Phoenix Consulting Archaeology Limited

Network Archaeology Limited

Archaeological Excavations at Pode Hole Quarry

Bronze Age Occupation on the Cambridgeshire Fen-edge

Patrick Daniel

edited by

Andy Richmond and Gary Coates

AGGREGATE INDUSTRIES

BAR British Series xxx

2008

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by

Patrick Daniel

with principal specialist contributions from

Paul Buckland, Kate Brayne, Catherine Langdon, Gemma Martin, Elaine Morris, James Rackham, Rob Scaife, Maisie Taylor, Jane Wheeler and Tania Wilson

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Bronze Age Occupation on the Cambridgeshire Fen-edge

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Aerial photo of Pode Hole Quarry, taken by Ben Robinson.

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“…this uncertain tract of land”

W. Elstobb, Engineer, 1793, An Historical Account of the Great Level of the Fens

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Summary

Archaeological investigations in response to the expansion of Pode Hole sand and gravel quarry exposed a well-preserved prehistoric Fen-edge landscape covering an area of approximately 58 acres (c. 23.5ha). Pottery dates and a series of radiocarbon determinations reveal that the site was occupied throughout the second millennium BC, with activity apparently intensifying later in that period.

A broadly linear group of four ring-ditches, probably the remains of an Early Bronze Age barrow cemetery, provided the focus for later Bronze Age fields. These formed a rectilinear field system which was aligned on the barrow cemetery, which itself reflected the alignment of the nearby Fen-edge. Midden areas and scores of waterhole pits were found within the field system. The latter features were key in allowing the partial reconstruction of the Bronze Age environment, as they contained well-preserved organic deposits. Although no evidence of domestic structures was found on the site, the type and amount of the artefacts that were recovered from it indicate that it was occupied, possibly by a series of small farmsteads.

Environmental analysis of the waterholes revealed that its Bronze Age inhabitants were subsistence agriculturalists, with cattle representing the mainstay of the economy. These animals grazed the damp, largely deforested grassland that covered the site and the wider area. Little was found to indicate arable agriculture, and the remains preserve only limited evidence that hunting and fishing were carried out, although it is likely that hedges provided some wild foodstuffs. As well as waterlogged environmental data, the waterhole pits and ponds also contained quantities of preserved wood, including artefacts such as wattlework panels, a probable ard and a well-preserved two piece vessel, as well as occasional human remains.

Saltmaking also featured in the lives of the area's Bronze Age inhabitants; early briquetage was found on the site, including vessels and utilised supports. However, it is thought that salt collection must have occurred elsewhere, as the environmental data records an overwhelmingly freshwater habitat.

A substantial assemblage of locally made Bronze Age pottery and other ceramic artefacts was gathered during the excavations. Analysis of this material records that during the Bronze Age, shell-gritted clays completely replaced all use of grog temper in pottery fabrics and continued to be used well into the post-Deverel-Rimbury Late Bronze Age. This is interpreted as being symptomatic of a shift in attitudes towards ancestors and the land during this period. Grog-tempered pottery represented the continuation of the old into the new, and its use perhaps expressed attitudes to lineage and ancestors given form through the materiality of pot-making. By contrast, the abandonment of grog-tempered pottery in the later Bronze Age, in favour of clays tempered with shell- a more directly natural resource- may be a further manifestation of the growing importance of land tenure and ownership that this period witnessed.

During the early first millennium BC, environmental changes saw the area around Pode Hole become too wet for human occupation, and peat grew across the site. This period marks the start of a hiatus in occupation of the site that lasted for approximately 2500 years. It was not until the post-medieval period, when drainage improvement schemes allowed the area to be returned to agriculture, that the archaeological narrative resumes. When fieldwork commenced in 1999, the site contained open arable fields, raked by scores of infilled claying trenches as well as the remains of grubbed-out Enclosure-era field boundaries.

The prehistoric remains uncovered at Pode Hole are part of a much larger buried agrarian landscape that once ringed the Cambridgeshire Fen-edge. The scale and quality of this archaeological resource has only become apparent in recent times; this is largely due to developer-funded excavation.

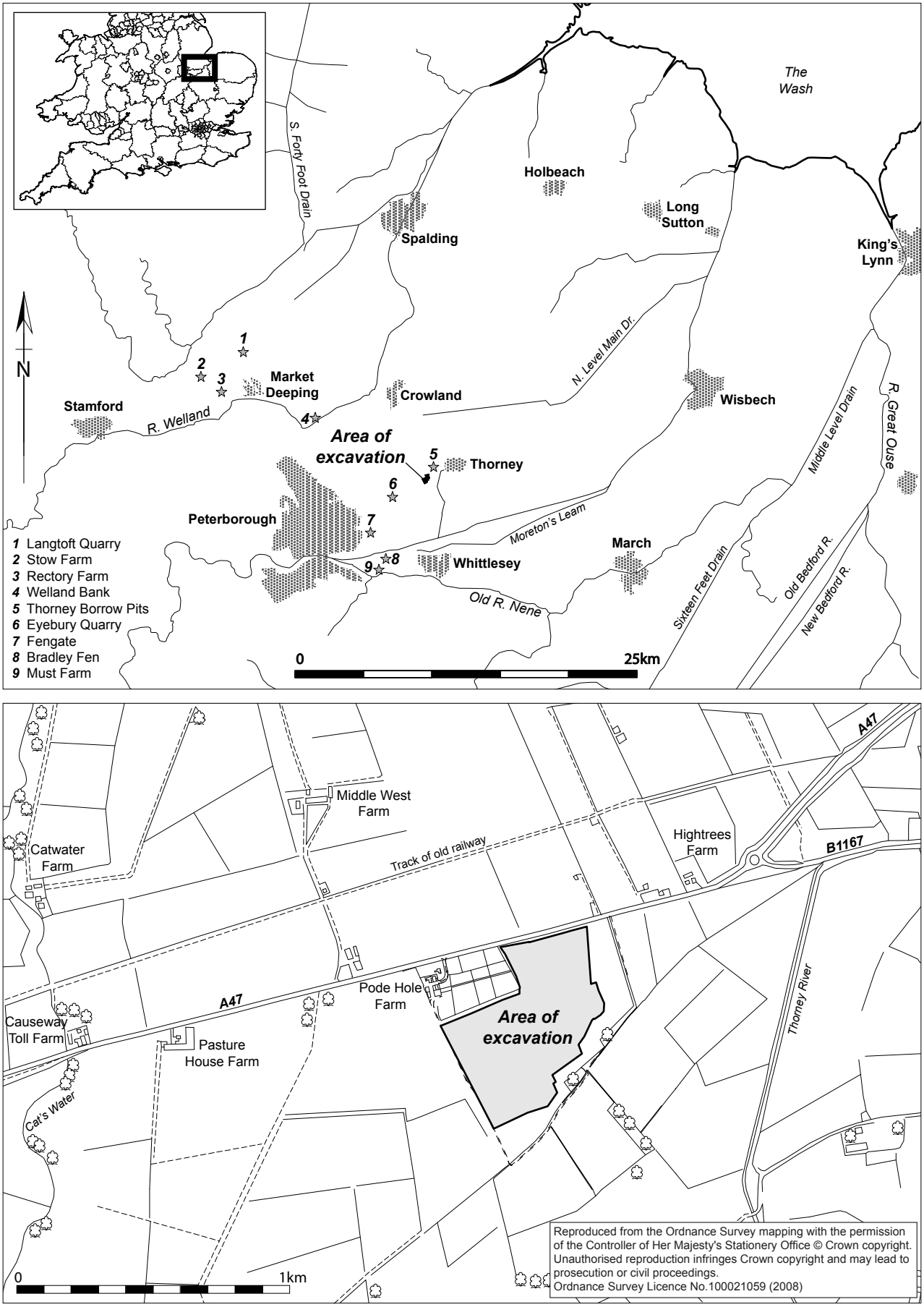

Figure 1.1: Location of the excavation area, with the other sites referenced in this report.

Chapter 1: *Introduction*

Background to the Project

This report presents the results of archaeological investigations carried out at Pode Hole quarry, Peterborough, between 1999 and 2005. The archaeological work was undertaken as pre-quarrying mitigation in order to fulfil a condition of planning consent.

Pode Hole (sand and gravel) quarry lies to the south of the A47, between Eye and Thorney, in the parish of Thorney and is thus situated in the part of the Cambridgeshire Fens known as the 'North Level'. Pode Hole is considered part of the City of Peterborough for administrative purposes, but has historically been part of Cambridgeshire. The investigated area (hereafter referred to as the 'project area') was centred on NGR 526500 303600 and occupied a single block of land covering slightly over 23.5 hectares (c. 58 acres).

The project area was the subject of pre-quarrying watching brief, evaluation and excavation carried out intermittently between 1999 and 2005. The archaeological fieldwork was carried out by Network Archaeology Ltd working for Phoenix Consulting Archaeology Ltd, on behalf of Aggregate Industries Ltd.

Project Aims

The quarry expanded intermittently over a number of years, via a number of 'Extraction Areas', with the archaeological investigation of each Extraction Area taking place immediately prior to its quarrying.

The episodic nature of the archaeological intervention at Pode Hole quarry therefore offered the opportunity to refine the research aims and methodologies of the project as it progressed. At the start of the project, the nature and location of potential archaeological remains were uncertain, and an early written scheme of investigation (WSI) noted '*an apparent lack of target features*' (Howlett, 2001, p.10). However, by the time the final Extraction Area was topsoiled, the archaeological deposits and features thereby revealed conformed to an anticipated pattern.

Below is a summary of the recurrent research themes that came to guide the excavation of the project area:

1. The transition from the monument-dominated landscape of the Late Neolithic and Early Bronze Age to the settlement and field landscapes of the later Bronze Age.
Fieldwork was undertaken not only to record the form and extent of the barrow cemetery and field system, but to explore the role the barrow cemetery played within the field system. To what extent did the builders of the field system take account of the existence of the barrows? Did they re-use them as depositories of the dead, or did they become mere guide-posts for land survey? To what degree were barrows the focus of later activity?

2. The character and development of the agricultural landscape of the later Bronze Age.
Was all of the field system set out and used at the same time, or was it modified during use? What was the land at Pode Hole used for during the Bronze Age? What was the relationship between it and the supposed 'Romano-British' field system preserved in an adjacent Scheduled Ancient Monument (SAM No. 20802)? Was there any evidence of structured deposition of artefacts and ecofacts within it? Two characteristics of the field system were that it contained many interruptions, and that some elements were partially double-ditched, and fieldwork was undertaken in awareness of the need to explore and explain these features.

3. Environmental change in the second millennium BC, and human interaction with, and exploitation of, that changing environment.
Due to the anaerobic conditions that existed towards the bases of the waterhole pits and ponds, the opportunity was available, via the study of preserved pollen, plant macro-fossils, molluscs and wood, to embark upon detailed reconstruction of the past environment at Pode Hole. Was there evidence of gradual or intensive deforestation? How much woodland was present on the site during the main period of its occupation? Was this woodland harvested and managed? Did the site host arable or pastoral agriculture?

4. The distribution, nature and development of the Bronze Age domestic activity, particularly with regard to flintworking and its ceramic technology.
Where was settlement focussed in the project area, how was it integrated into the field system, and how did this relate to pre-existing uses of the landscape? Was it possible to identify the extents of landholdings associated with structures? How did the material culture of the area's inhabitants change during the Bronze Age?

Fieldwork was therefore undertaken to best capture and interpret the physical products of the dynamic interrelationships between changing landscape and changing society that the site was found to contain for the second millennium BC.

The archaeological fieldwork was not carried out in isolation from either the aims or results of other research in

the locality. The guidance and regional overview provided by Ben Robinson, the City of Peterborough Historic Environment Officer was particularly welcome in this regard. The initial written scheme of investigation (Howlett, op. cit.) was designed with reference to the regional research agenda (Glazebrook, 1997), and during fieldwork at Pode Hole site visits were undertaken by excavation staff to other units active on neighbouring sites.

Methodology

Work at Pode Hole quarry commenced in 1999, with an evaluation and watching brief prior to the quarrying of Extraction Area 5. In following years, Extraction Areas were not evaluated prior to quarrying. Instead, initial topsoiling was carried out under permanent and direct archaeological supervision. Before subsoiling and quarrying took place, the Extraction Area was located and planned, and then targeted features and deposits were excavated in accordance with the WSI and the project's developing research aims. This pattern repeated itself over several years, with the excavation of Extraction Areas 5 to 8 inclusive.

Plate 1.1: Paul Gelderd excavating Pond Cluster 3.

In practice, this meant that 10% of the total length of ditches were hand excavated, and 10% of isolated features were half sectioned. The intersections between features were targeted in order to construct a stratigraphic sequence for the site. The termini of ditches also formed a focus for investigation, as did apparent interruptions in the ditches forming the field system. This was done in order to ascertain whether the interruptions were deliberate or the result of plough damage to shallow features, and to investigate the existence of possible entrance structures.

All ring-ditches were excavated, with 50% of the circumference being removed by hand. Potential archaeological features within and around each ring-ditch were investigated in order to check for primary, secondary or satellite burials.

All of the waterhole pits in each Extraction Area were at least 50% hand dug, with up to 100% of the work being carried out by hand. Anaerobic lower fills of these features were dug entirely by hand.

Environmental sampling focussed on the fills of these features, as soil conditions were most conducive to organic preservation. Pit fills found to contain pottery and bone were especially targeted. By complementing the samples taken from the stratified sequence of artefact-bearing deposits in pits with radiocarbon samples, it was hoped to create an absolute chronology to better understand the development of the ancient economy of the site.

A full excavation methodology, regarding recording conventions, photographic formats etc, is presented in the interim reports for Extraction Areas 5 to 7 (Phoenix Archaeology Consulting Ltd/Network Archaeology Ltd, 1999-2004 inclusive).

Report Structure

This report contains six chapters. An introductory chapter introduces the circumstances of the project, its research aims, and the methodologies chosen to pursue these aims. Chapter 2 presents the project area in the context of its location in time and place, and summarises the results of other archaeological and palaeoenvironmental work in the immediate vicinity. Chapter 3 gives the results of the fieldwork, and presents the evidence of the archaeological features found in the project area. A description and analysis of artefacts and ecofacts recovered from the site follows in Chapter 4 and 5. Chapter 6 draws the evidence together, and discusses the development of the project area through time, as demonstrated by its archaeological features, material culture and the changing environment they existed within. The nature of the archaeology of the project area means that this report emphasises its occupation during the final two millennia BC, a period commonly referred to, with the attendant recognised pitfalls (Parker Pearson, 2005), as the Bronze Age (2000-700 BC).

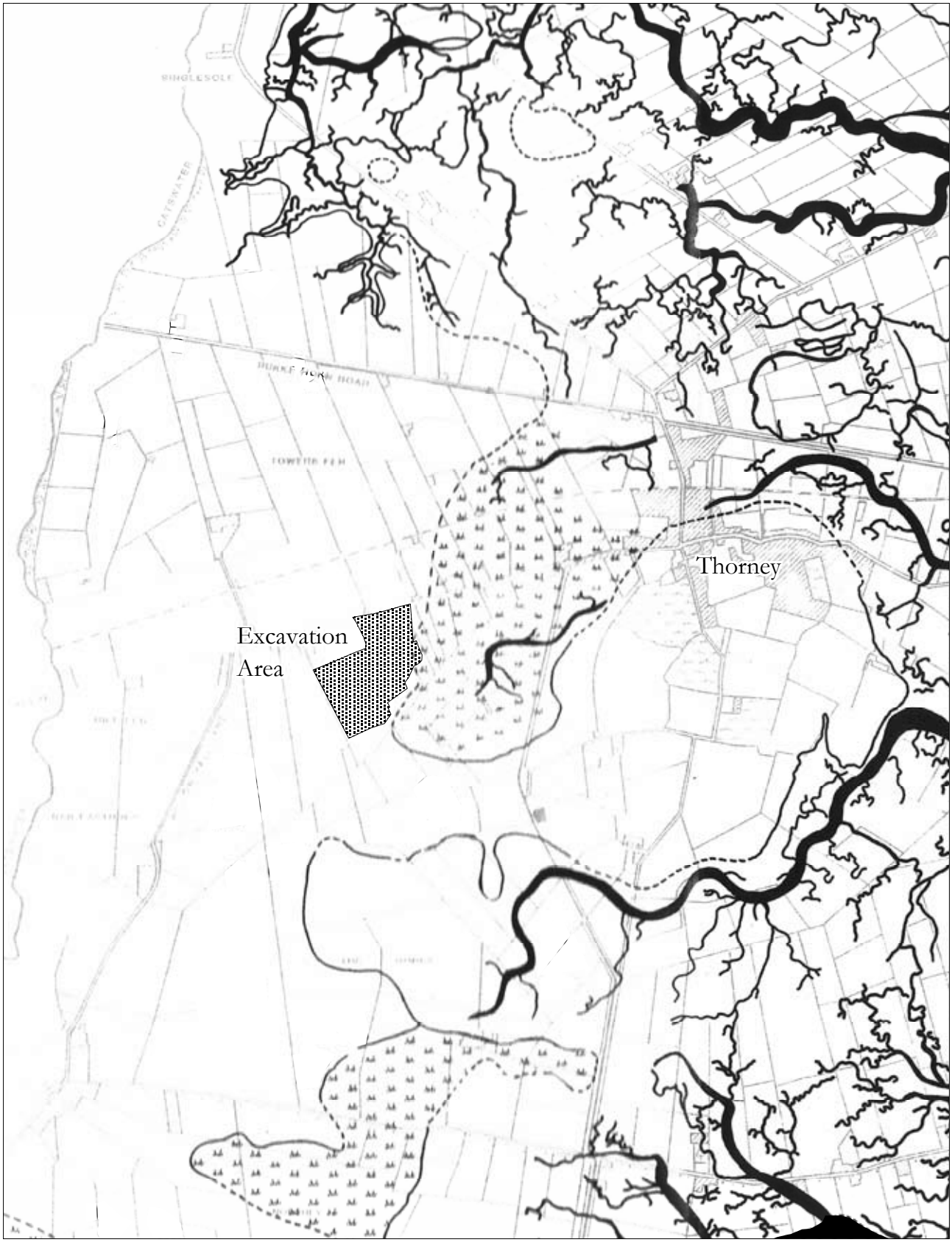

Figure 2.1: Excavation area overlaid on map of Bronze Age fenland landscape from Hall, 1987.

Chapter 2: *The Contexts of the Project Area*

Archaeological investigations at Pode Hole quarry benefited from the fact that the Cambridgeshire Fens and their margins have been the focus of much previous work. Many sites in the vicinity have been intensively examined, not least in and around the Flag Fen basin (Pryor, 2001a). Due to the expansion of Peterborough and the presence of an active aggregate quarrying industry, large areas of the surrounding landscape have been investigated, providing an extensive view of the archaeological resource. Several syntheses of the archaeology and landscape of the area have also been produced, under the aegis of the Fenland Survey. It is therefore both possible, and necessary, to present the results from Pode Hole quarry in the context of an already detailed narrative of human interaction with a changing landscape.

The Landscape Context

Pode Hole quarry lies on the margin of the Cambridgeshire Fens, within the watershed of the River Nene. Although the surrounding landscape is largely flat and low-lying, with arable agriculture being the dominant land-use, it has only recently taken on this well-managed appearance. Before the commencement of large-scale drainage works in the 17th century, the Fens were a boggy reedswamp, whose margins shifted over time and provided a somewhat uncertain interface between land and water. Permanent occupation within the Fens was only possible on a series of sand and gravel islands; the shifting and winding creeks between them provided the easiest transport routes. The low-lying fenland basin was particularly susceptible to changes in sea-level: marine incursions led to sedimentation and consequent peat growth. This in turn caused, on the landward side of the Fens, freshwater flooding and alluvial aggradation followed by further peat growth, as rivers debouched into peat swamps where there had previously been sea. These complex geophysical processes made for a particularly dynamic landscape, and have bequeathed an intricate geoarchaeological record (French and Pryor, 1993).

The land at Pode Hole quarry was particularly susceptible to these changes, due to its elevation and its location on a Fen-edge embayment to the west of Thorney island (Fig. 2.1). During the later prehistoric period, open fenland lay to the south and south-east of the project area. From a maximum height of 1.6m above OD, the ground surface dipped gradually away to the east and south-east to meet the Fen at just below the 1m contour. The slight elevation of the site, which ultimately linked it to the 'high ground' of the Eye peninsula to the west, was crucial in that it enabled at least seasonal occupation of the site[1].

The quarry thus occupies what was once 'skirtland', a term used for land on the western margin of the Fen that occasionally experienced peat growth and episodes of alluvial deposition (French and Pryor, op. cit.). The skirtland has been characterised as open flood meadow, fringed by carr woodland and punctuated by embayments of reedswamp (French, 2003, p.100 and 148).

The Geoarchaeological Context

Jurassic clay of the Oxford and Kellaways Beds forms the geological substrate to the site, overlain at Pode Hole quarry by gravels of the March series. These were laid down in the last interglacial period, about 120,000 years ago (Chaburin, 1961, p.11 and p.69). These gravels are overlain by a thin (c. 0.4-1m) deposit of gravelly silty clay of various grey, orange or yellow hues. This has been interpreted as pre-Flandrian alluvium, or as a soil resulting from the weathering of an ancient ground surface (Hall, 1987, p.48; French and Pryor, 1993, p.6). This semi-permeable deposit makes the land at Pode Hole quarry somewhat slow draining, despite the thick layers of gravel that underlie the site.

The majority of the archaeological features at Pode Hole quarry directly overlay, or were cut into, this horizon. Remains of the deposit known as the Older Barroway Drove Bed, or 'fen clay' were present in the extreme south and east of the excavation area below the 1m contour. This material is evidence of a marine incursion dated to the fourth millennium BC (French and Pryor, 1993, p.7).

Evidence for a further marine incursion in the later Bronze Age has been recorded immediately to the south of the quarry (French and Pryor, 1993, p.89-90). These deposits were not recorded in the project area; it therefore seems that the prehistoric land surface at the quarry was not directly affected by this event. However, it is likely that the site was quickly rendered uninhabitable by the peat growth that was caused by the subsequent deterioration in drainage conditions.

The archaeology then records a hiatus in human activity within the project area until the post-medieval period when the land was subjected to drainage, enclosure and ploughing. By these processes most of the former peat cover was transformed into a friable dark greyish brown

1. It is all too easy to underestimate the importance of the slightest topographical variation within the Fens; 'Highlands' and 'Hill Farm', once part of Thorney 'island,' lie at just 6m above OD.

agricultural topsoil, and only survived in its original state in isolated pockets where it had dipped into deflation hollows in underlying archaeological features.

This summary of the geoarchaeological setting of the project area therefore provides a framework to understand past human activity in it: during the second millennium BC the position of the project area site in relation to ongoing processes of sea-level change, aggradation, erosion and drainage placed it on the Fen-edge. This location encouraged settlement, as it enabled exploitation of the combined resources of open grassland, woodland, rivers and the sea. It offered a very rich, if precarious, niche for human settlement.

Implications for Archaeological Survival

Many of the Fen-edge sites have benefited from protection in the form of blanketing layers of river or marine sediments. Unfortunately this was not the case at Pode Hole quarry, where the location and elevation of the project area placed it beyond the limits of major aggradation deposits such as the upper Barroway Drove Beds, and the later Terrington Beds. When removing modern ploughsoil at Pode Hole quarry, the greyish orange-yellow pre-Flandrian gravels and silts were generally the first horizon to be encountered. Archaeological features and deposits were cut into or overlay this horizon, and were not protected by any intervening deposits of significant depth or extent. They were therefore vulnerable to the effects of modern agriculture. The prehistoric ground surface is believed to have suffered major truncation in the project area. Comparisons of the results of the field assessments carried out at the quarry in the 1990s (see below) reveal that significant deterioration of features took place in as little as six years.

On a more positive note, the lack of blanketing layers of river or marine sediments did at least allow the initial identification of much of the site through cropmark evidence visible on aerial photographs.

The large-scale drainage that accompanied the advent of modern agriculture also affected the survival of archaeology on site. The remnants of peat found in pockets below the ploughsoil show that the site was once at least seasonally waterlogged. However, waterlogged deposits were not encountered in the project area until about 0.3m OD, a level only reached towards the bases of the deepest features. Much of the once-preserved organic content of the site had therefore been lost. In consequence, the site presented a rather taphonomically skewed organic assemblage that favours those artefacts and ecofacts that came to be located in such 'sumps of preservation'.

Dewatering and ground surface truncation have therefore been identified as two major post-depositional factors that have distorted the archaeological record within the project area.

The Archaeological Context

The resource-rich Fen-edge was a favoured location for settlement and farming, and was exploited through a range of periods. The following section summarises the archaeological evidence of this Fen-edge activity and land-use in the vicinity of Pode Hole quarry.

Palaeolithic (c. 500,000-c. 10,000BC)

There are no known sites of human activity of Palaeolithic date from the Cambridgeshire Fen-edge. Fossil remains of Pleistocene fauna have however been recovered from the gravels at Pode Hole quarry and its vicinity. Some of these are on display in Peterborough city museum.

Mesolithic (c. 10,000-c. 5000BC)

The Mesolithic is currently only represented in this area by occasional sparse and poorly understood lithic scatters. It has been noted that these findspots are often found in the lower reaches of former river valleys and on the Fen-edge, and these locations often witnessed subsequent Neolithic activity (French, 1992, p.2; Hall and Coles, 1994 cited in Pryor, 2006, p.45).

Neolithic (c. 5000 - 2000BC)

The Neolithic period witnessed the introduction of agriculture, pottery, monumental earthworks and a more settled pattern of human occupation. The human population of the Fen-edge thus becomes much more archaeologically visible. In the immediate vicinity of the project area the period is only represented by shallow pitting and occasional lithic findspots. However, a Neolithic 'ritual landscape' was uncovered to the north-west of the project area at Maxey (Pryor, 1998), whilst to the south-west bordering Flag Fen significant finds include a series of mortuary enclosures and structures (Pryor, 2001a) and an oval barrow (Evans et al. 2005).

Bronze Age (c. 2000- 700BC)

It is perhaps unhelpful to distinguish between the Neolithic and the Bronze Age when considering the archaeology of the Fen-edge, as the period of transition between the periods is well represented in the local archaeological record. Several sites in the area have been found to contain Beaker occupation, usually small pits containing lithics and the pottery characteristic of the period (e.g. Beadsmoore, 2005, p.64-66). These features seem representative of only low-level or sporadic occupation, but the mortuary remains from

the period are presumably the product of a population intimately linked to the landscape. During this period many round barrows were constructed around the Fen-edge, several of which have been excavated in and around the project area (Cuttler and Ellis, 2001).

Marine transgressions responsible for the Older Barroway Drove Beds affected settlement during this period, but it recommenced with renewed vigour from the middle of the second millennium BC.

Aerial photography and the results of large-scale open area excavations have revealed that during the middle of the Bronze Age thousands of hectares bordering the Fen came to be enclosed in extensive field systems[2]. Direct continuations of the Pode Hole field system have been excavated north of the A47 close to Thorney (Phoenix Consulting Archaeology Ltd, 2007). Following the Fen-edge south, broadly comparable Bronze Age field systems have been revealed at Eyebury (McFadyen, 2000), Fengate (Pryor, 2001a; Beadsmoore, 2005 and 2006), Must Farm (Evans et al. 2005) and Bradley Fen (Gibson and Knight, 2006). The latter two sites, part of Whittlesey 'island' ,seem particularly well equipped to provide much evidence about the nature of domestic settlement during this period (Cambridge Archaeological Unit, forthcoming). Evidence from archaeological investigations has revealed that large-scale Bronze Age land enclosure also extended north around the Fen-edge into Lincolnshire, at Welland Bank and Rectory Farm, West Deeping (Hunn and Rackham, forthcoming), Stowe Farm (Kibberd, 1996), Langtoft quarry (Dickens, 2006) and Billingborough (Chowne et al. 2001). Only at the northern limit of the Fens does this pattern of enclosure and settlement diminish (Yates, 2007, p.84) Further swathes of this enclosed ancient landscape no doubt currently await further detection, masked and partially protected by layers of alluvial or marine sediment.

Several sites in the area show evidence of an increase in intensity of occupation and subdivision during the later Bronze Age. However climatic deterioration and rising water-levels made the most low-lying regions of the Fen-edge increasingly unsuitable for permanent occupation at this point, and it is against this backdrop that the celebrated platform at Flag Fen, with its rich assemblage of votive objects, came to be built (Pryor, 2001a).

Iron Age (700BC-AD43)

Whilst the archaeological evidence would seem to suggest that the land within the Pode Hole project area was too wet for permanent occupation in the Iron Age, other nearby excavations have revealed that settlement sites and field systems from this period are common on or near the contemporary Fen-edge. Slight remains of Iron Age activity have been recorded 2 to 3km to the south-west of Pode Hole quarry at Eyebury quarry (see Gibson and White, 1998, p.4 onwards). Due east of this point, at Bar Pasture Farm, scheduled cropmarks and earthworks are believed to be the remains of an Iron Age settlement site (SAM No. 20803). Iron Age occupation has been comprehensively confirmed at Fengate, where a group of up to 55 roundhouses and huts were excavated at the Cat's Water site (see Pryor, 2005, p.166 onwards).

Romano-British (AD43 - 410)

Despite siltation events in the Roman period the climate was generally more benign at this time. Following Roman occupation, infrastructure projects were installed in the area: the Cat's Water drainage dyke was dug to the west of the Pode Hole project area, and the Fen causeway road was built across Flag Fen. Remains of Romano-British occupation are commonly encountered around the nearby Fen-edge; a complex of settlement and enclosure features has been recorded between Pasture House Farm, Bar Pasture Farm and Willow Hall. Remains of Romano-British fields adjacent to a villa or farmstead (itself located offsite) have been excavated slightly further around the Fen-edge at Eyebury quarry (Patten, 2004). Elsewhere in Eye parish a small Roman cemetery and a stone coffin have been recovered. Land around Flag Fen contains numerous sites of Romano-British occupation. Closer to Pode Hole, recent excavations to the east of the project area, in Thorney, have revealed residual scatters of Roman artefacts (Thomas, 2006, p.181). However, the low-lying position of the Pode Hole project area is likely to have discouraged settlement during this period[3], especially towards its end when climatic deterioration again saw expansion of the peat Fen and resultant alluviation (French and Pryor, 1993, p.7-8).

Early Medieval (410 - 1066)

It is probably a testament to the remote and inhospitable nature of the area during this period that Thorney attracted a small Late Saxon anchorite hermitage. This foundation was sacked by Danish raiders in the 9th century AD, and the island reverted to the uninhabited wasteland hinted at by its place-name evidence: 'Thorney' means 'thorn island'. However, the location presumably retained some spiritual importance, as in AD 972 St Aethelwold established a monastery at Thorney.

Medieval (1066 - 1485)

Thorney Abbey flourished during this period, and became one of the great 'Fen five' monasteries (along

2. Land enclosure was not just a Fen-edge phenomenon during this period. Knight (2002) records that Middle Bronze Age field enclosures were present in the 'uplands' now occupied by Peterborough.

3. The scheduled earthwork remains of a rectilinear field system at Pode Hole Farm (SAM 20802) are officially recorded as Romano-British but are now believed to be Bronze Age (see Chapter 6).

with Crowland, Ely, Peterborough and Ramsey). The Pode Hole project area lay within the monastic estate, and the occupants probably carried out drainage works during this period. John Hexham's c. 1590 map of '*the fenland between Peterborough and Wisbech*' records regular water courses around Thorney, and it is likely that the abbey was responsible for the construction of these.

Post-medieval (1485 - c. 1760)

Thorney Abbey was surrendered during the Dissolution in 1539. Recent excavations in Thorney have uncovered evocative traces of the physical dismantling of the abbey, with fragments of decorative masonry being used as hearth bases for the smelting and robbing of the lead from stained glass windows (Thomas, 2006 [4]). Following the Dissolution, Thorney and the abbey estates passed into the ownership of the Duke of Bedford. The Hexham map and place name evidence on Benjamin Hare's 1652 '*The True Plot and Land Description of the Manor of Thorney Abbey...*' map suggest that a windmill was located just to the west of the Pode Hole project area during this period. No archaeological evidence of occupation within the Pode Hole project area was found for this period and it seems likely that the area was still uninhabited. Manorial records from the 16th and 17th centuries record the presence of 16,000 acres of fen around Thorney, seasonally flooded, with sedge, flag and reed beds, willow and alder woods (Bedfordshire Records Office, Russell Collection, cited in Thomas, op. cit.). Similar damp conditions probably prevailed in the project area at this time: Hare's c. 1590 map uses the name 'Pode Hole' for the area, 'pode' being a local word for 'frog' or 'toad' (Healey, 1997, p.28).

Such damp conditions were not to last however. Following an entrepreneurial partnership between the Duke of Bedford and Sir Cornelius Vermuyden in the 17th century, much of the land around Thorney was systematically drained. Ordnance Survey maps from the late 19th century show Pode Hole Farm with its drainage dykes and field boundaries much as it appeared at the commencement of quarrying at the end of the twentieth century. Former wetland had come to be replaced by intensively farmed arable land.

Other Investigations at Pode Hole

Prior to the work that is the subject of this report, a number of other archaeological investigations had taken place in the quarry.

4. This site report for the excavations at Thorney also contains a useful summary of the development of the abbey. It draws on cartographic sources and also attempts to relate the geography of the modern village to the layout of the medieval abbey.

1981-2, Fenland Project, fieldwalking survey

The area, that is the subject of this report, was fieldwalked in 30m transects in good conditions, but no concentrations of artefacts were recorded (Hall, 1987).

1983, Fenland Archaeological Trust, dyke survey

In 1983 the Fenland Archaeological Trust examined modern drainage dykes directly to the south of the project area to record the deposits revealed in section in their sides (French and Pryor, 1993). This revealed something of the sedimentation events the area had been subjected to. A wooden trackway was also revealed, as well as a small quantity of worked flint of probable Late Bronze Age date. The exposed portion of the trackway measured 12m in length. It was found to be built of oak timbers and oriented north-west to south-east. The trackway was sealed by the older Barroway Drove Bed fen clay. This material resulted from major marine incursions dated to the earlier second millennium BC, and a Late Neolithic/ Early Bronze Age date was therefore suggested for the trackway. When the site of the trackway was re-examined by the Fenland Archaeological Trust in 1990 (see below) it was found that the feature had not survived, supposedly due to dewatering of the Fen. The orientation of the trackway would have taken it into the western Extraction Areas investigated by the current project, but no trace of it was found there either. However, deposits of older Barroway Drove Bed fen clay were also generally absent. This suggests that generally dryer conditions prevailed there, and the trackway would therefore not have been needed. In any case, without the protection of the capping layer of clay, such a wooden structure would not have survived modern agricultural practices.

1990, Fenland Archaeological Trust, trench evaluation, geophysical survey and aerial photograph interpretation

In 1990 the Fenland Archaeological Trust produced an archaeological statement for the environmental impact assessment required for the quarry at Pode Hole. During the course of this work, aerial photographic interpretation, targeted geophysical survey, trench evaluation and a review of known sources was carried out (Gater, 1990 and French, 1991).

The aerial photographic survey and trench evaluation revealed the remains of ditched enclosures and ring-ditches associated with gravel barrow mounds, as well as post-medieval ditches. The geophysical survey also located anomalies thought to be barrows, but the work was largely hampered by post-medieval drainage features, and it was not possible to produce a coherent plan of them, or the adjacent field system. A known Romano-British site exists within the area of the 1990 survey, at Pasture

House Farm. It seems that, on the basis of this site, the field system throughout the entire surveyed area was similarly dated to the Roman period, despite a lack of dating evidence. However, because of the nature of their fills, the possibility was raised that some of the ditches may have been prehistoric (French, op. cit. p.12).

An area of upstanding earthworks present in a pasture field to the east of Pode Hole Farm was also examined, and perhaps partly on the basis of the 1990 survey, the remains were subsequently scheduled (SAM No. 20802). The earthworks represent the remnants of ditches, banks, a droveway and building platforms. The evaluation also revealed upstanding earthworks not only in the field now scheduled, but surviving at the base of the ploughsoil in the field immediately to the south, which lies within the current project area. However, these earthworks no longer survived when the area was stripped of ploughsoil more than ten years later.

1996, Chris Blandford Associates, quarry planning application, assessment of existing sources of information

In 1996 an archaeological assessment was included in the environmental statement that accompanied the quarry planning application (Chris Blandford Associates, 1996). This work was based on the previous field assessment carried out by the Fenland Archaeological Trust in 1990, but was supplemented with a re-examination and rectification of aerial photographs, a contour survey of the barrow mounds, and a renewed desktop assessment. This work confirmed the presence within the planning application area of barrows and ring-ditches, as well as over 10ha of a cropmark field system. This was believed to be Roman in date, although the possibility was raised that it contained Bronze Age elements. The contour survey revealed that ploughing had largely levelled the barrows in the six years that had elapsed since the Fenland Archaeological Trust's field assessment.

1996, Birmingham University Archaeological Field Unit, trench evaluation, excavation and watching brief

Conditional planning permission was subsequently granted for gravel extraction at Pode Hole. In response, in 1996 the quarry operators commissioned an investigation of the first of the Extraction Areas to be quarried. These lay south and west of Pode Hole Farm, and were therefore located immediately to the west of the current area. This fieldwork was undertaken by Birmingham University Field Archaeological Unit (BUFAU), and comprised a watching brief, evaluation, and a limited open area excavation (Cuttler and Ellis, 2001). This targeted the barrows previously identified on site. In the event, only one barrow was found to be present. This was Early Bronze Age in date and was found to seal a number of pits and gullies that contained Neolithic and Early Bronze Age material. The barrow did not contain a central inhumation, but traces of three cremations were found dug into, and next to, the mound. Ditches forming a rectilinear field system, principally aligned north-east to south-west, were also found. This was presumably a continuation of the field system revealed at Pode Hole quarry in subsequent years, and described later in this report. At the time, however, it was again interpreted as an Iron Age/Romano-British construction, despite a lack of dating evidence.

In 2006, following the completion of the work described in this report, a further 15 ha area was excavated by Archaeological Solutions Ltd (Andy Richmond, pers. comm.). This area was located directly to the south-west of the project area that is the concern of this report. A continuation of the field system was located, although it was built on a different alignment, a change that probably reflects the change in the orientation of the Fen-edge in this area.

Summary

The geographical location of the project area places it at what was, in later prehistory, the Fen-edge. This was a resource-abundant location at the interface between two environmental regions: the Fens, and the woods and meadows of the lowlands. The Fen-edge was thus a rich area, but it was also environmentally unstable; prone to flooding, sedimentation and peat growth. Despite these 'risks' (to the modern observer, at least), this area was an attractive location for human activity, and in the second millennium BC it came to be extensively and systematically enclosed into field systems covering thousands of hectares.

Subsequent flooding events in the late first millennium BC, and during the Roman period made the more low-lying regions of the Fen-edge, below about 3m OD (French, 2003, p.152), an inimical location for permanent human occupation. Consequent sediment aggradation has preserved much of the abandoned prehistoric landscape.

It is tempting to think that the archaeological fieldwork at Pode Hole has revealed an archaeological 'site' but in reality it has merely opened a small window onto the prehistoric Fen-edge landscape, '*perhaps the most remarkably rich and diverse archaeological landscape in England*' (Pryor, 2005, p.22). Largely as a result of the modern need for the gravel deposits that helped drain the fields of the Bronze Age settlers, their landscape has been re-exposed and archaeologically excavated in many locations around the Fen-edge.

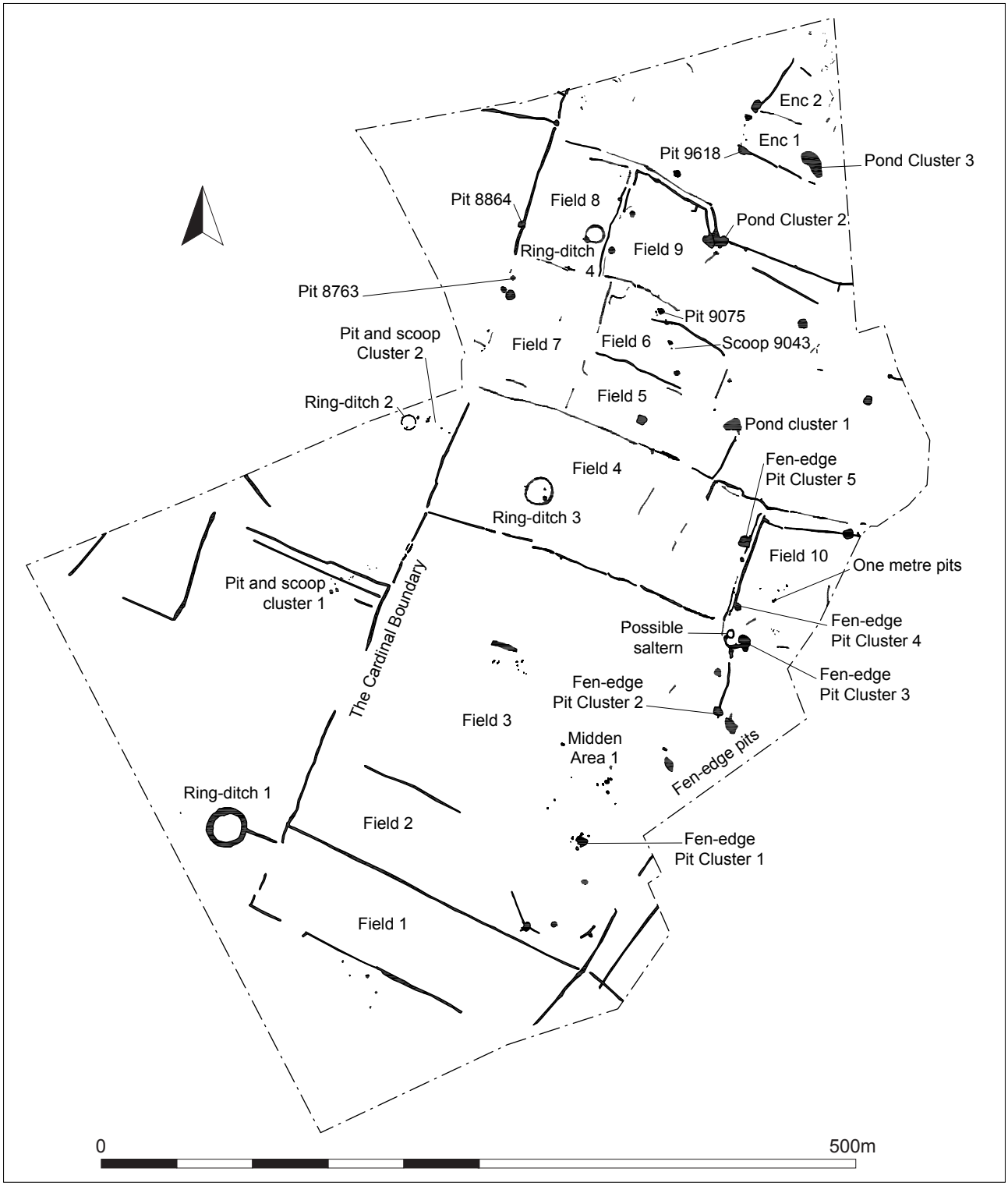

Figure 3.1: The Bronze Age landscape.

CHAPTER 3: *The Excavation*

The Nature of the Archaeological Record

A total of 3322 context numbers were issued during the course of the excavations at Pode Hole. Of these, 785 were allocated to cut features. Remains found in the project area include ring-ditches, ditches forming a co-axial field system, waterhole pits, ponds and numerous small negative features, variously interpreted during excavation as small pits, scoops, post holes, or natural features. Almost all of these minor features were found to be artefactually sterile, lacked patterning, and few are described here. Details of all excavated features are, however, available in the project archive, which has been deposited at Peterborough City Museum, with an electronic version available online via the Archaeology Data Service.

Archaeological features were widely dispersed across the project area and created a fairly simple 'site' in plan (Fig. 3.1). In prehistory this appears to have remained static, with no great realignments of boundary elements or superimposition of features.

As detailed in the previous chapter, the processes of ground truncation and dewatering both adversely affected the survival of archaeological remains at Pode Hole quarry. In addition, disturbance from post-medieval features hampered efforts to understand the sequential development of the site, as, with exasperating frequency, key relationships between intercutting archaeological features were either destroyed or obscured by later remains.

In addition to post-depositional factors, the very nature of the surviving archaeological remains also hindered their interpretation. Where features did intercut, the similarity of fill material (generally a compact mid-grey-brown sandy silt) across the project area invariably made it difficult, if not impossible, to discern sequential relationships between them. Similar soil formation processes appear to have been in operation for long periods of time. This resulted in remains from different periods becoming filled with much the same sort of material. While excavators' field interpretations of relationshipshave been checked and have mostly been respected, their inclusion in this report is, perhaps more than ever, no guarantee of infallibility.

Phasing the Archaeology

In common with many rural sites, the majority of features at Pode Hole cut natural basal geology and were sealed by modern ploughsoil. Generally, there was little intercutting of features, and because of the normally sparse amounts of artefacts recovered from them, it has not been possible to place all contexts within a coherent site-wide phasing. It is nevertheless important to attempt to tell the story of the site.

Study of the pottery and other ceramic artefacts recovered from Pode Hole has identified five principal ceramic phases (Morris, the prehistoric pottery, this report):

- *Ceramic phase (CP) 1:* Early Bronze Age (c. 2000-1500BC)
- *CP 2:* Early Middle Bronze Age (c. 1500-1300BC)
- *CP 3:* Late Middle Bronze Age (c. 1300-1100BC)
- *CP 4:* Post Deverel-Rimbury (PDR) Late Bronze Age (c. 1100-800BC)
- *CP 5:* PDR-possible Early Iron Age (c. first half of first millennium BC)

This phasing has been adopted to provide a chronologically based structure for discussing the development of the prehistoric landscape of Pode Hole. However, CP3 and CP4 pottery were often difficult to distinguish, and pottery representing the transition between the two phases was relatively abundant. Therefore, these two phases have been grouped together to represent the later Bronze Age. This report presents the archaeological narrative according to a five-fold structure:

1. The Monumental Landscape (Early Bronze Age)
CP1 features, principally an alignment of ring-ditches, other funerary features, and several small pits, including a cremation.
2. The Enclosed Landscape (Middle Bronze Age)
The principle elements of the rectilinear field system. CP2 features including an early waterhole pit and a concentration of small midden pits.
3. The Working Landscape (later Bronze Age)
CP3-4 features including extensions to the field system and numerous waterhole pits and ponds. Most of the archaeology of the site is discussed in this section, as features that *possibly* date to either CP3 or CP4 (based on all dating considerations) were the most common on site.
4. Decline and Abandonment (First Millennium BC)
CP5 features, including a small midden area. Peat growth, created by worsening drainage conditions, blanketed the area during this period.
5. The Second Period of Enclosure (Post-medieval to Modern)
Linear features that drained and defined the landscape from the 16th century onwards.

Within this primary structure, features are then described according to land-use, type and activity. It is recognised that phasing, whilst necessary, is somewhat reductive. The gradual or non-synchronous nature of change, the importance of continuity of land-use, as well as the long lifespans of monuments across phases are all acknowledged.

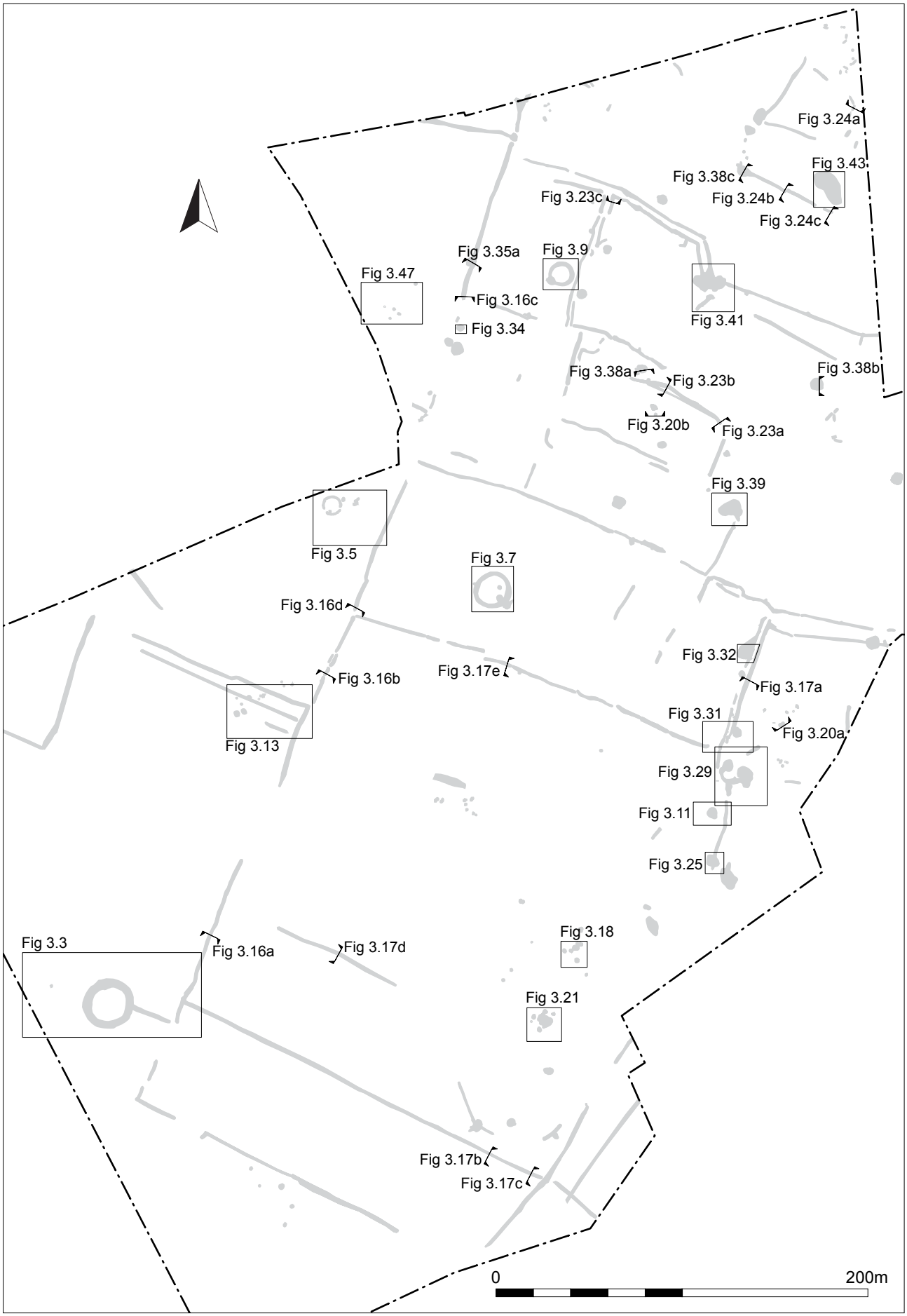

Figure 3.2: Detail plan and section locations.

The Monumental Landscape (Early Bronze Age)

Four ring-ditches were found within the project area. These were oriented on a north-east to south-west alignment, which runs broadly parallel to the prehistoric Fen-edge. Continuing on this alignment to the south-west beyond the project area, the site of the barrow excavated by BUFAU in 1996 is encountered (Cuttler and Ellis, 2001). It would therefore appear that the northern side of the Fen-edge embayment to the north-west of Thorney island was once marked by at least five of these monuments, scattered over a distance of nearly 700m.

Following the discovery of human remains in, or in association with, some of the ring-ditches, all of these features found within the project area have been interpreted as truncated barrows.

Ring-ditch 1 (Figures 3.3-4)

Description

Ring-ditch 1 was centred on NGR 526272 303424, and located close to the western edge of the project area. The external diameter of the feature varied between 25.5m and 27.2m. The ditch was typically between 3.5m and 4.0m wide with a maximum depth of 1m. This enclosed a central circular area with a maximum diameter of just over 20m.

The profile of the ditch was generally quite gentle, often appearing to have a dish-shaped form in cross section. Although the exact sequences of fills revealed in the excavated sections were complex, an overall pattern emerged. The primary fills consisted of rather thin banded layers of gravel and sand deposits derived from the collapse and erosion of the sides of the ditch. Thicker secondary fills consisted of naturally deposited silting layers. These were overlain by sandy clay or silt deposits forming a tertiary fill in the top of the ditch. It was not possible to clearly discern bank collapse from one side or another.

The ring-ditch enclosed an area of around 300m^2, much of it covered by a fine pale brownish grey friable sandy silt with frequent sand silt patches and frequent gravel concentrations. This deposit may represent either the remains of a central mound, or, more likely, the original ground surface that was buried beneath such a mound. Excavation revealed this deposit to be just a few centimetres thick and to overlie clean natural subsoil. It was found to be artefactually sterile and devoid of any features except for a probable tree throw.

Dating

The construction and initial use of the ring-ditch has been dated to the Early Bronze Age on the basis of its pottery. A total of nine sherds of pottery were recovered from the fills of the ring-ditch and all belong to ceramic phase (CP) 1. Eight of these were of fragments of Beaker, typically dated to the Early Bronze Age. One fragment of a Collared Urn, dated to the Early Bronze Age/Middle Bronze Age transition was recovered. This fragment was from the uppermost fill of the ring-ditch and may suggest an extended period of use for the feature. Following

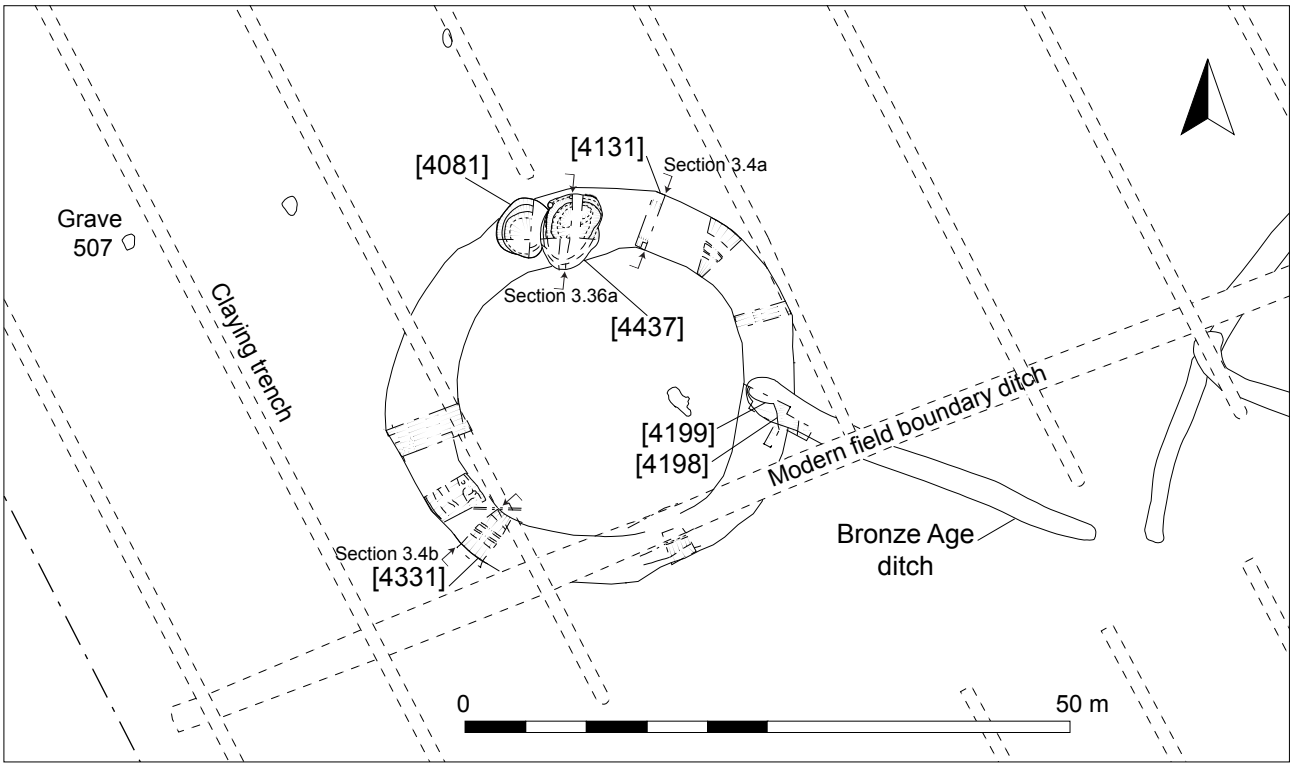

Figure 3.3: Ring-ditch 1, cut by waterhole pits and field system ditch.

its construction, it is likely that this feature formed a presence in the landscape throughout its subsequent occupation. This is confirmed by the later activity that Ring-ditch 1 attracted: it was cut by a cluster of large pits on its northern side, and a ditch on its south-eastern side. This ditch seems to have been dug specifically to link the ring-ditch into the later field system.

Discussion

Although no evidence of a mound or central burial was found, it is assumed that Ring-ditch 1 represents the remains of a barrow. It is likely that the mound itself has been lost to subsequent ground erosion. In the 19th century many features known as 'claying trenches' were dug on a regular pattern in the project area (see below). A noticeable interruption in these features coincides with the position of the putative barrow mound in the centre of Ring-ditch 1. This suggests that there was some obstruction or obstacle there when the claying trench system was created.

Fragments of human bone and two bronze objects (a pin and blade) were recovered from a pit cluster that cut Ring-ditch 1 on its northern side. These may have originally been placed in a grave in the barrow mound itself, and were redeposited into the pits when the mound eroded. The same taphonomic processes may have occurred to the human bone found in a field boundary ditch that cut the ring-ditch.

A relatively unabraded fragment of a type of pottery normally used for cremation urns was recovered from the ring-ditch, suggesting deposition nearby, and thus supporting the interpretation of this feature as the remains of a barrow. This interpretation is also strengthened by the discovery of a grave approximately 18m from the north-west edge of Ring-ditch 1. This grave, which contained the poorly preserved remains of a young adult (skeleton 508) buried in a crouched position and oriented north to south (Brayne, this report), further suggests that the area was a focus for funerary practice.

Plate 3.1: Skeleton 508, a crouched inhumation found in the vicinity of Ring-ditch 1.

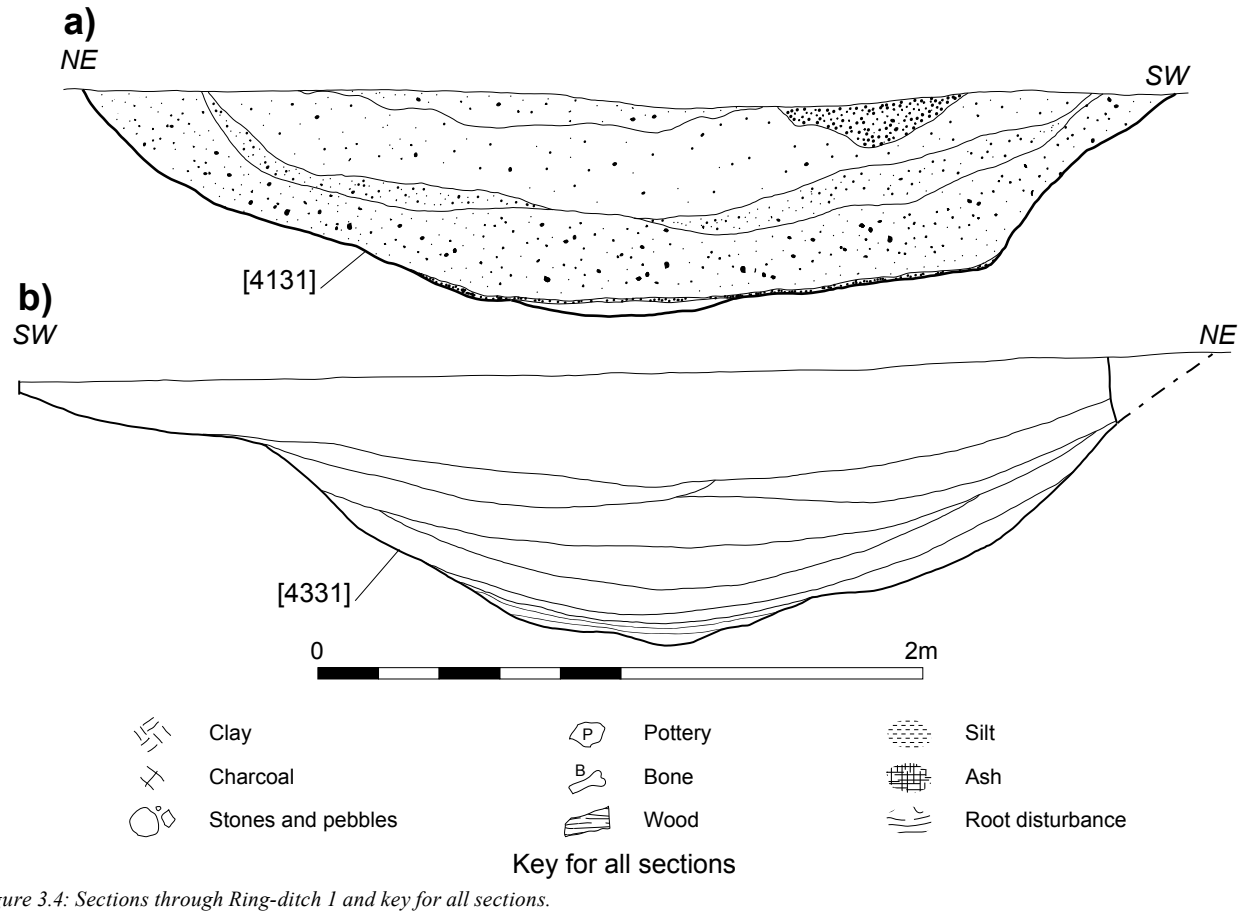

Figure 3.4: Sections through Ring-ditch 1 and key for all sections.

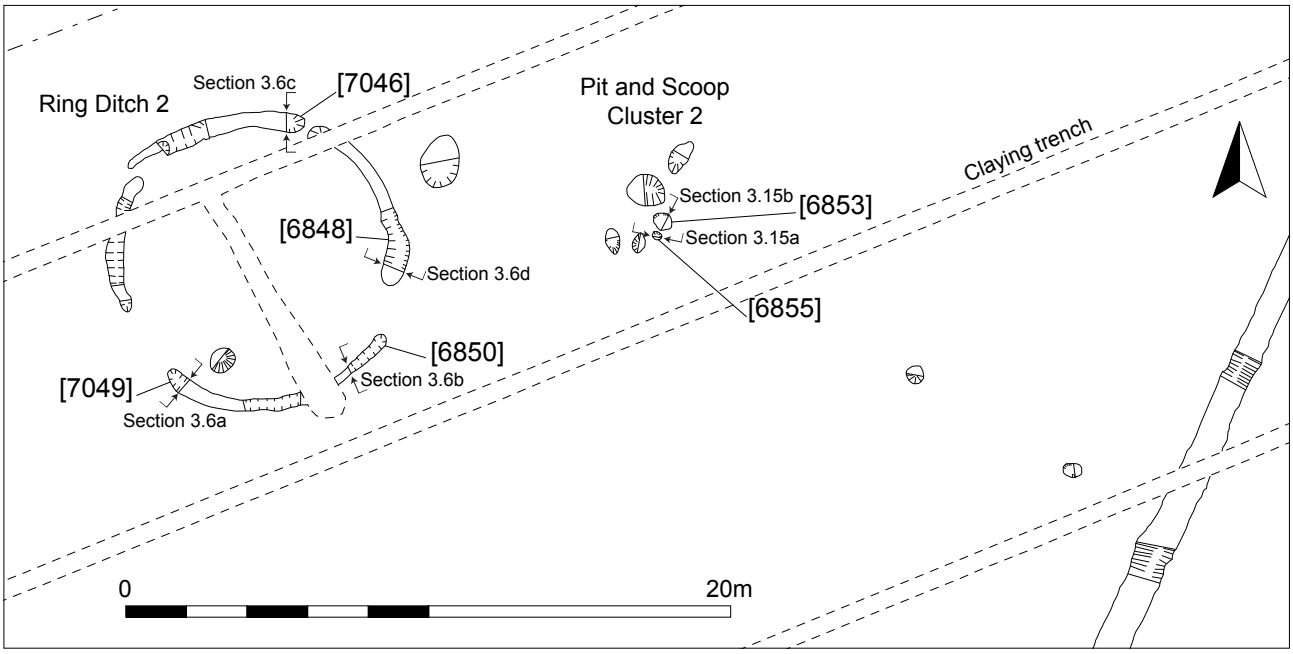

Figure 3.5: Ring-ditch 2 and Pit and Scoop Cluster 2.

Ring-ditch 2 (Figures 3.5-6)

Description

In comparison to Ring-ditch 1, Ring-ditch 2 was a much slighter feature. It was centred on NGR 526392 303693, and located close to the northern edge of the project area. It consisted of an arrangement of four curvilinear ditch segments that formed a broadly circular, though interrupted, ring-ditch. The external diameter of the feature varied between 9.6m and 9.8m. The ditch segments were typically between 0.3m and 0.7m wide, with a maximum depth of 0.23m. The feature had a central circular area with a maximum diameter of just over 8.9m.

Ring-ditch 2 was rather poorly defined. Excavation of its component ditches typically revealed an irregular bowl-shaped profile, with a concave or flattish base. The majority of the fills were orange-grey or brown mixtures of sand and silt. This material was very similar to the natural subsoil that the feature was dug though, and may represent a weathered redeposition of the initial upcast. Five of the cross sections had peat-like deposits as their uppermost fills. This material probably represents the peat that once blanketed the site slumping into the feature as it subsided. No artefacts were recovered from any of the fills in the feature.

A small pit or tree throw was recorded inside the ring-ditch. This was also found to be artefactually sterile.

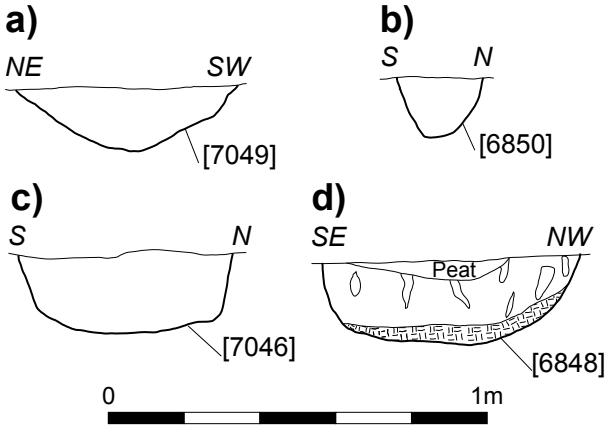

Figure 3.6: Sections through Ring-ditch 2.

Dating

Without any artefacts or other datable material from Ring-ditch 2 it cannot be dated with certainty. It has however been tentatively attributed to the Early Bronze Age. This assumption is based on its presence within an alignment of other physically comparable features more confidently dated to this period.

Discussion

It is suggested that this feature functioned as a quarry for a barrow mound. No mound or funerary remains were found to confirm this interpretation, but this again may be due to truncation of the original ground surface. The interpretation of the feature is based on its broadly circular form, and on the fact that it forms part of the collection of circular features running across the site on a north-east to south-west alignment. These other features (Ring-ditches 1, 3 and 4) have been interpreted as barrows with more confidence.

The feature was initially thought to be the drip gully from a roundhouse. However, this was before the full alignment of circular features across the entire project area had been revealed. Additionally, the fills of the feature were perhaps too sterile, too lacking in artefacts and ecofacts, to suggest any occupation in the immediate vicinity. It is to be hoped that further excavation in the wider area will uncover a better preserved example of such an interrupted ring-ditch to better explain its original function.

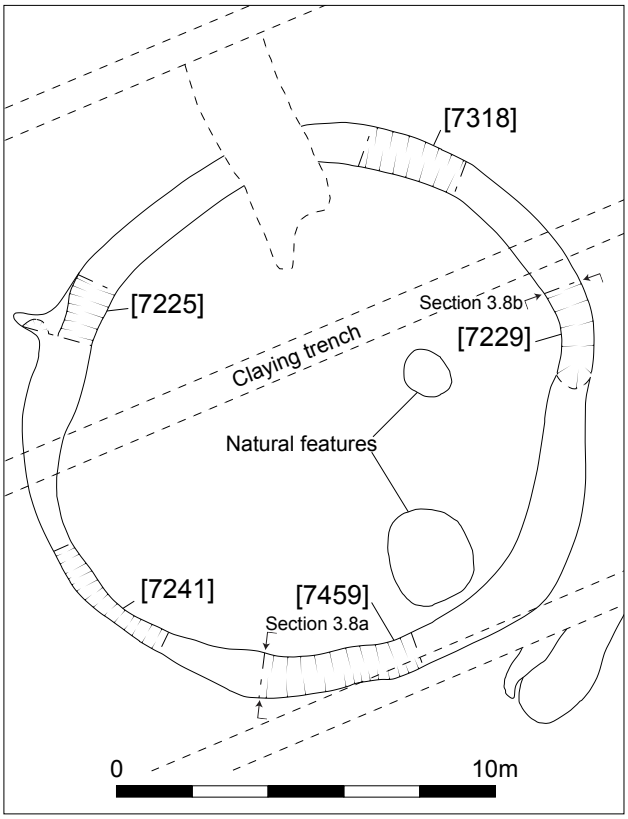

Figure 3.7: Ring-ditch 3.

Ring-ditch 3 (Figures 3.7-8)

Description

Ring-ditch 3 was a rather more substantial feature than Ring-ditch 2, being much larger, and continuous. It was centred on NGR 526247 303647, and located close to the central part of the project area.

The external diameter of the feature varied between 18m and 19.4m. The width of the ditch varied from 0.67m to 1.5m, and its depth varied from 0.12m to 0.32m. The feature had a central circular area with a maximum diameter of just over 17m.

As with Ring-ditch 1, the profile of the ditch was typically broad and shallow, with moderately sloping sides and a concave base. Where excavated the ditch was generally found to contain just one fill. This was a friable yellow- or orange-grey sandy silt, and is likely to represent a natural silting of the ditch. There was no evidence of a bank collapsing in from either side.

Two amorphous anomalies within the circumference of Ring-ditch 3 were investigated, but these proved only to be tree throws or natural soil stains.

Dating

A total of seven sherds of pottery were recovered from two of the five interventions cut into Ring-ditch 3. These were all of a Beaker-type fabric, and have been assigned to CP1 (Early Bronze Age). Ring-ditch 3 did not have any stratigraphic relationships with any other features within the project area, other than being cut by post-medieval drainage features. The pottery found within the fills of the ring-ditch indicate that it predates the rectilinear field system that came to be constructed across the project area.

Discussion

This feature forms part of the north-east to south-west aligned collection of ring-ditches, interpreted as a barrow cemetery. Ring-ditch 3 has thus been interpreted as the quarry ditch for a burial mound. However, no human remains were found in association with it, nor was there any evidence of a retaining palisade around the postulated mound. Ground erosion has probably destroyed the barrow mound along with whatever may have been buried beneath it, or cut into it.

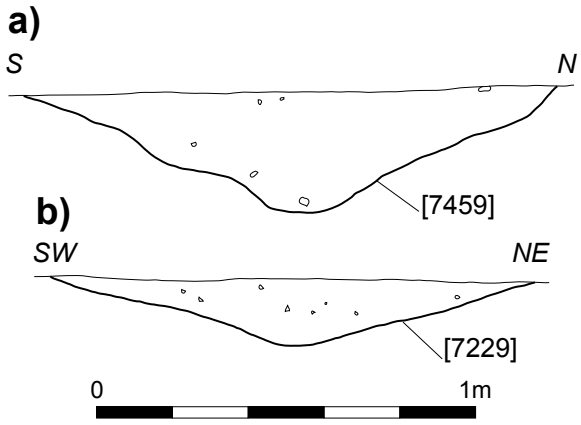

Figure 3.8: Sections through Ring-ditch 3.

Ring-ditch 4 (Figures 3.9-10)

Description

Ring-ditch 4, centred on NGR 526515 303818, was the most northeasterly of the group. The external diameter of the feature varied from 12.3m to 13.5m. The width of the ditch measured between 0.8m to 1.85m, but its depth was more constant, recorded as varying between 0.52m and 0.55m. The ditch enclosed a central circular area with a maximum diameter of just over 10m. The profile of the ditch was typically quite steep, either U-shaped or bowl-shaped, with a flattish or concave base.

Generally, the ditch contained a number of fills; typically a primary fill of yellow, grey, or brown silts and sands overlain by yellow and orange clay silts, which contained darker laminations, thought to represent weathering episodes during which time the ditch contained standing water. An upper fill of coarse yellow gravel often made the feature extremely hard to discern in plan, so similar was it to the surrounding gravelly natural subsoil. This material probably represents collapse of natural upcast. This material generally seemed to have slumped into the ditch from the centre of the ring-ditch outwards, supporting the argument for a central mound. Due to the similarity of this deposit to the surrounding natural deposits, it was only the uppermost fill, a friable grey silt, that initially

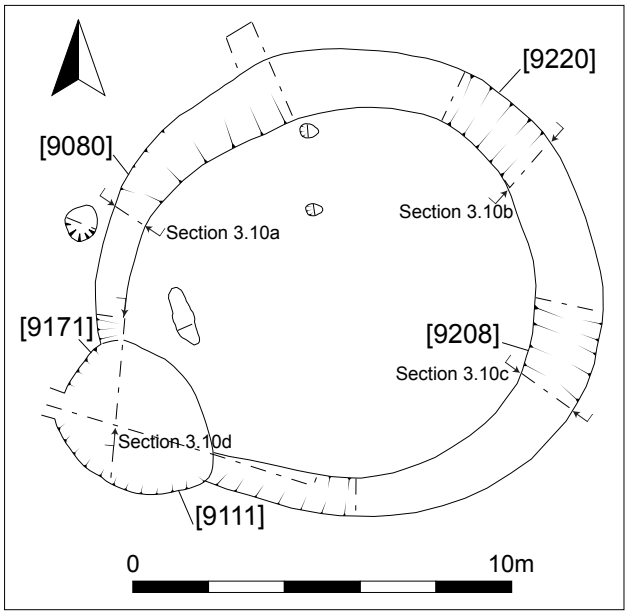

Figure 3.9: Ring-ditch 4.

betrayed the presence of this feature on the ground. Because this uppermost fill was not found everywhere around the ring-ditch, the feature was initially thought to have a penannular shape in plan. This grey silt, probably a waterborne deposit, was seemingly laid down long after the ditch had fallen out of use, as it is appeared identical to the uppermost fill of a pit that had been cut through the ditch on its western side.

Three small features lying within the area enclosed by the ring-ditch were investigated. Two of these were dismissed as natural soil staining or disturbance, but the third produced a fragment of animal bone, marking the existence of some pre-barrow activity.

Dating

None of the fills of this feature produced any pottery, although a sherd dated to CP5 (PDR Late Bronze Age-Early Iron Age) was recovered from the tertiary fill of the pit that cut the ditch. If the pottery was not too residual then it would provide a loose *terminus ante quem* date for the ring-ditch, which at least does not undermine its presumed Early Bronze Age date as part of a barrow cemetery.

Discussion

On the basis of its form, evidence of slumping from a central mound and the feature's location on the north-east to south-west oriented line of ring-ditches, Ring-

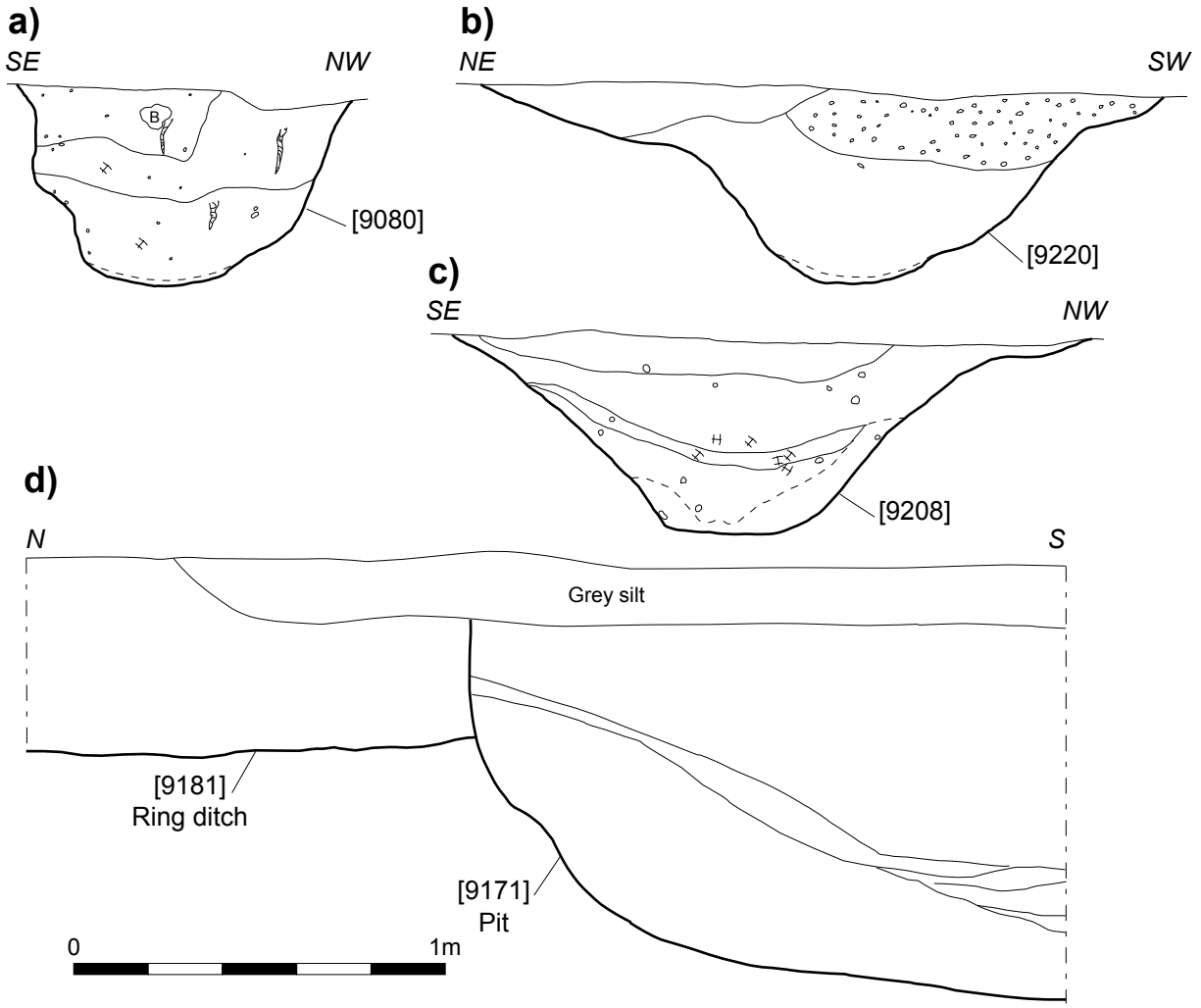

Figure 3.10: Sections through Ring-ditch 4.

ditch 4 has been interpreted as the remains of a barrow within a larger barrow cemetery. However, as with the other ring-ditches ground erosion has removed the postulated mound and whatever was buried beneath it, or cut into it. Ring-ditch 4 had a later waterhole pit cut into it, repeating the sequence not only observed for Ring-ditch 1, but also nearby at Fengate, at the Storey's Bar Way sub-site (Pryor, 2005, p.75-78).

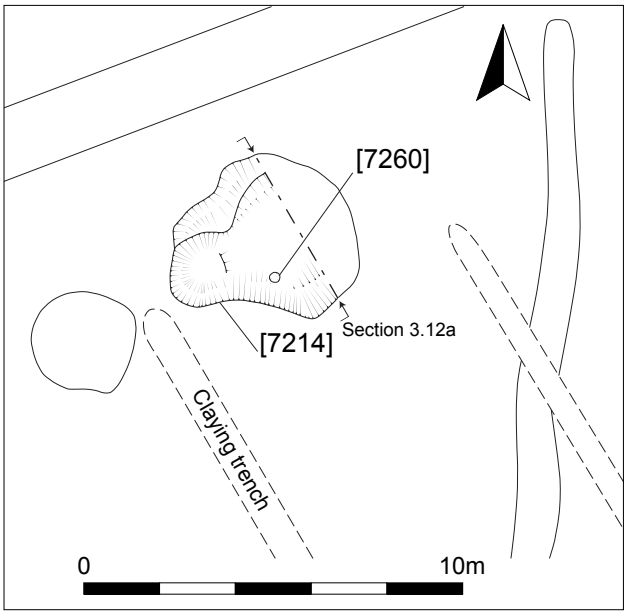

Figure 3.11: Waterhole pit 7214.

Occupation on the Fen-edge (Early Bronze Age)

Evidence of occupation of the project area before it became enclosed by the field system is sparse. It seems likely that the dead were placed into the landscape during the Early Bronze Age, yet few traces were recovered of the daily lives and routines of the area's inhabitants from this period.

On many Early Bronze Age sites, archaeological evidence of occupation consists of durable artefacts such as flint and pottery. However, such material of this date was only rarely recovered from the project area, and then it was usually found in either residual contexts alongside more recent artefacts, or recovered as unstratified material from the stripped ground surface following topsoiling.

Nevertheless, the presence of these finds, albeit in secondary contexts, is indicative of occupation of the landscape during this period. Based upon composition and technological aspects, the flint assemblage from Pode Hole quarry has been interpreted as being associated with Late Neolithic-Early Bronze Age settlement, and it has strong affinities with Beaker industries from the east and the south of England (Wilson, this report). Those few archaeological features thought to be direct evidence of Early Bronze Age occupation are described below.

Pit 7214 (Figures 3.11-12)

Description and dating

This was a sub-circular cut with irregular, steeply sloping sides and a concave base, located close to the Fen-edge in the south-eastern part of the project area, at NGR 526580 303527. It measured c. 7m in diameter, and attained a maximum depth of 1.2m. A small post hole, cut 7260, measuring 0.3m in diameter and 0.1m deep was found dug into the base of the pit, on its south side. This contained the badly preserved remains of the base of a wooden post. Modest amounts of heat-affected stone were found throughout this feature. Over 3kg of animal bone were recovered from it, the majority of it from two contexts, one low in the depositional sequence and one high. The bone assemblage included three bones of aurochs. The uppermost fill of pit 7214, context 7215, was a friable brownish grey silty sand, c. 0.3m thick. It contained the only flint artefact found in the feature, a single flake, as well as four sherds of CP1 pottery in a coarse grog-tempered vesicular fabric. One of these pot sherds was found with burnt food residue adhering to it, which returned a radiocarbon date of 1950-1750 cal BC (SUERC-12095). A single sherd of pottery, in a similar grog-tempered fabric, was recovered from deeper within the feature, and has been interpreted as a possible Beaker fragment. These dates correspond with the finds of aurochs bone, as this animal which would have been more common earlier in the Bronze Age. Pit 7214 did not have any stratigraphic relationships with any neighbouring features. The plant macrofossils that were recovered from

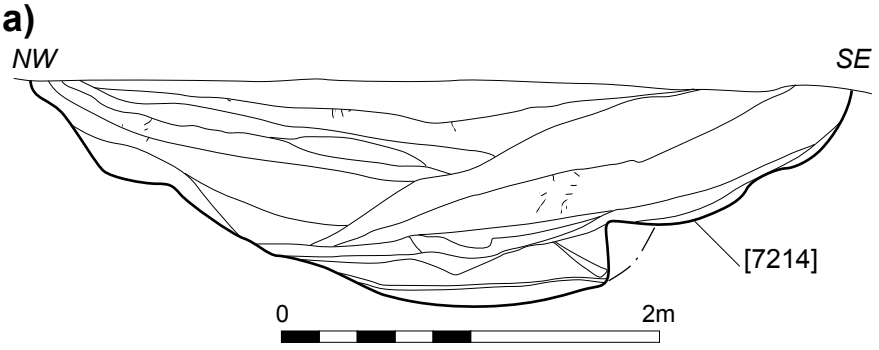

Figure 3.12: Section through waterhole pit 7214.

this feature derive from taxa that favour scrubland, and also cultivated or disturbed ground. Damp conditions were attested by finds of willow and hazel from within the pit (Rackham, this report).

Discussion

The form of pit 7214 suggests that it should be interpreted as a waterhole pit (see below). Many such features were excavated in the project area, especially along the Fen-edge. Where dated, waterhole pits generally seem to have been in use in the Middle to Late Bronze Age. Conversely, the dating evidence from pit 7214, whilst sparse, did consistently place it in the first half of the second millennium BC. Pit 7214 would therefore be a rather early example of this type of feature, although there is the possibility that residuality of artefacts has resulted in the misrepresentation of the date of the construction and use of this feature.

Cremation burial 7380

Description and discussion

Cremation burial 7380 was recovered from a small pit 66m to the north-west of pit 7214, at NGR 526537 303561 (Fig. 6.3). The pit was a small, well-defined, circular cut feature (1.08m in diameter and 0.36m deep) found to contain modest amounts (52g) of cremated human bone (Brayne, this report). It probably represents a 'token' cremation burial (Yates, 2007, p.18) as the volume of cremated material was not large enough to comprise the complete remains of an (adult) individual. The basal fill of this feature, where the burnt bone was located, was found to contain flint debitage, including two retouched flakes. All of this material shows signs of burning. A total of 15 sherds (14g) of CP1 pottery was also recovered from this deposit. The less productive upper fill of the feature contained a further flint flake and fragment of debitage. This material was unburnt, and the depositional sequencing of material in different states may have formed part of the funerary rites (Brück, 2001).

The botanical assemblage from the pit consists of charred seeds with no cereal chaff and only 12 cereal grains, including several barley grains and a single possible wheat grain. The charred weed seed assemblage is dominated by a notable concentration of flax. Although traces of flax occur in other features across the project area, their density here suggests that the flax may have some ritual significance, perhaps part of an offering associated with the cremation.

Following the discovery of this feature, other discrete anomalies in its vicinity were excavated, but these transpired to be either artefactually sterile, or natural soil stains. Similar 'token' cremation burials have been excavated nearby at Eye (McFadyen, 2000, p.15) and Whittlesey (Mortimer, 1995, cited in McFadyen, ibid.), where they were interpreted as Late Bronze Age, but this would appear to be an earlier example. Cremation burial 7380 did not appear to be spatially associated with any other feature; at

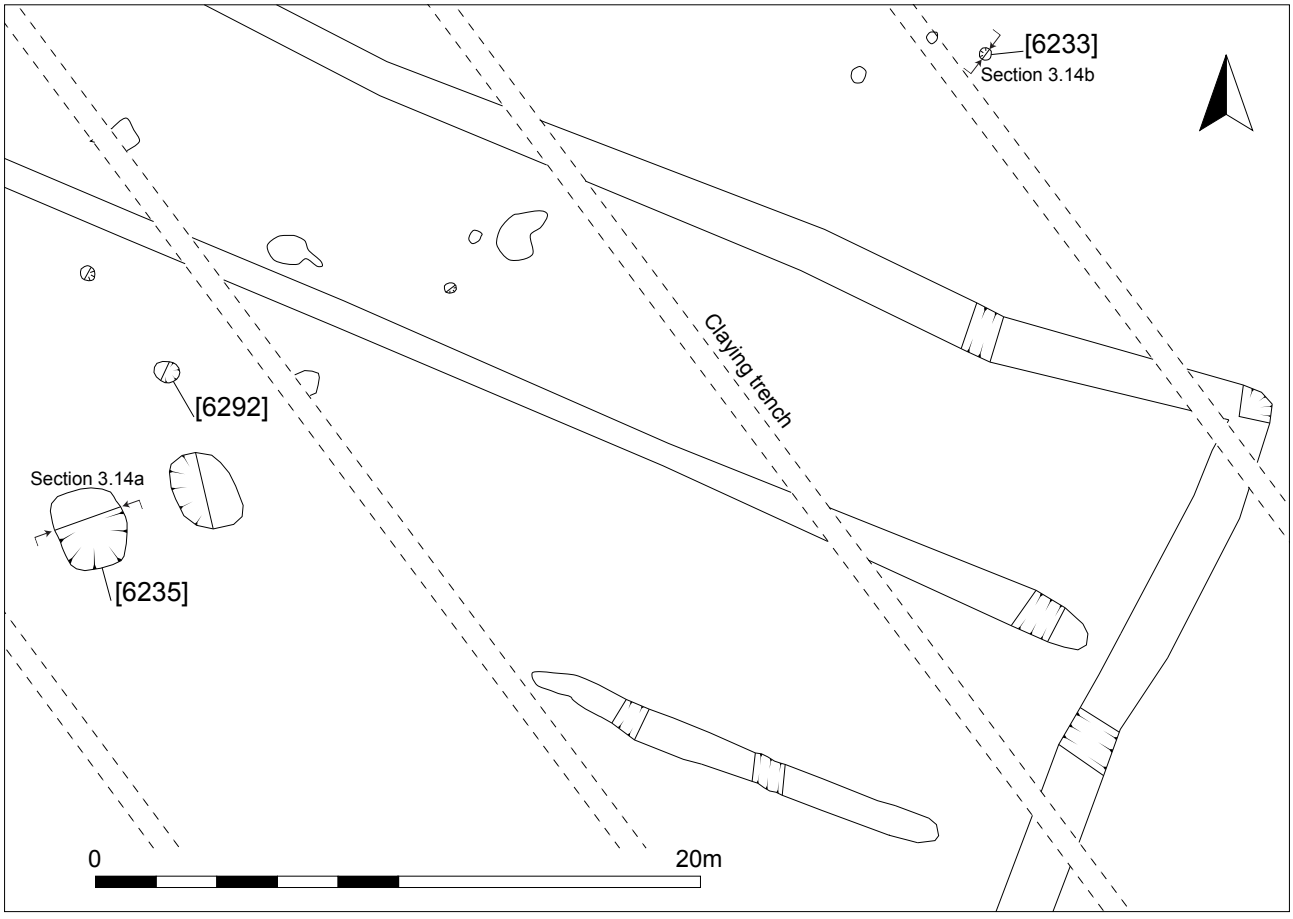

Figure 3.13: Plan of Pit and Scoop Cluster 1.

104m south-east of Ring-ditch 3, it was probably too far from that monument to be a satellite burial.

Scoop 9043

Description

Scoop 9043 was a sub-oval cut with an irregular dish-shaped profile. This feature was located at NGR 526565 303745 (Fig. 3.1). It measured 0.65-0.75m in diameter and was just 0.15m deep. A plethora of minor scoops and diffuse stains were recorded throughout the project area. Most proved to be sterile. However, the fill of this feature was prominent in plan, a friable mixed orangish brown, grey and black clayish silt. When excavated, this material was found to contain frequent flecks of charcoal.

Dating

Scoop 9043 contained a single sherd of CP1 pottery. This was in a grog-tempered fabric, which is thought to be of Early Bronze Age date.

Discussion

The fill of this feature contained small granules of burnt bone that were too small to permit osteological analysis. This feature may also represent the truncated remains of a 'token' cremation, although domestic waste is also a possible explanation. A small number of fragments of charred cereal grains were also found preserved in this feature.

Pit and Scoop Clusters 1 and 2 (Figures 3.13-15)

Description

A north-east to south-west oriented alignment of 12 cut features was found towards the western end of the project area, centred around NGR 526348 303585. Five of these sub-circular features were excavated; the largest had diameters in excess of two metres, and were up to 0.84 metres deep. However, a diameter of less than one metre was more typical, with depths more commonly varying between 0.13m and 0.36m. These features were dish or bowl-shaped in section, with concave bases, and were filled with generally sterile grey and orange silts.

The second cluster of pits and scoop found to contain Early Bronze Age material was centred on NGR 526411 303691, and was located directly to the east of the fragmented circular feature described above as Ring-ditch 2. Nine features were recorded, marking a rough alignment running north-west to south-east over a distance of around 25m (Fig. 3.5). The north-western terminus of this alignment coincided with the position of Ring-ditch 2, and it is possible that the pits were structured around that monument. These features tended to be filled with a sterile grey silty sand, overlain in some cases by a thin peaty layer.

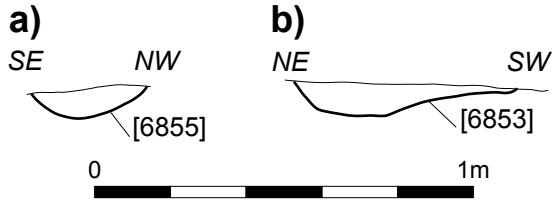

Figure 3.15: Sections from Plan of Pit and Scoop Cluster 2.

Dating

Of the five features from Pit and Scoop Cluster 1 that were excavated, only two contained any artefacts. One was found to contain a flint scraper alongside a noticeable concentration of charcoal, the other also contained a scraper, a keeled flint core and a fragment of heat-affected clay. Keeled cores are regarded as part of a Late Neolithic to Early Bronze Age flintworking tradition, and it is therefore assumed that this feature, and those spatially associated with it, date to this period. This cluster would seem to predate the prehistoric field system as some of its elements occur within a double-ditched boundary that forms part of the field system.

Only one artefact was recovered from Pit and Scoop Cluster 2: a small flint core from the deepest feature in the group.

The Enclosed Landscape (Middle Bronze Age)

The numerous ditches that went together to create a rectilinear field system form the most visually striking element of the archaeology within the Pode Hole project area. As stated above, the field system found at Pode Hole is a small component of a much larger enclosed landscape found throughout the Fen-edge area. The features that belong to the phase of the initial division of the project area are examined below.

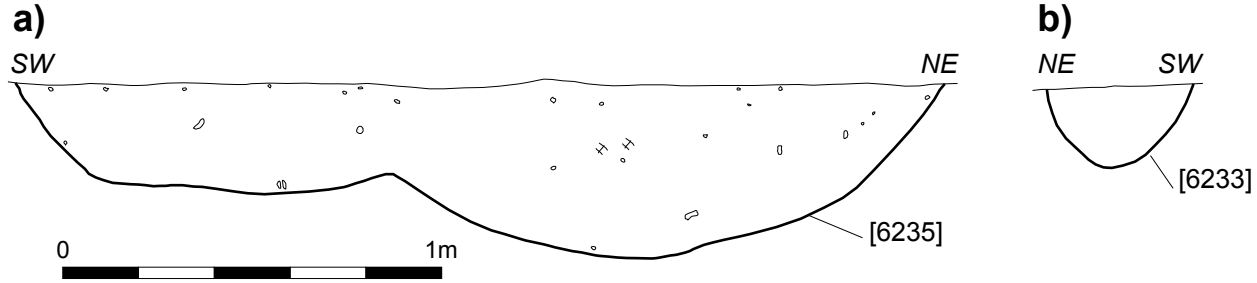

Figure 3.14: Sections from Pit and Scoop Cluster 1.

The cardinal boundary (Figure 3.16)

Description

A group of fifteen individual ditches together created a north-east to south-west aligned segmented linear feature that ran for over 580m across the project area, from NGR 526287 303372 at the south-west to NGR 526497 303914 at the north-east. This feature was quite fragmented, and contained many interruptions (397m of ditch, with 183m of 'gaps'), but it did seem to form a single entity within the landscape. It could also be discerned continuing across a neighbouring archaeological site to the north of Pode Hole quarry, the 'Thorney Borrow Pit', excavated by Northamptonshire Archaeology in 2004 (Phoenix Consulting Archaeology Ltd, 2007). With an overall length in excess of 830m thus discernable, the feature clearly represented a major landscape boundary. It has been referred to as the 'cardinal boundary' because it is the most extensive field system element found within the project area and because subsequent fields are set out in relation to it, hinged on its axis.

The individual ditches that made up this boundary were anywhere between 4.5m and 94m in length, and ranged in width from 0.4m to 2.3m, with a width of around 1.15m being average. Depth was typically around 0.35m-0.45m, but it could vary from 0.07m to 0.9m.

