EAST ANGLIAN ARCHAEOLOGY

The Archaeology of the Essex Coast, Volume II: Excavations at the Prehistoric Site of the Stumble

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Cover photograph
Tony Wilkinson and Peter Murphy in the Blackwater Estuary (*copyright Essex County Council)*

Contents

List of Plates

List of Figures

List of Tables

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Summary

The prehistoric intertidal occupation site at the Stumble is named after a mud bank or shoal located in the Blackwater Estuary some 700–800m to the east of the site itself. Today the site is fully estuarine, being covered at high tide by some 3m of water and positioned between 10 and 250m from the seaward edge of the saltmarsh. This location, within a bleak, windswept tract of mudflats, can be inhospitable even on a summer's day, and in mid-winter can be positively arctic. It is a demanding environment within which to carry out archaeological fieldwork.

Occupation occurred here in the earlier and later Neolithic periods, as well as during the Early Bronze Age and the Iron Age, Roman, Anglo-Saxon and post-medieval periods. Since these periods are all well-represented on neighbouring dryland sites nearby the excavation of a site like the Stumble might seem to require some justification, especially given the

technical problems involved. However, the Stumble has produced evidence of a kind that can usually only be recorded on inter-tidal or wetland sites. For example, the Neolithic period is represented by an intact old land surface strewn with occupation debris and peppered by pits of various dimensions. Neither of these types of evidence would have survived the millennia of ploughing that has transformed most inland Neolithic habitation sites into little more than lithic scatters. This virtually intact Neolithic site was occupied during the 3rd millennium BC, and a little earlier. During this period sea levels were significantly lower than they are today, and hence there was no preservation of waterlogged wood. Nevertheless, the quantity and quality of remaining inorganic evidence fully justified excavation.

During the later Neolithic period this landscape was gradually being inundated as a result of rising sea levels. By the time of the recorded Iron Age activity the landscape had been transformed. Occupation debris, sherds and other artefacts were virtually absent, and instead the archaeological record consisted of wooden structures, single or multiple posts, brushwood and interwoven wattles. Clearly, at this stage of the Holocene marine transgression the locus of settlement had moved inland beyond the tidal fringe, and the evidence from the Stumble must therefore represent activity that took place on salt marshes, along tidal creeks or on the mudflats.

The objective of this report is to describe the unusual diversity of archaeological evidence at the Stumble, to place it within its immediate and regional environmental setting, and to view it within the context of the archaeological landscape of the region. This landscape is now becoming better known archaeologically, thanks to recent excavations conducted in advance of development nearby at Chigborough Farm, Slough House Farm and elsewhere.

Résumé

Le site intertidal dénommé Stumble tire son nom d'une rive ou d'un banc de boue situé dans l'estuaire Blackwater, à une distance comprise entre 700 ou 800m à l'est du site néolithique. Le site est complètement estuarien; il est couvert à marée haute par environ 3m d'eau et il est compris entre 10 et 250m du rivage marin du marais salant. Situé dans une étendue désolée de bancs de boue balayés par les vents, l'endroit peut se révéler inhospitalier, même en été, et il devient franchement glacial en plein hiver. On trouve différentes périodes d'occupation. Le début et la fin du néolithique, un peu du début de l'âge du bronze, l'âge du fer, les périodes romaines, anglo-saxonnes et post-médiévales sont bien représentés dans les sites de terres arides avoisinantes. C'est pourquoi il est nécessaire de justifier les fouilles du Stumble, en particulier en raison des problèmes techniques soulevés.

Tout d'abord, même si les phases d'occupation découvertes existent dans de nombreux sites de la région, les types de preuves mises à jour à cet endroit se trouvent en général uniquement dans des sites situés dans des zones intertidales ou humides. C'est pourquoi le néolithique est représenté par une étendue de terres intactes jonchées de débris d'occupation et parsemés de fosses de dimensions variées. Aucun de ces objets n'aurait survécu aux mille ans de labourage qui ont transformé la plupart des sites d'habitation du néolithique en à peine plus que quelques fragments lithiques. Ce site néolithique, qui est pour ainsi dire intact, était occupé pendant le troisième millénaire avant notre ère et un peu avant, lorsque le niveau de la mer était beaucoup plus bas, ce qui explique l'absence de bois détrempé sur le site. Toutefois, la quantité et la qualité des restes inorganiques suffisent à justifier la fouille de ce site. Les traces de la période néolithique tardive proviennent d'un site semblable de « terre aride » qui a été inondée par la mer dont le niveau s'est progressivement élevé. Mais à l'âge du fer, ces traces se sont complètement transformées. Les débris de l'occupation, les tessons ainsi que d'autres artefacts sont pour ainsi absents ; ils sont remplacés par des traces archéologiques composés de structures en bois de poteaux isolés ou groupés, de brindilles et de clayonnages entrelacés conformément à la description de la partie 5 ci-dessous. Il est clair qu'à ce stade de la transgression marine de l'Holocène, l'implantation a dépassé la périphérie de la marée pour atteindre l'intérieur des terres. C'est pourquoi les traces provenant du Stumble doivent correspondre à l'activité qui s'est développée dans les marais salants, le long des bancs de boue ou des chenaux de marée. Le présent rapport a ainsi pour objectif de décrire la diversité inhabituelle des preuves archéologiques découvertes, de les situer dans leur environnement régional immédiat en s'attachant à dégager le paysage archéologique de la région, celui-ci étant désormais mieux connu grâce aux récentes fouilles de sauvetage menées près de Chigborough Farm et de Slough House Farm.

(Traduction: Didier Don)

Zusammenfassung

Die in der Gezeitenzone befindliche Stätte The Stumble ist nach einer Sandbank oder Untiefe benannt, die etwa 700 bis 800 Meter östlich der neolithischen Fundstelle in der Mündung des Blackwater liegt. Der zwischen 10 und 250 Meter vom Rand der Salzmarsch entfernte Ausgrabungsort, der vollständig in den Gezeitenbereich

der Flussmündung fällt, liegt bei Flut etwa drei Meter unter Wasser. Dieses öde, windige Schlickgebiet kann selbst an Sommertagen höchst unwirtlich sein, während hier im Winter zuweilen sogar arktische Verhältnisse herrschen. Es sind mehrere Siedlungsphasen nachweisbar: neben Früh- und Spätneolithikum in geringem Ausmaß auch die frühe Bronzezeit sowie die Eisenzeit, die Römerzeit, die angelsächsische Zeit und das Nachmittelalter, die alle auch an benachbarten landgebundenen Orten gut vertreten sind, so dass die Ausgrabung des Stumble, insbesondere angesichts der einhergehenden technischen Probleme, einer Begründung bedarf.

Als wichtigster Grund ist zu nennen, dass die vorgefundenen Befundkategorien gewöhnlich nur in Gezeitenbereichen oder Feuchtgebieten gemeinsam auftreten. Das Neolithikum ist beispielsweise in einer unversehrten oberen Bodenschicht erhalten, die mit Siedlungsschutt und unterschiedlich großen Gruben übersät ist. Beide Merkmale hätten den Pflügen, die die meisten neolithischen Siedlungsstätten im Landesinneren über Jahrtausende hinweg in wenig mehr als verstreute Steinreste verwandelt haben, andernorts nicht standgehalten. Die praktisch vollständig erhaltene neolithische Stätte war im 3. Jahrtausend v. Chr. und auch schon kurz davor bewohnt. Der Meeresspiegel war damals deutlich niedriger als heute, weshalb unter den neolithischen Funken kein Nassholz zu verzeichnen war. Die Menge und Qualität der anorganischen Überreste reichen jedoch aus, um die Ausgrabung der Stätte zu rechtfertigen. Die spätneolithischen Befunde deuten ebenfalls auf eine « Trockenlandschaft » hin, die nach und nach von einem steigenden Meeresspiegel überflutet wurde, so dass sich die nachfolgenden eisenzeitlichen Befunde deutlich unterscheiden. Siedlungsschutt, Scherben und andere Artefakte fehlen fast gänzlich, stattdessen findet man Holzstrukturen, Einzel- oder Mehrfachpfosten sowie Niederholz und Flechtwerk, wie in Teil 5 beschrieben. In dieser Phase der holozänen Meerestransgression war die Ansiedlung hinter die Gezeitenzone ins Hinterland verlegt worden, so dass die zugehörigen Befunde im Gebiet des Stumble nur Aktivitäten illustrieren können, die auf den Salzwiesen, entlang der Gezeitenbuchten oder auf den Schlickflächen stattfanden.

Der Bericht dient dazu, die außergewöhnliche Vielfalt an archäologischen Befunden, ihre Einreihung in das unmittelbare sowie das regionale Umfeld und ihre Betrachtung im Kontext der Archäologielandschaft der Region zu beschreiben, einer Landschaft, die dank kürzlicher Rettungsgrabungen auf den nicht weit entfernten Gehöften Chigborough Farm und Slough House Farm zunehmend stärker archäologisch erschlossen wird.

(Übersetzung: Gerlinde Krug)

1. Introduction

I. Background

(Pl. 1.1; Figs 1.1 and 1.2)

The transmission of agriculture to Britain continues to be a much debated topic, and it has even been claimed in recent years that 'Neolithic studies are on the verge of yet another revolution in thinking' (Jones 2004, S 102). This is partly because there is a clear need for more data on the subject of Neolithic settlement and everyday life, and for these data to be incorporated into our economic and social models.

The discovery of the site of the Stumble within the Blackwater Estuary of the Essex coast, in the mid 1980s, demonstrated the potential of coastal wetlands for advancing understanding of British prehistory, specifically because sites like the Stumble are capable of contributing more data on the Neolithic way of life than an occupation site that has not seen waterlogging. Not only was there excellent preservation of artefacts and charred plant macrofossils, but it was also possible to recognize a more complete range of features than has been recorded on conventional 'dryland' sites in the vicinity. This relatively complete archaeological record contrasts with the degradation of archaeological remains on dryland sites and enables us to collect a wider spectrum of occupational evidence. Consequently, the evidence from the Stumble offers a valuable corrective to many common suggestions and assumptions about the British Neolithic — for example, that settlement was mobile, that houses were rare, and that the contribution of cereals to the domestic economy was minimal. This report, which complements the original report in the *East Anglian Archaeology* series on the Hullbridge Survey (Wilkinson and Murphy 1995), presents the basic results of the excavation conducted between 1986 and 1989 and sets them within the context of Holocene environmental change in the estuaries of eastern Essex.

The 480km-long Essex coast, running from the Thames at Purfleet to the head of the Stour, is rendered distinctive by a series of long estuaries, those of the Roach, Crouch, Blackwater and Colne. The long history of archaeological research along the coast from the late 19th century onwards includes work by Spurrell (1885 and 1889), F.W. Reader (1911) and Hazzeldine Warren. Of particular relevance was the work on an intertidal Mesolithic site at Hullbridge on the Crouch (Reader 1911, Warren 1911). Warren went on to carry out extensive studies of the pre-transgression land surface at associated prehistoric settlement sites at Walton, Clacton, Jaywick and Dovercourt (Warren *et al.* 1936). More recently, a number of local archaeologists have also provided valuable studies on the area's intertidal archaeology. Of particular note are the work of Vincent and George (1980) on prehistoric sites, de Brisay and the Colchester Archaeology Group on the 'red hills' (Fawn *et al.* 1990) and the recognition of extensive fish trap complexes by Ron Hall, Kevin Bruce and Barry Pierce (*e.g.* Strachan 1998).

In 1982 Wilkinson and Murphy began work on a limited area around Hullbridge, with the aims of providing further stratigraphic, environmental and dating information about the sites previously identified by Reader and Warren, and also of identifying new sites. The objective of the project was to provide a record of

Plate 1.1 General view of the site, looking towards Osea Island

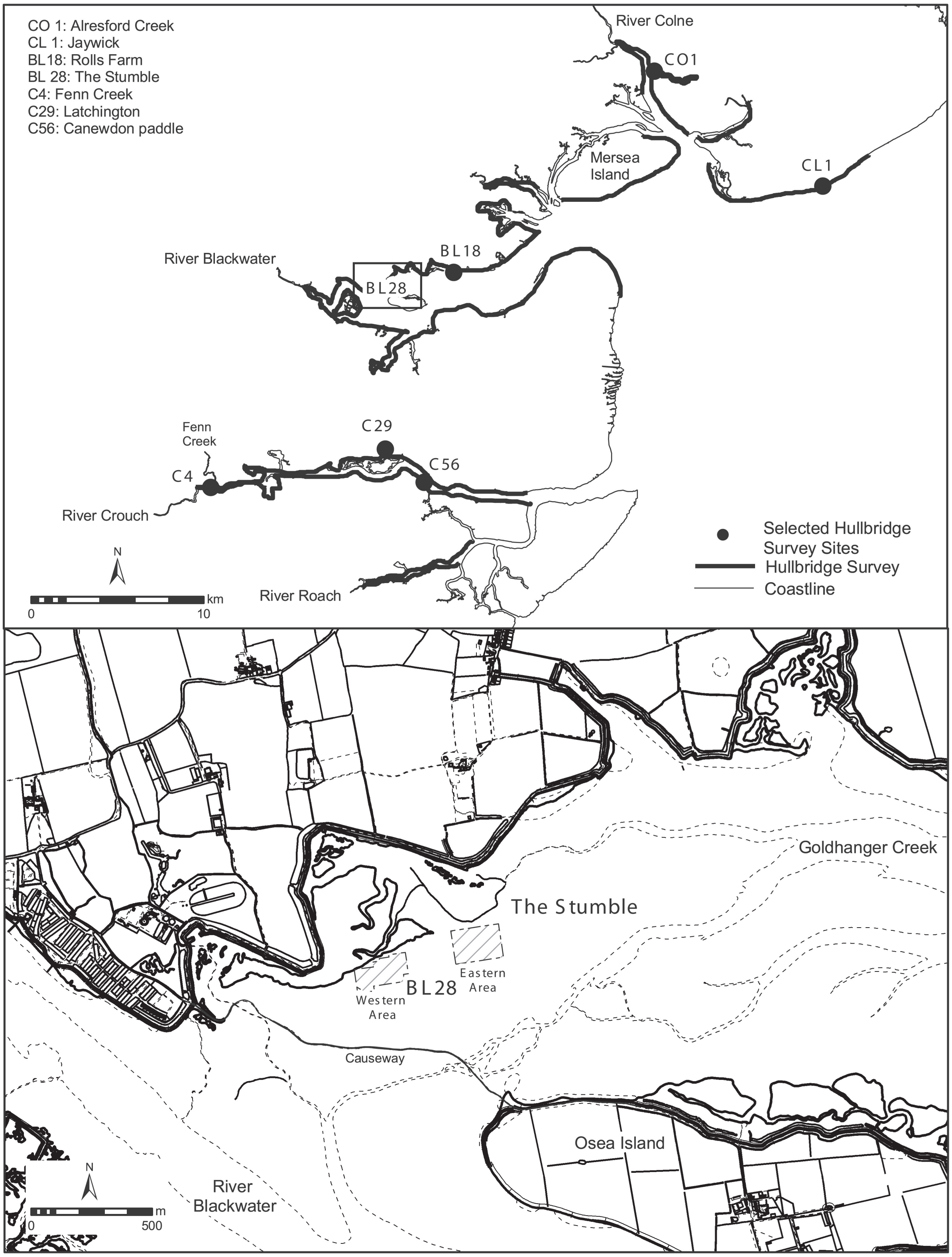


Figure 1.1 Site location

the archaeological remains in the intertidal zone, to place these remains within their cultural and environmental contexts, and to assess the scale of damage by coastal erosion. The results of the first season of the project were so promising that it was progressively extended and became known as the Hullbridge Survey (Wilkinson and Murphy 1995). By 1987 some 200km of the coast had been surveyed, this process comprising both reconnaissance and more detailed survey in selected areas. The discovery of the site at the Stumble (Blackwater Site 28) was a piecemeal process that took place during the summer of 1985, although further important elements continued to appear in 1986. Initially, only a series of post-Neolithic wooden structures (Part 6: contexts *96*,

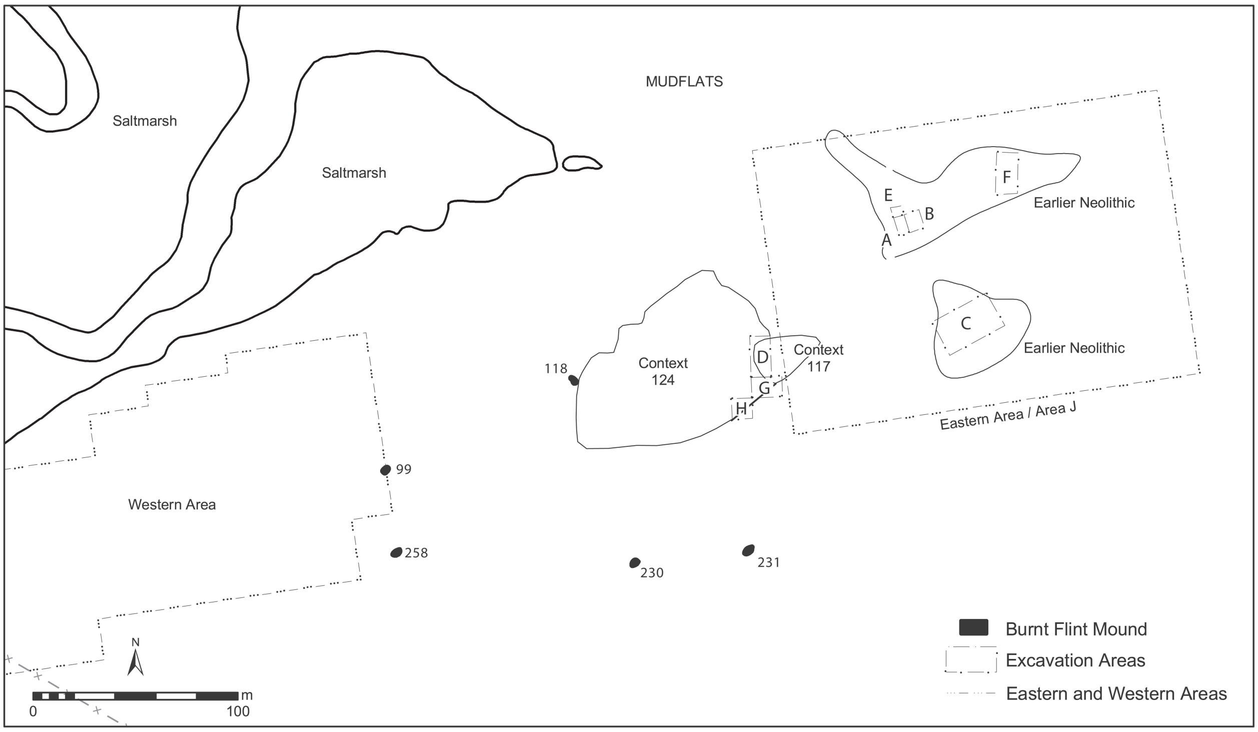


Figure 1.2 Site plan showing western and eastern areas, burnt flint mounds, wooden structures, Area J site grid, salt marsh

97 and *98*) were recognised, but subsequently the earlier Neolithic site at the eastern end of the site was noted (Fig. 1.2). Additional areas of the site, including that which proved to be richest in artefacts (Area C), were recorded as mapping and surface collection continued.

The Stumble, named after a nearby mud bank, is located in the Blackwater Estuary east of Maldon in south-east Essex (Fig. 1.1). The site's location, between Goldhanger village and Osea Island, places it *c*. 4.5km east of the present head of the estuary near Maldon and 15km from the estuary mouth. It is therefore within view of the open sea, and today is subjected to strong easterly storms as well as tidal currents that skirt the north side of Osea Island. The site is now fully estuarine, being covered at high tide by some 3m of water. Its location between 10m and 250m from the seaward edge of the saltmarsh places it within a bleak, windswept tract of mudflats which can be inhospitable, even on a summer's day; in mid-winter, conditions can be positively arctic. Evidence for all of the occupation phases present — earlier and later Neolithic, a little Early Bronze Age, Iron Age, Roman, Anglo-Saxon and post-medieval — had been recorded on neighbouring inland sites so the excavation of such a site, especially in view of the technical problems involved, required some justification. The technical difficulties particularly related to the limited working windows allowed by the tide and the need to ensure safe access to working areas, either by boat or across the flats. Because the site was inundated by the tide twice daily and was only exposed for 3–4 hours every tidal cycle, it was necessary to devise new techniques of survey, excavation and site protection. These are discussed in more detail below (pp. 5–8), as well as in the appropriate parts of each chapter.

Although the occupation phases recorded at the Stumble are represented at many sites in the area, the total range of evidence to be found at this site is of a kind that can usually only be found on inter-tidal or wetland sites. In contrast to conventional dryland sites on neighbouring terraces and uplands — where the topsoil, perhaps part of the subsoil and associated archaeological features, have often been lost as a result of soil erosion — the ancient land surface at a submerged estuarine site can survive remarkably intact. At the Stumble the soil of the relict ground surface often remained as a dark grey-brown A horizon. In some cases this was peppered by pits, post-holes, or shallow scoops; elsewhere, even the surface of a midden deposit remained. Where a sample of lowland-wetland activities can be studied (*cf*. Kooijmans 1993, fig. 6.20), it is possible for complementary exploitation strategies to be examined. At the Stumble a diachronic component was also present because the function of the site changed as the Flandrian transgression progressed. During the third millennium BC and a little earlier, when sea levels were significantly lower than today, the site was apparently occupied by a small Neolithic agricultural community and the quantity, variety and quality of remaining inorganic and carbonized remains noted was sufficient to justify excavation. By the later Neolithic period, a 'dryland' site of rather different function from that of the early Neolithic was in the process of being inundated as the result of a gradually rising sea level. The archaeological record for the Iron Age and later periods, when the site was now 'wet', was entirely different — occupation debris, sherds and other artefacts were virtually absent, and instead the evidence consisted of wooden structures, single or multiple posts, brushwood and interwoven wattles (Part 6). Clearly, by this stage of the Holocene marine transgression, the locus of settlement had moved inland beyond the tidal fringe and the evidence from the Stumble must therefore represent activity that took place on saltmarshes, along tidal creeks or on the mudflats.

The aim of this report is to describe this unusual diversity of archaeological evidence, to place it within its immediate and regional environmental setting and to view it within the context of the archaeological landscape of the region. This landscape is now becoming better known thanks to rescue excavations conducted at nearby Chigborough and Slough House Farms (Wallis and Waughman 1998; Adkins and Adkins 1984, 1992).

Although no individual elements recorded at the Stumble were unique in themselves, the range, diversity, quantity and quality of the archaeological remains made it the most important site studied during the entire Hullbridge Project. In fact the only site in any way comparable was that at Rolls Farm (Blackwater Site 18: Wilkinson and Murphy 1995, 71–6) where a 'dryland' Neolithic site was identified, along with Bronze Age wooden structures and Roman-period Red Hills. The advantage of the Stumble for the purposes of further investigation was that archaeological features were spread over an extensive area of mudflats which were amenable to detailed palaeogeographic mapping. Furthermore, the Neolithic site yielded abundant pottery and lithics for specialist study, and was at a sufficiently high level (–0.20 to –0.45m OD) to make it well-drained and exposed for more time during each low tide than was the case at the low and ill-drained site at Rolls Farm.

II. The archaeological site at the Stumble

(Figs 1.1 and 1.2)

The visible extent of the old land surface and associated archaeological remains on the foreshore at any given time is partly dependent upon the amount of recent muds and related deposits that obscure the old land surface. The location of the recent deposits, and therefore of the areas that they obscure, can vary on an almost daily basis. In addition the Neolithic land surface is also obscured by later estuarine silts and clays which are now gradually being eroded away. It is therefore likely that much evidence of Neolithic occupation remains obscured, as well as the remains of later wooden structures. This view has been supported by later work on the mudflats which has identified additional artefact scatters (Heppell 2006). In the 1980s, lower down the foreshore from the main areas of investigation, stumps and trunks of trees which were starting to appear as a result of erosion may represent the remains of later Neolithic woodland comparable to that recorded elsewhere around the Essex coast (Wilkinson and Murphy 1995, part 2 and 90–100). The stretch of foreshore between the site and Osea Island consists of intermittent mud flats, pools and shelly mud hummocks, but the gradual emergence of an old land surface is indicated by observations of occasional artefacts, outcrops of 'Lower Peat' and submerged forest. Given all of these variable factors, it must be emphasised that the site described in this report is therefore that which was visible during the 1985–8 field seasons.

The Stumble is an area of extensive mudflats covering an area of *c.* 24ha, bounded to the south and east by Goldhanger Creek, which separates Osea Island from the mainland, and to the west by the causeway to the island. To the north lies saltmarsh, terminating in an abrupt scarp 1.5–2.0m high. This fringes the hard sea defences protecting reclaimed marsh on the landward side of the wall. The old land surface and archaeological remains extended across the mudflats over a distance of 620m E–W and *c*. 200m N–S. To the north, archaeological remains were obscured by beds of recent clay and shells. To the south, they were masked by increasingly thick deposits of mobile estuarine silts and fine sands. Within the 'windows' of older sediments and palaesol exposed between 1985 and 1988 it was possible to define the following areas (illustrated on Fig. 1.2):

i) *The western area* (220m E–W x 140m N–S) formed the main area in which Iron Age and later wooden structures were encountered. These were cleaned, photographed, planned and sampled. Investigated contexts are described and illustrated in Part 6. In addition this area was investigated by means of a section through a saltmarsh 'island' and by an auger survey conducted on a 10m grid. Both these interventions were designed to investigate the main sequence of sediments and the topography of the area, and to learn something of its post-transgression palaeoecology.
ii) *The eastern area*, centred on the earlier Neolithic site, measured 200m E–W x 140m N–S. It was recorded within the framework of a 20m grid, sharing the alignment of that in the western area. This area was further investigated by means of four localised excavation areas: Areas A, B and E were contiguous interventions alongside a small creek which had cut into the old land surface, while Area C lay *c*. 50m to the south. Detailed surface sampling also took place in Area F.
iii) *Contexts 124 and 117* represented the intervening land surface between the western and eastern areas. Measuring 95m E–W x 75m N–S, this tract yielded occasional concentrations of flint and prehistoric pottery. Artefact findspots were triangulated onto the site grid; the resultant distribution allowed an additional activity area to be identified for further investigation. Finds recorded during the early field seasons from around the periphery of context *124* were designated Area X. Further investigation took place in three areas, designated Areas D, G and H.

Area J, an area measuring 200m x 140m which broadly coinciding with the eastern area, was investigated by means of 'bin sampling' based on a 20m grid (Part 5: Fig. 5.1). This aimed to provide systematically collected data to improve understanding of the layout of the earlier Neolithic settlement, and of artefact distribution and palaeoenvironmental material within the sediments.

In addition to these areas, isolated recorded contexts included *195* (wooden hurdle: Part 5), *125* (a dense scatter of wood charcoal with a smaller scatter of fired clay) (Wilkinson and Murphy 1986b, 22, 70 and 71), *230*, *231* and *258* (three burnt flint mounds: Part 4), as well as a number of isolated morticed timbers perhaps washed out of a former sea wall.

Plate 1.2 General view of the site, with surviving bank of Lower Peat in the foreground

Plate 1.3 Surface collection of artefacts at the Stumble

III. Techniques and excavation

(Pls 1.2–1.5; Fig. 1.2)

Introduction

Any site exposed in the intertidal zone is probably in the process of being destroyed by tidal erosion; at the Stumble, erosion from the surface of the pre-transgression palaeosol appears to have been taking place at rates of 1–2cm per year. Dramatic erosion has been noted elsewhere in the Hullbridge Project area — at Crouch Site 29 (Fig. 1.1) the authors monitored the almost total destruction, over a three-year period, of a Late Bronze Age wooden platform (Wilkinson and Murphy 1995: 138–39). Against this background of ongoing loss, excavation of sites of critical importance found during the survey seemed likely to be worth investigating. Following the initial survey, it quickly became clear that a low budget/ 'low-tech' methodology would be more appropriate than a relatively sophisticated and costly approach involving coffer dams and other special equipment

Excavation within any intertidal area is more complex logistically, and requires longer to complete, than work within an equivalent dryland area; it also calls for the

Plate 1.4 Working conditions

Plate 1.5 Excavation in progress

adaptation of standard archaeological techniques. It is therefore generally more expensive. When planning such works, a number of specific factors need to be considered:

- *Tidal regimes.* Since intertidal sites are only exposed for limited periods between tides, the time available for fieldwork will be limited. Fieldwork needs to be planned around low-tide windows (identified with reference to tide tables). It should be noted that tide tables present predictions as to the times and heights of tidal flows: in reality these can vary, and it is therefore important that field teams remain vigilant.
- *Health and safety.* There are generally more potential risks to be considered when working in an intertidal area. These have been considered in various published reports (*e.g*. Allen and Gardiner 2000, 19 and appendix 3, reporting on work at Langstone Harbour, Hants).
- *Access.* Physical access to sites can be difficult. It is unusual to be able to get vehicles close to a work area, and transporting equipment across flats can be both tiring and time-consuming. The use of a boat is some-

times possible, but the safety aspects of this need to be carefully considered.

- *Nature conservation.* Many sites around the coast are of significance in terms of nature conservation and this needs to be considered when planning fieldwork.

The investigative strategy at The Stumble was designed taking factors such as these into account along with the aims and objectives of the archaeological work. The following section details the fieldwork techniques utilised during the 1980s fieldwork seasons. It should be noted that these techniques were designed to meet the specific requirements at the Stumble and might need to be adapted to be used elsewhere.

Neolithic remains: the eastern area

The excavation team consisted of six to eight experienced archaeological volunteers who were capable of undertaking all stages of excavation and recording with minimal supervision. In addition, the main field staff included the authors, Steve Godbold and Sandy Grey (site supervisors) and Judy Wilkinson (finds supervisor). The team also benefited from the expertise of Glynn Barratt (surveyor) and David Schofield (illustration and wet-sieving). Special tribute must be paid to Sandy Grey, a former laboratory technician with a genius for adapting simple technology to unusual situations. In addition to making major contributions to the field methodology of the original survey, he also devised most of the techniques used for site protection, drainage and equipment storage. Maintaining equipment and keeping the site dry and workable were full-time jobs in themselves: neglect of either led to inefficiencies elsewhere in the system, with diggers sometimes being laid off as a result of flooding and other problems.

While most areas at the Stumble were drained by foreshore creeks, some parts were less well drained than others. Consequently, in the (earlier Neolithic) Area C for example, water had to be evacuated by a system of perimeter drainage channels. Incursions of standing water from outside the excavation, and seepage through the loose foreshore sands and silts, were minimised by the use of low dams made from plastic or metal lawn edging. The channels drained into a sump which was emptied using a submersible electric pump powered by a car battery. Where finer control of site drainage was necessary, large soil samples in polythene sample bags made ideal sluice gates. Elsewhere at the Stumble, where the foreshore slope was sufficient to conduct water directly from the site, gravity flow was sufficient to drain the working area prior to excavation. On arrival at site, however, regardless of whether the site had been pumped or was gravity drained, it was still necessary to empty water-filled features using hand-operated bilge pumps, or by bucketing or sopping up with large sponges.

The surfaces of intertidal mudflats will not withstand prolonged trampling, and it was therefore necessary to construct walkways around excavations, connecting them to spoilheaps and other key areas. Walkways were made of rolls of wired split chestnut fencing, secured into place with grid pegs. (In fact, these were noted as still surviving on the site in 2005!) Within the excavated area, damage to exposed surfaces was avoided by laying down boards of plywood *c.* 10mm thick. These were nailed to the site surface itself (*i.e.* the sandy clay loam palaeosol) with 6-inch nails and equipped with cord handles so that they could be easily moved and stored. Tools and equipment which would not suffer from submersion were stored on site in a cage of metal mesh firmly anchored into position. Tubular steel tables and chairs were driven securely into the surface of the mudflat in order to make site recording, finds work and tea breaks more convenient. A hat-stand from which coats and cameras could be suspended was a crucial item, though it was important to lower this when work was finished to avoid perforating the hulls of yachts passing the site at high tide.

A light fibreglass boat was used to move equipment which could not be stored on site, and also to remove soil samples. The voyage to site was taken from the north-west tip of Osea Island (*i.e.* the excavation 'land base') on a falling tide, and the boat was then floated off-site as the tide returned. Children's plastic sledges were used for moving soil samples and other heavy items between the boat and the site.

When operating within the disciplines and infrastructural framework described above, conditions were little worse than those encountered on terrestrial sites on clay subsoil in wet weather. Following the surface collection of artefacts, excavation proceeded with the removal of overlying sludge, loose sands and algae, by means of a series of spits, or by excavating onto the palaeosol surface and/or the Holocene estuarine clay which overlay it or which infilled old creeks that had been cut into it. The surface that was exposed by this clearance was reduced in further spits, or *trowelling passes*. As the palaeosol was removed (involving between two and six spits, depending upon the character of the excavated area) underlying features were revealed and these were sectioned, recorded and sampled using conventional terrestrial methods. The number of passes required to reach the stage that all subsoil features present in an area had been exposed varied, and depended on the thickness of overlying sedimentary deposits.

In Areas A, B and E the locations of finds (pot, flint, fired clay, stone and larger fragments of burnt bone) made during each pass were plotted individually. During trowelling, findspots were marked with plastic garden labels which were left in place until enough had accumulated within reach to make triangulation worthwhile. The finds were then individually numbered and bagged, with their locations marked on the bag or on a separate A4 film sheet. Due to the limited time available, individual findspots were not levelled in. The recovery of material by spit, however, allowed some control of finds distribution within the recorded sediment column. Following each fieldwork session the survey data was transferred onto recording sheets. Once features had been identified they were assigned context numbers. In Area A, finds from smaller features such as post-holes were recorded using the appropriate context number while those from larger features continued to be triangulated. In subsequently excavated areas, however, all finds from features were recorded by context number.

Although it allowed the graphical display of finds distributions, and potentially the correlation of spit finds with the locations of underlying features, the point-plotting of individual items proved prohibitively time-consuming in the field, significantly slowing excavation without providing a commensurate increase in useful data. This was particularly the case in Area C, where artefact densities were high. The technique was therefore amended in the remaining investigation areas and finds were collected by 1m square in each trowelling pass, with each finds group assigned a context number.

A single soil sample, from which carbonised plant material and bone could subsequently be extracted, was collected from each 1m square and transported 'back to base' for processing. Methods for processing samples from 'dryland' intertidal sites are given in Murphy (1989). Samples from the palaeosol were also collected for analysis of soil pollen and micromorphology.

The twice-daily inundation of the site resulted in the excavation areas, and (as work progressed) exposed features, becoming rapidly obscured by mud and algae. It was therefore necessary to plan all cleaned areas (at a scale of 1:20) at the end of each cleaning session.

Logistical constraints, as well as the time-consuming nature of finds plotting, limited the area that could be excavated by the team of six to ten people. One particularly issue was that, as the area and volume of the excavated trench increased, the volume of sea water that became trapped within it increased too. This increased the length of time required to pump it out, thereby cutting into the excavation time for each tide. This is less likely to be an issue at self-draining sites, but it always will be significant wherever deep features are being investigated. As a result, it was possible to suggest a 'threshold' size for an excavated area, beyond which excavation was scarcely practical without large numbers of sturdy pumps. This is the main reason why Area C was excavated within a series of subdivisions varying in size between 15 and 35 sq. m.

Where open-area excavation was not required, a convenient system of sub-surface sampling devised which involved inserting into the foreshore an open-ended cylinder created from a cut-down oil drum. This technique — like so many others — was devised by Sandy Grey. By driving the bin securely into the sediment (in the case of Area J at 20m grid intervals: Figs 1.2 and 2.1), any standing water could be evacuated from within, and the fixed area thus isolated could then be stratigraphically excavated and the finds recorded. In addition to providing information about artefact density, these samples recorded the depth of the Holocene estuarine clay while a soil subsample was taken for carbonised plant remains. Where the depth of overlying estuarine clay exceeded a critical depth of *c.* 0.3m, the oil drum was dispensed with and the clay depth was measured using a hand auger.

Wooden structures in the western area

When sampling and record wooden structures, each working area was prepared by digging drainage channels and laying plywood boards to protect the underlying clay. Each structure was cleaned, planned and photographed. Numbered samples were taken for identification and stem ageing, preferably from all roundwood components. Any worked timbers, cut ends and coppice heels were collected for drawing, radiocarbon dating, and dendrochronology, if appropriate. Analysis of macro- and microfossils was by means of samples taken from the associated sediment. These are all standard procedures used by wetland archaeologists, but structures in estuarine clays present a range of specific problems which are elaborated on in Part 6.

To help understand the context and chronological sequence of the wooden structures and to help interpret their function, the deposits underlying the modern mudflat surface were investigated by augering, either along single-line transects or (where possible) over a 10m grid (Part 6).

2. The Earlier Neolithic Site

I. Introduction

(Figs 1.2 and 2.1)

The earlier Neolithic site, as first identified, comprised a series of lithic and pottery scatters located on 'islands' of old land surface, usually surrounded by areas of indeterminate mud or relict creeks infilled with estuarine clay. Definition of the individual areas of investigation, detailed below, was most readily performed by means of surface collection of artefacts in 1m x 1m squares and, in the case of the large Area J, by means of samples collected using bins sunk into the palaeosols. Overall, the Neolithic site extended *c*. 250m E–W by 100m N–S and lay to the east of the area with the later preserved wooden structures (Part 6). Two basic subdivisions of the Neolithic site can be recognised, as follows.

The eastern area

(Figs 1.2 and 2.1)

An eastern area was distinguished by a fragmented area of old land surface, cut by a sinuous feature which had been infilled with grey, estuarine clay. The artefact assemblages recovered from these areas exhibited a greater degree of clustering than those from elsewhere at the site, and included larger proportions of pottery to flint. For example, Table 2.1 demonstrates that sample plots from Areas C and F, within this earlier Neolithic eastern area, had a higher pot:flint ratio than that seen in similar samples from Areas D, G and H to the west. Although some later Neolithic activity can be demonstrated for the eastern area (below, p.66), the only diagnostic later Neolithic pottery recovered was a group of Peterborough ware sherds from context *181*, to the south-west of Area A.

The following areas were investigated in greater detail:

- *Area J*, a large area sampled by means of bins set out on a 20m grid (Fig. 1.2);
- *Area A/B/E*, excavated by means of three small trenches (Fig. 2.1, within Area J);
- *Area C*, excavated to the south of A/B/E (Fig. 2.1,within Area J);
- *Area F*, investigated in 1988 by surface sampling only (Fig 2.1, within Area J).

Investigation of these four areas, when combined with qualitative observations of artefacts on additional exposures of palaeosol, provided sufficient data to outline the layout, stratigraphy (where present) and occupational history of the earlier Neolithic site.

Context *124*

(Fig. 1.2)

One area where an extensive exposure of old land surface produced a moderate density scatter of struck flints and occasional pottery was designated context *124* (also known as Area X). In two areas, shallow irregular depressions infilled with estuarine clay were distinguished by augering. Although the southern feature is poorly defined and of uncertain origin, that to the north may have been the head of a shallow creek system, linked with a larger sinuous feature that cut the Neolithic site near Areas A and C.

Several mounds of burnt flints (*117*, *118*, *230*, *231* and *258*; Fig. 1.2) were located. Of these, the 'peripheral' mounds *230*, *231* and *258* were devoid of finds, whereas those to the north (*117* and *118*) were associated with scatters of flints and pottery. To define context *117* more precisely, artefact collection areas were laid out at D, G and H (Fig. 2.1). From these, surface pottery and flint was collected within 1m squares, and in Area D a number of minor features were partially excavated.

The area of context *124* produced earlier Neolithic flints, as well as a significant number of diagnostic later Neolithic lithics — the latter included a discoidal knife roughout fragment which may have been made from Grimes Graves floorstone (Holgate, Part 4, Fig. 4.18, 92). However, because these scatters were difficult to separate temporally in the field they are reported on by period in both Parts 2 and 3. The burnt flint mounds and excavated features in Area D, however, were mainly dated to the later Neolithic by radiocarbon assay, by artefact finds or stratigraphically. These contexts are described separately in Part 3.

Area	*Surface collections*	*Excavated passes*	*Excavated features*	*Mean*
A (2–4)*`	-	0.47	0.62	0.55
B (1, 2, 3, 4, 6)	-	0.74	0.66	0.70
C (1–3)	2.10	0.89	1.24	1.41
D	0.38	-	0.25	0.32
E	0.34	-	-	0.34
F	1.40	-	-	1.40
G	0.06	-	-	0.06
H	0.57	-	-	0.57
J	-	-	0.97**	-

* Trowelled passes 2–4; 1, 2 3, 4, 6, and 1–3 respectively

** Obtained from excavation within bins

Table 2.1 Pottery:Flint ratios by area

II. Investigations in Area J

(Fig. 2.1)

Methodology

In 1988 an area of 200m x 140m of the eastern tract of the Neolithic landscape, designated Area J, was investigated by 'bin sampling' (Fig. 1.2 and 2.1). Sampling was carried out at 20m intervals by means of bins (below, p.10) and/or hand augering. The results allowed artefact scatters to be quantified, both in terms of their distribution in plan and within the recorded deposit column. It also allowed a map to be produced showing the pattern of estuarine clay-filled features within the landscape. This was crucial to understanding the development of the landscape, and the size and layout of the earlier Neolithic settlement within it.

It rapidly became apparent during the early stages of the project that haphazard sample survey, with more detailed sampling and excavation taking place only in selected areas, was providing a rather poor record of the layout of the earlier Neolithic settlement. Thus during the 1988 field season, following discussions with Geoffrey Wainwright and Mike Parker-Pearson (then of English Heritage), it was decided to initiate a more comprehensive scheme of grid sampling, by means of excavated trial pits. Inevitably, our technical supervisor Sandy Grey suggested the most water-tight method of sample excavation.

Where the overlying estuarine clay was less than 0.30m deep, a sawn-off oil barrel, 0.55m in diameter was thrust into the mudflat to such a depth that it formed a coffer dam that would prevent the inflow of water. Any surface water remaining within could then be soaked up using a sponge. When the sediment within the 'bin' was sufficiently dry, excavation proceeded in the conventional manner. Following the removal of estuarine clay (if present) the underlying old land surface was cleaned with a trowel and then excavated. During excavation, a 3–5kg soil sample was taken for carbonised plant remains. All struck flints, pottery, burnt flints and other artefactual materials were collected and recorded, the burnt flints being discarded after counting. In addition, a field estimate was made of the relative abundance of carbonised plant remains, according to the following scale: absent, rare, occasional, common, abundant. Excavation then continued through the grey, chemically-reduced palaeosol of the old land surface and into the underlying firm clay loam 'head', derived mainly from London Clay.

Where the depth of overlying estuarine clay exceeded 0.30m excavation by means of bins became increasingly difficult and it was necessary to auger down to the resistant subsoil. While this method supplied no information on artefacts, it enabled a number of sinuous, clay-filled hollows (possibly relict creeks) to be mapped.

Initially 'bins' numbered J1–J88 were positioned at intervals on a 20m grid extending 200m E–W by 140m N–S (Fig. 2.1). It would have been prohibitively time consuming to excavate 'bins' every 10m (a total of

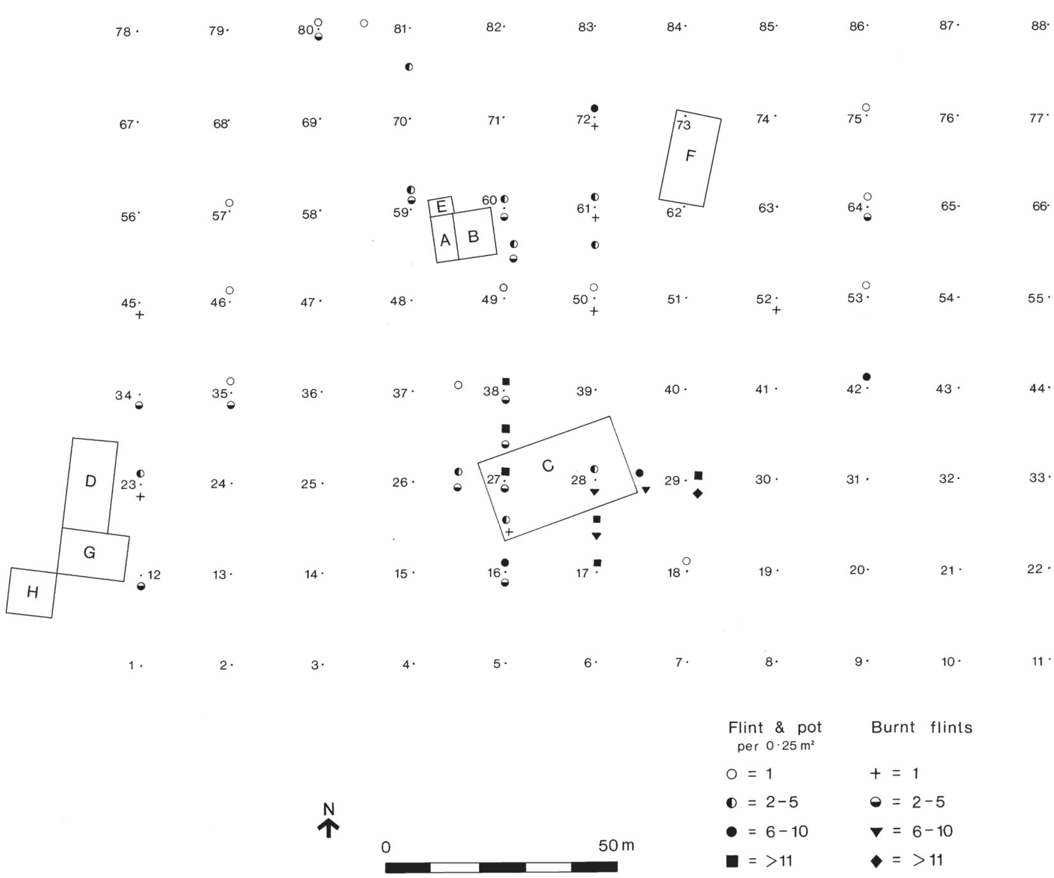


Figure 2.1 Area J grid sampling area

315 would have been required within the defined area, compared with 88 on the 20m grid); in order to provide a finer sampling grid where required, however, a further 21 sample points were used. These were designated using the form (for example) J27+10N (*i.e*. 10m N of J27).

Area J results

The 109 sample points comprised 63 bin locations and 46 auger holes (Table 2.2). The bins yielded 113 sherds of pottery (all flint-gritted wares), 116 struck flints and 87 burnt flints. From this it seems that pottery was present in roughly the same proportion as flint, with burnt flints less common. The high ratio of pot to struck flints (0.97) and pot to burnt flints (1.3) contrasts with the very low ratio from the excavated later Neolithic features and old land surface in Area D (Table 2.1). Some 90% of the lithics are likely to be of earlier Neolithic date, and the pottery assemblage also largely dated to this period.

The results of the bin sampling provided data on the distribution of artefacts within the main sediment units (estuarine clay and old land surface/palaeosol). In general, artefacts and charcoal were absent from the overlying estuarine clay, were most frequent in the upper palaeosol, and declined with depth from that point.

Artefact distribution

In general, wherever pottery was concentrated flints were also common. Burnt flints, while not as abundant as in Area D or in the other burnt flint concentrations, also appeared to increase wherever artefacts were more common.

In areas where the old land surface lay within 0.3m of the surface of the foreshore bin-sample excavation successfully pinpointed the primary activity areas — or, perhaps more realistically, the areas of rubbish disposal. This is clear from Fig. 2.1, which shows a strong clustering of flints and pottery around Areas C and A/B/E. Minor concentrations, represented by finds from only a few sample points, were also detected in the vicinity of J70/80/81 and J42/53/64, as well as in the west near Area D (*i.e.* J12/23/34/35). The bins did not detect significant scatters around Area F, although haphazard and systematic survey conducted in previous years had demonstrated the presence of much pot and flint in this area (Fig. 1.2). This is probably because the relatively small, tight artefact concentrations hereabouts were not always easily detected using the rather coarse grid employed for the bin survey. It is impossible to say anything about those grid points where the estuarine clays formed a thick overburden because the auger probe was unlikely to have been capable of retrieving pottery or lithics. Nevertheless, the area sampled using bins was sufficiently extensive to suggest that Areas A/B/E and C were located within the main artefact scatters that were recordable. In future, however, erosion of the estuarine clay cover may expose previously un-recorded artefact concentrations. Indeed, fieldwalking carried out on the mudflats in 2005–6 established not only that prehistoric pottery and flint were still present in the parts of Area J that were re-surveyed but that this material was also present in the western area of the site where the later wooden structures had been noted in the 1980s (Heppell 2006, 34). This would support the previous assertion. These artefact concentrations had, in the 1980s, been covered by the clays and have been exposed by the ongoing erosion of the mudflats.

Estuarine clay and related features

Auger probes, in combination with data from bin samples, demonstrated the existence of at least one sinuous, estuarine clay-filled hollow. This meandered through the site to the east of Area A/B/E and to the north of Area C, after which it merged with the eastward-thickening wedge of estuarine clay to the east.

The clay fill of this depression was clearly estuarine. However, where such fills were excavated adjacent to major artefact concentrations, artefact-bearing or occupation deposits did not interdigitate with the estuarine sediments. Moreover, the slopes of the feature in Area B were shown to truncate the chemically reduced 'A' horizon, which had developed in the upper palaeosol (Area B, below). Because this horizon was apparently developed as a result of waterlogging of the soil after invasion by the sea (Macphail, p.20–22 below), truncation of the land surface here and formation of the slope would appear to post-date the transgression. Consequently, the formation of this creek system probably post-dates the occupation of the site. As a result, isolated areas of artefact scatters such as a small island at J38 between Areas C and B may simply result from post-Neolithic creek erosion that has dismembered a former continuous artefact scatter.

Artefact and ecofact distributions and site geomorphology

Charcoal fragments, unlike artefacts, were widely dispersed. This is expressed by the overall spatial distribution as well as by a scatter diagram. The latter shows virtually no visual correlation between total artefact (*i.e.* flint and pot) and charcoal concentration in grammes per kilogramme of excavated soil. Specific classes of charred material, such as cereals, burnt bone, weed seeds and rhizomatous materials, have more restricted distributions (Murphy, Part 5, pp.73–85). In general, however, artefacts relating to either waste disposal or occupation appear most strongly concentrated; charred materials relating to food processing or production are slightly more dispersed (also being lighter), whereas indeterminate charcoal shows the most widespread distribution of all. This hierarchy of dispersal may either reflect the location of specific functional activities or result from site formation processes that relate to the transportability of individual elements. Alternatively, it may also result from the longer time-period over which indeterminate charcoal had accumulated: some finds of charcoal might relate to early Neolithic food processing, others to later Neolithic cultivation, and yet others to later Neolithic woodland activities (see Parts 5 and 6).

Although it is tempting to view the creek system as contemporaneous with the earlier Neolithic occupation, with the habitation having developed adjacent to a small winding stream, this idea is not supported by the field evidence. A small stream may indeed have been present at this time, but the feature as mapped and partially excavated seems to have been subject to heavy scouring during the Flandrian transgression. Because considerable time must have elapsed to allow for the formation of the now-truncated chemically reduced palaeosol 'A' horizon, it is unlikely that scouring occurred immediately when the sea invaded. At the western end of the site the creek systems were clearly in existence by the Iron Age (the hurdle bridge *96* crosses one such creek: below, p.121) and it seems reasonable to propose that the creek system

Grid location	*Bin or auger*	*Depth of clay*	*No. of sherds*	*No.of flints*	*BF*	*Est. char.*	*Wt. char.*
J1	B	10	0	0	0	Ab	-
2	B	4	0	0	0	Abs	0.011
3	B	24	1	0	0	Occ	0.081
4	A	100	-	-	-	-	-
5	A	93	-	-	-	-	-
6	A	120	-	-	-	-	-
7	A	115	-	-	-	-	-
8	A	105	-	-	-	-	-
9	A	110	-	-	-	-	-
10	A	85	-	-	-	-	-
11	A	103	-	-	-	-	-
12	B	6	0	0	5	Occ	0.105
13	B	8	0	0	0	Com	0.123
14	A	55	-	-	-	-	-
15	B	4	0	0	0	Com	0.017
16	B	8	1	3	2	Com	0.023
17	B	18	15	17	0	Com	0.033
18	B	30	0	1	0	Abun	0.359
19	A	70	-	-	-	-	-
20	A	c. 90	-	-	-	-	-
21	A	120+	-	-	-	-	-
22	A	80	-	-	-	-	-
23	B	0	0	2*	1	R	0.026
24	?	20-30	-	-	-	-	-
25	B	0	0	0	0	Abs	0.008
26	B	0	0	0	0	R	N.S.
27St	B	0	5	6	5	Com	0.032
28	B	11	3	1	6	R	0.016
29	A	45	-	-	-	-	-
29+2mE	B	20	25	11	16	Abun	0.284
30	A	>120	-	-	-	-	-
31	A	120	-	-	-	-	-
32	A	110	-	-	-	-	-
33	A	100	-	-	-	-	-
34	B	10	0	0	3	Occ	0.008
35	B	12	0	1	2	Occ	0.004
36	B	9	0	0	0	R	0.005
37	B	20	0	0	0	Occ	0.032
38 FC	B	12	8	7	4	Com	0.071
1 FC	-	-	-	-	-	-	-
39	A	80	-	-	-	-	-
40	A	38	-	-	-	-	-
41	-	-	-	-	-	-	-
42	B	25	5	4	0	Com	0.084
43	A	120+	-	-	-	-	-
44	A	120	-	-	-	-	-
45	B	9	0	0	1	Abs	0.039
46	B	12	0	1	0	Abs	0.007
47	B	12	0	0	0	R	0.008
48	B	10	0	0	0	R	0.013
49	B	10	0	1	0	R	0.318
50	B	20	1	0	1	Abun	0.042
51	B	20	0	0	0	Com	0.144
52	B	10	0	0	1	Abun	0.030
53	B	7	0	1	0	Occ	0.005
54	A	75	-	-	-	-	-
55	A	50	-	-	-	-	-

Grid location	*Bin or auger*	*Depth of clay*	*No. of sherds*	*No.of flints*	*BF*	*Est. char.*	*Wt. char.*
56	A	70	-	-	-	-	-
57	B	7	0	1	0	Occ	0.117
58	B	0	0	0	0	Abs	0.060
59	A	70	-	-	-	-	-
60	B	13	2	0	2	R	0.060
61	B	13	2	0	1	Abun	-**
62	B	5	0	0	0	R	0.02
63	B	0	0	0	0	R	0.006
64	B	23	1	0	3	Occ	0.042
65	A	60	-	-	-	-	-
66	A	58	-	-	-	-	-
67	A	72	-	-	-	-	-
68	A	85	-	-	-	-	-
69	B	30	0	0	0	R	0.001
70	A	70	-	-	-	-	-
71	B	3	0	0	0	Occ	0.002
72	B	1	4	4	1	R	0.021
73	B	0***	0	0	0	Abs	0.020
74	B	7	0	0	0	Abs	N.S.
75	B	7	0	1	0	R	0.009
76	A	55	-	-	-	-	-
77	A	30	-	-	-	-	-
78	A	40	-	-	-	-	-
79	A	70	-	-	-	-	-
80	B	7	1	5	2	Occ	0.078
81	B	12	0	0	0	-	-***
82	A	50	-	-	-	-	-
83	A	46	-	-	-	-	-
84	A	45	-	-	-	-	-
85	A	40	-	-	-	-	-
86	A	60	-	-	-	-	-
87	A	70	-	-	-	-	-
88	A	80	-	-	-	-	-
Other ‘bin’ samples or auger probes taken off the main grid							
68+10mN	B	16	0	1	0	Occ	-
70+3.5mN	B	13	2	0	0	Com	-
47+10mE	B	9	0	0	0	Occ	-
16+10mN	B	3	1	2	1	R	-
27+10mN	B	8	15	10	5	Com	-
38+10mN	B	23	0	0	0	Com	-
49+10mN+2mE	B	14	1	3	5	Occ	-
17+10mN	B	12	8	5	8	Comm	-
72+10mN	B	14	0	0	0	Abs	-
50+10mN	B	32	1	4	0	Occ	-
26+10mE	B	15	1	4	0	R	-
5+10mN	A	40	-	-	-	-	-
37+10mN	A	85	-	-	-	-	-
37+10mE	B	16	0	2	0	Occ	-
28+10mE	B	12	4	3	5	Abun	-
70+10mN	B	0	1	3	0	Occ	-
80+10mE	B	0	1	0	0	Abs	-
62+10mN	B	0***	0	0	0	Abs	-

* – Chisel arrowhead
** – Soil sample floated away and was lost
*** – Truncated old land surface

Table 2.2 Area J results

within Area J was also a later prehistoric development.

III. Context *124*

(Fig. 1.2)

This area, irregular in shape and covering roughly 1ha of foreshore between Areas D, G, H, and context *118*, was designated during the initial reconnaissance phases of investigation (Wilkinson and Murphy 1995, 80). It was largely an area of exposed old land surface, comprising a leached fine sandy loam horizon with occasional charcoal flecks. The surface exhibited a scatter of struck flints, burnt flints and flint-gritted potsherds, but there was little to suggest *in situ* occupation.

Area D was located on the edge of the area of contexts *124* and *117*. It was investigated and is considered in Part 3; the lithics are reported on in Part 4.

IV. Areas F, G and H

(Figs 2.1, 2.2, 3.3 and 3.6)

Area F

Area F was located to the east of Areas A/B/E (within the larger area designated Area J), in an increasingly muddy area of foreshore (Figs 1.2 and 2.1). General survey had noted that surface flints and flint-gritted pottery were especially frequent across the area. It should, however, be noted that because of the coarse survey grid used (20m), the bin sampling did not identify this concentration.

A 10m x 20m area of the artefact concentration was subject to detailed sampling, with artefacts collected within 1m x 1m sample squares (Fig. 2.2). The most common find type was pottery; worked flint was less frequent and burnt flint least of all. A significant proportion (*c.* 60–90%) of the lithics recovered were Early Neolithic in date. While it is likely that there were extant archaeological features in this area, it was not earmarked for further investigation owing to the high promise of Areas A, B and C.

Areas G and H

(Figs 3.3 and 3.4)

Areas G and H, located to the south of Area D and within the extents of context *124*, also lay within areas where a surface concentration of artefacts had been noted (Fig. 1.2). As in Area F, these were plotted and sampled according to a 1m grid.

Area G, immediately south of Area D and measuring 10m x 15m, included part of the burnt flint concentration *117*. In addition to the abundant burnt flint, the artefact concentration in this sample area was dominated by struck flints; pottery was scarce. As in Area F, no further action was taken.

Area H, to the south-west of G (Fig. 1.2) and measuring 10m x 10m, exhibited a fairly even scatter of struck flints and a similar, but rather sparser, scatter of flint-

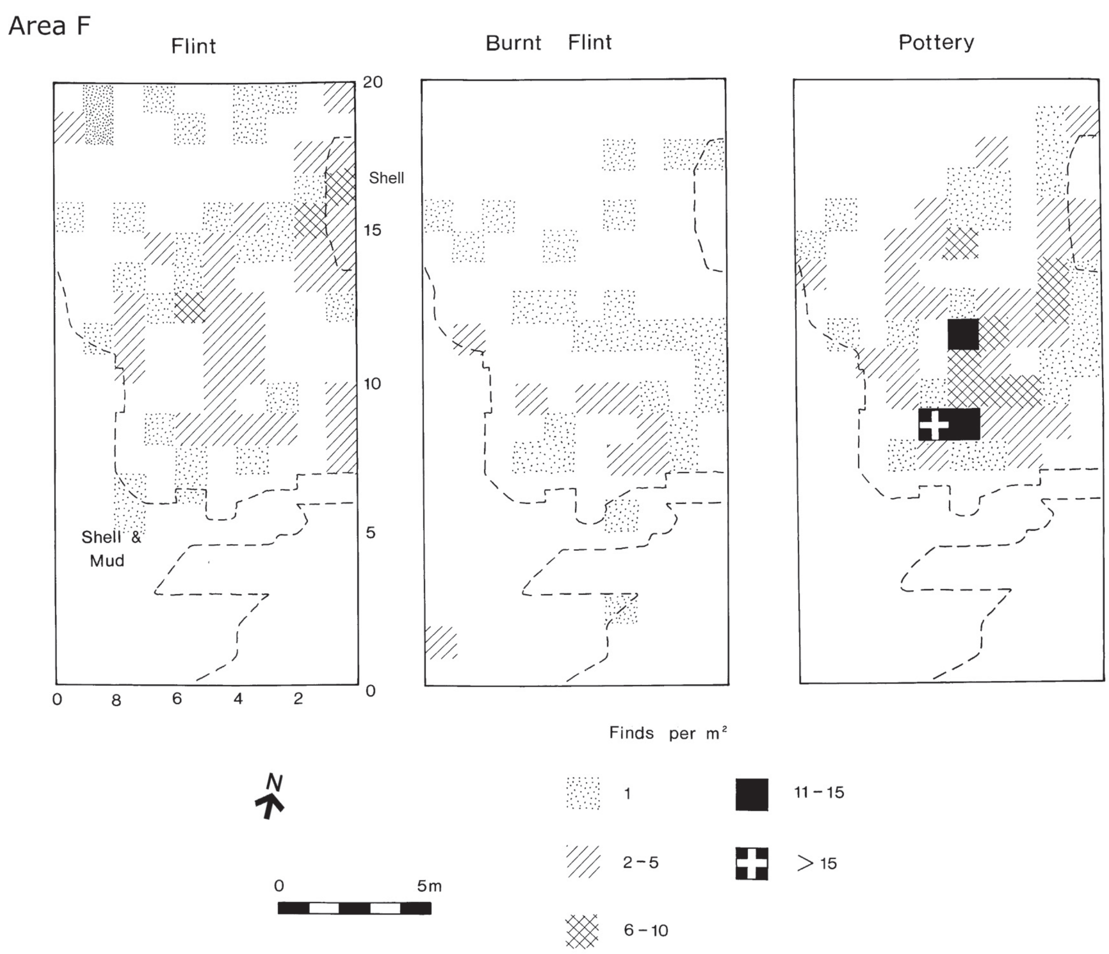


Figure 2.2 Surface artefact collections from Area F

gritted pottery. Again, no further action was taken after initial collection.

V. Areas A, B and E: detailed sampling and excavation

(Figs 2.1–2.12)

Introduction

(Figs 2.1–2.3)

Within the area of significant artefact concentrations in the eastern area of the flats two locations were chosen for excavation: the contiguous Areas A/B/E (excavated in 1986 and 1987) and Area C (sampled and excavated in 1987 and 1988). Descriptions of the two excavations will place greater emphasis than is normal upon techniques of excavation simply because of the significance of the physical conditions, which required adaptation of archaeological techniques used on dry land, and because the large quantity of artefacts recovered required a major rationalisation of finds recording as work progressed. The Area J bin sample survey, although conducted during the excavation programme rather than before it, confirmed that the areas chosen for excavation were indeed located within those of greatest artefact concentrations.

During the survey of the Stumble in 1986 a dense scatter of pottery and struck flints was found where a shallow eroded gully had cut into a flat bench of old land surface (Fig. 1.2). Trial cleaning exposed two post-holes in a small area of palaeosol adjacent to the gully, hinting at the presence of a Neolithic building. An adjacent gully provided a natural drain for the daily removal of tidal waters prior to excavation as well as a convenient dumping ground for spoil, making this location easier to excavate than the comparable site at Rolls Farm where similar artefact concentrations and exposures of old land surface had been noted (Blackwater site 18, Wilkinson and Murphy 1995, 71–6). The exposed old land surface at Rolls Farm was situated far lower in the tidal range than these areas at the Stumble, thus providing a narrower daily window for working. The elevation of the Stumble at *c.* –0.40m OD, some 3m below the modern high water mark, still posed numerous technical problems despite the longer tidal window. In addition to assessing its potential contribution to our understanding of British Neolithic occupation sites, one aim of the first excavation season had been to develop appropriate excavation and sampling techniques, as discussed in Part 1 (above, p.5).

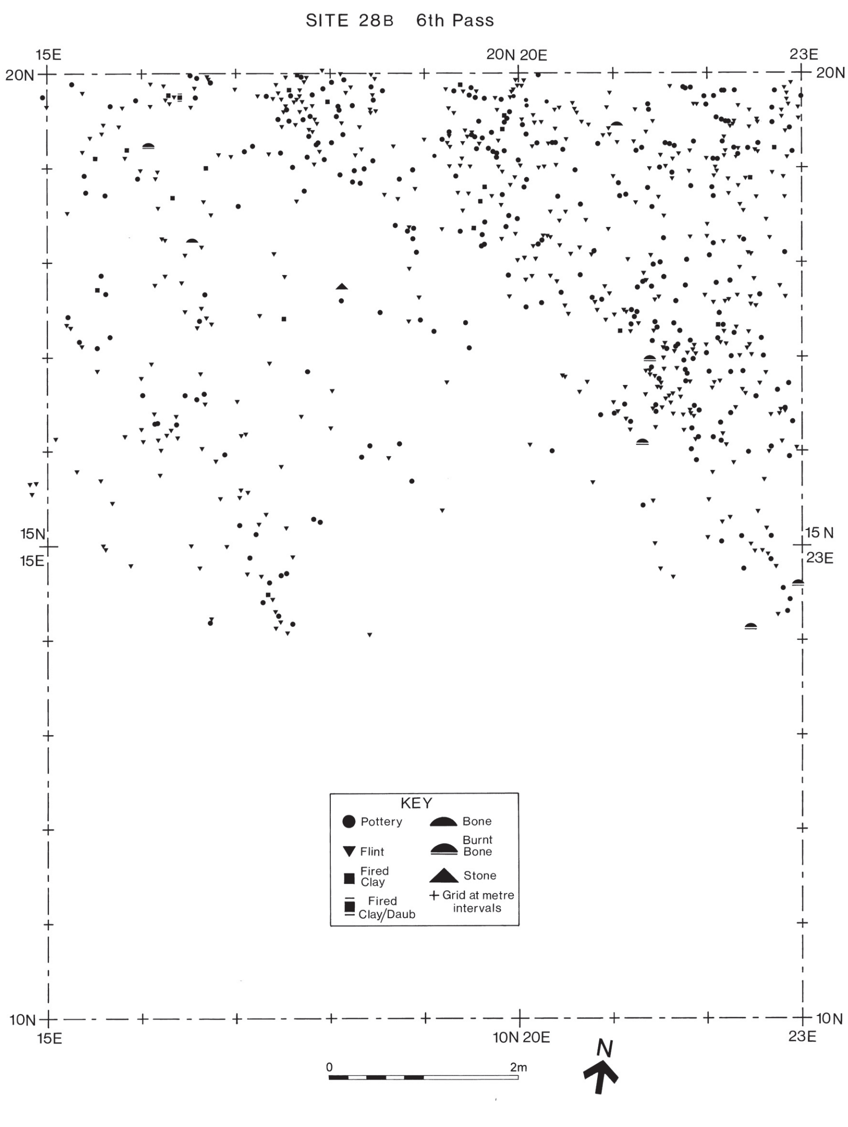


Figure 2.3 Example of point plot of artefacts from Area B

To make it possible to expose configurations of post-holes, some of them noted during the initial survey, and potentially other features as well, an area measuring 10m x 5m and designated Area A was set out for excavation. This was extended in 1987 by the opening of Area B measuring 10m x 8m immediately to the east, and by Area E (4m x 4m) to the north; thus the total area excavated measured 146 sq. m.

The excavation area was virtually flat and was covered by a 'veneer' of algae, sandy mud and marine shells. In Area A surface sludge and algae were removed, and all artefacts within this collected as 'surface finds'. Point-plotting of pot, flint, fired clay stone and larger fragments of burnt bone started with the second trowelling pass (*i.e.* excavation of a second spit). In Areas B and E, surface finds were point-plotted from the first pass and from all subsequent passes other than those carried out for cleaning purposes. Although allowing extra sensitivity in the display of spatial data, the point-plotting proved time consuming, especially where artefact densities were high — this proved a significant drawback in an environment where working time was strictly limited. Consequently, in other sampling and excavation areas, 1m squares were adopted as the basic unit for recording artefact locations and densities. Figures 2.3 (point-plotting of finds from Area D) and 2.4 (overall densities of artefacts recorded by 1m square in Areas A and B) offer a comparison between the types of interpreted data generated by these two processes.

Because the Neolithic site was located significantly above its contemporary sea level (Wilkinson and Murphy 1995; Macphail, p.20–2), no waterlogged wood survived within Neolithic contexts as the site had been desiccated prior to the advance of the sea in later prehistoric times. The only two recorded wood pieces from Area A were

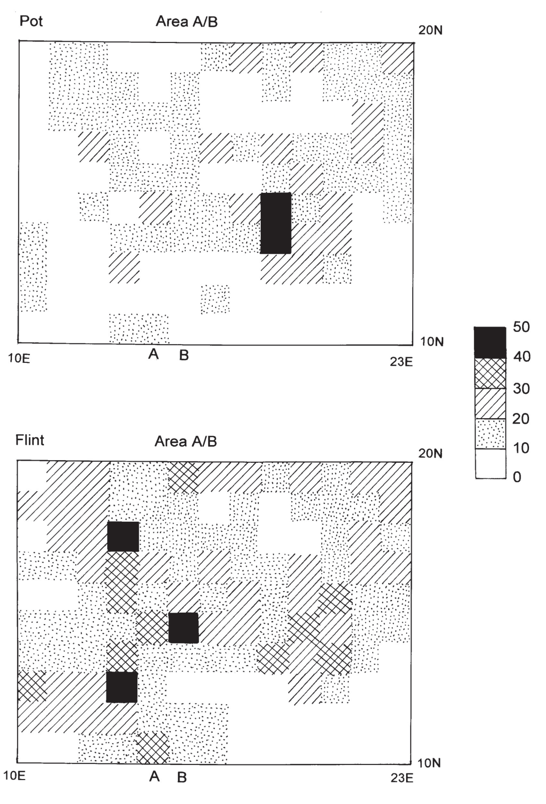


Figure 2.4 Areas A and B: artefact densities per sq. m

both from the south-east part of the area, and came from the post-Neolithic estuarine clays which overlay the Neolithic ground surface (*131*).

Features and their fills were allocated context numbers which continued the series already allocated for fieldwork in the Blackwater Estuary. In Area A, the final feature plan was revealed after the fifth trowelling pass, for B after the sixth pass and for E after the second pass. Consequently, the overall feature plan shows features which were exposed after varying numbers of passes but which had all been cut into roughly the same level of the palaeosol profile.

Soil samples, which were wet-sieved for carbonised plant remains (Part 5), were taken as follows: one sample weighing approximately 4kg was taken from each 1m square during the excavation of the second and third passes (in Area A) or from the third pass (Area B). In addition, one or more samples were taken from most excavated features.

Trowelling passes

(Figs 2.4–2.12)

Area A

First Pass

20–50mm of soft sandy mud, including abundant shells, was removed from the entire area. In the SE, where superficial deposits were thicker, 100mm was removed. Owing to clear signs of recent disturbance at this level, findspots were not triangulated but were separated out according to different 1m-wide trowelling lanes. Surface finds and those from the first pass were allocated the general context number *123*. The first pass exposed a poorly differentiated, moderately firm mineral soil, which was removed during the second pass.

Second Pass

Approximately 20mm of mixed mineral soil was removed. One *c.* 4kg soil sample was taken from each 1m square . Excavated soil comprised pale greyish-brown and pale grey moderately firm sandy clay loam with dark greyish-brown clay loam patches, the latter being more common in the SW (*e.g. 130* centred on 10E 11N). Charcoal flecks were common in *130* (not illustrated) which may represent a residual of old topsoil.

This pass appeared to collect material from the old land surface, a spread of occupation debris and the upper part of extensive clay-filled features which had started to appear at the base of the first pass (*131*, *132* and *175*, Fig. 2.5). Shells of burrowing marine molluscs remained common, especially in the softer sediments. Finds were abundant but were less common in the SE area (*131* and *134*) where later clay sealed the old land surface.

Third pass

The moderately firm mineral soil removed was classed as follows:

a: Very dark greyish-brown sandy clay loam along much of the eastern edge of the site.

b: Grey sandy loam; probably a chemically reduced 'A' horizon resulting from waterlogging during the early phases of the Flandrian transgression (Macphail, below p.20–2). It approximates to the upper horizon of the old land surface.

c: Very firm reddish-brown sandy clay loam subsoil, probably a soil 'B' horizon developed upon the head.

d: Soft, creamy grey clay or sandy clay, mainly in SE part of the area (*131*; Fig. 2.5).

Finds were common in **a** and **b**, and less common in **c**. In contrast to the results from the second pass, finds became increasingly common in **d**, which was thinning at the edges with the result that artefacts associated with the underlying old land surface were starting to be revealed.

Fourth pass

Approximately 20mm was cleared across the site except in areas where reddish-brown subsoil (**c**, above) was already exposed, in which case less soil was removed. By the end of the pass subsoil was exposed over most of the excavation area. Deposits were as described for the third pass.

Context *131*, a thin soft grey sandy loam, was removed down to a pale brown fine sandy silt loam. The latter, which formed part of the subsoil along the western edge of the site, may be the remains of an aeolian Pleistocene cover loam. One or two lenses of fine/medium sand present at the base of *131* may have resulted from re-sorting of the adjacent sediments by wave action during the initial phases of the marine transgression. Where charcoal appeared in the exposed surface, it appeared to be emerging from the fills of features that were gradually being revealed.

Fifth pass
The definition of features which were beginning to appear during the fourth pass was enhanced during the fifth by the removal of a shallow skim. The-defined features were then planned (Fig. 2.6).

Area B

First pass
Up to 100mm of soft mud and shells was removed over *c.* 50% of the extent of Area B. Finds were very rare, but became abundant on the old land surface which started to be exposed in 'window'-like areas through the recent muds as work progressed. These areas of old land surface were not trowelled, but finds from them were triangulated and allocated to the first pass.

Second pass
A depth of 20–40mm was removed. The south quadrant was occupied by moderately soft, grey estuarine clay (*183*; Fig. 2.7) defined by a sharp edge to the north. Augering along the south and east baulks showed it to be approximately 0.6m deep. A second clay-filled feature (*202*) showed as a sinuous soil mark oriented N–S leading away from *183*. Grey estuarine clay also covered patches of charcoal-rich clay loam (*184*) and patches of dark brown slightly humic clay loam occurred around the fringes of the clay and apparently merged with it.

The old land surface, a grey sandy loam (above, Area A, third pass **b**), became a dark greyish-brown sandy clay towards the centre of the excavated area. Finds were concentrated in the central and western regions, were absent from clay layer *183*, and were sparse along the eastern edge of the trench. In the NE quadrant, the old land surface was overlain by an increasing thickness of grey estuarine clay which had probably accumulated under saltmarsh.

Third pass
The extensive clay-filled feature *183* was left in place and soil removal continued from its northern edge across the site. A grey sandy loam, removed from most of the area, continued down below the base of the pass except where the underlying reddish-brown subsoil was evident (Fig. 2.9). The grey clay-filled feature *202* remained, but narrowed and was flanked by very dark brown clay loam. Finds were very abundant around its outer edge. Clay overlying the charcoal-rich context *184* was removed, except for minor patches near the north baulk. Patches of wood charcoal, common in the north, overlay the grey sandy loam

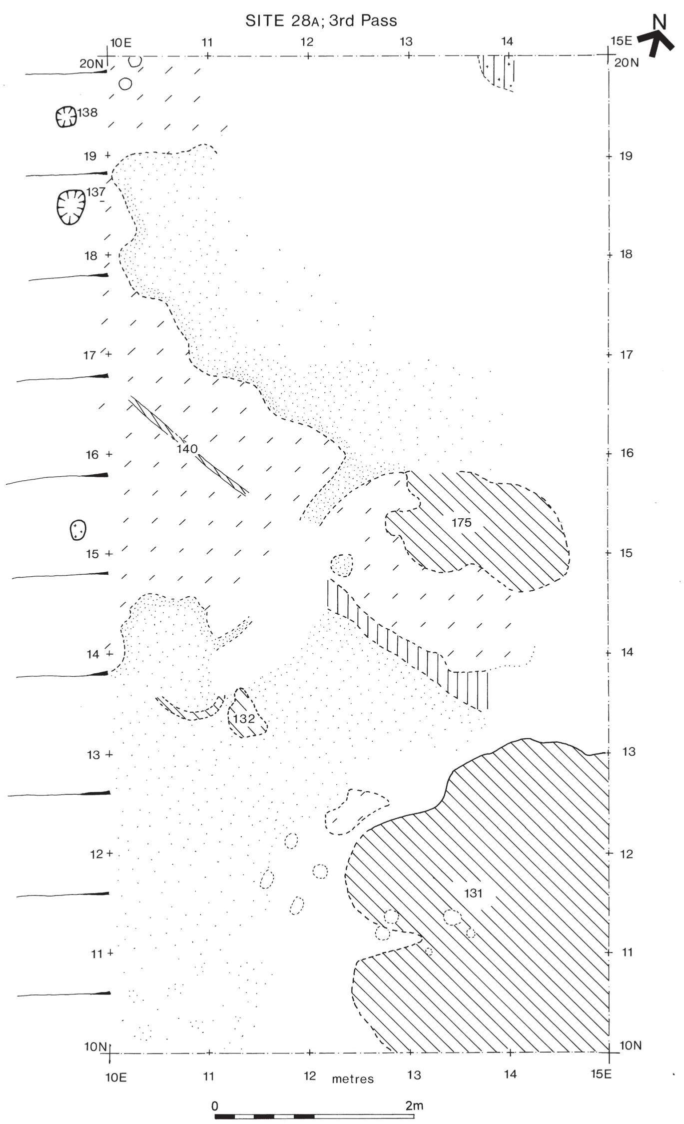


Figure 2.5 Context plan of Area A: third pass

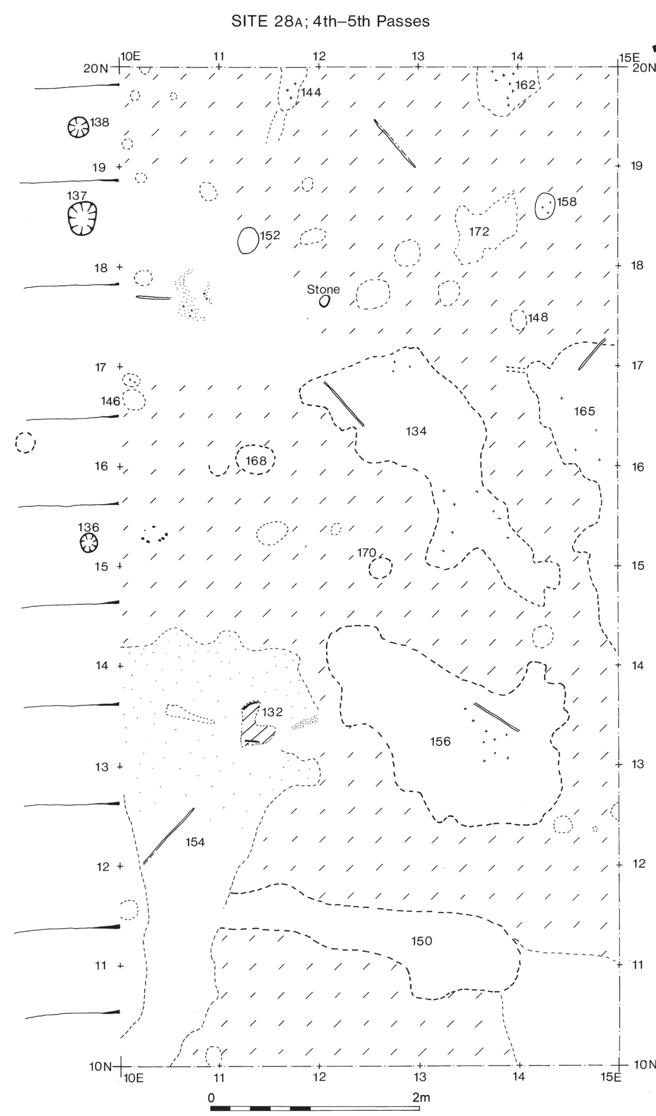


Figure 2.6 Context plan of Area A: fifth pass

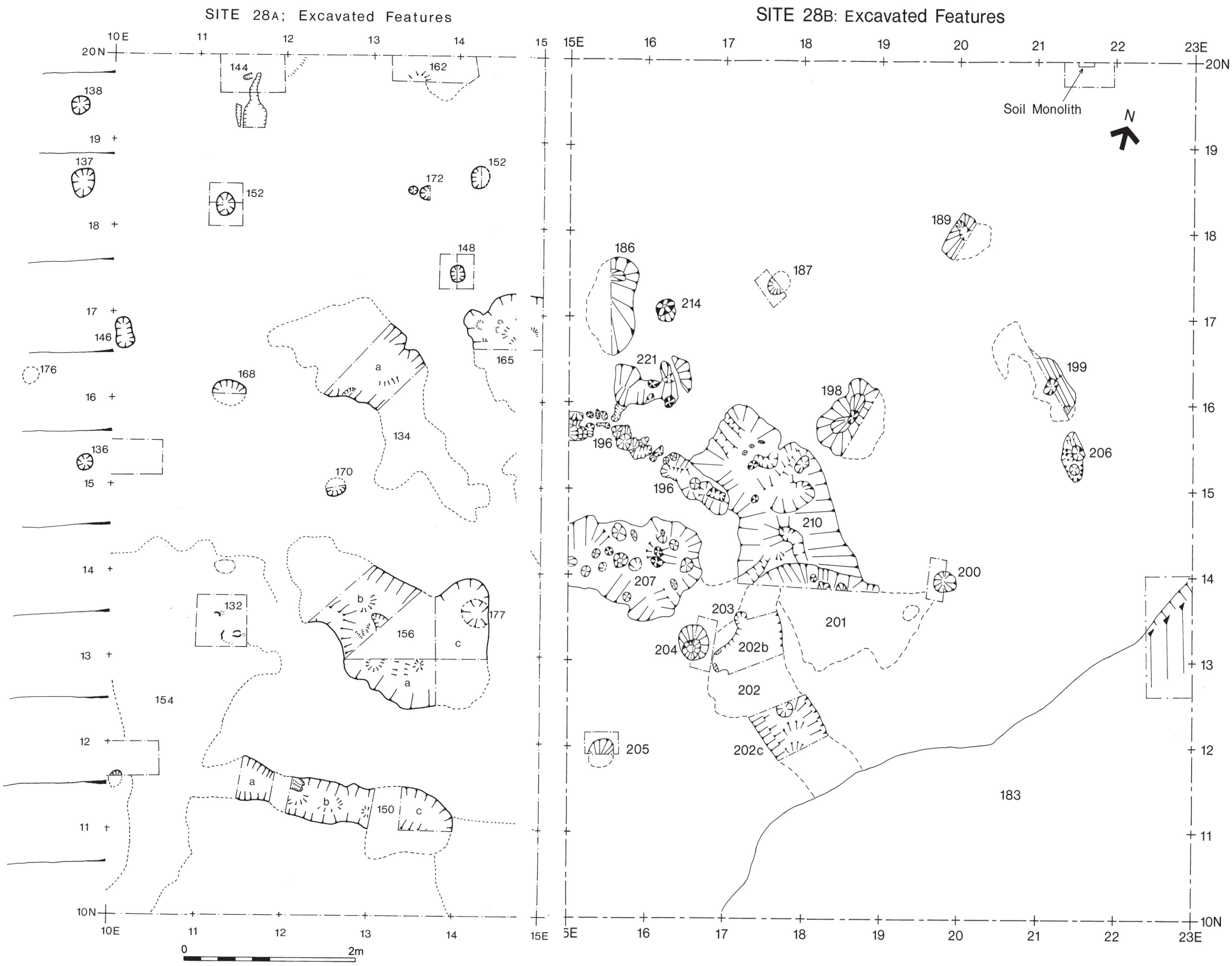


Figure 2.7 Areas A and B: overall feature plan

of the upper palaeosol. To the east, finds were scarce except where grey estuarine clay *222* overlay a charcoal deposit (*223*) and the old land surface (*224*, section Fig. 2.9).

The recorded ground plan of the third pass is incomplete because weather conditions made planning impossible during the limited duration of the low tides when this phase of work was under way.

Fourth pass
Charcoal scatters (*223*) beneath the grey estuarine clay in the east and north of the trench were partially removed to reveal the old land surface beneath (*224* and *225*). Finds became more common below the charcoal layer, with flints being apparently more frequent from the charcoal and in its vicinity (*223*), while pottery predominated below in *224*.

Firm reddish-yellow or brown clay loam subsoil appeared patchily except in the NW and NE. Very dark greyish-brown clay loam *201* appeared NE of *202* (Fig. 2.7) but elsewhere to the north the subsoil was overlain by undifferentiated greyish-brown clay loam. Small patches of charcoal-rich, greyish-brown clay loam resembling features (*e.g.* 200 and *203–205*) became evident in the south (below, p.23–4).

