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Excavation of an Iron Age Settlement and a Middle Saxon Cemetery at Great Houghton, Northampton, 1996

by

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with contributions by Trevor Anderson, Karen Deighton, Tora Hylton and Dennis Jackson

SUMMARY

A corridor 400m long by 15m wide along the course of a proposed Anglian Water pipeline was stripped under archaeological supervision to determine the presence and character of any archaeological remains. The dense palimpsest of features located was sampled in an archaeological recording action.

The majority of the features related to an extensive area of Iron Age settlement. The earliest activity probably comprised unenclosed posthole and pit groups. A sub-rectangular ditched enclosure contained numerous pits, and in one an adult inhumation burial with a lead alloy neck ring or torc around its neck has been radiocarbon dated to the early 4th century BC. To the east, a roundhouse ring ditch lay outside a small oval enclosure. Settlement began at the end of the early Iron Age, at around 400BC, and continued through the middle Iron Age. It was abandoned in the early 1st century AD.

A group of 23 inhumation burials, all aligned west-to-east, and without grave goods, formed the southern part of a cemetery of unknown extent. A single radiocarbon date indicates that it was a Christian cemetery dating to the second half of the 7th century. The burials produced much evidence for healed traumatic injuries, and a high incidence of anatomical variants may indicate that they were from a small, inbred community. One individual shared an uncommon genetic trait with the Iron Age pit burial.

At the western end of the area a group of rectangular clay pits of medieval date were aligned on the ridge and furrow of the medieval field system.

INTRODUCTION

A proposed Anglian Water pipeline ran from the reservoir at Great Houghton to the Brackmills Business Park, Northampton (Fig 1 and Plate 1: NGR SP 79455829 to SP 79135815). It crossed an area in which Iron Age, early-middle Saxon and medieval pottery scatters had been identified by fieldwalking (Fig 2 and Shaw 1990, 4 and figs 5-7). A more recent programme of desktop study and archaeological field evaluation had indicated that major archaeological remains were unlikely to be encountered in the western part of the pipeline route (Wessex Archaeology 1996).

Northamptonshire Heritage identified a need for a programme of archaeological investigation to determine the date, character and extent of any archaeological remains affected by the proposed scheme. Observation of the soil stripping identified the presence of numerous archaeological features, including the Iron Age enclosures and the cemetery. They were subsequently excavated by Northamptonshire Archaeology prior to the construction of the pipeline during September and October 1996.

ACKNOWLEDGEMENTS

Michael Webster and Peter Masters observed the soil stripping, and the main excavation was under the direction of Andy Chapman, with Michael Webster as site supervisor. The excavation team comprised Rob Atkins, Tony Baker, Steve Morris and Paul Thompson. The work was carried out on behalf of

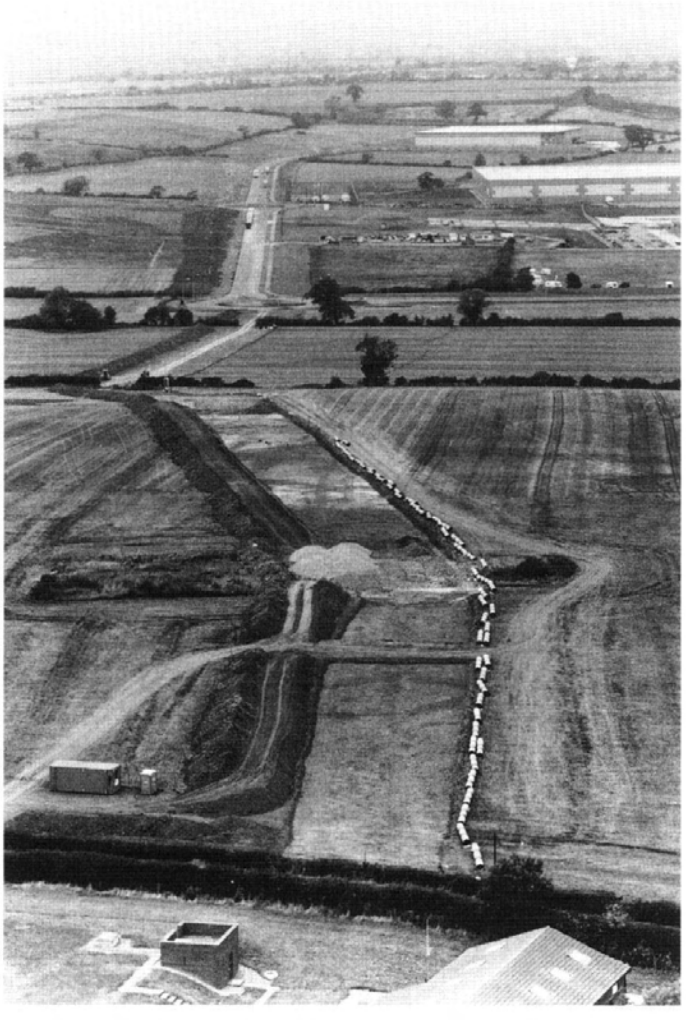

Plate 1 Great Houghton: Aerial photograph of site under excavation, looking south-west (by courtesy of Crawshaw Robbins & Co. Ltd)

and was fully funded by Anglian Water. All plant was supplied by Crawshaw Robbins & Co. Ltd, the principal contractor to Anglian Water. The aerial photograph of the site is by courtesy of Crawshaw Robbins & Co. Ltd. The pottery has been studied by Dennis Jackson, the animal bone by Karen Deighton, the metal objects by Tora Hylton and the human bone by Trevor Anderson. The illustrations are by Cain Hegarty, Mark Roughley and Andy Chapman.

The Iron Age and Saxon burials were featured in an article in *Current Archaeology* (1998, **159**, 92-95) and this generated subsequent interest in both national (*The Guardian*, September 11, 1998) and local newspapers (Northampton, *Chronicle and Echo*, September 12, 15 and 17, 1998).

The Iron Age burial was the subject of a film documentary recorded by Electric Sky TV for National Geographic in 2000, producer Sally Jenkinson, and due to be broadcast in 2002 as part of a series entitled *Tales of the Living Dead*. As part of the making of this documentary a replica torc was manufactured by David Freeman at the Butser Ancient Farm, Hampshire. David Freeman's comments on the manufacturing of this object have added considerably to its description and discussion in this report.

OBJECTIVES AND METHODOLOGY

Along the eastern 400m of the pipeline route a 15m wide corridor was stripped to archaeological levels under archaeological supervision by a 360° excavator fitted with a toothless ditching bucket. A basic plan of the exposed features was recorded using a total station theodolite, and pottery visible on the exposed surface was recovered to provide preliminary dating evidence. A watching brief was maintained along the western part of the pipeline route, but no archaeological features were recovered.

In consultation with Northamptonshire Heritage and Anglian Water, a previously identified contingency was utilised in a programme of more detailed recording of the dense palimpsest of archaeological features revealed along the eastern part of the pipeline corridor. This involved sample excavation of the major Iron Age and medieval features and the excavation and removal of all human burials.

The site archive will be deposited in the Northampton Archive, curated by the Northampton Museums and Art Gallery.