In common with excavations of other prehistoric field systems elsewhere in the vicinity, the fills of these features typically consisted of a single clean, artefactually sterile friable grey silt sand. Deposits of redder or browner hues were occasionally recorded towards the base of the feature, but this was likely to be a result of differential chemical weathering of the fill, rather than a separate episode of deposition. It is likely that this material represented gradual infilling of water-borne surface material. No coherent evidence of bank collapse could be discerned.

A total of 38 interventions were dug into the ditches that made up the cardinal boundary. Their profiles varied, with bowl-shaped or blunted V-shaped appearances, occasionally somewhat irregular, being the norm. There were only six recorded recuts. However, the often irregular or 'stepped' profile of many of the ditch cross sections may also be evidence of this activity. Whilst it may be assumed that such a significant monument would have required regular maintenance, its interrupted nature suggests that it did not have any strategic drainage function. Recutting would therefore have been less important.

The fifteen lengths of ditch that comprised the cardinal boundary were excavated with particular attention being paid to the termini of individual ditches. Such interventions always recorded abrupt and steep butts (see Plate 3.2), thus indicating that the ditch did originally terminate at that point, and the segmented appearance of the feature was not due to surface erosion of a very shallow, once-continuous feature.

Plate 3.2: Ditch 8804, part of the cardinal boundary.

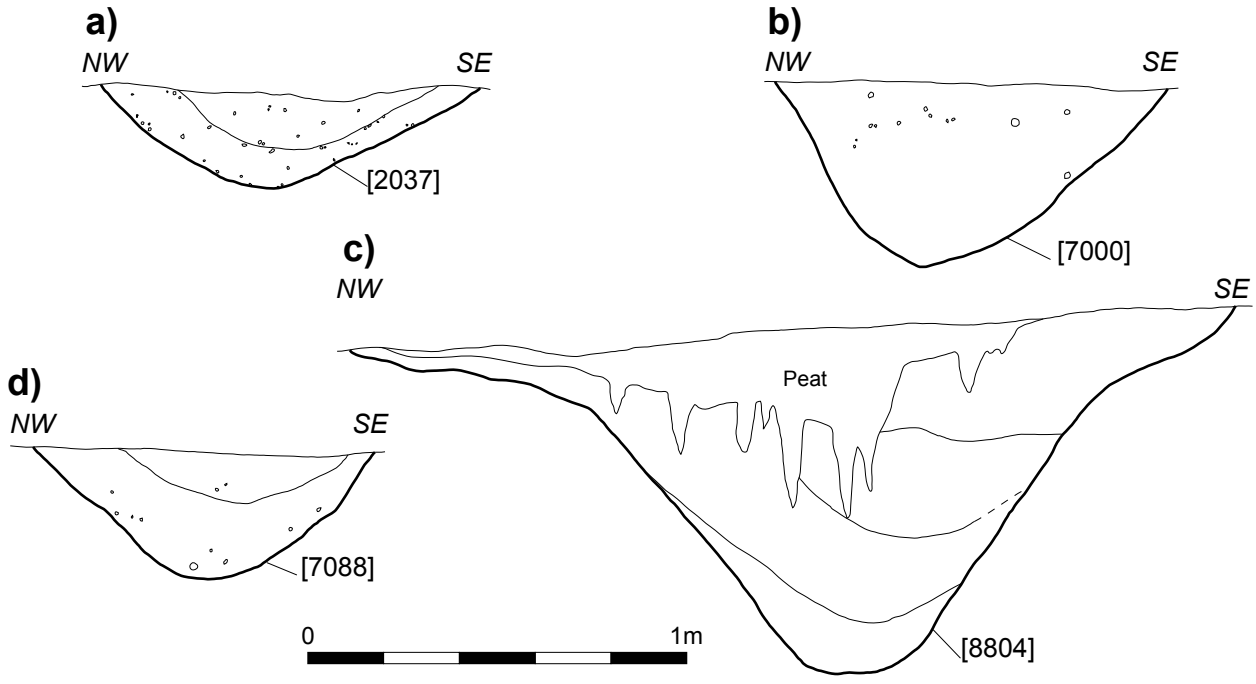

Figure 3.16: Sections through the cardinal boundary.

Discussion
This monumental land boundary would have been an impressive and forceful feature in the mostly flat prehistoric landscape. Crucially, it shares the path and alignment of the barrow cemetery, and possibly utilised the barrows so that they formed an avenue for it.

A continuation of the cardinal boundary was not apparent in those areas to the south-west of the project area excavated by other archaeological units (Cuttler and Ellis, 2001, p.6; Andy Richmond, pers. comm.). However, these areas do not border the Fen-edge embayment located by Hall (1987). This indicates that the cardinal boundary served a particular purpose:; to define the edge of the embayment. This line was already marked by the barrows, but it was reemphasised by the cardinal boundary. The barrows marked a change in the landscape; the cardinal boundary placed a physical obstruction there. The cardinal boundary seems to have been a key element to the subsequent rectilinearl field system, with a series of ditches set out perpendicular to it creating a series of rectangular ditched enclosures (see below).

Dating
Excavations elsewhere typically record that Fen-edge field boundary ditches are remarkably 'clean' in terms of finds, and the cardinal boundary was typical of such features. It only produced eight sherds of pottery, all recovered from the tertiary fill of the same intervention (context 6249). The sherds are in a CP2 fabric composed of a sandy clay matrix with grog temper. Both Early Bronze Age (Collared Urns) and early Middle Bronze Age (Deverel-Rimbury Bucket Urns) vessels recovered from the project area utilised this fabric. Therefore, these sherds from the cardinal boundary date from the first half of the second millennium BC.

This is a rather early date for such an enclosure feature, as the creation of field systems generally seems to have occurred later in the Middle Bronze Age (Bradley, 2001, p.230). Assuming this pottery is not residual, its relatively early date may emphasise the importance of the cardinal boundary as a key enclosure feature, the earthwork which formed the axis for all subsequent enclosure in the project area.

The finds of pottery would suggest that the construction of the field system postdated the barrow cemetery, which contained more material more securely dated to the Early Bronze Age period. This sequence was confirmed by on-site stratigraphy: a short length of ditch was dug into Ring-ditch 1 and extended to the terminus of a ditch within the cardinal boundary, thus 'linking' the two monuments. This again accords well with the commonly encountered sequence for the second millennium BC with a progression from a monument-dominated landscape to one subdivided by field systems.

Fields 1-4 (Figure 3.17)

On many archaeological sites, linear anomalies such as ditches form the focus of the subsequent report. However, because of the scale of the area uncovered at Pode Hole, it was possible to discern the actual fields and enclosures that the ditches were forming. The field boundary ditches were merely a means to an end: to create the parcels of land to divide the Fen-edge. The large scale of the excavations at Pode Hole offered an opportunity to view these parcels and thus determine how the landscape operated. The following section favours these larger areas over individual features.

Description
A strip of four reasonably regular fields was revealed in the southern half of the project area, and their orientation and dimensions are summarised below.

Field	Orientation	L. (metres)	W. (metres)	Area (acres)
1	NW-SE	215	55	3
2	NW-SE	215	55	3
3	NW-SE	215	180	9.6
4	NW-SE	205	87	4.4
Total	*N/A*	*N/A*	*N/A*	*20*

Table 3.1: Summary of Fields 1-4

These fields were aligned north-west to south-east and so lay perpendicular to the cardinal boundary, which defined their north-west sides. This alignment may have taken practical advantage, for reasons of drainage, of the topography of the site, which descended very gradually from north-west to south-east. Fields 1-4 seemed to post-date the cardinal boundary, either cutting or abutting it.

These rectangular fields varied in their archaeological visibility. Some were clearly defined by ditches on all four sides, others require a certain degree of imaginative 'filling in'. A possible explanation for this variability in definition may be that some fields were not laid out with ditches. Hedges or fences may have been used instead in some cases, which, as Pryor points out (2006, p.71), would be much less archaeologically visible. As far as can be determined, these fields had a consistent length of around 215m, although their widths varied from 55m to 180m.

Field 1 was one of the best defined fields at Pode Hole and lay in the extreme south-west of the project area. It measured approximately 215m by 55m and so enclosed an area of around three acres. Immediately adjacent to this field to the north-east lay Field 2, less well-defined than Field 1 but apparently of exactly the same dimensions. In this part of the project area there seem to have been a regular 'blocking out' of the landscape.

To the north-east of Field 2 lay a third much larger field of approximately 10 acres. This field may have been subdivided

into smaller holdings similar to Fields 1 and 2, but no unequivocal traces of these subdivisions were found.

Field 4 was the most northeasterly of the regular rectangular fields. It was well-defined on all four sides and enclosed an area of about 4.4 acres. Like all of the fields within this group, it was rectangular in plan, aligned north-west to south-east and was defined on its north-west side by the cardinal boundary. However Field 4 contains traces of some minor ditches suggesting that it was subdivided into smaller plots aligned north-east to south-west. These may have occupied an area of just under 1 acre.

Fields 1-3 were defined by single ditches, as was Field 4 on all but its south-eastern side, and part of its north-eastern. In those sides the boundary was double-ditched. Double-ditched boundaries may represent either more substantial boundaries, or droveways, and the topic is dealt with more fully in Chapter 5.

The ditches that defined Fields 1-4 varied greatly in length; some ran for up to 250m and so defined the entire side of a field. Other field boundaries were more fragmented being composed of a series of shorter ditches, as little as 22m in length. The width of these ditches varied between 2.5m and 0.64m, with a typical range between 1 and 1.5m. Their depths varied between 0.75m and 0.12m, typically slightly less than 0.5m. The ditches generally had either a shallow U-shaped profile, or a less steep bowl-shaped profile.

As with the cardinal boundary, archaeological interventions targeted the termini of individual ditches. Such interventions always indicated that the ditch did originally terminate at that point, rather than having been ploughed out or truncated.

Dating

The period of use of the ditches that defined Fields 1-4 is tentatively dated to the Middle Bronze Age. The fields defined by the ditches themselves may have had a longer lifespan. Fields 1-4 certainly postdated the Late Neolithic-Early Bronze Age transition. The ditches that defined them either cut or abutted the cardinal boundary, which postdated Ring-ditch 1 (see above).

A further *terminus post quem* is provided by a stratigraphic relationship observed at the southern end of Field 2. The south-eastern boundary of that field was cut through an extensive deposit of compact mid-brownish grey clay silt with occasional small flint and quartz pebbles (context 6944). This overlay the natural subsoil in this part of the site. This deposit was found to contain twelve fragments of worked flint, representing five flakes, three blades and a knife, of Late Neolithic to Early Bronze Age date.

This deposit may represent the northernmost extent of the Older Barroway Drove Bed deposit identified by French at a similar height (c. 1m OD) immediately south of this area during the Fen Dyke Survey (1993, p.89 and Fig. 59). The deposition of this material is thought to have occurred in the Late Neolithic to Early Bronze Age period. This *terminus post quem* date for the ditch may reasonably be extended to all of Fields 1-4.

Of the scores of interventions dug into the ditches that comprise Fields 1-4, only four produced any ceramic artefacts. One of the ditches that formed part of the north-east boundary of Field 4 (cut 7451, fill 7452) was found to contain CP3 shell-gritted pottery dated to the mid-second millennium BC. A ditch that formed part of

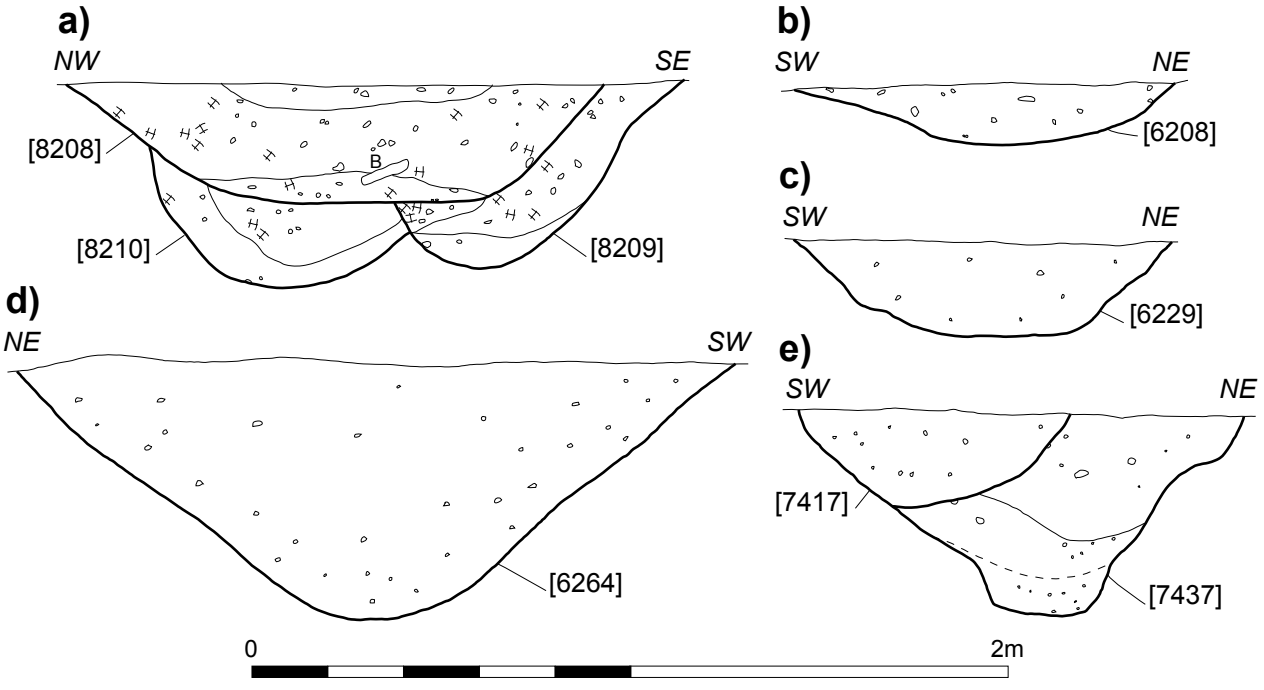

Figure 3.17: Sections through ditches defining Fields 1-4.

the south-eastern boundary of the same field was also found to contain a fragment of later Middle Bronze Age briquetage pedestal (cut 8209, fill 8215). There was clear evidence of later recutting of this ditch (see Plate 3.3), and its successor (cut 8208, fill 8212) came to be filled with plentiful (62) fragments of Late Bronze Age CP4 pottery. A radiocarbon date of 1270-1000 cal BC (SUERC-12862) was obtained from burnt food residue found adhering to one of these fragments. These dates accord well with the accepted dating of the enclosure of the prehistoric Fen-edge, which is believed to have commenced some time in the mid-second millennium BC, and continued into the first.

Plate 3.3: Re-cut field boundary ditch.

The ditches that defined Fields 1-4 abutted or cut the cardinal boundary. Where they cut the cardinal boundary they did not extend beyond it, suggesting that, far from being 'out of use', the cardinal boundary was still an acknowledged presence in the landscape. One seamless right-angled ditch junction between the fields and the cardinal boundary was recorded. Although it is apparent that Fields 1-4 postdate the cardinal boundary, it is not currently known what period of time elapsed between the construction of the two sets of features. It may be that the cardinal boundary and Fields 1-4 were set out all at the same time, or equally it may be the case that the Middle Bronze Age ditch diggers created a field system by utilising the feature that their forebears had dug to mark the change between the dry land and the wet land. The excavated features did not contain enough dating evidence to resolve this.

Fragmentary fields

Fields 1-4 all lay on the south-eastern side of the cardinal boundary. Fields were also present on the opposite side, to the north-west, but the limits of the project area prevented these from being fully exposed. Up to another five fields may be discerned, but none are fully visible. A double-ditched boundary ran at a right angle away from the cardinal boundary towards where Pode Hole Farm now stands. In doing so it created the south-west boundary of the most apparent of these fragmentary fields. This would seem to have been aligned north-east to south-west, measured approximately 172m by 130m and thus enclosed an area of around 5.6 acres. This field, and some of its neighbours, extend into the scheduled area of pasture to the east of Pode Hole Farm (SAM No. 20802). It therefore seems likely that the earthworks visible in that pasture field may at least partly represent the remains of Bronze Age field enclosures. Where exposed in the project area, the fragmentary fields were defined by boundary ditches that shared the characteristics of those that demarcated Fields 1-4: straight, narrow, shallow and filled with an artefactually sterile grey sand silt.

Midden Area 1 (Figures 3.18-19)

Description

Midden Area 1 was a concentration of twelve relatively artefact-rich small cuts. The cluster was centred on NGR 526513 303452, and covered an area of approximately 200m^2. Whilst hardly a dense concentration, Midden Area 1 was a noticeable hotspot of finds in the generally uneventful acres of the western half of the project area.

The features of Midden Area 1 ranged in length from 0.56m to 1.74m, in width from 0.32m to 1.3m, with a minimum and maximum depth of 0.15m and 0.45m respectively. The features were generally sub-circular in plan, and had irregular bowl-shaped profiles.

Two thirds of the cuts contained just a single fill, a mid-grey silt/sand, of probable waterborne origin. The remaining cuts contained two fills, which typically consisted of a darker deposit overlying the grey silt/sand.

Discussion

In terms of the low average artefact count from features on the site, those of Midden Area 1 were relatively finds-rich. The artefacts recovered included 127 (333g) sherds of pottery, 229 fragments of animal bone (1.14kg), and 45 fragments of worked flint (c. 150g) including at least three scrapers. Evidence of burning or hearth material was also present: charcoal, heat-affected flint, stone and clay were recovered from features in the group.

Because this group of cuts formed an isolated concentration of finds-rich features it has been interpreted as the remains of a midden area. Most pits in the area displayed evidence of recutting, suggesting re-use of the area over time. This would suggest occupation of some duration in the immediate vicinity. However, no traces of domestic structures were visible nearby, and it is presumed that they have been lost to ground erosion.

The analysis of charred plant remains found in these pits revealed the presence of cultivated cereals and flax, as well as the gathering of wild food resources, especially hazelnuts. The faunal remains, including frog or toad, watervole, field mouse and grass snake indicate a damp, open, grassy environment. A number of dock and sheep's

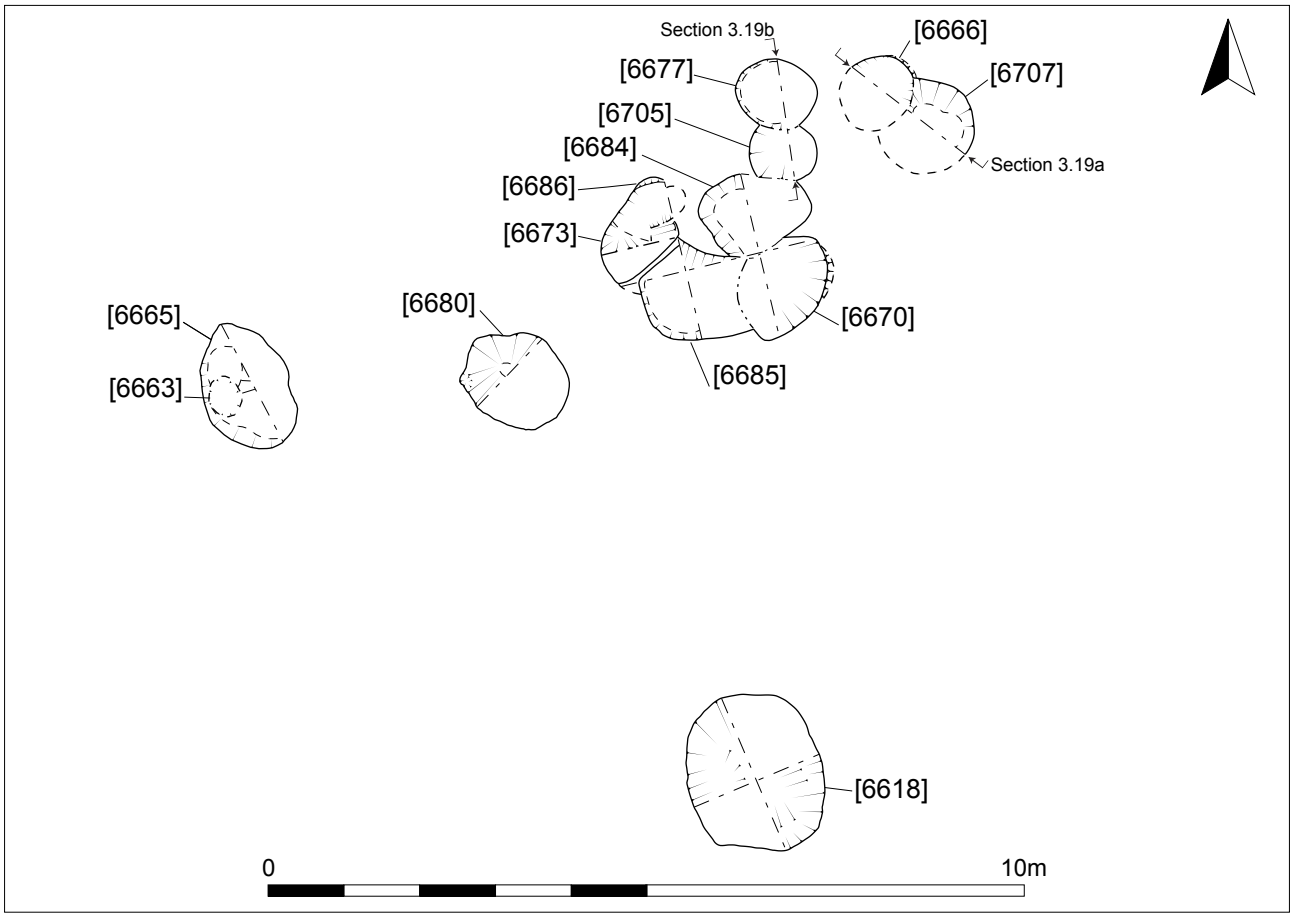

Figure 3.18: Midden Area 1.

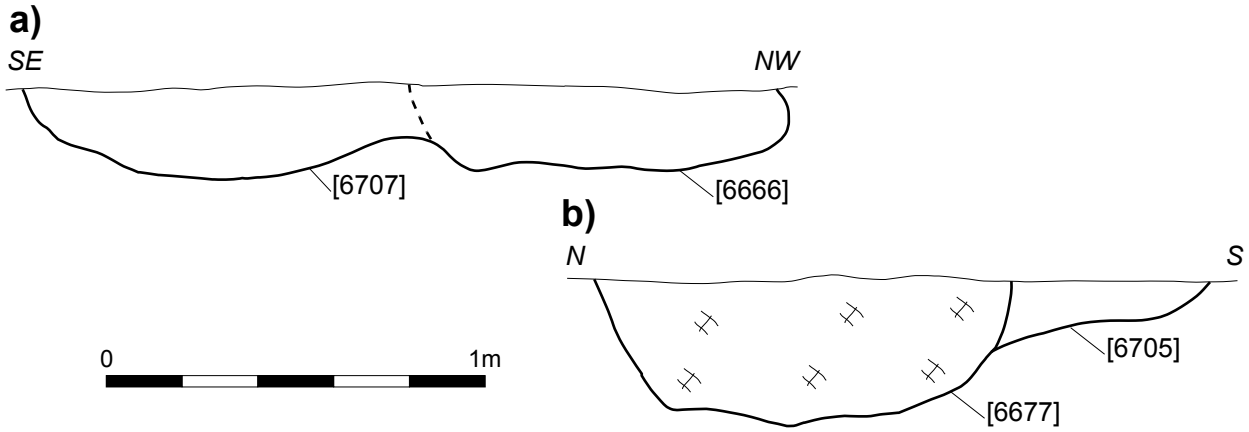

Figure 3.19: Sections from Midden Area 1.

sorrel seeds, again indicative of open and disturbed ground, were also recovered from this group.

Dating

The majority of the pottery recovered from Midden Area 1 is of a coarse grog-tempered domestic type dated to CP2, the early Middle Bronze Age. Occasional fragments of earlier Beaker pottery were also present. This suggests that Midden Area 1 represents some of the earliest in situ evidence of occupation within the project area, and marks an intensification of the activity responsible for the earlier and slighter Pit and Scoop Clusters. Midden Area 1 was situated in the south central area of Field 3, but it is not possible to know if it pre- or postdated the creation of the field system.

The pottery recovered from this area was noticeably abraded, suggesting prolonged surface exposure, congruent with its location in a reworked midden area.

One metre pits (Figure 3.20)

Description

Three examples of a distinctive type of pit feature were found on the site. These were referred to, on the basis of their dimensions, as 'one metre pits'. These seem to represent a separate class of feature from the large waterhole pits and the small, usually sterile scoops that abounded within the project area.

Two were found immediately adjacent to each other at NGR 526634 303572, whilst a third was located 182m away to the north-west at NGR 526567 303742. These features were steep-sided, roughly circular in plan, measured 1m to 1.5m in diameter, and were up to 1m deep. With their steep, deep U-shaped profiles they were atypical for the site, but what particularly distinguish them is the complex artefact assemblages they were found to contain.

Pit 8085 contained 41g of pottery, 775g of heat-affected stone, 17g of flint and 507g of animal bone, including worked antler. Pit 8091 contained 502g of pottery, 684g of animal bone, 1948g of heat-affected stone, 3841g of heat-affected clay and 117g of flint. Pit 9107 contained 69g of pottery, 30g of flint, 1007g of heat-affected stone, 331g of briquetage and 222g of animal bone, including the partial skeleton of a pine marten from the primary fill. Pits 8091 and 9107 both contained quantities of fragments of clay weights; these artefacts were only very rarely encountered elsewhere on site.

The backfill sequence for these features was very similar. The uppermost fill was a grey sand/silt. This was probably washed in and levelled up the feature after the main backfill had settled somewhat. The main backfill was typically a brownish or greyish orange homogeneous silt, and was probably redeposited upcast placed back into the hole it was originally dug from. An absence of silt lenses within this material suggests that it was placed back in a single event, not long after the original hole had been dug. One of the pits, 9107, differed from the other two in that it contained a deposit of burnt material at its base. This was a charcoal-rich grey and black clay and was around 0.4m thick.

Discussion

In both their form and the richness of their contents these features were atypical for the site. They may have functioned as waste-disposal pits. However, if they were a common part of the repertoire of feature forms for the period, then more would have been present within the project area. It seems that domestic waste was more usually disposed of in the midden areas and waterhole pits or, more commonly, in a fashion that rendered it invisible to the archaeological record.

The presence of so many fragments of different artefact types suggests a function beyond simple refuse disposal; these features may instead represent the physical aftermath of votive deposition ceremonies. Finds from the pits represent an array of domestic activities: '*food storage and processing (in the form of household pots), salt production (briquetage) and, most importantly, textile production and/or thatching, as shown by the clay weights. All of these activities contribute towards the subsistence and survival of the social group.... they are a mark of the significance of the range of subsistence activities which make the community function as a whole with fragments acting as metaphors of community life*' (Morris, The Clay Weights, this report).

Given the generally dispersed nature of archaeological features on site, the close proximity of two of the pits (less than 1m apart) is perhaps revealing, possibly suggesting

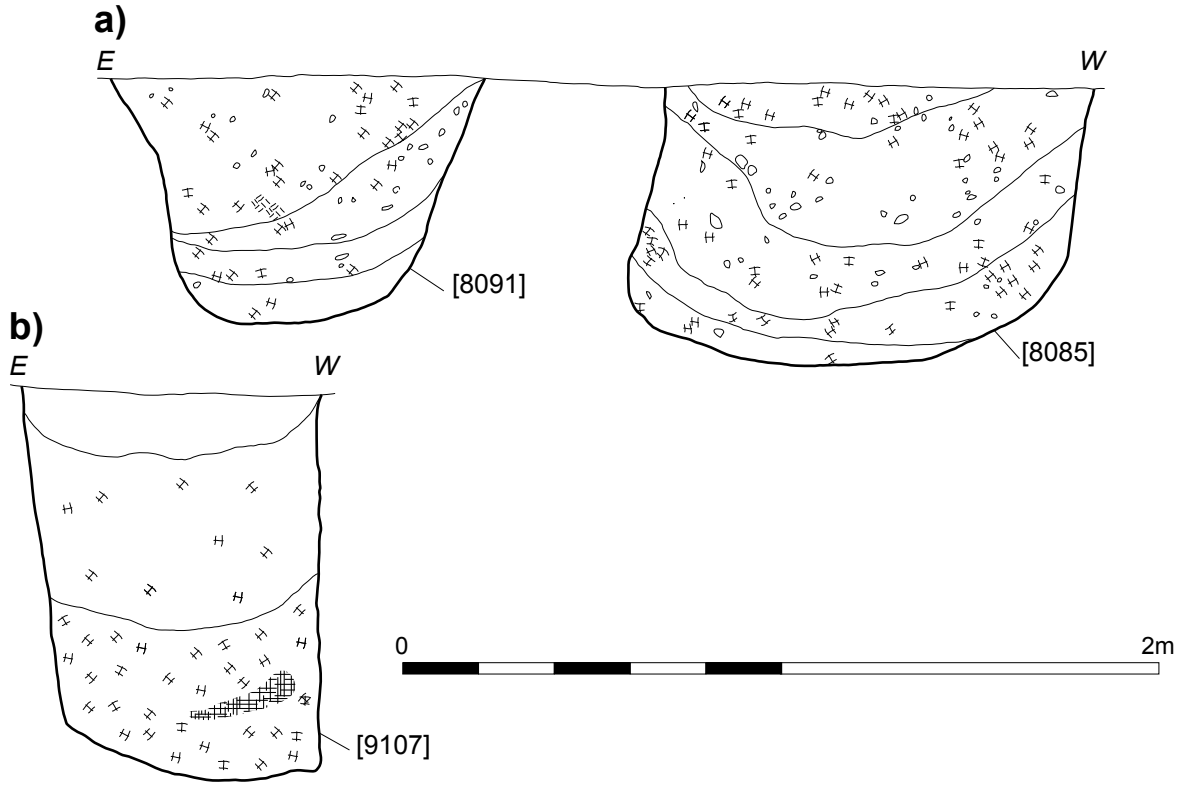

Figure 3.20: Sections from One metre pits.

that the location was reserved for a specific activity. Pits 8085 and 8091 were located close to the Fen-edge, and the marginal location may have been integral to the meaning of their creation and filling. Alternatively, these features may have been so close together because they once shared the same enclosed space, possibly a house. Excavation of a nearby site on the north-western tip of the Bronze Age island of Whittlesey has revealed pits dug into the floors of buildings (Knight, 1999). These contained a similar range of mixed and fragmented artefacts (including broken saddle querns, burnt pottery sherds, loomweights and animal bones). At Pode Hole, ground truncation would have scoured away traces of any building, leaving instead only the deepest negative features.

As well as the pits at Whittlesey, loose parallels for these features have been recorded elsewhere in the vicinity. Pryor records finding '*a large number of... vertical sided hole*[s] *just large enough to hold a modern bucket…dug and filled as part of the same operation…* [containing] *valuable objects*' (2006, p.58). These features were dated to the late Neolithic period, and therefore predate the Pode Hole examples by several centuries. Closer to Pode Hole, at Eye quarry, considerably larger 'Collared Urn pits' were recorded, interpreted as rubbish disposal pits on the basis of their finds-rich fills (Patten, 2003, p.10) However, they were strung along an alignment later followed by the field system, hinting at a purpose beyond waste disposal. Like Pit 9107, two of these features contained charcoal-rich deposits towards their bases.

Dating
Pits 8085 and 8091 contained grog-tempered pottery from CP2, the early Middle Bronze Age, and would appear to be contemporary. Pit 9107 contained shell-tempered late Middle Bronze Age pottery (CP3).

A type of activity of considerable longevity is possibly apparent. Pryor suggests that the Neolithic pits from Etton '*represented individuals*' (2006, p.61), whilst Patten (2003, p.18) suggests that those from Eye quarry marked boundaries. The recurrence of patterns amongst the fragmented and disarticulated objects from the late Bronze Age site at Whittlesey was also interpreted as evidence of '*something other than simple discard*' (Knight, 1999, ii). The one metre pits from Pode Hole would seem to have been part of recurring activity in the second millennium BC, where selected objects were apparently deliberately placed into holes dug into the landscape, possibly to articulate ownership or occupancy of it.

Fen-edge Pit Cluster 1 (Figures 3.21-22)

Description
A number of waterhole pits were observed forming a belt running along the southern and eastern edge of the project area. Most of these are discussed in subsequent sections. However, the early date of the first of these, Fen-edge Pit Cluster 1, necessitates its inclusion here in the section concerning early Middle Bronze Age occupation of the project area. This cluster of pits was located in the south-east corner of Field 3, where it was centred on NGR 526506 303416. It first appeared in plan as a dark sub-oval anomaly, measuring approximately 7.5m x 5m and aligned approximately north-west to south-east. A series of hand and machine-dug trenches revealed two large pits with bowl-shaped profiles, up to 1.4m deep. An earlier pit, cut 6967, had been recut to the north and west in such a way that little of the original feature survived. Both features contained similar backfill sequences with dark clayish basal deposits overlain by grey/ brown sand/ silt deposits that probably represent a natural silting up of the feature. The earlier pit contained more gravel-rich deposits suggesting that it was partially backfilled with its own upcast, or upcast generated by the digging of the pit that succeeded it.

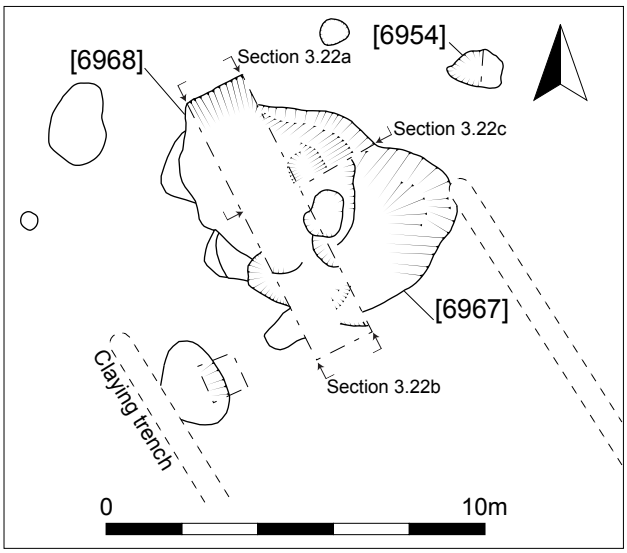

Figure 3.21: Fen-edge Pit Cluster 1.

A post hole, 6954, measuring 0.7m in diameter and 0.7m deep was found immediately to the north-east of this pit cluster. Uniquely for Pode Hole, it contained post-packing stones. This feature may have supported a post that signalled the presence or the ownership of the waterhole pits, or it may have had a functional role in the extraction of water from the pits.

Discussion
Pot dates indicated that the earlier pit fell out of use at some point during the early Middle Bronze Age. Pottery was much more abundant in the later pit. This was also mostly of early Middle Bronze Age (CP2) date, with some fragments of grog-tempered Beaker (CP1) date also present. That the second pit in fact dated from somewhat later in the Bronze Age is suggested by the environmental and pollen data extracted from the pit cluster.

Pollen analysis suggets that at the time of the earliest pit woodland containing oak and lime was present in the locale (see Langdon and Scaife, this report). By the time

of the use of the second pit, the pollen record suggests that the woodland had declined and had been replaced by a more open and disturbed grassland habitat with cereal cultivation and/or use. The timespan between the two pits seemed to coincide with the often described (e.g. Glazebrook, 1997, p.14) 'lime decline' that resulted from clearance of woodland for agriculture during the Bronze Age. Evidence from plant macro-fossils is in accordance with this model of land-use succession; samples from the earlier pit contained no cereal grains, whereas these were present (in low numbers) in the second pit, particularly in its upper fills.

An intensification of occupation is also suggested by the artefactual evidence. Pottery, charcoal, flint and animal bone were all more abundant in the later pit. A pin or awl made from a sheep metatarsal, possibly used for leatherworking, was also recovered from it (see below). This, along with the recorded presence of magnetised hearth waste, would suggest occupation in the immediate vicinity during the Middle Bronze Age. Finds evidence indicates that, at this time, sheep/goat were being kept for food and deer and marten were hunted, the latter presumably for their fur.

The anaerobic lower fills of both features suggested the presence of wet conditions at the time of use. This was confirmed by the remains of aquatic fauna and flora found preserved within them. These included water vole, frog/toad, water flea eggs, newt, alder, water crowfoot, chickweed and catkins. This assemblage suggests the waterhole pits were not kept particularly 'clean' for use by humans and became colonised by water-loving species. This may have happened after the pits fell out of use, which would suggest that the pits were not comprehensively backfilled as soon as they became redundant. This accords with the observed stratigraphy which often records thick upper fills of fairly clast-free homegeneous grey/ brown sand/ silt in these features, evidence of gradual low-energy infilling over a lengthy period of time.

Wood was recovered from the primary fills of both pits in this cluster. This occurred as twigs and small roundwood, rather than worked objects, although possible woodchips, suggestive of woodworking were observed. No traces of any structures such as wooden revetting, duck-boarding or access steps were recorded.

Fen-edge Pit Cluster 1 would have been an oft-visited part of the landscape of Pode Hole during the early part of the Middle Bronze Age. Midden Area 1 also contained plentiful pottery of CP2 date, as well as other settlement detritus. This was situated nearby, just 40m away to the north-east. The area of these features marks a focus of activity during the middle of the second millennium BC.

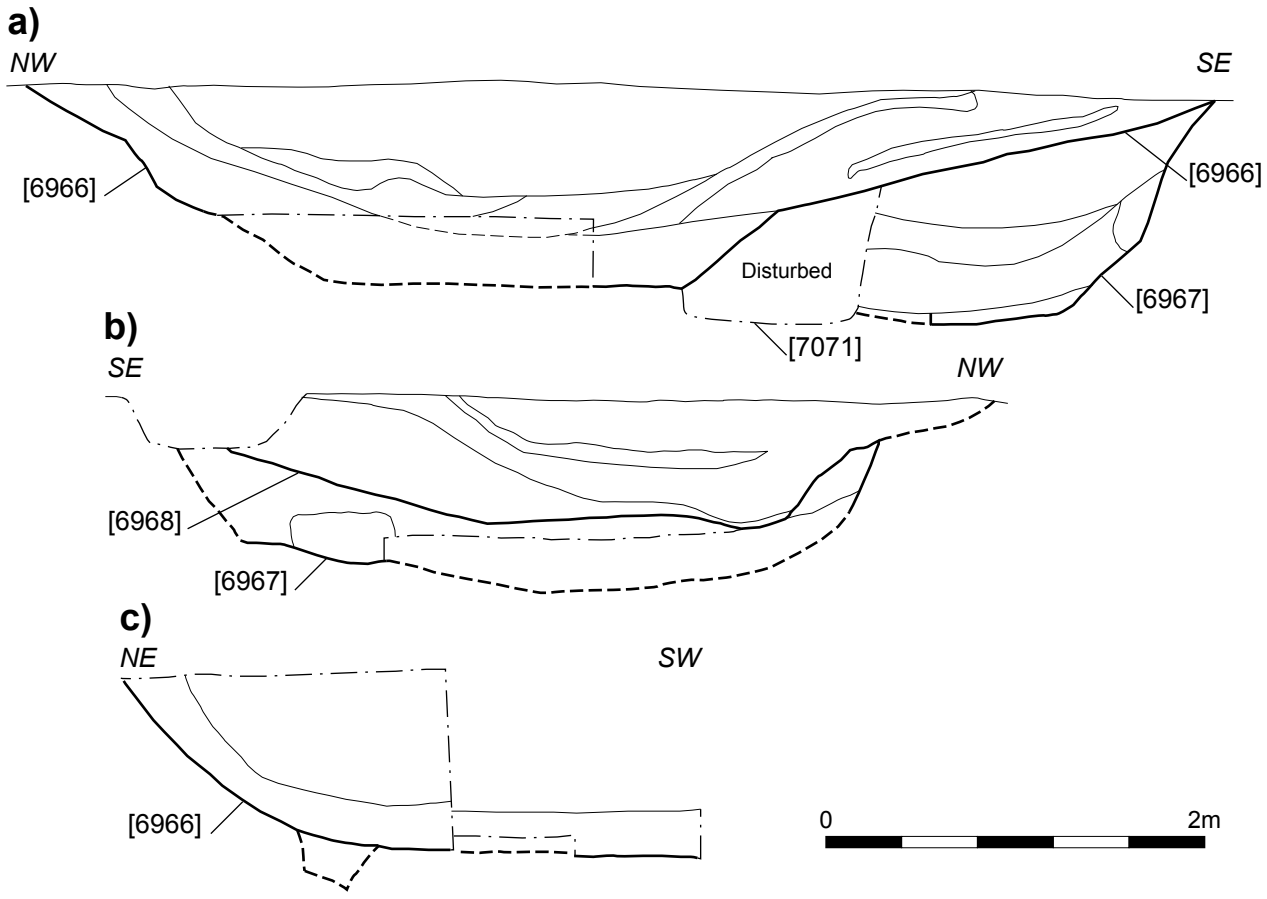

Figure 3.22: Sections through Fen-edge Pit Cluster 1.

The worked bone object (Figure 4.7)
by Francis Pryor

Description and function
The pin is in remarkably good condition with clear traces of wear polish and scratches. It is longer and possesses a more slender point than is usually found. It is made from a sheep metatarsal of a mature animal. Rather unusually, it has been made from a split bone, and the split was started at the articular end by chopping with an axe-like implement. This would suggest that the bone was 'green' or fresh when it was worked.

Awls of this sort are usually associated with weaving or leather working. Given the wear on this piece, the latter is more probable.

Parallels
The best parallels are from Late Bronze Age contexts as at Runnymede Bridge (Needham, 1991, Fig 64, B1 and B2, and Needham and Spence, 1996, Fig 101, B15 and B16) and Potterne (Seager Smith, 2000, Fig 90, 15). The two examples from the first reference, however, were bones from immature animals. Similar awls can occur in Neolithic and Iron Age contexts.

This item is described in more detail alongside similar artefacts recovered from elsewhere in the project area in Chapter 4.

The Working Landscape (later Bronze Age)

More archaeological remains dating from the later Bronze Age (CP3-4) were found than from any of the earlier or subsequent phases. It would appear that this period coincided with the most intensive use of the landscape in prehistory.

Fields 5-10 (Figure 3.23)

Description
Located in the crook formed by the cardinal boundary and the north-eastern edge of Field 4, a series of smaller fields was uncovered that extended over more than six and a half acres. These fields have been numbered 5-10 and their orientation and dimensions are summarised below.

Field	Orientation	L. (metres)	W. (metres)	Area (acres)
5	NW-SE	109	44	1.3
6	NW-SE	89	33	0.7
7	NE-SW	89	65	1.5
8	NE-SW	72	57	1
9	NE-SW	70	53	0.9
10	NW-SE?	80	61+	1.1+
Total	*N/A*	*N/A*	*N/A*	*6.5*

Table 3.2: Summary of Fields 5-10.

Fields 5-10 were contiguous with the main field system, thus the cardinal boundary and the north-easternmost boundary of Field 4 also helped to define Fields 5-10. Of those ditches that were unique to Fields 5-10, lengths varied from 3m to over 60m. They had varying widths, between 0.31m to 1.6m, with 0.81 to 0.87 being typical. Depths ranged between 0.15m and 0.74, with 0.35m providing the average. These ditches were therefore slightly less substantial than those that define the cardinal boundary and Fields 1-4. They were also generally shorter and more frequently interrupted.

Like Fields 1-4, Fields 5-10 were defined by slightly meandering interrupted ditches. These tended to fall short of their cross members, thereby creating 'open' corners. Where corners were defined by continuous right-angled junctions, there were often signs of recutting or extensions, suggesting that this was the product of later consolidation. Interventions in the ditches from Fields 5-10 often recorded slightly irregular profiles, which tended to be bowl-shaped, or less frequently, U-shaped. Evidence for recutting was recorded only occasionally, but the slightly irregular profiles could also be evidence of this.

These ditches generally contained just one fill, usually recorded as a grey silt with only occasional small stone inclusions. This material is therefore very similar to that found in the ditches that defined Fields 1-4 and the cardinal boundary. This suggests that the same sort of material was making its way into these ditches by the same low-energy transportation methods. This may not have necessarily happened at the same time throughout the project area; the dating evidence suggests that the ditches that defined Fields 5-10 became infilled somewhat later than those of Fields 1-4.

Field 5 measured approximately 109m by 44m and so enclosed an area of 1.3 acres. It utilised part of the ditch that helped define Field 4, and contained a pond cluster in its north-eastern corner.

Field 6 measured approximately 89m by 33m and so enclosed an area of 0.7 acres, although its northern boundary may have been somewhat staggered. It may have contained a small paddock or enclosure in its north-western corner.

Field 7 was located in the right angle formed by the junction of Field 4 and the cardinal boundary. Fields 7, 8 and 9 were aligned north-east to south-west, perpendicular to the orientation of most of the fields recorded within the project area. Field 7 covered 1.5 acres, and measured 89m by 65m. It contained a trio of waterhole pits in its western side, located in an interruption within the cardinal boundary.

A T-shaped double ditch partly defined Fields 8 and 9. Field 8 lay between this and the cardinal boundary, and was

well-defined on all four sides. It measured approximately 72m by 57m and covered an area of 1 acre. Enclosed within Field 8 was Ring-ditch 4, which was located in its south-eastern quarter.

Field 9 measured approximately 70m by 53m and so enclosed an area of 0.9 acres. The word 'enclosed' must be used in rather a loose sense, as this field was, as it survived in the archaeological record, open on its south-eastern side. The three sides that are present do, however, define a regular rectangle that closely matches Field 8 in form and size. At some point in its history, the double-ditched boundary that defined the north-east side of Field 9 was extended at a somewhat irregular angle towards the south, seemingly done deliberately, in order to connect the boundary to a cluster of intercutting pits and ponds (Pond Cluster 2, below). The excavated stratigraphy confirmed that this extension postdated the original elements of the double-ditched boundary and the water features. One would presume that the extension was dug to drain the double-ditched boundary into the area of pits and ponds, but the somewhat interrupted nature of at least some of the ditch elements within this group does not quite accord with this interpretation. Perhaps the ponds were considered enough of an obstacle to be incorporated into the boundary itself. Field 9 also contained a pair of waterhole pits on its western side, located 23m apart.

Field 10 measured approximately 80m from north-east to south-west, but its south-eastern boundary lay beyond the limits of the site. It was defined on its north and west sides by double-ditched boundaries. The double-ditched boundary on the northern side measured over 10m at its widest point, and may have defined a track or droveway. This became narrower as it approached the Fen-edge, which is counter to those found at Fengate (Pryor, 2001a, p.61 and 72). To judge by its position, size and possible orientation, Field 10 should perhaps be grouped with Fields 1-4. However, excavation evidence clearly suggests that it was renewed in the Later Bronze Age; the ditch that defined its north-western side was recut, and CP4 pottery radiocarbon dated to 1270-1000 cal BC (SUERC-12862) was recovered from it. Field 10 has therefore been grouped with Fields 5-9. It is however acknowledged that in its earliest manifestation it may have been contemporary with Fields 1-4.

Discussion and dating

Dating evidence was more plentiful for Fields 5-10 than Fields 1-4. The artefacts recovered from several field boundary ditches or adjacent features indicated that at least some of Fields 5-10 hosted activity in the later Bronze Age. For example:

- *as mentioned above, a ditch that partially defined Field 10 was found to contain CP4 pottery that was radiocarbon dated to 1270-1000 cal BC (SUERC-12862).*
- *ditches 9337 and 9147, both part of Field 9, contained CP3-4 and CP4 pottery respectively. They also appear to have fed into pond features that had themselves cut earlier pits which contained CP4 pottery.*
- *Pond Cluster 1 was located in the corner of Field 5, and the two were presumably contemporary. This feature contained CP3 pottery, and wood from it was radiocarbon dated to 1460-1310 cal BC (Beta-238590).*

The dating evidence from these smaller fields therefore strongly indicates that they were added as an extension to the Middle Bronze Age field system represented by Fields 1-4. However, the later Bronze Age fields shared the alignment of their Middle Bronze Age predecessors and did not impinge on them. This implies that the Middle Bronze Age fields had some longevity in the landscape, and were presumably still in existence late into the second millennium BC. The lack of later Bronze Age material from them may seem somewhat discordant with this interpretation. However, the ditches themselves may have silted up whilst the fields remained defined by hedges and banks. Alternatively, Fields 1-4 may have been located too far away from the occupation activity whose by-products made their way into the ditches of Fields 5-10.

The Middle Bronze Age field system represented by Fields 1-4 was characterised by artefactually sterile ditches that defined large regular spaces; these contained relatively few features. In comparison, Fields 5-10 defined smaller, less regular units of land. Their ditches produced more artefactual material, and more features were associated with the fields they defined. Fields 5-10 represent an extension and an intensification of an earlier, but still extant, field system. The later Bronze Age witnessed more activity within a smaller area of the site.

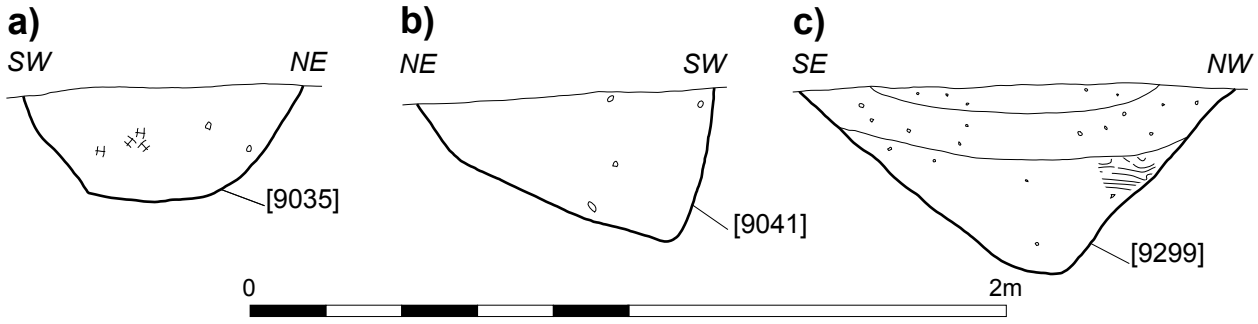

Figure 3.23: Sections through ditches defining Fields 5-10.

Enclosures 1 and 2 (Figure 3.24)

Description

In the extreme north-west of the project area, two small ditched areas could be discerned. The ditches that defined these areas were somewhat insubstantial and intermittent, possibly suggesting more transitory land divisions. Because of their small size (each covered less than half an acre) and their slighter appearance, these features have been referred to as enclosures. The majority of the fields in the project area shared the north-east to south-west orientation of the cardinal boundary. Enclosures 1 and 2 display a slight clockwise drift away from this orientation. This strengthens the impression that they were somewhat subsidiary to the main field system.

Enclosure 1 was oriented north-west to south-east and measured approximately 56m by 30m and thus enclosed an area of 0.4 acres. Enclosure 2 shared this orientation, but was smaller. As far as can be discerned, it had the same general width but measured only 37m in length, and thus enclosed an area of just 0.3 acres. Orientation and dimensions are summarised below.

Enclosure	Orientation	L. (metres)	W. (metres)	Area (acres)
1	NW-SE	56	30	0.4
2	NW-SE	37	30	0.3
Total	*N/A*	*N/A*	*N/A*	*0.7*

Table 3.3: Summary of Enclosures 1 and 2.

In common with Fields 1-8, Enclosures 1 and 2 are defined by interrupted segments of ditches with open corners. Overall, Enclosures 1 and 2 appear less well-defined than the fields; both appear open on their south-east sides. Enclosure 1 is particularly poorly defined on its north-western side.

The ditches that form these enclosures varied in length from 2.2m to 30m. They were generally 0.7 to 0.75m wide, although this could vary between 0.4m and 1.1m. The depths of these ditches varied between 0.16m and 0.68m, but their bases were generally reached between 0.25 and 0.3m below the ground surface. They generally had a rounded profile, appearing either bowl-shaped or U-shaped in section.

The backfill of these ditches shared the characteristics of that recorded in the ditches that defined Fields 1-10: typically a grey silt containing few artefacts. Where more than one backfill was recorded in an intervention, the primary fills were recorded as being more yellowish. This may be a result of primary deposition of upcast bank material, or chemical leaching from the fill around the sides of the features.

No evidence of recutting was recorded in any of the interventions in the ditches that defined Enclosures 1 and 2, although there was evidence of some ditches being extended to join up with others. Two ditches were later 'linked' by a small pit. This activity does at least suggest a certain degree of longevity of use of these features.

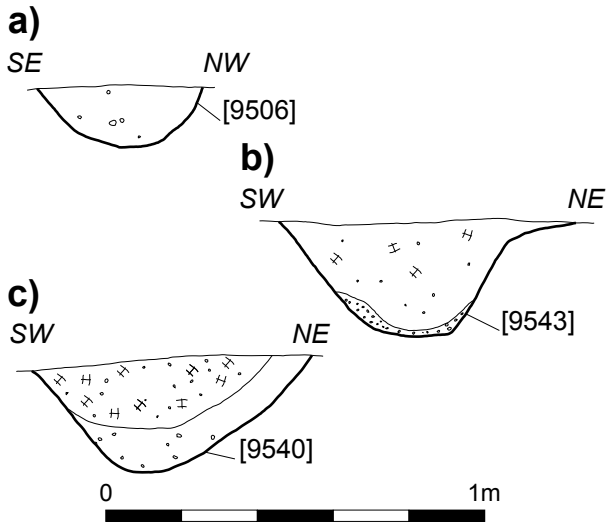

Figure 3.24: Sections through ditches defining Enclosures 1 and 2.

Discussion and dating

The word 'enclosure' has been used to describe, and thus interpret, the areas of land created by these ditches. A differentiation has been drawn between these areas of land and the main field system. This is because these areas of land are smaller, less clearly defined, are not contiguous with the field system and do not quite share its alignment.

The ditches that defined Enclosures 1 and 2 were becoming backfilled during the Late Bronze Age. CP4-5 pottery typical of the period was recovered from one of the ditch fills within this group. Enclosure 1 was recorded as having cut a waterhole pit; this pit was found to contain numerous fragments of CP4 pottery. This evidence suggests that Enclosures 1 and 2 date to rather later in the site's history, and were certainly likely to have been constructed subsequent to the regular rectangular fields of Fields 1-4.

The enclosures seem somewhat subsidiary to the main field system, but this is not, however, to suggest that these areas were of lesser importance. Other finds suggest that these enclosures defined an area of some significance in the later Bronze Age Fen-edge.

Both enclosures contained waterhole pits in their north-western corners. Enclosure 1 also contained a cluster of waterhole pits intercut with a pond in its south-eastern area (Pond Cluster 3, see below). The pond and one of the pits contained in situ wattlework lining, and an inverted wooden two-piece vessel was discovered set into the base of the pond. Whilst there was no stratigraphic evidence to determine the relationship between Enclosure 1 and this cluster of

water features, the dating evidence suggests they were broadly contemporary: rope around the wooden vessel mentioned above returned a radiocarbon date of 1380-1050 cal BC (SUERC-12890). It may therefore be supposed that the pond and the ditches co-existed in an enclosed landscape.

A badly truncated grave was found in an interruption within the north-western side of Enclosure 1 (Fig. 6.3). The grave contained the fragmentary remains of an individual, aged 35-45 years old at death, and probably female (skeleton 9655, Brayne, this report). Again there was no stratigraphic relationship between this feature and the ditches to determine a relative sequence between them. The ditch-diggers may have stopped short of a burial of whose location they were aware. Equally, the grave-diggers may have chosen the interruption within the field system as a position of significance when choosing a burial site. In both scenarios the burial is deliberately made part of the boundary.

Similar coincides of burials and field boundaries have been recovered elsewhere in the vicinity. Patten (2004, p.50) describes discovering cremations located next to ditches at Eye quarry, or along the routes of 'invisible boundaries' that share the alignment of the field system at that site. This, and other examples he cites, suggest a relationship between funerary remains and land division, but the chronological sequence remains obscure.

Occupation of the Working Landscape (later Bronze Age)

Enclosure of the landscape seems to have commenced in the mid-second millennium BC and continued throughout, and possibly extended into the first. The archaeological evidence suggests that this partitioned landscape was also peopled during this period. Whilst no definite remains of house structures were found in the project area, it seems likely that it was occupied, or that such permanent settlement existed somewhere in the immediate vicinity. Certainly the project area would have been host to numerous activities in the Bronze Age, only a few of which remain visible in the archaeological record. The most prominent of these is the agricultural activity indicated by the fields and enclosures, as described above. But burial of the dead, flint-knapping, woodworking and water management also occurred here on the Fen-edge. It is with these lingering traces of the lives lived in the working landscape of the later Bronze Age that the following section is concerned.

Waterhole pits

Large cut features measuring up to 1.5m deep were a distinctive component of the repertoire of archaeological features encountered in the project area: over thirty were recorded.

The features were typically circular or sub-circular in plan, and had steep bowl-shaped profiles with flattish or concave bases. They varied between about 3m and 5m in diameter, with an average depth of 1.3m to 1.5m below the (stripped) ground surface. Their backfill sequences often began with a hard interface of iron panning that formed between the underlying natural gravel deposits and the backfill proper. The basal deposits were layers of grey, blue or green clay containing preserved organic remains, including wood. This was generally overlain by thick deposits of redeposited brown and orange gravelly clayish silt. This was probably a redeposited upcast, which had slumped back into the hole it had originally been dug from. This was followed by quantities of homogeneous grey silt, which may represent a waterborne redeposited former topsoil. This was finally topped by a layer of peat-like soil, which probably represents the peat that once blanketed the site slumping into the feature as it subsided. This gives a general description of this type of feature (Plate 3.4), but a good deal of variation in backfill sequence, form and dimensions was observed between individual examples. Slumping and in situ chemical weathering of fills often made backfill sequences appear somewhat chaotic in section, with orderly sequences of deposition not always apparent.

These features have been interpreted as waterhole pits[1], deliberate excavations to tap into the high water table close to the Fen-edge. It is presumed that they provided drinking water for nearby domestic occupation. Such features are routinely encountered on sites of this period (Yates, 2007, p.16) At Fengate they were referred to as 'sock wells' from a local word for the water table (Pryor, 2005, p.56).

Plate 3.4: Pit 9500 contained a backfill sequence typical of waterhole pits at Pode Hole.

1. This term is preferred to 'watering hole', which is sometimes encountered in the literature. 'Watering hole' suggests something that could be accessed by animals, whereas these features are much too steep-sided for that. More stock-friendly, gently sloping features were found at Pode Hole, and they have been referred to as 'ponds'.

Their utility to their original creators – namely, their ability to hold water – mirrors their utility to the archaeologist. At up to 1.5m deep these were the only class of features present on site that penetrated the modern water table, generally found at 0.3m OD. The bases of these features therefore contained anaerobic waterlogged deposits, and the majority of the environmental reconstruction of the site is based on the organic material found preserved within them.

Approximately thirty such features, or clusters of such features, were investigated within the project area. This report does not detail all of these. Indeed, beyond the outline given above, many were rather nondescript. What follows is an examination of the most informative or noteworthy of the waterhole pits.

Fen-edge pits

A collection of ten waterhole pits, or clusters of waterhole pits, was visible running along the south-east edge of the project area. This alignment of pits generally shared the path of the Fen-ward boundary of Fields 1-4. Like the field system itself, they seem to mark and mirror the Fen-edge. At its north-eastern extent, this alignment stopped abruptly at a double-ditched boundary that ran perpendicular to the pit alignment. The boundary appeared to separate land that was intensively pitted from land that was not.

Fen-edge Pit Cluster 2 (Figures 3.25-26)

Description

A succession of three intercut waterhole pits was found on the southern side of Field 3, centred on NGR 526597 303501. The first of these, 7330, measured 3m in diameter and attained a maximum depth of 1.2m. It was cut to the north by a second, shallower pit, 7213, (0.85m deep). One of the fills of this feature, context 7212, was a 0.13m thick deposit of compact pale grey, gravelly sand that contained evidence of burning (heat-affected clay and stone) as well as fragments of a quern stone that had been subjected to extremely high temperatures (see below). The final pit in this sequence, 7368, which measured 1.6m in diameter and was only 0.4m deep, was artefactually sterile. The pit cluster was sealed by an extensive layer of compact, charcoal-rich, dark grey silt (context 7205), up to 0.16m thick, from which further finds of heat-affected clay and stone and a drilled pebble mace head were recovered. Finally, a small cut measuring 0.7m in diameter and 0.5m deep was dug into context 7205 and the waterhole cluster beneath. This contained dark brown and grey clay silts, with further finds of charcoal and heat-affected stone (23g) as well as animal bone and two fragments of briquetage container in a Middle-Late Bronze Age shell-tempered fabric. This feature was sealed by an extensive spread of compact grey silt with orange mottling (context 7206). This deposit was indistinguishable from the material that filled a length of field boundary ditch that coincided with the position of the waterhole pit cluster. Because of this similarity, and also because of disturbance from a post-medieval drainage feature, no relationship could be discerned between the pit cluster and the field boundary ditch, but it seems probable that the ditch cut the pits, and context 7206 represents the disuse of the whole.

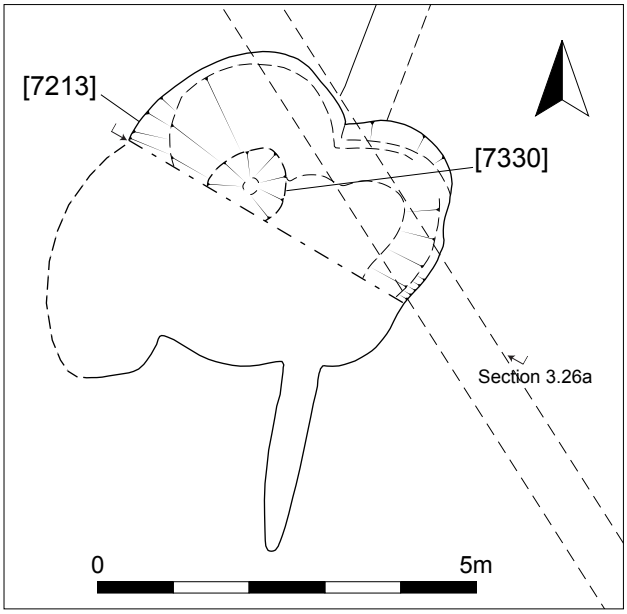

Figure 3.25: Fen-edge Pit Cluster 2.

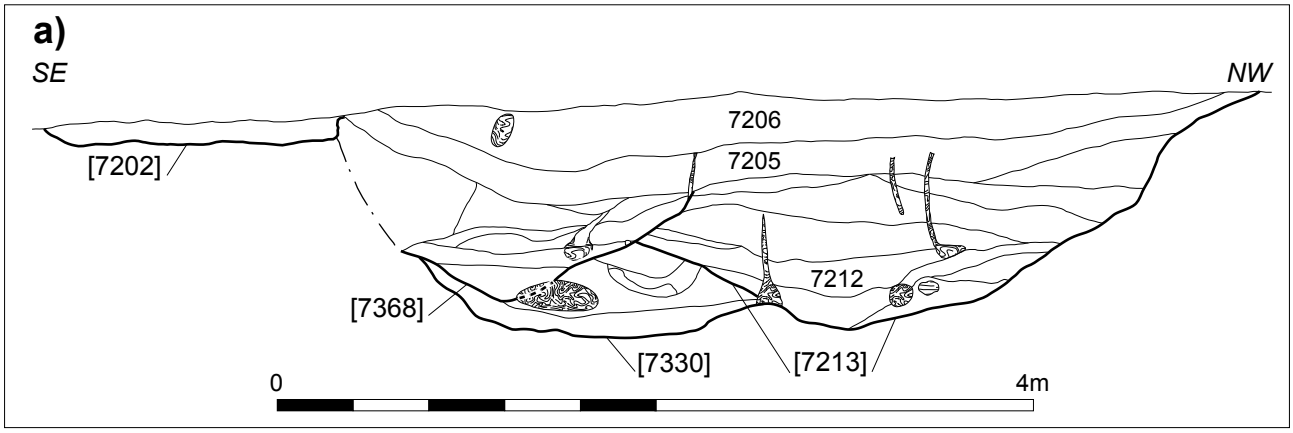

Figure 3.26: Section through Fen-edge Pit Cluster 2.

The quern stone (Figure 3.27)
by Elizabeth Wright
Five fragments of stone, weighing 1543 grams, were recovered from context 7212, Small Find 8020. The pieces were very much altered by heat, probably both intense and prolonged, perhaps such as seen in a furnace or kiln. The raw material, which may once have been of a sedimentary rock, was very light in weight and had a scoria-like appearance, any volatile minerals and chemicals having been lost from the matrix. The somewhat enigmatically shaped fragment appears to derive from the lower stone of a saddle quern, having one very flat and smooth surface. Other surfaces, which are curved and undulating, also have a smooth finish, probably as a result of the heat treatment which the stone has received. The present condition and colour of this artefact may suggest that it was heated in a reducing rather than oxidising atmosphere as in a clamped kiln rather than an open bonfire. However, it is possible that such an appearance could arise from long burial in a wet and anaerobic context subsequent to the episode of heating.

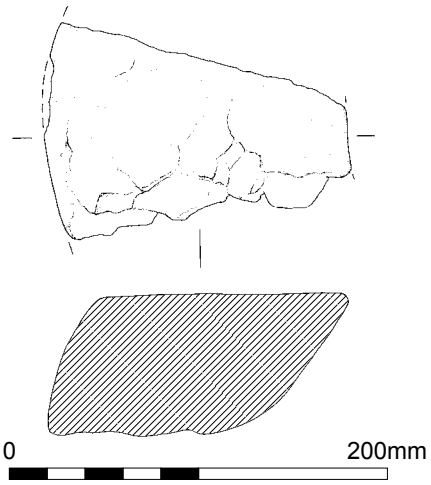

Figure 3.27: Quernstone.

The pebble mace (Figure 3.28)
by Mark Edmonds
A complete mace-head was recovered from context 7205. It measures 78mm in length and is 32mm thick (at perforation).

The artefact is a fairly typical example of an 'Ovoid Mace-head', defined in some detail by Fiona Roe (Roe, 1968). While petrological analysis has not been possible, macroscopic inspection suggests that the piece is made of fine-grained quartzite. The relatively smooth nature of one face close to the perforation may be the result of working, but there are few striations, thus raising the possibility that the artefact was made from a water-worn pebble.

Close inspection reveals that the mace-head is largely symmetrical in plan, but rather less so in section, with a marked tapering across the piece, perpendicular to the perforation. The piece is also characterised by heavy pecking on both the broader face and narrower 'butt', such wear patterns entirely consistent with use. The sides of the mace-head are altogether smoother, but show signs of pecking as part of the initial manufacturing process. Unlike a number of ovoid mace-heads, the perforation here is 'hourglass' shaped, rather than parallel, in section.

Following Roe and more recent reviews of dating and associations, this mace-head most likely dates to a sequence that takes in the final centuries of the Neolithic and the earliest stages of the Bronze Age. This would make it somewhat older than the features from which it was recovered. The artefact itself does not shed much light on whether or not its inclusion in these features was simply a matter of residuality or the result of a more considered act of curation or deposition.

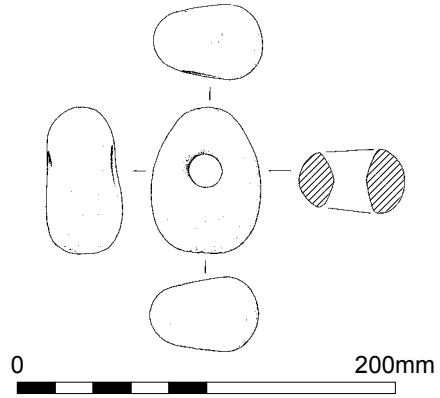

Figure 3.28: Mace-head.

Discussion
The waterholes in this pit cluster are amongst many that form a south-west to north-east aligned belt that would appear to respect the likely position of the contemporary Fen-edge. This pit cluster is not well-dated, but the similarity of the component features to other better understood examples suggests that this feature dates to the second half of the second millennium BC. This date accords with the finds of briquetage from the final feature in the cluster's sequence. The pits were found to be spatially coexistant with a length of field boundary ditch, but a definite sequence could not be easily discerned.

The recovery of stone tools and artefacts from this feature cluster is unusual. Such exotic items are only occasionally encountered, and often enter the archaeological record via votive deposition. This is particularly the case with burnt quernstones (Brück, 2001, p. 152-153; Pryor, 2001a, p.327) and other objects that, like the mace head, were already centuries old when they were deposited. The finds from Fen-edge Pit Cluster 2 together are perhaps an example of such votive rites being focussed on waterhole pits.

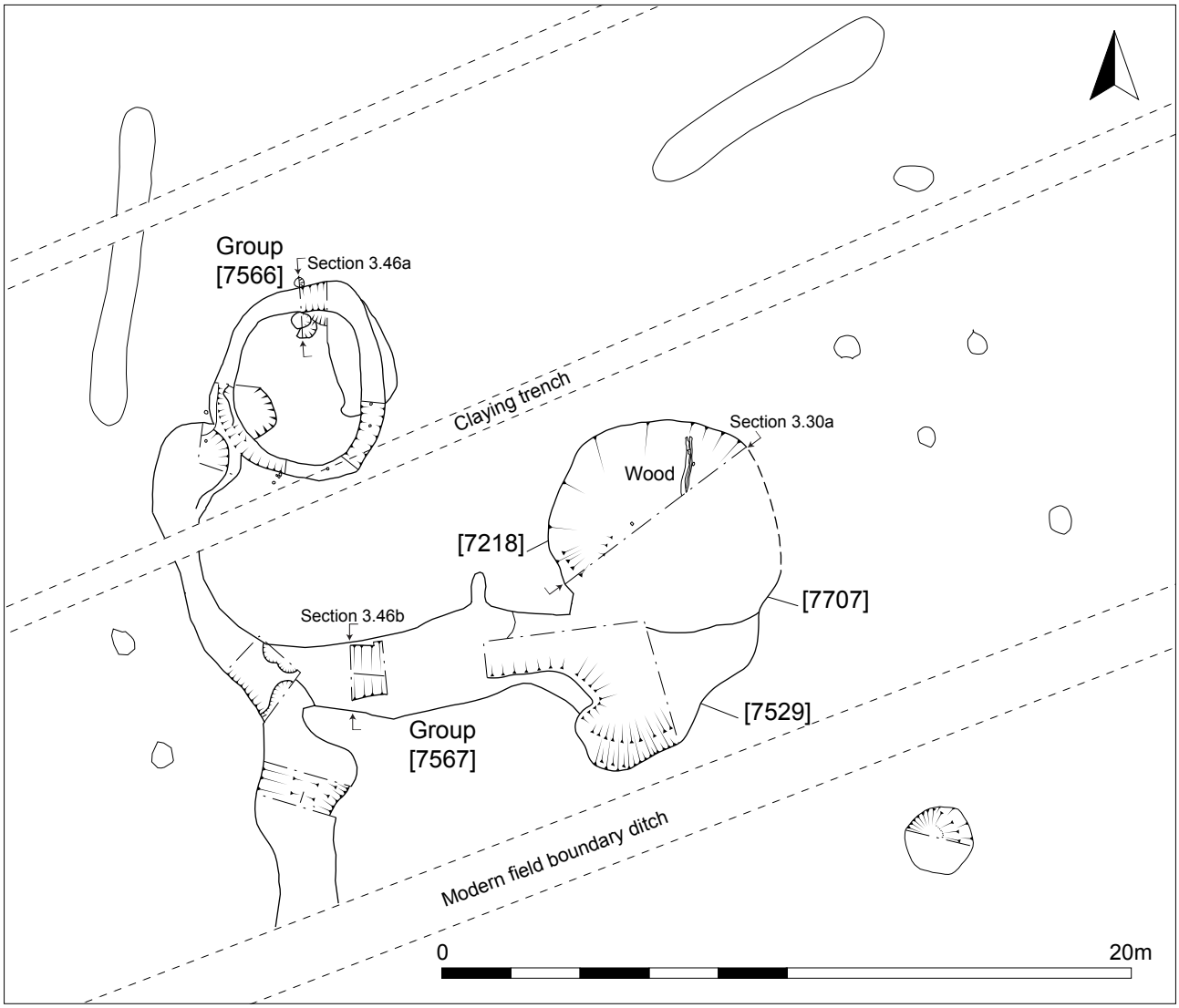

Figure 3.29: Fen-edge Pit Cluster 3.

Fen-edge Pit Cluster 3 (Figures 3.29-30a)

Description

This collection of intercutting pits was found on the south side of Field 10, centred on NGR 526615 303550. In plan Fen-edge Pit Cluster 3 appeared as a dark amorphous peaty anomaly measuring approximately 10m long by 6m wide. Four sections were dug into the group, two hand-excavated and two machine-assisted, which revealed four intercutting pits with a maximum depth of 1.4m. The earliest pit survived as a relict cut visible only in section. This was truncated to the north by a second pit that contained two in situ wooden stakes. This was cut to the south-west by a third pit which in turn had been truncated to the north by a fourth and final pit. This pit was found to contain pottery with burnt residue adhering to it, two in situ wooden stakes and wooden planking with a possible lap joint. Fired clay vessel supports used in saltmaking were also found in this feature. These resemble tapered bricks, similar to kiln bars (see Fig. 4.5).

Discussion

This cluster of features represents four incarnations of a large waterhole pit, which was clearly maintained and re-used on a number of occasions. It fell out of use permanently at the time of the Middle to Late Bronze Age transition. Two stratified fragments of CP3 pottery with adhering burnt residue were recovered from the tertiary fills of the fourth and final pit. The lower of these returned a date of 1410-1210 cal BC (SUERC-12096), the higher was dated to 1410-1200 cal BC (SUERC-12097) The vessel support bars may have originated in the possible saltern located a few metres to the west. It is presumed that the wooden stakes and planks may have been the remains of revetting that was placed in the waterhole pit to shore up its sides whilst it was in use. Whilst traces of such structures were routinely encountered, more complete examples were only rarely found, suggesting that they were usually dismantled to be re-used elsewhere when a pit fell out of use.

Analysis of the plant macrofossil assemblage from Fen-edge Pit Cluster 3 suggests that the feature was surrounded by damp scrubland and cultivated or disturbed ground. The macrofossil profile from the feature strongly resembles that of the nearby pit 7214 (located just 25m away to the south-west). Given the

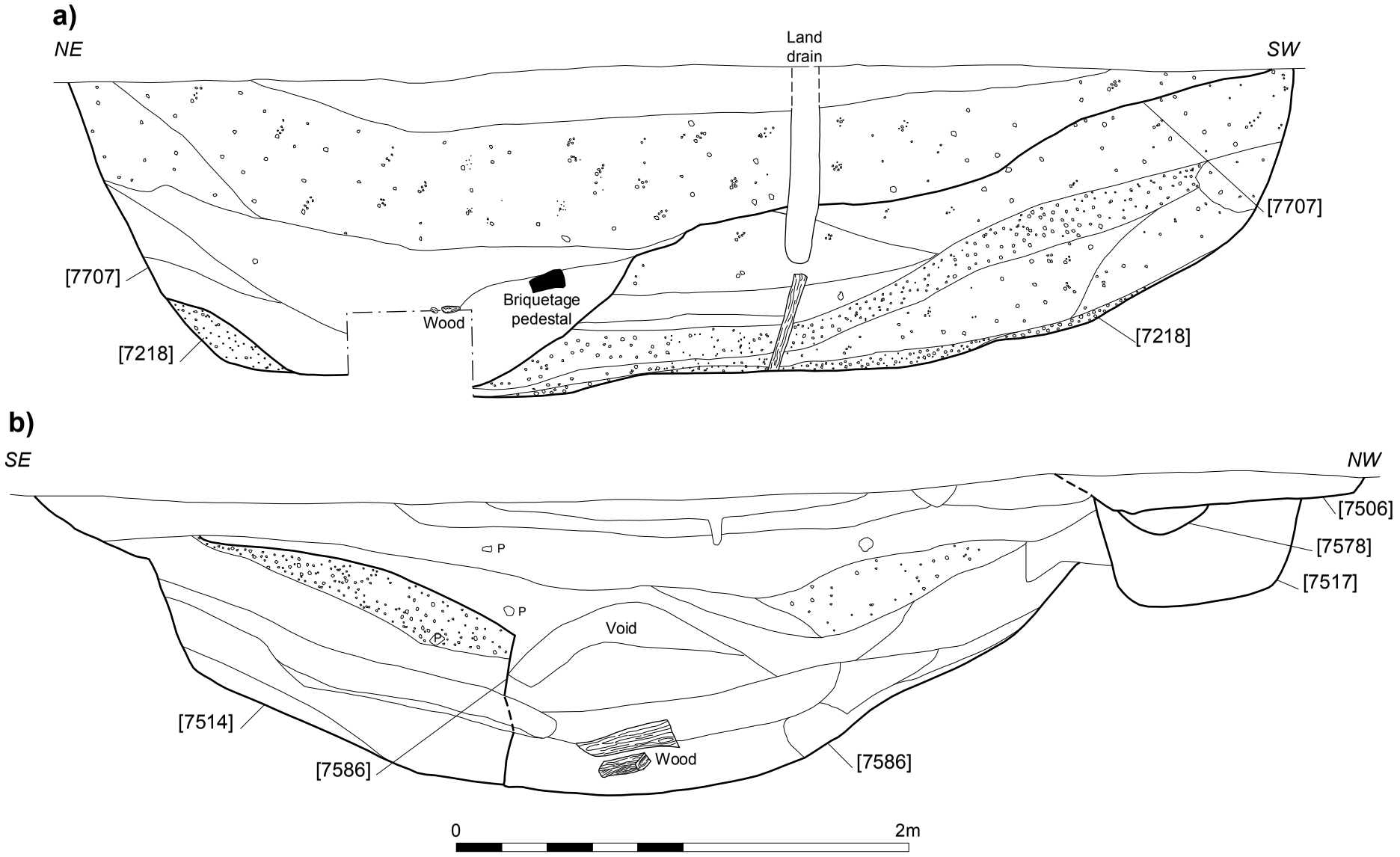

Figure 3.30: Section through Fen-edge Pit Clusters 3 and 4.

proximity of these features the evident similarities between their environs may not be noteworthy, but it should be remembered that, on the basis of radiocarbon dates from the pottery they were found to contain, approximately five centuries separate the use of the two pit groups. The evidence therefore suggests a degree of stability in the environment of this part of the project area through the second millennium BC.

Fen-edge Pit Cluster 4 (Figures 3.30-31)

Description

This group of features was located at NGR 526620 303570, in the western corner of Field 10. It was initially visible as a dark circular anomaly, measuring 4.5m in diameter. Excavation of its eastern half revealed it to comprise two intercutting pits, reaching a maximum depth of 1.3m. The original pit, cut 7514, was fairly broad and shallow; this was recut to the north by 7586, a later pit with a much steeper profile.

This later feature appeared to have been cut by the ditch that defined the western side of Field 10.

Discussion and dating

Observation of the lower fills of the features in this pit cluster again revealed gleying and a good level of organic preservation, once more favouring the interpretation that features such as these were dug as waterholes. The dewatering that the site has undergone was indicated by a subsidence or shear void that was present in the section excavated through this cluster.

The upper fills of pit 7586, the later pit in the sequence, were unusually abundant in pottery: 171 sherds were recovered, all of it shell-tempered. This assemblage represented a mix of CP3 and CP3 or 4 pottery. Such an amount of material may suggest that the backfilling of that feature was partly the result of domestic refuse disposal typically associated with pits on settlement sites. In this it was rather unusual for Pode Hole. Material from an intervention dug elsewhere into the ditch that cuts this pit was radiocarbon dated to 1270-1000 cal BC (SUERC-12862). The lifespan of Pit Cluster 4 therefore seems securely dated to the latter portion of the second millennium BC.

Fen-edge Pit Cluster 4 was located just 20m north of the concentration of saltmaking debris associated with Fen-edge Pit Cluster 3, and itself contained fragments of briquetage container. An antler digging stick was recovered from the primary fill of this feature (see Figure 4.7).

Fen-edge Pit Cluster 5 (Figures 3.32-33)

Description

This cluster of intercutting pits was found on the south-eastern side of Field 4. Like Fen-edge Pit Cluster 3, this group of features was initially apparent as an amorphous surface spread of peat. At least three pits were present, with several other almost entirely truncated cuts visible. Excavation revealed a murky and complicated series of recuts, many of which had almost entirely obliterated their predecessors. The earliest well-preserved pit in this sequence was circular in plan, 1.5m in diameter with

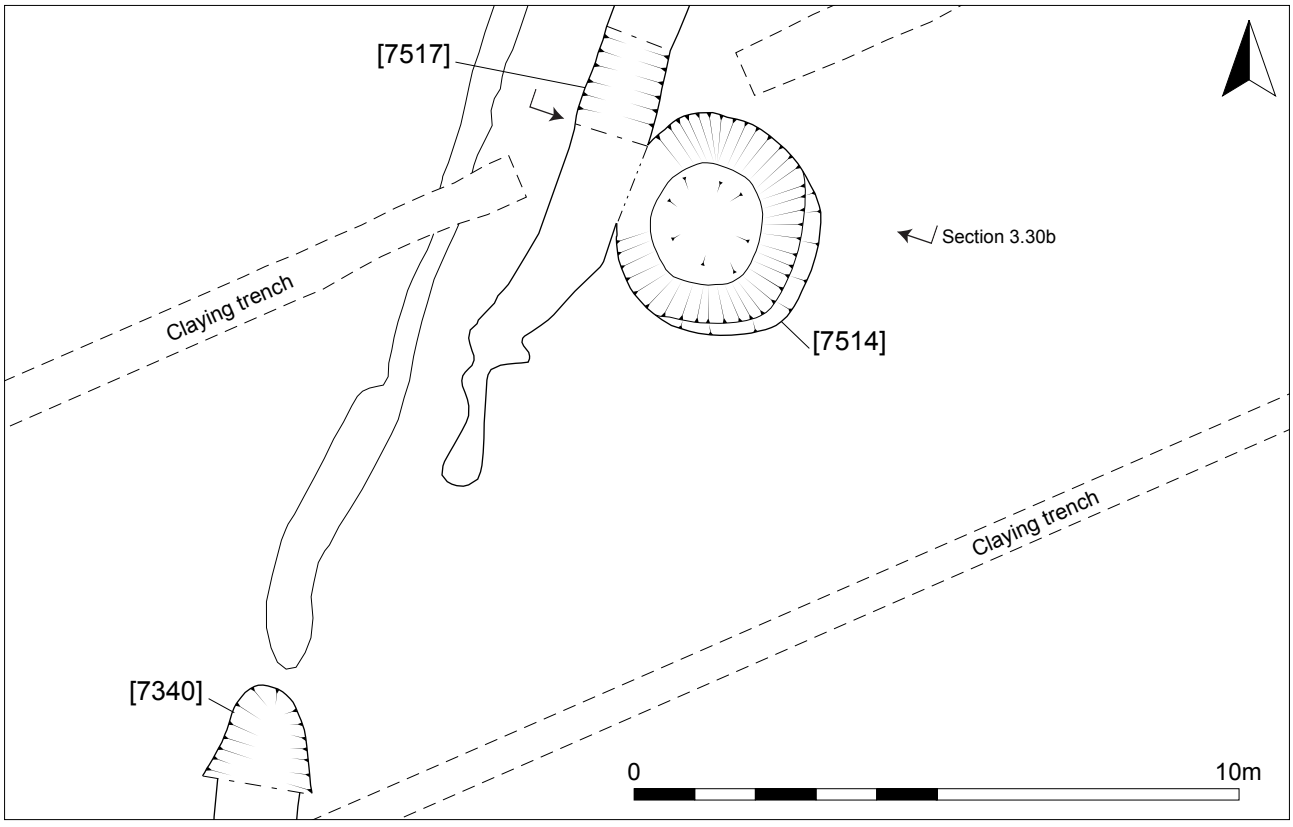

Figure 3.31: Fen-edge Pit Cluster 4.

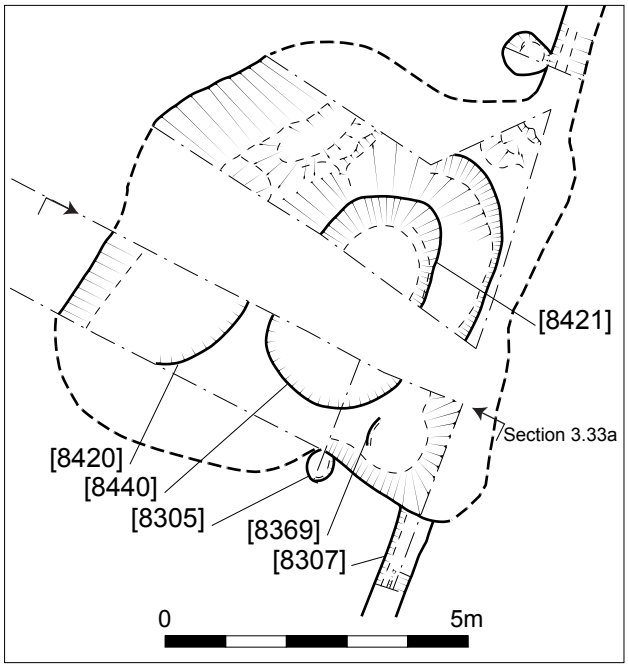

Figure 3.32: Fen-edge Pit Cluster 5.

steeply sloping sides and a concave base. The second surviving cut, which was 1.9m in diameter and had a flat base, marked the renewal of this feature. Deposits sealed this later pit, and also continued the infilling of the initial pit, suggesting that it had not become fully backfilled when it was recut. A third circular pit, measuring 2.5m in diameter and 1.2m deep, represented the final large waterhole in the cluster. This had steeply sloping sides and a flat base. This final pit contained a large amount of preserved wooden material, including a log ladder and a possible ard, which are discussed in Chapter 4 (Taylor, The Waterlogged Wood, this report).

Discussion and dating

Fen-edge Pit Cluster 5 represents several incarnations of a large waterhole pit, which suggests a regular regime of use, maintenance and renewal over an extended period of time. A radiocarbon date was obtained from the second pit in the sequence; this had an age range of 1520-1400 cal BC (Beta-238593). Other than this, the sequence cannot be dated with any great precision. The radiocarbon date accords with evidence from pottery. Only seven sherds of pottery were retrieved from the whole group. These sherds were fragments of CP3 and CP3-4 shell-tempered pottery, of Middle to Late Bronze Age date. They were found in deposits that sealed the backfilled pit cluster. The dating evidence therefore seems to suggest that the cluster as a whole dates from the Middle Bronze Age, and may have been in use for several generations. As such, this pit cluster is contemporary with other similar features discovered in the project area.

A single flint artefact was recovered from Fen-edge Pit Cluster 5. This was a fine plano-convex blade (Fig. 4.6, 15) found in the deposit which overlay the ard and log ladder in the final pit. Blades of this type typically date from the later Neolithic and continue into the Early Bronze Age, although in this instance, the moment of its insertion into the feature would seem to be somewhat later. This may possibly be another example, along with the pebble mace-head from Fen-edge Pit Cluster 2 (see above), of the deliberate deposition of 'antique' objects during the Middle Bronze Age.

Plate 3.5: Wooden objects found in the base of Fen-edge Pit Cluster 5, including the remains of a log ladder and possible ard.

Fen-edge Pit Cluster 5 was spatially coincident with one of the field boundary ditches that separated Fields 4 and 10. The pit cluster was interpreted as having cut this ditch (although this relationship was somewhat ambiguous) which would therefore imply that the ditch, cut by a Middle Bronze Age pit cluster, dates from (or before) the Middle Bronze Age.

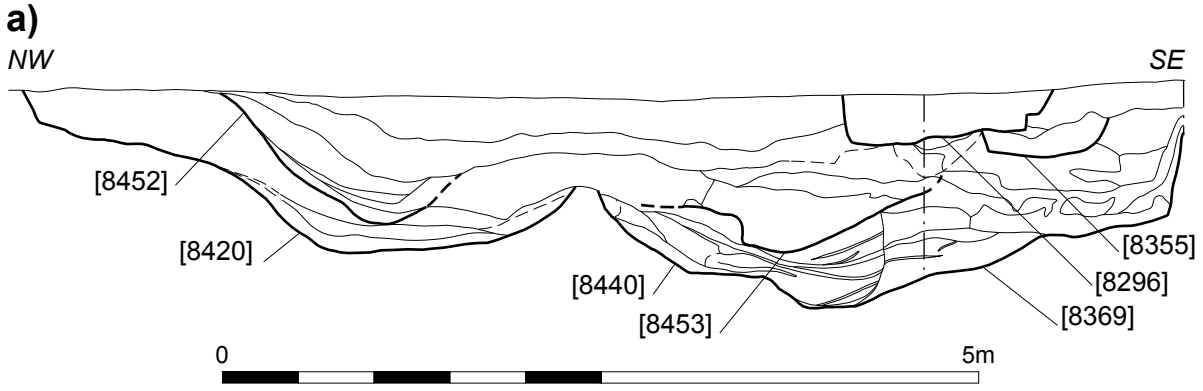

Figure 3.33: Section through Fen-edge Pit Cluster 5.

However, other features which mark the boundary between Fields 4 and 10 have returned more reliable evidence of dating. Pottery radiocarbon dated to 1270-1000 cal BC (SUERC-12862) was recovered from a separate boundary component 15m away. A period of use extending into the later Bronze Age is therefore suggested for this boundary.

Plant macrofossils found preserved in Fen-edge Pit Cluster 5 suggest that the feature was surrounded by cultivated or disturbed ground (perhaps the upcast from the cutting and recutting of the cluster itself), with species favouring scrubland or hedgerows and damp habitats present in all samples analysed. Aquatic species of vegetation were also present in most samples, suggesting the waterholes stood open for sufficient time for such plants to become established. This feature contained one of the few crop plants recovered from the project; a single wheat grain was found in one bulk sample. This may be taken as evidence of the presence of arable agriculture somewhere nearby, but such finds were so rare as to suggest that the large-scale or long-term growing or processing of cereal crops did not occur within the project area.

Pits associated with the cardinal boundary

As previously mentioned, in contrast to the number of pits that mark the Fen-ward boundary of Fields 1-4, far fewer pits were found along the course of the cardinal boundary. Five were recorded, and all but one of these were found in gaps within it. The most notable of these are described below.

Pit 8763 (Figure 3.34)

Description and discussion

Pit 8763 was located at NGR 526461 303789, in a gap between ditches that formed a length of the cardinal boundary in the northern area of the site. It was circular in plan, and had a bowl-shaped profile. It measured 3m in diameter and was 1.6m deep. Pit 8763 was found to contain a relatively large amount of animal bone, mainly cattle, weighing nearly 7.5kg in total. The majority of this was recovered from the uppermost fills of the pit. The penultimate fill in the feature's backfill sequence was particularly productive, containing as it did nearly 4kg of animal bone and a flint core, along with heat-affected flint and clay. The basal fills of this feature were sterile in terms of artefacts, although a wooden lining was found relatively intact in the base of the feature. This lining comprised fifteen wooden stakes holding in place a number of wooden planks. These wooden planks, up to 0.65m in length, were set at right angles to each other. They thus appeared to form the surviving half of a box-shaped wooden structure that once supported the sides of the base of the pit. Although this revetting structure had been disturbed prior to the infilling of the pit, it did form one of the best preserved pit linings found in the excavation area.

Plate 3.6: Remains of in situ wooden lining in the base of Pit 8763.

The sterility of the lower fills in comparison to the numerous finds found in the upper fills suggest that efforts were made to keep the pit clean when it was in use, and that it only became used as a receptacle for rubbish after it was mostly backfilled.

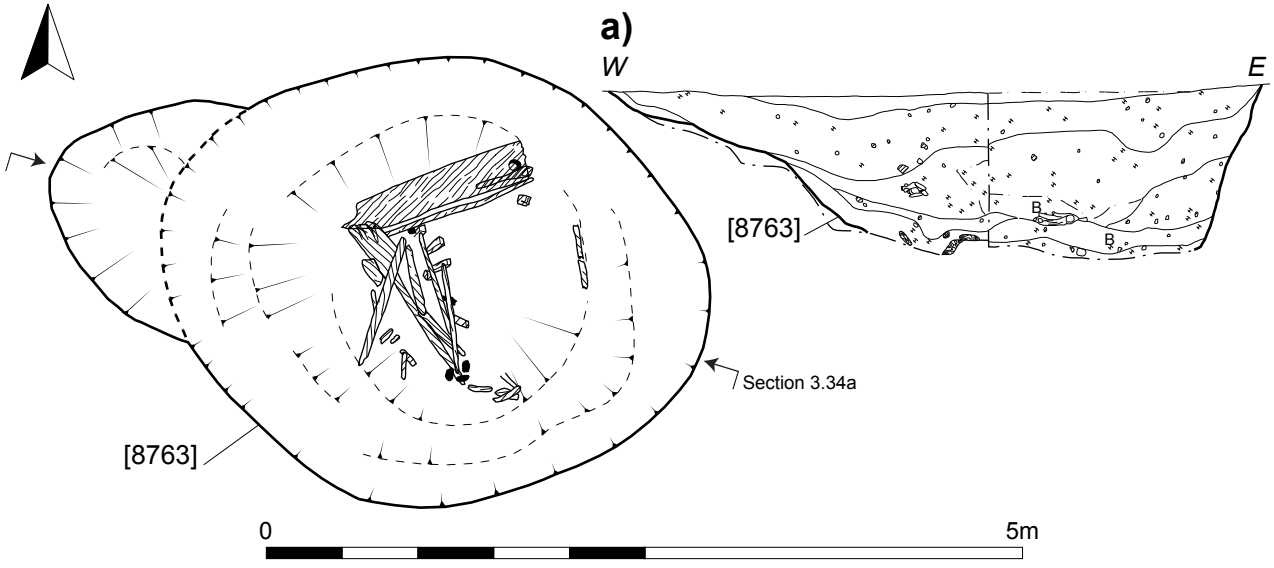

Figure 3.34: Plan and section of the surviving wood lining at the base of waterhole pit 8763.

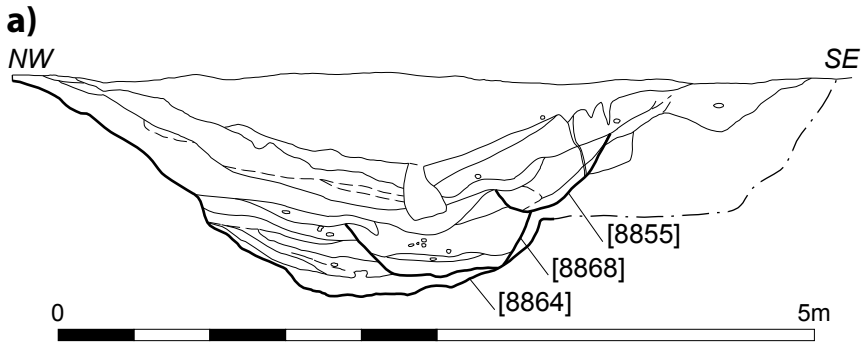

Figure 3.35: Section through waterhole pit 8864.

The remains of weed species of cultivated or disturbed ground, as well as species of hedgerow and scrubland plants were recovered from this feature. Species favouring damp habitats were poorly represented, and no aquatic plants were present in the macrofossil assemblage, perhaps suggesting that pit 8763 had a comparatively short period of use.

Pit 8864 (Figure 3.35)

Description and discussion

Pit 8864 was located close to the northern edge of the project area at NGR 526468 303824. The position of Pit 8864 coincided with the cardinal boundary; excavation suggested that the boundary ditch (here numbered 8855) had cut the pit, although the relationship was not clear. Pit 8864 was a circular cut, 5.3m in diameter and 1.45m deep with a bowl-shaped profile. The partial skeleton of a sheep was found towards the base of this feature. Higher in its backfill sequence, the pit appeared to have been subjected to a minor recutting or dredging event.