Fifth pass
This cleaning pass revealed soil marks and features originally exposed during the fourth pass. Consequently, there is no finds record for this pass as they could be assigned to features. The southern part of the area comprised reddish-brown subsoil with occasional possible features. Pale grey sandy loam (*224*) remained in the NE part of the area and a poorly differentiated brown/greyish-brown clay loam extended over the remainder of the northern part. Charcoal patches remained in the north (near grid 20m E), and small patches of pale grey sandy loam were noted along the north baulk.

Sixth pass
Trowelling commenced at 14m N and continued northward to remove the pale grey sandy loam (*224*) and greyish-brown clay loam down to the reddish-brown subsoil. It exposed firm reddish-brown clay loam over the entire excavated area, except where greyish-brown clay loam patches indicated potential features. A NNE–SSW line of charcoal patches and possible features extended from *205* to *188*, and a very dark brown/greyish-brown feature fill (*201*; Fig. 2.7) was recorded too. Features included *186*, *187*, *196*, *198*, *199* and *200*, but other soil marks were less convincing. Finds were recorded from the entire area but were more abundant from the NE quadrant, where a spit up to 40mm thick was removed from *225* to expose the underlying subsoil (Fig. 2.9).

By the end of the pass the whole of Area B had been excavated down to a level between 10mm and 50mm below that of Area A.

Area E
Following triangulation of surface finds, Area E was trowelled. Grey estuarine clay, which overlay the old land surface, was thickest in the east and thinned rapidly to the west where the palaeosol was evident

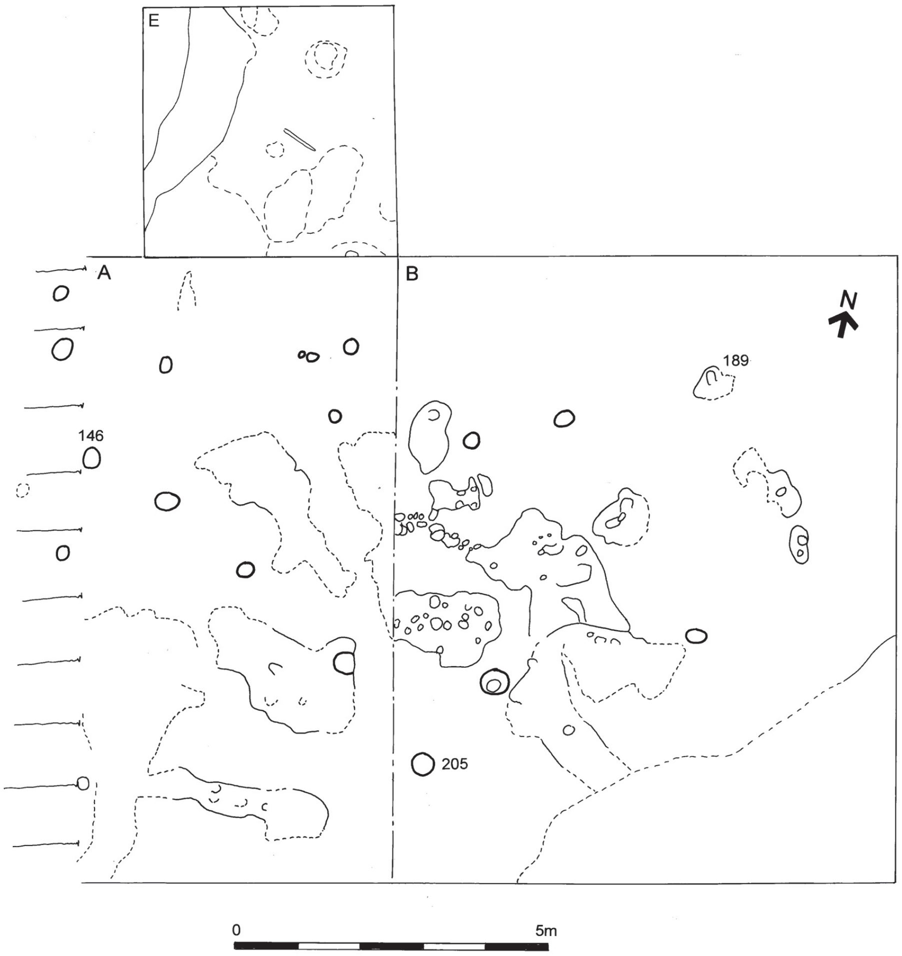


Figure 2.8 Areas A/B and E: plan of Phase I features

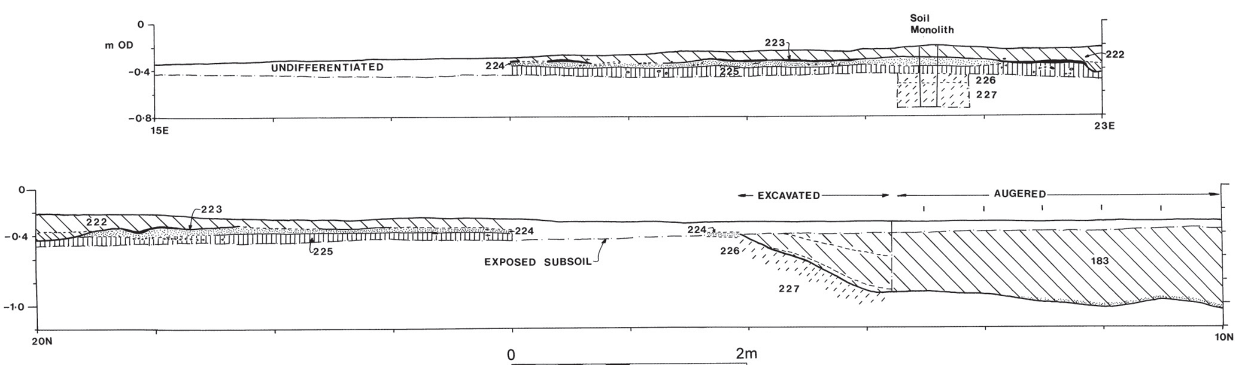


Figure 2.9 Main sections through Area B

in the adjacent creek. In 1987 two passes through the overlying grey estuarine clay exposed the palaeosol, thereby revealing archaeological features. A crescentic, clay-filled feature along the western edge of Area E appeared to represent an infilled creek. No features were excavated in 1987, and when work continued in 1988 the trowelled area was again dotted with artefacts. These were triangulated as the third pass and exposed features were excavated (below, p.25). Although no other stratigraphy was distinguished during trowelling, a two-phase sequence was apparent during excavation of features (below, Table 2.4).

VI. Area B: stratigraphic and sedimentary sequence

(Fig. 2.9)

Although trowelling passes were effective in providing data on artefact distribution, they provided little help with establishing the sedimentary stratigraphy. The sequence was more clearly defined along the north and east baulks of the trench following excavation, which enabled certain key layers exposed in plan to be related to a stratigraphic and chronological sequence.

Sedimentary sequence (North Baulk Area B)
Described from monolithic column indicated on Fig. 2.9. 0cm = present surface of mudflat at *c.* –0.24m OD.

0–6cm	*222*: Grey 10YR 5/1, soft smooth silty clay, structureless. Occasional brown flecks of organic matter. Merging boundary.
6–10cm	Also *222*: Dark grey 10YR 4/1, soft silty clay, structureless. Occasional small lenses of pale grey sandy loam and charcoal. Sharp, wavy boundary.
10–11cm	*223*: Black 10YR 2.5/1 silt loam, leaves ?organic stain on fingers. Common charcoal, locally abundant. Sharp wavy boundary.
11–13cm	*224*: Grey 10YR 6/1, fine sandy loam. Forms discontinuous irregular layer or occasional lenses. Very indistinct lower boundary.
13–22cm	*225*: Grey 10YR 5/1, plastic silty clay loam, structureless. Rare charcoal flecks, occasional vertical fine root-holes. Merging boundary.
22–31cm	*226*: Brown 10YR 5/3, firm clay loam, structureless or with very weak structural units. Common fine vertical root-holes, some with grey linings and occasional fine vertical roots. Merges down very gradually.
31–50cm	*227*: Brown/dark brown 10YR 4/3, firm clay loam, weak blocky structure, occasional vertical root-holes with grey linings and occasional vertical roots. Base of monolith 50cm.

Context *222* is estuarine silt. The charred material within it was probably derived from the underlying charcoal-rich layer *223*, which must therefore have been exposed to erosion at this time. *222* filled feature *183*, which formed part of a sinuous silt-filled depression resembling, in plan, a stream or creek. Feature *183* was floored with a coarse sandy or gravel lag deposit; this suggests a moderately high-energy current flow, either of a freshwater stream or tidal currents. The estuarine silt fill of the sinuous depression was devoid of Neolithic occupation deposits or artefacts and is therefore unlikely to have been open at the time of occupation. Moreover the steep side-slope (Fig. 2.9) cut the clay-depleted horizon of the palaeosol *224,* which was shown by Macphail (below, p.20–2) to have been a result of the marine transgression. The erosion of this slope must therefore post-date the initial sea influx — by analogy with other places around the Essex coast where this event has been dated, this probably occurred around or shortly after 3500–3600 BP. The initial phase of the transgression, according to Macphail, may have been a sudden event similar to a storm surge.

223: by analogy with scatters of wood charcoal recorded elsewhere around the Essex coast, this layer probably dates to around 4000 BP (Wilkinson and Murphy 1995, 86–90). Its presence as a discrete rather than a dispersed scatter suggests that there had been no ploughing or similar disturbance in the immediate vicinity since its deposition.

224: the upper palaeosol in the NE part of Area B contained more flint than pottery. This may indicate increased trampling of the old ground surface, resulting in the destruction of surface pottery; alternatively, the upper palaeosol might have been associated with a slightly later phase of occupation than that beneath. The later Neolithic artefact scatters were dominated by flint; either very little pottery was deposited, or it was so soft that it was readily abraded and seldom survived erosion. These characteristics, together with the stratigraphic position of *224* above *225*, suggest that the cultural material contained in the former deposit is later than that in the latter.

225: earlier Neolithic artefacts, especially pottery, were more common in the lower part of the upper palaeosol in the NE part of Area B. This may result from sedimentary accumulation in this area, but not further to the west where such a depth of sediment is lacking or has been eroded. Less likely, the pottery could have been concentrated in this stratum by worm action during the Neolithic, any pottery at a higher level having been destroyed by trampling.

224 and *225* represent the remains of the original palaeosol (the old land surface), the structure of which fell apart as a result of the transformation of the soil chemical environment by the transgression of the sea. This resulted in the fine silts and clays which were a component of the palaeosol translocating down into 226 and 227, the original subsoil (Macphail, below).

Soil micromorphology
by Richard Macphail
At the Stumble three areas were investigated on London Clay Head, as follows:

1. two areas of the Neolithic occupation area in Areas A and B, deposits in the latter sampled by a 0.5m-long monolith (subsampled for four thin sections);
2. an off-site area (Section 1) of the terrestrial land surface beneath an estuarine detrital mud (*c.* 1700–2000 BC, Wilkinson *pers. comm.*).

At the sampled locations in Area B and at Section 1 the palaeo-surfaces were still well sealed by estuarine silts, whereas Area A had become exposed to modern estuarine biological and soil ripening processes. On the present-day mudflat at Area B, the estuarine sediment was considered to date to *c.* 1600–1500 BC, with Neolithic artefacts at 15–22cm and slightly later charcoal scatters at 10–11cm (T. Wilkinson, *pers. comm.* 1987).

Fourteen undisturbed samples (thin sections A–M) were thus taken for thin section preparation (Murphy 1986). Acetone replacement was carried out to remove the saline salts that interfere with resin polymerisation. Unfortunately, the first series of sections were not prepared successfully and had to be surface re-impregnated. Extra leaching with acetone of the second batch of samples (Area B) permitted perfect slides to be made. Thin sections were described according to Bullock *et al*. (1985) and interpreted using the guidelines of Courty *et al.* (1989). Bulk samples, complementary to the thin section samples, were analysed for calcium carbonate, organic carbon and grain size (Avery and Bascomb 1974).

Results
Analytical data is presented in Table 2.3, while soil micromorphological description and preliminary interpretation is presented in Appendix 2. Unfortunately, all the soil and sediments have undergone a variety of transformations resulting from the admixture of sodium salts when the soil was inundated and saturated by brackish estuarine inundation. These transformations include hydromorphic changes (Bouma *et al.* 1990), iron depletion ('leaching' of upper soil horizons), iron reprecipitation (ferruginous mottling associated with aquatic root channels; pyrite precipitation in voids), and soil slaking. The last relates to the soil becoming saturated by water rich in sodium ions, these totally displacing cations such as calcium which aid flocculation in soils. As a consequence the soil

became dispersed or deflocculated: *i.e.* the soil ped fell apart. This occurs because clay particles with attached sodium ions repel each other. Most fine soil material at the Stumble and other Blackwater sites was affected in this way, and dispersed fine silts and clay were translocated down into the 'subsoil'.

The removal of fine soil, especially from the surface horizons, and its relocation downprofile into a subsoil means therefore that there is little fine fabric data on the prehistoric soils. Many of the diagnostic features, formed by the arrangement of clay and fine silt particles, which create a pedological record of a particular soil were completely lost or transformed. For example, the grey upper A2 horizons of the Blackwater land surfaces are typical of alkali soils (Duchaufour 1982) that have become leached as a result of clay dispersion — they are not a relict of prehistoric *lessivage*, and are typical of soils encountered in the intertidal zone (Kooistra 1978). Similarly, soil material to a depth of 40cm had also been altered by hydromorphic and slaking phenomena. It is also likely that soil pollen laid down under pre-estuarine soil conditions became dispersed at the same time as the fine soil was slaked by brackish water inundation, and as a consequence the soil pollen may have to be regarded as unstratified. At the Stumble, however, a soil column analysed for soil pollen revealed none either in the surface or the 'subsoil' horizons (Evans, AMLR 7/90).

Discussion

Estuarine inundation caused both anaerobic leaching of iron and dispersion of the fine soil, with the latter process significantly altering the grain size distribution of the soils from their pre-inudation character. The prehistoric parent material, nevertheless, can be considered as a fine loamy soil (Table 2.3; sample 41), as found presently on slopes on the London Clay (Jarvis *et al.* 1983). Possible ancient soil fragments preserved by ferruginisation support this conclusion, although it is not possible to state whether the prehistoric soil cover was an argillic one developed under woodland (R. Scaife, *pers. comm.*) or, as more commonly found now, a pelo-stagnogley soil (Windsor Association: Jarvis *et al*. 1983). The presence of charcoal at *c*. 40cm depth may be the result of soil mixing after clearance, whereas the Neolithic pottery at *c*. 13cm at Area B was possibly deposited by earthworm working of the soil penecontemporaneously with continued Neolithic activity in the area (*e.g.* Area A). A little later a 2–3cm thick charcoal-rich soil layer formed at the soil surface. Elsewhere (*i.e* Area A), although not recorded in the microfabric, there is a surface soil association of charred seeds, wood charcoal, Neolithic artefacts and archaeological features (Wilkinson and Murphy 1986b, 19–54; P. Murphy, *pers. comm*.). At Area B, the surface charcoal layer seems to have been reworked in places by estuarine inundation, insofar as the overlying estuarine silts seem to contain some similar coarse charcoal. The estuarine silty clay loam (Table 2.3; *c.f.* sample 40), when compared with the underlying prehistoric soil, is better sorted and displays horizontally deposited organic detritus which provides an indication of weak bedding.

The charcoal concentrations at the Stumble, although shown to be *in situ* (P. Murphy, *pers. comm*.), may nevertheless have become involved in some localised reworking associated with the dispersion of surface soils during brackish water inundation (as at Area B). Alluvial clay balls of reworked soil are sometimes in evidence in soils and sediments associated with freshwater inundation (French 1988), but here all fine soil material seems to have been totally dispersed. So here again the lack of fine fabric data in the Neolithic surface horizons underlying the estuarine silts makes it impossible to establish exactly the pedological relationship between the charcoal and mineral matrix at the soil's surface, or to understand why the pottery collected at Area B occurs some 10cm below this charcoal-rich soil layer.

Results from the off-site Section 1 show that initial inundation had leached and slaked the prehistoric soil before the detrital organic and mineral sediment was deposited, producing in places wetting fronts marked by fine soil accumulations. Across the whole prehistoric landscape surface horizons were dispersed and clay and fine silt were washed downprofile, whereas it is possible that some soil (and charcoal: see above) may even have been washed away. Coarse artefacts remained in place. Further downprofile, finer soil was transported to produce the dark brown textural (argillic/Bt) horizons noted below 30cm. This downward movement is evidence of brackish water flooding, but at the same time shows that the permanent water table was low. This, along with the finding of charcoal at depth and the presence of possible ancient soil fragments, indicates that the area was truly terrestrial in the Neolithic, and not just a tract of seasonally wet mudflat of the kind occupied by some Mesolithic communities (Balaam *et al.* 1987).

Phenomena relating to exposure of the estuarine mud flats (Miedema *et al.* 1974) are rare gypsum (calcium sulphate), along with large amounts of pyrite and localised ferruginisation associated with reed penetration aerating the anaerobic sediment and soil (Bouma *et al.* 1990).

Conclusions

Inundation by brackish water and burial of soils by estuarine sediments has in most cases transformed the prehistoric soils so that they display saltmarsh soil profiles (unripened gley soils) characteristic of the intertidal zone. The disposition of macrofossils and artefacts has been little affected, but it is likely that any prehistoric soil

Sample	*Depth*	*%CaCO$_3$*	*%ORG C*	*Clay*	*FZ*	*MZ*	*CZ*	*Silt*	*VFS*	*FS*	*MS*	*CS*	*VCS*	*Sand*	*Texture*	*Thin section*
The Stumble Site A																
40	0–7.5cm	<0.1	0.5	20	6	24	40	70	2	3	4	<1	<1	10	Silty clay loam	F
41	22–29cm	0.1	0.2	15	7	17	51	75	4	4	1	<1	<1	10	Silt loam	H

Table 2.3 Soil micromorphology: analytical data

pollen stratification once existing here has been totally lost and contaminated. At all studied Hullbridge Survey locations, the combination of estuarine inundation and recent exposure has caused a variety of hydromorphic effects including iron mottling, pyrite precipitation and gypsum crystallisation. Blackwater Sites 3 (Maylandsea), 18 (Rolls Farm) and 28 (the Stumble) can be shown to have supported truly terrestrial soils, although details of their original soil types cannot be elucidated. At the Stumble, charcoal was found at depth (perhaps suggestive of clearance); Neolithic artefacts seemed to have been earthworm worked in places, whereas surface charcoal scatters, although essentially *in situ*, may have been locally involved with surface soil dispersion during primary inundation. The water tables of these Blackwater soils would have been relatively low (at depths of at least 400mm), at the time of estuarine inundation. Therefore, the first flooding event is likely to have been the result of a storm surge, such as that experienced along the North Wales coastline in the early 1990s, rather than of a gradual rise in sea level.

VII. Excavations in Areas A/B and E

(Figs 2.10–2.13)

Following the completion of the fifth pass in Area A, the sixth pass in Area B and the third pass in Area E all exposed features were excavated, in 1986 (Area A), 1987 (Area B) and 1987 and 1988 (Area E). Descriptions are in numerical order.

Excavated features

Area A
(Figs 2.5–2.7 and 2.10)

130 Patches of dark greyish-brown clay loam containing common charcoal flecks. Mainly in SW part of Area A, in squares 10E 11N and 10E 12N. Removed during trowelling of 2nd–4th passes (no section drawing; plan Fig. 2.6).

131 Extensive area of grey estuarine clay covering SE corner of Area A. Overlay feature *150*; removed during trowelling of 2nd–4th passes (no section drawing; plan Fig. 2.5).

132 Area of grey clay which cleaned off to expose crescent-shaped area of dark humic loam. All traces disappeared after a further trowelling pass of 0.02–0.03m below the level of 5th pass (no section drawing; plan Fig. 2.5).

133 Small possible feature in square 12E 13N; removed during excavation of 3rd pass. Fill of greyish-brown clay (not illustrated).

134 Irregular feature; one segment (a) excavated. Shallow and irregular with uneven base. Possible post-hole of 0.15m diameter excavated in base to depth of 0.13m below cleaned surface. Fill *164*: dark greyish-brown sandy clay loam; common charcoal. *134* overlaid by grey estuarine clay (*175*) (Figs 2.7a, 2.12).

136 Post-hole: 0.20m N–S, 0.16m E–W, 0.13m+ deep. Eroded. Fill *143*: greyish brown sandy clay loam; common charcoal (Figs 2.7a, 2.10).

137 Post-hole: 0.33m N–S, 0.20m E–W, 0.12m+ deep. Eroded. Fill *141*: greyish-brown sandy clay loam; common charcoal (Figs 2.7a, 2.10).

138 Post-hole: 0.18m diameter, 0.13m+ deep. Eroded. Fill *139*: greyish-brown sandy clay loam; common charcoal (Figs 2.7a, 2.10).

140 Narrow, very shallow linear feature with grey clay fill. Of uncertain origin, and removed during 3rd and 4th trowelling passes (Fig. 2.5).

142 Scatter of charcoal on old land surface to north of area A.

144 Small feature of irregular shape and indeterminate profile. Possibly area of disturbance in antiquity. Fill *145*: very dark greyish-brown clay loam; abundant charcoal (Fig. 2.6).

146 Probable post-hole: 0.36m N–S; 0.26m E–W; 0.12m deep. Fill *147*: firm brown silty clay loam; occasional charcoal flecks (Figs 2.6, 2.7, 2.10).

148 Probable post-hole: 0.20m N–S; 0.17m E–W; 0.11m deep. Fill *149*: brown silty clay loam (Figs 2.6, 2.7, 2.10).

150 Shallow, irregular gully excavated as segments: a) fill *151*: brown silty clay loam, even and homogeneous; rare charcoal; occasional artefacts and heat-shattered flints throughout. b) fill *161*: greyish-brown sandy clay loam; occasional charcoal fragments becoming more common towards base of feature. c) fill *167*: as for segment b; pot rim close to floor of feature within E–W section. Width varies from 0.35m to 0.60m (Figs 2.6, 2.7a, 2.10).

152 Post-hole: 0.20m diameter; 0.15m deep. Fill *153*: dark greyish-brown loam to clay loam; abundant charcoal (Figs 2.7a, 2.10).

154 Spread of relict topsoil or possible occupation horizon. *154* refers to perimeter of spread, *155* to the deposit. Poorly defined to west and north. Either part of *130* or of the horizon beneath, but during excavation no meaningful difference could be discerned between *130* and *154*/155. *155*: deposit contained within *154*, brown clay loam with occasional charcoal (Figs 2.6, 2.7a, 2.10).

156 Irregular pit with very irregular floor, excavated in three segments: a) fill *157*, dark greyish-brown sandy clay loam; common charcoal especially towards north and base of feature. b) fill *160*, dark greyish-brown sandy clay loam; common charcoal becoming abundant within suspected 0.15m diameter post-hole. c) fill *174*: dark greyish-brown sandy clay loam. *177*: possible post-hole in floor of c) (Figs 2.6, 2.7a, 2.10).

158 Post-hole: *c*. 0.25m diameter; 0.10m deep. Fill *159*: moderately soft greyish-brown silty clay; burnt flint and one or two fragments of fired clay (Figs 2.6, 2.10).

162 Spread of charcoal-rich loam covering area 0.60m E–W by 0.50m N–S. Box-sectioned. *162* refers to perimeter of spread, *163* to the contained deposit. *163*: clay loam, common charcoal, one or two heat-shattered flints and some fragments of burnt bone. Area of dump, midden or hearth (Figs 2.6, 2.7a).

165 Very shallow irregular feature. Segment a fill *166*: brown silty clay loam; rare charcoal. Possible disturbance (Figs 2.6, 2.7a, 2.10).

168 Post-hole: 0.40m E–W, 0.30m N–S; 0.16m deep. Broad open profile suggests that feature remained open for some time. Fill *169*: greyish-brown silty clay loam; common small charcoal fragments; occasional small potsherds. Thin layer of soft grey clay plastered against base and sides. Potsherd 15mm long on base (Figs 2.6, 2.7, 2.10).

170 Post-hole: 0.27m E–W; 0.20m N–S; 0.12m deep. Fill *171*: greyish-brown sandy loam; occasional charcoal (Figs 2.6, 2.7a, 2.10).

172 Post-hole: 0.30m N–S; 0.25m E–W; 0.13m deep. Fill *173*: greyish-brown sandy clay loam; included one potsherd and fragment of fired clay (Figs 2.6, 2.7, 2.10).

175 Thin layer of grey estuarine clay above and sealing *134*. (Fig. 2.5).

176 Possible post-hole forming distinct soft spot in bed of creek immediately west of Area A. Presumably the fill was soft clay, but this was not confirmed (Fig. 2.7a).

177 Possible post-hole, *c*. 0.30m diameter, within feature *156*c. Note: although the concentration of charcoal at *177*, reported in *156*, implies that *177* had been cut into *156*, this relationship would not hold if *156* was in fact a hollow caused by trampling (see discussion) (Fig. 2.7a).

Area B features
(Figs 2.7, 2.9 and 2.11)

(Note: fills are identified by the same context number as their containing features, unless specified otherwise.)

183 Large irregular feature occupying entire SE corner of site. 0.70–0.80m deep, steep sloping sides. Fill: grey estuarine clay, thin layer of sand/fine gravel on base. Feature truncates soil horizon that developed as post-transgression feature on adjacent old land surface. Finds and occupation material from the Neolithic site are absent. Forms part of estuarine creek system of post transgression (*i.e.* post–1600 BC) date; possibly much later (Figs 2.7, 2.9).

186 Irregular feature, roughly basin-shaped with uneven base. 1.07m N–S; 0.80m E–W; 0.16m deep. Irregularities may result from the action of tree roots, but depression in SE quadrant contained a small pot rim. Fill: brown loam; occasional charcoal (Figs 2.7b, 2.13).

187 Very shallow feature with small depression in base. 0.40m NE–SW; 0.20m NW–SE; 0.07m deep. Fill: brown loam (Figs 2.7b, 2.11).

189 Feature with irregular ground plan. Deep central pipe of indeterminate depth thrusts obliquely into ground. 0.60m SE–NW; 0.50m SW–NE; 0.22m deep. Fills: dark grey clay loam with concentration of charcoal roughly over central depression. Oblique pipe filled with clay loam; occasional charcoal flecks; slightly softer than adjacent subsoil. The central pipe, although possibly a stake-hole, could also be a root or rodent hole (Figs 2.7b, 2.11).

196 Series of possible stake-holes, averaging 0.08–0.12m in diameter, occupying an area measuring *c*. 2.00m NW–SE and 0.30–0.40m wide; maximum depth 0.12m. Comprises at least sixteen small probable stake-holes, line is terminated by a single larger feature at SE end. Fill: dark brown clay loam; occasional charcoal (Figs 2.7b, 2.11).

197 Small irregular feature *c.* 0.25m in diameter, 0.05m deep. When cleaned, visible as a concentration of charcoal. Not evident as feature on final plan. Fill: dark grey clay loam; common charcoal (Fig. 2.11).

198 Oval pit: very shallow along original profile line, therefore profile (Fig. 2.11) drawn across deepest points. Irregular in plan and profile. 0.95m NE–SW; 0.60m NW–SE; 0.17cm deep. Fill: dark brown loam (Figs 2.7b, 2.11).

199 Feature, irregular in both plan and section. Box section revealed diffuse lower boundary. Depression in base may represent a stake-hole. Fills: greyish-brown loam; depression in base has soft clay fill (Figs 2.7b, 2.11).

200 Shallow circular feature resembling post-hole in plan, but not section. Box section proved feature to be only 0.06m deep. Diameter 0.28m (Figs 2.7b, 2.11).

201 Irregular depression 2.40m N–S; 1.40m E–W; 0.15m deep. Feature as originally planned traced perimeter of upper dark fill *201*. This overlay a lower fill which locally extended beyond the limits of *201*. Irregular floor cut by numerous circular and linear depressions, and by wear/traffic erosion feature *202*. Fills: *201*: very dark greyish-brown loam; common charcoal. *210*: greyish-brown clay loam; less charcoal than *201*. The feature as a whole was interpreted as hollow rather than a cut feature, perhaps

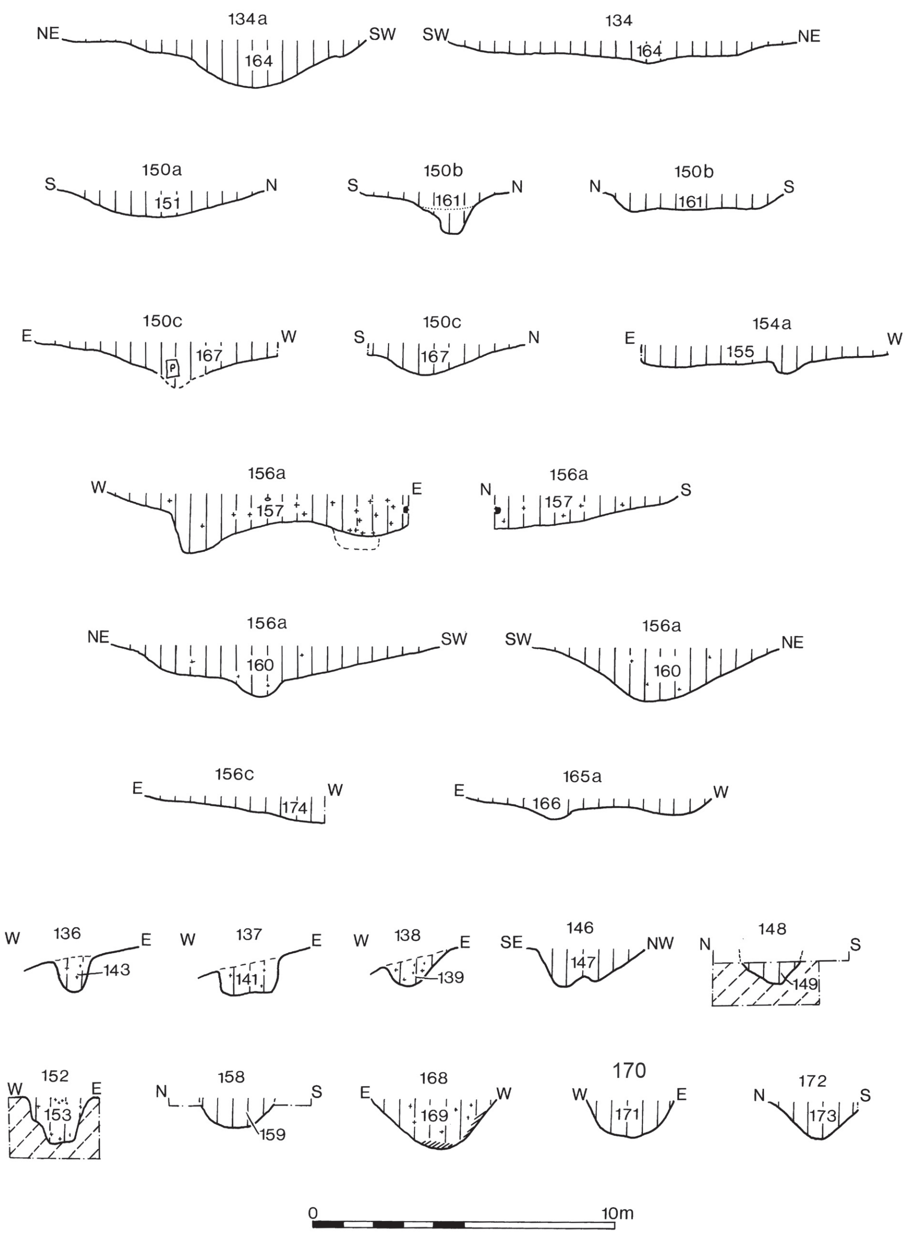


Figure 2.10 Feature sections: Area A

resulting from trampling or wear within a living area or entrance (Figs 2.7b, 2.11).

202 Broad, roughly L-shaped hollow cutting *201* and in turn cut by small feature *203*. The three excavated segments (a, b and c) demonstrated that the feature was consistently shallow. Overall length 3.00m N–S; maximum width 1.00m; *c*. 0.07m deep. Fill: greyish-brown, soft, creamy clay. Interpreted as an area worn by the passage of humans or animals, perhaps within living space or an entrance zone. Note: the clay fill resembles estuarine clay, perhaps suggesting that the feature may have been open when the site was initially flooded (Figs. 2.7b, 2.11).

203 Probable post-hole, *c*. 0.20m diameter, 0.14m deep. Cut into clay fill of *202*. Either the post was cut through the fill of *202*, or the post was still in place when the clay accumulated. Fill: dark brown loam; common charcoal (Figs. 2.7b, 2.11).

204 Oval feature with shallow perimeter rim and central depression. Box-sectioned, but no distinctive fill within 0.20m diameter central feature. Overall dimensions: 0.34m N–S; 0.28m E–W; 0.12m deep. Fill dark brown clay loam; occasional charcoal. Central feature may be post-hole (Figs 2.7b, 2.11).

205 Very shallow circular feature 0.33m diameter, 0.03m deep. Fill: dark grey clay loam; abundant charcoal (Figs 2.7b, 2.11).

206 Irregular feature. Initially appeared to be of indeterminate shape, but further cleaning revealed deep, slightly oblique pipe penetrating to 0.17m (*c.f. 189*). Two small depressions penetrated the base. Overall dimensions: 0.55m N–S; 0.35m E–W; 0.17m deep. Fill dark brown clay loam. The oblique pipe is somewhat ambiguous, and may have represented either a stake-hole or a root/rodent hole (Figs 2.7b, 2.11).

207 Irregular depression with very uneven floor pock-marked by at least sixteen small shallow depressions. 1.70m E–W; 1.20m N–S; average depth: 0.02–0.05m, maximum depth 0.10m. Fill; dark brown clay loam. Possibly caused by wear or trampling. This could account for the shallow depressions, which alternatively could be stake-holes (Figs 2.7b, 2.11).

214 Possible post-hole, roughly circular with V-shaped section. Double cut visible in plan. *c*. 0.20m diameter; 0.14m deep. Fill: dark brown loam (Figs 2.7b, 2.11).

221 Irregular feature extending *c*. 1.00m E–W and 0.50m N–S. Includes several possible stake-holes, but these could

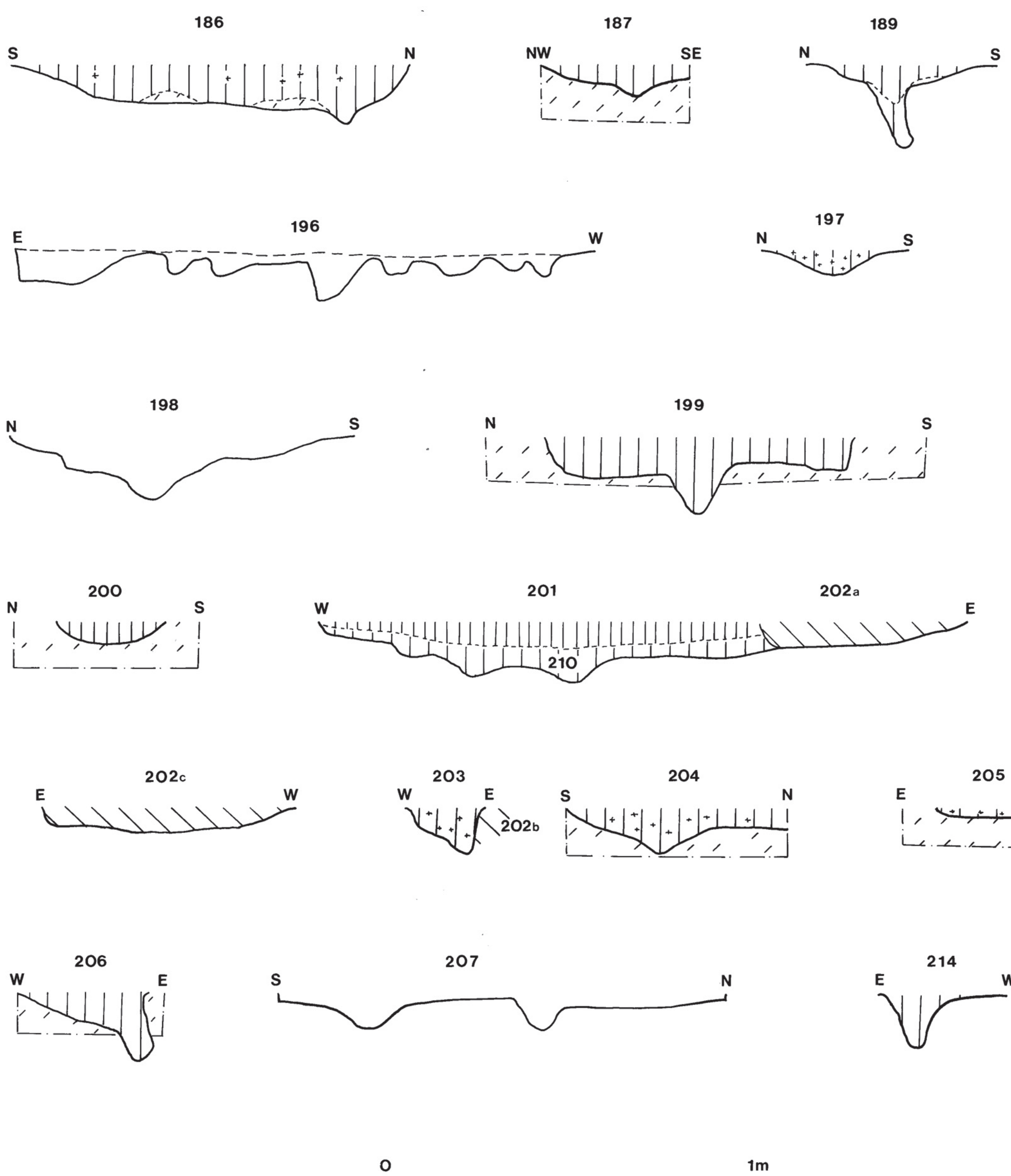


Figure 2.11 Feature sections: Area B

equally well have been rodent or root holes. Fill: dark brown loam (Fig. 2.7b).

Area E features

(Sections Fig. 2.12)

233 Post-hole, *c.* 0.25m diameter, 0.12m deep. Fill *234*: dark greyish-brown clay loam merging down into greyish-brown clay loam. Charcoal present to base of feature.

235 Post-hole, *c.* 0.40m diameter, 0.14m deep. Fill *236*: grey clay with occasional small charcoal flecks. Distinct edge in section. In plan, has dark greyish-brown perimeter stain to east. The pale grey sandy loam (*243*), which underlies *236*, appears to extend up and over feature *242* to the north thus rendering *235* stratigraphically later than *242*.

237 Irregular depression, shallow with occasional sub-depressions. Upper fill *238*: pale greyish-brown clay loam; occasional pale greyish-brown sandy loam patches. Occasional flint and pottery. Lower fill *239*: pale grey sandy loam; some charcoal; common flint and pottery up to 50mm in size. *248* (fill of southern quadrant of *237*), description as *238*.

240 Post-hole within feature *237*. Fill as *238*.

242 Feature sealed beneath pale grey sandy loam in north part of E. Fill *247*: dark greyish-brown clay loam; common charcoal flecks including wood charcoal to *c.* 6mm. Common struck flint, mainly small flakes and blades; two flakes from polished stone axe.

245 Small feature to north of *237*, *c.* 0.30m diameter and 0.08m deep. Fill *246*: greyish-brown clay loam; occasional flecks of charcoal and burnt bone. One small body sherd *c.* 20mm in diameter.

Phasing

(Figs 2.8–2.11)

The observed stratigraphic and sedimentary sequences, when combined with the excavation results presented above, suggest the following four-fold sequence in Area A/B/E, from earliest to latest. Phasing evidence is presented in Table 2.4.

Phase I

Various shallow pits, post-holes, miscellaneous features and hollows were cut or eroded into the old land surface (Fig. 2.8). Feature fills were primarily dark brown to grey brown loam/clay loam, with occasional flecks of charred plant material (Figs 2.10 and 2.11). Although these features did not all necessarily belong to the same sub-phase they could not be sub-divided chronologically, using either stratigraphic or artefactual evidence. Features had been cut through context *225*, the lower part of the palaeosol, and were at least partly overlaid by *224*, the upper palaeosol. Charred grain from the fill of post-hole *138* yielded an accelerator ^{14}C determination of 4020 ± 70 (BP Ox-A 1914) 2855-2465BC (Table 5.17); this makes it approximately contemporary with the occupation in Area D, and slightly earlier than the one radiocarbon date from a burnt flint mound (context *279*) 3885±70 BP (Ox-A 2297), 2570-2140 BC. Such a late date for context *138*, which conflicts with the Early Neolithic date for the occupation indicated by ceramic typology, underlines the problem of interpreting occupation phases on this probably multi-period part of the site.

Phase II

Accumulation of the upper palaeosol (*224*, above) occurred together with a spread of predominantly wood charcoal (*223*) in the north-west part of Area A and the north-central and north-west parts of Area B (Fig. 2.9). Few cut features were demonstrably of this phase, although if the ^{14}C date from *138* is accepted at face value there was some temporal overlap between features of Phase I and the accumulation of Phase II.

Phase III

This was represented by cut features and various hollows with grey clay fills. In Area E, Phase II features *235* and *237* are stratigraphically later than those of Phase I (see below), whereas in Areas A and B, a post-Phase I date is inferred from their grey silt/clay fill of apparently estuarine origin. Such features must therefore have been open during the initial phases of the transgression and are probably of Late Neolithic date.

Phase IV

The accumulation of grey estuarine silt/clay *222* was noted in at least one cut feature (*183*), and over the site generally. As noted above, this phase probably post-dated significantly the marine transgression.

Although the above four-phase sequence is supported by the stratigraphic sequence exposed in the north and east baulks of Area B (Fig. 2.9), the problems involved in directly relating individual features to this sequence makes this archaeological phasing a matter of probability only. Hence, although most of the post-holes are probably of Phase I some of them, like *138*, probably belong to the later part of this stage. Similarly there will have been an overlap between Phases II and III, which post-date the early Neolithic occupation yet pre-date the marine transgression. These features are best regarded as of Late Neolithic date. The erosion of feature *183* (and perhaps

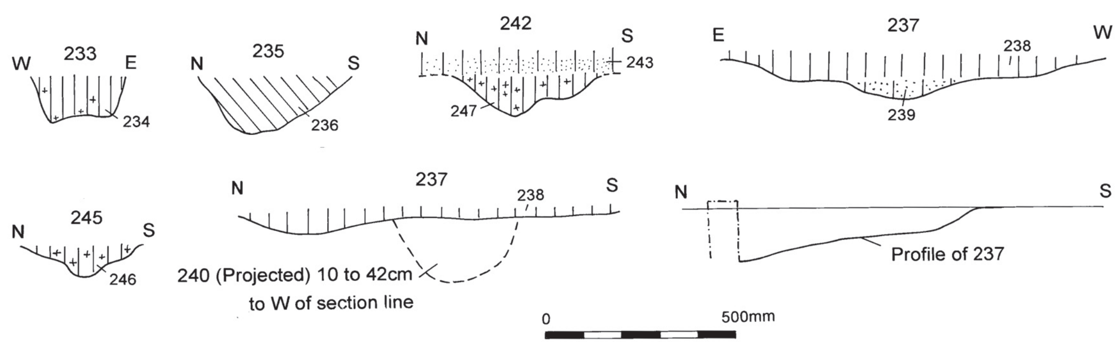


Figure 2.12 Feature sections: Area E

an equivalent feature along the west edge of Area E), and the accumulation of the filling deposit within it probably took place during the Bronze Age or Iron Age.

Discussion
(Fig. 2.13)

Understanding feature formation processes
The excavated features at The Stumble, as detailed above, have been assigned to types according to either conventional terminology, or using less specific terms such as 'hollow' which require some further explanation. The following feature types tend, in some instances, to merge into one another; the terms used are partially descriptive rather than interpretative, and do not necessarily relate to the original function of features.

1. Post-holes
Predominantly 0.15–0.30m in diameter and 0.10–0.20m deep, but often of rather open cross-profile (*e.g. 148*, *158* and *200*). Occasionally (*e.g. 189* and *206*) they exhibit deep pipes, seemingly extending below the base of the post-hole proper, which could result either from root/faunal activity or from the deep emplacement of the foot of a wooden post into the ground.

2. Stake-holes
Usually 0.05–0.15m in diameter. In some situations they occur in groups: *196* (Area B) formed an east–west alignment which may have represented a fence, internal partition or windbreak/porch at a hut entrance. Other features display stake-hole-like phenomena (*e.g. 207*) but these may simply result from trampling, with local-

Area	*I (earliest)*	*II*	*III*	*IV*	*Indeterminate*
A	134 F	130 CH	131 CS	-	144 D
	136 PH	133 ?	132 CS	-	176 ?PH
	137 PH	162 CH	140 L	-	-
	138 PH	177 ?PH	-	-	-
	146 ?PH	-	-	-	-
	148 ?PH	-	-	-	-
	150 F	-	-	-	-
	152 PH	-	-	-	-
	154 PH	-	-	-	-
	156 F	-	-	-	-
	158 ?PH	-	-	-	-
	165 H	-	-	-	-
	168 H	-	-	-	-
	170 PH	-	-	-	-
	172 PH	-	-	-	-
B	186 F	Various CH spreads	202 H	183 CS	200
	187 ?PH	184 CH	-	-	203 ?PH
	189 ?PH	185 CH	-	-	221 D
	196 SHs	197 CH	-	-	-
	198 F+PH	-	-	-	-
	199 F+PH	-	-	-	-
	201 H	-	-	-	-
	204 PH	-	-	-	-
	205 F	-	-	-	-
	206 F+PH	-	-	-	-
	207 H	-	-	-	-
	214 ?PH	-	-	-	-
E	233 PH	-	235 ?PH	-	-
	240 PH	-	237 CS	-	-
	242 PH	-	-	-	-
	245 ?PH	-	-	-	-

CH – charcoal; CS – clay spread; F – feature or indeterminate pit; PH – post-hole; L – linear cut; D – disturbance; PS – palaeosol; H – hollow; SH – stake-hole(s)
I – Earlier Neolithic features with loam or clay loam fill and occasional charcoal
II – charcoal fill, stratigraphically above Phase I features
III – Neolithic features with clay fills of possibly estuarine origin
IV – clay-filled feature(s) of post-Neolithic date

Table 2.4 Areas A/B and E: phases of features ised basal perforations being created by the impacts of human feet or animal hoofs.

3. Miscellaneous features and indeterminate pits
Exemplified by features *150* and *156* in Area A, these are little different from 'hollows' except that they are shallower. These features have very open profiles with length:depth ratios of roughly 4 or 5; this compares with true excavated pits at the site, which exhibit length/diameter:depth ratios of 1 to 3 (Wilkinson 1988, 40–1). Visually, features of this kind at the Stumble display much more open profiles than (for example) those interpreted as Neolithic pits at Hurst Fen, Mildenhall, Suffolk (Clark 1960, 205–12). Area A feature fills were undifferentiated, and their fills showed no traces of upcast that had collapsed or washed in. The uneven floors of such features are hard to interpret: although possible post- or stake-holes were sometimes present (*e.g. 177* in *156*), localised holes and deeper areas in their bases may have resulted from trampling.

4. Hollows
These resemble the above features but were even more shallow and open, with length:depth ratios of >5. They appeared irregular and pock-marked; owing to their gentle side-slopes, all were ill-defined in plan. Such features, usually elongate, resembled the hollowed areas that develop within prehistoric huts, or at their entrances, as a result of prolonged trampling or wear (*e.g.* Wainwright and Smith 1980, 87, 92).

5. Linear cuts
These were only recognised in Areas A and E (Figs 2.5 and 2.6) where they were merely narrow linear incisions 10–50mm in width and 10–20mm deep. Fills were predominantly grey estuarine clay, indicating that the features must have been open at the time the site was flooded during the Thames III transgression (below, p.138). Although such features may result from some kind of cutting activity in antiquity — perhaps Late Neolithic turf-cutting — they are difficult to explain convincingly.

6. Disturbances
Miscellaneous features of indeterminate shape and complex cross-profile (*e.g. 144* and *221*), usually with numerous individual deep cavities, probably resulted from the activities of burrowing animals or were root-holes.

With the exception of the linear cuts, the above six classes of feature in reality form a continuum. Some of them (*e.g.* post-holes) had clearly been dug out, but most appear to have been formed by continued trampling, disturbance or wear. Feature fills, when sub-divided according to sediment type (Table 2.4), suggest at least two phases of activity within Areas A/B/E. In the case of entrance hollows, an early phase (*201*/*210*) may have been replaced by a later feature that remained open until the onset of the marine transgression. The other miscellaneous features and hollows, although nominally assigned to Phase I on the basis of their fills, could have been formed at any time in the Neolithic.

Of the 26 Phase I post-holes, only thirteen were sufficiently deep to be described as structural features. The other thirteen, being rather shallow, may have not held load-bearing elements of significant structures, or even

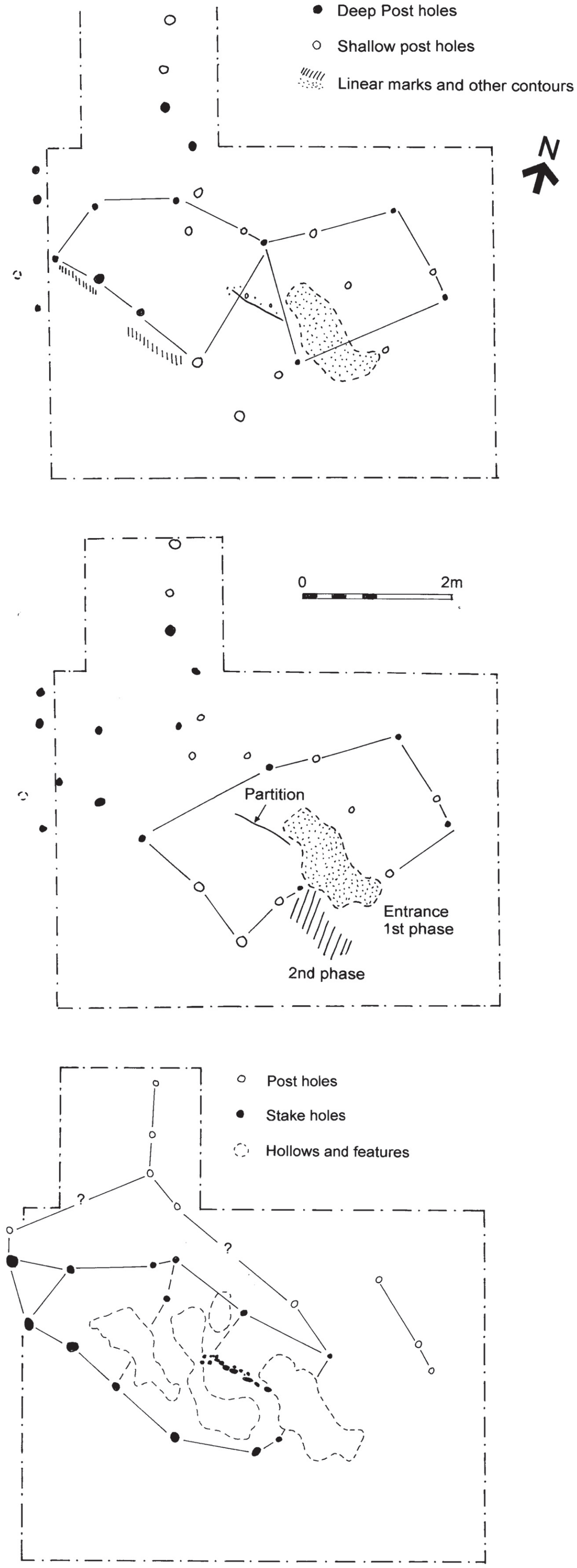


Figure 2.13 Reconstructions of possible building configurations, Areas A/B and E

have been post-holes at all. Given the restricted areas exposed during excavation the ambiguous nature of some of the 'post-holes', and the possible lack of contemporaneity of the features, it was impossible to identify any definite hut structures. The following possible structures are suggested with due caution (Figs 2.8 and 2.13, top):

a) An east-west oriented structure: *146–168–170–177–214–172*, paralleled by a linear feature (*140, hatched*) and soil-mark.
b) A line of stake-holes (*196*), on the same orientation as **a**, and possibly forming an entrance structure to that building c) A Phase I hollow (*201*), succeeded by a Phase III hollow which led into structure **a** d) A rectangular structure to the east of **a** comprising six external posts and one central one, and encompassing an area of *c*. 4.5m x 3.5m (defined by *214–189–206–203*).

Alternative speculative plans are illustrated on figure 2.13 (centre and bottom), but it is clear that any structural interpretation of the feature plan is very subjective; perhaps only more extensive clearance (at least double the *c.* 150 sq. m exposed) might have made it possible to identify unambiguous building plans.

Interpretation of artefact distribution

In Areas A/B and E, point-plotting of individual artefacts resulted in innumerable recording and post-excavation problems. Therefore, for simplicity and for ease of comparison with spatial data from Areas C, D, F, G and H, the point plots were converted to density distributions per sq. m (an example showing the plots for A/B is illustrated on Fig. 2.4).

Patterns of pottery and lithic distribution were broadly similar, but because there were more lithic finds than potsherds lithic densities were greater. The recorded distribution, although partly reflecting the presence of underlying features, was largely determined by which stratum was being excavated by the trowelling pass in question. Hence if the pass cross-cut an artefact-rich horizon, artefact density would rise; if that stratum then dipped, trowelling elsewhere in the pass would produce fewer artefacts as it went through the overlying estuarine clay. Conversely, a rise in the level of such a horizon would result in it passing from an artefact-rich horizon into a subsoil containing many fewer artefacts. For example, in the first pass across Area B, the gap in the distribution between the two areas of high density reflects the presence of an artefact-poor stratum (grey estuarine clay *202*) between two artefact-rich areas of occupation horizon lying on old land surface. With the removal of the clay, the upper fills of this hollow were exposed, resulting in a 'ridge' of high density noted in the subsequent pass. By the sixth pass in Area B the usually artefact-poor north-west corner, where previous passes had trowelled Phase II and III deposits, came down on to the enriched Phase I buried soil. For these reasons, only the aggregate distribution of finds from all passes provides any realistic estimate of sherd/flint distribution (Fig. 2.4).

Fig. 2.4 shows that recorded lithic distributions in Area A/B were denser than those of pottery and were more concentrated in Area A. Maximum pottery concentrations (>40 sherds per sq. m) were located over the hollow *201* in Area B, but consistently high densities were also present immediately to the east and south. The latter concentrations were unrelated to underlying features, and must have simply formed a spread of rubbish over the old land surface. A second feature-specific concentration occurred over the north-west parts of irregular ?post-hole *134*, but otherwise many of the sherd concentrations seemed unrelated to features or were only loosely related to them. The peak sherd concentration around *201* also corresponded to a peak in lithic densities, but maximum recorded lithic densities (>40 lithics per sq. m) were concentrated in a triangular area over features *156*, *134* and *207*, an area with rather more modest (although locally intense) sherd scatters.

Overall, the concentration of pot and flint over and around hollow *201* could result from rubbish disposal around the entrance of a dwelling. The lithic concentration within Area A required another explanation. The low density of pottery might indicate that locally more intense trampling had destroyed much of the pottery deposited here. Lithic-specific activities may have occurred in this area; alternatively, the deposit may simply result from rubbish disposal during a phase of the occupation when pottery was scarce or absent. Although the possibility of Mesolithic activity in this area cannot be excluded, only one microlith was recorded (Holgate, Part 4). It is therefore most likely that these deposits represent later Neolithic activity (note the low pottery:flint ratio from Area D), a view supported by the single later Neolithic ^{14}C determination from post-hole *138* (above, p.25).

As is demonstrated by Brown (below, Part 4), both sherd size and the degree of wear suggest that in Areas A/B and E sherds were subjected to a significant amount of trampling and breakage. Pottery recovered from both trowelling passes and features was similarly small and abraded (mean sherd weight 4.5–5.0g), compared with mean weights of 7–8g from Area C. Significantly, sherd size and % abraded sherds were similar for Areas A/B and E, whereas in Area C sherds from subsoil features were less abraded (29% from features, 44% from superficial contexts). Similarly Holgate (below, Part 4) showed that lithics in Areas A/B and E were indeed more fragmentary than those from other areas. These results all suggest that trampling is likely to have been a more significant factor in the development of the archaeological record in Areas A/B and E than in Area C.

Sherd to flint ratios may also reflect differential abrasion and breakage: all other things being equal, after numerous trampling cycles there should be an increase in the proportion of flints to pottery (Table 2.1). Hence in Areas A/B and E pottery to flint ratios range from 0.47 to 0.74, compared with ratios of 0.89 to 2.10 for Area C. Although this might indicate greater trampling in Areas A/B and E the initial proportions of flint to pottery are, of course, unknown. Bearing this problem in mind, however, the degree of wear on pottery, the percentage of broken flints and the sherd to flint ratios all suggest that there was a greater degree of trampling in Areas A/B and E. Taken together, the evidence from features artefacts and charred plant remains implies that Areas A/B and E comprised an area of both open or enclosed space which was subjected to considerable trampling. Such activity probably took place both outside and within buildings, although both the layout and chronological development of such buildings remains poorly understood.

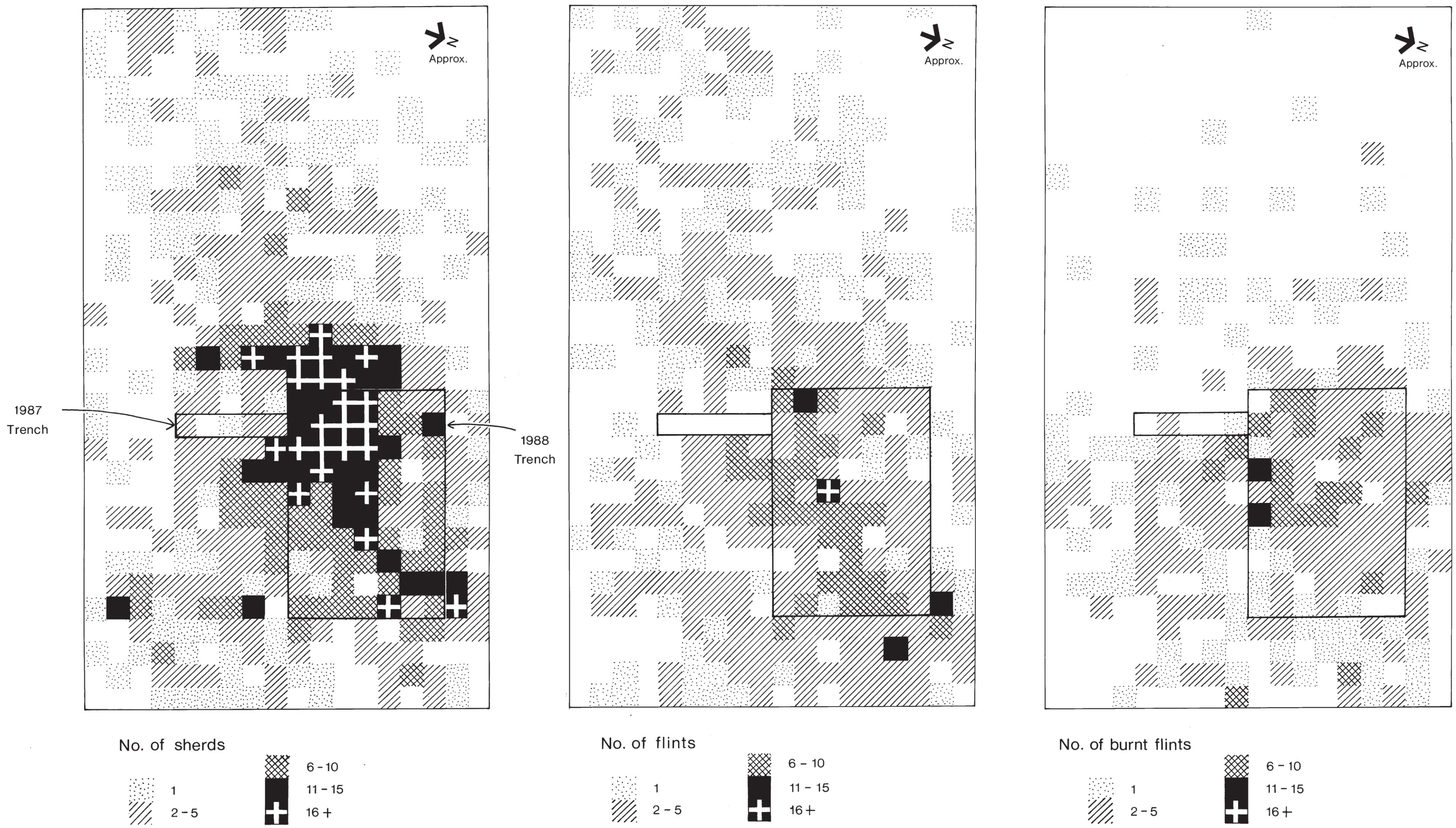


Figure 2.14 Density of surface-recorded artefacts from Area C (1988): a – potsherds; b – flint; c – burnt flint

VIII. Excavations and survey in Area C

(Figs 2.14–2.17)

Artefact collection and clearance

(Fig. 2.14)

In 1986 a very dense scatter of large sherds of flint-gritted pottery, some of them decorated, as well as occasional lithic finds, was located over a small area of mudflat to the south of Area A. Collection in 1986 was initially general, all artefacts being allocated to context *135*, but systematic collection in the area, designated Area C, was conducted in 1987 and 1988 as a prelude to excavation.

The first systematic recording in Area C was aimed at defining the area of artefact scatter. It entailed sampling an area of 18m north–south by 31m east–west (*i.e.* 558 sq. m) by means of 1m x 1m sample squares, as indicated on the density distribution maps (Fig. 2.14). The distributions of both flint and pottery appear roughly comparable but pottery was more abundant than flint. In addition to a roughly axial east–west spine of artefacts, finds were concentrated in the central and western part of the area. Here pottery attained surface densities of twelve sherds per sq. m and flints six per sq. m. The peripheral area had fewer or no finds, perhaps because estuarine clays overlay the old land surface in this area and thus obscured any finds from view.

The sample survey resulted in the collection of artefacts visible on the surface, but re-collection in 1988, as illustrated on Fig. 2.14, not only showed roughly the same pattern as before (*e.g.* Wilkinson and Murphy 1988, Figs 41 and 42), but an increased density of both pot and flint. Again, pottery counts were in excess of those of flint. This time burnt flints were included in the counts; although densities were comparable to those of struck flints, the scatter was somewhat sparser in the northern half of the area.

Sedimentation has probably affected the pattern illustrated, which may reflect not only the original distribution of finds but also a slight rise in the underlying ground surface which was obscured elsewhere by a veneer of estuarine silts. This is confirmed in part by the subsurface contour plot of the 'bin' sampling survey (Fig. 2.1) which shows cultural material sealed below a sedimentary veneer to the east of Area C.

Following the 1987 sample collection, a trial trench measuring 5m x 1m and oriented north–south was positioned to cross the area of maximum artefact concentration (Fig. 2.14). Finds were allocated numbers, in the same series used in Areas A and B, according to the trowelling pass (first or second) and 1m square in question. Context numbers *5061–5070* were allocated for finds; one soil sample weighing *c.* 5kg was taken from each 1m square.

The first trowelling pass removed an initial surface skim of sand and shells, exposing just sufficient of the underlying old land surface to provide a clean surface for the next pass. In the second pass an arbitrary depth of *c*. 20–50mm of mineral topsoil was excavated from the underlying old land surface: this palaeosol was a variegated dark brown humic clay loam and pale grey sandy loam. Details of the sediments removed are given in Wilkinson and Murphy 1988, 123–4).

The 1988 excavations

(Fig. 2.15)

Excavation commenced in 1988 with an initial area measuring 5m x 5m — because sea water tended to drain into any excavated trench here, any area exceeding *c.* 5m x 7m would have been prohibitively large to pump dry during the falling tide. Subsequent extensions of the area had to be limited to smaller 'pounds' to the south-west of this first area, measuring 4m x 5m and 3m x 5m, which were separated from the main area by small baulks. By this means a total area of 7m x 10m — almost as large as Area B — was excavated in 1988.

Once again, excavation was carried out by means of *c.* 1m wide trowelling passes; artefacts were collected according to 1m squares, with the resulting distributions thus comparable to those from the surface collections. Pottery, flint and other artefacts were retained, as well as burnt bone; burnt flints were counted and discarded.

Trowelling passes were as follows:

First pass

A cleaning pass that removed sand, shell and a few stones from over the entire area. Burnt flints were not counted during this pass. The underlying old land surface was evident as three different sedimentary types, as follows:

a) Mainly dark grey to dark greyish brown humic clay loam with common charcoal flecks and artefacts. This was exposed across most of the cleaned area, but in places it was covered by small patches of grey clay, which were possibly residuals of a former estuarine clay cover.

b) Pale grey, slightly firm clay. At its most distinct this was surrounded by subsoil of type c).

c) Islands of firm, reddish-brown clay loam: evidently this was the underlying subsoil penetrating through.

Second pass

A 20–30mm layer of dark greyish-brown humic clay loam (**a**, above) was removed. Reddish-brown subsoil patches (**c**) were slightly larger than those encountered during the first pass. Sherds from **a** were large; flints and burnt flints were moderately common; sparse animal bone fragments and teeth were also collected. Soil samples from this pass were processed for carbonised plant remains (Murphy, below p.84).

Third pass

Approximately 20mm of dark grey humic clay loam (**a**) was removed from most of area. Where reddish-brown subsoil, which occupied roughly one third of the area, was encountered less soil was removed. Pale grey clay **b**, which was evident in patches and also in section (see below), appeared to form an intermediate horizon between the **a** and **c** sediments, except where features were present. Feature definition did not appear to be good, even after this third pass, but this probably reflected the sheer number of underlying features.

For logistical reasons, only two passes were removed from the north-western extension.

Reddish-brown subsoil **c** was evident along the southern part of the area, presumably where the overlying A horizon and associated occupation deposits had been stripped off by marine erosion. Grey sandy clay and sandy loam **b** probably corresponded with the palaeosol A horizon which immediately overlay the reddish-brown subsoil. In at least one area, though, this horizon appeared to overlie a feature (*318*, in the south-west corner), suggesting that it resulted from soil formation processes that post-dated the site's abandonment (Macphail, p.20–2). Extensive areas of dark grey brown clay loam **a** remained over most of the area, and were especially clear as layer *264* (originally defined in error as the fill of a 'feature': *263*). In places the dark grey clay loam remained as a fill of the underlying features (as in the case of *265*, *267*, *277*: Fig. 2.15), but to the south and west of

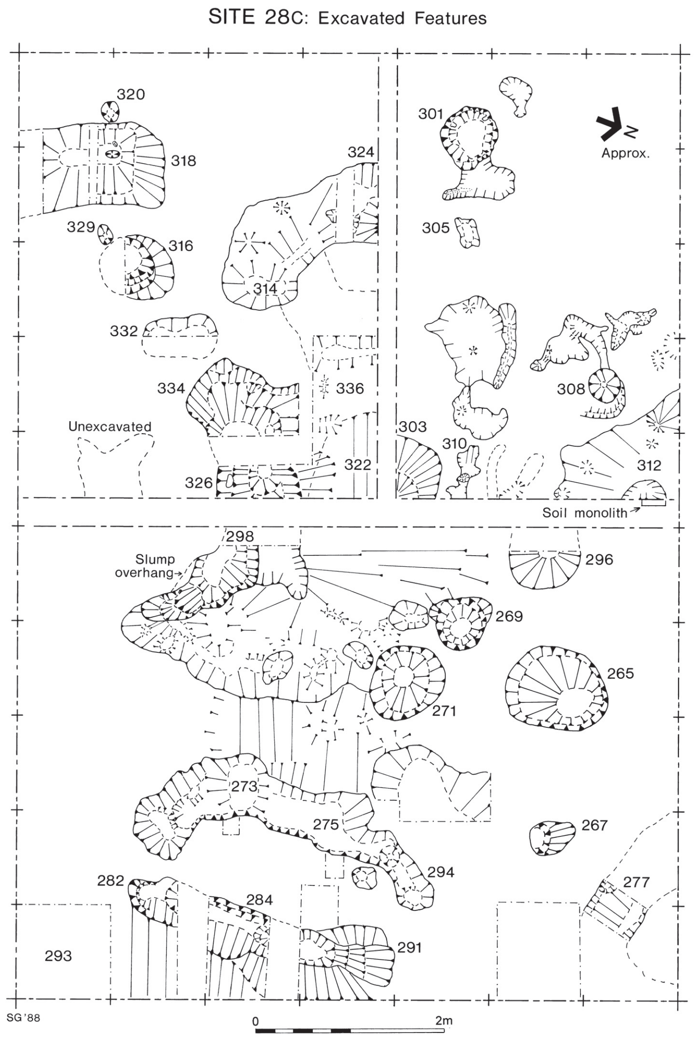


Figure 2.15 Area C: excavated features exposed after the third pass

this group of features the extensive spread of layer *264* obscured what proved to be a complex of underlying features (Fig. 2.15).

Sediment sequence

A monolith sample taken from close to the northern limit of Area C (Figs 2.15 and 2.17) indicated the following sequence. (Munsell colour values taken when moist.)

0–2/5cm	Black, 10YR 2.5/1 clay loam. Matrix appears to include finely powdered charcoal. Irregular, moderately distinct boundary. Type **a**.
2/5–6/7cm	Greyish-brown, 10YR 5/2 to dark grey 10YR 4/1, sandy clay loam, locally sandy loam. Plastic, very variable with paler greyish-brown mottles trending up into the horizons above and beneath. Merging boundary. Type **b**.
6/7–12cm	Yellowish-brown 10YR 5/4 and greyish-brown 10YR 5/2 mottled firm clay loam with very weak blocky structure; occasional fine root hairs. Lower boundary indistinct, gradually merging with the weathered London Clay. Type **c**.
12–33cm	Dark greyish-brown 10YR 4/2 (unweathered) and dark brown 10YR 4/3 to dark yellowish-brown (10YR 4/4) (weathered). Very plastic, firm silty clay; weak blocky structure with occasional vertical and horizontal structure planes. Occasional fine root hairs throughout. Weathered London Clay.

Unlike in Area B there was no obvious sedimentary stratigraphy, or signs of chronological sub-division within the sequence. Horizon **b** showed some signs of chemical reduction but also included small sandy concentrations. There was no real equivalent of context *224* (the prominent Area B upper palaeosol with numerous lithic finds and indications of trampling) in Area C. Although horizon **c** showed some indication of having been the subsoil horizon of a pre-transgression soil, it also showed some evidence of chemical reduction. As pointed out by Macphail (p.20–2), this was probably a result of flooding during the marine transgression, rather than of waterlogging during the period of the occupation of the site.

Excavated contexts

(Figs 2.15–2.17)

263	General context covering area of dark greyish-brown clay loam extending E–W through centre of main area. Features exposed during removal of this moderately thin layer were contexts *269*, *271*, *273*, *275*, *282*, *284*, *291* and *294*. With the exception of *271*, none were evident on the surface prior to the removal of *263*. Finds were recorded according to metre squares as for passes 1-3. During removal of this fill small 'stake-hole' type features were exposed in the west end of 263.
264	Sediment forming part of *263*. Dark greyish-brown clay loam, common charcoal, potsherds, flints and burnt flint.

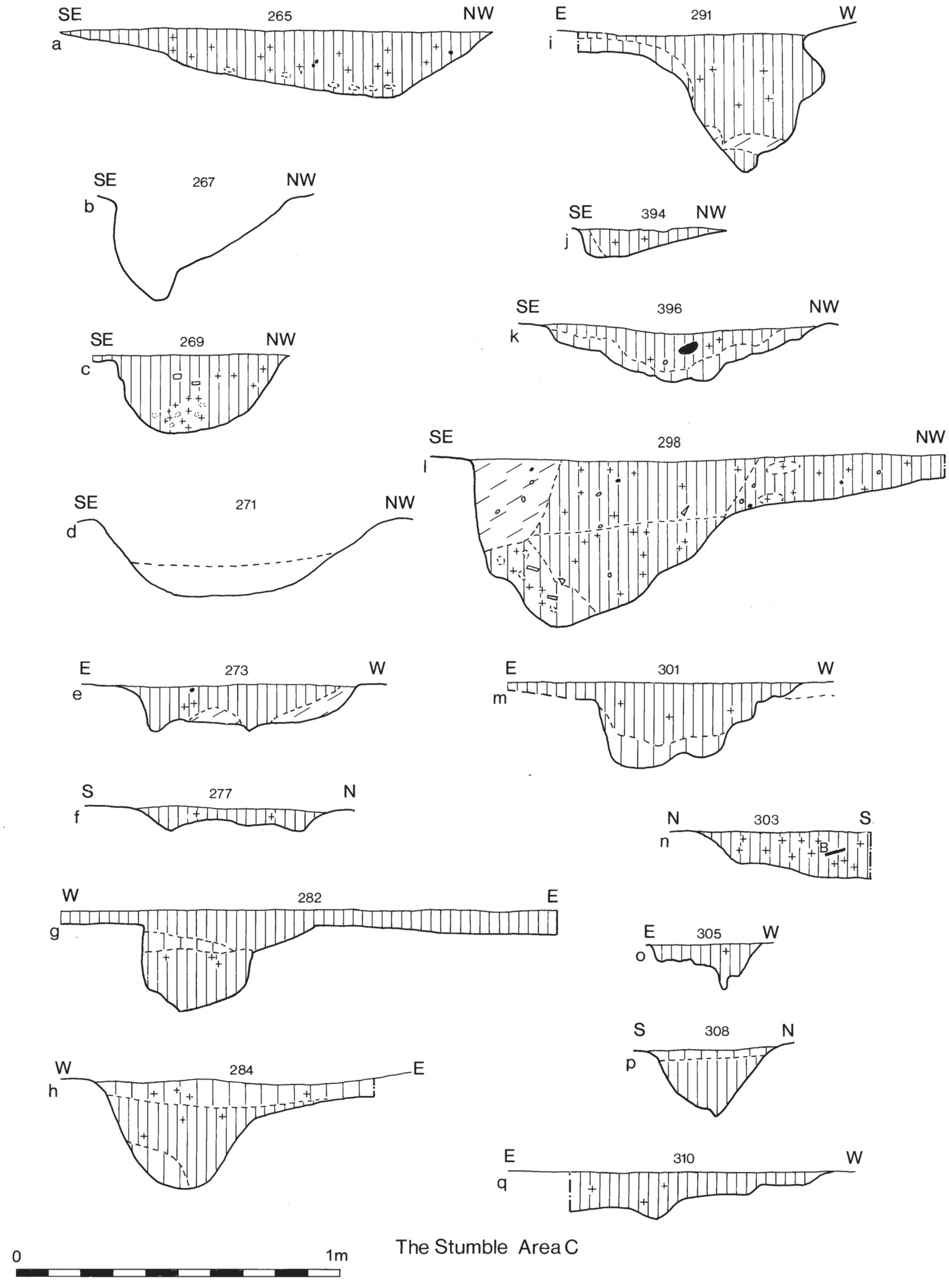


Figure 2.16 Area C: feature sections (i)

265 Sub-rounded pit with gentle side slopes. 1.30m long x 0.90m wide x 0.20m deep. On N side *265* cut the pale grey-brown sandy clay of old land surface (type **b**) as well as the reddish horizon **c** below it.

266 Fill of *265*. Very dark greyish-brown clay loam with inclusions of brown clay subsoil at base of fill. Common charcoal flecks. Pottery included decorated Mildenhall ware. Section Fig. 2.16 a.

267 Post-hole. Irregular in plan, 0.65m x 0.38m. Deepest at SE end; maximum depth 0.33m. 0.03m overhang on SE side was probably caused by slumping.

268 Fill of *267*. Dark grey clay loam, common charcoal flecks. In addition to some pot and flint, burnt flint was abundant. Section Fig. 2.16 b.

269 Post-hole. Circular, W edges slightly truncated by disturbance. Moderately steep sides, 0.50m diameter and 0.24m deep.

270 Fill of *269*. Dark grey clay loam, common charcoal flecks and some small brown lumps in centre of base. Finds included rim fragment 0.12mm long, small fragment of decorated Mildenhall ware and abundant burnt flints. Section Fig. 2.16 c.

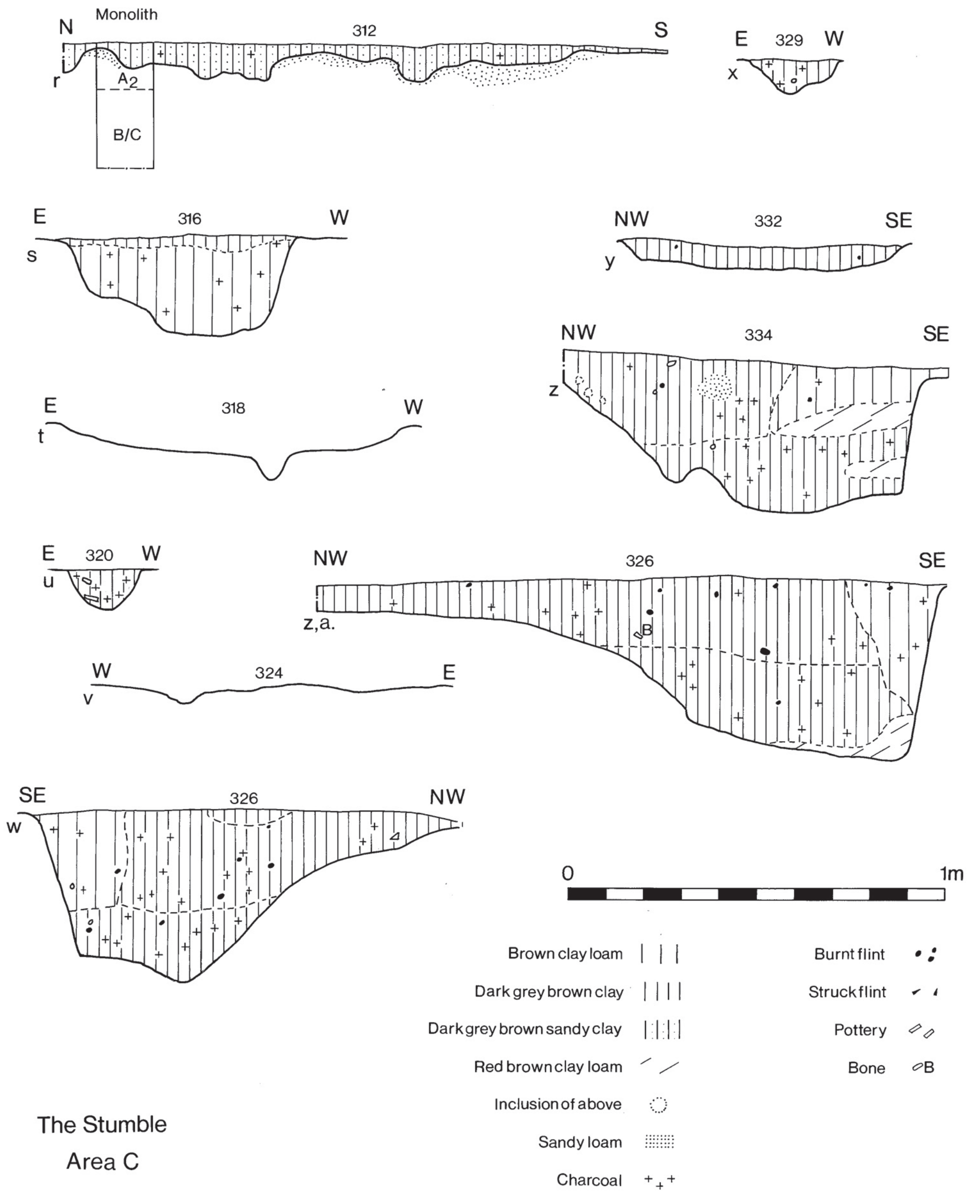


Figure 2.17 Area C: feature sections (ii)

271 Small pit, sub-circular with flat base and moderately gentle side slopes. 0.80m diameter, 0.23m deep. Two fills, *272* and *281*.

272 Upper fill of *271*. Dark grey clay loam *c.* 0.14m thick. Slightly darker than *281* beneath. Frequent charcoal flecks; finds included leaf-shaped arrowhead.

281 Lower fill of *271*. Pale grey clay *c*. 0.10m thick, occasional charcoal flecks and a little pottery and flint. Section Fig. 2.16 d.

273 Exposed by removal of *264*. Connected with *275* and *294* to form crescent-shaped feature 3.40m long. Base and sides irregular, slightly deeper at N end (*c*. 0.20m); c. 0.60m wide.

274 Fill of *273*. Dark grey clay with some reddish-brown clay slumped in at base; occasional charcoal. Section Fig. 2.16 e.

275 Central part of curving feature immediately N of *273*. Originally separated from *273* and *294* by baulks, which were later removed. Irregular base and sides, maximum depth 0.16m. Evidence of slumping in fills and erosion of sidewalls.

276 Fill of *275*. Dark grey clay with reddish-brown inclusions, probably slumped in. Occasional charcoal.

277 Narrow band of dark grey clay loam running E–W. 0.58m wide and 0.04–0.07m deep in excavated segment. Either natural feature or result of trampling.

278 Fill of *277*. Dark grey clay with traces of pale grey at base. Occasional charcoal flecks. Section Fig. 2.16 f.

282 Southern end of 3.00m long elongate feature, the centre and N parts being *284* and *291*. Fairly steep sides with a 0.02m overhang on W side. *c*. 0.40m wide and 0.30m deep. A deeper depression was half exposed near section.

283 Fill of *282*. Dark grey clay with intrusion of reddish-brown subsoil and dark grey clay probably caused by slumping of side. Occasional charcoal. Section Fig. 2.16 g.

284 Middle segment of *282*. Moderately steep sides, with those in the E part being gentler. *c*. 0.60m wide, 0.35m deep; rounded base.

285 Fill of *284*. Dark grey clay with slumped subsoil at base of fill. At top of *285*, 0.07m deep layer of pale grey mixed with dark grey clay. Occasional charcoal. Section Fig. 2.16 h.

291 Northern segment of elongated feature that includes *282* and *284*. Steep sides; W end being gently sloped, but terminating abruptly. *c*. 0.50m wide, 0.43m deep, narrow base. E side lower than W, perhaps as result of erosion, slumping or trampling. W side slightly overhung, perhaps as result of slumping.

292 Fill of *291*. Dark grey clay with inclusions of reddish-brown subsoil, probably slumped. Occasional charcoal. Section Fig. 2.16 i.

293 Trial excavation area measuring 1m x 1m, opened in NE part of main area to investigate a spread of dark greyish-brown clay loam which proved to be thin.

294 Feature exposed by removal of *264*. Probably connected with *273* and *275*, which together made up a 3.40m long curving feature. Irregular base and sides with small ?stake-holes (0.14m and 0.16m deep) at each end, *c*. 0.40m apart. A third ?stake-hole a short distance further E.

295 Fill of *294*. Dark grey clay with some reddish-brown inclusions of ?subsoil in fill. Occasional charcoal. Section Fig. 2.16 j.

296 Shallow pit, half of which lay under baulk. Roughly circular with gently concave sides. Diameter *c.* 0.76m, 0.18m deep.

297 Fill of *296*. Dark grey clay loam with a lighter grey clay and some reddish-brown inclusions. Section Fig. 2.16 k.

298 Curved feature comprising *298* in main area and *326*/*324* in SW area. Total length of feature 3.50m. *298* steep-sided with a steep rounded end reaching depth of 0.50m near the baulk. Width 0.25m in SE part, 0.60m further W. On N side near baulk feature surface was lower as a result of erosion or trampling. On S side subsoil slumping appears to have produced a 0.10–0.20m overhang. Two fills: *299* and *300*.

299 Dark grey clay loam, 0.20m thick with common charcoal. On W and N side traces of reddish-brown subsoil inclusions, and slightly clayey.

300 Lowest fill of *298*. Dark grey clay, with more clay than *299* and also a little darker. On S side slight overhang (?slumping) with traces of reddish-brown inclusions in fill. Common charcoal and other finds, but no burnt flint. Section Fig. 2.16 l.

301 Small pit or post-hole in NW extension. Sub-circular, 0.70m x 0.60m, 0.26m deep with moderately steep sides and slightly irregular base. E edge apparently disturbed by trampling or rodents.

302 Fill of *301*. Dark grey clay loam, some grey or brown clay lumps protruding from sides (slumped?). Reddish-brown inclusions near base. Occasional charcoal. Section Fig. 2.16 m.

303 Shallow scoop running below S and E baulks of NW area. Could link with *322* in SW area. *c*. 0.10m deep. Cut through pale grey sandy loam as well as subsoil.

304 Fill of *303*. Dark grey clay loam with common charcoal. Section Fig. 2.16 n.

305 Small rectangular feature, *c*. 0.30m by 0.20m in plan and 0.20m deep. Steep sides and irregular base. Although possibly a cultural feature, this may be a rodent hole or root disturbance.

306 Fill of *305*. Dark grey clay loam, rare flint, few finds. Section Fig. 2.16 o.

307 General context assigned to finds from various shallow depressions and small linear marks that were probably animal or root disturbances.