LOCATION, TOPOGRAPHY AND GEOLOGY

The site lies to the south-east of Northampton, and on the southern side of the valley of the River Nene (Fig 1). It is situated on the west-facing slope of a spur of high ground, with extensive views across the river valley to the north and west. The present village of Great Houghton lies to the north-east, on the northern slope of the spur, and the Brackmills Business Park occupies the lower ground to the west and north-west. The nearest present day watercourses lie c.1.5km to the north-east and east, comprising the sources of streams running both north and south from the spur of high ground and eventually feeding into the River Nene. However, given the complex geological sequence on the hillside below the Iron Age enclosures there may have been former springs much closer to the excavated area, see below.

The main Iron Age enclosures at the eastern end of the pipeline corridor lay on near level ground at 103.5m aOD, and on the margin of the Boulder Clay that caps the higher ground (Figs 2 and 3). To the west the ground drops steadily, and a complex geological sequence of the Great and Inferior Oolite Series was exposed (Geological Survey of Great Britain, solid and drift, Sheet 185). Blisworth Limestone lay between 102.0 and 103.0m aOD, coinciding with the Iron Age pits and "working hollow" to the west of the enclosures. There were mixed marls and clays at the base of the limestone and Upper Estuarine varicoloured clays on the slopes below this, a zone devoid of archaeological features. The Saxon inhumation cemetery was situated on a slight shelf of Upper Estuarine Limestone at around 99.5m aOD. The medieval pits at the westernmost end of the site lay on Lower Estuarine clayey silts at between 96.5 and 97.5m aOD. Immediately below this Ironstone of the Northampton Sands was exposed.

THE EXCAVATED EVIDENCE

SUMMARY OF SITE CHRONOLOGY

In terms of excavated features three major periods of activity are represented, and a fourth is denoted by a single recovered find. The dating is based primarily on the recovered pottery, and other characteristic finds, supported by two radiocarbon dates from human skeletal material. The site chronology is briefly summarised below, and the evidence is then discussed in detail:

PERIOD	ACTIVITY/EVIDENCE
Neolithic and Bronze Age	A polished stone axe, no associated features (see finds report).
Iron Age	Settlement remains comprising unenclosed posthole and pit groups, two enclosures, and a roundhouse ring-ditch. Activity includes an early Iron Age pit burial with lead torc or neck ring. Date range: end of the early Iron Age (radiocarbon date centred on c.400BC) to middle Iron Age, and some late Iron Age activity (first century AD).
Saxon	Inhumation cemetery, containing 23 burials aligned W-E and without grave goods. Christian cemetery, radiocarbon dating indicates use in the second half of the 7th century AD.
Medieval	A group of clay pits situated within the furrows of the contemporary field system. Probably 13th-14th century in date.