Dating

Eight fragments (5g) of pottery were recovered from a bulk sample from this feature. This material was in a shell-tempered fabric dating from CP3 or 4, the later Bronze Age.

Pits cutting Ring-ditches

Two of the four large ring-ditches revealed in the project area were found to have been cut by later waterhole pits. These pits are described below.

Pits cutting Ring-ditch 1 (Figures 3.3 and 3.36)

Description

Following removal of deposits of peat that had formed on the surface of the features, Ring-ditch 1 was found to be cut on its northern side by a cluster of three intercutting pits. These covered an area 6.5m long and 5m wide.

The westernmost pit (4081) was the earliest of the three. It was sub-circular in plan, 4m long, 3.8m wide and 1.1m deep. Where the sides cut through the surrounding gravels, they were generally quite steep, but sloped more gradually along the pit's northern edge, and where the pit cut the lower fills of Ring-ditch 1.

Pit 4081 was truncated on its east side by pit 4437. Pit 4437 was rather deeper than pit 4081, at 1.5m, but, prior to heavy truncation by pit 4046, may have been a similar shape and size to its predecessor.

The final pit in the sequence was pit 4046, which was displaced slightly to the south, but largely cut through the fills of 4437 and again had similar dimensions.

Discussion

Finds evidence supports the assumption that by cutting Ring-ditch 1 these waterhole pits must postdate the Early Bronze Age. A single sherd of CP1 Beaker pottery was recovered from a lower fill of the earliest pit of the trio. This was abraded, suggesting the passage of some time prior to deposition. An unabraded, shell tempered rim sherd of CP3 Deverel-Rimbury type was recovered from an upper fill of pit 4437 and suggests that this feature fell out of use during or after the Middle Bronze Age.

The final pit in the sequence contained an unusual assemblage. This included two fragments of CP1 Early Bronze Age Collared Urn, a bronze blade and pin (see Bevan, below) and a fragment of human skull. Also recovered from this later pit was a discoidal thumbnail scraper of likely Early Bronze Age date. This material would appear to be residual, as stratigraphically, it postdates the CB3 Deverel-Rimbury material. This later deposition of Early Bronze Age and funerary material may well represent disturbance to the barrow mound by the digging of the waterhole pits, or subsequent erosion of that mound into the pit that had been dug through its ring-ditch. Alternatively, this could be another example of the deliberate deposition of 'antique' objects during the Middle Bronze Age.

Five out of six environmental samples taken from the pits were waterlogged. None of the samples contained archaeological finds. Plant remains from the waterlogged samples indicated that there was an open, damp environment at the time when

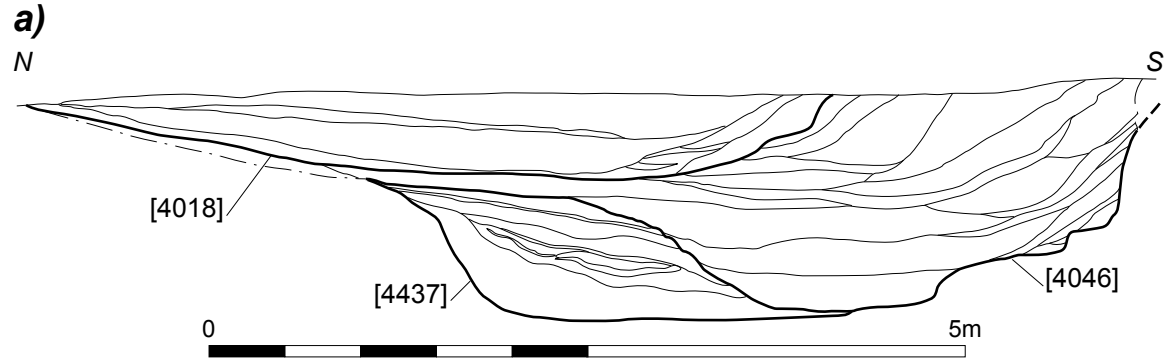

Figure 3.36: Section through pits cutting Ring-ditch 1.

the pits were silting up. A single grain of wheat was found in this cluster, from an upper fill of pit 4046.

All three pits yielded substantial pieces of worked wood. Within the fills of 4081, these appeared to be largely randomly disposed, but were more regularly arranged in 4437 (see below).

A large concentration (1235g) of animal bone came from a middle context of pit 4081. The majority of the bone was identified as cattle, but there was also a fragment of sheep, and possible fragments of pig and duck.

Cattle teeth from pit 4046, along with teeth from four other contexts were found to be from either two to three year old individuals, or from fully mature animals. Further animal bones discovered in pit 4046 included a possible cow bone and possible pig bones. A mandible from a mature sheep and a jaw from an immature pig were found in an upper deposit, which was impossible to distinguish from an upper fill of the ring-ditch. Burnt fragments of bone were also present in the pit. These probably resulted from the disposal of butchery waste or food residues (Fig. 4.5, 22).

Pit 4437 contained a largely complete briquetage pedestal, weighing nearly 1.1kg. This object, which would have been used to support brine pans over fires during the saltmaking process, was an unusual find of this type of material in the western part of the project area.

Wood from pits 4437 and 4081 (Figure 4.4)
by Maisie Taylor

The wood from pit 4081 was considered to be a dump. Pit 4437 was cut into the fill of pit 4081 and contained worked wood which was believed to have come from a structure. This comprised the in situ remains of five posts or substantial stakes, extending from the centre of pit 4437 towards its north and west edges, with smaller pieces of brushwood present around the sides. This material may represent the remains of revetting used to shore up the sides of the pit during its use. Typically for the project area, this revetting did not survive intact, presumably because of removal of some of its components prior to final abandonment of the feature. The structure formed by the posts in pit 4437, would have been disrupted by the later pit (4046), especially on the south side. The fills of pit 4046 included large amounts of small wood fragments, as well as some larger pieces, possibly suggesting that they included re-deposited material from the earlier pit(s).

Nine fragments of wood were examined from pit 4081. All are some form of debris from woodworking, except 4418, which is the best part of half a tree stump. All of this material appears to be derived from Fen species, probably alder. At many periods in prehistory alder (*Alnus glutinosa*) was the dominant tree over large parts of the Fen-edge (Scaife, 2001). The woodworking of this timber is very simple radial splitting with tangential hewing.

The roundwood is a series of poles, varying between 28mm and 40mm in diameter. One pole has a slight curve, which is one of the indicators of coppiced wood, and the fact that all are straight with virtually no side branches gives quite a strong indication that the material is derived from coppicing.

The final piece from this pit is a tree root bole, with a considerable length of trunk. This has been roughly split in half, but tapers. This taper is more likely to be connected with the poor splitting qualities of the fen species rather than to be entirely intentional.

The wood from Pit 4437 was thought by the excavators to be the remains of a structure, and the assemblage certainly differs from that in the other pit. There is some roundwood, but this constitutes a smaller proportion of the assemblage than it does in the other pit. Two of the roundwood pieces are trimmed at one end in one direction, and one is trimmed to a point from all directions. At least one (4441) shows classic signs of having been coppiced. The remainder of the wood is either timber or derived from timber, and much of it is oak (*Quercus* sp.).

None of the timber is from large oak trees, but from relatively small, young trees, perhaps with a maximum diameter of 200mm. All the splitting is radial, with further trimming and hewing to produce planks and posts.

All the wood in 4081 is derived from Fen species. These species do not have the load bearing qualities of oak

which was the preferred species for construction in the past, but they have different qualities which were well appreciated. Alder in particular was used, especially in wet areas like the Fens, for wattle and hurdle making. All the pieces of roundwood fall within the range of diameters used for hurdle and fence making. A few of the poles have survived well enough for examination of the worked ends. Poles of this range of diameters can usually be harvested with one or, occasionally, two axe strokes (4420). The trimming up of the end with strokes from all directions (4418, 4422) is subsequent working, presumably to ease the insertion of the pieces into the ground where they are needed as vertical elements in a structure. The fact that there is subsequent working of the poles suggests that the roundwood is not simply debris lying about from coppicing nearby, but represents poles which have been selected for use.

The tree with its root bole is very interesting given the proximity of the barrow and the deteriorated quality of the wood. Tree stumps with roots have recently been found on a number of sites in the area, but always in a 'ritual' or religious context (e.g. Holme-next-the-sea, Pryor, 2001b) The tree from Pode Hole is in very poor condition, making any further analysis impossible; however, it is possible that the poor condition is due to the fact that the tree was re-deposited into the pit when the pit was cut into the ditch of the barrow.

The occurrence in 4437 of a higher proportion of oak suggests that the wood represents the remains of a plank structure. Structures in Bronze Age pits are very common and are usually connected with facilitating access or shoring up the sides of the feature. Almost all gravel sites in central and eastern England produce these holes and many of the holes produce structures. The range of diameters of the roundwood is appropriate for this kind of structure, as are the small, fairly rough planks and posts.

None of the debris from the pits cutting Ring-ditch 1 was small woodworking debris, which suggests that the wood was not actually being worked close to the pit cluster, but was brought to it when finished.

Copper alloy objects (Figure 3.37)
by Lynne Bevan

1. Flat fragment from a tanged blade or razor. Length: 96mm, width: 22-30mm. Small Find 8000, Context 4026).

2. Small pin with a short, tapered shank. Length: 27mm, width of head: 8mm, width of shank: 4mm. Small Find 8001, Context 4029.

Two copper alloy objects were recovered: a fragmentary blade or razor (Small Find 8000, Context 4026) and a small pin with a short, tapered shank (Small Find 8001, Context 4029). Both objects were in a poor, degraded condition and there was an iron-rich encrustation on one side of the blade. The pin (Fig. 3.37, 2) was even more degraded than the blade/razor. It appears to have a short, tapered shank rather than being part of a much longer pin. A similar date to the blade/razor (discussed below) is likely, although no close published parallels were identified.

The blade or razor (Fig. 3.37, 1) is completely flat, roughly leaf-shaped, with damaged edges and a short, broken tang. Its form is similar to some of the Middle Bronze Age blades and Class 1 razors discussed by Coles (1963/4, Fig. 14: 7, 8, p.120-121), although it lacks any decoration or central rib. Another similar Middle Bronze Age razor comes from the Thames in London (Rowlands, 1976, Plate 35), although it has a perforated tang. A possible contextual association with discoidal scrapers, which are characteristic of the Early Bronze Age, suggests that it might conversely be a blade, and therefore earlier in date. However, no close published parallels for this type of blade could be found in Early Bronze Age assemblages, in which daggers and knives tend to be triangular-shaped. A 'small tanged knife' which might be of a similar form to this example was associated with a triangular knife, a bracer and a beaker in an Early Bronze Age group from Dorchester, Oxfordshire (Coles, 1968/69, p.43). However, if it is a Class 1 razor, which is possible but by no means certain in view of the edge damage, this type '*can be dated to both the Early Bronze Age and early Middle Bronze Age*' (Rowlands, 1976, p.47).

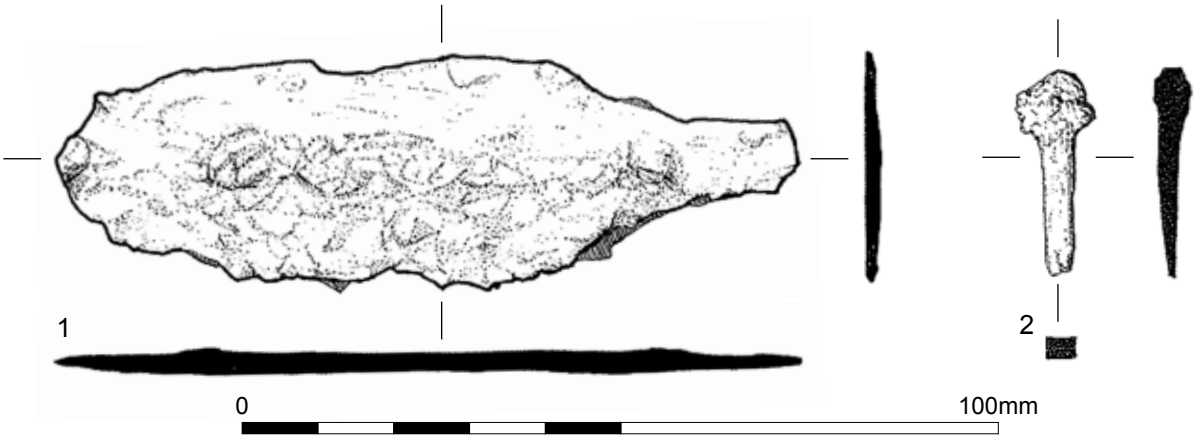

Figure 3.37: Blade and pin from pits cutting Ring-ditch 1.

The remains of both Early and Middle Bronze Age pottery, including urn fragments, have been recovered during previous excavations of an Early Bronze Age barrow at Pode Hole (Cuttler and Ellis, 2001). It is possible that the blade and pin were originally part of a grave group or that they entered the archaeological record by being interred with a burial or as an act of deliberate deposition (e.g. Bradley, 1990). Although it is hitherto unknown for a blade/razor to be disposed of in this way, as opposed to the more elaborate metalwork usually associated with depositional practices, razors were a specifically male item and such gendered ritual disposal is therefore not impossible.

Pit cutting Ring-ditch 4 (Figure 3.10d)

Description and discussion

A single waterhole pit was found cutting Ring-ditch 4 on its south-eastern side. This feature was centred on NGR 526510 303814 and measured approximately 4m in diameter. Excavation revealed it to be 1.3m deep. The majority of the backfill of the waterhole pit was a primary deposit of coarse gravel, presumably a redeposited upcast, and an upper fill of sticky pinkish orange mixed clay and sand. This material may represent gradual erosion of the assumed barrow mound into the waterhole pit. Interleaved between these two deposits were silts and sands of various mixed grey and brown hues, which may represent episodes of standing water. The uppermost fill of the waterhole pit was a pale grey silt. This was one of only two fills of the pit to contain artefacts, and the only one in which they were found in any number. Only one fragment of pottery was recovered; this was a fragment of a vessel of probable Late Bronze Age to possible Early Iron Age date (CP5). This may not date the construction of the pit with any precision as the deposit was late in the backfill sequence. No other artefacts of note were recovered from this feature, which did not even contain the thick layer of organic-rich material commonly encountered at the base of waterhole pits.

Environmental Analysis of Other Waterhole Pits

Pit 9075 (Figure 3.38a)

Description and discussion

Pit 9075 was located at NGR 526559 303767. It stood alone in a small strip of land between Fields 6 and 9. It had a sub-oval cut with a deep bowl-shaped profile and a

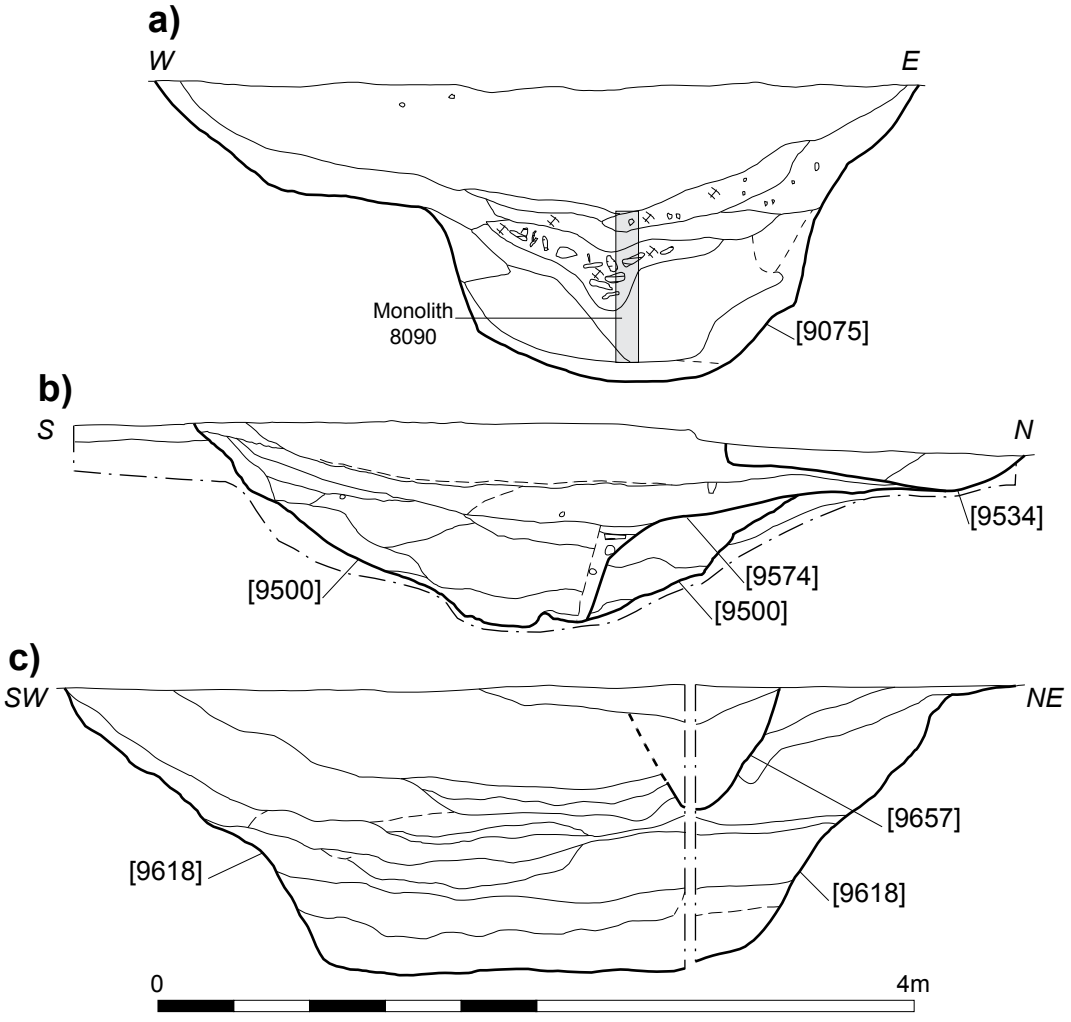

Figure 3.38: a) Section through pit 9075, b) Section through pit 9500, c) Section through pit cutting Ring-ditch 1.

concave base. An access step had been cut into its western side (see Plate 3.7). The feature measured 4.1m in length by 3.5m wide, and was 1.55m deep. Pit 9075 contained thin deposits of redeposited natural gravel around its base and sides. This was sealed by thick deposits of dark brown and black loose peaty silts and sands containing abundant organic matter. This material was up to 0.7m deep and was overlain by a deposit of orange brown silt sand, possibly upcast used to deliberately backfill the feature from the east. A final thick deposit of mid-grey sandy silt, 0.6m deep, marked the final abandonment of the feature. The pit did not appear to have been recut, and no traces of a wooden lining were observed.

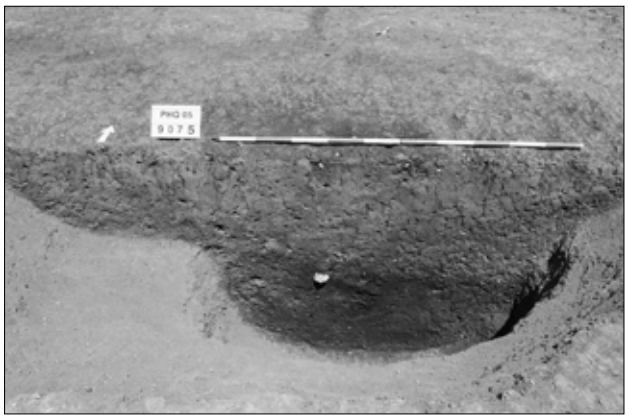

Plate 3.7: Pit 9075 with well-defined 'step' on western side.

The uppermost segment of the rich organic fill layer was comparatively rich in finds; it was found to contain over 1kg of animal bone, heat-affected flint and stone, and two fragments of CP3 shell-tempered pottery, thought to date from the later Middle Bronze Age.

Plants favouring cultivated or disturbed ground and hedgerow/scrubland/woodland dominate the plant macrofossil assemblage found preserved within the fills of this feature, with elder and willow being particularly abundant. Species favouring grassland, and damp or aquatic habitats are also present, albeit in smaller quantities. With no crop plants present, the macrofossil assemblage from pit 9075 seems typical of those recovered from other waterhole pits across the project area. Pollen preserved in a soil monolith taken from the organic fills of this feature likewise shows a predominantly grassland, most probably pastoral habitat (see Chapter 5, Pollen Report). Nitrogen-rich soils resulting from stock rearing are suggested by some of the pollen grains present. Whilst flax and cereal pollen were observed, it was only in very small quantities, suggesting that these may have come from secondary sources. Macrofossil and pollen evidence both suggest that the pit became fringed with willow over time, although insect remains found preserved within this feature suggest damp grassland with little tree cover. The insect remains do however support the evidence suggesting stock rearing, as dung beetles were present in this feature in some number. This feature contained the broadest range of insect species of all the waterhole pits studied.

Dating

Material from the column sample was submitted for radiocarbon analysis. This returned a date of 1420-1190 cal BC (Beta-238589), which is in accordance with the date of the pottery recovered from the feature. The pottery and the material for radiocarbon dating were both recovered from the same context (9092). This suggests that the waterhole pit was becoming infilled in the latter part of the Middle Bronze Age, and was contemporary with the main period of occupation of the project area.

Pit 9500 (Figure 3.38b and Plate 3.4)

Description and discussion

Pit 9500 was located at NGR 526654 303759, in the extreme east of the excavation area. It lay around 14m to the south of a possible droveway, and appeared to be situated outside of the field system.

Following ploughsoil stripping, the feature was marked by an extensive spread of black peaty silt covering an area of 6m by 5m. Investigation of this found the cut of the waterhole pit sealed beneath. Pit 9500 was sub-circular in plan, with a diameter of approximately 4m. It was 1.5m deep, with anaerobic deposits occupying approximately the lower 0.8m of the feature. These were sealed by deposits of grey brown gravelly clayish silt that were found to contain four small fragments of pottery in shell-tempered CP3 or CP4 fabric, dating from the later Bronze Age. Several large fragments of wood were found resting on the surface of the anaerobic material, and the cross section through the feature revealed signs of further rotting, or removal, of wooden objects. Pit 9500 contained three flint flakes, fragments of mussel shell, quantities of heat-affected clay, flint and stone, as well as 1.84kg of animal bone, which included a partial lamb skeleton. Lower down, towards the base of the feature, was the skeleton of a second sheep, this one a young adult.

Six bulk samples retrieved from pit 9500 were submitted for environmental analysis. The plant macrofossil assemblage they were found to contain confirms that pit 9500 held water more or less permanently (damp-loving and aquatic species were present) and existed within a fairly open habitat characterised by cultivated or disturbed ground containing scrubland or hedges, with only slight evidence of grassland or meadow in the vicinity. Willow was the dominant tree in the record with varieties of alder being replaced by hazel over time. The variety of species present as carbonised remains suggests the possible clearing of hedgerow material from within the vicinity of this feature. Remains of flax, along with wheat, barley and wheat chaff were also recovered from within this pit 9500. Whilst these indicate that arable production was not unknown in the area, they were not of sufficient quantity to suggest that the proximity of extensive arable cultivation or processing.

Dating
Organic material from one of the samples was submitted for radiocarbon analysis. This returned a date of 1400-1130 cal BC (Beta-238592), which is in accordance with the date of the pottery recovered from the feature. This suggests the waterhole pit 9500 was becoming infilled in the latter part of the Bronze Age, and was also contemporary with the main period of occupation of the project area.

Pit 9618 (Figure 3.38c)

Description and discussion
Pit 9618 was located in the western corner of Enclosure 1, where it was cut by the boundary ditch that defined that enclosure. Pit 9618 was centred on NGR 526613 303873 and was sub-oval in plan. It was oriented north-west to south-east, the same as the boundary ditch that was later superimposed onto it. On this axis it measured 6.7m, it was 4.8m wide. Excavation revealed that the feature had stepped flared sides and a flat base at a depth of 1.5m. The basal deposits of this feature consisted of interleaved lenses of gravelly sand and anaerobic grey and green silts and clays. A more extensive layer of anaerobic fill existed 0.5m above the base of this feature. This was sealed by deposits of orange sandy gravel that had possibly entered the feature from its north and west sides. A thick deposit of homogeneous grey clayish silt marked the final disuse and infilling of this feature. The pit was found to contain a relatively large amount of occupation debris; nine flint flakes, numerous fragments of CP4 pottery representing the remains of two ovoid jars, nearly 1kg of animal bone, and half that of heat-affected stone. The majority of this material was recovered from the upper fills of the feature, especially the grey clayish silt that marked the final disuse of the feature. This would suggest that, in this case, the pit was used as a repository of rubbish to a limited degree, but such usage was postponed until the feature was no longer fit for its original purpose. This is in contrast to pit 9500, which contained significant amounts of animal bone in its base (see above).

Ponds

Six particularly large cut features were identified in the project area. In their basic form and backfill sequence they resembled the waterhole pits. However, their larger shape in plan, and gentler profiles, suggests that they could have been directly accessed by stock animals, and so have been referred to as ponds.

Sub-circular in plan, these features had a maximum diameter that varied between approximately 7m and 14m. They were typically around 10cm to 20cm shallower than the conventional waterhole pits, normally ranging in depth from around 1m to 1.2m. Their sides were less steeply sloping, usually resulting in a profile that was dish-shaped, unlike the bowl-shaped profile of the waterhole pits.

Excavation revealed the same basic backfill sequence as encountered in other deep features on site. Organic-rich primary fills were overlain by secondary dirty clayish gravelly deposits of various brown, orange or grey hues. The disuse of the ponds was represented by a substantial deposit of homogeneous grey silt. This was often sealed by a layer of peat, which formed on the surface of the feature, dipping into it as its fills subsided.

Pond Cluster 1 (Figures 3.39-40)

Description
A collection of cut features, probably representing the remains of a recut pond, were located in the eastern corner of Field 5, centred on NGR 526608 303690. It covered a sub-oval area, and measured 11.6m east to west and 7.5m north to south. Excavation revealed that the constituent features typically reached a depth of 1.15 to 1.3m below the stripped ground surface.

The form of the original pond was somewhat difficult to discern due to later recutting. Variations in the natural ground surface, disturbance of edges, similarity of fills and post-medieval truncation all prevented these later recuts from being easily distinguishable or clearly sequenced.

Whatever the total number of individual cuts within this cluster, the deposition of three extensive layers seems to have marked its abandonment. The earliest of these was a 0.2m thick deposit of mixed orange and brown gravelly sand and silt. This may represent the original upcast from the pond being redeposited back into it. The ubiquity of this material across the area of the cluster would suggest that it was deliberately deposited, possibly to level up the ground surface. This was overlain by a c. 0.25m thick deposit of homogeneous friable brownish grey clayish silt. This material may represent natural silting up of the hollow formed by the former ponds. This was sealed by peat growth, which in the post-medieval period had been cut by a drainage feature.

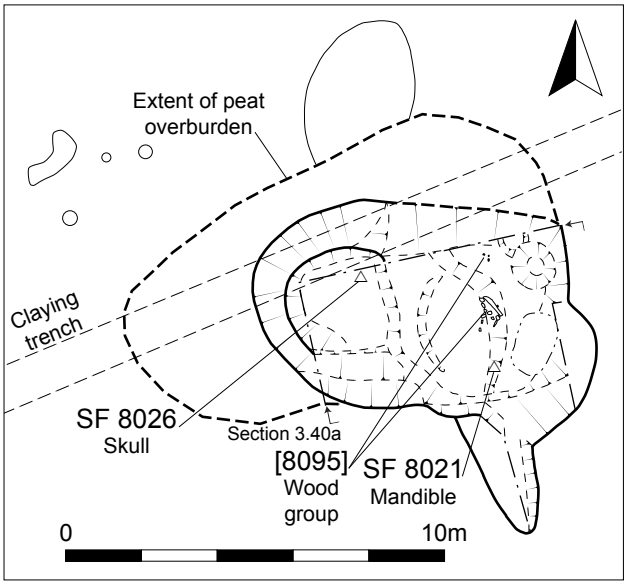

Figure 3.39: Pond Cluster 1.

The original pond, which may have exploited the position of a slight natural hollow, was recut slightly to the north by a second similar feature. This sloped down very gradually from the north-east to the south-west and suggests that the pond was accessed from the north-east side, that is, from the unenclosed side, which lay beyond the field system.

Environmental analysis

Analysis of plant macrofossils found preserved in Pond Cluster 1 found the remains of aquatic species, and the feature was evidently surrounded by damp scrubland, with disturbed or cultivated ground. Wood, twigs, buds and thorns were found in this feature, suggesting that the scrubland was well-established when they became incorporated into its fills. A very small number of flax seeds was recovered from Pond Cluster 1, too few to suggest that flax was being intensively cultivated within close proximity, but it may have been present in the wider area. Analysis of pollen preserved in a soil monolith taken from the lower fills of the cluster reveal that herbs of open pasture are dominant throughout, with woodland present, but diminishing over time (Langdon and Scaife, this report). The results of the study of insect remains preserved in this feature are broadly complementary, suggesting damp weedy grassland grazed by large herbivores, with little evidence for the proximity of woodland, but perhaps with scattered trees present. The insect remains do not suggest that there was any human settlement close to this feature. Interestingly, the condition of some insect remains from this feature suggests that a corvid (crow, rook etc) may have perched above the pond and regurgitated its pellets into it.

Discussion

The remains of ten sharpened wooden planks were found driven into the base of one of the later ponds within the cluster (Group 8095). These were placed in two converging alignments that formed, in plan, an irregular T-shape within a 1m square area. The uprights did not form any coherent structure, and as found, they probably represent only a fraction of the original structure. Their function is thus unclear. It is most likely that these uprights supported material that lined the pit, but the lining itself was removed in antiquity, although from their position in plan, the uprights do not seem to be situated close to the edge of a cut. However, the position of edges of cuts can be difficult to determine where wood, which once separated different fills within a single cut is subsequently removed.

Pond Cluster 1 was found to contain two large fragments of human skull. A cranial vault was recovered from the basal deposit of a later pond in the sequence, whilst a mandible was found in the upper homogeneous brownish grey clayish silting layer. These remains both represent an adult male in late middle age (45+) at death and it seems likely that they represent a single individual (Brayne, this report), although the two fragments were found some five metres apart. Whilst it is difficult to gauge the significance of this material, it is straightforward enough to identify it as highly unusual in the project area. Human remains were only encountered within one other water feature on the site, the pit cluster cutting Ring-ditch 1. In that case, the adjacent barrow mound may have been the source of the remains. No funerary features were identified in the vicinity of Pond Cluster 1 and it would seem that the material represents a deliberate deposition. The position of the cranial vault within the pond did not, however suggest it had been placed there with any sort of veneration; it was found inverted, and resting on 0.08m of basal material. This consisted of a friable grey clayish silt, with frequent organic remains, including wood, twigs etc. The nature of this material would suggest that when the skull was deposited, the pond was somewhat dirty, and probably foul and out of use.

The disposal of human remains is an activity carried out with rites deeply rooted in social convention, and the archaeology of the Fen-edge suggests that this was as true in the Bronze Age as it is today. During the later Bronze Age, the dead were typically disposed of in a manner that left them invisible to the archaeological record, yet isolated body parts and lone burials are occasionally recovered.

Brück has observed that where such remains are encountered on sites of this period, they are generally unburnt and fragmentary, often found in pits and ditches linked to settlement boundaries (1995). Skull fragments are particularly prevalent in the archaeological record (p.247). Such deposition is interpreted as a deliberate utilization of human remains in ceremonies very different to the modern Western concept of a funeral. Brück argues that body parts formed the focus of rituals that were used to confer political or social power on their leaders, as these rituals sought to control the agricultural fertility so vital to the communal wellbeing. Thus, '*the deposition of human remains may have been part of regular practices designed to renew fertility and to reproduce the authoritative structures of society.*' (p.262).

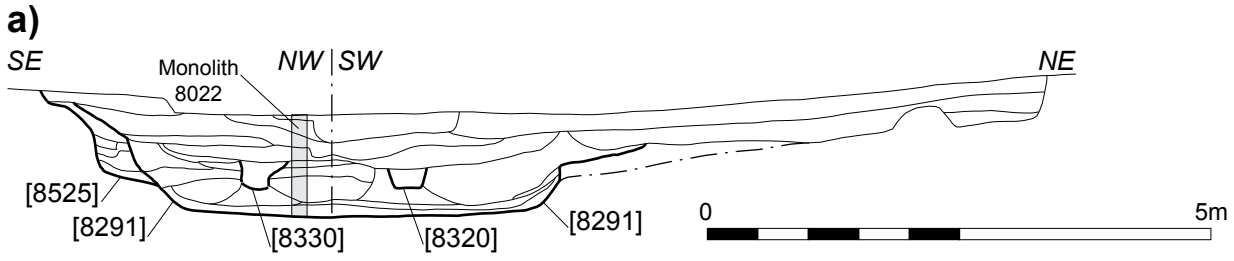

Figure 3.40: Section through Pond Cluster 1.

The discovery of human remains seemingly deliberately deposited in a waterhole pit, a type of feature '*central to economic prosperity*' (Yates, 2007, p. 136), is in agreement with Brück's theories regarding the treatment of human remains during the period, and suggests that such rites were seemingly practised at Pode Hole, but apparently not very frequently. A similar find of a fragment of human skull in a Bronze Age waterhole pit was also made nearby, at Langtoft quarry (Hall, 2000, p.15).

Dating

Two samples were submitted from Pond Cluster 1 for radiocarbon dating. Material from a monolith sample through the fills of one of the later ponds in the cluster returned a date of 1460-1310 cal BC (Beta-238590). This date is in accordance with the later Bronze Age briquetage that was recovered from two deposits within the same pond. This feature was sealed by a homogeneous brown gravelly silt and sand levelling layer found to contain CP3 pottery. Burnt residue adhering to some of this pottery recovered from the homogeneous brown levelling layer returned a radiocarbon date of 1620-1430 cal BC (SUERC-12866). This seemingly older material therefore stratigraphically postdates the more recent material. This inversion of the expected sequence may be due to the vagaries of radiocarbon dating, or it may indicate that the pottery with burnt residue was residual. Given the fragile nature of this material, it is assumed that it would not have survived for long if exposed on the surface.

These dates suggest that the use period of Pond Cluster 1 dated to some time in or after the Middle Bronze Age. They had probably fallen out of use by the later Middle Bronze Age period, and the landscape as a whole would seem to have been rendered uninhabitable by the Early Iron Age, as evinced by the peat layer that sealed this cluster.

Pond Cluster 2 (Figure 3.41-42)

Description

Pond Cluster 2 consists of two large ponds separated by an area of concentrated pitting. The ponds were located on the eastern side of Field 9, centred on NGR 526595 303816. Each of the ponds was located on the southern extent of one of the ditches that made up the double-ditched boundary that defined the northern and eastern sides of Field 9. Each of the pair of ditches presumably drained into one of the pair of ponds. Pond Cluster 2 measured approximately 16m east to west and 9m north to south and covered an area of approximately 120m^2.

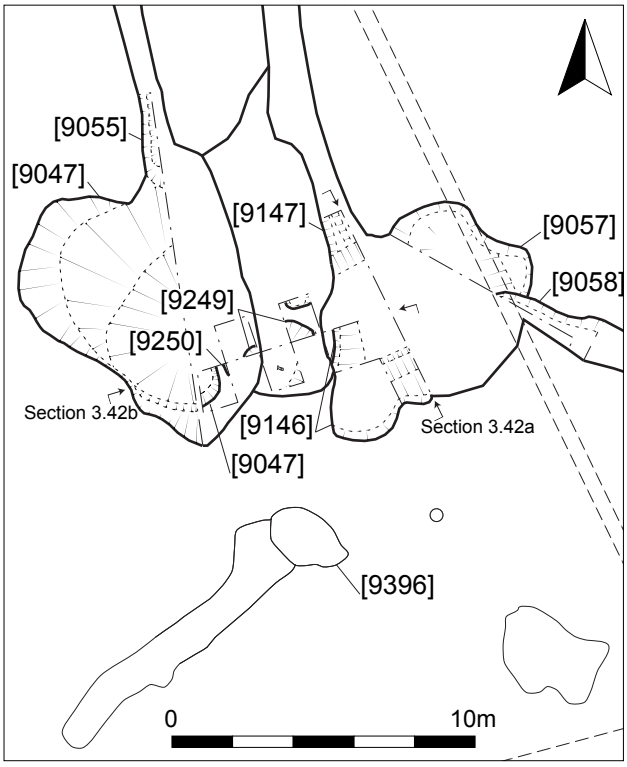

Figure 3.41: Pond Cluster 2.

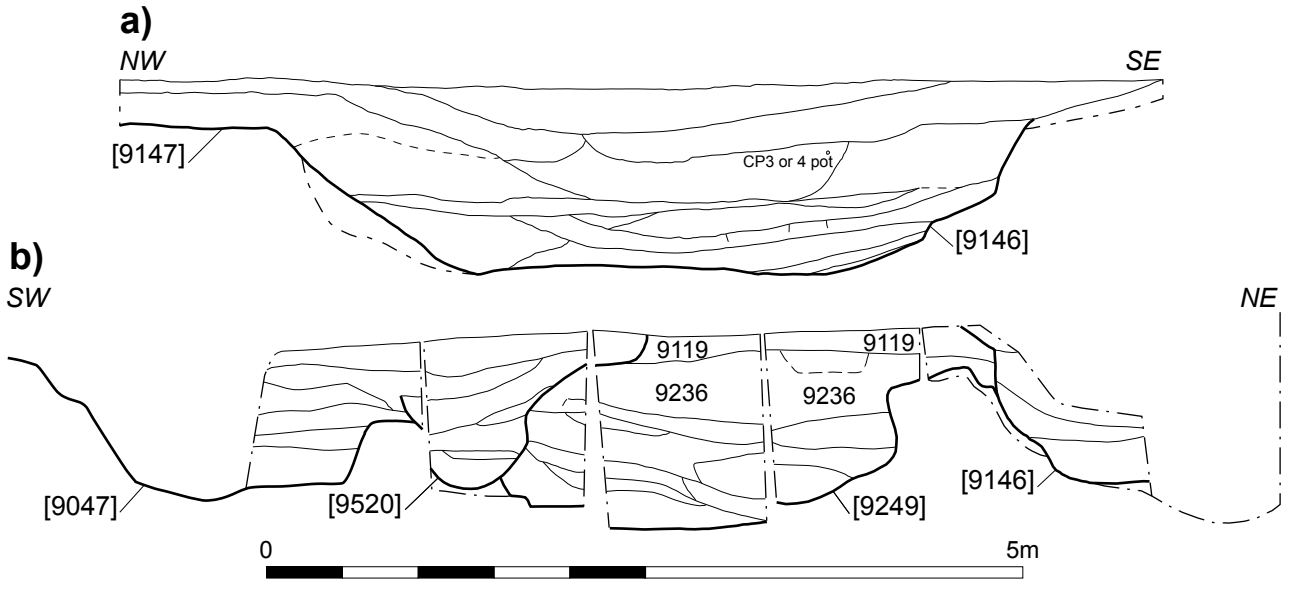

Figure 3.42: Sections through Pond Cluster 2.

The westernmost of the pair of ponds was numbered 9047=9349. It was sub-oval in plan, measured 9m by 6m and was approximately 1m deep. It had an irregular dish-shaped profile, and was gently sloping on all its sides except the southern. The direction of slumping of its fills seemed to suggest that the upcast from 9047=9349 was stored on the southern side of the feature.

The easternmost of the pair of ponds was numbered 9057=9146. It measured approximately 6m by 5m, by 1.2m deep, was sub-circular in plan, and bowl-shaped in profile. Its eastern edge was the most gently sloping and the pond was probably accessed from this side. A field boundary ditch extended from the south-east of this feature. This ditch formed the northern part of a probable 12m-wide droveway. The droveway extended beyond the limits of the project area towards the south-east, and probably ran down towards the prehistoric Fen-edge.

The upper fills of each of these ponds consisted of clayish silts or sands of various orange, brown and grey hues. The difference between this material and the fill of the ditches that fed into the ponds was not readily apparent. It appears that the upper regions of the ponds became infilled with broadly the same material as the ditches that fed into them. Their use and disuse would therefore seem largely contemporary.

Waterhole pits associated with Pond Cluster 2

Description

Ponds 9047=9349 and 9057=9146 lay around 4m apart, and the ground that separated them had been intensively pitted before the ponds were dug. This area was investigated with a 'chequerboard' pattern of test pits in order that the complex and subtle archaeological sequence could be investigated, whilst retaining some stratigraphic control. The ensuing investigation in this area revealed six cuts probably representing four individual pits. A further waterhole pit was located less than 4m to the south of this area.

The earliest pit in this sequence survived only as a relict feature in section. It had been heavily truncated by a succeeding pair of waterhole pits, 9375 and 9249=9376. Following the disuse and backfilling of these features, an extensive deposit of firm orangey brown sandy silt, 9236=9366=9371, was laid down over the area, to a depth of up to half a metre. This was likely to have been a deliberate act of levelling in order to render a probably soft and boggy area useable again. This levelling material was itself physically sealed by a deposit which probably resulted from renewed occupation in the area. This deposit, context 9119, was a colourful mixed green, grey and dark orangey brown sandy silt, which extended over an area measuring 4.9m by 2.5m, and was 0.12 thick.

Because of its complex coloration and the quantity of artefacts (including animal bone, heat-affected stone, worked flint, charcoal and 186g of pottery) recovered from it, this material was interpreted as an occupation layer. As such it was a rare survival of the original prehistoric ground surface within the project area. This surface seems to have formed the horizon for later activity within the area.

Pond 9057=9146 was recorded as having been cut from the level of this deposit, although it is likely that the use period of the pond is contemporary with the continued build up of the occupation surface. No relationship between the occupation surface and Pond 9047=9349 could be discerned because of later truncation. The eastern side of Pond 9047=9349 cut a further waterhole pit, 9320=9377. This was located just to the north of the occupation layer, and so again it was not possible to discern a sequence between them. It may be that waterhole pit 9320=9377 and the occupation layer are contemporary, a scheme not precluded by the stratigraphy. Waterhole pit 9320=9377 itself measured around 2.8m in diameter and was 1.15m deep. It had a fairly regular bowl-shaped profile.

The rich artefact assemblage recovered from waterhole pit 9320=9377 recalls that found in occupation layer 9119, which would suggest that they are contemporary. The pit was found to contain 750g of animal bone, 590g of pottery, 22g of worked flint. The feature may have also received hearth material; 8400g of heat-affected stone and 1600g of heat-affected clay were recovered from it. Carbonised cereal grain and chaff was also present in this feature, in relatively large numbers. Much of this material was recovered from contexts 9359 and 9360, dark grey sandy silts with abundant charcoal found towards the base of the feature.

A final pit, numbered 9396, was located to the south of this feature, and between the waterhole pits. Pit 9250 cut the firm orange levelling layer 9236=9366=9371. It has also been tentatively interpreted as cutting occupation layer 9119, although this relationship was unclear in section. Pit 9250 measured 5.2m by 2.5m and was just under 1m deep.

Environmental analysis

One bulk sample from Pond 9057=9146 was studied in detail. As expected of such a feature, it contained plant macrofossils of species that favour damp and aquatic habitats. The preponderance of species of hedgerow/scrub and woodland, and disturbed or cultivated ground, apparent from other similar features across the project area is also borne out. Pond 9057=9146 was marked out by having wheat chaff and at least one barley grain contained within it. In addition to pit 9320=9377, cereal chaff and grain were also recovered from pit 9249=9376, albeit in very low quantities. Although Pond Cluster 2 therefore represents something of a

concentration of cereal crop remains in the project area, the actual quantity of material present is very small, and is not sufficient to suggest large scale cultivation or processing of cereal crops was occurring here.

Dating

In contrast with the many of the features excavated within the project area, those that constituted Pond Cluster 2 were generally quite finds-rich. The dating evidence from these finds suggests that the use of the area was confined to the Late Bronze Age.

The earliest deposit in the stratigraphic sequence to have produced pottery was the orangey brown sandy silt levelling deposit, 9236=9366=9371, which sealed the earliest pits in the sequence. The pottery recovered was the distinctive CP3-4 shell-tempered ware dated to the later Bronze Age. The rest of the pottery recovered from features within the cluster dates to the post-Deverel-Rimbury Bronze Age (CP4), with the exception of one sherd found in a grey silting fill of the western pond, which is earlier in date of manufacture (CP3) and presumably residual in deposition.

Pond Cluster 2 seems to represent an intense reworking of the same area as a location for water extraction during a comparatively short period of time around the early first millennium BC. Early pits were decommissioned by a levelling deposit which came to be physically sealed by an occupation surface. This was the surface with which two waterhole pits, one containing considerable quantities of burnt and domestic material, was associated. The occupation surface later served two large ponds. These were fed by ditches that extended from the T-shaped double-ditched boundary that partly defined Field 9. The Late Bronze Age date of Pond Cluster 2 is in accordance with the known period of use of Fields 5-10, with which the Pond Cluster is physically linked and functionally related.

Pond Cluster 3 (Figures 3.43-44)

Description

A third group of large water features was located at NGR 526660 303865, which placed it on the eastern edge of Enclosure 1. This cluster of three principal features initially appeared as an irregular peat-filled sub-oval shape in plan. It measured 19m north-south by 9m east-west and covered an area of approximately 150m^2.

Excavation revealed the truncated remains of a waterhole pit in the north-west of this area. This feature, cut 9714, seemed to have had a diameter of around 5m and a depth of 0.75m. It had largely been destroyed in antiquity when it was renewed by a later waterhole pit, cut 9691, which was dug into its northern and central area. It had also been truncated by 9512=9680, the main feature within Pond Cluster 3.

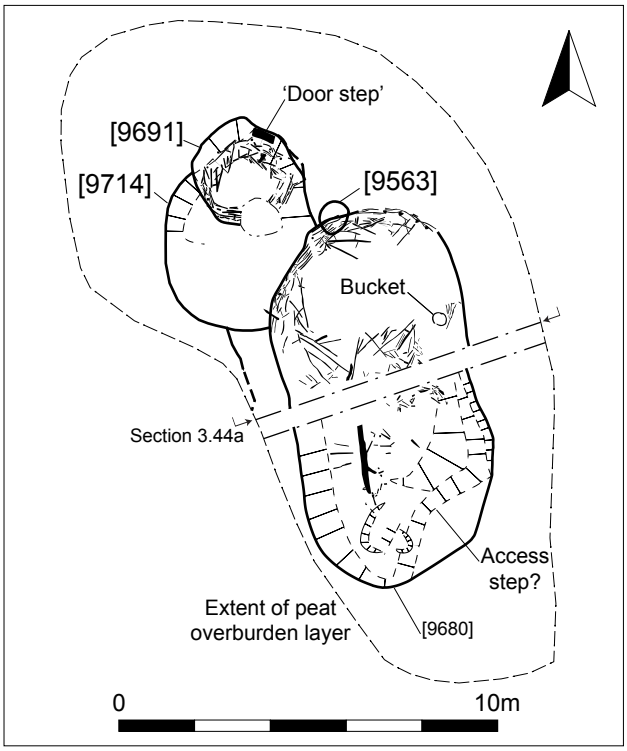

Figure 3.43: Pond Cluster 3.

Waterhole pit 9691 was a circular feature with a shallow bowl-shaped profile. It measured 3m in diameter and was 0.9m deep. This feature was unusual in that it was found to contain a complete lining of wattlework (see Plate 3.8). This measured some 5m in circumference and was pinned in place by 14 stakes hammered into the sides and base of the feature. The pit also had a 'doorstep' of wood, measuring 0.7m long by 0.3m wide and 0.06m thick, laid horizontally in place adjacent to its northern edge. It is thought that this artefact functioned as a foot support to facilitate access to the pit.

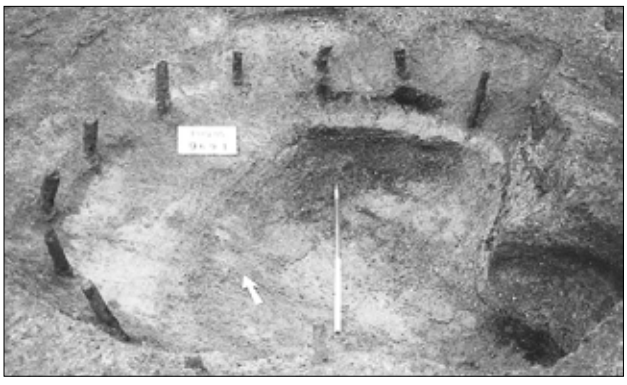

Plate 3.8: Pit 9691 in Pond Cluster 3 with support stakes for wattlework lining.

Pond 9512=9680 was the main feature within the Pond Cluster 3. This extensive feature was sub-rectangular in plan, and aligned north to south. It measured 13m on this axis, and was 8m wide. Excavation revealed it to be 1.2m deep, and that it originally contained a wattlework lining. This lining was well-preserved, and around the northern side of the cut, much of this appeared to be in its original

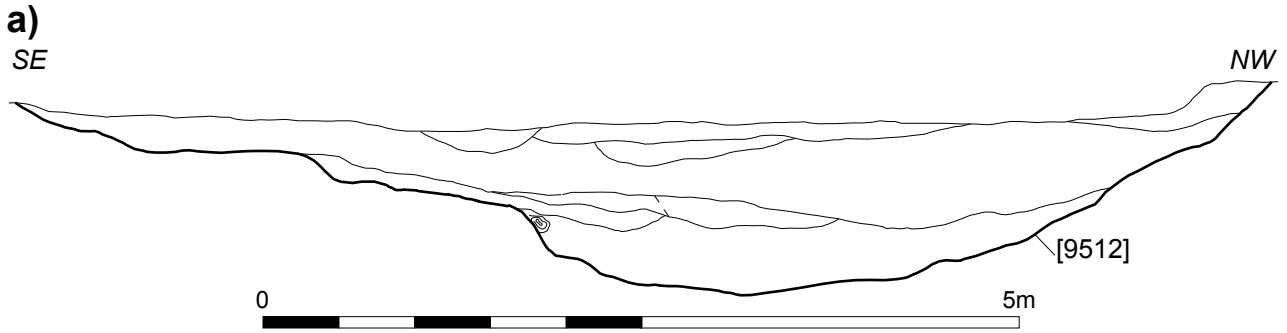

Figure 3.44: Section through Pond Cluster 3.

position. Elsewhere it had either been disturbed or entirely removed prior to the final abandonment of the feature. A second unusual wooden find was recovered from this pond: a large wooden bucket, carved out of a single log (see Plate 3.9). This was found inverted, set into a cut in the base of the north-eastern side of the pond. The bucket was known to be inverted as it had two integral wooden handles carved into the top of its brim; these were pushed into the base of the cut. The base of the bucket was not recovered, it either lay above the level of anoxic preservation, or was not in place when the bucket was placed in the pond. Parallels for re-used wooden vessels found inserted into water features have been found elsewhere. One was recovered from Girton quarry in the Trent valley, along with two, perhaps more purpose-built hollowed wooden logs (Guilbert and Garton, 2007). These objects possibly acted as taps for clean ground water, protecting it from the surrounding muddy pond water. It seems likely that this feature would have contained such dirty water, especially later in the period of its use; a thick layer of plastic grey clay, rich in organic remains and up to 0.46m deep was found in its base. A fragment of perforated clay slab was recovered from this clay (see below). The clay was sealed by deposits of loose brownish orange and grey silty sands and gravels, homogeneous material that marked the disuse of the pond and may have been deliberately dumped to level up the land surface in this area.

Pond 9512=9680, the main feature within Pond Cluster 3, had no stratigraphic relationship with waterhole pit 9691 and the two may have been contemporary. This possible pairing of ponds and waterhole pits recalls the situation described above with Pond Cluster 2, and similar examples were also encountered at the Thorney Borrow Pit site (Phoenix Consulting Archaeology Ltd, 2007, p.36).

Plate 3.9: John Foulkes excavating the wooden bucket. Note honeysuckle 'rope' still in situ around the artefact.

Environmental analysis

Analysis of plant macrofossils from the primary silting of pond 9512=9680 records the presence of damp-loving species, with aquatic species also identified in two thirds of the samples analysed. The surroundings would appear to have been characterised by hedgerows, scrub and/or woodland, with disturbed or cultivated ground also present. Remains of weed species indicating grassland or meadow habitats are present, but are comparatively less frequent. Pollen analysis from a soil monolith complements this data, as it clearly indicates a strongly pastoral/grassland local habitat. Pollen evidence is therefore useful in overcoming some of the apparent bias due to differential preservation and deposition of plant macrofossils.

Remains of willow and elder were abundant in this feature, especially from its lower fills. As willow pollen was rather sparse, this material is more likely to represent debris from a few specimens growing adjacent to the feature, rather than more distant yet widespread Fen vegetation. Small amounts of cereal pollen, cultivated flax and hemp or hop pollen were also present.

A stratigraphically later soil sample from the pond, from an infilling layer, shows that the surrounding habitat had not changed much by the time it was deposited. It shares the biological characteristics of the earlier fill, but has a greater proportion of weeds of cultivated or disturbed ground. This may represent either a deliberate infilling of the pond with material from its original upcast, which had been colonised by vegetation during the use period of the feature, or an increase in weed cover in the later years of the site, or both.

Discussion

Compared to the steeper and deeper domestic waterhole pits, the ponds recorded in Pond Clusters 1 to 3 would have been relatively easy to access, and have therefore been interpreted as animal watering holes. Pond 9512=9680, the main feature within Pond Cluster 3 had a step excavated into its south-eastern side, perhaps to further facilitate access.

The animal bone evidence suggests that cattle and sheep were reared and farmed on the site, and these pond features, along with the field boundary ditches, are partial remains of the infrastructure of that animal husbandry.

As with the waterhole pits, there is evidence of maintenance, with all of the ponds showing signs of recutting. The insertion of the wooden bucket into Pond Cluster 3, in particular, seems to suggest attempts were made to extend the lifespan of this feature. Like the pits, the ponds also showed evidence that attempts were made to preserve the initial excavators' efforts by shoring up the sides of cuts. Two of the ponds contained in situ wooden remains. Pond Cluster 1 contained remains of stakes and wooden shuttering, whilst Pond Cluster 3 was found to have been lined with wattlework. As with the waterhole pits, it would be expected that many, if not all of the ponds would have been initially wood-lined, but in most cases this wood lining was removed for re-use elsewhere when the feature finally fell out of use.

Dating

Radiocarbon dating was carried out on three samples from Pond Cluster 3. The wooden bucket recovered from Pond 9512=9680 was found to have a length of twisted honeysuckle rope wrapped around it, possibly the remains of a handle. This was radiocarbon dated, as it was thought that a date from this, rather than from the wood of the bucket itself, would better date the deposition of the artefact. A date of 1320-1050 cal BC was returned (SUERC-12890)[2]. Two radiocarbon dates were obtained from the column samples taken from Pond 9512=9680. These were of 1300-1020 cal BC (basal deposit of pond) and 1430-1200 cal BC (Beta-238591 and Beta-238594). All three dates overlap in the thirteenth century BC. These dates are not only in broad accordance with each other, but also with the four later Bronze Age potsherds recovered from Pond Cluster 3 (CP3 or 4, and CP5). These potsherds were all found in the deposits that marked the sealing and disuse of the Pond Cluster. The dating evidence suggests that the bucket was placed into the pond relatively late in the feature's lifespan.

The range of dates recovered from the ponds within the project area cover the entirety of the second half of the second millennium BC. This period coincides broadly with the lifespan of the field system itself. Their lasting presence in the Bronze Age landscape is presumably a testament to their enduring utility and the continued presence of livestock during this period.

Perforated clay slab (Figure 3.45)

by Elaine L. Morris

A small fragment (143 grams) from a perforated clay slab was recovered Pond Cluster 3 (pond cut 9680, context 9628). It was made from coarse quartz sand and detritus fabric Q1 (see Chapter 4), which was also used to make both briquetage supports and clay weights. The width or length of the slab cannot be determined as there is only one flat side edge remaining. The pre-firing perforation measures just over 20mm in diameter and the slab is approximately 25mm thick at the side edge. The remaining piece from this slab was fired in an oxidising atmosphere on one surface and irregularly fired elsewhere, particularly through the perforation which seems slightly unusual and suggests that it had been partially refired at some stage in its history.

Perforated clay slabs are an artefact phenomenon of Late Bronze Age sites from south-eastern England (Champion, 1980), in Lincolnshire, Essex, Kent and up the Thames Estuary and into the lower Thames Valley as far as Runnymede Bridge at Egham on the Surrey-Berkshire border. The largest published piece displays eight perforations measuring 10mm in diameter and these are arranged in two ordered rows (Field and Needham, 1986, fig. 5, 1). Perforated clay slabs measure between 10mm and 25mm thick. They are invariably post-Deverel-Rimbury Late Bronze Age to Early Iron Age in date. The slabs are often, but not always, found in association with briquetage and have been linked with pottery production as well. It would be helpful to determine if the perforated clay slabs found on sites located some distance inland from the sea, and therefore unlikely to have had access to saltwater, were actually made from saltwater rather than freshwater and associated with activity of a maritime nature. Proctor (2002, p.86) has demonstrated that at least one briquetage container had been transported to a Late Bronze Age/Early Iron Age settlement site at Carshalton, which is well inland from the Thames, and therefore it appears that perforated clay slabs may also have been traded during the later prehistoric period, even though their function is still uncertain.

Figure 3.45: Perforated clay slab.

Possible saltern (Figures 3.29 and 3.46)

Description

An unusual collection of features was identified in the western corner of Field 10, at NGR 526605 303552. It included a small ring-shaped ditch and a conjoined curvilinear ditch. Also present were three small cut features found in direct association with the ditches. These features have been tentatively interpreted as the remains of a Middle Bronze Age saltern.

2. One of the hollowed logs from Girton quarry was radiocarbon dated to 1130-920BC, a closely comparable occurrence of this technology (Guilbert and Garton, 2007, p. 35) .

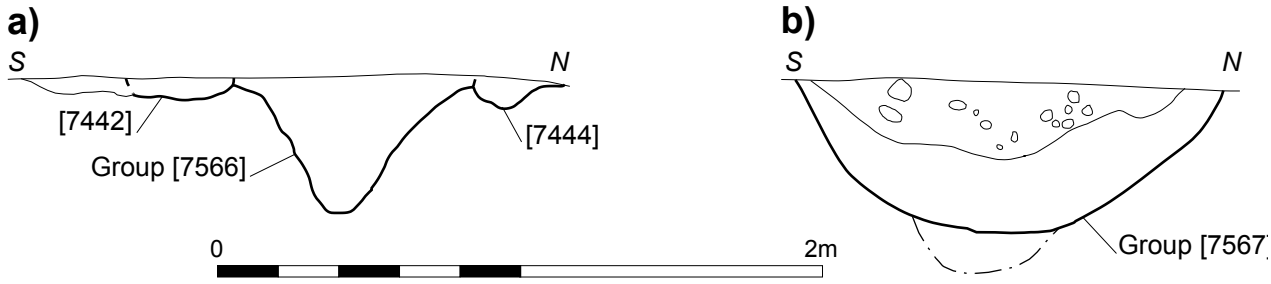

Figure 3.46: a) Section through Group 7566, b) Section through Group 7567.

The ring-shaped ditch, Group 7566, enclosed a circular area approximately 4m in diameter. The ditch itself was generally 0.7m wide, and, where excavated, was found to range in depth between 0.3m to 0.5m. The cut was quite well-defined, with steep sides and a regular flat base. Its fill was a soft/friable grey clayish silt, with red mottling and infrequent small stone inclusions in the matrix.

Excavation revealed a number of stakeholes set into the base of the ditch, but these were not numerous or regular enough to represent a fence or stockade. Three small cut features within and adjacent to this feature were investigated but were found to be artefactually sterile.

Extending from the south-west quadrant of this feature was a curvilinear ditch, Group 7567, which arced around to run to the south-east where it linked in to Fen-edge Pit Cluster 3. The curvilinear ditch was 18m in length, with a width that varied from 0.6m to 2.3m (becoming wider towards the south-eastern end), and a typical depth of 0.6m. Its upper dark grey to black clayish silt fill contained charcoal and frequent pieces of rock, probably heat-affected limestone, presumed to be evidence of burning occurring nearby. It also contained fragments of briquetage. Heat-affected rock and briquetage were likewise recovered from some of the fills of Fen-edge Pit Cluster 3, situated at the eastern end of the ditch, suggesting that material was being transported in that direction.

Discussion

This group of features is rather difficult to interpret and seems to fall outside of the familiar local repertoire of Bronze Age archaeological features. Small ring-shaped gullies are occasionally encountered on the Fen-edge, where they have been interpreted as hayricks; such features have been recorded at Welland Bank (Mouraille, 1996, p.6) and Langtoft, (Alison Dickens, pers. comm.[3]). Perhaps significantly, evidence of salt production or refining has been found from both these sites, although it is not known if these small ring-gullies were found, as at Pode Hole, in direct association with briquetage. Horseshoe-shaped ditches similar to the one described here are often found enclosing Romano-British saltern hearths, but the one at Pode Hole seems to have had more of a drainage function. The presence of the heat-affected stone is also somewhat anomalous. It may be thought that potboilers were being used to heat the brine, but the presence of briquetage pedestals from the cluster of waterhole pits suggests that brine was being heated in vessels supported over a fire. However, similar deposits of heat-affected stone and flint have also been recovered from early saltern sites at Welland Bank and Stickford, and presumably played some part in the process (Tom Lane, pers. comm.). The evidence of burning and briquetage has been taken to suggest that the ring-gully at Pode Hole may be the remains of a saltern. Whilst Romano-British salterns are reasonably well-documented, those of the Bronze Age are rather more obscure and enigmatic (Lane, 2007). The briquetage, pedestal fragments and charcoal-rich fills would suggest that that a hearth involved in salt production may have been located somewhere in the immediate vicinity, although no remains of hearth material were found.

However, and in contrast to the evidence outlined above, it is unlikely that saltmaking was ever carried out at Pode Hole. All of the various strands of environmental data indicate freshwater conditions, with almost no evidence of a marine habitat or the presence of seawater. The issues raised by the apparent disconnect between the briquetage assemblage from Pode Hole and its seemingly anomalous environmental setting are discussed further in Chapter 5.

Dating

The curvilinear ditch, Group 7567, was found to contain briquetage of later Bronze Age date, and presumably drained into the pit cluster that contained CP3 pottery which has returned radiocarbon dates of 1410-1250 cal BC (SUERC-12096) and 1410-1200 cal BC (SUERC-12097). Stratigraphic relationships recorded where these features met were not able to produce a definitive relative sequence as their fills were difficult to distinguish. It seems likely that all of these features were initially operational together, with the curvilinear ditch draining the ring-shaped ditch into the pit cluster. The pit cluster seems to have remained in use once the ditches had finally silted up, with recuts of the pits truncating the infilled curving drainage ditch. Even if the small ring-ditch does not represent the remains of a saltern itself, then it remains apparent that saltmaking was occurring somewhere nearby during or after the mid-second millennium BC.

3. Lecture on Cambridge Archaeological Unit excavations at Langtoft quarry, given at Lincoln, 6th October 2007.

Decline and Abandonment (First Millennium BC)

No evidence was recorded during the archaeological investigation of the project area to suggest that its occupation extended far into the first millennium BC. Some time shortly after 1000BC occupation activity ceased.

Pottery belonging to CP5 was judged to be the most recent (barring modern finds) recovered from the project area. This material may belong to the post-Deverel-Rimbury period and its use may have extended into the Early Iron Age. Pottery from this phase was only rarely encountered: it represents less than 5% of the total pottery assemblage (by weight). This meagre assemblage leaves an impression of a dwindling of activity in the latter part of the prehistoric period at Pode Hole.

CP5 pottery was recovered from 12 cut features within the project area; several of these formed a notable concentration and this is discussed below.

Midden Area 2 (Figure 3.47-48)

Description

A collection of six small cut features was found close to the northern edge of the project area, and immediately east of the scheduled area represented by SAM No. 20802. These features were scattered over an area, centred on NGR 526431, 303801, of approximately 360 square metres. Whilst hardly representing a dense concentration, like Midden Area 1 this group of features was noticeable for being relatively rich in artefacts.

The features of Midden Area 2 were rather slight. They ranged in length from 0.14m to 1.2m, in width from 0.11m to 1.16m, with a minimum and maximum depth of 0.03m and 0.34m respectively. The features were generally sub-circular in plan, and with irregular bowl-shaped profiles. All except one contained a single fill, a mid grey clayish silt, of probable waterborne origin.

Discussion

Although initially interpreted as post holes, none of the features contained discernable post-pipes or post-packing, nor did they seem to produce a coherent pattern

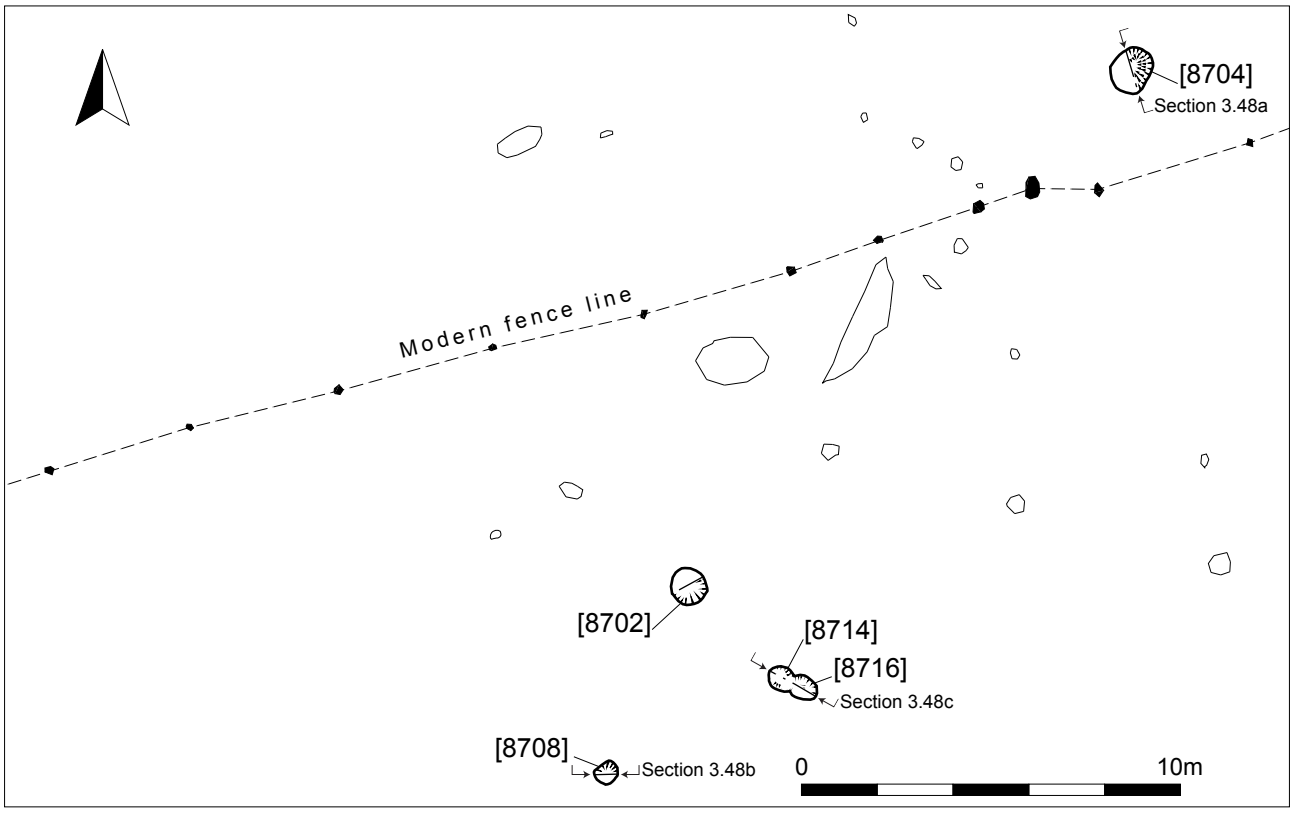

Figure 3.47: Midden Area 2.

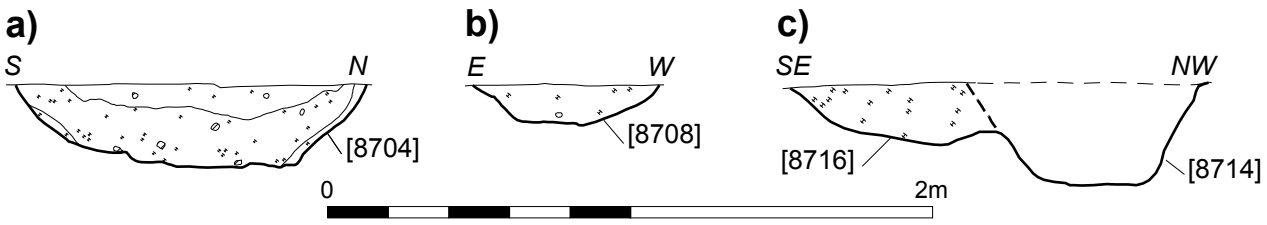

Figure 3.48: Sections from Midden Area 2.

in plan. Too small to be storage pits, it would seem that these scoops were dug to contain the material that was recovered from them. This was quite finds-rich. In terms of the average artefact count from features on the site, those of Midden Area 2 were relatively productive. They yielded 34 sherds of pottery (195 g), as well as a quantity of charcoal, three pieces of worked flint, and heat-affected clay. Animal bone was almost entirely absent, but it is unlikely to have survived well in such shallow features dug into the sandy natural subsoil in the vicinity.

This isolated concentration of finds-rich features has been interpreted as a midden area for nearby domestic occupation, but erosion of the original ground surface may have truncated these features to the point that only their bases survived.

Dating

Four of the six features in Midden Area 2 produced dating evidence. One feature was found to contain a sherd of grog-tempered pottery, which suggests a date earlier in the Bronze Age, but the remainder of the pottery

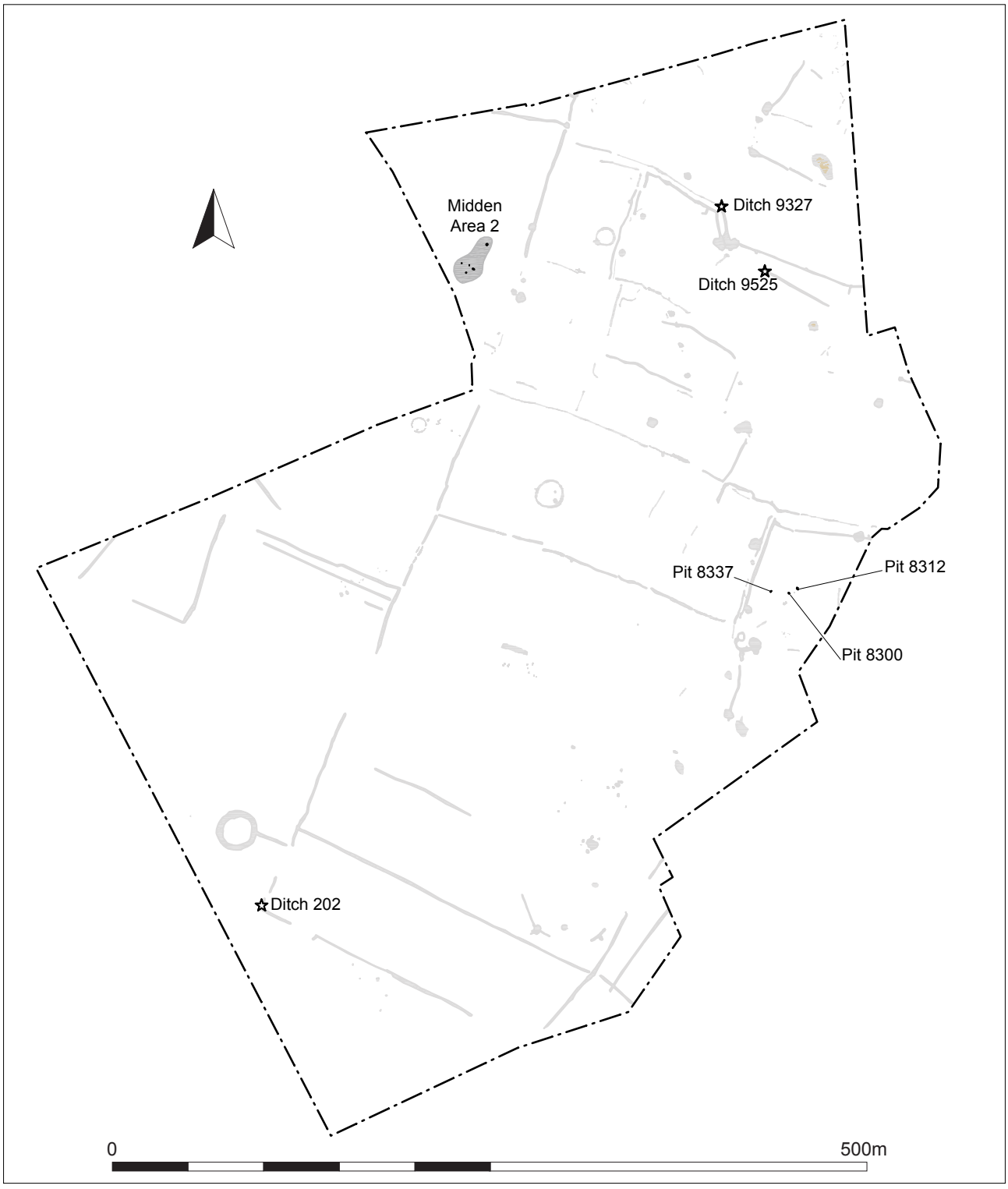

Figure 3.49: CP5 features.

recovered from these features is of a type of vesicular fabric, occasionally decorated, in use in the later Bronze Age. This may point to a reuse of the area of time, possibly involving redeposition and mixing of deposits. Overall, the dating evidence suggests that Midden Area 2 probably postdates the main period of occupation on the site.

Other CP5 features (Figure 3.49)

CP5 pottery was also recovered from three neighbouring minor sub-circular cut features in Field 10 (cuts 8300, 8312, 8337) and three lengths of field ditch. Significantly, these portions of field ditch cover almost the full extent of the project area. Cuts 9327 and 9525 partially defined the eastern extent of Field 9 in the north-east of the project area, whereas cut 202 formed the western corner of Field 1 in the extreme south-west. The implication would appear to be that most, if not all, of the field system remained in use up until the final abandonment of the site.

Abandonment

The reason for the abandonment of the project area is thought to be climatic change, leading to a worsening of the drainage of the Fens, and subsequent encroachment of marshland onto previously inhabited areas. Evidence for marine flooding in the later Bronze Age has been recorded immediately to the south of the project area (French and Pryor, 1993, p.89-90). It is likely that this event disrupted drainage, and subsequent peat growth rendered the site uninhabitable. Peat was commonly observed in the upper fills of cut features at Pode Hole and probably once blanketed the area. Pond Cluster 3 was sealed by up to 0.4m of such material, the lower reaches of which returned a radiocarbon date of 1120 to 910 cal BC (Beta-244198). This date suggests that the project area was affected by wet conditions, poor drainage and peat growth from the beginning of the first millennium BC onwards[4].

Modern drainage and ploughing has led to the removal of the peat that was once present in the area, and it now only survives, in a somewhat desiccated state, where it has slumped into subsiding archaeological features and thus lies below the level of ploughing. The subsidence of the archaeological features is probably itself accelerated by improved drainage.

Occupation may have ceased soon after the start of the first millennium BC, but the land itself was probably still used. Its varied resources were probably exploited in a number of ways, including fishing, wildfowling, woodcutting and rush gathering. However, such activity would be largely invisible in the archaeological record.

4. This date is in broad accordance with other peat samples taken at locations approximately 12km from Pode Hole, where peat has been dated to 1780-840 cal BC (SRR-1764, cited in French and Pryor, 1993, p. 10) and 810-420 cal BC (SRR-1759, ibid.).

The Second Period of Enclosure (Post-medieval to Modern)

The archaeology of the project area recorded a hiatus in occupation which lasted for nearly three millennia. No features or artefacts were recovered that would suggest that the area was settled in either the Iron Age, the Roman period, or the Middle Ages. This impression is confirmed by the general blankness of the area on historical maps, which are discussed below.

Documentary evidence

The limits of the project area were set to the north by the modern A47 (this stretch is known locally as 'the causeway') and to the south by a drainage channel that runs north-east to south-west. Consultation of old maps shows that these features have been present in the landscape for many centuries.

The causeway and the drain appear on John Hexham's c. 1590 'Map of the Fenland between Peterborough and Wisbech'. This shows no occupation or enclosure in the project area, framed as it is by these features. Hexham differentiated between drained and undrained land; the latter was indicated by reeds. On Hexham's map, the project area is shown as drained, possibly indicating that it was rough pasture at this time. A (water?) mill and cross are shown to the west of the project area.

The drain and causeway also both appear on a 1710 copy of Benjamin Hare's 1652 map of 'The True Plott and Linear Description of the Manor of Thorney' (Peterborough Sites and Monument Record reference E1/144B). By the time this map was produced initial enclosure of the project area had commenced. Field divisions are shown running NNW-SSE; these formed the basis of the later enclosure scheme. Some houses appear to have existed on the opposite side of Thorney causeway, but no settlement is shown in the area itself. This is named as 'Mile Fen and Pode Hole'. Mile is possibly a corruption of Mill, from the mill shown on the 1590 map.

Pode Hole Farm was built in 1860 on land belonging to the estate of the Duke of Bedford (http://www.horrell-podehole.co.uk/pode_hole_aboutus.html) and it appears on the First Edition Ordnance Survey map of 1886. The large rectangular field to the east of the farm, which is currently under pasture and contains the Scheduled Ancient Monument, is also shown. By 1886 the plots shown on the 1652 map between Thorney Causeway and the main north-east to south-west drain had been further subdivided, creating thin strips of land running NNW to SSE. For the second time in its history, the project area was covered by a regular gridwork of rectangular fields.

Excavated Evidence

Field boundaries

Archaeological investigations of the project area revealed that the enclosure scheme shown on the first edition Ordnance Survey map was largely intact at the commencement of quarrying. Some of the field boundaries had been removed, probably grubbed up in the 20th century in order to increase field size. These were encountered as linear cuts, up to 3m wide and filled with loose dark brownish black peaty silt. These were only archaeologically excavated when their removal was necessary to investigate earlier features that they had cut through.

Claying trenches

Description

Following enclosure, scores of features known as claying trenches were inserted into the majority of the fields in

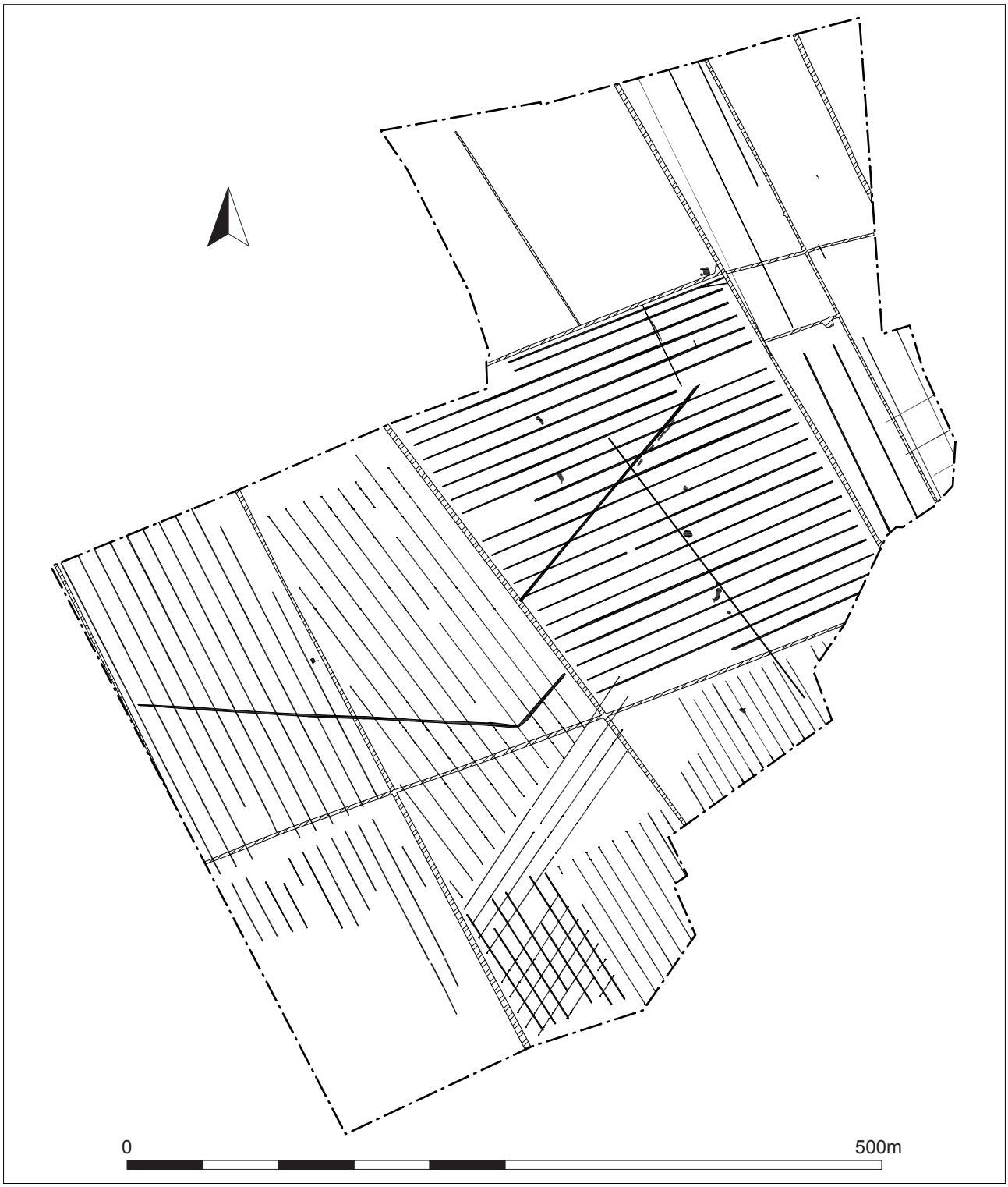

Figure 3.50: Post-medieval and modern features.

the project area. Claying trenches were typically 0.75m to 1m wide and rarely reached a depth of more than 0.2m. They were regularly set out at just under 11.5m intervals, the original labourers probably working to a 12 yard scheme. They were filled with a dark peat-like silt, and their extensive parallel lines formed a visually striking pattern against the natural subsoil.

Discussion

According to Hills (2003, p.154) citing Jonas (1878), the digging of claying trenches was a technique of marling that involved *'opening furrows in the field intended to be clayed, about fourteen yards apart, parallel to each other'* [5]. They were extensively dug to assist drainage and to provide marl to spread across fields to increase soil fertility by neutralising soil acidity, and to improve crumb structure. This was important as the light peat soil, newly dewatered by improved drainage, was susceptible to aeolian loss (Astbury, 1970, p.62). The excavation of claying trenches was an important improvement in Fenland agriculture, which could double the value of land (Hills, 2003, p.155). According to Astbury (ibid.) systematic claying was practised from about 1830 onwards[6]. By the 20th century the ready availability of lime and artificial fertilisers rendered the practice obsolete. It is therefore likely that the trenches in the Pode Hole project area were dug in the mid to late 19th century.

Filled as they were with soil from the peat formation, the claying trenches illustrate that this was obviously still present on site when were constructed. This material was quite different to the modern topsoil, and its presence in the trenches indicates the need at the time to carry out ground improvement works.

Fields in the extreme north and east of the project area did not receive claying trenches, whereas at the south of the project area two overlapping sets were inserted, and these were set out closer together, at 8m intervals. This possibly indicates differing drainage and ground conditions across the area.

Other features

The project area was found to contain a variety of other features dating from the 19th and 20th centuries. The majority of these were ceramic and plastic land drains. These ran parallel with the NNW to SSE modern field boundaries, and illustrate the drainage fall to the south-east of the site.

A rubbish pit of 2.15m diameter and a sheep burial were found to the south of Pode Hole Farm. The domestic waste that the rubbish pit contained indicated that it was backfilled some time between 1910 and 1920 (Richmond, 2000). This feature is assumed to have served the farm, but its distance from it, approximately 315m away, is somewhat anomalous. Additionally, if the farm's inhabitants commonly used such a method of disposing of rubbish, then much more material ought to have been recovered from the site.

At the commencement of the archaeological investigation of the project area, Pode Hole Farm was a mainly arable farm, with some beef cattle. At the time of writing, the owner Mr. Charles Horrell also keeps a small flock of prize-winning Hampshire Down sheep. These are pastured on the Scheduled Ancient Monument to the east of the farm, where they graze the earthworks that corralled their Bronze Age predecessors.

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5. Fortunately for archaeological survival at Pode Hole, its claying trenches were not dug to the depth outlined in Jonas's scheme. He described claying trenches as being several feet deep, and the workmen using rope ladders to exit them.

5. More opportunistic claying in the Fens was carried out for many centuries prior to this. Fourteenth century court records for Cottenham, Cambs. record the fines imposed on villagers for 'carrying away the lord's marl' (Ravensdale, 1974, p.55).

CHAPTER 4: *Material Culture*

Archaeological features at Pode Hole tended to be generally finds-poor. However, because of the large scale of the excavation area, significant quantities of artefacts were eventually recovered, with the pottery and briquetage assemblages being particularly extensive and informative. By contrast, only a modest quantity of flint was found on the site, and most of this material was unstratified, or redeposited and residual. Reports on these principal artefact groups are presented in this chapter. Regarding the finds types of which few examples were found, such as the pebble mace-head from Fen-edge Pit Cluster 2 or the perforated clay slab from Pond Cluster 3, these are discussed in the preceding chapter, alongside the features from which they were recovered.

The environmental evidence from Pode Hole is presented in a separate chapter, Chapter 5, and so Material Culture and Environmental Archaeology are discussed separately. However, difficulties in deciding which chapter to present certain excavated remains in, such as the worked animal bones or carved wooden objects, served to illustrate the falseness of this modern dichotomy between material culture and the natural world. The evidence presented here suggests that such distinctions would have been less apparent to the prehistoric inhabitants of the Fen-edge.

The Prehistoric Pottery

by Elaine L. Morris, with Carol Allen and Elizabeth Bryan

Summary

A significant assemblage of prehistoric pottery, including sherds from at least 80 vessels dating from throughout the Bronze Age period, was examined in detail. Most of these vessels were made from either grog-tempered or shell-gritted wares and are likely to be local products. The assemblage represents a major change in potting technology that reflects different attitudes towards people, land and pottery during the turbulent second millennium BC. Several different Beakers and Collared Urns were identified. Barrel and Bucket Urn-type jars and ovoid jars of the later Bronze Age, however, are the most common vessels present, including decorated examples typical of the Deverel-Rimbury style of the Middle Bronze Age and plain assemblage post-Deverel-Rimbury Late Bronze Age types. Vesicular sherds from ovoid, shouldered and necked jars, two of which are decorated, a possible bowl and one abraded, quartz sand fabric necked jar suggest that changes in settlement activity occurred during the final years of prehistoric occupation, possibly during the Late Bronze Age/Early Iron Age. Five ceramic phases have been outlined and four are supported by radiocarbon assays taken from burnt residues on the interior of selected vessels, confirming that the use of these pots took place between 1950-1750 and 1270-1000 cal BC, spanning the entire second millennium cal BC of the Bronze Age.

Introduction

A total of 834 sherds of prehistoric pottery, weighing 5006g, were recovered (see project archive for full catalogue), including sherds from Beakers, Collared Urns, Middle Bronze Age Bucket and Barrel-type jars, post-Deverel-Rimbury Late Bronze Age ovoid jars and decorated Late Bronze Age/Early Iron Age vessels representing various activities throughout the entire second millennium and into the early first millennium BC. Some of the pottery is in moderately poor condition with single sherds, or just flakes of sherds, representing entire vessels with the remainder in excellent condition as large, robust sherds providing evidence for detailed reconstruction of vessels (Fig. 4. 1-2). All of the pottery had been sensitively processed after excavation with substantial evidence of burnt residues still adhering to the interior of many sherds.

The assemblage has been analysed and recorded according to the Prehistoric Ceramics Research Group guidelines (PCRG, 1995, 1997) with recorded data – including count, weight in grams, fabric group based on the dominant inclusion (alpha code) and type based on variation of that inclusion (numeric code), rim/base/profile form, diameter and percentage of form present, decoration type and position, wall thickness code and evidence of use within each context where appropriate – available in the project archive, which has been deposited at Peterborough City Museum, with an electronic version available online via the Archaeology Data Service. All sherds with diagnostic features such as rim, decoration, or profile angle were sketched for archival record and illustration reference at 1:1. The grog is usually oxidised to various shades of buff to orange-red unless otherwise indicated.

Fabrics

Seventeen fabric types were identified amongst seven broad fabric groups. Each sherd was examined using a binocular microscope at x10 power to characterise the dominant inclusion and any minor inclusions in the clay matrix. The dominant inclusion is provided with a letter code and if a significant inclusion is also naturally present

in the clay matrix of a fabric then it is indicated in the code as a second letter. For example, G signifies grog-tempered fabrics, S indicates shell-gritted fabrics and Q is for quartz sand-bearing fabrics, with D representing fabrics with a vesicular texture probably resulting from the loss of shell inclusions based on the shape of the vesicles. Samples were selected for clarification of fabric type details where appropriate; the fabric definitions benefiting from this detail are indicated with an asterisk (*) in the descriptions below. The frequency of pottery by general period is presented below in Table 4.1.

Fabric	Count	Weight (g)
Beaker (Ceramic period 1)		
G1	1	1
G2	14	63
GD1	1	5
GD2	1	12
GQ1	12	27
Sub-total	*29*	*108*
Collared Urn (Ceramic period 1)		
G1	4	62
GQ2	150	509
Sub-total	*154*	*571*
Early/Middle Bronze Age (Ceramic period 2)		
QZ1	12	75
G1	63	314
G3	1	15
G4	1	6
GS1	35	83
Sub-total	*112*	*493*
Middle/Late Bronze Age (Ceramic period 3)		
S1	204	2396
S2	117	796
Sub-total	*321*	*3192*
Late Bronze Age (Post-Deverel Rimbury) (Ceramic period 4)		
DQ1	160	393
S3	2	3
S4	1	16
Sub-total	*163*	*412*
Late Bronze Age/Early Iron Age (Ceramic period 5)		
D1	43	191
Q2	12	39
Sub-total	*55*	*230*
Total	***834***	***5006***

Table 4.1: Relative amounts of different of fabric types recovered.

At least six different local clays were exploited during this millennium of funerary and settlement activity: a silty clay (G1), a sandy clay (GQ1, GQ2; Q2), a gravelly clay (G3), a slightly shell-gritted clay (GS1), a moderately shell-gritted clay (S1), a coarsely shell-gritted clay (D1; S2) and probably two others (S3, S4). It is the selection of different clays and the addition, or absence, of grog temper which make them distinctive. The closest likely geological source for the fossil shell-bearing fabrics is the Oxford Clay of the Upper Jurassic strata, located at and around the quarry site itself (Chatwin, 1961). This deposit is rich with fossil shells. The grog-tempered fabrics made with less diagnostic clay matrices could have been made from local clay and crushed potsherds, or equally could have been made from clays located further afield. The gravelly clay-based grog-tempered fabric with its detritus of rare shell and flint (G3) may have been made from a local terrace deposit (Chatwin, 1961; Horton, 1989).

Beaker pottery was made from a variety of grog-tempered fabrics (G1, G2; GQ1; GD1, GD2), with a single exception: one decorated vessel was made from a coarsely, shell-gritted fabric (S2; Fig. 4.1, 1). The vesicular clay matrices of grog-tempered fabrics GD1 and GD2 may represent the presence of former shell fragments naturally occurring in those clays and link fabric S2 to these grog-tempered fabrics. One Beaker vessel, with wall thickness measuring between 7mm and 9mm, had been made from fabric GD1 and fired in a fully oxidising atmosphere on the exterior only. The vessel, presumably viewed as a coarseware, had been used as a cookpot and the burnt residue was dated to 1950-1750 cal BC (SUERC-12095), indicating that this grog-tempered fabric type with a vesicular clay matrix had been in use during the later Beaker period.

One fabric (QZ1) was found only as fragments of a single, undiagnostic vessel recovered fromthe pit that contained cremation 7380, but the wall thickness of these sherds strongly suggests that they derive from a former Collared Urn, or similar Early Bronze Age type of vessel. The fabric is difficult to characterise with confidence using x10 power microscopy alone and it may well be that the quartzite fragments in the fabric are a quartzose sandstone.

Diagnostic Collared Urns, on the other hand, were made from grog-tempered fabrics with and without distinctively quartz sand-bearing clay matrices (GQ1-GQ2; G1), one of which (G1) also had been used to make Beakers. Two of these grog-tempered fabrics were also used to make earlier Middle Bronze Age pottery (G1; GQ2). The use of these fabrics provides a clear demonstration of the continuity of pottery manufacturing technology during the first half of the second millennium BC. The variation in clay matrices between G1 and the GQ fabrics, which have a significantly greater amount of medium to coarse-sized quartz sand grains naturally occurring in their clays, is typical of grog-tempered fabric Early and Middle Bronze Age vessels in cemeteries across the East Midlands (Allen, et al., 1987, tables 1-2), and is likely to reflect local clay variations.

One grog-tempered fabric (GS1) may signal the end of the early Middle Bronze Age ceramic tradition and the beginning of the later Middle Bronze Age, but there are only flakes of body sherds made from this fabric.

It consists of grog-tempered grog added to a naturally shell-gritted clay matrix and indicates a sequence of three generations of pottery manufacture – the GS1 vessel, the vessel (pot B) crushed to make the grog added to create the GS1 fabric, and the original grog-tempered vessel (pot A) crushed to provide the temper for pot B. In thin section, the grog in fabric GS1 appears to have been made from a fabric G4 vessel, which itself appears to have been made from a fabric G1 vessel, but this should be viewed with caution as the grog fragments are very unrepresentative of their original vessels. The addition of the 'grog-in-grog' temper to the shell-gritted clay matrix points towards a new development in the Middle Bronze Age in this area.

During the later Middle Bronze Age, a dramatic change took place in pottery fabric technology: naturally shell-gritted clays (S1-S2) completely replaced all use of grog temper in pottery fabrics and continued to be used well into the post-Deverel-Rimbury Late Bronze Age with the addition of two new shell-gritted fabrics (S3-S4) and the vesicular variant (D1) being used. In addition quartz sand fabrics (DQ1; Q2), one with and one without natural shell in the clay matrix respectively, were added to the potting repertoire at some time during the Late Bronze Age.

Grog-tempering may be seen as a significant cultural action taking a pot, one which may symbolise an ancestor (Sterner, 1989) and embodied with community history and a past of its own, fragmenting it, and thus adding it to the creation of a new vessel to provide continuity into the present (Brown, 1995; Morris, 1994a). The whole process is steeped in social meaning and the processes of death and rejuvenation by including the past in the present. Any uncertainty associated with this may be mitigated by the tempering action. This is reinforced by the technological value of grog having identical firing characteristics to the new clay matrix and therefore providing a reliable firing outcome. The confirmed presence of grog-tempered grog in two fabrics (G4; GS1) emphasises the inheritance of ancestral significance through three generations of pots, a lineage represented in one vessel. The use of grog-tempered grog is not unique to Pode Hole quarry: one of the three potsherds found in association with the Bronze Age Dover boat (c. 1550 BC) was thin-sectioned and identified as a grog-tempered fabric, in which the grog itself had been derived from a grog-tempered vessel (Gibson et al., 2004). It may be equally significant that one of the Pode Hole quarry 'grog-in-grog'-tempered fabrics (GS1) also has a shelly clay matrix and, therefore, may belong to a phase of transition in pottery manufacture representing a change taking place in the local world from a time dominated by the presence of the dead to one where the land and its productivity, a period of land ownership by the social group for the maintenance or reproduction of the group, was becoming more significant (cf. Barrett, 1994). This change is rooted in the distinctive shell-rich clays of the area used to make the later Middle Bronze Age and Late Bronze Age pots and would link the landscape directly to the containers of food production and consumption resulting in group maintenance.