308 Circular post-hole 0.38m diameter. Steep sides and almost pointed base, *c*. 0.20m deep. N side disturbed by roots or trampling.

309 Fill of *308*. Dark grey clay loam with thin band of light grey clay at top. Occasional charcoal. Section Fig. 2.16 p.

310 Small linear feature running beneath E baulk of NW area. Irregular, narrow and steep-sided. *c*. 0.60m long from E baulk. Base irregular with deeper depression in centre. Possibly animal/root disturbance but does align with other depressions to W (including *305*).

311 Fill of *310*. Dark grey clay loam, occasional charcoal. Section Fig. 2.16 q.

312 Amorphous feature running under E and N baulks of NW area. Very gradual sloping sides, irregular base, pitted with shallow depressions. Depth *c*. 0.10m.

313 Fill of *312*. Mainly dark grey sandy clay loam with a few patches of light grey/brown sandy loam. Occasional charcoal. Section Fig. 2.17 r.

314 Very shallow scoop in SW area. Oval, 0.80m x 0.55m and 0.03–0.04m deep. Flat base and sloping sides. May link with wide shallow feature *324*. Perhaps part of natural hollow or area of trampling.

315 Fill of *314*. Dark grey clay, occasional charcoal.

316 Post-hole/-pit. Diameter *c*. 0.60m, 0.27m deep, with steep sides and flat base, slightly off-centre. Overcut during excavation. Ground surface slightly lower on N side, perhaps due to trampling.

317 Fill of *316*. Dark grey clay; except for upper 0.02–0.03m which was mixed with traces of reddish-brown subsoil. Common charcoal. Section Fig. 2.17 s.

318 Elongate feature *c*. 1.50m long, 0.90m wide. Two segments excavated separated by small baulk. Only 0.08m deep, with gently sloping sides. Large piece of fired clay was pressed into base. Cut into reddish-brown subsoil with black mottles. Possibly a trampled depression.

319 Fill of *318*. Dark grey clay, rare charcoal. Section Fig. 2.17 t.

320 Stake or post-hole. 0.21m x 0.18m in plan, c. 0.11m deep. Steep sides and round base; cut into black-mottled subsoil. Possibly related to another stake-hole (*329*) to the E, with *318* occupying intervening area.

321 Fill of *320*. Dark grey clay loam, common charcoal. Section Fig. 2.17 u.

322 Shallow scoop, 0.07–0.08m deep. Excavation restricted by N and E baulks of SW area. Gently sloping sides. Appeared to cut *336* in plan, although this was not obvious in section. Could link with *303* to N.

323 Fill of *322*. Very dark grey clay, common charcoal and moderately frequent finds.

324 Wide, shallow feature extending *c*. 2.00m from N baulk of SW area. Appears to include *314*. Gently sloping sides, 0.05–0.06m deep. Trampled area or natural depression.

325 Fill of *324*. Dark grey clay, occasional charcoal. Section Fig. 2.17 v.

326 Segment of crescent-shaped feature, comprising also *298* and *334*. Steep on SE side, gentler on NW side; width *c*. 1.10m, *c*. 0.50m deep. Signs of slumping on SE side. NW side lower, perhaps as result of erosion or trampling. Circular depression in base may have supported a post.

327 Top fill of *326*. Dark grey clay loam *c*. 0.22m thick. Common charcoal. On NW side indistinguishable from *323* (fill of *322*). Finds included several pieces of unburnt bone.

328 Middle fill of *326*. Dark grey clay with dark grey sandy loam and inclusions of reddish-brown subsoil probably resulting from slumping. Common charcoal.

331 Lowest fill of *326*. Very dark grey clay, with more clay than overlying *328*. Common charcoal (more than *328*). At bottom on SE side mixed with reddish-brown subsoil, probably slumped. Finds included unburnt bone, one piece of which was pressed into subsoil at base of feature. Sections Fig. 2.17 w and za.

329 Oval stake-hole, *c*. 0.15 x 0.22m and 0.09m deep. Moderately steep sides, rounded base.

330 Fill of *329*. Dark grey clay with occasional charcoal. Section Fig. 2.17 x.

332 Shallow scoop. Sub-rectangular 0.80m long and 0.40–0.50m wide. Gently sloping sides and flat base. *c*. 7cm deep.

333 Fill of *332*. Dark grey clay loam; rare charcoal. Section Fig. 2.17 y.

334 West terminal segment of crescentic feature. Steep slopes on both SE and NW sides. *c*. 1.00m wide, maximum depth 0.40m. Moderately steep at terminus; evidence of apparent slumping.

335 Fill of *334*. Dark grey clay, lowest 0.20m being darker and more clayey than above. On SE side especially reddish-brown subsoil and dark greyish-brown inclusions suggest slumping. Common charcoal. Finds included decorated Mildenhall Ware rim and numerous other finds. Section Fig. 2.17 z.

336 2m long strip, 0.70m wide excavated in dark grey soil. Area partly excavated as *322*. Soil 0.02–0.03m deep infilling shallow depression, possibly natural hollow caused by trampling. Tenuous connection with *314* and *324* to W.

337 Fill of *336*. Dark grey clay, occasional charcoal.

Interpretation of features and fills

The small area excavated did not necessarily encompass any habitation feature in its entirety. If the excavated extent of Area C is superimposed over, for example, the plan of one of the Bronze Age long houses from Molenaarsgraaf, the Netherlands (Kooijmans 1974, figs 72 and 73), it is evident that the chances of picking up a clear, unambiguous ground plan of a building are not great. This problem is compounded by the likelihood that parts of several building phases are present. Therefore, despite the quality of much of the feature data, the scale of excavation may have been insufficient to allow fully developed interpretation of any structures that were once present here.

In plan and profile the features appear to represent the full range to be expected in such an occupation environment, ranging from very shallow scoops (*277*, *310*, *332* and *324*) through small pits and possible post-holes (*265*, *267*, *269*, *271*, *296*, *301*, *305*, *308*, *316*, *320* and *329*) to larger, more amorphous features (*282*/*284*/*291*; *273*/*275*/*294*; *298*/*326*/*334*). In addition, there were a number of features that can only be categorised as 'miscellaneous'.

It is almost certain that a number of the shallowest features, such as *312*, resulted from trampling and disturbance of the ground under wet conditions. This process probably resulted in the soil being converted into a slurry, with the result that only minor residual areas of original topsoil now remained (*e.g*. the stippled sandy loam in *312*: Fig. 2.17 section r).

Larger cut features frequently had at least one very steep side, which sometimes resulted in localised collapses. This was sometimes indicated by large inclusions of reddish-brown subsoil material within feature fills, or by fills that appeared to run underneath adjacent bodies of natural subsoil (*298* section l; *326* sections w and za (*328*); *334*, red-brown clay loam). Although these larger features might also have resulted from disturbance their depth argues against this, as does the presence of collapsed sediments. Evidence for rapid fill or backfill is lacking, but the fine-grained homogenous appearance of fills, which contained many artefacts and burnt flints as well as much carbonised material, suggests that infill took place slowly in an environment that saw considerable human activity and associated dumping.

That trampling contributed to the formation of the shallower features (*e.g*. *312*, *273*, *277* and *310*) is suggested by the frequency of worn and abraded sherds, as well as the irregular profile of some features. Such activity would have generated high localised sediment yields, which would then have led to nearby features becoming infilled rapidly. To complicate interpretation further, some larger features may have included post-holes or may have represented timber slots which also held upright posts (*e.g*. *282*/*291*, *298*/*326*).

Feature fills in Area C were significantly darker than those of Areas A/B and E, which suggests either that occupation and associated rubbish accumulation was more intense in Area C, or that more organic material was deposited there. It might therefore be suggested that this area lay closer to the centre of habitation (*c.f*. Kooijmans 1974, 194–5). Certainly the combination of dug features, trampling and abundant cultural debris suggests that the remains noted in Area C were not simply those of a midden.

To conclude, despite the excellent preservation of much of the evidence, the small size of the area that could be excavated and the clear signs of multiple phases of use (Holgate, Part 4) mean that no straightforward structural interpretation or ground plan can be inferred. Indeed, the quality and quantity of stratigraphic and artefactual preservation may in fact have complicated interpretation within such a small area, with the recording of artefact distributions and numerous small features effectively generating a 'background noise' which made it hard to identify and interpret special patterning. Nevertheless, many of the features appear to have been dug either as post-holes to contain upright posts of buildings, or as storage pits. Specifically, pits and post-holes *269*, *271* and *301* resemble features from Hurst Fen, Mildenhall (Clark 1960). If these features relate to buildings, it is likely that other component features of these structures lay beyond the excavated area. Alternatively some of the larger, more amorphous, features may have been dug to provide clay for the walls of buildings.

3. Later Neolithic and Early Bronze Age

I. Introduction

(Fig. 1.2)

Due to the predominance of Early Neolithic lithics across virtually the entire site (Holgate, Part 4), it is not possible to indicate whether or not particular areas saw exclusively Early or Late Neolithic activity. Nevertheless, there are areas where Late Neolithic and Early Bronze Age activity (dated to *c.* 4000 radiocarbon years BP) can be identified, and those areas which provide the best evidence for these periods are described in this section of the report. Archaeological remains of these periods at the Stumble were usually found either on or cut into the old land surface, but the Late Neolithic/Early Bronze Age evidence differed markedly from that for earlier Neolithic activity in Areas A/B/E and C. Where Late Neolithic and Early Bronze Age remains were present the surface finds assemblage was usually dominated by burnt flint which was largely unstruck. Indeed four of the five areas described here — contexts *99*, *117*, *118* and *231* — featured the remains of burnt flint mounds, and associated artefacts other than burnt flint were almost entirely absent. Only in Area D did the evidence share some of the characteristics of that recorded in the earlier Neolithic areas.

II. Areas D, G and H

(Figs 1.2, 3.1–3.4)

Area D, sampled and excavated in 1987, was located some 150m west of the earlier Neolithic area (Fig. 1.2), where struck flints and burnt flints were sporadically scattered across the old land surface. Initial survey and surface collection in 1986 indicated the approximate limits of the spread and recorded the surface density of struck flints over a broad area which was designated context *124*. Area D, measuring 10m east–west x 20m north–south, was laid out at the eastern end of *124*. A collection was made of all burnt flints, struck flints and pottery from each meter square within its extent (Figs 3.1 and 3.2). Only two small areas, one along the west baulk and a second in its north-east part, were not sampled

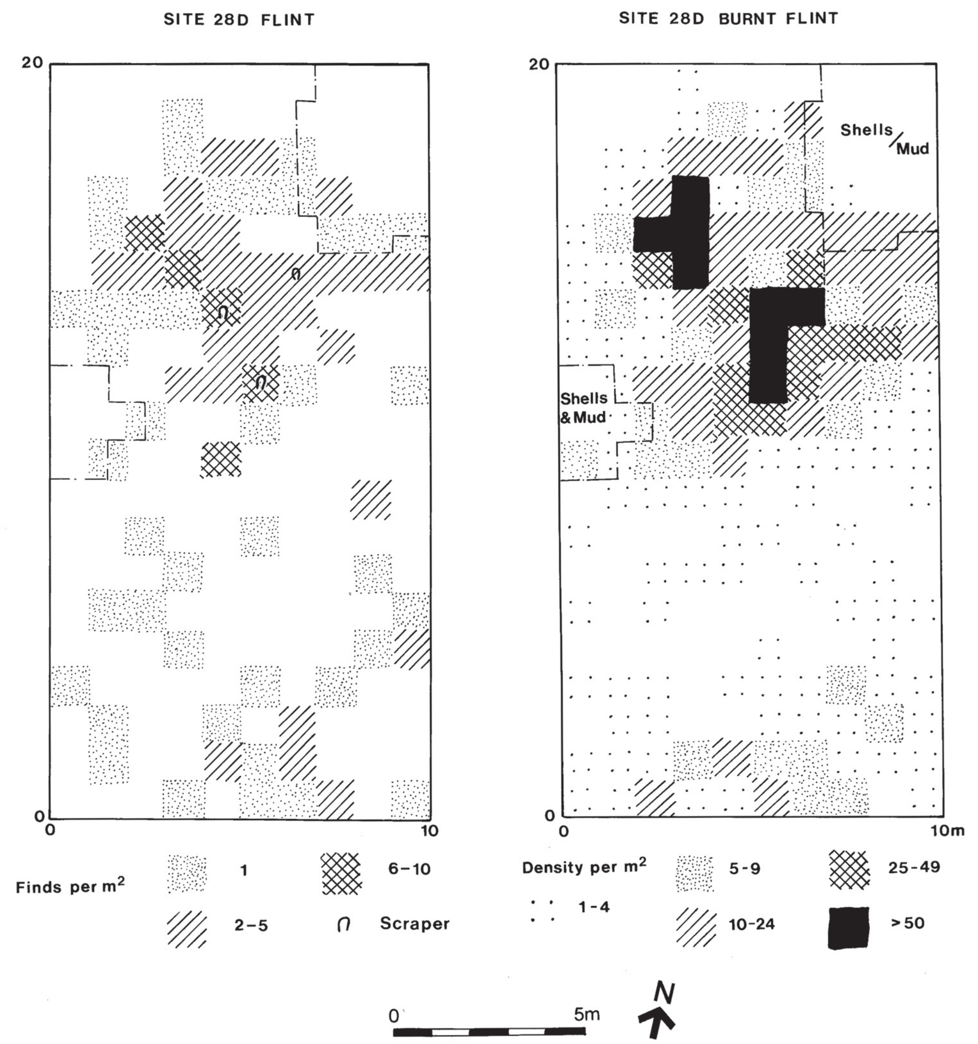


Figure 3.1 Area D: density of burnt flints per sq. m; density of struck flints per sq. m

because of the presence of obscuring deposits of recent shells and mud.

In 1988 two further surface collection areas — G (15m x 10m) and H (10m x 10m) — were laid out, to the south and south-west of Area D respectively, in order to extend sampling of a surface concentration of burnt flint, context *117* (below, p.40).

In Area D the distributions of burnt and struck flints were very similar, with a relatively dense scatter in the northern part of the area (Fig. 3.1). These distributions reflected the presence of underlying features that were subsequently excavated. The presence of three scrapers within the surface flint scatter suggests perhaps that specialised activities were carried on in this area (Holgate, Part 4). Pottery, by contrast, was concentrated to the south of the main flint scatter (Fig. 3.2). All sherds were remarkably similar to one another, but no rims or other diagnostic sherds were present to indicate a date. This rather dense scatter corresponded neither with any recorded flint scatter nor with the presence of pits and related features; it is tentatively suggested that it represented a single vessel that was broken, perhaps in antiquity and remained virtually *in situ* in its final resting place until uncovered by tidal erosion of the old land surface. Diagnostic Late Neolithic pottery was not found on the surface within the area of 1m square sample collection, but several very soft Grooved Ware sherds were collected at a number of locations immediately to the south-east and east of Area D (Brown, Part 4).

Areas G and H were positioned on the edge of deposit *124*, where the surface concentration of artefacts and burnt flints was particularly noticeable. Each area was laid out and sampled according to a 1m grid. Area G, immediately south of Area D and measuring 10m x 15m, included part of the burnt flint concentration *117*. Pottery, entirely prehistoric and predominantly flint-gritted, was sparse in Area G but more prevalent in Area H to the south west (Figs 3.3 and 3.4). This sampling area, measuring 10m x 10m, exhibited a fairly even scatter of struck flints and a similar but sparser scatter of flint-gritted pottery. There was nothing to suggest that the pottery was associated with the burnt flint, although in previous field seasons one or two sherds of Grooved Ware had been picked up from the burnt flint deposit and its environs. The abundance of flint-gritted pottery relative to Grooved Ware is not surprising, because the former is much harder and more likely to survive the rigours of intertidal erosion. Indeed much of the Grooved Ware collected was in a semi-disintegrated state. No further investigations were undertaken in Areas G and H after the initial collection.

Following surface collection at Area D the old land surface of pale grey sandy loam was exposed over an area indicated on Fig. 3.5, other than in areas where features filled with grey, greyish-brown or black clay loam were evident. These were partially excavated (Figs 3.6 and 3.7).

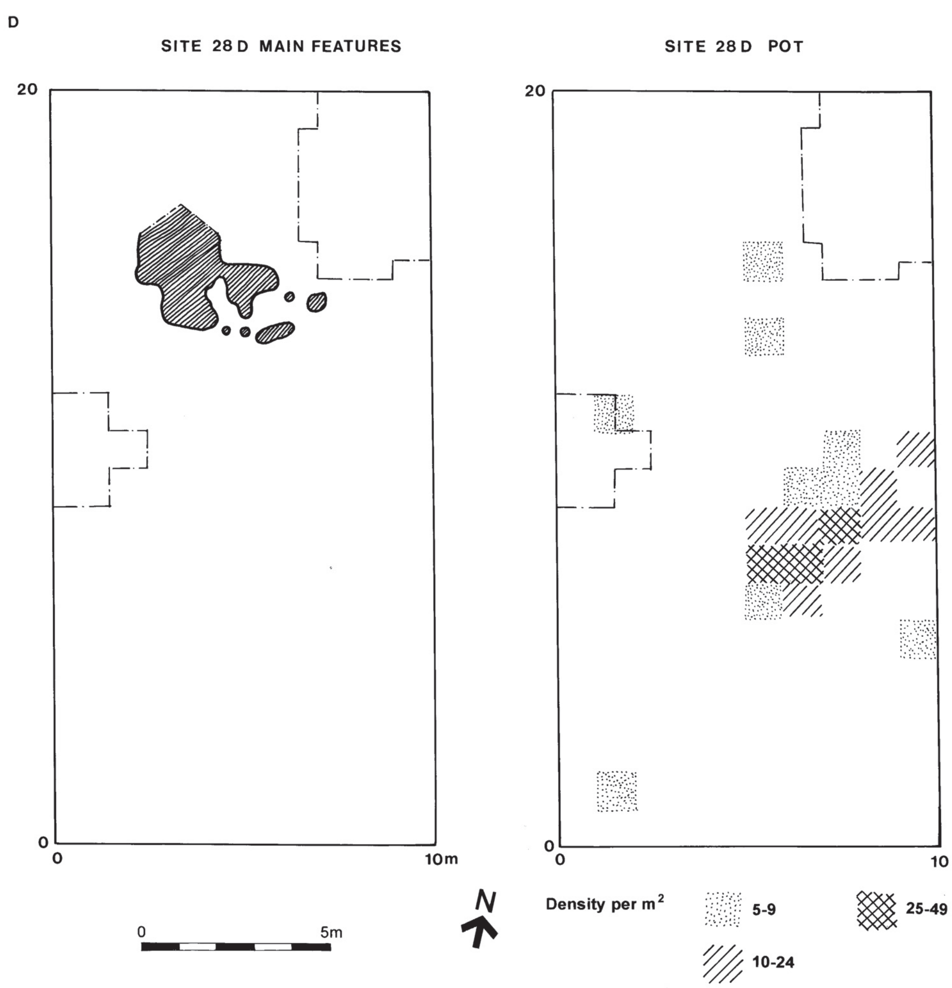


Figure 3.2 Area D: density of potsherds per sq. m from main excavated features

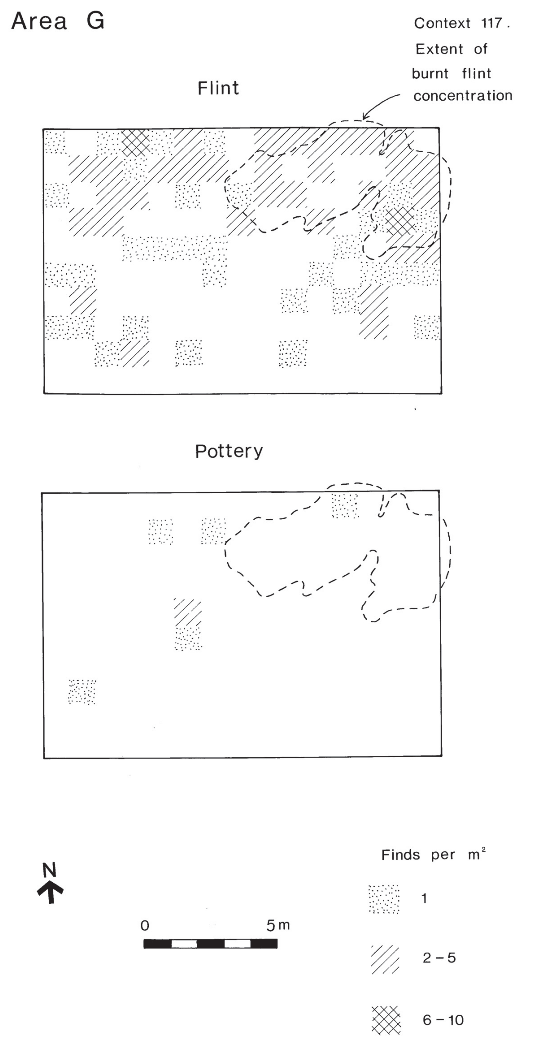


Figure 3.3 Area G: density of struck flints per sq. m; density of pottery per sq. m

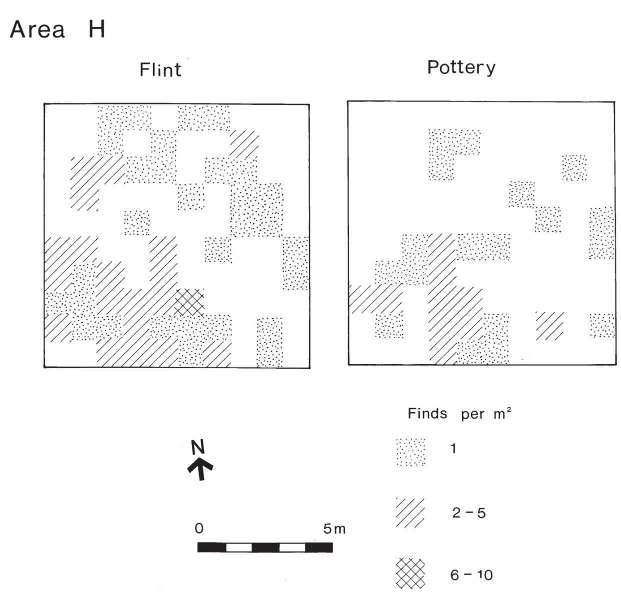


Figure 3.4 Area H: density of struck flints per per sq. m; density of potsherds per sq. m

Area D excavated contexts
(Figs 3.5–3.7)
The feature fills take the same context numbers as the feature containing them unless specified otherwise.

208 Irregular, shallow depression 2.00m NW–SE, 1.00m NE–SW, 0.02–0.05m deep (occasionally 0.14m where cut by possible post-holes: *228*, *229*). NB: a possible post-hole *c*. 0.75m from the NW end of the section line was probably just an arbitrary overcut. Fill: mainly dark grey loam, occasional to common charcoal fragments, common burnt flints (72 from first sector).

209 Oval shallow depression, 0.40m N–S, 0.50m E–W, max. depth 0.07m. Fill: very dark grey loam with abundant charcoal. A slightly abraded Beaker base sherd came from the base of the pit.

211 Possible post-hole, *c*. 0.30m diameter, 0.20m deep. Fill: dark grey sandy loam, common charcoal.

212 Possible post-hole, *c*. 0.20m diameter, 0.20m deep. Fill: dark grey loam, some charcoal.

213 Large, irregular depression in N and NE part of Area D. Excavated by a single trench, which showed the feature had a maximum depth of 0.15m. Fill: grey estuarine clay, no charcoal, burnt flints or artefacts.

216 Irregular depression 1.50m E–W, *c*. 0.90m N–S; merged with *217* to NW. 0.09m maximum depth. Fill: dark grey loam, common charcoal, occasional burnt flint. To the E an area of pale grey clay containing occasional charcoal and burnt flints was excavated within an arbitrary cut. This clay deposit was not the same as the feature fill, but was either a cultural deposit or an area of disturbance containing cultural material.

218 Shallow depression 0.40m N–S, 0.40m E–W, *c*. 0.07m deep. Fill: Grey clay loam, occasional charcoal.

219 Shallow oval depression 1.10m NE–SW, 0.50m NW–SE. 0.09m deep at deepest point. Fill: dark greyish-brown clay loam, abundant burnt flints (32+ in SW sector, 57+ in NE sector of half-sectioned pit); abundant charcoal. Fill of SW sector of pit contained several large but very soft fragments of disintegrating Grooved Ware.

228 Possible post-hole cut into fill of *208*. 0.25m diameter, 0.14m deep. Fill dark grey loam, common charcoal, occasional burnt flints. (Not illustrated).

229 Possible post-hole cut into fill of *208*. *c*. 0.23m diameter, 0.16m deep. Fill: as for *228*. (Not illustrated.)

Other excavated features, the sections of which were not drawn, included the following.

215/217 Broad area of very shallow fill extending over *c*. 2.00m E–W by 1.80m N–S. Mainly less than 0.05m deep. Fill: dark grey loam with occasional charcoal fragments, merging into pale grey clay/clay loam to N and NE. The latter deposit resembled that to the E of *216* and contained occasional burnt flint and charcoal. No clear limit was evident to the NE, N and NW, and the boundaries indicated on Fig. 3.6 are arbitrary. Charcoal became abundant towards the centre of the feature. Several Grooved Ware sherds were recovered from the central area.

Other features not numbered on the soil mark plan (Fig. 3.5) were shallow irregular pits with a pale greyish-brown clay/clay loam fill containing occasional flecks of charcoal.

A soil section through deposits *c*. 1m east-north-east of context *219* recorded the following sequence.

0cm Level of cleaned surface of Area D.

0–10cm Firm, pale brown silty or fine sandy clay loam. Massive structure, with abundant fine vertical root-holes; occasional stones. Slightly clayey with some charcoal and burnt flints in upper part. Merging boundary.

10cm+ Very firm yellowish-brown clay loam mottled with olive green. Fine vertical root-holes. Subsoil developed on London Clay.

There were no artefacts in the soil profile and the only cultural material was sparse charcoal and burnt flint in the upper subsoil (0–10cm). Unlike in Area B, excavation of the upper subsoil did not produce significant quantities of artefacts and it seems unlikely that this deposit obscured or overlay additional structures at greater depth.

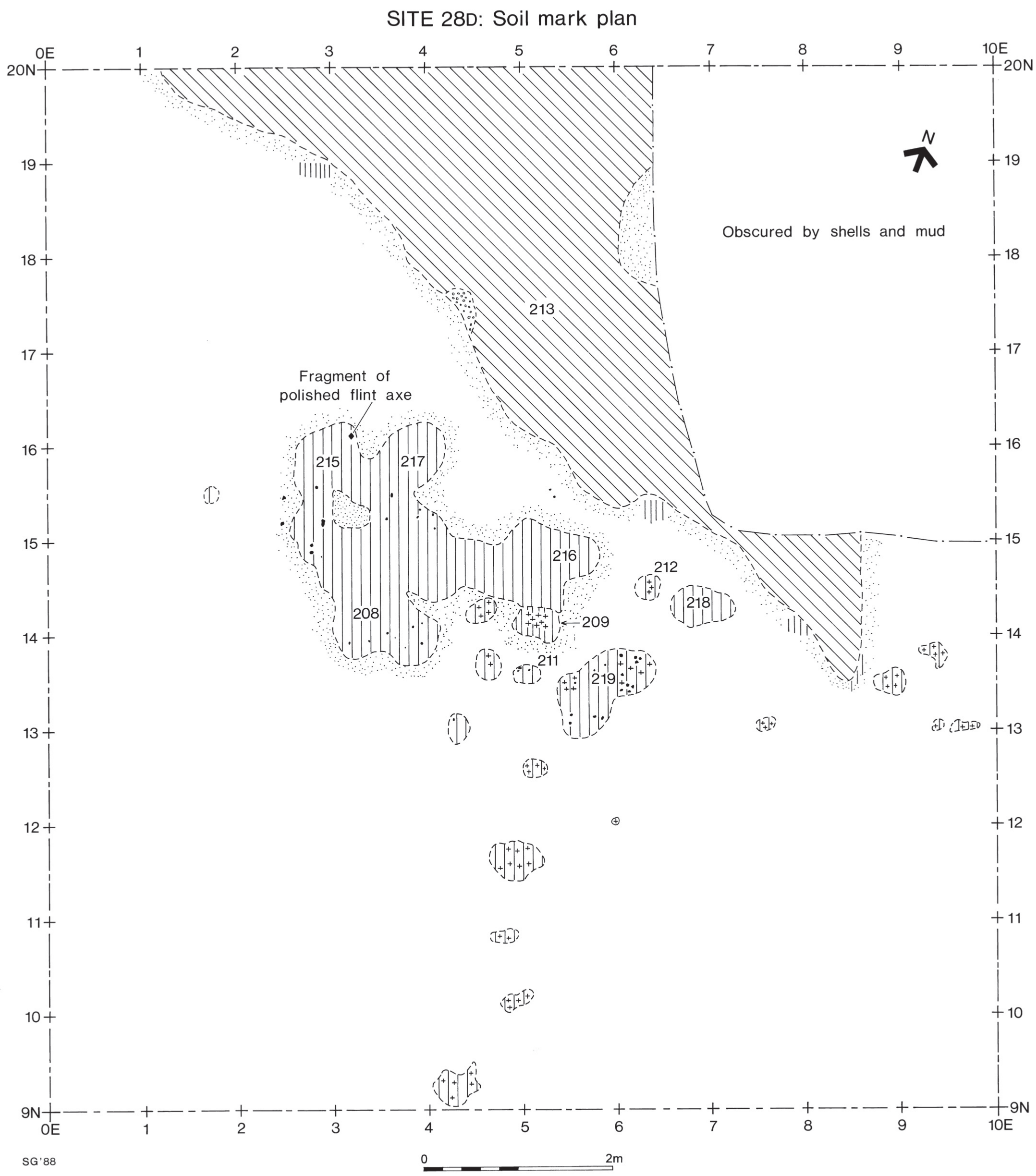


Figure 3.5 Area D: soil-mark plan

Discussion

The surface distribution of flint and burnt flint within Area D was directly related to the presence of underlying features. The surface scatter of flint-gritted pottery may, however, represent nothing more than the chance occurrence of a single broken pot, while Grooved Ware sherds are too few to allow their distribution to be interpreted.

Context *208* (Fig. 3.6), although similar to what Warren described as a 'cooking hole' (Warren *et al.* 1936, 179), had such gently-sloping side walls, and was so shallow and irregular, that it may not have been a dug feature at all. Instead it may, together with adjacent features *215*, *216* and *217*, have resulted from trampling, either by animal hooves or by human feet. No individual prints were recognizable, however.

Context *213* (Fig. 3.6), distinguished by its large size, its estuarine clay fill and the absence of occupation debris, may be compared with similar feature *183* in Area B (above, p.22–3). In both cases the clay-filled depressions seemed to be part of more extensive systems of anastomosing hollows, which perhaps formed the head reaches of an infilled system of minor creeks. The significance of the location of burnt flint scatters adjacent to such putative creeks is discussed below.

No coherent pattern can be inferred from the arrangement of the post-hole-type features *211*, *212*, *228* and *229* (Fig. 3.6). One pair of these features, *228* and *229*, was rather shallow and unlikely to have been structural. By contrast, *211* and *212* were deeper and more like 'true' post-holes. All that can be hazarded is that these two pairs of features may have been traces of one, or perhaps two, simple shelters.

The excavated features yielded abundant burnt flints, significantly more than in features at the earlier Neolithic site. Also present were numerous struck flints (Holgate, Part 4), a significant number of flint scrapers and one or two scraps of polished flint axe, as well as a small amount of Grooved Ware and one Beaker sherd. Burnt flint scatters immediately to the south of Area D (context *117*) were also associated with one or two sherds of Grooved Ware, and it is therefore possible that the remainder of the burnt flint scatters or mounds at the Stumble are of

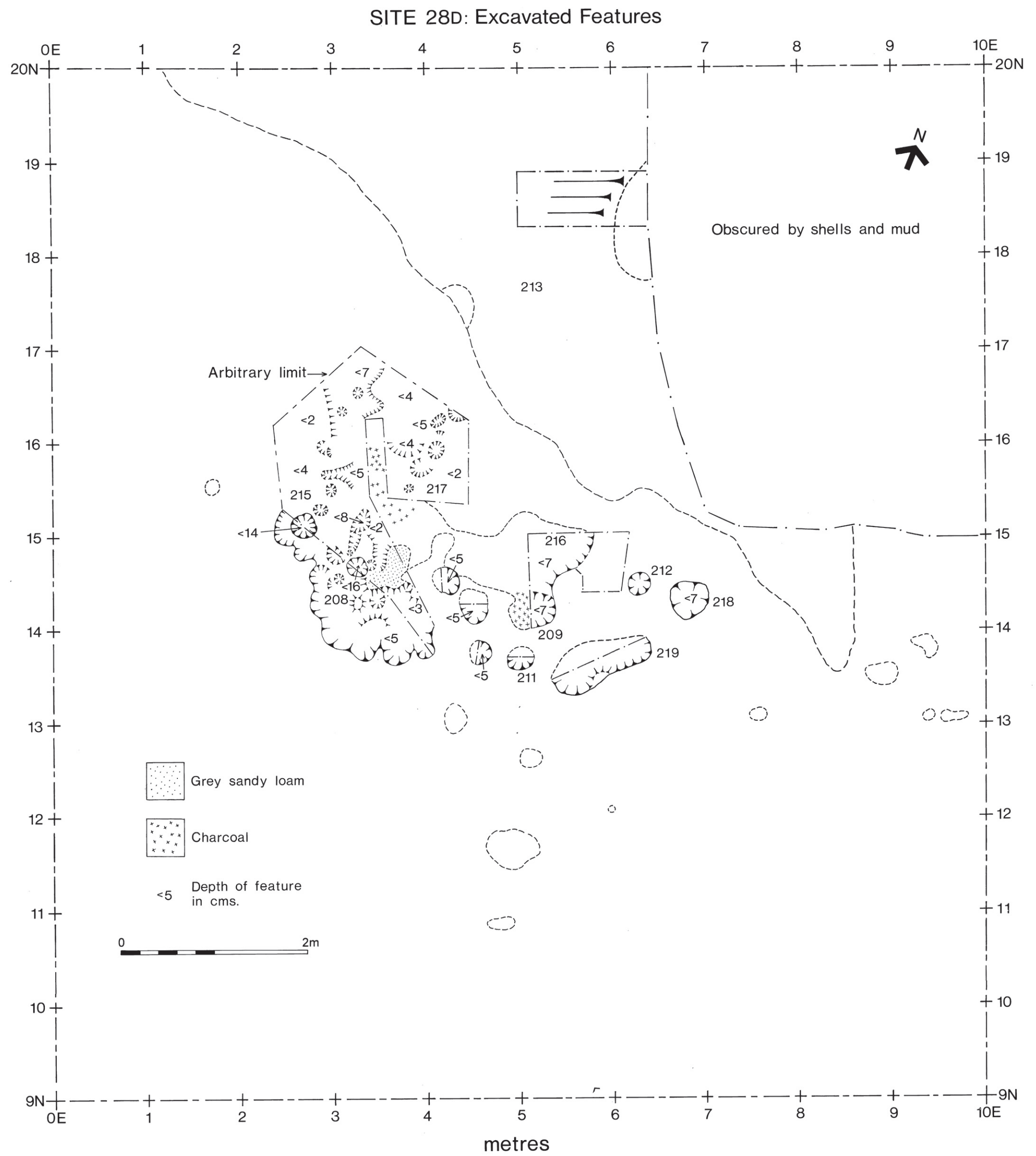


Figure 3.6 Area D: plan of excavated features

later Neolithic or Early Bronze Age date (see context *231*: below, p.41).

In conclusion, the presence of Grooved Ware and Beaker pottery suggests that Area D had been a later Neolithic activity area. However, the presence of flint-gritted sherds and typologically earlier Neolithic struck flints (Holgate, Part 4) suggests that it had also seen significant earlier activity. Although some of the remains could be interpreted as being traces of occupation, the nature of the activity remains obscure. A more wide-ranging discussion of the evidence from Area D will follow at the end of Part 4 (below, p.61–2, 69).

III. Burnt flint mounds and scatters

(Figs 1.2, 3.8 and 3.9)

Context *99*
(Fig. 1.2)
Of the five burnt flint concentrations identified at the Stumble, this had a partially sealed stratigraphic context, but because an account has already been published (Wilkinson and Murphy 1995: 80–1) it will not be described here. This very low mound measured 6.10m NE–SW and 6.20m NNW–SSE. The heat-shattered flints, which formed a layer 0.03–0.09m thick, were located along the interface between the mineral soil of the old land surface and the overlying 'lower peat', and extended beneath the 'lower peat' to the east. In contrast the other examples were without a sealed stratigraphic context.

Context *117*
(Fig. 1.2)
During the preliminary survey of the area of context *124*, context *117* emerged from the general pattern of recorded artefacts as a concentration (although at relatively low density) of burnt flints. Subsequent mapping and investigation (Area G) defined the limits of the area as 8m E–W by 4m N–S (Fig. 1.2 and 3.3). In addition to the burnt flint, struck flints were significantly more common than pottery (above, p.37). Struck flints were concentrated around the periphery of the burnt flint concentration as well as to the

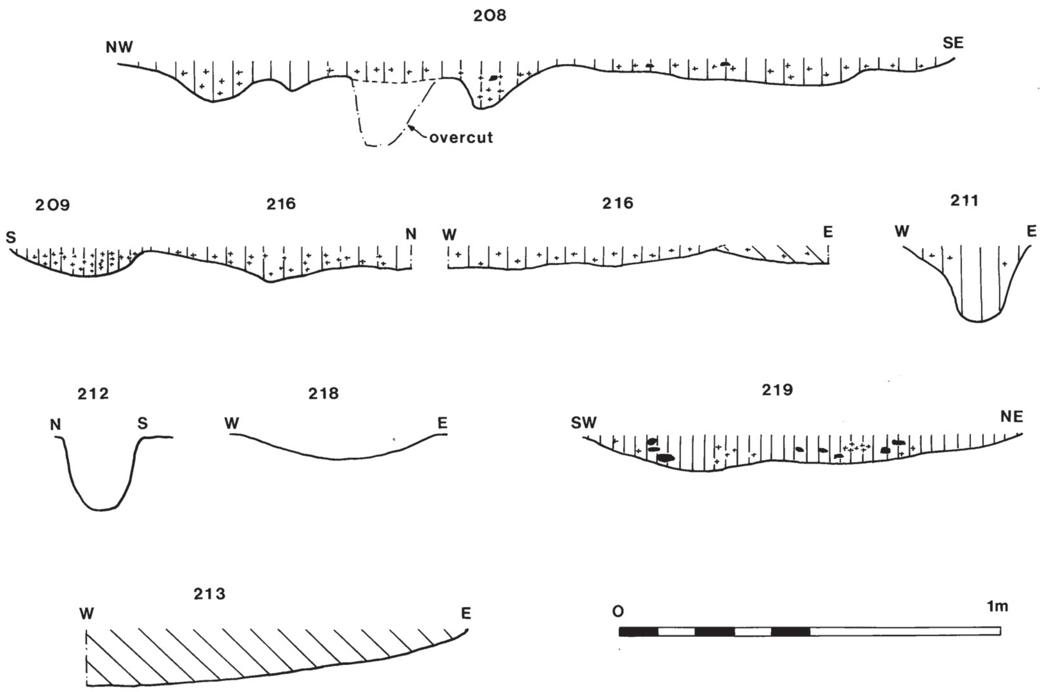


Figure 3.7 Area D: sections across excavated features

west. This continued the scatter recorded in 1987 at the south end of Area D (Fig. 3.3).

Because the moderately dense scatter of struck flints relates to the burnt flint area, context *117* more closely resembles the remains in Area D than the other burnt flint mounds *99* and *231*.

Context *118*
(Fig. 1.2)
Context *118* was a poorly defined scatter of heat shattered flints located on the western edge of context *124*, an extensive exposure of old land surface producing a moderate density scatter of struck flints and occasional pottery (above, p.9). In addition to the burnt material a single blade was recovered.

Context *231*
(Figs 1.2, 3.8 and 3.9)
Situated *c*. 100m to the south-west of Area D, this dense concentration of burnt flint (with some relatively recent mollusc shells), measured 10.00m N–S by 8.90m E–W and rose to a maximum height of *c*. 0.10m above the adjacent old land surface. In plan the feature formed a distinctive tight crescent shape, with a marked re-entrant oriented south-east–north-west towards the mound centre. The burnt flints overlapped a broad clay-filled feature towards the west. This may have been a relict creek but time did not allow for its full investigation. The eastern two thirds of context *231* rested on the old land surface of pale grey sandy loam. At one point (the east end of section C), the burnt flint deposit was seen to run under a thin accumulation of 'lower peat' (section Fig. 3.9) which occupied much of the area to the east of the mound. This means the flint concentration pre-dated the lower peat and occupied a stratigraphic context equivalent to burnt flint mound *99* (above, p.40). A fragment of a twig from fill *279* within the series of shallow depressions *280* yielded a radiocarbon date of 3885±70 BP, suggesting an approximately similar date to that provided by ceramics for the Late Neolithic/Early Bronze Age activity in Area D.

It was only possible to excavate a 2.60m (N–S) x 2.80m (E–W) area of the eastern part of this burnt flint concentration (Fig. 3.8). After the removal of 0.02–0.10m of heat-shattered flint and shell from this area, the following features and fills were exposed (Fig. 3.9).

280 Shallow feature, sectioned along the N baulk and comprising an irregular series of shallow depressions <10cm deep.

279 Fill of *280*. Black and dark grey clay loam, dominated by burnt flints and burnt gravel, much of it <10mm diameter. Common–abundant wood charcoal contained in a matrix that included abundant charcoal dust. Common olive concretions of clay or claystone, with a reddish-brown soft weathering rind. These appeared to be London Clay nodules that had become olive green as a result of prolonged waterlogging. *279* ran below the 'lower peat' to the east.
Fill of feature to west contained black loam containing abundant burnt flint and charcoal, at least some of which appeared to be wood charcoal.

286 Complex gully feature in western part of excavated area. Maximum depth 0.19m.

287 Fill of segment *286*a. Black, common charcoal; few claystone nodules; common burnt flints. Base of feature apparently lined with brown fibrous organic material (*289*) which resembled decayed wood.

288 Fill of segment *286*b. As for *287*, in section could be seen to be subdivided as follows:
Upper fill: Dark grey gritty clay with common charcoal.
Lower fill: Grey silt loam with occasional charcoal flecks. Fibrous organic deposit (*289*) evident on base.

289 Brown organic material below *288*.

Interpretation
Several features make this burnt flint mound very similar to those identified elsewhere at the Stumble, as well as at other localities in Britain. The position of the mound next to a possible creek is often seen, and suggests the need for a substantial water supply. The central re-entrant may have been the location of a pit or similar feature of the kind reported by Barfield and Hodder (1987), but

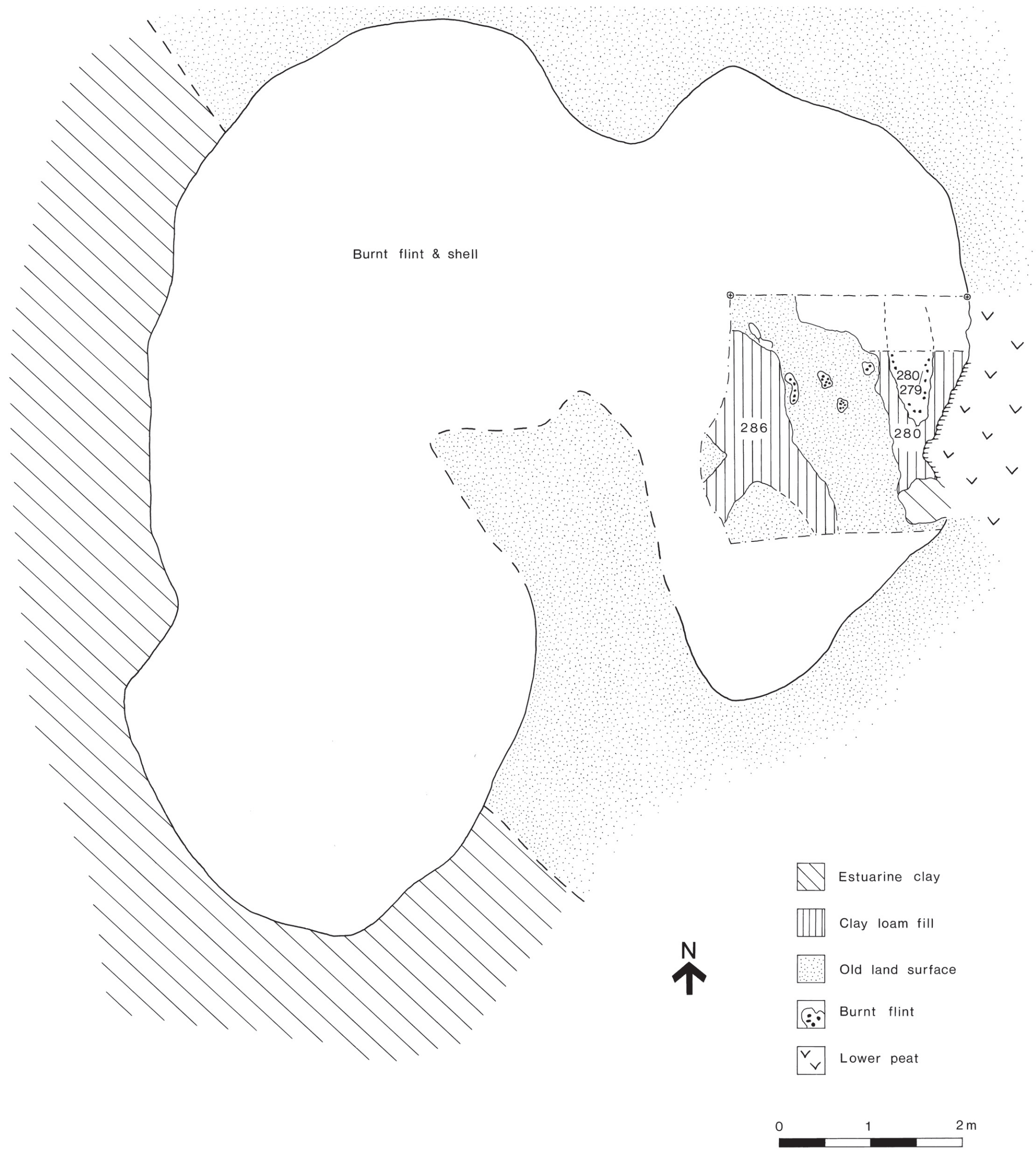


Figure 3.8 Burnt flint mound, context *231*

this was not investigated during the 1988 field season. Alternatively, this space could have contained a structure or some activity area around which the burnt flints accumulated. The features revealed within the excavated area are so shallow and irregular that they, like equivalent features in Area D, may simply have resulted from prolonged trampling. The organic deposit *289* on the base of the feature could be interpreted as a former pit lining for retaining water (Barfield and Hodder 1987, 370); equally, however, it may just have been stray organic matter that had been preserved by rising water levels. The absence of artefacts is another characteristic of burnt mounds (*ibid*., 370), but the presence of significant quantities of nut-sized fragments of claystone (apparently derived from London Clay) has not been reported elsewhere.

Although the function of the burnt flints remains uncertain the dating of the mound to *c*. 4000 BP (later Neolithic) seems clear. This corresponds to the period when water levels at the Stumble were rising. It would appear that shortly after the burnt flints had accumulated, water levels were sufficiently high to result in the preservation of organic materials within a high saltmarsh environment.

Context *258*
(Fig. 1.2)
This was an ill-defined scatter of burnt flints, largely sand-covered, which had not been recognised in previous field seasons. It was apparently situated on the clay fill of an infilled creek, in its central part.

IV. Discussion

The analysis of flints from Area D and adjacent areas (Holgate, Part 4) suggests that this area saw activity over a long span of time. This differs from the original impression gained during survey. All of the locations investigated in the field and discussed in this chapter exhibit one common factor — the presence of abundant calcined flint. Because heated flints could have been used for a variety of purposes, including cooking meat, heating

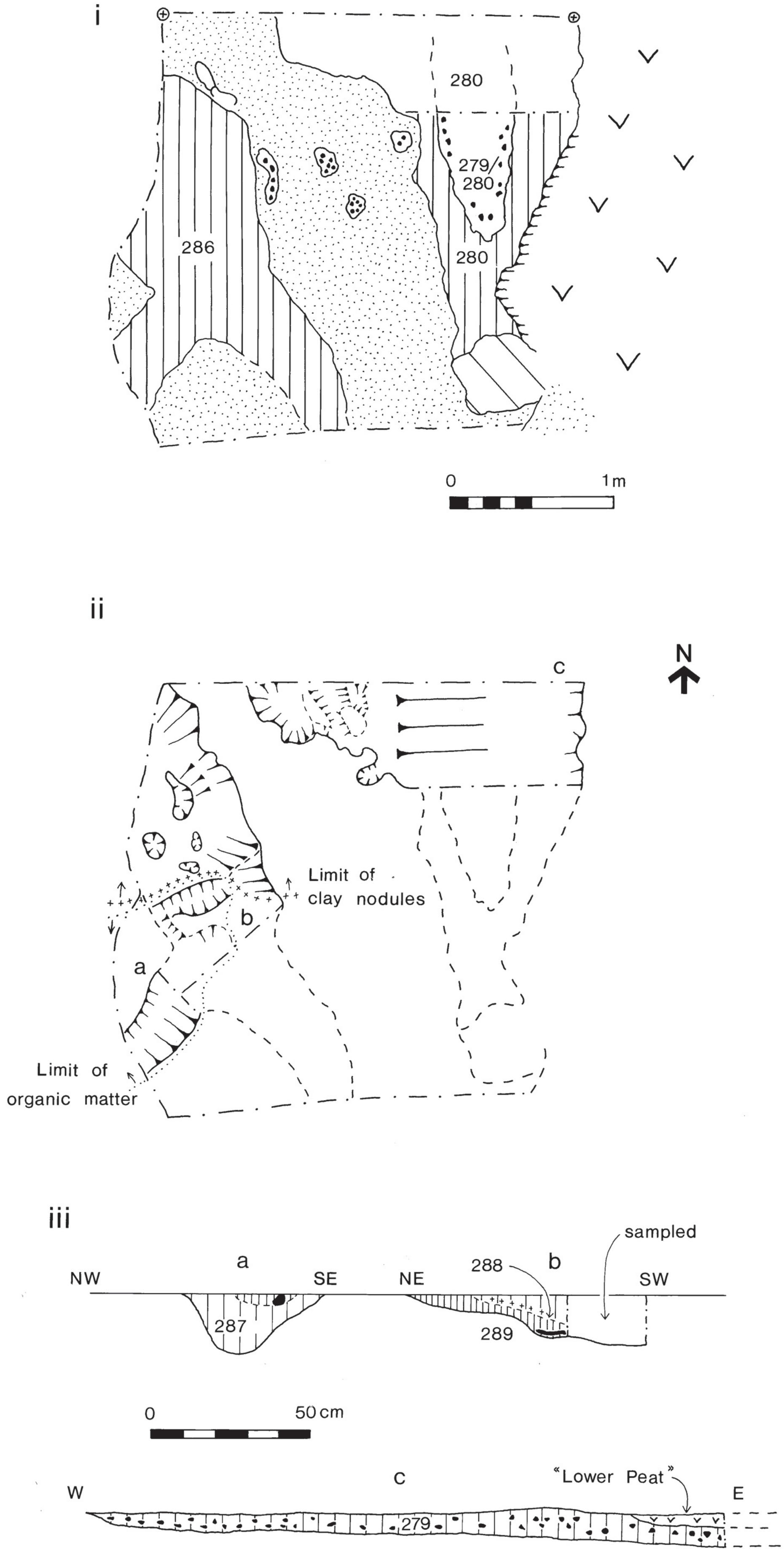


Figure 3.9 Burnt flint mound, context *231*: i – detailed plan of soil marks; ii – plan of excavated features; iii – section across excavated features

water, producing steam and drying various materials, it is not necessary to seek a single common interpretation for all of the burnt flint concentrations. In fact, the Stumble deposits would appear to fall into two groups:

a) dispersed scatters of calcined flints which included struck flints and pottery (*e.g*. Area D; deposit *117*);
b) concentrated scatters or low mounds, with few or no artefacts (deposits *99*, *118*, *231*, and *258*).

The group **b** features exemplify the 'classic' burnt mounds described by Barfield and Hodder (1987), while the group **a** deposits are of a kind that would not be out of place on an occupation site. Although 'transitional' types may also have existed within this landscape it is not always possible to characterise these features that closely from surface evidence alone, mainly because artefacts found on the surface may be of various dates and are not necessarily contemporaneous with the context upon which they rest. This is especially true of the intertidal zone, where tidal currents and storms give rise to constant lateral movement.

Barford and Hodder have described the following as common characteristics of burnt flint mounds:

1. location close to water;
2. consisting of large accumulations of heat-cracked flints as well as charcoal;
3. absence of other artefacts;
4. traces of hearths;
5. evidence of a trough or basin which was lined with stone, clay or wood in order to retain water.

Deposits *99*, *118*, *231* and *258* all appear to fall into this category of burnt mound, although without total excavation it is impossible to say whether or not troughs had been present.

An additional feature of burnt mound *231* was the presence of small fragments of very pale to light grey (10YR 7/3–7/2) claystone or siltstone, frequently veined with orange mottles. These nut- to fist-sized pieces appeared to be nodules from the London Clay, the mottling presumably resulting from wetting and drying cycles since the marine submergence. They occur in no other excavated contexts on the site; although they might be expected within the underlying London Clay bedrock they are unlikely to have occurred by chance within a burnt flint mound. One possible explanation for these concretions (see also Barfield and Hodder 1987) is that clay was used as some form of cleansing agent, either for washing the human body (see below) or in cleaning wool, textiles or other materials. Although not a universal ingredient of soap, clay has been used from the beginning of history as an ingredient of soap; it is also interesting to note that ashes of plants containing soda and potassium were also used. Such plants include saltworts (*Batis maritima*) which would have been very common on the nearby saltmarsh. When carbonised, however, these could have become pulverised into a black dust, resembling the black component in the soil matrix in the features.

Alternatively, the clay might have been used in some kind of fulling process. Traditionally, this involves soaking woollen cloth in a solution of Fuller's earth (or an equivalent absorbent clay) and either pounding it with the feet or, in more recent times, using mechanical methods. Fuller's earth is a clay with a high absorptive capacity which can be used for removing grease from fabrics. At the Stumble the clay/siltstone may have been used in nodular form; alternatively (and perhaps more plausibly), the nodules may have been the insoluble residue of pure London Clay that was used and became disaggregated during the cleansing process. Such an interpretation is not necessarily at odds with that of Barfield and Hodder (1987), who suggested that burnt mounds might have been the remains of steam baths which utilised burnt flints to produce steam or dry heat within some form of shelter. In the case of the Stumble features, it is possible that the London Clay nodules and perhaps the burnt saltwort ashes may have been connected with the use of saunas; alternatively there may have been an industrial element to their function, with wool or textiles being cleansed.

The archaeological evidence recovered from Areas D, G and H shows significantly more evidence for occupation than was the case with the burnt flint mounds, with both pottery and struck flints being common. In Areas D and G (*i.e*. context *117*) struck flints were associated with burnt flint concentrations, whereas flint-gritted pottery was not. Also, the presence of a number of scrapers in Area D suggests that perhaps some activity involving the preparation of skins or hides had taken place there. Although not necessarily within a settlement area, Areas D and G may have lain close to the limits of any occupation area that had existed within this landscape in the later Neolithic. Nowhere, however, is there unequivocal evidence for later Neolithic occupation on the scale of that seen for the earlier Neolithic in Areas A/B/E and C.

Excavated features within Area D might be compared with what Warren described as 'cooking holes', which he records as being roughly 3 feet in diameter and up to 18 inches deep (Warren *et al.* 1936, 179). In addition to black earth and calcined flints these contained worked flints and bones (sometimes calcined) as well as sherds, often of Grooved Ware and early Beaker. It is impossible to say whether or not the Stumble features had been used for cooking, but the absence of unburnt or calcined bone would suggest that cooking was not a primary activity.

Three of the six burnt flint concentrations recorded are dated in some way. Context *231* is dated by radiocarbon to *c*. 4000 BP and underlay the 'lower peat', which itself formed around 4000 BP or slightly later. Context *99* was also sealed below 'lower peat'. The Area D activity yielded a radiocarbon date of 4060±80 BP (OxA 1915) and also produced Grooved Ware, a Beaker base and a suite of characteristically later Neolithic struck flint.

At this time sea level was encroaching upon the area of the Stumble site, which was transformed from a fully dryland settlement site during the earlier Neolithic to being close to the shore or saltmarsh during later Neolithic times. The activities described are therefore almost certainly specific to a coastal location, rather than taking place in an intensively settled environment. This is in keeping with the siting of other 'burnt mounds', which may have been located on the fringes of settlement to minimise any risk of fire (Barfield and Hodder 1987, 373).

4. Artefacts

I. Neolithic pottery

by N. Brown
(Figs 4.1–4.11)

Introduction

A substantial quantity of pottery, 7554 sherds weighing 49.533kg, was recovered from the excavations. The pottery was recorded using a system adapted from that used for later prehistoric pottery in Essex (details in archive). This report was written in 1989, and no major revision has been undertaken subsequently.

Fabrics present were as follows:

A	Flint, S 2 well sorted
B	Flint, S–M 2
C	Flint, S–M with occasional L 2
D	Flint, S–L poorly sorted
E	Flint and sand, S–M 2
H	Sand, S–M 2–3
M	Grog, often with some sand or flint and occasional small rounded or sub-angular voids
N	Vegetable temper
O	Quartz and Flint and some sand S–L 2 poorly sorted
P	Sparse very fine sand may have occasional M–L flint or sparse irregular vain
R	Shell M–L 2
Z	Unclassifiable.
	Where:
S	less than 1mm diameter
M	1–2 mm diameter
L	more than 2 mm diameter
1	less than 6 per cm^2
2	6–10 per cm^2
3	more than 10 per cm^2.

Most pottery is in fabrics A–E and O. M is a Grooved Ware fabric; the other fabrics are only represented by a few sherds.

Rim forms present are categorised as follows:

1	Simple
2	Rolled
3	Externally thickened
4	Expanded
5	T-Shaped.

Owing to the fragmentary nature of the assemblage, attribution of the pottery to precise forms was rarely possible; instead, a number of broad categories have been used:

A	Open bowl, uncarinated
B	Closed bowl, uncarinated
C	Open bowl, carinated
D	Closed bowl, carinated
E	Bag-shaped vessel.

Often sherds could not be assigned to these broad categories, however many rim sherds could be classed as from open or closed vessels.

The pottery is described below by Area.

Areas A/B and E

A total of 2363 sherds weighing 12.947kg were recovered from these areas (667 sherds/3.826kg Area A; 1558 sherds/8.684kg Area B; 138 sherds/0.437kg Area E) (Table 4.1).

The pottery was largely recovered from excavation of the surviving Neolithic soil, with relatively little (6% by sherd count 5% by weight) from the underlying features cut into the subsoil. Sherd size was relatively small (average sherd weight 5g), sherds from the subsoil features were of similar size (average weight 4.5g) to those from overlying deposits. Quite a high proportion of the pottery was abraded (45% by sherd count, 37% by wt). This is due in part to post-depositional factors which affected pottery in all areas. Pottery near the surface of the deposits was prone to encrustation by barnacles and other marine growths, which damaged the surfaces of the sherds. Examination of the abraded sherds showed that the damage was often limited to the finished surfaces, and broken edges often appeared quite fresh. Only a cursory attempt was made to search for joining sherds; however some cross-context joins were noted between sherds from different trowelling passes. A large part of an S-profiled bowl (Fig 4.3, 1.41) could be reconstructed from sherds recovered from passes 2, 3 and 4 in an area of 2m sq. just south of the centre of Area B. A joining rim sherd from this vessel was recovered from the underlying hollow *201*.

Of identifiable rims, 26% by sherd count (31% by weight) were of form 1, 64% by sherd count (53% wt) were of form 2 and 10% by sherd count (16% wt) form 3. 53% of the sherds (63% wt) were identifiable as coarse or fine ware, of which 35% by sherd count (22% wt) were fine. Of all rim sherds identifiable as from open or closed vessels, 20% by sherd count (22% wt) are from closed forms. Apart from a rim with faint fingernail impressions (Fig 4.2, 1.30), and three with possible ripple burnish (Figs 4.1 and 4.2, 1.13, 1.21 and 1.22) the assemblage is undecorated. One small abraded rim sherd (not illustrated) has what appears to be a cylindrical stabbed impression below the rim. With this exception, the illustrated pottery (Figs 4.1–4.3) represents the full range of forms and decoration and comprises 19% of the diagnostic sherds.

Area C

A total of 4585 sherds weighing 32.571 kg were recovered, again largely from excavation of the surviving superficial deposits with relatively little (9% by sherd count, 10% by weight) from the underlying subsoil features. The pottery was of relatively small sherd size (average weight 7g), material from the subsoil features being of similar size (average weight 8g) (Table 4.2). Again, quite a high proportion of the pottery in the overlying deposits was abraded (44% by sherd count, 36% weight). There were considerably fewer abraded sherds from the subsoil features (29% by sherd count, 19% weight). Only a cursory attempt was made to search for joining sherds. However, cross-context joins were noted between sherds from different trowelling passes, and between material

Fabric	*A*	*B*	*C*	*D*	*E*	*O*	*P*	*Z*
% Sherd count	11	21	23	25	1	3	1	15
% Weight	5	17	24	42	1	4	1	16

Table 4.1 Prehistoric pottery: Areas A/B and E

Fabric	A	B	C	D	E	O	P	R	N	Z
% Sherd count	5	22	29	30	4	5	<1	<1	<1	5
% Weight	4	13	23	34	5	6	<1	<1	<1	1

Table 4.2 Prehistoric pottery: Area C

Fabric	A	B	C	D	E	H	M	O	P
% Sherd count	1	2	13	60	1	1	18	3	1
% Weight	1	1	11	51	4	3	13	4	3

Table 4.3 Prehistoric pottery: Area D

Fabric	A	B	C	D	O	Z
% Sherd count	2	16	29	27	23	3
% Sherd weight	1	8	20	41	30	<1

Table 4.4 Prehistoric pottery: Area F

Fabric	B	C	D	O	P
% Sherd count	2	21	73	2	2
% Sherd weight	1	14	84	1	<1

Table 4.5 Prehistoric pottery: Areas G and H

Fabric	A	B	C	D	O	M	Z
% Sherd count	8	24	2	41	4	2	9
% Sherd weight	1	14	13	61	7	3	1

Table 4.6 Prehistoric pottery: Area J

Fabric	B	C	D	H	O	P
% Sherd count	13	10	43	2	30	2
% Sherd weight	4	9	35	<1	50	2

Table 4.7 Prehistoric pottery: Area X

from the superficial deposits and one of the underlying features, the sub-rounded pit *265*. These provide insights into the differential preservation of material from the subsoil features and overlying deposits. A large, highly decorated unabraded sherd (Fig. 4.4, 2.5) was recovered from fill *266* within *265*, and small abraded sherds with similar decoration, almost certainly from the same vessel (Fig. 4.6, 2.38, 2.39; Fig. 4.7, 2.60, 2.62) were found scattered throughout the overlying deposits. A pair of joining rim sherds (Fig. 4.4, 2.11), one from fill *266* and one from the overlying deposits, provide an interesting contrast. That from *266* retains a burnished finish, with ripple decoration; the other has lost its burnished sheen and all trace of ripple burnish, although it would scarcely be described as abraded.

Of the identifiable rims, 27% by sherd count (29% by weight) were of form 1, 53% by sherd count (54% wt) of form 2 and 18% by sherd count (15% wt) of form 3; forms 4 and 5 made up 1% each by both count and weight. 66% by sherd count (78% wt) of the pottery was identifiable as coarse or fine ware, of which 32% by sherd count (19% wt) was fine ware. Of all rim sherds identifiable as from open or closed forms, only 8% by sherd count (12% wt) were from closed forms. Although decorated sherds were not common, there is a clear contrast with the virtual absence of decorated sherds in Areas A, B and E. A wide variety of decorative techniques were noted on sherds from Area C, including ripple burnish, incised and impressed patterns, fingertip fluting, fingernail impressions and light stroke patterns. Six sherds (two illustrated: Fig. 4.6, 2.35, 2.40) had pre-firing perforations below the rim.

The illustrated sherds represent the full range of forms and decorative techniques and comprise 21% of the diagnostic sherds (67% of the decorated sherds).

Area D

A total of 160 sherds weighing 1.035kg were recovered (this total includes some pottery assigned to context *124*, representing a more extensive exposure of old land surface in the vicinity). Pottery was far less frequent in the superficial deposits. As in the other areas, relatively little pottery was recovered from the excavated features (6% by sherd count, 5% by weight). The pottery from this area is diagnostically Late Neolithic, with Beaker, Peterborough Ware and Grooved Ware all present. Once again the sherds are quite small (average weight 6g), with material from the subsoil features being of similar size (average sherd weight 5g) to that from superficial layers (Table 4.3). Most of the pottery was recovered during surface collection, and consequently a very high proportion is abraded (72% by sherd count/70% by weight). Only twelve rim sherds were recovered: the majority (nine) were of form 1, one was of form 2 and two of form 3. Owing to the high degree of abrasion only 14% of the sherds (by count and weight) could be identified as coarse or fine ware, of which 18% by sherd count (28% wt) were fine ware. The assemblage included several sherds in a similar fabric with finger impressions on the neck (one sherd illustrated: Fig. 4.10, 3.5), all of them heavily abraded but possibly from the same vessel.

The illustrated sherds (comprising 33% of the diagnostic assemblage) represents the full range of forms and decoration.

Area F

A total of 197 sherds (weighing 1.123 kg) were recovered from Area F. The proportion of abraded pottery is somewhat smaller in this area (32% sherd count 20% by sherd wt) although sherd size was much the same (average sherd wt 8g) (Table 4.4). Only eight rim sherds were present: three of form 1, three of form 2 and two of form 3. 52% by sherd count (65% by wt) of the sherds could be described as coarse or fine of which only 5% by sherd count (3% by wt) were fine ware. The illustrated sherds (Fig. 4.10; 3.13–3.17) represent the full range of rim forms and decorative techniques and comprise 50% of the diagnostic sherds.

Areas G and H

A very small quantity (nine sherds, weighing 55g) was recovered from Area G. They included two small decorated Grooved Ware sherds (not illustrated), one with fingertip impressions and the other with grooved lines.

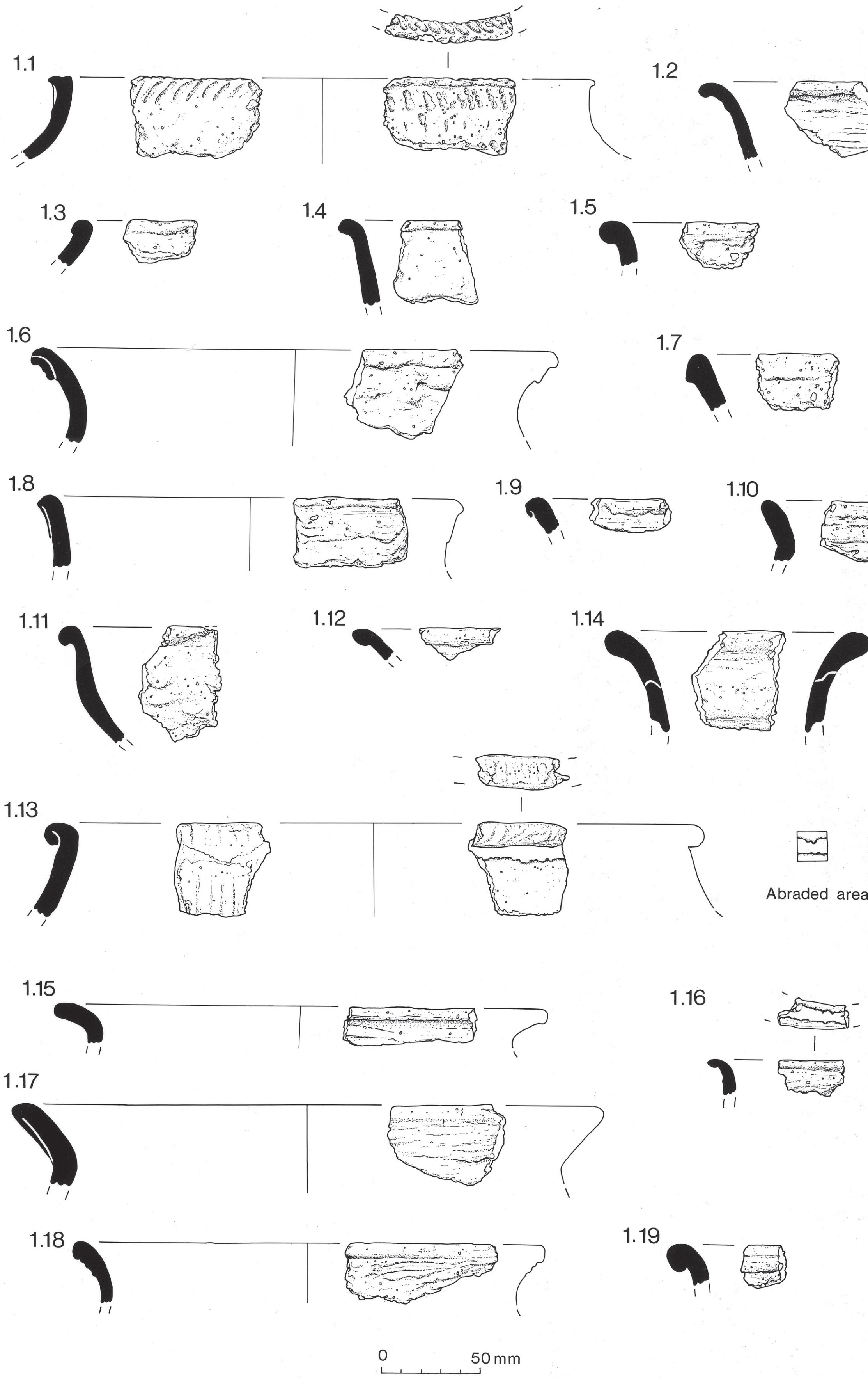


Figure 4.1 Illustrated prehistoric pottery: Areas A and B

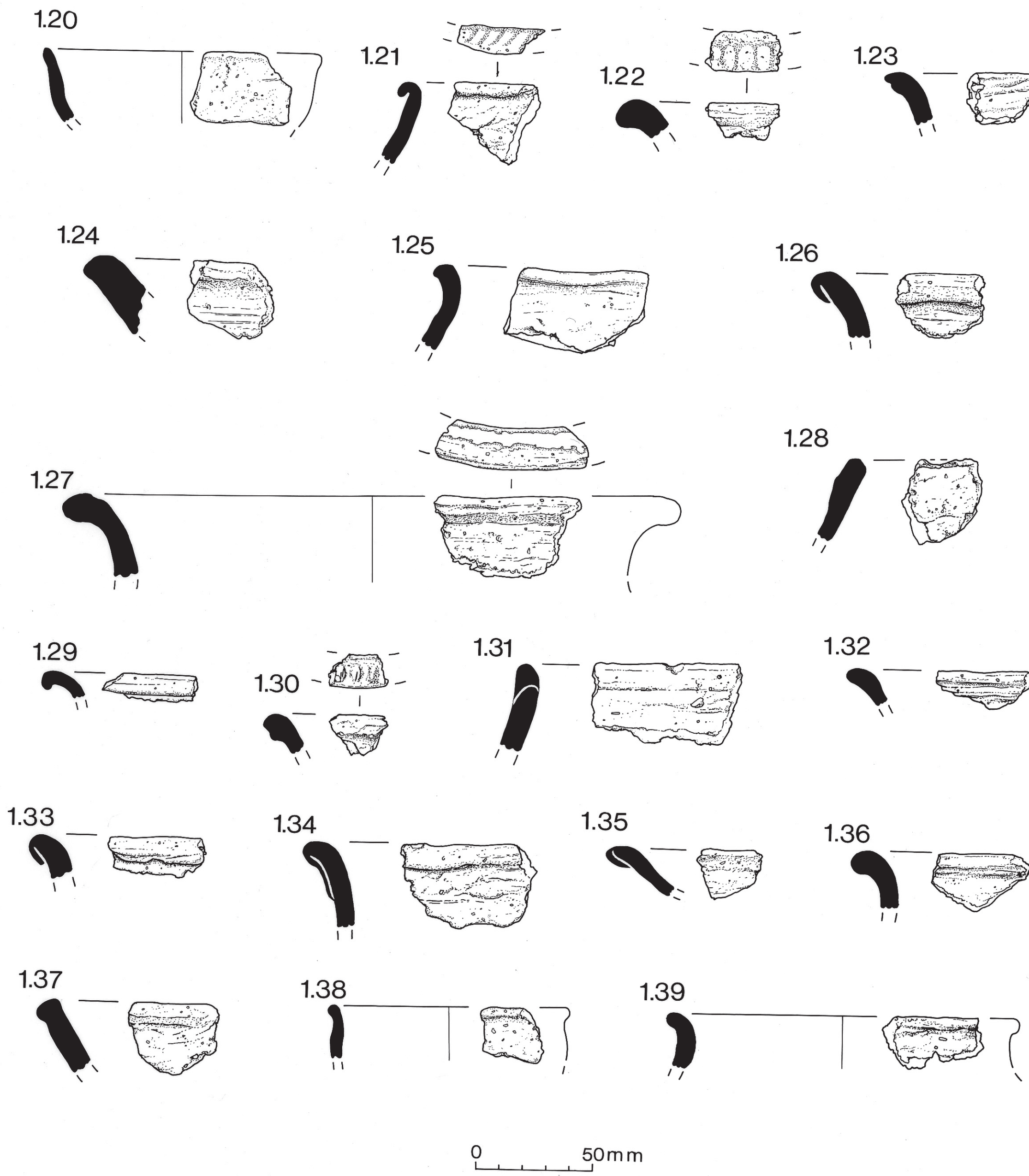


Figure 4.2 Illustrated prehistoric pottery: Area B

A total of 48 sherds weighing 369g were recovered from Area H. Relatively little of the pottery was abraded (21% by sherd count/24% by weight) and the sherds were marginally larger than those from the other areas (average wt 8g) (Table 4.5). Only three rims were present, one each of form 1, 2 and 3. All the diagnostic sherds are illustrated (Figs 4.10, 3.18–22).

Area J

A total of 132 sherds weighing 808g were recovered. The sherds were of quite small size (average weight 6g) but relatively little was abraded (22% by sherd count/11% by weight) (Table 4.6). Only ten rim sherds were present, four of form 1 and six of form 2. A number of decorated Peterborough Ware and Grooved Ware sherds were also present. The illustrated sherds (Figs 4.10 and 4.11, 3.23–9) represent the full range of decorative traits and rim form and comprise 41% of all the diagnostic sherds.

Area X (context *124*)

A small amount of pottery was recovered: 69 sherds weighing 690g (Table 4.7). The sherds were somewhat larger than pottery from other areas (10g average weight), although there was a high proportion of abraded pottery (57% by sherd count/38% wt). Seven rims were recovered, five of form 2; one of form 4 and one of form 5. One abraded rim sherd (Fig 4.11, 3.31) has a decorative scheme sufficiently similar to suggest it may be from the same vessel as Fig. 4.4, 2.4. The illustrated sherds represent the full range of forms and decoration present and comprise 43% of the diagnostic sherds.

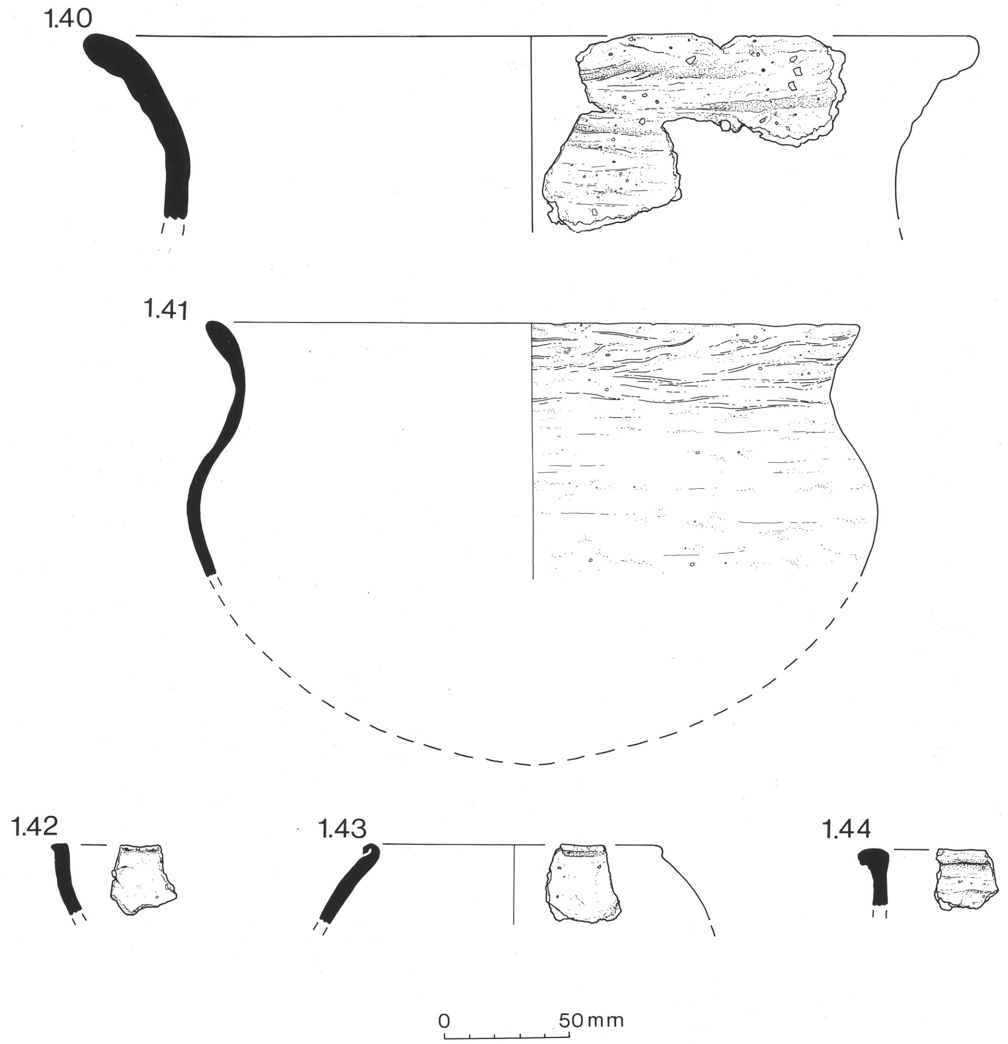


Figure 4.3 Illustrated prehistoric pottery: Areas B and E

Catalogue of illustrated sherds
(Figs 4.1–4.11)
Descriptions of all illustrated sherds may be found in Table 4.8.

Discussion

Early Neolithic
Pottery from Areas A, B, E and C could be classified as being of Mildenhall style (Longworth 1960). The decorative traits employed on the pottery from Area C, can all be matched in Mildenhall-type assemblages. The predominance of open forms in the Stumble material is matched elsewhere in Essex at Orsett (Kinnes 1978) and Springfield Lyons (Brown and Medlycott forthcoming). Very few shouldered vessels were recognised (the range of shoulder forms present is illustrated by Fig. 4.11, 3.32–6), and the lack of shouldered pots is again comparable to Orsett and Springfield Lyons. Both traits contrast with Mildenhall-type assemblages from further north in East Anglia, at Hurst Fen (Longworth 1960) and Spong Hill (Healy 1988), indicating the difficulty involved in attributing Early Neolithic ceramics from a particular site to one or another of the broad regional styles commonly used to categorise such pottery. The linear zoned decoration on a large sherd from context *266* in Area C (Fig. 4.4, 2.5) is of interest, since Healy (1988) suggests that vessels with atypical decoration appear to be a normal, if rare, component of any large Mildenhall assemblage. This sherd may represent an example of a small group of highly decorated, well finished vessels, often employing fabrics and decorative schemes not typical of Mildenhall Ware. These vessels appear to fit the criteria used by Howard (1981) in defining pots made specifically for ritual use.

Two sherds of lugs were recovered, a large ledge-like example (Fig. 4.11, 3.42) and a smaller decorated one (Fig. 4.11, 3.43); a third sherd (Fig. 4.11, 3.44) may be part of a lug/handle, or just possibly part of a handle from a pottery spoon. A small object, broken at both ends and with a central pre-firing perforation (Fig. 4.11, 3.45), may be part of a pottery bead. A few rim sherds (two illustrated: Fig. 4.6, 2.35, 2.40) had pre-firing perforations below the rim, while one body sherd has a post-firing ?repair hole (Fig 4.11, 3.41).

The assemblage preserved very frequent evidence for coil construction of pots (*e.g*. Fig. 4.11, 3.38–40). Some small pots (Fig. 4.8, 2.68) may have been formed from

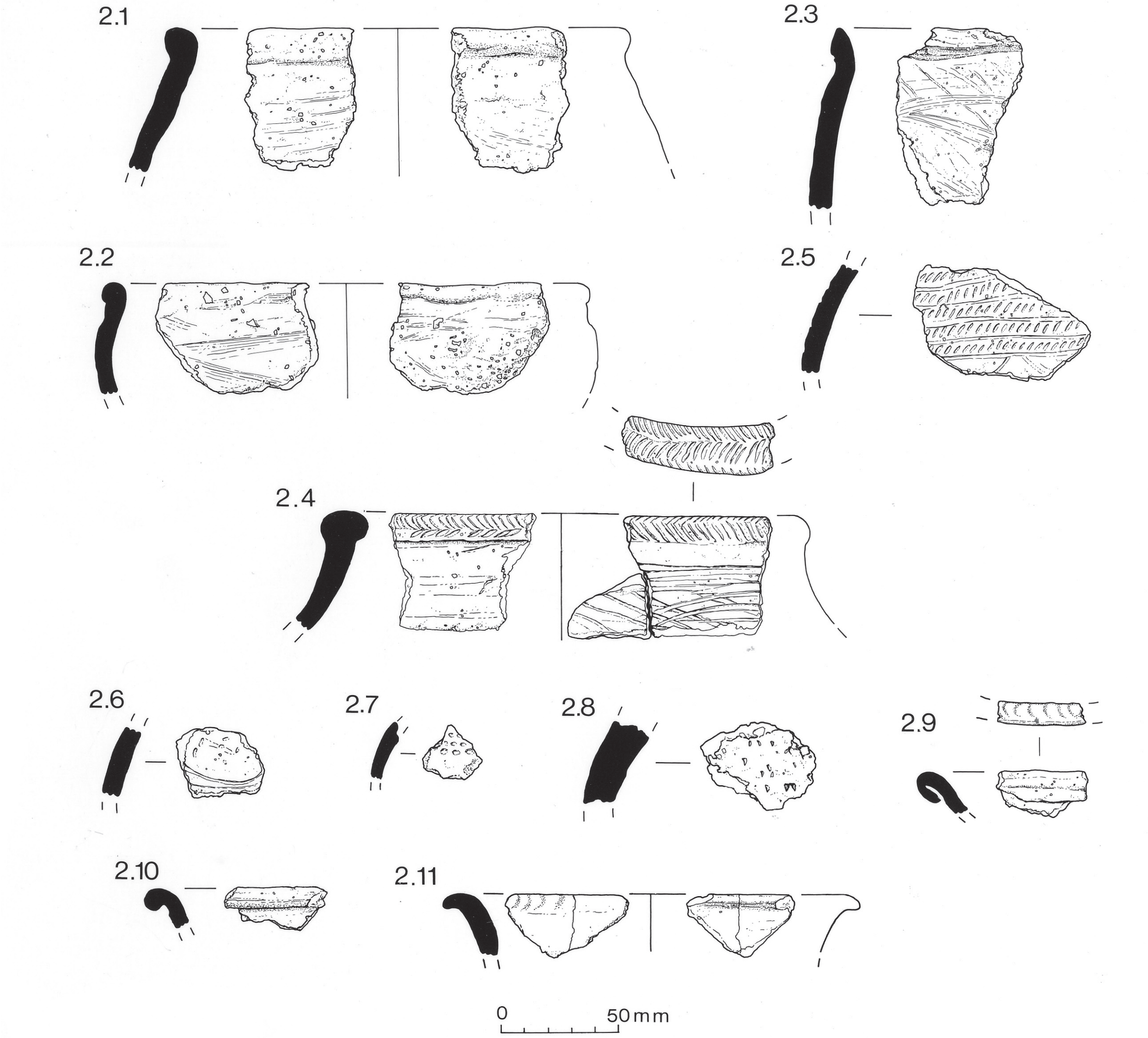


Figure 4.4 Illustrated prehistoric pottery: Area C

a single lump of clay. These two techniques are the only ones evidenced by the Stumble material, as they were in the Windmill Hill assemblage (Smith 1965, Howard 1981). This presents a strong contrast with later prehistoric assemblages, such as the Late Bronze Age pottery from Springfield Lyons, where a variety of techniques were employed in pottery manufacture (Brown and Meddlycott forthcoming). Differential abrasion inside some rims on the upper surface (*e.g.* Figs 4.1 and 4.2, 1.16 and 1.27) would indicate the use of lids, or that the vessels were frequently stored upside down. Bands of apparent abrasion below some rolled rims (*e.g*. Figs 4.4 and 4.5, 2.1–13, 2.21) might indicate that leather or fabric lids had been tied on below the rolled rims. Alternatively, the awkwardness of working close up to the rolled rim may have meant that smoothing and burnishing during manufacture stopped short of the rim. Similar bands where abrasion has occurred or where surface treatment appears unfinished have been noted elsewhere (Henshall 1983, fig. 2.4).

