a similar, prominent location, but on a ridge crest, overlooking watercourses.

This pattern of distribution on riparian slopes and gravel terraces or on knolls, clifftops, or plateau areas overlooking watercourses is also reflected in the spread of stray finds of similar date in Kent. In addition most have come from locations that are peripheral to the main geologies – towards the edges of the chalk itself, on the tertiary deposits and greensands fringing it, or on the margins of the London Clay on or close to the present coastline. Beyond Kent examples of Long Blade material from Essex also seem to show a bias in distribution towards margins of the London Clay, with several findspots occurring on relict areas of Bracklesham Beds lying within the clay

belt. There also seems to be a fairly clear separation of sites between valley floor and higher ground, or elevated terrace, locations in the Norfolk/Suffolk/Cambridgeshire border area and the Thames valley in central London.

Much of this is speculative, nevertheless it provides some attempt to place Long Blade artefact assemblages in their environmental setting and with groups making them. These two locales were probably used by the same communities for differing purposes and as a part of their whole resource-exploitation lifestyle. The riparian locations provided water, fish, water fowl and extensive open, largely treeless, grassy plains for herbivores, particularly reindeer and horse. The river valleys also provided collection areas and migration routes for many of these species, giving rise to seasonal abundance of meat resources. The ecotonal locations provided observation points, enabling easy exploitation of the riverine resources and plants below, and of the more upland, drier land in the hinterland. These transitional locations may also have enjoyed lighter woodland than is likely on the upland – providing ideal browse for herbivores, foraging for smaller animals and scrub/bramble vegetation producing berries and nuts for both man and animal alike. At Underdown Lane the identification of probable raptor or mustelid scat implies the presence of some trees and scrub.

Within this landscape flint tool manufacture and use was an important activity. The presence of a microlith implies hunting. Those few sites that have produced faunal assemblages appear to have been engaged in butchery and carcass processing. The use that generated the *lames et éclats mâchurées* has been discussed, with suggestions that they fulfilled the otherwise missing function of axes or choppers (Barton 1986), possibly used for cutting bone or more likely antler. Fagnart and Plisson (1997, quoted in From 2005) believe that they had been utilised on hammerstones and From himself (2005, 34–8) argues for multiple uses. In common with other Long Blade sites, all the bruised blades and flakes at Underdown Lane were closely associated with the formal tools and debitage, and appear to have been used during the reduction sequence. However the spectacular damage noted on some pieces (e.g. Fig. 6.16–17) would allow little or no control in knapping. It seems likely, therefore, that these are both tool and tool-maker – general purpose pieces robust enough to perform a variety of ‘heavy’ tasks (and large enough to provide a good grip or for hafting).

The general association of Bruised Blades with debitage and core fragments sufficient to enable detailed reconstruction of the *chaîne opératoire*, but with only a small element and limited range of formal flake and blade tools, indicates that, basically, they were the expedient pieces that got left behind when people moved on. This may be an obvious statement but it seems to have led to the general assumption that all Long Blade assemblages were utilised for the same range of activities. This may be largely the case, but the observation that there are at least two zones of activity – in the river valleys and in higher ground locations – makes it possible to put forward an

outline model of habitat use that extends beyond the few carefully excavated and recorded assemblages.

It is possible that the higher ground zone, represented by, for instance, Underdown Lane and Launde, was used stochastically throughout the year for short visits with probably little in the way of site focus – ie, the exact same sites were not necessarily revisited. The use of this zone was not *specifically* activity or event dependent – it provided reliable resources over a wide range while, at the same time allowing access to other zones and clear views over lower ground from which to assess resource availability. Flint knapping, hunting, butchery, carcass processing, and fire setting are all indicated.

In contrast, the riparian zone provided an area in which sites were more numerous, possibly larger (though, to date, this may be partly a function of excavation strategy and preservation) and activity dependent. The flint assemblages do indicate a similar range of activities to those of the higher ground zone but here, we argue, activity is geared towards the *seasonal exploitation of resources*. This is not to suggest that favoured areas were only occupied for part of a year – they may have been utilised more or less year round but their use depended on the concentrated availability of specific animals (or birds or fish, though we have no evidence for these). Thus while the activities represented by these lowlying sites are themselves seasonal, the use of the zone is not seasonally constricted – different resources were exploited at different times of year. The archaeological data in this zone comprises (or should comprise according to this model) large numbers of sites, some of which may have been regularly reused, comprising significant accumulations of butchery, processing, and consumption debris and extensive flint knapping waste indicative of short-lived, spatially restricted activities.