This transition period may have been a disruptive phase during the middle of the second millennium BC; many social changes have been identified such as the end of burying in cremation cemeteries (Brück, 1995), performances which had incorporated grog-tempered urns as essential items of material culture in the ritual activity. There is presently only one fossil shell-gritted burial urn from a published Middle Bronze Age cemetery in nearby Lincolnshire, a Bucket Urn (Allen et al., 1987, Fig. 6, pot 7); it appears that all other Middle Bronze Age examples are grog-tempered during this period. This regional ceramic transition from grog-tempered fabric burial urns to shell-gritted fabric settlement vessels at some time during the Middle Bronze Age was first recognised as chronologically significant in successive phases of activity and occupation at the multi-period site excavated at Billingborough Fen (Allen et al., 1987: 214), and confirmed in full publication (Cleal and Chowne, 2001: 9). Cleal (2001) attempted to unravel the transition from the Middle Bronze Age grog-tempered tradition of Deverel-Rimbury style bucket-like vessels (site phase 1) to one which gradually introduced new vessel forms of bowls and jars and incorporated shell and calcareous limestone into the existing repertoire of grog-tempered wares (a transition phase recognised in the upper fills of enclosure ditches but still allocated to site phase 1). Eventually, by the Late Bronze Age/Early Iron Age (site phase 2), a new tradition of only shell-gritted fabrics and jars and bowls had become established. However, there is a major gap in occupation at Billingborough when these changes were taking place. When did this transformation between the sole manufacture and use of grog-tempered Early and Middle Bronze Age urns in eastern England and shell-gritted Middle and Late Bronze Age pots actually take place? The earliest radiocarbon dated shell-gritted fabric Middle Bronze Age pot at Pode Hole quarry is a decorated body sherd in fabric S2 from layer 8124 of Pond Cluster 1 (Fig. 4.1, 22) with a result of 1620-1430 cal BC (SUERC-12866) from burnt residue on the interior of the sherd. Two other results from residues on shell-rich fabric pots are 1410-1200 cal BC (Fig. 4.1, 23; SUERC-12097) and 1410-1210 cal BC (Fig. 4.2, 28; SUERC-12096). Therefore, this change seems to have first occurred during the mid-second millennium BC, to have been adopted exclusively during the later Middle Bronze Age, and to have continued in use during the Late Bronze Age.

It is also important to emphasise that there is a great deal more shell-gritted pottery in this assemblage than grog-tempered material. This may imply that the manufacture, use and deposition of shell fabric vessels was more common in the second half of the Middle Bronze Age than during the Early Bronze Age and the first half of the Middle Bronze Age, and that pots were taking a greater role in social life, not just pots for the dead but also for the living. The recognition of later Middle Bronze Age

and Late Bronze Age settlement activity at Pode Hole quarry through the deposition of material culture debris in distinctive features such as waterholes, pits and post holes is proof of this change.

Grog-tempered fabrics

G1 coarser, grog-tempered fabric (*)

Moderate to common (10-25%), very poorly sorted, angular, buff-coloured, silty or slightly sandy grog, < 6mm with rare examples up to 10mm, in a predominantly silty but also slightly sandy clay matrix with sparse (3-7%), well sorted, sub-rounded quartz, < 0.8mm, and very rare (<1%), naturally occurring shell, rounded iron oxides, sub-rounded to sub-angular flint and micaceous sandstone, all < 2mm; the presence of the very rare pieces of small detritus may link this fabric to G3 below.

G2 finer, grog-tempered fabric

Common (20-25%), moderately sorted, angular, silty or slightly sandy grog, < 3mm, in a predominantly silty but also slightly sandy clay matrix with sparse (3-7%), well sorted, sub-rounded quartz, < 0.8mm.

G3 grog-tempered fabric with rare detritus

Common to very common (25-30%), moderately sorted, silty, angular grog, < 3mm, in a slightly sandy clay matrix containing rare (1-2%), sub-rounded quartz grains, < 0.5mm, with rare (1-2%) shell and flint detritus, < 4mm.

G4 coarser, 'grog-in-grog'-tempered fabric (*)

Common (25%), poorly sorted, angular, buff-coloured, grog-tempered grog, < 7mm, in a very slightly sandy orange-coloured clay matrix containing rare to sparse (1-3%), sub-rounded to rounded quartz, < 0.5mm; the original grog-temper also has a slightly sandy clay matrix similar to the clay matrix of this fabric and to G1.

Grog-tempered fabrics with shell-bearing clay matrices

GD1 coarser, grog-tempered, vesicular fabric

Common to very common (20-30%), moderately sorted, angular, platey and irregularly shaped vesicles, < 2mm, and moderate (10%), poorly sorted, angular, silty grog, < 4mm, in a silty clay matrix with a distinctive hackly fracture despite being softly fired; the grog and the clay matrix are the same buff-colour.

GD2 finer, grog-tempered, vesicular fabric

Common (20-25%), moderately sorted, angular, silty grog, < 3mm, and sparse (3-7%), angular, platey and irregularly shaped vesicles, < 3mm, in a slightly sandy clay matrix containing rare to sparse (2-3%), sub-rounded quartz grains, < 0.5mm; the grog and the clay matrix are the same buff-colour.

GS1 'grog-in-grog'-tempered, shell-bearing fabric(*)

Moderate (10-15%), moderately sorted, sub-rounded to angular, black grog, < 4mm, in a clay matrix containing sparse (3-5%), well sorted, rounded quartz, < 0.5mm, and sparse to moderate (7-10%), poorly sorted, sub-angular to angular shell, < 3mm; the grog is grog-tempered itself with crushed sherds from another vessel, possibly derived from a G4 fabric vessel, and indicates a sequence of three generations of pottery manufacture.

Grog-tempered quartz sand fabrics

GQ1 finer, grog-tempered, sandy fabric

Common (20-25%), well sorted fine angular grog, < 2mm, in a sandy clay matrix containing moderate to common (15-20%) moderately well sorted, sub-rounded quartz, < 1.0mm, in the clay matrix.

GQ2 coarser, grog-tempered, sandy fabric(*)

Moderate to common (10-20%), poorly sorted, angular, grog, < 10mm, in a clay matrix naturally containing moderate to common (15-20%), well sorted, rounded quartz, < 0.5mm, and some iron oxides; the grog in this fabric is similar to fabric G1 as it is slightly sandy.

Quartzite or sandstone-gritted fabric

QZ1 quartzite or sandstone-gritted fabric

Sparse (5%), angular quartzite or quartzose sandstone, < 1.5mm, and moderate to common (10-20%), disaggregated, well sorted, angular quartz derived from the quartzite/ sandstone, < 0.3mm, and which gives the fabric a hackly texture, in a clay matrix containing rare to sparse (2-3%), sub-rounded quartz, < 0.5mm.

Fossil shell-gritted fabrics

D1 coarse fabric with shell-shaped vesicles

Very common to abundant (30-50%), moderately sorted, irregularly shaped and platy but not linear vesicles, < 7mm, in a fine, probably silty, clay matrix; the shapes of the vesicles strongly suggest that the former inclusions were once shell fragments now leached out.

S1 finer, shell-bearing fabric (*)

Very common to abundant (30-50%), moderately sorted, angular to sub-rounded, fossil shell, < 4mm with the majority < 2mm, in a nearly quartz-free clay matrix containing very rare (< 1%) quartz, < 0.6mm.

S2 coarser, shell-bearing fabric (*)

Very common to abundant (30-50%), very poorly sorted, angular to sub-rounded, fossil shell, < 7mm, in a nearly quartz sand-free clay matrix containing very rare (< 1%) quartz, < 0.3mm.

S3 moderately coarser, shell-bearing fabric

Moderate to common (15-20%), poorly sorted, angular to sub-rounded, fossil shell and shell-rich limestone rock, < 7mm, in a clay matrix containing no visible quartz sand at x10 power microscopy.

S4 very fine, shell-bearing fabric
Abundant (40-50%), very well sorted, angular shell fragments, < 2mm with the majority < 1mm, in a clay matrix containing very rare (<1%) quartz, < 0.5mm with the majority < 0.1mm.

Vesicular texture/fossil shell and quartz sand fabric

DQ1 fabric with shell-shaped vesicles and sandy clay
Common to very common (20-30%), moderately sorted, irregularly shaped and platy vesicles, < 4mm, in a sandy clay matrix containing rare (1-2%), patinated flint, < 1mm, and common (15-20%), moderately sorted, sub-angular to sub-rounded quartz, < 0.8mm.

Quartz sand fabric

Q2 medium-grained quartz sand fabric with rare detritus (*)
Common to very common (20-30%), moderately sorted, sub-rounded quartz, < 1mm with the majority < 0.4mm, and with other rare (1%) rounded inclusions such as possible flint and ironstone or iron ore visible macroscopically, < 3mm, and one piece of limestone, 2mm, with a single foraminifera shell preserved in it which was only visible microscopically; a finer version of briquetage fabric Q1 (see briquetage report).

Pottery vessels and decorations

There are sherds from eight diagnostic Beakers in the assemblage. At least five are represented by different decorated sherds. On the first pot, random fingertip-impressed decoration is still visible (Fig. 4.1, 1), while rows of comb-impressed decoration occur on the second (Fig. 4.1, 2) and incised parallel lines in a lattice pattern are seen on the third (Fig. 4.1, 3). There are two pinched-up cordoned body sherds, one with slightly thicker walls and a single fingernail impression above the cordon, the other quite plain and with thinner walls (Fig. 4.1, 4-5). The rims of two very different Beakers were recovered. One is from a small cordoned Beaker decorated with pairs of impressed dots or punctate impressions, one pair above and one pair below the cordon (Fig. 4.1, 7) which is remarkably reminiscent of the lid-seated rim types of many Collared Urns, while the other is a typical upright, rounded rim form decorated with a complex pattern of twisted cord impressions in parallel rows (Fig. 4.1, 6). The eighth Beaker is plain but derives from the carinated zone at the lower belly of the vessel (Fig. 4.1, 8).

Beaker pottery is considered to date from about 2600 to 1800 BC, in the period of the Late Neolithic and Early Bronze Age (Kinnes et al., 1991, p.39), although regional and chronological variations are thought to occur. Comb decoration is seen in all periods, but vessels with a more defined waist may have been apparent in the mid to later part of this period. The comb and fingertip decoration seen on these sherds are known close by in Lincolnshire, indicating that these sherds fit well into the regional styles. Individual vessels with comb decoration are known from Denton (Clarke, 1970, no 760), Grantham (ibid. no 808) and Revesby (ibid. no 784). However, fingertip decoration or rusticated ware is more commonly seen on domestic sites, such as Hockwold on the Fen-edge in Norfolk (Bamford, 1982, Figs 5 and& 6), where comb decorated sherds were also apparent (ibid. Fig. 2). All four types of decoration are known from occupation sites, as at Risby Warren and Manton Warren in Lincolnshire (Riley, 1957; Gibson, 1982, Fig. RW6) and at Fengate. (Gibson, 1980, Figs. 121-7; 1982, Fig. FEN 1). Rusticated Beaker sherds were also recovered during BUFAU's 1996 excavations at Pode Hole Farm (Woodward, 2001, Fig. 11, 1-2) and charcoal from the associated pit deposit was dated to 2340-2130 cal BC (Hood, 2001, F4/1012, table 5). The simple rounded rim form is the commonest type in the Wyman Abbot collection of Beaker pottery at Peterborough Museum (Gibson, 1980, Fig. 119). Fragments from at least five other Beakers, including the coarseware example made from fabric GD1, which had been used as a cookpot and radiocarbon dated to 1950-1750 cal BC (SUERC-12095), were also identified from their fabrics, thin vessel walls (less than 7mm) and the nature of their original firing conditions. Therefore, it may be chronologically significant that the Beakers from Pode Hole quarry are all grog-tempered rather than the range of fabrics, including organic tempered, fine quartz and mixed fabrics of medium-fine shell-tempering, with naturally occurring flint, quartz, haematite and fossiliferous limestone, identified amongst other Beakers in the area (Gibson, 1980, p.235; Woodward, 2001, p.20).

Four Collared Urns were identified from small fragments. One vessel, represented by two body sherds and the base of the collar of the pot, displays typical twisted cord decoration in diagonal rows above a single horizontal row of twisted cord. Below the collar on the neck of the vessel is incised diagonal decoration (Fig. 4.1, 9). A second vessel was represented by the collar alone and is decorated with two horizontal rows of twisted cord on the collar (Fig. 4.1, 10). The third example is a rim fragment with a series of deeply impressed dots or punctate impressions on both the interior, exterior and across the top of the lid-seated rim (Fig. 4.1, 11). This technique, and the use of grog-tempering, is reminiscent of the cordoned Beaker rim decoration described above and demonstrates a close relationship between Beakers and Collared Urns during this Early Bronze Age period at the site. Punctate impressions are present on urns from Fengate (Pryor, 1980, Fig. 59, 26-27). The fourth vessel is represented by an attached collar and wall remnant decorated with two rows of S-twisted cord along the base of the applied collar bulge and impressed marks in two parallel rows above (Fig. 4.1, 12). Collared Urns with twisted cord decoration are widely known in this area, in particular from nearby Fengate (Pryor, 1980, Figs. 55, 29, 31-32, 35; 58, 21; 59, 28; and 89, 2). Several pots with a comparable pattern of twisted decoration on the neck were found at from West Keal (Longworth 1984, no 917). Incised decoration is

also known on Collared pots, for example at Coneygre Farm in Nottinghamshire (Allen et al., 1987, Fig. 10.54), and twisted cord is visible on an example from Pasture Lodge Farm in Lincolnshire (ibid. Fig. 15, 24B). The use of impressed dots is less well known, and could be a technique unique to a Pode Hole quarry potter during the Early Bronze Age. Generally, these vessels are thought to have emerged about 2300 BC and to have been mostly in use around 1800 to 1700 BC, and therefore largely contemporary with Beakers, but may have continued in use until about 1500 BC (Needham, 1996, p.131-3).

There are several early Middle Bronze Age vessels which belong to the transition from the end of the Early Bronze Age into the Middle Bronze Age. These include a narrow, applied, flat strip or cordon which had become detached from its original vessel wall (Fig. 4.1, 20). The vessel had been made from a grog-tempered fabric with a mixed detritus clay matrix (G3), and similar decoration can be seen on grog-tempered Bronze Age cremation urns from Pasture Lodge Farm and Frieston, Lincs. (Allen et al., 1987, Figs. 14, 14 & 20 and 16, 4) and one grog-tempered and one shell-gritted Middle Bronze Age (phase 1) Bucket Urn-type vessels from the settlement at Billingborough (Challis and Laidlaw, 2001, Figs. 21, 8 and 22, 23). More common, however, are the five different examples of grog-tempered Deverel-Rimbury style of Bucket Urn-type jars with ovoid profiles and bevelled rims (type R3; Fig. 4.1, 13-14, 15, 18-19). The term jars will be used here on the advice of specialists who have emphasised a distinction between Middle Bronze Age urns recovered from funerary deposits and Middle Bronze Age jars recovered from settlement sites (Allen et al., 1987; Gibson, 2002). Similar bevelled rim Bucket Urns made from grog-tempered fabrics were found in the cremation cemeteries at Coneygyre Farm, Notts. (Allen et al., 1987, figs. 6, 1, 5, and 8; 7, 10 and 12; 8, 16-17; and 9, 22-23 and 25), Pasture Lodge Farm, Lincs. (ibid. Figs. 13, 4B; 14, 17; and 15, 26), and Grantham, Lincs. (ibid. Fig. 17, 4). Two of the Pode Hole vessels are decorated with fingernail or short incised impressions along the bevel and exterior of the rim, identical in nature to many examples from Pasture Lodge Farm. In addition, there are two decorated sherds from straight-walled, urn-like jars which were decorated respectively with short, incised parallel lines and impressed fingernail designs, both creating herringbone patterns along the body of the vessels (Fig. 4.1, 15 and 17). All of these early Middle Bronze Age sherds were recovered either solely from features with no other pottery, or in association with other grog-tempered fabric sherds; none were found with shell-gritted pottery.

A body wall sherd derived from a shell fabric vessel recovered from context 8124, a layer which is part of Pond Cluster 1, was decorated with what appear to be randomly applied fingernail impressions (Fig. 4.1, 22). The position on the pot was where the wall is 9-11mm thick. Similar examples of the use of irregularly placed, fingernail impressions can be seen on the body zones of grog-tempered urns from Grantham (Allen et al., 1987, Fig. 17, 1 & 7) and a shell-gritted and grog-tempered fabric body sherd from the settlement at Billingborough displayed similar but not identical impressions (Cleal, 2001, Fig. 23, 39). The radiocarbon date resulting from the burnt residue on the interior of this sherd is early in the Middle Bronze Age at 1620-1430 cal BC (SUERC-12866). This is the earliest absolute date for the direct use of shell-gritted pottery at Pode Hole quarry and possibly in the whole of the East Midlands.

Bucket Urn-type jars made from shell-gritted fabrics, some with softer, slightly hooked versions of bevelled rims, were used later in the Middle Bronze Age at Pode Hole quarry (Fig. 4.1, 27 and Fig. 4.2, 28), and a new rim form was also introduced (type R4; Fig. 4.1, 21 and Fig. 4.2, 31 & 34). One of these Bucket Urn-type jars (Fig. 4.2, 28) was radiocarbon dated to 1410-1210 cal BC (SUERC-12096). One of the buckets recovered from one of the waterhole pits cutting Ring-ditch 1 in the western area of the site was decorated with fingertip impressions on the top of the rim (Fig. 4.1, 21). In addition, shell fabrics were used to make Barrel Urn-type jars with distinctive T-shaped rims expanded to the interior and exterior (type R2; Fig. 4.1, 23, 25-26 and Fig. 4.2, 30 and 33). The T-shaped rim jars are very large vessels and two are decorated; one with a wide, applied, horizontal cordon around the body, which has been deeply slashed diagonally along its length, and the other with a single row of fingertip impressions placed just below the rim. One of these vessels (Fig. 4.1, 23) had been used as a cookpot and the burnt residue from the interior of the base was dated to 1410-1200 cal BC (SUERC-12097); sherds from this pot were found in the same pit group complex (Fen-edge Pit Cluster 3) as the radiocarbon dated Bucket Urn-type jar above. A surprisingly thin-walled version of this decoration (Fig. 4.2, 29) was found in association with other T-shaped rim Barrel Urn-type vessels. Identical examples of shell-rich fabric vessels with this same style of long incisions or slash-decorated, wide, flat cordon, including a thin-walled example, were found nearby at Pode Hole Farm (Woodward 2001, Fig. 11, 6-7), together in the same feature with a radiocarbon date of 1395-1010 cal BC from associated charcoal (Hood 2001, F31/1087, table 5). Therefore, the shell fabric Deverel-Rimbury style vessels consistently belong to the later centuries of the Middle Bronze Age. The decorations on the pots contrast with the short, fingernail-like impressions or insertions of the early Middle Bronze Age. A similar T-shaped rim vessel made from a vesicular fabric and another decorated with the cordoned and slashed decoration style and made from a shell fabric were found at the Newark Road subsite at Fengate (Pryor, 1980, Figs. 54, 21 & 56, 45). One shell fabric sherd retained a pinched knob or lug (Fig. 4.1, 24). This is a well-known appendage to Middle Bronze Age vessels in England, as at Pasture Lodge Farm (Allen et al., 1987, Fig. 14, 18).

Hooked rim and simple variations of Bucket Urn-type vessels in the shape of ovoid jars were also found to have been made from shell-rich fabrics (Fig. 4.2, 37-38, 40-

41, 43-45). In addition, a thin-walled, shell-rich vessel is represented by a distinctive base type with a splayed or pinched out footplate (Fig. 4.2, 46). One example of these jars (Fig. 4.2, 36), made from the vesicular and quartz sand fabric DQ1, had a body sherd bearing burnt residue which was dated to 1270-1000 cal BC (SUERC-12862), indicating that this subtle change in the rim shape and fabric type heralds the beginning of the post-Deverel-Rimbury Late Bronze Age ceramic phase (PDR). This vessel was found with no other pottery in ditch cut 8208 of field boundary 8026. The use of shell-bearing fabrics continued into the PDR; one vessel with a distinctive shouldered profile found in some PDR Late Bronze Age assemblages was also recovered (Fig. 4.2, 42). The Pode Hole quarry assemblage is an excellent example of the gradual evolution of late Middle Bronze Age Bucket Urn-type vessels into post-Deverel-Rimbury Late Bronze Age ovoid profile jars; type R3 vessels embody this change. A shouldered sherd from a shell-rich fabric jar, decorated with fingertip impressions along the shoulder point (Fig. 4.2, 39), could belong to the PDR phase but is equally likely to have been a Late Bronze Age/Early Iron Age jar (Knight, 2002, Fig. 12.3, 16-18).

Several other vessels also appear to belong to the decorated phase of the later Bronze Age. An everted rim sherd from a possible bowl made from the fabric rich with shell-shaped vesicles (D1) was found in the field boundary ditch cut 202 (type R5; Fig. 4.1, 27). One vessel, made from the same fabric D1 (type R6; Fig. 4.2, 48), is bipartite in profile with a rounded rather than pronounced shoulder at the widest point. The jar is decorated with an irregular pattern of linear incising within a zone created by two parallel, horizontal lines around the upper part of the pot. The fabric of this pot would place the vessel anywhere in date from the later Bronze Age through the Iron Age. However, because of the presence of this distinctive decoration, a Late Bronze Age to earlier Iron Age date may be considered more appropriate. The decorated phase of the later Bronze Age (Barrett, 1980) is poorly represented in the Lincolnshire area (Knight, 2002), and therefore this vessel appears at present to be very unusual, if not unique. The jar, which would not be out of place as a Class II vessel in lowland England (cf. Barrett, 1980), was recovered from post hole 8710 (Midden Area 2) and the context described as a 'pot interment', which suggests that the 14 sherds (83g) had been deliberately placed in the post hole, either as practical post-packing to support the post or as a form of ritual action, or both. In addition, two small rim sherds derive from similar necked jars. These vessels have short, upright to slightly flared, rounded rims. One, made from a finely gritted shell fabric, is decorated with fingertip impressions around the exterior of the rim (Fig. 4.2, 49), a characteristic of the decorated Late Bronze Age to Early Iron Age jars in this region (Knight, 2002, Fig. 12.3, 16) and elsewhere in Britain (Barrett, 1980). The other (Fig. 4.2, 50), a fineware example, is undecorated, thin-walled and made from a medium-grained quartz sand fabric with no obvious shell inclusions.

Rims

- *R1 lid-seated, cordoned Beaker rim* (Fig. 4.1, 7).
- *R2 T-shaped rim with overhanging edges to interior and exterior on straight-sided vessel; barrel jar* (Fig. 4.1, 23, 25-26 and Fig. 4.2, 30, 33).
- *R3 convex or ovoid-profile, Bucket Urn-like jar which may have a rounded, bevelled, or hooked rim* (Fig. 4.1, 13-14, 16, 18-19, 27 and Fig. 4.2, 28, 36-38, 40-41, 43-45).
- *R4 bucket-shaped vessel with upright, rounded or slightly flattened rim* (Fig. 4.1, 21 and Fig. 4.2, 31, 34).
- *R5 short, upright, slightly flared, rounded or everted rim on necked jar or bowl* (Fig. 4.2, 47, 49-50).
- *R6 bipartite or shouldered jar with simple rounded rim* (Fig. 4.2, 48).
- *R7 upright to slightly everted or flared Beaker rim* (Fig. 4.1, 6).
- *R8 lid-seated style Collared Urn-type rim* (Fig. 4.1, 11).

Shoulder sherds

- *A1 shouldered sherd with distinct change of wall angle* (Fig. 4.2, 39, 42).

Bases

- *B1 flat base* (Fig. 4.2, 36).
- *B2 flared, flat base* (Fig. 4.2, 46).

Decorated sherds

- *D1 decorated body sherd usually with no vessel form present* (Fig. 4.1, 17, 20, 22 and Fig. 4.2, 29, 32, 35)*, with the exception of decorated collars of Collared Urn-type vessels* (Fig. 4.1, 9-10, 12).
- *P1 plain body sherds.*

Lug/Knob

- *H1 pinched knob used as a lug or as decoration* (Fig. 4.2, 24).

Contextual associations and ceramic phases

This rich assemblage of Bronze Age pottery can be divided into five ceramic phases based on the associations of vessel fabric, form and decoration, and on the co-occurrences of vessels in features (the project archive, available at Peterborough City Museum, or online via the Archaeology Data Service, contains full contextual listing of all sherds).

Ceramic phase 1 (CP1)

This consists of deposits of Beaker pottery, sherds from Collared Urns with other thick-walled grog-tempered sherds, or simply Beaker sherds, and belongs to the Early Bronze Age. It is normal to attribute Beaker pottery to the Late Neolithic/Early Bronze Age. However, the absence of sherds of Peterborough Ware bowls, as found in the 1996 BUFAU excavation at Pode Hole (Woodward, 2001, p.20, Fig. 11, 5), or Grooved Ware vessels, as found at Fengate (Pryor, 1980, Figs. 57, 5-13 and 58, 14, and 16-19), indicates that this ceramic phase postdates the Late Neolithic.

Beaker and Collared Urn sherds were found in Ring-ditch 1, mostly within the fill of the barrow ditch, with both types also recovered from waterholes 4046 and 4081, the pits which cut into Ring-ditch 1. All the sherds were abraded and it seems very likely that this material had been disturbed and redeposited in the ditch. The material found within this ring-ditch suggests similar activity, probably more domestic in character, which took place before the ring-ditch was constructed. Beaker sherds were also recovered from pits 6684 (Midden Area 1), 6925 and pit 7214, and Fen-edge Pit Cluster 1, with four thick-walled sherds of fabric GQ2 pottery also from pit 6925. Ring-ditch 3 contained only Beaker sherds. Pit group 7087, also part of Midden Area 1, may belong to this phase or the following.

Ceramic phase 2 (CP2)
This is represented by sherds from undiagnostic thick-walled Early Bronze Age vessels and early Middle Bronze Age Deverel-Rimbury Bucket Urn-type vessels constructed from grog-tempered fabrics only. This phase appears to be later in character than the material assigned to CP1 because of the presence of these grog-tempered Bucket Urn-type jars with their bevelled rims, and can be referred to as the 'early Middle Bronze Age'. Features which belong to this phase include field boundary 6309, ditch 6266 pits 6501, 6508, and the following pits within Midden Area 1: 6598, 6599 and 6608. One of the one metre pits, pit 8085, contained only thick-walled, base and body sherds from grog-tempered vessels and is likely to belong to this ceramic phase as well. It is during CP2 that the introduction of shell-gritted Middle Bronze Age pottery may have occurred. The second one metre pit, pit 8091, appears to show the end of the Early/Middle Bronze Age CP2 and the beginning of the late Middle Bronze Age CP3. The pottery in this pit was likely to have been in contemporary use, with several good-sized sherds of G1 and G2 thick-walled vessels (eight sherds; mean weight, 21g) recovered in association with a single decorated shell-gritted Bucket Urn-type jar rim (Fig. 4.2, 34), which weighs 36g.

Ceramic phase 3 (CP3)
This is characterised by vessels of late Middle Bronze Age Deverel-Rimbury bucket and Barrel Urn-types made from shell-rich fabrics only. Applied flattened cordons decorated with diagonal slashes can be found on the Barrel Urn-type jars. This phase appears to have started around the middle of the second millennium BC, with a layer from Pond Cluster 1 providing the key example: a single shell fabric, decorated sherd dated to 1620-1430 cal BC (SUERC-12866) (Fig. 4.1, 22), amongst four significant sherds of shell fabric pottery (mean weight 33g). This ceramic phase can be referred to as 'late Middle Bronze Age'. There are many features which have only shell fabric pottery, in particular Fen-edge Pit Clusters 3 and 4, ditch 7710 and waterholes 9047, 9075, 9107 and 9250, and as discussed above two of the vessels from the pit groups are dated to 1410-1210 and 1410-1200 cal BC.

Ceramic phase 4 (CP4)
The pottery continued to be made from shell-bearing fabrics, but the rims of these Bucket Urn-type jars had softened into hooked forms on the ovoid profile vessels, and new shouldered jar types are also found. In addition, vesicular versions of shell fabrics with hooked or bevel rims were also recovered. This pottery is referred to as the post-Deverel-Rimbury Late Bronze Age or PDR ceramic phase. The contents of features that belong to this ceramic phase include field boundary 8026, ditch 9411, three waterhole pits associated with Pond Cluster 3 (9249, 9250 and 9320), and waterhole pit 9618. The single vessel recovered from field boundary 8026 was dated to 1270-1000 cal BC (Fig. 4.2, 36).

Ceramic phase 5 (CP5)
The pottery is also identified as having a vesicular fabric but is usually decorated, either with complex geometric motifs on shouldered, bipartite profile vessels or fingertip impressions on the exterior of necked jars. It is likely that quartz sand fabric necked jars also belong to this phase, as do bowls with everted rims. Future excavations in the area should reveal more assemblages containing these types of pottery which can be radiocarbon dated; if so, they may prove to belong to the PDR period at the end of the second millennium BC or to the subsequent decorated phase of the later Bronze Age (Late Bronze Age/Early Iron Age). Features containing this type of pottery include field boundary 202, post hole/pit group 8263, and post hole/pits 8300, 8313, 8337, and the following cuts within Midden Area 2: 8710, 8714 and 8716.

Deposition

Relatively large quantities of pottery were found in one CP3 feature group and two CP4 features; relative, that is, within this Bronze Age pottery assemblage. These deposits were found in the intercutting pits of Fen-edge Pit Cluster 3, and also 7514 and 7586 of Fen-edge Pit Cluster 4 (68 sherds; 1546g excluding sieved samples), ditch cut 8208 of field boundary 8026 (160 sherds; 393g) and charcoal-rich pit 9320 associated with Pond Cluster 2 (31 sherds; 488g).

The CP3 features contained sherds from at least nine bucket and Barrel Urn-type jars of which seven are illustrated (Fig. 4.1, 23 and Fig. 4.2, 29). Several sherds from the same pots were found distributed amongst these pits and at least three had been used as cookpots (see digital archive for details). The assemblage from the two CP 4 features consists of sherds from a single ovoid jar in the field boundary (Fig. 4.2, 36a-b) and four vessels, including two ovoid jars and a shouldered jar, in the pit (Fig. 4.2, 41-43). One of the ovoid jars from pit 9320 had been used to contain acidic material and the other had been used as a cookpot. Both deposits contained ovoid jars, implying a reasonable

contemporaneity of the vessels in these deposits, and both deposits had an association with the processing of food at some stage in the histories of the vessels prior to deposition. These deposits, therefore, indicate settlement activity at these locations or nearby if they had been purposeful deposits of material culture at the edges of the settlement areas. What they also demonstrate is that during the second half of the second millennium BC, pottery was deposited differently than during the first half of this millennium. Much more pottery was available for deposition during the Middle and Late Bronze Age compared to the Early Bronze Age at Pode Hole quarry. Many bulk samples from these features were sieved; even with this additional care and attention to the recovery process, rarely was more than 5% of any particular vessel recovered. Where are the rest of these pots? It is not possible to answer this question from the excavated material. However, what these three relatively pot-rich deposits do indicate is that material culture dated to the final quarter of the second millennium BC (in the form of late Middle Bronze Age Bucket and Barrel-type jars and Late Bronze Age ovoid jars and shouldered jars, at least) appears to have been treated differently to comparable settlement debris from the Early/Middle Bronze Age. Fen-edge Pit Cluster 2 in particular and also pit 9320 contained significant quantities of briquetage (see Table 4.3). The recovery of Early Bronze Age pottery in pits, scoops and post holes indicates that the Pode Hole quarry area was not simply a funerary landscape at that time, but one of settlement-type features as well. This is confirmed by the presence of burnt residue on the interior of five vessels made from earlier Bronze Age grog-tempered fabrics (see archive). It may be that attitudes towards ceramic artefacts in the later part of the second millennium BC changed significantly from those of the earlier Bronze Age in this area, and that the manufacturing frequency of pottery production may also have changed (cf. Hill, 2002). Further research into these apparent trends is required at both regional and national scales of investigation.

Generations, transitions and individual potters

Analysis of this pottery assemblage has provided an opportunity to consider the meaning of 'grog-within-grog', or generations of pots. It is commonly recognised that pots can represent people; their shapes in particular and the names of the parts of vessels reflect this. Ethnographic studies have revealed that the makers of handmade pottery in African communities often refer to pots as living creations and the embodiment of ancestors. For such communities, ancestors are most important and the idea of ancestors is incorporated into the materiality of the pot-making, with death represented by the crushing and fragmenting of pots (the pot of an ancestor: the pot is an ancestor) and the re-creation of their spirits/themselves to invoke good spirits when storing food and seed and in the cooking of food (cf. Sterner, 1989; David, 1990; Barley, 1994; Morris, 1994a; Brown, 1995; Gamble, 2001). There is a strong link between people in pots – literally and figuratively – and pots being metaphors for people. This is particularly striking when Early-Middle Bronze Age grog-tempered storage jars are used to store the cremated remains of people with an old pot being crushed (death of Pot 1) to make a new pot fabric (procreation) to create a new pot (birth of Pot 2) which for a number of years (vessel life-use/lifespan) is used to hold the food of the family (food of life) until there is a death in the family and the pot is selected (Pot 2 removed from the living world) to hold the cremated bones of the person in the ground or to be itself crushed to create another new pot due to its own antiquity (death of Pot 2).

That time, however, contrasts with the second half of the second millennium BC when the land or landscape itself, the ownership of it by the community and the fruit of that land, became more important to the community (Barrett, 1994). In some form, the land itself needed to be recognised as part of the materiality of pot-making, to become part of the pottery more visibly, and this was achieved by using naturally occurring fossil shell-gritted clays to represent the land – 'the land of our people' – as this was visually distinctive when fired with the pieces of white shell against the red, brown, grey and black-fired clay of the pots. Therefore, pottery made from shell-gritted fabrics was a visual statement – whereas for the previous 500 years or more the making of the pots was the important spiritual factor and what the pots were made from being included in the process of making but not actually visible, simply spiritual.

At Pode Hole quarry, the individuality of potters was also being expressed on vessels through their 'signatures' (cf. Tomalin, 1995). Middle Bronze Age grog-tempered vessels with bevelled rims were often decorated with fingernail impressions along the rim bevel and again on the exterior below the rim. These short, personal impressions are extremely similar in appearance to the short impressions of tools creating the herringbone designs on two pots. This fingernail-impressed technique was replaced during the later Middle Bronze Age production of shell fabric vessels with fingertip impressions and slashed cordons. During the Middle Bronze Age, therefore, it appears that stylised decoration and 'personal' decoration were being applied to pots. Imprinting of vessels with a single row of fingernail or fingertip decoration around the rim or body of the pots could have been a signature statement. There can be nothing more personal, in the absence of a photograph, than a signature-impression identifying a common pot amongst members of a close-knit community of families.

Catalogue of illustrated sherds (Figures 4.1-2)

(PRN, Database Pottery Record Number)

Beaker

1. Body sherd, decorated; fabric S2; impressed fingertip rustication; context 4073, ring ditch cut 4080, Ring-ditch 1.

2. Body sherd, decorated; fabric G2; toothed comb impressions in parallel rows; context 4332, ring ditch cut 4331, Ring-ditch 1.

3. Body sherd, decorated; fabric G2; incised lattice pattern; context 4027, waterhole 4046, waterhole cutting Ring-ditch 1.

4. Body sherd, decorated; fabric G2; pinched out cordon at vessel waist; context 4059, waterhole 4081, waterhole cutting Ring-ditch 1).

5. Body sherd, decorated; fabric G2; pinched out cordon at vessel waist; sample 6045, context 6507, pit/posthole 6508, ungrouped; PRN 11027.

6. Rim sherd, decorated; form R7; fabric GQ1; less than 5% of rim present; complex design of horizontal and parallel twisted cord impressions; sample 6041, context 6600, pit/posthole 6599, Midden Area 1; PRN 11042.

7. Rim sherd, decorated; form R1; fabric GD2; 10% of 10cm diameter rim present; two parallel rows of individual, impressed dots along upper and lower sides of cordon; context 7223, pit 7214, ungrouped; PRN 1003.

8. Body sherd, carinated; form A1; fabric G2; context 7230, ring ditch cut 7229, Ring-ditch 3; PRN 1004.

Collared Urn

9. Collar sherd, decorated; bottom of collar; fabric G1; twisted cord impressions in diagonal rows above single horizontal row on collar and incised diagonal slashes below collar on vessel body; context 4293, Ring-ditch 1.

10. Collar sherd, decorated; bottom of collar; fabric GQ2; two parallel rows of twisted cord impressions on collar; sample 6065, context 6567, pit 6621, ungrouped; PRN 11032.

11. Rim, decorated; form R8; fabric GQ2; less than 5% of rim present; horizontal row and irregular pattern of impressed deep dots on both interior and exterior surfaces with faint traces of twisted cord impressions along top edge; sample 6055, context 6664, pit/scoop 6665, Midden Area 1; PRN 11046.

12. Collar sherd, decorated; bottom of collar; fabric G1; two parallel rows of twisted cord impressions below two rows of faint traces of impressed tool/ fingernail marks; sample 8006, context 8092, pit 8091, One metre pits; PRN 1223.

Middle Bronze Age (early)

13. Rim, decorated; form R3; fabric GQ2; less than 5% of rim present; two horizontal, parallel rows of fingernail impressions on exterior with single additional line along bevel; sample 6060, context 6500, pit/posthole 6501, ungrouped; PRN 11023.

14. Rim, plain; form R3; fabric G1; less than 5% of rim present; sample 6045, context 6507, pit/posthole 6508, ungrouped; PRN 11030.

15. Body sherd, decorated; fabric GQ2; incised parallel lines forming possible herringbone pattern; sample 6056, context 6567, pit 6621, ungrouped; PRN 11033.

16. Rim, decorated; form R3; fabric GQ2; less than 5% of rim present; short, incised marks or fingernail impressions in horizontal row on exterior with single additional line along bevel; context 6592, pit 6691, ungrouped; PRN 11017.

17. Body sherd, decorated; fabric GQ2; two horizontal rows of fingernail impressions forming herringbone pattern; context 6597, pit 6598, Midden Area 1; PRN 11013.

18. Rim, plain; form R3; fabric GQ2; less than 5% of rim present; sample 6050, context 6674, pit 6685, Midden Area 1; PRN 11051.

19. Rim, plain; form R3; fabric GQ2; less than 5% of rim present; sample 6047, context 6687, pit 6686, Midden Area 1; PRN 11058.

20. Applied cordon, plain; fabric G3; context 9188, waterhole 9125, ungrouped; PRN 1168.

21. Rim, decorated; form R4; fabric S1; less than 5% of rim present; single row of fingertip impressions along top of rim; context 4447, pit 4437, waterhole cutting Ring-ditch 1.

22. Body sherd, decorated; fabric S2; two irregular rows of fingernail impressions; pitted surface and burnt residue on interior; radiocarbon dated 1620-1430 cal BC; context 8124, layer, Pond Cluster 1; PRN 1101.

Middle Bronze Age (late)

23. Rim, decorated; form R2; fabric S1; 8% of 40cm diameter rim present; applied broad cordon with single row of diagonal incised lines or slashes; burnt residue on interior of vessel base; radiocarbon dated 1410-1200 cal BC; contexts 7382, 7487, and 7654, Fen-edge Pit Cluster 3; PRNs 1009, 1021, 1057-1058.

24. Pinched knob or lug; fabric S1; context 7385, waterhole 7707, Fen-edge Pit Cluster 3; PRN 1064.

25. Rim, plain; form R2, fabric S1; less than 5% of rim present; contexts 7509 and 7511, waterholes 7586 and 7514, Fen-edge Pit Cluster 4; PRNs 1050-1051.

26. Rim, decorated; form R2; fabric S1; 7% of 34cm diameter rim present; single horizontal row of fingertip impressions beneath rim exterior; context 7511, waterhole 7514, Fen-edge Pit Cluster 4; PRN 1052.

27. Rims, plain; form R3; fabric S1; 20% of 20cm diameter rim present; contexts 7507-7508 and 7654, layer and waterholes 7586 and 7218, Fen-edge Pit Cluster 3, and Fen-edge Pit Cluster 4; PRNs 1022, 1041 and 1062.

28. Rim, plain; form R3; fabric S1; less than 5% of rim present; burnt residue on interior; radiocarbon dated 1410-1210 cal BC; context 7589, waterhole 7514, Fen-edge Pit Cluster 4; PRN 1043.

29. Body sherd, decorated; fabric S1; wide, flattened, applied cordon with diagonal incised lines or slashes; context 7511, waterhole 7514, Fen-edge Pit Cluster 4; PRN 1053.

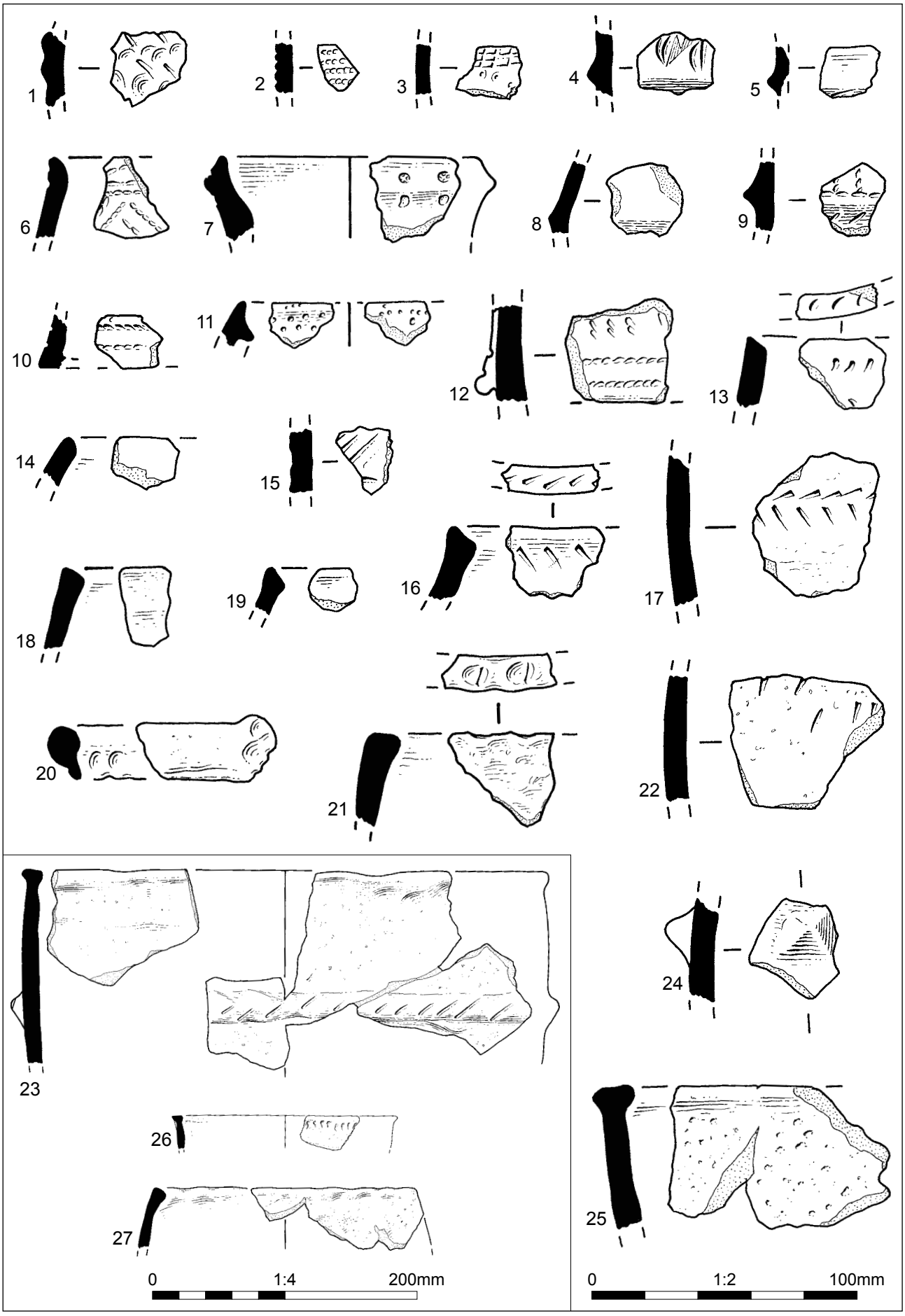

Figure 4.1: Pottery 1-27.

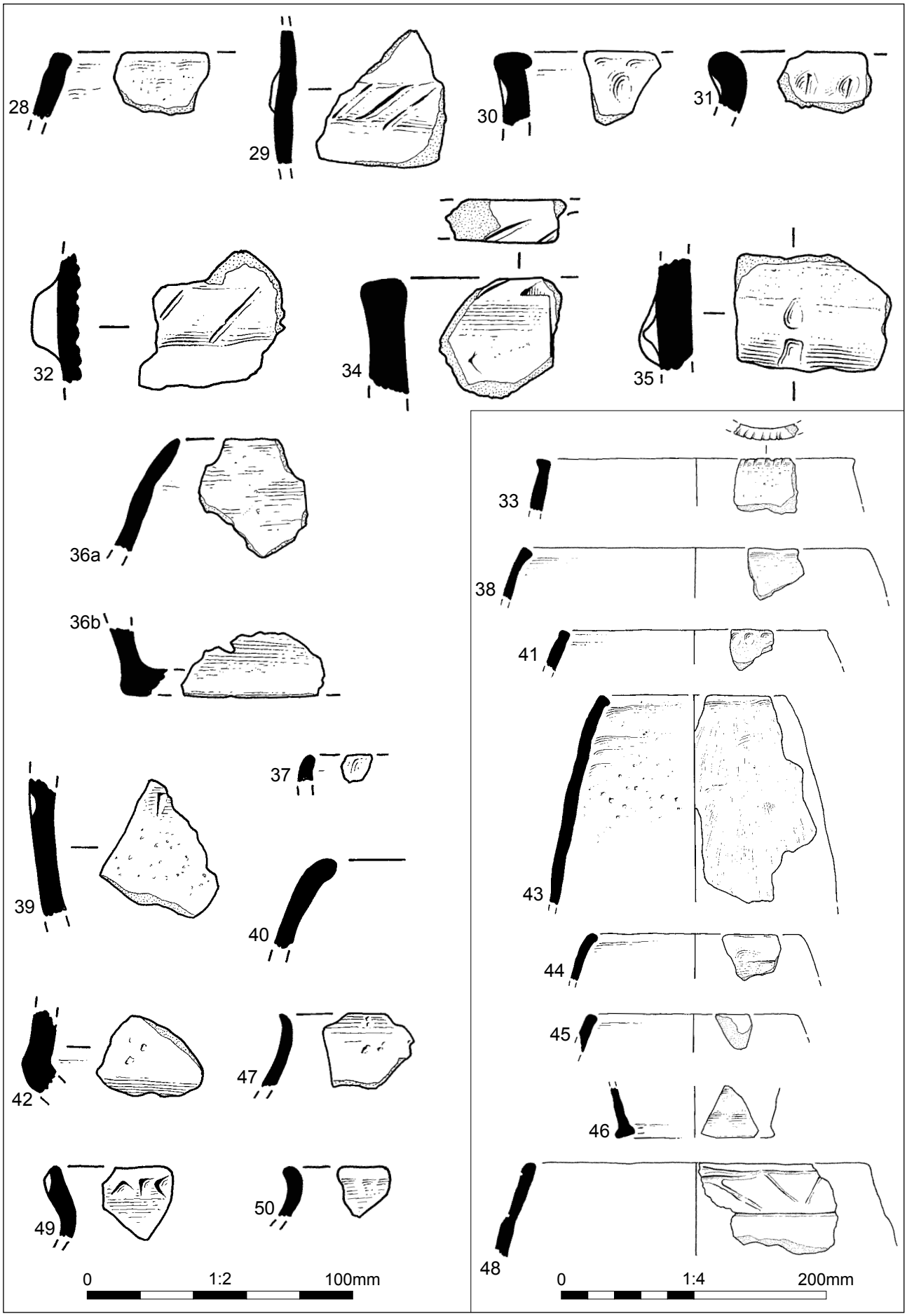

Figure 4.2: Pottery 28-50.

30. Rim, plain; form R2; fabric S2; less than 5% of rim present; manufacturing thumb impression beneath exterior rim lip (or fingertip impression); sample 8012, context 8147, pit 8155, group 8263; PRN 1120.
31.Rim, decorated; form R4; fabric S2; less than 5% of rim present; row of fingertip impressions beneath rim exterior; associated with saltwater due to bleached effect visible throughout; context 8147, pit 8155, group 8263; PRN 1122.
32. Body sherd/flake, decorated; fabric S2; wide, flattened, applied cordon, sample 8012, context 8147, waterhole 8155, group 8263; PRN 1121.
33. Rim, plain; form R2; fabric S1; 5% of 24cm diameter present; context 9092, pit 9075, ungrouped; PRN 1147.
34. Rim, decorated; form R4; fabric S2; less than 5% of rim present; incised diagonal line on top of rim; context 8351, pit 8091, one metre pit; PRN 1215.
35. Body sherd, decorated; fabric S1; applied strip with fingertip pinching effect across the strip; sample 8024, context 8294, layer, Fen-edge Pit Cluster 5; PRN 1226.

Late Bronze Age (post-Deverel-Rimbury)
36. Rim and base, plain; forms R3, B1; fabric DQ1; less than 5% of rim present; vessel body sherds with burnt residue; radiocarbon dated 1270-1000 cal BC; context 8212, ditch cut 8208, field boundary group 8026; PRNs 1126-1128.
37. Rim, plain; form R3; fabric S3; less than 5% of rim present; sample 8087, context 9109, pit 9107, ungrouped; PRN 1231.
38. Rim, plain; form R3; fabric S1/S2; 5% of 26cm diameter rim present; pitted on interior; context 9119, waterhole 9249, ungrouped; PRN 1153.
39. Angled/shoulder sherd, decorated; form A1; fabric S1; fingertip impression at shoulder angle; context 9119, waterhole 9249, ungrouped; PRN 1156.
40. Rim, plain; form R3; fabric S1; less than 5% of rim present; context 9157, ditch cut 9147, field boundary group 9411; PRN 1166.
41. Rim, plain; form R3; fabric S2; 5% of 20cm diameter rim present; possibly sooted on exterior (or residue of associated rich charcoal deposit); context 9360, pit 9320, ungrouped; PRN 1181.
42. Angled/shoulder sherd, plain; form A1; fabric S1; context 9360, pit 9320, ungrouped; PRN 1183.
43. Rim, plain; form R3; fabric S2; 12% of 14cm diameter rim present; wiped on exterior; pitted on interior; context 9361, pit 9320, ungrouped; PRN 1185.
44. Rim, plain; form R3; fabric S4; 7% of 16cm diameter rim present; context 9669, waterhole 9618, ungrouped; PRN 1195.
45. Rim, plain; form R3; fabric S1; 5% of 16cm diameter rim present; context 9669, waterhole 9618, ungrouped; PRN 1196.
46. Rim, plain; form type R5; fabric D1; less than 5% of rim present; context 203, ditch cut 202, field boundary in evaluation.
47. Rim, decorated; form R6; fabric D1; 5% of 26cm diameter rim present; two parallel incised lines on upper vessel zone with irregular, geometric pattern of incised line infilling; context 8711, posthole 8710, Midden Area 2; PRNs 1137-1138.
48. Rim, decorated; form R5; fabric D1; less than 5% of rim present; horizontal row of fingertip impressions on exterior rim edge; context 9112, pit 9111, waterhole pit cutting Ring-ditch 4; PRN 1152.
49. Rim, plain; form R5; fabric Q2; less than 5% of rim present; context 9712, waterhole 9512, Pond Cluster 3; PRN 1199.
50. Base, plain; form B2; fabric S1; 8% of 12cm diameter base present; context 9233, waterhole 9250, ungrouped; PRN 1172.

The Clay Weights

by Elaine L. Morris

Summary

Fragments of several ceramic clay weights (116 fragments; 4789g) were recovered from six contexts contained within four features (Table 4.2). Close inspection suggests that there could be approximately 25 individual weights represented. Three form types have been identified, cylindrical (CYL), square (SQR) and pyramidal (PYR), but all are made from the same medium-coarse, quartz sand fabric with flint detritus (Q1) as defined for briquetage supports (see The Briquetage, this report). These clay weights may have been used in the production of textiles (Barclay, 2001a; Pryor, 1980, p.128) or as thatch weights (Bradley, et al 1980, p.275) but there is no specific evidence from Pode Hole quarry to contribute to that discussion.

Types

Cylindrical

Cylindrical weights have the circular footprint of a vertical-walled cylinder and a centrally positioned, axial perforation through it. If the weight is hung with the rope running freely through the perforation, then it would hang in a horizontal position; if knotted beneath the base, then it would be in a vertical position. The key point is that the perforation is located in the centre of cylindrical weights. The edges of cylindrical weights are softly rounded. Of the seven examples in this assemblage, three displayed full height/length with measurements of 100mm, 90mm and 84mm (Fig. 4.3, 1, 3-4), two of these have measurable diameters of 90mm and 75mm (Fig. 4.3 1 & 6) and four have measured perforations of between 15-23mm in diameter (Fig. 4.3, 1-3 & 6). None of the weights is complete. The largest total weight for any single example is 521g from a weight represented by approximately 70% of the original (Fig. 4.3, 1) while the smaller example with 30% of the original present (Fig. 4.3, 6) weighs 241g. Extrapolating from these data, a complete weight might register at approximately 750-800g but these are the two smaller examples based on height.

Cylindrical weights were also recovered from excavations nearby at Fengate, including five from Padholme Road and from Early/Middle Bronze Age contexts at Newark Road including two from pits and four from ditches (Pryor, 1980, Figs. 13, 4-5, 60, 33-34 and 75, 1-4). The description of the fabric of these Fengate weights is similar to the Pode Hole quarry fabric description. The range of measurable clay weight diameters, from 75mm to 100mm, and perforation diameters, 18mm to 25mm, are also similar. These parallels suggest that the objects derive from a close-knit community with strong cultural links, as would be expected from archaeological sites locationed in such close proximity to each other, which are also broadly of the same date. Further north, at Billingborough, fragments from 11 cylindrical clay weights were recovered from Middle Bronze Age contexts and had been redeposited in later contexts, with only two from the same context (Bacon, 2001, Fig. 35). North again of Billingborough, in the Lincolnshire Wolds west of Grimsby, five cylindrical weights were found at Site E along the route of a gas pipeline in the parish of Swallow (Leahy 1990, 48, Fig. 1, A-D). These weights are shaped and finished slightly differently from those at Pode Hole with incised marks on two of them, recessed ends on two and two with slightly larger axial perforations measuring 30mm in diameter.

Fragments from several cylindrical weights were found in a Middle Bronze Age ditch overlain by Late Bronze Age occupation at Mucking North Ring in Essex (Bond, 1988, 16, 37, Fig. 26, 6), and one from salvage work (Barford, 1988, Fig. 34, 1). The Late Bronze Age occupation included several examples of pyramidal weights, which indicates that cylindrical weights were in use before pyramidal examples in eastern England. Excavations on ten later Bronze Age sites in Essex revealed evidence of cylindrical weights (Barford and Major 1992, Fig. 6) including one group of 13 weights from South Ockendon on the north side of the Thames which are now housed in Thurrock Museum. The majority of weights are loosely associated with Middle Bronze Age pottery but at Baker St, Orsett only Late Bronze Age pottery had been found on the site (Major 1988, 94, Fig. 91).

In the Upper Thames area, cylindrical weights were recovered at Eynsham Abbey, Oxfordshire (Barclay, 2001a, p.139, Fig. 17, 1) in ditch 250 with six radiocarbon determinations centring at the end of the second millennium cal BC (Barclay, 2001b, p.138; Bayliss, et al. 2001, table 16), while in Berkshire cylindrical weights were found in association with very distinctive, post-Deverel-Rimbury pottery at Knights Farm subsite 2 in F2 (Bradley, et al. 1980, 243-4, Figs. 33, 63-72 and 37, 1-3). The illustrated weights range between 80mm to 105mm tall, 115mm to 140mm in diameter and 1000g to 1200g. The illustrated cylindrical weight from Aldermaston was 100mm by 140mm (Bradley, et al 1980, Fig. 19, 5).

Nearby at Pingewood, an unusual short, bun-shaped weight in a heavily flint and grog-tempered fabric, and also a classic cylindrical weight measuring 90mm tall and 110mm in diameter, were found (Johnson and Bowden, 1983-5, p.33, Fig. 10, 3-4). Unfortunately, neither appears to have been directly associated with pottery and no radiocarbon determinations were obtained, but the prehistoric pottery from the site belongs to the challenging period of transition between the Deverel-Rimbury and post-Deverel-Rimbury Late Bronze Age. At Black Patch in East Sussex, ten complete or reconstructable cylindrical weights were found in hut 3, nine actually from the hut floor itself and one from an associated post hole (Drewett, 1982, p.371-2, Fig. 34, 1-4). Additional fragments of loomweights were recovered from two enclosures, two house platforms and two lynchets at this site in association with 1192 sherds (15kg) of Middle Bronze Age Deverel-Rimbury type. No Late Bronze Age pottery could be identified within the Black Patch assemblage which has prompted an interpretation, based on radiocarbon dates (Otlet, 1982), that Middle Bronze Age material culture existed far longer there than in areas such as the Thames Valley (Ellison, 1982, p.362 and 364).

Feature	Context	CLAY WEIGHT TYPES								Total count	Total weight (g)
		Cylindrical		Square		Pyramidal		Uncertain			
		Ct.	Wt.	Ct.	Wt.	Ct.	Wt.	Ct.	Wt.		
Pit 8091	8092	-	-	-	-	3	510	-	-	3	510
	8140	1	28	-	-	17	460	-	-	18	488
	8351	3	804	1	247	5	556	61	1004	70	2611
Posthole/pit 8300	8301	11	792	-	-	-	-	10	128	21	920
Posthole 8337	8338	-	-	-	-	-	-	1	19	1	19
Pit 9107	9108	3	241	-	-	-	-	-	-	3	241
Total		*18*	*1865*	*1*	*247*	*25*	*1526*	*72*	*1151*	*116*	*4789*

Table 4.2: Clay weights.

Therefore, cylindrical clay weights were made and used primarily during the Middle Bronze Age but they continued to be made and used in some areas into the beginning of the Late Bronze Age, representing activity during the second half of the second millennium BC. The Berkshire cylindrical weights are best described as bun-shaped cylindrical weights, as they are wider than they are tall, with diameters of between 115mm to 140mm and heights of 80mm to 110mm. These weights are also heavier than those found in Lincolnshire, at between 1000g and 1200g. This evidence indicates that there was a regional variant of cylindrical clay weight in Berkshire, as in Lincolnshire.

Square

There is only one example of a square weight in the collection; it has a square footprint, vertical walls with right angled corners and a vertical, axial perforation through the centre (Fig. 4.3, 4). The edges of this square weight are clearly defined and the perforation's central, axial position is the same as for cylindrical weights. The weight measures 82mm tall and the perforation measures 13mm in diameter. It is the position of the perforation which indicates that this weight has a square, rather than rectangular, footprint and results from a conceptual similarity of manufacture to the cylindrical type of weight rather than to the pyramidal type of weight (discussed below). One example of a square weight with vertical/axial perforation was found at Mucking North Ring in phase 6 ditch 42, a phase rich with post-Deverel-Rimbury pottery (Bond, 1988, Figs. 17 & 26, 11). The example from Pode Hole quarry was recovered in direct association with several examples of both cylindrical and pyramidal weights and sherds in One Metre pit 8091.

Pyramidal

For the Pode Hole quarry collection, pyramidal weights are defined as having square, sub-square, sub-rectangular or rectangular footprints with four, vertical to slightly inward-sloping walls and a single perforation located running through the weight from opposing wall sides on the upper half of the object (Fig. 4.3, 5). This upper wall, horizontal position of the perforation contrasts significantly with the axial perforation of cylindrical and square weights. Elsewhere, pyramidal weights with their distinctive wall perforation may also have a circular footprint as at Aldermaston (Bradley, et al., 1980, Fig. 19, 1).

Pyramidal weights are usually found in contexts which postdate cylindrical weights, a sequence established at Mucking North Ring where several pyramidal weights were recovered from Late Bronze Age occupation (Bond, 1988, p.16, Fig. 3) and an additional nine from salvage work including four small weights from the lower fills of a single feature (Barford, 1988, Fig. 34, 2-5). Fragments from 18 pyramidal weights were found at Aldermaston Wharf in association with post-Deverel-Rimbury pottery (Bradley, et al., 1980, p.243, Fig. 19, 1-4). At Pode Hole quarry, however, pyramidal weights appear to have been contemporary with cylindrical weights for at least some of the later Bronze Age, unless they were simply selected for contemporary deposition (see below). The pottery found in the main feature where pyramidal weights (and the square weight) were recovered at Pode Hole Quarry, pit 8091, is both Early/Middle and Middle Bronze Age in fabric and form types (Fig. 4.1, 12 and Fig. 4.2, 34), and the contents have been assigned to the end of the Early/Middle Bronze Age and the beginning of the late Middle Bronze Age (CP2 into CP3).

Date and deposition

Twenty of the approximately 25 clay weights in the collection were recovered from three contexts in pit 8091 (Table 4.2). One of the fragmented cylindrical weights in this feature joins a large piece found in pit/post hole 8300, situated six metres to the north-east of pit 8091 (Fig. 4.3, 2). This match suggests that the infilling of these two features may represent contemporary or near-contemporary activity. The pottery found in pit 8091 derives from three contexts (8092, 8140, and 8351) and consists of both Early/Middle Bronze Age grog-tempered body sherds from a minimum of two vessels (based on fabric and firing variation) and a decorated Middle Bronze Age shell-gritted rim sherd from a Barrel Urn/jar (Fig. 4.1, 12). The sherd sizes of the Early/Middle Bronze Age pottery recovered from all three contexts range from 12g to 41g and the Middle Bronze Age potsherd found in 8351 weighs 36g. There is nothing in particular to suggest that the pottery and the clay weight fragments were anything but contemporary in deposition. Whether they had been curated elsewhere, as in a midden, and then deposited into this feature is also a possibility. Whether they had been contemporary in use, however, is difficult to determine. All factors suggest such an interpretation. If so, then this is the earliest evidence for the deposition of pyramidal weights in Britain. Pit 8091 also contained pieces of shell-gritted briquetage salt container sherds, including a rim, a base (Fig. 4.5, 4 and 8) and a fragment from a round-section pedestal support stem, a type similar to briquetage supports found at Mucking North Ring (Bond, 1988, Fig. 27, 15). There may be an association between the briquetage and the clay weights if the latter are remnants of textile production, because salt can be used to fix the colours of some textile dyes. Pieces of clay weights, however, dominate the man-made material culture debris deposited in this feature. This clay weight deposit is unusual amongst the evidence from the entire Pode Hole quarry fieldwork.

The fragmentation of the weights, as well as the fragmented pottery and briquetage, could be significant as evidence of ritualised behaviour. In the absence of structural features defining a dwelling in the vicinity of these two features, it may be appropriate to suggest that the deposits represent purposeful or structured deposition of a special nature at some distance from a settlement rather than refuse disposal

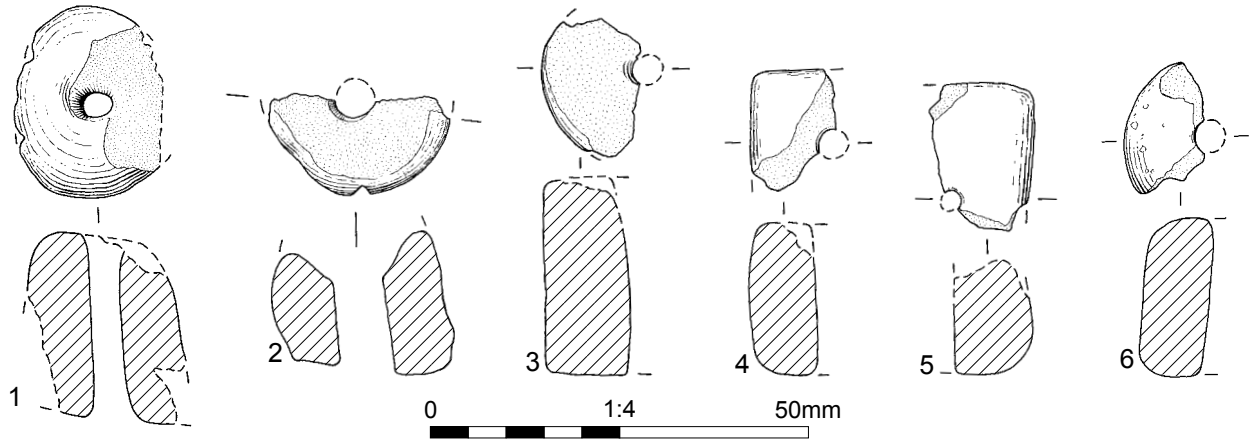

Figure 4.3: Clay weights 1-6.

around the homestead. If simple disposal was the activity creating the deposits, then where are the majority of pieces of pottery, briquetage containers and supports and clay weights? At Black Patch, East Sussex, the ten cylindrical weights recovered from the hut floor were either complete or reconstructable, suggesting that the hut was the primary location of use and abandonment. In contrast, the presence of so small an amount of so many different weights of different types in one pit at Pode Hole quarry strongly indicates that this is more than simple discard or disposal. An array of domestic activities is represented by the materials deposited in pit 8091: food storage and processing (in the form of household pots), salt production (briquetage) and, most importantly, textile production and/or thatching, as shown by the clay weights. All of these activities contribute towards the subsistence and survival of the social group. However, the two deposits do not appear to be near domiciles within the excavated area; rather, they are located on its edge. It may be that these deposits are evidence of the propitiation of life forces through earthly burial of fragments near the margin of the settlement zone at the Fen-edge, or that they are a mark of the significance of the range of subsistence activities which make the community function as a whole with fragments acting as metaphors of community life. A national review of clay weight evidence from Bronze Age sites would be welcomed in order to provide a wider context and understanding within which to place this significant collection of weights, whatever their purpose.

Catalogue of illustrated clay weights (Figure 4.3)

(CWRN, clay weight record number in database)

1. Cylindrical weight; height, 90mm; diameter, 90mm; perforation diameter 15-18mm; oxidised on surfaces, unoxidised core; c. 70% of weight present; CWRN 1007, context 8301, pit or posthole 8300.
2. Cylindrical weight; height, > 90mm; diameter, c. 85mm; perforation diameter, c. 25mm; oxidised on surfaces, unoxidised core; two joining pieces from different features and a third fragment from one; CWRNs 1006/1012, contexts 8301/8351, pit or posthole 8300/pit 8091.
3. Cylindrical weight; height, 100mm; diameter, 100mm; perforation just visible; oxidised throughout; CWRN 1010, context 8351, pit 8091.
4. Square weight; height, 84mm; perforation diameter, 13mm; corner piece fragment, c. 30% present; CWRN 1013, context 8351, pit 8091.
5. Pyramidal weight; corner piece fragment with two sides and base; height, > 75mm; perforation diameter, c. 10mm; CWRN 1002, context 8092, pit 8091.
6. Cylindrical weight; height, 84mm; perforation diameter, c. 15mm; c. 30% present; CWRN 1025, context 9108, pit 9107.

The Briquetage

by Elaine L. Morris

Summary

A very significant assemblage (714 pieces; 14,390g) of briquetage – ceramic material associated with the evaporation of brine to produce salt crystals – was recovered at Pode Hole quarry. It consists of shell-gritted fabric container sherds, quartz sand with detritus fabric pedestal fragments and evidence of a possible hearth structure made from an organic-tempered fabric. More than one fabric type was used to make the containers, sherds of which were recovered from three layers and nine features, mainly pits. The pedestals had been made from only one fabric type; complete or fragmented examples were deposited amongst seven layers and 20 features, mainly waterholes. Six of these features contained both container sherds and pedestal fragments. All of the briquetage was found on the eastern half of the excavated area near the Fen-edge, often in association with Middle or Late Bronze Age types of pottery. Sherds from two of these pottery vessels which retained interior burnt residue were submitted for radiocarbon dating. The results confirmed that salt production took place during or after the mid-second millennium BC which makes this area of the Fen-edge the earliest location in eastern England for such an important industrial activity.

Introduction

A total of 389 container sherds (3061g), 78 pieces (10,084g) from pedestal supports, and 247 undiagnostic or miscellaneous pieces (1245g) of ceramic material associated with salt production were identified from both hand-excavated and sieved environmental samples (Table 4.3). The assemblage is in a generally fragmented but moderately good condition despite the considerable number of pieces which are covered, or at least affected, by deposition of iron oxides through the fabric and as surface accretions. Some fragments have grains of quartz sand derived from the soil attached to the original surfaces and fractured edges in these accretions.

The assemblage has been analysed and recorded according to the system established for the analysis of ceramic materials associated with prehistoric salt production in the Fenland (Lane and Morris, 2001). The form codes used in this report follow the established codes directly while the definitions assigned to fabric codes are unique to Pode Hole quarry because form types are often similar across the region while the fabric types display local variability. The detailed computerised dataset is available within the archive.

Fabrics

There are two major and three minor fabric types identified amongst the briquetage (Table 4.3). Three shell fabric types (S1-S3) used to make briquetage containers are described in the prehistoric pottery report (see above). The same fabrics were used to make both pottery vessels and briquetage containers. Therefore, the fabrics used to make briquetage containers were not unique to that system of production but were common fabrics used by potters to make their vessels as well.

The quartz sand and detritus fabric (Q1), used to make briquetage pedestals, and the organic-tempered fabric (V1), which may have been used to make a hearth structure, are described below. Fabric Q1 was also used to make clay weights (see that report).

The container sherds were normally made from either the finer, shell-gritted fabric S1 (76.9% of the containers) or coarser shell-gritted fabric (22.6%). However, two small sherd flakes recovered from context 8065 of waterhole 8062 also appear to be from a briquetage container and these were made from shell-gritted fabric S3, a similarly rare pottery fabric. All three fabrics were most likely to have been made from the naturally shell-gritted Jurassic clays, found within 1km of the excavated area by the inlets or brackish steams of the Fen-edge where production hearths would have been located. It is intriguing that three-quarters of the briquetage should have been made from only one of the pottery shell-gritted fabrics. It is important to emphasise that none of the briquetage containers had been made from grog-tempered fabrics, a situation which seems to have occurred at Billingborough (Cleal, 2001, p.58, Fig. 29, 3-5). Therefore, it appears that salt production at Pode Hole quarry took place after the use of grog-temper in vessel fabrics had been replaced by the selection of shell-gritted fabrics. This chronology is discussed further below.

In strong contrast, the only fabric type used to make supports or pedestals which held the containers above the salt evaporation hearths was fabric Q1. This was a rough, quartz sand fabric with occasional, large and small fragments of naturally occurring weathered flint, displaying cortex and patination or iron ore detritus present. The closest source for this fabric is most likely to be an alluvium deposit from along the banks of a nearby river where silty deposits of sandy clay in which there are occasional seams of gravel can be found (Chatwin, 1961, p.77). This fabric appears to have been only briefly wedged to create the large pedestal supports with their horned tops as shown by the layers and folds of clay visible in the fractured pieces and the presence of the large pieces of naturally occurring detritus still present in the clay. Nevertheless, the pedestals had been smoothed on the exterior surfaces during the damp stage of manufacture.

There are also four pieces of briquetage material found in context 8233 of cut 8291, part of Pond Cluster 1, which were made from an organic-tempered fabric (V1). The material fragments may have originated from a heating structure such as a hearth but this is uncertain. The single surface still present was bleached through a depth of 3mm of the largest fragment which is at least 41mm thick. These fragments appear to have been part of a structure built up using successive layers of clay. The use of organic-tempered fabrics to make briquetage containers and supports was a common technique during the later prehistoric period both in Lincolnshire as at Tetney during the Late Bronze Age and elsewhere in the country from the Middle Bronze Age to the Roman period (Lane and Morris, 2001, table 98) but it was not used in this particular part of the Fenland until the later Iron Age and Roman periods (Lane and Morris, 2001).

Quartz sand fabric

Q1 quartz sand fabric with various detritus

Rare to sparse (1-7%), rounded to sub-angular, patinated and cortex-bearing flint, < 20mm, and rare (1-2%), rounded to angular iron oxide fragments, < 3mm in a clay matrix containing common to very common (20-30%), moderately well sorted, sub-rounded to sub-angular, quartz sand, < 0.8mm; laminated texture, due to the unwedged nature of this fabric, revealed in fresh fracture; this is an un-cleaned clay with no added temper.

Organic-tempered fabric

V1 organic-tempered quartz sand fabric with detritus

Common to very common (25-30%), linear, chopped organic matter, < 8mm long, added to the Q1 fabric clay matrix.

Feature	Cut	Fill	Sample	Containers						Pedestals		Miscellaneous/Other			
				S1		S2		S3		Q1		Q1		V1	
				CT	WT	CT	WT	CT	WT	CT	WT	CT	WT	CT	WT
(a) Hand-excavated															
Pits cutting Ring-ditch 1	4432	4434	(SF8003)							1	1062				
Fen-edge Pit Cluster 4	7514	7519	-							1	127				
	7514	7589	-	19	72										
	7514	7679	-									2	41		
	7586	7508	-	2	30	84	668			4	68				
	7586	7509	-	10	17										
	7586	7577	-							3	101				
	layer	7507	-	47	208					2	19				
Fen-edge Pit Cluster 2	7213	7211	-							1	33				
7566, Possible Saltern	7440	7439	-									5	74		
7567, ditch connecting possible saltern to Fen-edge Pit Cluster 3	7431	7434	-			3	13			1	17	5	116		
	-	7300	-	7	36					1	21	33	509		
Fen-edge Pit Cluster 3	7218	7382	-			1	33			3	4980				
	7218	7485	-							1	32				
	7218	7654	-							1	267				
	7529	7499	-							1	16				
	7529	7500	-							1	20				
	7529	7532	-									6	15		
	7529	7540	-							2	56				
	7529	7542	-									7	11		
	7707	7385	-	5	18					1	4	1	6		
	7707	7438	-							1	82				
	7707	7477	-							1	1538				
Waterhole pit 7220	7220	7234	-							1	33				
Ditch 8209	8209	8215	-							1	28				
Posthole 8079	8079	8078	-							4	29				
Pond Cluster 1	8291	8232	-							19	553				
	8291	8233	-											4	36
Posthole/pit 8263	8155	8147	-	75	1325					4	106	4	38		
Waterhole pit 8459	8062	8065	-					2	2						

Feature	Cut	Fill	Sample	Containers						Pedestals		Miscellaneous/Other			
				S1		S2		S3		Q1		Q1		V1	
				CT	WT	CT	WT	CT	WT	CT	WT	CT	WT	CT	WT
Burnt layer	-	8013	-							1	30	1	8		
(voided)	(voided)	8066	-							2	15				
One metre pit	8091	8351	-	24	257										
Waterhole pit 9125	9125	9173	-							1	68				
Pond Cluster 2	9320	9359	-							4	285				
	9320	9360	-							13	492				
(b) Sieved environmental samples															
Pond 7207	7528	7576	6118									1	4		
Waterhole pit 7208	-	7672	6136									1	2		
Fen-edge Pit Cluster 4	7586	7508	6121	2	4										
Fen-edge Pit Cluster 2	7213	7212	6092									4	10		
	7246	7245	6077	2	4										
	-	7205	6084									4	6		
	-	7357	6087									5	5		
Group 7567, ditch connecting possible saltern to Fen-edge Pit Cluster 3	7431	7434	6098									87	254		
	-	7300	6097	3	9							48	88		
Fen-edge Pit Cluster 3	7707	7385	6102									3	2		
Waterhole pit 7214	7214	7268	6076									1	1		
Cremation 7380	7379	7380	6083									10	5		
	7379	7380	6090									15	14		
Posthole/pit 8263	8155	8147	8012	100	364										
Waterhole pit 8459	8110	8111	8001	3	1										
	-	8064	8000							2	2				
Total	*N/A*	*N/A*	*N/A*	*299*	*2345*	*88*	*714*	*2*	*2*	*78*	*10084*	*243*	*1209*	*4*	*36*

Table 4.3: Contextual catalogue of Briquetage.

Forms

Fragments from containers, supports, a possible heating structure and miscellaneous materials were identified.

Containers

Four different types of briquetage container rims were identified. Two of these types, the cut rim (Briq R1; Fig. 4.5, 1) and the rounded rim (Briq R3; Fig. 4.5, 2), are commonly found on early Iron Age and Iron Age salt production sites in the Lincolnshire Fenland, during Phase 2 at Billingborough (Bacon, 2001; Cleal 2001, p.57), at Langtoft (Morris, 2001b), Market Deeping (Morris, 2001c) and at Cowbit (Morris, 2001a). Two types, a flattened rim container (Briq R8; Fig. 4.5, 3-4) and a container with a slender, pointed rim (Briq R9; Fig. 4.5, 5) appear to be unique to the Middle Bronze Age repertoire of briquetage container types at present. The cut rim is famous for the method of its manufacture; this consists of slicing a cylinder of clay in half along its length, which creates two troughs, and adding a half-moon slab of clay to the open end (Lane and Morris, 2001, Fig. 92). The rounded rim could simply be a smoothed over version of the cut rim type. The other types may well have been constructed like domestic pots, by slab or coil-building, and can be referred to as salt pans.

Two different base profiles (Briq B1 and B8; Fig. 4.5, 6-9) were also identified. All other fragments are body sherds from large containers, often with quite substantial walls (Fig. 4.5, 10). It may be that some of these 'body' sherds are actually from the flat base zone of containers; no complete profile of a Bronze Age salt container from Lincolnshire has ever been found. Some of the containers could be broad, flat, shallow pans rather than the very distinctive cut rim, trough-shaped cylindrical type of vessel well-known in the Fenland (Lane and Morris, 2001, Fig. 92). A very similar, large thick body sherd of briquetage was found at Padholme Road, Fengate (Pryor, 1980, Fig. 13, 1).

These briquetage pans and troughs were used to dry wet salt crystals, but there is no evidence in eastern England for their use as vessels to transport the salt to consumer sites (but see Cleal, 1990, p.58 for possible disagreement), which did occur extensively elsewhere in Britain (Morris 1985, 1994b, 1994c, 2001d). Instead, there is ample evidence, not only on the Pode Hole quarry briquetage container sherds but also in other prehistoric briquetage assemblages in the Fenland (Morris, 2001a, b, and c; plate 4b), for the scraping out of the salt from the interior of these troughs and pans.

It is evident that these containers had been used in association with saltwater and heat as shown by the presence of a distinctive white bleached effect to the fabric of nearly all of the sherds. This effect, which occurs with repeated long-term use of the containers for this purpose (Morris, 2007) is probably the result of chemical changes affecting the iron-rich clay matrix, but may also involve the movement of salts to the surface of the vessels (Matson, 1971; Peacock, 1984). Some of the sherds also displayed evidence of interior abrasion which may have resulted from scraping out of the salt during the saltmaking process.

Very small fragments of briquetage container sherds were recovered from sample 6077 of pit 7246 in Fen-edge Pit Cluster 2 which had not revealed larger sherds of pottery or any briquetage during excavation. This emphasises the significance of systematic sampling and sieving procedures which can tie-in apparently unrelated features and site activities otherwise excluded because of lack of apparent dating evidence.

- *BriqR1 cut rim* (Fig. 4.5, 1).
- *BriqR3 rounded, upright rim* (Fig. 4.5, 2).
- *BriqR8 flattened rim, expanded to exterior and/or interior; possibly folded over to interior* (Fig. 4.5, 3-4).
- *BriqR9 slender, pointed rim* (Fig. 4.5, 5).
- *BriqB1 flat base with sharp base angle* (Fig. 4.5, 6-8).
- *BriqB8 flat base with rounded base angle* (Fig. 4.5, 9).
- *BriqBS1/2 body sherd* (Fig. 4.5, 10).

Supports-Pedestals

The most distinguishing characteristic of this salt production ceramic assemblage is the presence of very substantial pedestal supports used to secure the containers over open-fire hearths for at least drying the salt crystals if not actually boiling the brine itself to evaporate the water. There are three types of pedestal in the Pode Hole quarry assemblage: a square-sectioned, solid, brick-shaped pedestal (PD17; Fig. 4.4, 11-15), a very solid pedestal which is sub-rectangular in plan with rounded corner sides and two horn-like projections on the top (PD18; Fig. 4.5, 16-17), and a round-stemmed, slender pedestal with a circular, flat footplate (PD19; Fig. 4.5, 18-21). Fragments of similar briquetage pedestals were recovered from the same phase group features as these diagnostic examples but it is extremely difficult to determine which pedestal type is represented by these fragments. Therefore, the fragments are represented by form codes PD98 and PD99.

One complete and one nearly complete example of type PD18 (Fig. 4.5, 16-17) were recovered from waterhole pit 7218, part of the inter-cutting Fen-edge Pit Cluster 3. These massive objects, weighing 2.22 and 2.09kg respectively, display evidence indicating that they were used to support containers. Each has a cup-like groove on the top, apparently formed by the use of a stick as shown by the presence of faint scratches along the groove, so that container troughs in particular could be stabilised. In addition, there are identical patches of oxidised, orange clay zones on one side of this top zone

which indicates that the containers were positioned between pairs of these pedestals since the opposite sides were bleached white from the continuous splashing from the adding of brine into the containers as the water evaporated and the dripping of brine down the exterior sides of the supports. These objects are 16.8cm and 15.8cm tall; on average only slightly taller than the PD17 examples, and may be part of a set of pedestals (see below). Another PD18, which is missing its top half and weighs only 1.1kg, was found in waterhole 4432. Other small fragments which appear to derive from type PD18 pedestals were also identified.

Two nearly complete and large parts of two other type PD17 pedestals (Fig. 4.5, 11-14) were recovered from features 7218 and 7707 which are both part of Fen-edge Pit Cluster 3, where the best preserved PD18 examples (described above) were found. These are less massive objects than the PD18 examples; the nearly complete ones weigh 1.54 and 1.26kg and are 15 and 15.8cm tall respectively. Another well-preserved example of PD17 was found in waterhole pit 9125. Both of these types of Middle Bronze Age briquetage pedestals from Pode Hole quarry are at least 50% bigger that the three-tined pedestals found in the Middle Bronze Age deposits at Brean Down in Somerset (Foster, 1990, p.165, Figs. 116, 119-120). Broken examples of PD17 supports revealed that they were made by folding over layers of clay repeatedly and then smoothing the surface to finish the shape. The resulting top end construction of PD17 supports may have been better suited than PD18s to receive the shape of the container troughs; it is this design which was developed further in the Late Bronze Age/Early Iron Age at Billingborough and in the early Iron Age at Langtoft when horned, pyramidal pedestals with substantial footprints were used (Chowne, et al., 2001, Figs. 30-34; Lane and Morris, 2001, Figs. 89-90). Again it is possible to see that the containers were positioned on top of these pedestals because one top corner had been protected from the bleaching effect of the splashing brine (Fig. 4.5, 5-8). It may be that PD17 was an improvement of the PD18 design, but this cannot be confirmed at present; it may simply represent pedestals made by different saltmakers or a range of pedestals required to conduct the evaporation process with PD17 and PD18 types used at the same time. Crosby (2001) has suggested that the different sizes of Late Iron Age pedestals found in the Ingoldmells Beach unstratified collection may have been used to set evaporation pans deliberately at an angle, and the Pode Hole material could have been designed for this same method of evaporation. Or it may simply be that contemporary saltmakers made their pedestals in different ways since these types were found in Fen-edge Pit Cluster 3.

Fragments of pedestal type PD19 were only found in pit 9130. This type consists of a round stem and at least one circular footplate (Fig. 4.5, 18-21). Two examples of footplates from this feature are truly flat while two examples are slightly rounded in cross-section and therefore less stable as pedestal bases. If this is significant, then it may be that the slightly rounded footplates are for resting on the irregular floor of the salt-hearth while the truly flat footplates are for resting the base of a container above the fire in the hearth and are the tops of PD19 pedestals. These pedestals are also bleached on the exterior surfaces, and occasionally into the interior core of the pedestal stem as well, but this may be misleading, as such effects could be due to post-deposition accretions. An identical example of a round-stemmed and circular footplate pedestal was recovered at Billingborough in the topsoil (Bacon, 2001, Fig. 33, 71).

The Pode Hole quarry pedestals are thick, densely structured and quite hard-fired. The evidence of their use as salt production pedestals is very clear with both white, salt-bleached exterior surfaces and also evidence of this bleaching even into the interior core of the thick, densely structured pedestals in some cases. What is extremely striking about all of the diagnostic examples in the collection is the actual extent of the bleaching of their surfaces, which in the more fragmented PD17 examples is seen to have penetrated into the interior of the pedestals. In fresh fracture it is possible to see the extent of the salt effect on the clay matrix colours with peculiar pinks and purples evident; these salt colours have been observed on pottery in Mesopotamia (Matson, 1971) and North Africa (Peacock, 1984) in association with the use of salt water during manufacture of those vessels. Salt-bleaching is known to occur on briquetage of Iron Age and Roman date (cf. Lane and Morris, 2001), and is discussed further below.

- *PD17 squared cross-section 'brick' with pair of 'horns' or a hint of one 'horn' or broad groove on top, sharp or rounded corners to the untapered but slightly waisted sides and finished surfaces* (Fig. 4.5, 11-15).
- *PD18 sub-rectangular pedestal with pair of 'horns' created by pressing a branch or similar rounded instrument onto the top of the pedestal, only slightly tapering sides with rounded corners and finished surfaces* (Fig. 4.5, 16-17).
- *PD19 round-stemmed pedestal with circular, flat, splayed footplate* (Fig. 4.5, 18-21).
- *PD98 fragment of pedestal stem and foot undiagnostic to type (not illustrated).*
- *PD99 fragment of pedestal undiagnostic to type (not illustrated).*

Possible structural material and miscellaneous

There are a few pieces of undiagnostic but salt-affected, fired clay materials in fabric Q1 which are classified as miscellaneous (Morris, 2001a). In addition, four pieces of organic-tempered material (fabric V1) may have originated from a simple, open hearth floor or had been

part of an experiment to use a new fabric type to make pedestals.

- *FC99 fragment undiagnostic to specific form type (not illustrated).*

Deposition and recovery

No container sherds were found in the entire western half of the excavated area, with only a single, large pedestal fragment having been recovered from cut 4432, one of the waterhole pits that cut Ring-ditch 1. However, fragments or complete examples of pedestals were found in 21 features and layers all along the eastern half of the excavated landscape (Fig. 4.4). In contrast, sherds from containers were unevenly distributed amongst nine features or layers in the eastern half, with rich deposits of sherds recovered from waterhole 7586 and layer 7507 (Fen-edge Pit Cluster 4), post hole/pit 8155 (group 8263) and pit 8091.

Fabric S1 container sherds were recovered from features located along the eastern half of the area, but fabric S2 container sherds were confined to the central part of the excavated area only. The very small quantity of fabric S3 sherds were found in waterhole 8062 only. This contrasts with the frequency of pottery fabrics recovered; amongst the shell-gritted pottery in the north-eastern part of the landscape, half was made from fabric S2, therefore the deposition of fabric S2 briquetage was not coterminous with the deposition of fabric S2 pottery.

Support type PD17 was found in five features across the eastern half of the area; two of these are in the north-eastern part and three in the south-western part. In three of these features, the pedestals were found with container sherds, and in three with PD18 supports. All but one of the sub-rectangular PD18 supports were found in features located in the southern part of the eastern half of the excavated area, one having been recovered from waterhole 4432 at some distance from all other briquetage deposits. In three of these features, the type PD18 pedestals were found with container sherds and in three with PD17 supports, as mentioned previously. In complete contrast, all of the type PD19 examples, between four and eight of these round-stemmed pedestals with circular baseplates, were found in the charcoal-rich pit 9320, part of Pond Cluster 2. No pieces of briquetage containers or any other types of pedestals were associated with these very distinctively stemmed pedestals.

Therefore, the deposition of briquetage containers and pedestals was relatively infrequent and dotted across the eastern half of the project area. Whilst the part of this site may not have been the actual location of salt production activity, it may have received briquetage debris from nearby activities located just outside the excavated area to the east. The presence of a single pedestal in waterhole 4432, over 100 metres west of the main area of briquetage deposition, suggests that people may have re-used these massive clay objects for other purposes as well. The same fabric type used to make briquetage pedestals was used to make clay weights (see that report).

Dating by association

Dating evidence for salt production comes from the association of briquetage material with distinctive pottery types in six features. Some of these pottery vessels had been used as cookpots and displayed burnt residues on their interiors, two of which provided samples for radiocarbon dating.

The association of briquetage with ceramic phase 2 (CP2) pottery was demonstrated in the contents of one metre pit 8091. This pit contained 24 sherds (257g) from briquetage containers (Fig. 4.5, 4 and 8) in association with a mixed pottery assemblage including a single sherd from the decorated collar of a Collared Urn (Fig. 4.1, 12), five bodysherds from three grog-tempered vessels of Early/Middle Bronze Age type, and a rim sherd from a Middle Bronze Age Deverel-Rimbury Bucket Urn-type vessel, with incised decoration on the flat rim, made from fabric S2 (Fig. 4.1, 34). This deposit is discussed as an example of the end of CP2 activity due to the similarity in size of the pottery sherds recovered including the single shell-gritted rim. What is interesting is that this pottery vessel was not made from the same shell fabric as that used to make the briquetage containers found with it (S1).

The deposits recovered from three waterholes provide examples of the association of briquetage with ceramic phase 3 (CP3) pottery. Fen-edge Pit Cluster 3 and 4 contained sherds from several diagnostic vessels, including a decorated Deverel-Rimbury style Barrel Urn-type vessel, dated to 1410-1200 cal BC (SUERC-12097), an undecorated ovoid jar of Middle Bronze Age Bucket Urn-type, dated to 1410-1210 cal BC (SUERC-12096), a second ovoid jar, two additional Deverel-Rimbury style Barrel Urn-type vessels and a decorated Middle Bronze Age type vessel, all made from shell-gritted fabrics (S1-S2) (Fig. 4.1, 23 and Fig. 4.2, 29), in association with 116 briquetage container sherds (820g) (Fig. 4.5, 1, 3, 5, & 7) and PD17 and PD18 supports (Fig. 4.5, 11-14 and 16-17). Briquetage container sherds (Fig. 4.5, 2, and 9-10) were also recovered from pit 8155 in association with CP3 sherds of S2 fabric pottery including one of the Barrel Urn-type jars, a Bucket Urn-type vessel with finger-tip decoration, which was salt-affected, and a Middle Bronze Age Deverel-Rimbury style vessel with an applied strip (Fig. 4.2, 30-32). These shell fabric potsherds (3; 50g) are interpreted as part of CP3 but the presence of a single sherd of D1 fabric pottery (2g) and one of Q2 (2g) may

indicate a final infilling of this feature during the post-Deverel-Rimbury (PDR) Late Bronze Age phase or later.

Pit 9320, part of Pond Cluster 2, contained the largest amount of pottery in the southern part of the excavated area in addition to the largest amount of clay weight fragments and the only examples of type PD19 pedestals. The pottery has been assessed as belonging to ceramic phase 4 (CP4) because, while it has only S1 and S2 fabric sherds, the types of vessels are typical of this phase with two ovoid jars and a PDR Late Bronze Age shouldered jar (Fig. 4.1, 41-43).

Therefore, the contents of six different features show that briquetage was deposited during the later Bronze Age, from the Middle Bronze Age into the Late Bronze Age period, and demonstrates that salt production was taking place during the second half of the second millennium BC.

Figure 4.4: Distribution of briquetage.

The saltmaking on the Fen-edge

Given that there is no environmental evidence that seawater ever came near or onto the site during the Bronze Age (Rackham, this report), how can we determine the significance of this briquetage assemblage from Pode Hole? Where was production occurring? What is the nature or level of production as an industrial activity? Was the amount of production for local consumption, or for regional and wider distribution?

None of the briquetage was recovered from primary deposits; there are no hearths, settling tanks or feeder ditches as are found on Iron Age and Roman salterns (cf. Lane and Morris, 2001). However, the number of briquetage fragments is similar to the number of sherds of pottery recovered from the excavations (although the quantity of briquetage is three times greater due to the great weight of each pedestal). At Iron Age salt production sites, the quantity of briquetage is always far greater that the quantity of pottery and is used as a factor for confirming the function of such sites. Salt consumer sites, in contrast, have a reversed ratio with far more pottery than briquetage containers if the salt is transported in these evaporation vessels (Morris, 1985; 1994b; 1994c). Because there are few Middle and Late Bronze Age salt production sites in Britain that have been excavated (Morris, 2001d), it is not yet certain how to interpret the level of salt production at these sites. Nevertheless, the ratio of briquetage to pottery at Pode Hole quarry suggests that the nature of production may well be in excess of production for local consumption indicating that the saltmakers were making salt for trade, but this topic needs further research.

One aspect which would support such an interpretation is the level of intensification of production which is visible on the briquetage itself. During the first millennium BC, the evidence for intensification provided by the degree of bleaching on the container sherds and pedestal fragments recovered is restricted to the exterior of some sherds and a thin skin of white on the supports. In addition, it is possible to infer the positioning of the pedestals, usually pyramidal in shape, by the absence of bleaching effect on one side of these substantial objects. At the end of this period and into the Roman period, salt production does intensify with evidence of completely bleached container sherds and heavily bleached support pieces (Morris, 2007). The finds from Pode Hole quarry suggests that, during the second millennium BC, salt production was just as intensive as at the end of the first millennium. This is shown by the repeated use of the pieces of briquetage resulting in complete bleaching of container sherds and bleaching sometimes into the cores of pedestals, even though the amount of briquetage recovered is modest when compared with Late Iron Age and Roman assemblages. This discovery needs to be assessed by comparison to the Late Bronze Age salt production evidence along the Fen-edge at Welland Bank Quarry (Pryor, 2006), Nine Bridges, Northborough (Knight, 1998) and Langtoft (Dickens, 2006), once these assemblages have been analysed and fully published, in order to determine if the evidence from Pode Hole quarry is unusual or part of a general later Bronze Age phenomenon along the Fen-edge and why this should be the case. There is no evidence to explain why salt production began in Britain during the Middle and Late Bronze Age period and whether the reason for this might be similar to the intensification of production a thousand years later.

Potters, saltmakers and clay weight makers

There is undoubtedly a very strong link between pottery vessels of Middle and Late Bronze Age date and contemporary salt production containers at this location. Both types of artefact are made from the same shell-bearing fabric types. In contrast, the pedestals, made to support the saltmaking containers over an open fire, are made from sandy clays which have not been cleaned of flint detritus. These pedestals are reminiscent of loomweights or clay weights in their massiveness and finished appearance. Handmade pottery made for local use is nearly always associated with production by women, and even when the level of production increases to provide pots for trading beyond the local community use, it is nearly always a craft practised by women (Peacock, 1982, p.8). It is not possible to prove that this was the case here in the Pode Hole quarry landscape during the Middle Bronze Age where salt production occurred, but it is highly likely that prehistoric salt production was conducted by women, as indicated by the appearance of the manufactured ceramics. The containers are made from the same fabrics as the contemporary, domestic pottery vessels and the pedestals are finished in a style which is reminiscent of loomweights. If these supports were simply industrial objects for the production of salt and utilised only at the source of production, then there would have been no reason to finish their surfaces with any extra effort – but these are finished objects. It may be that the motor habits of potters, women who were also weavers, can be seen in the production of these ceramic containers and pedestals which are part of the saltmaking repertoire.