The contrast between the decorated pottery in Area C and the undecorated material in Areas A/B and E is of particular interest. The difference is likely to be chronological, particularly if the deposits are regarded as resulting from successive occupations of the same site, as suggested for Spong Hill (Healy 1988) and Broome Heath (Wainwright 1972). It is, of course, possible that the differential occurrence of decorated pottery at the Stumble is a result of factors other than stylistic variation over time. However, in terms of vessel form there is little difference between the material from Areas A/B/E and from Area C. Both contain a range of fine bowls and occasional cups, suitable for eating and drinking, and larger coarser vessels suitable for cooking/storage. The only differences appear to be the presence of part of an extremely large, thick-walled storage jar from Area A/B/E (Fig 4.3, 1.40) and the rim of a very large fine ware vessel from Area C (Fig 4.6, 2.43). Therefore, there seems to be no evidence of any simple functional division between the two areas — for example, with one a focus for cooking and the other for and eating. Perhaps the decorated/undecorated dichotomy is a reflection of age and sex and/or status divisions, although as noted above the ceramic differences may simply reflect a chronological development.

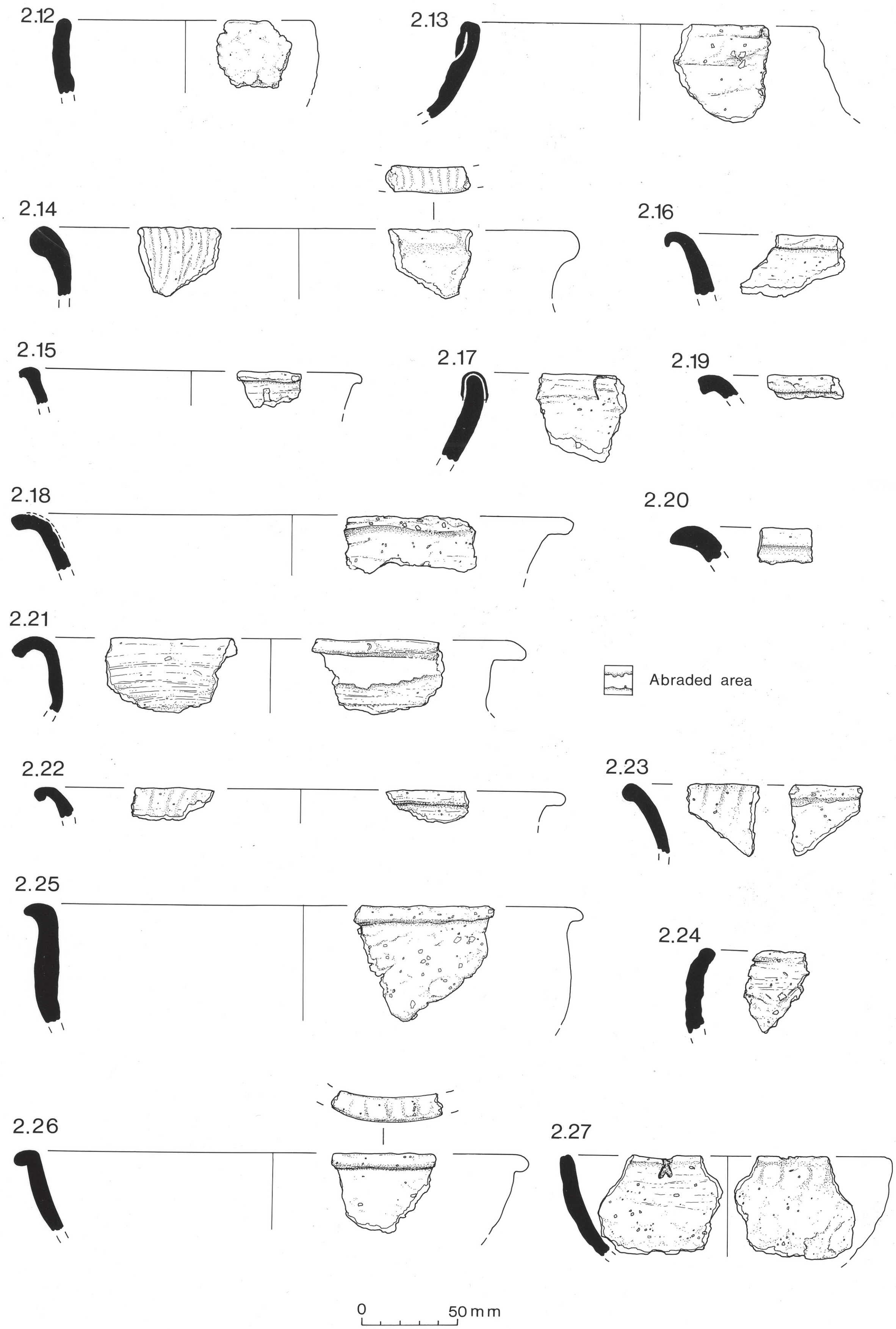


Figure 4.5 Illustrated prehistoric pottery: Area C

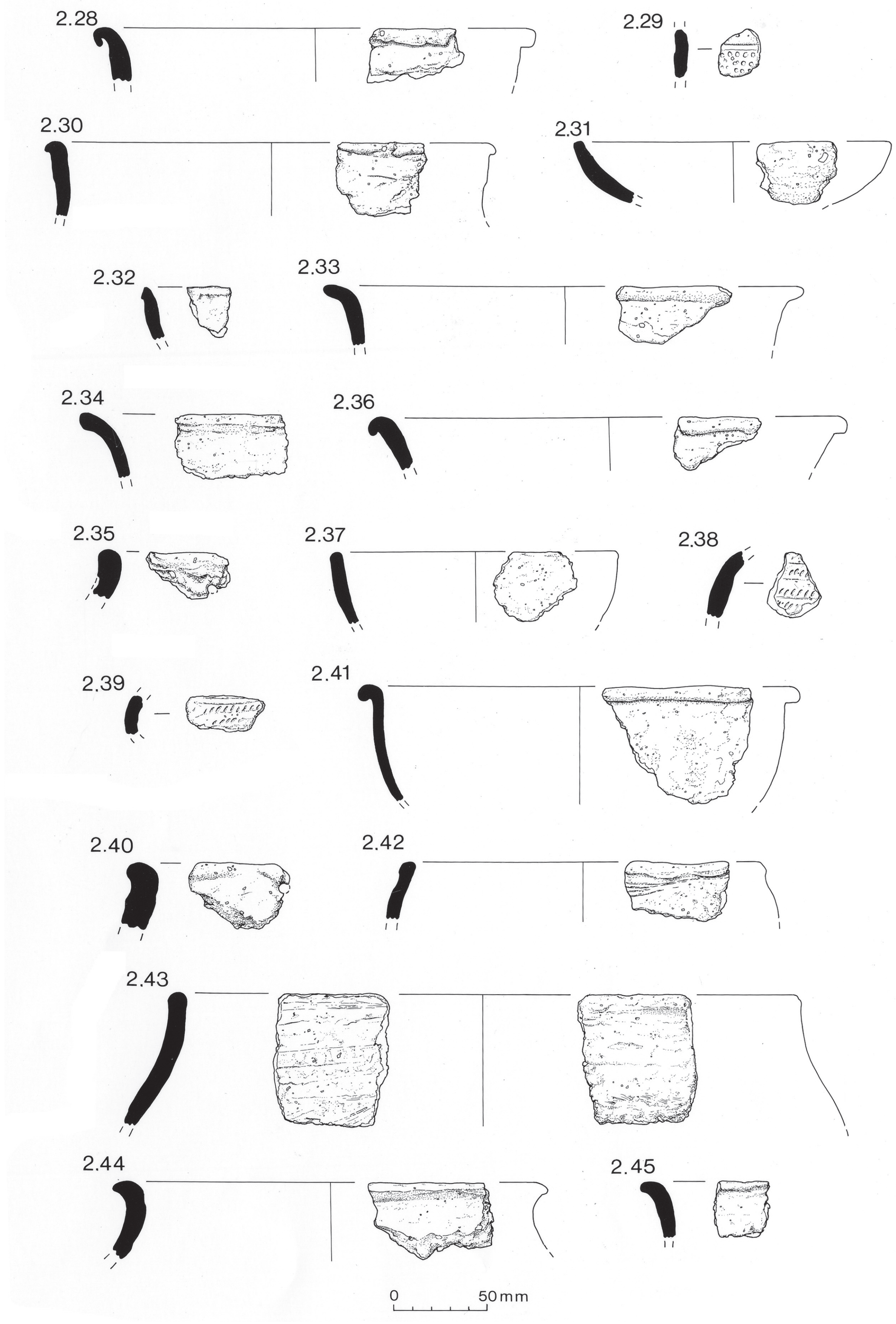


Figure 4.6 Illustrated prehistoric pottery: Area C

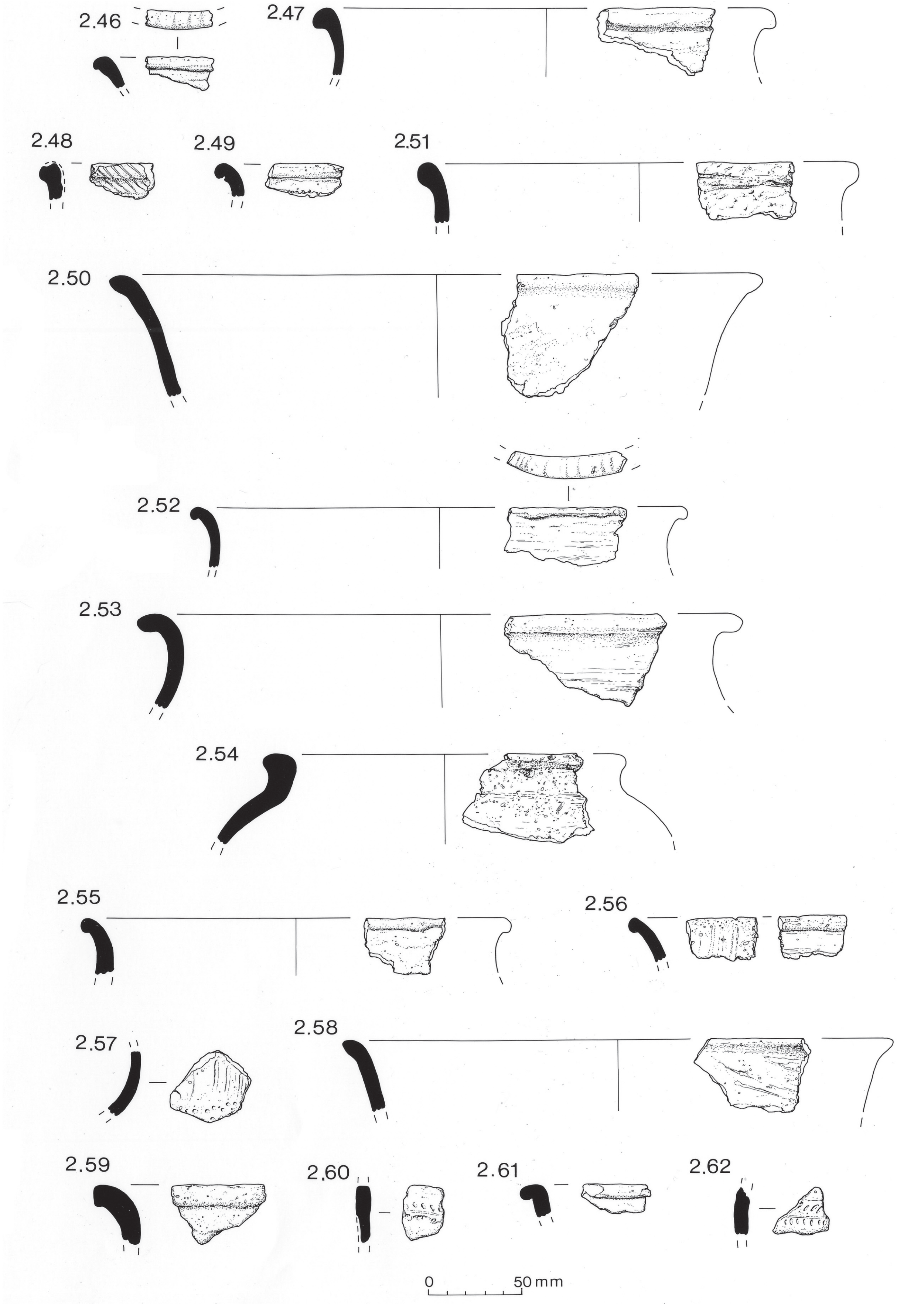


Figure 4.7 Illustrated prehistoric pottery: Area C

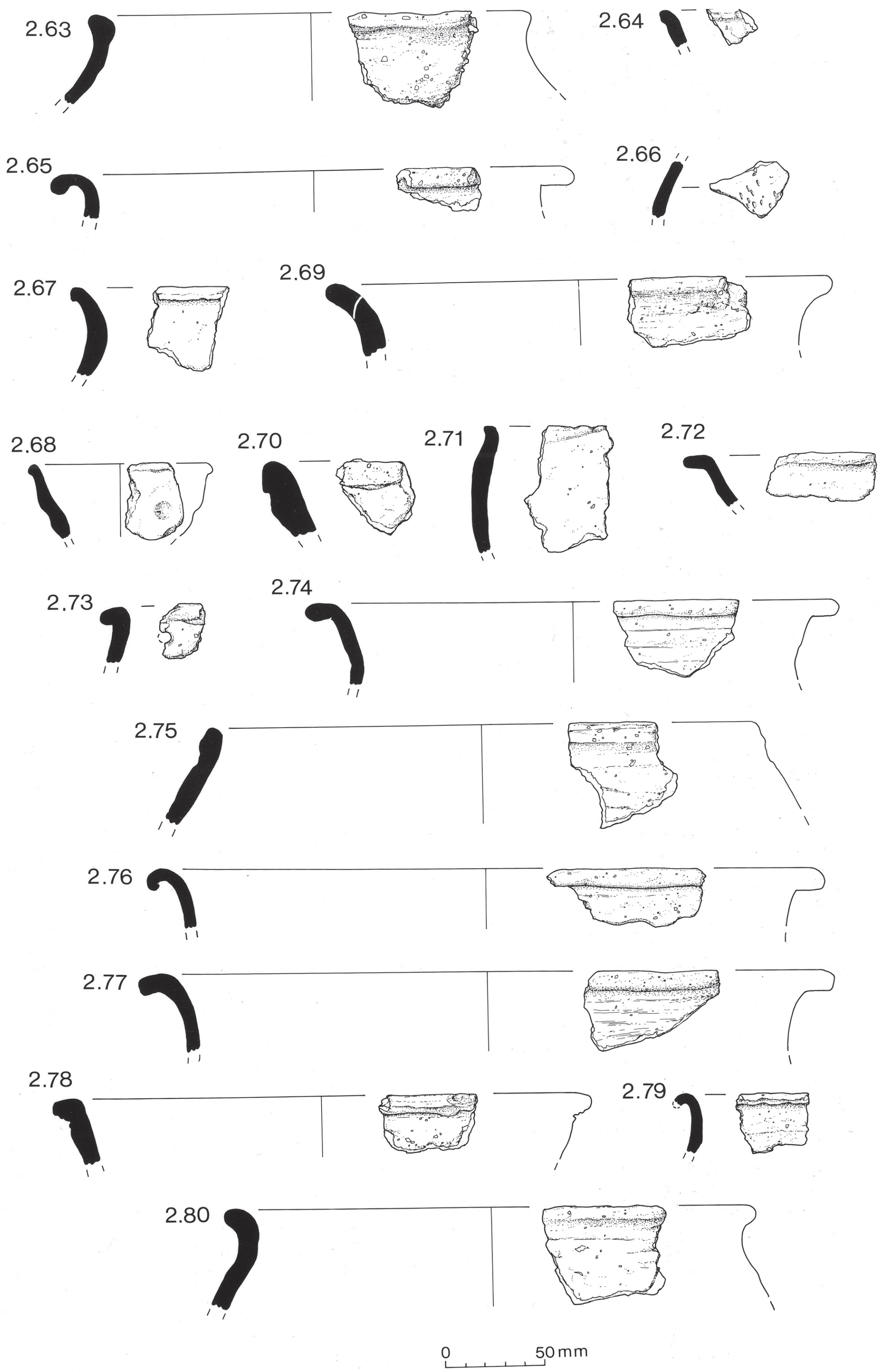


Figure 4.8 Illustrated prehistoric pottery: Area C

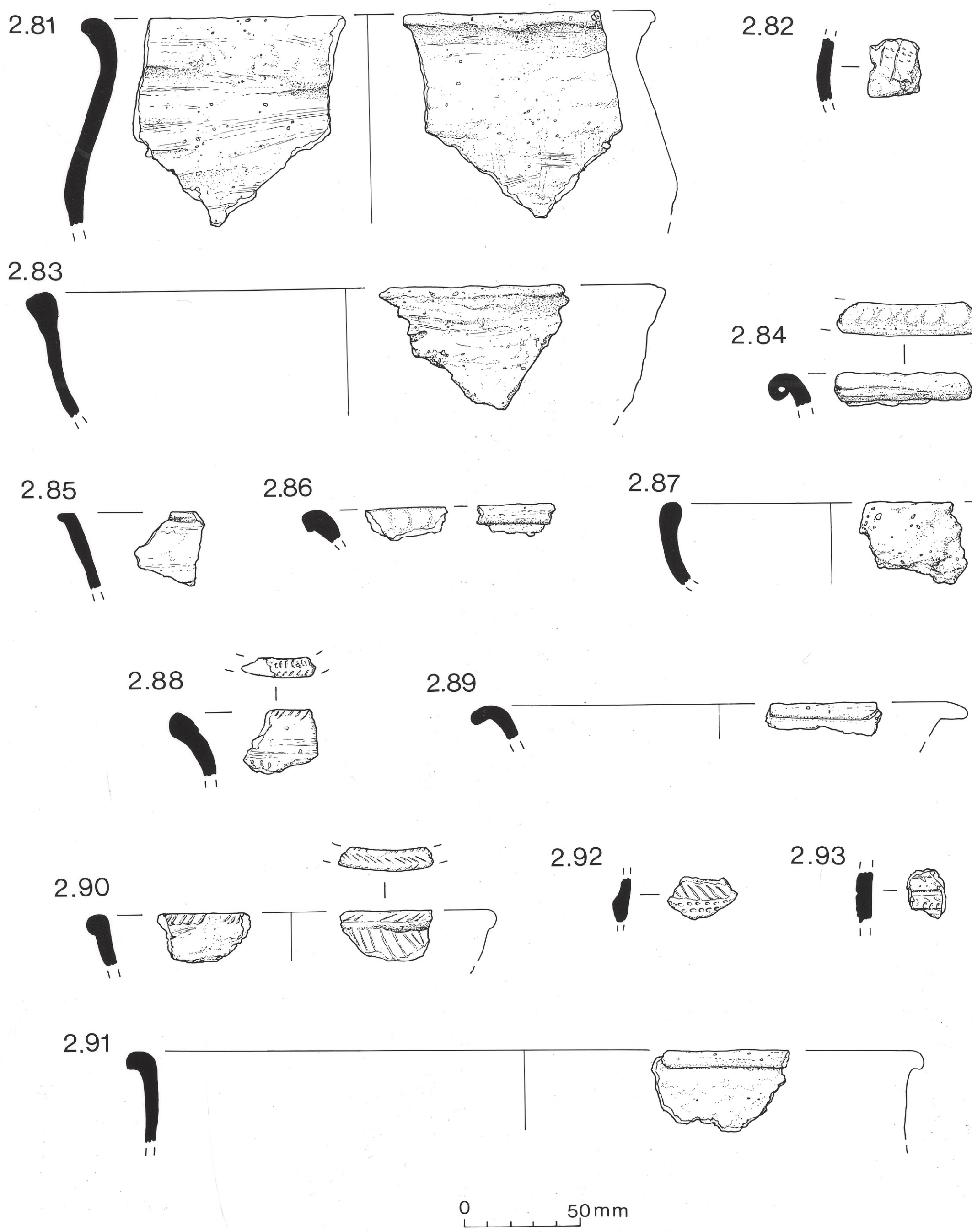


Figure 4.9 Illustrated prehistoric pottery: Area C

It appears that post and stake structures like those present in Area A/B and E were absent from Area C, where the features appear rather more amorphous. The ceramic distributions may shed light on the nature of the superficial deposits from these areas, and their relationship with underlying features. The problems are similar to those encountered in interpreting the extensive Late Bronze Age deposits at Runnymede (Needham and Sörensen 1988). In Area A/B and E the joining sherds from the scatter immediately above *201* and in its fill may indicate that the feature had been cut through the superficial deposits, even though it only became visible to the excavators at subsoil level. There seems to be no indication that the post-/stake-hole rows in Area A/B and E delimited midden deposits, as may have been the case in the Neolithic levels at Runnymede (Needham and Trott 1987). This may provide some indication of depositional sequence. The post/stake structures were erected; after they had gone out of use, the artefact-rich superficial layers were deposited and/or accumulated; feature *201* was then cut through these deposits and into the subsoil.

The distribution of ceramics in Area C suggests a different kind of sequence. Joining sherds from three different vessels represented in pit *265* were found in the overlying deposits, but instead of being concentrated immediately above the feature these were widely scattered. This may indicate that pit *265* had been filled at the same time that the overlying layers were deposited. This would be similar to the sequence suggested for the abandonment phase of the settled areas at Spong Hill

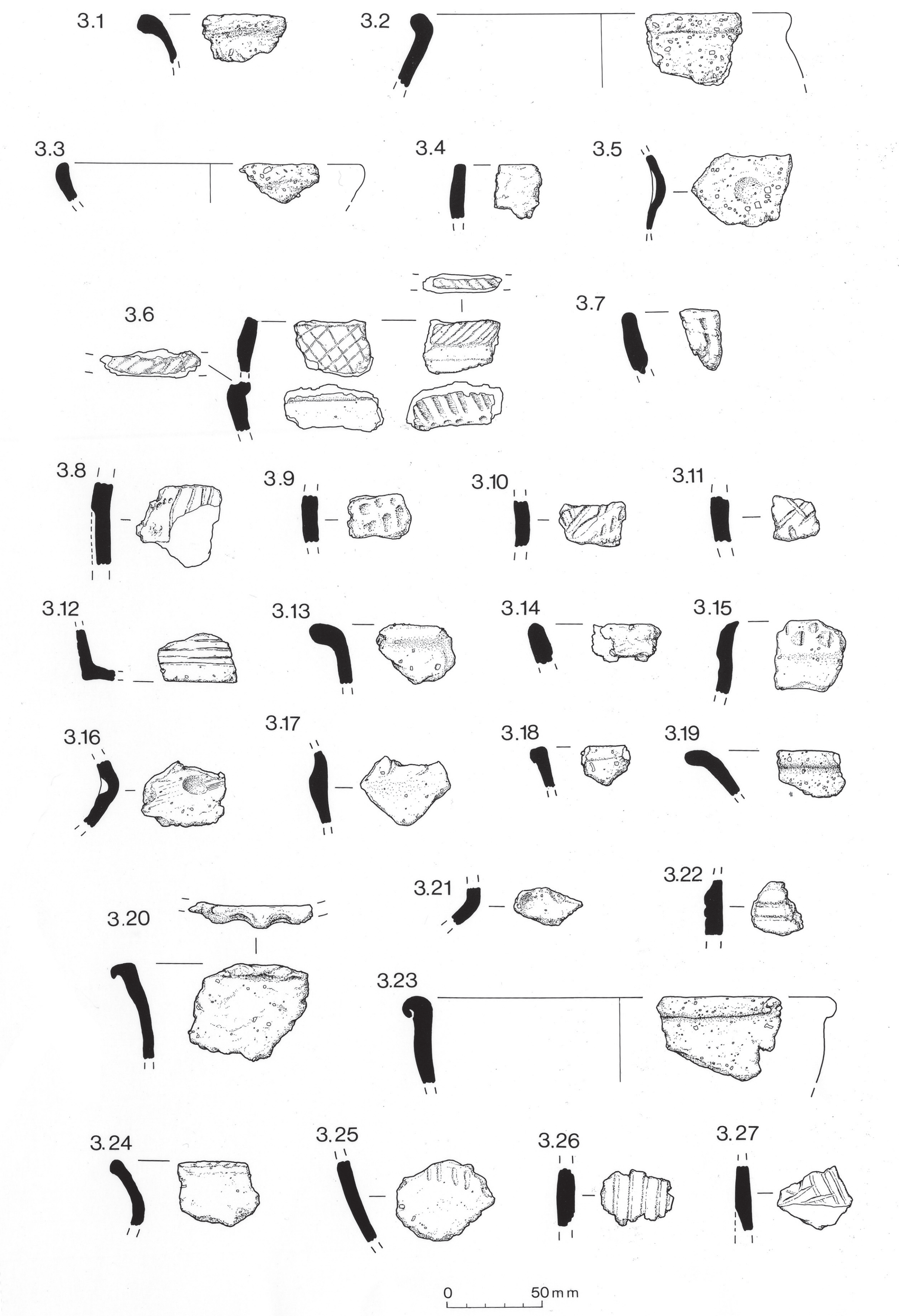


Figure 4.10 Illustrated prehistoric pottery: Areas D, F, H and J

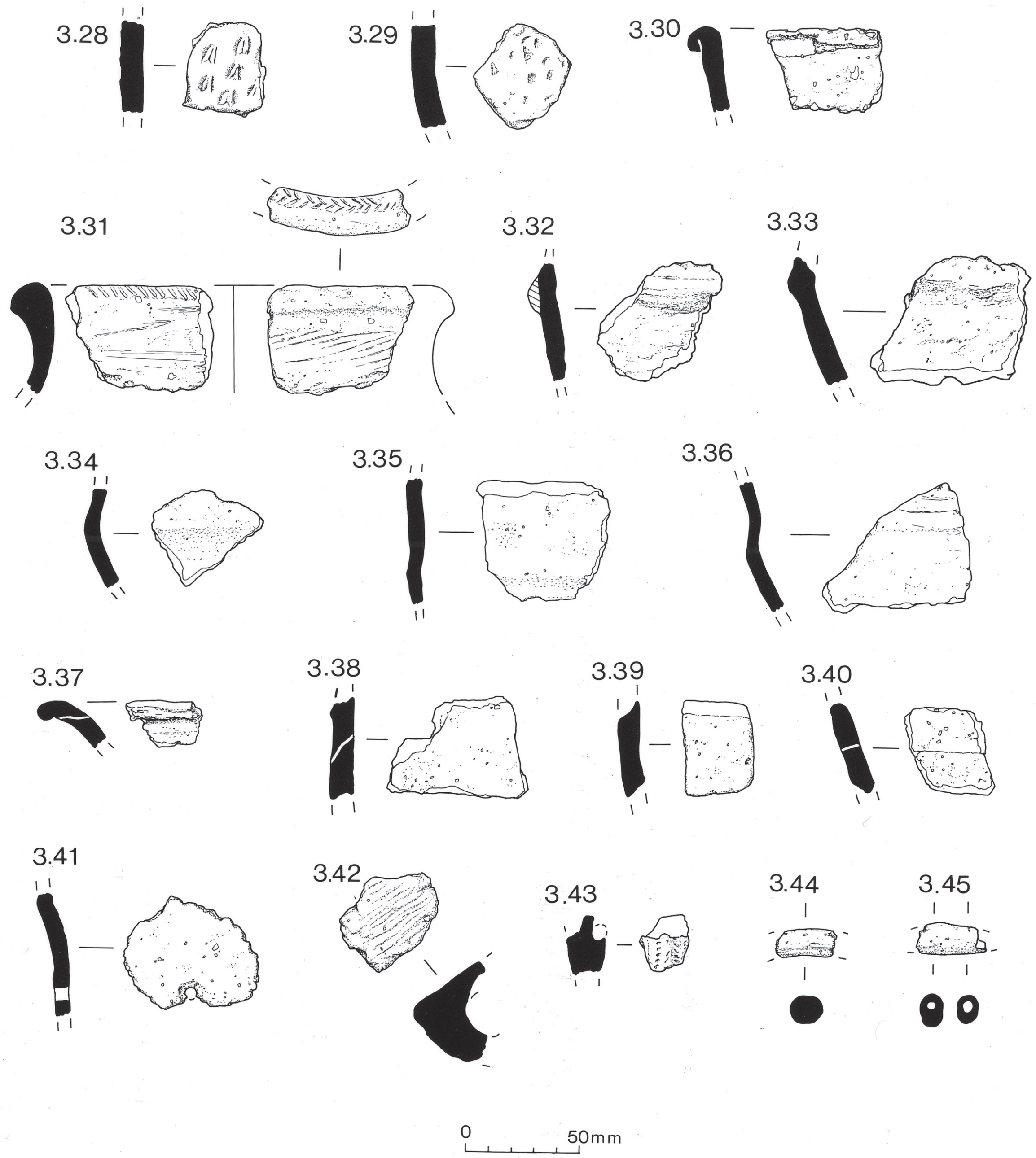


Figure 4.11 Illustrated prehistoric pottery: Areas A, C, J and X

(Healy 1988). Such a process probably served symbolic purposes as well as the practical ones suggested by Healy. The pottery from pit *265* (Fig. 4.4, 2.1–11) does not appear to be a random collection casually discarded, but may well represent a deliberate deposit of selected sherds. The rims provide a fairly representative sample of both coarse and fine wares from the site; also present are a variety of decorated sherds including a large elaborately decorated rim (Fig. 4.4, 2.4), a sherd with stabbed decoration not represented elsewhere on the site (Fig. 4.4, 2.8), and the sherd with atypical decoration noted above (Fig. 4.4, 2.5). Deliberate deposition of sherd material is known in Neolithic contexts, at sites such as West Kennet (Thomas and Whittle 1986), Springfield Cursus (Buckley *et al.* 2001), and can be widely documented ethnographically (Okpoko 1987, Sterner 1989). If the sherds from pit *265* had been deliberately deposited, the joining sherds from overlying layers were probably also deliberately included in this process.

The quantity of pottery contained in the superficial deposits at the Stumble is enormous. No fewer than 2360 sherds came from the 142m^2 extent of Area A/B/E, while the 12,000m^2 excavated at Broome Heath produced only 9326 sherds. It is uncertain whether or not every Neolithic site that is represented only by subsoil features would originally have featured superficial deposits like those at the Stumble. There seems little reason to suppose that the Stumble is in any way an atypical site in this regard. The Neolithic soil preserved beneath the bank at Broome Heath yielded '… a great quantity of Neolithic pottery and flint artefacts …' (Wainwright 1972, 3), while Clark's 'culture layer' at Hurst Fen may represent the remains of a deposit like those at the Stumble. It may be that the scatters of Neolithic pits recorded at various locations on

	Context	Rim form	Comments	Fabric
Fig. 4.1				
1.1	Surface SW of Area A	3	Cord maggots on top exterior and interior of rim. Finger nail impressions on neck. Trace of impressions on surviving part of shoulder. Peterborough Ware: ?Ebbsfleet.	D
1.2	A71	2	Wiped partly abraded surfaces	B
1.3	A164	2	Partly abraded surfaces	C
1.4	A178	2	Partly abraded exterior	C
1.5	A189	2		D
1.6	A370	3	Partly abraded rim	D
1.7	A850	1		D
1.8	A919	3		D
1.9	A1025	3	Partly abraded	C
1.10	A1055	1		D
1.11	A1131	2	Form A. Rim broken, exterior partly abraded	C
1.12	A1176	2		B
1.13	A1328	2	Burnished exterior? Abraded below rim. Burnished partly abraded interior. Some trace of ripple burnish on top of rim and interior.	B
1.14	A1472	2	Partly abraded exterior. Coil joins visible at fracture and below rim.	D
1.15	A1502	2	Burnished interior, partly damaged rim.	B
1.16	A1582	2	Inside of rim abraded where rim balances, indicating use of lid or that the vessel had been frequently placed upside down.	B
1.17	A1698	3		C
1.18	B4102/ B4409	3	Clay smeared across exterior below rim.	
1.19	B1997	2	Interior well smoothed probably originally burnished.	C
Fig. 4.2				
1.20	B2136	1	Plain cup partly abraded	B
1.21	B2140	2	Ripple burnish on rim	A
1.22	B2175	2	Ripple burnish on rim	D
1.23	B2561	2		L
1.24	B2627	3		D
1.25	B2729	2	Rim distorted and pushed out, large areas of interior surface flaked off.	C
1.26	B2906	2	Interior smoothed/burnished exterior grass wiped.	C
1.27	B3092	2	Inside of rim abraded where rim balances, indicating use of lid, or that the vessel had been frequently placed upside down.	D
1.28	B3200	1	Partly abraded, part of rim missing.	C
1.29	B2279	2	Interior smoothed/burnished	B
1.30	B3973	2	Faint finger nail impressions on rim, partly abraded.	D
1.31	B3284/ B2898	3	Surface partly abraded, fracture shows rim added as separate strip of clay.	D
1.32	B4097	2	Wiped surfaces	B
1.33	B4114	2	Interior smoothed	D
1.34	B4446	3	Abraded exterior, slight trace of black deposit below rim on interior.	D
1.35	B4810	3		B
1.36	B5133	2	Smoothed surface, probably originally burnished, interior partly abraded.	A
1.37	B5331	3		C
1.38	B5448	2		B
1.39	B5716	2		D
Fig. 4.3				
1.40	B2446/ 3537/ 2946	3	Wiped surfaces	D
1.41	Various	2	Wiped exterior; wiped, smoothed interior	B
1.42	E3503	1	Smoothed surfaces	D
1.43	E6765	3	Smoothed surfaces	A
1.44	E6700	3	Abraded	D
Fig. 4.4				
2.1	C266	3	Slight sooting of exterior, differential abrasion to top of rim, wiped interior.	D

	Context	*Rim form*	*Comments*	*Fabric*
2.2	C266	3	Wiped surfaces	D
2.3	C266	2	Wiped surfaces	D
2.4	C266/ C6284	4	Chevron pattern on rim, slashed line on inside of rim combed decoration on neck. Burnished. Joining neck sherd has lost burnished sheen.	E
2.5	C266	-	Horizontal grooved lines separating rows of stabbed impressions. Two curving lightly grooved lines below.	E
2.6	C266	-	Vertical and horizontal stabbed impression? Contained within a curving lightly grooved line.	E
2.7	C266	-	Rows of rounded stabbed impressions	B
2.8	C266	-	Random roughly triangular stabbed impressions on exterior.	O
2.9	C266	3	Burnished interior, ripple burnish on interior of rim.	A
2.10	C266	2	Burnished interior	A
2.11	C266/ 7223	2	Sherd from *266* retains burnished surfaces and ripple burnish on interior of rim.	E
Fig. 4.5				
2.12	C00	1	Abraded interior	E
2.13	C00	3	Abraded interior	D
2.14	C00	3	Abraded exterior ripple burnish on interior and top of rim	E
2.15	C270	2		O
2.16	C270	2		C
2.17	C270	3	Fracture shows extra layer of clay added to produce thickened rim.	C
2.18	C272	2	Smoothed surfaces partly abraded.	A
2.19	C276	2	Burnished interior	C
2.20	C276	2	Smoothed surfaces partly abraded	B
2.21	C276	2	Smoothed surfaces	B
2.22	C299	2	Ripple burnish on interior	B
2.23	C299	2	Burnished interior, trace of light fluting on interior	O
2.24	C299	1		O
2.25	C4207	2	Abraded	D
2.26	C4233	2	Interior burnished, exterior smoothed, both partly abraded. Light fluting on top of rim.	B
2.27	C4263	1	Faint finger impressions below rim as a result of rim formation. Two impressions of burnt out cereal grains on interior of rim.	B
Fig. 4.6				
2.28	C00	2	Smoothed interior	D
2.29	C00	-	Rows of rounded impressions below shallow grooved line. Abraded.	A
2.30	C3653	2		C
2.31	C3654	1	Abraded	C
2.32	C3654	1	Smoothed surfaces, partly abraded	E
2.33	C3655	2	Abraded	C
2.34	C6225	1	Smoothed? Originally burnished surfaces	A
2.35	C6225	2	Abraded exterior, pre-firing perforation below rim.	D
2.36	C6224	2	Smoothed partly abraded surfaces	B
2.37	C6230	1	Interior abraded.	A
2.38	C6254	-	Horizontal shallow grooved lines separating rows of stabbed impressions. Abraded exterior, probably from same vessel as 2.6.	E
2.39	C6154	-	Horizontal shallow grooved lines separating rows of stabbed impressions. Abraded exterior, probably from same vessel as 2.6.	E
2.40	C6255	2	Abraded, pre-firing perforations	D
2.41	C6265	2	Abraded smoothed surfaces ?originally burnished.	B
2.42	C6267	3		B
2.43	C6268	1	Wiped surfaces, rim abraded	C
2.44	C6270	2		D
2.45	C6273	2		C
Fig. 4.7				
2.46	C6285	2	Ripple burnish on interior of rim	A
2.47	C6283	3	Abraded	C
2.48	C6283	3	Light stroke pattern on neck and exterior of rim, interior and top of rim missing.	B
2.49	C6314	2	Burnished partly abraded interior	B

	Context	*Rim form*	*Comments*	*Fabric*
2.50	C6316	2	Smoothed surfaces ? originally burnished, partly abraded	A
2.51	C6316	3		C
2.52	C6317	2	Burnished partly abraded surfaces, trace of ripple burnish on interior of rim.	A
2.53	C6317	2		C
2.54	C6317	3		D
2.55	C6320	2	Smoothed interior abraded exterior	A
2.56	C6225	3	Finger tip fluting on interior, smoothed surfaces rim abraded.	B
2.57	C6350	-	Abraded light stroke pattern on neck, dots below.	C
2.58	C6372	2	Smoothed surfaces abraded interior	D
2.59	C6514	3	Smoothed interior with ripple burnish exterior abraded.	D
2.60	C6529	-	Shallow horizontal lines separating rows of stabbed impressions heavily abraded. Probably same vessel as 2.5.	E
2.61	C6544	2	Smoothed surfaces.	A
2.62	C6545	-	Shallow horizontal lines separating rows of stabbed impressions heavily abraded. Probably same vessel as 2.5	E
Fig. 4.8				
2.63	C6581	3	Abraded exterior.	D
2.64	C6571	2	Smoothed surfaces.	B
2.65	C6584	2	Smoothed interior, abraded exterior	B
2.66	C6566	-	?Finger nail impressions on shoulder, smoothed surfaces.	B
2.67	C7185	2	Smoothed interior abraded exterior.	C
2.68	C7194	3	Abraded exterior finger impression on exterior as result of vessel formation.	E
2.69	C7194	2	Smoothed surfaces partly abraded, fracture shows coil joins.	C
2.70	C7215	?5		D
2.71	C7219	1	Overfired appearance, brittle feel	D
2.72	C7214	2	Smoothed interior abraded exterior.	B
2.73	C7181	2	Pre-firing perforation	D
2.74	C7225	2	Wiped surfaces	C
2.75	C7235	3		E
2.76	C7241	2	Abraded	B
2.77	C7241	2	Smoothed exterior, abraded interior	C
2.78	C7251	3	Smoothed ? originally burnished interior	D
2.79	C7287	2	Smoothed partly abraded surfaces, exterior of rim missing.	A
2.80	C7231	2		D
Fig. 4.9				
2.81	C7310	2	Wiped surfaces.	D
2.82	C7319	-	Incised and stabbed decoration	P
2.83	C7328	3		D
2.84	C7346	2	Exterior abraded, ripple burnish on interior	A
2.85	C7294	3	Smoothed/burnished surfaces.	A
2.86	C7389	2	Ripple burnish on inside.	A
2.87	C7875	1		D
2.88	C7369	4	Chevron finger nail impressions on top of rim, stabbed impressions just above break	C
2.89	C7294	2	Smoothed interior.	O
2.90	C7294	3	Lightly incised chevron on exterior of rim slashed impressions on interior, light stroke pattern below rim on exterior. Burnished.	A
2.91	C7237	3	Smoothed surfaces lightly abraded.	A
2.92	C7237	-	Light stroke pattern on neck, stabbed impressions below. Abraded.	A
2.93	C317	-	Impressed chevrons between grooved lines. Burnished.	A
Fig. 4.10				
3.1	D124.27	3	Abraded	C
3.2	D124.138	1	Abraded	D
3.3	D124.146	1	Abraded	C
3.4	D4381	1		B
3.5	D124.116	-	Finger impressions on neck, surfaces missing. Peterborough Ware.	D

	Context	Rim form	Comments	Fabric
3.6	D124.6382	3	Cord maggot chevron pattern on rim and shoulder. Neck wiped. Incised hatching inside rim Peterborough Ware.	C
3.7	D124.54	1	Finger nail impressions on exterior, abraded. Grooved Ware.	M
3.8	124.54	-	Zone of grooved lines with two finger nail impressions surviving to one side, part of exterior missing. Grooved Ware.	M
3.9	124.54	-	Finger nail impressions Grooved Ware.	M
3.10	124.54	-	Grooved chevrons borded by rows of finger nail impressions. Grooved Ware.	M
3.11	124.54	-	Grooved chevrons. Grooved Ware	M
3.12	D209	-	Abraded. Horizontal ? incised lines on exterior.	P
3.13	F6423	2	Abraded.	D
3.14	F6423	1	Abraded.	
3.15	F6461	3	Abraded finger tip impressions on exterior of rim. Peterborough Ware.	D
3.16	F6445	-	Finger impressions on neck. Peterborough Ware.	D
3.17	F6421	-	Finger tip impressions on neck. Peterborough Ware.	O
3.18	H7137	1		C
3.19	H7119	2	Abraded	C
3.20	H7155	3	Abraded, finger nail impressions on exterior rim. Peterborough Ware.	C
3.21	H7139	-	Finger nail impressions on neck Peterborough Ware	M
3.22	H7117	-	Grooved lines on exterior. Grooved Ware.	
3.23	J26	2	Abraded	D
3.24	J25	1	Smoothed exterior abraded interior.	C
3.25	J23	-	Smoothed interior abraded exterior. Row of impressed cord maggots at shoulder. Peterborough Ware.	C
3.26	J24	-	Grooved lines. Grooved Ware.	M
3.27	J28	-	Chevron pattern of grooved lines. Grooved Ware.	M
Fig. 4.11				
3.28	J24	-	Pairs of finger tip impressions. Grooved Ware. Black deposit/sooting on interior.	M
3.29	J24	-	Finger tip impressions. Grooved Ware.	M
3.30	X10	2	Abraded	D
3.31	X15	4	Heavily abraded top of rim. Abraded exterior. Combed lines on neck, slashed decoration on interior of rim, ?chevron pattern on top of rim.	D
3.32	C276			
3.33	A120	-	Join visible in break.	D
3.34	C6317	-	Smoothed surfaces.	C
3.35	C6316	-	Smoothed surfaces, ? originally burnished.	B
3.36	C6316	-	Smoothed surfaces partly abraded.	C
3.37	C00	2	Coil joint visible within sherd.	C
3.38	C6288	-	Coil joins visible within sherd and at top and bottom fracture.	D
3.39	C7192	-	Coil joins visible at top and bottom fracture. Abraded exterior.	B
3.40	C7215	-	Coil joins visible within sherd and at top fracture.	C
3.41	C7237	-	Post-firing perforation, drilled from exterior.	C
3.42	A367	-	Ledge lug, abraded, wiped upper surface.	D
3.43	C6578	-	Small lug, abraded, chevron pattern of stabbed impressions on exterior.	C
3.44	A171	-	Lug or handle	B
3.45	C6575	-	?Bead. Pre-firing perforation running the length of the object. Broken at both ends.	A

Table 4.8 Catalogue of illustrated sherds

the gravel terraces along the Blackwater estuary represent sites from which the superficial deposits (together with perhaps 90% of the pottery once present) have been removed, first by ploughing and then by machine stripping.

Later Neolithic
Later Neolithic pottery, including Peterborough Ware, Grooved Ware and Beaker, was recovered from Areas H and J.

Peterborough Ware
There are two highly decorated rim sherds, one (Fig. 4.1, 1.1) a stray find from the surface south-west of Area A,

the other (Fig. 4.10, 3.6) from Area D; two other rims bear fingertip decoration (Fig. 4.10, 3.15, 3.20). One abraded shoulder sherd has cord impressions (Fig. 4.10, 3.25). Areas D and F produced sherds with finger impressions on the neck (Fig. 4.10, 3.5, 3.16). Fingernail impressions occur above the shoulder of one sherd (Fig. 4.10, 3.17) and on the neck of another (Fig. 4.10, 3.21). The material lacks the highly developed rims of the Mortlake style. The whipped cord decoration and finger-impressed necks are appropriate to the Ebbsfleet style. Although finger-impressed rims are not common in Ebbsfleet Ware, they do sometimes occur (*e.g*. Grimes 1960, fig. 71).

Grooved Ware

Finger impressed and grooved motifs (Fig. 4.10, 3.7–11) are all represented, but the sherds are too small to make an attempt at classifying them according to Longworth's (1971) scheme worthwhile. Some of the finger-impressed body sherds (*e.g*. Fig. 4.11, 3.28) may be rusticated Beaker, but the fabric makes a Grooved Ware attribution more likely.

Beaker

Only one piece was recovered, an abraded base sherd (Fig. 4.10, 3.12).

Discussion

Although the different ceramic styles occurred in the same areas, they were not found in the same contexts. This kind of exclusivity is typical throughout East Anglia (Cleal 1984). Each of the areas which produced later Neolithic pottery also yielded possible Mildenhall Ware sherds which may have been residual. The nature of the superficial deposits in the areas producing Late Neolithic pottery is clearly different from those in Areas A–C. Very little pottery was recovered from these layers; instead, pottery was concentrated in the underlying features, a situation paralleled by that recorded at the 'cooking holes' at Jaywick (Warren *et al.* 1936).

II. Saxon pottery

by S. Tyler

Three small sherds (weight 7g) of Early Saxon pottery broadly datable to the period AD 400–800 were recovered at the Stumble. They are catalogued here by context.

111 Upright angular rim, very abraded outer surface, inner surface carefully smoothed. Body sherd, no surface smoothing, medium soft reddish-orange sandy fabric with common iron oxide, wt 5g.

98 Body sherd, medium hard, dark grey fabric with common vegetable temper, abraded surfaces, wt 2g.

III. Flint

by Robin Holgate
(Figs 4.12–4.19)

Introduction

A total of 11,526 flints was recovered by surface collection and excavation (Table 4.9). The bulk of the assemblage can be dated to the earlier Neolithic period on the basis of both technological and typological characteristics, although some pieces are Mesolithic or later Neolithic/earlier Bronze Age in date.

Over 90% of the flints were recovered from the prehistoric land surface and other superficial deposits, rather than from underlying features cut into the subsoil. The range of debitage and implements present suggests domestic activity on the site.

Nearly 60% of the assemblage consists of broken pieces, perhaps indicating that the flints had been disturbed in some way since they were deposited, for example by trampling. However, the recovery of flakes struck from the same nodule of flint or ground flint axe fragment within a few metres of one another suggests that artefacts have not moved far from their place of deposition.

Raw material

The raw material is mostly dark brown, brown, dark grey brown, light grey brown or grey flint with very occasional grey cherty mottles. Some pieces, where cortex is present, have a distinctive orange band underneath the cortex, indicating initial origination from Bullhead and Thanet Beds. About 3% of pieces have acquired a blue-white patination while about 5% are fire-fractured.

The majority of the flint deposited at the Stumble was flaked from nodules up to 100mm in diameter. Cortex, where present, is mainly thin and abraded. This flint probably originated from local riverine or beach deposits. The Stumble is surrounded by dissected sheets of terrace gravels, with the gravel in some of these outcrops comprising over 90% flint nodules from the Chalk (Bridgland 1988, 309). These nodules are similar in nature to those recovered from the site. Thus most of the raw material used for flaking was probably obtained very close by.

A small, but significant, number of flints comprises grey and dark brown material from further afield. The grey flint, from which all ground flint axe flakes and fragments (from Areas A/B/E, C, D, F and J, as well as from surface collection *124*) were produced, comes either directly from a Chalk source or from East Anglian till deposits. The homogeneous dark brown flint, which was used to produce the discoidal knife roughout fragment from *124* (Fig. 4.18, 124-92), was probably floorstone mined from Grimes Graves, Norfolk. There are five other pieces from *124* and Area C that are of similar colour to this knife roughout fragment, but it cannot be said for certain that they also originated from Grimes Graves. It would be unusual to find more than one or two implements of floorstone in a Neolithic/earlier Bronze Age domestic flint assemblage (*c.f.* Healy 1991).

On the whole the flint is of a good quality for flaking although some pieces have incipient cracks or other flaws, many resulting from frost action.

Technology

The majority of the assemblage, which is Mesolithic or earlier Neolithic in date, consists of pieces flaked from flint pebbles that had been carefully selected as being suitable for controlled flaking. The cores (Table 4.10) weighed between 15g and 90g, and the longest flake scar on any of the flaked surfaces was 48mm. The relatively small size of most of the cores is clearly related to the parent material chosen for flaking. Over 80% of the assemblage was flaked to produce mainly blades, blade-

	Flakes	*Blades*	*Bladelets*	*Chips*	*Shattered pieces*	*Crested blades*	*Core rejuvenation pieces*	*Cores*	*Hammerstones*	*Misc.retouched pieces*	*Cutting flakes*	*Cutting blades*	*Scrapers*	*Knives*	*Piercers*
1985–87 General	306	74	28	2	34	2	6	29	1	6	16	13	32	13	2
Areas A, B and E 3	474	786	349	4	226	3	1	121		15	44	69	33	5	1
Area C 2	630	1036	177	1	281	1	5	179	1	20	94	114	43	10	6
Area D	186	18	1		12			10		2	2	2	5	1	
Area F	68	30	1		14			4			5	11	2	2	
Area G	57	11	1		20			9			6	3	1	1	
Area H	39	13			13			8			6	3	1		
Area J	84	37	9		2			3			3	8	5		
Area X	21	20						1		1	3	8	1		
124	161	56	1	1	19	1	1	26		5	28	23	18	5	
Total	**7026**	**2081**	**567**	**7**	**621**	**7**	**13**	**390**	**2**	**49**	**207**	**254**	**141**	**37**	**9**

	Ovates	*Microdenticulates*	*Denticulates*	*Notched pieces*	*Rods*	*Truncated blades*	*Burins*	*Tranchet axe sharpening flakes*	*Flaked chisel fragment*	*Ground axe fragments*	*Ground axe flakes*	*Geometric microliths*	*Leaf-shaped arrowheads*	*Transverse arrowheads*	*Barbed and tanged arrowheads*	*Fire-fractured flint*	*TOTAL*
1985–87 General	1		1							1	3		1	2			573
Areas A, B and E 3	2						3			2	17	2	6				
Area C 2	11	4	1	1		1		1		1	9		11		1		
Area D		1									1						
Area F	1										1						
Area G																	
Area H		2											1				
Area J		2									1						
Area X	1																
124	1	9		1	3		2		1		2						
Total	**17**	**18**	**2**	**1**	**3**	**1**	**5**	**1**	**1**	**4**	**34**	**2**	**19**	**6**	**1**		**11,526**

Table 4.9 The flint

lets and axes, almost exclusively using soft hammers. The remainder was flaked into flakes using hard hammers or the Levallois technique. About 94% of the assemblage is debitage. Studying this material reveals evidence for the use of at least five different core reduction strategies at the Stumble.

The first strategy involved producing objects (mainly blades) from one-, two- and three-platform cores. Initially, one flake was removed or the nodules were either halved or quartered, using mainly hard hammers, in order to create a striking platform (Fig. 4.12, 880). This was then abraded before each blade was detached in order to remove any angular or projecting pieces of flint around the platform edge. Once the angle between the striking platform and the flaked surface had become too obtuse to continue flaking, the core was either abandoned as a one-platform core or it was rotated to locate another surface suitable for use as a striking platform, thus becoming a two-platform core (Fig. 4.12, 913). This time, when the angle between the striking platform and the flaked surface was too obtuse to continue flaking, the core was either abandoned or rotated again to locate another surface to use as a striking platform, thus creating a three-platform core (Fig. 4.15, 4231). This core reduction strategy was mostly used during the earlier Neolithic period (Holgate 1988a, 59–60).

The second method for reducing cores began in a similar fashion to the one outlined above, with the creation of a single-platform core from which blades could be detached using soft hammers. From this point onwards, the main intention was to detach long, narrow blades or bladelets. When the angle between the striking platform and the flaked surface became too obtuse for flaking, a new striking platform was created on the opposite end of the core in order to continue detaching bladelets, thus creating a two-opposing platform core. This core reduc-

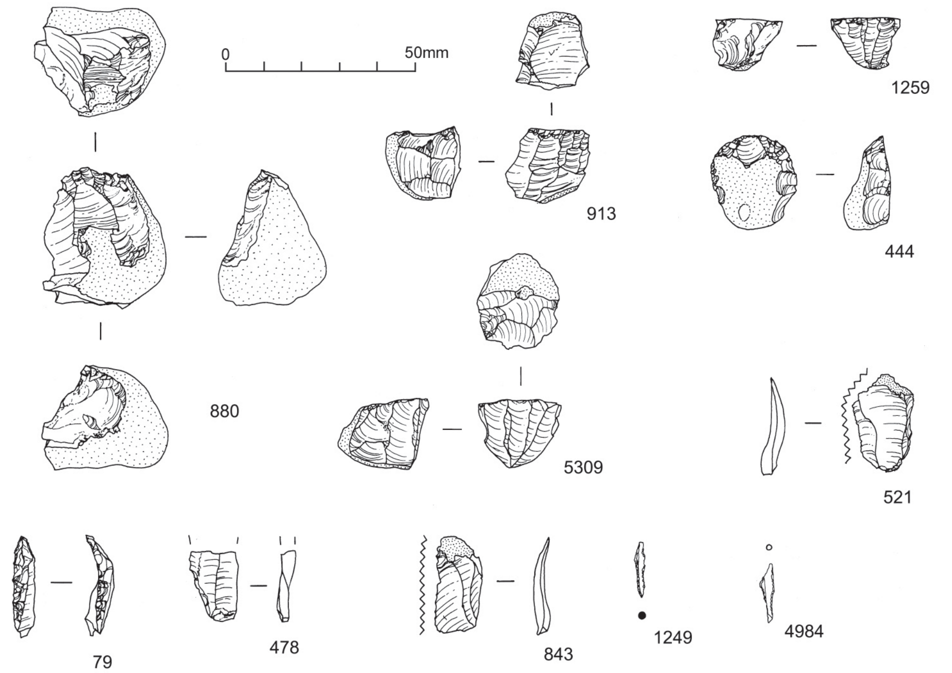


Figure 4.12 Flints from Area A: cores (*880*, *913* and *1259*); end scraper (*444*); piercer (*79*); burin fragment (*478*); cutting flakes (*521* and *843*); geometric microlith (*1249*). Flints from Area B: core (*5309*); geometric microlith (*4984*)

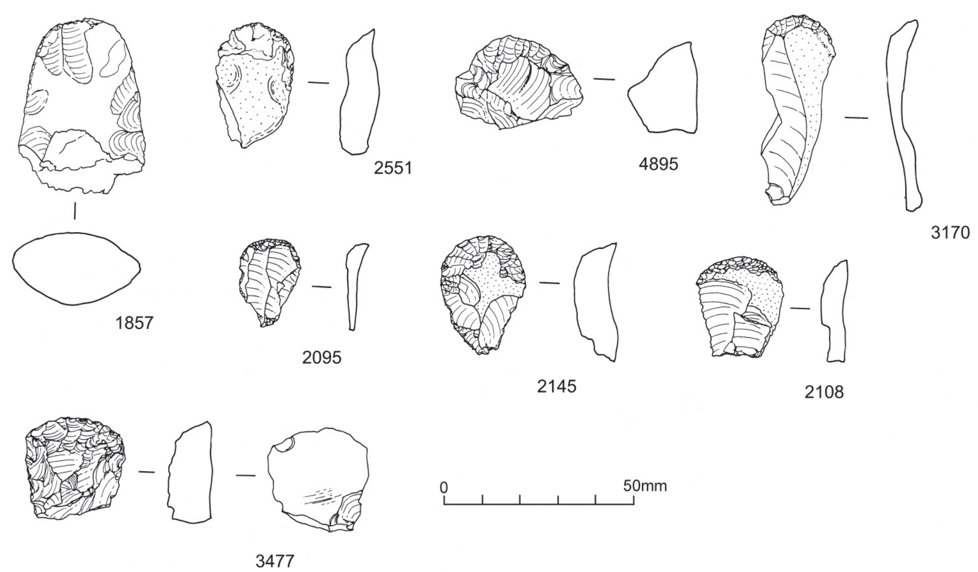


Figure 4.13 Flints from Area B: ground flint axe butt end fragment (*1857*); end scrapers (*2095, 2108, 2145, 2551, 3170, 3477* and *4895*)

tion strategy was used in the Mesolithic period (Barton 1981; Holgate 1988a, 54–9).

In some instances, ground flint axes were flaked. This was done either by using the fractured facet of an axe fragment as a striking platform, or by using a side, butt or cutting edge on the axe for this purpose. Where bulbs of percussion survive, it is apparent that soft hammers were used for detaching flakes from axes. The flaking of ground flint axes probably took place during the Neolithic period. Amongst the debitage from the Stumble is a small quantity of soft-hammer-struck axe-thinning flakes. As there is also a tranchet axe-sharpening flake of flint similar in colour to the axe-thinning flakes in the Stumble assemblage, it is possible that all these pieces result from the manufacture or modification of axes in the Mesolithic period.

The fourth strategy consisted of taking a piece of flint, regardless of its quality, and then exploiting a surface that could be used as a striking platform, either using a flat-tish surface that was already available or by removing a flake. Flakes were then detached using hammerstones. No care was taken to prepare the striking platform in between detaching each flake. When the angle between the striking platform and the flaked surface had become

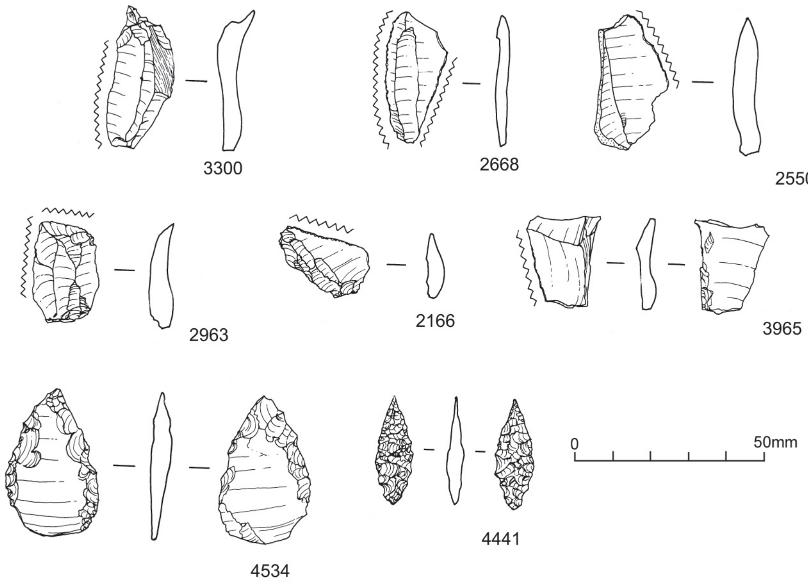


Figure 4.14 Flints from Area B: cutting flakes (*2166*, *2550*, *2668*, *2963* and *3965*); cutting flake on ground flint axe flake (*3300*); ovate (*4534*); leaf-shaped arrowhead (*4441*)

	General	*Areas A, B, E*	*Area C*	*Area D*	*Area F*	*Area G*	*Area H*	*Area J*	*Area X*	*Area 124*
Single-platform cores	-	-	-	-	-	-	-	-	-	-
Flake removals	7(2)	32(18)	(33)	2(-)	-	-	-	-	-	-
Blade removals	3(3)	21(19)	34(31)	1(1)	-	-	-	-	1(1)	-
Bladelet removals	-	6(5)	7(7)	-	-	-	-	-	-	-
Two-platform cores	-	-	-	-	-	-	-	-	-	-
Flake removals	9(4)	26	25(12)	-	-	-	-	-	-	-
Blade removals	3(3)	23(19)	18(16)	-	-	-	-	-	-	-
Bladelet removals	-	1(1)	2(2)	-	-	-	-	-	-	-
Two opposing platform cores	-	-	-	-	-	-	-	-	-	-
Flake removals	-	1(-)	3(3)	1(-)	-	-	-	-	-	-
Blade removals	-	4(4)	6(6)	-	-	-	-	-	-	-
Four- or more platform cores										
Flake removals	2(1)	1(1)	2(1)	1(1)	-	-	-	-	-	-
Discoidal cores	1(1)	2(2)	5(5)	-	-	-	-	-	-	-

Figures in brackets indicate those which have been prepared by detaching angular or projecting pieces from platform edges before detaching removals

Table 4.10 Details of flint cores

too obtuse for further flaking, the core was either abandoned or rotated to find a new striking platform. This method of reducing cores was mostly in use during the later Neolithic period and Bronze Age (Holgate 1988a, 60–1).

The fifth reduction strategy involved the creation of discoidal-shaped Levallois-like cores. One side of the core was flaked, usually with a soft hammer, to produce a flattish surface (Fig. 4.17, 135.3). Another side, perpendicular to this flat surface, was flaked to produce a striking platform from which one flake, usually trapezoidal or sub-triangular in shape, was detached. This 'prepared flake' was usually used as a blank for producing chisel arrowheads in the later Neolithic period (Saville 1981; Holgate 1988a, 60). Some cores, such as a one-platform blade core of earlier Neolithic date from Area C (Fig. 4.18, 7320), were subsequently used as hammerstones.

Implements were manufactured on robust flakes or blades, 29% of which were stone-hammer-struck and 35% of which had been detached using a soft hammer. Retouch was usually executed with care, either using a stone or soft hammer or by pressure flaking.

Typology

About 6% of the assemblage consists of implements. Cutting tools, comprising cutting blades (Fig. 4.17, 135.4), cutting flakes (Fig. 4.14, 2166, 2550, 2668, 2963 and 3965), knives (Fig. 4.16, 5066 and 5327 and Fig. 4.18, 124-102), microdenticulates (Fig. 4.18, 124-8 and 124-104), ovates (Fig. 4.14, 4534; Fig. 4.16, 5063 and 6335; Fig 4.18, 3533) and the two possible sickle fragments (Fig. 4.16, 135.1 and 5354), predominate. Indeed, they account for nearly 70% of all implements. There is also a large number of scraping tools (nearly 20% of implements), including end, side and discoidal scrapers (Fig. 4.13, 2095, 2108, 2145, 2551, 3170, 3477 and 4895; Fig. 4.15, 4279.1, 4311 and 6282; Fig. 4.19, 124–55 and 124-30). Fragments of axes/chisels (Fig. 4.13, 1857 and Fig 4.18, 124-115), piercing tools (Fig. 4.12, 79; Fig. 4.16, 4348 and 5287), burins (Fig. 4.12, 478; Fig. 4.19, 124-104 and 124-125), rods (Fig. 4.19, 124-1) and notched pieces (Fig. 4.18, 3527) are also present. Projectile points comprised 3% of implements and included geometric microliths (Fig. 4.12, 1249 and 4984), leaf-shaped arrowheads (Fig. 4.14, 4441, Fig. 4.16, 135.2, 5068, 7222 and 7236 and Fig. 4.17, 280), transverse (including both chisel and oblique) arrowheads (Fig. 4.17, Site 88 and 4398; Fig 4.19, 124-98) and a barbed-and-tanged arrowhead (Fig. 4.17, 6154). That arrowheads were made on site is indicated by the presence of unfinished leaf-shaped and chisel arrowheads.

One unusual feature of certain pieces is that the bulbs on the ventral surfaces of certain objects — for example, some of the scrapers (Fig. 4.15, 4279.2 and Fig 4.19, 124-30), knives (Fig 4.16, 5327) and microdenticulates — had been thinned by invasive retouch, perhaps to facilitate hafting in an organic handle. A number of the cutting blades and cutting flakes (*e.g*. Fig. 4.14, 2166) have one edge which is sharp (and usually partially serrated through use) whilst the other edge is blunt, and are thus likely to have been held in the hand when used.

All the implements could date to the earlier Neolithic period, although the burins (which all had one spall removed from the distal end), geometric microliths and tranchet axe-sharpening flake are forms usually encountered in Mesolithic assemblages. The scrapers and knives with invasive retouch (Fig. 4.16, 5066 and 5327) and the transverse and barbed-and-tanged arrowheads are forms commonly found in later Neolithic/earlier Bronze Age contexts.

Taking the assemblage as a whole, over three-quarters of the flints from Areas A/B/E, C, F and J date to the earlier Neolithic period, with a significant number of both later Mesolithic and later Neolithic/earlier Bronze Age flints also being recovered. In Areas D/G/H and old land surface deposit *124* about two-thirds of the flints probably date to the earlier Neolithic period: some pieces are later Mesolithic whilst the remaining fraction, perhaps as many as a quarter, date to the later Neolithic period or the earlier Bronze Age.

Area J

The vast majority of the flints are likely to be of earlier Neolithic date. There is some Mesolithic debitage present; the rest (*e.g*. the cutting flake on a prepared flake detached from a Levallois discoidal core) is later Neolithic/earlier Bronze Age in date. Of the implements present, about two-thirds are cutting tools — cutting blades, cutting flakes and microdenticulates — which show signs of use before they were discarded. Of the scrapers, two were probably broken in use; one has invasive retouch and could date to the later Neolithic/earlier Bronze Age.

The distribution of flints from Area J shows two main clusters: the denser one is in the vicinity of Area C, whilst the less dense/more diffuse one is closer to Area A/B/E.

Nearly half of the flints from this area are broken; the fracture facets on broken cutting tools are consistent with breaks caused by trampling.

Areas A, B and E

Excavation of Areas A, B and E yielded 44% of the flints from the Stumble (Table 4.9). About 4% were recovered from subsoil features. The majority of the flints from this area probably date to the earlier Neolithic period. However, some pieces date to the later Mesolithic period. These include at least eight of the cores, some of the blades and most of the bladelets, and probably the axe-thinning flakes, crested blades and the core rejuvenation flake. Of the implements, the three burins and the geometric microliths (Fig. 4.12, 1249 and 4984), and possibly some of the cutting blades, are later Mesolithic in date.

A small proportion of the flints are later Neolithic/earlier Bronze Age in date, including some of the flakes and cores (including the two discoidal cores), along with some of the scrapers and the oblique arrowhead.

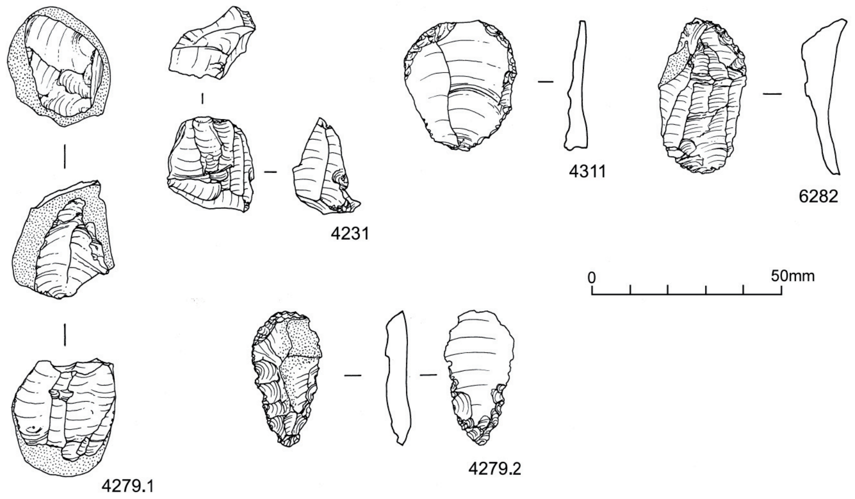


Figure 4.15 Flints from Area C: cores (*4231* and *4279.1*); end scrapers (*4279.2*, *4311* and *6282*)

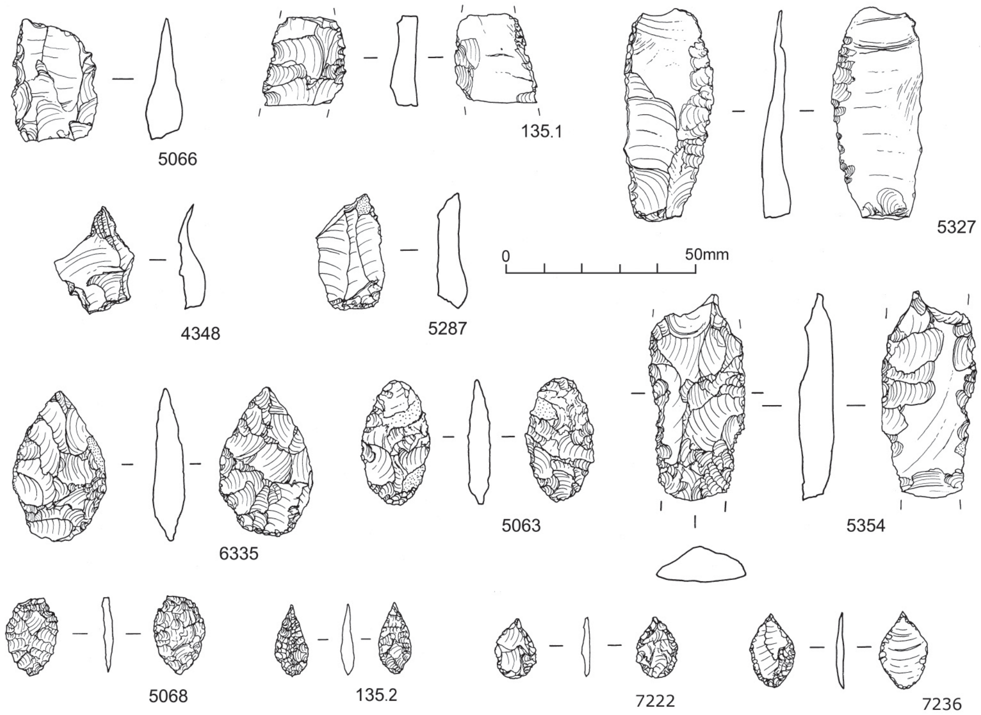


Figure 4.16 Flints from Area C: knives (*5066* and *5327*); knife/sickle fragments (*135.1* and *5354*); piercers (*4348* and *5287*); ovates (*5063* and *6335*); leaf-shaped arrowheads (*135.2*, *5068*, *7222* and *7236*)

Only a cursory attempt was made to explore refitting patterns, but it was noted that there were flints from different passes (1–6) which had been flaked from the same nodule. This suggests that there has been some vertical movement of flints, but not necessarily much horizontal displacement.

Two-thirds of the earlier Neolithic implements recovered from Areas A/B/E are cutting tools, with the remainder (about a sixth) consisting of scrapers and piercing tools, along with projectile points and ground flint axe fragments. Two-thirds of flints are broken, some through use but the majority probably through post-depositional processes, such as trampling.

The flints from the subsoil features are all earlier Neolithic in date. Most of the implements showed traces of use or of breakage in use, suggesting that they may have been deliberately discarded once they no longer served any practical purpose.

Area F

The majority of the flints are probably earlier Neolithic in date, although some of the debitage could date to the Mesolithic period. Possibly as much as a tenth of the flint could be later Neolithic or earlier Bronze Age, comprising flakes, a discoidal core from which a prepared flake had been detached, and possibly both the scrapers. The earlier Neolithic implements are almost exclusively cutting tools (cutting blades, cutting flakes, knives and an ovate), some of which showed signs of use.

Nearly half of the flints recovered are broken pieces. The fracture facets on some of the cutting blades are consistent with damage caused by trampling.

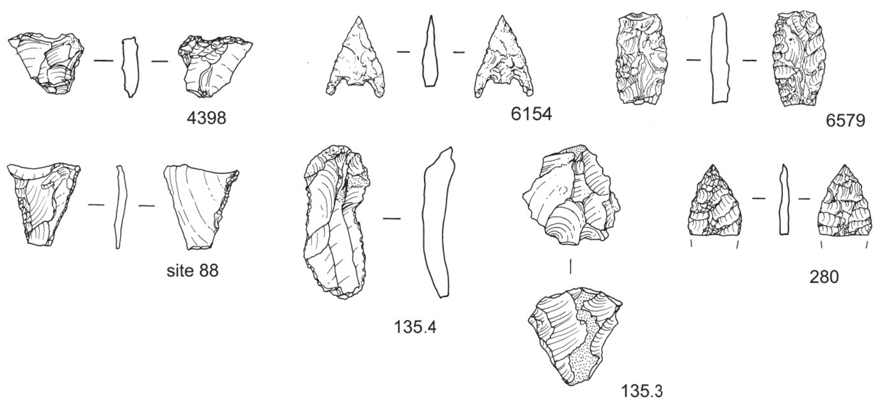


Figure 4.17 Flint from the Stumble site: chisel arrowhead (Site 88). Flints from Area C: discoidal core (*135.3*); cutting blade (*135.4*); leaf-shaped arrowhead (*6579*); barbed-and-tanged arrowhead (*6154*). Flints from Area D: leaf-shaped arrowhead (*280*); transverse arrowhead (*4398*)

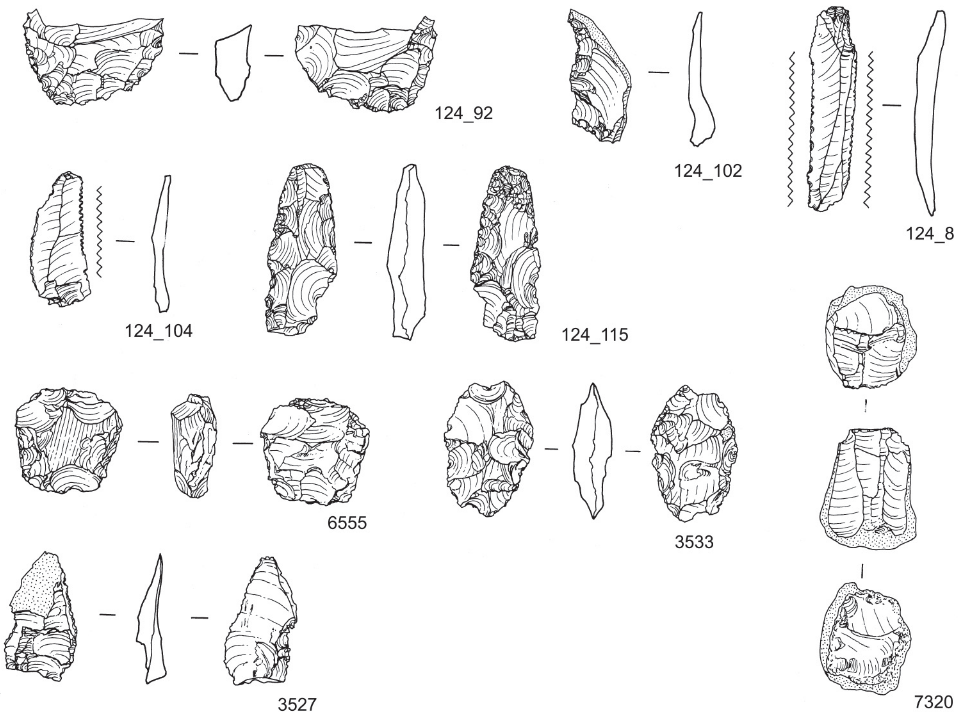


Figure 4.18 Flints from Area C: ground flint axe fragment used as a core (*6555*); blade core reused as a hammerstone (*7320*); ovate (*3533*); notched flake (*3527*). Flints from deposit *124*: discoidal knife roughout fragment (124-92); knife (124-102); microdenticulates (124-8 and 124-104); flaked chisel butt end fragment (124-115)

Area C

Area C produced 42% of the flints from the Stumble (Table 4.9), with 14% coming from subsoil features. Although a mixture of Mesolithic, earlier Neolithic, later Neolithic and earlier Bronze Age flints was present, the majority are likely to date to the earlier Neolithic period — over three-quarters of pieces where bulbs of percussion survived had been detached from cores using soft hammers. The earlier Neolithic component includes the bulk of the flakes and blades, over half of the one-, two- and three-platform flake cores and possibly all of the one-, two- and three-platform blade cores (Fig. 4.15, 4231 and 4279.1; Fig. 4.18, 7320). It also includes the majority of the cutting, scraping and piercing tools, the ground axe fragments and flakes, and the leaf-shaped arrowheads (Fig. 4.14, 4441; Fig. 4.16, 135.2, 5068, 7222 and 7236; Fig. 4.17, 6579 and 280).

A significant group of Mesolithic flints from Area C includes some of the blade/bladelet cores and blades and most of the bladelets, along with a core tablet, possibly a crested blade, a tranchet axe-sharpening flake, axe-thinning flakes, a truncated blade and possibly some of the cutting blades. The later Neolithic/earlier Bronze Age flints include a small number of one- and two-platform

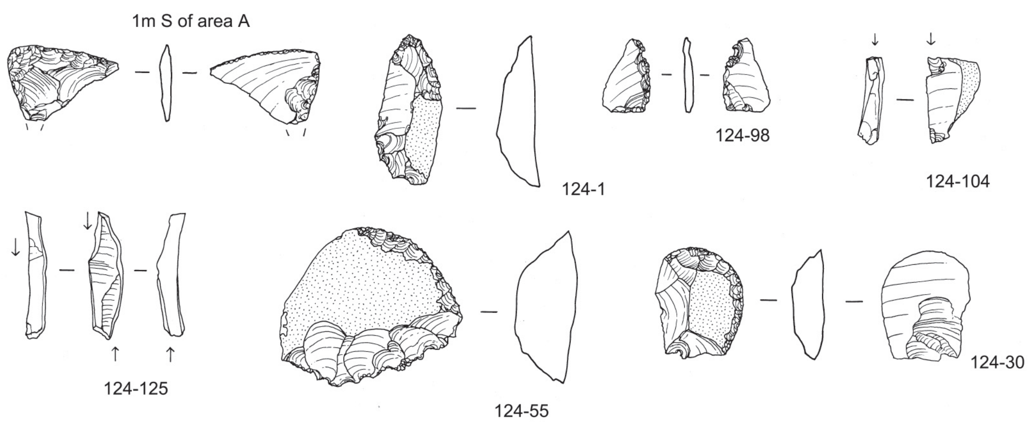


Figure 4.19 Flint from south of Area A: chisel arrowhead. Flints from deposit *124*: rod (124-1); end scrapers (124-30 and 124-55); burins (124-104 and 124-125); oblique arrowhead (124-98)

flake cores, five discoidal cores, some of the scrapers (including a discoidal scraper) and a barbed-and-tanged arrowhead.

Over three-quarters of the earlier Neolithic implements represent a full range of cutting tools, with scrapers, piercers, a notched flake, projectile points and ground flint axe fragments also well-represented. The quantity and range of implements present suggest domestic activity — probably one or more working areas of some description — before the site became a midden/dump associated with living/working areas nearby. Subsequently, later Neolithic and earlier Bronze Age activity took place in this area.

As in Area F, nearly half of the pieces from this area are broken.

Context *124*

About half of the pieces are earlier Neolithic in date, although some Mesolithic material in the form of debitage and possibly the burins is present (Fig. 4.19, 124-104 and 124-125; Table 4.9). The earlier Neolithic material includes end scrapers on blades. Six of these — two of which had invasive retouch on the distal end for hafting (Fig. 4.19, 124-30) — may have been broken in use, along with a microdenticulate which also bore invasive retouch at its distal end for hafting. All of these objects had been used. Nearly three-quarters of the earlier Neolithic implements are cutting tools: cutting blades, cutting flakes, knives, microdenticulates and an ovate, a number of which show extensive signs of use (and of breakage in use). Other implements present include scrapers, rods and a notched flake (Fig. 4.18, 3527).

The later Neolithic/earlier Bronze Age material includes possibly two invasively-retouched scrapers, a discoidal knife fragment (Fig. 4.18, 124_92), a transverse arrowhead (Fig. 4.19, 124-98) and a flaked chisel butt end fragment (Fig. 4.18, 124_115).

Nearly half of the pieces recovered from this area were broken.

Area X

Almost all of flint from this area probably dates to the earlier Neolithic period: this includes the implements, which comprise cutting tools and a scraper on a blade (Table 4.9), many of which had clearly been used. About a third of the flints recovered are broken.

Area D

About three-quarters of the flints from Area D are earlier Neolithic in date, consisting mainly of debitage, cutting tools (cutting blades, cutting flakes and microdenticulates) and scrapers which were used and then discarded (Table 4.9). The remainder of the flint, including debitage, scrapers, the transverse arrowheads and possibly the knife, date to the later Neolithic/earlier Bronze Age. About a third of the flints recovered from this area were broken. Around 15% of the flints were recovered from subsoil features, the majority of them earlier Neolithic pieces. Contexts *215* and *217* contained flakes which might be later Neolithic/earlier Bronze Age in date, suggesting that they might have been deposited during use in this period, with the earlier Neolithic flints being residual. Although later Neolithic/earlier Bronze Age flint artefacts were found in all areas investigated, Area D produced the greatest concentration of later Neolithic/earlier Bronze Age material.

Area G

The majority of the flints are earlier Neolithic in date, consisting of debitage, cutting tools and a scraper (Table 4.9). Some of the cutting flakes probably date to the later Neolithic/earlier Bronze Age. Only about a quarter of the flints from this area were broken, perhaps indicating that Area G remained relatively undisturbed. The scraper had probably been broken in use but all the other implements appear to be intact.

Area H

The majority of flints are earlier Neolithic in date, including debitage, cutting tools (cutting flakes, cutting blades and microdenticulates), a scraper and a leaf-shaped arrowhead (Table 4.9). About a third of the flints are broken, the fracture facets on some of the cutting flakes and cutting blades being consistent with trampling.

Discussion

It is evident from the flint assemblage that a range of domestic activities took place at various locations at the Stumble during the earlier Neolithic period. The site had also been occupied in the later Mesolithic period, and was also in use during the later Neolithic/earlier Bronze Age.

Excluding the ground flint axe flakes, all the parent material in the assemblage probably originated from the same source. Rolls Farm, situated *c*. 2km to the east, is a contemporary site where flint from a similar source was used, but the flint from the earlier Neolithic sites at Lofts Farm (Holgate 1988b, 276) and Chigborough Farm/Slough House Farm/Howells Farm, located *c.* 5km to the north-west, seems to derive from a different location (Holgate 1998). The flint nodules used for flaking in the earlier Neolithic period are indistinguishable in colour, size and quality to those used for flaking in the later Mesolithic period. This makes it almost impossible to distinguish later Mesolithic from earlier Neolithic flintwork. The use of a similar source might suggest that a native population who were fully 'in tune' with the natural resource availability and potential of the landscape selected the site as a focus for agrarian and domestic activity in the earlier Neolithic period.

Mesolithic flints, all of which probably date to the later Mesolithic period, include debitage and a limited range of implement types — cutting blades, truncated blades, burins, an axe-sharpening flake and geometric microliths. This material probably results from hunting and wild plant gathering activities, possibly in autumn and winter months, in a wooded environment. It could represent either the remains of a short-stay woodland resource exploitation camp or episodic exploitation of the site over a number of years.

The lithic evidence suggests that when the site saw domestic activity in the earlier Neolithic period the main living area was in the vicinity of Area J, although perhaps the initial focus was at Areas A/B and E. The main occupation area then shifted, although its precise location or locations thereafter are unclear. However, dumps of domestic refuse certainly accumulated at Areas A/B/E and C. The variety of implement types recovered from both of these areas demonstrates that a range of tasks was performed here and elsewhere too if the area had, perhaps, become a dump zone. There is a significantly high proportion of cutting tools, and some scraping and piercing tools are also present. The ground flint axe flakes and fragments indicate the use of hafted axes, but as flint suitable in size and quality for producing axes is not available locally these items may have been 'curated'; thus the fragmentary axe remains at the site do not necessarily reflect the use made of axes for woodworking and other tasks on the site. Similarly, given the time invested in the production of leaf-shaped arrowheads, their use off-site is also likely, again hinting at an under-representation of the use of these projectile points by the flint assemblage recovered from the site. It is likely that cereal cultivation, processing and consumption took place on site, along with the processing and consumption of wild plant foods. The site was also likely to have been a base for hunting and further exploitation in the surrounding woodland.