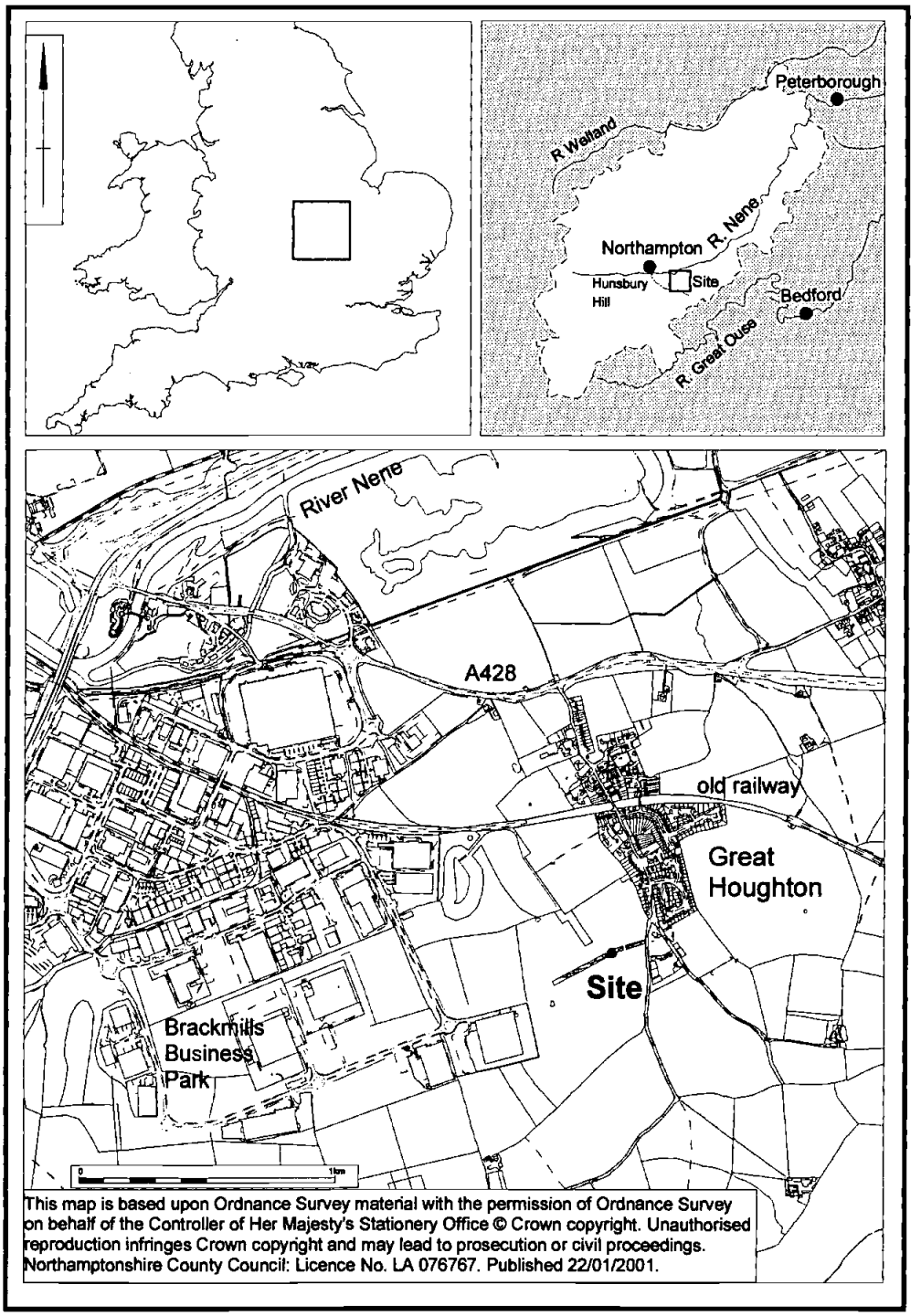

Fig 1 Great Houghton: Location plan

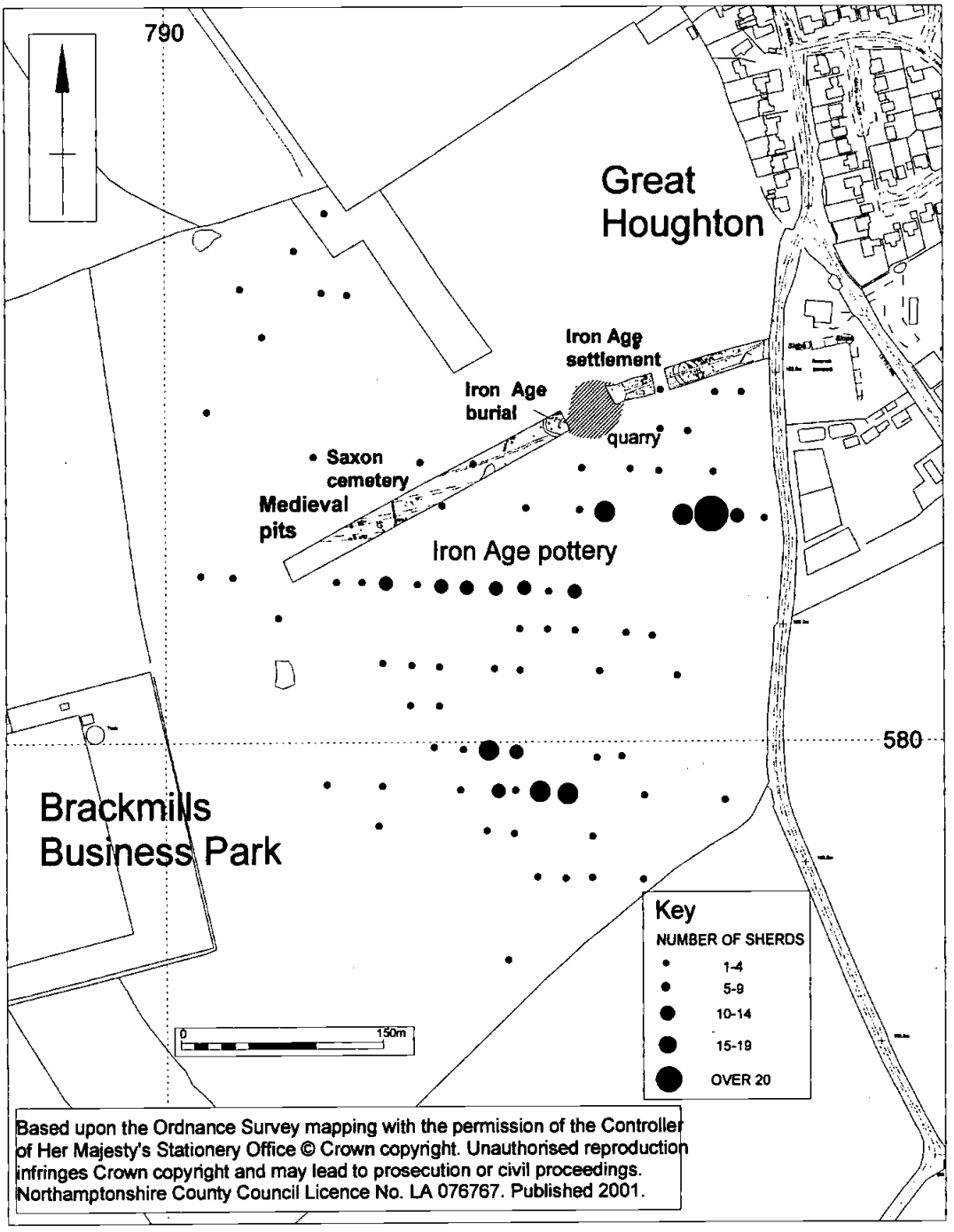

Fig 2 Great Houghton: The site and the fieldwalking pottery scatter

THE IRON AGE SETTELEMENT

INTRODUCTION

Iron Age settlement features were spread along 300m of the pipeline corridor (Figs 2 and 3). Scattered activity comprising unenclosed pit groups, and a "working hollow" lay on the hill slopes to the west. Two enclosures and a roundhouse occupied a more restricted zone, 140m in length, at the eastern end of the pipeline corridor and situated on more level ground at the edge of the high, Boulder Clay capped, plateau. A 50m length, including part of one enclosure, had been destroyed by a recent quarry. There was also a scatter of postholes and pits across the area between the enclosures, which may represent both earlier and contemporary activity.

The assemblage of Iron Age pottery largely comprises residual material from the ditches but some pits produced small primary groups. It spans the early and middle Iron Ages, while the final filling of the ditch of the eastern enclosure contained some late Iron Age and "Belgic" pottery. Animal bone was only recovered in any quantity from the ditches of the two enclosures and from the roundhouse ring ditch. The terminals of the eastern, oval enclosure produced some fuel ash slag.

THE WESTERN PIT GROUP

The westernmost area of Iron Age activity lay 60m downhill from the "working hollow". It comprised two clusters of pits, each comprising several individual pits beside a larger feature that was probably a group of intercutting pits, but these were not fully investigated (Fig 4). The western area comprised a line of three pits all greater than 1.0m in diameter (243, 244 and 254) and an oval area of intercut pits 6.0m long by 3.0m wide (245). They were all 0.20-0.40m deep, and the fills were typically dark grey clays with only sparse to some inclusions of smaller pebbles and limestone. The eastern cluster of pits, which continued beyond the excavated area, were smaller, typically less than 1.0m in diameter, but of the same depths and with similar fills (237 etc).

The small group of pottery includes no later forms, so the pits can be dated to the early Iron Age (ceramic phase 1, Fig 12, 4 and 5). Pit 254 contained two joining skull fragments from the cranial vault of an adult human. These were identified during the cataloguing of the animal bone and they do not appear in the human bone report.