Catalogue of illustrated briquetage (Figure 4.5)

(PRN or BRN, Briquetage Record Number)

Containers

1. Briquetage container; cut rim BriqR1; fabric S1; abraded interior; oxidised throughout; context 7508, waterhole 7586, Fen-edge Pit Cluster 4; PRN 1033.

2. Container rim; rounded rim BriqR3, fabric S1; bleached white on both interior and exterior surfaces; context 8147, posthole/pit 8155, group 8263; BRN 1207.

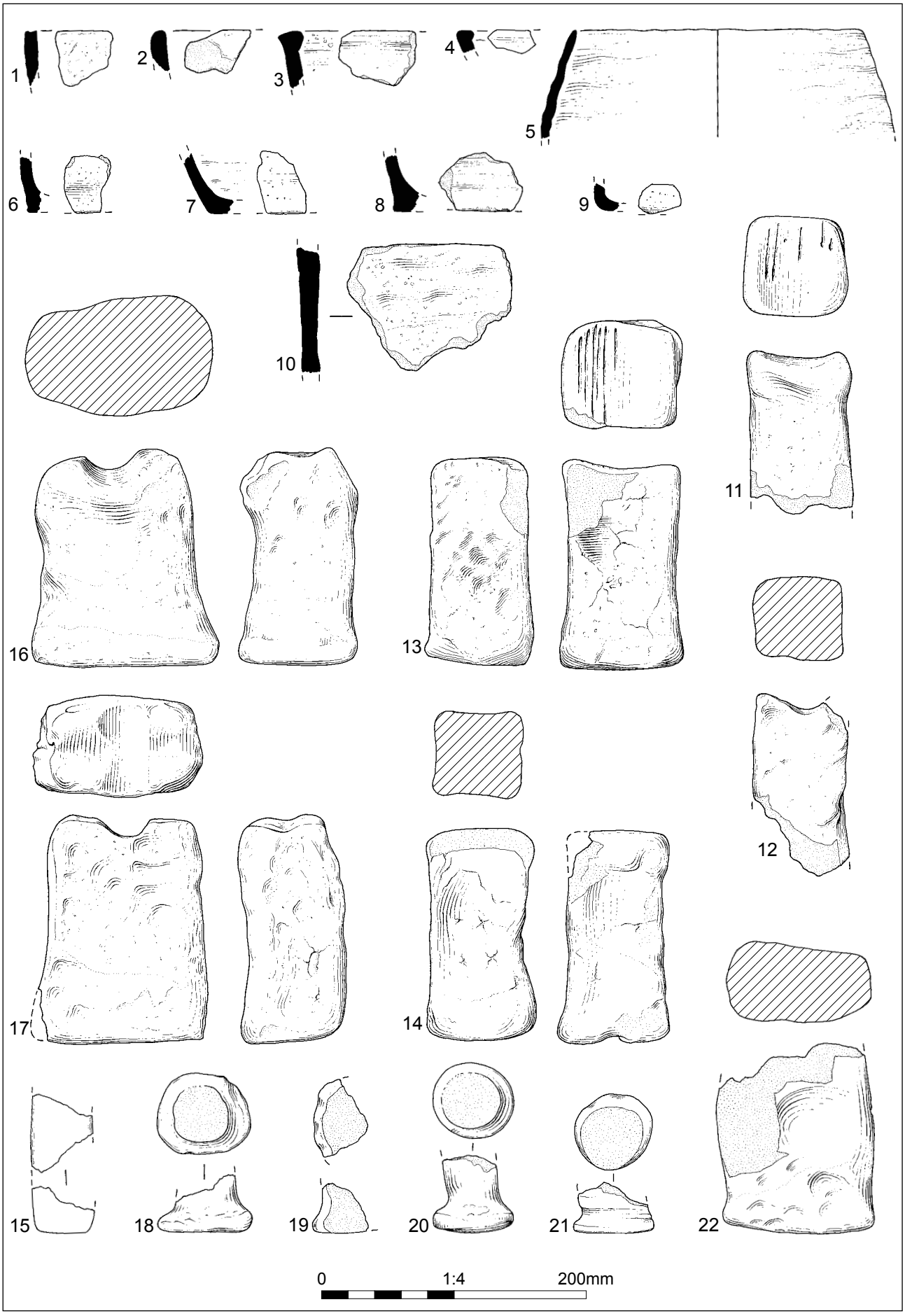

Figure 4.5: Briquetage 1-22.

3. Briquetage container; flattened rim BriqR8; fabric S2; bleached white on exterior, core and most of interior; context 7382, possible waterhole/large pit 7218, Fen-edge Pit Cluster 3; PRN 1008.
4. Container rim; flattened rim BriqR8, fabric S1; bleached white throughout; context 8351, pit 8091; BRN 1216.
5. Briquetage container; pointed rim BriqR9; fabric S2; if circular, 9% of 22cm diameter present; abraded interior; oxidised throughout; context 7508, pit 7586, Fen-edge Pit Cluster 4; PRN 1034.
6. Briquetage container; flat base with curved wall, BriqB1; fabric S1; oxidised on exterior and interior, unoxidised core; context 7385, pit 7707, Fen-edge Pit Cluster 3; PRN 1013.
7. Briquetage container; flat base BriqB1; fabric S1; oxidised throughout; less than 5% present; context 7589, waterhole pit 7514, Fen-edge Pit Cluster 4; PRN 1047.
8. Container base; flat base BriqB1, fabric S1; bleached white on exterior surface, abraded from scraping on interior surface; context 8351, pit 8091; BRN 1210.
9. Container base; flat base with rounded base angle BriqB8, fabric S1; bleached white on both surfaces; context 8147, posthole/pit 8155, group 8263; BRN 1209.
10. Container sherd; bodysherd BriqBS1/2, fabric S1; slightly bleached white in general, possibly abraded from scraping on interior; context 8147, posthole/pit 8155, group 8263; BRN 1201.

Supports - Pedestals
11. Support; squared, brick-like horned pedestal, PD17; fabric Q1; half of top zone oxidised, remainder of object completely bleached; context 7382, waterhole 7218, Fen-edge Pit Cluster 3; PRN 1006.
12. Support; squared, brick-like horned pedestal, PD17; fabric Q1; between 50-75% oxidised, remainder mottled with bleaching; c. 60% of pedestal present; context 7382, waterhole 7218, Fen-edge Pit Cluster 3; PRN 1007.
13. Support; squared, brick-like horned pedestal, PD17; fabric Q1; top and one corner oxidised, remainder bleached on exterior with base zone particularly hardened; context 7477, waterhole 7707, Fen-edge Pit Cluster 3; PRN 1015.
14. Support; squared, brick-like horned pedestal, PD17; fabric Q1; top and one side oxidised, remainder bleached on exterior with base zone particularly hardened; context 7477, waterhole 7707, Fen-edge Pit Cluster 3; PRN1031.
15. Support; squared, brick-like horned pedestal; PD17, fabric Q1; irregular evidence for bleaching on exterior surfaces; context 9173, waterhole 9125; BRN 1415.
16. Support; sub-rectangular horned pedestal, PD18; fabric Q1; oxidised on half of top area, mottled bleaching on upper half, nearly completely bleached on lower half; context 7382, waterhole 7218, Fen-edge Pit Cluster 3; PRN 1004.
17. Support; sub-rectangular horned pedestal, PD18; fabric Q1; upper third oxidised, mottled bleaching of middle area, nearly completely bleached on lower third; context 7382, waterhole 7218, Fen-edge Pit Cluster 3; PRN 1005.
18. Support; round-stemmed pedestal; PD19, fabric Q1; white bleaching on exterior surface; context 9359, pit 9320, Pond Cluster 2; BRN 1416.
19. Support; round-stemmed pedestal; PD19, fabric Q1; white bleaching on exterior surface; context 9359, pit 9320, Pond Cluster 2; BRN 1417.
20. Support; round-stemmed pedestal; PD19, fabric Q1; white bleaching on exterior surface; context 9360, pit 9320, Pond Cluster 2; BRN 1419.
21. Support; round-stemmed pedestal; PD19, fabric Q1; white bleaching on exterior surface; context 9360, pit 9320, Pond Cluster 2; BRN 1423.
22. Support; sub-rectangular pedestal, complete base, all edges rounded, sides complete; top horns missing-broken; PD18, fabric Q1; White-grey colouring faintly visible on exterior surface; Small Find 8003, context 4434, pit 4432, pits cutting Ring-ditch 1; BRN 1500.

The Flint Assemblage

by Tania Wilson

Introduction

A total of 508 struck flint artefacts were recovered from the Pode Hole project area. A number of natural unmodified pieces (174) were also collected, including some 12 burnt pieces weighing 55g. Flint artefacts were recovered during each phase of fieldwork and from all of the quarry 'Extraction Areas' excavated.

The majority, some 63%, of the artefacts were retrieved by hand. The remainding 187 struck pieces, were recovered from environmental samples. The majority (113) of these are small chips less than 10mm in length.

Methodology

All of the artefacts, struck and unmodified, have been recorded and catalogued. The catalogue is held with the site archive. The unmodified pieces have been listed with their quantities and weights recorded. The struck pieces have been recorded in greater detail, noting the following attributes: identification, breakage, condition, weight, raw material, presence/absence of cortex, type of striking platform, presence/absence of platform abrasion, termination type, and any further comments. Irregular chunks of waste, and chips of less than 10mm in length have been broadly categorised as 'knapping debris'.

The method employed for the measurement of flakes follows Saville's recommendations (1980, p.16). Cores have been classified according to Clark and Higgs (1960, p.216).

Raw material and condition

Where it could be determined, it appears that a wide range of raw material types has been selected for use. The proportions of each type are shown in Table 4.4. Each of the raw material types described in the table has examples containing opaque inclusions. The cortex varies between a buff or grey-colour and is invariably hard and worn. Two pieces have 'chatter' marks.

Raw material type		% of struck assemblage
Brown / Black opaque		1
Black, semi-translucent		49
Grey, opaque		3
Grey, semi-translucent		1
Grey / Brown, semi-translucent		12
Orange/Brown, semi-translucent		4
Indeterminate	Patinated	2
	Burnt	5
	Stained black	1
	Too small	22

Table 4.4: Raw material types.

The site is situated upon sand and gravel deposits, and based upon the range of types present, it is likely that gravel pebbles were the principal source for raw material. Some 11% of the struck pieces have scars produced by shattering along flaws within the flint, indicating that poor quality and shattered raw material was selected for use. This would be consistent with the use of flint from this source. The use of gravel pebbles for raw material has previously been recorded within the locality at Pode Hole Farm (Bevan, 2001, p.15) and at 'The Power Station site' at Fengate (Pryor, 2001a, p.321).

Only one piece within this assemblage, a core, may suggest that some raw material was collected from an alternative source. The core is made on a large nodule of black semi-translucent flint with a thick chalky cortex, and was presumably collected from a primary chalk source and brought to the site. However, no other artefacts of similar raw material were recovered.

As Table 4.4 shows, the raw material used for some 30% of the struck assemblage could not be determined. With the inclusion of pieces bearing only slight patination, some 5% of the assemblage is patinated. However the majority of the assemblage is in a fresh, unpatinated condition. Three artefacts, and a number of natural pieces, have been stained to a black colour. This staining, observed within the main matrix of the flint and also on the cortex, is probably the result of deposition within organic sediments, such as the peat encountered in the study area.

There is some evidence of post-depositional damage within the assemblage in the form of edge damage, which was observed on 10% of the assemblage. In addition, a further 28% are incomplete.

The assemblage

Cores

Some 46 cores were recovered. The composition of this group of artefacts and the mean weight of each class is presented in Table 4.5. A significant proportion of the cores (39%) are fragmentary, having broken along flaws within the flint. One keeled core appears to have shattered during flaking, but has subsequent flake scars demonstrating continued use (Fig. 4.6, 1).

Type		Quantity	%	Mean Weight (g)
Single-platform	A1	2	4	43
	A2	3	8	17
Multi-platform	B1	1	2	10
	B2	1	2	16
	B3	7	15	37
	C	6	13	131
Keeled	D	1	2	17
	E	7	15	15
Core fragment		18	39	22
Total		*46*	*100*	*N/A (complete cores)*

Table 4.5: Core typology.

A total of seven complete cores have natural scars demonstrating that shattered nodules were selected for use as cores, and one two-platform core reveals that very small nodules were also selected (Fig. 4.6, 2).

Multi-platform cores are the most common class of cores represented, but there is also a significant quantity of keeled cores present. Overall, as the mean weight shows, the majority of the cores are small in size. The smallest example, a keeled core weighing just 7g, appears to have been worked beyond the point of usefulness (Fig. 4.6, 3). In contrast the multi-platform cores with three or more platforms (type C) are the largest, with the heaviest example weighing some 518g (Fig. 4.6, 4).

Other cores worthy of note are a blade core (Fig. 4.6, 5) and a small flat core (Fig. 4.6, 6).

Flakes and blades

Some 34 blades were recovered, weighing a total of 84g. A relatively high level of breakage (68%) has been observed within this group of artefacts. However this is

likely to be due to the narrow shape of the blades. All of the blades were recovered from deposits dated to the Middle Bronze Age and later.

Some 224 waste flakes were recovered, weighing a total of 1064g. In contrast to the blades just 34% of the flakes are incomplete. As with the blades, the majority of the flakes were recovered from deposits of Middle Bronze Age and later date.

The dimensions of complete flakes and blades are presented in Tables 4.6-7. It can be seen that the assemblage largely consists of short squat flakes. However the blade element of this assemblage is poorly represented within this data, due to the poor survival of complete examples.

When the striking platform characteristics of blades and flakes are considered, it can be seen that plain platforms predominate. Relict core edges are evident on one blade and six flakes, demonstrating that core trimming was practiced, perhaps in an effort to capitalise on the better quality flint.

Hammerstone

One small hammerstone was recovered (Fig. 4.6, 7), measuring 31 x 28 x 27mm and weighing 26g. The hammerstone has a localised area of crushing, which is situated at the base of single platform core.

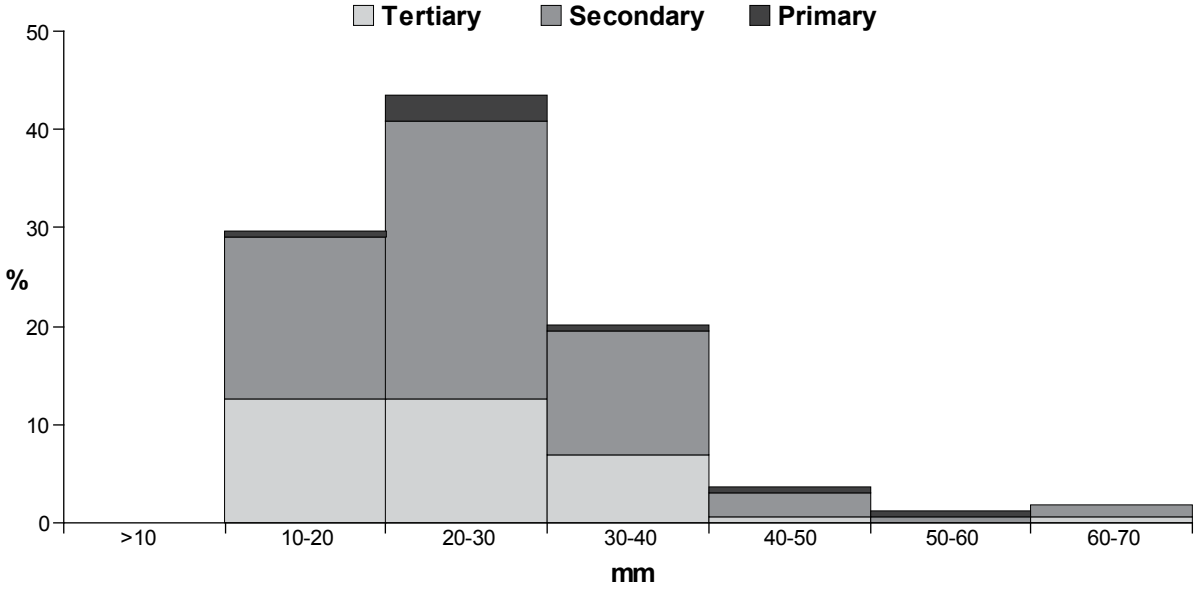

Table 4.6: Length of complete un-retouched flakes and blades.

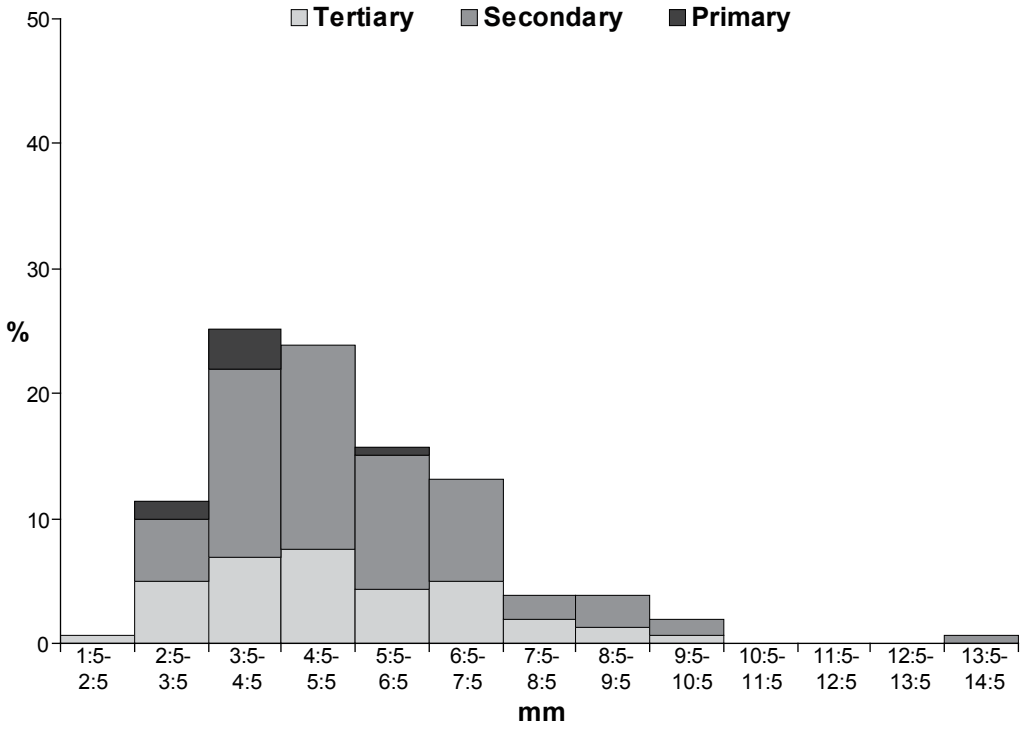

Table 4.7: Breadth to Length ratios of complete un-retouched flakes and blades.

Type	The Ring-ditches	The Field system	Middle - later Bronze Age occupation	Peat formation deposits	Post-Med, Unstratified & Unphased	*Total*
Arrowhead	0	0	0	0	2	*2*
Borer	0	0	0	0	1	*1*
Denticulate	0	0	1	0	0	*1*
Knife	0	0	2	1	2	*5*
Laurel leaf	0	0	0	0	1	*1*
Miscellaneous Retouched	1	1	7	0	9	*18*
Notched Flake	0	0	0	0	2	*2*
Scraper	0	5	11	0	13	*29*
Utilised Blade / Flake	0	0	3	1	5	*9*

Table 4.8: Retouched and utilised pieces.

Retouched pieces
Some 68 retouched and utilised pieces were collected, forming 13% of the overall assemblage. Table 4.8 shows the relative proportions of each implement type represented and the distribution.

Arrowheads
One leaf-shaped arrowhead was recovered; this piece has extensive flaking on the dorsal surface of a flake but is sparsely flaked on the ventral surface; the tip is absent (Fig. 4.6, 8). One barbed and tanged arrowhead was also retrieved; the arrowhead is long and narrow in form with extensive flaking on both surfaces. The barbs are incomplete and the tip is also absent (Fig. 4.6, 9). Although incomplete, the latter could be attributed to Green's Sutton b or c type (1984, p.29).

Borer
Only one borer was collected. This piece has a point at the distal end of a flake formed by a notch on the right-hand side.

Denticulate
One fragmentary denticulate was recovered. This piece, with at least two notches along one side, has a further notch at the distal end that serves to form a point (Fig. 4.6, 10).

Knives
A total of five knives were collected. One incomplete example has abrupt retouch along the left-hand side with probable evidence of use-wear along the right (Fig. 4.6, 11). Another fragmentary knife is cortical on the left-hand side, with flaking along the right which appears to be worn (Fig. 4.6, 12). This piece is also slightly burnt. The third has retouch along both sides (Fig. 4.6, 13). A blade was modified to form a knife with flaking along the left-hand side and probable use-wear on the right (Fig. 4.6, 14). The final piece, a fine plano-convex knife, has continuous invasive retouch along the entire piece (Fig. 4.6, 15).

Laurel leaf
One bifacially flaked piece was recovered, which may represent a fragment of a laurel leaf (Fig. 4.6, 16).

Miscellaneous retouched
This category comprises flakes and blades that are characterised by irregular flaking and retouch. Two main groups are evident within this category. The first consists of flakes and blades that have localised areas of retouch usually situated along part of one of the sides. The second group consists of some five flakes that have had one or more subsequent flakes detached from them. In each case the flakes have been detached from the ventral surface, the removals occurring in random locations around the edge of the flake including the bulbar end.

Notched flakes
Two small, notched flakes were recovered. In both cases the notch is located on the right-hand side of the flake, on one example it is located towards the distal end.

Scrapers
The largest group of implement types represented within this assemblage are the scrapers. Some 29 examples were recovered forming 41% of the retouched assemblage. This group comprises eight end retouched, 16 end and side retouched and four atypical examples.

Seven of the scrapers could be best described as thumbnail scrapers (Fig. 4.6, 17-23), in that they are small and circular. Few have the extensive invasive retouch that is characteristic of this form (Edmonds, 1995, p.140) but often this is due to the presence of cortex.

Other larger end and side retouched examples are also represented, including a fine horseshoe form (Fig. 4.6, 24).

The atypical scrapers demonstrate the application of a less formal approach to scraper production, and three examples are characterised by the retouch being situated at the bulbar end of the flake. Another example has only sparse retouch but appears to be making use of an angle created by a natural scar.

The dimensions of the complete scrapers are presented in Table 4.9. It can be seen that the scrapers are generally made on small squat flakes, which tend to be almost as

broad as they are long. As Table 4.9 shows, a number of the scrapers are broader than they are long.

Utilised blades and flakes
Some four blades and five flakes with possible utilisation damage were also collected. Utilisation damage in the form of slight chipping was observed along both sides of two blades and two flakes, along the left-hand side only on one blade and one flake and on the right-hand side only for the remainder.

Distribution

As Table 4.10 shows, the greater part of the assemblage was recovered from deposits associated with the Middle and Later Bronze Age activity, with a significant quantity being retrieved from post-Bronze Age deposits.

Very few flint artefacts were recovered from the earliest features encountered at the site. Ring-ditch 2 produced no flint artefacts, and Ring-ditches 3 and 4 produced just one flake each. However Ring-ditch 1 produced three flakes, two keeled cores and a miscellaneous retouched piece, all in a fresh unpatinated condition. Additionally, features cutting this ring-ditch produced one further blade, ten flakes and two scrapers, again in a fresh condition and it is possible that these artefacts are derived from the ring-ditch.

Deposits associated with the field system also produced relatively few flint artefacts, but included one keeled core, one core with two platforms, a fragmentary core, one miscellaneous retouched piece, and some five scrapers including a thumbnail example.

Spatially, the artefacts appear to be widely distributed across the study area, and there are no apparent clusters, other than the fact that the flints tend to occur more frequently in the areas where greater activity is represented by cut features. Furthermore the assemblages recovered from individual features tend to represent a general mix of artefact types, raw material types and pieces of varying condition.

Discussion

The greater part of the struck flint assemblage (65.5%) was recovered from features dating from the Early Bronze Age through to the later Bronze Age. The ring-ditches and field system contained only 7.5% of the total assemblage, whereas 58% of the total was recovered from occupation features dated to the Middle or later Bronze Age (Table 4.10). However the flint assemblage does not demonstrate any clear characteristics associated with Middle Bronze Age and later assemblages (Young & Humphrey, 1999, 239-240) and, based upon the assemblage composition and technological aspects, it appears that the bulk of the assemblage is likely to be associated with the Late Neolithic/Early Bronze Age activity on the site.

The assemblage includes a wide range of retouched forms, many of which are typologically diagnostic. The types of arrowheads represented can be considered to be indicative of a Late Neolithic/Early Bronze Age date,

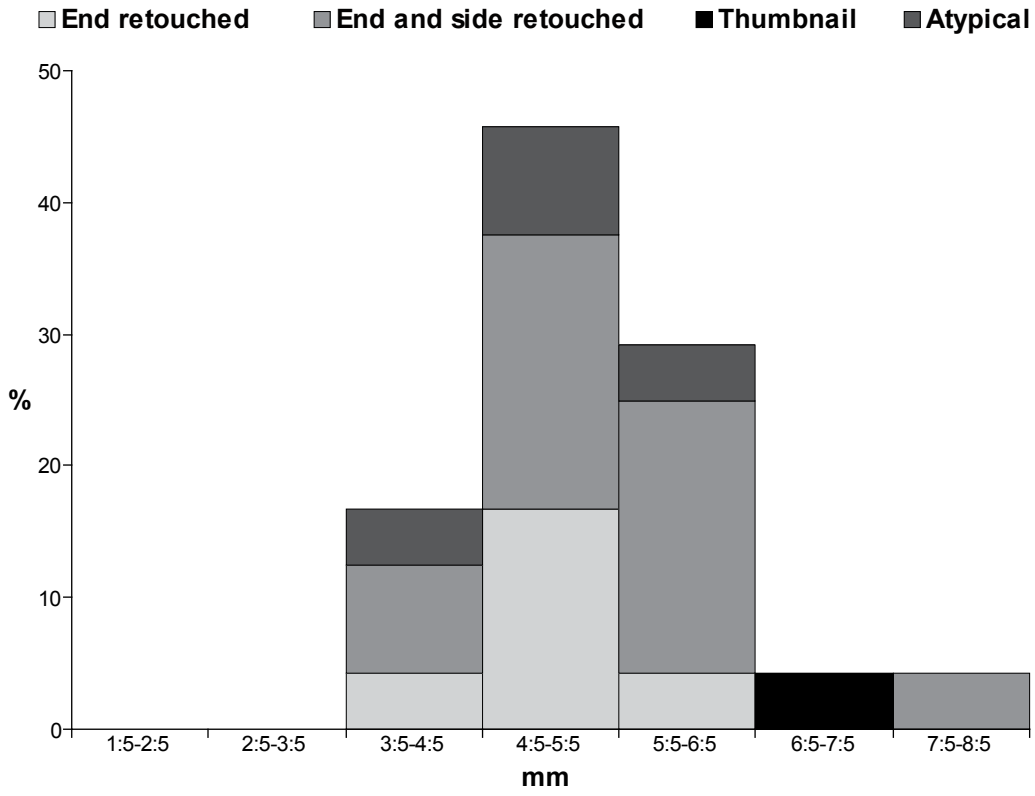

Table 4.9: Breadth to Length ratios of complete scrapers.

as Green (1984, p.33-35) has shown that leaf-shaped arrowheads and barbed and tanged arrowheads occur in Beaker contexts. The knives are also indicative of this period, as they are all scale-flaked, a practice often observed within Beaker industries (Healy, 1988, p.46). Of particular note is the fine plano-convex knife, the form of which dates from the later Neolithic and continues into the Early Bronze Age (Edmonds, 1995, p.159). Laurel leaves from early Neolithic contexts are known, but this form continues into the later Neolithic (Edmonds, 1995, p.47) and this piece is likely to be contemporary with the bulk of the assemblage.

A further aspect to consider is the predominance of scrapers within the retouched assemblage. Cleal has demonstrated the dominance of scrapers within Beaker-associated assemblages from eastern England (1984, p.151), and the high proportion of scrapers within the retouched assemblage from Pode Hole quarry are comparable with a number of Beaker domestic industries, for example the Beaker settlement at Belle Tout, East Sussex (Bradley, 1970; see also Healy, 1984, Fig. 2). Furthermore, thumbnail scrapers are also considered to be a common element of Beaker-associated assemblages (Edmonds, 1995, p.140).

Whilst the retouched forms shown clear associations with Beaker traditions, the core typology is somewhat less defined. Cleal has shown that Beaker industries are marked by a predominance of A2 type cores and unclassifiable cores (1984, p.151). However the Pode Hole quarry core assemblage is perhaps more akin to Cleal's grooved ware-associated core types, where a greater incidence of keeled forms is evident (1984, 155, Fig. 9.10). Healy has also demonstrated the association of keeled cores with grooved ware industries (1984, p.12), but the inclusion of this core type is also apparent within Beaker assemblages (Healy, 1984, p.11, Fig. 1). However, the Pode Hole quarry core assemblage is perhaps more comparable with the Beaker assemblage recovered from Chippenham, Cambridgeshire which comprised keeled cores and a high incidence of multi-platform cores (Healy, 1984, p.11, Fig. 1), and the core assemblage from Belle Tout, which also included a significant proportion of multi-platform cores (Bradley, 1970, p.345).

Further technological aspects of this assemblage also have affinities with other industries of Beaker date. Blades are often associated with Mesolithic and earlier Neolithic assemblages. However, the presence of blades within Beaker assemblages is recorded in Clarke's examination of grave groups (1969) and at Belle Tout (Bradley, 1970). It is likely, therefore, that the blades recovered from Pode Hole quarry are contemporary with the remainder of the assemblage. The dimensions of the flakes (Tables 4.6-7) demonstrate that the flakes tend to be short and squat rather than blade-like, a characteristic that Pitts (1978) has shown to be a trend for this period. The flake dimensions are comparable to those recovered from 'Layer 4' at the Beaker domestic site at Holywell Coombe, Kent (Healey, 1998, Fig. 6.21). Equally, as the scraper dimensions show (Table 4.9), broad flakes were largely selected as blanks for scraper production. The dimensions of the scrapers are comparable to those recovered from the Beaker levels at Windmill Hill (Bradley, 1970, p.357).

The struck flint assemblage from Pode Hole quarry has, therefore, strong affinities with Beaker industries from the east and the south of England. The recovery of cores, a hammerstone and knapping waste suggests that some flint-working was taking place within the area. However a significant quantity and range of formal tool types were also recovered, a factor often used as an indicator for settlement-based activities. In this manner the Pode Hole quarry assemblage is comparable with Beaker domestic sites such as Belle Tout, Hockwold-cum-Wilton and Holywell Coombe.

Type	The Ring-ditches	The Field system	Middle - later Bronze Age occupation	Peat formation deposits	Post-medieval features, unstratified & unphased	*Total*
Blades	0	1	15	3	15	*34*
Cores & Struck Nodules	2	3	15	0	26	*46*
Flakes	5	16	113	8	82	*224*
Hammerstones	0	0	1	0	0	*1*
Knapping Debris	0	2 (2)	15 (111)	0	5	*22 (113)*
Natural, Burnt Pieces	0	1	11	0	0	*12*
Natural, Unmodified Pieces	2	12	144	0	4	*162*
Retouched & Utilised Pieces	1	6	24	2	35	*68*
Total	*10*	*43*	*449*	*13*	*167*	*682*
Percentage of struck assemblage	***1.5***	***6***	***58***	***2.5***	***32***	***100***

Table 4.10: Distribution of artefacts per phase of activity (Quantity of small debris recovered from environmental samples indicated in brackets).

A Beaker date for this assemblage also provides an association with the ring-ditches encountered within the immediate area, two of which produced sherds of Beaker pottery. Beaker pottery was also recovered from features of later date further afield from the monuments. One later feature group, Fen-edge Pit Cluster 5, produced the plano-convex knife. This piece is of particular interest as it is complete and in a pristine condition. The knife is clearly a prestige object, and Edmonds (1995, p.97) has shown that objects such as this tend to be found within burials, hoards or formal deposits. The knife, therefore, may have been disturbed from its original context by the insertion of the pit, or it may represent the deliberate deposition of a prestigious 'antique' object later in the Bronze Age.

Activity of a later Neolithic/Early Bronze Age date is well attested within the locality at Fengate and Flag Fen. Additionally, the discovery of a small flint assemblage

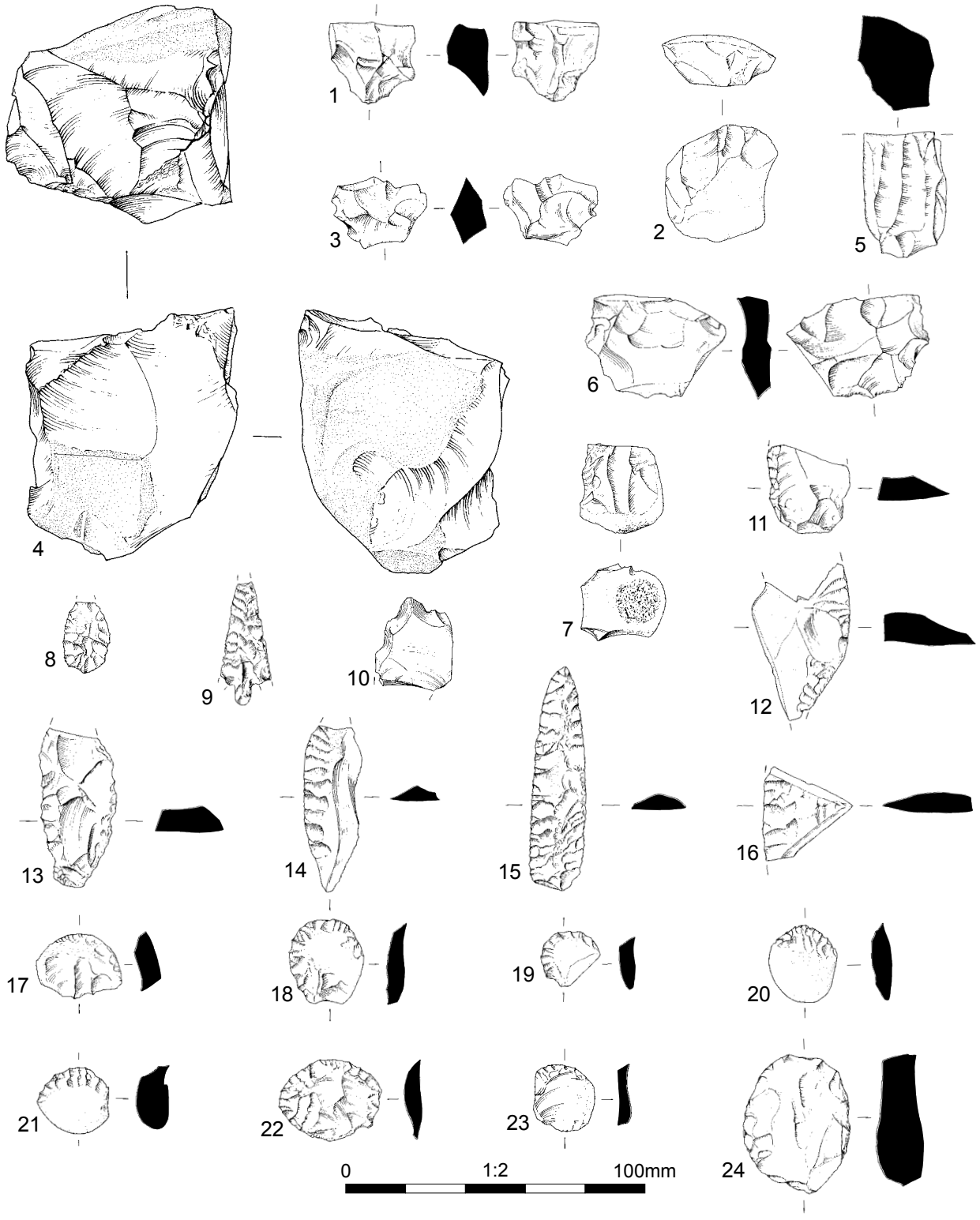

Figure 4.6: Flint 1-24.

nearby at Pode Hole Farm is significant. Given the proximity of Pode Hole Farm to the Pode Hole quarry study area, this assemblage, a component of which has been dated to the Late Neolithic/Beaker period (Bevan, 2001, p.17), may well be directly associated with the quarry assemblage. As Bevan noted, a number of local and regional industries of similar date have associations with round barrows (Bevan, 2001, p.17). However, the poor survival of the monuments at Pode Hole quarry, presents difficulties in understanding the relationship between them and the subsequent occupation of the area.

Catalogue of illustrated flint (Figure 4.6)

1. Shattered keeled core; context 8797, fill of field boundary ditch terminal (part of cardinal boundary).
2. Two-platform core; context 6945, unstratified finds.
3. Exhausted keeled core; context 4332, fill of Ring-ditch 1.
4. Multi-platform core; context 8082, unstratified finds.
5. Blade core; context 8701, unstratified finds.
6. Flat core; context 8082, unstratified finds.
7. Hammerstone; context 9214, fill of waterhole pit 9263.
8. Leaf-shaped arrowhead; context 2044, fill of waterhole pit 2003.
9. Barbed and tanged arrowhead; context 7259, unstratified finds; Small Find 8014.
10. Pointed denticulate; context 8719, fill of waterhole pit 8720.
11. Knife; context 2042, fill of waterhole pit 2003.
12. Cortical knife, slightly burnt; context 6944, layer of fen clay in southern tip of project area.
13. Retouched knife; context 7259, unstratified finds.
14. Blade/knife; context 7347, fill of scoop or natural depression; Small Find 8015.
15. Plano-convex knife; context 8366, Fen-edge Pit Cluster 5; Small Find 8025.
16. Fragment of possible laurel leaf; context 6942, unstratified finds (modern ploughsoil).
17. Thumbnail scraper; context 7259, unstratified finds; Small Find 8013.
18. Thumbnail scraper; context 2029, fill of small pit 2006.
19. Thumbnail scraper; context 2043, fill of waterhole pit 2003.
20. Thumbnail scraper; context 4476, unstratified finds.
21. Thumbnail scraper; context 2041, fill of waterhole pit 2003.
22. Thumbnail scraper; context 8041, fill of field boundary ditch.
23. Thumbnail scraper; context 2009, fill of field boundary ditch.
24. Horseshoe scraper; context 7259, unstratified finds.

The Worked Antler and Bone

by Mark Matlby

Antler objects

Possible antler pick (Figure 4.7, 1)
Context 7577, Pit 7586, Fen-edge Pit Cluster 4
This is a largely intact left antler of a red deer. The upper part of the stem has been broken into two pieces relatively recently and the very top of the stem has been broken off. The brow tine is largely complete apart from slight damage to its tip, which is also slightly charred. There are signs of wear along the basal length of the tine, particularly adjacent to its tip and near its junction to the stem at the coronet. The bez tine has been largely removed with only its base surviving. This also shows evidence of smoothing and wear. The trez tine has been broken off near its base. The top of the stem has been worn smooth on all sides.

The antler has been shed. It probably belonged to quite a young adult animal, having no evidence for more than four points and having a fairly thin beam. The base of the coronet has a maximum diameter of 59.9mm and a circumference of about 173mm. The antler survives to a length of about 540mm. The brow tine has a basal length of 180mm from the edge of the coronet. The object weighs 525g.

The object possesses the classic characteristics of a pick of the type commonly encountered on Neolithic sites such as Grimes Graves and Durrington Walls (Clutton-Brock 1984). The top of the stem acted as the handle, which could be grasped with two hands, which accounts for the wear along its length. The brow tine acted as the pick point and this specimen has clearly been used, quite possibly to excavate the pit in which it was finally deposited.

Possible handle (Figure 4.7, 2)
Context 7234, Pit 7220
This consists of the central part of the tine of a red deer antler. It follows the natural, slightly curved profile of the tine, has a greatest length of 68.4mm and weighs 21g. The greatest diameter at the thicker basal end measures 22mm and the diameter of the tip measures 13.6mm. The tip has been removed and this end of the object is neatly cut flat with evidence of slight polishing. The edge, however, has been chipped at some stage in the past. The basal end bears much cruder evidence of processing. Apart from an area where subsequent damage has removed the evidence, saw marks can be observed on all sides extending for over 10mm above the end. These marks have roughly trimmed the outer surface of the tine but the process does not appear to have been completed and the end has not been cut flat. Both ends have also been drilled, providing hollow sockets to a depth of about 12mm (basal) and 8mm (tip), with maximum diameters of about 10.3mm and 5.6mm respectively. Again the tip socket is much smoother and appears to have been completed, whereas the basal socket is less smooth and probably incomplete. Slight traces of smoothing can be

observed along the length of the tine. There is no evidence for use and it is possible that the manufacture of this object was abandoned, possibly because it was accidentally damaged.

A fairly close later Bronze Age parallel for this object can again be found at Runnymede Bridge (Needham and Serjeantson, 1996, Fig 102. B22). This also consists of a red deer antler tine, which has been cut flat at both ends, both of which have been hollowed out. Although this example is rather longer (greatest length 117.7mm) and has two small peg holes near the basal end, it could be that this was the type of object being manufactured at Pode Hall. The Runnymede Bridge specimen was described as a handle (Needham and Serjeantson, 1996, p.190).

Antler working waste (Figure 4.7, 3)
Context 8086, Pit 8085, One metre pit
A slightly eroded base of a shed red deer right antler weighs 61g and has a greatest length of 59.1mm. The maximum diameter of the coronet measures 44.2mm and it has a circumference of about 135mm. It is therefore from quite a small antler, probably of a relatively young stag. The beam has been carefully removed about 30mm above the edge of the coronet. A groove encircles most of the circumference of the beam just below the break indicating the method of removal. The base of the brow tine survives to a basal length of about 25mm above the edge of the coronet. The edge of the break also shows evidence for deliberate removal of the tine. This represents the discarded waste from antler working.

Awls

Awl, Small Find 8012 (Figure 4.7, 4)
Context 7107, Fen-edge Pit Cluster 1
This is a well-preserved awl made from the distal end of a sheep metatarsal. Its total length is 92.8mm and it weighs 4g. The maximum (inner) and minimum (outer) depths of the distal condyle measure 14.9mm and 10.1mm respectively. The ratio of these measurements confirms that the bone belonged to a sheep rather than a goat (Boessneck 1969). The bone has been split axially from the distal end in a posterior-anterior direction. There are clear striations associated with use on the shaft towards the tip. Similar objects made from distal sheep metapodials of later Bronze Age date have been recorded at Runnymede Bridge (Needham and Serjeantson, 1996, Fig 101. B15-B16) but it is unusual for the bone to have been split. The awl may have been used in weaving or leather working.

Awl
Context 9669, waterhole pit 9618 (Figure 4.7, 5)
This consists of an awl similar in form and manufacture to Small Find 8012. It consists of the distal end of a sheep metatarsal, which has been split axially in an anterior-posterior direction. The shaft of the bone has been shaped towards a point but the tip has been broken. It survives to a length of 93.6mm and therefore would have been slightly longer than Small Find 8012. The shaft has also been broken. The fused distal condyle formed the butt of the awl and possesses a maximum depth of 14.8mm. Damage precluded a measurement of the outer part of the condyle, but the morphology of the bone indicates that it came from a sheep rather than a goat. Fine striations on the shaft indicate the object had been used.

Other worked bone

Possible burnisher (Figure 4.7, 6)
Context 7679, Pit 7514, Fen-edge Pit Cluster 4
The medial half of a right cattle metatarsal with a fused distal epiphysis has been split longitudinally in a posterior-anterior direction. It weighs 87g and has a greatest length of 203mm and a maximum proximal depth of 37.8mm. There is evidence for grooving along the posterior shaft made preparatory to splitting. The marrow cavity has been exposed along its length. The anterior has been flattened along most of the length of the shaft whereas the posterior has a slightly convex profile. Signs of polish and wear are apparent on both surfaces adjacent to the marrow cavity along with longitudinal striations, a few of which are also seen on the posterior aspect near the distal end.

The wear suggests that the bone was held at both ends allowing the bone to be rubbed along its longitudinal axis. It may have been thus used as a burnisher. A similar object, albeit smaller and made from a sheep metatarsal, was found at Runnymede Bridge (Needham and Serjeantson 1996, Fig 102. B21)

Possible burnisher (Figure 4.7, 7)
Context 9613, Waterhole pit 9556, Pond Cluster 3
This object consists of the lateral portion of the fused distal end of a left cattle metatarsal. The object has a greatest length of 87.3mm and weighs 36g. The maximum depth of the distal condyle measures 30.7mm. The bone has been split axially in a posterior-anterior direction. Several fine transverse incisions survive on the lateral aspect of the distal condyle and on the lateral part of the posterior aspect just above the condyle. These were probably made during initial disarticulation from the phalanges prior to splitting. There is evidence for polishing and wear on the inner surfaces of both the posterior and anterior aspects just below the break. The distal condyle probably acted as the handle for this object, which may originally have been similar to the complete object found in pit 7514 and it may have served as a burnisher.

Bone working waste (Figure 4.7, 8)
Context 9669, waterhole pit 9618
This object consists of the distal end of a sheep/goat right tibia. The epiphysis has fused. The maximum distal breadth measures 23.1mm and it has a distal depth of 17.6mm. The bone is slightly eroded. A sub-circular hole extends through the posterior and anterior surface just above the distal end. There is, however, no clear indication that this was the result of drilling. The edges are quite rough and it is feasible that this is a puncture resulting from dog gnawing. There is also slight damage to the edge of the articular surface typical of such activity. However,

there is clear evidence of working on the shaft. There is a transverse groove extending around most of the surface just below and on the break of the shaft about 61mm above the distal extremity. This indicates that the proximal part of the bone has been carefully removed and it is probably that portion of the bone that was required for further working. This segment is therefore best considered to be waste.

Catalogue of illustrated antler and bone (Figure 4.7)

Antler objects

1. Possible antler pick: Context 7577, Pit 7586, Fen-edge Pit Cluster 4.

2. Possible handle: Context 7234, Pit 7220.

3. Antler working waste: Context 8086, Pit 8085, One metre pit.

Awls

4. Awl, Small Find 8012: Context 7107, Fen-edge Pit Cluster 1.

5. Awl: Context 9669, waterhole pit 9618.

Other worked bone

6. Possible burnisher: Context 7679, Pit 7514, Fen-edge Pit Cluster 4.

7. Possible burnisher: Context 9613, waterhole pit 9556, Pond Cluster 3.

8. Bone working waste: Context 9669, waterhole pit 9618.

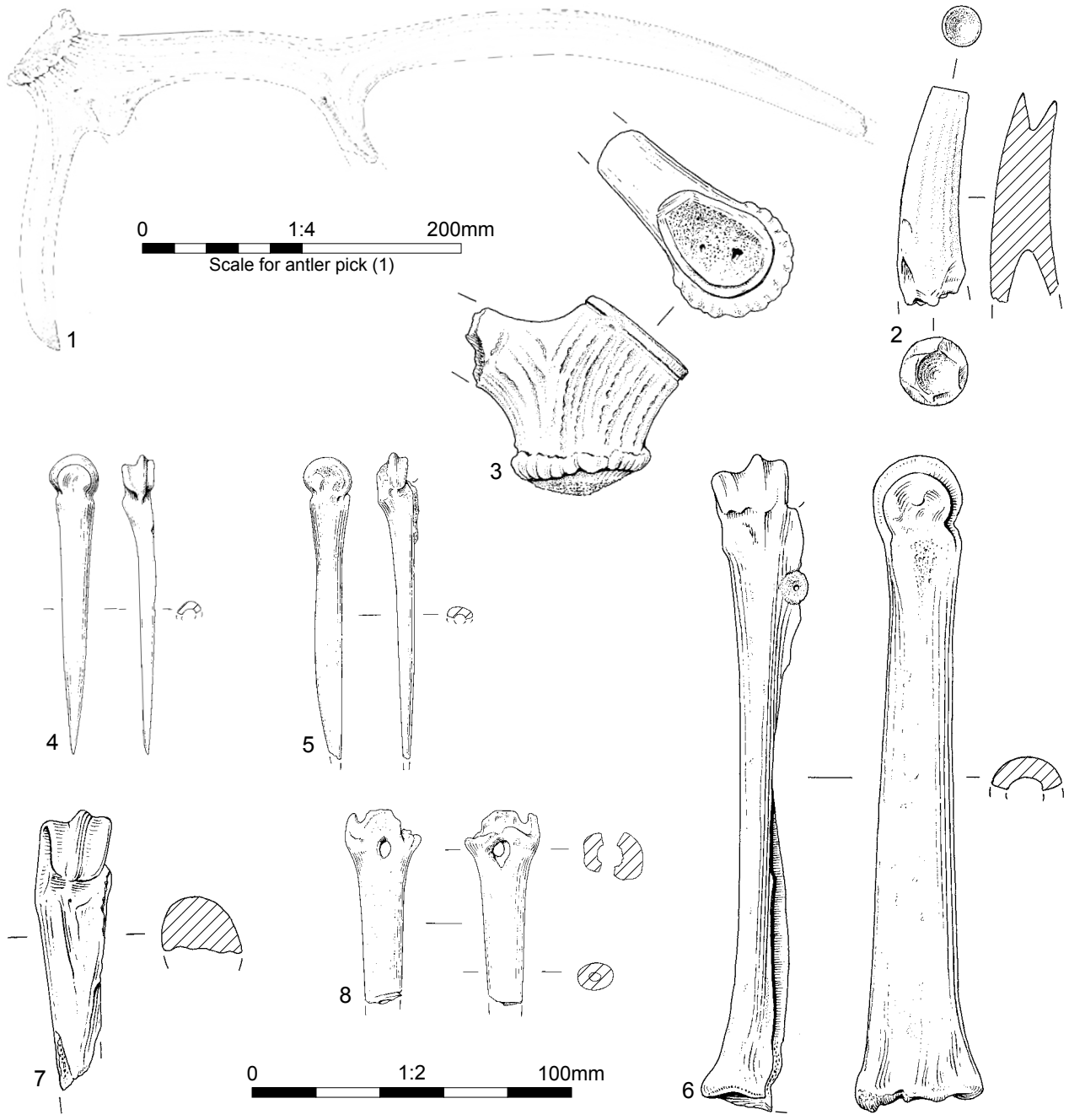

Figure 4.7: Worked antler and bone artefacts 1-8.

Chapter 5: *Enviromental Archaeology*

Introduction

by James Rackham

The most interesting aspect of the archaeology of Pode Hole is the exceptionally well-preserved later Bronze Age landscape of fields, waterholes and droveways, accompanied by traces of more superficial features. The archaeology, although suffering from variable preservation conditions, has not been significantly disturbed by later activity on the site. Some of the deeper features, particularly the ponds and waterhole pits, had preserved organic remains in their basal fills, although organic sediments higher in the sequence were unfortunately too degraded to allow analysis.

A programme of environmental sampling was implemented in each season of excavation, consisting of the collection of samples specifically for palaeoenvironmental analysis, including pollen samples and monoliths, samples for dating purposes and bulk-sieve samples taken for general palaeoenvironmental and palaeoeconomic evidence. Over the years the samples have been submitted to the Environmental Archaeology Consultancy for assessment and reporting (Phoenix Archaeology Consulting Ltd/ Network Archaeology Ltd, 2002-2004 inclusive) and the results are now presented and synthesised.

The environmental palaeoeconomic aspects of the site have been considered primarily through the analysis of the surviving charred plant remains and the excavated animal bone, while the palaeoenvironmental aspects have been considered using waterlogged plant macrofossils, insect remains, pollen, terrestrial and freshwater snails and waterlogged wood remains.

It was not practicable to analyse all the samples so although the majority of the bulk samples were processed, the post-excavation study has been restricted. The environmental material from all the non-waterlogged samples was studied but the analysis of the waterlogged deposits was restricted to nine of the waterholes, with only three of these being studied for the full range of analyses. Their selection was made on the basis of radiocarbon dates, with material being selected from waterholes with dates of 1460-1310 cal BC, 1420-1190 cal BC and 1300-1020 cal BC. The majority of these samples were taken from large waterholes (84 samples), pits (58 samples) and ditches (33 samples, of which nine are from Bronze Age ring-ditches). Samples have also been recovered from post holes (seven), cremations (six) and others deposits (seven). A total of 216 bulk samples were processed, of which 106 produced only dry and charred material; the remaining 110 samples all included some waterlogged material although preservation varied greatly, from very poor to excellent.

Pottery and flints were recovered from many of the samples. The fills of smaller pits produced the bulk of pottery sherds (27 samples producing 190 sherds) and flints (22 samples producing 184 flakes), with proportionately fewer waterholes fills producing a significantly smaller assemblage (58 sherds from 14 samples; 41 flakes from 19 samples). The pits also produced over two and a half times the weight of bone per litre of sample than the waterholes, and if one waterhole sample with several cattle bones and teeth is excluded this rises to over four times the bone per sample litre.

Clearly the smaller pits were functioning largely as rubbish pits while the waterholes were not typically being used for domestic rubbish when they fell out of use, although some include assemblages of hand-collected animal bone. This appears to be evident from the plant remains also, where very little charred material has been recovered from the waterlogged samples in the waterholes (see Table 5.5 below). Fire-cracked flint and pebbles also occur across the site. These are normally represented by a few stones in the residue, but one or two samples produced concentrations. Group 7567, the ditch curving from Fen-edge Pit Cluster 3, yielded a high proportion of fired earth and fire-cracked flint and pebbles in two samples from its fills indicating fire debris entering the deposits. The three samples from pit 9107 also produced fire-cracked pebbles and fired earth, possibly briquetage material. Pit 9508 which was suggested in the field as a possible cremation produced over 1.5kg of fire-cracked pebbles from one 30 litre sample and a relatively large quantity of charcoal (a flot of over 100mls) but no burnt human bone, so it seems likely that this may have been a cooking pit or some other domestic feature. Another suggested cremation, context 3010 (sample 5000), produced identifiable sheep bones and burnt animal bone, but no human bone, suggesting a probable domestic pit rather than cremation. Human bone was found in context 4191, where two adjacent samples, one from the cremation pit and one from the ditch cutting it, both produced cremated human bone. A fragment of unburnt human cranium was recovered from Pond Cluster 1, and a possible fragment of human cranium from Fen-edge Pit Cluster 3. There was no evidence for metalworking found in the samples and no copper alloy finds were made in over 3.5 tonnes of processed soil.

The following reports detail the results of the post-excavation analyses of the charred and waterlogged plant macro-remains, insects, pollen, wood, terrestrial molluscs and animal bones from a selection of the samples collected from the site. All processed samples have been assigned to the Middle and later Bronze Age.

The Charred Plant Remains

by Gemma Martin with John Giorgi and Andrea Snelling

Identification of the charred plant remains from the site was carried out in order to provide information on aspects of crop husbandry, from the range of cereals and soils cultivated around the site to evidence of any crop-processing activities, as well as to attempt to identify spatial and temporal foci of activity.

Recovery and identification methods

The methods of processing and assessment of the samples are described in the interim reports (Phoenix Archaeology Consulting Ltd/Network Archaeology Ltd, 1999-2004 inclusive). On the basis of the preliminary work, those samples identified as containing charred plant remains were selected for further analysis and the dry flots that were not included in the initial assessments were also sorted for charred botanical remains. The exception to this criterion are the flots from sample group 1500-1512, for which no further work on the charred plant remains was recommended following the assessment. Therefore samples 1501, 1502, 1506, 1507 and 1508, which contain some charred plant remains, have been excluded from any further analyses. Of the remaining samples, a total number of 91 flots yielded charred plant remains and are listed in Table 5.1.

The charred plant remains were sorted from the dry flots using a binocular microscope whilst modern and charred reference material, together with reference manuals, were used for the identification of the botanical remains. All identifiable charred plant items (including estimates based on the larger cereal fragments) were quantified with the exception of hazelnut (*Corylus avellana*) shell fragments, stem fragments and unidentifiable plant remains.

Low numbers of charred plant remains were also recorded in several of the waterlogged flots. However, only a small proportion of these organic flots were scanned in an initial assessment, which precludes the full estimation of the charred component of the organic flots at this time. Additional charred items from the waterlogged samples were studied in detail and are noted below (Table 5.5).

As very low numbers of charred items were recovered, the frequency of species identified are arranged broadly by feature type in Table 5.2, whilst the samples that are relatively rich in charred botanical remains are presented individually.

Results

In general, the overall state of preservation of the charred plant remains is poor with the remains being corroded or distorted in appearance, which has prevented positive identification to species in most instances. The majority of the flots also contain very small numbers of charred items, with only 17 of the 91 flots yielding relatively large quantities of charred remains or otherwise noteworthy assemblages. The scarcity of charred botanical remains is not unusual given the prehistoric date of the material and, despite the limitations outlined previously, the assemblages do provide some economic information.

Uncharred seeds occur consistently, with variable, but often high, numbers of seeds. Most of these seeds represent high seed-producing plants of waste places and disturbed (including cultivated) ground as well as a number of robust seeds, such as blackberry/raspberry (*Rubus* sp.) and elder (*Sambucus nigrum*). Wetland plants including aquatic species such as crowfoots (*Ranunculus* Subgenus *Batrachium*) and duckweed (*Lemna* sp.) have also been recorded. In some instances these uncharred remains may be contemporary with the deposits, but for the most part, if contemporary, the suites of species identified implies the poor survival of organic material and therefore the assemblages will be significantly biased. In the light of this, the uncharred remains have been noted, but will not be included in the following discussion.

The full list of species identified is detailed below in Table 5.2. For the most part each taxon is represented by one or two charred items only.

It is apparent that there is a greater frequency of charred remains and species diversity in deposits associated with the pit/scoop features and post holes and, to a lesser degree, those derived from the waterhole pits and ponds (Table 5.2). The remains of cereals and hazelnut shell are notably associated with the pit/scoop and post hole fills, indicating the disposal of domestic residues chiefly into these features. Conversely, the remaining barrow ring-ditches, other ditch features and cremation deposits are comparatively sparse in charred plant remains.

Only four samples yielded over fifty identifiable charred items and are of particular note. Two from cremation 7380, when combined, produced 126.5 charred items; in addition, deposit 9119 from waterhole pit 9249 and deposit 9509 from refuse pit 9320 (both part of Pond Cluster 2), yielded 62.5 and 250 charred items respectively.

The botanical assemblage from cremation 7380 consists of charred seeds with no cereal chaff and only twelve

Sample	Context	Sample vol. (L)	Deposit/comment	Ceramic phase/ radiocarbon date
6003	4011	19	Silt of large pit/ pond [4018]	No/No
6006	4026	30	Fill of waterhole pit [4046] (queried to discard)	CP1/No
6007	4025	18	Fill of waterhole pit [4046] (queried to discard)	CP1/No
6010	4029	27	Fill of waterhole pit [4046]	CP1/No
6023	4192	12	Fill of possible cremation scoop [4191]	No/No
6024	4194	6	Fill of claying trench [4193], contains crem bone	No/No
6027	4359	22.5	Fill of NE-SW aligned field boundary ditch [4356]	No/No
6029	4361	30	Fill of NE-SW aligned field boundary ditch [4360]	No/No
6032	4292, 4293	30	Tertiary fill (lens within 4292) of Ring-ditch 1 (queried to discard)	CP1/No
6033	4286,4287, 4289	30	Fills of barrow ring ditch [4279]	CP1/No
6034	4281,4282, 4283, 4284	30	Fills of barrow ring ditch [4279]	CP1/No
6035	4378	30	Fill of barrow ring ditch [4189] (queried to discard)	No/No
6037	4380	30	Uppermost peaty silt fill of barrow ring ditch [4189]	No/No
6039	4370-72	30	Fills of barrow ring ditch [4349]	No/No
6044	6676	5	Fill of refuse pit [6677]	No/No
6046	6672	4	Uppermost fill of pit/ scoop [6673]	CP?1 or 2/No
6047	6687	10	Uppermost fill of posthole/ scoop [6686]	CP2/No
6048	6706	5	Fill of pit/ scoop [6705]	CP?1 or 2/No
6049	6688	5	Primary fill of posthole/ scoop [6686]	CP?1 or 2/No
6050	6674	9	Uppermost fill of refuse pit/ scoop [6685]	CP2/No
6051	6675	9	Primary fill of refuse pit/ scoop [6685]	CP?1 or 2/No
6060	6970	8	Fill of waterhole pit [6968]	CP2/No
6061	6964	5	Fill of posthole [6954], charcoal rich band towards base	No/No
6063*	6977	5	Fill of waterhole pit [6967]	No/No
6065	6969	5	Uppermost fill of waterhole pit [6966=6968]	CP?1 or 2/No
6066*	6970	8	Fill of waterhole pit [6968]	CP2/No
6067*	6972	8	Fill of waterhole pit [6966]	CP?1 or 2/No
6068*	6975	10	Fill of waterhole pit [6966]	CP1/No
6069	6969	30	Uppermost fill of waterhole pit [6968]	CP?1 or 2/No
6102	7385	29	Fill of pit [7707]	CP3/No
6103	7382	14	Fill of pit [7218]	CP3/1410-1210 cal BC (SUERC 12096)
6120	7512	30	Fill of waterhole pit [7586]	CP?3 or 4/No
6121	7508	30	An upper fill of waterhole pit [7586]	CP3/No
6126	7590	24	Fill of waterhole pit [7514/7586], equivalent to 7511, 7579	CP3/No
6127*	7628	10	Primary fill of waterhole pit [7514, same as 7577]	CP?3 or 4/No
6136	7672	29	Spread layer sealing pits [7676] and [7677]. Probably formed by bogging of site post-abandonment	No/No
8000	8064	25	Layer of alluvial material/ buried topsoil which has slumped into a backfilled through subsiding pair of intercutting waterhole pits	CP?3 or 4/No No
8001	8111	24	Fill of waterhole pit [8110]	CP?3 or 4/No No
8002	8124	17	Wash of redeposited natural upcast seals a cluster of disused waterhole pits	CP3/1620-1430 cal BC (SUERC-12866)
8003	8051	28	Alluvial layer/ buried topsoil sealing a cluster of backfilled waterhole pits	CP3/1620-1430 cal BC (SUERC-12866)
8006	8092	30	Uppermost fill of storage/ midden pit [8091]	CP2 /No
8007	8140	30	Fill of storage/ midden pit [8091]	CP2 /No
8008	8086	30	Fill of storage/ midden pit [8085]	CP2 /No
8085	9108	29	Middle (of 3) fill of pit [9107]	CP3/No
8087	9109	30	Primary fill of pit [9107]. Possible burnt offering? Or just random deposition of domestic waste	CP3/No
8089	9110	24	Uppermost (of 3) of pit [9107]	CP3/No

Sample	Context	Sample vol. (L)	Deposit/comment	Ceramic phase/ radiocarbon date
8094**	9154	27	Fill of pond/ substantial waterhole pit [9146], above 9164. Prob abandonment fill	CP?3 or 4/No
8104	9119	27	Uppermost fill of waterhole pit [9249]. Pot-rich layer/ occupation trample	CP4/No
8116	9360	25	Fill of possible waste disposal pit [9320], with abundant charcoal. Domestic waste?	CP4/No
5000	3010	10	Fill of sheep cremation scoop [3011]	No/No
6000	4003	30	Peat layer, slumped into pit & posthole [4008]	No/No
6001	4004	10	Primary peat fill of posthole [4005]	No/No
6052	6671	9	Fill of pit/ scoop [6670]	No/No
6053	6689	9	Fill of pit/ scoop [6684]	CP1/No
6040	6600	4	Fill of refuse pit [6599], prob same as 6692=6592	CP1/No
6041	6600	14	Fill of refuse pit [6599], prob same as 6692=6592	CP1/No
6042*	6597	8	Fill of refuse pit [6598]	CP2/No
6043	6500	18	Fill of refuse pit [6501]	CP2/No
6045	6507	9	Primary fill of pit/ scoop [6508]	CP2/No
6054	6690	10	Fill of pit/ scoop [6680]	No/No
6055	6664	9	Fill of pit/ scoop	CP1/No
6056	6567	8	Uppermost fill of pit [6621]	CP2/No
6057	6605	9	Uppermost fill of pit/ scoop [6608]	CP?1 or 2/No
6073	7235	25	Fill of pit [7220], redeposited natural gravel	CP?3 or 4/No
6074	7258	9	Fill of pit [7220], redeposited natural gravel	CP?3 or 4/No
6080	7283	13	Uppermost fill of boundary ditch [7282]	No/No
6081	7287	27	Fill of pit [7214]	CP1/1950-1750 cal BC (SUERC-12095)
6082	7290	27	Fill of pit [7214]	CP1/1950-1750 cal BC (SUERC-12095)
6083	7380	23	Basal fill of cremation pit [7379]	No/No
6087	7357	19	Layer sealing Fen-edge Pit Cluster 2 sequence	No/No
6090	7380	25	Basal fill of cremation pit [7379]	No/No
6094	7424/7425	30	Lower fills of large posthole [7418], VOID?	No/No
6095	7338	20	Fill of ditch [7340], VOID?	No/No
6096	7405	19	Upper fill of ditch [7407]	No/No
6097	7300	30	Occupation layer, (possible burning event?).Or, fill of ditch	No/No
6098	7434	28	Burnt material forming the uppermost fill of curvilinear feature [7431]	CP?3 or 4/No
6099	7460	27	Fill of Ring-ditch 3	CP1/No
6117	7562	30	Fill of ditch (terminus) [7561]	No/No
8010	8212	30	Fill of NE-SW aligned field boundary ditch [8208]	CP4/1270-1000 cal BC (SUERC-12862)
8012	8147	28	Fill of possible large posthole or midden pit [8155]	CP3/No
8013	8148	28	Fill of possible large posthole or midden pit [8155]	CP3/No
8024	8294	24	Layer of alluvial material/ buried topsoil which has slumped into a backfilled through subsiding Fen-edge Pit Cluster 5.	CP3/No
8054	8835	3	Fill of possible storage/ midden pit [8836], deposit of burnt material	No/No
8062	8722	27	Fill of waterhole pit [8718]	No/No
8075	9018, 9018	28	Upper fills of waterhole pit [9003]	No/No
8079	9044	20	Fill of small scoop [9043], possible disturbed cremation?	CP1/No
8083	9053	26	Layer of alluvial material/ buried topsoil which has slumped into a backfilled through subsiding pair of intercutting waterhole pits	CP3-4/No
8103	9128	27	Fill of waterhole pit [9125], charcoal rich layer. Indicative of burning and possible occupation/ domestic activity in the vicinity	CP2/No
8131*	9509	30	Fill of possible cremation pit [9508]	No/No

Sample	Context	Sample vol. (L)	Deposit/comment	Ceramic phase/ radiocarbon date
8138	9598	23	Fill of waterhole pit [9562]	No/No
8150	9531	20	Fill of waterhole pit [9500]	CP?3 or 4/1400-1130 cal BC (Beta-238592)

Table 5.1. Samples containing charred plant remains and studied for post-excavation analysis. (Although many samples were from contexts with no dating evidence all can be treated as Bronze Age for analytical purposes – see Table 5.3). (Sample produced an organic flot and a dry flot, ** Produced a wet flot only).*

cereal grains, including several barley grains and a single possible wheat grain. The weed seed assemblage is dominated by flax (70%), the majority of which has been identified as the cultivated species *Linum usitatissimum*. The remaining species include those commonly associated with disturbed ground such as goosefoots/oraches (Chenopodiaceae) and knotweed (*Persicaria* sp.) and also grassy habitats e.g. small-seeded grasses (Poaceae <4mm) and small leguminous seeds identified as medick, trefoil or melilot (*Medicago/Trifolium/Melilotus* spp).

In contrast, waterhole pit 9249 and refuse pit 9320 are characterised by a dominance of cereal grains and relatively small quantities of cereal chaff and weed seeds. These assemblages point to the later stages of crop processing (following van der Veen, 1992 and Hillman, 1981), perhaps the vestiges of cleaned grain or fine sieve residues, with little or no cereal chaff and smaller numbers of weed seeds. The other pit features including those of Midden Area 1 and pit 6508 are less abundant in charred botanical remains: these assemblages are characterised by

Species	English name	Waterhole pits/ ponds	Pits/scoops & postholes	Ring-ditches & other ditches	Cremation scoops & other deposits (layers)	*Total*
	No. bulk samples	***32***	***34***	***16***	***9***	***91***
Cereals						
Triticum spelta L.	spelt wheat	1				*1*
T. cf. spelta	?spelt wheat	2	1	1	1	*5*
T. dicoccum	emmer wheat	1	1			*2*
T. cf dicoccum	?emmer wheat		2		1	*3*
T. dicoccum/spelta	emmer/spelt wheat		1			*1*
T. cf aestivum sl	?bread wheat		1		1	*2*
Triticum sp(p).	wheat	2	5	2	1	*10*
cf Triticum sp.	?wheat	2	4		2	*8*
Hordeum vulgare vulgare L.	six-rowed barley	1	1			*2*
Hordeum vulgare L.	barley	6	9	2	2	*19*
cf H. vulgare	?barley	6	7	1	2	*16*
Hordeum/Triticum sp.	barley/wheat	2	2			*4*
cf Avena sp.	?oat		2			*2*
Indeterminate cereals	grains	10	22	7	6	*45*
Cereal chaff						
Triticum spelta L.	spelt glume bases	1				*1*
T. cf spelta	?spelt glume base	1	2			*3*
T. cf dicoccum	?emmer glume base		1			*1*
Triticum sp(p).	wheat glume bases	2	5	2	1	*10*
Triticum sp(p).	wheat spikelet bases	2	2	2	1	*7*
Hordeum sp.	barley rachis		1			*1*
Indet. chaff					1	*1*
grass stems		1				*1*
Other plants						
cf Ranunculus sp.	?buttercup		1	1	1	*3*
Chenopodium album L.	fathen		1			*1*
Chenopodium sp.	goosefoots		1		1	*2*

Table 5.2. Frequency of identified species from the charred botanical assemblages arranged by feature type (numbers represent the number of samples in which the taxon was identified).

cereal grains and hazelnut shell fragments. The deposits from Fen-edge Pit Cluster 3 and the curvilinear ditch (Group 7567) that is linked to it contain small quantities of cereal residues including chaff and very small weed assemblages with no hazelnut shell.

In addition, the fill of pit 9508 (previously classified as a possible cremation pit) produced an organic flot and a charcoal rich second flot. The second flot primarily consists of 100 millilitres of comminuted charcoal with some small roundwood and herbaceous stem fragments also present, and is noteworthy due to the presence of a small concentration of glume wheat chaff with no cereal grain and only a single indeterminate seed.

Discussion

Spatial and temporal distributions

Distinguishing patterns in the distributions of the charred plant macrofossils is problematic. Despite the fairly large size of the study group, the samples are dispersed over a wide area and the few deposits that are relatively rich in charred remains are derived from a disparate range of features that, for the most part, do not appear to have any notable relationships, be they stratigraphic or otherwise. In broad terms, detecting evidence for temporal change or continuity in terms of arable activities is also difficult, not only due to the scarcity of material but also to the inherent difficulties associated with dating and phasing the site because of the lack of datable evidence and stratigraphic relationships. Therefore, while Table 5.3 shows that the majority of the phased samples containing charred plant remains are either dated to Middle Bronze Age or remain unphased, this distribution may be skewed by non-archaeological factors.

Whilst taking the above considerations into account, when grouped by broad feature type Table 5.2 does demonstrate some general patterns in deposition. It is evident that the pit features (including scoops and post holes) are receiving domestic residues, most notably refuse pit 9320, as are the waterhole pits and ponds to a lesser degree, particularly feature 9249. The barrow ring-ditches and other ditch features, as well as the cremations, do not seem to contain much in the way of domestic waste or assemblages that could be interpreted as ritual in nature, with the exception of the concentration of flax (*Linum usitissimum*) recovered from cremation 7380 which is unusual on the site. Although traces of flax and less well-preserved seeds identified as flax/whitebeam (*Linum/Sorbus* sp.) occur in other features across the site, the density suggests that the flax may have some significance on this occasion.

It is not unexpected that more domestic debris is being interred into pits rather than the other features, but again, there is also sample bias due to a greater proportion of samples being taken from pit features and waterhole pits and ponds.

Arable economy

The range of cereals identified from deposits across the site includes spelt wheat (*Triticum spelta*), emmer wheat (*T. dicoccum*) and barley (*Hordeum vulgare*), including lateral grains of six-row barley (*H. vulgare vulgare*). There are also several grains sharing similar morphological characteristics to oat (*Avena* sp.) as well as bread wheat-type (*Triticum aestivum* s.l.). These are similar to the range of cereals recovered from comparable Bronze Age sites in the region (Murphy, 1998).

In broad terms, barley occurs more frequently than wheat, and in the grain-rich samples from Pond Cluster 2, barley dominates the cereal assemblages. However the paucity of charred remains and the mixed nature of deposits prevents information being gained regarding potential crop preferences and broader issues of arable husbandry such as the range of soils under cultivation, harvesting techniques or crop processing activities. The presence of crop residues entering certain deposits does indicate some crop processing taking place within the site, again notably associated with 9320 and 9249 within Pond Cluster 2, but overall it remains difficult to reconstruct these activities based on such small assemblages.

Other plants of economic value

The domestic residues also contain remains of hazelnuts and plum/sloe/cherry type (*Prunus* sp.) stones, including fragments with charred fruit flesh attached. These would have been locally available, based on evidence from the organic remains from the waterhole pits and ponds (see below), but it remains difficult to gauge the extent of the reliance on these gathered foods as part of the overall diet of the Bronze Age occupants.

As discussed above, charred seeds of flax have been recorded from a range of deposits across the site, but in general one or two seeds only, with the exception of the fill of pit cremation 7380. Flax is a valuable resource for fibre and oil and also for medicinal purposes, as the oil has laxative effects and the seeds have long been used in poultices since they retain heat well (Dickson and Dickson, 2000, p.254). The ultimate use of flax, whether for fibre or oil, is dependent on when the plant is cropped and how it

Date	EBA- early MBA			MBA-LBA			LBA-EIA	Undated	Total
	CP1	CP?1 or 2	CP2	CP3	CP?3 or 4	CP4	CP5	Aceramic sample	
No. bulk samples	15	8	12	12	9	3	0	31	90

Table 5.3. Pode Hole Quarry, summary of the numbers of phased samples containing charred plant remains.

is processed (Gale and Cutler, 2000, p.152) and therefore affects which components of the plant will be preserved. Charred flax seeds recovered from hearth deposits tend to be interpreted as domestic use (Dickson and Dickson, 2000, p.254). The context in which the seeds were found on this occasion, interpreted as a cremation pit, may also suggest domestic use, since pottery, bone, a little fired earth and fire-cracked pebbles with a relatively high magnetic component suggests domestic and hearth material.

Wild plants
The weed assemblages tend to be small and consist of rather unspecialised weed floras. Weeds of disturbed (and cultivated) ground are frequent such as goosefoots/oraches (Chenopodiaceae), chickweed/stitchworts (*Stellaria* sp.), black bindweed (*Fallopia convolvulus*), knotweeds (*Persicaria* sp.) and dock (*Rumex* sp.). Indicators of grassland habitats are also present such as vetch/vetchling (*Vicia/Lathyrus* sp.), ribwort plantain (*Plantago lanceolata*) and grasses (Poaceae indet.) and occasional finds of blinks (*Montia fontana*), sedges (*Carex* sp.), bur reed (*Sparganium* sp.) and club-rush (*Schoenoplectus* sp.) denote damp or wet habitats.

Given the mixed nature of the deposits, it is not possible to determine whether these species may be associated with cereal crops and derived from crop processing activities or were growing within the locality of the occupation activity. The weed assemblages provide limited scope for economic or environmental reconstruction.

Conclusion

The range of cereals identified at Pode Hole are typical of those cultivated during the Bronze Age, and, like other comparable sites cited in Murphy's (1998) regional synthesis such as Deeping St. James, there is also no evidence for large-scale on-site cereal processing, nor is there sufficient evidence to enable further reconstruction of crop processing activities. The Late Bronze Age Pond Cluster 2 produced particularly grain-rich assemblages which are dominated by barley and contain the strongest evidence for crop processing from the site. The dominance of grain points to cleaned grain but the assemblages are still quite small and could constitute fine sieve residues.

The presence of flax supports the existing evidence for the cultivation of flax at sites on poorly drained terrace and Fen-edge sites (Murphy, 1998). Flax would have been an important multi-purpose crop and traces have been found in domestic contexts and a cremation, 7380, at Pode Hole. There is no evidence to indicate what the plant was being used for although fibre, oil production or 'seed cakes' are possibilities.

Other plants of economic value include hazelnut and fruits of *Prunus* sp. which would have been locally available and were evidently exploited. Unfortunately, it is not possible to gauge the contribution that these gathered foods made to the overall diet of the occupants.

Waterlogged Plant Remains

by Gemma Martin

Introduction

The substantial number of deposits and features that included waterlogged remains in their basal fills allows the opportunity to integrate the results of the analyses of waterlogged plant macrofossils, insect remains, pollen, wood and vertebrate material. Because of the high costs of such an approach, these analyses have been limited in their extent. Three waterhole features were chosen for detailed analysis on the basis of their radiocarbon dates, and pollen series, waterlogged plant macrofossils, insects and wood remains have been studied from these features. In addition several further features have been studied for their waterlogged plant remains. These studies have been largely targeted at the palaeoenvironmental reconstruction of the landscape of Pode Hole in the Bronze Age, but some palaeoeconomic data has also come out of the study.

The analysis of the plant macrofossils can be expected to contribute to the ecological reconstruction of the selected features and the site in general. Evidence for anthropogenic activity, notably in the form of charred plant remains, has also been looked for as potential indicators for the use of the waterhole pits. The proximity of any settlement or agricultural activity may also be indicated by the quantities of charred material present. The samples selected for botanical analysis are listed in Table 5.4.

Methodology

The flots were analysed wet using a binocular microscope with up to 40x magnification and for ease of sorting split into coarse (>6.7mm), medium (2-6.75mm) and fine fractions (<2mm). Each of the coarse fractions and the majority of the medium fractions were examined in full, with the exception of a number of medium fractions that were generally over 500ml in volume. In each of these instances, only a proportion was examined (approximately 50%, or 200-300 ml if very large in volume). A small proportion of the accompanying fine fraction, approximately 30ml, was judged to be sufficient for the analyses, with an equal proportion scanned for additional species.

In order to overcome some of the potential bias in the samples due to differential preservation, the results are shown by frequency with the species recorded from each of the nine waterhole features presented in Table 5.5. To further help characterise the assemblages, the identified species are broadly grouped by habitat, but it should be noted that many of the species listed are not confined to any one particular habitat and there is some scope for overlapping. The summary diagram (Table 5.6) also characterises the results from each individual sample as a means for analysing internal variation within each feature.

Feature	Sample No.		Ceramic phase/radiocarbon date	Analysis carried out			
	Bulk	Monolith		Plants	Insects	Wood	Pollen
Pond Cluster 1	-	8022	1460-1310 cal BC	-	-	-	X
	8016	-	CP 3/1620-1430 cal BC	-	X	X	-
	8018	-	CP 3/1620-1430 cal BC	X	-	X	-
	8020	-	1460-1310 cal BC	X	X	X	-
Waterhole 9075	-	8090	1420-1190 cal BC	-	-	-	X
	8091	-	CP3/1420-1190 cal BC	X	X	X	-
Waterhole 9500	8150	-	CP?3 or 4/1400-1130 cal BC	X	-	X	-
	8158	-		X	-	-	-
	8133	-		X	-	-	-
	8136	-		X	-	X	-
	8137	-		X	-	-	-
	8151	-		X	-	-	-
Pond Cluster 3	-	8172	1300-1020 cal BC-1120-910 cal BC	-	-	-	X
	8173	-	1300-1020 cal BC	X	-	X	-
	8175	-	1430-1200 cal BC and 1380-1050 cal BC	X	-	-	-
	8199	-	1120-910 cal BC	X	-	-	-
	8200	-	1300-1020 cal BC and 1430-1200 cal BC	X	X	-	-
Fen-edge Pit Cluster 5	8026	-	CP3	X	-	-	-
	8028	-	1520-1400 cal BC	X	-	-	-
Waterhole 7214	6076	-	CP1/1950-1750 cal BC	X	-	X	-
Fen-edge Pit Cluster 3	6104	-	1410-1200 cal BC	X	-	X	-
Waterhole 8763	8072	-	CP?3 or 4	X	-	-	-
Pond Cluster 2	8094	-	CP?3 or 4	X	-	-	-

Table 5.4: Samples from waterlogged waterhole features selected for palaeo-environmental investigation.

Aid in identifications included modern reference material together with reference literature (Cappers et. al., 2006), whilst cereal grain and chaff identification criteria follow van der Veen (1992). Nomenclature and taxonomy follow Stace (1997).

A summary of the analyses is presented in Table 5.5 and Table 5.6. The raw data from the individual samples is available in the archive.

Summary of results

The overall state of preservation of the botanical remains is variable which has impeded identification to species in many instances. In addition, species of high seed producing plants and of those producing robust seeds occur frequently, which may indicate the poor survival of remains and potential biasing in a number of the botanical assemblages. The organic flots contain only traces of charred plant remains, which generally consist of comminuted charcoal, along with several cereal grains, a single fragment of chaff and a few charred seeds. The abraded and distorted state of preservation of the charred remains prevented positive identification to species on most occasions, with one or two grains of wheat (*Triticum* sp.) and barley (*Hordeum* sp.) and also charred cleavers (*Galium aparine*) identified.

Other plant remains that occur frequently are preserved wood, including roundwood, worked wood and comminuted wood, as well as frequent thorns of bramble-type (Rosaceae) and blackthorn/hawthorn-type (*Prunus spinosa/Crataegus* sp.). The state of preservation of the wood is variable and in many instances it is very degraded. Small twigs, buds, possible catkins and cones akin to alder (cf. *Alnus* sp.) have also been recorded in many of the flots, whilst grass-sized culm nodes and internodes and stems and leaves of mosses (*Bryophyta* sp.) occur less frequently. In addition, rootlets and degraded vegetative material are ubiquitous in the fine fractions.

Analysis and interpretation

Crop plants

Evidence for cereal remains from the nine waterholes is extremely sparse. Charred cereal grains occur in extremely low densities, consisting of several poorly preserved wheat and barley grains, in addition to a single fragment of wheat chaff and one or two charred seeds, including cleavers. These were identified as occasional records from waterholes 8455 (Fen-edge Pit Cluster 5), 9146 (Pond Cluster 2) and 9500 (Table 5.6). This evidence provides only a limited insight into the arable economy of the associated settlement and indicates that the early stages of crop processing were not taking place within

Taxa/ species		Pit 7214	Fen-edge Pit Cluster 3	Pond Cluster 1	Fen-edge Pit Cluster 5	Waterhole 8763	Waterhole 9075	Pond Cluster 2	Waterhole 9500	Pond Cluster 3	*Total*
No. Samples		1	2	4	3	1	1	1	6	4	*23*
Vol. soil (l)		20	58	99	80	26	29	27	125	100	*564*
Flot vol. (l)		1	2.7	8.05	4.8	3.5	1.25	0.1	9.5	6.45	*37.35*
Crop plants											
Triticum sp(p).	wheat				1						*1*
Hordeum sp(p).	barley								1		*1*
cf *Hordeum* sp(p).	?barley							1			*1*
indet. cereal frags								1			*1*
Linum usitatissimum L.	cultivated flax			2							*2*
Cereal chaff											
Triticum sp(p). glume bases	glume wheat							1			*1*
Weeds of cultivated/disturbed ground											
Ranunculus arvensis L.	corn buttercup				1					1	*2*
Papaver sp(p.)	poppy				1						*1*
Fumaria officinalis L.	common fumitory				1					1	*2*
Urtica dioica L.	common nettle	1	2	3	2	1			4	4	*17*
Chenopodium album L.	fat-hen	1	1	3	3				3	2	*13*
Chenopodium sp(p).	goosefoots		1		2	1			1	1	*6*
Atriplex sp(p).	orache		1		2		1	1	1	1	*7*
Chenopodiceae	goosefoot family	1	2	1	2		1	1		2	*10*
Stellaria media (L.) Vill.	common chickweed	1	2	4	3	1	1		4	3	*19*
Persicaria cf. *lapathifolia* (L.) Gray	?pale persicaria				1						*1*
Polygonum aviculare agg.	knotgrass						1			2	*3*
Fallopia convolvulus (L.) A Love	black-bindweed			1	2		1	1	1	1	*7*
cf. *F. convolvulus*	?black-bindweed	1	1						1		*3*
Brassica/Sinapis sp.	cabbage/mustard type		1	1	1	1				1	*5*
cf. *Brassica/Sinapis* sp.	cabbage/mustard				1						*1*
Aethusa cynapium L.	fool's parsley	1			1				1		*3*
Torilis sp.	hedge-parsley			1	1				2		*4*
Solanum nigrum L.	black nightshade		2	4	2				1	4	*13*
Lamium sp(p.)	dead-nettle				2				1	1	*4*
Galeopsis sp(p.)	hemp-nettle	1			1				1	1	*4*
Plantago major L.	greater plantain									1	*1*

Taxa/ species		Pit 7214	Fen-edge Pit Cluster 3	Pond Cluster 1	Fen-edge Pit Cluster 5	Waterhole 8763	Waterhole 9075	Pond Cluster 2	Waterhole 9500	Pond Cluster 3	*Total*
Galium aparine L.	cleavers				1						*1*
Sonchus asper (L.) Hill	prickly sow-thistle	1									*1*
Sonchus sp.	sow-thistle			2	1				1	1	*5*
Weeds of grassland/meadow habitats											
Ranunculus Subgenus *Ranunculus* L.	creeping/meadow/ bulbous buttercup	1	1	4	2		1		3	4	*16*
Stellaria graminea L.	lesser stitchwort			1	1				1	1	*4*
Rumex cf. *acetosella* agg.	sheep's sorrel						1				*1*
Prunella vulgaris L.	selfheal			3	1		1			1	*6*
cf. *P. vulgaris* L.	?selfheal								1	1	*2*
Species of hedgerows/scrub/woodland											
cf. Primulaceae (cf. *Lysimachia nemorum* L.)	?primrose family (?yellow pimpernal type)				1						*1*
Torilis cf. *japonica* (Houtt.) DC.	?upright hedge-parsley					1	1				*2*
Strachys sp(p.)	woundwort			2							*2*
Lapsana communis L.	nipplewort				1						*1*
Corylus avellana L.	hazelnut shell intact		1								*1*
C. avellana L.	hazelnut shell frags.	1	2	1						3	*7*
cf. *C. avellana*	?hazelnut kernel		1								*1*
Prunus cf. *spinosa* L.	?blackthorn (sloe)						1			1	*2*
Prunus avium/cerasus/padus sp.	wild/sour/bird-cherry type fruit stones				1	1				3	*5*
Prunus sp(p).	sloe/plum/cherry fruit stones	1	1	2	1	1				1	*7*
Crataeugus monogyna Jacq.	hawthorn (seed)			2	1		1		2	4	*10*
Crataegus sp.	hawthorn (fruit)									1	*1*
Crataegus sp.	hawthorn (seed)									1	*1*
cf. *Crataegus* sp.	?hawthorn			4	1	1			1	4	*11*
Prunus and/or *Crataegus* sp.	gnawed fruits present		1		1	1	1		1	1	*6*
Rubus sp(p).	bramble	1	2	4	3	1	1	1	5	4	*22*
Maloideae (Pomoideae)	apple/pear/ whitebeam type	1									*1*
Sambucus nigra L.	elder	1	2	4	2		1	1	1	3	*15*

Taxa/ species		Pit 7214	Fen-edge Pit Cluster 3	Pond Cluster 1	Fen-edge Pit Cluster 5	Waterhole 8763	Waterhole 9075	Pond Cluster 2	Waterhole 9500	Pond Cluster 3	*Total*
Weeds of damp ground											
Ranunculus sceleratus L.	celery-leaved buttercup	1	1		1				1		*4*
Montia fontana L.	blinks		1	1							*2*
Bidens sp.	bur-marigold		1		1				1		*3*
Juncus sp(p).	rushes									1	*1*
cf. *Juncus* sp(p).	?rush				1					1	*2*
Carex sp.	sedges			1	1				3	3	*8*
Carex sp(p).	sedge(s)	1	2	1	2	1	1		1	2	*11*
Carex sp(p.)	sedge nutlet with urticle				1				2		*3*
Cyperaceae	sedge family		1	2							*3*
cf. Cyperaceae	?sedge family	1									*1*
Aquatic species											
Ranunculus Subgenus *Batrachium*	crowfoots		1	4	2		1	1	6	3	*18*
Potamogeton sp(p.)	pondweed			3					1		*4*
Zannichellia palustris L.	horned pondweed			1					1		*2*
Schoenplectus sp(p).	club-rush				1						*1*
cf. *Schoenplectus* sp(p).	?club-rush									1	*1*
Unspecified habitats											
Ranunculus sp(p).	buttercup type		1								*1*
Urtica sp.	nettle		1								*1*
Stellaria sp.	stitchwort				1	1			1		*3*
cf. *Silene* sp.	?campion			1							*1*
Persicaria sp.	knotweed				1				1	1	*3*
cf. *Persicaria* sp.	?knotweed	1					1		2		*4*
Polygonum sp.	knotgrasses				1						*1*
Rumex sp.	docks	1								1	*2*
Rumex sp(p).	dock(s)		1	4	1		1	1	2	3	*13*
cf. Brassicaceae	?cabbage family			1							*1*
Fabaceae indet.	pea family	1									*1*
Indet. cotyledon fragments					1						*1*
Apiaceae indet.	carrot family				1		1				*2*
Solanaceae	nightshade		1			1					*2*

Taxa/ species		Pit 7214	Fen-edge Pit Cluster 3	Pond Cluster 1	Fen-edge Pit Cluster 5	Waterhole 8763	Waterhole 9075	Pond Cluster 2	Waterhole 9500	Pond Cluster 3	*Total*
Lamiaceae	dead-nettle family	1			1						*2*
Galium sp.	bedstraw				1						*1*
cf. *Arctium* sp.	?burdock		1								*1*
Carduus/Cirsium sp.	thistles	1	1	4	1	1	1		4	3	*16*
Asteraceae indet.	indet. daisy family						1				*1*
Poaceae indet.	grasses			1							*1*
Poaceae indet. (<4mm)	small indet. grasses	1		1							*2*
indet. seeds		1	1	2	2	1		1	4	4	*16*
Indet. nutshell/fruit stone frags		1	1	4	3	1				1	*11*
Other plant remains											
Wood/roundwood >6.75mm		1	1	4	3	1	1		4	3	*18*
Degraded wood >2mm			1		3	1			1		*6*
Comminuted wood/twigs 2-6.75mm		1	1	4	3	1	1	1	6	4	*22*
Comminuted wood/twigs <2mm		1	1	4	3	1	1	1	5	4	*21*
Cones cf. *Alnus* sp.	?alder type cones	1	1								*2*
Indet. buds			1	2	1	1	1		1	3	*10*
Indet. buds/catkins				1	1					2	*4*
Leaf abscission pads										1	*1*
Rosaceae thorns	bramble-type thorns		2	4	2	1	1		1	3	*14*
Prunus spinosa/Crataegus sp. thorns	blackthorn/hawthorn thorns	1	2	1	1	1			1	3	*10*
Indet. thorns					1						*1*
Grass-sized culm nodes/internodes					1					1	*2*
Bryophyta indet.	Mosses (stems and leaves)	1	1	1					1	3	*7*
Degraded vegetative material		1	2	4	2	1	1	1	6	4	*22*
Root pseudomorphs									1		*1*
Charred Plant remains											
Charcoal		1	1	3	3		1		6	3	*18*

Table 5.5: The number of samples in which each taxa was found from the pits and waterhole features.

the vicinity of these features, as there is no discernable evidence for the by-products of harvesting or winnowing, such as charred or anaerobically preserved awn fragments or concentrations of straw. This may also imply that cereals were not being cultivated in the immediate vicinity of the waterhole pits.

The only non-cereal crop identified from the nine features consists of a very small number of uncharred flax seeds, which have been recovered from two samples within Pond Cluster 1. There is no associated evidence for the processing (retting) of flax stems for fibre, and the low frequency of flax seeds suggests that it was not being cultivated within close proximity of Pond Cluster 1, although it is possible that it was growing nearby as a weed.

Other plants of economic value

Wild plants of economic value occur consistently within the sample group, including remains of sloe/plum/cherry (*Prunus* sp.), hawthorn (*Crataegus monogyna*), brambles (*Rubus* sp.) and elder (*Sambucus nigra*), and to a lesser degree hazel (*Corylus avellana*). The remains of hazel are principally associated with pit 7214 and Fen-edge Pit Cluster 3, and consist of nutshell fragments and a possible nut kernel. This may point to debris generated from the consumption of hazelnuts around these pits. In addition a single pip of apple/pear/whitebeam-type (Maloideae) has also been recovered from pit 7214.

Fruit stones sharing similar morphological characteristics to cherry-type (*Prunus avium/cerasus/padus*) and sloe (*Prunus spinosa*) have been recovered from a number of samples. However, the state of preservation of the majority of the *Prunus* fruit stones prevented identification beyond genus, although the cautious identification of sloe could be supported by recovery of thorns of blackthorn/hawthorn type (*Prunus spinosa/Crataegus* sp.) from a number of the samples. In addition, some of the flots contain fruit stones as well as fruits of hawthorn (including cf. *Crataegus* sp.) that have been gnawed by small mammals, suggesting that these species are likely to have been growing in the vicinity or overhanging the waterholes and that the remains constitute the natural accumulation of plant detritus in the features during the disuse phases of the features (see below).

Varying quantities of bramble seeds are ubiquitous, with the exception of an upper fill of waterhole 9500 (sample 8150), while Rosaceae thorns are also quite frequent (being recorded in 61% of the sample group). In addition, elder is present in 65% of the samples and is particularly abundant in the two waterholes 9075 and 9146 as well as the lower fill of Pond Cluster 3. This suggests that brambles (blackberry or raspberry type) and elder grew around many of the waterholes. These species present further potential food resources, which were feasibly forming scrub or hedgerow vegetation around or adjacent to the features along with the hawthorn and *Prunus* species.

Palaeoecology of the waterhole features

As shown in Table 5.6, the general character of the nine waterholes is fairly consistent. Disturbed or cultivated ground, together with scrub and hedgerow vegetation, are frequently the dominant habitats represented, whilst species of damp ground and aquatic habitats are a consistent but comparatively minor component of many of the assemblages. The groups referring to 'unspecified habitats' often form a significant percentage of the assemblages and consist of weed identifications that could not be taken to species and those which could be found in a range of different habitats, which unfortunately renders them poor ecological indicators.

The species which occur in over 50% of samples (see Table 5.5) include those of high seed-producing plants and those with robust seeds such as common nettle (*Urtica dioica*), fat-hen (*Chenopodium album*), common chickweed (*Stellaria media*), bramble (*Rubus* sp.), elder (*Sambucus nigra*), dock (*Rumex* sp.) and thistles (*Carduus/Cirsium* sp.). The frequency of these species could potentially be a reflection of poor preservational environments, suggesting a loss of material that may bias many of the assemblages, and could perhaps account for the possible under representation of species of damp, wet, or more open grassy habitats. The trend for the frequency of species to decline in deposits forming the upper fills of the features, notably in Fen-edge Pit Cluster 3 and Pond Cluster 1, is also likely to be a reflection of the changing and deteriorating perservational environments. However, it is possible that the frequency and abundance of the aforementioned species may be a reliable representation of local vegetation, which points towards disturbed rough or scrub ground around the immediate vicinity of many of the waterholes.