An, albeit rudimentary, examination of the locational aspects of Long Blade assemblages has enabled us to present an outline model of habitat use which places Underdown Lane in our category of higher ground sites – a short term occupational site in an ecotonal position with a small group of people engaged in hunting, butchery, flint knapping, and fire setting.

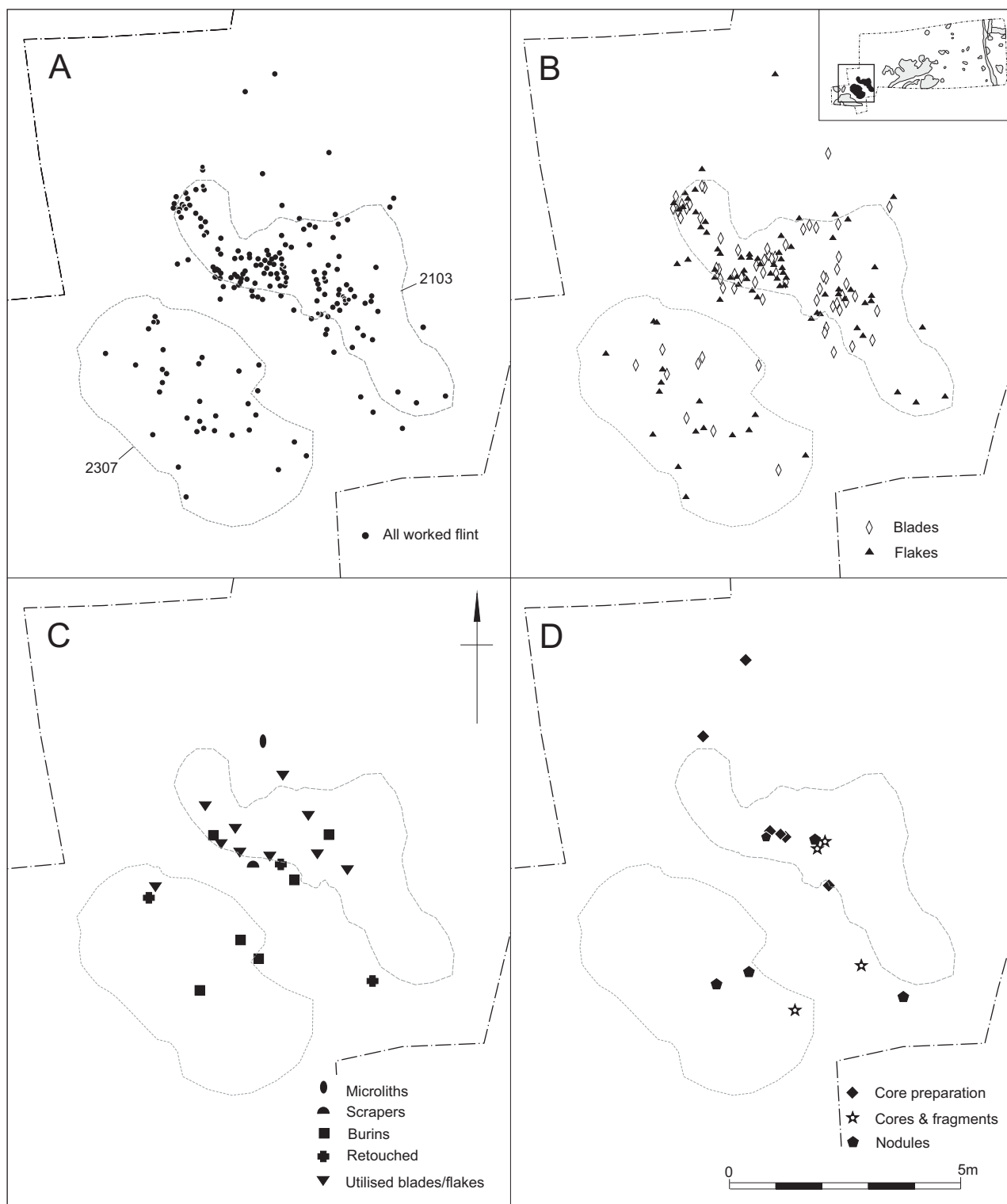


Figure 7 Distribution of worked flint in hollow 2103

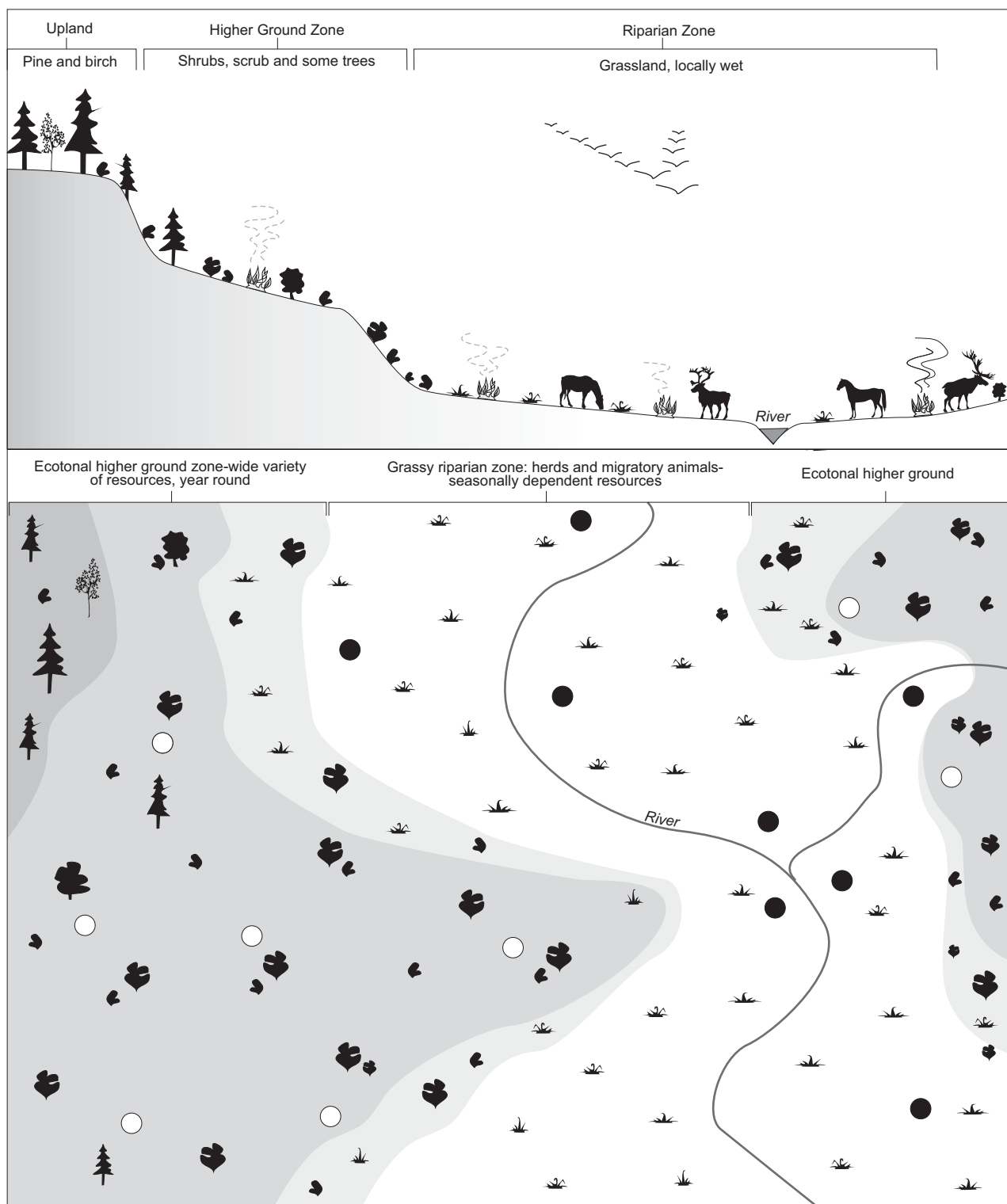


Figure 8 Outline model of habitat use

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Bibliography

- Allen, T. 1995. *Lithics and Landscape: archaeological discoveries on the Thames Water Pipeline at Gatehampton Farm, Goring, Oxfordshire 1985–92*. Oxford: Thames Valley Landscapes Monograph 7
- Andrews, P. 1990. *Owls, Caves and Fossils. Predation, Preservation and Accumulation of Small Mammal Bones in Caves, with an Analysis of the Pleistocene Cave faunas from Westbury-sub-Mendip, Somerset, UK*. London: Natural History Museum
- Andrews, P., Cook, J., Curren, A. and Stringer, C. 1999. *Westbury Cave. The Natural History Museum Excavations 1976–1984*. Bristol: Centre for Human Evolutionary Research at the University of Bristol
- Barton, R.N.E. 1986. Experiments with long blades from Sproughton, near Ipswich, Suffolk. In D.A. Roe (ed), *Studies in the Upper Palaeolithic of Britain and Northwest Europe*, 129–41. Oxford: British Archaeological Report S296
- Barton, R.N.E. 1991. Technological innovation and continuity at the end of the Pleistocene in Britain. In Barton *et al.* (eds) 1991, 234–45