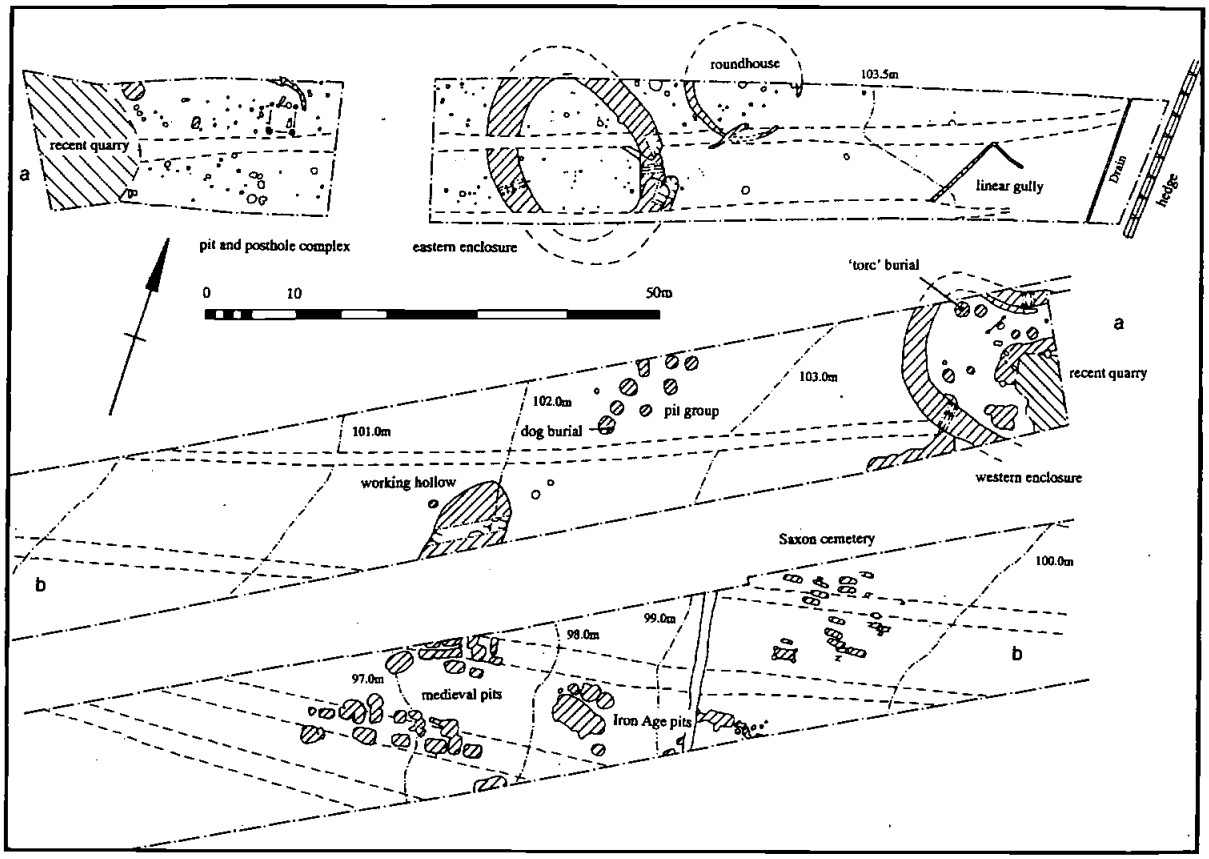

Fig 3 Great Houghton: General site plan

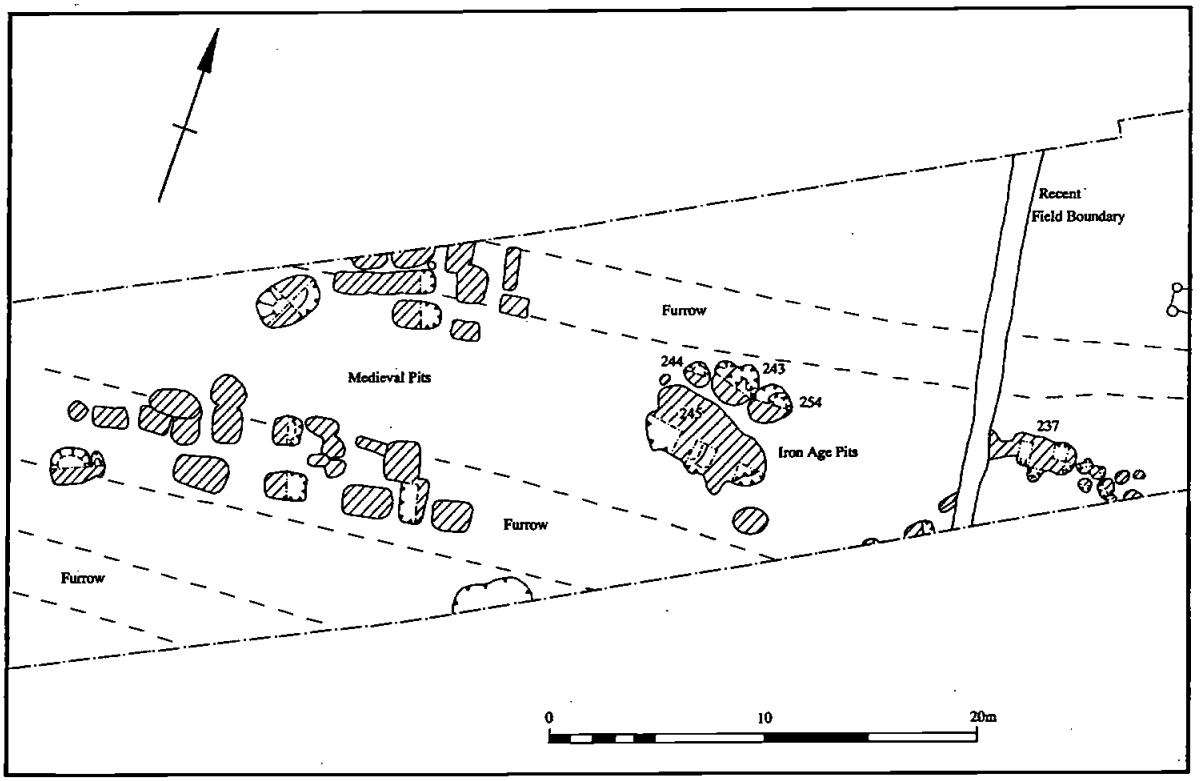

Fig 4 Great Houghton: The medieval marl pits and the western pit groups

PIT GROUP AND "WORKING HOLLOW"

A cluster of circular pits and scattered smaller pits or postholes lay to the north of a broad shallow hollow of the form traditionally described as a "working hollow". They lay on the upper slope of the hill and at the western margin of the main area of Iron Age activity (Fig 5).

To the north there were seven, very regular circular pits varying from 1.0m-2.0m in diameter, and the group probably extended further to the north, beyond the limit of excavation. Five were sectioned (204-5 and 207-9), and these were all near vertical-sided and flat-bottomed, ranging from 0.50-0.75m deep (Fig 9, 208, S11). They had been cut through the limestone natural to bottom on or just into the underlying clay. Their fills comprised multiple sharply defined layers and lenses of compact yellow to brown clays containing varying quantities of clean limestone chips or small fragments of up to 100mm. There was no scattered occupation debris of pottery, bone or even charcoal within these features, but two contained specific deposits. Pit 204 contained part of a small shouldered jar of middle Iron Age date (Fig 13, 7, pottery phase 2A). Pit 209 contained the articulated skeleton of a dog. The fore and hind limbs of the dog were drawn together and the neck was bent back upon itself, so that the head lay beneath the thoracic vertebrae, indicating that it had been trussed and that perhaps its neck had been broken prior to deposition. A shallow rectangular hollow (206), up to 0.1m deep lay on the margin of the pit group. This group of pits were therefore quite distinctive in a number of ways; the regular plan and profile forms, the well stratified fills of clean clays and limestone, the absence of general domestic debris, and the deposition of a dog burial and part of a single pottery vessel.

To the south, the broad shallow "working hollow" was 7.5m wide and in excess of 11.0m long (215). A 1.5m wide section was cut across it by machine. The sides were shallow, sloping down to a flat bottom, but with some deeper sub-circular hollows and a distinct shelf along the eastern side. It was no more than 0.35m deep, bottoming within the limestone. The fill was of brown clay containing chips and small fragments of limestone, but there were no burnt stones and very little charcoal. Pottery was scattered through the fill, and there was a small cluster of sherds in the easternmost circular hollow. The rim forms date to the late middle Iron Age (pottery phase 2B).

A number of shallow depressions, probably the bases of truncated pits (214 and 218-9), lay around the main hollow. They were no more than 0.12m deep and their clay fills all produced some small pottery sherds of middle Iron Age date (pottery phase 2A).