The presence of fruits of hawthorn and sloe/plum/cherry, particularly gnawed remains, which occur frequently in the upper fills of a number of the waterholes, would correspond to the infilling of features with plant detritus derived from adjacent or overhanging vegetation. This evidence points towards more established scrub vegetation developing in the later phases of the features, which is likely to be associated with decline in the use and subsequent abandonment of the waterholes. One notable exception to this scenario is waterhole 9500. There is very little in the way of scrub vegetation represented either in the seed assemblages, other than low frequencies of brambles, or by remains of wood, twigs or other plant remains, but there is a relatively greater frequency and abundance of species of aquatic environments such as crowfoots (*Ranuculus Subgenus Batrachium*), and also damp habitats including sedges (Table 5.6). This suggests that the feature functioned as a waterhole in a fairly open habitat. Another waterhole that contained an abundance of aquatic and damp weed species in all of the sampled deposits is Pond Cluster 1. However, the fills from this waterhole also contain frequent hawthorn, bramble and, to a lesser degree, elder seeds, as well as other vegetative

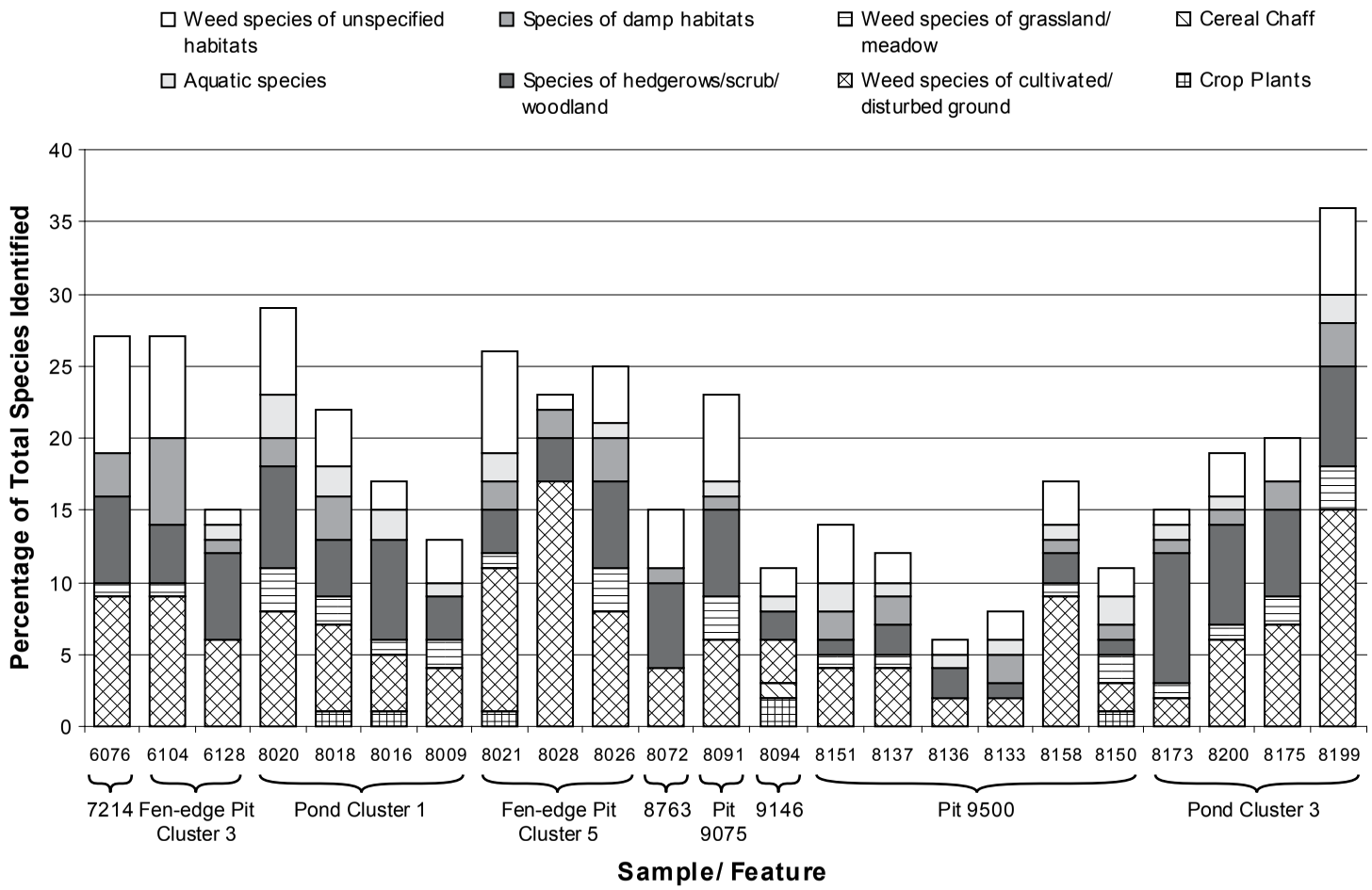

Table 5.6: Broad habitatsrepresented by the species identified from each sample.

material including wood, twigs, buds and thorns, suggesting an open waterhole with adjacent established scrubby ground or hedgerows.

Palaeoecology of the wider environs

There is some material derived from anthropogenic activity, in the form of charred cereal grain, chaff and weed seeds as well as remains of hazelnut. However, these remains occur in very low concentrations: they would appear to constitute background material. As previously discussed, there appears to be no direct botanical evidence for crop processing activities aside from a few uncharred seeds of flax. This suggests that the waterhole features were generally located in the (pastoral) landscape around the occupation areas. Flax may have been cultivated relatively near to Pond Cluster 1

Species of scrub and hedgerows occur very frequently, particularly brambles, elder and hawthorn. The spatial differentiation in the dominant species of scrub vegetation appears to vary across the waterholes, but this may also be a factor of preservation. This vegetation may have formed hedges, but there is no direct archaeological evidence for hedgerows on the site despite strong boundary indicators. The extent of the scrub associated with the majority of the waterholes remains uncertain. Only one waterhole, feature 9500, seems to have been situated in an open environment with some rough or scrubland nearby. This is indicated by the presence of remains of species such as common chickweed, common nettle, fat-hen, sedges and brambles.

Discussion of combined botanical evidence

Diet and economy

The typical crops cultivated during the Bronze Age were emmer wheat (*Triticum dicoccum*) and spelt wheat (*Triticum spelta*), with hulled barley (*Hordeum vulgare*) also being an important staple (Greig, 1991). Other known crop plants from this period include flax. Despite the adoption of farming during the Bronze Age, there is consistent evidence for the continued collection of wild resources such as blackberry, raspberry (*Rubus idaeus* and *R. fruticosus* agg.), sloe, bird cherry (*Prunus padus*), hazelnut, wild strawberry (*Fragaria vesca* s.l.) and elder, but seemingly to a much lesser degree than in the Neolithic period.

With this in mind, the flora associated with the waterhole features includes species such as elder, hawthorn, sloe and cherry/plum-type, brambles and hazel which would have been valuable local wild resources that were undoubtedly exploited by the local inhabitants. The corresponding charred evidence from the non-waterlogged features (see above) includes small quantities of charred fruit stones (some with charred flesh still attached) from cremation 7380 and One Metre pit 8091, as well as traces of charred hazelnut shell from a series of five pit and scoops in and around Midden Area 1 (features 6501, 6508, 6685, 6670 and 6684), which fits with the exploitation of the scrubland found around the waterholes. Also, while the increasing abundance of plant detritus and fruits of these species in some of the features points towards the abandonment of the features as waterholes, it does not necessarily follow that these areas were in general decline given the potential for wild resources. It is, however, difficult to determine to what extent these foods supplemented the local diet: it is likely that these gathered foods are under represented, in the waterhole contexts they almost certainly reflect natural deposition. This probable discrepancy can be attributed to the fact that the seeds of soft fruits such as brambles and even fruit stones will be ingested and, unless midden or cess deposits are present, are unlikely to be recovered in situations where they were utilised.

The charred botanical evidence from the non-waterlogged features at Pode Hole provides only limited evidence for crop-processing activities and none for the mass storage or processing of cereals. Despite the low levels of charred botanical residues in the form of comminuted charcoal and cereal remains, there is no reliable corresponding evidence for crop processing activities associated with the waterholes, suggesting that the earlier stages of crop processing or other related activities were not taking place near these features. Furthermore, while weed floras that are typically characteristic of arable land occur frequently, notably species such as common chickweed, fat-hen, knotgrass and black bindweed, there is no direct evidence for the cultivation of cereal crops within the locality of any of the waterholes. The ground disturbance that favours these species could easily have been caused by animals.

The plant macrofossil evidence for non-cereal crops is tenuous and consists of a small concentration of flax seeds from Pond Cluster 1. No other remains of flax have been recovered from any of the waterhole deposits. Cremation 7380 yielded a concentration of (charred) flax seeds along with charred fragments of fruit stones. This evidence appears to confirm that flax was not being processed for fibre but was used for domestic purposes, perhaps in the diet.

Dietary and economic evidence from the nearby Thorney Borrow Pit at Tower's Fen (Phoenix Consulting Archaeology Ltd, 2007) complements the findings from Pode Hole, with wheat and barley recorded and evidence for the exploitation of scrubland vegetation associated with the ditches and field boundaries. Pollen analysis of one pond feature indicated isolated cereal cultivation (Branch and Silva, 2007), which also seemed to be reflected in the plant macrofossil assemblages from the same feature (Vaughan-Williams, 2007). The only evidence for non-cereal crops from Tower's Fen, Thorney, consists of a single possible uncharred flax seed, recovered from a ditch deposit, as well as seven charred pulses identified as possible lentils (cf. *Lens* sp.). The concentrations of bramble seeds in certain pit deposits were taken to suggest the incorporation of cess into some of the features.

Palaeoecology of waterhole features and wider environs
The presence of aquatic species such as crowfoots and pondweeds shows that non-seasonal standing water was present in some of the waterholes, notably Pond Cluster 1 and pit 9500, although the probable bias due to variable preservation may mean that these species are under represented. Damp ground and open scrub is generally characteristic of the immediate environs of the waterhole features. The scrubland includes species that could be interpreted as hedgerow species, such as blackthorn, hawthorn, elder and hazel, although there is no other archaeological evidence for hedgerows as boundary features. Such evidence is anyway generally very rare on sites.

Weed floras typically associated with arable land as described above (including fat-hen, chickweed, knotweed, knotgrass, docks, black bindweed etc) not only occur frequently in the deposits from the waterholes, but have also been recovered from the non-waterlogged features across the site. It is difficult to determine if this is due to the presence of similar floras denoting disturbed and rough ground which were found around the waterholes as well as around the settlement areas. Considering there is no wealth of evidence for crop processing: this could suggest that foliage from these disturbed/cultivated habitats was perhaps used for tinder or for flooring before being discarded into the hearths.

The pollen and plant macrofossil evidence recovered from the nearby Thorney Borrow Pits site on Tower's Fen presents a similar scenario with damp ground, tall grassland and localised cereal cultivation in and around the analysed pond features, with open woodland and scrubland on the periphery of these features and also along the ditches or field boundaries (see Branch and Silva 2007, Vaughan-Williams 2007).

Conclusions

The palaeoenvironmental reconstructions based on the plant macrofossil evidence suggests that the series of nine waterhole pits and ponds were situated in a predominantly pastoral landscape with some possible flax cultivation taking place near Pond Cluster 1. Many of the waterholes were situated in fairly open scrubland consisting of species of economic value that were probably exploited for domestic purposes, with direct evidence for the use of hazelnuts and *Prunus*. Only waterhole 9500 seems to have been located in a more open habitat, and all the waterholes' weed floras contain an element of disturbed/cultivated or rough ground, suggesting activity around the features, possibly caused by stock.

There is limited evidence for crop processing activities, and the waterholes appear to have been located away from main settlement areas. Flax seems to have been primarily used for consumption, since evidence for the processing of flax for fibre has not been identified in any of the waterlogged deposits. This suggests that the series of waterholes analysed here did not function as retting pits at any point.

Insect remains

by Paul Buckland

Introduction

The features identified as waterhole pits and ponds at Pode Hole proved to be sufficiently deep to have excellent preservation of insect remains, and several were sampled. Scanning of the material recovered by paraffin flotation (Coope and Osborne, 1968) indicated a close similarity between assemblages, and five samples were therefore selected for detailed identification. Three samples (8016, 8020 and 8091 – the latter providing the taxonomically most diverse list) are from the two pollen successions examined by Langdon and Scaife (see below) and the other samples are from two similar features. After initial sorting, the sclerites were identified using the collections housed in the Doncaster Museum, and the results are presented below (Table 5.7). Taxonomy follows Böhme (2005).

Species of note

A single pronotum of a small cucujid occurs in sample 8020. The presence of a single slight lateral keel on either side immediately places the specimen in the group *Laemophloeus* (s.l.), divided into five genera by Lefkovitch (1959), and the slightly transverse form (width:length 3:2.5), occurrence of small teeth on both the anterior and posterior angles and fine close punctuation serve to identify the specimen as *Notolaemus castaneus* (Er.). This species is not recorded from the British Isles, occurring in scattered localities in France, Germany, Austria, Hungary, Poland, the Czech Republic, and Italy (Fauna Europaea, 2008; Koch, 1989; Ratti, 2000), reaching its northern limit in Strömsholm, Vestmannaland, Sweden (Palm, 1959); Hermanson (2001) also notes the species from adjacent Uppland, and Ferenca et al. (2005) from Lithuania. The beetle is recorded from beneath the bark of a range of deciduous trees, principally oak and hazel, but also from beech, birch and chestnut, where, like other members of the group, it is probably largely predatory on the larvae of other insects.

The environment

Despite the presence of one species which is clearly an *Urwaldrelikt* (*sensu* Buckland, 1979), the samples all show little evidence for the proximity of woodland, and the general picture is of a damp, weedy meadow, perhaps with scattered trees, and with some large herbivores. The ground beetle fauna is largely one of damp grassland, ranging to the edge of wetlands. *Blethisa multipunctata*, *Asaphidion flavipes* and species of *Bembidion*, *Pterostichus* and *Agonum* often occur on the wet mud at the side of ponds, although *Limodromus* assimile is more

	Group	Pond Cluster 1			-	Pond Cluster 3
	Cut	**8291**	**8291**	**8130**	**9075**	**9512**
	Sample	**8016**	**8020**	**8009**	**8091**	**8200**
	Context	**8232**	**8233**	**8131**	**9094**	**9713**
Taxon						
Coleoptera						
Carabidae						
Nebria brevicollis (F.)					1	
Blethisa multipunctata (L.)						1
Elaphrus cupreus Duft.			1			
Loricera pilicornis (F.)					1	
Clivina fossor (L.)				1	9	
Dyschirius luedersi Wagner	1				1	
D. globosus (Hbst.)	1		2	1	3	
Trechus quadristriatus (Schrank)					1	
T. obtusus Er.	1					
Bembidion lampros (Hbst.)					6	1
B. properans (Steph.)					1	
B. articulatum (Panz.)					1	
B. biguttatum (F.)			1			
B. guttula (F.)					5	
B. lunulatum (Fourc.)			1		7	
Bembidion sp.			2		4	
Asaphidion flavipes (L.)			1		2	
Ophonus cf. rufibarbis (F.)					1	
Pseudoophonus rufipes (Deg.)					2	
Ophonus sp.			1			
Bradycellus harpalinus (Serv.)					1	
Acupalpus parvulus (Sturm)					1	
Poecilus cupreus (L.)				1		
P. cupreus/versicolor (L.)/(Sturm)			1		3	1
Pterostichus strenuus (Panz.)					2	
P. diligens (Sturm)					2	
P. vernalis (Panz.)	1				1	1
P. nigrita/rhaeticus (Payk.)/Heer	2					
Calathus fuscipes (Goeze)				1	2	
C. melanocephalus (L.)					2	
Agonum afrum (Duft.)					1	
A. nigrum Dej.			1			
A. micans Nic.	2					
Limodromus assimile (Payk.)						1
Amara plebeja (Gyll.)					2	
Amara sp.			2	1	5	
Badister bullatus (Schrank)					1	
B. sodalis (Duft.)					1	
Paradromius longiceps (Dej.)					2	
P. linearis (Ol.)					2	
Syntomus obscuroguttatus (Duft.)					1	
Haliplidae						
Haliplus sp.					2	1
Dytiscidae						
Hydroporus palustris (L.)	2					1

	Group	Pond Cluster 1			-	Pond Cluster 3
	Cut	**8291**	**8291**	**8130**	**9075**	**9512**
	Sample	**8016**	**8020**	**8009**	**8091**	**8200**
	Context	**8232**	**8233**	**8131**	**9094**	**9713**
Taxon						
Hydroporus sp.		1			4	1
Agabus bipustulatus (L.)			1	1	1	
Agabus/Ilybius sp.					1	
Colymbetes fuscus (L.)		1	1		1	
Gyrinidae						
Gyrinus suffriani Scriba			1			
Hydraenidae						
Hydraena testacea Curtis			1	1	40	
Hydraena sp.		1				
Ochthebius bicolon Germ.		1			3	
O. minimus (F.)		4	6	1	15	4
O. marinus (Payk.)			1			
Ochthebius sp.		30	40	14	83	154
Limnebius aluta Bedel		1			1	1
Hydrophilidae						
Helophorus grandis Ill.					5	
H. aquaticus/grandis (L.)/Ill.		1		3		2
H. brevipalpis Bedel				2	5	
Helophorus (small) sp.		8		2	13	8
Coelostoma orbiculare (F.)		1	2			
Sphaeridium scarabaeoides (L.)			1			
S. lunatum F.		1	1		1	
S. scarabaeoides/lunatum F./(L.)						1
Sphaeridium sp.				1		
Cercyon impressus Sturm		1				
C. marinus Thoms.		1				
C. pygmaeus (Ill.)					1	
C. convexiusculus Steph.			3			1
C. sternalis Sharp		2	6		1	2
Cercyon sp.		1	3		2	1
Megasternum obscurum (Marsham)				3	16	
Cryptopleurum minutum (F.)		1	3			
Paracymus scutellaris (Rosen.)		1				
Hydrobius fuscipes (L.)		2	2		1	2
Anacaena globulus (Payk.)					1	
Enochrus sp.		1				
Histeridae						
Acritus nigricornis (Hoff.)					1	
Margarinotus carbonarius (Hoff.)			1			
Hister unicolor L.			2			
H. bisexstriatus F.			1	1	1	
Atholus duodecimstriatus (Schrank)			1		1	
Silphidae						
Blitophaga opaca (L.)					1	
Silpha obscura L.					2	
S. tristis Ill.					1	
Catopidae						

	Group	Pond Cluster 1			-	Pond Cluster 3
	Cut	**8291**	**8291**	**8130**	**9075**	**9512**
	Sample	**8016**	**8020**	**8009**	**8091**	**8200**
	Context	**8232**	**8233**	**8131**	**9094**	**9713**
Taxon						
Catops chrysomeloides (Panz.)					2	
Catops morio (F.)			1			
Orthoperidae						
Corylophus crassidoides (Marsham)					2	
Ptiliidae						
Acrotrichis sp.				1		
Staphylinidae						
Micropeplus staphylinoides (Marsham)				1		
M. porcatus (F.)					1	
Metopsia clypeata/similis (Müll.)/Zerche					1	
Megarthrus sp.					1	
Proteinus brachypterus (F.)						1
Phyllodrepa floralis (Payk.)			1			
Omalium excavatum Steph.	1					
Omalium sp.			1		2	1
Olophrum fuscum/piceum (Grav.)/(Gyll.)						1
Lesteva longoelytrata (Goeze)			1		13	
Omaliinae indet.				1		
Carpelimus bilineatus (Steph.)			1			
C. rivularis (Mots.)					2	
Carpelimus sp.	3		6		1	5
Anotylus rugosus (F.)	2		2	1	14	
A. sculpturatus (Grav.)	1				2	1
A. nitidulus (Grav.)			2	1	11	1
A. complanatus (Er.)					2	
Platystethus arenarius (Geoff.)	6		2			
P. degener Muls. & Rey	2				10	
P. alutaceus Thoms.	1		3		1	
P. capito Heer	1					
P. capito/nodifrons Heer/Mann.					1	
P. nitens (Sahl.)			1			
Platystethus sp.	1		3			
Bledius gallicus (Grav.)			1			1
Stenus sp.			3		24	3
Paederus sp.					1	
Rugilus geniculatus (Er.)					1	
R. orbiculatus (Payk.)					1	
R. erichsoni (Fauvel)					1	
Medon sp.				1		
Lathrobium (s.l.) sp.	1		1		1	
Leptacinus pusillus (Steph.)			3			
Phacophallus parumpunctatus (Gyll.)					1	
Gyrohypnus fracticornis (Müll.)			2		1	
Xantholinus linearis (Ol.)					5	1
X. longiventris Heer	1				3	
X. linearis/longiventris (Ol.)/Heer					1	
Othius laeviusculus Steph.					1	

	Group	Pond Cluster 1			-	Pond Cluster 3
	Cut	**8291**	**8291**	**8130**	**9075**	**9512**
	Sample	**8016**	**8020**	**8009**	**8091**	**8200**
	Context	**8232**	**8233**	**8131**	**9094**	**9713**
Taxon						
O. angustus Steph.						1
Othius sp.			2			
Neobisnius villosulus (Steph.)		1				
Philonthus laminatus (Creutz.)				1		
Philonthus sp.		2	5		22	2
Gabrius sp.					4	1
Quedius sp.		2				
Sepedophilus constans (Fowler)			1			
Tachyporus nitidulus (F.)			1			
T. tersus Er.					5	
Tachyporus sp.					1	
Tachinus rufipes (L.)					1	
T. laticollis Grav.					1	
Cypha sp.			1			
Drusilla canaliculata (F.)					1	
Ilyobates cf. *bennetti* Donis.					1	
Aleochara sp.		1			2	
Aleocharinae indet.		3	4	3	10	4
Cantharidae						
indet.					2	
Cantharis sp.			1			
Elateridae						
indet.			1			
Agriotes obscurus (L.)				1	3	
Agriotes sp.					5	
Agrypnus murina (L.)			1			1
Haplotarsus incanus (Gyll.)						1
Hemicrepidius hirtus (Hbst.)			1			
Throscidae						
Trixagus dermestoides (L.)				1		
Dryopidae						
Dryops sp.			1	1	2	1
Heteroceridae						
Heterocerus fenestratus (Thun.)					1	
Brachypteridae						
Brachypterus urticae (F.)		1	1		4	
Nitidulidae						
Meligethes sp.				1	4	
Cucujidae						
Notolaemus castaneus (Er.)			1			
Cryptophagidae						
Atomaria sp.		1		1	4	
Phalacridae						
Phalacrus substriatus Gyll.						1
Lathridiidae						
Enicmus transversus (Ol.)		2			4	
Enicmus sp.					2	

	Group	Pond Cluster 1			-	Pond Cluster 3
	Cut	**8291**	**8291**	**8130**	**9075**	**9512**
	Sample	**8016**	**8020**	**8009**	**8091**	**8200**
	Context	**8232**	**8233**	**8131**	**9094**	**9713**
Taxon						
Corticaria punctulata Marsham					1	
Corticaria/Corticarina sp		1			3	1
Coccinellidae						
Adalia bipunctata (L.)					1	
Coccinella septempunctata L.					1	
Anobiidae						
Anobium punctatum/inexpectatum (Deg.)/ Lohse				1	7	2
Oedemeridae						
Oedemera nobilis (Scop.)					2	
Anthicidae						
Anthicus antherinus (L.)					1	1
Lagriidae						
Lagria hirta (L.)					2	
Geotrupidae						
Geotrupes (s.l.) sp.		1	1		1	
Scarabaeidae						
Onthophagus joannae Goljan		1	1	2	2	
O. vacca (L.)			1			
Onthophagus sp.				1		1
Oxyomus sylvestris (Scop.)		4	3		4	
Aphodius erraticus (L.)					1	
A. arenarius (Ol.)					3	
A. rufipes (L.)				1	2	
A. sticticus (Panz.)		1				
A. sphacelatus (Panz.)			1	1		
A. prodromus (Brahm)		1		1	5	
A. foetidus (Hbst.)		1				
A. fimetarius (L.)						1
A. ater (Deg.)				1		
A. granarius (L.)		10	25		18	1
Aphodius sp.		4	12	2	3	4
Anomala dubia (Scop.)				2		
Hoplia philanthus (Fues.)				1		
Chrysomelidae						
Donaciinae indet.			1	1	1	
Oulema melanopus/rufocyanea (L.)/ (Suffr.)					1	1
Gastrophysa polygoni (L.)					1	
Linaeidea aenea (L.)					1	
Phyllotreta sp.		1	1	1	4	
Longitarsus sp.					3	3
Hippuriphila modeeri (L.)					1	
Epitrix pubescens (Koch)			3		1	
Chaetocnema concinna/picipes Marsham/ Steph.					15	1
C. hortensis (Geoff.)						1
Psylliodes sp.			1		1	

	Group	Pond Cluster 1			-	Pond Cluster 3
	Cut	**8291**	**8291**	**8130**	**9075**	**9512**
	Sample	**8016**	**8020**	**8009**	**8091**	**8200**
	Context	**8232**	**8233**	**8131**	**9094**	**9713**
Taxon						
Scolytidae						
Scolytus rugulosus (Müll.)			1			
S. mali (Bech.)				1		
Hylesinus oleiperda (F.)				1	1	
Curculionidae						
Omphalapion laevigatum (Payk.)					2	
Oxystoma craccae (L.)					3	
Apion (s.l.) sp.			3	4	39	1
Phyllobius roboretanus Gred.					3	
Liophloeus tessulatus (Müll.)						1
Barypeithes araneiformis (Schrank)					3	1
Strophosoma melanogrammum (Forst.)			1			
Sitona sulcifrons (Thun.)					2	1
S. lepidus Gyll.			1	1	6	1
S. hispidulus (F.)					1	
S. humeralis Steph.		1			1	
Sitona sp.			2		1	2
Cleonis pigra (Scop.)					1	
Tanysphyrus lemnae (Payk.)		1			4	
Acalyptus carpini (F.)			1			
Alophus triguttatus (F.)		6	7			2
Hypera zoilus (Scop.)						1
H. meles (F.)					2	
Acalles misellus Bohe.				2		3
Ceutorhynchus erysimi (F.)						1
Hadroplontus litura (F.)					1	
Ceutorhynchus (s. l.) sp.					2	
Nedyus quadrimaculatus (L.)		2	1		3	
Ceutorhynchinae indet.				2	6	5
Gymnetron labile (Hbst.)					1	
G. pascuorum (Gyll.)		1				1
Gymnetron sp.		2				
Rhynchaenus quercus (L.)						1
Isochnus foliorum (Müll.)					1	
Rhamphus pulicarius/oxycanthae (Hbst.)/ Marsham)						3
Hymenoptera						
Formicidae						
Tetramorium caespitum (L.)					1	
Lasius fuliginosus (Latr.)					1	
L. niger (L.)					1	

Table 5.7: Insect taxa identified from samples from Pond Clusters 1 and 2, and Waterhole Pit 9075.

likely to occur in woodland near water (Luff, 1998). The dung faunas, whilst relatively diverse, are poor in those species which would inhabit the nutrient-rich mud alongside ponds. It is unlikely that domestic animals had direct access to any water in the features. The species of *Paradromius* are sympatric in grassland, *P. longiceps* occurs in the wetter, more swampy localities, often amongst reeds, and *P. linearis* in tussocky grassland (Luff, 1998). The phytophages of the more permanent aquatic and semi-aquatic vegetation, however, are poorly

represented, with only small fragments of donaciines, insufficient to secure identification to the species level. In addition, the minute *Corylophus cassidoides* is usually found in the damp litter of waterside vegetation. There is, however, relatively little evidence for open, standing water in the features, and the few larger water beetles are as likely to be casualties in small temporary pools in the eutrophic mud accumulating in the base of each feature as to be part of any resident population, a point reinforced by the absence of recognisable fragments of dytiscid larvae. The proximity of fen would explain the presence of the now rare whirligig beetle *Gyrinus suffriani*, although its preference for dystrophic waters (Foster, 2000) would link it with other elements in the fauna. The hydraenids include large numbers of *Ochthebius* spp, most of which are probably *O. minimus*, and these are more characteristic of semi-liquid organic mud adjacent to stagnant water than of the water body itself. That the waterholes were sufficiently permanent for caddis flies and chironomids to complete their breeding cycle is evident from their larval exuviae, and is further suggested by the weevil *Tanysphyrus lemnae*, which feeds on duckweed, *Lemna* sp. (Koch, 1992). Although much of the nutrient-rich wet mud fauna overlaps with that of dung, the dominance of mud over dung species of *Cercyon* and *Platystethus* is evident. Whilst some of the species are occasionally synanthropic, the elements strongly associated with human habitations, stalls, or other structures are poorly represented and there is no evidence for settlement close to any of the features examined. The few furniture beetles, *Anobium punctatum/inexpectatum*, the latter largely recorded from ivy (Hyman, 1992), may relate to fencing or other structures around the pits such as the wattle linings recorded in some, and a similar source is possible for the examples of the small weevil *Acalles misellus*, although as this is flightless, usually associated with thin twigs of either ivy or hawthorn (Morris, 2002), it is possible that the xylophagous elements relate to hedges.

There are some indicators of the meadowland vegetation around the pits. *Brachypterus urticae* is found on nettles, characteristic as much of eutrophic fenland vegetation as of nutrient-rich anthropogenic soils and well manured soils (Koch, 1989) and bittersweet, *Solanum dulcamara*, indicated by the chrysomelid *Epitrix pubescens*, also thrives in wet meadow and fens, climbing up other plants. Another species of chrysomelid, *Gastrophysa polygoni*, feeds on various species of *Rumex* (docks), the weevils *Ceutorhynchus erysimi* on shepherd's purse and *Gymnetron* spp on plantains. Both the weevils *Cleonis pigra* and *Hadroplontus litura* develop on thistles, and Omphalapion laevigatum breeds in the flower heads of *Anthemis* and *Matricaria* sp. Clovers and vetches are well represented by species of the weevils *Sitona* and *Hypera*, and it is probable that the large number of *Apion* (s.l.) sp. belong to species feeding on Leguminosae. The general nature of the meadow is indicated by several species of click and chafer beetle, whose larvae feed either on the roots of grassland vegetation or are predators on rhizophagous taxa. *Agrypnus murinus* and *Agriotes obscurus* larvae belong to the familiar group referred to collectively as 'wireworms'; both prefer light sandy soils, where the larvae of the chafer beetles *Anomala dubia* and *Hoplia philanthus* also develop (Koch, 1989). Another elaterid in one sample, *Haplotarsus incanus*, is also recorded from wet meadowland and bogs.

Oak is suggested by the single individual of *Rhynchaenus quercus*, which mines in the leaves of the tree; alder by its leaf feeder *Linaeidea* (= *Chrysomela*) *aenea*, and willow by both the weevils *Acalyptus carpini* and *Isochnus foliorum*, and possibly also by *Rhamphus pulicarius/oxycanthae*, although the latter occurs on hawthorn. In all cases, the numbers of individuals are insufficient to suggest that the trees were growing in the immediate vicinity of the features, although the flightless weevil *Acalles misellus* is also found on hawthorn and is unlikely to occur far from the woodland edge unless in hedges. Ash is the host of the bark beetle *Hylesinus oleiperda*, and the two small species of *Scolytus, S. rugulosus* and *S. mali*, are found on a range of rosaceous trees and shrubs (Lekander et al., 1977). However, all these species fly readily and seek out trees when under stress: the presence of single individuals in samples need not imply the close proximity of trees.

Whilst combining the samples provides a coherent picture of muddy pools in a fairly nutrient-rich damp meadow, with some large herbivores as grazers, there are significant differences between the samples which cannot be assigned purely to taphonomy and the stochastic nature of faunal recovery. The samples from the top and bottom of Pond Cluster 1 are similar and they are characterised by the relatively large numbers of dung beetles, mostly *Aphodius granarius*, and the weevil *Alophus triguttatus*. Both show similar features in terms of preservation with the elytra curled and broken as if dried; some fragments also appeared packed inside each other. Such features are often characteristic of insects recovered from bird pellets (cf. Meyer et al., 1994; Girling, 1977), and it is probable that pellets, possibly from a corvid perched on a post adjacent to the feature, contributed to the fossil assemblage. The adults of *A. granarius* feed widely on a range of decaying plant materials as well as in herbivore dung, although Landin (1961) records the larvae specifically from cow and horse dung. *A. triguttatus* is a polyphagous weevil, which occurs in grassland; Morris (1997) suggests an association with *Plantago lanceolata*, fed upon by the small weevil *Gymnetron pascuorum* which also occurs in two samples. With the probable proximity of the contemporary coastline only a few kilometres away, the samples provide little evidence either for this or for estuarine conditions, a point shared with the near-contemporary site of Flag Fen closer to the Nene, 10 kilometres to the south-west (Robinson, 2001). The halobiontic hydrophilid *Paracymus aeneus* is difficult to distinguish from acid mire species *P. scutellaris* on the basis of a fossil elytron, but the darker bronzed and more elongate oval form appear diagnostic. It is presently

restricted to the Isle of Wight and S. Essex (Foster, 2000), although there are Bronze Age fossil records from North Ferriby on the Humber Estuary (Buckland et al., 1990) and Goldcliff in the Severn Estuary (Smith et al., 2000). The species is strongly halobiontic and prefers vegetated pools; in Europe, away from the coast, it is restricted to a few inland lowland saline localities (Lohse, 1971). The single example of the minute hydraenid *Ochthebius marinus* is probably a casual in the deposit. The species is largely restricted to brackish water, but it is a strong flier and there are occasional inland records (Hansen 1987). Girling (1991) also found examples in the Iron Age pond deposits on the top of the Breiddin in the Welsh Borders, and there are several inland interglacial records (e.g. Latton, Wiltshire (Lewis et al., 2006) and Waverley Wood, Warwickshire (Shotton et al., 1993)).

Insects	Plants
Brachypterus urticae *Nedyus quadrimaculatus* (L.)	*Urtica dioica* (nettles)
Phalacrus caricis	*Carex* sp. (sedges)
Oulema melanopus/rufocyanea (L.)/(Suffr.) *Chaetocnema hortensis* (Geoff.)	Poaceae (grasses)
Gastrophysa polygoni (L.)	*Rumex* sp. (docks)
Linaeidea aenea (L.)	*Alnus glutinosa* (alder)
Phyllotreta sp.	Cruciferae (mustard and cabbage family)
Hippuriphila modeeri (L.)	*Equisetum arvense* (horsetail)
Epitrix pubescens (Koch)	*Solanum dulcamara* (bittersweet)
Chaetocnema concinna/picipes Marsham/Steph.	usually on Polygonaceae (knotweed family)
Scolytus rugulosus (Müll.) *S. mali* (Bech.)	On tree and shrub Rosaceae
Hylesinus oleiperda (F.)	*Fraxinus excelsior* (ash)
Omphalapion laevigatum (Payk.)	*Anthemis* & *Matricaria* sp. (chamomile family)
Oxystoma craccae (L.)	*Vicia* sp. (vetches)
Liophloeus tessulatus (Müll.)	Apiaceae (umbellifers)
Sitona sulcifrons (Thun.) *S. humeralis* Steph. *Hypera meles* (F.)	Papilionaceae
S. lepidus Gyll. *S. hispidulus* (F.) *Hypera zoilus* (Scop.)	*Trifolium* sp. (clovers)
Cleonis pigra (Scop.) *Hadroplontus litura* (F.)	*Carduus* & *Cirsium* sp. (thistles)
Tanysphyrus lemnae (Payk.)	*Lemn*a sp. (duckweed family)
Acalyptus carpini (F.) *Isochnus foliorum* (Müll.)	*Salix* sp. (willow)
Ceutorhynchus erysimi (F.)	*Capsella bursa-pastoris* (shepherd's purse)
Gymnetron pascuorum (Gyll.)	*Plantago lanceolata* (ribwort plantain)
G. labile (Hbst.)	*Plantago* sp. (plantain)
Rhynchaenus quercus (L.)	*Quercus* sp. (oak)
Rhamphus pulicarius/oxycanthae (Hbst.)/Marsham)	*Salix* spp/*Crataegus* sp. (willow/hawthorn)

Table 5.8: Plants indicated by the insect record.

Sample 8091, from waterhole pit 9075, provides the most diverse list of species, totalling 636 individuals. Although this is largely an expansion of the lists obtained from other features, there are a number of differences, some difficult to evaluate. Why for example, does this sample include 40 individuals of *Hydraena testacea*, only present as singletons in two other samples? Superficially its habitat, in the wet zone around the edge of stagnant water (Hansen, 1987), is very similar to that of the most frequent *Ochthebius, O. minimus*. The presence of the small hydrophilid *Megasternum obscurum* in some numbers in the sample may indicate a more eutrophic environment in that this is frequently found in herbivore dung (Skidmore, 1991), and if the large number of *Aphodius granarius* in Pond Cluster 1 are ascribed to bird pellets, there are a few more dung beetles. Animal excreta may therefore have contributed more to the mud along the edge of the feature, but there is still no satisfactory evidence of the animals regularly drinking from the pond.

Conclusion

The landscape around the features with waterlogged sediments at Pode Hole was one of damp meadow with few if any trees, in the immediate environment. Animals lightly grazed the fields, but did not have direct access to the waterhole pits. There is a slight suggestion of hedges in the insect assemblages, but insufficient to be diagnostic.

Column Samples and Palynology

by James Rackham

Introduction

Twenty-four soil monoliths were collected from the excavation area. However, only seven of these preserved material suitable for pollen analysis. These seven were all then radiocarbon dated. Of the waterholes from which samples were available for pollen analysis, dates ranged from 1520BC to 910BC (calibrated), with considerable overlap between several of the features. For practical and cost reasons, only three of the seven monoliths suitable for pollen analysis were studied. In addition to these, four spot samples from Fen-edge Pit Cluster 1 were also analysed.

The earliest of the soil monoliths (monolith 8022) was collected from Pond Cluster 1. A date from the sample itself produced an age of 1460-1310 cal BC (Beta-238590). Waterhole 9075 (monolith 8090) would appear to be a slightly later feature, with a date for a deposit just over halfway up the monolith of 1420-1190 cal BC (Beta-238589). Pond Cluster 3 (monolith 8172) produced a date in the bottom half of the monolith sequence of 1300-1020 cal BC (Beta-238591) and one for the top of the monolith sequence (75-80cm) of 1120-910 cal BC (Beta-244198).

This latter deposit would appear to represent the completely humified remains of an episode of peat formation across the pond. The date of this deposit is important, as it may mark the time when the whole site became permanently waterlogged and unsuitable for occupation.

Monolith 8022

Monolith 8022, from Pond Cluster 1, is the earliest of the samples selected for pollen analysis. The sediments had dried and oxidised to some extent since sampling and iron deposition was extensive. However, the greatest degree of decomposition must have taken place over the last few decades, when the water table was lowered through agricultural drainage and quarrying. The deposit sequence illustrates a mix of fairly rapid inwash and slow sedimentary deposition, and the section (Fig. 3.40) shows evidence of several recuts. The sediments indicate a primary episode of silting with an associated inwash of sands from the sides of the waterhole. An increase in the proportion of flint gravel suggests disturbance or erosion of the waterhole sides, and the increase of wood and twigs at 32cm indicates debris, possibly from scrub or adjacent hedgerow trees entering the deposits. The humified peaty silt above indicates a period of permanent waterlogging, with both silts and vegetation accumulating on the floor of the feature. The silt fraction fines upwards into a clayey silt with degraded wood. These deposits appear to reflect a stabilisation of the sides of the waterhole with little bank erosion, but with the feature drying out occasionally and preventing the buildup of further organic rich sediments. The stoney sandy silt loams above indicate the re-occurrence of some erosion of the feature sides with the gravel lens at 90-96cm perhaps indicating redeposition of gravels during re-cutting elsewhere in the feature. The upper deposit indicates slow silting, long after this part of the waterhole had ceased to function. However, the upper fills, represented by contexts 8232, 8190 and 8189 (the top 47cm of the monolith), produced collections of hand-recovered animal bone, while the lower fills produced none. These deposits represent a period when the waterhole was no longer functional and had been substantially infilled. Bone debris from cattle, red deer, pig and sheep, and red deer antler, suggests that a settlement may have moved closer to the feature during this phase of the site.

Height from base	Description of sediment
96-100cm	10YR 3/2 – very dark greyish brown silt loam
90-96	5YR 5/6 – yellowish red sandy flint gravel
79-90	10YR 3/3 – dark brown sandy silt loam with small stones and slight iron staining
65-79	10YR 3/3 – dark brown sandy silt loam with larger stones and iron stained root holes
53-65	10YR 3/1 – very dark grey slightly clayey silt with iron staining and degraded wood fragments
48-53	10YR 2/2 – very dark brown completely humified peaty silt
32-48	10YR 3/1 – very dark grey sandy stoney silt with degraded wood – C14 sample at 44-45cm
14-32	10YR 5/3 – brown slightly clayey sandy silt with frequent flint gravel and grits
6-14	10YR 3/2 – very dark greyish brown slightly sandy silt with occasional stones
0-6	empty

Table 5.9: Monlith 8022 characterization.

Monolith 8090

The middle series was chosen from monolith 8090, from pit 9075. There is considerably less evidence of erosion of the waterhole sides in this sequence, despite the feature being much smaller and having steeper sides than Pond Cluster 1. The primary fill of this feature is an organic silt with occasional stones inwashed from the gravel sides. The deposits are heavily humified but much of this degradation could be fairly recent in origin. The deposits above become sandier with occasional stones, fining upwards into a stone-free clayey silt at 37-47cm. There is little evidence for substantial organics in this deposit, suggesting open standing water in the waterhole, but perhaps now seasonally drying out, in contrast to the organic silts below. A wetter episode is suggested above 47cm as wood appears in abundance (context 9092 in Fig. 3.38b), its current degraded state almost certainly a product of relatively recent changes in the ground water table. This horizon, 51-60cm, comprises a humified organic silt with numerous wood fragments and suggests a further episode of permanently standing water in the feature, perhaps a generally wetter episode on the site. The oxidised grey brown silty sand and sandy silt loam above imply the slow accumulation of sediment in the hollow of

Height from base	Description of sediment
72-88cm	7.5YR 5/6 – strong brown heavily iron stained sandy silt loam
60-72	10YR 4/2 – dark greyish brown slightly silty sand with grits and occasional stones
51-60	10YR 4/3 – brown woody layer in silt – very woody in upper half – C14 date was taken from this deposit adjacent to the monolith – context 9092
47-51	10YR 4/2 – dark greyish brown sandy silt
40-47	10YR 4/2 – dark greyish brown slightly clayey silt with iron mottles
37-40	7.5YR 5/6 – strong brown slightly clayey silt, but heavily iron mottled
29-37	10YR 4/1 – dark grey slightly sandy slightly sticky silt with localised heavy iron staining and occasional stones
28-29	as above but iron stained band
20-28	10YR 4/2 – brown slightly sandy silt, iron mottled with occasional stones
0-20	10YR 3/2 – dark brown humified organic silt with occasional stones and frequent vertical roots
-1-0	sandy gravel – natural base of feature

Table 5.10: Monlith 8090 characterization.

the largely infilled feature, with no evidence of any peat formation, indicating at least seasonally dry conditions with no evidence of any substantial erosion from the sides. Six fragments of cattle bone were recovered by hand from the woody deposit, while 9094 in the basal half of the sequence produced one bone and the upper fills, 9086, another one. This contrasts with Pond Cluster 1 and suggests little occupation nearby at any period during the infilling of the feature.

Monolith 8172

The latest in the series of sequences used for pollen analysis is monolith 8172, taken from deposits infilling cut 9680 in Pond Cluster 3. As with the other monoliths, the sediments had undergone some drying out, oxidation and degradation since being taken. The basal part of the sequence is comprised of humifed organic silts, with visible wood and twigs and occasional stones. These grade upwards into slightly sandy silts with surviving organics and wood whose degradation is likely to have been fairly recent. The upper part of this series is a slightly clayey silt, but still with frequent degraded wood fragments, occasional small stones and heavy iron mottling. These lower deposits must have formed in permanently wet conditions with some erosion from the sides of the feature bringing in sands and stones. The deposits are largely horizontal in this feature (see Fig. 3.44) and suggest a pond rather than waterhole, with sediments accumulating in open water. Above the organic deposits is an oxidised stoney silty clay, with evidence of rooting and heavy iron mottling. The absence of a residual organic component in this deposit suggests the natural infilling of the feature in dry or seasonally dry conditions, with an increase in disturbance perhaps being responsible for the stone content, which could have been caused by stock using the hollow. These upper fills produced almost no hand-collected bone (three pieces including two lamb bones from 9623) and do not show any evidence for nearby domestic occupation.

Height from base	Description of sediment
66-82cm	10YR 3/2 – very dark greyish brown slightly stoney humified organic silty clay with some iron mottling – C14 date taken at 75-80cm
42-66	10YR 4/1 – dark grey silty clay with stones, rare roots and bone, heavily iron mottled
29-42	10YR 4/1 – dark grey slightly clayey silt with frequent small degraded wood, small stones – heavily mottled in upper half
11-29	10YR 3/1 – very dark grey slightly sandy silt with visible degraded organics and wood, stones and some iron mottling
2-11	10YR 3/2 – very dark greyish brown humified organic silt with occasional stones and degraded wood and twigs
0-2	7.5YR 5/6 – strong brown coarse gritty sand.

Table 5.11: Monlith 8172 characterization.

The lower radiocarbon sample was taken from deposit 9628 represented in the monolith by the sediments between 2 and 42cm.

A completely humified peat horizon overlay the whole feature and was machined off, but a little remains at the top of the monolith. This humified organic silty clay has been radiocarbon dated to 1120-910 cal BC (Beta-244198) and would appear to mark the start of a period of very much wetter conditions on the site where peat deposits were forming within all the hollows and depressions created by the waterholes, pits and ditches of the Bronze Age landscape. These increasingly wet conditions across the site must have made it impossible to continue farming, and the landscape is likely to have been abandoned by the beginning of the first millennium BC.

Pollen Analysis

by Catherine Langdon and Rob Scaife

Introduction

This report presents the results obtained from the analysis of the sub-fossil pollen and spore assemblages from selected waterhole and pond features at Pode Hole which consecutively span the Middle and Late Bronze Age (approx. 1400-1000 BC). Three soil monoliths were examined, along with four spot samples. The three monolith profiles show differences, and thus have been described separately.

There have been few pollen analyses of such waterhole and pond features, largely due to their rarity and also to the perceived problems of the pollen taphonomy and interpretation of the data. However, a small number of analyses have been undertaken, as exemplified by the Bronze Age waterholes at Farmoor, Oxfordshire (Lambrick and Robinson, 1979), Mildenhall, Suffolk (Scaife, 1989), Pomeroy Wood, Honiton, Devon (Scaife, 1999) and Reading Business Park (Scaife, 2004). Small watering holes of Romano-British age near Haddon, Cambridgeshire (Scaife, 1994) and Pingwood, Berkshire, (Keith-Lucus, in Johnston, 1983-5) have also provided pollen data. These studies, in spite of the potential problems of interpretation, demonstrate that useful palaeo-environmental information may be gained from analysis of the sediment fills of such features.

Pollen method

Standard techniques for concentrating pollen of the sub-fossil pollen and spores were used on sub-samples of 2ml volume taken from box monolith profiles (Moore and Webb, 1978; Moore et al., 1991). Pollen was identified and counted using Nikon and Olympus

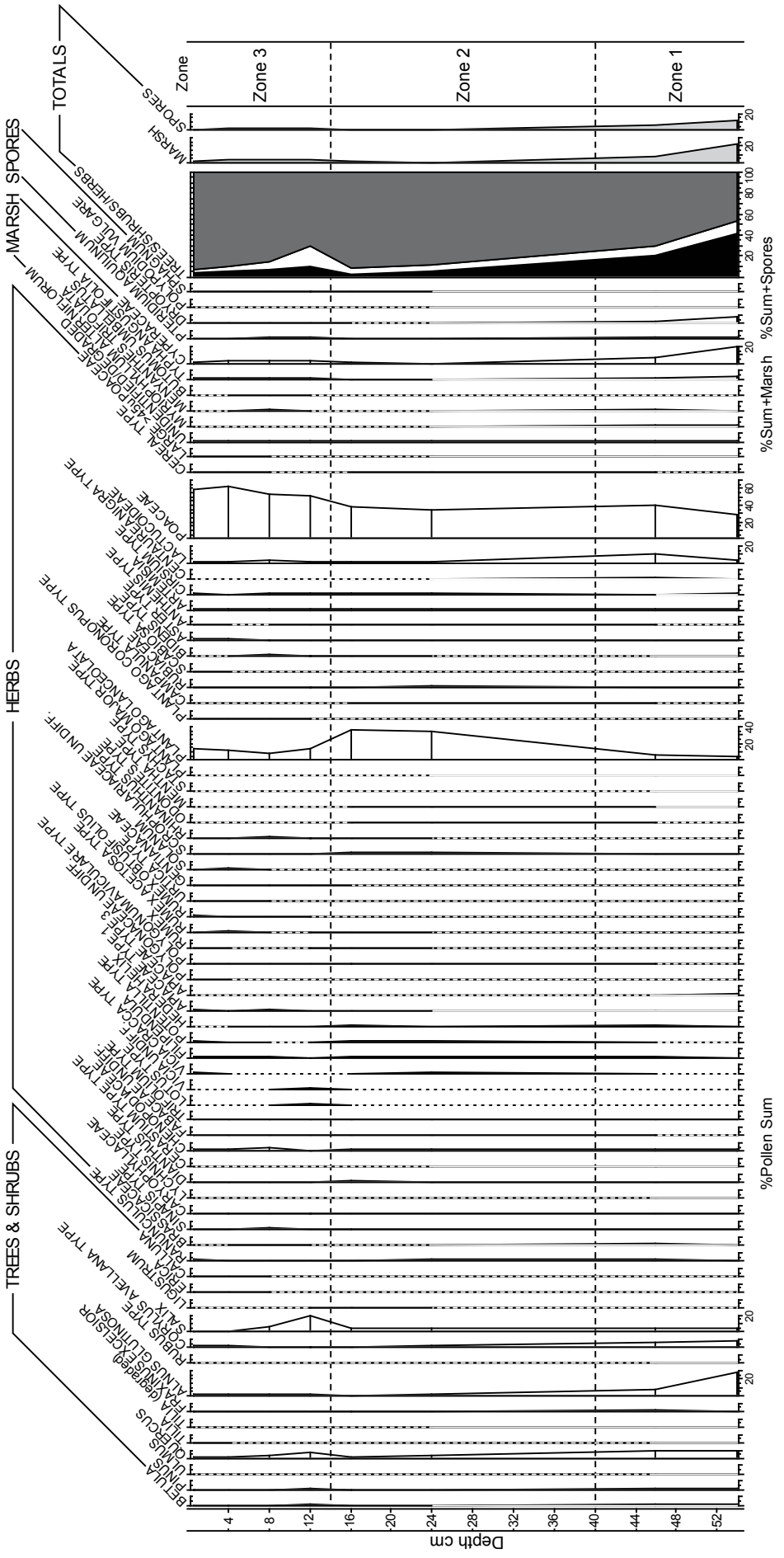

Table 5.13: Pollen diagram for Monolith 8022, Pond Cluster 1.

biological research microscopes. A total of 600 grains of dryland pollen, together with any extant wetland/ marsh taxa and spores of ferns, were identified and counted for each level from the three soil monoliths. Standard pollen diagrams (Tables 5.13-15) have been produced using Tilia View. The samples are plotted by depth from the top of each monolith (in contrast to the monolith characterisations above) because of the way that Tilia View uses the raw data. Percentages were calculated as follows:

Sum =	% total dry land pollen (tdlp)
Marsh/aquatic herbs =	% tdlp + sum of marsh/aquatics
Spores =	% tdlp + sum of spores
Misc. =	% tdlp + sum of misc. taxa.

Figure 5.12: Percentage calculation formulas.

Taxonomy in general follows that of Moore and Webb (1978) modified according to Bennett et al., (1994) for pollen types and Stace (1991) for plant descriptions. These procedures were carried out in the Palaeoecology Laboratory of the Department of Geography, University of Southampton.

The three waterhole profiles analysed span the Middle to Late Bronze Age. The palynological characteristics of these profiles are described below.

Profile 8022 - Pond Cluster 1

Dated to 1460-1310 cal BC (from 44-45cm in monolith; this corresponds to level 9-10cm on Table 5.13), the Middle Bronze Age, this profile is the earliest of the three sequences examined.

Herbs are dominant throughout, but with higher arboreal and shrub values in the lowest levels (zone 1). Three local pollen assemblage zones (LPAZ) have been recognised and are characterised as follows.

LPAZ 1: 60cm to 42cm.
Alnus has highest values (30% declining) with *Quercus* (to 10%) and *Corylus avellana* type (9%). There are small numbers of *Fraxinus* and *Salix* (4%) and occasional *Tilia*. There is a diverse range of herbs which are dominated by Poaceae (32-40%) with *Plantago lanceolata* (3-7%) and Lactucoideae (peak to 12%). There are only small numbers of cereal pollen. Marsh/fen taxa consist largely of Cyperaceae with highest values at the base of the profile (22%). *Myriophyllum spicatum, Menyanthes trifoliata* and *Typha angustifolia* type are present. *Pteropsida* comprise (monolete) *Dryopteris* type forms and small numbers of *Pteridium aquilinum* and *Polypodium vulgare*.

LPAZ 2: 42cm to 14cm.
Trees and shrubs of the preceding zone are reduced to small values. Herbs are characterised by expansion to high values of *Plantago lanceolata* (to 40%) which along with Poaceae (35-40%) are the dominant herb taxa. There are small numbers of cereal pollen. There is a reduction in marsh/fen taxa (especially Cyperaceae) and spores of ferns.

LPAZ 3: 14cm to 0cm.
This zone is delimited by a reduction of *Plantago lanceolata* (to 10%) and expansion of Poaceae (to 65%). Trees and shrubs remain the same as zone 2 but with a peak of *Salix* (19%) at 12cm. Herb assemblages remain similar with minor increases in Chenopodiaceae (to 6%) and in fen marsh taxa, Cyperaceae (4-5%), *Typha angustifolia* type (1-2%) and a single record of *Butomus umbellatus*.

Vegetation summary - Pond Cluster 1
As the earliest profile examined, it might be expected that there would be greater evidence of woodland remaining in the landscape. This appears the case with greater numbers of oak, alder, hazel, lime and elm (the latter two species in albeit small quantities). These are all, however, subordinate to herbs, and an open agricultural local environment is suggested for this period. There are only sporadic occurrences of cereal pollen and weeds of disturbed ground. Other taxa are of predominantly grassland/pastoral affinity with high values of grasses and ribwort plantain, the latter especially in LPAZ 2. There is some evidence that the waterhole was populated by aquatic and marginal aquatic plants including water milfoil (*Myriophyllum*), bog bean (*Menyanthes*), flowering bulrush (*Butomus*), bur reed and/or reed mace (*Typha angustifolia* type) and sedges (Cyperaceae). Willow is largely under represented in pollen profiles, and even the small values found here and in the other later profiles are indicative of local growth. This is certainly the case in LPAZ 1 where substantial values suggest autochthonous growth.

Profile 8090 - waterhole 9075

This profile has been radiocarbon dated to 1420-1190 cal BC (Beta-238589) for the middle part of the monolith (which represents the top few centimetres, 0-10cm, on Table 5.14) and is, therefore, of Middle to later Bronze Age date. Three pollen assemblage zones have been recognised in the lower two thirds of this 0.88m profile. These are characterised from the base of the profile upwards as follows.

LPAZ 1: 60cm to 38cm.
This zone is characterised by high values of Chenopodiaceae (10%), *Plantago lanceolata* (18%), Lactucoideae (5%). There are also smaller numbers of *Bidens* type, *Sinapis* type, *Trifolium* type, *Plantago major* type and Apiaceae. *Linum catharticum* type (probably cultivated *Linum usitatissimum*) is of particular note. Numbers/values of trees and shrubs are small and

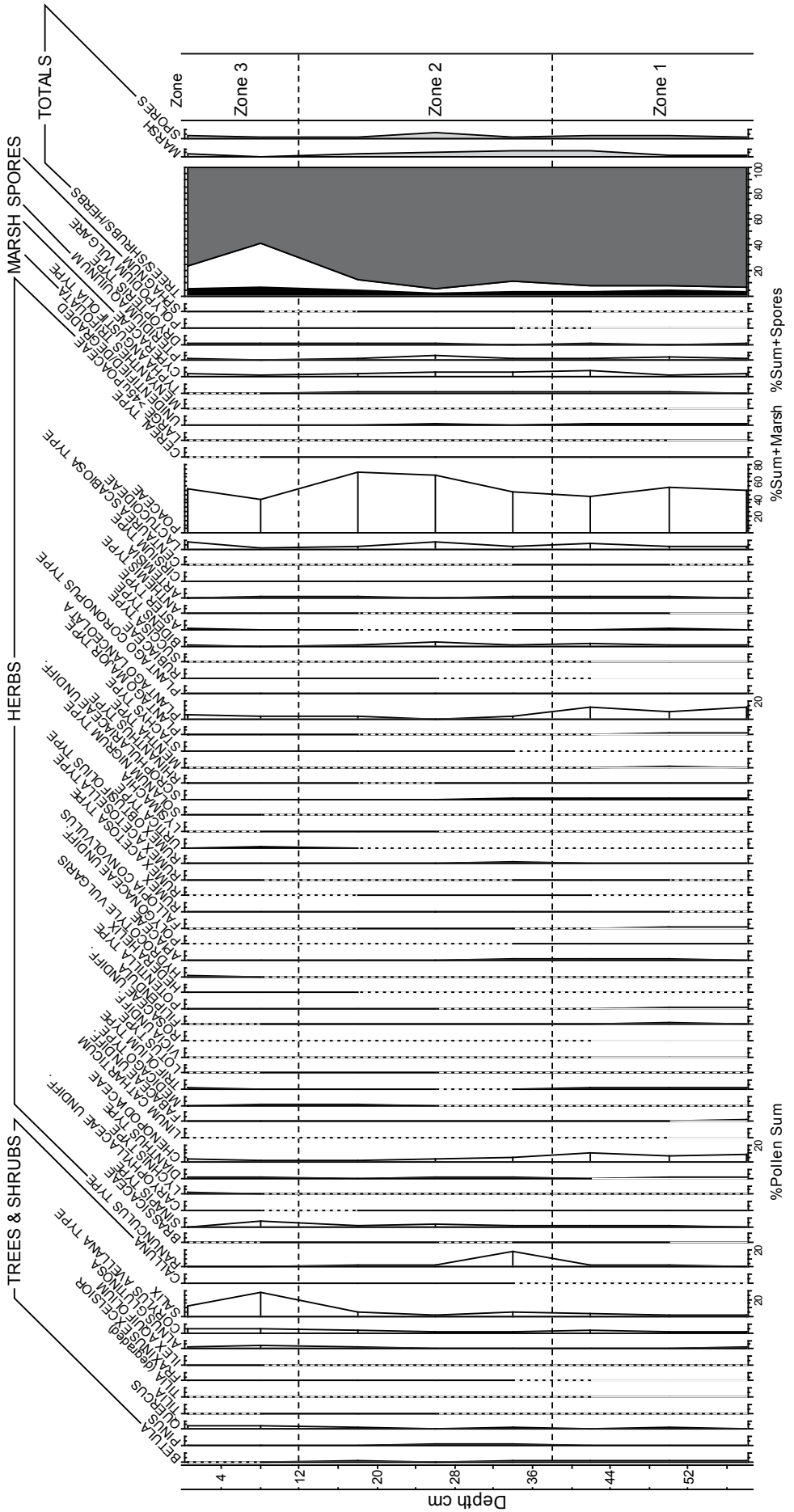

Table 5.14: Pollen diagram for Monolith 8090, Waterhole 9075.

comprise occasional pollen of *Quercus, Alnus, Tilia, Fraxinus, Corylus avellana* type, and *Salix*. Marsh/fen taxa include Cyperaceae, *Typha angustifolia* type and occasional *Menyanthes trifoliata*. Spores comprise *Pteridium aquilinum* (6%) and occasional *Dryopteris* type and *Polypodium vulgare*.

LPAZ 2: 38cm to 16cm.
Values of Chenopodiaceae and *Plantago lanceolata* in LPAZ 1 decline. Poaceae remain dominant with a maximum of 75% for the profile. Ranunculaceae has a single peak at 38cm. Values of marsh/fen taxa increase slightly with Cyperaceae (8%) most important with occasional *Typha angustifolia/Sparganium* type. Spores remain as in LPAZ 1.

LPAZ 3: 16cm to 0cm
There is some expansion of trees and shrubs with expansions of *Quercus* (3%), *Alnus glutinosa* (2-3%), *Corylus avellana* type (4%) and especially *Salix* (peak to 26%). A small number of *Calluna* (1-2%) are present in the upper level of the profile. Poaceae (40%) remains the principal herbaceous taxon with *Plantago lanceolata* and Lactucoideae (6-7%). There are fewer *Typha angustifolia*, with Cyperaceae reduced.

Vegetation summary - waterhole 9075
Overall, this profile shows a predominantly grassland, most probably pastoral, habitat as indicated by the high values of grass (Poaceae) pollen and other pastoral indicators including buttercups (*Ranunculus*), ribwort plantain (*Plantago lanceolata*), Asteraceae types, goosefoots and oraches (Chenopodiaceae). The latter may be associated with nitrogen enhanced soils associated with stock rearing.

There is only a very small representation of arable activity with small numbers of cereal pollen. These may also have come from secondary sources such as pollen liberated from crop processing and from waste products (especially human and animal faeces) although there is little evidence of such activity around waterhole 9075. Flax (*Linum catharticum* type = *L. usitatissimum*) is also a possible cultigen and may derive from local cultivation or from flax retting in the waterhole, although no evidence for retting was present among the plant macrofossil remains from the site (see Martin, above).

Values of tree and shrub pollen are small throughout with the exception of willow (*Salix*). The occasional records of ash (*Fraxinus*), lime (*Tilia*) and holly (*Ilex* – in LPAZ 3) are from trees which are usually poorly represented in pollen assemblages unless there is growth local to the sample site. The small numbers here suggest not the immediate locale but possibly within some hundreds of metres of the site. Oak, alder, birch, pine and hazel are high pollen producers and are viewed as being anemophilous, the pollen being wind-transported from regional sources.

Profile 8172 - Pond Cluster 3

Deposits present in the lower half of this profile were radiocarbon dated to 1300-1020 cal BC (Beta-238591), with a date of 1120-910 cal BC (Beta - 244198) gained from the top of the monolith (75-80cm), 44cm above the sequence displayed in Table 5.15. Overall, the profile has fewer changes than seen in the preceding and earlier Bronze Age profiles. As such, no local pollen assemblage zones have been recognised.

Trees and shrubs include *Quercus* (2-3%), with occasional *Pinus* (long distance), *Betula, Tilia, Fraxinus, Alnus* and *Ilex* aquifolium. The latter is present in the upper half of the profile. *Salix* is the dominant shrub with values to 35% at the base of the profile but declining from around 36cm to an average of approximately 20%. *Corylus avellana* type (2-3%) and *Sorbus* type are present in small numbers. Herb assemblages are diverse and are dominated by taxa of pastoral affinity. These include *Plantago lanceolata* (10-12%) and dominant Poaceae (to 50%). There are small/sporadic numbers of cereal pollen and records of *Linum catharticum* type (*L. usitatissimum*) and *Cannabis sativa* type. Marsh/fen taxa include Cyperaceae, *Typha angustifolia* type and *Menyanthes trifoliata*. Pteropsida include largely *Pteridium aquilinum* and small numbers of monolete (*Dryopteris*) forms and *Polypodium vulgare*.

Vegetation summary - Pond Cluster 3
The vegetation represented in this Late Bronze Age sequence is more consistent than that shown for the preceding periods. The pollen data clearly indicate a strongly pastoral/grassland habitat in the region of the site. This was probably a species-rich pasture which was undoubtedly long and of damp character in and around the margins of the waterhole. The presence of holly (*Ilex*), hawthorn/whitebeam (*Sorbus/Crataegus* type) and blackberry (*Rubus* type) are likely to be local elements and may be postulated as coming from hedgerows. However, oak, alder and hazel are high pollen producers and probably represent the background regional woodland. Willow (*Salix*) is poorly represented in pollen profiles, and the numbers here suggest that it was growing around the edges of the waterhole with a ground flora of wet fen-herb taxa which included marsh pennywort (*Hydrocotyle vulgaris*), bur–reed and/or reed mace and bog bean (*Menyanthes trifoliata*). Small numbers of cereal pollen and occasional segetals are evidence for arable cropping, although it may be considered that these elements may come from secondary sources (such as pollen liberated during threshing and winnowing) or from waste material including human and animal faecal debris.

Cultivated flax (*Linum catharticum* type including *L. usitatissimum*) and hemp (*Cannabis sativa* type) are also possible cultigens. The former is extremely poorly represented in pollen assemblages, and it is possible that the waterhole was used for flax retting, although there is no macrofossil evidence for this. *Cannabis sativa* type also

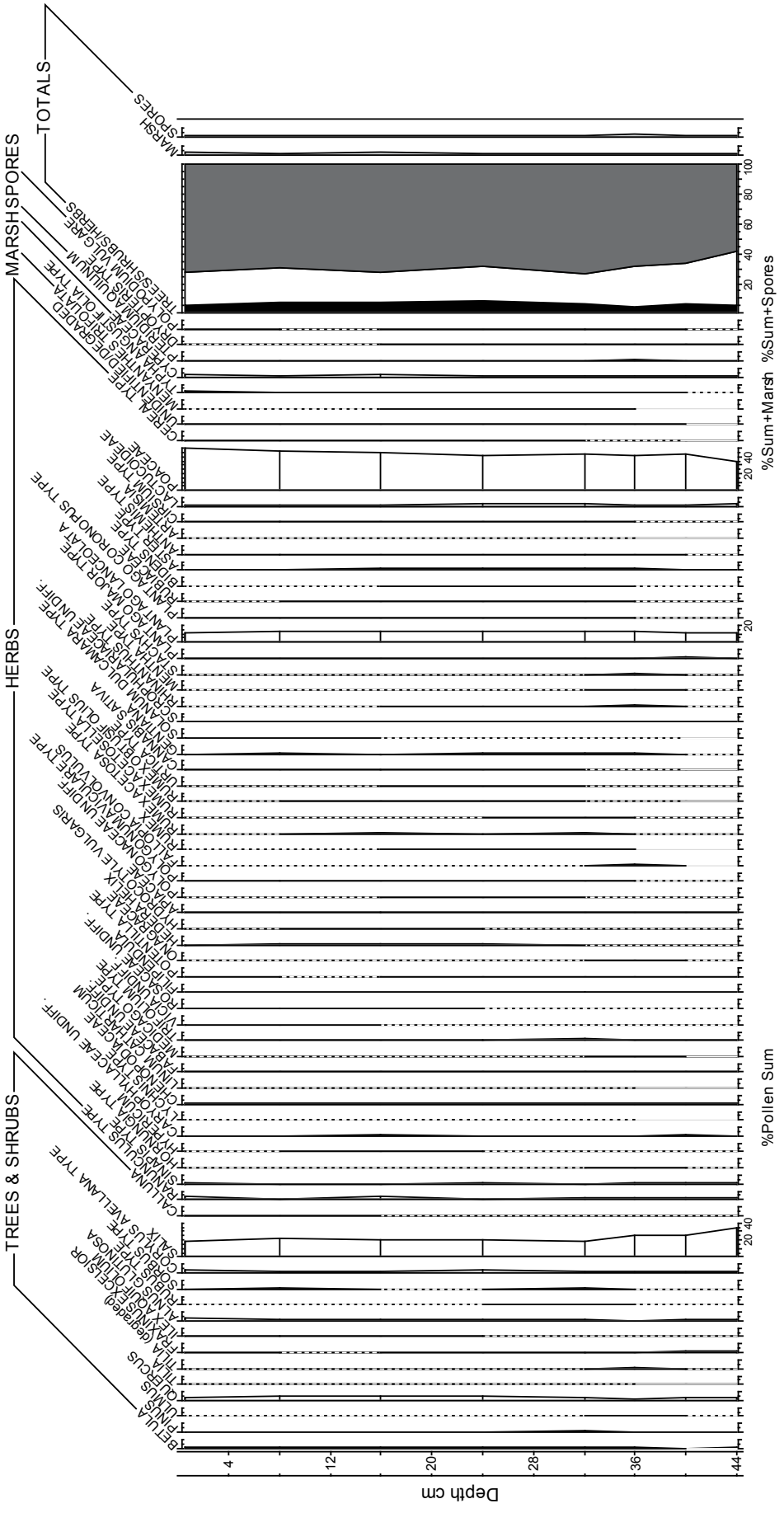

Table 5.15: Pollen diagram for Monolith 8172, Pond Cluster 3.

includes hop, and it is not possible to determine whether cultivated hemp or wild hop is represented here.

Summary and discussion

These water holes were apparently steep-sided, and pollen evidence suggests that there was a fringe of marginal aquatic fen taxa. It is very probable that these on- and near-site plant communities, combined with the nature of the depositional habitat, will have resulted in a complicated pollen taphonomy: the assemblages consist of pollen derived from on-site, near-site and regional sources, plus secondary, derived pollen coming from refuse and debris, including animal faeces. The animal and human related origins may have been minor since the beetle evidence does not suggest an abundance of animal dung, and apart from animal bone debris in the upper levels of Pond Cluster 1, above the pollen profile, there is little cultural debris associated with these waterhole deposits.

The possibility remains, however, that some of the pollen has been introduced into these contexts via secondary routes, and that the pollen from the surrounding environment will therefore be proportionally under represented.

All three waterholes have produced pollen assemblages which are largely herb dominated, showing that an open, grassland pasture environment existed locally in the area of occupation. In the earliest profile (sample 8022 from Pond Cluster 1) there is some evidence that the waterholes supported an aquatic flora with surrounding marginal aquatics (sedges, reeds etc). In subsequent profiles/periods, only the latter appear to be present, even in 'pond' 8172. In the case of LPAZ 3 in profile 8090, LPAZ 3 in profile 8022 and throughout profile 8172, high pollen percentage values of willow strongly suggest that it was growing along the fringes of these waterholes or on the nearby Fen-edge. It is possible that the upper levels of profile 8090 LPAZ 3 mark the establishment of this fringing willow during the Late Bronze Age which subsequently continued during the deposition of the deposits sampled by profile 8172. This may have resulted from decreasing use of these features specifically or perhaps the expansion of the local fen environment associated with rising waterlevels.

Apart from the local importance of willow noted above, the more regional woodland flora is only poorly represented. This may in part be due to the swamping effect of the vegetation which was growing close to the site on the pollen input to the waterholes. This was clearly damp and probably long pasture grassland producing copious quantities of pollen. It can be noted that the profiles (8022; Middle Bronze Age) does have a slightly greater importance of trees and shrubs with higher percentage values of oak, alder and hazel in the lower levels of the profile (LPAZ 1). Lime and ash are also present. This represents the last vestiges of woodland which existed during the Neolithic and Early Bronze Age (and, of course the preceding early and middle Holocene), occurring at the base of the profile and predating the 1460-1310BC date for the upper middle part of the pollen profile. This especially applies to lime/linden (*Tilia*) which is markedly under represented in pollen spectra (Andersen, 1973) and is known to have formed dominant or co-dominant woodland with oak for much of the middle Holocene (Atlantic/Flandrian II) and the Sub-Boreal (early Flandrian III). In subsequent, later profiles there is a consistent record of trees but in small numbers. Although the swamping effect of pollen from local plant communities may have depressed the relative importance of the arboreal and shrub component, it is never the less apparent that most of these taxa are from a more regional origin. This applies to oak and hazel which are frequently the only arboreal pollen components which show continuous representation after the principal, earlier phases of woodland clearance. Occasional ash (*Fraxinus*), beech (*Fagus*), holly (*Ilex*) and lime (*Tilia*) appear sporadically in the later profiles. These tree taxa tend to be poorly represented in pollen assemblages and as such some occasional local growth may be suggested (i.e. late Bronze Age). Plant macrofossil evidence (see Martin, above) shows hawthorn, *Prunus*, Maloideae, hazel, alder and elder, while wood remains have proved the presence of oak, alder, Maloideae, hazel, *Salix*, holly and ivy (see Taylor and Wheeler, below). These pollen taxa plus holly, blackberry and privet (and other tree and shrub taxa) are tentatively suggested as coming from local hedgerows, but this cannot be substantiated.

All profiles show a dominance of grassland and associated pastoral taxa. This was probably the pastoral element of a mixed agricultural economy. Small numbers of cereal pollen and segetals demonstrate growth and use of cereals at this time. It is difficult to say whether cereals were being grown local to the site or not, but in the later period the soils may have been too wet. The arable pollen component could come from cereals grown on some of the fields revealed in the site plan (Fig. 3.1), or on drier ground in the local region, or from secondary sources such as waste food debris, floor coverings and human and animal faeces which may have been disposed of in these features. With regard to the latter, it is now well understood that pollen can remain trapped in the ears of cereal remains (Robinson and Hubbard, 1977) throughout crop processing and may become incorporated in food (e.g. bread) and fodder (crop processing waste). This can readily pass through the stomach and gut, ultimately being deposited in a range of archaeological contexts. Nevertheless the general absence of macrofossil anthropogenic taxa of plant or insect suggests that this element of the pollen assemblage may have arrived naturally in the deposits.

Spot samples from Fen-edge Pit Cluster 1

A total of four spot samples were examined from contexts 6970, 6977, 6690 and 6597. A pollen sum of 100 grains per sample was counted for contexts 6970 and 6977, but context 6597 and 6690 did not contain enough pollen grains to enable even assessment counts to be made. The raw count pollen data are presented in Table 5.16.

Context	6970	6977
Sample	**6066**	**6063**
Tress & Shrubs		
Pinus	1	
Quercus	1	11
Tilia	1	16
Fraxinus		1
Alnus	5	4
Corylus avellana type	1	7
Herbs		
Ranunculus type		1
Sinapis type	4	
Chenopodiaceae	3	1
Potentilla type	1	
Apiaceae		1
Rumex acetosella type	1	
Persicaria maculosa type	1	
Scrophulariaceae undiff.	1	2
Plantago lanceolata		15
Plantago coronopus type	1	1
Bidens type	1	
Cirsium type	1	
Lactucoideae	12	
Poaceae	55	40
Cereal type	9	
Marsh		
Sparganium	3	
Spores		
Pteridium aquilinum	19	
Sphagnum	1	

Table 5.16. Pollen count data from Fen-edge Pit Cluster 1.

Sample 6066, context 6970, came from the top of a waterhole pit dated to the early Middle Bronze Age, while sample 6063, context 6977, is from a stratigraphically earlier pit, but is not otherwise firmly dated. However, there are clear differences between their pollen spectra. The latter, earlier, sample has greater numbers of tree pollen including oak (*Quercus*) and, notably, lime/ linden (*Tilia*), hazel (*Corylus avellana*) with occasional ash (*Fraxinus*) and alder (*Alnus*). The former, early Middle Bronze Age sample, has only occasional records of trees and shrubs, but, in contrast, has a dominance of herbs with a greater taxonomic diversity than the earlier sample. This suggests that there was progressive woodland clearance in proximity to the site, as the pollen catchment of such pit features is of only very local extent. It can be noted that the lime (*Tilia*) values are both typical of the late prehistoric woodland, and in fact are greatly under represented in pollen spectra due to their entomophily and flowering during summer when all trees are in full leaf thus inhibiting their pollen dispersion (Andersen, 1970 and 1973). It is, therefore, likely that typical open lime woodland was present locally and is in accord with other data from this period throughout southern and eastern England (Greig, 1982; Scaife, 1980 and 1987; Sidell et al., 2000). In this earlier sample, the dominant herbs are grains of Poaceae (grasses). It is not possible to say from this spot sample if this comes from open grassland/pasture areas within an open woodland habitat or whether it is from growth within the pit or from secondary derived sources placed within the pit. The presence of *Plantago lanceolata* may, however, indicate grassland pasture. The later sample 6066, however, has a contrasting flora with evidence of cereal cropping. The *Plantago lanceolata* noted above is absent and the herb flora may be more typical of the disturbed ground which may be associated with cereal cultivation and/or human settlement (e.g. *Persicaria maculosa* type, *Artemisia, Sinapis* type, Chenopodiaceae). Also of importance is the absence in this later sample of lime (*Tilia*) which implies that the woodland of this character had been cleared by the Middle Bronze Age. Such clearances have also been recognised in many late prehistoric pollen sequences and are predominantly dated to the Middle to Late Bronze Age, although they occur as early as the Neolithic and clearances even as late as the Saxon period have also been recognised. Once thought to be a synchronous event resulting from climatic deterioration at the Sub-Boreal/Sub-Atlantic boundary (c. 500BC), it is now clearly an asynchronous event caused by anthropogenic clearance (Turner, 1962).

Conclusion

The habitat throughout the period represented by the sediments was open and one of pasture surrounding the waterholes and ponds. The features themselves appear to have been fringed by marginal aquatic sedge and reed-swamp taxa. In the earliest sequence, there is evidence of aquatic vegetation. During the later part of the Bronze Age, willow became important around the perimeter and along the Fen-edge. There is no evidence for woodland of any note in the region of the site, although tentative evidence of hedgerows has been suggested. Small quantities of cereal pollen attest to use of arable crops and, as such, a mixed agricultural economy was being practised. Flax pollen has also been recorded and with the presence of macrofossils remains as well (see Martin above) it is possible that this was also being cultivated locally. The possible use of the waterholes for flax retting is not supported by any macrofossil remains.

The spot samples from Fen-edge Pit Cluster 1 demonstrate the diminishing importance of woodland dominated by lime (*Tilia*). The later spot sample shows a more open and disturbed habitat, possibly with cereal cultivation, but certainly with use of cereals. Between the ages of the two samples, the often described 'lime decline' occurred with the increased need for land during the Bronze Age. However, spot samples are difficult to interpret fully, especially in light of the complexity of the taphonomy of pollen in such pit features.

The Waterlogged Wood

by Maisie Taylor

Quantity of material

The hand-collected wood from the project was received in several batches, at different stages of the excavations between 2003 and 2005. Altogether 663 record sheets were completed, some representing multiple pieces. Most of the material was not suitable for analysis because of desiccation. This material was collected in the later stages of the excavation when the de-watering from the adjacent quarry was beginning to have an effect.

Provenance

All the material received was derived from deeper feature in the excavations, mostly waterholes, all of which were at least provisionally dated to the Bronze Age. All of the wood that was collected came from features that are assumed to be part of the same field system.

Range and variation

Excluding bags of samples and material which was too dry or decayed for meaningful analysis, a total of 545 pieces of wood were recorded in detail. The wood fell into eight categories. There was also a single piece of burr wood which, although worked ('hacked about'), did not coincide with any of the conventional divisions.

By far the largest category of wood from the site is the roundwood at over 45% (by count) of the total. Radial woodchips are the next largest category (25%) with timber debris (14.3%) and timber (12%) well behind. Grouping related categories simplifies the picture considerably. If timber and timber debris are considered together, they make up over 25% of the total. Combining the woodchips, i.e. all the small woodworking debris, alters that category very little, raising it slightly to 27.1%.

Category	Frequency	% (by count) of assemblage
Artefact	5	0.9
Timber	66	12
Timber debris	78	14.3
Woodchip-radial	136	25
Woodchip-tangential	9	1.7
Woodchip-cross grained	2	0.4
Roundwood	246	45.1
Roundwood debris	2	0.4
Other	1	0.2
Total	***545***	***100***

Table 5.17: Classification of all wood.

Condition of material

Using the scoring scale developed by the Humber Wetlands Project (Van de Noort, Ellis, Taylor and Weir, 1995, Table 15.1) most of the material scores 3 or 4, with a few pieces, mostly recovered late in the excavation, scoring 2 and a similar small number scoring 5. This condition scale is based primarily on examination of the surface of the wood and the data which was recorded from that examination. The condition score reflects whether each type of analysis might be profitably applied, it is not intended as a recommendation for various analyses or treatment.

Score	Museum conservation	Technlogy analysis	Woodland management	Dendro-chronology	Species ID
5	+	+	+	+	+
4	-	+	+	+	+
3	-	+/-	+	+	+
2	-	+/-	+/-	+/-	+
1	-	-	-	-	+/-
0	-	-	-	-	-

Table 5.18: Condition of material scoring scale (after Van de Noort, Ellis, Taylor and Weir, 1995, Table 15.1).

Over thirty bags of samples were received in very poor condition (1 or even 0). Most of these have little or no potential for further study. Even some reasonably substantial timbers (e.g. Small Find 8034) were similarly in such poor condition that not even species identification was possible. The site was obviously seriously affected by progressive de-watering throughout the excavations.

One piece of roundwood (Small Find 8060) from pond 9512 (part of Pond Cluster 3) is strangely smooth and has some of the characteristics of water-worn wood. If this is the case, the piece must have been redeposited after spending some time in running water. Another piece which may have been water-worn is Small Find 8048, a piece of radial timber debris with a smoothly rounded end. The nearest running water must have been some little way off.

The wood

Artefacts

Although there are only five artefacts from the site, they are extremely important. Their importance lies partly in their provenance and partly in the rarity of complete, or nearly complete domestic and agricultural wooden artefacts. The five wooden artefacts are: a largely complete two-piece vessel (with associated rope) (Fig. 5.1 and Plate 5.1), a fragment of another two-piece vessel (Fig. 5.2), a dowel with an expanded end, a log ladder and the main body of a probable ard (Fig. 5.3).

The log ladder and the dowel are both fairly common, but very few have been published. The virtually complete two-piece vessel and the similar fragment are very rare, but the additional survival of the rope is almost unique, as is the probable ard fragment. All of these artefacts were excavated from ponds or waterhole pits.

1. Small Find 8062: (two-piece vessel with rope) from context 9520 in cut 9512 (wattle-lined pond), part of Pond Cluster 3.

The vessel itself, although fragmentary is virtually complete. It was originally carved from a single trunk of wood (*Quercus* sp.) and would have had a carved, thickened flange at the bottom where a wooden disc would have been inserted for the base. The vessel was discovered upside down, and the base was either never present or not preserved. The top, however, is well-preserved, and has two integral lugs carved from the body of the vessel.

Plate 5.1: The wooden bucket following conservation.

To the top of the lugs, this two-part vessel survives to a height of 595mm. The height to the rim between the lugs varies between 460mm and 490mm. The original diameter of the vessel was probably around 400mm. One tool mark, apparently made by an axe with a blade 40mm wide, survived on the shaping round the lugs. The toolmark was incised to a depth of 5mm.

It is not known whether or not the base was intact when the vessel was originally deposited. The base may have been removed before the vessel was placed in the ground, or it may have rotted away subsequently. The vessel was inverted when it was found, and so the base, raised above the level of anoxic preservation, would not have been preserved even if it had been originally present. There was not even any sign of the thickening of the vessel walls towards the basal flange. The fact that the vessel was found in a pond, still with its rope, suggests that it was originally a bucket used for collecting water.

The rope is made from three or four twisted stems tapering from 17mm at the chopped end, down to 10mm. These stems have been twisted to make the fibres more flexible and then plied, to make a rope of approximately 40mm diameter.

After excavation, the two-part vessel was taken to Flag Fen for initial examination. A problem arose because the fill of the bucket was extremely rough gravel with large angular pebbles. During the excavation, despite the care taken by the excavation team, the wood had dried out and shrunk to some extent, whereas the fill had not. The wood had become weakened in the ground. The partial drying out had led to cracking of the walls, but some of the damage was more likely due to heavy machinery moving about on the surface above the piece before it was discovered. The honeysuckle rope was also extremely brittle. As these stems were all quite young, and would therefore have had more cellulose in their structure, they were presumably more susceptible to the effects of drying out. Although it was not discussed in the report (Brennand and Taylor, 2003), the honeysuckle rope from the timber circle at Holme-next-the-sea was in a similar condition. It may be that the twisting of the stems, to soften them and make them suppler, damages the fibres to such an extent that it affects the preservation.

After the initial cleaning and recording the large vessel was packed and sent to the Conservation Laboratory at York Archaeological Trust for treatment. The subsequent treatment of both the rope and the vessel has been fully recorded in a detailed report (Allen, 2008).

A similar two-piece vessel was excavated on the other side of the A47, on the Thorney Borrow Pit site (Phoenix Consulting Archaeology Ltd, 2007). A large pond produced a two-piece vessel constructed from a carved cylinder of alder (*Alnus glutinosa*) tree-trunk (Allen, 2006), but with only one integral lug. Like the vessel here, the base was missing but the vessel was otherwise complete. The cylinder of the vessel had been compressed, but the original diameter of the vessel was probably around 200mm. The diameter for the vessel

from Pode Hole is much larger, possibly as large as 400mm. The Borrow Pit vessel is also shorter than the one from Pode Hole quarry: 358mm to the top of the lug as opposed to 595mm. The Pode Hole quarry bucket does not have its complete height and would originally have been even bigger, and it was possibly designed to fuction as a tub or water butt.

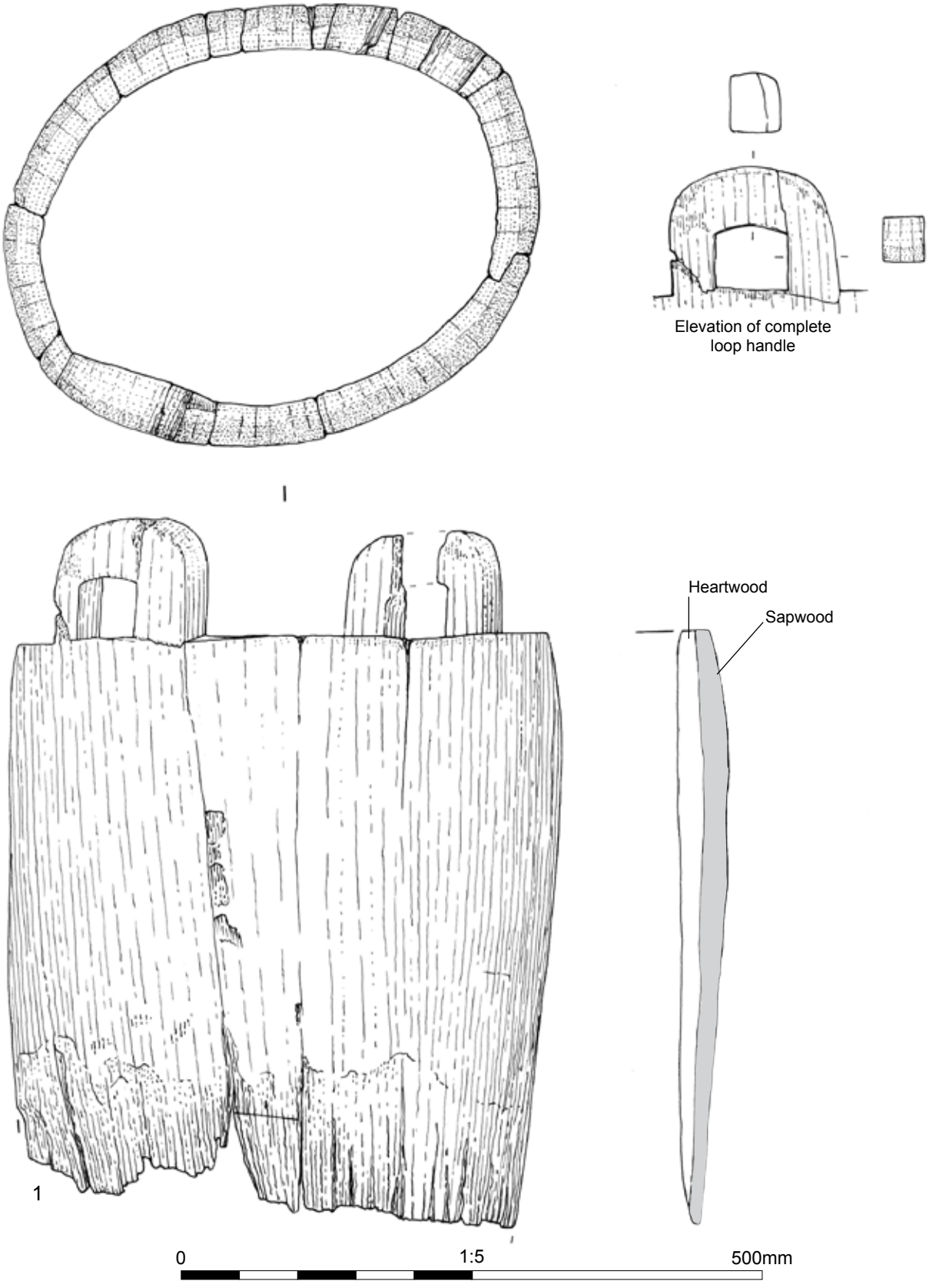

Figure 5.1: Large wooden bucket.

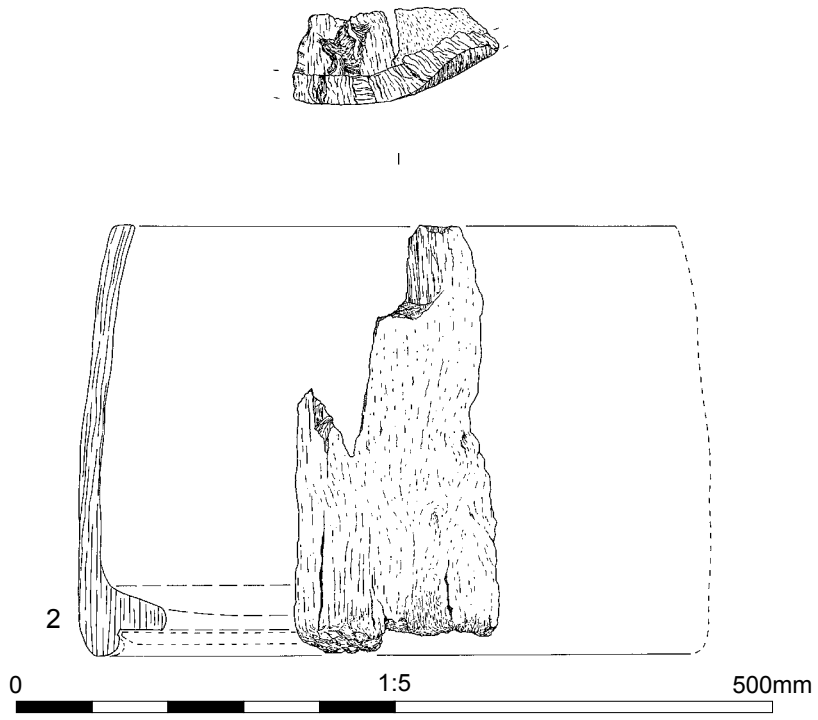

Figure 5.2: Fragment of two-piece vessel.

It has been calculated that, when full of water, the vessel would weigh at least 50kg. The rope may have originally passed through the lugs of the bucket, to prevent the loss of the vessel in the pond. However, if the bucket was to be carried any distance, it would be easier if the weight could be shared between two people. A pole passed through the holes in the two lugs would enable this.

Two-piece vessels such as these were made over a long period throughout prehistory, but for one to be closely dated is almost unknown. Until recently, the only example of a similar vessel from the east of England was the Stuntney bucket from the Isle of Ely. It is fragmentary and missing the rim (Earwood, 1993, p.288), but the method of construction is similar to that used here. The body is carved from a solid log; the bark and sapwood has been trimmed off to make a smooth surface. The interior has been hollowed out, with a heavy flange towards the base. There is a slot in the flange for a one-piece base with a bevelled edge. The base would have been sprung into place from below.

The rope associated with the vessel is very similar to the rope from the central tree of the circle at Holme-next-the-sea (Brennand and Taylor, 2003, p.30-31). Although apparently made in a closely similar way to the rope from Holme, the rope associated with the bucket is slightly lighter-weight, presumably reflecting the fact that although the vessel full of water would have been very heavy, it would only have been a fraction of the weight of the tree at Holme.

The young stems of the rope have been radiocarbon dated to 1380-1050 cal BC (SUERC-12890). This closely dates the vessel, making it very early for one this style. Earwood describes an Irish 'tub' of closely similar size and construction from Altanagh as the earliest known of this type in Britain or Ireland. The date she quotes is between the sixth and ninth century BC (Earwood, 1993, p.57 Fig. 32). The Pode Hole vessel pushes the fabrication back by at least 100 years. This would be remarkable in itself, except that context 8233, which produced the smaller fragment of a similar vessel, has been dated to 1460-1310 cal BC (Beta-238590). This dates the use of these vessels back another century or more.

2. Fragment of two-piece vessel: from context 8232 in cut 8291, part of Pond Cluster 1.
The other example of a two-piece vessel, also found in a waterhole, was part of a similar, but much smaller vessel. It was approximately 285mm high (Fig. 5.2). It was in very poor condition but the carved bottom was better preserved than that of the larger piece. The disc base of this vessel was also missing, however.

3. Dowel: from context 9713 in cut 9512 (wattle-lined pond), part of Pond Cluster 3.
A dowel of oak (*Quercus* sp.) with a slightly expanded end was excavated from Pond Cluster 3. The dowel was broken, but when the fragments were reunited the total surviving length was 419mm, although it was probably originally longer. The dowel was slightly oval in section and measured between 32mm and 35mm in diameter.

Dowels most commonly occur as hafts and handles. Roundwood handles or hafts might have been used where their flexibility was not problematic, but spearshafts and many kinds of axe foreshafts are formed from dowels for added rigidity. The dowel described here would have

been far too large for a spearshaft, for example, but comparable in section to certain axe foreshafts (Taylor, 2001, Fig 7.62 and 7.63). The choice of oak for the dowel would also make it suitable for an axe foreshaft, but the surviving length of 419mm, and the expanded end makes it unlikely that this is what it was destined for. The exact function of this piece remains unknown.

4. Log ladder: context 8431, in context 8421, part of Fen-edge Pit Cluster 5.

A more or less complete log ladder was retrieved from the site. It was in extremely poor condition and badly dried out. It did not survive the lifting process well but, as it was partly recorded whilst still in the ground, the dimensions stated below are probably fairly accurate. It was 1760mm long with what was originally a natural fork at the top. The 'arms' of the fork were approximately 370mm long and the diameter of the original log was 150mm. The ladder only had two conventional steps, but an unusual feature was a third step in the cruck of the fork. The fork had been modified by flattening the trunk where it joined the arms, and widened slightly at the expense of the right hand arm.

The bottom of the ladder had been trimmed in one direction. The first step was 860mm above the bottom and the second step was almost directly above the first. These two steps were 50mm and 55mm deep respectively. The risers were 110mm and 170mm high.

Often only the lower part of these artefacts survive. This means that although log ladders are not particularly rare, it is unusual to see so much detail concerning the top end. The ladder is quite substantial. The natural fork at the top would have kept it stable when in use, and stopped it falling sideways into the waterhole. The first step is very high, 860mm from the bottom. Obviously the bottom end, which was cut from one direction, was expected to sink into the bottom of the waterhole, probably adding to its stability. Log ladders frequently occur in waterholes on these gravel sites and were probably the normal way of gaining access. The variability in design suggests that they were 'made to measure'.