Context *124* and Area X also produced evidence for earlier Neolithic occupation, but this does not appear to have been an area where midden dumps accumulated. These remains are more likely to represent a working area — perhaps a succession of cereal cultivation or horticultural plots — associated with Area J, where debitage and (mainly) cutting tools were discarded when there was no further use for them. Later Neolithic/Early Bronze Age activity took place at the site, perhaps intermittently. The limited quantity and range of implement types represented suggests that task-specific activities took place, for example the hunting and processing of animals and the gathering and processing of wild plant resources.

The Stumble has yielded the largest earlier Neolithic flint assemblage collected from any site in Essex. It is also amongst the largest recovered to date from a site in Eastern England, being comparable in size to that from Broome Heath which comprised 8931 flints. In terms of the activities carried out at the Stumble, it is perhaps significant that, whilst the assemblages from the domestic sites at Broome Heath, Hurst Fen and Spong Hill have a comparable range of debitage and implements, that from the Stumble is distinctive in having far fewer scrapers and a greater number of cutting tools, and (other than Hurst Fen) a greater number of leaf-shaped arrowheads.

IV. Animal Bone

by Umberto Albarella

The investigation at the Neolithic site produced a tiny animal bone assemblage (Table 4.11).

All material, apart from a cattle tooth fragment recovered from sieving, was hand-collected. The preservation was poor, and this explains why teeth predominate. Many bones and teeth are burnt, and in several cases calcined (*i.e*. burnt at a very high temperature). Butchery and refuse were probably discarded in a fire.

The bones are too few and too fragmented to permit any assumptions or conclusions on the domestic or wild status of cattle and pigs. Sheep remains are uncommon on British Neolithic sites, thus their absence from this assemblage is not surprising. Cut marks have been noted on the red deer specimen — a scapula fragment — indicating that meat from the animal was consumed.

	Early Neolithic			*?Early Neolithic*			*Neolithic*			*Total*		
	Bones	*Teeth*	*Total*	*Bones*	*Teeth*	*Total*	*Bones*	*Teeth*	*Total*	*Bones*	*Teeth*	*Total*
Cattle (*Bos* sp)	-	5	5	-	10	10	3	15	18	3	30	33
Pig (*Sus* sp)	2	2	4	-	-	-	1	-	1	3	2	5
Red Deer (*Cervus elaphus*)	-	-	-	1	-	1	-	-	-	1	-	1
Roe Deer (*Capreolus capreolus*)	-	-	-	-	1	1	-	-	-	-	1	1
Total	**2**	**7**	**9**	**1**	**11**	**12**	**4**	**15**	**19**	**7**	**33**	**40**

Table 4.11 Animal bone

5. Charred Plant Remains and Palaeoeconomy

I. Introduction

Systematic survey and selective excavation on exposed areas of the Neolithic palaeosol at the Stumble began during the 1986 season. It was decided at an early stage that, despite the practical problems posed by the intertidal location of the site, extensive sampling in order to retrieve palaeoecological and palaeoeconomic information would be necessary. The site clearly provided opportunities to obtain assemblages of charred Neolithic plant macrofossils, and from contexts in which problems of contamination with later charred material could be discounted. It was also hoped that the spatial distribution of macrofossils across the site might provide information on 'activity areas'.

Sampling began in 1986 at Area A, and continued in the following season in the adjacent Areas B and E. Also in 1987, shallow late Neolithic features were sampled at Area D. The samples produced unusually rich assemblages of Neolithic plant remains, and were summarised in an interim report (Murphy 1989; see also Table 5.16). However, it was apparent that the areas excavated were simply too small for informative interpretations of spatial distributions to be made. Equally, it was clear that large-scale area excavation was impractical. Consequently, in 1988, a grid of trial pits was dug across the entire area of exposed land surface, designated Area J. Alongside this extensive sampling, excavation and sampling continued in 1988 at Area C and one of the burnt flint mounds, *231*.

In this report, a summary of methods is followed by an account and interpretation of results from Area J. This is followed by a presentation of results from Areas A/B and E, together with a detailed description of macrofossils from Area A. The material from Area A is similar to that from the remaining sample groups, though a few types of macrofossil not found at Area A are described in the appropriate sections. This is followed by the results from Area C and D and, finally, by a synthesis and discussion of results from the Stumble as a whole.

II. Methodology

Sampling and processing samples from intertidal sites presented a number of practical problems, so it may be helpful to describe the methods used in some detail.

Sample size was limited by practical considerations, in particular the weight of soil that could be transported from the site — initially on foot over mud flats, and subsequently in a small inflatable. Samples nominally of 5kg (dry weight) were taken from the palaeosol, together with samples of varying weight from the fills of cut features, depending on their size. In fact, variations in lithology and in excavators' perception of weight led to dry sample weights of *c*. 3–10kg. On-site processing was considered but was found to be impossible, because the clay/silt-rich matrix of the samples could not readily be disaggregated.

On the basis of trial processing (Wilkinson and Murphy 1987, 71–3), the following methods were adopted:

- The samples were stored in an unheated out-building with bags open, allowing very slow drying.
- After weighing, the dry samples were immersed in fresh water over a 0.5mm mesh and wet-sieved when they had disaggregated — usually after a few minutes.
- The material retained in the mesh (coarse sand, shells of modern molluscs, annelids, crustaceans and uncharred plant detritus, charred Neolithic plant material, bone fragments and artefacts) was transported to the laboratory without drying.
- After wet-sieving and washing with fresh water on a 6mm mesh (to remove the larger components), charred plant material was separated by flotation/washover with a 0.5mm collecting mesh. The flots and residues were washed thoroughly to remove as much salt as possible.
- The residues were re-floated since they still contained some charred material.
- The dried flot fractions, which consisted of mats of modern plant detritus with charred material, were gently teased apart before sorting under a binocular microscope at low magnification.

Selected categories of material were weighed on a digital laboratory balance, including charcoal (g. of charcoal fragments>2mm/kg of air-dried soil), hazel nutshell, and bone fragments. In some sample groups, however, weights and densities of hazel nutshell were so small that weighing and density determination were impossible. Quantities of sloe endocarp and bone fragments were similarly very small in most samples. Consequently, for present purposes, abundance of these macrofossils is best considered mainly in terms of frequency and spatial distribution (*i.e.* numbers. of samples in which nutshell and bone occurred, and their locations across the exposed palaeosol).

Despite several stages of immersion and washing in fresh water, some of the charred macrofossils retained surface deposits of salt crystals after drying. It was feared that, in the long term, salt efflorescence might cause fragmentation of the material. In fact, when the material was partly re-inspected in 2002, during archiving for storage as part of the Murphy Collection at Norwich Castle Museum, no evidence for extensive fragmentation was observed.

Contamination

The samples included Neolithic material, but also intrusive biological remains: foraminiferans, hydrozoans, mollusc shells, crustacean and insect remains, small fish bones and plant detritus (vegetative material with fruits and seeds chiefly of halophytes *(Suaeda maritima, Plantago maritima, Triglochin maritima, Aster tripolium, Ruppia* sp. *etc*.). This intrusive material is likely to have been introduced into the Neolithic deposits in two phases: first when the site was submerged in the early 2nd millennium

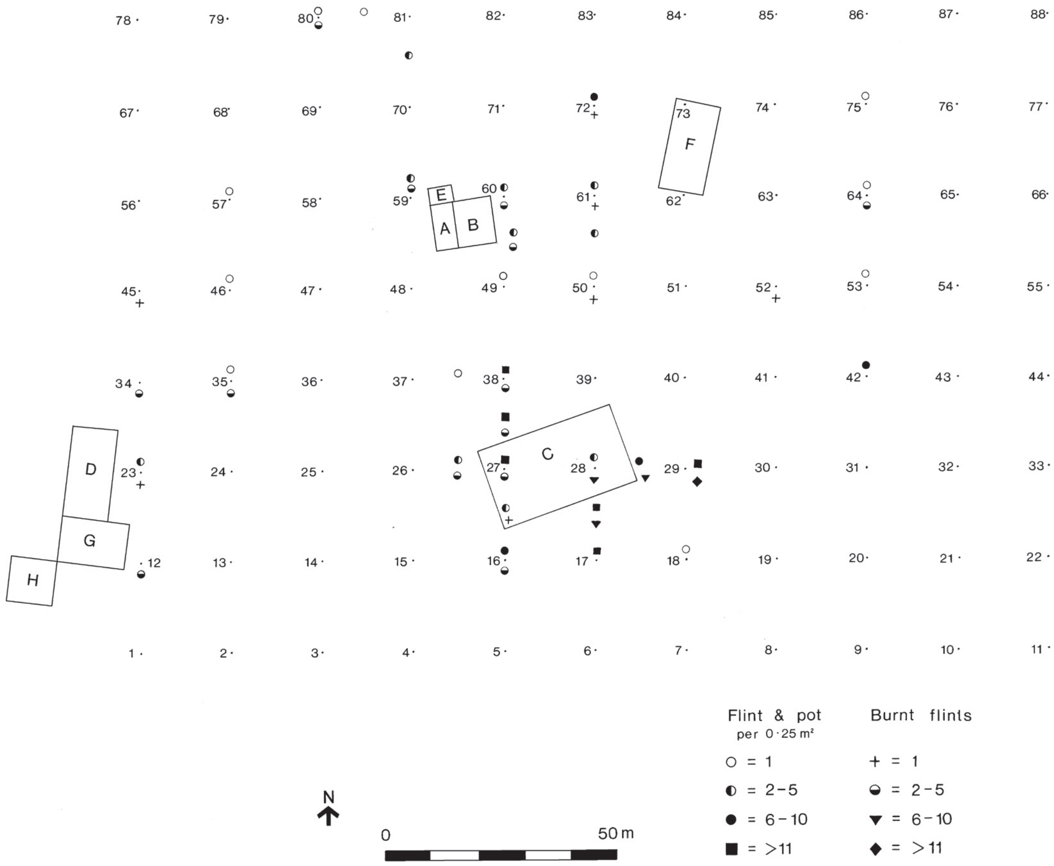


Figure 5.1 Key plan for Area J, showing locations of trial pits and excavated/sampled areas (Sites A–H)

BC; and secondly in recent times once sediment cover had been largely removed by erosion. This contamination is easily detected and accounted for.

When considering the significance of these assemblages for prehistoric studies, the key point is that there is no possibility of any intrusive post-Neolithic *charred* plant material or *burnt* mammal bone being present. This is emphatically not the case at many multi-period terrestrial sites in the UK, where it is not unusual to find that later charred cereal remains have been introduced to dryland Neolithic deposits via soil cracks, or by faunal burrowing and root growth. At two nearby excavations (at Slough House and Chigborough Farms) on the gravel terraces of the Blackwater where Neolithic pits were sampled, this could easily be demonstrated: cereal grains gave one determination of 1500±100 BP (OxA 3036; cal AD 340–690 at 95% confidence) and a second of 113±1.2 BP (OxA 3035: Murphy 1998). It is therefore plain that former dryland intertidal sites produce more reliable results than contemporary adjacent sites which are still in terrestrial situations. All AMS dates on cereal grains from the Stumble were consistent with the dating of the site inferred from artefactual evidence.

Finds of *uncharred* macrofossils of land plants, especially those of *Rubus* (bramble), *Fragaria* (strawberry) and *Sambucus* (elderberry), were more problematic. It is not unusual to find some remains of terrestrial plants in estuarine sediments, so these might merely represent contaminants introduced by the same processes as those of halophytes. On the other hand, these fruitstones, achenes and seeds are very durable, and could conceivably have represented Neolithic food wastes. The distribution of these macrofossils as a low-density, fairly uniform, scatter across the excavated areas is thought to indicate that they were, in fact, intrusive.

In the areas where excavations took place, samples were collected from the palaeosol in each 1m-grid square and from excavated cut features. Across Area J, following surface gridded collection and plotting of artefacts, trial pits were placed in a 20m x 20m grid pattern over an area of 200m x 140m using 'bins' (above, p.4). A sample for flotation and wet sieving was taken from each sample bin (J1–J88), except in locations where the palaeosol had been truncated by erosion, or where thick deposits of estuarine sediments probably indicating pre-existing or incised palaeochannels were encountered.

III. Results

(Figs 5.1–5.22)

(NB: Table 5.1–5.16 follow the text and illustrations, and are on pp. 92–114)

Area J

The results from the sample grid (Fig. 5.1; Tables 5.1 and 5.2) are analogous to the data that might have been obtained had the site still retained a sediment cover, necessitating geoarchaeological prospecting by means of a grid of boreholes (*c.f.* Goudeswaard 2000). Densities of charcoal, and the distribution of remains of cereals, hazelnut shell, sloe endocarp and burnt bone in the

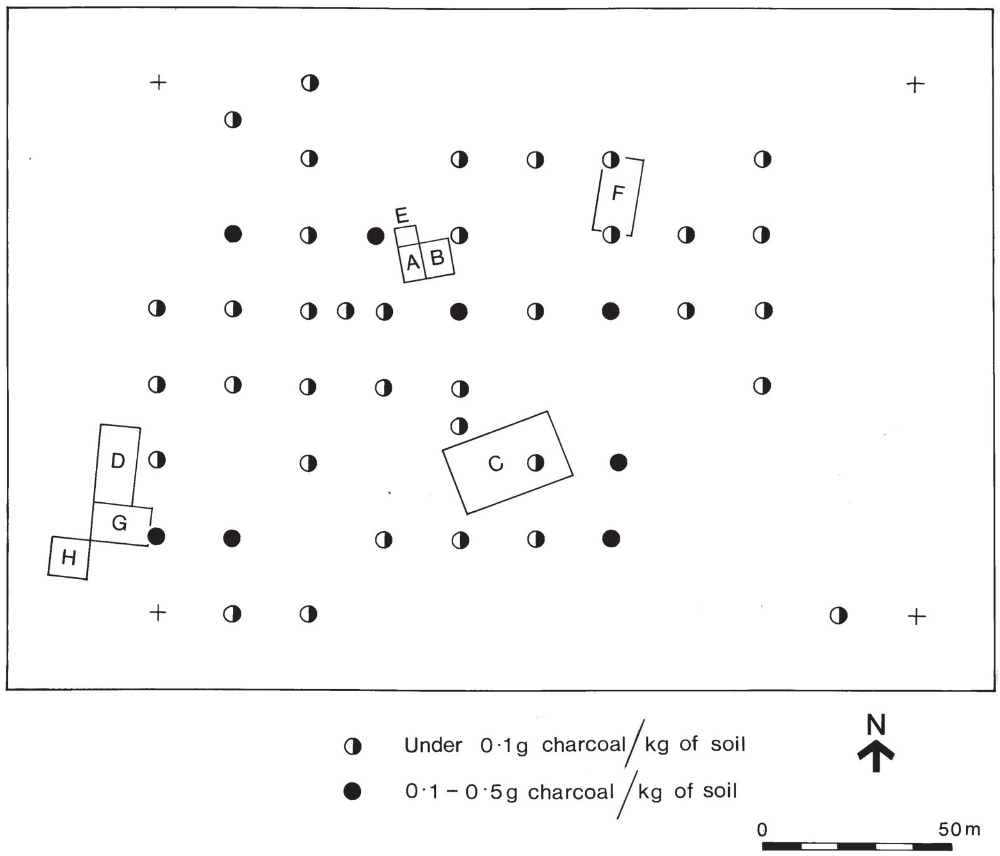


Figure 5.2 Distribution of charcoal in samples from Area J

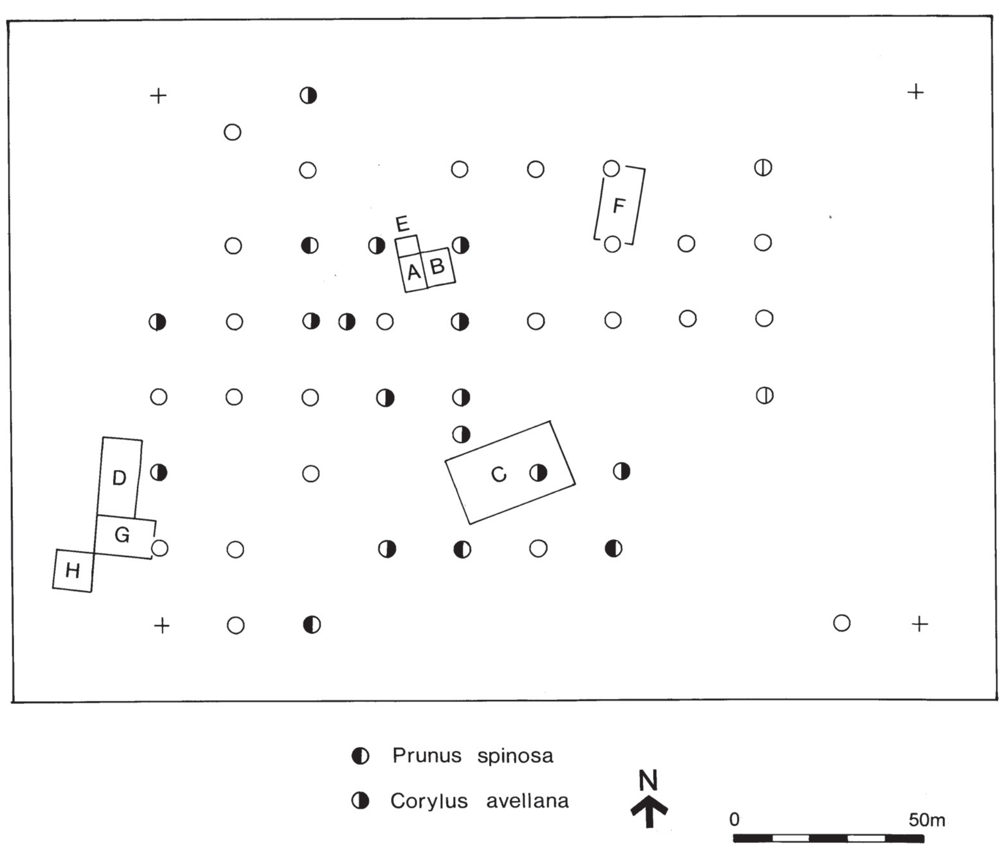


Figure 5.3 Distribution of *Prunus spinosa* endocarp and *Corylus avellana* nutshell in samples from Area J. Blank circles in this and following plans indicate sample collected, but macrofossils absent. Tentatively identified specimens omitted

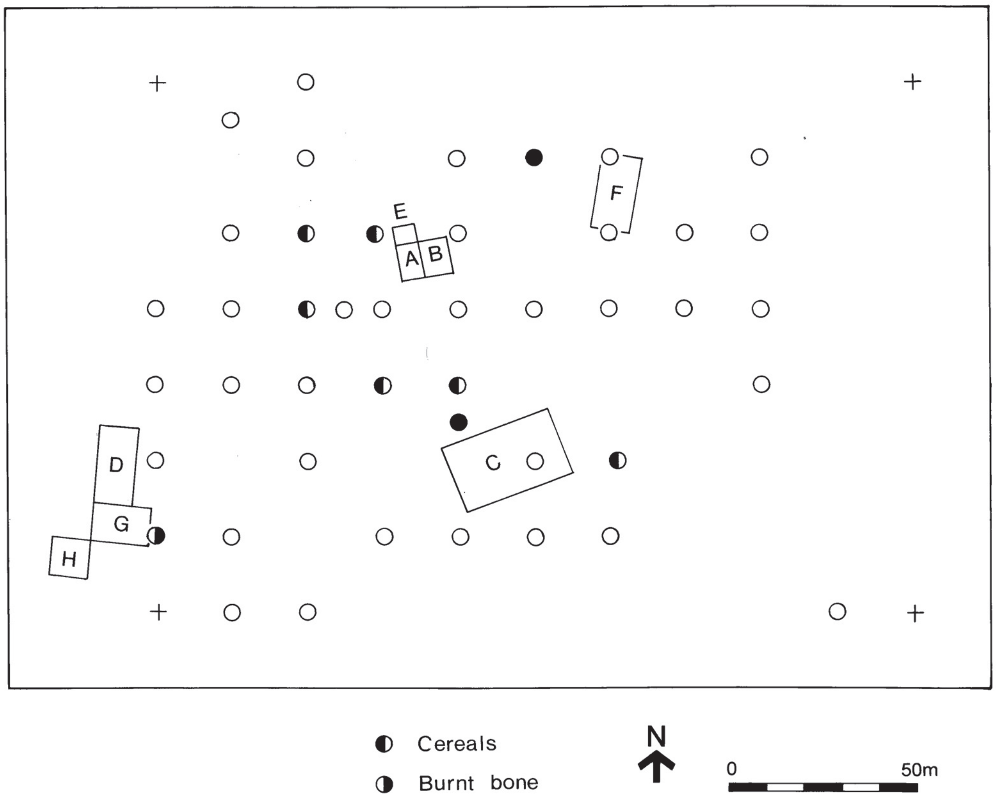
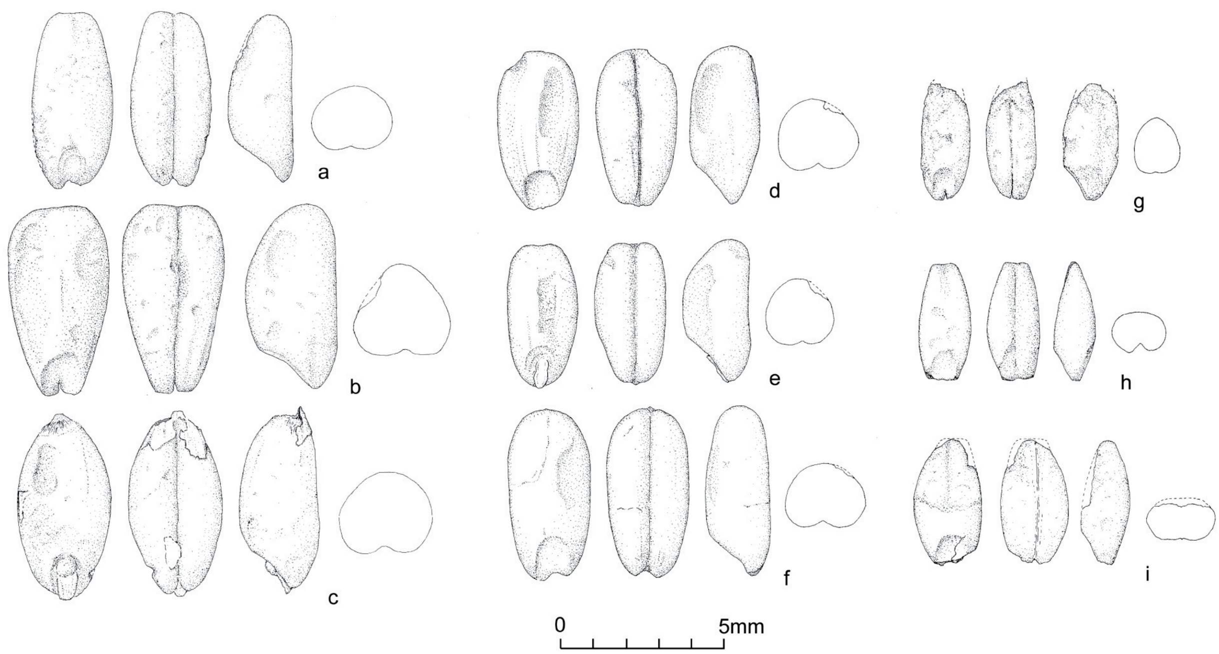


Figure 5.4 Distribution of cereal remains and burnt bone fragments

surviving palaeosol, are shown in Figs 5.2 , 5.3 and 5.4. All samples included some charcoal, but densities of >0.1g/kg of soil were very rarely recorded, and higher densities were not always in immediate proximity to the area excavations. Remains of hazel and sloe were quite widely distributed and showed little correlation with excavated areas; however, cereal remains and burnt bone fragments were not found in samples more than 25m from these areas. It is notable that a sample from the Area J grid, which lay within the open area excavation at Area C, did not stand out as exceptional — the result, taken in isolation, would have given no indication that there was an artefact concentration and cut features in this vicinity.



(a–f) *Triticum dicoccum*-type, from samples 81, 25, 59, Context *138* and samples 60 and 78 respectively; (g) *Triticum* c.f. *monococcum*, sample 9; (h–i) *Hordeum* sp. *var. nudum*, samples 72 and 21 respectively. Scale graduated 1mm

Figure 5.5 Cereal grains from Site 28A

Charcoal densities of >1.5g/kg of soil were recorded only in samples from the excavated areas, and only one sample from Area J lying outside the excavated areas included >0.5g/kg..

Most samples from the Area J sample grid included no cereal remains, but most samples from the excavated areas contained at least some. An exceptionally high cereal density (for an English Neolithic site) of 95 macrofossils/kg of soil was recorded at Area A. There was, overall, good correlation between the presence of cereal remains, artefact concentrations and cut features. Altogether, 39% of samples from the Area J sample grid included hazel nutshell, along with 88% of those from Area A, B and E and 95% of those from Area C. Thus, in general terms, hazel nutshell was more frequent in samples associated with sites, but was too frequent in outlying areas to be a reliable indicator of foci of Neolithic activity. 7% of Area J grid samples included burnt bone fragments; this compares with 72% of samples from Areas B and E, and 88% from Area C.

It appears, therefore, that there is a background scatter of charred material across the entire exposure of Neolithic land surface. This represents a long-term accumulation of material, no doubt related to a wide range of domestic and other activities (*e.g.* woodland and scrub clearance). Cereal remains and burnt bone, however, are generally correlated with artefact concentrations and these, therefore, are plausibly interpretable as 'domestic' locations.

Areas A/B and E

Area A

Samples were taken from the palaeosol during the second and third trowelling passes from most 1m grid squares (Samples 1–50 and 51–100 respectively). Sampling was inadvertently omitted from a few grid squares. In addition, samples were taken from excavated features. Plant remains extracted are listed in Table 5.3 and 5.5, and the results are summarised in Table 5.16.

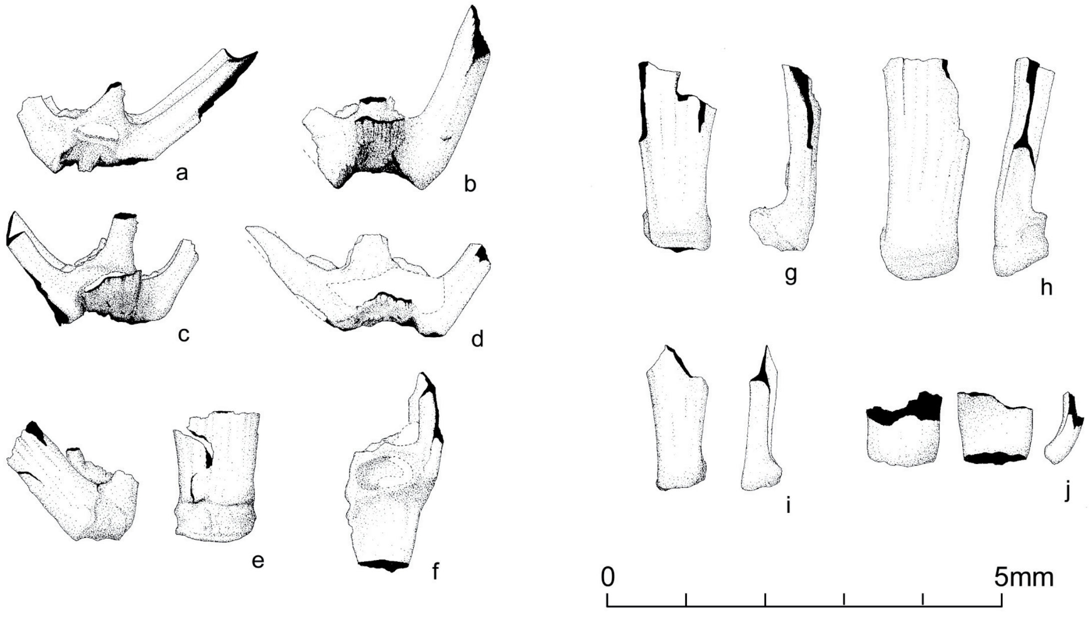
Charred cereals

Wheats (Triticum spp)

Most cereal grains in these samples were in a poor state of preservation: deformed, and with porous or abraded surfaces. Many could not be identified even to genus; others, though certainly of *Triticum* spp, were too fragmented or distorted to be identified to species. However, of the better preserved specimens, almost all were of *T. dicoccum*-type (emmer). There was a range of forms (Fig. 5.5a–f). Typical emmer-type grains from two-grained spikelets had rounded or blunt apices, straight or slightly concave ventral surfaces, fairly rounded and often asymmetrical cross-sections, and maximum widths halfway up the grain or above. One specimen (Fig. 5.5c) retained its apical brush of hairs and had fragments of inflorescence bracts fused to its surface. There were a few drop-shaped grains (Fig. 5.5b: *c.f.* Van Zeist 1968, 52). Grains with convex ventral surfaces, possibly from single-grained surfaces, also occurred.

Samples 1 and 9 produced two very battered grains which were thicker than they were broad and had rather curved, convex ventral surfaces and ridged dorsal sides. Their apices were damaged but they appeared to have been rather pointed (Fig. 5.5g). They are tentatively identified as einkorn, *Triticum c.f. monococcum*. A deformed grain from sample 4 showed features resembling a hexaploid free-threshing wheat, but no definite bread wheat-type grains were seen.

The wheat spikelet fragments consisted of spikelet forks, glume bases, detached rachis internodes and 'spikelet bases'. This last term refers to forks that had lost almost all trace of their internodes and the outer surfaces of the glume bases. The most fragmented examples were barely recognisable as cereal chaff and none of these 'spikelet bases' could be specifically determined with any confidence. The relatively small proportion of better-preserved wheat chaff has been identified with reference to unpublished criteria devised by G.C. Hillman, and to Jacomet's (1987) guide. The morphological criteria used in identification were as follows: presence/absence of nerves on the outer surface of rachis internodes (to detect any hexaploid wheats present); angle between glume faces on spikelet (viewed from above); angle between glumes on spikelet (viewed from front); prominence of primary and secondary keels and degree of tertiary nerve development on outer glume faces; angles between glume faces on either side of primary and secondary keels; distance between top of rachis internode scar and base of glume insertion; and relative width of rachis internode scar. The



(a–d) *Triticum dicoccum* spikelet forks, a–c from sample 60, d from sample 30; (e) *Triticum dicoccum* terminal spikelet fork, oblique view, Context *138*; (f) *Triticum* c.f. *monococcum* spikelet fork, sample 15; (g–i) *Triticum dicoccum* glume bases, illustrating range of forms, g from sample 3, h–i from sample 60; (j) *Triticum* c.f. *dicoccum* rachis internode, Context *138*. Scale graduated in mm.

Figure 5.6 Wheat spikelet and rachis fragments from Site 28A

Plate 5.1 Swollen basal internode of Poaceae (Type 1), c.f. *Arrhenatherum elatius* var. bulbosum. Exterior surface showing epidermal cells. Site 28A, Sample 54

Plate 5.2 Fractured radial longitudinal section of swollen basal internode of Poaceae. Site 28A, Sample 61

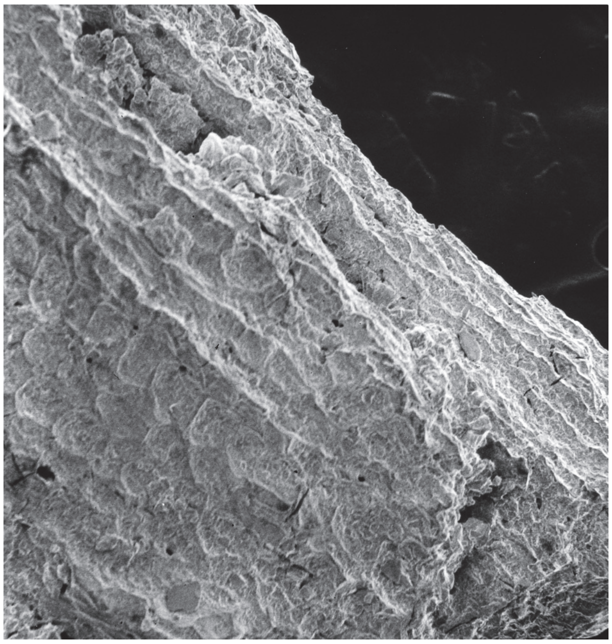


Plate 5.3 Detail of Pl. 5.2

degree of precision in identification is mainly related to the numbers of these features surviving on each specimen.

Measurements have not been used as a basis for identification, in part because of the poor preservation of most material — for example, few of the spikelet forks remained undeformed or retained the outer surface of their glumes. The only dimension fairly consistently determinable was the width of detached glume bases, since these were often well preserved. Jacomet (1987, 62) gives width ranges for einkorn of 0.45–0.90mm and for emmer of 0.70–1.10mm. However, in these samples there were some very slender bases (less than 0.60mm) with distinctively emmer-type morphology. Consequently, the distribution of glume widths in this case is not likely to give a reliable separation.

Some of the best preserved material is illustrated in Fig. 5.6. Spikelet forks of emmer are shown in Fig. 5.6a–d. They show wide angles between the glumes, and the internode scars are generally narrow. On many specimens the internode scar was obscured by scraps of tissue remaining from the internode. Fig. 5.6e illustrates a terminal spikelet fork of emmer. This has no ascending internode scar and the glumes are roughly symmetrical. The specimen shown is illustrated at an oblique angle; the crack in the glume makes it appear wide. The fork shown in Fig. 5.6f is thought to be of einkorn, from near the base of the ear. The surviving glume ascends almost vertically. It is narrow and has prominent primary and secondary keels, partly broken away. Some of the spikelet forks (*e.g*. in sample 9 and from post-hole fill *138*) had wide internode scars. The example from sample 9 was too poorly preserved to be identified specifically, and the specimens from *138*, though showing this einkorn-like feature, had emmer-type glumes set at an angle when viewed from above. They are assumed to represent extreme forms of emmer.

Almost all the identifiable detached glume bases were of emmer. A typical example is shown in Fig. 5.6g. It has a prominent primary keel; the secondary keel is marked by an obtuse angle on the glume face, and the tertiary nerves are visible, though faint. The glume faces on either side of the primary keel are at an acute angle. There were a few much more robust emmer glume bases with strongly developed keels and tertiary nerves (Fig. 5.6h). In post-hole fill *138* there were some extremely narrow and badly distorted glume bases, perhaps from immature ears. The example illustrated in Fig. 5.6i shows very faint traces of tertiary nerves, and has the faces on either side of the primary keel set at just under 90^{o}.

Intact rachis internodes were very rare. The detached examples from *138* mostly had damaged outer faces, but none of them showed nerves on these abaxial surfaces (Fig. 5.6j).

In summary, features of the grains and spikelet fragments indicate that emmer (*Triticum dicoccum*) was the main wheat in these samples. There was a small proportion of einkorn (*Triticum monococcum*). No evidence for the presence of hexaploid wheats was seen.

Barley (*Hordeum* sp(p))

Grains of barley were uncommon and the few specimens present were either under-developed or poorly preserved (Fig. 5.5h–i). Presumably a six-row form is represented, but all the grains in these samples are, or were, symmetrical. The grain shown in Fig. 5.5i is deformed. The rounded profiles of these grains and, in some specimens, the presence of a central groove on the dorsal surface and a narrow ridge in the ventral furrow establish the presence of naked barley (var. *nudum*). No barley rachis fragments were seen.

Grass/cereal culm

Post-hole fill *138* produced some large fragments of charred grass or cereal culm with a few nodes. The fragments were up to 10.5mm in

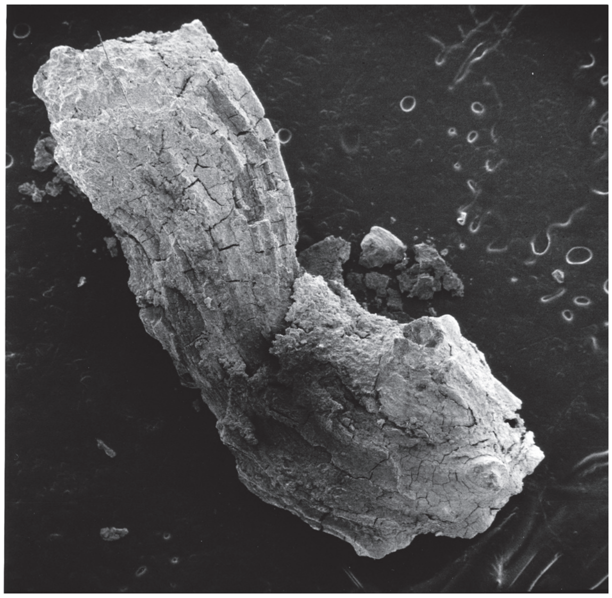


Plate 5.4 Monocotyledonous basal internodes with strong longitudinal ribs, Type 3. Site 28A, Sample 99

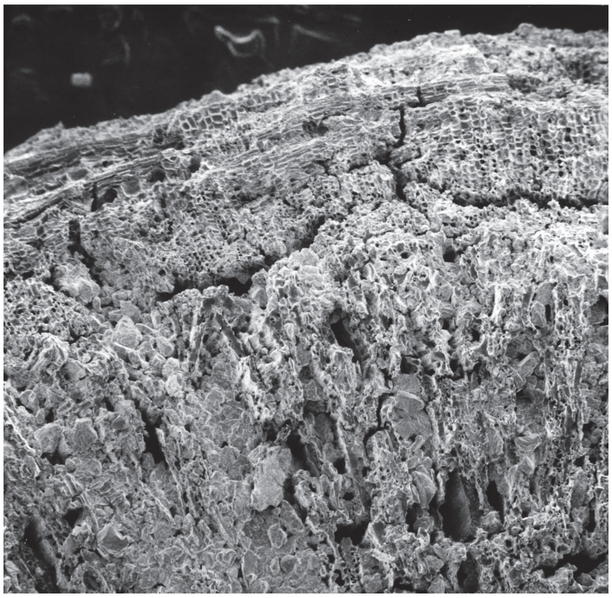


Plate 5.5 Dicotyledonous fleshy taproot in transverse section, Type 4. Site 28A, Sample 2

length and 1.4mm in diameter, but generally less. There was also a single node from sample 60.

Weed flora

Charred fruits and seeds of weed species were uncommon, but in the samples from the palaeosol and most feature fills *Vicia/Lathyrus* sp(p) and *Galium aparine* were the two most frequent taxa. The former were represented mainly by badly damaged, separated cotyledons. There were some whole seeds, but no well-preserved intact hila. Nutlets of *Rumex* sp(p) and *Polygonum aviculare*, seeds of Chenopodiaceae and small caryopses of Poaceae occurred in a few samples.

The assemblage from deposit *138* was different. As noted below, this post-hole seems to have contained a proportion of crop-cleaning waste, including weed seeds. In order of abundance these were of *Rumex* sp(p), Poaceae, *Chenopodium album*, *Polygonum* c.f. *aviculare*, *Polygonum* sp(p), *Vicia/Lathyrus* sp(p), *Stellaria graminea* and indeterminate Caryophyllaceae. However, the total weed 'seed' assemblage from this sample only comprised 39 identified specimens.

Nuts and fruits

Fragments of charred hazel nut shell (*Corylus avellana*) were amongst the commonest macrofossils, though the density of fragments in the soil was very low. No intact nuts were recovered, apart from one almost complete immature nut 6mm long. Weights of fragments in each sample were recorded.

Fragmentary fruitstones of sloe (*Prunus spinosa*) came from fifteen samples. Most fragments were small and were identifiable only from the rough surface of the endocarp. The most complete example, from sample 50, retained its prominent dorsal ridge. Context *164* produced a fruitstone of hawthorn (*Crataegus monogyna*), 5.0mm x 3.7mm in size. The fruitstone of *Rubus* from sample 90 was in a poor state of preservation: only traces of the endocarp with its coarsely reticulated surface survived on the finely striated internal tissue. A few samples contained small enrolled fragments of tissue thought to be epidermis of apple (*Malus sylvestris*). Two immature fruits of *Tilia* sp came from samples 52 and 89. Both were sub-spherical with pentagonal radial symmetry. Sample 40 produced two charred oak leaf galls (*Neuroterus* sp.).

Charred tubers, rhizomes, roots and stem fragments

Charred fragments of vegetative plant material were frequent in these samples. They were divided into nine main categories, and examples of each were shown to Dr Jon Hather (Institute of Archaeology, University College London), to whom I am indebted for some comments below.

Type 1 Swollen basal internodes of Poaceae. These pyriform or bulbous swollen internodes vary considerably in size (length approximately 3.00–5.40mm; width 0.90–3.10mm) and shape, depending partly on their original positions at the stem base. Examples of lower internodes are rather rounded, upper ones more elongate (*c.f.* Hubbard 1968, 234). Sub-rectangular epidermal cells are visible on the outer surfaces of most specimens (Pl. 5.1–3). Many of them are fractured longitudinally, showing parenchyma cells on the fractured surfaces in radial longitudinal section (Pls 5.2 and 5.3). Small tubers of this general type are typical of many Poaceae (Hather 1993, 112–15), but these examples most closely resemble those of the onion couch, *Arrhenatherum elatius* ssp *bulbosus* (Wild.) Hyl.

Type 2 Other Poaceae stem fragments with short internodes. An example from context *164*, approximately 3mm in length, comprises one whole and two incomplete internodes. It is longitudinally fractured, and in radial longitudinal section (RLS) a central area of parenchyma with fibre and vessel tissue at the periphery is visible. The very short lengths of the internodes imply an underground or basal stem section. The presence of aerial grass/cereal stem nodes and fragments in post-hole fill *138* and sample 60 has been noted above.

Type 3 Monocotyledonous internodes with strong longitudinal ribs. A specimen from sample 99 (Pl. 5.4) consists of two conjoint short internodes up to about 2mm in width. There are faint traces of epidermal tissue on the ribs. In transverse section (TS) most of the cell structure has been reduced to amorphous carbon, although small lumina (probably of fibre cells) are visible in the rib areas.

Type 4 Section of dicotyledonous fleshy tap-root. The specimen from sample 2 (Pl. 5.5) is an incomplete disc, comprising a transverse section across a root, approximately 5mm in diameter, and about 1.5mm thick. It is not clear why it has fractured in this way (longitudinal fracturing rather than transverse would be expected), though there is the possibility that it was cut before charring. In TS, a radial pattern of linear cavities, very characteristic of degraded xylem parenchyma, can be seen. The outermost thin band of tissue does not have cavities, and probably consists of degraded phloem and epidermis. A second fragment from sample 44 (Pl. 5.6) shows similar degraded tissue with radial cavities, but is attenuated to a point at one end. Similar fleshy roots with comparable types of tissue degradation are illustrated by Hather (1993), but positive identification is not possible.

Type 5 Central xylem and fibre tissue 'cores' of ?roots (Pl. 5.7). These specimens consist of 'twig-like' fragments 0.4–2.0mm in diameter, irregularly curving, sometimes 'branched' and with numerous small side 'shoots'. In relation to the main axis, these diverge at all angles, suggesting that the material is from roots rather than aerial stems. Their surfaces appear to consist of fibre tissue and they are thought to represent the central vascular and fibrous cores of roots that have lost their periderm, phloem and associated parenchyma. Specimens examined in TS show on solid masses of amorphous carbon, often very glossy. One specimen, from sample 51, partly retains its

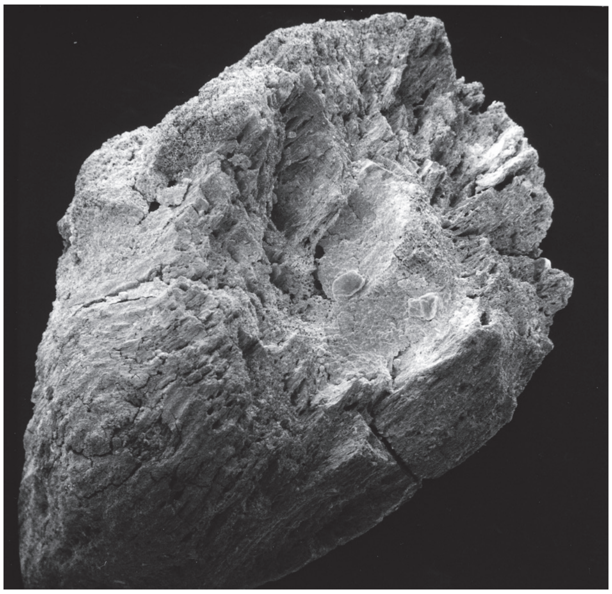


Plate 5.6 Dicotyledonous fleshy taproot, tapering at one end. Type 4. Site 28A, Sample 44

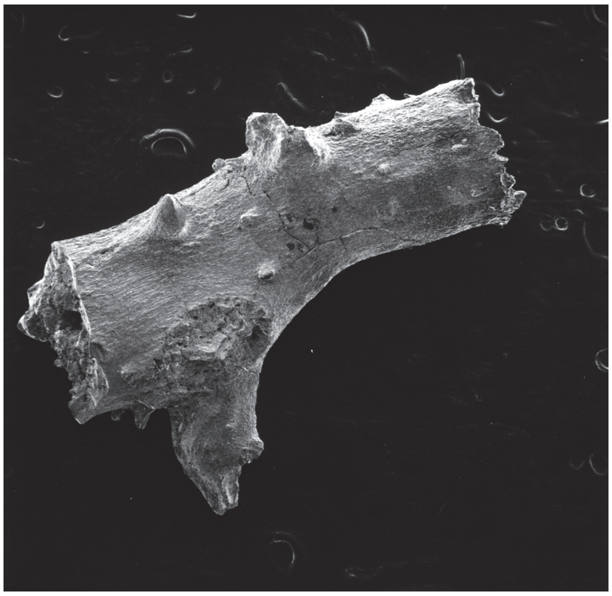


Plate 5.7 Central xylem and fibre tissues of ?root. Type 5. Site 28A, Sample 84

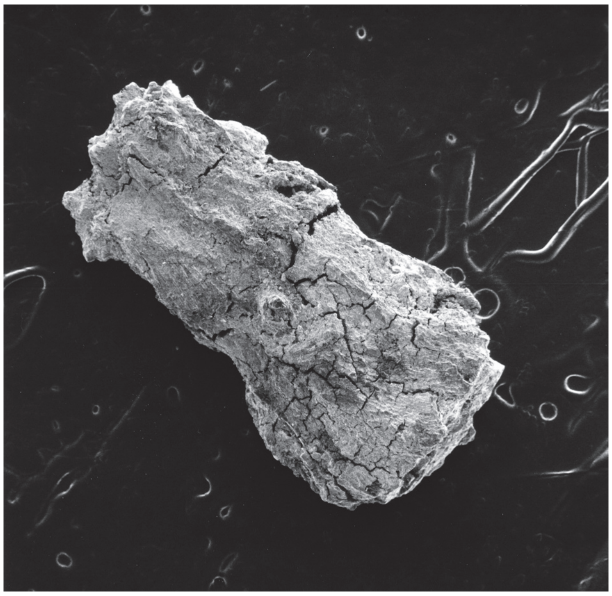


Plate 5.8 Rhizomatous fragment with prominent circular root scars. Type 6. Site 28A, Sample 8

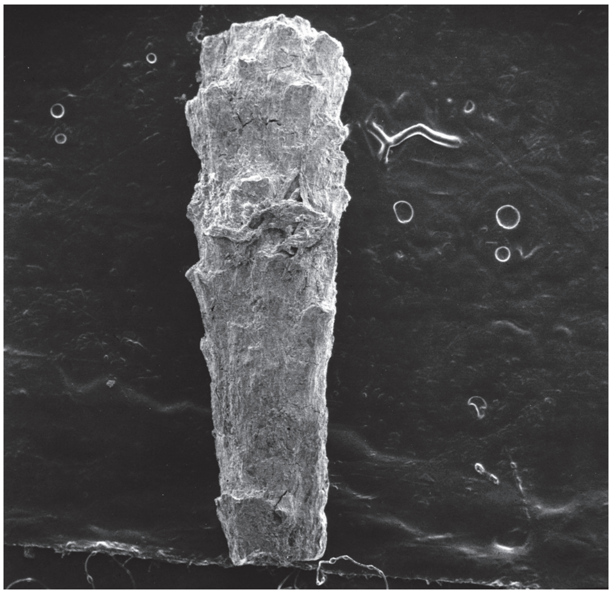


Plate 5.9 Inflorescence axis. Type 8. Site 28A, Sample 82

outer tissues, represented by a fragile sheath of porous and vesicular carbon.

Type 6 Rhizome fragments with prominent circular root scars. A typical example is illustrated in Pl. 5.8. Characteristic features are the short internode length, irregular longitudinal ribbing on the internode and conspicuous circular root scars. Some of the latter have hollow centres whist others have small circular projections. The specimens are very irregular in width and are often rather flattened. Traces of epidermal tissue are visible on some specimens.

Type 7 ?Rhizomatous fragments of ill-defined form. Small and/or abraded fragments believed to be rhizomatous because of the short internode lengths and apparent root scars.

Type 8 ?Inflorescence axis. Sample 82 produced a flattened short length of stem with numerous small shoots diverging at acute angles from the axis (Pl. 5.9).

Type 9 Stem/rhizome with whorls of ?shoot or root bases at nodes. These are quite robust lengths of stem, 2.0–2.6mm in diameter, with short internodes, at which there are whorls of small circular scars. There are also large circular scars on the internodes at intervals.

Area B

In this investigation area, 64 samples were taken from the palaeosol in a 1m x 1m grid pattern, omitting the south-east corner of the excavation which was dominated by a large clay-filled feature, *183*. A further eighteen samples were taken from post-holes, pits and gullys. The palaeosol samples were collected during the third trowelling pass. Extraction methods were as for Area A, and a similar range of contaminants was present. Plant remains are listed in Tables 5.7–5.9, and the results are summarised in Table 5.16.

Charred cereals

Samples from this site included generally lower densities of cereal remains, with a higher proportion of unidentifiable material than that seen in Area A. Almost all the cereal remains identifiable to genus are of wheats (*Triticum* sp). The only wheat specifically identifiable is emmer (*Triticum dicoccum*), which is represented by grains, spikelet forks

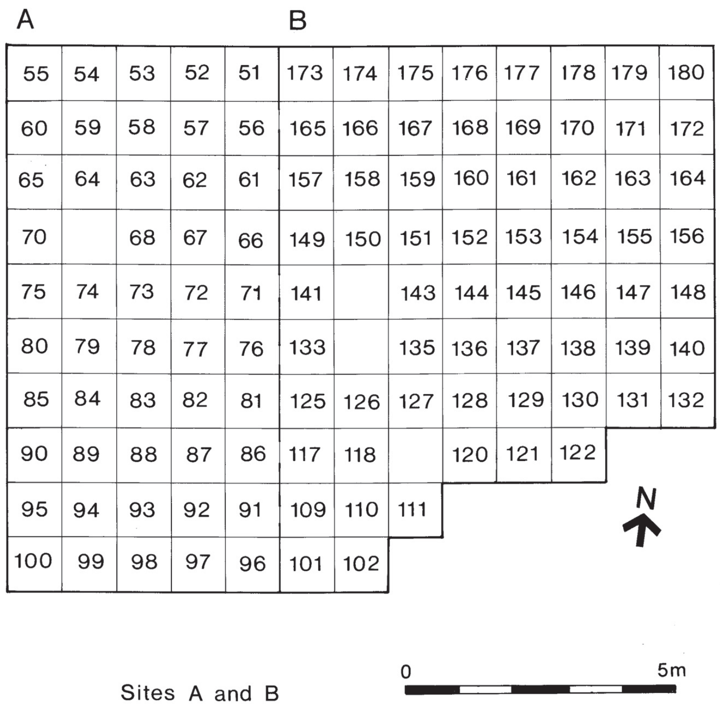


Figure 5.7 Key plan for Sites A and B, showing locations of grid square samples from the palaeosol at the level of the third trowelling pass

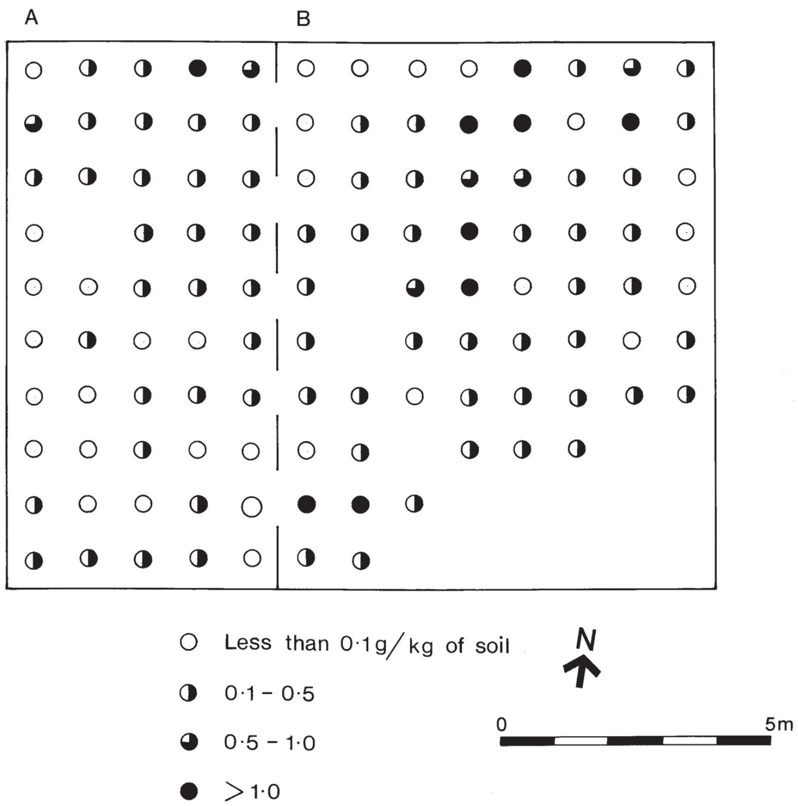


Figure 5.8 Sites A and B: distribution of charcoal fragments > 2mm

and glume bases. Naked barley (*Hordeum* sp) is represented by poorly preserved grains from four contexts. Two samples produced cereal or grass culm fragments and nodes.

Weed flora

As at Area A, the two most frequent taxa are *Vicia/Lathyrus* spp and *Galium aparine*. *Vicia/Lathyrus* spp are again represented by poorly preserved cotyledons and whole seeds lacking well-preserved hila. However, one seed from grid square 160 is about 1.9mm in diameter, with a damaged oblong hilum around 1.5–1.6mm long; it may be of

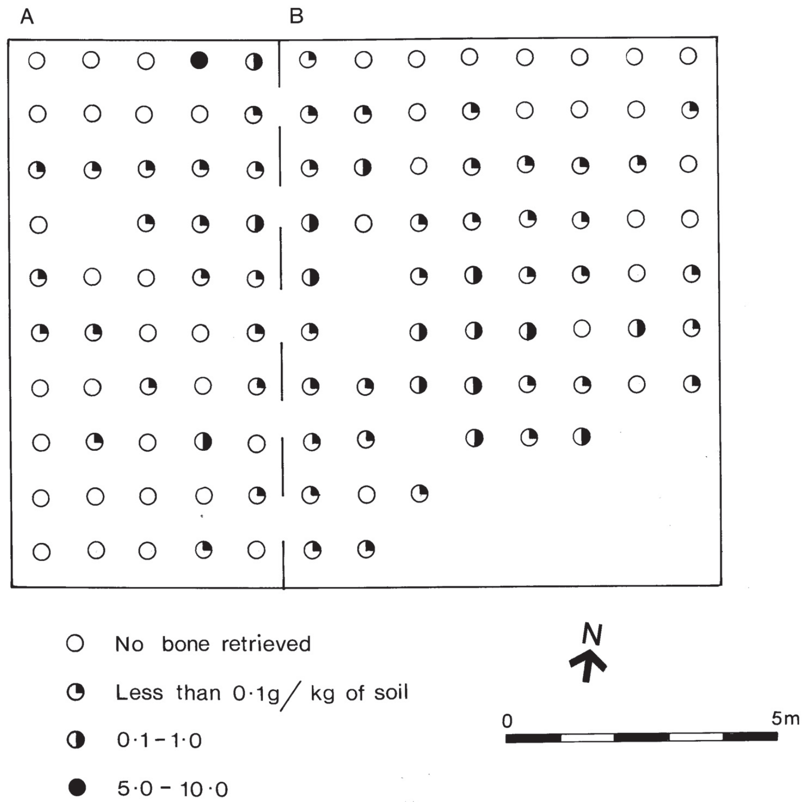


Figure 5.9 Sites A and B: distribution of burnt bone fragments > 2mm

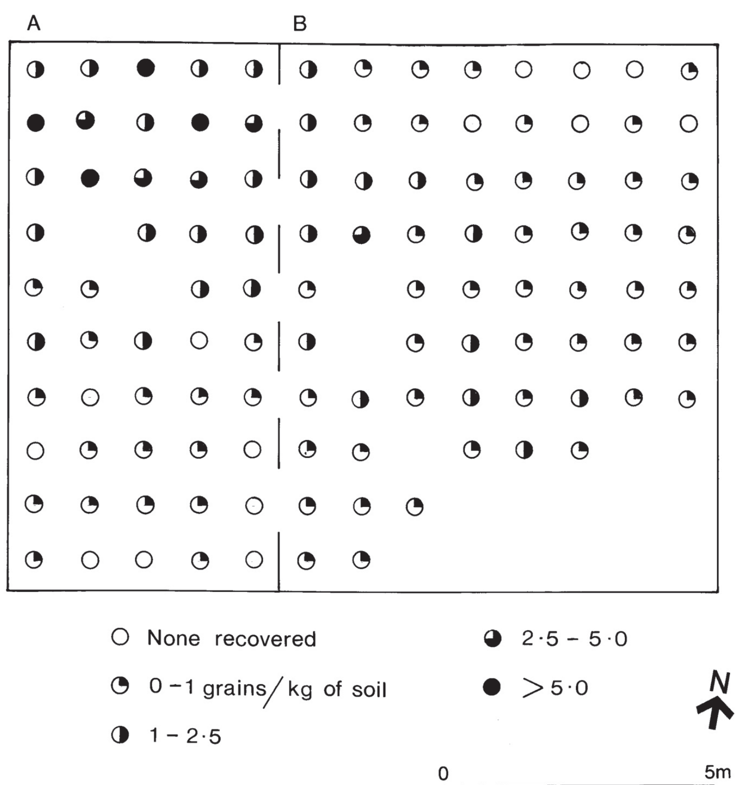


Figure 5.10 Sites A and B: distribution of cereal grains

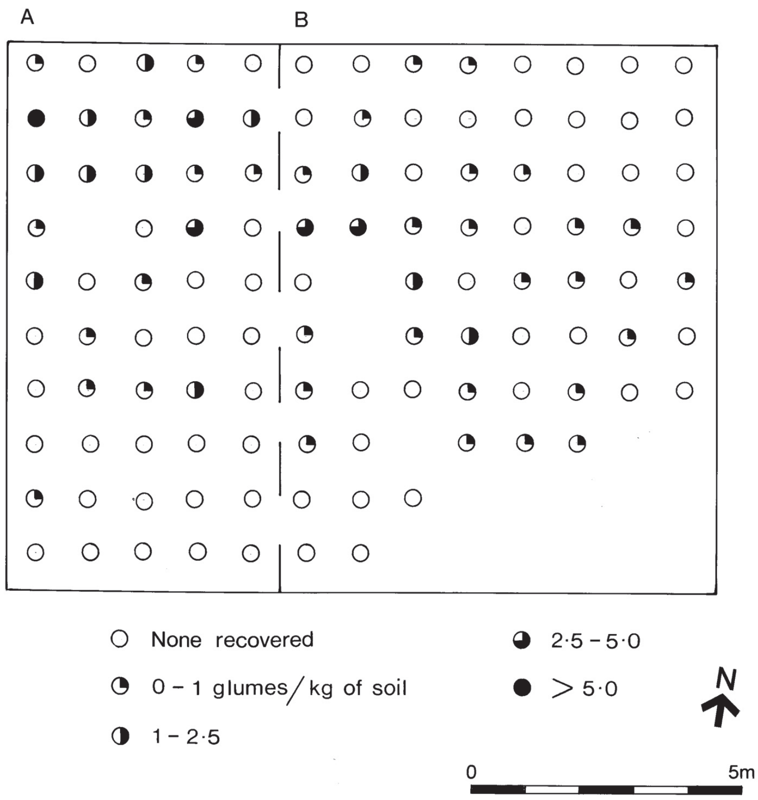


Figure 5.11 Sites A and B: distribution of wheat glume bases

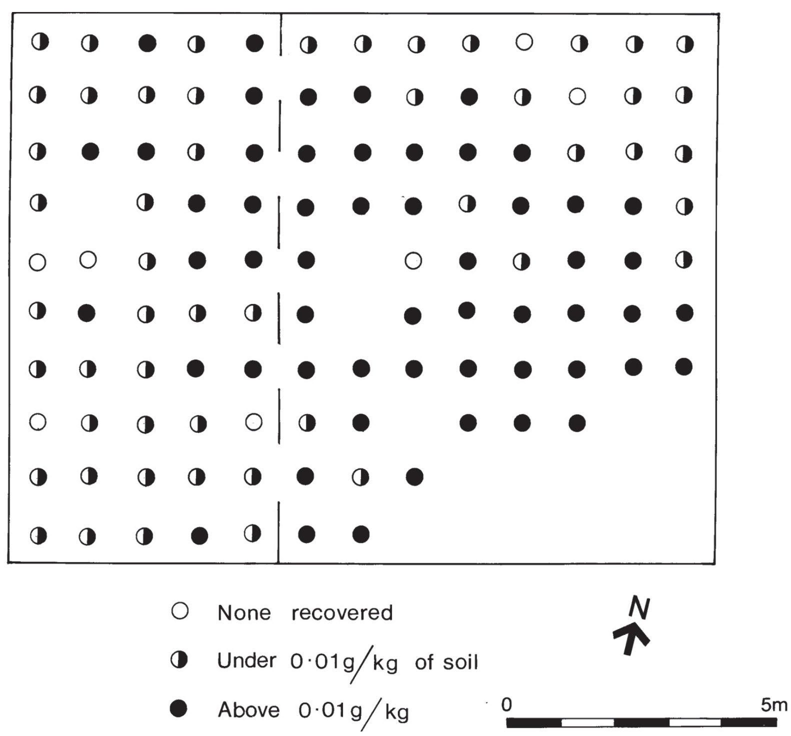


Figure 5.12 Sites A and B: distribution of *Corylus* nutshell fragments

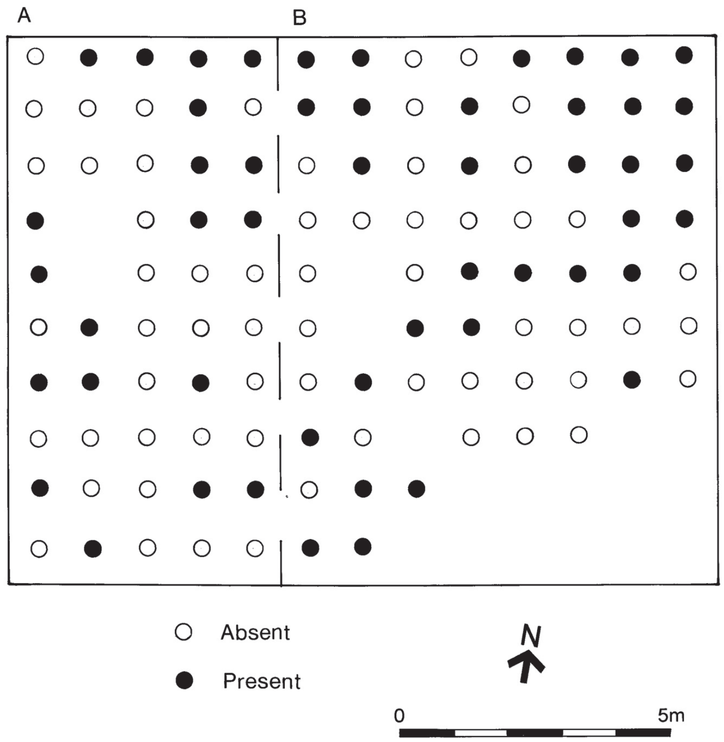


Figure 5.13 Sites A and B: distribution of roots, rhizomes, tubers *etc*.

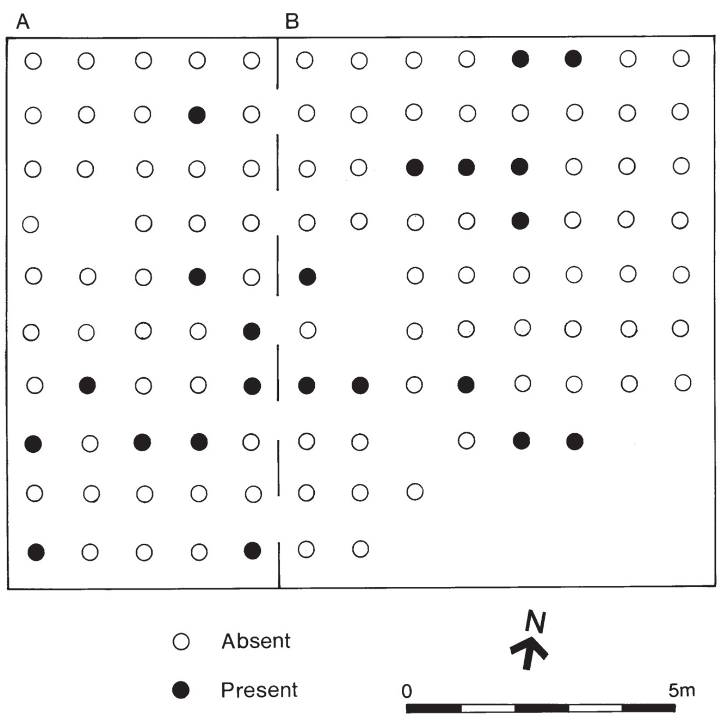


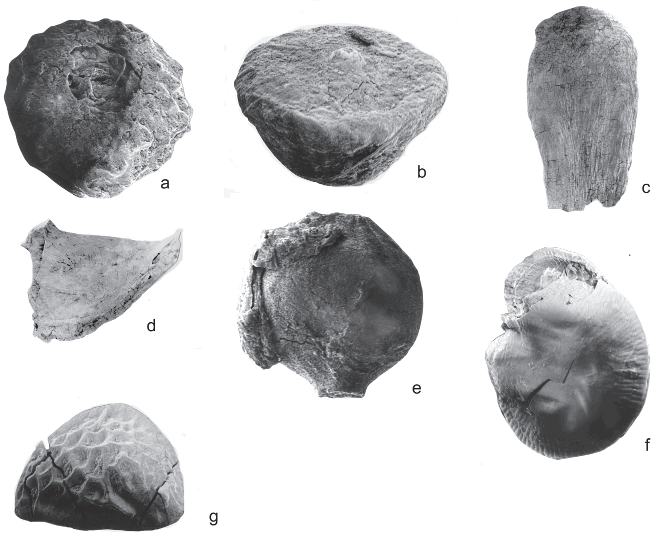
Figure 5.14 Sites A and B: distribution of *Prunus spinosa* and *Rubus fruticosus* fruitstones

Vicia tetrasperma. The wide range of cotyledon sizes (up to *c.* 3.5mm) indicates the presence of more than one species.

Additional taxa not noted at Area A are *Stellaria media*-type, *Moehringia trinervia, Veronica hederifolia,* and indeterminate Apiaceae and *Scirpus* sp. Small-seeded Caryophyllaceae are frequent, but most specimens have lost their rows of marginal papillae.

Nuts and fruits

Fragments of *Corylus avellana* nutshell occurred in over 96% of samples, but in small quantities. *Prunus spinosa* fruitstone fragments were also frequent. Fruitstones of *Rubus* sp, a tentatively identified seed of *Malus sylvestris*, immature cupules of *Quercus* sp (Pl. 5.10a) and a *Neuroterus* gall were also identified.



a – *Quercus* sp., immature oak cupule, width 4.1mm, 28B, Sample 168; b – *Neuroterus* sp., oak leaf gall, width 2.0mm, 28A, Sample 40; c – *Malus* sp., apple seed, surviving length 4.1mm, 28D, Context *215*; d – *Malus* sp., apple endocarp fragment ('core'), surviving length 3.5mm, 28D, Context *208*; e – *Tilia* sp., immature fruit, 28A, context not recorded; f – *Moehringia trinervia*, seed. 28B, Context *203*; g – *Rubus fruticosus*, fruitstone, 28B, Context *185*

Plate 5.10 Macrofossils of woodland plants

Charred tubers, rhizomes, roots and stem fragments

Vegetative plant material was divided into nine main classes, as for Area A. The material includes swollen basal internodes of Poaceae, most probably of *Arrhenatherum*, a dicotyledonous fleshy tap root fragment, central xylem and fibre 'cores' of roots, and various rhizomatous fragments probably from monocotyledonous plants. As in the case of Area A there is a high proportion of abraded fragments, and of specimens with ill-defined morphology.

Area E

Plant remains were extracted from eight samples from the palaeosol using the same methods as at Area A and B. Plant remains identified are listed in Table 5.10 and summarised in Table 5.16.

Spatial distribution of macrofossils at Areas A and B

Sampling the palaeosol in a grid pattern made it possible to examine the distribution of macrofossils across the excavated area (Fig. 5.7). It was hoped that activity areas within the excavated trenches might be apparent. Distribution plans of charcoal, burnt bone, cereal grains, wheat glume bases, *Corylus* nutshell, vegetative plant material and edible fruits collected during the third trowelling pass were prepared. However, any patterning perceptible is at best tenuous, and is not thought to merit detailed presentation. Charcoal, *Corylus* nutshell fragments, *Prunus* fruitstone fragments and vegetative plant material were distributed across almost the entire area of the palaeosol, and it is doubtful whether the apparent variations in concentration are significant. Burnt bone fragments were generally commonest in the central area of the site, and appear to be related to the central group of cut or worn features (Fig. 5.9). Cereal remains were most abundant in the north-west part of Area A, with a maximum density in sample 60 (12.5 grains/kg of soil; 8.38 glumes/kg), in close proximity to post-hole *138*, which had the highest

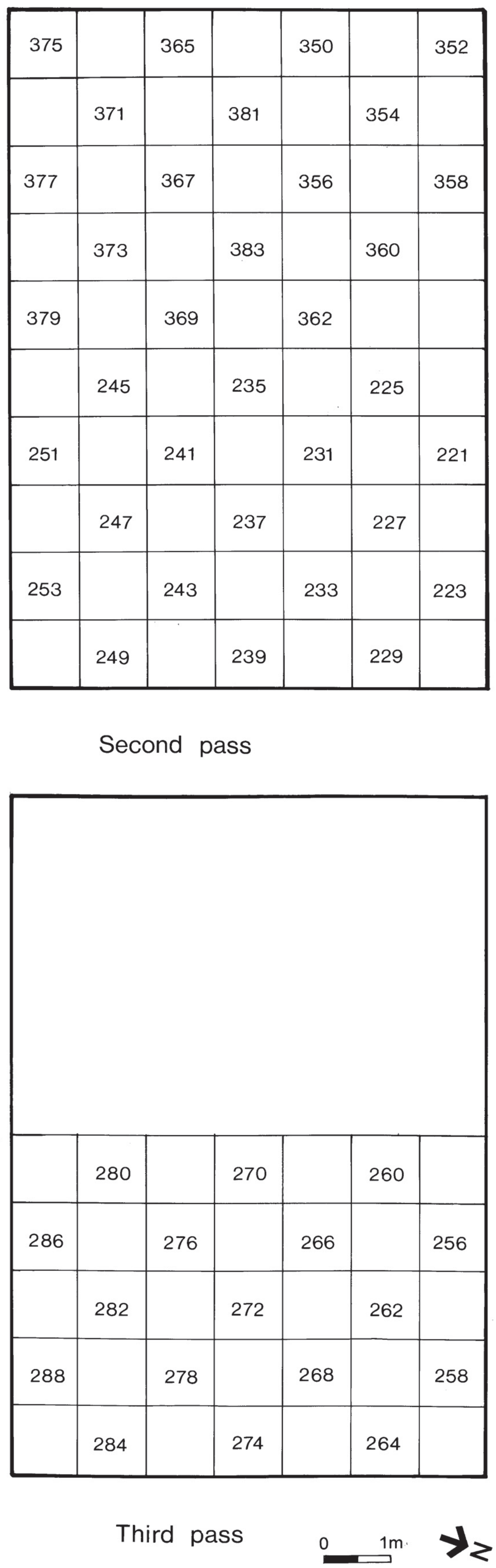


Figure 5.15 Key plan for Site C, showing locations of grid square samples from the palaeosol at the level of the second and third trowelling passes

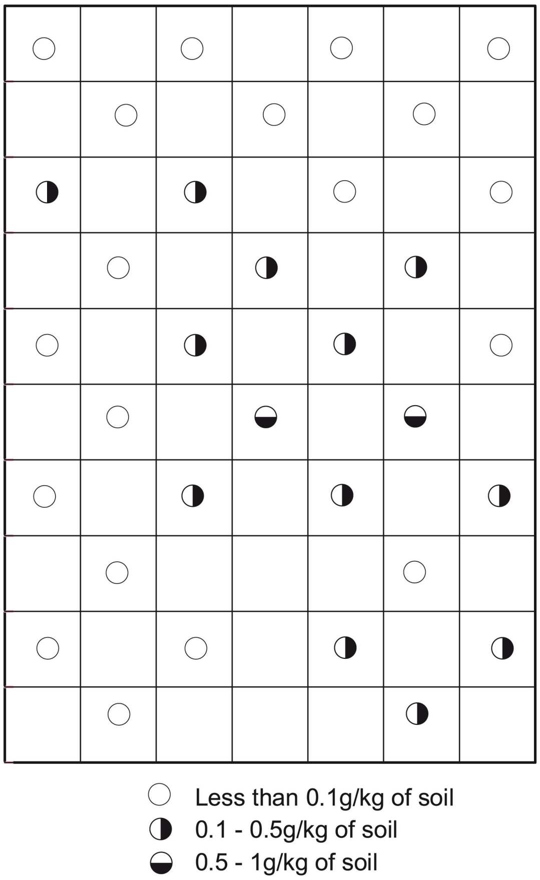


Figure 5.16 Site C: distribution of charcoal fragments > 2mm

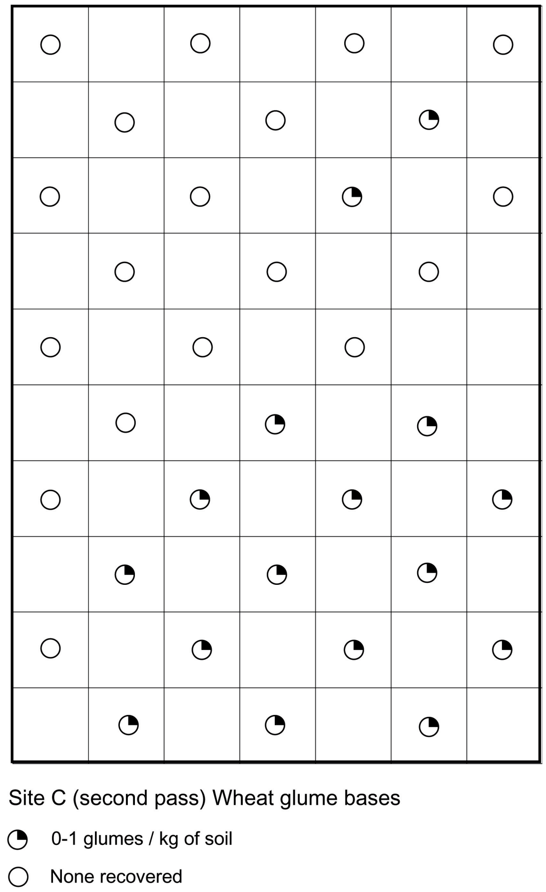


Figure 5.17 Site C: distribution of wheat glume bases

density of cereal remains at the site (thirteen grains/kg; 97 glumes/kg). This might perhaps indicate a focus of cereal processing in this area (Fig. 5.10). However, none of these concentrations are well-defined. Although Area A and B obviously represent a concentration of material, within the area investigated by 'bin sampling' (Area J) detection of finer-scale spatial variation may be impossible.

Area C

Introduction

Area C was excavated during the final season in 1988. As in Area A/B and E, the palaeosol was sampled using a 1m^2 grid pattern. The entire area was sampled during the second trowelling pass, but only the eastern half of the excavation was sampled in the third pass. Densities of material, and the range of taxa present, seemed fairly consistent across the site, and full analysis of all samples was not thought necessary: instead, alternate samples were examined in a chess-board pattern. This gave 34 samples from the second pass and seventeen from the third. Eighteen samples were taken from *264* (the dark fill of the large feature *263*) and 28 samples came from other cut features. Methods were the same as those used in the earlier seasons, and a similar range of contaminants was present. The results are presented in Tables 5.11–5.14 and are summarised in Table 5.16.

Charred cereals

The better preserved grains are all of *Triticum* spp, with *Triticum dicoccum*-type grains predominating. In addition, there are a few short grains of free-threshing hexaploid type (*Triticum aestivum s.l.*) in samples from *239*, Context *264* (7294 and 7295) and Context *274* (Fig. 5.19a–b). The identified wheat spikelet fragments are all of *Triticum dicoccum*, though there are many indeterminate specimens.

Flax

Damaged seeds of flax (*Linum* sp) came from three samples, from 362 and Ct *309* and *317* (Fig 5.19c–e). None of the seeds is complete, so overall dimensions cannot be determined, but the seed from *309* must have been *c*. 3.1mm long. Epidermal cell patterning survives on their surfaces, but is partly obscured by tarry exudations.

Weed flora

As at previous sites, *Vicia/Lathyrus* predominates, though 'weed seeds' were markedly less frequent. Two additional taxa are *Fallopia convolvulus* (black bindweed) and *Thlaspi arvense* (penny cress).

Nuts, fruits and other woodland taxa

As in samples from the other areas, *Corylus* predominates (in almost 95% of samples), with *Prunus spinosa* in over 70%. Angular fruitstones, possibly of rose (*Rosa* sp), seed fragments with striated fibrous surfaces probably of apple (*Malus sylvestris*) and a single fruitstone of hawthorn (*Crataegus monogyna*) are present. Several samples produced fragments of parenchymatous tissue, perhaps fruit mesocarp tissue. Immature *Tilia* fruits occur at low frequencies. An additional taxon is woody nightshade (*Solanum dulcamara*): *264* produced especially well preserved seeds, flat, with a maximum dimension of 2mm and showing the characteristic sinuous reticulation on their surfaces.

Charred tubers, rhizomes, roots and stem fragments

Area C produced a range of forms previously differentiated at Area A and B, but in lesser amounts.

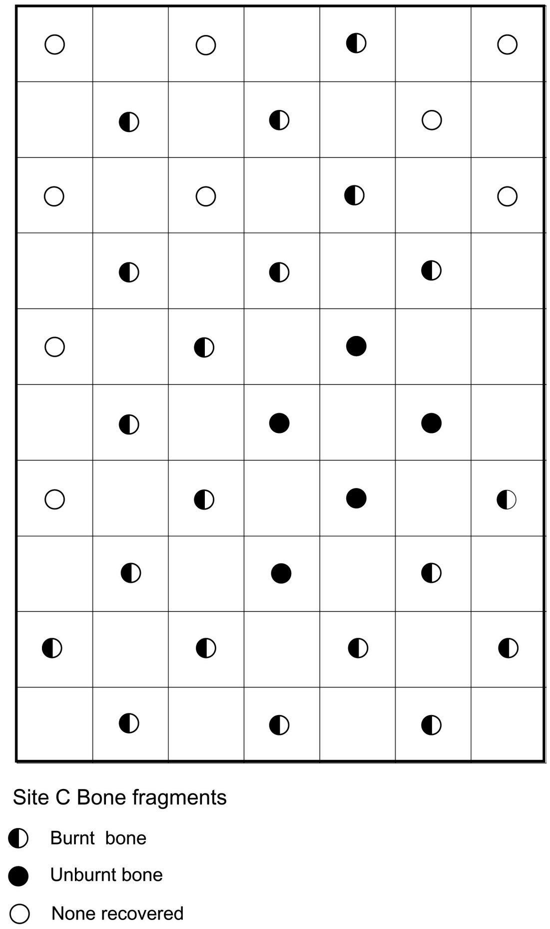
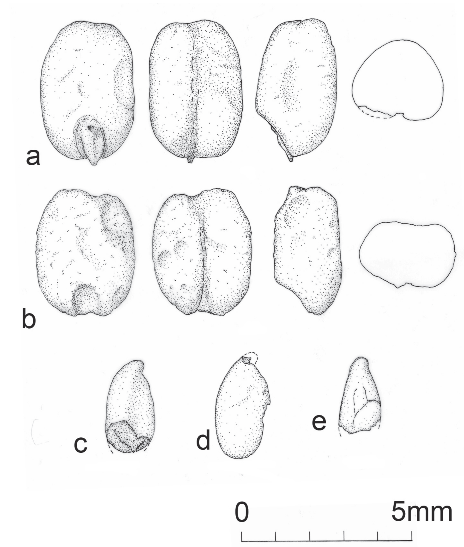


Figure 5.18 Site C: distribution of burnt and unburnt bone fragments

Spatial distribution of macrofossils
Distributions of charcoal fragments, wheat glume bases and burnt and unburnt bone fragments from the second trowelling pass are shown in Figs 5.16–5.18. Densities of these three categories of material are related directly to the locations of underlying pits in the central and north-eastern areas of the excavation area.

Area D and burnt mound *231*

Area D
Six samples were collected from shallow depressions and possible post-holes associated with late Neolithic pottery (Table 5.15). None of the samples produced any remains of cereals or other cultivated plants. They had high mean charcoal concentrations (1.47g/kg of soil:



a,b – *Triticum aestivum* s.l., Contexts *264/7294* and *264/7295*. c–e – *Linum* sp., 362, Contexts *309* and *317*. Scale graduated in mm.

Figure 5.19 Cereal grains and flax seeds from Site 28C

range 0.53–2.93g/kg). Fragments of *Corylus* nutshell were consistently present, and were abundant in depression *209*. Apple seeds (*Malus sylvestris*) and fragments of endocarp tissue with its distinctive fibrous patterning, were common (Pl. 5.19c and d) Fragments of epidermal tissue were also noted. These could be of *Malus*, but have not been identified specifically. Vegetative plant material also occurred.

Burnt mound 231
Three samples from subsidiary contexts *279*, *287* and *288* were collected. They included only charcoal, including some vegetative plant material (Table 5.15).

IV. Discussion

Dating
The first point to be considered is the dating of the material (Table 5.17). AMS dates were obtained from charred cereal grains, *Corylus* nutshell fragments and twigs. These include the only Neolithic cereal remains to have been dated by ^{14}C in the East of England and, as such, they provide the earliest precise, direct and indisputable evidence for cereal farming in the region.

Palynological evidence for early cereal farming is based upon the presence of Poaceae (grass) pollen grains with large annulae, generally referred to as 'cereal-type', though it should be noted that certain large wild grasses

Area	*Context*	*Material*	*Uncalibrated date BP*	*Cal BC*
C	270	*Corylus avellana* nutshell	4780±70 (Ox-A 2298)	3685–3385
C	266	*Triticum dicoccum*-type grains	4675±70 (Ox-A 2299)	3605–3370
D	215	*Corylus avellana* nutshell	4060±80 (Ox-A 1915)	2870–2500
A	138	*Triticum dicoccum*-type grains	4020±70 (Ox-A 1914)	2855–2465
	231	Twigs	3885±70 (Ox-A 2297)	2490–2285

Table 5.17 Radiocarbon dates

also have pollen grains of this form. In a palaeochannel of the Ouse at Haddenham, Cambridgeshire, Waller (1994) reports 'cereal-type' pollen grains, from 5420±100 BP (Q-2814; 4460–3990 cal BC at 95% confidence). 'Cereal-type' pollen was also associated with the elm decline at the Mar Dyke, Essex, dated to 4650±90 BP (HAR-4523; 3650–3090 cal BC at 95% confidence: Scaife 1988). Cereal cultivation also seems to be attested palynologically close to the causewayed enclosure at Etton, Cambridgeshire (Scaife in Pryor *et al.* 1985, 206–14).

Earlier ^{14}C dated charred cereals have been reported from elsewhere in England. For example, at Lismore Fields, Buxton (Derbyshire), radiocarbon dates on *Triticum* grains and *Linum usitatissimum* seeds and charcoal, associated with Neolithic buildings ranged from 5024±120 BP (UB-3290; 4220–3530 cal BC) to 4680±70 BP (OxA-2435; 3640–3340 cal BC) (both calibrated ranges at 95% confidence: Wiltshire and Edwards 1993). However, most Neolithic crop and wild plant food remains are dated, as at this site, by associated ceramics and other artefacts. Although much of the pottery from the Stumble is of Early/Middle Neolithic date, some Grooved Ware and Beaker ceramics have been recovered. Artefactual material from Area D is exclusively Late Neolithic. These results seem to indicate repeated, but presumably not continuous, small-scale activity within the area of the exposed palaeosol right through the Neolithic (*c.f.* Healy 1988, 108–10).