At the southern edge of excavation a 1.0m diameter cluster of burnt cobbles (203) was seen in section resting on the natural surface. They may have lain within a shallow feature, with their survival resulting from preferential preservation on the top of the ridge between the furrows of the medieval field system. Sherds

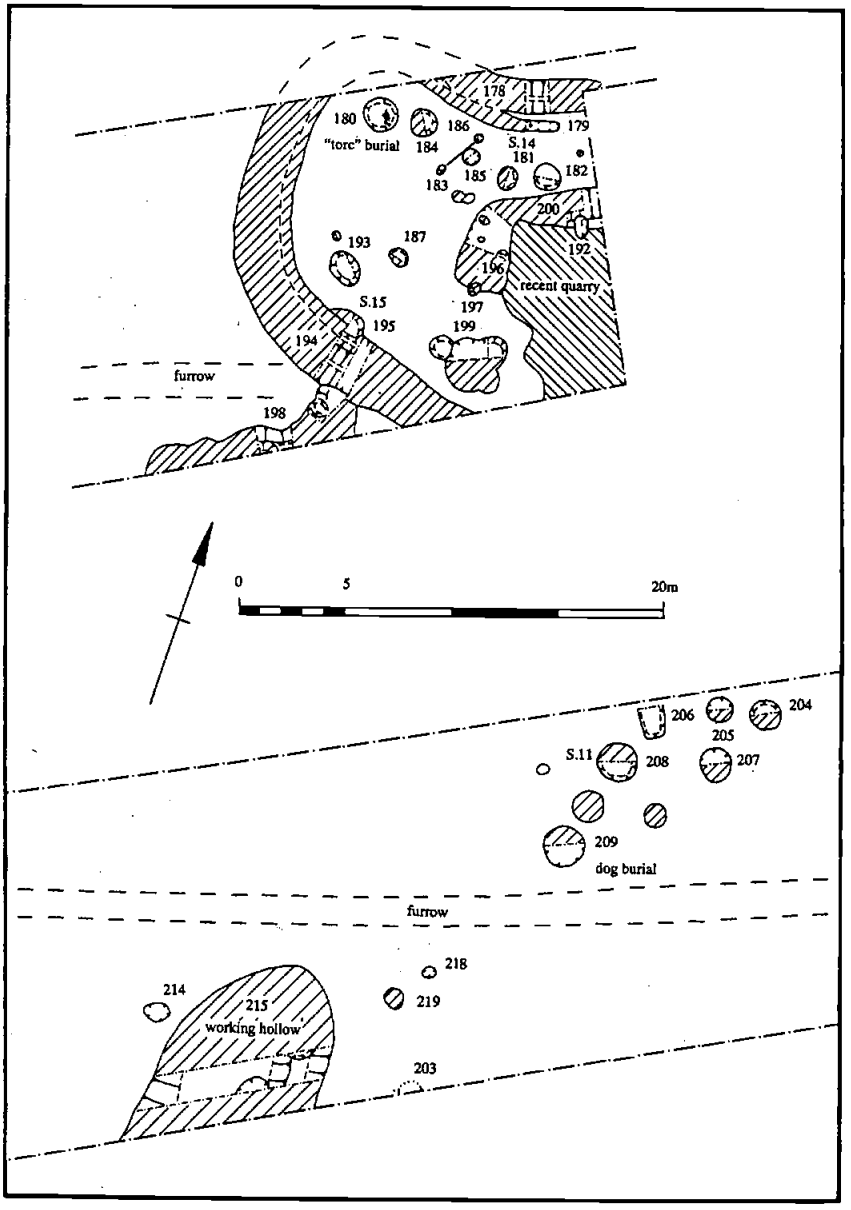

Fig 5 Great Houghton: Pit group, "working hollow", and the western enclosure

from a curvilinear decorated bowl of late middle Iron Age date (pottery phase 2B), the only example from the site, lay among the stones.

THE WESTERN ENCLOSURE

The western end of the sub-rectangular enclosure lay within the pipeline corridor; a recent clay pit had largely removed its eastern end (Fig 5). A group of pits pre-dated the enclosure ditch and are dated to the early Iron Age, while the later use of the enclosure occurred in the middle Iron Age. This leaves it unclear whether the pits within the enclosure but containing early pottery, such as pit 180 containing the torc burial, pre-dated the enclosure or related to its earlier use.

Early pits

To the south a group of pits were cut by the enclosure ditch (195 and 198). They comprised a chain of intercut, bowl-shaped pits, 0.30-0.40m deep, with fills of brown to grey-brown clays with sparse stone inclusions, including some burnt stone, and producing some pottery and animal bone. The pottery from 198

was probably of early Iron Age date (pottery phase 1) but there were no diagnostic rims.

The enclosure

The enclosure was sub-rectangular in plan, 12.0m wide and in excess of 15.0m long. If the northern entrance were near central it would have been 25-30m long. There were two distinct phases of ditch. The earlier ditch was broad-bottomed. To the south it would have been c. 1.00m wide by 0.54m deep (Fig 9, 194a, S15), and was filled with brown clays containing some limestone. To the north it was only 0.50m wide by 0.10m deep (Fig 9, 179, S14), with a terminal to the east containing some burnt limestone.

The enclosure was later redefined by a broader and deeper ditch cut from the top of the secondary fills of the original. To the south it was V-shaped, 2.30m wide by 1.05m deep (194b, S15), while at the north it was 1.60m wide by 0.46m deep (178, S14). To the south the primary and lower secondary fills comprised brown clays with some limestone, and on top of the secondary fill there was a concentration of limestone and cobbles, typically burnt. The final fill was a grey-brown clayey loam. To the north the ditch contained an even more marked sequence of deposits comprising burnt cobbles, clean and scorched clays and mixed unburnt and burnt limestone and cobbles, although these appeared to have been tipped from the outer edge of the ditch. There was also pottery and animal bone mixed with the stones. To the east the northern ditch was approaching a terminal that lay on the margin of the area destroyed by quarrying.

No pottery was recovered from the earlier ditch. Pottery from the recut is middle Iron Age in date (pottery phase 2A), with the northern terminal including some scored ware. However, there were also residual sherds with early Iron Age characteristics (pottery phase 1). Some 2.5kg of animal bone were recovered from the excavated lengths of the ditch.

Pits and postholes

There were several pits and postholes within the enclosure. Some of these are undated, some produced early Iron Age pottery and may either pre-date the enclosure or be contemporary with its earlier use, while others produced middle Iron Age pottery and were contemporary with the enclosure. The features producing earlier pottery were 180, 186 and 193, and also the soils filling a broad shallow hollow (200) that occupied the central area of the enclosure (Fig 12, 1). The features producing middle Iron Age pottery (pottery phase 2A) were 197 and 199 (Fig 13, 6 and 9-13). The internal features are described below:

Pits 180-182, 184 and 185

Pit 180 lay in the north-western corner of the enclosure, it was 1.55m in diameter by 0.50m deep, with near vertical sides and a flat bottom. It is notable for containing an inhumation burial of an adult female buried face down and with a lead torc or neck ring around her neck, and is described in detail below. Four other circular pits in the same area varied from 0.75-1.30m in diameter and 0.10-0.40m deep, with near vertical sides and flat bottoms. They were filled with grey-brown clays containing some limestone, and 184 also contained burnt limestone and cobbles, and 185 some burnt clay. They were similar in form to pit 180 and may well be contemporary.

Postholes 183 and 186

Two deep postholes set 2.3m apart and with similar fills appear to form a two-post structure. The postholes were both 0.50m in diameter, near vertical-sided, 0.48m deep and filled with distinctive light grey fine (ashy) silty clay, containing charcoal flecks and small pieces of burnt limestone. Two nearby postholes were not excavated.

Hollowed area, 200, and associated postholes, 190-192

On the northern and western margins of the area lost to quarrying there was a sunken area, up to 3.0m wide and 0.10m deep. It was filled with grey clay, and to the north-east there was a shallow gully along its northern margin (200). There were three postholes in the base of this area, varying from 0.13-0.30m deep (190-192). This sunken area may have been associated with a central building or heavier usage of the central area, but the loss of much of it to quarrying leaves its interpretation uncertain.