5. Small Find 8027: (possible ard): from context 8394 in cut 8421, part of Fen-edge Pit Cluster 5.

Small Find 8027, an artefact which appears to be part of an ard, was retrieved along with the log ladder from the bottom of Fen-edge Pit Cluster 5. The ard is carved from the fork between the trunk and the side branch of a tree. The sole comes from the main trunk of a tree at least 280mm in diameter, and the stilt from a side branch which was at least 80mm in diameter (Fig. 5.3). The sole contains a mortice, measuring approximately 50mm long by 40mm wide. The 'front' is heavily worn, slightly more on one side than the other, suggesting that it may be the foreshare. There is no evidence for a separate share of any kind. Although worn, broken and incomplete, the piece

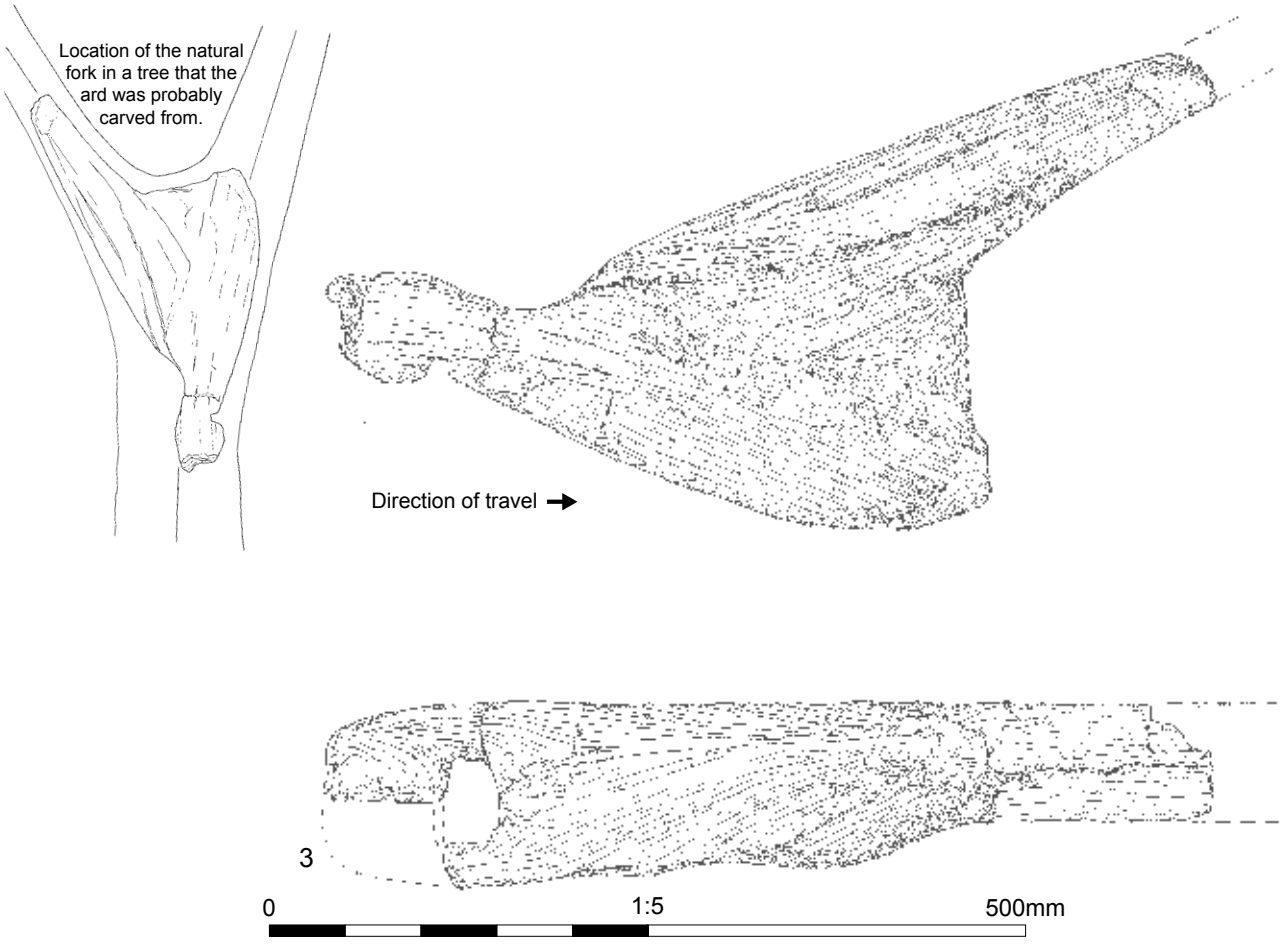

Figure 5.3: Wooden ard.

appears to fit Sach's description of a Type 8 'crook ard' (Rees, 1979, p.33 and Fig. 35).

Following initial cleaning and recording the ard was sent to the Conservation Laboratory at York Archaeological Trust for treatment. At the time of writing, this treatment is still ongoing.

Although ard-heads and stilts are occasionally found in Britain, they are not common. There are few parallels for this piece, and none from England.

A crook ard may be constucted out of a naturally forking branch where one arm of the fork acts as the beam and the other as a horizontal sole into which the stilt is morticed. The size of the mortice in the horizontal sole of this ard would appear to be comparable with the stilt of the ard recently excavated from the Eton rowing lakes (work in progress) at the point where it would have passed through a similar mortice: the stilt measured 40mm x 59mm in section.

The only other parallel seems to be a piece from Oakbank Crannog. This has not been written up in full but a photograph has been published (Dixon, 2004, Fig. 59; Morrison, 1985). The Oakbank version appears to be less worn, has more of the beam surviving, and the sole is slightly longer: the ard from Pode Hole is c. 400mm long; the Oakbank example is c 550mm. The angle between the beam and the sole is also reasonably similar at slightly less than 45 degrees. Dixon describes the Oakbank implement as an ard, but feels that it was more likely to have been used as a foot plough. He also suggests that it may have originally had an iron share (2004, p.152). The implement from Pode Hole, however, is far too worn for any evidence for a share to survive. It could be argued that this extreme wear is, in itself, evidence that it did not have a share, and that the wood itself was digging into the soil.

There are a number of differences between the Oakbank and the Pode Hole implements. The dates for Oakbank run from 800-300 BC. The ard was found beneath a floor and is not heavily worn and it is therefore suggested that it might have been a votive deposit (Dixon, 2004, p.152). The situation with the Pode Hole ard is more complex. Its date is extremely early: the feature cluster from which it was excavated has been dated to 1520-1400 cal BC (Beta-238593). The collection of wood within which this artefact was found was interpreted in the field as the revetment of a waterhole. As the surface of the ard is cracked and worn, it is possible that the ard was inserted into the waterhole as part of its revetment when it was no longer fit for its original function.

However, the selection of a waterhole as the location for the ard's resting place may have been guided by more than functional concerns. The ard dates from a time when many artefacts were being deposited in the water at Flag Fen only six kilometres away to the south-west. It may be that such a valuable, well-used artefact had such status that it was more 'fitting' to set into the side of a waterhole, rather than to use it as a bit of extra fuel for the fire. A fine plano-convex flint blade was found alongside this artefact, which perhaps supports the argument for votive deposition.

The cultivation of cereals in the area has not been widely discussed and in the examination of the extensive field systems in the area, there has been a great deal of emphasis on livestock for which there is clear evidence (Pryor, 1996). The site at Pode Hole, however, extends well up the slope of the Eye peninsula to the north. This land would have been clear of floods for the majority of the second millennium BC and highly suitable for cereal production. The wear on the implement suggests quite convincingly that it was very heavily used before it was disposed of. However, the general scarcity of cereal remains in the environmental assemblage of the project area is somewhat at odds with the presence of this artefact.

Timber and timber debris

Much of the timber and timber debris from the site is relatively lightweight and probably derives from domestic structures. It is not always possible to calculate the diameter of the original timber. Only 19 pieces of timber and 12 pieces of timber debris had enough data for the estimation of the diameter. Where the diameter of the original could be calculated, almost all of it is under 200mm.

Some of the material making up the revetments and steps in the waterholes is re-used. One clear example of the re-use of a domestic timber is from context 8810, from waterhole pit 8763. This timber is a half split trunk of a small oak tree. The original tree would have been approximately 150mm diameter. The timber had broken at some time in the past so that only 590mm survived. It had obviously been much longer originally. The unbroken end of the timber is shaped into a tenon or 'finger joint'. Joints of a similar fabrication and size were found at Flag Fen (Taylor, 2001, Fig. 7.33).

There is as much timber debris as timber, suggesting that some of the modification was done in the vicinity of the waterholes. It might be possible that some of this debris was generated by extra modification to adapt existing timbers for re-use. If there was extensive timber working close by, a much higher proportion of debris would be expected (see Brennand and Taylor, 2003, Table 1).

Various types of timber reduction are represented in both the timber and the timber debris. Timber Small Find 8061 (from cut 9575, a post pipe within waterhole pit 9500), for example, is a half split (radial) oak trunk which has been modified to a square section. Amongst the timber debris, pieces which have been radially split are also often squared: Small Find 8037 and Small Find 8039, for example. This debris is not, therefore, splitting

debris which is tapering like context 8831. Timber context 9696, a probable 'step' from the edge of waterhole pit 9691, is tangentially split and squared oak.

The relative proportions of the various types of woodworking are summarised in the following table:

Category	Timber	Timber debris	Total	%
Radial	41	48	89	77.4
Tangential	12	8	20	17.4
Cross-grained	3	3	6	5.2
Total	*56*	*59*	*115*	*100*

Table 5.19: Types of timber reduction.

Where most of the timber is of a relatively small diameter, radial splitting is likely to be the predominant technique. 77.4% of the timber in this assemblage is radially split, in contrast to the 17.4% which is derived from tangential splitting. These smaller trees can be radially split to produce beams, posts and feather-edge boarding. Radial splitting of larger trees produces large baulks of timber which are unsuitable for domestic building (Taylor, 2001, p.203). Larger trees are more likely to be split tangentially, but the timbers generated are not usually suitable for domestic buildings and are more likely to be found in a 'monumental' context.

Domestic and agricultural sites such as this do not often produce timber and timber debris. Bronze Age sites which produce timber are usually situated in low-lying wetlands and are 'monumental' sites such as Flag Fen, Peterborough (Pryor, 2001a) or Fiskerton, Lincolnshire (Field and Parker Pearson, 2003). The extensive agricultural sites on the higher and drier gravel terraces, such as Yarnton in the Thames Valley, tend to produce information about small woodworking and 'bodging' (Hey, in prep.). For a site to produce so much relatively lightweight or domestic timber is very rare, and so little is known about the use of such material in construction.

Monumental timber

The timbers which have been split tangentially are derived from larger trees. Often these large tangentially split timbers come from straight-grained trees which would most likely have been forest grown. There are several here which would be totally unsuitable for use in a domestic context and therefore might be classed as 'monumental'. These are discussed below.

Timber context 8335 was recovered from the base of Fen-edge waterhole pit 8334 (Fig. 5.4). The lower part of the timber is heavily marked and grooved by wet rot.

Experimental woodworking at Flag Fen (Francis Pryor, pers. comm.) has indicated that oak heartwood is easily worked with bronze tools while it is fresh, or 'green'. Once the wood has started seasoning this is not the case. Oak heartwood may be unworkable with bronze tools as soon as six months after felling. This being the case, we can assume that context 8335 must be complete and unmodified.

Such horizontal timbers, when found in the bottoms of waterhole pits, are generally interpreted as steps or firm standing. The bottom end of the timber is an unmodified felled tree with hinge; the diameter of the original tree must have been well over 400mm.

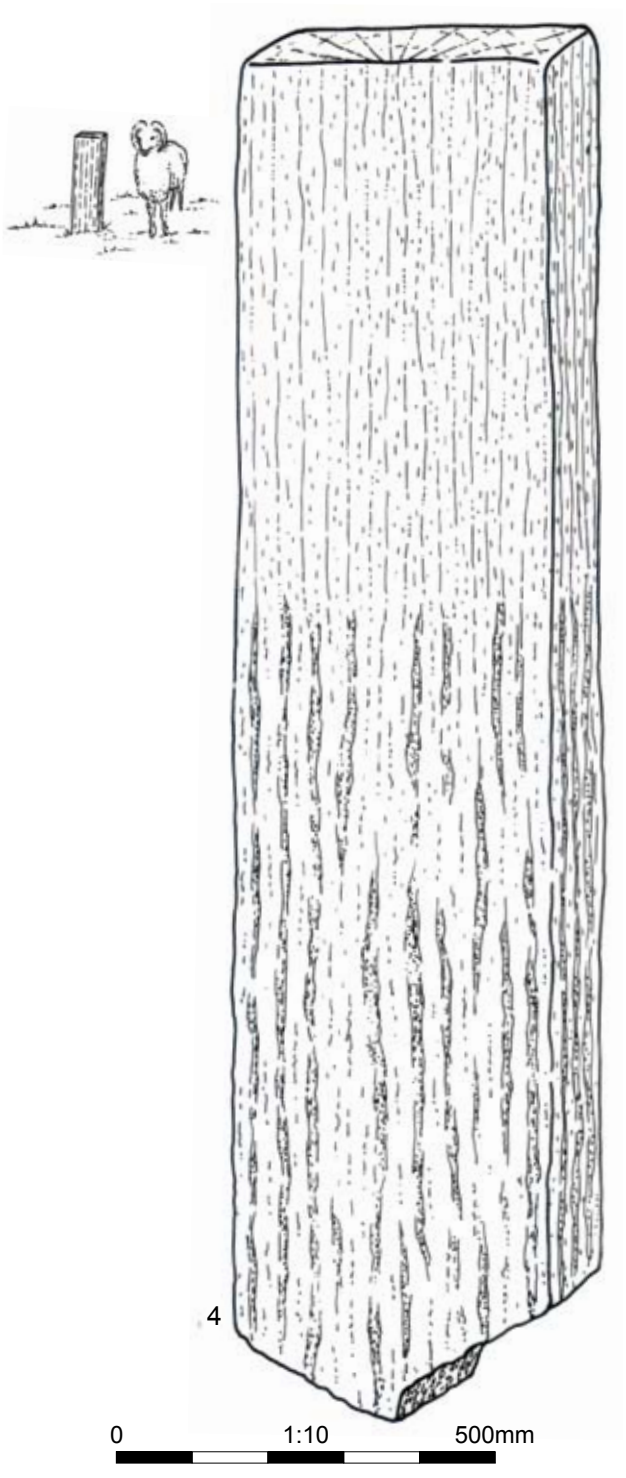

Figure 5.4: Wooden post 8335.

Uniquely, the lower part of the timber is heavily marked and grooved by wet rot. This rot is obviously not connected with the re-use of the timber where it was set horizontally, but with an earlier usage, where it must have been set vertically. The wet rot damage shows the depth of the original setting. This makes it possible to estimate the original height of the timber in situ. The wet rot indicates that the bottom 1080mm of the timber was set in the damp or wet ground, with the top 720mm above ground in conditions that allowed it to survive undamaged (Fig. 5.4).

Vertical timbers usually only survive below the old ground surface in waterlogged conditions. This makes it very difficult to calculate original heights. It is often taken as a rule of thumb that timbers are usually set with one third below ground and two thirds above. This view is partly based on modern practice but is also a pragmatic response to a practical problem. One of the few clues to the fact that this may have been standard practice in the past was indicated by a timber excavated at Flag Fen. Timber B1421 is a modified alder tree trunk, sharpened at the tip, with a mortice. There is a blind mortice 1500mm further up and an 'eared' housing joint at the top (Taylor, 2001, p.203 and Fig. 7.33 No.2). It is likely that the blind mortice would have been set at ground level to take a cross member for spreading the load. If this was the case, there would have been 1500mm below ground and 2520mm above, giving us slightly more than a third below ground but not far off the 'ideal'.

Before its re-use in the waterhole pit, over half of timber 8335 had been set below ground. This would mean that it was set in the ground much more 'solidly' that was apparently necessary. Set like this, the timber would not have been visible at a distance and therefore is much more likely to have been some kind of land marker post, as opposed to a monumental upright. It must have been marking something important however, as for such a large timber to be set so deeply, it was obviously important that it should not move or tip over (even when used as a rubbing post by the local livestock).

A sample of this timber was taken and submitted for dendrochronological dating. It was examined by Ian Tyers at the University of Sheffield, but he was unable to match it with another chronology. This is particularly intriguing given the proximity of Flag Fen with its extensive chronology. The combined master for the Flag Fen Basin falls between 1406 and 937 BC. As this timber cannot be matched anywhere on that sequence, the tree from which it was derived must either have been felled outside of these dates or have been brought in from a totally different forest or timber source.

There are three other possible 'monumental' timbers, but they are less convincing than timber 8335. Small Find 8061 from context 9575 in waterhole pit 9500 was a tangentially split timber, derived from a relatively large (minimum 300mm diameter) oak tree, although too fragmentary for fine detail to have survived. Another possible re-used monumental timber was found set on the edge of waterhole pit 9691. This piece, context 9696, was set on the edge of the feature as a kind of step or footplate. This timber has a certain amount of wet rot, apparently from its horizontal setting. One of the timbers discussed below (Small Find 8050) is the third potential candidate for this class of timber, as it is tangentially split out of a larger oak tree. Unfortunately, although all three of these timbers are substantial, there is nothing distinctive to make the identification of them as monumental timbers secure.

Joints

The joints from the site are quite diverse. Some waterholes have linings with jointed timbers, but more usually any jointed timbers found in such a context are re-used.

Mortices are the most common type of joint from the site, as indeed they are at Flag Fen (Taylor, 2001, p.204-8). A large timber, discussed as a possible monumental type above (Small Find 8050), has two mortice holes. It was excavated from a pit with well-preserved timber revetting (cut 8763). The timber, which is 840mm long, is a tangentially split piece, 260mm wide and 52mm thick. It has two mortices, one 40mm by 41mm and a second 60mm by 60mm. A reasonable parallel from Flag Fen (Taylor, 2001, Fig. 7.38 No.20) is larger and has a hole as well as two mortices. Waterhole pit 8763 also produced a tangentially split timber of very slow-grown oak (recovered in two pieces: context 8814 and Small Find 8032) with a broken mortice. The mortice is 100mm wide with 40mm depth surviving. A close parallel for this timber was found at Flag Fen (Taylor, 2001, p.206 and Fig. 7.38 No. 18). The two pieces have similar dimensions although the method of splitting is different and a second mortice is present in the other end of the Flag Fen example. Other than this, the two timbers are very alike.

Tenons are much less common than mortices, possibly because their shape means that they survive in a recognisable form less often. The only tenon joint on the site also comes from pit 8763. Context 8810, part of the in situ revetment, is a re-used 'domestic' timber, probably a vertical structural component. Context 8810 is a half-split timber which was once longer (590mm survived). One end is badly damaged, possibly in antiquity, the other has a long tenon. There is a similar timber from Flag Fen (Taylor, 2001, Fig. 7.33 No.1) which is a similar size, although the one from Flag Fen is cut from a roundwood pole, rather than a half-split timber.

Two timbers have evidence for notches or lap joints: One waterhole (cut 7707), which is part of Fen-edge Pit Cluster 3, produced a heavily worked timber (7524). The timber was in poor condition but it is clearly radially split and modified to be square, although still 'feather-edged', i.e. the edge tapers in thickness (Corkhill, 1979).

One end is shaped from two directions, the other is less clear, but slightly rounded. Two long notches are cut into the feather edge. Both of the notches are approximately 20mm deep, whilst one is 110mm long and the other 130mm. Although there are a number of lap joints recorded from Flag Fen (Taylor, 2001, p.209-210), none are cut into the feather-edge of a plank. No parallels have been found for notches such as these cut into a feather-edge, and it is possible that they were simply cut out to accommodate other timbers rather than being joints in the true sense.

The second timber with evidence of a notch or lap joint was Small Find 8028, a heavily worked piece from Fen-edge Pit Cluster 5. However, it was so fragmented, and charred, that it was very difficult to reconstruct. It was definitely longer than 500mm and had been split radially. It appeared to have a notch half way along its length and possibly two lap joints, but the details of the joints were obscured by later charring.

Hewing

As oak is such a strong and flexible timber, it has been the species of choice from earliest times for building structures. It has the added advantage of being easily split accurately into useable posts, spars, beams and planks. By contrast, other species, such as willow, alder or poplar, do not split easily and would need to be hewn to produce flat surfaces or planks. Unfortunately, it can be very hard to detect hewing because, if done well, it leaves no distinctive marks.

Pit 8763 produced unusual evidence for hewing, in the form of thickness gauges on a timber. Such slots were cut as a guide for the person hewing. The slots would be cut to the correct depth and then the wood hewn out between them . Small Find 8035 may have been tangentially split (but as it is not oak this seems unlikely) or carefully hewn flat: the underside is clearly marked out with two thickness gauges. One of the timbers mentioned above (Small Find 8028 from Fen-edge Pit Cluster 5) is also notched, this could also have been done to provide guidance when hewing, but the condition of the timber makes it difficult to judge.

These timbers with possible thickness gauge slots are very unusual and provide new information about this woodworking technique. Hewing was presumably very common in the Bronze Age, but examples rarely survive to be recorded and studied. For this reason, no exact parallel has been discovered.

Woodchips

The woodchips from a site reflect the woodworking that has been going on locally. At Pode Hole woodchips make up more than 25% of the entire wood assemblage.

The alignment of the woodchip within the original log (Taylor, 2001, Ffig 7.3) is related to the shaping of roundwood and timber. Pode Hole produced a high percentage of radially aligned woodchips (91.9%). This is not surprising, however, given that the site produced a high percentage of radially split timbers and timber debris (77.4%).The relative proportions of different types of woodchips are summarised below.

Category	Woodchip count	%
Radial	136	91.9
Tangential	9	6.1
Cross-grained	3	2
Total	*148*	*100*

Table 5.20: Categories of woodchips.

Roundwood debris is virtually absent and the quantities of tangential and cross-grained woodchips are also very small, suggesting that there was very little going on locally except the radial splitting. If posts were being sharpened or bark was being trimmed, it was either occurring somewhere else or the debris was being disposed of or burnt.

Roundwood

Roundwood is 'harvested' in various sizes or diameters for various functions. Roundwood makes up more than 45% of the wood assemblage from Pode Hole, with 246 pieces, mostly unworked. The working of the ends can be informative, but this part of the wood is vulnerable to crushing and deterioration. Many of the roundwood ends from Pode Hole, as with many sites, are crushed, deteriorated or missing altogether. It may be assumed that more of the roundwood was worked, but that the evidence is lost. For this reason, the diameters of all the roundwood have been assessed and not just those of the worked material.

Diameter	Number	%
0-20mm	99	40.2
21-40mm	76	30.9
41-60mm	44	17.9
61mm +	27	11
Total	*246*	*100*

Table 5.21: Diameter of roundwood.

Much of the roundwood was not lifted individually but as part of larger samples, and many of these samples were difficult or impossible to analyse and interpret because of poor preservation. Small roundwood, with a high level of cellulose in the wood, is prone to distort and disintegrate more than the larger material as it dries out. This means that, although the smallest diameter range (0-20mm) is the largest category (40.2%) it is quite possible that it was proportionally even larger originally. The larger material (61mm+) is likely to be a reasonably accurate indication of what was originally here. Much of the smallest material is quite twiggy, and the impression gained from subjective assessment of the desiccated samples suggests that much of that material too was small and twiggy.

Roundwood debris, derived from trimming or working roundwood, is represented by less than 10 pieces, and most of those are ½ split trimmings from coppice or felled trees.

There is some evidence for coppicing, although some of the wood (e.g. context 8101, a stake found in the base of Pond Cluster 1) is derived from very slow-grown plants, whereas coppicing tends to stimulate growth.

Coppice
The biggest group of material within this section is roundwood which shows clear signs of having been coppiced, although there is one piece of debris which is possibly a coppice stool. Attributes which could be considered as symptomatic of coppicing include long straight stems, the heels where the stem was attached to the stool and the curve and 'flare' in the stem towards the heel. Preferably, there should be more than one of these attributes. The way that a stem is trimmed may sometimes be an indirect indicator of coppicing: roundwood that has been shaped for insertion into the ground is usually trimmed to a point from several directions, whereas coppiced stems are usually cut from just one direction (this is because of the way that stems grow on a coppiced plant and the practicalities of access when cutting them). They may also be cut and torn, or in the case of larger stems, cut from two directions like a felled tree.

Coppiced roundwood at Pode Hole quarry occurs in the form of wattlework lining from two adjacent features in Pond Cluster 3. Cut 9691 produced 13 in situ roundwood stakes, trimmed in several different ways, but all with clear indicators of coppicing including one (context 9704) which is carefully trimmed to compensate for the curve of the stem. The diameter of the stems varies between 38mm and approximately 60mm, although some of the diameters have become distorted by drying out. The material from an adjacent pond, cut 9512, is very similar except that there are six pieces, and the diameter varies between 30mm and 50mm. The range of material used for modern hurdles ranges from 15mm to 50mm (Forestry Commission, 1956) which suggests that the rods from Pond Cluster 3 could originally have been destined for hurdle making or for something more heavyweight. The large quantities of twigs in the samples from these contexts may indicate that the rods were being trimmed up, and detritus discarded close by.

Felled trees
Evidence for felled trees on a site usually takes the form of larger roundwood which has been cut from two directions. This method of felling trees came in very quickly with the adoption of metal axes and still remains the standard method.

There is evidence for five felled trees at Pode Hole quarry. Three of them are parts of trunks, giving us data on the size of the trees felled, but, more unusually, two pieces are debris from the actual felling.

Two of these trees come from waterhole pits. One trunk (Small Find 8090) still has the 'hinge', formed when the tree went over during felling and another has been half split after felling. Both trees were of a similar size with trunks of approximately 130mm diameter. The third trunk, which is of a similar diameter, was excavated from a waterhole in Pond Cluster 3. The two pieces of debris were both from a waterhole, cut 8130, in Pond Cluster 1 and were both from slightly larger diameter trees (c. 170mm).

It is generally difficult to calculate the diameter of these felled trees accurately because of the fragmentary nature of the evidence, but they do all seem to be quite small.

Toolmarks
Partly due to the poor preservation of much of the wood, there are only six toolmarks, certainly not enough for any kind of statistical analysis.

'Toolmarks' are not to be confused with 'tool facets' which are the scoops and ripples where the axe blade has passed over the wood. The tool facets are not reliable indicators of tool types, as they vary according to the angle of use and other factors. For toolmarks, the record of the blade shape is taken directly from marks where the blade has bitten into the wood, leaving a profile.

The wood which produced toolmarks came from five contexts in three separate features or feature clusters: Pond Clusters 1 and 3, and waterhole pit 8763. It is all very diverse: two timbers, two felled trees and an artefact.

The toolmark data is presented as follows: the width of the toolmark is measured in millimetres straight across from one end to the other; the depth of the toolmark is then measured from that line to the lowest point of the curve (Taylor, 2001, Fig. 7.30.). The width:depth measurements for the six toolmarks recorded from the project area are:

- *19:1 – possible felled tree (SF 8060) from wattle-lined pond 9512 in Pond Cluster 3.*
- *23:1 – possible felled tree (SF 8060) from wattle-lined pond 9512 in Pond Cluster 3.*
- *30:5 – tangentially split timber (context 8232) from waterhole 8291 in Pond Cluster 1.*
- *40:1 – felled tree (context 9713) from wattle-lined pond 9512 in Pond Cluster 3.*
- *40:5 – lug of two-part vessel with rope from wattle-lined pond 9512 in Pond Cluster 3.*
- *46:2 – radially split timber (context 8834) from waterhole with revetment 8763.*

There is a lack of correlation here between the size of the tool and the size of timbers being worked, which has been noted on other sites (Brennand and Taylor, 2003, p.24 and Table 2). For example, the felled tree (Small Find 8060) is not very big (c. 130mm in diameter), but it was felled by two different,

tiny axes which measured 19mm and 23mm wide. It has also been noted on other sites that two different axes are used quite frequently to fell a tree (See, for example, Brennand and Taylor, 2003, Tree E). This suggests that this work was commonly done by two people working opposite each other. The felling of the small tree with tiny axes contrasts with the fine finishing of the bucket (Small Find 8062) with an axe with a blade twice as wide (40mm).

Structures and other wood from the waterholes

The only wooden structures recorded on the site are those associated with ponds and waterholes. These structures were generally designed to consolidate the sides and to make access easier. Revetments, either plank or wattle, for waterholes and ponds are reasonably common from the Bronze Age onward, particularly in those cut into gravel sub-strata. Most structures of this kind seem to be completely ad hoc. Stakes are driven into the bottom of the waterhole to keep the structure secure. After this planks may be wedged or pegged into place to act as a revetment, or roundwood rods may be woven in and out of the stakes to make a wattle revetment. There may also be steps set into the side of the pit or above the water to aid access.

These wooden structures from Pode Hole vary, although, as their function is similar this variety is not particularly great. Some of the features on the site only produced one or two odd pieces of wood, possibly because the original assemblage had been affected by the drying out of the surrounding soil matrix. Waterhole pit 9500, for example, is potentially quite interesting but as the wood from it had been so badly desiccated, it was an unproductive feature for further examination. To some extent, however, it is possible to characterise the wood content of different types of features.

While they were in regular use waterholes needed to be kept clear if the water was to remain potable. Once these holes were no longer needed for water, they seldom seem to be used as rubbish pits. This may well be evidence for taboos related to the avoidance of contamination of ground water. Where waterholes are abandoned or backfilled, the wood finds in the lower layers may reflect activity in the vicinity.

The wood from waterhole pit group 7207 is mainly roundwood, varying in diameter from 16.5 to 77.5mm, with just a couple of pieces of timber or timber debris. A group of wood finds such as this might suggest that there had originally been a wattle revetment. The wood from waterhole 7214, on the other hand, has more woodchips, mostly radial, as well as charred roundwood. There is also timber debris, including part of a possible coppice stool and a large sample of roundwood. This is the kind of debris that would be expected where coppicing was going on locally, rather than deriving from a wattle lining or revetment. This is highly reminiscent of the activity associated with the ditch segments of the causewayed enclosure at Etton. Etton, although much earlier, is a site where coppicing was practised, coppice stools were being rejuvenated and the debris and rubbish burnt. (Taylor, 1998, p.127-129 and Fig. 140). Waterhole cut 8130, in Pond Cluster 1, is similar in many ways with roundwood and debris, but here, the evidence is for a felled tree and debris from felled trees, rather than detritus from coppicing.

The contents of the waterhole context 9691 from Pond Cluster 3 again included roundwood and coppiced roundwood, originally a wattlework lining, as well as a large, possibly 'monumental' timber with wet rot, which was re-used as a step or threshold timber. The need for a timber to reinforce the edge of the cut implies that the gravel may have been unstable. Similarly, the tangentially split timber from context 8421 from Fen-edge Pit Cluster 5 probably indicates a revetment, but it is difficult to be certain.

Quite a few of the waterholes contained woodworking debris. It can be assumed that if small woodchips can survive, then a revetment or other structure would survive if it had been there in the first place. Indeed, most of the woodchips from these contexts are small, and almost invariably radially aligned. Pit 7220, for example, contained radially aligned woodchips, bark and small roundwood. The woodchips are extremely small. All this suggests activity nearby, perhaps trimming up small trees or coppices, rather than any kind of in situ structure. Fen-edge Pit Cluster 2 had similar contents with small woodchips and very small roundwood, in quantity. In these contexts 'small roundwood' means less than 20mm. Waterhole pit 8291 from Pond Cluster 1 contained quite a quantity of wood, including several radially split timbers, radially split timber debris and radially aligned woodchips. There was also a fragment (not in very good condition) of a two-piece vessel and a quantity of small roundwood. Some of this roundwood is twiggy and almost all under 200mm in diameter. This suggests woodworking debris from close by or rubbish rather than the remnants of any kind of structure. The contents of context 8394 from Fen-edge Pit Cluster 5 also suggest a general dump consisting, as it does, of roundwood, timber debris and the extremely weathered remains of what appears to be part of an ard. The contents of cuts 8740 and 9249=9376 (both waterholes, the latter part of Pond Cluster 2), with their roundwood and timber debris probably come into the same category.

Where a waterhole contains a complete log ladder (e.g. Fen-edge Pit Cluster 5), it does not seem unreasonable to assume that the waterhole has been abandoned and probably backfilled. The other material from this context is timber debris and roundwood. This may suggest that a 'background noise' of woodworking debris should be considered the norm.

The waterhole with the most complete timber revetment (waterhole pit 8763) produced a selection of wood: timber, timber debris, roundwood, roundwood debris and

other debris. There are three pieces of roundwood and roundwood debris, all fairly chunky (diameters ranging from 24mm to 75mm). Radially split timbers are the most common category, with 11 pieces over half a metre long. None of these pieces are particularly sophisticated, with several pieces still retaining evidence of the original trimmed ends. There does not appear to be any regular pattern in the size of the timbers: lengths and widths vary considerably. A tangentially split timber appears to be re-used as it has a joint which is irrelevant in this context (a broken mortice). Another jointed timber, this time a tenon, also appears to be re-used. The timber debris is all radially split and may consist of the stakes which originally held the revetment boards in place. Unusually, there are also timbers which show direct or indirect evidence for hewing, with notches cut and wood shaped across the grain. The strange variety of timbers, the irrelevant joints and the lack of woodworking debris all suggest that the timbers were worked elsewhere, and were re-used. These revetments or linings were obviously built ad hoc, depending on need and availability of raw materials.

The pits also tend to favour radially split timber and timber debris: Fen-edge Pit Cluster 3 is a pit group which contains radially aligned timber and timber debris. Fen-edge Pit Cluster 4, which is a series of intercutting pits and an associated ditch, contains radially split timbers, radially and tangentially aligned woodchips, some roundwood and root.

Turning to the smaller pits and post holes, the wood finds might be expected to be different. Unlike the waterholes, there is unlikely to be any taboo about what goes into them, and they would not contain the structures required in a waterhole. However, very little wood was recovered from these features, as they were not generally dug deep enough to allow anaerobic preservation. That wood which was recovered from the smaller features was not in a suitable condition to allow further analysis. Context 8042 contained small, very decayed wood fragments, context 8458. Context 7260 is slightly different in that, as well as the radially aligned woodchips and a piece of tangentially aligned timber debris, there are a number of samples taken from it which contain badly decayed roundwood. This material possibly represents the remains of an in situ post recovered from its hole.

Unusually, some of the tree-throw pits on the site contained wood. Context 7495 contained radially split and squared timber debris. This is a fairly sophisticated piece of woodworking debris and is not derived from the roots of the tree, and suggests that the feature may have been misinterpreted when excavated.

Species

A proportion of the wood from Pode Hole quarry has been identified as oak (*Quercus* sp.) with a much smaller amount of ash (*Fraxinus excelsior*). The remainder is a mixture of the 'fen species': willow (*Salix* sp.), poplar (*Populus* sp.) and alder (*Alnus glutinosa*), with a sprinkling of other species which would be happy growing a little way off the fen on slightly drier ground, such as hazel (*Corylus avallana*). Decay or dying out rendered 10% unidentifiable. Not surprisingly, very dried out material seems to be more common in the later stages of the excavation. Obviously the effects of the adjacent quarry were beginning to make themselves felt (French and Taylor, 1985).

Species	Number	%
Oak	97	17.8
Ash	7	1.3
Fen spp	86	70.6
Unid.	56	10.3
Total	*246*	*100*

Table 5.22: Relative proportions of species.

The assemblage suggests extensive exploitation of the local trees, with a relatively small percentage of oak. The local species would have produced coppice material suitable for fences, gates and domestic structures, and so these proportions seem completely acceptable.

The importance of this assemblage lies, to a great extent, in its context. Wood from waterholes is not that uncommon, but the wood here comes from waterholes surrounded by an extensive agricultural landscape. The waterholes are, by definition, deep enough to penetrate the water table, and waterlogged wood is therefore not so surprising. The assemblage reveals much about the activities in the area and the quality of artefacts that were routinely available in a rural agricultural community. The presence of a general 'background noise' of small woodchips, roundwood debris, fragments of artfacts, twigs and bark suggests that this kind of material was ubiquitous. This may not be surprising, but it is rare to find direct evidence.

Catalogue of illustrated wooden artefacts (Figures 5.1-4)

1. Two-piece vessel: Small Find 8062, Pond Cluster 3.
Quercus sp., 595mm high, c. 200mm diameter, two integral lug handles, base missing.
2. Fragment of two-piece vessel: Context 8232, Pond Cluster 1.
Quercus sp., approximately 285mm high, grooving for base visible.
3. Possible ard: Context 8394, Fen-edge Pit Cluster 5.
Natural fork with mortice, 510mm x 260mm x 100mm. Mortice in the horizontal sole is approximately 50mm x 40mm.
4. Monumental timber: Context 8335, pit 8334.
Quercus sp., timber, tangentially split, trimmed at one end from two directions, 1800mm x 400mm x 80mm.

Analysis of Waterlogged Wood and Charcoal from Bulk Samples from Selected Waterholes and Pits

by Jane Wheeler

Aims

The primary aims of this analysis have been to identify the extent of archaeological (worked or utilised) and natural wood debris from a series of waterhole pits and ponds at Pode Hole quarry, and their spatial and chronological relationship. The excavated worked wood is reported elsewhere (Taylor, above), whereas this section considers the wood recovered from ten bulk samples. The ten samples selected for wood analyses were chosen from dated contexts (Table 5.23). In addition, this information complements the results of the analysis conducted on the plant macro-remains from these features.

Methodology

All samples were recovered by flotation and separated from the remainder of the organic component of the sample by wet-sieving on a 6.7mm mesh. Each sample-set was initially assessed to ascertain if carbonised fragments were present, but as the material was waterlogged, it was difficult to identify and sub-categorise carbonised material prior to fracture in equal proportions to wood fragments at this stage. Therefore sub-sample sets of 30 fragments were randomly selected from each sample-set, with a deliberate 50:50 selection strategy being followed if charcoal fragments were present in the bulk material. If the quantity of material in a sample-set comprised <30 fragments then all material available was selected for analysis.

Standard specimen preparation followed Leney and Castell (1975). Examination of the wood anatomy used a Leica Wild M3Z low power stereomicroscope at x10-40, and a high power incident microscope (Nikon Optiphot) up to x400. Identification to genus was made using modern wood keys and published sources (Hather, 2000 and Schweingruber, 1990 and 1979), supported by a modern reference collection.

Analysis of the wood assemblage utilised standard methods of quantification including: percentage frequency analysis, ubiquity/presence analysis (Table 5.24) and species diversity (Table 5.25). Non-taxon analysis (annual growth ring analysis) was conducted to collate data to evidence short series growth trends (Table 5.26). This can suggest development in a natural or managed environment, and the condition of that environment in relation to the presence or absence of growth stresses which can be used as markers to indicate species management and selection, as well as the structural source: twigwood, stemwood, branchwood, or rootwood (Bernard et al., 2006; Boyd, 1988; Haneca et al., 2006; Rackham, 2001; Rasmussen, 1990; Schweingruber et al., 2006). Counts were also recorded of the ratios of natural wood fragments to carbonised fragments (see Table 5.27), and unworked 'natural' fragments to wood fragments showing signs of working (see Table 5.28) to reveal feature specific trends in data to quantify the presence or absence of archaeological material: i.e. worked or utilised wood and wood debris, and/or charcoal.

Wood analyses

A total of 325 fragments were analysed. 17.8% of fragments were categorised as indeterminate due to poor preservation or immature anatomy. Taxa composition was low at ≤4 (Table 5.25) with seven species identified from six features. Ubiquity/presence scores show that a similar variety of taxa were present in all contexts (see Table 5.24). *Salix* (willow), *Alnus* (alder), *Corylus* (hazel), and *Quercus* (oak) were the most prevalent species respectively. Salix was the only taxon common to all features and contexts. Low presence scores were registered by *Hedera helix L.* (ivy) 0.3% (context 7138), *Ilex aquifolium L.* (holly) 0.3% (context 9094), and

Sample no.	Context no.	Feature type	Group/feature	Radiocarbon date range (calibrated)
6076	7268	Waterhole pit	7214	1950-1750BC (SUERC-12095)
6104	7138	Waterhole pit	Fen-edge Pit Cluster 3	1410-1210BC (SUERC-12096)
6128	7651	Waterhole pit	Fen-edge Pit Cluster 3	1410-1210BC (SUERC-12096)
8016	8232	Pond	Pond Cluster 1	1460-1310BC (Beta-238590)
8018	8319	Pond	Pond Cluster 1	1460-1310BC (Beta-238590)
8020	8233	Pond	Pond Cluster 1	1460-1310BC (Beta-238590)
8091	9094	Waterhole pit	9075	1420-1190BC (Beta-238589)
8136	9503	Waterhole pit	9500	1400-1130BC (Beta-238592)
8150	9531	Waterhole pit	9500	1400-1130BC (Beta-238592)
8173	9628	Pond	Pond Cluster 3	1300-1020BC (Beta-238591)

Table 5.23. List of wood and charcoal sample-sets analysed.

Maloideae (most probably *Prunus spinosa L.* (blackthorn) or *Crataegus* sp., most probably *Crataegus monogyna* Jacq. (hawthorn), 0.9% (context 9531), which, in the example of the latter category and context, were also identified in the plant macrofossil remains (see Martin above).

Percentage frequency data (Table 5.24) show *Salix* to be the dominant taxon in 70% of contexts, i.e. both contexts 7651 and 7138 from Fen-edge Pit Cluster 3, context 9094 from waterhole 9075, both contexts 9503 and 9531 from waterhole 9500, and context 9628 from Pond Cluster 3. *Salix* is also the dominant taxon in context 8319, but *Quercus* becomes the dominant species in the adjoining context 8233 and in the overlying context 8232 – which forms part of the stratigraphic sequence for Pond Cluster 1. Worked wood was also identified in this feature from contexts 8232 and 8233, whilst context 8319 contained only 'natural' wood fragments. Interestingly all worked wood from context 8233 was *Quercus* with 73% of worked fragments being stake tips, whilst all other worked fragments showed signs of cutting.

Sample 8233 was noteworthy as it contained a stake tip which appears to have been cut from a larger branch. Which had been split longitudinally to produce the stake. The worked wood assemblage from the overlying context 8232 contained equal proportions of *Quercus* and *Alnus* (both 46%) with the remaining 8% represented by *Salix*. The majority of worked wood fragments from this context were square-shaped wood chips (46%), stake tips represented 23% (all *Alnus*), and the final 31% of the worked wood fragments was in the form of cut stemwood. Of the cut stemwood, half was *Quercus*, with equal proportions of *Alnus* and *Salix* completing the total. Regarding the species composition of the square-shaped wood chips, *Quercus* was twice as common as *Alnus*. Mean annual growth ring counts for contexts 8233, 8319, and 8232 – all from Pond Cluster 1 – were greater than mean growth ring tallies for all other contexts and features (see Table 5.26). The data indicate little difference in the average age of wood found in the natural deposit (context 8319) and the worked and natural material from context 8232. The greater number of mean annual growth rings recorded in worked and natural wood fragments from context 8233 appears to be the result of larger and older pieces of branchwood being cut or split to produce stakes. No wood from Pond Cluster 1 was carbonised.

Corylus was the dominant taxon identified in context 7268 from waterhole pit 7214. Of the total number of wood fragments from this context, 43% were carbonised, with this particular taxon also dominating carbonised fragments (61%), with lesser frequencies of *Quercus* and *Salix* (both 15.5%), and *Alnus* (8%). Stem cutting was apparent in 13% of *Corylus* fragments. The relatively high mean annual growth ring counts for this context (Table 5.26) suggests that older and larger

Taxon	All contexts		Fen-edge Pit Cluster 3				Pond Cluster 1						Waterhole pit 7214		Waterhole pit 9075		Waterhole pit 9500				Pond Cluster 3	
	n=325		7651		7138		8233		8232		8319		7268		9094		9503		9531		9628	
			n=30		n=30		n=30		n=30		n=30		n=30		n=25		n=30		n=30		n=60	
	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Alnus sp.	37	11.4	0	0.0	0	0.0	1	3.3	7	23.3	5	16.7	1	3.3	4	16.0	7	23.3	8	26.7	4	6.7
Corylus sp.	27	8.3	1	3.3	5	16.7	0	0.0	0	0.0	1	3.3	15	50.0	3	12.0	2	6.7	0	0.0	0	0.0
Hedera helix L.	1	0.3	0	0.0	1	3.3	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Ilex aquifolium L.	1	0.3	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	4.0	0	0.0	0	0.0	0	0.0
Maloideae	3	0.9	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	3	10.0	0	0.0
Quercus cf.	15	4.6	0	0.0	0	0.0	7	23.3	6	20.0	2	6.7	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Quercus sp.	28	8.6	0	0.0	6	20.0	8	26.7	5	16.7	0	0.0	3	10.0	0	0.0	0	0.0	0	0.0	6	10.0
Salix cf.	12	3.7	6	20.0	6	20.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Salix sp.	143	44.0	8	26.7	4	13.3	4	13.3	8	26.7	22	73.3	10	33.3	14	56.0	17	56.7	10	33.3	46	70.0
Indeterminate	58	17.8	15	50.0	8	26.7	10	33.3	4	13.3	0	0.0	1	3.3	3	12.0	4	13.3	9	30.0	4	13.3

Table 5.24: Summary of presence of taxa by feature and context.

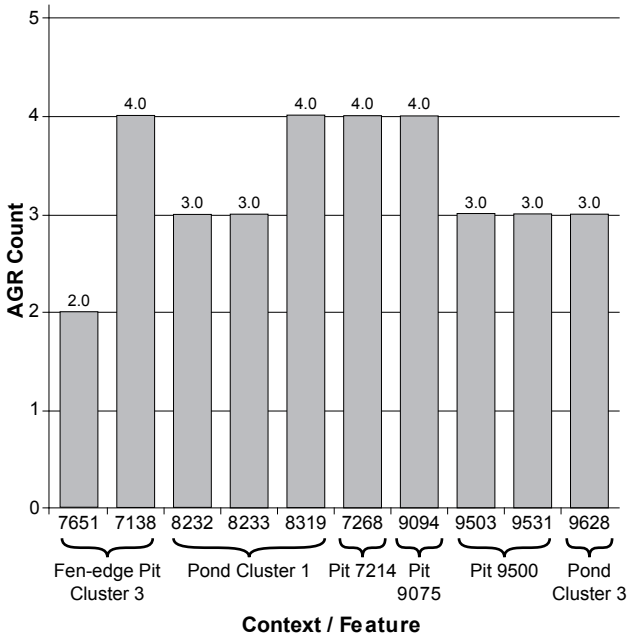

Table 5.25: Species diversity by context and feature.

stemwood and branchwood may have been specifically selected for fuelwood, as the charcoal sample-set in this context is dominated by *Corylus*, which is consistent with debris from an individual fire being deposited into the pit.

No further deposits provided wood fragments that appeared to have been worked. All other contexts, with the exception of 7651 from Fen-edge Pit Cluster 3, contained charcoal.

The two contexts (7651 and 7138) from Fen-edge Pit Cluster 3 differed in terms of species diversity and mean annual growth ring counts (Tables 5.25-26). Context 7651 contained immature stemwood and twigwood fragments dominated by *Salix*, which is probably representative of a natural deposit of juvenile twigwood debris. By contrast context 7138 contained a more varied and balanced range of taxa, albeit dominated by *Salix* and respectively, *Quercus* and *Corylus*. Context 7138 also contained more mature and larger fragments of stemwood and branchwood, as shown by the greater number of annual growth rings. The dominance of *Quercus* in the charcoal assemblage from context 7138, and the greater number of annual growth rings counted (maximum 14) in relation to much lower tallies for *Corylus* and *Salix* (maximum four respectively) suggests that the former species, in relation to fuelwood, originated from a more mature source and formed the major component of the fuelwood assemblage. The dominance of natural wood fragments (71%) and the relative immaturity of these fragments in this context suggests that this deposit may have been exposed after the deposition of charcoal, therefore becoming mixed with natural debris from vegetation surrounding the feature. The presence of *Hedera helix L.* charcoal is interesting as it suggests that wood such as *Quercus* may have been brought into the site from nearby woodland, or hedgerow vegetation may have been cut with the material being simply burnt or used as fuelwood before being deposited in the pit.

Similarly the presence of *Ilex aquifolium L.* charcoal (25%) in context 9094 from waterhole cut 9075 may also, in association with the presence of *Corylus* (50%) and *Alnus* (25%) charcoal, be representative of hedge vegetation with cuttings being utilised to provide fuelwood or simply being burned. The dominance of immature fragments of *Salix* in this deposit, none of which are carbonised, suggests that willow may not have been selected as a fuelwood or was present in the hedge vegetation, or that the presence of this particular taxon is simply the result of deposition from vegetation adjacent to the open waterhole.

Context 9628, the basal deposit of Pond Cluster 3, has a greater proportion of mean annual growth ring counts than all other contexts containing natural wood fragments and carbonised specimens. Annual growth ring data reveals no difference between the mean age of natural wood fragments and carbonised fragments. A third of all fragments showed signs of damage caused by water transportation or erosion, with 11% of carbonised fragments and 6% of natural wood fragments demonstrating anatomical deterioration caused by water transportation or water percolation, suggesting that this deposit may have been subjected to hydrological fluctuations in situ and/or transportation into the pond during localised flooding. The relative immaturity of all fragments of natural twigwood and stemwood, representative of all species, is consistent

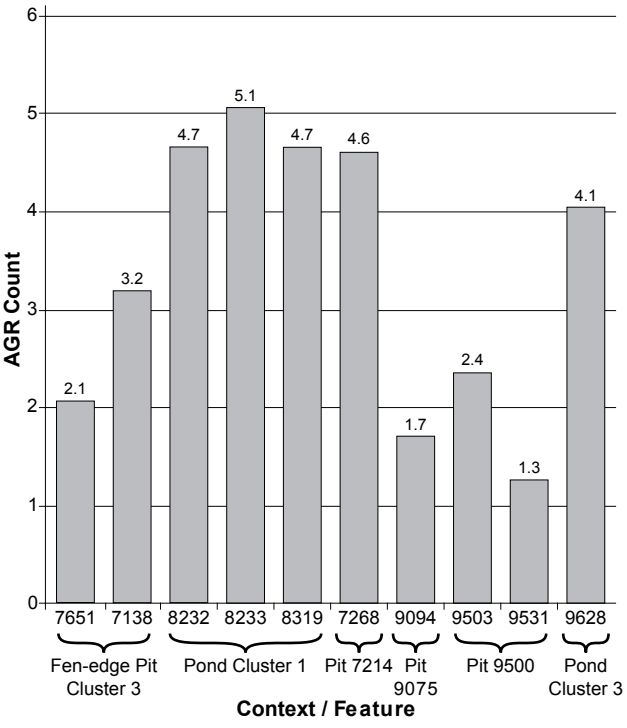

Table 5.26: Mean annual growth ring count by context and feature.

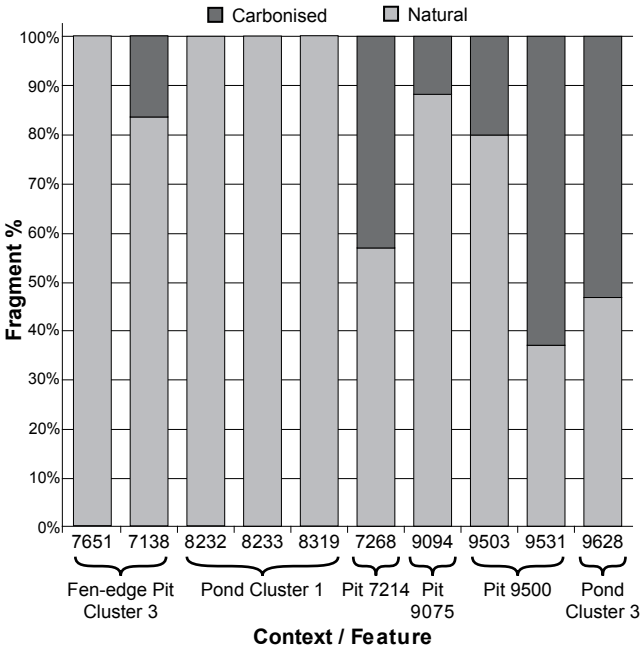

Table 5.27: Fragment percentage of carbonised and 'natural' wood by context and feature.

with vegetational debris from sources relatively local to the feature. Similarly the charcoal presence is reflective of the dominant taxon *Salix*, whilst interestingly, *Quercus* is not represented in the sample of carbonised fragments. There is no trend in the charcoal data-set to suggest species selection for fuelwood, or any indication from the annual growth ring counts and growth ring width variation data to imply species management. It is possible that the carbonised fraction may be the result of natural fire or the selective burning of vegetation adjacent to the pond. Similarly, in this context, the immaturity of all *Quercus* fragments would appear to be consistent with influx and debris from a relatively local source growing near to or immediately adjacent to the feature.

Contexts 9503 and 9531 from waterhole pit 9500 reveal a slight change in species composition between the upper fill (9531) and the lower deposit (9503), which has been truncated by cut 9574 (a post hole which was later infilled with the remains of a wattle fence structure). The underlying context 9503 is dominated by *Salix* and *Alnus*, with lesser frequencies of *Corylus*, whereas the overlying context 9531 is dominated by *Salix* and *Corylus*, with Maloideae also represented. Context 9531 has the greater number of carbonised fragments (53%) in comparison to context 9503 (20%), with 64% and 71% of charcoal respectively showing signs of degradation consistent with damage caused by water transportation or hydrological fluctuations in situ, and are highly fragmented. Both deposits have similarly low annual growth ring counts and growth ring width variation sequences indicative of juvenile stemwood and twigwood. The presence of Maloideae in context 9531 suggests this particular deposit may be representative of hedgerow species or a thicket near to the waterhole, which, if the latter, may have been cut and burned to clear the area adjacent to the feature. There is no evidence in the annual ring count data or species presence for context 9531 to suggest taxon selection specifically for fuelwood, although there is the possibility that species variance could be the result of a series of events where fuelwood debris has been deposited in the open waterhole and become mixed in situ. In comparison, *Salix* is the dominant species represented in both natural wood fragments and in all identified charcoal fragments (67%) from context 9503. The presence of eroded carbonised fragments from this deposit is similarly consistent with hydrological degradation or re-deposition of material that had undergone surface erosion.

Summary

The analysis of material from selected contexts from these waterhole pits and ponds has shown that the major species presence common to all contexts and features was *Salix*, which is probably representative of nearby fen vegetation and/or scrubby vegetation which may have grown around the waterholes. Similarly *Alnus* was identified in eight contexts, from Pond Clusters 1 and 3, and waterhole pits 9075, 9500 and 7214. *Alnus* may indicate boundary features, such as hedging, or it may represent scrubland growing adjacent to these five features. The local availability and accessibility of this species and its utilisation for staves and pegs (Gale and Cutler, 2000) is consistent with the worked wood identified in contexts 8232 and 8233 from Pond Cluster 1. The presence of *Corylus*, and to a lesser extent *Quercus*, is consistent

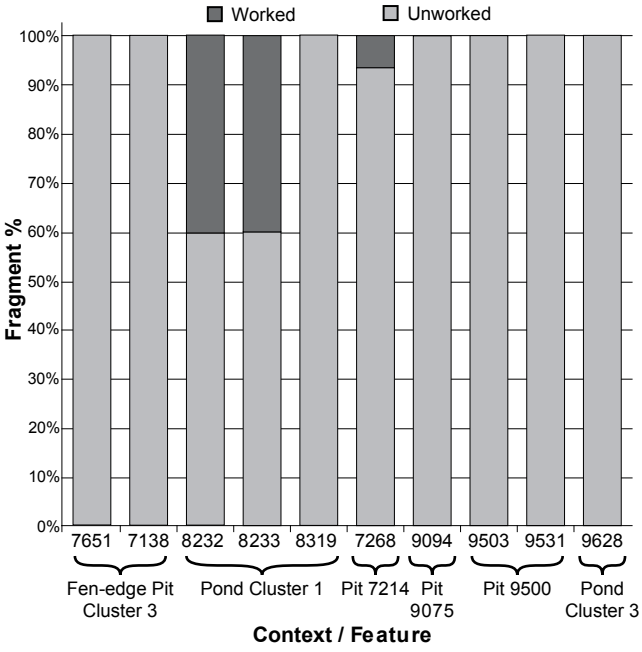

Table 5.28: Fragment percentage of natural 'unworked' and archaeological 'worked' wood by context and feature.

with a local hedgerow presence with occasional oak standards present, or felled or cut wood representative of the latter species being brought onto the site and stripped and worked in the vicinity of Pond Cluster 1. High levels of fragmentation in all wood and charcoal fragments has limited the expectations of the annual growth ring count and growth ring width variation data-sets, although trends were observed in data from Pond Cluster 1 as a result of the presence of larger fragments of stemwood and branchwood consistent with having been worked, in the form of stake tips and wood chippings. There is no conclusive evidence in the dendrological data to suggest cutting regimes consistent with cyclical management. Carbonised wood was represented in six contexts, from pits 7214, 9094, 9500, and Pond Cluster 3. Species presence in relation to carbonised fragments is consistent with selection and utilisation for fuelwood, specifically *Corylus* (context 7268) and *Quercus* (context 7138). Species compositions representative of carbonised and natural wood are similar in all contexts, with the exception of context 9628 (Pond Cluster 3) where *Quercus* is not represented in the carbonised fraction.

Terrestrial and Freshwater Snails

by James Rackham

The preservation of calcareous snail shells was not uniform across the site. Only a small proportion of the samples produced any snails, and of these, few produced numbers that justified further study. None of the samples selected above for detailed analysis of the waterlogged plant remains produced sufficient snails to warrant study.

The samples that were studied for snails were recovered from across the site, coming from pits, a barrow ditch, waterholes and soil and sealing layers (Table 5.29). They include samples dated to the Early, Middle and Late Bronze Age. In general the assemblages suggest a damp grassland environment. The characteristic taxa in all the samples are *Vallonia excentrica, Vallonia costata, Vertigo pygmaea, Trichia hispida, Cochlicopa* sp., *Carychium* sp. and *Lymnaea truncatula* (Table 5.30). All except the latter two are primarily associated with open grassland environments, although *T. hispida* and the *Cochlicopa* species occur widely across a range of habitats. *Lymneae truncatula* is an amphibious species frequently found on the edge of ditches, rivers and small streams, but also in damp places in fields and in water-meadows (Ellis, 1969; Macan, 1977). These assemblages are similar to that recorded by Robinson (1988) from a hay meadow at Picksey Mead, although *Carychium* is more abundant. Where shells of *Carychium* could be confidently identified they tended to be assigned to *C. tridentatum* rather than *C. minimum*, although both taxa are present in the samples. Taxa favouring

Sample	Context	Vol.	Description
1301	905	18	Fill of Bronze Age field boundary ditch
6033	4286/ 4287/ 4289	30	Fill of Ring-ditch 1 - Early Bronze Age
6081	7287	27	Fill of large pit 7214 - 1950-1750BC (SUERC-12095)
6114	7555	24	Old ground surface over pit 7528
8000	8064	25	Alluvial material/soil layer slumped into waterhole 8459 - later Bronze Age
8001	8111	24	Lower fill of large waterhole 8459 - later Bronze Age
8002	8124	17	Wash deposit sealing Pond Cluster 1 - 1620-1430 BC
8008	8086	30	Fill of one metre pit 8085 - early Middle Bronze Age
8012	8147	28	Fill of large posthole or midden pit 8155 - later Bronze Age
8013	8148	28	Fill of large posthole or midden pit 8155 - later Bronze Age
8085	9108	29	Secondary fill of pit 9107 - later Bronze Age
8103	9128	27	Charcoal rich layer in fill of waterhole 9125 - early Middle Bronze Age
8116	9360	25	Tertiary fill of possible waste disposal pit 9320 (p/o Pond Cluster 2) - Late Bronze Age

Table 5.29: Details of the samples studied and quantified for snails.

marshy environments are not that abundant, although Succinidae are present, and occasional shells of *Vertigo pusilla, V. angustior* and *V. antivertigo*. The *Carychium* shells, rather than being indicators of wet or marshy conditions, may be more indicative of damp, shaded conditions at the base of long grass, a habitat where *C. tridentatum* can occur in abundance (Evans, 1972).

A damp meadow environment could therefore be suggested for samples 8008, 6114, 8000, 8001, 8103, 8002 and 8116. The occasional occurrence in pits and waterholes of shells of *Hydrobia ventrosa* and *H. ulva*, both taxa typical of brackish or estuarine conditions, could conceivably be shells brought in with material from coastal areas, but *H. ventrosa* occurs in inland habitats with suitable conditions.

Although a damp meadow is suggested by most of the samples there are variations from this pattern. Sample 6033 from the Early Bronze Age Ring-ditch 1 has a small marsh component, with *V. pusilla, V. angustior* and *V. antivertigo*, and a single bivalve shell, *Pisidium* sp. That sample 6033 apparently represents marshier conditions seems to be easily explained by its context. Sample 8085, from later Bronze Age pit 9107, lacks shells of *L. truncatula* and *Carychium* sp. suggesting a drier and perhaps shorter grassland around this feature. Sample 8002, collected from context 8124 which is described as a 'wash of redeposited natural upcast sealing Pond Cluster 1', has the typical fauna of the site but with the addition of a very large number of shells of *Gyraulus*

Feature	Waterhole pit 7214	One metre pit 8085	Ring-ditch 1	Palaeosol	Waterhole pit 8459	Waterhole pit 8459	Pit 8155	Pit 8155	Waterhole pit 9125	Wash over Pond Cluster 1	One metre pit 9107	Pond Cluster 2	Ditch
Sample	**6081**	**8008**	**6033**	**6114**	**8000**	**8001**	**8012**	**8013**	**8103**	**8002**	**8085**	**8116**	**1301**
Context	**7287**	**8086**	**4287**	**7555**	**8064**	**8111**	**8147**	**8148**	**9128**	**8124**	**9108**	**9360**	**905**
Date	**EBA**	**eMBA**	**EBA**	**BA?**	**lrBA**	**lrBA**	**lrBA**	**lrBA**	**eMBA**	**eMBA**	**lrBA**	**LBA**	**BA?**
Open grassland													
Pupilla muscorum			5							1			1
Vertigo pygmaea	1		5	1		3	67		2	3	1	15	3
Vertigo sp.			11				56			1	2	8	
Vallonia excentrica		4	14	1	7	48	217	3	19	39		63	13
Vallonia costata		1	1		3	19	236		6	10	6	4	
Vallonia pulchella							4					7	
Vallonia sp.		6	17			20	198	1	33	59	14	87	
Catholic taxa													
Trichia hispida	1			3	2	21	176	19	16	46	4	64	
Trichia striolata									3?			2	
Cepeae sp.							6	7					1
Cochlicopa lubrica						3	37	1		2		8	
Cochlicopa lubricella							14	2					
Cochlicopa sp.		8	4			2	365	12	8	10	8	29	
Shade loving													
Acanthinula aculeata						2	28	7			1		
Punctum pygmaeum			1				143	2		1		3	1
Discus rotundatus						4							
Vitrea crystallina				1			2		1				
Nesovitrea hammonis		1			1		35	7		3		4	1
Aegopinella pura						2	47	6	2			1	
Aegopinella nitidula						3	20	3					
Oxychilus alliarus							20	23					
Oxychilus cellarius							12						
Oxychilus sp.						2	37	20	1	2			
Vitrea sp.							34	4		1			
Vitrea contracta							2						
Zonitidae									1				
Vitrina sp.		1					32						

Feature	Waterhole pit 7214	One metre pit 8085	Ring-ditch 1	Palaeosol	Waterhole pit 8459	Waterhole pit 8459	Pit 8155	Pit 8155	Waterhole pit 9125	Wash over Pond Cluster 1	One metre pit 9107	Pond Cluster 2	Ditch
Sample	**6081**	**8008**	**6033**	**6114**	**8000**	**8001**	**8012**	**8013**	**8103**	**8002**	**8085**	**8116**	**1301**
Context	**7287**	**8086**	**4287**	**7555**	**8064**	**8111**	**8147**	**8148**	**9128**	**8124**	**9108**	**9360**	**905**
Date	**EBA**	**eMBA**	**EBA**	**BA?**	**lrBA**	**lrBA**	**lrBA**	**lrBA**	**eMBA**	**eMBA**	**lrBA**	**LBA**	**BA?**
Clausilidae					1	1	57	2				1	
Marpessa laminata								1					
Clausilia bidentata							2						
Carychium tridentatum		21					+	47					
Shade/marsh?													
Carychium sp.			15	28	2	61	1300+	9	5	109		119	4
Marsh													
Carychium minimum							+	3		1			
Succinidae		1	2		1		19	1	5	2		1	1
Lymneae truncatula	1		36		4	73	10		46	21		33	
Vertigo pusilla			1										
Vertigo angustior			1			1				1			
Vertigo antivertigo	1		15			1						1	3
Brackish water													
Hydrobia ventrosa					2	2					1	13	
Hydrobia ulvae							1				1	4	
Freshwater													
Pisidium sp.			1	6						4			
Gyraulus laevis										1			
Gyraulus crista										2000+			
Total	*4*	*43*	*129*	*40*	*23*	*268*	*3177+*	*181*	*148*	*2315+*	*37*	*467*	*28*

Table 5.30: Frequency of shells of snail taxa in the larger assemblages from the site (habitat groupings broadly taken from Evans, 1972; Macan 1977; Ellis 1969; Cameron and Redfern 1976; Cameron 2003).

crista, and a few shells of *Pisidium* sp. and *Gyraulus laevis* (Table 5.30). These latter three species are aquatic and the 'wash' deposit should perhaps be re-interpreted as a pond infilling the hollow over the former cluster of waterholes. *G. crista* is a common taxon in ponds, ditches, marshes and lakes, but these numbers suggest material washed in off the nearby fen. The shells are very small and light and would be more easily carried by flood waters than many other aquatic taxa. Context 8124 lies beneath a layer decribed as 'alluvial' so this fauna may reflect the transport of shells in floods from the fen to the east.

Two samples were collected from pit 8155 which lies at the junction of two ditches, alongside a droveway, and is dated to the later Bronze Age on the basis of pottery in the feature. The snail assemblages are relatively rich. The lower context is dominated by shade-loving taxa, with very few shells associated with open country. This suggests a woodland habitat, which is inconsistent with most of the evidence from the site. If it was an early feature, late Neolithic or early Bronze Age, then a woodland environment is possible, but in the Late or Middle Bronze Age this suite of species may be more explainable in the context of an overgrown hedgerow area or small area of scrub at the corner of the field. In the layer above *Carychium* sp. becomes super abundant, and grassland taxa exceed the woodland component, although it is still abundant. Large numbers of *Cochlicopa* sp. and *Punctum pygmaeum*, perhaps reflect a transitional habitat, with drier and more open conditions than previously, supported also by the dominance of *Vallonia costata* among the vallonids, which can occur in dry open woods, scrub or hedgerows (Evans, 1972; Cameron, 2003).

Conclusions

The snail assemblages across the site are indicative of damp grassland or meadow environments, with only occasional woodland taxa present. The possibility of an extensive flood event, or a period of wetter conditions, may be suggested by the 'wash' deposits in the top of Pond Cluster 1. However, the latter scenario might perhaps have been expected to result in a greater diversity of freshwater taxa.

Species suggestive of a woodland habitat dominated in just one feature, pit 8155 at the junction of a field ditch and droveway. This particular assemblage need not indicate a wider woodland environment, rather, it could be interpreted as evidence for a hedgerow or the development of an area of scrub in the corner of the field.

Vertebrate and Marine Shells from the Samples

by James Rackham

The identified vertebrate and marine shells that have been identified from the samples are summarised in Table 5.31. The finds include both economic and environmental evidence. Taxa of economic significance include cattle, sheep/goat, goat, pig, red deer, a possible duck species, a small fish, and probable cockle and mussel shell fragments. These almost certainly all derive from food remains, and it is possible that the small birds and even the water voles may also have been consumed. The presence of burnt water vole bones in context 8148, a fill of possible midden pit 8155, certainly raises the possibility that this species was eaten. Of the two samples that produced human bones, one was a cremation and the second, which produced a cranium fragment, the lower fill of Pond Cluster 1. Interestingly the ratio of cattle:sheep/goat:pig in these samples is quite different from the excavated bones (see below). Cattle fragments occur more commonly than sheep in the pit samples, less commonly in the waterhole samples.

Of the smaller vertebrates, bones of frog/toad are the most abundant, but these taxa are not habitat specific and of little use for environmental reconstruction. Water vole is the next most frequent, but unfortunately there are two sub-species of this taxa, one of which is more terrestrial in habit and occurred in Britain in the past (Jefferies, 2003), so without a genetic identification, the presence of this species may not be indicative of local water, or waterfilled ditches. It may even be possible that its abundance is related to exploitation rather than natural deaths. Nevertheless, with a higher proportion of ditch samples (18%) producing water voles, despite poorer preservation, than either the waterhole samples (13%) or small pits (5%) then it is more likely that these animals are the amphibious sub-species and their abundance does reflect the presence of waterfilled, well-vegetated ditches. Perhaps an unexpected result is that wood mouse occurs in a greater number of samples than the field vole. The latter is in particular a species of grasslands, which may be the primary habitat on the site, whereas the wood mouse is more characteristic of ground with good cover, although it readily uses hedgerows and may well have exploited Bronze Age buildings at a time when the house mouse was not yet introduced to Britain. It occurs in ditches, pits and waterholes and perhaps indicates good vegetation cover, such as long grass and reeds growing along the ditches and around the waterholes. The relatively low number of field voles might reflect the managed character of the meadows and grasslands of the site, or possibly their dampness. The near absence of both bank voles and shrews is unusual. The former is shy of leaving cover and favours deciduous woodland,

scrub, hedgerows, banks and ground with good cover. The latter is fairly common in thick grassland and might have been expected in a much greater number of samples. The possible slow worm, grass snake and newts are not habitat specific although the latter need water for breeding, and all would be at home in grassland. The stickleback in a single sample from a waterhole might well have been living there.

The most specific environmental element in this suite of species is the abundance of water voles. Irrespective of any taphonomic issues that might favour the occurrence of this species over the other taxa, its dominance does appear to reflect waterfilled ditches, damp, well-vegetated ditch banks and waterhole margins, and perhaps limited human disturbance of the habitat. This contrasts somewhat with the molluscan data discussed above which apart from a few marsh taxa and occasional aquatic species did not produce a fauna indicating a wet environment, although only two of the snail samples derived from waterholes and none from the ditches.

Animal Bones

by James Rackham

Animal bones have been recovered from the samples and by hand collection during the excavation. Although the total hand-excavated sample recorded after washing was estimated at approximately 10,000 fragments weighing just over 77kg, when these were recorded they comprised only 2768 fragment entries. The reason for this is that many of the bones were very brittle and many fragments had broken or fragmented further during excavation and subsequent cleaning, with the result that, in some contexts in which eight to twelve fragments may have been counted, or in exceptional occasions as many as 50 or 60, all were found to derive from the same bone and to have been broken by the recovery process. For this reason the ancient fragmentation was much lower than might have been thought. This is most clearly seen when the level of fragmentation of the bones in different states of preservation are assessed (Table 5.32). The fragmentation index (no. zones/no. fragments) for the poorly preserved bones of all identification categories

Total no. samples taken	*197*	**33**	**6**	**58**	**8**	**86**	**6**
Species	***Number of samples containing identified taxa***	**Ditch**	**Cremation and Scoop**	**Pit**	**Posthole**	**Waterhole**	**Soil**
Human	*2*		1			1	
Cattle	*19*	1		9		9	
Sheep/goat	*19*		1	5		13	
Goat?	*1*					1	
Pig	*6*			1		4	1
Red deer	*2*					2	
Small carnivore	*1*					1	
Weasel	*1*					1	
Shrew	*2*			2			
Mole	*1*					1	
Wood mouse	*13*	3		5		5	
Water vole	*20*	6		3		11	
Field vole	*12*	3			2	7	
Bank vole	*1*					1	
Vole sp.	*20*	2		3		12	3
Rodent	*8*			4		4	
Duck sp.	*1*			1			
Small bird	*8*			3		5	
Grass snake	*1*			1			
Snake	*1*			1			
Slow worm?	*1*			1			
Newt	*2*			1		1	
Frog/toad	*33*	3		6	1	20	3
Stickleback	*1*					1	
Fish sp.	*1*			1			
Cockle?	*1*					1	
Mussel?	*1*					1	

Table 5.31: Summary table of identified vertebrate and marine shell taxa in the samples.

(preservation codes 2 and 3) is 0.3, while that for the well-preserved fragments (category 4) is 0.86, nearly three times less fragmented. How much of this variation is due to the contexts from which the bone was recovered or the burial environment and the condition of the bone is a difficult issue, but it is likely that a substantial proportion of the fragmentation of the brittle, poorly preserved bones may be due to recent damage. Many of the bones are fairly heavily mineralized or concreted which has made cleaning and identification problematic. If only the sheep, pig and cattle are considered then the index varies between 0.93 and 1.58 for cattle, 0.5 and 0.8 for sheep, and 1.25 and 1.5 for pig. These figures also serve to show that the identifiable pig bones are generally less fragmented than cattle, which are themselves less fragmented than sheep. Such figures must clearly have an impact on the ratio of the different species across the site and any attempts to assess their relative importance. A much higher proportion of the cattle-size bones were unidentifiable in the poorly preserved assemblages when compared with the well-preserved bone, probably largely due to this greater fragmentation. In total, nearly 60% of the bone fragments were classified as poorly preserved.

Preservation	2		3		4	
	Zones	Frags	Zones	Frags	Zones	Frags
Horse	-	-	0	4	10	9
Cattle	7	9	295	317	659	419
Cattle size	1	19	4	661	11	241
Sheep and goat	0	2	27	54	97	122
Sheep size			1	123	11	200
Pig			25	20	117	78
Red deer			6	21	15	16
Roe deer					11	4

Table 5.32: Frequency of zones (Rackham 1986) and individual fragments of each species in terms of the general condition of the bone fragments (see Appendix for preservation categories).

This analysis of the impact of context on the bones can be taken further. Table 5.33 presents the preservation state in different feature types. The data in this table is somewhat of a problem because it does not take account of the differences between upper and lower fills, and waterlogged and non-waterlogged contexts but it throws up some interesting results. Features merely classified as pits, those classed under soil layers (these are sealing and soil layers, and peats over features) and waterhole fills all produced assemblages in which well-preserved bones (class 4) predominate. In contrast midden and refuse pits, scoops and ditches all produced a marked predominance of fragments assigned to the poorer categories (classes 2 and 3).

The relative ratio of cattle, sheep and pig is very similar irrespective of the feature type. This suggests that context type has little or no impact on the ratio of the different species. Therefore, the preservational variations by feature, highlighted in Table 5.33, should not have affected the relative frequency of species within overall site assemblage.

Preservation	2	3	4
Natural		7	
Tree throw		6	
Animal burial		10	26
Barrow ditch	1	26	
Ring-ditch		50	1
Cremation		2	
Ditch	7	138	33
Ditch terminus	8	250	11
Hollow		3	2
Scoop	5	99	16
Shallow pit		4	1
Midden pit		69	35
Refuse pit	1	187	55
Pit	1	126	235
Posthole	3	9	14
Soil	1	194	291
Waterhole	4	369	388

Table 5.33: Number of fragments of each preservation category in the different feature types.

These analyses suggest, at least superficially, that context type has little impact on the species ratios, although bone preservation and fragmentation does. There is a contradiction in this, since it has already been established above that preservation varies across the feature types, so to test this further, the species ratios are compared across those feature types with the best preservation and those with the worst. When considered at this scale the poorer preservation favours cattle bones, while pig bones appear to have suffered the greatest loss. This suggests that the feature types and contexts in which preservation is generally best are most likely to reflect the original depositional ratio of the major domestic animal bones. This is taken into account below when discussing the relative importance of the different domestic animals.

The frequency of fragments of each identified taxon or category from the whole site is presented in Table 5.34.

The sample is dominated by bone fragments of cattle and cattle-size animals. Cattle constitute nearly 70% of the identified component, while sheep and goat manage only 16.5% and pigs 9%. Even allowing for the preferential survival of cattle indicated by the fragmentation and preservational evidence discussed above, this would appear to reflect a pastoral economy that relies on cattle. Of the contexts and features that have been provisionally dated, it is evident that most of the bones derive from Middle Bronze Age and Middle to later Bronze Age deposits. The recovered sample

Taxon	No. fragments
Horse	13
Aurochs	3
Aurochs?	1
Cattle	745
Cattle size	922
Sheep/goat	169
Sheep	10
Sheep size	324
Pig	98
Dog	1
Red deer	37
Roe deer	4
Fox or cat	1
Pine marten	1
Rodent	5
Small mammal	2
Duck sp.	1
Frog/toad	2
Unidentified	429

Table 5.34: Number of identified fragments of each taxon or group from the whole site.

from contexts assigned to the Early Bronze Age and later Bronze Age is small, although a large component of the assemblage could be dated no closer than 'Bronze Age?'.

In addition to the main domesticates, horse and dog are present, with the wild fauna represented by aurochs, red deer, roe deer, a small fox or cat calcaneum fragment, a partial skeleton of a pine marten and a carpometacarpus of a duck (Table 5.34).

The samples are rather small for comparison across the periods, but if the features least affected by poor preservation are considered, the proportion of cattle is highest in the Middle Bronze Age deposits and lowest in the Middle to Late Bronze Age. The figures are, however, perhaps biased by one context, 8189, an alluvial layer overlying Pond Cluster 1, in which pig bones, possibly part of the remains of two or three juvenile animals, occur nearly as frequently as cattle. Without this context the overall proportions are 64% cattle, to 18% sheep or goat and 18% pig. The variability is also reflected to a degree in the zone data (Table 5.35) indicating that differential fragmentation between the species is probably biasing the results less than small sample size and context variability. One final comparison has been made between the most frequent element zone of each species in the better preserved features. In these groups there were 22 different cattle radii, nine different sheep/goat tibiae and six different pig humeri and mandibles, giving a percentage ratio of approximately 60:24:16 for these species.

Clearly, given the preservational issues, sample sizes, and probably low reliability to the phasing, it would be a mistake to attach any significance to the actual numbers presented. It is enough to say that cattle must have constituted the most important animal by a long way, both in terms of numbers of beasts and meat supply. The sheep are small prehistoric types (see below) and it is probable that as much, or more, meat was obtained from the pigs as from the sheep, although the latter will have supplied other products such as milk and wool. A generalised stock ratio among the slaughtered animals in the Bronze Age of something like one pig to two sheep to four cattle might be suggested, taking into account all the issues.

Among the sheep/goat bones is a single fragment of metacarpus from one of the samples that has been tentatively assigned to goat. This is the only evidence for goat from the site. Evidence of dog gnawing was recorded on 69 bone fragments; not surprisingly, all but seven of these were from well-preserved fragments. However, only one fragment of dog was identified, an upper premolar 4 from an Early Bronze Age barrow ditch. Only 13 bones and teeth in total were identified as horse. We can learn little from this material, although a mandibular molar 3 carries no wear, indicating an immature animal of perhaps 3.5- 4 years of age, while the few other bones suggest adult animals, and the two fragments that could be measured indicated that the animals were probably typical later prehistoric animals in terms of their stature.

The wild animals made only a small contribution to the assemblage. Three bones of aurochs have been identified from Early Bronze Age pit 7214. It is possible that all three fragments could have derived from the same animal, a beast very much larger than the domestic cattle on the site. A possible aurochs radius was also recovered from a fill of waterhole pit 9250, an

	EBA		MBA		MBA/LBA		LBA		BA?	
	Frags	Zones	Frags	Zones	Frags	Zones	Frags	Zones	Frags	Zones
No.	42	56	180	219	198	191	117	89	166	214
Cattle	62%	71%	79%	84%	59%	58%	66%	63%	79%	72%
Sheep/ goat	21%	14%	14%	11%	15%	20%	31%	33%	17%	18%
Pig	17%	14%	7%	5%	26%	22%	3%	4%	4%	10

Table 5.35: The percentage contribution made by cattle, sheep/ goat and pig in the better preserved features by period group using fragment counts and zone counts.

apparently Late Bronze Age context. This was a very poorly preserved fragment that was identified on the basis of its size and robustness.

This would be a late record for aurochs in Britain but it is possible that it was re-deposited in the context; as it is the only bone from this deposit, we cannot establish whether its poor condition is due to a poor burial environment or redeposition from earlier deposits. Two other bones, a rib and scapula, were highlighted as possible aurochs on the basis of their size.

Bones of both red and roe deer are present in the samples. The roe deer is represented by only four bones, an adult mandible from a possible Early Bronze Age context, a tibia fragment from a Middle-Late Bronze Age context, and two complete antlers, one shed and the second broken from the skull. The shed antler from Early Bronze Age context 7268 in pit 7214 (which produced the aurochs bones above), although not worked, did carry score marks which may be gnawing or human action. The antler broken from the skull was recovered from waterhole pit 8461, which is undated but presumably Bronze Age.

The red deer remains are more numerous, and include bones and both worked and unworked antler. Among the 37 identified fragments 26 are antler. They occur in all periods and were found in ditches, pits, waterholes and soil spreads. A metacarpus occurred in Early Bronze Age pit 7214, while Middle Bronze Age midden pit 8085 produced the proximal end of a femur and a worked, shed antler base and brow tine. The beam of the antler had been ring-grooved to remove the beam above the tine, indicating that this was a piece of waste. The Middle Bronze Age material was recovered from Midden Area 1, waterhole pits 8263 and 7220, Fen-edge Pit Cluster 4, and Pond Cluster 1. Apart from a distal tibia in Pond Cluster 1, all of this material was antler. Two fragments are waste or unutilised fragments showing evidence of grooving to remove them from the rest of the antler, and one was a complete shed antler from the lower fill of Pond Cluster 1. This had eight tines, with one cut off and a second possibly removed, but no other evidence of working. This seems to have been collected but deposited largely unutilised.

Two definite antler artefacts were present (discussed in full by Maltby, above). An uppermost fill of pit 7220 produced a tine both ends of which had been smoothly hollowed into a cone shape, with the basal end removed by grooving. There is no obvious wear and the function of the artefact is not known. The second object is a digging stick from the primary fill of a pit within Fen-edge Pit Cluster 4. This is a shed antler with the brow tine tip charred, the bez removed and the trez broken. The beam served as the handle while the brow tine functioned as the pick point. The object is complete, although sadly broken during or after recovery, but the wear on the point of the brow tine is not severe, suggesting that it was not used for any great length of time.

A fragment of shed antler, two right metatarsi and an innominate fragment were recovered from the alluvial layers sealing Pond Cluster 1 in a context dated to the Middle to Late Bronze Age. A fragment of antler cortex was recovered from the late Middle Bronze Age primary fill of pit 9107. Among the bones from contexts of only indeterminate Bronze Age date was the distal shaft of a tibia (recovered from waterhole pit 8740) and a radius shaft fragment (from waterhole pit 9500). The tibia carried several score or cut marks, but these do not appear to be associated with butchery. The remainder of the red deer fragments are antler: fragments of beam or tine, with no evidence for working, except for a crown fragment from waterhole pit 8740, from which a tine had been removed by grooving, and a second crown fragment from ditch 7058 whose beam had been chopped through. Two tine fragments were recovered from contexts assigned to after the Bronze Age (from spread deposits over earlier features). Both seem likely to derive from the Bronze Age occupation of the site.

While red deer antler was clearly an important resource for bone-working, and the shed antlers must have been collected or even perhaps traded, the post-cranial bones of red and roe deer and aurochs clearly indicate that deer and wild ox were also hunted, which also suggests the availability of a suitable habitat for these animals in the area. The only other wild animal bones are a carpometacarpus fragment of a duck of mallard size from a later Bronze Age waterhole found cutting Ring-ditch 1, and the partial skeleton of an adult pine marten from charcoal rich primary fill of pit 9107. The pine marten is an arboreal animal and, unless traded, it suggests woodlands of sufficient size with reach of the site.

Cattle

There are three 'types' of cattle present on the site. The wild ox or aurochs has already been discussed, but there appear to be two types among the domestic cattle. Several of the frontal fragments and larger skull fragments have a typical 'celtic shorthorn' conformation: a small skull with the horn cores short and flattened, ridged, and oval in cross section, projecting laterally from the posterior skull and curving forward (see Plate 5.2). A few of the cores are larger, not flattened or ridged, but round in

Plate 5.2: Skull of celtic shorthorn.

cross section, and occasionally upward curving as well as forward. These may reflect a sexual dimorphism in the horn core form rather than any breed/variety difference, the classic pattern being the female.

Phase	pm2	pm3	pm4	m1	m2	m3
Less than 6 months?						
MBA/LBA?				2		
MBA/LBA	f	g	h7			
MBA/LBA		g8	h8	3		
MBA/LBA	f	g	h8/9			
7 months and older						
MBA	f	g	h9	4	0	
BA?	f	g	h11	6		
EBA			h11			
LBA			h11			
MBA/LBA?			h12			
LBA			h12	4		
MBA/LBA?	f	g	h14	4	2	0
MBA				6		
BA?	f	g	h14	7	4?	
MBA/LBA				7		
18 months and older						
LBA					9	
BA?					11	
BA?						5
30 months and older						
MBA/LBA?					12	
MBA/LBA?					12	
BA?			h	12	12	
MBA?				15	12	
MBA/LBA						7
MBA					12	7
MBA-LBA						8
MBA	F	G			13	9/10
EBA	F	G10				
40 months and older						
MBA		G11		15		
EBA						11
MBA/LBA	F		H11	15	13	11
MBA		G	H11	15		
MBA/LBA						12
MBA/LBA						12
BA?						12
MBA/LBA			H11	14	12	12
MBA/LBA				15		12
MBA		G	H11	16	15	12
MBA			H12	16	15	14
MBA?					14	14
MBA				17	16	13

Table 5.36: Cattle mandibular tooth eruption and wear from waterholes, pits and soils (age estimates broadly after Higham 1967; wear stages follow Grant, 1982). Single teeth are included from contexts or features where there was no mandible that could account for it.

The age at which the cattle were slaughtered or died is indicated by their teeth and fusion of the epiphyses of the bones. The tooth eruption data is presented in Table 5.36-37 and the epiphyseal data in Table 5.38. The dental data suggests a relatively large proportion of beasts were slaughtered young. A few animals less than six months old and a larger group in their later first or early second year were killed. Few animals were killed in their late second or early third year, but numbers increased in the late third year, and after four years. If tables 5.36 and 5.37 are compared, it can be seen that animals less than 6 months old are absent from the second table, that is, the features with poorer bone preservation. This reinforces the conclusion that preservation is impacting significantly on the bone assemblage. Young calves are also reflected in the epiphyseal fusion data but, as with the dental data, the features with generally poorer bone preservation have largely lost this youngest group.

The sample size for epiphyseal data is too small to sensibly assess the proportions of the animals killed at different ages, but the dental data suggests 12% were young calves, 29% in their late first year or early second, less than 9% in their late second-late third year; 26% between 30 and 40 months, and 24% adult. These figures may under-represent the youngest age groups because of preservational and scavenging biases. There may have been some seasonal slaughter of cattle in their late first, second and third years, all of which would have been used primarily for meat and hides. The young calf cull could

Phase	pm2	m3	pm4	m1	m2	m3
7 months and older						
MBA	f	g	h13	7		
MBA	f	g	h14	7	3?	
MBA			h14			
MBA				7	4	
18 months and older						
BA?		g	h14	11	5	
MBA						6
30 months and older						
MBA		6	h17	14	11	7
MBA			5	14	11	7
BA?						9
40 months and older						
BA?					14	
BA?				15	14	10
MBA/LBA		G11	H11	15	14	12
BA?		G11	H11	15	15	12
BA?			H11	15	15	12
BA?		G11	H12	15	15	12
EBA						12

Table 5.37: Cattle mandibular tooth eruption and wear from the remainder of the Bronze Age deposits (age estimates broadly after Higham 1967; wear stages follow Grant, 1982). Single teeth are included from contexts or features where there was no mandible that could account for it.

be associated with removing calves from milking cows, weeding out poor stock or disease and natural mortality. The late third year animals must reflect stock primarily slaughtered for meat at a near optimum return for their investment. The older than 40 month group is likely to represent animals slaughtered over a much longer period than the earlier groups with the oldest animals being perhaps older than 12-14 years (see Rackham, 1986b for absolute age estimates for dental wear stages). This last group could reflect animals slaughtered each year between the ages of four and 16 or culled at more specific ages. Those in which the third molar had reached stage 12 (Grant, 1982) may have been cows of six to eight years or more, which had been kept for breeding or for draught.

Fusion state	Unfused		Just fused		Fused	
Feature preservation	Good	Poor	Good	Poor	Good	Poor
Bone						
Metapodial, shaft	1	-	-	-	-	-
Scapula, d.	3	-	-	-	7	1
Acetabulum	-	1	-	-	6	1
Radius, p.	4	-	-	-	16	6
Humerus, d.	-	-	-	-	11	2
Phalnx 2	-	-	-	-	2	1
Phalanx 1	-	-	-	-	6	1
Tibia, d.	3	2	1	-	12	7
Metacarpus, d.	2	2	-	-	3	1
Metatarsus, d.	1	1	-	-	9	1
Metapodial, d.	-	2-	-	-	-	-
Calcaneum, p.	3	-	-	-	4	-
Femur, p.	2	-	-	-	6	1
Radius, d.	3	-	-	-	8	-
Humerus, p.	-	-	-	-	4	-
Tibia, p.	3	-	-	-	3	1
Femur, d.	2	-	-	-	-	3
Ulna, p.&d.	1	-	-	-	-	-
Vertebrae, ant.	-	4	1	-	9	1
Vertebrae, post.	2	6	1	-	13	-

Table 5.38. Epiphyseal fusion data for cattle, with the numbers from the better preserved features presented independently of the poorer features. The epiphyses are listed in their approximate order of fusion.

The complete adult bones allow us to assess the stature of the cattle. Using factors taken from von den Driesch and Boessneck (1974) the range for shoulder or withers height lies between 1036mm and 1268mm (Table 5.39) with a mean for the metacarpi, metatarsi and radii of 1114mm, 1106mm and 1113m respectively. The measurements on the radii when plotted (greatest length against midshaft width) suggest two males and six females, which if true would give a mean withers height of males at 1225mm and that of females at 1075mm. These data and the horn core data suggest that females probably dominate the adult sample, the males having been slaughtered at younger age groups when, for instance, the distal epiphysis on the radii were still unfused, and therefore they do not appear in the adult measurement data.

Bone	Phase	Withers height in mm
Metatarsus	EBA	1095
Humerus	MBA	1183
Metacarpus	MBA	1119
Metacarpus	MBA	1119
Metatarsus	MBA	1117
Metatarsus	MBA	1090
Metatarsus	MBA?	1090
Radius	MBA	1071
Metacarpus	MBA	1058
Radius	MBA	1041
Radius	MBA	1036
Metatarsus	MBA/LBA	1155
Radius	LBA	1268
Humerus	BA?	1216
Radius	BA?	1182
Metacarpus	BA?	1162
Metatarsus	BA?	1150
Radius	BA?	1139
Radius	BA?	1122
Metatarsus	BA?	1046
Radius	BA?	1041

Table 5.39: Cattle stature. Heights at shoulder in mm calculated from bone length.

It is clear from the frequency of fragments of each cattle bone that there is a bias in favour of the more robust elements. Table 5.40 presents these frequencies for the better preserved waterholes, pits and soils, and those from the remaining Bronze Age features. Mandibles, scapulae, humeri, radii, metacarpi, innominates, femurs, tibiae and metatarsi occur most frequently. Vertebrae and ribs are poorly represented. Carpals, tarsals and phalanges are also very under-represented, which could be partly due to recovery efficency. The effect of fragmentation and preservation is clearly seen on the front limb where particular readily identifiable parts of the bone are the most frequent, for instance the point on the neck of the scapula where the spine arises (23 fragments), the foramen and junction point for the ulnal shaft on the radius shaft (33 fragments) and the posterior distal angle above the fossa of the distal humerus (28 fragments); the next most frequent zones of these bones are represented by 18, 20 and 18 fragments respectively. The abundant zones are those parts least likely to be destroyed by scavenging or mechanical damage, and are associated with some of the densest parts of the bone. This dominance of the robust parts of the major limb bones and mandibles raises questions as to whether the relative absence of vertebrae, skull fragments, phalanges

	Waterholes, pits, soils and postholes						All other Bronze Age contexts					
Bone	**BOS**	**CSZ**	**OVCA**	**OVI**	**SSZ**	**SUS**	**BOS**	**CSZ**	**OVCA**	**OVI**	**SSZ**	**SUS**
SKEL	1		1	2								
SKL	37	31	2			17	17	24	1		2	
HC	9						5			1		
MAX	3		1			3	4					
UC												1
DUP3	2											
DUP4	1								1			
DUPM	1											
UPM2	1						1					1
UPM3	1						1					1
UPM4	3		1				1					
UM	2		3				2		1			
UM1	7						3					
UM2	7		3				6		4			
UM3	3						3		3			1
MAN	60	3	17		2	8	48	8	3		2	3
LC						3						
LI	4						2					
DLP4	2						1					
LPM2	1											
LPM3	1						1					
LM	4						3					
LM1	7						2					
LM1/2	1						1					
LM2	4		1				2		4			
LM3	5		3				1		2			
TTH	4		1				4		2			
ATL	3					1	1					
AXI	2											
CEV	8	5					3	6				
TRV	9	9			2	4	6	3				1
LMV	3	4	1		4	1		5				
VER		10						29				
RIB	18	135	2		115	9	1	53			34	
CC		1										
SCP	35	11	6		3	4	13	8				1
HUM	31	3	9			6	11	2	1		1	
RAD	28		14			2	10	1	8			
RUL	2						1					
ULN	9		3			4	2					
CAR	2						3	1				
CPI	1											
Carpus/tarsus								1				
MC3												1
MTC	20		8	1			12		2			
PH1	6		3				2		1			
PH2	2						1					
PH3							1					
INN	18	1	10			2	10	2	1			1
FEM	30	1	7		3	7	13		1		4	2

	Waterholes, pits, soils and postholes						All other Bronze Age contexts					
Bone	**BOS**	**CSZ**	**OVCA**	**OVI**	**SSZ**	**SUS**	**BOS**	**CSZ**	**OVCA**	**OVI**	**SSZ**	**SUS**
PAT	1											
TIB	51	5	19		2	8	27	2	7		5	2
FIB						1						
LML							1					
AST	6						4					
CAL	12					1						1
CQ	1						1					
MT3						1						
MTT	33		6	5			10		4		1	
MTP							2				1	
LBF		103			57			107			38	
UNI		163			1			184			12	

Table 5.40: Frequency of fragments of each bone element from the Bronze Age deposits.

and ribs is more a reflection of the natural attrition of the assemblage rather than any human actions.

There is, however, some visible evidence of human action. A few of the cattle bones are chopped. These include skull, vertebrae, scapulae, humeri, innominate and femur fragments. Chops down the sides or centre of cervical and thoracic vertebrae suggest that the carcasses, or at least the upper backbone, may have been split down the middle. Two horn cores were chopped from the skull, and a frontal bone heavily chopped, perhaps to get to the brain. The scapulae and innominates may have been chopped during dismemberment, and a distal humerus was chopped on the distal articulation, possibly for similar reasons, as was a chop through the caput of the femur, in order to remove it from the pelvis. All these chop marks indicate a heavy, fairly sharp cleaver or chopper, presumably bronze, which must have been a fairly standard tool for butchery. Three bones were worked. A metatarsal shaft from late Middle Bronze Age pit Fen-edge Pit Cluster 4 had been grooved down the middle to split, and after splitting the cut surface of the shaft was well polished from handling or wear, although its function is not known. The condyles of a distal metatarsus from Pond Cluster 3 retained part of the shaft which appears to have been fashioned into a point, whose tip has broken off. The condyles would have formed a handle for an object that may have functioned as an awl. Finally the glenoid of a scapula appears to have been 'shaved' around its edge, but it is difficult to imagine that this could have had any function and no other part of the bone exhibited any working. Only twelve of the recorded cattle and cattle size bones have been burnt suggesting that it was not habitual to throw consumed or butchered bones onto the fire.