Samples from the trial pits in Area J show that this activity has resulted in a low density scatter of charcoal in the palaeosol across the entire site. Fruitstones of sloe and hazel nutshell fragments show a wide distribution, but charred cereal remains and burnt bone are most frequent in samples from trial pits close to Area A/B and E and Area C (Figs 5.1–5.4). This repeated use of the entire area throughout the Neolithic means that any sample from the palaeosol might include charred plant material related to more than one phase of activity, though obviously most material from the excavated sites is likely to be contemporary with the associated high densities of artefacts. Material from cut features is more certainly from one phase of Neolithic activity, but even in these features some admixture of 'background' material cannot entirely be excluded. Single-phase sites and/or radiocarbon-dated specimens are thus particularly important.

There are some difficulties in establishing dating from purely artefactual evidence — plainly lithics are durable artefacts that may persist indefinitely, whereas poorly fired ceramics might have disintegrated rapidly. The ceramics and plant remains from Area C are consistent in date, but even here single-phase activity cannot be demonstrated with certainty. In Area D around 75% of the lithics were Early Neolithic, yet the AMS dates on charred plant material indicate a much later phase of activity. As noted below (p.142), Area D may have coincided with a specialised Late Neolithic activity area where woodland plant foods were processed.

Sample composition

Despite problems of dating, the samples from the three main excavated areas (Area A, B and C) are remarkably consistent in overall composition (Table 5.16; Area D is discussed separately below):

1. cereal remains are present in the majority of samples;
2. emmer is consistently the main crop;
3. the range of weed taxa is restricted, with large-seeded forms predominating;
4. hazel nutshell fragments are very frequent;
5. sloe fruitstones occur consistently, but at lower frequencies;
6. root, rhizome and tuber fragments are common.

The main differences between sample groups from these areas are as follows:

1. presence or absence of 'minor' crops — einkorn, bread-type wheat, naked barley, flax;
2. markedly lower frequencies of weed seeds noted at Area C;
3. presence or absence of some other woodland taxa — hawthorn, apple, oak, rose, bramble, elder, lime, woody nightshade;
4. somewhat lower frequencies of vegetative plant material at Area C.

Differences between sample groups involving taxa which are, in any case, uncommon plainly need not be significant. Considering these characteristics of sample composition it is hard to see any clear qualitative differences between assemblages from these sites. In conclusion it seems impossible to identify any significant differences between Early and Late Neolithic plant food production and foraging at The Stumble.

Cultivated crops

(Fig. 5.20)

The evidence points to cultivation based on emmer production (*Triticum dicoccum*). Einkorn (*Triticum monococcum*) is restricted to Area A, where it occurs in only two samples. Elsewhere, this crop has been reported from Windmill Hill at low frequencies (Helbaek 1952, 224–5) and a charred glume base from Hazleton chambered cairn is tentatively attributed to this species (Moffett *et al*. 1989), but nowhere in Britain does it seem to have been common. Free-threshing hexaploid bread-type wheat grains (*Triticum aestivum* s.l.) were found in four samples from Area C. There is a single grain impression from Maiden Castle (Helbaek 1952) and several reports of charred grains from Neolithic contexts in lowland Britain (Moffett *et al.* 1989). Naked barley (*Hordeum* sp. var. *nudum*) occurs in six samples from Area A and four from Area B. It has been reported from other British sites as impressions and charred grains, sometimes in association with hulled barley. Whether these 'minor' cereals were cultivated separately, or whether they represent no more than contaminants of the emmer crop, is unclear.

Detecting evidence for on-site crop-processing is problematic, principally because it would no doubt have been done on a small scale as and when required. Generally speaking, grains are more common at this site than chaff fragments, although one sample, from Area A post-hole fill *138*, is exceptional in including a definite excess of glumes over grains. The grain:glume ratio is about 1:7.5; in an unprocessed ear of mainly two-grained spikelets, a ratio of about 1:1 would be expected. The sample also included culm fragments and weed seeds (Table 5.6). This does seem to represent crop-processing

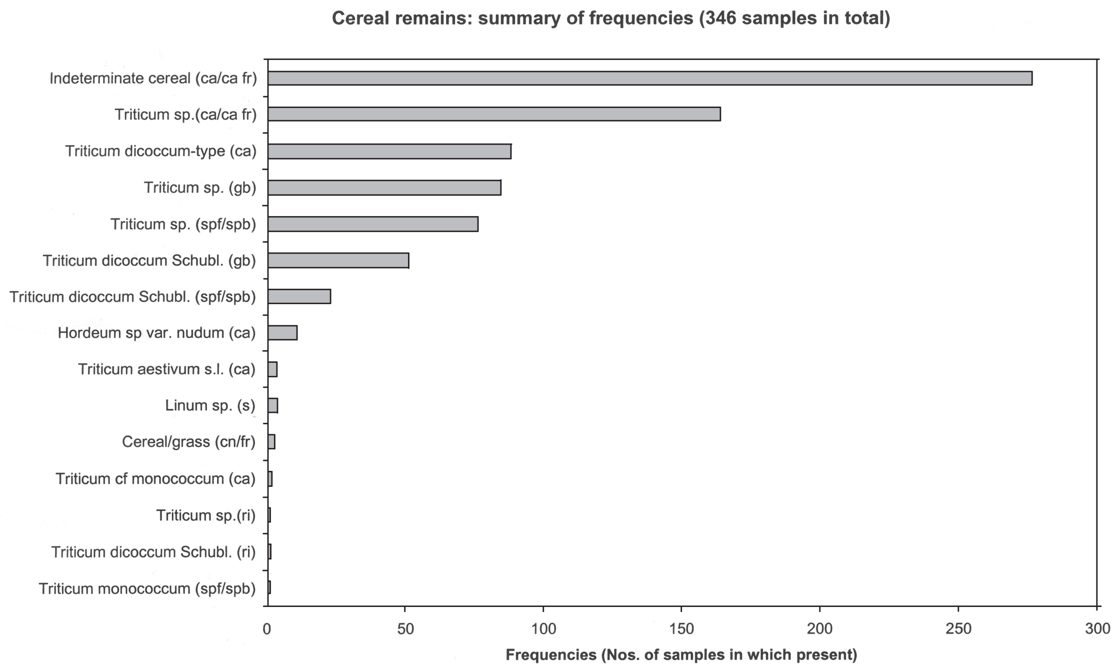


Figure 5.20 Crop remains: summary of frequencies (346 samples in total)

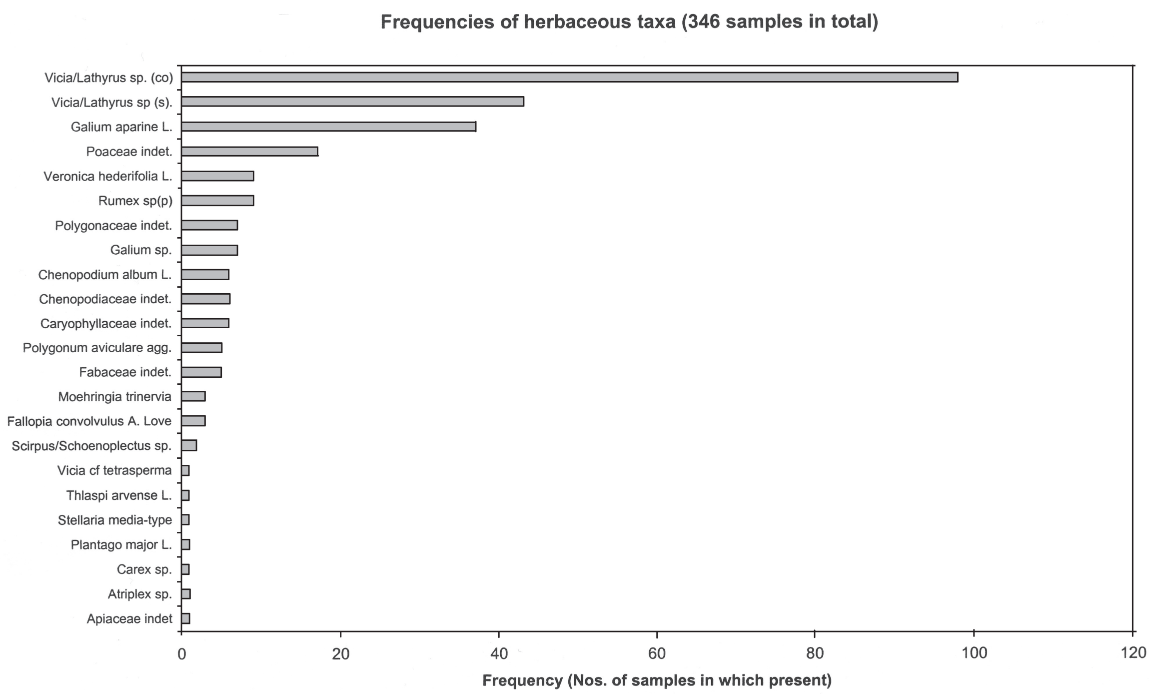


Figure 5.21 Frequencies of herbaceous species

waste; the presence of culm fragments implies that the earlier stages of processing were taking place, implying production in the vicinity (*c.f.* Hillman 1984, 33). Most samples from the Stumble seem to represent a background scatter produced during small-scale domestic activities such as spikelet parching and grain roasting. The fragments of inflorescence bracts fused to a grain from Area A, Sample 59 (Fig. 5.5c) certainly imply charring in the spikelet.

The only other domesticated crop represented in these samples is flax/linseed (*Linum* sp), three seeds of which came from Area C. Helbaek (1952, 199) reports impressions of two seeds from Windmill Hill, which he attributes to *L. usitatissimum*. *Linum* has also been reported from Lismore Fields, Derbyshire (Wiltshire and Edwards 1993), but apparently not elsewhere. At the Stumble, it occurred in only three samples out of 352. This might reflect the fact that heat-processing is not a necessary stage for this crop, and its rarity need not indicate that it was unimportant. There is no way of determining whether it was grown for fibre or oil production, or both.

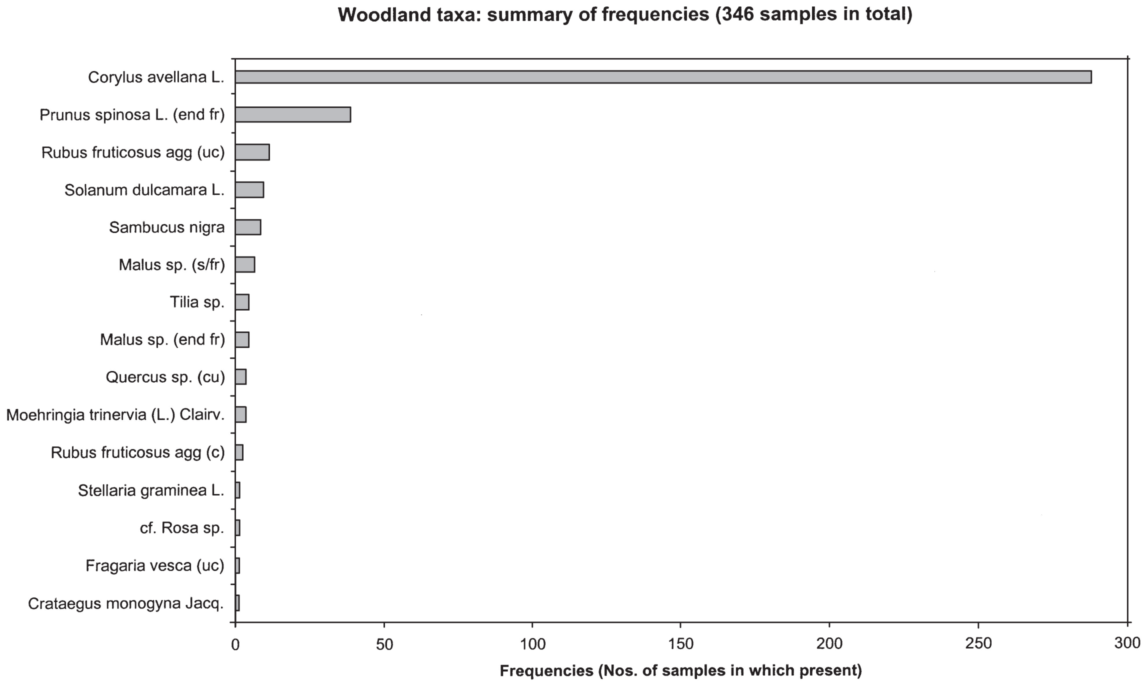


Figure 5.22 Frequencies of woodland taxa

Herbs

(Fig. 5.21)

The ‘weed’ and wetland herbaceous taxa identified are listed in Table 5.16. Compared to later sites in the same area, the list of taxa is obviously restricted. Assuming that most of these remains of herbaceous plants do in fact represent crop weeds, it is probable that many arrived originally as contaminants of seed corn, though the weed flora would have been supplemented by ruderals already growing locally. It is highly likely that the cultivated plots at the Stumble were separated from those of nearby settlements by woodland, and there may have been little trade or exchange of cereals between Neolithic communities. Consequently, there would have been far fewer opportunities for the spread of weeds than in later periods, and the weed floras would consequently have been species-poor.

The two commonest weed taxa (*Vicia/Lathyrus* spp and *Galium aparine*) both include climbing or scrambling plants that would have ascended cereal culms. Their seeds and fruits could easily have been accidentally collected during harvest, particularly if this involved ear collection by cutting or plucking. Furthermore, the large propagules of these taxa would have been less easy to remove from the harvested crop than those of smaller-seeded weeds. In general, semi-cleaned crop products tend to include a high proportion of weed seeds in approximately the same size category as the crop itself. It therefore seems that the composition of the weed seed assemblages in these samples has been influenced mainly by the growth habit of the weed plants and the limitations of crop-cleaning by winnowing or sieving. The two wetland taxa (*Carex* sp, *Scirpus/Schoenoplectus* sp) could represent collection of plant material for litter, bedding or thatching.

Trees and shrubs

(Fig. 5.22)

Woodland plants are well represented in these samples, and include trees, shrubs and also the woodland herb *Moehringia trinervia*. Pollen analysis of the palaeosol outside the settlement area, to the north, indicates a local deciduous woodland type dominated by *Tilia* (lime), oak (*Quercus*) and hazel (*Corylus*). Elm (*Ulmus*) and alder (*Alnus*) were also recorded. *Pinus* values are high, but may include re-worked Tertiary pollen, or may result from differential preservation (Scaife, below, p.115–17). A monolith adjacent to Area C proved to be devoid of pollen (A. Evans, *pers. comm*.). It is assumed that the Neolithic site or sites were located within woodland clearances.

Amongst the charred macrofossils, fragments of hazel nutshell (*Corylus avellana*) are extremely common, occurring in 85–96% of samples from Areas A, B and C. However, the quantities of this material are extremely small, never representing more than one nut per sample and usually much less. It is possible that hazel is over-represented, compared to cereals, since its nutshells are woody, and would readily have become charred. Once charred, even small fragments are durable and could easily have become dispersed across the site. Nevertheless, the high frequency of nutshell fragments does imply that hazel was a significant dietary component. There are good grounds for thinking that Neolithic communities were capable of managing woodlands to produce specific products, such as the hazel rods used to construct some of the Somerset Levels trackways (Morgan 1988), and it is quite possible that in the Neolithic period hazel stands were managed to maximise flowering and nut production (Dimbleby 1967, 15).

Plants in the family Rosaceae are likely to have been under-represented in the palynological analysis (Scaife, Part 6), since they are insect-pollinated. Of the rosaceous fruits likely to have been available locally, *Prunus* *spinosa* (sloe) is the most abundant species in these macrofossil samples. As with hazel, this might in part be related to the durability of its fruitstones. Other edible fruits represented are *Rubus* sp (probably bramble), *Malus* sp. (presumably *M. sylvestris*, crab apple), *Crataegus monogyna* (hawthorn) and probably *Rosa* sp (rose). Macrofossils of these species are likely to represent food wastes, but other may be debris from domestic hearths or localised woodland clearance. These include seeds of the woodland herbs *Stellaria graminea* (lesser stitchwort) and *Moehringia trinervia* (three-veined sandwort), immature acorn cupules (*Quercus* sp), seeds of *Solanum dulcamara* (woody nightshade) and immature fruits of *Tilia* sp (lime). The fact that all fruits of *Tilia* from the site are immature might be significant. It has been suggested that the nutritious leaves of this tree were used as fodder in prehistory (*e.g.* by Tinsley 1981, 238); if so, boughs would plainly have been collected before fruit maturity. Further information on the composition of local woodland later in prehistory came from wood samples obtained from foreshore structures (Part 6).

Vegetative plant material

A final category of macrofossils comprises vegetative plant material: principally charred roots, rhizomes, and tubers. Types of material present have been described above. Unfortunately, close identification has not been possible: it is hoped that the illustrations given here (Pls 5.1–5.9) might aid identification in future. Nevertheless, the close association of this plant material with food wastes strongly implies that some or all of it was intended for consumption. Sub-surface plant organs of this type contain a high proportion of parenchymatous tissue and, hence, of water. Tissue of this type is therefore relatively likely to explode or fragment during charring and hence will be under-represented compared to cereal grains or nutshell. Below-ground organs also commonly include stored starch (besides their vitamin content). It seems highly likely that foraging for roots and tubers was of dietary significance during the Neolithic, and it is unfortunate that at present the range of species exploited cannot be defined.

Area D and the burnt flint mounds

The results from Area D require separate consideration (Table 5.16). The samples came from a series of shallow features associated with Grooved Ware and Beaker pottery. As noted above, they contain a higher mean density of charcoal and hazel nutshell fragments than samples from Area A–C, along with relatively abundant seeds and endocarp fragments (cores) of crab apples, epidermal and parenchymatous tissue that might also be from apples, and some rhizomatous material. In the samples examined from Area D there are no cereal remains. Cereal grains from Area A were dated to 2855–2465 cal BC, near contemporary with a date on *Corylus* nutshells from Area D of 2870–2500 cal BC (Table 5.17). Clearly, then, there was no cessation of cereal production at this time, so Area D must represent some type of specialised activity area. One characteristic of Area D — the abundance of heat-shattered flints — seems to link it with the 'burnt flint mounds' at Site 28. However, the only one of these to be extensively sampled, *231*, produced no definite food remains, just wood charcoal with some vegetative material, so the function(s) of Area D may have differed from those of the burnt flint mounds. The evidence seems to suggest that Area D was associated with the collection of woodland plant foods, either for immediate cooking and consumption, or for drying/roasting before transportation to the main settlement area. Evidence for dried apples in the Neolithic is discussed by Monk (1988). Burnt bone fragments also came from Area D and these, too, could relate to either cooking or the drying or smoking of meat.

The ^{14}C date of 2490–2285 cal BC (Table 5.17) on a charred twig from burnt flint mound *231* indicates that it relates to a final phase of activity at the site during the earliest stages of the Thames III transgression (Devoy 1979).

Taphonomy and preservation

In general, charred macrofossil remains of crops have proved to be very sparse in Neolithic/Beaker deposits in the East of England. The results from Lofts Farm, Essex, only about 1.5km north of the Blackwater Estuary, are typical: about 292 litres of soil were processed but only two cereal grains, grass fruits, rare hazel nutshell fragments and a scrap of sloe fruitstone were retrieved (Murphy 1988a). Other sites producing similarly sparse results were Springfield Lyons, Slough House Farm and Chigborough Farm in Essex (Murphy 1990; 1998), Brampton and Godmanchester in Cambridgeshire (Murphy 1992; Murphy unpublished), Spong Hill, Redgate Hill, Hunstanton and Grimes Graves in Norfolk (Murphy 1988b, 1993; Legge 1981); Pakenham, Suffolk (Murphy and Wiltshire 1989) and Deeping St Nicholas, Lincolnshire (Murphy 1993). At Maxey, Cambridgeshire, 320 litres of fill from a cursus ditch produced no seeds at all (Green 1985). An unusually large deposit of some 80 grains of bread wheat, *Triticum aestivum*, was reported by Boyd (1987) from a pit at Woodham Walter, Essex.

Another problem at many sites is contamination. Features are commonly shallow, directly underlying the modern ploughsoil, and their fills are ramified by modern roots. Most sites are multi-period, with abundant evidence for crop processing in later phases. There is a real likelihood of later charred cereals contaminating Neolithic deposits. At Slough House and Chigborough Farms, Essex this could easily be demonstrated: cereal grains from Neolithic pits gave a determination of 1500±100 BP (OxA 3036; cal AD 340–690 at 95% confidence) and a second of 113±1.2 BP (OxA 3035). At other sites contamination was also suspected: at Spong Hill only impressions of cereals remains and those of other plants on pottery were thought to be reliable indicators of crop production and foraging whilst at Maxey, Green (1985) considered that possible contamination and low densities of material invalidated any interpretation of cereals from Neolithic contexts.

For these reasons, sites well sealed beneath later deposits and thus protected from contamination, such as the Stumble, are particularly important. Clearly no post-Neolithic charred plant material could have intruded into the feature fills and palaeosol after they had been sealed by intertidal sediments. Since submergence, the Neolithic deposits have been protected from root action and burrowing animals, and a very constant depositional environment in terms of water content and temperature has been maintained. As a result the charred plant remains are generally well preserved and, it is thought, far fewer seeds have been lost by the processes of physical weathering (wetting/drying, freezing/thawing) prevalent at terrestrial sites. It is probably for this reason, (as well as the apparent domestic status of the site) that samples from the Stumble have produced more charred Neolithic crop remains than all other sites in the East of England put together.

Farming, foraging and the Neolithic economy

The results presented above indicate an economy based in part on wild plant food collection, and partly on cultivation. Reference to Table 5.16 shows that hazel nutshell fragments in particular are approximately as abundant as cereal remains and that other wild plant foods — fruits and probably roots, rhizomes and tubers — also occur at high frequencies. There are real difficulties in making any quantitative assessment of the relative importance of cultivated and wild plants in the economy of the site, for the different types of foodstuff differ both in terms of cellular structure and in the ways in which they might have been prepared for consumption. Differential preservation, too, has no doubt had an impact. Nevertheless, the marked contrast between the assemblages from this site and those from nearby later prehistoric sites is very clear. Later Bronze Age samples from Lofts Farm, for example, were composed almost entirely of cereal remains, with very few wild plant food remains (Murphy 1988c). The results from the Stumble are entirely consistent with the general pattern for British Neolithic sites discussed by Moffett *et al.* 1989, who concluded that 'throughout the Neolithic the landscape was not being exploited to its full agricultural potential'. Discussing the earlier Neolithic, Williams (1989) considers that initially cereal cultivation could have fitted into established hunter-gatherer economies without necessarily affecting the subsistence base fundamentally.

Postscript

The paragraph above was written in the 1990s. Had all gone smoothly, it would have been published soon after and would at the time have represented a perfectly adequate account of the situation. As it happens there have been delays, and the participants in the project have since taken divergent paths. However, archaeology is a process involving reinterpretation of existing data as well as the accumulation of new data. The external reader of the draft of this report has justifiably pointed out the lack of reference to more recent publications. It is therefore pleasing to revisit the paragraph above in the light of more recent publications; to re-visit the original report, rather than just revising it to give an apparently seamless product. It is hoped that this will give some impression of subsequent changes in interpretation.

The Neolithic archaeobotanical data from the southern half of England were first summarised by Campbell and Straker in 1999 (pub. 2003), some time after the original report on the Stumble had been written. Jones (2000), Robinson (2000) and Fairbairn (2000) also reviewed data available at that time. Jones and Rowley-Conwy (2007) built on this and presented a new interpretation of data from other sites that became available subsequently. They made several perceptive comments: for example, they point out that hazel nutshells are waste products (useful, in a minimal way, as fuel) whereas cereal grains are food, and therefore 'people will make considerable efforts to avoid charring cereal grains'. Moreover on the rare occasions that charred Neolithic food stores have been found by excavation they are composed of cereals, not hazelnuts. Jones and Rowley-Conwy also point out that the low density (macrofossils/kg or litre of soil) of charred cereal remains at Neolithic sites has likewise been taken by some researchers on the British Neolithic to indicate that grain consumption was not significant. At the Stumble, collection of large bulk soil samples was impractical due to logistical problems (specifically the fact that the samples had to be transported from this intertidal site by carrying them across mudflats, or in a small inflatable boat). Nevertheless, some of the relatively small samples from the Stumble yielded densities of charred cereal remains that are comparable with those from later prehistoric sites.

With regard to the Stumble it is difficult to comment on any architectural or ritual contexts that might have influenced the density of material, or whether cereals themselves might have been in some way 'special', since extensive excavation was plainly not possible. However cereals, if not ubiquitous in samples, were certainly very frequent and there is no reason to suppose that this was any sort of dedicated or specialised ritual site.

In the writer's opinion, the main factors affecting the density of charred plant remains in most Neolithic deposits in England are post-depositional and taphonomic (excepting the occasional exceptionally dense deposits that arise when a charred food store is encountered). Charred plant macrofossils were at one time considered to consist simply of elemental carbon, but in fact biomolecules also survive in them. The survival of DNA in charred grains was first reported by Allaby *et al.* (1994). Despite this charred grains are essentially inorganic clasts (and not very recalcitrant ones) which are subject to the processes of weathering that affect any other clast in soil, principally wetting/drying, and bioturbation by soil fauna and roots. Over millennia, disintegration of charred cereal macrofossils in bioactive soils and shallow terrestrial archaeological deposits is inevitable. At the Stumble, however, rising relative sea-level led to a near-constant depositional environment. The deposits were overlain by intertidal sediments so that the Neolithic deposits remained permanently waterlogged with little temperature variation. Intertidal bioactivity from burrowing annelids and molluscs would initially have caused some disturbance of the deposits; as sediment accumulated over the Neolithic site; however, it would have eventually have lain below the depth to which these organisms could burrow. Further disintegration of charred macrofossils then no longer occurred. This appears to be the explanation for the exceedingly low densities of charred macrofossils in Neolithic sites on the adjacent terrestrial gravel terraces of the Blackwater (Murphy 1998) compared to the relatively high densities and frequencies at the Stumble. Sites such as this help to correct the general experience that charred crop remains are rare at British Neolithic sites.

The imponderable factor in any attempt at reconstructing diet relates to vegetative plant material. Leaf foods hardly ever survive in the archaeobotanical record, and certainly did not at this site. Charred roots, rhizomes and 'tubers' were, however, exceptionally well-preserved and frequent at the Stumble. Their charred residues are not robust and would not normally be preserved at terrestrial sites subject to millennia of sub-aerial weathering. Their dietary significance is hard to assess, due to problems of identification. Their calorific input to diet must presumably have been small, due to the time required to dig out sub-surface plant structures in a region of the world where these structures tend to be small. Their vitamin content should not be under-estimated, however, especially at times of year when wild fruits were not available.

Occam's Razor leads one to conclude that this was just an 'ordinary' (although exceptionally well-preserved) Neolithic domestic site, producing deposits which very frequently included cereal remains, sometimes at high densities. The inference from this is that cereals formed a significant, and probably fundamental, component of the Neolithic diet there.

(Tables 5.1–5.16 follow on pp.92–114)

	J2 *310*	*J3* *311*	*J10* *328*	*J12* *305*	*J13* *309*	*J15* *312*	*J16* *313*	*J17* *314*	*J18* *315*	*J23* *303*	*J25* *300*	*J27(1)* *347*	*J28* *304*	*J29 (2)* *308*	*J34* *306*	*J35* *316*	*J36* *320*	*J37* *325*	*J38* *329*	*J42* *343*	*J45* *307*	*J46* *317*	*J47* *321*	*J47 (3)* *336*	*J48* *326*	*J49* *330*
Crops/possible crops																										
Triticum sp.(ca/ca fr)												1		1												
Triticum sp. (spf/spb)																			1							
Indeterminate cereal (ca/ca fr)												fr		fr				fr	fr				fr			
Dryland/wetland herbs																										
Atriplex sp.									2																	
Carex sp.									4																	
Chenopodiaceae indet.									11					3												
Galium aparine L.			1				1		1																	
Plantago major L.					1																					
Poaceae indet.								1	2					cf												
Polygonaceae indet.														1												
Rumex sp(p)									1																	
Vicia/Lathyrus sp (s).							2																	1		
Vicia/Lathyrus sp. (co)							17	15																1		
Woodland/scrub taxa																										
Corylus avellana L. (g)						+				+		+	+	+				+	+	+	+		+	+		+
Moehringia trinervia (L.) Clairv.									3+8cf																	
Prunus spinosa L. (end fr)		+					+		+																	
Solanum dulcamara L.									1cf																	
Roots, rhizomes, tubers etc.																										
Poaceae c.f. Arrhenatherum (sbi)														1				1								
Stem fragments					1				+																	
Rhizome fragments (Type 6)					5		2	1						10												
Root/rhizome fragments					1		2	2	3				+	6												
Amorphous parenchyma fragments																										
Charcoal (g.)	0.004	0.3	0.16	0.57	0.66	0.15	0.24	0.25	2.78	0.13	0.05	0.16	0.09	1.49	0.04	0.04	0.02	0.21	0.53	0.57	0.2	0.03	0.07	0.25	0.06	2.33
Unidentified seeds etc.		2					2	2	10								1						1			
Bone fragments (burnt)				+								+														
Sample weight (kg.)	3.65	3.7	4.6	5.4	5.35	9	10.3	7.5	7.75	5	6.5	5	5.5	5.25	4.75	9.15	4.2	6.5	7.45	6.75	5.1	4.1	8.25	7.8	4.75	7.3
% of fraction <2mm sorted (if <100%)									25																	

NB. JI, 4-9, 11, 14, 19-22, 24, 26, 30-33, 39–41, 43–4, 54–6, 61, 65–7, 70, 74, 76-7, 78–8, 81–8 – no samples, usually due to truncation of old land surface.
In some cases sampling points deviated from the grid for practical reasons. (1) 10m north; (2) 2m east. (3) 10m east (4) 2m west.(5) 10m north.

Table 5.1 Plant macrofossils from Area J (i)

	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*13*	*14*	*15*	*16*	*18*	*20*	*21*	*22*	*23*	*24*	*25*	*26*	*27*	*28*	*29*	*30*	*31*	*32*	*34*
Crops/possible crops																														
Hordeum sp var. nudum (ca)																		1										1cf		
Triticum cf *monococcum* (ca)	1								1																					
Triticum monococcum (spf/spb)														1																
Triticum dicoccum-type (ca)	1		14	4	7	3	1	4	5	8	2	2		1			2	1		2		5							2	
Triticum dicoccum Schubl. (gb)	1		1		4				1		1		1	2			1			2	1	1								
Triticum dicoccum Schubl. (spf/spb)			1							1				1													1			
Triticum sp.(ca/ca fr)		1	2	9	2		1	5	1	14	2	2		5	1	1	2		3	1	3	7	2		1	6	2	2		
Triticum sp. (gb)				1		3		2		1		1	1	1			3			1						1	1	1		1
Triticum sp. (ri)				1																										
Triticum sp. (spf/spb)	2		1	1	4			1	5	1	1			2	1					2						1				
Indeterminate cereal (ca/ca fr)	2+fr	fr	9+fr	3+fr	10+fr	4+fr	4+fr	10+fr	17+fr	15+fr	7+fr	3+fr	4+fr	12+fr	7+fr	10+fr	20+fr	2+fr	2+fr	4+fr	4+fr	3+fr	1+fr	fr	fr	3+fr	fr	3+fr	1+fr	5+fr
Cereal/grass (cn/fr)																														
Dryland/wetland herbs																														
Chenopodium album L.																					1									
Fabaceae indet.																														
Fallopia convolvulus A. Love																														
Galium aparine L.								1							3		1				1									
Montia fontana subsp.*chondrosperma* (uc)																								1						
Poaceae indet.			1											fr	1															
Polygonum aviculare agg.																														
Rumex sp(p)					1																									
Vicia/*Lathyrus* sp (s).							1																			1				
Vicia/*Lathyrus* sp. (co)				1	1		1	2		1		1									2							2		
Woodland/scrub taxa																														
Corylus avellana L.(g)	0.03		0.05	0.02	0.04	0.09	0.05	0.02	0.02	0.02	0.04	0.02	0.01	0.01	0.03	0.01	0.01	0.03	0.05	0.005	0.02	0.06	0.02		0.05		0.02	0.04	0.01	0.02
Fragaria vesca L. (uc)																					1									

Table 5.2 Plant macrofossils from Area J (ii)

	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*13*	*14*	*15*	*16*	*18*	*20*	*21*	*22*	*23*	*24*	*25*	*26*	*27*	*28*	*29*	*30*	*31*	*32*	*34*
Crops/possible crops																														
Hordeum sp var. nudum (ca)																		1										1cf		
Triticum cf *monococcum* (ca)	1								1																					
Triticum monococcum (spf/spb)														1																
Triticum dicoccum-type (ca)	1		14	4	7	3	1	4	5	8	2	2		1			2	1		2		5							2	
Triticum dicoccum Schubl. (gb)	1		1		4				1		1		1	2			1			2	1	1								
Triticum dicoccum Schubl. (spf/spb)			1							1				1													1			
Triticum sp.(ca/ca fr)		1	2	9	2		1	5	1	14	2	2		5	1	1	2		3	1	3	7	2		1	6	2	2		
Triticum sp. (gb)				1		3		2		1		1	1	1			3			1						1	1	1		1
Triticum sp. (ri)				1																										
Triticum sp. (spf/spb)	2		1	1	4			1	5	1	1			2	1					2						1				
Indeterminate cereal (ca/ca fr)	2+fr	fr	9+fr	3+fr	10+fr	4+fr	4+fr	10+fr	17+fr	15+fr	7+fr	3+fr	4+fr	12+fr	7+fr	10+fr	20+fr	2+fr	2+fr	4+fr	4+fr	3+fr	1+fr	fr	fr	3+fr	fr	3+fr	1+fr	5+fr
Cereal/grass (cn/fr)																														
Dryland/wetland herbs																														
Chenopodium album L.																					1									
Fabaceae indet.																														
Fallopia convolvulus A. Love																														
Galium aparine L.								1							3		1				1									
Montia fontana subsp.*chondrosperma* (uc)																								1						
Poaceae indet.			1											fr	1															
Polygonum aviculare agg.																														
Rumex sp(p)					1																									
Vicia/*Lathyrus* sp (s).							1																			1				
Vicia/*Lathyrus* sp. (co)				1	1		1	2		1		1									2							2		
Woodland/scrub taxa																														
Corylus avellana L.(g)	0.03		0.05	0.02	0.04	0.09	0.05	0.02	0.02	0.02	0.04	0.02	0.01	0.01	0.03	0.01	0.01	0.03	0.05	0.005	0.02	0.06	0.02		0.05		0.02	0.04	0.01	0.02
Fragaria vesca L. (uc)																					1									

	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*13*	*14*	*15*	*16*	*18*	*20*	*21*	*22*	*23*	*24*	*25*	*26*	*27*	*28*	*29*	*30*	*31*	*32*	*34*
cf *Malus* sp. (epi)									+											+										
Malus sp. (s/fr)																														
Moehringia trinervia (L.) Clairv.																														
Prunus spinosa L. (end fr)			+																	+								+		+
Quercus sp. (cu)																														
cf. *Rosa* sp.																														
Rubus fruticosus agg. (uc)							2	1																						
Rubus sp.																														
Sambucus nigra L. (uc)																		1			1								1	
Tilia sp.																														
Vegetative material																														
Poaceae c.f. *Arrhenatherum* (sbi)										1											1									
Dicotyledon (trf)																														
Stem fragments								1																						
Root fragment (Type 4)		1																												
Root fragment (Type 5)	1		1												3							2						1		
Rhizome fragments (Type 6)								1		2		A															1			1
Root/rhizome fragments				+			+				+														+					
Amorphous parenchyma fragments																														
Catkin frag.																														
Bud				1											1															1
Charcoal (g.)	1.94	nr	1.33	0.84	0.89	0.86	0.36	0.37	1.24	0.99	0.69	0.61	0.72	0.99	3.67	0.76	0.39	0.57	0.47	1.18	0.66	0.66	0.2	0.02	0.85	0.23	0.11	0.96	0.76	0.34
Unidentified seeds etc.									1			1	1		1					1		1					1	3	1	2
Sample weight (kg.)	3.5	4.25	3.55	3.85	2.8	2.85	2.8	3.85	3.65	3.85	3.1	3.1	2.9	3.2	3.9	4.7	4.5	3	3.75	3.63	3.75	3.75	2.75	3.15	3.56	3.95	3.7	4	3.8	3.45

Table 5.3 Plant macrofossils from Area A grid-squares (i)

	35	*36*	*37*	*38*	*39*	*40*	*41*	*42*	*44*	*45*	*47*	*48*	*49*	*50*	*51*	*52*	*53*	*54*	*55*	*56*	*57*	*58*	*59*	*60*	*61*	*62*	*63*	*64*	*65*	*66*	*67*	*68*	*70*
Crops/possible crops																																	
Hordeum sp var. *nudum* (ca)																	fr			fr													
Triticum cf *monococcum* (ca)																																	
Triticum monococcum (spf/spb)																																	
Triticum dicoccum-type (ca)									1								6		1		8	1	7	16	1		5	5	2		3		1
Triticum dicoccum Schubl. (gb)																				1	2		1	9	2		2		2		3		1
Triticum dicoccum Schubl. (spf/spb)																				2	2		1	9				1			2		1
Triticum sp.(ca/ca fr)															1	1	2	1	2	4	6	1	4	7	2	4	5	4		1	5	2	2
Triticum sp. (gb)	1															1	4		2		4	2		9	1	1	2	2	2		4		
Triticum sp. (ri)																																	
Triticum sp. (spf/spb)																1	3			2	3	1	2	4			2	1	1		3		
Indeterminate cereal (ca/ca fr)	3+fr		fr	1+fr	fr	fr	fr	1+fr	fr	1+fr	1+fr				3+fr	4+fr	16+fr	5+fr	5+fr	13+fr	19+fr	7+fr	12+fr	43+fr	5+fr	14+fr	9+fr	15+fr	10+fr	6+fr	4+fr	5+fr	5+fr
Cereal/grass (cn/fr)																																	
Dryland/wetland herbs																																	
Chenopodium album L.																																	
Fabaceae indet.																																	
Fallopia convolvulus A. Love																																	
Galium aparine L.																		2			fr		1			1		1					
Montia fontana subsp. *chondrosperma* (uc)																																	
Poaceae indet.						2				1								1						1		1							
Polygonum aviculare agg.																					1												
Rumex sp(p)																								1									

	35	*36*	*37*	*38*	*39*	*40*	*41*	*42*	*44*	*45*	*47*	*48*	*49*	*50*	*51*	*52*	*53*	*54*	*55*	*56*	*57*	*58*	*59*	*60*	*61*	*62*	*63*	*64*	*65*	*66*	*67*	*68*	*70*
Vicia/*Lathyrus* sp (s).			2		3	4				5						1							1	1									
Vicia/*Lathyrus* sp. (co)	3		1	1	6	6				6	1		1					1					1	1				1			1	2	
Woodland/scrub taxa																																	
Corylus avellana L.(g)	0.003			0.04		0.01	0.03				0.005	0.01			0.04	0.01	0.08	0.01	0.03	0.09	0.04	0.02	0.02	0.05	0.1	0.03	0.07	0.05	0.04	0.09	0.07	0.04	0.01
Fragaria vesca L. (uc)																																	
cf *Malus* sp. (epi)				+																													
Malus sp. (s/fr)																																	
Moehringia trinervia (L.) Clairv.																																	
Prunus spinosa L. (end fr)														+							+												
Quercus sp. (cu)																																	
cf. *Rosa* sp.																																	
Rubus fruticosus agg. (uc)					1		1																										
Rubus sp.																																	
Stellaria graminea L.																																	
Tilia sp.																1																	
Vegetative material																																	
Poaceae c.f. Arrhenatherum (sbi)																1		1							1					1			
Dicotyledon (trf)																																	
Monocotyledon (st n)					1																			1									
Stem fragments					1	1				1							1																
Root fragment (Type 4)																																	
Root fragment (Type 5)	1														3	2					1												
Rhizome fragments (Type 6)					5	1				1																1							

	35	*36*	*37*	*38*	*39*	*40*	*41*	*42*	*44*	*45*	*47*	*48*	*49*	*50*	*51*	*52*	*53*	*54*	*55*	*56*	*57*	*58*	*59*	*60*	*61*	*62*	*63*	*64*	*65*	*66*	*67*	*68*	*70*
Stem/rhizome frags. (Type 9)																										1							
Root/rhizome fragments					5				2	4															1	1				2	1		1
Amorphous parenchyma fragments																																	
Bud					+	+			2																	1							
Catkin frag.															+																		
Charcoal (g.)	0.29	0.005	0.62	0.37	0.84	2.71	0.4	0.11	0.74	4.56	0.32	0.47	0.27	0.84	2.71	18.6	0.72	0.66	0.21	0.98	1.76	0.91	1.04	4.21	1.49	0.91	1.58	0.94	0.76	2.5	1.17	1.18	0.21
Unidentified seeds etc.	5		2	1	3	7				1		3		3	1	1	3	1		4	2	1		2	1	2		2	1	1	1	3	1
Sample weight (kg.)	4.3	2.5	4.25	4.2	3.75	3.75	4.25	4.1	4.1	4.6	4.35	4.3	3.9	4.2	3.5	3.65	4.25	4.75	4.45	5.35	5.5	5.25	5.25	5.25	5.2	5.1	4.2	4.05	4.8	5.75	5.25	4.8	5.25

Table 5.4 Plant macrofossils from Area A grid-squares (ii)

	71	*72*	*73*	*74*	*75*	*76*	*77*	*78*	*79*	*80*	*81*	*82*	*83*	*84*	*85*	*86*	*87*	*88*	*89*	*90*	*91*	*92*	*93*	*94*	*95*	*96*	*97*	*98*	*99*	*100*
Crops/possible crops																														
Hordeum sp var. *nudum* (ca)		1																	1											
Triticum cf *monococcum* (ca)																														
Triticum monococcum (spf/spb)																														
Triticum dicoccum-type (ca)	3	5						1		1	1						2	1												
Triticum dicoccum Schubl. (gb)			1		7																									
Triticum dicoccum Schubl. (spf/spb)					1																									
Triticum sp.(ca/ca fr)	2	1	1					1	1	3	1	2	1		1								1	1						
Triticum sp. (gb)									2				2												1					
Triticum sp. (ri)																														
Triticum sp. (spf/spb)			1		1							3	1																	
Indeterminate cereal (ca/ca fr)	2+fr	1+fr	4+fr	3+fr	3+fr	1+fr	fr	6+fr	5+fr	9+fr	2+fr	1+fr	1+fr	fr	3+fr			1+fr	1+fr	fr	fr	1+fr	1+fr	1+fr	3+fr		fr	fr	fr	1+fr
Cereal/grass (cn/fr)																														
Dryland/wetland herbs																														
Chenopodium album L.																														
Fabaceae indet.																														
Fallopia convolvulus A. Love																														
Galium aparine L.																								1						
Montia fontana subsp.chondrosperma (uc)																														
Poaceae indet.																														
Polygonum aviculare agg.																														
Rumex sp(p)																														
Vicia/*Lathyrus* sp (s).			1					1						1	2												1			

	71	*72*	*73*	*74*	*75*	*76*	*77*	*78*	*79*	*80*	*81*	*82*	*83*	*84*	*85*	*86*	*87*	*88*	*89*	*90*	*91*	*92*	*93*	*94*	*95*	*96*	*97*	*98*	*99*	*100*
Vicia/Lathyrus sp. (co)			1	2				2	2					1	6	1								1	3	1	1		1	
Woodland/scrub taxa																														
Corylus avellana L.	0.06	0.07	0.02			0.01	0.01	0.02	0.1	0.02	0.08	0.06	0.01	0.01	0.05		0.02	0.04	0.01		0.04	0.02	0.01	0.005	0.01	0.09	0.1	0.03	0.005	0.02
Fragaria vesca L. (uc)																														
cf *Malus* sp. (epi)																														
Malus sp. (s/fr)																														
Moehringia trinervia (L.) Clairv.																														
Prunus spinosa L. (end fr)		+				+					+			+			+	+								+				+
Quercus sp. (cu)																														
cf. *Rosa* sp.																														
Rubus fruticosus agg. (uc)		1		1										1	1+fr			1											1	1
Rubus sp.																														
Sambucus nigra L. (uc)								1						1					2	1										
Tilia sp.																			1											
Vegetative material																														
Poaceae c.f. *Arrhenatherum* (sbi)					1																									
Dicotyledon (trf)																														
Monocotyledon (st n)																														
Stem fragments												1								1										
Monocot ribbed internode (Type 3)																													2	
Root fragment (Type 4)																														
Root fragment (Type 5)									1													1			1					
Rhizome fragments (Type 6)														1	1						3									
?Inflorescence axis (Type 8)																														

	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
Stem/rhizome frags. (Type 9)					1										2															
Root/rhizome fragments														2	2															
Amorphous parenchyma fragments																														
Bud										1				3	1															
Catkin frag.																														
Thorn frag.															1															
Charcoal (g.)	0.9	1.49	0.77	0.005	0.1	0.76	0.06	0.24	0.74	0.17	1.9	0.85	0.55	0.28	0.17	0.16	0.1	0.89	0.44	0.15	0.36	0.49	0.22	0.33	1.29	0.38	1.27	0.57	0.69	1.09
Unidentified seeds etc.		2		2	4		1	1	3	3	1	2	2	3	1										1					12
Sample weight (kg.)	4.35	5	4.5	5.1	5.5	4.7	4.4	5.12	6	5.35	5.15	5.25	4.8	4.6	5.2	4.7	5	5	5.25	4.7	4.08	4.45	4.65	5.1	5	4.6	4.25	4.1	5.5	5.3

Table 5.5 Plant macrofossils from Area A grid-squares (iii)

	138	*143*	*145*	*147*	*149*	*153*	*157*	*159*	*160*	*161*	*163*	*164*	*167*
Crops/possible crops													
Linum sp. (s)			1cf										
Triticum dicoccum-type (ca)	8	1		6					1		2	3	
Triticum dicoccum Schubl. (gb)	29			2					1			1	
Triticum dicoccum Schubl. (ri)	5												
Triticum dicoccum Schubl. (spf/spb)	9			1									
Triticum sp.(ca/ca fr)	1			2	2				2	1	2	2	1
Triticum sp. (gb)	24		1	4	1		3		3				
Triticum sp. (ri)							1						
Triticum sp. (spf/spb)	14								1			1	
Indeterminate cereal (ca/ca fr)	4+fr	fr	1+fr	8+fr	fr	fr	4+fr	fr	4+fr	fr	3+fr	5+fr	fr
Cereal/grass (cn/fr)	3+fr												
Dryland/wetland herbs													
Caryophyllaceae indet.	1												
Chenopodiaceae indet.					1							1	
Chenopodium album L.	1+fr												
Galium aparine L.		fr			2							fr	
Poaceae indet.	8												
Polygonaceae indet.	1								fr				
Polygonum aviculare agg.	fr												
Rumex sp(p)	23											1	
Vicia/*Lathyrus* sp (s).	1												
Vicia/*Lathyrus* sp. (co)	1	1				1						2	
Woodland/scrub taxa													
Corylus avellana L.	0.003	0.04		0.003	0.01	0.008	0.05	0.02	0.09	0.01	0.04	0.1	0.01
Crataegus monogyna Jacq.												1	
cf *Malus* sp. (epi)	+												
Stellaria graminea L.	1												
Vegetative material													
Poaceae c.f. Arrhenatherum (sbi)												1	
Poaceae shortinternodes (Type 2)												2	
Bud					1								
Thorn frag.		1											
Charcoal (g.)	1.86	2.38	1.15	0.26	0.45	4.32	2.28	0.05	2.18	0.19	0.96	1.4	0.27
Unidentified seeds etc.	7	2			1						1		
Sample weight (kg.)	1	2.3	8	5.6	2.5	1.4	5.1	1.6	8.1	5.15	5.3	4.9	4.5

Table 5.6 Plant macrofossils from Area A feature fills

	101	*102*	*109*	*110*	*111*	*117*	*118*	*120*	*121*	*122*	*125*	*126*	*127*	*128*	*129*	*130*	*131*	*132*	*133*	*135*	*136*	*137*	*138*	*144*	*145*	*146*	*147*	*148*	*149*	*150*
Crops/possible crops																														
Triticum monococcum (spf/spb)																														
Triticum dicoccum-type (ca)					1							4				2			1		1			3					2	4
Triticum dicoccum Schubl. (gb)									1		1									1									3	1
Triticum dicoccum Schubl. (spf/spb)																													1	
Triticum sp.(ca/ca fr)		2				1			2	1	3	2		4		2			5		5		2			1	1		5	7
Triticum sp. (gb)								1						1															7	6
Triticum sp. (ri)																														
Triticum sp. (spf/spb)						1		1		1						1			2	1	4				1	1		1	3	7
Indeterminate cereal (ca/ca fr)	1+fr	fr	fr	fr	2+fr	fr	1+fr	3+fr	8+fr	3+fr	2+fr	2+fr	3+fr	2+fr	4+fr	3+fr	1+fr	1+fr	3+fr	fr	3+fr	4+fr	4+fr	fr	fr	2+fr	fr	fr	3+fr	5+fr
Cereal/grass (cn/fr)																														
Dryland/wetland herbs																														
Apiaceae indet.																														
Caryophyllaceae indet.																														4
Chenopodiaceae indet.											1																			
Chenopodium album L.								1																1					1	
Fabaceae indet.																						1							1	
Fallopia convolvulus A. Love																														
Galium aparine L.									1		1			1							3		1+fr			1+fr			fr	4+fr
Galium sp.								fr					1						fr											
Poaceae indet.										1									1	1										
Polygonaceae indet.															1															
Polygonum aviculare agg.																														
Scirpus/Schoenoplectus sp.																														
Stellaria media-type													1																	
Veronica hederifolia L.			1																	1	1									2
Vicia cf *tetrasperma*																														
Vicia/Lathyrus sp (s).		1					1	1							1				1	3				2			2	1		
Vicia/Lathyrus sp. (co)		2					1		1		1	2		1	1				1	27	1	2		6				1		1

	101	*102*	*109*	*110*	*111*	*117*	*118*	*120*	*121*	*122*	*125*	*126*	*127*	*128*	*129*	*130*	*131*	*132*	*133*	*135*	*136*	*137*	*138*	*144*	*145*	*146*	*147*	*148*	*149*	*150*
Woodland/scrub taxa																														
Corylus avellana L. (g)	0.1	0.05	0.06	0.01	0.13	0.05	0.07	0.28	0.19	0.06	0.16	0.08	0.05	0.25	0.21	0.33	0.18	0.07	0.08	0.11	0.21	0.17	0.17	0.13	0.03	0.15	0.06	0.02	0.12	0.22
Malus sp. (s/fr)																														
Moehringia trinervia (L.) Clairv.																														
Prunus spinosa L. (end fr)									fr	fr	fr	fr		2fr																
Quercus sp. (cu)																														
Vegetative material																														
Poaceae c.f. *Arrhenatherum* (sbi)					1												2fr													
Root fragment (Type 4)																											1			
Root fragment (Type 5)																				4	2									
Rhizome fragments (Type 6)		1		1																				3		1				
Stem/rhizome frags. (Type 9)					1																									
Root/rhizome fragments	2	1		2	4							2								3				6	1	1				
Amorphous parenchyma fragments																														
Epidermis												fr								fr	fr	fr		fr					fr	
Bud													1							2				1						
Charcoal (g.)	1.03	0.61	5.25	1.44	2.48	0.52	1.56	0.94	1.55	1.3	0.79	1.52	0.24	1.22	1.33	1.6	1.13	0.79	0.72	2.42	1.59	1.4	0.72	6.27	0.16	0.57	0.53	0.09	0.84	0.93
Unidentified seeds etc.				5	1		1		1	1	2		2	3	1	1				6	2			4		1	1	2	2	1
Bone fragments (burnt)	+	+	+		+	+	+	+	+	+	+	+	+	+	+	+		+	+	+	+	+		+	+	+		+	+	
Sample weight (kg.)	5.5	4.5	4.5	5.75	6.75	5.5	4	5.5	4.25	5	7.5	5.75	3.25	5.5	5.75	5.5	5.25	5.5	6	5.6	5.75	6.25	6.3	5.5	5.75	4.6	4.75	6	5.25	6
% of fraction <2mm sorted (if <100%)				25																										

Table 5.7 Plant macrofossils from Area B grid-squares (i)

	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180
Crops/possible crops																														
Triticum monococcum (spf/spb)																														
Triticum dicoccum-type (ca)	1	2						1							2		1						1	2	1					
Triticum dicoccum Schubl. (gb)								2																						
Triticum dicoccum Schubl. (spf/spb)																														
Triticum sp.(ca/ca fr)	1	2	1			2	3	3	3	3	2	1	1		2	3							4	3	1					
Triticum sp. (gb)	1			2	1		1	3			3					1					1					1				
Triticum sp. (ri)																														
Triticum sp. (spf/spb)		1					1	1		1															1					
Indeterminate cereal (ca/ca fr)	3+fr	3+fr	2+fr	5+fr	2+fr	fr	4+fr	5+fr	4+fr	3+fr	2+fr	fr		fr	3+fr	2+fr	3+fr		1		fr		1+fr	fr	2+fr	1+fr				fr
Cereal/grass (cn/fr)																						1								
Dryland/wetland herbs																														
Apiaceae indet.																											1			
Caryophyllaceae indet.																														
Chenopodiaceae indet.																														
Chenopodium album L.																														
Fabaceae indet.																														
Fallopia convolvulus A. Love																														
Galium aparine L.	1+fr				1	1		1+fr	1						1							1								
Galium sp.		fr																												
Poaceae indet.		fr																										1		
Polygonaceae indet.																														
Polygonum aviculare agg.	1															1														
Scirpus/Schoenoplectus sp.											1																			
Stellaria media-type																														
Veronica hederifolia L.	fr						1																							
Vicia cf *tetrasperma*										1																				
Vicia/Lathyrus sp (s).		2								1	2								1	1	7				2		2	1	9	
Vicia/Lathyrus sp. (co)	1	12			1		1	2			3		5	1	2		1		3		6	1		2			6	7	5	4

	151	*152*	*153*	*154*	*155*	*156*	*157*	*158*	*159*	*160*	*161*	*162*	*163*	*164*	*165*	*166*	*167*	*168*	*169*	*170*	*171*	*172*	*173*	*174*	*175*	*176*	*177*	*178*	*179*	*180*
Woodland/scrub taxa																														
Corylus avellana L. (g)	0.18	0.07	0.13	0.21	0.09	0.04	0.13	0.11	0.19	0.19	0.11	0.02	0.05	0.06	0.1	0.09	0.06	0.02	0.008		0.01	0.02		0.03	0.05	0.02		0.007	0.01	0.02
Malus sp. (s/fr)	1																													
Moehringia trinervia (L.) Clairv.																														
Prunus spinosa L. (end fr)			fr						fr	fr	fr																	fr		
Quercus sp. (cu)																fr		1												
Vegetative material																														
Poaceae c.f. *Arrhenatherum* (sbi)					1					2fr																				
Root fragment (Type 4)																														
Root fragment (Type 5)													1							1		3						4		
Rhizome fragments (Type 6)										3											4									1
Stem/rhizome frags. (Type 9)					1							1												1						
Root/rhizome fragments						1		1		1		2	1		1	1		1			8	1	3				2	2	4	1
Amorphous parenchyma fragments																														
Epidermis	fr	fr					fr			fr									fr											
Bud		1			1																						1	1	1	
Charcoal (g.)	0.7	14.13	1.27	0.97	0.86	0.41	0.57	0.81	0.86	4.04	5.91	1.61	1.83	0.4	0.29	1.33	1.07	4.81	4.17	0.07	10.23	1.93	0.51	0.43	0.65	0.19	3.02	1.85	2.2	0.64
Unidentified seeds etc.		9							2	2	1	1					1		2	1	2					1	1	3	1	
Bone fragments (burnt)	+	+	+	+			+	+		+	+	+	+		+	+		+				+	+							
Sample weight (kg.)	5.5	7	5.75	6	6.75	6.75	6.5	6.75	5.25	7.5	7.25	5.6	5.5	6.5	5.5	7.25	6.75	5.5	7.75	5.75	4.8	8	5.5	6.5	7.75	6.5	6.5	4.75	5.25	6
% of fraction <2mm sorted (if <100%)																		25	25								25		50	

Table 5.8 Plant macrofossils from Area B grid-squares (ii)

	185	*186*	*189*	*196*	*197*	*198*	*199*	*200*	*202a*	*202c*	*203*	*204*	*205*	*206*	*207*	*210*	*214*	*221*
Crops/possible crops																		
Hordeum sp var. nudum (ca)						fr										fr		
Triticum dicoccum-type (ca)				1					1				2		1		1	1
Triticum dicoccum Schubl. (gb)				1														3
Triticum dicoccum Schubl. (spf/spb)																		3
Triticum sp.(ca/ca fr)					1	4	2		1		1		2		3			4
Triticum sp. (gb)				1											1	1		1
Triticum sp. (spf/spb)				2										1				1
Indeterminate cereal (ca/ca fr)		2+fr	fr	3+fr	1+fr	2+fr	4+fr	3+fr	2+fr	fr		1+fr	2+fr	1+fr	fr		fr	3+fr
Cereal/grass (cn/fr)																	1	
Dryland/wetland herbs																		
Caryophyllaceae indet.				8									1					2
Chenopodiaceae indet.																		
Chenopodium album L.									1									
Galium aparine L.			1								1							1
Galium sp.		fr														fr	fr	
Montia fontana subsp.*chondrosperma* (uc)																		
Polygonaceae indet.												1					1	
Rumex sp(p)						1							1					
Scirpus/*Schoenoplectus* sp.	1																	
Vicia/*Lathyrus* sp (s).	20				1	1							2					
Vicia/*Lathyrus* sp. (co)	25	1	1		1	1			1		1		3	1				
Woodland/scrub taxa																		
Corylus avellana L. (g)	0.03	0.08	0.03	0.003	0.05	0.12	0.03	0.09	0.16	0.03	0.03	0.04	0.09	0.05	0.04	0.008	0.01	0.04
Moehringia trinervia (L.) Clairv.											30							1
Prunus spinosa L. (end fr)	+								fr		1							
Quercus sp. (cu)					1													
Rubus fruticosus agg c	1																	1
Vegetative material																		
Epidermal fragments	+			+	+						+		+					
Monocotyledon (st n)																		
cf *Neuroterus* sp. (gall)					1													
Root fragment (Type 5)	2												1					
Rhizome fragments (Type 6)	5									1							1	
Stem/rhizome frags. (Type 9)																		
Root/rhizome fragments	4					1					1							
Large parenchyma fragments											+							
Bud					3											2		
Charcoal (g.)	7.29	0.18	1.91	0.3	4.93	4.22	0.78	0.53	0.95	0.09	1.43	0.22	4.43	0.24	0.25	0.07	0.22	0.21
Unidentified seeds etc.	8			1	2							1	1			3		1
Bone fragments (burnt)	+	+	+	+	+	+	+	+	+		+	+	+	+	+	+	+	+
Sample weight (kg.)	5.65	4.75	4.25	5.5	2.75	7.75	5	5.25	5.25	6.5	2.25	3.5	5	5	6.75	6.75	4	5.25

Table 5.9 Plant macrofossils from Area B feature fills

	189	190	191	192	193	194	196	198
Crops/possible crops								
Hordeum sp var. nudum (ca)							fr	
Triticum dicoccum-type (ca)							1	1
Triticum dicoccum Schubl. (spf/spb)				2				1
Triticum aestivum s.l. (ca)								
Triticum sp.(ca/ca fr)	1	1	2	3		2	7	4
Triticum sp. (gb)						1	1	
Triticum sp. (spf/spb)					1			
Indeterminate cereal (ca/ca fr)	2+fr	3+fr	2+fr	6+fr	1+fr	2+fr	5+fr	fr
Cereal/grass (cn/fr)								
Dryland/wetland herbs								
Caryophyllaceae indet.				1				
Galium aparine L.							1	
Polygonum aviculare agg.							1	
Veronica hederifolia L.							1	
Vicia/*Lathyrus* sp (s).			1	3				
Vicia/*Lathyrus* sp. (co)			1	5				1
Woodland/scrub taxa								
Corylus avellana L. (g)		0.002	0.04	0.06	0.01	0.02	0.09	0.006
Vegetative material								
Epidermal fragments	+						+	
Root fragment (Type 5)				2			2	
Root/rhizome fragments		1	1				1	
Large parenchyma fragments							+	
Catkin frag.							+	
Charcoal (g.)	0.57	3.28	2.16	4.14	0.61	1.41	5.17	0.71
Unidentified seeds etc.	1			3	2	1	1	
Bone fragments (burnt)			+	+			+	
Sample weight (kg.)	7.5	7.25	7	7.25	8.55	6	7.5	5.75

Table 5.10 Plant macrofossils from Area E

	221	223	225	227	229	231	233	235	237	239	241	243	245	247	249	251	253	256	258	260	262	264	266	268	270
Crops/possible crops																									
Linum sp. (s)																									
Triticum dicoccum-type (ca)						1			2	5	1														
Triticum dicoccum Schubl. (gb)		2	1				1	1						2							1				
Triticum *dicoccum* Schubl. (spf/spb)									1										1						
Triticum aestivum s.l. (ca)										1															
Triticum sp.(ca/ca fr)	3	1	3			2		1	1		4				1	1		1	3				2	1	1
Triticum sp. (gb)		1		1		2	1	1	1	1					1				1		2	1		2	
Triticum sp. (spf/spb)	1			1	2		1	1	1	1	1	1							2						
Indeterminate cereal (ca/ca fr)	1+fr	1+fr	4+fr	1+fr	2+fr	3+fr	2+fr	2+fr	4+fr	1+fr	2+fr	1+fr	fr	3+fr	1+fr	fr	1+fr	1+fr	4+fr	2+fr	2+fr	1+fr	5+fr	2+fr	5+fr
Dryland/wetland herbs																									
Fabaceae indet.			1												co							co			
Galium aparine L.																									
Poaceae indet.																									
Rumex sp(p)																									
Vicia/*Lathyrus* sp (s).						1																			
Vicia/*Lathyrus* sp. (co)																									1
Woodland/scrub taxa																									
Corylus avellana L.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+		+	+	+	+	+	+	+	+
Malus sp. (s/fr)		1																							
Prunus spinosa L. (end fr)								+							+										
cf. *Rosa* sp.			fr																						
Solanum dulcamara L.									1cf																
Tilia sp.																									
Vegetative material																									
Poaceae c.f. *Arrhenatherum* (sbi)																									
Stem fragments																	1								
Rhizome fragments (Type 6)																			1						
Root/rhizome fragments								1	1								1	1							1
Amorphous parenchyma fragments					+				+									+					+		+
Thorn frag.																									
Neuroterus sp. (gall)			1																						
Charcoal (g.)	2.17	1.28	4.9	0.42	1.68	2.92	2.19	3.83	6.27	2.98	1.7	0.46	0.41	0.62	0.64	0.1	0.3	0.8	3.14	0.43	1.07	1.25	2.6	1.34	2.43
Unidentified seeds etc.		1	1	2		2		1	4		4						1								
Bone fragments (burnt)	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+		+	+	+	+	+	+	+	+	+
Sample weight (kg.)	9.15	5.55	6.6	8.6	6.3	6.9	7.75	7.7	8.65	9.25	6	5.35	7.3	9.1	7.8	6.1	5	8.5	7.15	5.65	5.3	5.7	8.05	6.1	5.65

Table 5.11 Plant macrofossils from Area C grid-squares (i)

	272	*274*	*276*	*278*	*280*	*282*	*284*	*286*	*288*	*350*	*352*	*354*	*356*	*358*	*360*	*362*	*365*	*367*	*369*	*371*	*373*	*375*	*377*	*379*	*381*	*383*
Crops/possible crops																										
Linum sp. (s)																1										
Triticum dicoccum-type (ca)	1																						2			3
Triticum dicoccum Schubl. (gb)	1				1							1														
Triticum dicoccum Schubl. (spf/spb)													1													
Triticum aestivum s.l. (ca)																										
Triticum sp.(ca/ca fr)	1				1		1	1		1					1	2		3							1	
Triticum sp. (gb)						1						1														
Triticum sp. (spf/spb)	1																									
Indeterminate cereal (ca/ca fr)	4+fr	2+fr	2+fr	3+fr	fr	1+fr	2+fr	2+fr	1+fr	1+fr	fr	fr	1+fr	1+fr	2+fr	1+fr	1+fr	1+fr	1+fr	fr	1+fr	1+fr	2+fr		1+fr	3+fr
Dryland/wetland herbs																										
Fabaceae indet.																										
Galium aparine L.																		1		1						
Poaceae indet.																							1			
Rumex sp(p)																										1
Vicia/Lathyrus sp (s).																										
Vicia/Lathyrus sp. (co)						1														1			1			
Woodland/scrub taxa																										
Corylus avellana L.	+	+	+	+	+	+	+	+	+	+	+		+	+	+	+		+	+	+	+	+	+		+	+
Malus sp. (s/fr)																										
Prunus spinosa L. (end fr)		+																								
cf. *Rosa* sp.																										
Solanum dulcamara L.	1cf		1cf																							
Tilia sp.																				1						
Vegetative material																										
Poaceae c.f. Arrhenatherum (sbi)						1										1										
Stem fragments																										
Rhizome fragments (Type 6)																							1			
Root/rhizome fragments																				1		1				1
Amorphous parenchyma fragments																		+								
Thorn frag.															+											
Neuroterus sp. (gall)																										
Charcoal (g.)	2.86	1.57	0.9	0.49	0.4	0.33	1.15	0.4	0.26	0.68	0.22	0.06	0.46	0.21	0.76	1.11	0.15	1.36	1.12	0.36	0.59	0.27	1.13	0.04	0.54	1.98
Unidentified seeds etc.	2		3				1		3				2		1								1			2
Bone fragments (burnt)	+	+			+		+			+			+		+	+		+	+	+	+				+	+
Sample weight (kg.)	5.9	5.6	6.1	4.5	6	6.9	5.85	5.6	7.8	7.55	9.4	5.3	9.4	7.1	7.15	7.35	6.25	7.65	7.4	7.2	6.7	8.5	8.1	7.3	8.2	8.5

Table 5.12 Plant macrofossils from Area C grid-squares (ii)

Context	*264 7287*	*264 7288*	*264 7289*	*264 7290*	*264 7291*	*264 7292*	*264 7293*	*264 7294*	*264 7295*	*264 7296*	*264 7297*	*264 7298*	*264 7299*	*264 7300*	*264 7301*	*264 7311*	*264 7314*	*264 7316*	*266*	*268*	*270*	*272*
Crops/possible crops																						
Linum sp. (s)																						
Triticum dicoccum-type (ca)	1	1						2		2				3			1		6*	3		4
Triticum dicoccum Schubl. (gb)								1												1	6	
Triticum dicoccum Schubl. (spf/spb)								1														
Triticum aestivum s.l. (ca)								1	1													
Triticum sp.(ca/ca fr)	1				1			3	2	2		1		2		2	4	2	14	3	2	2
Triticum sp. (gb)			4			2fr		3		1	2			2	1			1	7		1	
Triticum sp. (spf/spb)						1		1										1			2	
Indeterminate cereal (ca/ca fr)	fr	fr	1+fr		4+fr	2+fr	fr	4+fr	1+fr	1+fr	1+fr	1+fr	fr	1+fr	fr	1+fr	fr	1+fr	18+fr	1+fr	5+fr	3+fr
Dryland/wetland herbs																						
Chenopodiaceae indet.																						
Fallopia convolvulus A. Love																						
Galium aparine L.								fr														
Polygonaceae indet.																						
Rumex sp(p)	1																					
Thlaspi arvense L.											1											
Veronica hederifolia L.													fr			fr						
Vicia/*Lathyrus* sp. (co)						1			1			1						1				
Woodland/scrub taxa																						
Corylus avellana L.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+'*	+
Malus sp. (s/fr)																fr	fr					
Prunus spinosa L. (end fr)												+									+	
Solanum dulcamara L.			2			1+1cf		1			1cf										1	
Tilia sp.																						
Vegetative material																						
Poaceae c.f. *Arrhenatherum* (sbi)									1													
Stem fragments																						
Root fragment (Type 5)																						
Root/rhizome fragments				1																	1	
?Epidermal tissue																			+			
Amorphous parenchyma fragments					+			+		+								+	+		+	
Bud								1														
Neuroterus sp. (gall)					1cf																	
Charcoal (g.)	0.51	0.3	0.8	0.52	1.98	1.5	0.33	3.72	0.3	1.13	0.72	0.66	0.43	0.7	0.3	0.76	1.24	1.51	6.28	3	5.91	5.34
Unidentified seeds etc.		2			2	1					1				1	1	2	1	1	1		3
Bone fragments (burnt)	+	+	+	+	+	+		+	+	+	+	+	+	+		+	+	+	+	+	+	+
Sample weight (kg.)	4.9	8.2	nr	4.25	5.7	6.95	3.5	6.45	6.7	7.1	3.95	6.15	7.35	6.85	5.2	5.3	5.75	3.7	3.7	6	6	4.9

Table 5.13 Plant macrofossils from Area C feature fills (i)

Context	274	278	281	283	285	292	293	295	297	299	300	302	304	309	311	314	317	319	321	323	327	328	330	331
Crops/possible crops																								
Linum sp. (s)														1			fr							
Triticum dicoccum-type (ca)										1		2				6	1			2				
Triticum dicoccum Schubl. (gb)								1	1							1				1				1
Triticum dicoccum Schubl. (spf/spb)																					1			
Triticum aestivum s.l. (ca)	1																							
Triticum sp.(ca/ca fr)	3	6	4	3	5	3	1		3		4		2	5	1	6	3	1		1	3	2		
Triticum sp. (gb)	1							1	1				2				2fr			1		2		2
Triticum sp. (spf/spb)		1				2		1	1				2				1			1	1	3		1
Indeterminate cereal (ca/ca fr)	1+fr	2+fr	3+fr	fr	fr	2+fr	3+fr	1+fr	10+fr	fr	4+fr	1+fr	6+fr	1+fr	3+fr	3+fr	2+fr	3+fr	2+fr	5+fr	2+fr	3+fr	fr	3+fr
Dryland/wetland herbs																								
Chenopodiaceae indet.																				1				
Fallopia convolvulus A. Love														1		1			1					
Galium aparine L.																								
Polygonaceae indet.													1											
Rumex sp(p)																								
Thlaspi arvense L.																								
Veronica hederifolia L.																								
Vicia/*Lathyrus* sp. (co)							1										1	1						
Woodland/scrub taxa																								
Corylus avellana L.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+		+
Malus sp. (s/fr)																								
Prunus spinosa L. (end fr)																	+							
Solanum dulcamara L.																								
Tilia sp.																		1						
Vegetative material																								
Poaceae c.f. Arrhenatherum (sbi)	1						1																	
Stem fragments				+			+	+																
Root fragment (Type 5)				1																				
Root/rhizome fragments							1											2		1				
?Epidermal tissue																								
Amorphous parenchyma fragments						+						+								+	+			+
Bud																								
Neuroterus sp. (gall)																								
Charcoal (g.)	2.95	1.22	1.73	0.61	1.52	1.28	0.83	0.87	3.36	2.39	1.88	0.59	6.02	1.8	0.82	8.55	4.68	0.76	0.82	2.68	2.02	2.14	0.33	2.65
Unidentified seeds etc.	4								1	1			1	1		1			1	2		1		2
Bone fragments (burnt)	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+		+	+	+	+	+
Sample weight (kg.)	4.9	5	5.2	8.15	6.25	5.35	8.15	4.55	5.1	4.7	4.7	5.6	6.3	4.8	5.3	6.9	6.6	6.8	2.8	5.25	7.25	5.4	2.35	7.35

Table 5.14 Plant macrofossils from Area C feature fills (ii)

	Site 28D						Context 231		
	208	*209*	*211*	*215*	*218*	*219*	*279*	*287*	*288*
Woodland/scrub taxa									
Corylus avellana (g)	0.51	1	0.04	0.47	0.04	0.006			
Malus sylvestris (seeds)		1		1					
Malus sylvestris (endocarp frags)	+	+		+	+				
Vegetative plant material									
Epidermal fragments	+	+		+	+	+			
Buds		1							
Poaceae cf *Arrhenatherum* (sbi)					2fr	fr			
Rhizome fragments	1						1	1	
Stem fragments							+		
Charcoal (g)	13.73	5.86	0.67	9.09	5.6	2.73	14.24	6.85	2.38
Indeterminate seeds etc.				2					
Sample weight (kg)	6	2	1.25	5	5	4	8.5	6.25	3.55
Bone fragments (burnt)	+	+	+	+	+	T			
% flot sorted (if <100%)							25	25	50

Table 5.15 Plant macrofossils from Area D and context *231* (burnt flint mound)

	J Sample bins	*28A* Grid squares	*28A* Features	*28B* Grid squares	*28B* Features	*28C* Grid squares	*28C* Features	*28E*	*28D*	*Cxt 231*
Crops/possible crops										
Hordeum sp var. nudum (ca)		6		2	2			1		
Linum sp. (s)			1			1	2			
Triticum cf *monococcum* (ca)		2								
Triticum monococcum (spf/spb)		1								
Triticum dicoccum-type (ca)		37	6	16	6	7	14	2		
Triticum dicoccum Schubl. (gb)		22	4	6	2	9	8			
Triticum dicoccum Schubl. (ri)			1							
Triticum dicoccum Schubl. (spf/spb)		12	2	1	1	3	2	2		
Triticum aestivum s.l. (ca)						1	3			
Triticum sp.(ca/ca fr)	3	52	8	31	8	23	32	7		
Triticum sp. (gb)		29	6	13	4	14	18			
Triticum sp.(ri)			1							
Triticum sp. (spf/spb)	1	27	3	17	3	11	14			
Indeterminate cereal (ca/ca fr)	7	86	13	53	15	50	45	7		
Cereal/grass (cn/fr)			1	1	1					
Dryland/wetland herbs										
Apiaceae indet				1						
Atriplex sp.	1									
Carex sp.	1									
Caryophyllaceae indet.			1	1	3			1		
Chenopodiaceae indet.	2		2	1			1			
Chenopodium album L.		1	1	3	1					
Fabaceae indet.				2		3				
Fallopia convolvulus A. Love							3			
Galium aparine L.	3	10	3	14	3	2	1	1		
Galium sp.				4	3					
Moehringia trinervia (L.) Clairv.	1				2					
Montia fontana (uc)		1								
Plantago major L.	1									
Poaceae indet.	3	7	1	5		1				
Polygonaceae indet.	1		2	1	2		1			

	J Sample bins	*28A* Grid squares	*28A* Features	*28B* Grid squares	*28B* Features	*28C* Grid squares	*28C* Features	*28E*	*28D*	*Cxt 231*
Polygonum aviculare agg.		1	1	2				1		
Rumex sp(p)	1	2	2		2	1	1			
Scirpus/Schoenoplectus sp.				1	1					
Stellaria media-type				1						
Thlaspi arvense L.							1			
Veronica hederifolia L.				6			2	1		
Vicia cf *tetrasperma*				1						
Vicia/Lathyrus sp (s).	2	14	1	19	4	1		2		
Vicia/Lathyrus sp. (co)	5	34	4	32	9	4	7	3		
Trees/shrubs										
Corylus avellana L.	17	78	12	57	18	48	45	7	6	
Crataegus monogyna Jacq.			1							
Fragaria vesca (uc)		1								
Malus sp. (s/fr)				1		1	2		2	
Malus sp. (end fr)									4	
Prunus spinosa L. (end fr)	5	14		10	3	3	3			
Quercus sp. (cu)				2	1					
cf. *Rosa* sp.						1				
Rubus fruticosus agg (c)					2					
Rubus fruticosus agg (uc)		11								
Sambucus nigra		8								
Solanum dulcamara L.	1					3	5			
Stellaria graminea L.			1							
Tilia sp.		2				1	1			
Vegetative material										
Poaceae c.f. Arrhenatherum (sbi) (Type 1)	3	7	1	4		2	3		2	
Monocotyledon (st n)		1								
Stem fragments	3	7				1	3			1
Poaceae short internodes (Type 2)			1							
Monocot ribbed internode (Type 3)		1								
Root fragments (Type 4)		1		1						
Root fragments (Type 5)		12		6	2		1	2		
Rhizome fragments (Type 6)	6	11		7	3	9				
Root/rhizome fragments (Type 7)	11	14		24	3	8	5	3	1	2
?Inflorescence axis (Type 8)		1								
Stem/rhizome fragments (Type 9)		3		4						
Epidermis		3	1	11	5		1	2	5	
Amorphous parenchyma fragments	1				1	6	10	1		
Catkin fragments		1						1		
Buds		10	1	8	2		1		1	
Thorns		1				1				
Neuroterus sp. (leaf gall)					1	1	1			
Unidentified seeds etc.	10	48	4	23	8			5	1	
Burnt bone fragments (Note 1)	3	23		44		25				
Unburnt bone	0	0		0		5				
Total number of samples	44	93	13	64 (note 2)	18	51	46	8	6	3

1– These data were recorded for the second and third trowelling passes *only* for 28A, B and C.
2 – Four samples included no charcoal >2mm or other botanical remains.
Taxa are represented by fruits or seeds unless otherwise indicated.
c – charred; ca – caryopsis; cn – culm node; end – endocarp; epi – epidermis; gb – glume base; n – node; ri – rachis internode; s – seed; sbi – swollen basal internode; spb – spikelet base; spf – spikelet fork; st – stem; trf – transverse root fragment; uc – uncharred.

Table 5.16 Frequencies of plant elements in samples from Areas J, A, B, C, D and E and context *231*

6. Archaeology and Palaeoecology of the Estuarine Foreshore: Iron Age to Post-Medieval

I. Introduction

One of the burnt flint mounds on the pre-transgression land surface gave a radiocarbon date of 3885±70 BP (Ox-A 2297; 2570–2140 cal BC), and thus represents the final phase of activity at the Stumble whilst it remained terrestrial. Very shortly thereafter, land which lies within the present-day intertidal zone was submerged during the major transgressive event known in the Thames sequence as the Thames III transgression (Devoy 1979). This is indicated at many locations around the Essex coast by estuarine sediments overlying charcoal scatters and tree-root systems on the palaeosol (Wilkinson and Murphy 1995, 57–60).

Following the onset of estuarine sedimentation, human interaction with the landscape would have become wholly different from that in the Neolithic period. Archaeological contexts recorded consist mainly of wooden structures stratified within the estuarine sediments, which relate to activities taking place on salt marsh and mudflats. To understand the nature of these activities it is necessary to consider the archaeological evidence in relation to the palaeoecology of the site. This chapter therefore includes:

1. a detailed description of the main sequence of estuarine sediments and their palaeoecology, as indicated by diatoms, palynomorphs and macrofossils;
2. results from a large-scale programme of hand augering, designed to reconstruct the former creek pattern across the site
3. descriptions of all wooden structures recorded at the site, with wood identifications, radiocarbon determinations and preliminary functional interpretations (below, p.120–35);
4. a discussion, drawing together these results, of palaeoecological changes and changing patterns of human activity in this area.

II. The estuarine sediments: stratigraphy and palaeoecology

(Figs 6.1–6.3)

Introduction and stratigraphy

Much of the archaeological significance of the Stumble lies in the fact that sediment cover had been truncated or entirely removed at the eastern end of the mudflats to expose the underlying palaeosol and associated dryland Neolithic deposits. Even at the western end of the flats there was truncation over large areas. Comparatively deep sections of sediments survived only within infilled creek systems and in a few residual islands of severely eroded saltmarsh. To learn something of the post-transgression palaeoecology of the area, a section in one of these islands (Section 1) was recorded, and samples were collected for analysis of diatoms, pollen and macrofossils. Methods have been described in Wilkinson and Murphy (1995, 14).

Results

Section 1
(Figs 6.1–6.3)

Stratigraphy
This isolated saltmarsh island was adjacent to an extensive spread of wood remains, context *98* (below, p.124; for location see Fig. 6.3). It had been colonised by *Spartina*, with roots and rhizomes penetrating deeply. However, by cutting back its edge, a clean, uncontaminated section was exposed, showing almost 0.8m of clays over the basal clayey biogenic deposit described in earlier reports as the Blackwater *Lower Peat*. Samples were collected, partly to check whether these sediments formed in comparable conditions to those recorded at Hullbridge Survey Sites BL3 and BL 18, Maylandsea and Rolls Farm (Wilkinson and Murphy 1995, 19–24).

The section was recorded as follows:

Surviving surface at + 0.82m OD.

0–9cm	Soft reddish-grey clay with abundant *Spartina* rhizomes; sharp boundary.
9–48cm	Soft grey clay; some *Spartina* roots and rhizomes; small black mottles; merging boundary.
48–76cm	Similar, but with larger, more prominent black mottles; merging boundary.
76–83cm	Similar but with clasts of eroded ‘peaty clay’; matrix slightly paler grey clay; moderately sharp boundary.
83–105cm	Soft brown peaty clay (‘Lower Peat’); sharp boundary.
105cm+	Pale grey slightly firm silt clay; rare flint pebbles (London Clay ‘Head’).

Diatom assessment
by Steve Juggins

30cm	No diatom preservation.
60/80/90/95cm	Assemblages dominated by *Caloneis westii* with *Scoliopleura tumida* and *Diploneis* spp. Indicates deposition on an intertidal mudflat.
100cm	Predominant species *Diploneis interrupta* and *Navicula peregrina*, with reduced numbers of *Caloneis westii*. A brackish water backswamp or saltmarsh environment is indicated.

The sequence of backswamp/saltmarsh to intertidal mudflat deposits recorded appears analogous to that in the fully-analysed sequence at Blackwater Site 3 (Wilkinson and Murphy 1995, 20–1).

Pollen analysis
by Rob Scaife
Samples for pollen analysis were taken from a section directly adjacent to that described above. Although showing the same stratigraphy, the depths and thicknesses of horizons observed differed slightly in this second section. Samples were collected from a depth of 40cm downwards (*i.e.* from below the levels where *Spartina* roots and disturbance were prevalent), at 4cm intervals to a depth of 108cm. Preservation of pollen and spores was found to be extremely variable throughout the sequence. It was found that pollen was only preserved in the inorganic sediments of the estuarine clay overlying the basal organic sediments, and from a single sample obtained from the underlying old land surface. Pollen was virtually absent in the peaty clay (‘Lower Peat’) deposits — technically an estuarine detritus mud — occurring between 82cm and 100cm, though a single level (88cm) contained a small quantity of pollen and spores of taxa usually regarded as being resistant to decay. Thus, this single spectrum at 88cm can only be regarded as having suffered extreme differential decay. It is unfortunate that the ‘peat’ sequence does not contain pollen, and in this respect it is similar to peats analysed from the Crouch estuary.

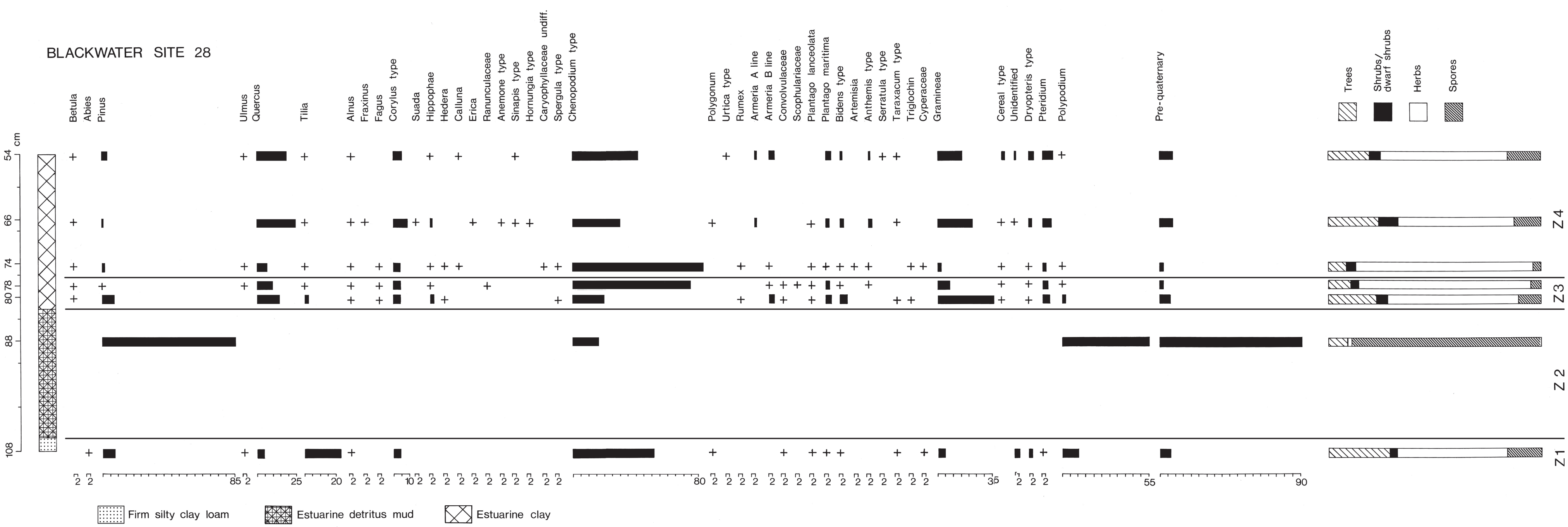


Figure 6.1 Site 28 pollen diagrams

Pollen zonation
(Fig. 6.1)
The pollen spectra recovered from this section can be discussed in four sections. These are as follows:

1. 108cm A single sample from the old land surface developed on the basal 'head' deposits. This is perhaps the most useful pollen count from this sequence since it pre-dates the local transgression and should be broadly contemporaneous with the Neolithic archaeology at the site.
The arboreal pollen is dominated by *Tilia*, which comprises 20% of total pollen. Relatively small quantities of *Pinus*, *Quercus* and *Corylus* are also present. However, these percentages are depressed by high values of *Chenopodium* type which form part of the total pollen sum. It is clear that *Tilia* was the dominant tree, with *Quercus* and *Corylus* of some importance. Although *Pinus* values are relatively high (22% AP) it is thought that these may include re-worked Tertiary pollen, or perhaps result from differential preservation of other pollen in favour of *Pinus*.
High percentages of *Chenopodium* type strongly indicate the presence of a maritime halophytic plant community, which compares closely with the macrofossil results (see below). It is unfortunately not possible to identify the *Chenopodium* type category to species or even generic level because of the uniform pollen morphology in the different genera. These high Chenopodiaceae values are, however, likely to represent *Salicornia*, whose seeds are common in the overlying estuarine sediments.