Pits 187 and 193

Pit 187 was 1.0m in diameter by 0.07m deep, and filled with grey-brown clay containing burnt limestone. Pit 193 was oval, measuring 1.50 by 1.70m by 0.40m deep, with near vertical sides and a flat bottom. It was filled with grey-brown clay containing some burnt cobbles and limestone.

Postholes 196 and 197

Two postholes cutting the fill of the hollowed area, were 0.70m in diameter by 0.35m and 0.30m deep. 196 was packed with burnt limestone, ironstone blocks and cobbles, and 197 with four large limestone slabs, all heavily burnt on one face and probably reused from a hearth. They lay 2.1m apart and may have formed a two-post structure.

Pit complex 199

The pit complex was only partially excavated, but it appeared to comprise three circular pits and a larger central pit, from 1.0-2.0m in diameter. They had steep to near vertical sides, flat-bottoms and were from 0.25-0.55m deep. The lower fills were brown clays, while the upper fill over the central area was grey-brown clay. The easternmost pit contained some burnt cobbles, fuel ash slag and limestone. The westernmost pit contained a substantial primary deposit of pottery including parts of five vessels; a small bowl, a handled jar, two large, thick-walled scored ware jars and a large plain jar (Fig 13; 6, 9, 11-13).

The inhumation burial

Pit 180 was 1.55m in diameter by 0.50m deep, with near vertical sides and a flat bottom. It was filled with grey-brown clay containing moderate inclusions of limestone chips and small fragments. There were some scattered patches of comminuted charcoal at the level of the inhumation burial, which had been deposited on top of 0.20m of fill. A small pottery assemblage comprises early Iron Age forms (ceramic phase 1), and a radiocarbon date from the bones of the burial is centred on cal BC 390 (cal BC 405-370 at 1 sigma, Beta-116571).

The inhumation burial lay face down, with the top of the skull tight against the side of the pit (Fig 6 and Plates 2 and 3). It was aligned north-west to south-east with the head to the south-east. The arms were folded under the torso and they crossed just above the wrists, and the hands lay under the face. The skeleton lay slightly on its right side, with the legs tightly contracted. The contraction of the legs suggests that the body may well have been trussed in this position, and the crossing of the arms just above the wrists would also be consistent with the arms having been bound. The damage to the back of the skull occurred when the burial was located during mattock excavation of the pit fill.