- Barton, R.N.E. 1992. Hengistbury Head Dorset Volume 2: the Late Upper Palaeolithic and Early Mesolithic sites. Oxford: Oxford University Committee for Archaeology Monograph 34
- Barton, N. 1995. The long blade assemblage. In Allen 1995, 54–64
- Barton, R.N.E. and Dumont, S. 2000. Recolonisation and settlement of Britain at the end of the last glaciation. 151–162. In Valentin, B., Bodu, P. and Christensen, M. (eds), *L'Europe Septentrionale au Tardiglaciaire. Nemours, L'Association pour la Promotion de la Recherche Archéologique en Ile-de-France*

- Barton, R.N.E., Roberts, A.J. and Roe, D.A. (eds). 1991. *The Late Glacial of North-west Europe: human adaptation and environmental change at the end of the Pleistocene*. London: Council for British Archaeology Research Report 77
- Barton, R.N.E., Antoine, P., Dumont, S., Hall, S. and Munaut, A.V. 1998. New optically stimulated luminescence (OSL) dates from a late-glacial site in the Kennet Valley at Avington VI, Berkshire, UK. *Quaternary Newsletter* 85, 21–31
- Bordes, F. 1967. Considérations sur la typologie et les techniques dans la Paléolithique. *Quartär* 18, 25–55
- Bordes, F. 1970. Réflexions sur l'outil au Paléolithique. *Bulletin de la Société Préhistorique Française* 67, 199–202
- Bratlund, B. 1991. A study of hunting lesions containing flint fragments on reindeer bones at Stellmoor, Schleswig-Holstein, Germany. In Barton *et al.* (eds) 1991, 193–207
- Bullock, P., Fedoroff, N., Jongerius, A., Stoops, G. and Tursina, T. 1985. *Handbook for Soil Thin Section Description*. Wolverhampton: Waine Research