2. 88cm This single anomalous count taken from within the 'peaty clay' is of little value. Pollen was extremely sparse and degraded. This spectrum shows the effects of extreme differential preservation in favour of taxa with more robust exines (*Pinus, Chenopodium* type, and spores).

3. 78–82cm In this zone of transition from the 'peaty clay' to the overlying estuarine clay, pollen preservation was found to be substantially improved. It is possible that rising water-tables due to positive eustatic changes, and/or the argillaceous character of the sediments, resulted in less oxidation taking place. The two pollen levels are dominated by *Chenopodium* type, Poaceae, and a range of herbs. *Tilia* is less important than in level 1 (108cm). *Quercus, Corylus* type and *Pinus* are also evident.
The pollen spectrum shows an increase in saltmarsh (halophytic) elements which undoubtedly indicate a transition to fully estuarine conditions. *Hippophae rhamnoides*, *Armeria* 'B' line, *Plantago maritima, Chenopodium* type and *Triglochin* are important. Other pollen taxa recorded may also include halophytic elements within their type categories. *Bidens* type, for example, is noted, and may include *Aster tripolium*, whose fruits have been found in these sediments. *Aster* pollen is usually somewhat larger than *Bidens* type, but here conditions of preservation and methods used to extract the pollen from these sediments will have resulted in shrinkage.
Terrestrial vegetation, which by this time may have been at some distance from the site, continued to be dominated by *Quercus* and *Tilia*. The latter has poor production and dispersal, which therefore may have resulted in lower pollen frequencies as conditions became locally unsuited to its growth.

4. 74, 68 and 54cm These three pollen levels were taken from the grey estuarine clay. As might be expected, these pollen spectra again show a halophytic plant community dominated by *Chenopodium* type (most likely *Salicornia*), *Armeria/Limonium*, *Plantago maritima* and Poaceae. These data again correspond to the plant macrofossil studies. However, in addition to this typical estuarine/mudflat flora, *Quercus, Corylus* and a variety of spores are present, including derived pre-Quaternary ?Tertiary elements. These undoubtedly represent fluvially transported pollen from the terrestrial river catchment. Although there is a likelihood that some of this derived pollen may be re-worked from older sediments, it is possible that the pollen reflects the vegetation of the landward areas at

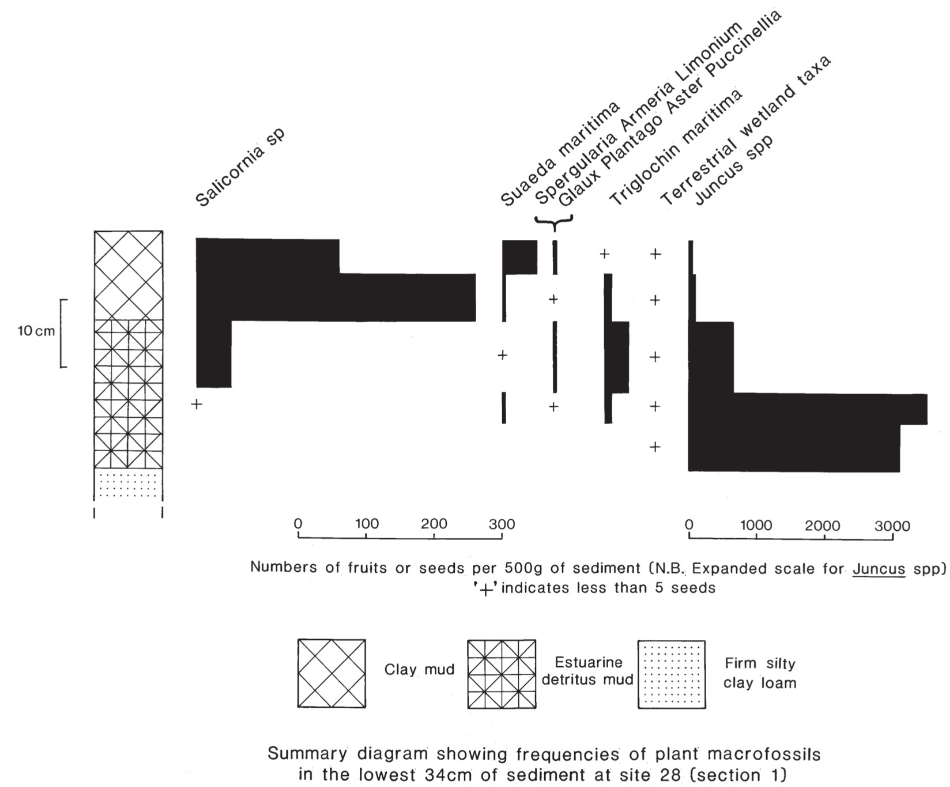


Figure 6.2 Summary plant macrofossil diagram showing frequency of macrofossils in the lowest 34cm of sediment sampled at the Stumble

broadly the same time as sediment deposition. From this, it is apparent that *Tilia* declined markedly in importance, whereas *Quercus* and *Corylus* remain the principal tree and shrub taxa. It is not clear whether this decline in *Tilia* can be attributed to anthropogenic causation or to local environmental change brought about by rising sea levels.

Conclusions

Pollen from the old land surface suggests an environment in which *Tilia* dominated the local woodland, perhaps just inland from the saltmarsh community which existed close to this site. The lower organic deposits at this site did not yield any pollen and it is thought that the conditions in which this peaty clay formed were perhaps subject to periods of desiccation and oxidising conditions. Following marine inundation and the accumulation of estuarine clay, pollen-preserving conditions improved, though they were not uniformly good. The pollen spectra from these sediments illustrate the increasing importance of halophytic vegetation (*Chenopodium* type, *Plantago maritima etc*.). The pollen record of terrestrial vegetation appears to show a decline in *Tilia*, but with *Quercus* and *Corylus* maintaining their importance.

Plant macrofossils

Results of macrofossil analysis on samples from Section 1 are given in Table 6.1 and Fig. 6.2. Nomenclature follows Stace (1997).

The assemblages from these samples are all dominated by seeds of halophytes. Below 93cm *Juncus* seeds, mainly of *J. gerardii*, are extremely abundant, but seeds of other taxa are rare. In the sample from 83–93cm *Juncus* seeds are less common, but seeds and fruits of *Salicornia* sp, *Triglochin maritima* and other halophytes (*Suaeda maritima, Armeria/Limonium, Glaux maritima, Puccinellia* c.f. *distans*) increase in abundance. Above 83cm *Salicornia* sp is by far the commonest taxon, though seeds of *Suaeda maritima* are fairly common in the topmost sample at 71–76cm. Saltmarsh taxa present in samples from nearer the base of the sequence persist, though *Juncus* seeds are rare in samples from above 83cm. Fruits and seeds of terrestrial and wetland taxa occur sporadically. These include *Ranunculus sceleratus, Mentha arvensis/aquatica, Sambucus nigra, Sonchus asper* and *Carex* sp.

The assemblages fall into three main categories, representing vegetation changes associated with the local transgression.

1. 93–105cm The predominance of *Juncus gerardii*, a species of rush characteristic of saltmarshes at levels upwards from just below high water of spring tides (Clapham *et al.* 1987) suggests that the lowest sediments at this site were formed in a high marsh environment. Seeds of taxa other than *Juncus* are either virtually absent or rare and poorly preserved. This suggests that periodic drying resulted in destruction of most plant macrofossils, apart from durable seeds such as those of *Juncus* spp.

Depth (cm)	*71–76*	*76–83*	*83–93*	*93–98*	*98–105*
Salt marsh plants/other halophytes					
Armeria/Limonium c.	1		3		
Aster tripolium L.	2			1	
Chenopodiaceae indet. b.	3	1	1		
Glaux maritima L.			1		
Juncus sp(p) e.	50	80	640	3490	3100
Plantago maritima L. d.		1	1cf		
Puccinellia cf *distans* (Jacq) Parl.			1		
Salicornia sp(p)	168	411	52	4	
Spergularia sp(p) a.	1cf	1cf			
Suaeda maritima (L.) Dumort	41+fr	6+fr	2	5	
Triglochin maritima L.	2	12	35	11	
Wetland taxa (brackish–fresh)					
Carex sp.			1		
Mentha arvensis/aquatica				1	
Ranunculus sceleratus L.				1	
Terrestrial species					
Sonchus asper (L.) Hill		1			
Sambucus nigra L.	1				1
Indeterminate					
Poaceae indet.	1		1	1	
Unidentified seeds etc.	1		3	1	
Other material					
Woody rootlets	+	+	+	+	
Monocotyledonous stem fragments	+	+	+	+	+
Charcoal fragments	+		+		++
Iron-replaced rootlets		+	+	+	++
Foraminifera	+	+	+	+	+
Insects	+	+	+	+	+
Sample weight (kg)	**0.4**	**0.5**	**0.5**	**0.5**	**0.5**

a – very poorly preserved; b – immature, or lacking testas; c – badly degraded calyces; d – capsule lids; e – all samples included a high proportion of poorly-preserved *Juncus* seeds in which the cell pattern is either totally or partly destroyed.

Amongst the better-preserved seeds, *J. gerardii*-type seeds predominate (see Koerber-Grohne 1964, for details). Some of the *J. gerardii*-type seeds fall in the size range of *J. compressus,* but it is unclear whether preservation conditions and treatement methods have effects on sub-fossil seed size. *J. gerardii* is certainly present and probably predominant. Counts given are estimates of seeds/0.5kg, based on 50g sub-samples.

Table 6.1 Results of macrofossil analysis on samples from Section 1

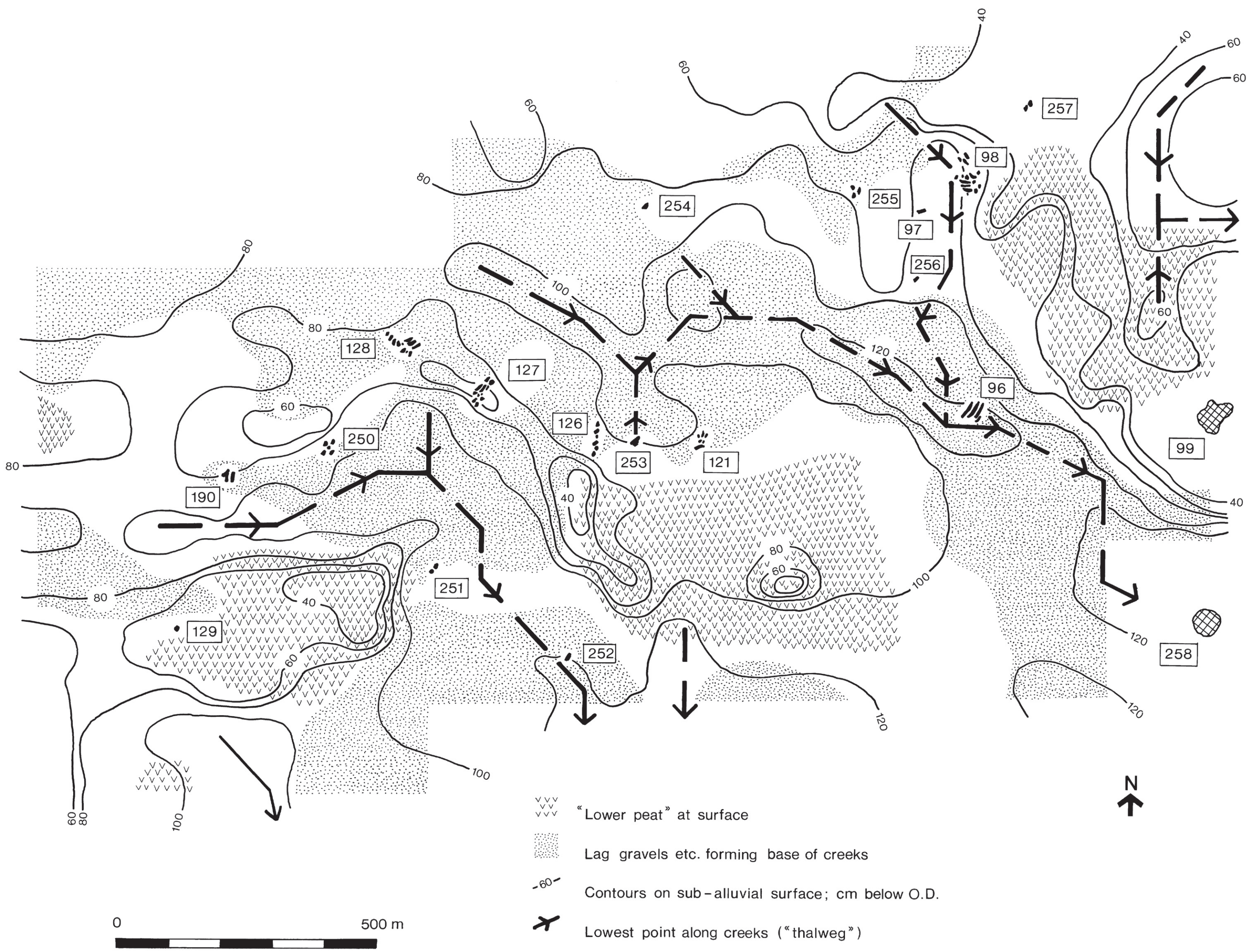


Figure 6.3 Plan of the western end of the site showing subsurface contours, sediment types and location of wooden structures

2. 83–93cm The sample from this level produced a more diverse assemblage of halophytes, including species with habitat ranges extending from upper to lower saltmarsh.

3. 71–83cm The assemblages from the grey clay at this level are dominated by *Salicornia* sp, a plant characteristic of low saltmarsh and intertidal mud flats.

In summary, the macrofossils indicate a transition from higher saltmarsh, through lower-level saltmarsh communities, to intertidal mudflats with *Salicornia* — this represents a transgressive sequence. The lowest sediments at BL 3 (Maylandsea) in the Blackwater estuary, although again indicating a transgressive sequence, did not produce macrofossil assemblages characteristic of the highest saltmarsh (Wilkinson and Murphy 1995, table 6): *Salicornia* was common from the very base of the sequence at that site. It is possible that this reflects variations in the rate of local transgression. It is possible that at Site 3 lower saltmarsh and mudflat habitats were established rapidly, whereas the Stumble lay at the estuary margin for a long enough period for high saltmarsh vegetation to become established. The difference in elevation between the two sites could also be relevant: the 'Head' surface at Site 3 is about –1.12m OD, but at the Stumble it is *c.* –0.23m OD. It is possible that there was penecontemporaneous deposition of low and high saltmarsh at the two sites.

Whatever the reasons for the difference between sites in the Blackwater Estuary, it does seem that the lowest sediments at the Stumble were formed at the highest zone of saltmarsh, a semi-terrestrial habitat lying roughly between Mean High Water (Standard Tides) and storm-flood level, and inundated comparatively rarely. The comparatively dry marsh surface would have been suitable for human activity, and charcoal fragments from 98–105cm certainly imply nearby human activity. The absence of datable material makes it difficult to correlate this phase with any of the structures at the site.

General conclusions

The stratigraphy and palaeoecological results from this section are similar to those from Blackwater Sites 3 and 18 (Wilkinson and Murphy 1995, 18–24, 43–51). The land surface on the London Clay Head at the base of the section contained a pollen spectrum indicating proximity of saltmarsh, with local woodland dominated by lime, with oak and hazel. The basal organic estuarine sediments ('Lower Peat') appear to have formed in semi-terrestrial saltmarsh conditions subject to intermittent desiccation. Charcoal fragments imply human activity in the vicinity while this sediment was forming. Diatoms, macrofossils and pollen all clearly indicate deposition of the overlying clays in an intertidal mudflat environment. The section is useful in providing a simple, apparently conformable, sequence uncomplicated by the incision of intertidal creeks.

III. Survey of the western end of the Stumble (1988 season)

(Figs 6.3–6.20)

Introduction

During the 1988 season a survey of the western end of the Stumble was undertaken, with the aims of reconstructing the topography of the surface beneath the sediment cover, and relating the wooden structures in this area to infilled estuarine palaeochannels incised into the buried land surface.

An area of 100m x 220m, within which most of the wooden structures lay, was examined. The present mudflat surface was levelled in relation to Ordnance Datum. Levels were taken at intersections of a $10m^2$ grid which had been laid out with a theodolite. At the same time, the underlying sediments were examined using a simple screw auger 1.2m long. Since some 200 auger holes had to be sunk, detailed stratigraphic study was not possible. Instead, the auger was pushed down through the unconsolidated estuarine clay of the mudflat until a firm surface could be felt, rarely at a depth of >1m. The depth and character of the 'basal' firm surface was noted where possible from sediment adhering to the auger tip. The main categories of basal sediment noted were as follows:

1. 'Lower Peat': Greyish-brown estuarine detritus mud.
2. 'Head': Very firm yellowish-brown to brown sandy or silty clay loam (sediment derived from London Clay).
3. 'Sandy clay, gravelly clay, gravel': Sediment of varying lithology, assumed to be coarse firm sediment at the beds of estuarine palaeochannels — lag gravels and similar deposits.
4. 'Grey clay': Recorded in the few auger holes which did not penetrate to a firm surface (*i.e*. superficial sediment cover was >1.2m.

The positions of recorded wooden structures were noted, together with other isolated posts or poorly exposed structures. The excavated structures were contexts *96*, *98*, *121*, *126*, *127*, *128*, *129*, *190* and *244* (Fig. 6.3). Additional poorly-exposed and preserved wooden structures were contexts *250–257*. Two burnt flint mounds (*99* and *258*) also lay within the survey area.

The results are summarised in Fig. 6.3. At least two creek channels, trending roughly north-west–south-east, can be distinguished. Both are characterised by central channels with beds floored by coarse lag sediments, incised into the basal 'head' surface, which directly underlies their fine upper clayey fills towards their margins. A complete profile across the eastern channel in the vicinity of *96* was obtained by means of a transect of auger holes at 2m intervals (Fig. 6.5). Between these channels are three interfluve areas, where the 'Lower Peat' up to *c*. 0.25m thick directly overlies the head surface. These interfluves seem originally to have been areas of saltmarsh (see above). The locations of particular wooden structures in relation to this drainage system are considered below; and in some cases this contextual information aids interpretation of the structures.

The wooden structures

Introduction

Small wooden structures are common within the present intertidal zone of the Essex coast (Wilkinson and Murphy 1995) — they are as characteristic of the foreshore as pits and post-holes are at sites on gravel terraces. Despite this, they represent a category of site which hitherto has received little attention. The principal problem is that simple post- and hurdle-type structures show no obvious dating characteristics and they are hardly ever associated with datable artefacts. On the Essex coast, radiocarbon dating has established that such structures are commonly either of Late Bronze Age/Iron Age date or are post-medieval, though a few are clearly Roman, Anglo-Saxon and medieval. In most cases, however, structures are undated, isolated and without any clearly-defined stratigraphic context. Funding constraints have meant that radiocarbon dating was possible only for selected wooden structures found during the Hullbridge Survey and at the Stumble. Consequently, many cannot be related to sequences of activity on mud-flats and saltmarsh, and their functions remain obscure.

At the Stumble, however, extensive recent erosion had exposed numerous structures over a foreshore area of *c*. 220m x 100m. This area was therefore selected for detailed study. The aims were to record all structures in detail, to obtain as many radiocarbon dates as possible, and to relate them to their contemporary topography and environment. Thereby, it was hoped to establish a chronological sequence and to propose functions for at least some of them. Data on construction techniques and wood supply were also obtained.

Investigation began in 1985 and continued over three seasons until 1988. In the first phase of study, all visible structures were cleaned and excavated, so far as was practicable, and planned and photographed. Wood samples were collected for radiocarbon dating, measurement, identification, measurement of stem diameters and determination of stem ages. This process continued in subsequent seasons, since erosion over winter repeatedly exposed new structures. As radiocarbon dates were received, it became obvious that structures of very different dates were being exposed on the same truncated mudflat surface. It was therefore necessary to relate the structures to former topography and stratigraphy (above, pp.115–19).

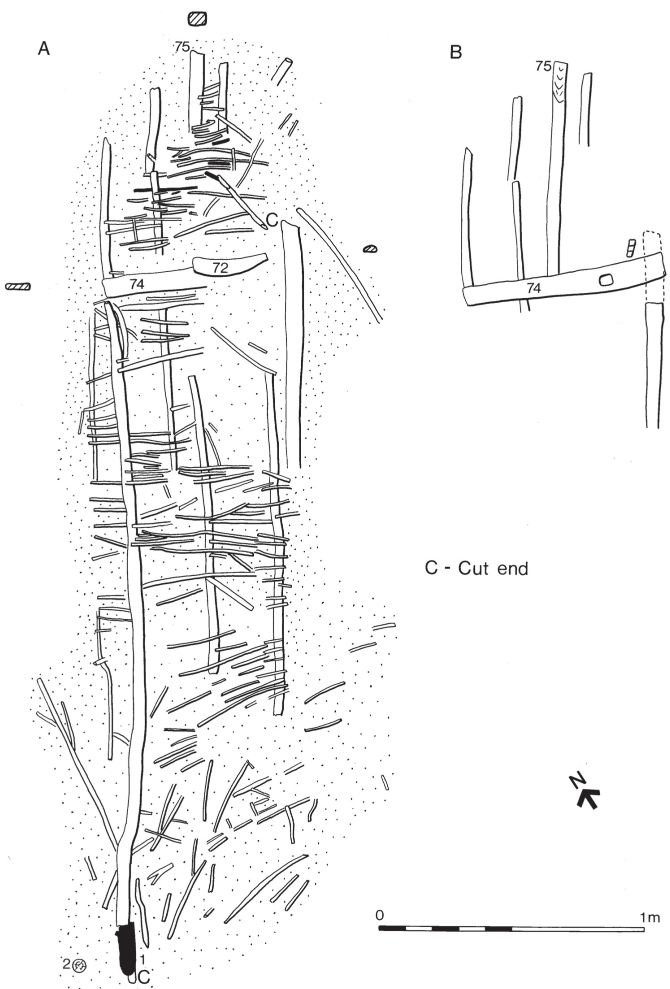


Figure 6.4 Context *96*: plan

Methods

Cleaning the exposed structures presented a number of problems. First, the areas investigated had to be drained by means of an *ad hoc* system of channels, dams and sumps; pumping would have been of little help since there was a continuous flow of water downslope across the mudflat surface. The unconsolidated nature of the surface meant that plywood boards had to be used at all times, to give a firm working platform and to avoid damage to peripheral elements of the structures. Wooden components were exposed by peeling away the surrounding estuarine clay by hand in lumps — trowelling or brushing the wood not only damaged the wood but also smeared clay onto it. Sponges were used to remove puddles, but due to seepage deep excavation was rarely possible. Usually only the superficial layers of wood could be exposed for recording and sampling. When structures had been exposed as far as was practicable, they were planned, photographed and sampled. This all had to be achieved within a single low-tide window, as cleaning left the structures vulnerable to tidal scour.

Wood from intertidal clays is commonly impregnated and coated with iron compounds, probably mainly pyrite, as a result of chemical and microbial processes. In some cases the wood was so indurated that it could not be sectioned for microscopic study, but more commonly just the bark, pith and some ray and vessel tissue was mineral-replaced. Although it was usually possible to obtain sections adequate for identification, sectioning right across the stem to obtain ring-counts was often difficult or impossible. For this reason, only identification and stem diameter were usually recorded.

Context 96: 2360±70 BP (HAR-7057, 800–200 cal BC) (Figs 6.3–6.7)

This structure was located within the intertidal zone about 90m south of the saltmarsh edge. It was 3.5m long, with a maximum width of 0.8m. It consisted of longitudinal roundwood poles, up to 2.5m long and about 20–70mm in diameter, with interwoven transverse rods (Fig. 6.4 A). Pole *75* at the northern end of the structure was roughly squared (see lower level plan, Fig. 6.4 B) and two other components (*74* and *72/6*) showed cut mortice joints.

Although preservation was rather poor, sufficient wood remained to demonstrate the interwoven construction technique, best seen in the central part of the structure. In effect, *96* was an elongated hurdle with unusually long sails. Few cut ends were visible (marked **c** in the plan). Preservation at the south end of the structure was poor and no interwoven structure was visible. At the northern end of the structure the constituent members were covered by grey clay, including woody plant detritus. A single vertical post of 60mm diameter, timber *2* (Fig. 6.4 A), was set in the grey estuarine clay substratum at the south-west end. This might have served to secure the structure in place.

To establish the stratigraphic context of *96*, a 40m-long transect of auger holes was sunk. Its orientation lay along the long axis of *96*, and approximately perpendicular to an apparent infilled palaeochannel. This channel, defined to the north-east and south-west by benches of firm organic clay on head, formed a distinct feature trending north-

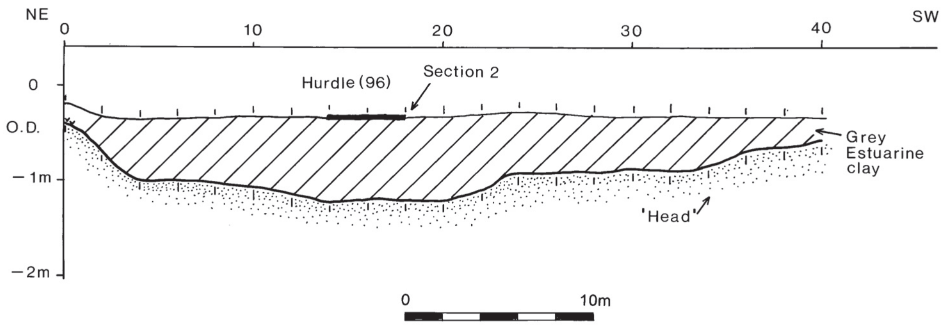


Figure 6.5 Context *96*: auger transect across palaeochannel showing location of structure

west–south-east. The 21 auger holes penetrated down to the underlying firm substratum of sandy silt, which was variously the old land surface itself or a surface incised into it. The transect clearly demonstrated that *96* had been emplaced over the deepest part of the channel (Fig. 6.5). The top 50cm of sediment infilling this channel, adjacent to *96*, was as follows (0cm=*c*. –0.40m OD):

0–40cm Very soft grey clay with black mottles; top 20cm too unconsolidated for retention in chamber); merging boundary.
40–50cm Very soft pale greyish-brown clay.

Samples were obtained for diatom analysis at 5cm intervals from 20–50cm depth. Soft sediments continued to a depth of 90cm at this point.

Augering and diatom assessment established that this structure had been placed close to the middle of a saltmarsh creek. Its location strongly suggests that it was intended as a 'bridge'. Practical experience shows that it is usually possible to walk most of the way across such creeks, across the relatively firm sediment at their margins, but that the low-tide channels require bridging in order to cross. It is not thought that *96* was necessarily part of a continuous Iron Age trackway; instead, it may simply indicate the line of a route which traversed the softest channel sediments. The main poles run longitudinally, not transversely as in a conventional hurdle, in order to take the stress of bridging either a channel void or extremely unconsolidated sediments. Mats of *Halimione*-type stems over the wooden structure may represent an attempt to keep it in use as it gradually subsided, under repeated traffic, into the creek muds.

Wood samples

Seventy samples of roundwood from three areas were collected for recording and identification. Since the structure was not completely dismantled and much of the wood was still embedded in estuarine clay it was not possible to ensure that all samples were collected from the oldest, lower, parts of stems. This has probably led to some errors in the ageing of particular stems, but the coherence of the results suggests that the overall picture is reliable.

The samples were examined in the laboratory, recording the features defined by Morgan (1982, 264–5): species, stem diameter, numbers of growth rings and the completeness of the outer ring. Results are summarised in Table 6.2, and presented in Figs 6.6 and 6.7.

The final, outer, rings were frequently narrower than the preceding rings, but none of the large stems showed growth terminating with the large spring-grown vessels. The width of the outer ring of small stems was, however, often difficult to determine due to surface erosion following loss of bark.

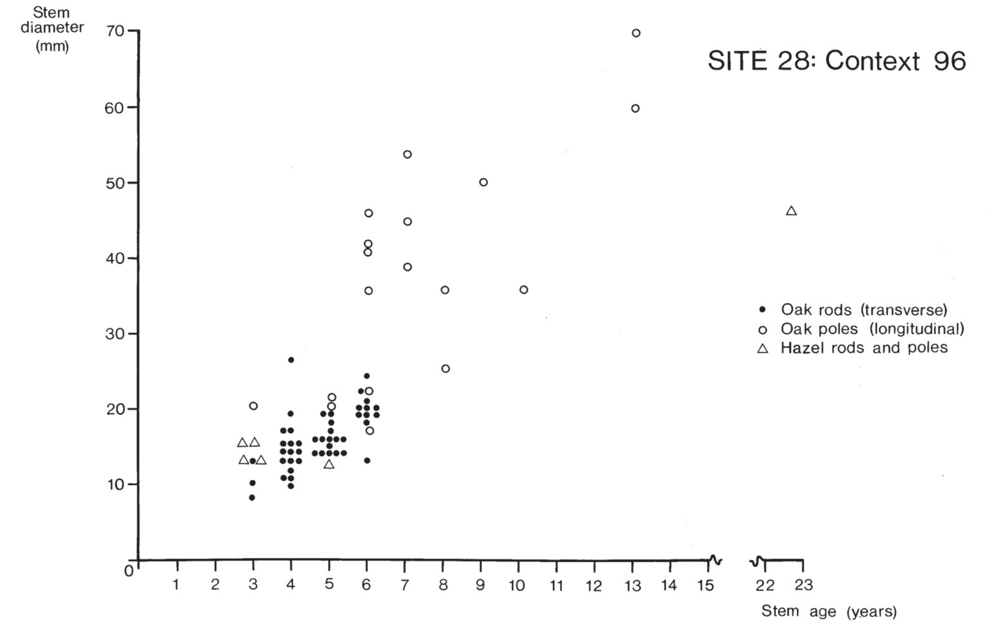


Figure 6.6 Context *96*: distribution of hazel and oak roundwood stem diameters and stem ages

Taxon	*No. of stems*	*Components*	*Stem diameters (mm)*
Quercus	18	Poles	17–70
Quercus	46	Rods	8–26
Corylus	1	Pole	47
Corylus	5	Rods	12–15

Table 6.2 Roundwood from context *96*

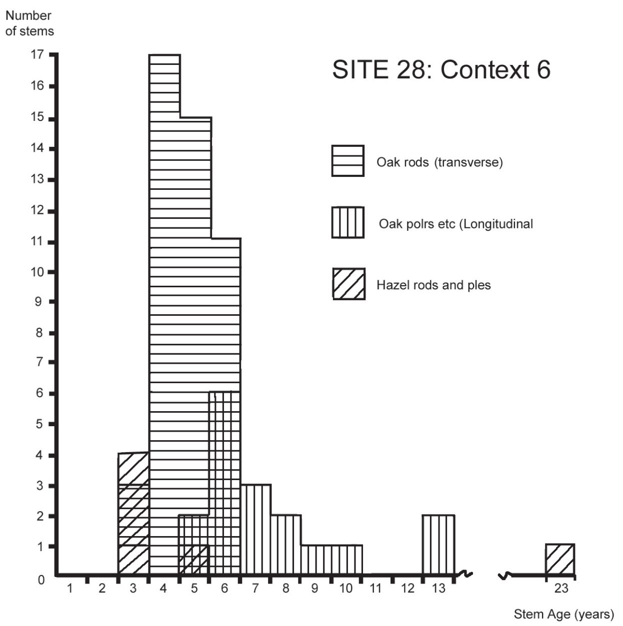


Figure 6.7 Context *96*: hazel and oak roundwood stem ages

The rather narrow age/size range of the transverse oak rods seems to indicate deliberate selection, though interpretation in terms of woodland management is uncertain. The complete or near-complete outermost rings imply cutting in winter.

Worked timbers from the structure were as follows:

74 770mm long, 70mm wide at west end, 100mm wide at east end. Roughly-cut mortice, 50mm x 40mm, cut through 30mm thickness of wood. Component slightly bent towards north at east end; the grain follows curvature.

75 Length 800mm, diameter 80mm. Squared end only continued for 150mm; remainder is untrimmed roundwood.

76 Small timber, *c.* 150mm long, 60mm wide. Set vertically in grey clay when found, but joins with *72*. Two mortice holes.

Since the woodworking on these pieces serves no clear structural function, they are likely to have been re-used.

Plant macrofossils

Associated with *96* (and *97*: see below) were densely compacted mats of thin woody plant stems. Two samples were examined (Table 6.3). The stems were irregular in form and up to *c.* 5mm in diameter, with nodal swellings. In transverse section, the vascular bundles were regularly arranged in an approximately concentric distribution. They compare closely in macroscopic and microscopic characteristics with reference stems of *Halimione portulacoides* (sea purslane). Macrofossils of halophytes from the matrices of these deposits are of *Spergularia* sp., *Suaeda maritima*, *Salicornia* sp., *Limonium/Armeria, Plantago maritima, Aster tripolium* and *Triglochin maritima*. The assemblages as a whole seem to represent saltmarsh rather than mud-flat vegetation: seeds of *Salicornia* are not common. The samples also produced an uncharred glume base of either spelt or emmer (*Triticum* sp.), twigs and leaf fragments of oak (*Quercus* sp.), foraminifers, insect remains, shells of *Hydrobia ulvae* and some very small fired clay fragments.

Context	*96*	*97*	*114 f*	*116*
Salt marsh plants/other halophytes				
Armeria/Limonium c.	23 d.	7	2	6
Aster tripolium L.	5	14		5
Chenopodiaceae indet. c.	4	4		4
Halimione-type (stems) b.	+++	+++	+	
Plantago maritima L. (capsule lids)	1		18 g.	
Plantago maritima L. (seeds)			1	
Salicornia sp(p)	8	3		148
Spergularia sp(p) a.	9	4		
Suaeda maritima (L.) Dumort	53	55		54
Triglochin maritima L.	2	1		
Aquatic taxa (brackish-fresh)				
Ruppia maritima L.				3
Terrestrial species				
Quercus sp. (charcoal)			+	
Quercus sp. (leaf fragments)	+			
Quercus sp. (twigs)		+		
Crop plants				
Triticum dicoccum Schubl. (glume bases)			2	
Triticum sp. (glume bases)	1 e.			
Triticum sp. (rachis nodes)			2 i.	
Indeterminate				
Poaceae indet (stem fragments)			+	+
Poaceae indet. (caryopses)	5	6	3	3
Juncus sp(p) (capsules)			7 h.	
Juncus sp (p) (seeds)	1			
Unidentified seeds etc.	5	6	45 j.	10
Leaf fragments				+
Buds		+		
Thorn				+
Wood				+
Stem fragments			+	+
Other material				
Foraminifera	+	+		+
Hydrobia ulvae (Pennant)	9			1
Beetle elytra *etc*.	+	+		+
Fly puparia	+	+		+
Fired clay fragments	+	+	+	+
Sample weight (kg)	**0.7**	**1.9**	**4.4**	**0.5**

a – mostly *S. media*-type with broad scarious border; b – small woody stems with nodal swellings (in TS the distribution and form of vascular bundles closely matches reference stems of *Halimione potulacoides*); c – testas absent; d – includes some calyces definitely of *Limonium*; e – not charred; f – all material from this sample charred; g – these include some seeds fused with the capsule lids during charring; h – capsules with aggregates of charred seeds; i – hexaploid free-threshing wheat; j – mostly elongate forms with poorly-preserved surface detail.

Table 6.3 Plant macrofossils from contexts *96*, *97, 114* and *116*

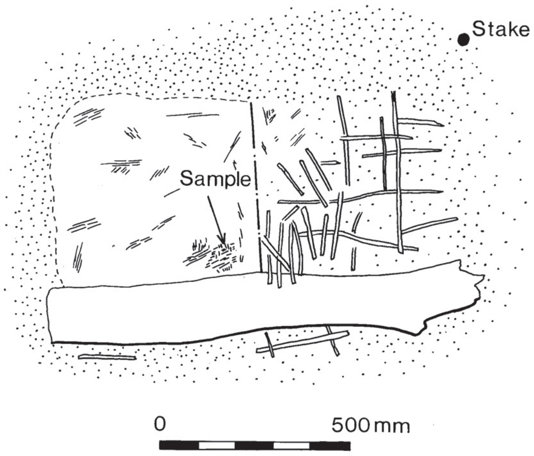


Figure 6.8 Context *97*: plan

Diatom assessment
by Steve Juggins

Two samples from the channel fill beneath *96* were examined:

25cm No diatom preservation.
50cm The assemblage is dominated by *Nitzschia navicularis* and *Paralia sulcata*. The numerical dominance of these two robust forms over a large number of more fragile, but nevertheless well-preserved, sediment-inhabiting species suggests that most of the assemblage is allochthonous, though clearly deposited in an estuarine environment.

Context 97 (no radiocarbon sample collected)
(Fig. 6.8)
Context *97*, situated in the upper intertidal zone 13m west-south-west of context *98*, consisted of a small patch of brushwood contained within grey estuarine clay (Fig. 6.8), alongside a length of tree trunk/large branch of oak (*Quercus* sp.) 140mm in diameter. The brushwood formed an interwoven lattice which, at its south end, rested on the oak timber. The lattice was overlain by grey clay, which contained a mass of plant material similar in form and composition to that recorded at context *96* (Table 6.3). There was a single vertical stake set in grey clay in the north-east corner of the structure.

Context *97* was stratified in grey estuarine clay and, like many wooden structures recorded elsewhere in the estuaries, was surrounded by a pale grey soil mark. This was not a cut feature, but appears to have resulted from localised chemical changes within the sediment surrounding the wood — presumably principally in the oxidation state of iron minerals. It seems to be the eroded remnant of a larger structure, perhaps similar to 'bridge' *96*.

Context 98: 1020±80 BP (HAR-7058, 860–1220 cal AD)
(Fig. 6.9)
A seemingly chaotic scatter of horizontal wood was contained within the upper remaining part of the estuarine clay. Its total length east–west was 5–6m; the length of the main wood scatter was 4.3m and the maximum width north–south 4.2m; width of the main wood scatter was 2.0m. The structural elements comprised a group of upright posts set in grey estuarine clay. Although some rough trends were visible, the horizontals were not consistently orientated. There were some localised areas of apparently interwoven rods (Table 6.4).

To the west of the structure lay context *114*, a moderately hard area of reddish-brown clay/silt containing numerous small flecks of reddish fired clay. Occasional small isolated fragments of similar material, 5–55mm long, were present within the grey clay matrix, together with a similar reddish-brown clay/silt. The two types of earthy material occurred both within and beyond the main mass of wood, but no clay fragments showed impressions of wood. The material is therefore unlikely to have been cob or daub used in house walls. The presence of briquetage fragments within the grey clay matrix (*112*) suggests that some of deposit *114* might have been associated with salt production. Examples of briquetage forms (firebars, wedges and slabs) were recorded, although not all are securely related to the excavated sediments of *98*.

Context *116* was a diffuse zone of very dark clay containing plant detritus, towards the east end of the structure, and also adjacent to the line of posts on the N side. It merged laterally and vertically into the grey estuarine clay *112*.

Finds included two very weak and friable pottery sherds from contexts *98* and *111*, dated to the Saxon period (Tyler, Part 4).

Unlike the other wooden structures in the western area, *98* was not associated with the infilled creek system defined by auger survey (Fig. 6.3). Instead, it appears to have been at the edge of an 'interfluve', and might have originally been constructed on a comparatively dry marsh surface. This may explain the unique association of charcoal, charred plant macrofossils, fired clay and pottery with a wooden structure. Structural interpretation is difficult, since no doubt some of the vertical posts had been lost to erosion while some of the horizontal wood could merely be non-structural driftwood. However, *98* is plausibly interpreted as the collapsed remains of a flimsy post and hurdle structure of early medieval date, and the

Taxon	*Number of stems*	*Components*	*Stem diameters (mm)*
Quercus sp.	2	Roundwood posts	65–*c*. 70
Quercus sp.	1	Split posts	200+
?*Quercus* sp.	2	Split posts (mineral-replaced)	?
Salix/Populus sp.	2	Roundwood posts	50-95
Salix/Populus sp.	2	Halved roundwood posts	112–*c*. 120
Betula sp.	1	Roundwood post	70
Indeterminate	1	Roundwood post (degraded)	70

Table 6.4 Wood samples from context *98*

Figure 6.9 Context *98*: plan

Taxon	*Number of stems*	*Components*	*Stem diameters (mm)*
Quercus sp.	2	Vertical roundwood stakes	70–72
Quercus sp.	54	Horizontal and oblique roundwood	10–42
Corylus sp.	29	Horizontal and oblique roundwood	12–33
Quercus sp.	1	Horizontal timber fragment	?
Indeterminate	7	Horizontal roundwood and other fragments	11–25

Table 6.5 Wood samples from context *121*

artefactual evidence implies domestic activity and some salt production. It could have been a temporary shelter for workers on the marsh engaged in salt production, sheep-herding, fishing or other activities.

Wood samples
Wood from *98* was not sampled when the structure was first recorded. By the time of sampling, in the 1988 season, only the vertical posts had survived erosion.

Other samples

114 The sample examined consisted of very porous, lightly-fired pinkish-grey clay including patches of unfired clay and charcoal flecks. After drying, this material disaggregated readily on immersion in water, releasing charred plant material which was collected in a 500 micron mesh sieve. The residue included irregular fragments of bright red well-fired clay and fuel ash slag. Charred plant remains are listed in Table 6.3. They include oak charcoal, charred *Halimione*-type stems, charred calyces of *Limonium/Armeria*, capsule lids and seeds of *Plantago maritima*, capsules of rushes (*Juncus* spp) containing seed aggregates, grass caryopses and cereal remains: glume bases of emmer (*Triticum dicoccum*) and rachis nodes of a free-threshing hexaploid wheat. Apparently saltmarsh plants and crop-processing waste were used to temper the clay before firing.

116 A sample from the deposit was found to include indeterminate monocotyledonous stems and woody stems, with some grass culm fragments, small wood fragments and a thorn. Seeds of *Salicornia* sp and *Suaeda maritima* were common. Fruits and seeds of other halophytes including the brackish water aquatic *Ruppia maritima* were also present.

Context 121: 2220±60 BP (HAR-8457, 400–110 cal BC) (Fig. 6.10)
This structure consisted of an area of horizontal and oblique roundwood stems, with an extent of *c.* 2m x 2m, with two large vertical roundwood stakes (Fig. 6.10).

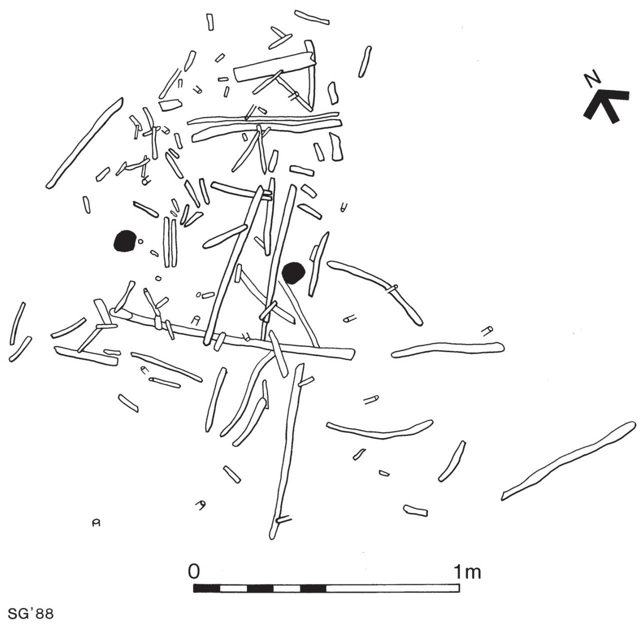


Figure 6.10 Context *121*: plan

Although much of the wood was apparently not *in situ*, having been dispersed by trampling and/or erosion, some stems were still aligned in a rectilinear cross-wise orientation. Although somewhat damaged and dispersed by erosion prior to recording, this structure resembles *96* in some respects. It consisted of oak and hazel roundwood laid cross-wise, perhaps originally interwoven, and asso-

Taxon	*Number of stems*	*Stem diameters (mm)*	*Stem ages (years)*
Fraxinus sp.	15	22–40	6–10
Quercus sp.	13	14–40; 60–80	
Corylus sp.	3	15–30	
Indeterminate	3	*c*. 30–40	

Table 6.6 Wood samples from context *126*

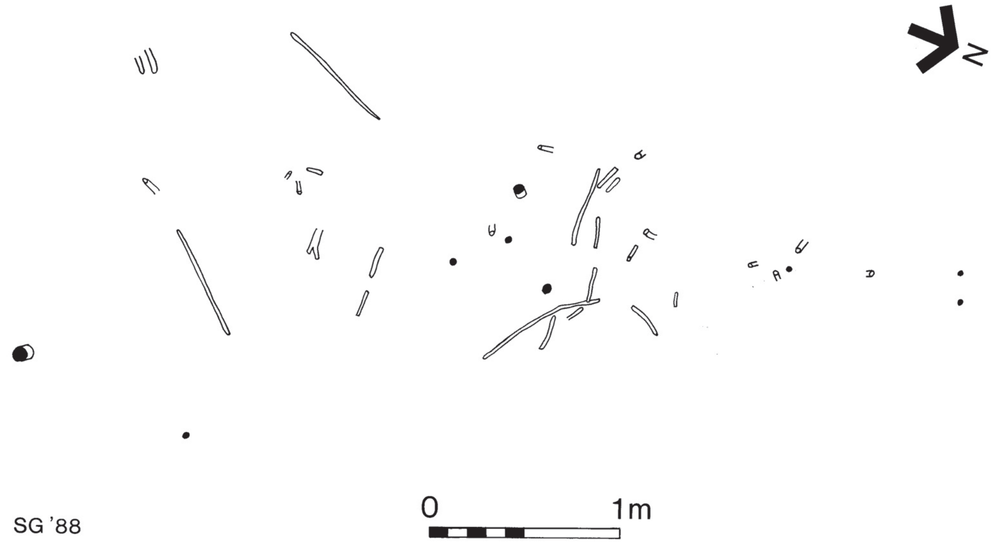


Figure 6.11 Context *126*: plan

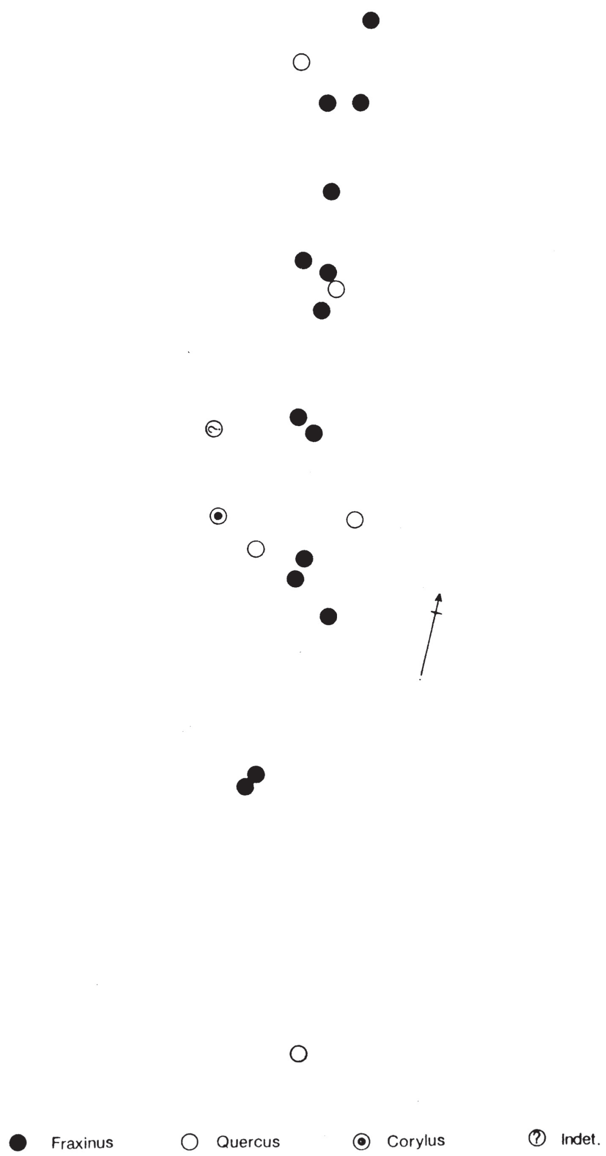


Figure 6.12 Context *126*: schematic plan with wood identifications

ciated with stakes which were perhaps intended to hold the structure in position (Table 6.5). It is probable that *121* had a similar function to *96*, consolidating an area of soft sediment; it was close to the creek edge, however, and may have been a platform rather than a bridge.

Wood samples

Most wood from this structure was fairly well preserved: only a few fragments were too decayed or mineral-replaced to be identified. However, the structure as a whole was badly damaged and many of the component stems appear to have been broken.

Context 126: 2380±80 BP (800–200 cal BC)
(Figs 6.11 and 6.12)

This comprised an irregular line of vertical and oblique roundwood stakes, just over 5m in length, associated with some horizontal roundwood (Fig. 6.11). The structure lay in a depression on the foreshore and was submerged even at low tide; hence complete cleaning and recording was impractical. Wood visible on the surface was, however, planned and sampled.

Figure 6.12 offers a schematic plan of the structure, showing the locations of vertical and oblique stakes that appeared to be *in situ* but omitting roundwood that might have drifted into its present position. There appear to be two main alignments of stakes. Roundwood stakes of ash, 22–40mm in diameter and often in pairs, formed an irregular alignment almost due north–south. A second alignment of oak roundwood stakes, several of which are from larger stems (60–80mm diameter), running roughly north-north-west–south-south-east, can also be distinguished (Table 6.6). It is possible that *126* was a two-phase structure, consisting of a line of stakes which was then replaced in approximately the same position.

There was no evidence for *in situ* horizontal wood, and the structure does not seem to have been designed as a trackway. One possible interpretation is that it was a simple fish trap to which nets could be attached.

Wood samples

The wood from this structure was superficially well preserved but many of the stems were partly decayed, having lost the central pith and some of the initial growth rings. The outer rings of many stems were heavily iron-impregnated. Detailed recording of stem ages was therefore not possible.

Context 127: 240±60 BP (HAR-8459, 1480–1960 cal AD)
(Fig. 6.13)

The structure consisted of a central mass of horizontal gorse stems with spiny twigs, which survived over a length of about 2m, with a surrounding thin scatter of stems, associated with eight large split and roundwood stakes (Fig. 6.13; Table 6.7). Seemingly a bundle of gorse stems held in place with stakes, it had clearly been laid down in order to consolidate the surface hereabouts but its specific function is uncertain.

Wood samples

The vertical and oblique stakes of oak comprised three whole roundwood stems, two halved stems and two quartered stems. The elm stake had been quartered. Many of the gorse stems showed oblique transverse cuts made with a sharp metal implement.

Other samples

A 0.5kg sample of matrix from the central mass of gorse stems and spines was examined. It consisted of a grey clay matrix including seeds of *Suaeda maritima* and *Salicornia* sp, a few fragments of charcoal, foraminifera, shells of *Hydrobia ulvae, Retusa* sp and fragments of indeterminate bivalves, with fly puparia and beetle remains. The

Taxon	*Number of stems*	*Components*	*Stem diameters (mm)*
Ulex sp.	37	Horizontal 'brushwood'	5–27
Quercus sp.	2	Horizontal 'brushwood'	14–18
Quercus sp.	7	Vertical/oblique stakes	63–140
Ulmus sp.	1	Vertical stake	105

Table 6.7 Wood samples from context *127*

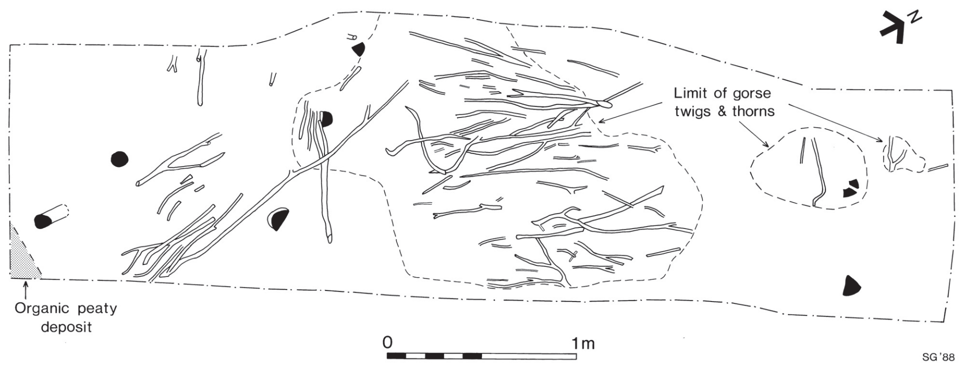


Figure 6.13 Context *127*: plan

macrofossils indicate an estuarine context, but none of them provides any specific clue to the structure's function.

Context 128: 250±60 BP (HAR-8460, 1470–1960 cal AD)

(Fig. 6.14)

This was a line of vertical and oblique large roundwood stakes associated with a mass of gorse stems (Fig. 6.14; Table 6.8), similar in both form and date to structure *127*. The gorse stems dipped steeply downwards and hence only a small area could be exposed. Within the grey clay matrix exposed in this area were blocks of brown peaty clay, possibly from a contemporary saltmarsh surface. The structure appears to have been partly displaced, perhaps as a result of slumping into a former creek.

Wood samples

The stakes were of whole roundwood. Several gorse stems showed oblique transverse cuts.

Other samples

A 0.2kg sample of grey clay from the main area of gorse stems contained *Ulex* twigs and spines, with some indeterminate woody stems up to about 3mm in diameter, and degraded leaf fragments with reticulate venation. Fruits and seeds of *Salicornia*, *Suaeda maritime*, *Aster tripolium* and Poaceae were also noted, together with foraminifers, shells of *Hydrobia ulvae* and insect remains.

Context 129: 2300±60 BP (HAR-8461, 550–150 cal BC)

(not illus.)

This structure was partly submerged even at low tide, since it lay in a depression. Excavation was impracticable but wood visible on the surface was planned. On the basis of this limited investigation, the structure appears to have consisted of a group of vertical and oblique posts, distributed over an area of about 3m east–west by 4m north–south, with outlying, perhaps unrelated, posts 4m to the south-west. At the periphery of the main posts

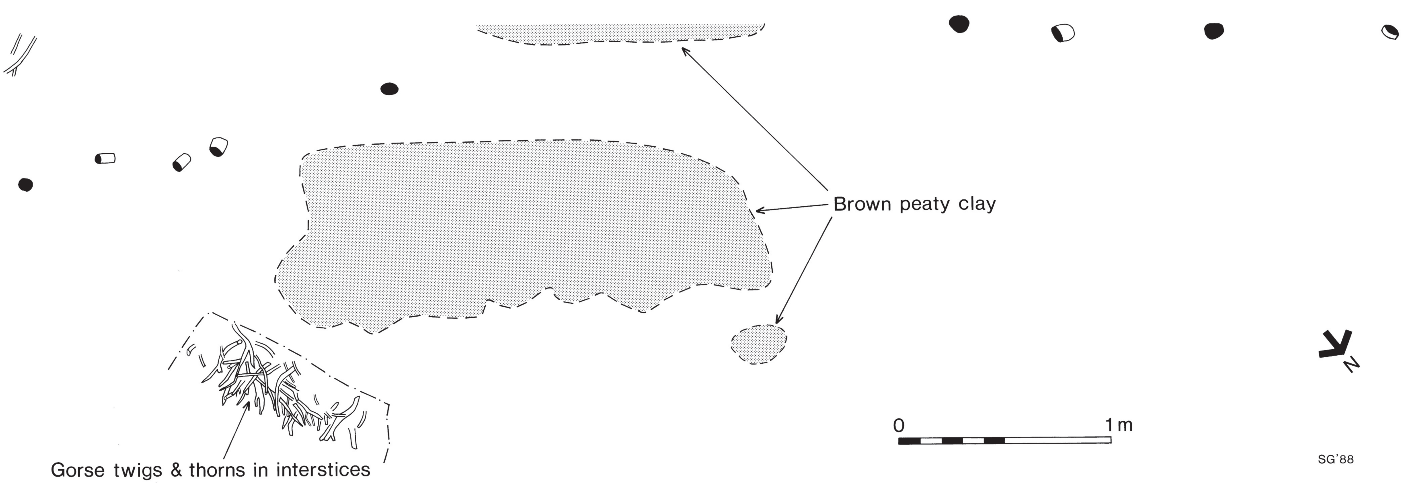


Figure 6.14 Context *128*: plan

Taxon	*Number of stems*	*Component*	*Stem diameters (mm)*
Ulex sp.	7	Brushwood	19–32
Ulmus sp.	5	Vertical/oblique stakes	35–59
Quercus sp.	4	Vertical/oblique stakes	59–65

Table 6.8 Wood samples from context *128*

Taxon	Number of stems	Component	Stem diameters (mm)
Quercus sp.	9	Roundwood posts	37–82
Quercus sp.	1	Trimmed roundwood post	*c.* 60
Quercus sp.	1	Radially split roundwood (c. 1/8)	*c.* 90
Quercus sp.	1	Split post	?
Corylus sp.	1	Roundwood post	48
Salix/Populus sp.	1	Roundwood post	90
Acer sp.	1	Roundwood post	*c.* 130
Indet.	1	Post (mineral-replaced)	?
Quercus sp.	14	Horizontal and oblique roundwood	14–65
Quercus sp.	1	Horizontal halved roundwood	63
Quercus sp.	2	Horizontal quartered roundwood	*c.* 100
Quercus sp.	1	Cut piece	?
Corylus sp.	16	Horizontal and oblique roundwood	14–40
Corylus sp.	3	Horizontal halved roundwood	22–40
Indet.	1	Decayed roundwood	?

Table 6.9 Wood samples from context *129*

were two concentrations of mainly near-horizontal wood, 1.40m x 0.40m and 1.90m x 0.40m respectively. Cut ends were noted on several pieces of roundwood (Table 6.9). The southern of these rested on a 0.20m-thick layer of estuarine clay over head. The only non-wooden artefact within the otherwise stone-less grey clay matrix was a large flint cobble battered on one face. This is reasonably interpreted as a hammer-stone.

The sixteen posts were mainly oak, with some hazel, willow/poplar and field maple, whilst the horizontal wood was of hazel and oak. It was poorly exposed and submerged. However, it is worth noting that only 0.20m of sediment underlay the wood, and the structure was therefore not close to the deeper part of a creek channel. This would suggest that it is unlikely to have been a fish trap.

Wood samples
These are listed in Table 6.9.

Context 190: 2400±60 BP (HAR-8880, 770–380 cal BC)
(Fig. 6.15)
This was a small structure, about 1.3m in length, consisting of three straight roundwood poles 36–63mm in diameter, laid approximately parallel and enclosing a compacted mat of thin woody plant stems (Fig. 6.15). Beneath this, and in the surrounding area, were small horizontal roundwood stems and vertical/oblique roundwood stakes (Table 6.10). The structure appears to have been an eroded remnant of a track/creek bridge similar to *96* and *97*.

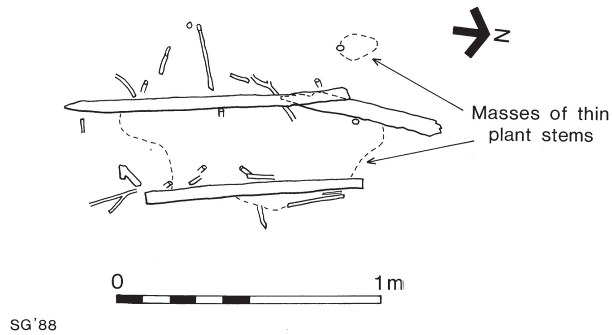


Figure 6.15 Context *190*: plan

Wood samples
The hazel stems from this structure were well-preserved. The smaller stems were 15–20mm in diameter, and mostly four years old.

Other samples
A 0.4kg sample from the middle of the structure consisted of a mass of *Halimione*-type stems (*c.f.* structures *96* and *97*) and indeterminate monocotyledonous stems. The clay matrix also contained macrofossils of *Salicornia*, *Suaeda maritima*, *Armeria/Limonium*, *Aster tripolium* and Poaceae, along with foraminifers and beetle remains.

Taxon	Number of stems	Component	Stem diameters (mm)
Corylus sp.	1	Horizontal pole	36
Quercus sp.	2	Horizontal poles	42–63
Corylus sp.	19	Horizontal roundwood and small oblique stakes	15–20
?*Corylus* sp.	2	Horizontal small roundwood	12–13
Quercus sp.	1	Horizontal small roundwood	37

Table 6.10 Wood samples from context *190*

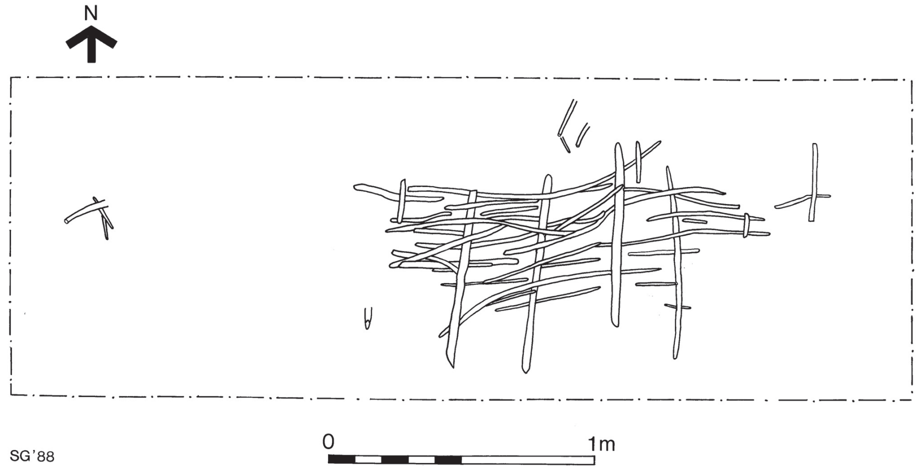


Figure 6.16 Context *195*: plan

Taxon	*Number of stems*	*Component*	*Stem diameters (mm)*
Quercus sp.	4	Sails	19–30
Corylus sp.	1	Sail	19
Indet.	2	Sails	*c.* 22
Quercus sp.	17	Rods	17–28
Corylus sp.	1	Rod	19
Indet.	5	Rods	?
Quercus sp.	1	Oblique stake	?

Table 6.11 Roundwood from context *195*

Context 195: 2080 ± 70 BP (HAR-8881, 360 cal BC– 80 cal AD)
(Fig. 6.16)
This comprised an incomplete hurdle, situated on the upper shore, close to the edge of the saltmarsh and to the north-east of structure *98*. It consisted of a horizontal panel with the remains of seven surviving roundwood sails and interwoven roundwood rods (Table 6.11). In the central area the wood was well preserved, though with weathered surfaces, but at the periphery it was badly degraded. One weathered cut end was noted. The main area of wood surviving measured *c*. 1.7m x 1.0m.

This hurdle panel might have been found *in situ*, in which case it would have functioned as a hard-standing or trackway component. Alternatively it might simply have been a loose element from some other type of structure, such as a sheep pen, which had drifted into position here.

Wood samples
Due to poor preservation many samples could not be identified, but oak was plainly the main wood used in this hurdle.

Context 244: 1900 ± 70 BP (HAR-9644, 50 cal BC–320 cal AD)
(Figs 6.17 and 6.18)
Although less than 4m to the north of structure *98*, which was first exposed in 1985, *244* was not exposed by erosion until 1988. It consisted of two areas of wattling, with mainly double roundwood sails, measuring about 0.90m x 0.20m and 0.60m x 0.20mm, with an area of roundwood stems up to about 0.40m x 0.20m to the north, and a thin scatter of roundwood around (Table 6.12). Resting on the southern area of wattling, which lay roughly horizontally, were two pieces of worked timber (*362* and *363*). Two other pieces (*380* and *361*) lay at the eastern edge of the structure (Fig. 6.17). The northern area of wattling dipped steeply downwards and was underlain by thin mats of plant material (B, C) within the grey clay matrix. The stems were inclined downwards towards the west and rested on an area of thin woody plant stems (A).

The proximity of *244* to structure *98* led to the assumption, in the field, that the two were related. Radiocarbon dating, however, has demonstrated that *244* was considerably earlier than its neighbour. It appears that the two structures were both constructed on a saltmarsh 'interfluve' area, and that neither was directly associated with a channel. Judging from their angles relative to the sediment surface, the hurdle panels of *244* do not seem to have been laid horizontally, but rather represent the collapsed remains of vertically-placed hurdles. Some sort of enclosure (*e.g.* a sheep pen), or perhaps a temporary human shelter, might be indicated. The unusual presence of worked oak timbers, with evidence of jointing, seems to suggest either the proximity of another more substantial structure or importation of re-used timber.

Wood samples
The two areas of hurdling were constructed mainly of hazel, with two rosaceous wood sails. The double-sailed construction may simply have

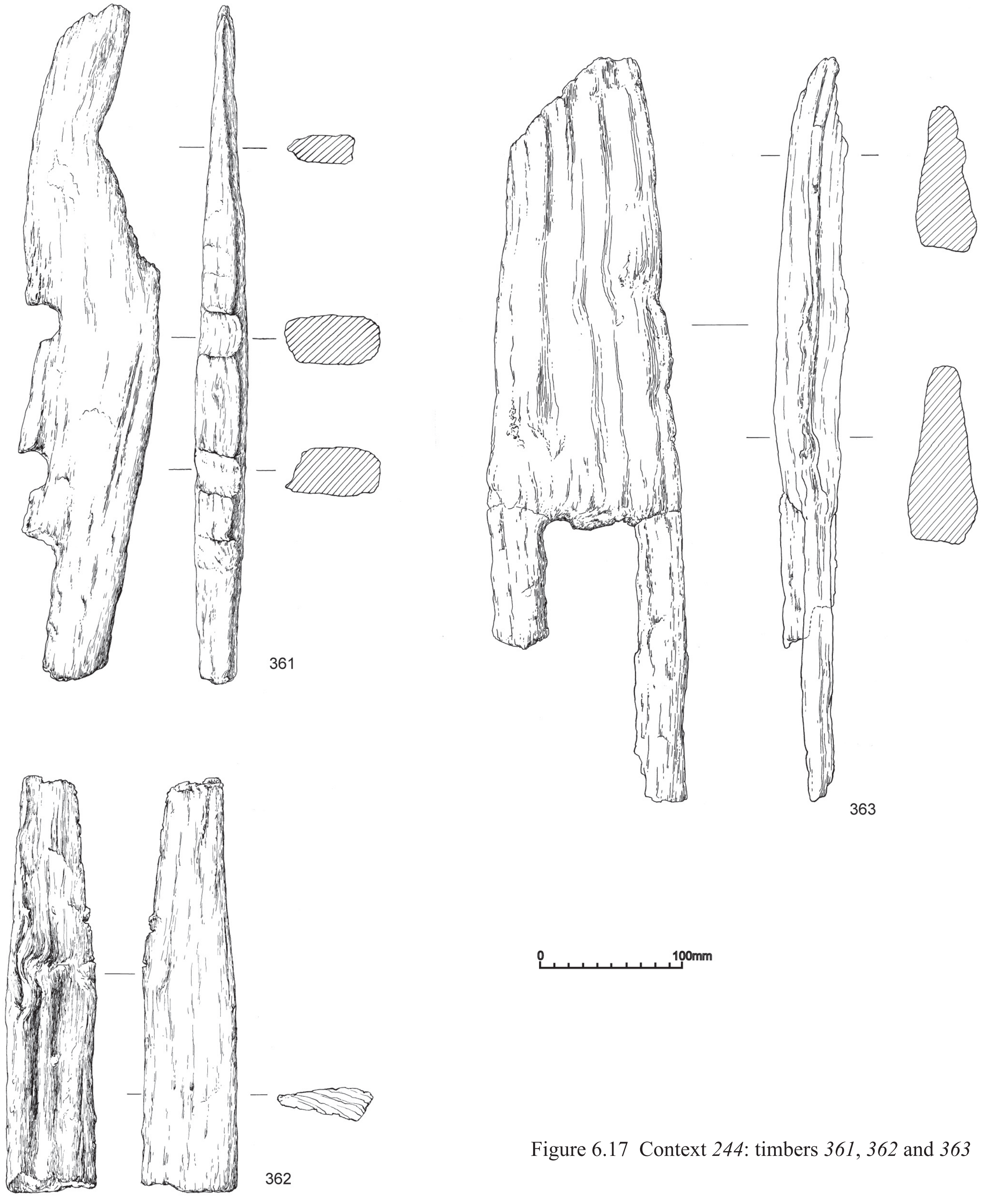


Figure 6.17 Context *244*: timbers *361*, *362* and *363*

been necessary because larger hazel roundwood was not available. Mineral replacement made determination of stem ages difficult, but it appeared that the hazel sails had 4 to *c*. 14 rings, and the rods 2 to *c.* 10 rings. The outermost rings were usually incomplete.

The worked pieces of wood (Fig. 6.17) were as follows:

- Radially-split plank of oak, 470mm x 100mm x 30mm, with two circular holes (*c*. 250mm diameter) and remains of a third.
- Radially-split segment of oak, 290mm x 60mm x 25mm, with a transverse cut at one end.
- Radially split segment of oak, 530mm x 130mm x 40mm, transversely cut at one end, with a rectangular mortice at the other.
- Split piece of oak, 320mm x 20mm x 30mm.

Other samples

Samples from the three areas of plant material underlying the wood were examined. Area 'A' consisted of young *Corylus* stems, up to 9mm in diameter, *Ulex/Cytisus* stems up to 4mm, *Corylus* nutshell fragments and macrofossils of *Salicornia, Suaeda maritima* and *Prunella vulgaris*, beetle elytra and foraminifers. 'B' and 'C' were composed largely of thin *Ulex/Cytisus* stems, *Corylus* stems, *Halimione*-type stems, and fruits and seeds of *Salicornia*, *Suaeda maritima*, *Spergularia*, *Aster tripolium* and *Anthemis cotula*, with foraminifers.

Taxon	*Number of stems*	*Component*	*Stem diameters (mm)*
Corylus sp.	8	Roundwood sails from hurdles	10 x 18
Corylus sp.	1	Halved roundwood sail from hurdle	20
Crataegus group	2	Roundwood sails from hurdle	13–15
Corylus sp.	21	Roundwood rods from hurdles	8–15
Corylus sp.	15	Other roundwood	11–26
Corylus sp.	1	Other halved roundwood	19
Ulex/Cytisus sp.	3	Other roundwood	6–8
Indet.	1	Other roundwood	

Table 6.12 Roundwood from context *244*

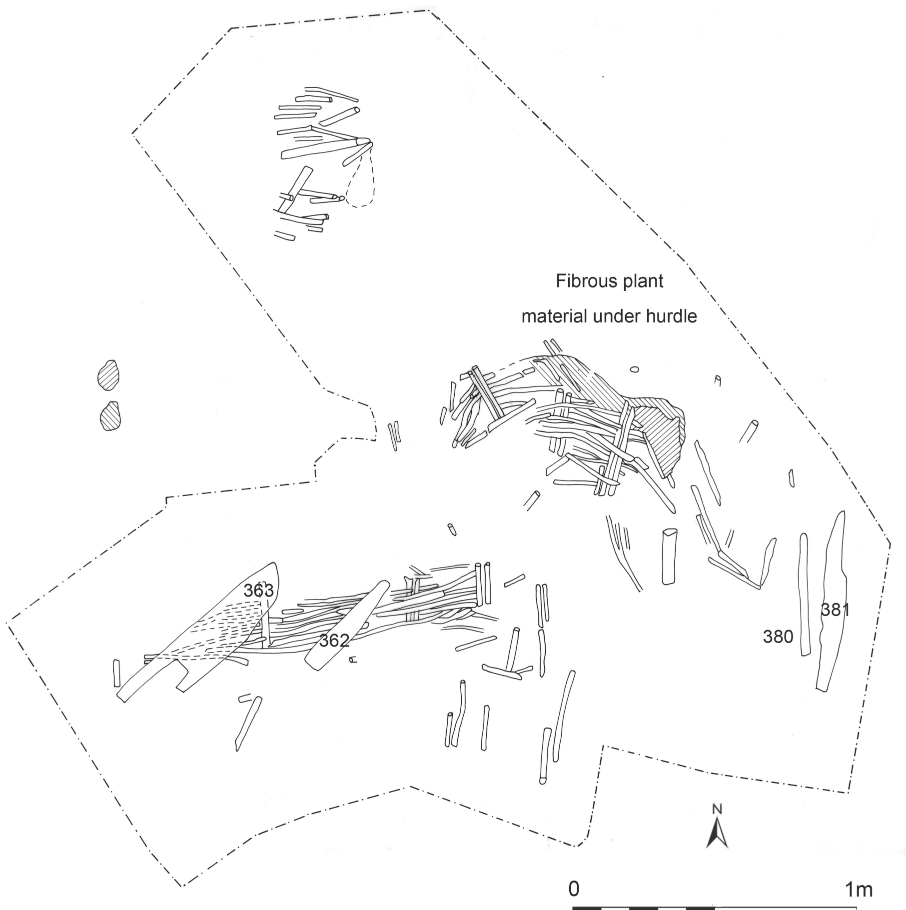


Figure 6.18 Context *244*, plan

Other wooden structures
In addition to the structures described above, some other isolated posts or post-groups were noted, as follows:

250 post-group with some horizontal wood, largely sediment-covered;
251 two posts;
252 post;
253 70mm diameter horizontal timber;
254 post;
255 three posts;
256 post;
257 post.

Their locations are shown on Fig. 6.3.

IV. Woodlands and wood use
(Figs 6.19–6.20)

Most of the wood would have come from land on the gravel terraces just inland from the saltmarsh. Several lines of evidence indicate that by the 1st millennium BC these terraces were quite densely populated and that the landscape was open, consisting of a complex of settlements and field systems. Palynological and macrofossil analyses of sites on the terraces of the Blackwater indicate open, predominantly pastoral, landscapes which were probably hedged (Murphy 1988; Wiltshire and Murphy 1998).

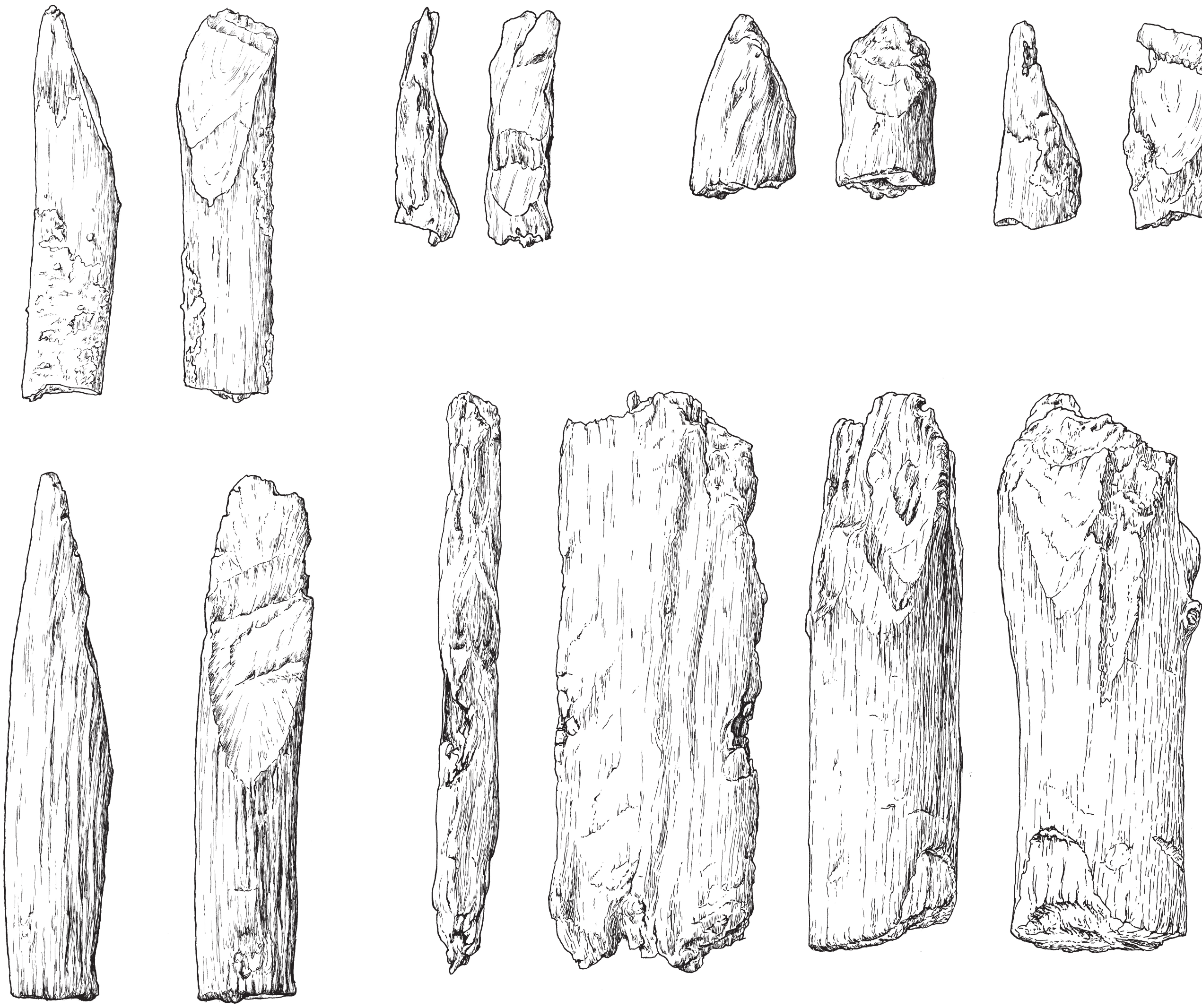


Figure 6.19 The Stumble: examples of roundwood stems showing cut ends from Iron Age structures

On the Thames terraces, the lime decline is thought to have been an Iron Age phenomenon (Scaife 1988); pollen analysis of the pre-hillfort soil at Asheldham Camp indicates an open agricultural landscape with little woodland except hazel scrub (Scaife 1991).

It seems reasonable to infer that wood was sourced from hedgerows and copses, as it was in historic times. The range of wood taxa used in these coastal structures is quite consistent with this. *Acer* (field maple) is common in Late Bronze Age structures at Rolls Farm (Site BL18: Wilkinson and Murphy 1995, 143–50). This tree occurs in woods and scrub, but is most commonly seen as a hedgerow tree. In most of the Late Bronze Age and Iron Age structures, however, *Corylus* (hazel) and *Quercus* (oak) were the main woods used, along with some *Fraxinus* (ash). Hazel was in general the most frequently used wood for hurdles and wattling during prehistory in this country. The unusual abundance of oak in the structures from both Rolls Farm and the Stumble might be related to the durability of this wood, or perhaps to the need for more rigid structures to stabilise mud surfaces.

The use of *Ulex* (gorse) in the Late Iron Age/Early Roman structure *244* and the post-medieval structures *127* and *128* is at first sight surprising, but gorse is in fact still common on nearby sea walls today. When the marshes were still used extensively as sheep pasture, the resistance of gorse to grazing may have resulted in its becoming one of the commoner shrubs in the area. Spreads of cut gorse would have provided a cheap and easy means of providing a firm footing on mudflats where needed.

To meet the needs of later prehistoric communities for structural wood and fuel from comparatively limited areas of woodland, some degree of woodland management would have been necessary. At Site BL18 (Rolls Farm), coppiced heels of field maple and hazel came from contexts *86* and *89*. Iron replacement and coating of the wood in this environment meant that detailed ring counts were seldom possible, but the oak roundwood from structure *96* at the Stumble was better preserved. The rather narrow age/size ranges for these oak stems (Figs 6.6 and 6.7) imply that the wood came from managed woodlands. A selection of roundwood stems showing transverse oblique cuts made with metal tools is shown in Fig. 6.19. Timber objects were very uncommon at the Stumble. A few worked pieces, some with mortices, were recovered.

Figure 6.20 The Stumble: examples of roundwood stems showing cut ends from post-medieval structures at Site 28

V. The palaeoecological and archaeological sequence

(Fig. 6.21)

In this section of the report, data from both the grid of auger holes (Fig. 6.3) and the sampling of the wooden structures are drawn together to provide an outline reconstruction of events at the site. The model proposed embodies certain assumptions and uncertainties. First, it is assumed that drainage patterns, once established, persisted over very long periods. Support for this assumption is provided by the work of Funnell and Pearson (1984) and Andrews *et al.* (2000a, 2000b) on the saltmarshes of North Norfolk, where persistence of the same palaeoenvironments over very long periods of time (*c.* 4000 years) was established. Indeed, the modern distribution of environments was shown to have been largely determined by a topography that was established in the early Holocene. At the Stumble it is suggested that the creek palaeochannels detected perpetuated the freshwater palaeochannel system pre-dating the local transgression. Secondly, there are uncertainties about

Context no.	*Radiocarbon determination*	*Cal BC/AD**	*Function*
190	2400±60 BP (HAR-8880)	770–380 cal BC	?Eroded remnant of larger structure.
126	2380±80 BP (HAR-8458)	800–200 cal BC	?Fish trap
96	2360±70 BP (HAR-7057)	800–200 cal BC	Creek bridge
129	2300±60 BP (HAR-8461)	550–150 cal BC	Post and brushwood structure.
121	2220±60 BP (HAR-8457)	400–110 cal BC	?Creek bridge/platform
195	2080±70 BP (HAR-8881)	360 cal BC–80 cal AD	Hurdle
244	1900±70 BP (HAR-9644)	50 cal BC–320 cal AD	Hurdles etc.

*OxCal v3.5 (Bronk Ramsey 2000). Calibrations quoted at 95.4% probability

Table 6.13 Iron Age to early Roman wooden structures at the Stumble

the correlation of sediment stratigraphy with phases of recorded archaeology — datable material came only from the pre-transgression land surface. Furthermore, over most of the site the upper intertidal sediments have been entirely lost due to erosion. Despite these problems it is possible to propose a seven-stage model, illustrated schematically on Fig. 6.21.

1. Pre-transgression (Early/Middle Neolithic). The area of the site consisted of a low-lying but undulating surface of London Clay Head, on which a thin palaeosol developed. Palynology indicates that woodland of *Tilia*, *Quercus* and *Corylus* covered most of the area, with limited clearances for settlement and farming, and with saltmarsh vegetation nearby.
2. Initial phases of local transgression (Late Neolithic: in the period immediately after 3885 BP). Waterlogging of the soil resulted in death of trees, and partial preservation of tree-root systems. The palaeosol was progressively covered by organic estuarine sediments (the so-called Blackwater 'Lower Peat') formed (on the evidence of diatoms and macrofossils) under saltmarsh vegetation, but prone to periodic desiccation which resulted in palynomorph degradation. Intertidal creeks traversed the area (probably following the channels of former freshwater streams), and coarse lag gravels derived from the London Clay Head were emplaced at their bases. The final phase of activity on the palaeosol related to burnt flint mounds (3885±70 BP; Ox-A 2297, 2570–2140 cal BC).
3. The rate of relative sea-level rise exceeded the rate of sedimentation; sediment, diatom and macrofossil analysis results show that much of the area became an intertidal mudflat. The drainage pattern of creeks apparently persisted, but there was accretion of fine-textured sediments within their channels.
4. Continued accretion of fine sediment, and stabilisation of mudflats by vegetation, producing a complex pattern of creeks, mudflats, low- and high-saltmarsh. The main phase of Iron Age activity took place within this complex intertidal environment. Radiocarbon determinations (in chronological order) with interpretations of structures are given in Table 6.13. The functions of the two 'late' hurdle structures *195* and *244* are uncertain, but they might have been related to sheep-grazing on saltmarsh. In historical times hurdles were used both for penning sheep and also as bridges to allow them to escape from the marsh during exceptionally high tides (Grieve 1959).
5. Abandonment, erosion and continued sediment accretion resulted in collapse, partial dispersal, decay and burial of the wooden structures. Most of these structures were certainly of Iron Age date, although *244* is probably early Roman. There is no evidence for renewed activity on the foreshore at the Stumble until the early medieval period, when structure *98* (1020±80 BP; HAR-7058, 860–1220 cal AD) was constructed. It is argued above that this structure, apparently built on a relatively high saltmarsh interfluve away from creeks, was 'domestic' in character, apparently representing a flimsy shelter for occasional use. Intertidal fish weirs in the Blackwater Estuary have yielded dates in the range 650–957 cal AD (Strachan 1997), though whether or not *98* was in any way related to these is uncertain.
6. In a final (post-medieval to modern phase) of activity, two post and gorse-brushwood structures, *127* and *128*, were emplaced. They presumably served to stabilise adjacent surfaces, but there is no evidence for the particular type of activity involved.
7. AD 1988. When the site was first located during survey, the combustion chamber of a World War II V2 rocket (since then salvaged by unknown persons) lay on the mudflats adjacent to the site. According to local informants this had (unsurprisingly) been deeply buried on impact but by 1985 it was fully exposed, plainly indicating a substantial erosion of the mudflat surface in the preceding 40 years. During survey and excavation in 1985–8, the remaining isolated residual islands of saltmarsh (one of which provided Section 1: above, p.115) rapidly diminished in size. This enhanced erosion might have been related to the dumping of additional hardcore and shingle to raise the level of the causeway leading to Osea Island, thereby increasing current velocities and scour. The result was extensive exposure of the pre-transgression land surface and Neolithic site at the eastern end of the site; however, over much of the western area the surface was truncated down to the basal organic deposits formed in Phase 2, and to the fills of palaeochannels. The less consolidated channel fills eroded relatively rapidly, producing a modern mudflat surface with a relief related to the underlying system of palaeochannels. It is likely that many wooden structures were destroyed without record by erosion before archaeological fieldwork in 1985–8, and again after it. The results presented in this chapter represent a short-term record of what is a long-term destructive process.