Sheep and goat

The bulk of the sheep bones (71%) were recovered from the better preserved features – waterholes, pits and soils. The sample is, however, quite small. Only one bone has been tentatively identified as goat, part of a metacarpus, while several metapodials, skull and a horn core fragment are assigned to sheep. The remainder of the collection has been catalogued as sheep/goat although it is probable that most, if not all, are sheep. The animals were horned and, on the basis of two metatarsi, had shoulder heights of 681 and 685mm, somewhat larger than a Soay sheep (Clutton-Brock et al., 1990). An adult metacarpus was much smaller, with an estimated shoulder height of only 494mm, and smaller than the Soay reported by Clutton-Brock et al. The bone has a relatively broad midshaft and may be from a small ram, or perhaps a small goat.

Phase	**m2**	**pm3**	**pm4**	**m1**	**m2**	**m3**
> 12 months - immature						
EBA		g	h12	8/9		
MBA/LBA		g	h15			
LBA?				12	3	
BA?					8	
Greater than 24 months – sub-adult						
MBA					10	3
LBA		G	H8	12	10	6
Greater than 3 years						
MBA				13	11	8
LBA?						8
MBA		G	H11	13	12	9
BA?		G	H13	13	12	9
4 years and above						
MBA-LBA		G	H11	12		10
LBA		G	H14	14		
MBA		G	H14	14	12	
LBA				13	12	11
MBA		G	H14	16	12	
MBA/LBA						11
6 years and above						
LBA?						13

Table 5.41: Sheep/goat mandibular tooth eruption and wear from waterholes, pits and soils (age estimates broadly after Clutton-Brock et al 1990; wear stages follow Grant, 1982). Single teeth are included from contexts or features where there was no mandible that could account for it.

Phase	pm2	pm3	pm4	m1	m2	m3
< 12 months - lamb						
MBA	f	g	h10			
Greater than 24 months – sub-adult						
EBA					9	
BA?					9	
BA?					10	
LBA					10	
6 years and above						
LBA						13
LBA						14

Table 5.42: Sheep/goat mandibular tooth eruption and wear from the remainder of the Bronze Age deposits (age estimates broadly after Clutton-Brock et al, 1990; wear stages follow Grant, 1982). Single teeth are included from contexts or features where there was no mandible that could account for it (all bar one of these were single teeth).

The slaughter age for these animals is dominated by adults, with the molar 3 fully erupted (Table 5.41-42). An estimate of the ages indicated by the teeth is made using the data for Soay sheep published by Clutton-Brock et al. (1990). This gives ages somewhat older than the traditional sources used for age estimates (e.g. Silver, 1969), and the primitive Soay would seem more appropriate as an analogy for Bronze Age sheep than even unimproved 18th century breeds. Only one mandible suggests a lamb of less than one year. Four mandibles derive from sheep probably in their second year, and two from those in their third. Four more probably represent animals slaughtered in their fourth year, and the remaining seven, sheep culled in their fifth, sixth and seventh years.

Bone	Unfused	Just fused	Fused
Scapula, d.	1		3
Acetabulum			5
Radius, p.	1		5
Humerus, d.			4
Phalnx 2			
Phalanx 1			4
Tibia, d.	3		5
Metacarpus, d.	1		2
Metatarsus, d.	4		4
Metapodial, d.	1		
Calcaneum, p.			
Femur, p.	2		
Radius, d.	5		1
Humerus, p.			
Tibia, p.			2
Femur, d.	2		
Ulna, p.&d.	1		1
Vertebrae, ant.			1
Vertebrae, post.			

Table 5.43. Epiphyseal fusion data for sheep/goat for all Bronze Age deposits. The epiphyses are listed in their approximate order of fusion.

The epiphyseal data is sparse (Table 5.43) although the youngest dental age group (Table 5.41-42) is represented, as are the two and three year old groups. Clutton-Brock et al. (1990) record that all the epiphyses they studied were fused by three years and five months in the Soay, so estimates cannot be made beyond this age using this data.

This pattern suggests sheep were culled every year, although lambs (<12 months) and third year animals were perhaps killed less often. Attrition of the assemblage may have reduced the lamb component, and a seasonal cull could have taken place. Such a cull does not favour any particular product, and presumably breeding, meat, milk, wool and skins were all important, as might be expected in a subsistence environment. Sheep were much less abundant than cattle in the sample and may have filled a broader economic role than the cattle, although their overall meat contribution to the diet could have been a relatively small proportion.

The sample is unfortunately too small to permit any detailed discussion of the skeletal elements present, but an abundance of tibiae, radii and mandibles mirrors the cattle data (Table 5.40) with the distal humerus shaft, proximal half of the radius shaft and the distal shaft of the tibia being the most abundant fragments.

The only chop mark was observed on the fragment of goat horn core, but three sheep/goat fragments are worked. A fragment of a metacarpus shaft has been worked into a point to make an awl, while a distal metatarsus has also been worked, with the condyles being used as a handle and the shaft worked to a point. Clearly this latter is also an awl, since the condyles allow some pressure to be applied to the point, which would allow the puncturing of leather or skins. This repeats the working of the cattle distal metatarsus described above. The distal end of a tibia was also worked. The articular end had a hole gouged through it, while the shaft was grooved and polished, but it is not clear what function the object had (see Maltby, above).

Three partial sheep skeletons were recovered from waterholes 9500 and 8868. In 9500, part of a lamb of perhaps six months of age, from context 9503, suggests a casualty disposed of in the disused waterhole, while the other skeleton from lower down in this feature was a young adult, which could have fallen in but was probably also a casualty. The partial sheep skeleton from waterhole 8868 was an animal older than six months but younger than two years. Without the mandible or maxilla a closer age cannot be established.

Pig

The pigs from the site are fairly small, although the only complete long bone, a femur in which the distal epiphysis had just fused, gives a withers height of 770mm using Teichert's factor (von den Driesch and Boessneck, 1974).

Phase	pm2	pm3	pm4	m1	m2	m3
Mandibular						
< 12 months						
MBA/LBA	f	g	h16	10	3	0
MBA/LBA	f	g	h16	10	4	
< 20 months						
EBA			H6	11	7	
> 20 months						
BA?	F	G		12	8	7
MBA	F	G	H10	17		

Phase	pm2	pm3	pm4	m1	m2	m3
Maxillary						
< 12 months						
MBA/LBA		g	h15	8	3	0
< 20 months						
EBA?				12	7	2
BA?			7	11	8	1
MBA/LBA?	F3	G7				
> 20 months						
MBA/LBA	F	G	H10	14	10	
LBA?			H11	14	10	6

Table 5.44: Pig mandibular and maxillary tooth eruption and wear from the Bronze Age deposits (mandibular on the left, maxillary on the right). (Age estimates broadly after Bull and Payne, 1982; wear stages follow Grant, 1982).

Pigs were slaughtered at under 12 months, between 12 and 20 months, and older than 20 months, with only one animal over about three and a half years of age on the basis of the dental data. The epiphyseal evidence (Table 5.45) is entirely consistent with almost all the animals being juvenile or immature when slaughtered, only one fragment again indicating an adult of three and a half years or more. One very small tibia indicates even young piglets were slaughtered, and a small piglet bone was also found in one of the samples.

Mandibles and tibiae dominate the pig bones, as they did for cattle and sheep (Table 5.40), and it would be inconsistent to interpret this in terms of human behaviour.

Bone	Unfused	Just fused	Fused
Scapula, d.	2		1
Acetabulum			1
Radius, p.	1	1	
Humerus, d.	1		1
Phalnx 2			
Phalanx 1			
Tibia, d.	5		1
Metacarpus, d.			
Metatarsus, d.			
Metapodial, d.			
Calcaneum, p.	2		
Femur, p.	4		1
Radius, d.	2		
Humerus, p.	1		
Tibia, p.	3		
Femur, d.	3	1	
Ulna, p.&d.	2		
Vertebrae, ant.			1
Vertebrae, post.	1	1	

Table 5.45: Epiphyseal fusion data for pig.

Two pig bones have been butchered. An atlas has been chopped down the centre from the ventral side and the back of a skull has also been split down the middle, presumably to extract the brain. A humerus shaft is also heavily scored, but it is not clear for what purpose.

Discussion

It is clear from the hand-excavated material that cattle remains dominate the Bronze Age assemblages on the site. Cattle must have been the mainstay of the site economy, even allowing for some bias resulting from preservational and fragmentation factors. The equal frequency of occurrence of sheep/goat in the samples appears anomalous, since the frequency of occurrence in the excavated contexts is cattle – 229 contexts; sheep/goat – 97; pig – 44, quite clearly mirroring the fragment and zone data. This could have been created if the samples were not consistently whole earth samples from which nothing was picked out before bagging. Extraction of the larger cattle bones during sampling could create such an anomally. Alternatively it may be that the waterhole samples (see Table 5.31) are recovering many smaller bones of sheep which were missed during hand excavation. With these prehistoric sheep being fairly small, their bones might easily have been missed in the organic fills of the waterholes, leading to a bias against sheep in the hand-collected assemblage. There is no solution to this, but clearly future excavation should take account of this discrepancy and minimise any bias. With this potential bias being against sheep bones rather than pig, it could indicate that sheep made a more important contribution to the site economy than the hand-collected bone assemblage indicates. When the different meat contribution made by each species is considered, even a significant increase in the frequency of sheep and goat might not make much of a dent in the dominance of cattle as the major meat source, although the secondary products, particularly wool, and perhaps milk (see below) may have been more important.

The site exploited only limited wild resources. The presence of red deer, roe deer, aurochs and pine marten all suggest woodlands. These may have been traded for meat, and the antler for working, but otherwise it implies woodlands within relatively easy reach of the settlement. Since the pine marten bones are part of a carcass, this would imply that it was obtained from local woodland, rather than a traded skin. Apart from the red deer, this component is small. Of the postcranial deer bones that could be attributed to a side, eleven of the twelve bones derive from the right side. While this could just be chance, selection of one side could be a cultural or social decision and might indicate sharing or exchange of these items. At least three red deer, one roe deer and one aurochs are represented among the bones, although, since the bones derive from features some distance apart, the bones could come from eight different animals. Apart from two duck bones and the possible consumption of water voles, this is the extent of the wild animals likely to have been exploited for meat.

The horses at the site were presumably for riding, but they were no more frequent than red deer bones, and while dogs were certainly present, they have left little visible impact.

The distribution of animal bone across the site suggests foci of domestic activity. Several waterholes and pits have produced assemblages of over 100 bone fragments, including midden pit 6691, waterhole pit 8868/8864, the features of Midden Area 1, Fen-edge Pit Cluster 4 and Pond Cluster 1, with several more with over 50 bones: Fen-edge Pit Clusters 2 and 3; waterhole pits 9125, 8763, 9618 and 8459; ditch group 8026 (which defined the eastern side of Field 4); and cuts 8091 and 9107 (both one metre pits). Considering that many features produced few bones, this abundance seems likely to reflect occupation or 'houses' in the immediate vicinity. In the southern part of the site, the bone-rich features are also associated with several of the richer charred assemblages (although all are relatively poor), tending to support this interpretation.

The husbandry of the stock can be tentatively considered. The presence of calves less than six months old suggests that stock was bred on the site, and removal of the calves may have been associated with a human demand for milk, although this seems unlikely since the cow's milk could be shared. The slaughter of a relatively large number of young beasts suggests a demand for meat and perhaps a limit on resources. The yearlings were preferentially slaughtered before older stock; these were presumably retained for breeding, milking or draught purposes. This seems likely to be a specific selection of the poorer animals that the farmer did not wish to fatten on to an optimum slaughter age, perhaps because of limits on available pasture or overwintering fodder. These might be quite small scale farmsteads within an extensive agricultural landscape where fields for overwintering stock and fodder supplies were limited, putting restrictions on the numbers of stock that could be housed and fed during the winter. With the fens nearby, this would not be a problem for summer grazing.

An alternative picture might be considered following Legge (1981). Legge has argued for a high juvenile mortality as evidence for dairying in the Bronze Age at Grimes Graves and at some earlier Neolithic sites. The cattle assemblage at Pode Hole appears similar to Legge's model, in the high (but not as high) proportion of juveniles and the probable dominance of females in the adult sample. The juvenile component is not as large, and is composed mainly of animals probably over six months. The milk release in cattle requires that the calf is kept alive to encourage the cow to release her milk so that it can be shared, so there are arguments against Legge's model. Tresset (1997) has, however, interpreted a slaughtering peak at seven to nine months in Neolithic material as management for milk exploitation, which would fit better with the greater than seven month component of the cattle cull at Pode Hole. A substantial cull in the third to fourth year also implies that meat and hides are important. This would suggest a mixed or subsistence husbandry where milk, meat, hides and even traction may have played a role.

While it is possible from the bone remains to propose such models, it is very difficult to know what the herd size might have been. A small subsistence herd of only a few animals might produce similar assemblages to significantly larger herds when managed in the same manner although the subsistence character of the cull structure from Pode Hole might suggest relatively small stock numbers per farmstead. However, the pattern of culling at Pode Hole is similar to the Iron Age site at Potterne (Locker, 2000) where the scale of the bone deposits might imply a fairly substantial site. There is a suggestion of seasonal slaughter reflected in the distribution of the dental data, at least until the animals were over 40 months, after which wear patterns alone are inadequate for recognizing such seasonal culling.

The cull structure for the sheep appears to reflect a husbandry geared to meat and wool production, with animals culled in their second, third and fourth years, but few in their first year. The largest group is the four year olds and above, indicating the maintenance of a flock with a substantial adult component. Wool and sheep skins may have been important, but there is little indication of the milk production model of Payne (1973) which suggests a high lamb mortality designed to reduce the competition for milk. The pigs show the more typical pattern of meat supply, with most animals being culled as immature animals. The fecundity of pigs allows the maintenance of a small herd which can supply first, and second and perhaps third year animals for slaughter, but needs few adults. The immature pigs are an important winter meat resource and can be slaughtered during the winter months. Traditionally dried or smoked, one carcass might last a small family unit for several months through the winter.

The Human Bone

by Kate Brayne

Introduction

During the course of the fieldwork one cremation burial, two inhumations and some isolated finds of cremated bone and disarticulated bone were recovered (Fig 6.3).

The cremations

Methodology

The identified cremated material was stored as soil samples. The samples were soaked in water for 24 hours, then flotations were carried out. No organic material was recovered from these flotations. Following this, the soil samples were wet sieved into 5.6mm fractions, and the residues were dried.

The 5.6mm residues were sorted thoroughly. Any identified non-human material (particularly charcoal, but also animal bone, non-local stone, fossils etc) was bagged separately. The bone was sorted by hand, and any identifiable bone fragments were selected, and sorted according to skeletal element (i.e. skull, axial skeleton, and upper and lower limbs). The total weight of all identified human bone was recorded according to each skeletal element if such identification were possible. This was done in order to identify whether particular elements of the cremated skeleton appeared to have been preferentially selected when the bone was collected from the pyre debris following cremation.

Individual bones were examined for morphological features which could determine the sex and age of the individual when cremated, and, if possible, to identify any pathological conditions affecting the skeleton.In addition, the bone was examined to identify whether more than one individual was present in either cremation burial, or whether any animal bone had been cremated at the same time.

Cremation burial 7380

Cremation burial 7380 was recovered from a small pit in the north-eastern corner of Field 3. The pit was 1.3m in diameter, and attained a maximum depth of 0.23m. The cremated material was recovered from the lower of the two fills that the feature contained, a loose mid-greyish brown silt.

Preservation

Pottery and flint fragments were also found in this feature, but no complete vessels were present. The excavator described this as a deliberate 'token' burial of cremated material, rather than a complete cremation burial. However, the feature had been disturbed by a field drain, so it is possible that additional bone was lost in modern times. The bone which was recovered was in poor condition. The total weight of recovered bone was 52g, and none of the fragments were larger than 44mm in length, most being much smaller than this. There were no identifiable bones apart from a small fragment of the cranial vault.

Cremation Temperature

Nearly all of the bone fragments were buff white in colour. This indicates in general a high degree of oxidation of the organic content of the bone. A pyre must usually reach a temperature of at least 650º C for the bone to burn white (Mays, 1998). The high oxidation level demonstrated by the buff-white bone indicates that this was a very efficient pyre. The 5% of the bone which was dark grey/black or dark orange may either represent body parts which were positioned on the periphery of the pyre, or areas where the pyre temperature did not reach 650°C.

Contextual analysis

The small size of the the bone fragments that constituted this cremation meant that it was not possible to assess the age or sex of this individual, nor were any pathological lesions identified. Similarly, it was not possible to establish if bones from more than one individual were present, or if there had been any deliberate selection of bones for burial.

Additional finds of cremated bone

Two fragments of cremated bone were recovered from two contexts (203 and 417) in the vicinity of Ring-ditch 1. Neither of these fragments provided any osteological data at all. These fragments were recovered several hundred metres from cremation burial 7380, and probably derive from other cremation burials which were too damaged to be identified archaeologically. One of the fragments was recovered from a 19th century drainage feature, which may well have truncated an in situ cremation burial.

The inhumations

Two skeletons were recovered: both were lone burials, and did not appear to be geographically or temporally related to each other.

Methodology

Each skeleton was laid out with the bones in anatomical position in order to be studied. Each skeleton was assessed for sex, age, stature, pathology and morphological anomalies.

Determination of sex

The sex of a skeleton can be assigned according to morphological criteria; in particular by assessing features of the pelvis and skull, which display the most sexual dimorphism in humans.

Estimation of age at death

As a general rule, the younger an individual was at death, the more possible it is to assign a precise age. It is possible to age juveniles fairly precisely using a combination of dental development, diaphyseal length of long bones and degree of epiphyseal fusion (Sundick, 1978). Subadults can be aged using dental development and extent of epiphyseal fusion (Brothwell, 1981). Once all the epiphyses have fused (at approximately 28 years) age estimation is possible by assessing the degree of dental attrition (Lovejoy, 1985);

identifying morphological characteristics of the pubic symphyses (Katz and Suchey, 1986) and, to a lesser extent, by examining the degree of fusion of the cranial sutures (Meindl and Lovejoy 1985).

The accuracy of adult age estimation depends largely on the completeness and extent of preservation of the individual skeleton. The dentition is often the best preserved feature.

Skeleton 508

Skeleton 508 was an inhumation burial, which was recovered from a shallow grave located 18m to the north-west of Ring-ditch 1. This inhumation is likely to represent a satellite burial, and possibly dates from the Early Bronze Age. This was a crouched burial, oriented south to north, with the head to the south. The body was lying on its left-hand side, with the knees brought up to the chest. The grave had been heavily disturbed by plough damage, and the bone was in very poor condition when it was excavated. Only the axial skeleton of this individual was recovered (the limbs and skull). The hands and feet were missing, as was all of the appendicular skeleton (the vertebrae, ribs and pelvis). This is because the appendicular skeleton mostly consists of very porous trabecular bone, which is readily destroyed in a hostile burial environment. The surviving long bones were all fragmentary – no intact bone survived at all from this individual. Approximately 35% of the skeleton was recovered.

Determination of Sex

Because there were insufficient bones surviving which displayed sexually diamorphic traits, it was not possible to assign a sex to this individual.

Estimation of Age at Death

The dentition had survived fairly well, and from the extent of attrition presented it was possible to estimate the age at death of this individual as 18 to 24 (Lovejoy's Phase D).

Stature

Because none of the long bones were complete, it was not possible to estimate the stature of this individual.

Pathological Analysis

No pathological lesions were identified on this individual.

Skeleton 9655

This was an inhumation burial, which was recovered from a shallow grave in the corner of Enclosure 1. The inhumation was located in a gap in a field system whose component features contained good evidence of being in use in the Late Bronze Age. The skeleton had been adversely affected by post mortem disturbance by the mechanical excavator when the site was stripped, and probably also from ploughing prior to that. The skeleton was very incomplete, but those bones which were recovered were moderately well-preserved. The outer cortical bone (e.g. the shafts of the long bones) was quite well-preserved, although there was some exfoliation of the periosteum. The spongy, porous trabecular bone (e.g. in the vertebral bodies) was in poor condition, and crumbled to the touch.

Determination of Sex

Because there were insufficient bones surviving which displayed sexually diamorphic traits, it was not possible to confidently assign a sex to this individual. However, the general gracile nature of the surviving bones and their small dimensions suggested that this individual was probably female.

Estimation of Age at Death

From the degree of attrition on the surviving dentition, using Lovejoy's scheme (1985), it was estimated that this individual was aged 35 to 45 at death.

Stature

Because none of the long bones were complete, it was not possible to estimate the stature of this individual.

Pathological Analysis

No pathological lesions were identified on this individual. The teeth presented with a limited amount of supragingival calculus (mineralised plaque), which is consistent with normal deposition of calculus for an individual of this age.

Disarticulated bone

Pond Cluster 1

A skull vault (including the frontal bone and left and right parietal bones) was recovered from a lower fill in Pond Cluster 1 (context 8233). This individual was probably male, and, based on the degree of fusion of the cranial sutures, was probably in late middle age (45+) at death. In addition, a mandible was recovered from another pit in the same cluster (context 8051). The mandible also appeared to derive from an adult male, and the degree of wear on the surviving teeth indicated a mature individual of over 40. There was nothing to suggest that the jaw and skull were not from the same individual: both appeared to be from an adult male, and the degree of wear on the teeth corresponded with the degree of fusion of the cranial sutures. There was no pathology apparent on the cranial vault, but the teeth presented with profuse subgingival calculus, which is indicative of inflammatory periodontal disease. Burnt residue on pottery from a deposit sealing these pits has been radiocarbon dated to 1620-1430 cal BC, giving an approximate date for this individual's deposition.

Ring-ditch 1

The left femur of an adult was recovered from the fill of a field boundary ditch (context 4133) that cut Ring-ditch 1. No human remains accompanied this bone. Four fragments of an adult cranial vault were recovered from the fill of a one of the waterhole pits that had slighted Ring-ditch 1 (context 4030).

Summary and conclusions

The assemblage of human bone from Pode Hole quarry only provided limited information owing to the small sample size, and to the poor condition of the bone. However, whilst the osteological analysis of this assemblage offers little to the overall archaeological interpretation of the site itself, the data will be added to the archaeological archive, and may inform future analysis and synthesis of the archaeology of the region.

Chapter 6: *Discussion*

The Archaeological Sequence

This final chapter attempts to draw together the excavated evidence and discusses the remains found at Pode Hole in relation to the project aims outlined in Chapter 1. Chapters 2 and 3 identified factors which have impacted upon the archaeology of Pode Hole, namely ground truncation, dewatering and post-depositional disturbance. In addition, the scarcity of datable artefacts and stratigraphic sequences between features hindered attempts to construct a narrative of the site's development. The potential impact of these biases must be borne in mind when considering the success of the project in fulfilling its research aims. Nevertheless, the emphasis of this chapter is to show that Pode Hole has made an important contribution to understanding how the Bronze Age inhabitants of the Fen-edge lived and how they fared in managing the resources of an environment that they themselves had partly created.

The later Bronze Age produced the greatest intensity of archaeological remains at Pode Hole, and the population was presumably thriving and relatively prosperous during this period. However, this activity did not suddenly occur in an undisturbed landscape, and, despite the problems outlined above, a broad chronological sequence to the archaeology may be discerned. The first part of this chapter therefore uses the archaeological development of the site to provide a framework for a discussion of the themes identified in Chapter 1. A concluding discussion of perhaps the optimum evidence from Pode Hole, that relating to its Bronze Age economy and environment, then follows.

The barrow cemetery

The Early Bronze Age and preceding periods are not well represented in the archaeological record at Pode Hole quarry. In common with other sites in the vicinity, the excavation of Pode Hole has revealed only minimal traces of occupation and settlement at the turn of the third and second millennia BC.

The alignment of four ring-ditches forms the earliest landscape unit at Pode Hole, and the most substantial evidence of activity from this period. A barrow lying on the south-west extension of this alignment was excavated in 1996 (Cuttler and Ellis, 2001). Traces of three cremations were found dug into and next to the mound. Human remains were also found in association with Ring-ditch 1. It is because of the presence of these remains that all of the ring-ditches found within the project area have been interpreted as truncated barrows, and the ensemble interpreted as a barrow cemetery, extending for approximately 700m.

However, a degree of dissimilarity is evident amongst the features that comprise this alignment. The barrow excavated by BUFAU in 1996 was unditched and was present as an upstanding earthwork, which measured around 25m in diameter and survived to a height of 0.25m. By contrast, those barrows revealed in the project area existed only as ring-ditches. Ring-ditches 1, 3 and 4 measured approximately 26m, 19m and 13m in diameter respectively. Ring-ditch 2 was an altogether slighter feature, consisting of an interrupted enclosure ditch never more than 10m in diameter. There is therefore the possibility that these features were not closely contemporary in construction, and may not even have served the same purpose.

The finds allude to a funerary function for Ring-ditch 1 at least: the left femur of an adult and four fragments of an adult cranial vault were recovered from features that cut it. In addition, a crouched burial of a young adult, oriented south to north (the head to the south) was found nearby. The pit cluster cutting Ring-ditch 1 also produced the only metalwork from the project area, and it is possible that these items are grave goods disturbed from their original context.

The location of the ring-ditches in the Early Bronze Age would have positioned them close to the contemporary Fen-edge. Deposits of alluvial clay revealed during excavation along the southern and eastern edge of the project area suggest that the Fen-edge was further inland during this period. The liminal location on the shifting margin between wet and dry land may have been deliberately chosen for these monuments, where passage from the world of the living to the world of the dead was perhaps envisaged. The alignment of ring-ditches thus accentuates a natural boundary, rather than creating an artificial one.

Following their construction, these features seem to have maintained their importance in the landscape for a considerable time. An effort was made to connect Ring-ditch 1 to the field system, and this monument, along with Ring-ditch 4, was later targeted by waterhole pits. This repeats the sequence recorded nearby at Fengate, at the Storey's Bar Way sub-site (Pryor, 2005, p.75-78). Whilst not all ring-ditches were slighted by waterhole pits, and not all waterhole pits were dug into ring-ditches, three incidences of this sequence (that the present writer knows of) does suggest meaning and intention at work, rather than mere coincidence.

All of these waterhole pits cutting ring-ditches were positioned squarely over the ring-ditch; they do not appear to represent an incidental or glancing blow to the earlier feature. It would therefore appear that the pits were deliberately positioned over the ring-ditches, although the significance of this action is difficult to determine. The people who dug the pit may have been seeking to signal their lack of respect for the ring-ditch by digging into it, and therefore marking a deliberate break with the past. Or conversely, they may have been seeking to 'bless' their feature by physically linking it to a pre-existing and revered monument. Whether the superimposition of waterhole pits onto ring-ditches reveals a reverential or a hostile attitude to the earlier features, it seems apparent that the action stems from an awareness of the special and continuing significance of ring-ditches.

A more prosaic interpretation is, however, also possible. The low ground of the ring-ditch base may have been chosen as the location for a waterhole pit, as it represented a 'head start' for the pit diggers, and allowed the water table to be reached with the minimum of effort.

Early Bronze Age occupation

The ring-ditches may have been monuments to the dead, but the remains of the living community, those who constructed the ring-ditches and lived alongside them, are altogether less apparent. Archaeological remains suggest the contemporary population may have been slight or transient and was probably both.

In the area around Pode Hole, evidence of Early Bronze Age occupation is present, and typically occurs as small artefact-bearing pits (e.g. Patten, 2003, p.10, Beadsmoore, 2005, p.64-66). Similar features, containing late Neolithic/Early Bronze Age material and Beaker material, were found sealed beneath the barrow excavated by the Birmingham Field Unit in 1996. This date was reinforced by a radiocarbon date of 2340 BC to 2130 cal BC (Cutler and Ellis, 2001, p.23-24). Immediately north of Pode Hole, a similar radiocarbon date was obtained from a waterhole pit from the Thorney Borrow Pit site, which also yielded Early Bronze Age pottery (Phoenix Consulting Archaeology, 2007). Just to the south of Pode Hole lay the Guy's Fen trackway. This was found associated with the deposition of the older Barroway Drove Bed fen clay, and represents a footpath '*built across shallow salt marsh conditions in the late third or early second millennium BC*' (French and Pryor, 1993, p.90).

The remains at Pode Hole were meagre even in comparison with these other finds, although certain comparisons can be drawn. Pit and Scoop Cluster 2 formed a north-west to south-east alignment, as did the alignment of Collared Urn pits recorded nearby at Tanholt Farm (Patten, 2003, p.18). In both cases, the pit alignment shared the alignment of the later field system, and it is possible that pits were used at this period to mark boundaries that were later more obviously marked by ditches. It is possible that the pits marked certain key locations in the Late Neolithic to Early Bronze Age landscape, locations that were later marked by significant elements of the rectilinear field system. Pit and Scoop Cluster 1 was located adjacent to the area where a double-ditched boundary associated with the fragmentary fields intersected the cardinal boundary. Unfortunately, a lack of stratigraphic relationships and the sparseness of datable artefacts prevent this apparent landscape evolution being more fully understood. Pit-digging and artefact deposition in the Early Bronze Age are often interpreted as evidence of small-scale temporary seasonal occupation, or ceremonies concerning negations over land access and tenure (e.g. Lewis and Brown, 2007, p.91), but the evidence from Pode Hole is too slight to explore this theory.

Finds of CP1 pottery, the quantity of secondary and unstratified material recovered from the project area, in particular the flint assemblage, along with the funerary monuments, does bear witness to human activity at Pode Hole during the early second millennium BC. Yet, in common with other comparable sites in the region, of the people themselves, one is left with nothing more tangible than, in Alison Dickens' words, 'a sense of a presence in the landscape'.[1]

Later Bronze Age land division

As described above in Chapter 3, at some point in the Middle Bronze Age, the enclosure of the Fen-edge embayment around Thorney island into a series of ditched fields began. The pollen studies from the site suggest that during the second millennium BC the tree cover over the site declined (Langdon and Scaife, this report), and this may well be a result of the clearance and enclosure of the land that this period witnessed.

Character of the ditches

Individual fields were defined by segments of boundary ditch of various lengths. Fields could be defined by lengths of ditch that measured anything from in excess of 250m long to only 3m. Field boundaries also contained many interruptions. It is probable that the remains of slighter ditches or complementary boundary features such as fence lines or hedges, which would have completed this system, have been lost to ground surface erosion.

Typically the ditched boundary features were between 1 and 1.5m wide, just less than 0.5m deep and contained a single fill, which was almost always artefactually sterile. Where perpendicular sections of ditch converged, a gap was usually present, which further frustrated efforts to phase the development of the archaeology of the project area. Such gaps may have originally functioned as

1. Lecture on Cambridge Archaeological Unit excavations at Langtoft quarry, given at Lincoln, 6th October 2007.

entranceways, although ditch termini, may have been abutting now-vanished banks.

The generally shallow profile of the ditches meant that they did not penetrate the water table of the site, and so anaerobic soil conditions did not develop within them. This has adversely affected the survival of any organic artefacts present in the ditches and has probably distorted finds evidence from them. This perhaps creates a false contrast between the sterility of the ditches and the apparent richness of the waterhole pits, which did benefit from anaerobic preservation.

The profiles of the ditches that made up the system were variable. Bowl-shaped or shallow U-shaped profiles, occasionally somewhat irregular, were typical. Recutting was only rarely recorded, but the slightly irregular profiles could also be evidence of this. Overall, there was no evidence of widespread seasonal recutting of the system.

Other characteristics of the Pode Hole field system were that double-ditched boundaries around fields were occasionally present, fields were generally straight-sided (although some meandering was evident), and ditches often 'kinked' at their termini. A 55m interval is a recurring, but not ubiquitous, unit of land measurement. Such an interval is present in Fields 1, 2, 8 and 9, and is also observable in elements of the same field system exposed nearby on the Thorney Borrow Pit site (Phoenix Consulting Archaeology Ltd, 2007).

The overall impression is of a rectilinear, though not strictly gridded, pattern of land division. Such rectilinear field systems are commonly encountered around the prehistoric Fen-edge, and there is a growing awareness of their great extent throughout southern and eastern England (Yates, 2007).

Function of the ditches

Often consisting of short interrupted lengths of ditch, it would seem that the field boundaries were not initially intended to act as a drainage system, whereby each ditch would lead to a larger conduit designed to channel water away from the fields and out to the open Fen. Instead, it is thought that the ditches, whilst taking some drainage, principally served as quarries for linear banks that supported hedges. The existence of hedges within the project area is suggested by the presence of common hedgerow species such as brambles, elder and hawthorn within plant macrofossil and pollen assemblages, and also in the form of coppiced wood (Rackham, this report; Taylor, this report). This evidence complements that recovered from the Thorney Borrow Pit site (Phoenix Consulting Archaeology Ltd, 2007, Chapter 3). Thus, field boundaries were marked not only by ditches, but also by banks and hedges. Piecemeal repairs to short lengths of this system would explain the somewhat intermittent evidence of recutting that the field boundary ditches contain.

Well-managed hedges can provide a ready supply of fuel wood, fruit, nuts, bird's eggs and useful herbs, as well as animal fodder for winter feed (Williamson, 2002, p.36-39) and the area's Bronze Age inhabitants were seemingly aware of this. The plant macrofossil assemblage and pollen sequences recovered from Pode Hole reveal that wild foods such as hazelnut and fruits of plum/sloe/cherry type (*Prunus* sp.) were both locally available and exploited. The field boundaries would therefore have had a valued role in the subsistence economy of the area, and had functions beyond penning in livestock and defining parcels of land. Equally, they would originally have been much more bustling and colourful than the drab grey runnels that were encountered during archaeological excavation.

Development of the field system

As outlined in Chapter 3, three basic stages have been identified regarding the development of the field system. Initially, the cardinal boundary was set out. This followed the path and alignment of a barrow cemetery which itself followed the north and western shore of a Fen-edge embayment. By following the path of the ring-ditches, the field system was therefore precisely based on a significant axis of the earlier monumental landscape. The notional link between the two patterns of land-use was manifested physically by the excavation of a length of ditch between Ring-ditch 1 and the cardinal boundary. Subsequent to the creation of the cardinal boundary large rectangular fields (Fields 1-4) were set out perpendicular to it. The field system at this stage would appear to represent a 'cohesive' pattern of land division (Fleming, 1989, p.151), regular and centrally planned and imposed. Later, to judge by form and dating from finds, the smaller Fields 5 to 10, and Enclosures 1 and 2, were added to this system, marking an 'aggregate' (ibid.) extension to the existing framework of the initial cohesive plan. Significantly, the extension of the initial rectilinear field system was not marked by any great subdivision of its constituent units; only Field 4 shows any evidence of subdivision, and this is slight and fragmentary. This would suggest that the desire for more enclosed land that perhaps drove the creation of the later elements of the system was not so great as to force the breaking up of its larger original units into settlement areas and smaller allotments given over to an increased population or specialised production. This suggests that Fields 1 to 4 may have operated as a block of common pasture or a communal outfield, and was therefore not available for subsequent encroachment.

An early aim of the project was to investigate the relationship between the field system of the site and the supposed 'Romano-British' monuments preserved in an adjacent Scheduled Ancient Monument (SAM No. 20802). Excavation and aerial photographs (see cover photo) reveal that the Bronze Age field system shares the alignment of, and is physically contiguous with, some of the scheduled earthworks. No Romano-British material whatsoever was recovered from project area; the absence

of Romano-British artefacts seems to be evidence of the absence of settlement during this period. In reference to the project aims, there was no relationship between the field system and the scheduled earthworks to the north because they represent the same monument in different states of preservation. SAM No. 20802 at least partly contains the earthworks of a Bronze Age field system, and is a rare survival indeed.

Dating summary for the field system

Cardinal boundary

Construction

- Would appear to post-date Early Bronze Age ring-ditch alignment.

Use

- Context 6249, fill of Ditch 6245 contained eight sherds of pottery in a CP2 fabric used for both Early Bronze Age (Collared Urns) and early Middle Bronze Age (Deverel-Rimbury Bucket Urns) vessels in the project area.

Disuse

- Occasionally cut, but never transgressed, by Fields 1-4. Suggests that some of the ditches that marked the cardinal boundary had silted up when Fields 1-4 were dug, but the boundary itself, as marked by bank and hedges, was still extant.
- Presumably abandoned in the first millennium BC, when peat developed across the project area.

Fields 1-4

Construction

- Constituent ditches either cut or abut the cardinal boundary.
- Ditch 7081 cuts layer 6944, Fen clay deposit, thought to be the Older Barroway Drove Bed dated to the fourth millennium BC.

Use

- Ditch 7451 (fill 7452) was found to contain CP3 shell-gritted pottery dated to the mid-second millennium BC.
- Ditch 8209 (fill 8215) contained a fragment of later Middle Bronze Age briquetage pedestal.
- Ditch 8209 later cut by ditch 8208 which contained Late Bronze Age CP4 pottery, radiocarbon dated to 1270-1000 cal BC (SUERC-12862).
- CP5 pottery recovered from ditch 202 (Field 1).

Disuse

- Ditch Group 8465, (Field 4) was cut by Fen-edge Pit Cluster 5 which contained CP3 and CP3 or 4 pottery and was radiocarbon dated to 1520-1400 cal BC (Beta-238593). However, the boundary may have continued to stand following the incorporation of the pit into it.
- Presumably abandoned in the first millennium BC, when peat developed across the project area.

Fields 5-10

Construction

- These fields abut the cardinal boundary and Fields 1-4.
- Ditches 9337 and 9147, (both Field 9), fed into pond features that had themselves cut earlier pits which contained CP4 pottery.

Use

- CP3-4 pottery recovered from Ditch 9337 (Field 9).
- CP4 pottery recovered from Ditch 9147 (Field 9).
- CP5 pottery recovered from ditch 9525 (Field 9).
- Pond Cluster 1 situated in corner of Field 5 and may be contemporary. This contained CP3 pottery and was radiocarbon dated to 1460-1310 cal BC (Beta-238590).

Disuse

- Presumably abandoned in the first millennium BC, when peat developed across the project area.

Enclosures 1 and 2

Construction

- Appear subsidiary to, and therefore presumably later than, Fields 5-10.
- Enclosure 1 cut a waterhole pit that contained numerous fragments of CP4 pottery.

Use

- CP4 or 5 pottery was recovered from ditch 9546 (Enclosure 1).

Disuse

- Presumably abandoned in the first millennium BC, when peat developed across the project area.

Land-use at Pode Hole

Having examined the character, dating and function of the ditched boundaries, it is now necessary to consider the uses that the fields they defined were put to.

The rectilinear field system at Pode Hole bears certain similarities with the more well-known 'site type' field system exposed nearby at Fengate (Pryor, 2001a). There, parallel double-ditched droveways, with fenced paddocks between them, linked the seasonal pasture of the Fen to the higher ground to the west. A similar configuration of landscape boundaries has also been recorded to the north at Rectory Farm, West Deeping (Hunn and Rackham, forthcoming). Such field systems are interpreted as being used for intensive stock-rearing (Pryor, 2001a, p.418-20). However, on closer examination, the field system at Pode Hole does not conform to this pattern. Double-ditched features were present at Pode Hole, but these were often blocked by waterholes, and were too angular and too narrow (around 2m to 4m) for them to have functioned as droveways. It is more likely that they are the remains of simple boundaries with a central hedge flanked by ditches on both sides – although a droveway may have linked Field 9 to the Fen embayment to the east. The tendency of ditches to kink away slightly from the rest of their alignment at their termini may have had a functional purpose, facilitating the movement of animals by funnelling them into fields (although movement the other way would presumably have been more difficult). Despite the targeted investigation of gaps or entranceways in the field system, indisputable remains of stock-handling

features, such as gates or pens, were not found. This is not to say that stock-rearing was not carried out at Pode Hole. Rather, the morphology of the field system at Pode Hole is not of itself sufficient, on the basis of current models, to determine whether it hosted arable or pastoral agricultural regimes. Fortunately, environmental remains are more informative for determining land-use at Pode Hole (see Rackham et al., this report). The data reveals that the fields contained an open, species-rich damp grassland environment. The presence of large herbivores is suggested by the relative abundance of dung beetles in the insect assemblage, with the animal bones seemingly suggesting that it was predominantly cattle grazing these fields. Sheep and pigs were also present, but cattle were apparently the mainstay of the economy. The cull pattern of the cattle suggests a non-specialised, subsistence agriculture where animals were exploited for various resources: milk, meat and hides, and possibly also for traction.

The landscape of Pode Hole may not have been wholly pastoral: cereal grains, pollen and chaff were recovered from several features across the project area, albeit in very small quantities. Barley dominates the cereal assemblages, with the range of cereals present on the site being comparable with other Bronze Age sites in the region. The paucity of cereal remains prevents a fuller understanding of the arable husbandry regime practised, and indicates that mass cultivation, processing or storage of grain products did not occur here. The arable pollen component is thought to be secondary, originating from waste food debris, floor coverings and human and animal faeces. Nevertheless, cereal remains are present and comparatively widespread. The probable ard from Fen-edge Pit Cluster 5 is also strong evidence of agrarian practices, and environmental evidence suggests that flax was also grown within the project area or nearby.

There is only limited evidence that wild resources were exploited for food. The plant macrofossils suggest that fruiting species were present and presumably eaten, but there is much less evidence for the consumption of wild animals. The wild animal bone assemblage predominantly comprises woodland species such as deer and aurochs. Remains of aquatic or Fenland animals were very rare and amount to only one duck, and water rodents, which may have been eaten. There was no evidence of fishing, but this may reflect the site's aggressive preservation conditions.

In summary, it is clear that stock, and cattle in particular, were reared at Pode Hole, although the field system as a whole is not an artefact of a 'ranching'-style economy. Pode Hole probably represents a predominantly, but not wholly, pastoral swathe in a mixed agricultural landscape. The combined evidence from Pode Hole and the Thorney Borrow Pit site (Phoenix Consulting Archaeology Ltd, 2007, p.75) confirms that the inhabitants of the Fen-edge embayment around Thorney island engaged in a mixed agricultural economy in a familiar patchwork landscape of paddocks, meadows and arable fields.

The meaning of differences

The initial period of discovery of the rectilinear field systems around the Fen-edge was partly accompanied by an appreciation of how widespread and ubiquitous the monument type appeared to be. However, as more and more acres of field system have been uncovered, largely as a result of developer-funded excavation in advance of gravel extraction, there is a growing awareness of dissimilarities between different systems, of the variations that are possible around the theme of rectilinear enclosure (e.g. Knight, 2002, p.16-17, Phoenix Consulting Archaeology Ltd, 2007, p.70).

The field system exposed within the Pode Hole project area consists of rectangular fields set out on a dominant north-west to south-east axis, with several large fields occupying an area of three to nine acres each. These appear to have been later supplemented to the east by smaller fields, each measuring around one acre. Even over as little a distance as 2km the excavated evidence differs. While the Bronze Age fields revealed at Eyebury quarry bear comparison to those at Pode Hole, they are certainly not identical.

Although the plots at Eyebury are rectangular, they are aligned on a perpendicular axis (north-east to south-west). The fields were also generally smaller, measuring 135m by 70m and so each enclosed an area of just under 2.5 acres. (Patten, 2002, p.11). The fields at Pode Hole are certainly larger than those at Bradley Fen, where an average enclosed area of 1.28 acres was recorded (Gibson and Knight, 2006, p.23). There, different field alignments were present on opposing sides of that site's dominant boundary.

Whilst it is straightforward enough to identify differences between the various field systems exposed, it is more difficult to understand the implications of this regarding property holding and land-use, especially at the level of the individual site. The field systems around the Fen-edge all appear to have been in use in the later part of the second millennium, and differences in their form cannot be related wholly to chronology.

Knight observed that the Fen-edge field systems are not terrain-oblivious, but rather their dominant orientations are related to topography and pre-existing land-use (2002, p.17). This is seemingly borne out at Pode Hole. The excavation here suggests that the field system was based on an alignment of ring-ditches that themselves reflected the position and orientation of the nearby Fen margin.

There may be a link between enclosure size and land-use as Patten suggests (2002, p.12), and individual field systems may be the products of different farming practices employed by separate communities (ibid.). As discussed above, it may be possible to identify the

pattern of landholding diagnostic of purely arable or purely pastoral agriculture. In reality, the picture is obscured by the fact that a mixed agricultural regime was seemingly practised on the Fen periphery. Even at Fengate, with its paddocks, drafting gates and droveways (Pryor, 1996) the pollen sequence contains cereal and suggests that mixed agriculture was probably being practised throughout the Bronze Age (Scaife, 2001, p.366-368).[2]

Duration and intensity of use may alter the appearance of different field systems. Variations in the form and complexity of the ditches exposed at Fengate by the Cambridge Archaeological Unit have been interpreted as indicative of 'stress', the amount the system was used and the volume of animal traffic it was exposed to (Beadsmoore, 2006, p.80-81). This explanation may be appropriate for some aspects of the development of field systems. Combined evidence from both Pode Hole and the Borrow Pit site suggest that the land around Thorney embayment was more intensively used later in the second millennium BC: the earlier field system grew by abutment and accretion, and certain areas within the new fields came to be intensively worked, such as Pond Cluster 2 and its associated area of recut pitting.

A wide-ranging synthesis incorporating a detailed study of excavated data is necessary in order to further test inferences between the form and function of field systems.

The difference of meanings

Various models have been offered to explain what the creation of large scale field systems means, and why this happened when it did. These are briefly discussed below.

Fleming believes that rectilinear systems were not so much an event as a process, '*an attempt at regulation of land-use by communities with traditions of collective land-use and cooperative labour*', partly in response to increasing population (1989, p.160 and 157). Yates identifies complex socio-political causes for the systematic land enclosure and agricultural intensification of the second millennium BC (2007): agricultural surplus was generated to be converted into material wealth, necessary in a new prestige goods economy, in which a person's renown was established by valuables received and given in competitive exchange events. Rectilinear field systems are artefacts of this struggle to maximise productive capacity whereby individuals gained status through consumption. The concentration of rectilinear field systems in southern and eastern England close to river and sea trading links identifies a cross-Channel culture that participated in this new economy.

Both these models, very coarsely categorised as 'population growth' vs. 'status' assume that rectilinear field systems involved intensification of agricultural production. It is certainly beyond dispute that the rectilinear field systems bounded landscapes in which settled agriculture was practised. Can we go further and declare the new land division was consciously designed to facilitate and improve agricultural productivity? This may not always have been the case; arguments have been put forward questioning the economic necessity of some field systems. Evans and Knight suggest that the dispersed and low density settlement in the field systems of the Barleycroft and Over landscape argue against intensification, and point out that large-scale gridded field systems did not occur on the Continent, despite comparable and probably higher populations there (2001, p.86 and 94).

However, it seems widely accepted that rectilinear field systems enabled greater agricultural productivity, by allowing diversification and specialised management regimes of defined parcels of land (Fleming, 1989, p.159; Pryor, 2006, p.79). It has also been pointed out that rectilinear field systems were part of a broadly contemporary 'package' of agricultural innovations, including metalled trackways, the establishment of artificial waterholes and salt production (Yates, 2007, p.120-121). That the agricultural productivity of the field systems was a concern of their creators is further suggested by the fact that it was often the most fertile lands that were enclosed, and that soil conservation and improvement was undertaken within them (ibid. p.137-138). The overall impression is that with enclosure, the landscape was finally being 'put to work'.

The excavated evidence from Pode Hole suggests that an intensification of activity occurred in the later Bronze Age. The amount of pottery fragments from the later ceramic phases, as well as the quantity and range of features that they were recovered from far outweighs that from earlier periods. The bulk of this material was recovered from Fields 5-10 and Enclosures 1 and 2. However, the older Fields 1-4 remained 'archaeologically quiet' during this period. That this western part of the site was not subjected to occupation (as witnessed by finds density) or elaborate subdivision of holdings does argue against a model of increasing population pressure.

The new patterns of landholding may have reflected, and would almost certainly have led to a shift in attitudes to the land. The co-incident change in pottery technology at this time, with grog-tempered wares being replaced by shell-tempered wares may be symptomatic of this cultural shift, '*the land or landscape itself, the ownership of it… became more important…the land itself needed to be recognised as part of the materiality of pot-making, to become part of the pottery more visibly, and this was achieved by using naturally occurring fossil shell-gritted clays*' (Morris, this report).

2. Pollen analysis from the site at Rectory Farm suggests that the landscape there consisted almost exclusively of pastoral fields (Hunn and Rackham, forthcoming, p.269) and the form of this site may come to define a typical 'pastoral site type'.

Yates suggests that the co-occurrence of findspots of elaborate metal work (such as war gear and/or 'founder's hoards') and field systems is evidence of their interrelationship in a prestige goods economy (2007, p.112-120). Very little metalwork was recovered as evidence of this economy from Pode Hole: only a fragment of pin and a blade were found (see discussion of pits cutting Ring-ditch 1) [3]. However, an unusual and rare Bronze Age palstave-adze was recovered from a small irregular pit or tree throw on the neighbouring Thorney Borrow Pit site (Phoenix Consulting Archaeology Ltd, 2007, p.60). Therefore, there is some evidence in the area of the type of metalwork used in the prestige goods economy as posited by Yates.

The enclosed field systems of the second millennium BC may have arisen partly as a response to functional imperatives, and were superimposed onto landscapes that had hitherto been dominated by funerary monuments. But some writers argue that the new landscape was itself a stage for ritual behaviour: '*People did not simply substitute a landscape of ritual monuments with the more pragmatic monuments of fields and farms. Rather, their ritual and spirituality were incorporated... into dwellings in which they lived*' (Parker Pearson, 2005, p.6). At Barleycroft Evans and Knight have identified post alignments set within a pre-existing field system that formed part of a '*vast ceremonial space...possibly related to large-scale gatherings*' (2001, p.85). Regarding field systems in general, '*the ditched boundaries...were also the favoured location for special deposits around entranceways*' (Yates, 2007, p.136).

There is some evidence of the 'ritualisation' of the fieldscape of Bronze Age Thorney. Principally, the field system of the Pode Hole project area was based around a boundary that was itself overlain onto the alignment of four ring-ditches and at least one barrow mound. However, there is almost no surviving evidence of special deposition in field boundary ditches. At the neighbouring Thorney Borrow Pit site a probable shell necklace was recovered from the terminus of one ditch (Phoenix Consulting Archaeology Ltd, 2007, p.60). No such evidence was recovered from Pode Hole, where 10% of the length of ditches was hand-excavated, with a concentration on termini. It is not known whether an expansion of this methodology would have produced evidence of ceremonial deposition of objects within the field system. One inhumation was recorded in a gap in the boundary of Enclosure 1, and there is occasional evidence of special deposition of exotica into some of the waterhole pits that were contemporary with the field system. The suggestion that field systems were judged suitable locations for ceremonial behaviour is therefore borne out by the results of the excavations at Pode Hole. But significantly, this behaviour is not visible in the contents of the boundary ditches themselves.

3. One can only speculate what would have been recovered if the project area had extended slightly further to the south east and into the Fen-edge water margin.

Attention has been drawn to the fact that field systems are frequently set out on a north-east to south-west orientation, in locations as diverse as Salisbury Plain, Dartmoor and the Thames valley (Yates, 2007, p.136, and references cited therein). It is suggested that this possibly had a symbolic meaning, perhaps an '*acknowledgement of the life giving permanence of the sun*' (ibid.). This is of course the orientation of the cardinal boundary at Pode Hole. However, in this instance, the landscape alignment is dictated by the position of the shoreline of a small Fen-edge embayment. That topographical considerations rather than any astronomical factors dictate the alignment here is proven by the fact that the field system recently exposed just 300m to the east of the project area (and beyond the Fen-edge) has an altogether different east to west orientation (Richmond, pers. comm.). Finally, one must observe that, with few cardinal points available, probability suggests that 25% of rectilinear field systems will have a more or less north-east to south-west orientation.

The social implications of the construction of rectilinear field systems are numerous. As Yates says, their construction '*reflect*[s] *confidence in the future and sign that people were there to stay*' (2007, p.134). Certainly, their planning and execution was the work of people who could 'think big' and conceive of, and manage, their surroundings on an ambitious level (Fleming, 1987, p.153). It is likely that their construction was planned at the executive level, and carried out by many people working in unison. The nature of the political system that ordained this has not yet been identified. Some writers see such effort as the result of communal co-operation (e.g. Fleming, 1987, p.160; Pryor, 2005, p.97). An alternative possibility is that the prestige goods economy empowered certain individuals in an increasingly stratified later Bronze Age social order, and it was such 'strong men' who were behind such works, which may have been carried out with a degree of coercion. Yates has pessimistically commented that '*the possibility of an enslaved workforce cannot be ruled out*' (2007, p.144). Somewhere between these extremes, it has been argued that permanent land divisions may have been organised at the communal level, but in response to the demands of exploitative rulers (Fleming, 1994, p.64, cited in Yates, 2007, p. 128). However, it is almost certain that to attempt to identify a single underlying political system would be a gross over-simplification, as separate field systems in different territories were created by various groups who organised themselves in different ways at different times. As Yates says, '*different regional prehistories are apparent in the record*' (2007, p.128).

With specific regard to Pode Hole, to identify the political order responsible for the archaeological record of a single (prehistoric) site is highly problematic; such work requires thorough synthesis at the regional scale at least and is therefore beyond the scope of this report. The archaeology of Pode Hole records an absence of

the spectacular hoards of votive metalwork present at other Fen-edge sites such as Flag Fen and Bradley Fen (Gibson and Knight, 2006). In addition, it has neither the categorical evidence of house structures present at the latter site (although it is not known how much has been lost to ground truncation), or the large enclosure ditches and associated evidence of nucleated settlement that characterise the nearby site at Welland Bank (Mouraille, 1996; Pryor, 2006, p. 113-123). As such, the occupants of the Bronze Age Fen-edge at Thorney were probably also on the periphery of the regional political system, although it is not yet apparent what that was.

Waterhole pits

The waterhole pits contained within the field system were a distinctive component of its archaeological record; over thirty were recorded, along with a number of ponds. Artificial water sources are commonly encountered feature types, not only around the Fen-edge, and are often found in conjunction with Bronze Age land enclosure (Yates 2007, p.16). Where dated, the vast majority of the waterhole pits from Pode Hole contained CP3-4 material (later Bronze Age), with two features, pit 7214 and Fen-edge Pit Cluster 1 seemingly dating to earlier within the Bronze Age.

It is generally assumed that these features operated as sources for drinking water, with humans accessing the steep waterhole pits, and animals utilising the more gently sloping ponds. Cattle hoofprints have been found preserved around waterholes on other Fen-edge sites (Knight, pers. comm.[4]) indicating their use in this way. However, evidence from the Pode Hole insect assemblage is slightly anomalous, as the range of species present indicates that whilst animals grazed the fields, they do not appear to have had direct access to either the waterhole pits or the ponds. Yet the water needs of cattle are large[5], and assuming they were present, they must have drunk somehow. It may be that cattle were watered by an intermediary, and archaeologically invisible, mechanism, although the practical benefits of such a method are unclear. More probably, differential preservation of insect remains has distorted the picture.

The lifespan of these features is similarly uncertain. The environmental remains do, however, record that the waterholes stood open long enough for aquatic species of plant to become established, and for caddis flies and gnat-like insects to complete their breeding cycles. One waterhole (pit 9375 from Pond Cluster 2) was found to contain stickleback remains (Rackham, this report).

Both ponds and pits typically contained layers of organic-rich detritus at their bases, the product of the latter period of their use phases when they would have contained dirty water. These deposits were generally gleyed clays with lenses of sand and gravel.

The remains of wooden lining or revetting were occasionally found in waterhole features, preserved in these basal deposits. These wooden structures were almost always extremely fragmentary, suggesting that they were deliberately removed when the waterhole was decommissioned. Where wooden linings survive, it appears that rather than revetting the sides of pits for their entire depth, such structures were designed to maintain a small clear area in the base of the pit. Planks pinned back by stakes were used for this, and the re-use of the bucket as a ground water tap in Pond Cluster 3 was a significant find. The features in this cluster were unique in the project area in that they were lined with wattlework. This was generally much more intact than the plank and stake linings, presumably because it would have been too difficult to remove and re-use. If this was the case, then one may assume by extension that its use here was a rare occurrence, and that plank and stake revetting was more commonly used, but that this was usually removed once the waterhole was decommissioned.

The disuse of a waterhole was marked by thick deposits of gravelly sands and clay and silt mixes. In many cases this was interpreted as the re-use of the original upcast to deliberately backfill the features. A thick layer of homogeneous material, generally a compact mid-grey-brown sandy silt, formed the final fill of these features. Peat was often present filling small hollows on the surface of these features; this material had dipped in from above as the fills of the feature had settled and subsided. A considerable period of time may have elapsed between the first cutting of a pit and its final levelling.

The final stages of a waterhole's disuse was occasionally marked by the excavation of a small, subsidiary feature into the largely backfilled pit or pond. These were typically sub-circular in plan, 0.7 to 1.5m in diameter and their depths varied from 0.5 to 0.9m. In profile they were steep-sided with flat bases and their fills tended to be dark and loose with wood inclusions. At least four such features were encountered in the project area, cuts 7246 (Fen-edge Pit Cluster 2), 8067 (Pond Cluster 1), and 9563 and 9687 (both Pond Cluster 3). A similar feature was recorded on the nearby Thorney Borrow Pit site (cut 193, Phoenix Consulting Archaeology Ltd, 2007, p.15). As far as is known, these features have not been recognised as a 'type' before. Their function is currently unknown. Nothing in their fills was particularly remarkable, and if they did once hold posts to mark the positions of the waterholes, then they were removed in antiquity. It is nevertheless interesting that waterholes continued to attract activity long after they had fallen out of use.

4. 'Settling enclosure in the Welland and Nene Valleys'. Lecture given at Cambridge 10th May 2008.

5. Studies indicate that a modern lactating cow in temperate climates require approximately 50 litres of drinking water per day (Spörndly and Wredle, 2005).

Figure 6.1: Distribution of waterhole pits and ponds.

Aside from these minor features, waterhole pits were often repeatedly recut in the same location, suggesting that their location was an important part of their utility. This is also apparent by the non-random nature of their distribution in the project area (Fig. 6.1):

- *Pits generally avoided the interiors of Fields 1-4, but a distinct alignment of them is visible following the Fen-ward boundaries of these fields.*
- *Pits were scattered more randomly throughout Fields 5-9 and Enclosures 1-2, but were often located close to their edges or corners.*
- *Areas lying outside of the field system did not generally contain waterhole pits, which suggests a functional relationship between the two.*
- *Two of the four ring-ditches found on site had later waterhole pits dug into them.*
- *The cardinal boundary was marked, but generally respected by waterhole pits. Five were found along its length, but all except one of these were found in gaps within it. Only one directly impinged on the feature itself.*

The coincidence of the alignment of waterhole pits with the path of the Fen-edge suggests either that pits were used to mark boundaries, or that they could be set out along boundaries that already existed. Their linear distribution may also represent awareness that excavations along a certain contour were guaranteed to strike fresh water at the required depth. Alignments of waterhole pits have also been recorded at the nearby quarry sites of Eye (Patten, 2003, p.18) and Langtoft (Webley, forthcoming, p.17).

The ponds and waterholes were thus deliberately placed components that coincided chronologically and spatially with the planned and ordered agricultural landscape. By augmenting the water supply to the area's inhabitants and their stock, they would have had an important role in enabling the intensification of production in the newly enclosed landscape. The repeated recutting and clustering of waterholes marks an investment in place carried out by a static, or at last regularly revisiting, population. Yates has described waterhole pits as '*central to economic prosperity*' (2007, p. 136) and their integration into the working landscape of the Thorney Fen-edge suggests that this is an accurate view.

Some waterholes came to have a role beyond the mere supply of water. The distribution of artefacts within waterhole pits is not uniform, either across the project area or within individual features. Many ponds and waterholes were almost entirely artefactually sterile, yet others contained significant concentrations of finds. Where artefacts were present, they were generally found in a feature's upper fills. The concentration of artefacts in any particular feature may relate to its proximity to occupation, but it does not appear that the pits were used as simple middens. Rather, a degree of control appears to have been exercised over what came to be placed in the waterholes:

- *They contain a generally limited range and amount of material.*
- *Where pottery is present, less than 5% of individual pots are represented (Morris, this report)*
- *They came to contain special items such as human skull fragments, burnt quernstones and antique objects, possibly heirlooms*[6].

Waterholes were important to the agricultural success of the native population. This and the fact of their duality as surface/underground structures, which could be both wet and dry, may have encouraged their incorporation into the local belief systems. The deliberate targeting of ring-ditches as the location for waterhole pits is probably further evidence of this. Waterholes would appear to have been important for both the physical and spiritual well-being of the communities that constructed them.

Saltmaking

The archaeological record of the project area presents apparently contradictory evidence for saltmaking being carried out there during the second millennium BC. All of the environmental evidence indicates the existence of freshwater conditions, and the location of the site places it on the Fen-edge during the Bronze Age, rather than within the intertidal zone (Hall, 1987; French, 2003).

Conversely, over 14kg of briquetage was recovered from a variety of features across the extraction area. The assemblage contains both pedestals and container fragments, as well as miscellaneous unidentified materials, in several different fabrics. Much of this material is salt-bleached, indicating that it had been used in the saltmaking process; the argument that briquetage was merely produced at Pode Hole, for use elsewhere, cannot be sustained. Yet, significantly, what is lacking from this assemblage is fragments of hearths, or the indisputable remains of salterns themselves.

There are several explanations to account for the presence of this material at Pode Hole. It is possible that, for a short period, a shift in drainage patterns saw saltwater carried to the site at high tide via temporarily tidal creeks, as has been recorded nearby on a channel of the River Welland at Market Deeping (Lane, pers. comm.). This resource may then have been exploited by the opportunistic inhabitants of the Bronze Age Fen-edge. Alternatively, it may have been the case that, whilst the collection and primary boiling of salt occurred off site, the resultant concentrate was then brought back closer to habitation for further refining. Admittedly, this seems unlikely given the effort involved in transporting the presumably burdensome brine, although this is what may have occurred at the Langtoft quarry site (Dickens, pers. comm.). A third explanation is that equipment from saltern sites was brought back to the home, possibly with

6. See Lewis and Batt, 2006, p. 139-145, for well-illustrated further examples of this practice from elsewhere in the country.

the expectation that it would be re-used elsewhere in the future. However, for reasons unknown, it was disposed of in pits and ponds rather than being taken back to the areas of salt production. This disposal presumably occurred on a number of occasions, given the number and range of features from which briquetage was recovered.

A significant quantity of briquetage was recovered from Pode Hole, from a variety of contexts, many of which were found to contain material securely dated to the Middle and Late Bronze Age. To identify the location of salt production is perhaps secondary to acknowledging that, whilst Pode Hole may not have been a saltmaking site, it was probably inhabited by saltmakers, and this resource was both available and exploited on the Bronze Age Fen-edge. The finished product would have enabled the longer-term storage, and trade, of meat, as well as being a tradeable commodity in its own right. Salt may have contributed much to the local economy in the second millennium BC.

Decline and abandonment

The occupation of the project area seems to have ended fairly abruptly some time around the turn of the second and first millennia BC. CP5 pottery, the last phase of the prehistoric ceramic types from the project area, is rarely encountered, and represents less than 5% of the ceramic assemblage. Environmental data suggests that obsolete waterholes filled with plant detritus from adjacent or overhanging vegetation, and that some became overgrown with willow. Whether this reflects the disuse of individual features or the landscape as a whole is uncertain, but the processes are likely to have been the same.

The flat and low-lying Fens have always been vulnerable to climate change. Wetter conditions and a deterioration in drainage seem to have prevailed in the late second and early first millennia BC. At Pode Hole this is indicated by the peat, which spread across the project area and was commonly observed filling the upper parts of features. Where it sealed Pond Cluster 3, the lower part of the peat sequence was radiocarbon dated to 1120 to 910 cal BC (Beta-244198).

The combined geoarchaeological and excavated evidence therefore suggests that an area of Fen-edge that was affected by inundation in the late third or early second millennium BC (French and Pryor, 1993, p.89-90) had become dry enough for habitation in the Early Bronze Age, but became waterlogged again by the start of the first millennium BC. A 'window of opportunity' was therefore quickly exploited by the area's inhabitants. During the Middle and later Bronze Age, the briefly habitable strip of Fen-edge at Pode Hole came to be enclosed by the rectilinear field systems characteristic of that period, until renewed climatic deterioration led to a retreat of occupation from the Fen-edge. The scale of the impact inland of the relocated population is unknown; the actual numbers of people affected may have been small, and the timescale long. Nevertheless territory inland would presumably need to have been shared or subdivided, or new land brought under cultivation, and access would need to have been negotiated and agreed on. The departure of the Late Bronze Age population of Pode Hole has been identified archaeologically; its arrival elsewhere has not. This event may offer a model to interpret apparent intensification of settlement and land-use in the wider area.

The complex interrelationships between climate, coastline and human settlement form a continuum from the acute concerns of the present day, back into prehistory. The Fens remain particularly vulnerable to rising sea levels, and the issue is a current one (Cambridgeshire County Council, 2008; DEFRA, 2005).

Deposition

Distribution of finds

In lieu of the remains of domestic structures, a basic mapping of finds density was undertaken in the hope of identifying likely locations of occupation. This mapping assumed that pottery, worked flint, animal bone and heat-affected clay (both daub and briquetage) are the find-types most indicative of occupation, and that such debris was disposed of close to the settlement that had originally produced it. The combined weights of these finds-types in features, or intercutting clusters of features, was therefore calculated, categorised and plotted out, and the results are presented in Fig. 6.2.

Two particularly intense concentrations of finds are apparent. The first is Field 10, which contains two one metre pits, and is ringed by clusters of waterhole pits, as well as the possible saltern. No structures that may have been the sources of these finds were present. Investigations of possible post-built structures in this area foundered during fieldwork as their component features were revealed to be vanishingly indistinct or natural disturbances. It is likely that surface truncation has removed the evidence of any such, probably ephemeral, dwellings.

A second set of features particularly rich in finds is located in the north-west of the project area, where a number of waterhole pits associated with the cardinal boundary and a nearby midden area (Midden Area 2) were excavated. Again, no evidence of domestic structures was apparent, but these may be preserved in the scheduled earthwork area immediately to the east of this second likely settlement focus.

No other discrete, isolated concentrations of finds-rich features are immediately apparent. Instead, it is clear that such features occur in a dispersed swathe running approximately north-east to south-west across the project area. This swathe generally corresponds with the position

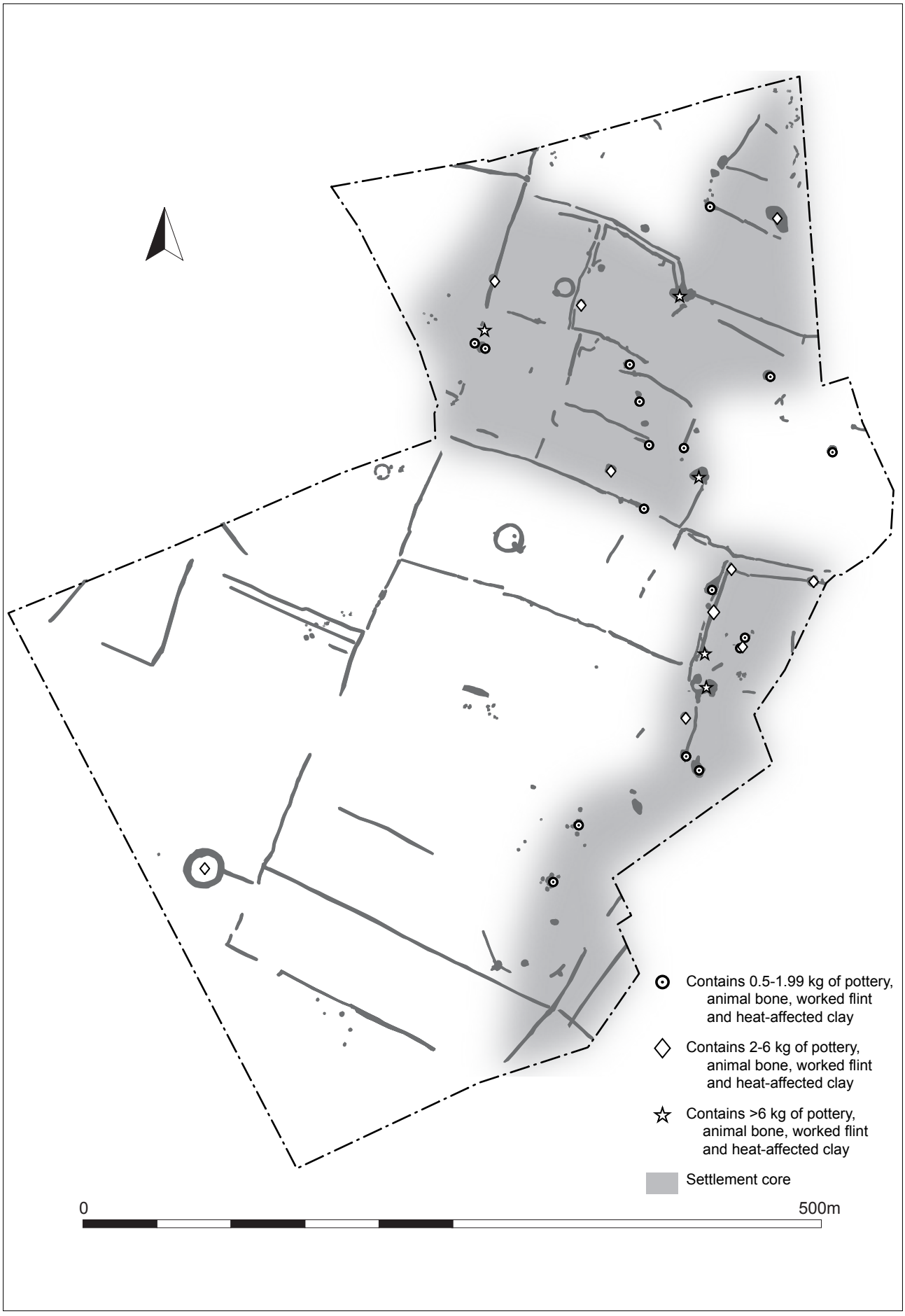

Figure 6.2: Finds concentrations.

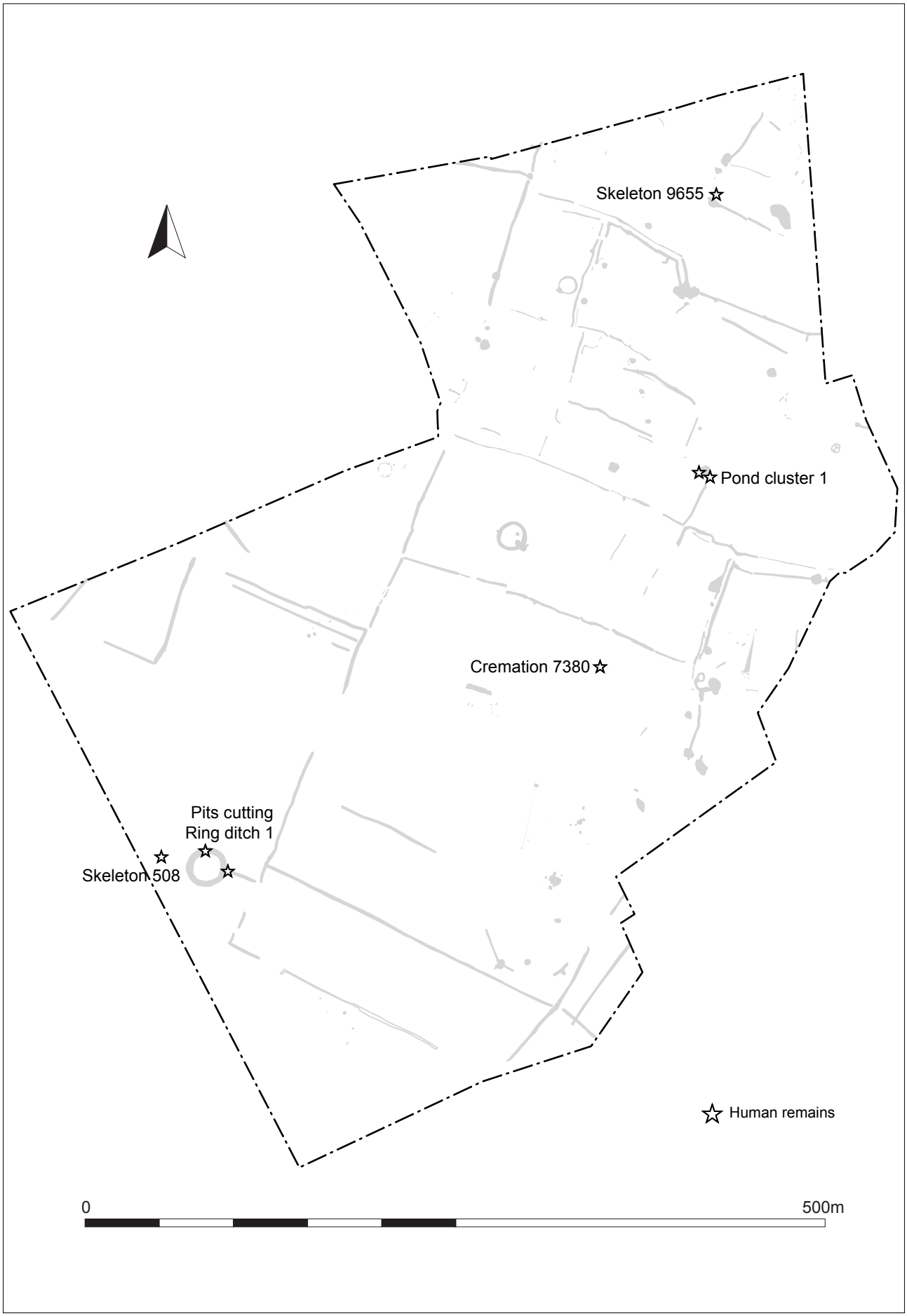

Figure 6.3: Distribution of human remains.

of waterhole pits and ponds, as these features contained the majority of the artefacts recovered during the archaeological investigations. This 'belt of occupation' seems to follow the likely orientation of the Fen-edge, indicating that this formed a focus of settlement and/or depositional activity. Finds concentrations therefore appear along the Fen-edge boundary and its accompanying clusters of waterhole pits, as well as in Fields 5-9 and Enclosures 1 and 2. In these enclosed spaces, finds concentrations are mostly confined to the corners of fields. In the absence of stratigraphic relationships between the field system components and occupation features, this positioning indicates that occupation activity was taking place in spaces *already defined* by the creation of the field system.

By examining the locations of finds concentrations, a coarse zoning of the project area becomes apparent (Fig. 6.2). Away from the Fen-edge boundary, Fields 1-4 seem mostly devoid of finds concentrations, as does a block of land in the extreme east of the project area. Finds were of course recovered from these areas, but not in sufficient quantities to count as a 'concentration' for the purpose of mapping. It would appear that these outlying areas were probably not occupied in the Bronze Age.

The double-ditched boundary that forms the north-eastern boundary of Fields 4 and 10, and marks the northern terminus of the Fen-edge waterhole pits, also seems to separate the area of land that was intensively settled from one that was somewhat archaeologically 'quieter'. The special importance of this boundary in the past is perhaps underlined by the discovery of an uprooted wooden orthostat in one of the waterhole pits along its course (Fig. 5.4). It has been postulated that field systems were aligned on upright timbers in post holes (McFadyen, 2000, p.13) and this unusual object may once have served this purpose. Mapping of finds density thus suggests that this double-ditched boundary may have separated a settlement core from an outfield area during the second millennium BC.

Distribution of human remains (Figure 6.3)
The distribution and quantity of human remains across the project area are similar to other Fen-edge Bronze Age sites, where such remains are spatially dispersed and rarely encountered. At Pode Hole, human remains were variously found:

- *In a gap within a field system (skeleton 9655);*
- *In close proximity to a ring-ditch (skeleton 508);*
- *As apparently deliberately placed skull fragments in a cut feature (Pond Cluster 1);*
- *As a 'token' burial of cremated material, representing less than a complete individual.*

The nature of the remains and the locations in which they were found conform to a broader repertoire of later Bronze Age mortuary practice (Brück, 1995). This typically rendered the dead archaeologically invisible. Where interment did occur, this was decentralised (i.e. bodies were not gathered together in large cemeteries) and often involved the deposition of selected body parts in certain spatially significant locations. Brück notes that the increase in the scale of votive deposition coincided with the decline of an archaeologically visible burial rite in the later Bronze Age (1995, p.250). The inference is that, when the dead did enter the archaeological record, this was itself a further manifestation of votive practice. Body parts may have been used as props in ritualised behaviour, possibly in an effort to link ancestor worship with agricultural fertility, and thus maintain or gain social control.

At Pode Hole, human remains were found equally spread between those areas within, and outside of, the postulated settlement core. This confirms that there has no inviolable prohibition concerning depositing human remains in settlement areas, but the situation is a complex one.

The Bronze Age Economy and Environment of Pode Hole

by James Rackham

The results of the study of the environmental archaeological data presented in this report are considered within two themes, that of the palaeoenvironmental reconstruction of the site and its palaeoeconomic character. The palaeoenvironment is considered first since the conclusions from this are likely to be relevant to a consideration of the economy of the site.

One of the primary palaeoenvironmental indicators is evident in the excavated field system plotted on Fig. 3.1. It shows a landscape divided into small ditched rectilinear fields, apparently postdating an earlier monumental landscape, with numerous large waterhole pits and ponds often located across the boundaries between the fields, or at junctions or corners. Some parallel ditches give the impression of trackways or droveways, and numerous pits and occasional scoops and post holes suggest residential occupation, although no traces of any buildings were found. The chronology of the site and the concentration of archaeological debris in particular phased deposits suggest that the main period of occupation, at least its densest, was Middle to Late Bronze Age, although earlier activity is evident. The radiocarbon dates might suggest a period of perhaps no more than 250 years for the active use of this field system and its associated waterholes, although a few waterholes and ditches have been dated by ceramics to the Early Bronze Age. The saturation of the area and the development of peat across the whole site by perhaps the end of, or soon after, the second millennium BC is suggested by the dating evidence and the occurrence of peats in the upper fills of most of the deeper features.

French (2003) has constructed a regional picture of this area with the major topographical feature being Thorney island and the thin peninsula of land running westwards from it which opens out towards Eye. In the Early Bronze Age the site of Pode Hole was situated on the margins of the 'skirtland' that lay between the saltmarsh and the dry land to the west on this ridge of slightly higher land that runs out to Thorney island. A major marine incursion occurred in the early second millennium BC at the time of the Early Bronze Age activity at Pode Hole and the construction of the round barrows on the site. This must have brought the sea and saltmarshes fairly close to the site and, where the land drops slightly south of the southern edge of the excavated area towards Priors Fen, must caused a margin of freshwater fen to develop around the encroaching salt marsh and tidal creeks. Hall (1987) describes a roddon running close to Thorney island on the south side, which was recognised in the auger transect between the Nene Washes and Thorney carried out by the Fenland Project (Waller, 1994). Although deposits associated with this creek were not dated, a date from what is interpreted as the same system suggests that the tidal creek represented by this roddon had penetrated along the south side of Thorney island by the end of the third millennium BC, in the Early Bronze Age. The presence of briquetage on the site clearly suggests some proximity to the coast, but there appears to be no extant evidence for this or any later transgression inundating, or even edging onto, the site at Pode Hole. The pre-Flandrian surface model produced by the Fenland Project (Waller, 1994, Fig. 10.19) would suggest that by the middle of the second millennium BC the saltmarshes may have lain, at their closest point, about a kilometre or so south-east of the site and a similar distance to the east-north-east. Peat deposits encroached on to the site at the end of the second millennium BC and presumably covered it in the succeeding millennium, although most of the peat has since been lost.

There is very little evidence indeed for brackish water or marine indicators in the environmental evidence. A few shells of *Hydrobia ulva* and *H. ventrosa* in a few of the snail assemblages, the presence of the halobiontic hydrophilid beetle *Paracymus aeneus* and the hydraenid *Ochthebius marinus*, a beetle that favours brackish conditions, are the only macrofossil indicators. The pollen data shows no evidence for saltmarsh either although a slightly higher Chenopodiaceae count in the basal half of profile 8090 and an associated rise in Cyperaceae may reflect the proximity of saltmarsh and fen. Two fragments of possible cockle and mussel shell are most easily explained as archaeological debris rather than tidal. On this basis there is no evidence that marine waters ever came near or onto the site and the briquetage recovered must surely have been carried to the site from a saltmaking location elsewhere.

The major environmental studies cover the period from the middle to the end of the second millennium BC. The pollen diagrams from Pond Cluster 1 and waterhole pit 9075 probably overlap, but there may be a gap between these and the diagram from Pond Cluster 3 which dates towards the end of the millennium. LPAZ 1 of sample 8022 from Pond Cluster 1 is probably the earliest of the deposits studied for pollen. In this sample there is evidence for the last vestiges of the extensive woodlands that must have covered much of the area in earlier times. The pollen indicates alder, oak and hazel woodlands with a little lime and ash. By the middle of this sequence the woodland is largely lost and remains absent throughout all three series indicating a largely unwooded landscape throughout the second half of the second millennium BC. Willow however appears more abundant near the top of profiles 8022 and 8090 (waterhole pit 9075) and by the later second millennium BC in profile 8172 (Pond Cluster 3) it occurs consistently throughout the studied sequence. With the Fen-edge probably no more than a few hundred metres to the south this could mark the expansion of willow carr on the Fen-edge as the area becomes wetter, although growth of willow around the waterholes and along the hedge or ditch boundaries is also probable. Willow is certainly the dominant taxon among the unworked wood assemblages from the studied waterholes, occurring in all the samples, which suggests that it was growing around the margins of these features. Two of the beetle taxa are also specific to *Salix* (Table 5.8).

The regional woodland flora is poorly represented in the pollen diagrams. Oak and hazel occur consistently throughout the series with occasional ash, beech, holly and lime. Alder occurs at low levels throughout, perhaps reflecting wet woodland on the margins of the fen or trees along the wetter ditches and field boundaries. The occasional catkin of alder in the plant macrofossils and identified alder wood suggest some local growth by the waterholes or along the ditches. The occasional tree taxa are generally poorly represented in pollen assemblages and, along with privet and blackberry, could also indicate local growth in hedgerows flanking the fields. Several of the taxa identified from the wood remains, such as holly, hazel, Maloideae and ivy, and from the macrofossils samples, such as hazel, hawthorn, *Prunus* and Maloideae, might be best interpreted as hedgerow trees and shrubs, and there is no reason why the willow and oak identified from the wood could not have been standards in the hedges. The presence of rodent-gnawed fruit stones and hawthorn seeds, some with flesh still attached, certainly implies the growth of these trees in the immediate locality of the waterholes and ditches where they were found. A few of the insects also confirm the presence nearby of trees (Table 5.8) such as ash, alder, oak, willow, hawthorn and tree and shrub Rosaceae which would support the occurrence of these taxa in hedgerows. Interestingly hedgerow, scrub and woodland plants make a significant contribution (Table 5.6) in the waterlogged plant macrofossil assemblages offering further support for hedgerows, although they could equally reflect the development of overgrown conditions and scrub in and around the waterholes.

The general lack of woodland is nevertheless clear but despite this absence of environmental data, bones of red deer, roe deer, aurochs and pine marten all indicate that woodlands must have lain within reach of the site, or that material was exchanged between communities in different vegetational zones.

Overall the pollen assemblages are herb-dominated, suggesting grassland with associated pastoral taxa, such as ribwort plantain and buttercups (*Ranunculus*), a picture supported by the beetle remains which suggest a damp, weedy meadow, with perhaps scattered trees and some large herbivores. The character of this grassland is perhaps best reflected in the macrofossil remains. The waterlogged plant remains indicate the presence of a few meadow plants such as selfheal, lesser stitchwort, creeping/meadow buttercup and sheep's sorrel. Beetles specific to docks, grasses, clovers and vetches, and ribwort plantain occur. The terrestrial land snails suggest a meadow environment, and the ground beetle fauna is what might be found in damp grassland, ranging to the edge of wetlands, the latter probably specifically the environment around the waterholes. A relative lack, but not absence, of dung beetles in the samples suggests that the animals did not have access to the waterholes, a conclusion established from the steep-sided character of most of them, but the numbers are low enough to suggest only light grazing of the adjacent grasslands. One might hazard the conclusion that many of these fields were meadows from which hay was cut for winter fodder for the cattle, and grazing may have been restricted to the autumn, winter and perhaps early spring, with animals grazed on the fens to the south in the summer. The possible droveways would allow control of the stock and keep them out of hay fields. The droveways extended to the south-east from the fields, and would lead to the slightly lower ground, where the fenlands were probably located.

Much of the environmental data reflects the immediate environment of the waterholes from which the samples were collected. An aquatic component is particularly evident in Pond Cluster 1 (monolith 8022). Pollen of water milfoil (*Myriophyllum*), bog bean (*Menyanthes*), flowering bulrush (*Butomus*), bur reed and/or reed mace (*Typha angustifolia* type) and sedges (Cyperaceae) occurs in many samples: one or two aquatic taxa occur among the plant macrofossils, and beetles and other invertebrates, such as the larval stages of caddis and chironomids (midges), and an occasional stickleback prove the presence of pools of water, although aquatic gastropods and bivalves were rare. The macrofossil component – plants, insects and snails – does not, however, reflect permanent or significant open water that would indicate permanent ponds. It is possible that even these waterhole pits may have been wet or damp, rather than waterfilled, during the summer months. Intermittent waterlogging or a limited lifespan could account for the absence of some aquatic plants and those animals that need time to colonise new habitats. Damp and wet muddy habitats certainly occurred around the waterholes, as shown by the marshy waterside vegetation with its associated invertebrate faunas. An abundance of water voles in the small mammal assemblage indicates that this species could readily obtain access by travelling up damp or wet ditches. One of the biggest components of the waterlogged plant macrofossils consists of weeds of cultivated or disturbed ground and these taxa and some of the hedgerow or scrub taxa must have colonised the sides of the waterholes and the upcast from their digging. If there had been herbivore access to the waterholes then dung would have been abundant around their margins, and the generally low density of dung beetles in most of the samples suggests that animals did not regularly drink from them.

Aspects of the farming economy have been discussed above. The site illustrates a pattern of small fields which were probably hedged, may well have been meadows from which hay was cut, and could have been seasonally grazed between autumn and spring. Pollen evidence suggests that on the lower ground to the south there may have been fen, a suitable environment for summer grazing.

Cattle were clearly the mainstay of this farming economy, probably being husbanded for a range of products including milk, meat and hides, but perhaps also draught, although there is no positive evidence for this in the form of pathologies that could be associated with ploughing. The absence of trees and the evidence for meadows suggests that the animals were foddered during the winter on hay, and may have been grazed on the fens in the summer. Animals may have been kept in the field system in spring for calving, before being led out onto the fens. The sheep appear to have been kept for meat, wool and probably their skins, but occur in much lower numbers than cattle, and their wool and skins may have been more important in economic terms than their meat. Finds of possible clay loomweights and bone awls from the project area may well be related to the processing of secondary products from domesticated stock. Pigs, probably kept exclusively for their meat and their suitability for slaughter in the winter months, could have supplied more meat than the sheep.

Other dietary contributions were made by occasional red and roe deer, an aurochs and the odd duck. The deer and aurochs suggest that some hunting was carried out, but with the environmental evidence indicating very little woodland around the site one might question how far the hunters would have had to go to hunt these animals. It remains possible that some of this material was exchanged or traded, and a similar argument could be put forward for the antler.

Apart from one roe deer antler broken from the skull, this is shed antler or worked or waste pieces, and would have been collected from the forest floor. This evidence and several worked bone fragments indicate bone working, which on the basis of the antler waste fragments and

apparently unworked antlers was undertaken on site. Some woodworking is also indicated by the wood chips, stake ends and other pieces of wood in the waterholes.

Evidence for arable cultivation is limited. The charred plant assemblages have produced evidence for emmer wheat, spelt wheat, possible bread wheat, six-row barley and possible oats, although the latter may be wild. Of these, barley occurs with the greatest frequency, but considering the volume of soil processed, the resulting assemblages are very poor. This is typical for most Bronze Age sites and is probably not significant. Barley was presumably the most important crop, since emmer and spelt are positively identified from only a few grains. The positive identification of a single grain of spelt wheat suggests that this species was already being cultivated in the Middle to Late Bronze Age. There are indications from the charred plants, the waterlogged plants and also the pollen that flax, *Linum usitatissimum*, was also being cultivated and the occurrence of *Cannabis*-type pollen might indicate the cultivation of hemp, although this could be from wild hops. There was no positive evidence for crop processing on the site, although charred cereal chaff and charred seeds of arable weeds are present. There is a question as to whether these crops were grown on site or elsewhere. Cereal pollen occurs at low levels in all three pollen sequences, as do several taxa that might be associated with cultivated ground. Many of the weed seeds from the waterholes are also characteristic of disturbed or cultivated ground, but the terrestrial snail fauna shows little evidence for disturbed soils. The few samples with a little chaff and charred arable weeds do suggest crop processing, which might imply cultivation on site.

The environmental picture presented above sees the fields on the site as pasture and meadows, rather than arable, and with no positive indications to the contrary one is inclined to assume that the arable land might lie to the north or north-west of the site. Two interesting artefacts, a complete antler digging stick from Fen-edge Pit Cluster 4 and the probable ard from Fen-edge Pit Cluster 5, might imply cultivation of some sort on site. Whether *Cannabis* or flax was grown is also problematic, although both charred and waterlogged seeds of flax have been identified. The waterlogged remains could have derived from cultivars seeding on the disturbed ground around the waterhole, which might imply cultivation at one time on the site. There is a general impression that the area of the site must have been too wet for cereal cultivation, but little of the environmental data positively indicates waterlogged ground, unless around the waterholes themselves. If the waterholes, some of which were quite deep, were prone to nearly drying out in the summer then there is no reason why a crop could not have been cultivated in the fields. Crop debris is generally at low densities on Bronze Age sites and its scarcity at Pode Hole do not preclude the fields being used for arable. Small farmsteads require much more pasture and meadow land than arable land: it would be difficult to recognise arable activity in fields that might have lain fallow for most of their existence and were only intermittently cultivated. Nevertheless, although we know that cereals, and possibly flax and *Cannabis*, were eaten or utilised, we cannot say whether or not they were grown on the site.

Several of the plants that are interpreted as being in the hedgerows afford seasonal food resources. Sloe, cherry, bramble, hazel, hawthorn, elder and apple/pear/whitebeam could all have been harvested in season to supply food and may have been encouraged in the hedgerows. If hedgerows were present they would have afforded other resources. A quantity of the wood studied was charcoal, and several pieces were worked. Worked wood included oak, alder and willow, while the most frequent charcoal was willow, followed by alder, hazel, oak, Maloideae and ivy. Most of these species are likely to have been available in the hedges, growing around the waterholes or on the nearby Fen-edge. This suggests that fuelwood and the wood for the simplest uses such as wattling, posts, pegs and stakes could be obtained from local resources and may not have required access to woodlands. The growth ring data indicates small roundwood consistent with prunings, coppicing or gleanings from hedgerows, scrub or willow on the Fen-edge. The willow has many uses that are unlikely to leave any trace in the archaeological record, and its harvesting for basketry and rope using stems or bark is certainly a possibility. The twisted honeysuckle rope, discovered around the wooden bucket, was a rare survival; it is apparent that this plant was available and utilised in the later Bronze Age.

It is possible that the distribution of the charred cereals and animal bone, when considered with the pottery and other finds, can give some indication of whether there were buildings on the site. This occupation debris is never very abundant on Bronze Age farming sites, although there are 'specialist' sites where bone and pottery assemblages can be very large, such as the midden at Potterne (Locker, 2000). Some of the richer charred plant assemblages derive from features at the western end of the site, and several of the waterholes have relatively large animal bone assemblages (over 100 recorded fragments per feature). The sample data indicates that, by volume, the smaller 'midden' pits contain the highest concentrations of bone, pottery and flint per litre of sediment. It is difficult not to see these features as associated with adjacent occupation. The upper fills of Pond Cluster 1 accumulated when the waterhole had long since filled in, and produced a relatively large sample of animal bone, including worked and waste antler fragments. The bones from these features are not heavily fragmented, which one might expect if they were being thrown out with middened material as a manure – the usual explanation for a scatter of cultural debris in the fields. It should be remembered that there is no evidence that these fields were being cultivated and therefore manured. Some of the bones have chop marks indicating butchery. This is surely all occupation debris and therefore, despite the

absence of any visible structural remains, one is inclined to conclude that houses were present on the site. Although the distribution of this material is not strongly focused, it does occur at specific locations across the whole site. If the spatial concentrations of cultural material identified on Fig. 6.2 are taken to indicate occupation, then one can envisage several buildings, with the fields representing a number of small farmsteads with access to the fens to the south and possibly further fields to the north. Some of the environmental evidence would appear contradictory to this suggestion, such as the lack of anthropogenic indicators among the beetles, and the general lack of charred plants except in Pond Cluster 1. Yet if there were no buildings on the site then the occurrence of occupation debris across it is somewhat anomalous.

The picture that has been put together for this site differs in several respects from that presented for the contemporary Thorney Borrow Pits site nearby (Phoenix Consulting Archaeology, 2007). The pond there appears to have been wetter with fringing alder and willow carr. The surrounding dry land was a mosaic of open woodland, shrubland and grassland, in contrast to the conclusions for Pode Hole, where woodland is not thought to figure, by the later Bronze Age except for willow carr along the Fen-edge. The agricultural economy was probably similar, although Pode Hole produced no evidence for the cultivation of vetches. It may be that the Thorney Borrow Pits site lies closer to the regional woodlands in which the deer, aurochs and pine marten could be found. However, the radiocarbon dates from the Borrow Pits site suggest that the studied samples predate those at Pode Hole, which could account for the differences between the results from the two investigations.

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Appendix

Lab. Code	Context	Cut	Feature	Material	Radiocarbon Age (BP)	2 Sigma Calibrated Age Range (95% prob.) (BC)
Beta-238589	9092	9075	Waterhole 9075	Indet. wood	3050+/-50	1420 to 1190 and 1140 to 1140
Beta-238590	8238	8291	Pond Cluster 1	Indet. wood	3120+/-40	1460 to 1310
Beta-238591	9628	9680	Pond Cluster 3	Blackthorn	2950+/-40	1300 to 1020
Beta-238592	9503	9500	Waterhole 9500	Willow/ poplar	3020+/-40	1400 to 1130
Beta-238593	8399	8440	Fen-edge Pit Cluster 5	Oak	3190 +/-40	1520 to 1400
Beta-238594	9713	9512	Pond Cluster 3	Hawthorn/*sorbus*	3060+/-50	1430 to 1200
Beta-244198	9623	N/A	Pond Cluster 3	Sediment (peat)	2849+/-40	1120 to 910
SUERC-12862	8212	8208	Field boundary ditch	Burnt food residue	2920+/-40	1270 to1000
SUERC-12866	8124	N/A	Pond Cluster 1	Burnt food residue	3250+/-40	1620 to 1430
SUERC-12890	9520	9521	Bucket in Pond Cluster 3	Honeysuckle rope	2980+/-40	1380 to 1330 (4.8%) 1320 to 1050 (90.6%)
SUERC-12095	7215	7214	Waterhole 7214	Burnt food residue	3530+/-35	1950 to 1750
SUERC-12096	7382	7218	Fen-edge Pit Cluster 3	Burnt food residue	3050+/-30	1410 to 1250 (92.6%) 1240 to 1210 (2.8%)
SUERC-12097	7654	7218	Fen-edge Pit Cluster 3	Burnt food residue	3040+/-35	1410 to 1200

Radiocarbon dates from Pode Hole project area (Wood remains identified by Rowena Gale, details available in original project archive).