- Bullock, P. and Murphy, C.P., 1979. Evolution of a paleo-argillic brown earth (Paleudalf) from Oxfordshire, England. *Geoderma* 22, 225–52
- Burchell, J.P.T. 1938. Two Mesolithic 'floors' in the Ebbsfleet Valley of the Lower Thames. *Antiquaries Journal* 18, 397–401
- Chandler, R.H. 1915. Implements of Les Eyzies-type and a working-floor in the River Cray valley. *Proceedings of the Prehistoric Society of East Anglia* 2(1), 80–98
- Coles B.J. 1998. Doggerland: a speculative survey. *Proceedings of the Prehistoric Society* 64, 45–81
- Cook, J. and Jacobi, R. 1994. A reindeer antler or 'Lyngby' axe from Northamptonshire and its context in the British Late Glacial. *Proceedings of the Prehistoric Society* 60, 75–84
- Cooper, L. 2006. Launde, a terminal Palaeolithic camp-site in the English Midlands and its north European context. *Proceedings of the Prehistoric Society* 72, 53–94
- Courty, M.A., Goldberg, P. and Macphail, R.I. 1989. *Soils and Micromorphology in Archaeology*. Cambridge: Cambridge Manuals in Archaeology
- Fagnart, J.-P. 1991. New observations on the Late Upper Palaeolithic site of Belloy-sur-Somme (Somme, France). In Barton *et al.* (eds) 1991, 213–26
- Fagnart, J.-P. and Plisson, H. 1997. Fonction des pièces mâchurées du Paléolithique final du bassin de la Somme: caractères tracéologiques et données contextuelles. In J.-P. Fagnart and A. Thévenin (eds). *Le Tardiglaciaire en Europe du Nord-ouest. Stratigraphie et environnement des occupations humaines du Tardi-glaciaire et du début de l'Holocène en Europe du Nord-*