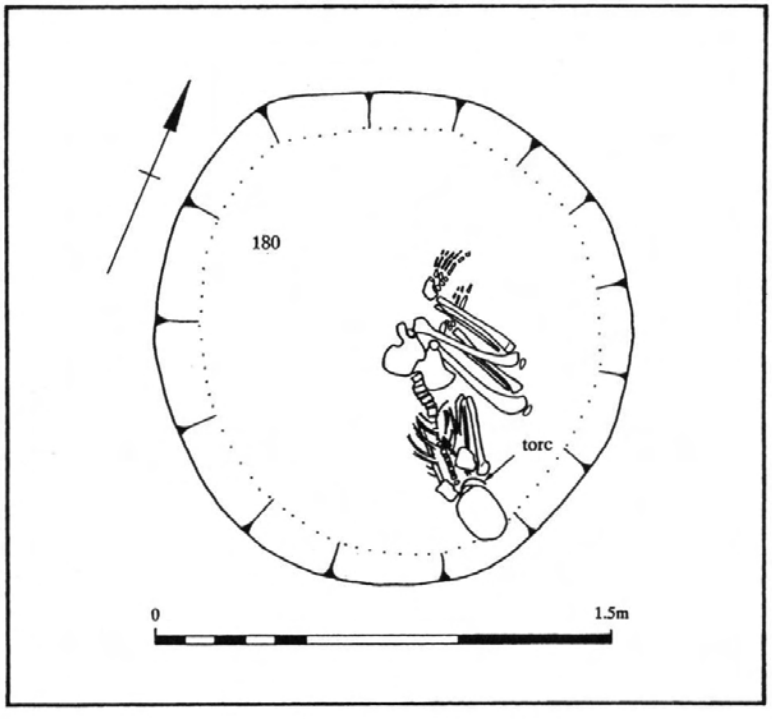

Fig 6 Great Houghton: The Iron Age burial, pit180

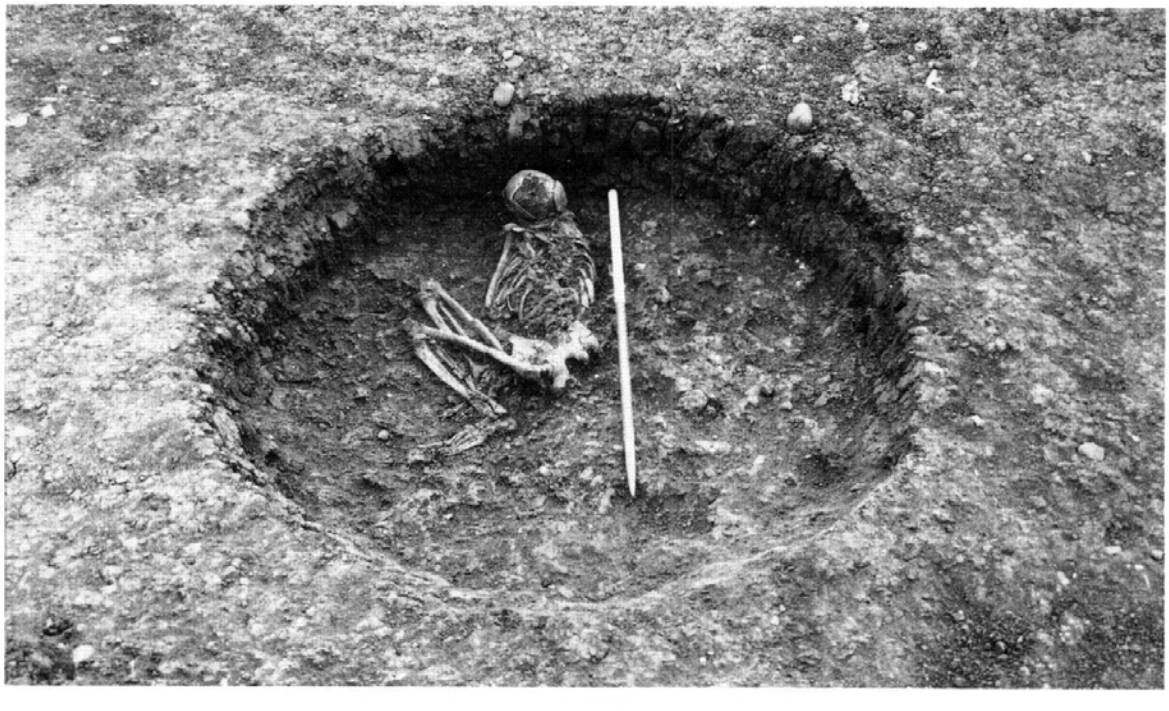

Plate 2 Great Houghton: Burial 180, general view

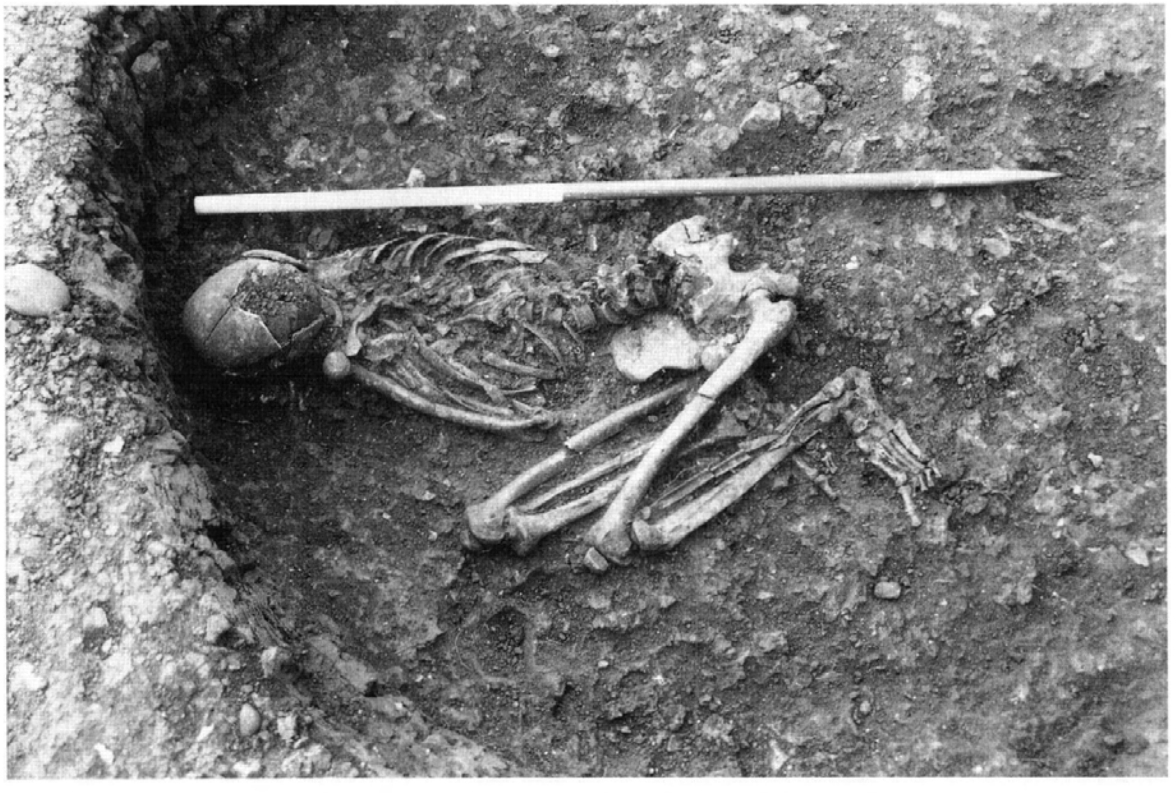

Plate 3 Great Houghton: Burial 180, showing body position

Around the neck there was a torc or neck ring comprising two square-sectioned, twisted rods of lead alloy (Plate 4). They both had decorative, circular-sectioned terminals at one end, while the opposed terminals were respectively perforated and notched to retain a binding, which had not survived (Fig 14). As found, the circular terminals overlapped at the nape of the neck and were still in close juxtaposition. Following removal of the skull, it was evident that the lower parts of the two arms had become displaced, so that the ends lay some 40mm apart, indicating that the original binding had been with some organic material. The arm with the perforated terminal was fractured in two places, but otherwise it appears to have retained its original shape. The arm with the notched terminal had lain near vertically in the ground and, as a result, it had been distorted out of shape by soil pressure. It had fractured at the mid-point, where most of the distortion had occurred, and towards the expanded terminal.

The skeleton is of a women 30-40 years old and 1.56m (5′ 1 ½″) tall. Squatting facets on her tibia indicate that she had spent much time kneeling, perhaps while preparing hides or grinding corn. Her dental health was poor, she had lost several molars and one that remained had a large abscess. In addition she had a hypo-plastic hamulus or, a reduced hook on the hamate wrist bone, a condition that occurs in only 1.4% of the modern population (see human bone report for full discussion). The appearance of the same condition in one of the burials in the Saxon cemetery (burial 222) lower down the hill has raised the possibility of a direct genetic link between two populations separated by over a 1000 years.

THE CENTRAL PIT AND POSTHOLE COMPLEX

To the immediate east of the modern quarry and west of the oval enclosure, there were scattered pits and postholes relating to an area of unenclosed settlement activity, including a possible four-post structure (Fig 7).

In the north-western corner of the area, and disturbed by the later quarrying, there was a large pit or hollow at least 2.0m in diameter (175). Only the final fill of dark grey clay was excavated, it contained some burnt clay and charcoal. To the south-east of this pit there were several smaller pits (including 168, 169 and 174). These were 0.50-0.70m in diameter by 0.10-0.20m deep, and the dark grey fills typically contained charcoal and quantities of limestone and cobbles, some burnt. Across the central part of the area there were further postholes and small pits, some with dense stone packing. To the south-east there was a group of shallow pits (116-119 and 122). They were from 0.60-1.00m in diameter but only survived 0.10-0.20m deep, with steep sides and flat-bottoms, indicating that the surface had been heavily truncated in this area. The fills were typically of

Plate 4 Great Houghton: Burial 180, showing torc around neck

Plate 5 Great Houghton: Burial 180, showing torc fully exposed

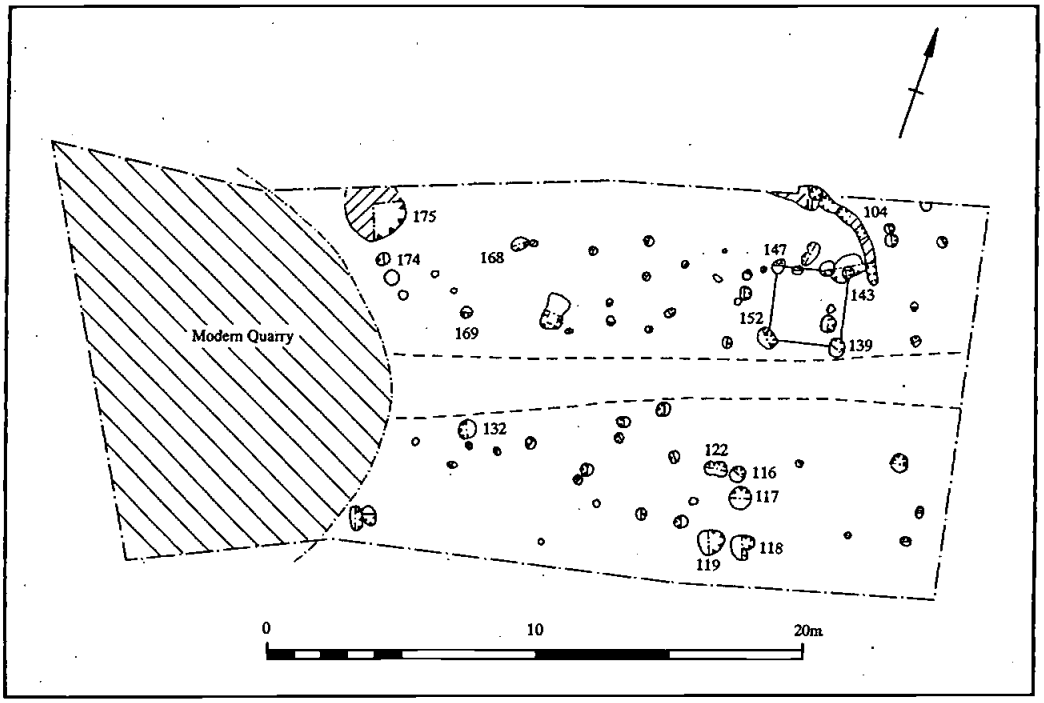

Fig 7 Great Houghton: The pit and posthole complex

grey clays containing quantities of limestone and cobbles, often burnt.