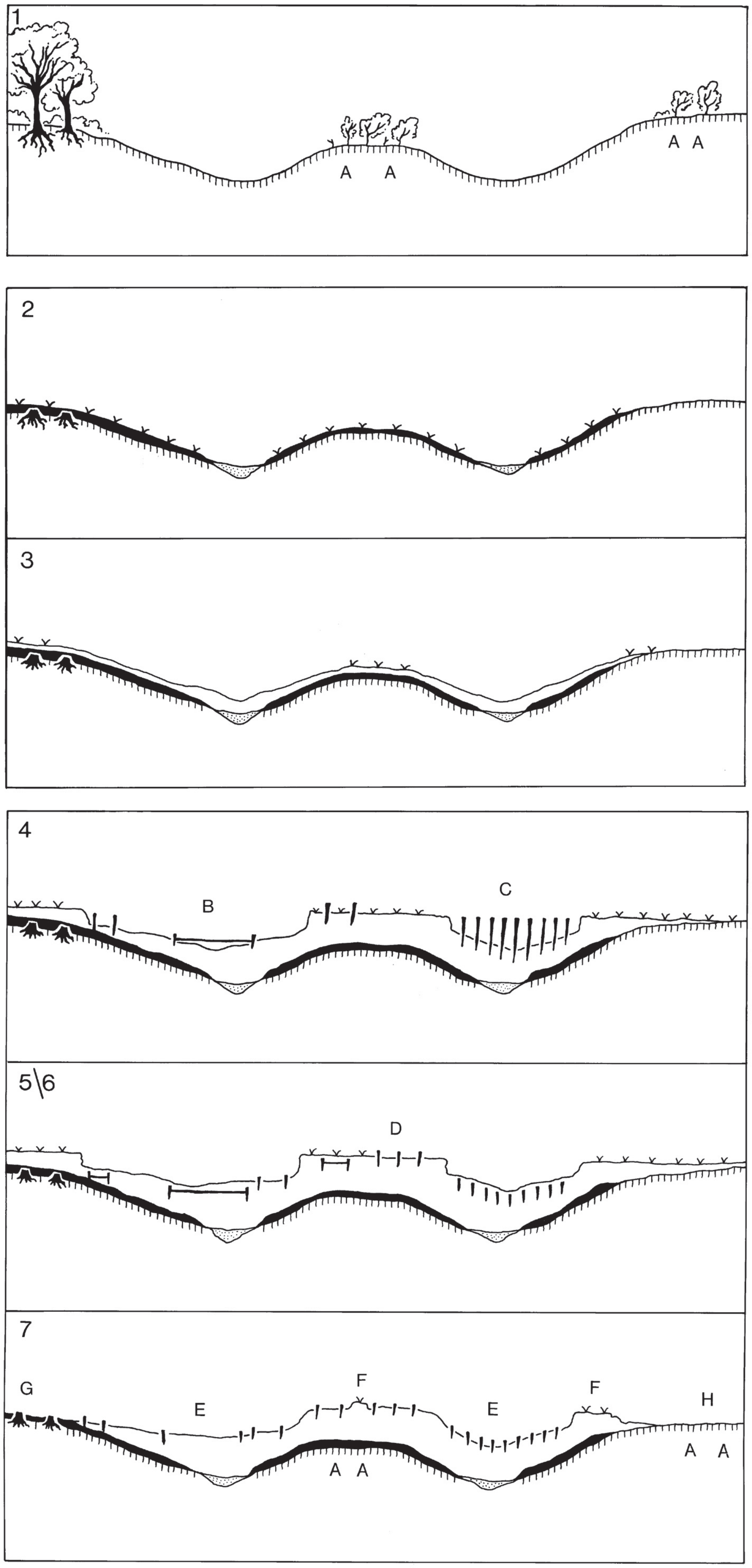


Figure 6.21 Sedimentation and structures: schematic reconstruction of sequence of events at the Stumble

7. Discussion

I. Site preservation and taphonomy

(Figs 7.1–7.4)

The Hullbridge Project in general, and the Stumble work in particular, have contributed to an understanding of Neolithic archaeology by providing an investigation of a particularly well preserved landscape, offering insights into the nature and development of Neolithic settlement and economy. The results of the work also offer a general model for the development of coastal prehistoric sites in eastern England. It is apparent from this model that when both dryland and wetland elements are present on the same intertidal site these can be resolved into different chronological phases (Figs 7.1–7.4). Preserved wood and timber structures at or near an Early/Middle Neolithic site exposed within the present intertidal zone in this area are unlikely to form part of the Neolithic occupation. At the Stumble, the wooden structures clearly relate to later phases of activity in the area, when it had ceased to be dryland and had become part of a coastal wetland — although remains of Late Neolithic valley-floor woodland were preserved by rising groundwater levels immediately before transgressive overlap at this site and others (above, p.115–18; Wilkinson and Murphy 1995, 76–8). An impression of this kind of sequence was starting to emerge during the survey phase of the Stumble project, but is now much clearer.

Publication over the last twenty years of a series of excavations of archaeological sites on the Blackwater terraces north and west of the Stumble (*e.g*. Brown 1988, Wallis and Waughman 1998, Atkinson and Preston 2001), together with sites further up the Blackwater and Chelmer river valleys to the west (*e.g*. Buckley *et al.* 1988; Buckley *et al.* 2001), and to the east at St Osyth on the Tendring peninsula (Germany 2006; Clarke and Lavender 2008) means that it is now possible to see the Stumble within its wider landscape context. Viewed in this broader perspective, the Stumble provides an impression of the nature of settlement and landscape in east Essex during the Neolithic, and has much to offer in exploring the nature of settlement economy and society in the Neolithic more generally.

In order to understand the settlement of the Blackwater Estuary, it is useful to examine it in terms of landscapes of destruction and survival (Williamson 1998). This is essentially a landscape of 'two halves' (Brown 1997, 96), with the estuarine zone and the former valley floor representing a patchy 'landscape of preservation'. In contrast, the flanking gravel terraces that have been under agriculture for millennia represent a 'landscape of destruction' in which the ancient land surfaces and carbonized plant remains are poorly preserved and many features have been truncated by ploughing and erosion.

It is not the aim of this report to evaluate the evidence for relative sea-level fluctuations and wider coastline morphological changes on the Essex coast over a long period (though some of the data from this study may contribute to that); still less to discuss possible correlations with events outside the county. However, in terms of the palaeogeographic model presented in Wilkinson and Murphy 1995 (2, fig. 2) it is proposed that in the Early to Middle Neolithic period the site at the Stumble was situated on a dry land surface roughly 1km to the west of its contemporary coastline. This suggestion rests upon study of modern estuarine morphology and available relative sea-level data. The latest radiocarbon date from the pre-transgression terrestrial surface is from a burnt flint spread, charcoal from which gave a radiocarbon date of 3885±70 BP (Ox-A 2297, 2570–2140 cal BC). In short, the terrestrial surface at the Stumble was exposed sub-aerially between the late glacial and the late Neolithic periods (Figs 7.1 and 7.2).

Neolithic valley-floor settlement has been obscured by the late Holocene estuarine clays and silts which form a protective sediment cover over the earlier prehistoric land surface and palaeosol. Through occasional breaks in this cover we can see a well-preserved former dryland surface. Exposures of this type resulted in the original discovery of the Stumble (BL 28), Rolls Farm (BL 18) and other Neolithic sites around the Essex coast (Wilkinson and Murphy 1995, 71–128). However, even at this broad level interpretation of this landscape unit is not simple, and at the Stumble exposure and preservation varied from area to area — some locations were slightly eroded areas, some exhibited virtually intact land surfaces (for example, in Area C), while in others (such as Area B) the pre-transgression surface remains obscured below a variable thickness of estuarine sediments. At the Stumble we are therefore dealing with chance exposure of prehistoric land surfaces which featured widespread remains of significant settlement. Finally, in some parts of the coast (although not at the Stumble) the old land surface has been heavily eroded down to the subsoil B, or even C, horizons which had developed on Head or London Clay.

The intertidal zone is dynamic. Recent fieldwork carried out 15–20 years after the original investigations at the Stumble has shown that, whilst the exposures of land surface originally recorded are still intact, other exposures are taking place further to the west in the zone where the Iron Age and later wooden structures had formerly been recorded (Heppell 2006). Whilst the deposits at the Stumble are clearly extensive, such fortunate circumstances in terms of Neolithic site preservation prevail only in three or four places along the Blackwater estuary (Wilkinson and Murphy 1995, 71–98). In the 1980s, when the original fieldwork took place, it was assumed that numerous similar Neolithic sites remained to be discovered in the intertidal zone of east and south-east England. However, results from the English Heritage *Rapid Coastal Zone Assessment Surveys* in adjacent counties have shown that this is not so. In Suffolk and Norfolk no comparable sites were detected (Everett *et al.* 2003; Robertson *et al.* 2005). A single Neolithic flint and ceramic scatter has been reported from North Kent at Hoo Flats (Wessex Archaeology 2005), and when further investigated this latter site could well prove to be comparable to those in Essex. Nevertheless, it is now plain that, far from being typical of the east and south-east of England, the extensive near-horizontal exposures of prehistoric land surface at the Stumble and other sites on the Essex coast result from the fortunate coincidence of a very specific set of variables. These include the subdued topography of the pre-transgression land surface, wide tidal ranges, extensive erosion and generally thin sediment cover. This means that the Essex sites actually represent a much rarer category of accessible site than has generally been appreciated to date, and accordingly are even more important for Neolithic settlement studies than was previously realised.

In contrast to the intertidal zone, the Blackwater terraces comprise a different kind of patchwork, in this case primarily consisting of a heavily eroded land surface on silty gravel and brickearth over Pleistocene gravel, which taken together represent successive phases of Pleistocene incision and aggradation on the subjacent London Clay. As a result of millennia of ploughing the upper parts of archaeological features have been planed off, so that some features have been removed entirely and their artefacts mixed with the ploughsoil, whereas only the bases of others survive. Furthermore the feature fills have been subjected to processes of bioturbation by soil fauna and roots, while numerous wetting and drying cycles have destroyed an unknown proportion of the charred plant remains and charcoal originally present. These processes of weathering seems to have operated progressively over time, with older assemblages suffering greater adverse effects. On the gravel terraces, charred plant macrofossil assemblages of the later Bronze Age are reasonably well preserved whilst those of Early Neolithic date are in poor condition (Murphy 1988). By contrast, at the Stumble most of the Neolithic plant remains are exceptionally well preserved and the relatively small-scale investigations have provided the largest Neolithic charred macrofossil assemblages yet gathered from the East of England. By comparing assemblages from nearby intertidal and dryland sites we can, at least to some degree, improve our understanding of relative levels of preservation on different sites.

Holgate (above, p.69–70) notes that the flint exploited both in the Mesolithic and in the Neolithic periods at the Stumble is similar, and it is also similar to that recovered from Rolls Farm. He also notes dissimilarity between the flint at these intertidal sites and that from sites on the adjacent gravel terraces, and suggests that the flint used at the latter was derived from different sources. However, the gravel terrace sites and those currently within the intertidal zone are in close geographical proximity. Furthermore, in every case the raw material is identified as having been derived from the local gravel terrace deposits (*e.g*. Holgate, p.62 above; 1988a; 1998). It is possible that the similarity in appearance displayed by material from the intertidal sites and the different appearance of material from terrace sites close by might reflect post-depositional changes. The flint from the terrace sites would have been subjected to the same processes of bioturbation and chemical and physical weathering that resulted in destruction of most charred plant material, and in the deposition of ferrimanganiferous concretions on much of the pottery, whereas the flint from the intertidal zone sites would have lain in wet but stable conditions.

Understanding contrasts of this kind may therefore contribute to a more general understanding of the implications of differential preservation. Charred plant remains recovered elsewhere in the world often show stark contrasts between those from 'protected' environments and those subjected to long-term processes of attrition (*e.g*. the interior *versus* the exterior of Franchthi Cave in Greece: Hansen 1991). As the sites on the terraces have been subjected to a much longer period of sub-aerial exposure than those in estuarine locations (including in some cases continuous settlement, funerary and agricultural activity up to the present day) shallow features have not survived, deeper ones have been truncated, and artefacts and ecofacts within surviving feature fills have been modified or degraded. In the estuarine zone, however, these particular destructive processes effectively terminated in the Late Neolithic or Early Bronze Age when the area was inundated by rising relative sea level. Although there has been activity in the area of the Stumble since that time there is evidence that, until comparatively recently, sediment cover over the Neolithic surface and feature fills (above, Part 6) physically protected the archaeological evidence for this period and provided a stable and undisturbed depositional environment.

In summary, we are comparing a locally very well-preserved site record in the intertidal zone with a more extensive and evenly distributed — although heavily eroded, weathered and potentially mixed — record from the adjacent dryland areas. It is essential to allow for these differences when comparing the archaeological results from the two areas, and attempting an integrated interpretation. Moreover, the evidence from the Stumble, Rolls Farm and other sites in the estuarine zone suggest that the circumstances of preservation are crucial to the recovery and interpretation not only of building plans (Darvill 1996, 80–2) but also of the evidence of food plants and everyday activities. Unfortunately the limited scale of the excavations at the Stumble made the interpretation of full building plans difficult and the practicalities of excavation in an intertidal environment meant that, without very substantial resources, it was not practicable to open up larger areas.

II. The Stumble in the context of changing sea-level

As was evident during the Hullbridge survey, the site of the Stumble was situated on a dry-land surface (Wilkinson and Murphy 1995, 76–81). While precision is impossible, it appears that sea level may have lain *c*. 4.0–5.0m below Ordnance Datum during the Early/Middle Neolithic. Accordingly, the Stumble site may have lain *c.* 3.5–4.0m above the contemporary high water mark and *c.* 1km from the contemporary shoreline. Analysis of soil micromorphology by Macphail (above, p.20–2) demonstrated that the water table was probably low during the site's occupation, and that the site was truly terrestrial when it was occupied. Later, however, presumably during the Thames III transgression, flooding by brackish water resulted in the movement of soil downprofile. Despite the construction of a number of refined sea-level curves over the last decade or so, owing to the numerous local factors that influence sea-level change it is still impossible to reconstruct accurately the Neolithic coastline in the vicinity of the Stumble. Nevertheless, the site appears to have been occupied during a phase of stabilising sea level which might perhaps be comparable to the late Wash IV transgression and the Fenland IV regression (Long and Roberts 1997, fig. 10), the latter part of which corresponds to the Tilbury III regression of the Thames estuary (Devoy 1980).

III. Mesolithic occupation

Mesolithic flintwork recovered from the Stumble appears to belong largely to the later Mesolithic. It has been interpreted as resulting from hunting and gathering activities in a wooded environment, representing a short-stay woodland resource exploitation camp which might have been occupied episodically over a number of years (Holgate, above p.69). In terms of their cultural features and artefact densities, the Mesolithic sites of the Essex estuaries exhibit relatively dense scatters of lithics over a buried land surface but little else. Dug or abraded features are absent, as are cultural deposits and charred plant remains. Because of the sheer quantity of artefacts at the Stumble, the Neolithic occupation effectively masks that of the Mesolithic, but there is little to show that the Mesolithic occupation here differs from that at other Mesolithic sites of the Essex estuaries such as at Hullbridge, or Maylandsea (Crouch Site 4 and Blackwater Site 3 estuaries respectively; Wilkinson and Murphy 1995, 62–70 and 105–116).

The environmental setting of the Mesolithic occupations must have differed somewhat from that of the Neolithic settlement that followed. Whereas any occupation of this now-estuarine tract during the earlier phases of the Mesolithic was probably in a forested setting some distance inland from the sea, by the Late Mesolithic a saltwater environment may have penetrated fairly close to the sites, as has been suggested for many Mesolithic sites of southern Scandinavia. This brought varied saltmarsh and estuarine environments, together with their associated valuable resources, to the Stumble region (Wilkinson and Murphy 1995, fig. 126; Rowley-Conwy 2001). The later Mesolithic date for the first recorded occupation at the Stumble may therefore be related to the changing ecological environments that resulted from the encroachment of estuarine conditions into formerly freshwater riverine environments. The predominance of Late Mesolithic flint forms at the Stumble also distinguishes it from the aforementioned Hullbridge and Maylandsea sites, where lithic assemblages included both earlier and later Mesolithic forms (Healey 1995, 123–4).

IV. The Stumble and earlier Neolithic settlement around the Blackwater estuary

In much of south and eastern England, Neolithic habitation sites have been elusive and building plans seldom recorded. Although Neolithic settlements have been suggested as consisting of family farmsteads, or of small sedentary settlements, the evidence for these has been rather scarce. Two papers on this topic highlight differences in perceptions here. On one hand Darvill (1996) suggests that ground plans of Neolithic buildings have been more common on archaeological sites than has often been suspected, but that they have seldom been recognised. By contrast, Thomas (1996, 3) argues that the very existence of the Neolithic house or of sedentary farmsteads in Britain should not be assumed, but instead that their advocates should be required to find evidence for sites of this kind. Certainly there is a strong contrast between the well-known 'standard' house plans of later prehistory and the kind of evidence usually recovered from Neolithic settlement sites in England. The Stumble is potentially important here because it offers the kind of stratigraphic preservation that could allow the recovery of ground plans of structures, together with preserved floors and midden remains. There are few dryland sites from mainland Britain that compare with the Stumble in terms of quality of preservation, although the situation in Ireland appears to have been different. As well as remains of a timber structure, the site at Ballygalley in Ulster produced a large assemblage of flint tools and pottery, as well as identifiable plant remains (Simpson 1996), while elsewhere in Ireland Neolithic houses seem fairly commonplace (Cooney 2000, 52–85; Grogan 2004). By contrast, in south and east England large house structures such as that recently revealed beneath 4m of colluvium at White Horse Stone, Kent (Oxford Archaeology Unit 2000) and smaller but still substantial buildings or building at Chigborough Farm on the terrace close to the Stumble (Wallis and Waughman 1998) appear exceptional. Because the excavated areas at the Stumble were so small, the site is less informative in terms of the ground plans of built structures than many conventional dryland Neolithic sites. What it loses in terms of building layouts, however, it makes up for with contextual information as well as indirect evidence of various activities.

Changing patterns of occupation can be identified at The Stumble. Features are rather slight in Areas A/B and E (rarely being over 0.2m deep) but are more substantial in Area C, where features up to 0.5m deep were recorded. Thus, while a number of structure plans can be suggested for area A/B/E (Fig. 2.13), all are somewhat conjectural. In contrast to dryland sites such as Chigborough Farm (Wallis and Waughman 1998) there is little doubt concerning the date of the features themselves: all must have been in use during the Neolithic, most probably within the earlier Neolithic. It may well be that the Essex coast, like that of the Netherlands, was characterised by an Early/Middle Neolithic 'small house' tradition that was associated with semi-sedentary occupation rather than fully sedentary agricultural communities (Kouijmans 1993, 78, fig. 6.11). It must be emphasised, however, that the large quantity of artefacts and features would appear to favour sedentary settlement.

Unfortunately it is very likely that many built structures at the Stumble extended beyond the limits of the small excavated areas, thus making it difficult to interpret the features that were exposed. This problem is exacerbated by the likelihood that in both Areas A/B/E and C the works recorded a palimpsest of buildings, rather than a single structure. This is even the case for Phase I, which embraces all the earliest structures cut into the old land surface. Although some of the ground plans on Fig. 2.13 look plausible on paper, none can be compared realistically with (for example) most of those in Darvill 1996, figs 6.4–6.10. Furthermore, if only the deeper and more 'convincing' post-holes are considered, (that is, those that might be expected to have accommodated structural load-bearing elements), these plans make even less sense. Nevertheless, the hollowed areas thought to result from repeated trampling do provide convincing evidence that prolonged human activity had resulted in the wearing down of the ground surface during occupation, and these were in fact interpreted as such during excavation. Unfortunately, these worn areas cannot be convincingly related to the reconstructed structures. Although it was not therefore possible to recognize any

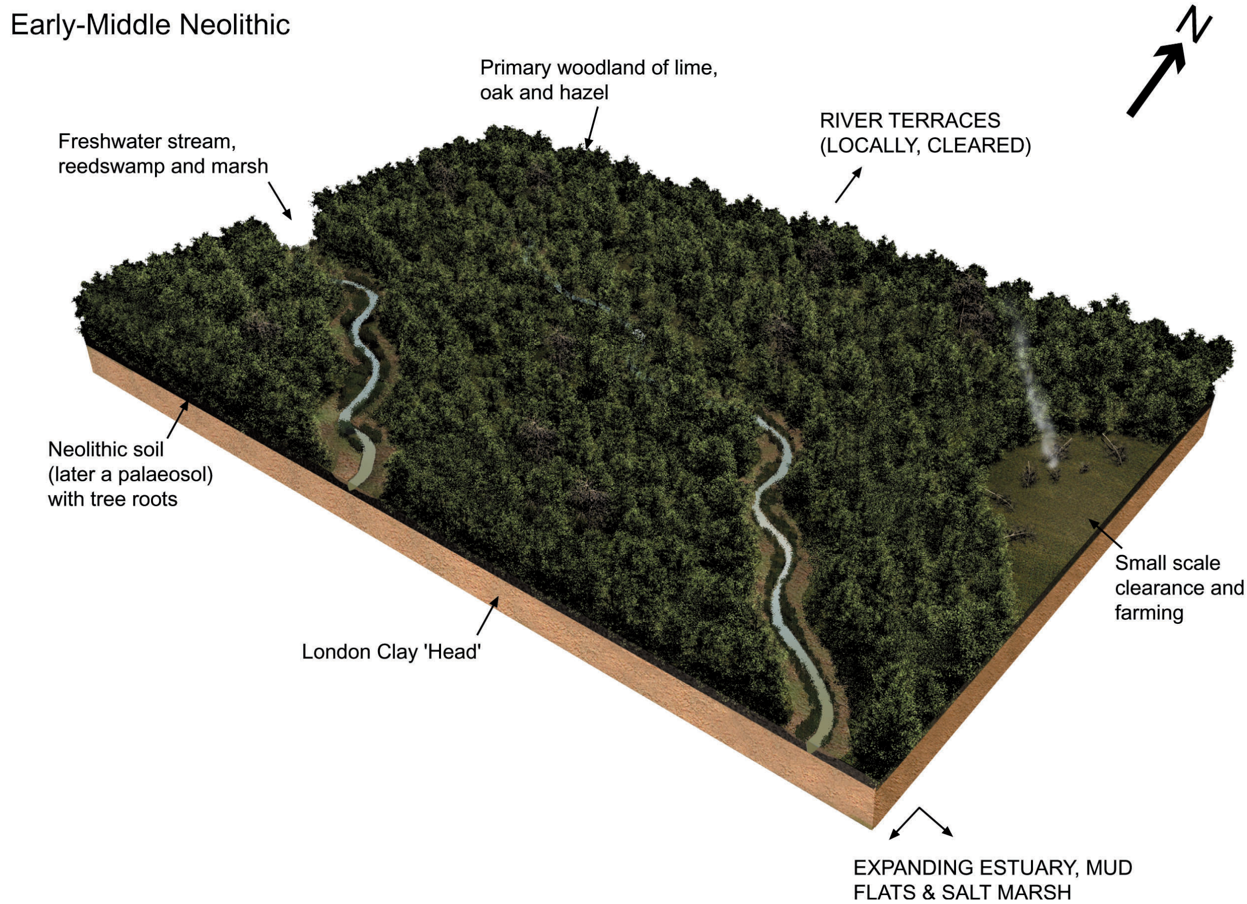


Figure 7.1 3D computer sketch of the landscape at the Stumble in the Early–Middle Neolithic

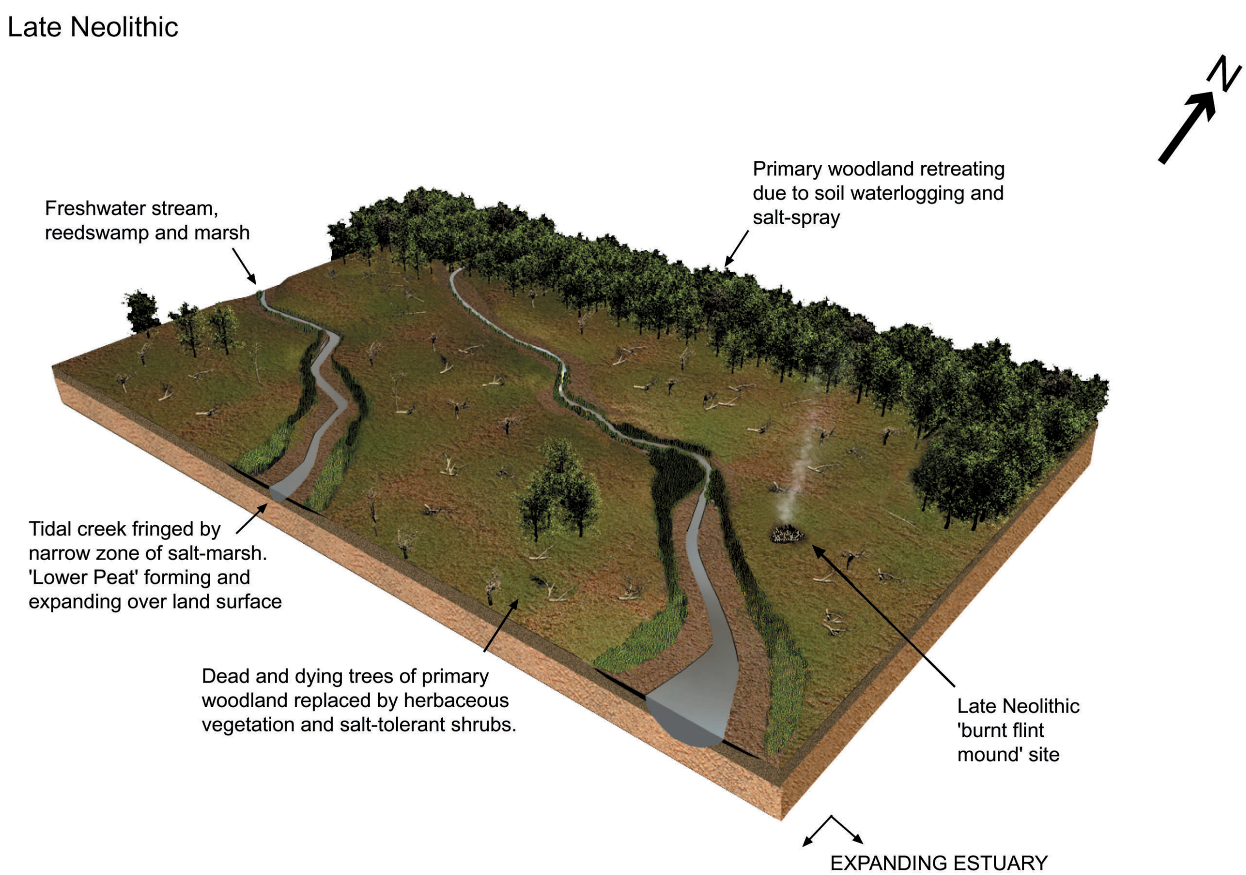


Figure 7.2 3D computer sketch of the landscape at the Stumble in the Late Neolithic

Iron Age to Early Medieval

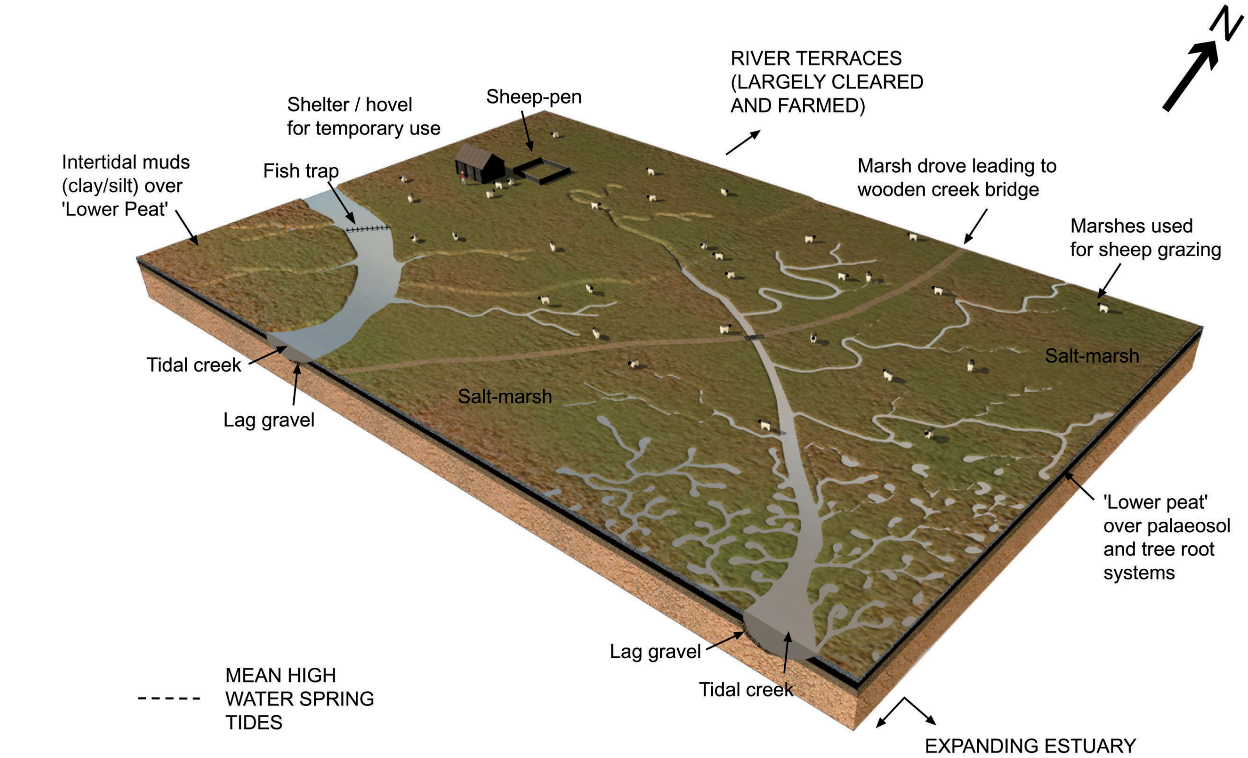


Figure 7.3 3D computer sketch of the landscape at the Stumble in the Iron Age to early medieval periods

1985 AD

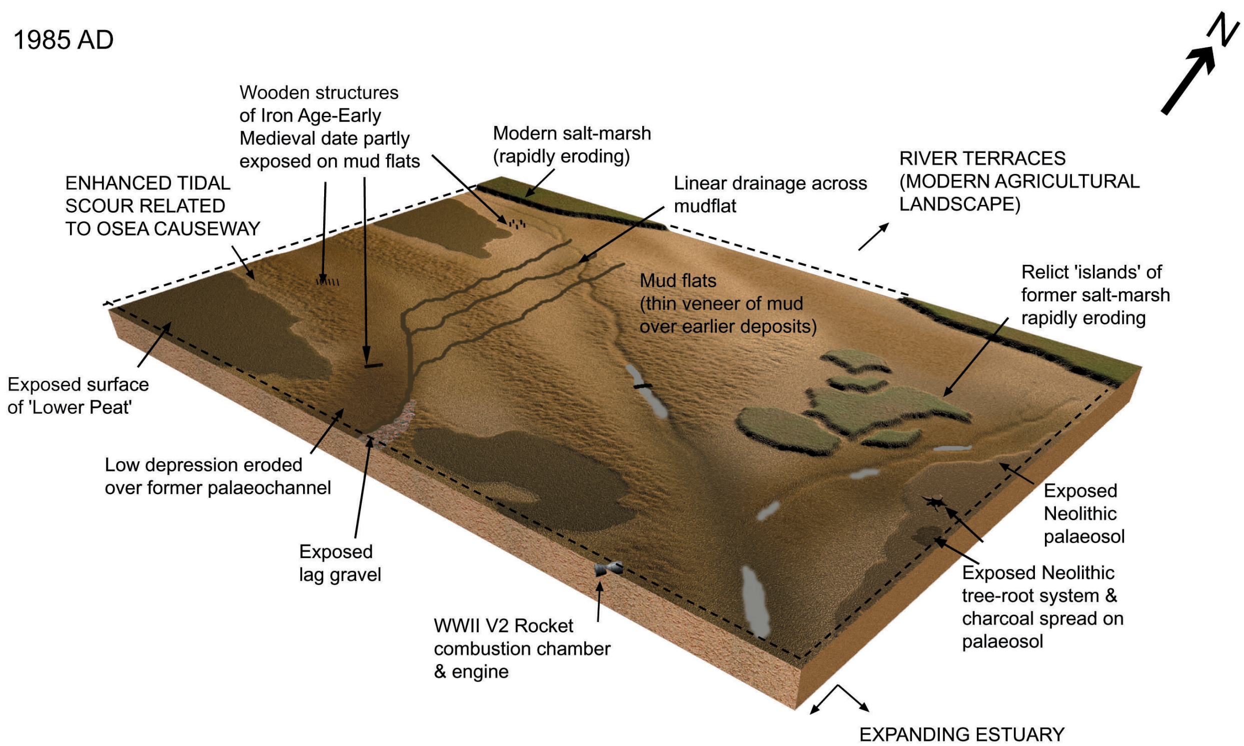


Figure 7.4 3D computer sketch of the landscape at the Stumble AD 1985

major built structures, it is likely that larger excavations on the Neolithic land surface at the Stumble would have revealed such buildings.

In Area C the dense scatter of features is even harder to interpret than in Area A/B/E, although some of the deeper features appear to have represented wall slots superficially similar, at least, to those noted at a number of Irish sites. In sum, the features provide a wide range of cultural contexts — shallow features possibly created by trampling (*e.g. 277* or *314*), genuine post-holes (*269*, *308*), possible post-slots (*273*/*275* or *282*/*284*), and a number of indeterminate features that were probably animal burrows. One interpretation of the feature group as a whole is that it represents the traces of a palimpsest of built structures over which a midden had accumulated. Although the form of any structures here remains elusive, we can however derive from such patterns an idea of the density of use through time as well as the possible functions of the area. In terms of the quantity, and perhaps also the status, of discarded material, Area C appears to represent the nucleus of the site, with lower densities of occupation extending northward from that area into Area A/B/E. The space between the two excavation areas was partly obscured by estuarine alluvium, as well as by a post-Neolithic fluvially-incised gully which had subsequently become infilled with estuarine silt/clay.

When finds from the different areas are compared in terms of key indicators such as sherd abrasion, pot:flint ratios *etc*., it is evident that there are significant qualitative differences between them which are suggestive either of different functions or of different histories of use. For example Area C produced the largest sherds, the most decorated pottery, the largest quantity of sherds and the highest pot:flint ratio. Indeed, it would appear the richest part of the site in terms of artefacts. Areas A/B/E and C produced similar assemblages of charred plant remains, although the range of species varied somewhat. The excavated areas appear to have a similar percentage of abraded to fresh pottery, although Area C produced a smaller percentage of abraded sherds from within features. This suggests that these features may have contained a higher proportion of primary rubbish, which had accumulated within them before sherds could become abraded by trampling. However the observation that sherds from the overlying layers join with others from the pits suggests that at least some of the pit fill was essentially the same material as that in the overlying deposit. Certainly the quantity of material that accumulated on the surface is suggestive of a midden, an observation supported by the possible presence of charred animal dung in Area C. Such remains are to be expected in a midden that has received the sweepings of hearths that have been fired by dung fuel (Miller and Smart 1984).

Further to the west in Area D the main phase of activity belongs to the Late Neolithic (below, p.143); however, the presence of earlier Neolithic flintwork indicates some contemporary activity. Between these two areas the results of the 'bin' survey, combined with *ad hoc* surface observations, suggested that the scatter of Early Neolithic pottery and flints was limited to the areas around Areas A/B/E and F, on the one hand, and Area C on the other (Fig. 2.1). Charred remains of cereals show a similar distribution, but were perhaps spread a little further to the west of the main occupation area. This might suggest that they relate to crop-processing on the edge of the site, a situation which is characteristic of traditional villages in the Middle East today. On the other hand, charred hazel nutshells, sloe stones and significant amounts of charcoal are distributed rather more widely, and as might be expected, are also present near Area D. However, the area of prehistoric land surface exposed at the Stumble had been occupied at least since the Mesolithic, and it is highly likely that residual charred macrofossils of woodland plants of various periods — some quite unrelated to settlement activity — would have been present in 'bin' samples collected from outside the excavated areas. The significance of charred macrofossil densities from submerged prehistoric palaeosols has been considered in more detail elsewhere (Murphy 1994).

Altogether the charred plant remains suggest general site activity over an area of a little more than 1ha, whereas the pottery and flint scatter from both bins and sample areas suggests a rather smaller area of concentrated activity and discard. This amounts to perhaps 0.2ha at a minimal, conservative estimate, or around 0.8ha if allowance is made for areas that might remain buried beneath the estuarine clay.

Fieldwork over the last twenty years in and around what is now the Blackwater estuary has shown that occupation at the Stumble is a component part of a wider Neolithic landscape (reviewed in Bayliss *et al.* 2008). When considering sites within this landscape, at first glance the sheer scale of the artefact assemblages present at the Stumble might be taken to indicate an intensity of settlement greater than that represented by the pit scatters on the adjacent terraces. However, had the Stumble been subject to the post-occupational erosion and degradation of the kind that has taken place on the terrace sites the palaeosol, surface midden-type deposits and upper levels of cut features would all have been lost, together with perhaps 90% of the artefact assemblages. All that would have survived would have been rather slight-looking features cut into the subsoil, and the quantities of artefacts derived from them would have been broadly similar to those recovered from sites on the gravel terrace.

The Stumble and other sites now in the intertidal zone, including Rolls Farm, a small site on Northey Island and Blackwater Site 10, on Goldhanger Creek, (Wilkinson and Murphy 1995, 71–87), represent the valley-bottom component of a wider settlement pattern. On higher ground excavations have revealed settlement at Chigborough Farm and Slough House Farm (Wallis and Waughman 1998), Lofts Farm (Brown 1988) Elms Farm (Atkinson and Preston 2001) and Heybridge Basin (Brown and Adkins 1988). In addition to these settlement sites there are two mortuary enclosures: the excavated example at Slough House Farm (Wallis and Waughman 1998) and a crop-mark at Tollesbury (Ingle and Saunders 2011). Together this group of sites (as well as any that might be sealed beneath the saltmarsh) suggest that the area was fairly densely populated. While these sites could be interpreted as representative of a kind of shifting settlement pattern, of the cyclical and sporadic sort that Thomas (1996, 12) has proposed, the scale and intensity of occupation at the Stumble may equally represent a more permanent year-round occupation.

While there is now significant evidence for later Bronze Age agricultural landscapes delineated by linear features — whether for cultivation or pasture — on the terraces (below, p.144), these observations contrast with the complete absence of evidence for any physical landscape subdivision during the Neolithic within what is now the inter-tidal zone. When taken alongside the evidence from charred plant macrofossils (indicating a plant economy based on both cultivated crops and woodland resources), and the palynological evidence for lime-dominated woodland at the site (Scaife, Part 6), it seems probable that cultivated areas were confined to woodland clearings. Temporary or permanent woodland clearance for cultivation may help to explain the frequent presence of charcoal scatters at other sites around the estuary, as well as at the Stumble (above, p.88; Wilkinson and Murphy 1995, 86–7). In short, there is no evidence for any kind of formal landscape sub-division — this would appear to contrast markedly with the situation in Ireland, for example, where distinctive and large-scale Neolithic field systems have become almost common finds (Cooney 2000, 33). Here in Essex, this Neolithic landscape of woodland clearances also contrasts with the (at least partially) enclosed landscapes of the Late Bronze and Iron Ages. Indeed, the Neolithic charred plant remains suggest an economy sharing many traits with that of the Mesolithic, conforming with what Kouijmans (1993, 78) described as a semi-agrarian economy. Alternatively, the plant remains could fit within one of the two phases of the Mesolithic/Neolithic transition defined by Zvelebil and Rowley-Conwy (1984) as either the 'substititution phase' (in which agriculture provided 5–50% of the diet) or the 'consolidation phase' (when it supplied > 50% of the diet). Although the plant remains would appear to indicate a genuinely mixed economy with hazel nuts, fruit (sloe) and cereal remains occurring in similar amounts, differential preservation and charring of hazel nutshells might have resulted in preservation biases. Not only are the latter more robust than cereal grains and therefore likely to be better preserved, but also they may have been re-used as kindling for fires, thereby enhancing their preservation and recovery (Rowley-Conwy 2004, Supplementary volume 89). However one interprets these results, it is evident that cereals supplied a significant amount of the plant remains, and they were distributed widely across the site (above, Part 5).

The charred plant remains, including the charcoal scatters, from the Blackwater estuary provide some evidence for the deliberate burning of Neolithic woodland, and may suggest a shifting pattern of cultivation. Perhaps any cyclical or semi-sedentary settlement pattern represents a development of the practices operated by local people during the Mesolithic. This might explain the palimpsest of post-holes that was noted in both Areas A/B/E and Area C at the Stumble. The plans of the putative structures at the Stumble (Fig. 2.13) are similar to those recorded at Barleycroft Farm, Cambridgeshire (Evans *et al.* 1999; Evans and Knight 2000), which were interpreted as representing cyclical occupation in a largely wooded landscape. Such a process at the Stumble might also explain the variation in ceramics between Areas A/B/E and Area C (above, p.49). The plain assemblage from Areas A/B/E, which is reminiscent of that from Broome Heath (Wainwright 1972), might be taken to represent earlier occupation; the pottery from Area C, which was reminiscent in decorative terms of the pottery from Hurst Fen (Longworth 1960), might have represented a somewhat later reoccupation. The process of deposition of the ceramics indicated by the joining sherds in Area C (above, p.45–6, 55) may represent a 'closure' of a particular phase of occupation of the kind noted by Healy (1988, 108) and Evans *et al.* (1999, 249). The suggestion (above, p.57) that some of the pottery had been deliberately selected acts as a reminder that ritual behaviour may have structured the daily lives of the inhabitants, and also have influenced the nature of the archaeological record (Bradley 2005).

In general terms, the interpretation of the earlier Neolithic at the Stumble which is outlined above is broadly similar to that suggested for this period in the Wash fenlands (Hall and Coles 1994, 45–7). On present evidence it seems that more permanent structures — such as the long mortuary enclosure and the substantial timber building or buildings at Chigborough Farm (Wallis and Waughman 1998) — were not constructed in the valley-bottom locations now within the intertidal zone, but on slightly higher ground. In the Blackwater/Chelmer river system, major monuments such as the causewayed enclosure and cursus at Springfield were constructed some distance upstream. An interpretation of how the diverse sites and varied topography seen within these river systems might have been integrated within a single prehistoric social system has been outlined elsewhere (Brown 1997).

At a more general level, the Stumble emphasises recent results from the analysis of carbon and nitrogen isotopes which suggest that there was a rapid transition from marine to terrestrial resources at the end of the Mesolithic (Schulting and Richards 2002). Here the Stumble, as an estuarine site dated to just after the Mesolithic/Neolithic transition, shows how significant terrestrial and grain resources had become (although here we must caution that the record may be biased because of the lack of survival of marine shells and fishbones). The results from The Stumble support Rowley-Conwy's objection to the prevailing consensus that cereal agriculture was of limited importance in the British Neolithic (Rowley-Conwy 2004).

V. The Stumble and later Neolithic/ earlier Bronze Age settlement around the Blackwater Estuary

Some 80m west of Area C the old ground surface was again recognizable in Area D, where an area of burnt flint mounds and later Neolithic activity was evident. Area D is clearly different from Areas A/B/E and C on account of its abundant burnt flint, predominantly Late Neolithic pottery, high abrasion of sherds and low pot: flint ratios, although the recovery of earlier Neolithic flints from the area is also indicative of earlier activity. Indeed, the absence of charred cereal macrofossils but relatively abundant remains of hazelnuts and crab apple reinforce this contrast. Area D therefore can be argued to be an activity area which appears to have been peripheral to the main areas of Late Neolithic settlement and was characterised by relatively dispersed scatters of material, especially flint and relatively abraded pottery. It appears to have been unrelated to cereal processing or consumption, but woodland foodstuffs were being processed or consumed there.

Nevertheless the presence of emmer grains radiocarbon dated to the late Neolithic in Areas A/B/E indicates that even though cereals appeared absent from Area D, there was no cessation of cereal use at the site in the later Neolithic. Nor was later Neolithic activity confined to Area D — in fact, the ceramic evidence indicates widespread, if not particularly intense, activity across the Stumble over quite a long period of time. A few sherds of Peterborough Ware, which may be of late 4th or early 3rd millennium BC date (Gibson and Kinnes 1997), were recovered from Areas D, F and J, with a single sherd from the surface of Area A. As well as in Area D, Grooved Ware was also recovered from Area G. Recent recording work has also recovered Grooved Ware and a sherd of what appears to be a globular urn of Middle Bronze Age date (Heppell 2006). A local boatman has also collected later Neolithic or earlier Bronze Age pottery from the western part of the Stumble, together with a fine polished discoidal knife of Later Neolithic date (Heppell 2006; Martingell and Larner 2006).

During this period relative sea-level was rising. However, the Stumble seems to have continued to be exploited as a semi-terrestrial (and initially well-wooded) location throughout the early Neolithic and into the early Bronze Age. We can envisage a landward-migrating zone of paludification resulting from rising groundwater levels in advance of marine inundation, with an associated zone of dead and dying trees. This would have been an untidy 'transitional' landscape where the nature of human activity was clearly rather different from that of the early Neolithic, having taken on more specialised functions.

On our present knowledge of the Late Neolithic and Early Bronze Age material recovered from the site it appears that the Stumble ceased to be exploited as a terrestrial location in the centuries immediately after *c.* 2000 BC. By this time, rising relative sea-level meant that the Stumble had become incorporated into the intertidal zone of the Blackwater estuary. The recent recovery of the single sherd of Globular Urn may indicate a slightly later date, towards the middle of the 2nd millennium BC, but the context of deposition of this sherd is uncertain and its significance is, at present, hard to assess.

A distinct zone of ring-ditches, mostly constructed during this period, is evident across the northern terraces of the Blackwater estuary (Wallis and Waughman 1998, fig. 132; Ingle and Saunders 2011). Whilst many of these ring-ditches are likely to be of Early or Middle Bronze Age date, some may well be earlier: a large early Neolithic ring-ditch has been excavated at Brightlingsea, 25km east of the Stumble on the Tendring Plateau (Clarke and Lavender 2008). A crop-mark of a segmented ring-ditch at Langford might also be of Neolithic date. Two excavated ring-ditches, also at Langford, appear to have originated in the later Neolithic and provided focal points for burial and other ritual activity, at least periodically, into the Middle Bronze Age (Roy and Heppell forthcoming). In general terms, Early Bronze Age settlement has proved even more elusive for archaeologists than early Neolithic settlement (Gibson 1993); nonetheless almost all of the sites noted above (p.139) as having produced indications of Early Neolithic occupation also yielded evidence of later Neolithic or earlier Bronze Age occupation. This often comprises pottery and flint recovered from shallow pits, but in many instances appears to involve a long-lived focal point (or points) associated with ritual and burial. In addition to the ring-ditches at Langford noted above, a ring-ditch at Elms Farm associated with Deverel-Rimbury ceramics served as a focus for cremation burials. This had been constructed *c.* 6m to the east of a large pit, possibly for an inhumation burial, into which a complete beaker had been inserted. Elsewhere at Elms Farm there is evidence of repeated deposition of Beaker material (Atkinson and Preston 2001), and similar evidence has been recorded at the immediately adjacent Langford Road site (Langton and Holbrook 1997). At Slough House Farm, a Beaker seems to have been a late deposit in one of the features defining the mortuary enclosure and a ring-ditch was constructed 10m from the enclosure's south-east corner, with another 300m to the west. Both were associated with Deverel-Rimbury ceramics (Wallis and Waughman 1998). At Lofts Farm a double-ditched ring-ditch had a central cremation burial of Early Bronze Age date (Brown 1988).

It seems that in the centuries after 2000 BC particular locations were selected for repeated acts of deposition and burial. These activities often involved, at some point, the digging and subsequent modification of ring-ditches, many of which would presumably once have enclosed barrow mounds. It may well be that this process was associated in part with changed patterns of land-use, land-holding and the establishment of land boundaries. The relationship between ring-ditches, other monuments and land boundaries has already been explored, largely on the basis of crop-mark evidence in the Stour valley to the north (Brown *et al.* 2002) and more locally in the Langford area (Ingle and Saunders 2011). The loss of land due to inundation associated with the Thames III transgression must have placed pressure on available resources, assuming that there was no reduction in population densities. There is no evidence to suggest that this was a rapid process, however, so there would have been time for adaptation. In time, this resulted in not only the abandonment of former land areas at low elevations around the estuary, but also the adoption of a new pattern of settlement on the adjacent terraced areas. The situation in the Blackwater Estuary appears similar to that found along the Dutch coast, where the freshwater tidal and peat districts were also deserted in Late Beaker times and were not resettled until the Early Iron Age (Kooijmans 1993, 77). In Essex a changed pattern of life could have been associated with sparser traces of settlement and a new pattern of burial and land holding.

VI. The Stumble and settlement around the Blackwater estuary in the 1st millennium BC and 1st millennium AD

On the river terrace gravels an agricultural landscape defined by rectilinear land divisions, and apparently associated principally with livestock management, developed during the first half of the 1st millennium BC (Brown 1988; Wallis and Waughman 1998). This process seems to have begun during the Middle Bronze Age in the later part of the 2nd millennium BC, and developed through the Late Bronze Age and Early Iron Age (Wallis and Waughman 1998, 104). Wells become a common feature of sites on the terraces at this time, with both Middle and Late Bronze Age examples known from a variety of sites including Rook Hall (Adkins *et al.* 1984–5), Lofts Farm (Brown 1988), Heybridge Basin (Brown and Adkins 1988) and Chigborough Farm (Wallis and Waughman

1998). The wells in themselves may be indicative of an emphasis on grazing: cattle, in particular, would have required a large and regular water supply. Environmental data from Lofts Farm (Murphy 1988) and Chigborough/ Slough House Farms (Wiltshire and Murphy 1998) indicate a later Bronze Age landscape of open damp grassland, but with areas of mixed oak woodland in the catchment, some indication of either hedges or woodland-fringe vegetation and some pollen and macrofossils of cereals.

During the later Bronze Age and continuing into the earlier Iron Age, there is evidence for an increase in estuary-edge activities in the form of various wooden and brushwood structures — first in the vicinity of Rolls Farm, where they are radiocarbon dated to the Bronze Age, and then in the Iron Age at the Stumble itself. These were recorded during the Hullbridge Survey (Wilkinson and Murphy 1995), and more recently during monitoring survey at Rolls Farm (Heppell and Brown 2008). A number of these structures were short lengths of hurdle, which had been laid flat across what appear to have been small creeks within former saltmarsh but which were found exposed on an eroded mudflat surface. By analogy with medieval practice, these have been interpreted as the foundations of sheep bridges (wattle providing the foundation over which turves were laid) which facilitated use of the open saltmarsh as pasture, providing stock with access to (and, when necessary, escape from) the marsh. It might be suggested that the late prehistoric saltmarsh at Rolls Farm, being further out in the estuary, was more dissected by such creeks, and became low saltmarsh at an earlier date. At the Stumble, further up the estuary, these measures did not become necessary until a later date. Other late prehistoric wooden structures at the site defy definitive interpretation, although they may have been simple fish traps and/or small landing stages. Whatever specific functions they served, they indicate an interest in estuary-edge activity.

Later Iron Age and Roman field systems and enclosures are widespread around the head of the Blackwater estuary and across the terraces north of the estuary (*e.g*. Brown 1988, Wallis and Waughman 1998), and a Romano-British small town developed at Elms Farm, just west of modern Heybridge (Atkinson and Preston 1998). To the south of the estuary the remarkable rectilinear pattern of fields and roads in the Dengie peninsula may, at least in part, be of Iron Age or Roman date (Rackham 1986, Rippon 1991). Environmental data from Slough House Farm and Chigborough Farm provides increased evidence of crop husbandry, with much less woodland than in the Bronze Age and evidence of still-extensive pasture with indications of increased pressure on the grazing land (Wiltshire and Murphy 1998). Woodland seems to have been somewhat more common at Slough House Farm, slightly farther away from the estuary than Chigborough Farm; the latter site may have experienced greater pressure on grazing. Continued activity along the edge of the present saltmarsh was represented by wooden structures at the Stumble, while salt production is demonstrated by the nearby Red Hills, a number of which are found along the northern edge of the Stumble mudflat. Indeed there is a dense concentration of Red Hills around the Blackwater estuary, and salt production was clearly a major activity around the inland tidal limit (Fawn *et al.* 1990; Murphy and Brown 1999). The main phase of salt production at these sites belongs to the early Roman period, although they have their origins in the Late Iron Age and recent work in advance of managed realignment of the coastal defences at Tollesbury might suggest an origin in the Middle Iron Age (Germany 2004). The Colne estuary and Mersea island, in the southern hinterland of the major town at Colchester, seems to have been a focus of Roman settlement (Drury and Rodwell 1980, Strachan 1998). In the late Roman period a Saxon shore fort, identified as *Othona*, was established at Bradwell at the mouth of the Blackwater (Drury and Rodwell 1980, Going 1996, Murphy and Brown 1999).

At the Stumble, wood from small structure *98*, perhaps a collapsed hut, has yielded a Late Saxon radiocarbon date and Saxon pottery (Part 6 above; Wilkinson and Murphy 1995, 205, table 18). This appears to represent domestic activity or salt production on the saltmarsh adjacent to the Blackwater estuary when it was a major focus of settlement during the Saxon period (Murphy and Brown 1999). To the north-east lay the royal vill at Brightlingsea (Rippon 1996) and important estates on Mersea (Crummy 1982). Timbers supporting the Strood causeway which links Mersea to the mainland have been dated to the Middle Saxon period (Crummy *et al.* 1982). St Peter's chapel at Bradwell represents the remains of a monastery established within the Roman fort (Rippon 1996, Murphy and Brown 1999). Settlement is known from Chigborough Farm, with evidence of substantial Middle Saxon ironworking at Rook Hall and Slough House Farm (Wallis and Waughman 1998). A town developed around a burgh established by Edward the Elder at Maldon, and of course the Battle of Maldon (AD 991) is the subject of one of the finest surviving Anglo-Saxon poems (Cooper 1993). Within the intertidal zone of the Blackwater estuary itself a series of massive timber fish traps are known, several of which have been radiocarbon dated to the middle or late Saxon periods (Strachan 1998). The largest of these is an enormous complex of timbers extending across 2km of mudflats around Collins Creek (Hall and Clarke 2000), situated *c.* 3km east of The Stumble.

VII. Future prospects

The significance of the Stumble in particular, and the intertidal zone of the Blackwater estuary in general, was highlighted in *England's Coastal Heritage* (Fulford *et al.* 1997). As part of the implementation of the *Archaeological Research Framework for the Greater Thames Estuary* (Williams and Brown 1999), it has been possible to carry out monitoring survey of a number of sites within the Blackwater estuary, particularly at Rolls Farm but also including some work at the Stumble (Heppell and Brown 2008). Through participation in the Planarch 2 Interreg project it has been possible to undertake some more detailed fieldwork at the Stumble (Heppell 2006). This work included walkover survey for surface collection of artefacts (in effect 'fieldwalking'), augered transects to establish depth of alluvium over the old land surface, and test-pitting employing a modified form of the 'bin sampling' carried out in the 1980s. The results, combined with observation and casual collection by local boatmen, has provided some understanding of changes at the Stumble since the fieldwork reported on in this volume. It appears that the Neolithic deposits on the old land surface recorded in the 1980s survive relatively well, although some erosion has taken place. New exposures are appearing further west, extending the known area of the surviving Neolithic landscape and indicating erosion of the sediment cover. By contrast, the wooden structures, peat deposits and occasional tree roots recorded in the 1980s have clearly suffered from erosion, many having vanished. The saltmarsh edge is actively eroding and this may well reveal new, previously buried, wooden structures. At the same time, new exposures of the estuarine biogenic sediment termed (for brevity) in this report the 'Lower Peat' are likely to be exposed. Further and more detailed palynological and other microfossil study would be justified in view of the disappointing results from the exposures extant in the 1980s.

It is clear that the Stumble still represents a significant archaeological resource, particularly in terms of the Neolithic land surface and associated settlement evidence but also with regard to later deposits and structures. It is also clear that this resource is being eroded, though on present evidence it may well be available for research for another ten or twenty years. Whilst the practical difficulty of fieldwork at the Stumble should not be underestimated, access is relatively easy compared to that for many intertidal sites. The archaeological community in its broadest sense will need to consider future policy for researching, and if possible managing, this resource. It is essential that the publication of this report is seen as part of this process, and not as an end in itself (Wilkinson and Murphy 1995, 222–3). An active policy, not only of monitoring but also of targeted research, could be developed and implemented. In the first instance it would be useful to develop the auger survey carried out in 2006 to establish a deposit model for the Stumble mudflat. Perhaps work could also be extended to the area between the Stumble and the Red Hills to the north — this could define a former network of tidal creeks, thereby tying the Red Hills, the Stumble, and the archaeological sites on the adjacent terrace into a single palaeogeographic framework.

Further work on the Neolithic land surface and associated cultural deposits has considerable potential. It would be useful to investigate further the suggestion that this tract saw shifting, perhaps cyclical, occupation with cultivation in woodland clearances. In this context, the recognition of activity in some areas followed by the deposition of midden-like deposits is an intriguing pattern and should repay further study, particularly in view of evidence from further afield for the deliberate selection of middens for cultivation (Guttman *et al.* 2004). The well preserved, often *in situ*, assemblages of artefacts associated with structural features, and the wealth of environmental data provide a great opportunity to address not only palaeogeographical and economic issues, but also the social and cultural practices with which they were inextricably bound up. In this regard the resources required to carry out further excavations of the kind undertaken in the 1980s, but on a larger scale, could be justified in view of the rarity of accessible, well-preserved English Neolithic settlement sites which display clear potential for study within a wider landscape setting.

Clearly any research programme developed for the Stumble would require partnership working between (amongst others) the local authorities, English Heritage and academic institutions. The context for the development of such a research programme may be provided by the process of review and revision of the Greater Thames Estuary Regional Research Framework. The nature of the estuarine environment means that close co-operation with nature conservation and other agencies is vital. Good working relationships are already established, and the process of developing and implementing the Shoreline Mangement Plan may provide a forum to help continue and develop such co-operation.

Appendix 1: Soil Micromorphological Description and Preliminary Interpretation

by R. Macphail

The samples examined come from the Stumble Areas A and B. All soils and sediments had been affected by marine inundation and sodium salts (NaCi). These have had a deleterious affect on the palaeosol microfabric, and this has to be born in mind when reading the descriptions and interpretations. Secondly, although attempts were made to leach out the salts from the samples with acetone, prior to impregnation, this was only fully successful in the last batch of samples from Area B, after some experience with the technique. Some materials such as sodium carbonate are preserved in the former samples; even after re-impregnation the method was not always fully successful, with the result that some thin sections are rather patchy.

The Stumble: Area B

Thin Section B

8–14.5cm: (a) 8–9(10)cm estuarine clay, (b) 9–11(12)cm organic lens and (c) 11–14.5cm buried soil.

Structure: massive microstructure. *Porosity:* 10%, very dominant very coarse plant channels (vertical orientation); few coarse chambers in c). a) very few horizontally oriented fine, elongate, smooth wall voids (plant detritus pseudomorphs, sometimes some plant material remaining in this estuarine layer. *Mineral:* a) C:F 90:10. *Coarse* very dominant silt (with few very fine, fine and medium) – size quartz; well sorted, subangular to subrounded; very few mica and opaque minerals; rare phytoliths. *Fine* very pale brown, lightly speckled (PPL), very poorly birefringent, very pale brown (OIL). B) C:F, 85:15, *Coarse* very dominant silt, frequent fine and medium sand-size quartz (as a). *Fine* pale brown to brown, heavily speckled in places (PPL), very low birefringence, pale brown to brown (OIL). c) C:F. 90:10. *Coarse* moderately well sorted; very dominant silt, with frequent fine to coarse sand size quartz, also very few angular coarse flint. (as a). *Organic Coarse* a, b, c frequent coarse to very coarse *in situ* vertically oriented roots, both browned and black (pyrite-replaced) material. a) very abundant woody ?plant fragments and wood charcoal; many coarse horizontally oriented pale yellow (or absent because of oxidation) plant detritus. *Fine* very abundant thin amorphous organic matter, many fine fragments. b) *Coarse* very abundant very coarse to fine charcoal and charred wood (oak?) and cereal charcoal (P. Murphy, *pers. comm*.) and straw ?*Fine* very abundant fine charred material, thin amorphous organic matter, occasional phytoliths; some small patches of organic 'clay', possible relic channel infills. c) *Coarse* rare coarse sclerotia (fungal), occasional charcoal, (roots already noted). *Fine* occasional fine charcoal, very abundant thin amorphous organic matter. *Groundmass*: porphyric, crystallitic (silty) b-fabric.

Pedofeatures. Textural occasional evidence for inwash of organic 'clay' related to rooting. *Depletion* fine fabric depleted of clay and iron. *Amorphous* abundant (focused in coarse peosity associated with roots) pyrite spheroids infilling voids. *Fabric* generally very homogenous throughout; some mixing of fine fabric in buried soil, relating to rooting and movement of material down profile.

Interpretation. Estuarine silt inundation had a very marked affect on the Neolithic soil. Firstly, however, the estuarine deposit is a weakly organic silt carrying detrital organic matter which was laid down horizontally in places. No mineral evidence such as laminae is visible. The silt contains rare fauna, and also charcoal suggesting source of underlying charcoal rich material is still open. The organic layer contains charred material of all sizes and therefore it is unlikely to be a sedimentary deposit. More likely it is an occupation surface where much burning and trampling took place. Unfortunately estuarine inundation and the influence of sodium ions has completely slaked this soil and all fine material (iron and clay) has been leached out — therefore there are no pedological (structures, coatings *etc*.) features to prove that this was the case. This conclusion can be inferred, however. The soil also differs from the estuarine silts by being less well sorted and by containing flint. All present rooting affects are post-depositional and estuarine in origin; the soil itself is apedal.

Thin Section C

16–23cm (buried soil containing Neolithic pottery)

Structure: massive. *Porosity*: 5% very dominant medium to coarse vertically orientated channels. *Mineral* C:F, 90:10, *coarse*: moderately well sorted, very dominant silt- (frequent sand-)size quartz, very few flint (as B); single stone size pottery sherd, grey brown clay with flint tempering. *Fine* very pale brown, lightly speckled (PPL), very poorly birefringent, very pale brown (OIL), *organic coarse* many coarse roots (as B), occasional fine charcoal. *Fine* rare amorphous organic matter, rare charcoal. *Groundmass* porphyric, crystallitic (silty) b-fabric. *Pedofeatures*. *Textural* rare infills of organic 'clay'. Rare void infills of yellowish brown, almost limpid, poorly orientated, moderately birefringent clay. *Depletion:* Almost total depletion of iron and clay some secondary leaching around roots. *Amorphous* abundant pyrite infilling of voids, root channels. *Fabric* homogeneous.

Interpretation. Slaking and leaching (of iron and clay) has developed an apedal and depleted soil. The presence of pottery (sherd at *c*.21cm) may indicate that earthworms may have been present to move this item, and charcoal, around. Some evidence of the slaking affect is seen in the rare presence of translated clay, and dusty organic 'clay'. Later root penetration also permitted total depletion around some channel margins.

Thin Section D

22–29cm (dark brown layer).

Microstructure: moderately poorly structured, massive with impression of fine prisms. (Crack microstructure, although drying was by acetone replacement.) *Porosity* 15%, very dominant medium, vertically oriented extensive (2cm) root channels; few fine zigzag cracks. *Mineral* C:F, 50:50. *Coarse* well sorted; very dominant silt-size quartz, few fine and medium sand particles; very few opaques and mica. *Fine* very pale or speckled yellow brown (PPL), moderately low birefringence, pale orange (OIL). *Organic* many coarse *in situ* root traces, some parenchymatous and lignified material; occasional charcoal. *Fine* occasional amorphous fine fragments. *Groundmass* close porphyric, crystallitic (silt) and weakly speckled b-fabric. *Pedofeatures* (within non-depleted areas) occasional clay separations (intercalculations) fragmented, clay coatings and more rarely yellowish brown, laminated clay coatings. Elsewhere and dominating fabric are very abundant, pale yellowish brown, speckled; very pale yellowish brown, finely dusty; moderately to poorly oriented clay coatings and infills. (Probably most porosity pre-dating the new coarse root channels has been infilled.) Many large clay infills stained darkish black. *Depletion* very abundant depletion of iron and sometimes clay, around coarse root channels. *Crystalline* rare densely packed euhedral lenticular crystals, (colourless, highly birefringent) of probable gypsum. *Amorphous* occasional pyrite framboids concentrated around roots. Moderate ferruginisation of roots; abundant ferruginisation of clay coatings and infills; occasional black ferro-manganese inpregnation of testural features. *Fabric* homogenised (chemically and physically), then through hydromorphic deletion wood new roots become heterogeneous.

Interpretation. Even this horizon was severely affected by estuarine inundation. Clay slaked in the upper soil by sodium ions had totally infilled porosity, and most *in situ* soil has been affected by minor depletion and slaking. There is, however, enough fabric evidence to suggest that the original soil was probably argillic in character. Later rooting by aquatics has caused severe iron depletion along channels. Further hydromorphic effects are iron sulphide (pyrite) formation, ferruginisation and rare occurrences of gypsum (calcium sulphate).

Thin Section E

33–40cm (brown layer)

Structure: weakly structured, essentially massive. *Porosity* 15%, very dominant coarse vertical root channels; frequent fine channels and chambers. *Mineral* C:F, as D, *Coarse* as D. *Fine* very pale brown and pale brown, speckled (PPL), moderately low birefringence, pale orange (OIL). *Organic Coarse* occasional coarse *in situ* root material;

rare charcoal (3mm). *Fine* rare to occasional amorphous material. *Groundmass* close porphyric, crystallitic (silt) and speckled b-fabric. *Pedofeatures Textural*: very abundant, but less than in D: many pale dusty clay coatings in coarse channels; generally only moderately well orientated and birefringent; pale yellow brown and speckled; intercalculations and total infillings usually; fewer microlaminated void infills (one shows at least three phases of few dusty particles, very many, to few again). *Depletion* very abundant pattern of depletion around possible relic subangular blocky structures within a coarser prismatic structure, both iron and clay loss; also iron loss around more recent coarse root channelling. *Amorphous* occasional ferruginisation of textural features; occasional infilling of coarse root channels by pyrite. *Fabric* strong homogenisation of structural soil.

Interpretation. As D, but less affected by down-profile clay translocation.

Overall interpretation

The Neolithic silt loam soils were probably argillic forest soils (Scaife, Part 6) with biological action moving charcoal down to *c.* 40cm, probably after an initial clearance event. Pottery fragments themselves were moved down to *c.* 20cm. The surface layer is dominated by coarse to very fine charcoal that may well relate to secondary clearance, occupation and trampling (Murphy, this volume). It seems that the main estuarine inundation occurred roughly at this time because these pure silts which feature horizontally layered plant detritus do contain charcoal which was probably locally mobilised.

The affect of estuarine inundation and its sodium salts on the Neolithic soil structure was catastrophic. It slaked it completely (like an irrigated solonetz); most clay and iron was leached out of the top 20cm, making this part apedal, and producing very abundant textural features down to *c.* 40cm depth. Even this lower part of the soil was affected, and possibly only rare textural features and possible ghost solid structures are relict of the Neolithic forest soil. A further affect of the inundation was the development of sulphate (gypsum) and sulphide (pyrite) features, after association with aquatic rooting through the estuarine silts.

The Stumble: Area A

Thin Section F

0–7cm

Structure: (apedal) massive microstructure. *Porosity* 15%, common medium moderately smooth wall channels, and common coarse, elongate (3cm) vertical (root) channels. *Mineral* C:F, 90:10. *Coarse* well sorted, very dominant silt and fine sand-size quartz, with few medium sand; very few mica, phytoliths. *Fine* very pale brown, lightly speckled (PPL), moderately low birefringence; pale brown (OIL). *Organic Coarse* occasional relict vertical root; occasional charcoal, *Fine* occasional amorphous material. *Groundmass* open porphyric, crystallitic (silty) b-fabric. *Pedofeatures*. *Textural* many dirty pale brown, finely dusty, moderately birefringent, moderately orientated clay coatings and infills of fine porosity. *Depletion*, very abundant moderately strong depletion of iron and clay. *Amorphous* many weak to moderate iron and manganese staining of textural features and relic roots; in coarse channels very abundant fine pyrite. *Fabric* very homogenous.

Interpretation. Strongly leached upper part of Neolithic soil. Later inundation caused rooting by aquatics, inwash of dirty clay and hydromorphic effects. General homogenisation. Possible buried soil/estuarine silt mixture (see Table 2.3, sample 40).

Thin section G

7.5–15cm (A2)

Structure: massive with prismatic tendancy. *Porosity* 10%, fine channels and vughs. *Mineral* C:F, 75:25, *Coarse* as F with few coarse flints, *Fine* pale brown, speckled (PPL), moderate to moderately low birefringence, pale yellowish orange (OIL). *Organic* occasional organic fragments. *Fine* occasional amorphous organic matter. *Groundmass* open porphyric, patchy crystallitic or speckled b-fabric. *Pedofeatures Textural* many dirty brown dusty clay void infills. *Depletion* abundant, patchy and coarse iron and clay depletion. *Amorphous* many coarse ferruginous impregnated areas, mainly clear to diffuse. One 3mm piece rough edge, single ring impregnative nodule (seems to have protected from depletion a possible original piece of soil) — C:F, 60:40, *Coarse* very dominant silt and few fine sand. *Fine* dark yellowish brown to dark brown, speckled (PPL), moderate to moderately low birefringence, brown to golden brown (OIL) — ferruginised — some disturbance in this soil produced strongly argillic part or infill.

Interpretation: generally strong leached, especially of clay, although also textural features present show whole zone not totally depleted. It is also moderately strongly mottled, one nodule possibly protecting the original somewhat argillic loamy soil.

Thin Section H

22–29cm (A3)

(As D.)

The Stumble: Site 28, Section 1

At the base of estuarine clay and estuarine detrital low peat at junction with mineral soil (*c.* 1m down).

Thin section I

c. 1.00–1.06cm (0–0.4cm estuarine peat, 0.4–6.0cm bAg).

Peat. *Structure*: massive. *Porosity* 25%, few fine channels and vughs; also cut by coarse vertical channels. *Mineral* C:F, 60:40. Coarse very dominant very fine silt, mainly quartz with mica. Molluscs present. *Fine* very pale brown, finely speckled (PPL), low birefringence, dark brown (OIL). *Organic Coarse* very abundant finely layered (10mm), detrital organic matter; many organic fragments. *Fine* very abundant amorphous organic matter. *Groundmass* porphyric, crystallitic (silt) b-fabric. *Pedofeatures Fabric* microlaminated *e.g.* every 250mm. Undulating but sharp boundary with b Ag (also pyrite).

Interpretation: organic and very fine mineral; low energy detrital peat deposition, laying down fine bands of amorphous detrital organic matter.

bAg. *Structure:* massive, *Porosity* 20%, very dominantly medium to coarse, mainly vertical (aquatic) root channels. *Mineral* C.F. 80:20. *Coarse* very abundant silt, frequent fine and medium sand; very few mica. Many photoliths. *Fine* very pale brown speckled; (PPL); very poorly birefringent, very pale brown (OIL). *Organic Coarse* (decalcifying mollusca present — in peat seem almost totally decalcified) many coarse root traces. *Fine* many (near top) to occasional (at base) amorphous organic matter. *Groundmass* close porphyric, speckled (silty) b-fabric. *Pedofeatures Textural* many, varying from a thin band of dusty clay ascribing a curve shape, beneath the peat in a fine infill/channel — like wetting front (suggests soil was pretty wet and leached by inundation before actual peat deposition?), to numerous very dusty clay laminae, and intercalations also associated with root channels microlaminated clay coatings, some not orientated to way up? But *in situ*. *Depletion*. Very abundant depletion of iron, clay and finest silt generally. *Amorphous* generally rare, but very abundant ferruginous impregnation around root channels, and pyrite infilling of many root channels. *Fabric* soil obviously churned up by aquatic rooting in places.

Interpretation: primary depletion of the soil by inundation of estuarine waters — washing down silt and clay and leaching (anaerobically) out the iron — probably took place prior to detrital peat deposition. Some further washing took place during this event and through root disturbance. The penetration of aerobic conditions by rooting caused localised ferruginisation.

Appendix 2: Context 99: Soil Micromorphological Description

by R. Macphail

Layer 1 Brown fibrous peat with many small greyish brown clay patches. Extensively bored by piddocks. Merging boundary into 2.

Layer 2 Light greyish-brown organic clay. Lenses of pale brown silt/fine sand.

Layer 3 Pale brown silt/fine sand.

Layer 4 Dark greyish-brown silty clay with heat-shattered flints. A 5kg sample from this deposit yielded a small quantity of abraded, but unidentifiable, charcoal fragments by flotation. The heat-shattered stones were mainly of flint with some quartzite. These represent rounded and sub-rounded pebbles up to about 45mm.

Layer 5 Disturbed pale brown silt/fine sand with dark greyish-brown patches and lenses.

Layer 6 Very firm pale brown silt/fine sand of the upper palaeosol. Rare small flint and quartzite pebbles. Small charcoal flecks; rare brown rootlets.

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Index

Illustrations are denoted by page numbers in *italics*. Places are in Essex unless indicated otherwise.

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No.27,	1985	Cambridgeshire: The Fenland Project No.1: Archaeology and Environment in the Lower Welland Valley
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No.30,	1986	Norfolk: Excavations at Thornham, Warham, Wighton and Caistor St Edmund, Norfolk
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No.32,	1987	Norfolk: Three Norman Churches in Norfolk
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No.34,	1987	Norfolk: Spong Hill, Part IV: Catalogue of Cremations
No.35,	1987	Cambridgeshire: The Fenland Project No.2: Fenland Landscapes and Settlement, Peterborough–March
No.36,	1987	Norfolk: The Anglo-Saxon Cemetery at Morningthorpe
No.37,	1987	Norfolk: Excavations at St Martin-at-Palace Plain, Norwich, 1981
No.38,	1987	Suffolk: The Anglo-Saxon Cemetery at Westgarth Gardens, Bury St Edmunds
No.39,	1988	Norfolk: Spong Hill, Part VI: Occupation during the 7th–2nd millennia BC
No.40,	1988	Suffolk: Burgh: The Iron Age and Roman Enclosure
No.41,	1988	Essex: Excavations at Great Dunmow, Essex: a Romano-British small town in the Trinovantian Civitas
No.42,	1988	Essex: Archaeology and Environment in South Essex, Rescue Archaeology along the Gray's By-pass 1979–80
No.43,	1988	Essex: Excavation at the North Ring, Mucking, Essex: A Late Bronze Age Enclosure
No.44,	1988	Norfolk: Six Deserted Villages in Norfolk
No.45,	1988	Norfolk: The Fenland Project No. 3: Marshland and the Nar Valley, Norfolk
No.46,	1989	Norfolk: The Deserted Medieval Village of Thuxton
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No.50,	1993	Proceedings of the Flatlands and Wetlands Conference
No.51,	1991	Norfolk: The Ruined and Disused Churches of Norfolk
No.52,	1991	Norfolk: The Fenland Project No. 4, The Wissey Embayment and Fen Causeway
No.53,	1992	Norfolk: Excavations in Thetford, 1980–82, Fison Way
No.54,	1992	Norfolk: The Iron Age Forts of Norfolk
No.55,	1992	Lincolnshire: The Fenland Project No.5: Lincolnshire Survey, The South-West Fens
No.56,	1992	Cambridgeshire: The Fenland Project No.6: The South-Western Cambridgeshire Fens
No.57,	1993	Norfolk and Lincolnshire: Excavations at Redgate Hill Hunstanton; and Tattershall Thorpe
No.58,	1993	Norwich: Households: The Medieval and Post-Medieval Finds from Norwich Survey Excavations 1971–1978
No.59,	1993	Fenland: The South-West Fen Dyke Survey Project 1982–86
No.60,	1993	Norfolk: Caister-on-Sea: Excavations by Charles Green, 1951–55
No.61,	1993	Fenland: The Fenland Project No.7: Excavations in Peterborough and the Lower Welland Valley 1960–1969
No.62,	1993	Norfolk: Excavations in Thetford by B.K. Davison, between 1964 and 1970
No.63,	1993	Norfolk: Illington: A Study of a Breckland Parish and its Anglo-Saxon Cemetery
No.64,	1994	Norfolk: The Late Saxon and Medieval Pottery Industry of Grimston: Excavations 1962–92
No.65,	1993	Suffolk: Settlements on Hill-tops: Seven Prehistoric Sites in Suffolk
No.66,	1993	Lincolnshire: The Fenland Project No.8: Lincolnshire Survey, the Northern Fen-Edge
No.67,	1994	Norfolk: Spong Hill, Part V: Catalogue of Cremations
No.68,	1994	Norfolk: Excavations at Fishergate, Norwich 1985
No.69,	1994	Norfolk: Spong Hill, Part VIII: The Cremations
No.70,	1994	Fenland: The Fenland Project No.9: Flandrian Environmental Change in Fenland
No.71,	1995	Essex: The Archaeology of the Essex Coast Vol.I: The Hullbridge Survey Project
No.72,	1995	Norfolk: Excavations at Redcastle Furze, Thetford, 1988–9
No.73,	1995	Norfolk: Spong Hill, Part VII: Iron Age, Roman and Early Saxon Settlement
No.74,	1995	Norfolk: A Late Neolithic, Saxon and Medieval Site at Middle Harling
No.75,	1995	Essex: North Shoebury: Settlement and Economy in South-east Essex 1500–AD1500
No.76,	1996	Nene Valley: Orton Hall Farm: A Roman and Early Anglo-Saxon Farmstead
No.77,	1996	Norfolk: Barrow Excavations in Norfolk, 1984–88
No.78,	1996	Norfolk:The Fenland Project No.11: The Wissey Embayment: Evidence for pre-Iron Age Occupation
No.79,	1996	Cambridgeshire: The Fenland Project No.10: Cambridgeshire Survey, the Isle of Ely and Wisbech
No.80,	1997	Norfolk: Barton Bendish and Caldecote: fieldwork in south-west Norfolk
No.81,	1997	Norfolk: Castle Rising Castle
No.82,	1998	Essex: Archaeology and the Landscape in the Lower Blackwater Valley
No.83,	1998	Essex: Excavations south of Chignall Roman Villa 1977–81
No.84,	1998	Suffolk: A Corpus of Anglo-Saxon Material
No.85,	1998	Suffolk: Towards a Landscape History of Walsham le Willows
No.86,	1998	Essex: Excavations at the Orsett 'Cock' Enclosure
No.87,	1999	Norfolk: Excavations in Thetford, North of the River, 1989–90
No.88,	1999	Essex: Excavations at Ivy Chimneys, Witham 1978–83
No.89,	1999	Lincolnshire: Salterns: Excavations at Helpringham, Holbeach St Johns and Bicker Haven
No.90,	1999	Essex:The Archaeology of Ardleigh, Excavations 1955–80
No.91,	2000	Norfolk: Excavations on the Norwich Southern Bypass, 1989–91 Part I Bixley, Caistor St Edmund, Trowse
No.92,	2000	Norfolk: Excavations on the Norwich Southern Bypass, 1989–91 Part II Harford Farm Anglo-Saxon Cemetery
No.93,	2001	Norfolk: Excavations on the Snettisham Bypass, 1989
No.94,	2001	Lincolnshire: Excavations at Billingborough, 1975–8
No.95,	2001	Suffolk: Snape Anglo-Saxon Cemetery: Excavations and Surveys
No.96,	2001	Norfolk: Two Medieval Churches in Norfolk
No.97,	2001	Cambridgeshire: Monument 97, Orton Longueville

No.98, 2002 Essex: Excavations at Little Oakley, 1951–78
No.99, 2002 Norfolk: Excavations at Melford Meadows, Brettenham, 1994
No.100, 2002 Norwich: Excavations in Norwich 1971–78, Part III
No.101, 2002 Norfolk: Medieval Armorial Horse Furniture in Norfolk
No.102, 2002 Norfolk: Baconsthorpe Castle, Excavations and Finds, 1951–1972
No.103, 2003 Cambridgeshire: Excavations at the Wardy Hill Ringwork, Coveney, Ely
No.104, 2003 Norfolk: Earthworks of Norfolk
No.105 2003 Essex: Excavations at Great Holts Farm, 1992–4
No.106 2004 Suffolk: Romano-British Settlement at Hacheston
No.107 2004 Essex: Excavations at Stansted Airport, 1986–91
No.108, 2004 Norfolk: Excavations at Mill Lane, Thetford, 1995
No.109, 2005 Fenland: Archaeology and Environment of the Etton Landscape
No.110, 2005 Cambridgeshire: Saxon and Medieval Settlement at West Fen Road, Ely
No.111, 2005 Essex: Early Anglo-Saxon Cemetery and Later Saxon Settlement at Springfield Lyons
No.112, 2005 Norfolk: Dragon Hall, King Street, Norwich
No.113, 2006 Norfolk: Excavations at Kilverstone
No.114, 2006 Cambridgeshire:Waterfront Archaeology in Ely
No.115, 2006 Essex:Medieval Moated Manor by the Thames Estuary: Excavations at Southchurch Hall, Southend
No.116, 2006 Norfolk: Norwich Cathedral Refectory
No.117, 2007 Essex: Excavations at Lodge Farm, St Osyth
No.118, 2007 Essex: Late Iron Age Warrior Burial from Kelvedon
No.119, 2007 Norfolk: Aspects of Anglo-Saxon Inhumation Burial
No.120, 2007 Norfolk: Norwich Greyfriars: Pre-Conquest Town and Medieval Friary
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No.126, 2008 Essex: Early Neolithic Ring-ditch and Bronze Age Cemetery at Brightlingsea
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No.128, 2009 Hertfordshire: Four Millennia of Human Activity along the A505 Baldock Bypass
No.129, 2009 Norfolk: Criminals and Paupers: the Graveyard of St Margaret Fyebriggate *in combusto*, Norwich
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No.132, 2009 Norfolk: Norwich Castle: Excavations and Historical Survey 1987–98 (Parts I–IV)
No.133, 2010 Norfolk: Life and Death on a Norwich Backstreet, AD900–1600: Excavations in St Faith's Lane
No.134, 2010 Norfolk: Farmers and Ironsmiths: Prehistoric, Roman and Anglo-Saxon Settlement beside Brandon Road, Thetford
No.135, 2011 Norfolk: Romano-British and Saxon Occupation at Billingford
No.136, 2011 Essex: Aerial Archaeology in Essex
No.137, 2011 Essex: The Roman Town of Great Chesterford
No.138, 2011 Bedfordshire: Farm and Forge: late Iron Age/Romano-British farmsteads at Marsh Leys, Kempston
No.139, 2011 Suffolk: The Anglo-Saxon Cemetery at Shrubland Hall Quarry, Coddenham
No.140, 2011 Norfolk: Archaeology of the Newland: Excavations in King's Lynn, 2003–5
No.141, 2011 Cambridgeshire: Life and Afterlife at Duxford: archaeology and history in a chalkland community
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