- ouest. 119e Congrès national des sociétés historiques et scientifiques. Amiens, 24.10.–28.10.1994, 95–106. Paris: Editions CTHS
- Fedoroff, N., Courty, M.A. and Thompson, M.L. 1990. Micromorphological evidence of palaeoenvironmental change in Pleistocene and Holocene Paleosols. In L.A. Douglas (ed.), *Soil Micromorphology: a basic and applied science*, 653–66. Amsterdam: Elsevier
- Froom, R. 2005. *Late glacial long blade sites in the Kennet Valley: excavations and fieldwork at Avington VI, Wawcott XII and Crown Acres*. London: British Museum Research Publication 153
- Gallois, R.W. 1992. *The Wealden District*. London: British Regional Geology 14
- Gob, A. 1991. The Early Postglacial occupation of the southern part of the North Sea Basin. In Barton *et al.* (eds), 227–33
- Goldberg, P. and Macphail, R.I. 2006. *Practical and Theoretical Geoarchaeology*. Oxford: Blackwell
- Housley, R.A. 1991. AMS dates from the Late Glacial and early Postglacial in north-west Europe: a review. In Barton *et al.* (eds) 1991, 25–39
- Jacobi, R.M. 1982. Later hunters in Kent: Tasmania and the earliest Neolithic. In P.E. Leach (ed.), *Archaeology in Kent to AD 1500: in memory of Stuart Eborall Rigold*, 12–24. London: Council for British Archaeology Research Report 48
- Jarvis, M.G. Allen, R.H., Fordham, S.J., Hazleden, J., Moffat, A.J., and Sturdy, R.G. 1984. *Soils and Their Use in South-East England*. Harpenden: Soil Survey of England and Wales Bulletin 15
- Lewis, J.S.C. 1991. A Late Glacial and Early Postglacial site at Three Ways Wharf, Uxbridge, England: Interim Report. In Barton *et al.* (eds), 246–55
- Lewis, J.S.C. with Rackham, J. 2011. *Three Ways Wharf, Uxbridge: A lateglacial and Early holocene hunter-gatherer site in the Colne valley*. London: Museum of London Archaeological Service Monograph 51
- Macphail, R.I. 2004. *Land at Underdown Lane, Eddington, Herne Bay, Kent: Soil Micromorphology*. Salisbury: Wessex Archaeology unpublished report
- Macphail, R.I. and Cruise, G.M. 2001. The soil micromorphologist as team player: a multianalytical approach to the study of European microstratigraphy. In: P. Goldberg, V. Holliday and R. Ferring (eds), *Earth Science and Archaeology*, 241–67. New York: Kluwer Academic/Plenum Publishers
- Macphail, R.I. and Goldberg, P. 1999. The soil micromorphological investigation of Westbury Cave. In Andrews *et al.* 1999, 59–86

- Macphail, R.I. and Goldberg, P. 2003. Gough's Cave, Cheddar, Somerset: microstratigraphy of the Late Pleistocene/Earliest Holocene sediments. *Bulletin of Natural History Museum London (Geology)* 58 (suppl) 51–8
- Macphail, R.I., Hather, J., Hillson, S.W. and Maggi, R. 1994. The Upper Pleistocene deposits at Arene Candide: soil micromorphology of some samples from the Cardini 1940–42 excavations. *Quaternaria Nova* 4, 79–100
- Mücher, H.J. 1974. Micromorphology of slope deposits: the necessity of a classification. In G.K. Rutherford (ed.), *Soil Microscopy*, 553–6. Kingston, Ontario: Limestone Press
- Preece, R.C. and Bridgland, D.R. (eds). 1998. *Late Quaternary Environmental Change in North-West Europe: excavations at Holywell Coombe, south-east England*. London: Chapman and Hall
- Preece, R.C., Kemp, R.A. and Hutchinson, J.N. 1995. A Late-glacial colluvial sequence at Watcombe Bottom, Ventnor, Isle of Wight, England. *Journal of Quaternary Science* 10, 107–21
- Roberts, M.B. and Parfitt, S.A. 1999. *Boxgrove. A Middle Pleistocene hominid site at Eartham Quarry, Boxgrove, West Sussex*. London: English Heritage Archaeological Report 17
- Shennan, I., Lambeck, K., Horton, B., Innes, J., Lloyd, J., McArthur, J., Purcell, T. and Rutherford, M. 2000. Late Devensian and Holocene records of relative sea-level changes in northwest Scotland and their implications for glacio-hydro-isostatic modelling. *Quaternary Science Reviews* 19, 1103–35
- Shennan, I. and Horton, B. 2002. Holocene land- and sea-level changes in Great Britain. *Journal of Quaternary Science* 17, 511–26
- Stoops, G. 2003. *Guidelines for Analysis and description of Soil and Regolith Thin Sections*. Madison, Wisconsin: Soil Science Society of America
- Van Vliet-Lanoë, B. 1985. Frost effects in soils. In J. Boardman (ed.), *Soils and Quaternary Landscape Evolution*, 117–58. Chichester: Wiley
- Van Vliet-Lanoë, B. 1998. Frost and soils: implications for paleosols, paleoclimates and stratigraphy. *Catena* 34, 157–83
- Van Vliet-Lanoë, B., Fagnart, J.P., Langohr, R. and Munaut, A. 1992. Importance de la succession des phases écologiques anciennes et actuelles dans la différenciation des sols lessivés de la couverture loessiques d'Europe occidentale: argumentation stratigraphique et archéologique. *Science du Sol* 30, 75–93
- Weir, A.H., Catt, J.A. and Madgett, P. 1971. Postglacial soil formation in the loess of Pegwell Bay, Kent (England). *Geoderma* 5, 131–49

- Wessex Archaeology 2003, Land at Underdown Lane, Herne Bay, Kent. Archaeological Excavation Assessment Report. Unpubl. report ref. no. 49995.2. Salisbury
- Wilkinson, T.J. and Murphy, P.L. 1995. *The Archaeology of the Essex Coast, Volume 1, the Hullbridge Survey*, Chelmsford: East Anglian Archaeology 71
- Wymer, J.J. 1976. A Long Blade industry from Sproughton, Suffolk. Dereham: East Anglian Archaeological Report 3, 1–15

TABLE 1: SUMMARY DESCRIPTION OF DEPOSITS WITHIN HOLLOW 2317

| <i>Depth (m)</i> | <i>Context</i> | <i>Description</i> |
|----------------------------------|----------------|--|
| <i>from ground level</i> | | |
| 0–0.32 | 2316 | Weakly humic yellowish brown (10YR 5/4) stonefree silty clay strong red brown medium mottles and firm small blocky structure, many fine fleshy roots, clear boundary. <i>Topsoil: A horizon</i> |
| 0.32–0.45 | 2317a | Brown (7.5YR 5/3) compact firm stonefree silty clay, with weak ? prismatic/columnar structure, few to common very fine clear yellowish brown (10YR 5/8) mottles, abrupt boundary. <i>Upper colluvial ‘brickearth’: B1 horizon</i> |
| 0.45– 0.51/3 | 2317b | Silty clay loam above, but with well defined medium blocky structure and common to many clear fine yellowish brown (10YR 5/8) mottles, clear boundary. <i>‘Brickearth: eroded humic soil: B2a horizon.</i> |
| 0.51/3– 0.67 | 2317c | Light brownish grey (10YR 6/2) massive firm compact silty clay to silty clay loam with common clear to sharp mottles of 10YR 5/8 (yellowish brown), clear boundary. <i>‘Brickearth’ eroded sediment: B2b horizon.</i> |
| 0.67–0.79 | 2318 | Light yellowish brown (2.5YR 6/4) structureless dense clay. <i>Weathered London Clay: Rw</i> |

TABLE 2: THE COMPOSITION OF THE STRATIFIED LITHIC ASSEMBLAGE

| <i>Flint Groups</i> | <i>Totals</i> | <i>% of total assemblage</i> |
|-------------------------|---------------|------------------------------|
| <i>Retouched tools:</i> | | |
| Microlith | 1 | 0.5% |
| Scraper | 1 | 0.5% |
| Burins | 6 | 2.8% |
| Misc. retouched pieces | 3 | 1.4% |
| <i>Total</i> | <i>11</i> | <i>5.2%</i> |
| <i>Utilised:</i> | | |
| Utilised pieces | 10 | 4.7% |

Debitage:

| | | |
|--|-----|--------|
| Flakes and unclasss.debitage | 84 | 39.6% |
| Blades | 65 | 30.7% |
| Core preparation / rejuvenation pieces | 6 | 2.8% |
| Cores | 5 | 2.4% |
| Unworked and partially worked nodules | 19 | 9.0% |
| Debitage>10 mm total | 179 | 84.4% |
| Spalls (<10 mm) | 11 | 5.2% |
| Debitage <10mm total | 190 | 89.6% |
| <i>Hammer stones</i> | 1 | 0.5% |
| Total | 212 | 100.0% |

TABLE 3. MONOLITH 509, THIN SECTIONS 2317/1 AND 2317/2: SELECTED SOIL MICROMORPHOLOGICAL COUNTS

| <i>Thin section context/sample</i> | <i>Depth (mm)</i> | <i>Recent? Root</i> | <i>Relict root</i> | <i>Burrow</i> | <i>Charcoal</i> | <i>Burned flint</i> | <i>Intercalations etc</i> | <i>Inwash nodules Weak Fe mottling</i> | <i>Fe nodules</i> | <i>Fe/Mn nodules</i> | <i>Fine bone</i> | <i>Fine bone 'clusters'</i> |
|--|-------------------|---------------------|--------------------|---------------|-----------------|---------------------|---------------------------|--|-------------------|----------------------|------------------|-----------------------------|
| 2137b 2137-1 | 120-220 | + | aa | ff | + | +1 | aaaaa | aa | aaa | aaa | - | - |
| 2137c 2137-2 | 220-320 | aa | + | - | + | - | aaaaa | aaaaa | aa | aaaaa | aa | a* (x8) (x70+) |

KEY: * = very few 0-5%; f = few 5-15%; ff = frequent 15-30%; fff = common 30-50%; ffff = dominant 50-70%;

+ = rare<2% (+* = 1%; +1 = single occurrence); aa = occasional 2-5%; aaa = many 5-10%; aaaa = abundant 10-20%; aaaaa = very abundant >20%

TABLE 4: SUMMARY OF DEPOSITIONAL SEQUENCE IN RELATION TO
ANTHROPOGENIC INDICATORS

| | | | | |
|---------------------------------|-------|-----|--|--|
| Topsoil | 2316 | | | Topsoil; A horizon |
| | 2317a | 509 | | Holocene colluvium; B1 horizon |
| Brickearth <i>sensu lato</i> | 2317b | | | Eroded humic topsoil with burnt flint and microscopic charcoal; B2a horizon (consequence of amelioration) <i>Few flints and no scat</i> |
| | 2317c | | | Eroded deposit with cold stage features; B2b horizon (evidence of amelioration) <i>Flints and scats</i> |
| London Clay | 2318 | | | Weathered London Clay; Rw |

APPENDIX: MONOLITH 509, THIN SECTIONS 2317/1 AND 2317/2: SOIL MICROMORPHOLOGY MICROFACIES TYPES (SOIL MICROFABRIC TYPES AND ASSOCIATED MICROMORPHOLOGICAL DATA)

| <i>Material</i> | <i>Sample Number</i> | <i>Sampling depth, Soil Micromorphology</i> | <i>Phase, Interpretation and Comments</i> |
|--------------------------------------|----------------------|---|---|
| Microfacies 2 (SMT 1 and 2) | 2317-1 | <p>120–220 mm = 0.41–0.51 m [B2a]</p> <p><i>Soil Micromorphology</i>: heterogeneous with pale grey, dark brown and blackish mottling/soil clasts; <i>Structure</i>: as below; <i>Coarse Mineral</i>: as below; <i>Coarse Organic/Anthropogenic</i>: rare instances of 1 mm size charcoal (Fe/Mn embedded) and an example of burned flint (1 mm); trace amounts of lignified and brown-stained fine (300 µm) root fragments; occasional very fine (200 µm) root traces in Fe/Mn stained soil clasts; <i>Fine fabric</i>: Very dominant SMT 1, as below, with frequent clasts of SMT 2: very dark brown, black (PPL), isotropic (close porphyritic, undifferentiated b-fabric, XPL), brown and black (OIL); possible strong relict humic staining – now Fe/Mn replaced, rare traces of fine charcoal and phytoliths; <i>Pedofeatures</i>: <i>Textural</i>: very abundant intercalations – some associated with dark soil clasts/nodules (see below), others with relict structures and (possibly collapsed) burrows; <i>Depletion</i>: very abundant iron depletion from main matrix; <i>Amorphous</i>: very abundant brown ferruginous mottling, with abundant Fe/Mn impregnation of relict (?) soil and organic features such as roots.</p> | <p>2317b – upper</p> <p>Complex soil/sediment, as below; but less strong iron depletion, and more abundant blackish Fe/Mn impregnation of relict – once humic and rooted – soil. Anthropogenic material include rare instances of burned flint and charcoal. (Other burned iron-rich material may have been transformed by iron depletion) Textural features indicate mass-movement inwash into hollow (as below). Biological working by roots and probable earthworms is recorded prior to later inundation and more recent structural collapse. <i>Lateglacial infill of hollow ground by soil that included eroded humic topsoil (and artefacts); with later biological activity and increasing wetness being recorded.</i></p> |
| Microfacies 1 (SMT 1 and mottles) | 2317-2 | <p>220–320 mm = 0.51–0.61 m [B2b]</p> <p><i>Soil Micromorphology</i>: heterogeneous with pale grey, brown and moderately sharp edge coarse (max. 8 mm) dark mottling/rounded inclusions; <i>Structure</i>: massive/medium prismatic, 15% voids, dominant fine (150 µm) to medium (600 µm) moderately accommodated planar voids, frequent fine closed vughs and fine/medium channels;</p> | <p>2317c – lower</p> <p>Complex soil/sediment, formed of medium brown iron-poor silty clay loam with sharply contrasting iron-rich mottles and included soil clasts/non-iron-depleted soil. Very large amounts of fine bone that</p> |

| Material | Sample Number | Sampling depth, Soil Micromorphology | Phase, Interpretation and Comments |
|----------|---------------|---|--|
| | | <p><i>Coarse Mineral:</i> C:F (limit at 10 µm), 40:60; very dominant very well sorted angular to subangular coarse silt and very fine sand-size quartz, with very few mica and opaques; very few sand and coarse sand-size ferruginous sharp edge nodules.</p> <p><i>Coarse Organic/Anthropogenic:</i> occasional fine to medium (300–600 µm) extant roots/root traces with organic residues, that are blue light autofluorescent, and commonly vertically orientated; rare examples of ferruginised medium roots (1 mm); rare instances of c. 50 µm size charcoal – also within dark mottles; occasional fine bone (both pale yellow and strongly reddish-Fe stained; all non-autofluorescent under BL); bone (50–200 µm) focused at c. 230–250 mm, 70+ individual bone fragments as scatters, and as 8 concentrations, e.g., 700 µm size ferruginised concentration of 25+bone fragments (max. 200 µm); examples of burned sand-size mineral grains;</p> <p><i>Fine fabric:</i> dominant SMT 1: speckled and dark speckled medium brown (PPL), low to medium interference colours (close porphyric, speckled b-fabric, XPL), pale greyish brown to pale orange (OIL); faint humic staining and rare examples of amorphous organic matter phytoliths; very dusty reddish brown to very dark reddish brown (PPL), generally very low interference colours to isotic (close porphyric, speckled to undifferentiated b-fabric, XPL), pale to dark orange and reddish brown (OIL); faint humic staining and rare examples of amorphous organic matter phytoliths;</p> <p><i>Pedofeatures: Textural:</i> a) rounded clasts – i.e., relict: many intercalations and moderately well oriented dusty clay void coatings and infills – some microlaminated impure clay/silty coatings (e.g., 100 µm); b) soil matrix – very abundant (300 µm wide) intercalations surrounding soil clasts ('embedded grains'), with very abundant intercalations throughout with associated impure void coatings associated with relict planar voids and channels (120 µm);</p> <p><i>Depletion:</i> very abundant iron depletion from main matrix, including rooted areas; likely weathering of apatite from bone, making it non-autofluorescent under BL; <i>Amorphous:</i> very abundant brown and moderately sharp edge coarse dark brown iron mottling/rounded inclusions.</p> | <p>are often in clusters are present, most commonly in the relict dark brown soil. Rare examples of charcoal and burned mineral grains occur. Relict soil clasts contain strongly formed textural features (of soil collapse and inwash), and have wide intercalations around them ('embedded grains') formed in the iron-poor matrix. (Other burned iron-rich material may have been transformed by iron depletion)</p> <p><i>Mass-movement soil/sediment deposited in a hollow – from a local late glacial/Holocene transitional Palaeolithic occupation soil, where bone was fragmented by trampling/and or scavenged, and where cool climate Younger Dryas conditions of freeze-thaw disrupted and slaked the soil. A subsequent Holocene rise in water table has led to iron depletion and rooting.</i></p> |