To the north-east there was a probable four-post structure, measuring 2.60m E-W by 2.80m N-S, with an adjacent arc of curving gully. Within a cluster of postholes, the structure was defined by four deeper, vertical-sided and flat-bottomed post-pits, 0.25-0.37m deep (139, 143, 147 and 152). The fills contained both limestone and cobbles, some burnt, and forming a dense packing in posthole 139. The adjacent arc of gully was 0.40m wide by 0.07m deep (104). There was a rounded terminal adjacent to one corner of the four-post structure, and 3.0m to the north of this the form of the gully changed, becoming a chain of individual small pits, up to 0.25m deep.

These features produced little pottery, and the only dating evidence is a rim of early form from the curving gully.

THE EASTERN ENCLOSURE COMPLEX

On the higher, more level ground at the eastern end of the site there was an oval enclosure and a roundhouse ring ditch (Fig 8). To the east of the roundhouse the scatter of postholes rapidly faded out, and an L-shaped gully appeared to mark the eastern limit of the Iron Age activity.

The eastern enclosure

A broad ditch defined an oval enclosure measuring c.17m by 12.5m. It was elongated NW-SE and had an entrance on the eastern side. The sequence of recutting at the eastern entrance indicates that there were at least four phases of development. The earliest appears to pre-date the enclosure, and comprised a 3.0m length of steep-sided, linear gully, 0.75m wide by 0.20m deep (44). To the west it was lost in a medieval furrow and to the east it was cut by the earliest phase of enclosure ditch (295). It indicates that there was activity pre-dating the enclosure, and many of the postholes and smaller pits might belong to this early phase.

The original enclosure ditch, which survived within the later entrance causeway, was V-shaped, 2.5m wide by 1.15m deep, with fills of light brown clay including some limestone fragments and a few larger blocks in the lower fills (295). The original entrance probably lay slightly to the north of its successor.

The early ditch had been fully infilled in the eastern area and a new entrance was created. The new ditch terminals were subsequently recut again, most clearly defined at the southern terminal, and the final causeway was only 2.10m wide. The same three-fold sequence of cuts was also seen on the western side of the enclosure, where the earlier ditches were 0.65m and 1.10m deep, while the final, V-shaped recut was 1.20m deep (Fig 9, 60c, S20). This suggests that at each stage the entire ditch circuit was recut.

At the southern terminal the earlier ditch was U-shaped and 0.50m deep (294). It was filled with grey brown clay and there were scattered fragments of limestone, burnt cobbles and fuel ash slag throughout the fill, but with a particular concentration of burnt cobbles against the western, inner, side of the ditch from top to bottom. To the north the earlier terminal had been largely removed.

The final ditch was up to 1.10m deep at the terminals. At the southern terminal (43) the lower fills were of yellow-brown clays containing some limestone and cobbles. Above this there was a 0.10-0.20m thick layer of dumped clean fragments of limestone,

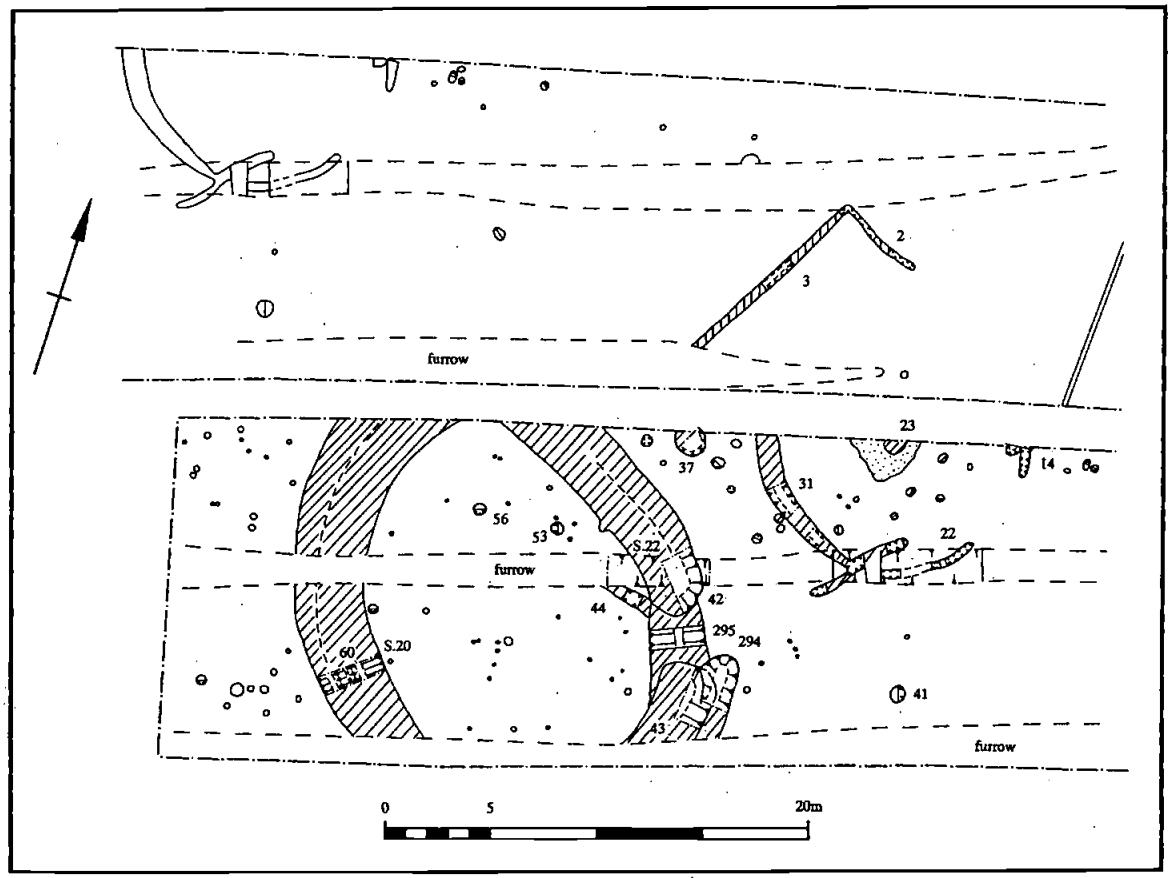

Fig 8 Great Houghton: The eastern enclosure and roundhouse

typically flat-lying and including a few burnt cobbles and fuel ash slag. The final fill was a dark-grey clayey loam, with sparse stone inclusions.

The northern terminal also contained substantial quantities of blocks and slabs of limestone and some fuel ash slag, but distributed more evenly through the secondary fills (Fig 9, 42, S22). The final fill was again a dark grey clayey loam. The enclosure ditch was cut into Boulder Clay, so all of the stone content of the ditch must have come from elsewhere on the site, and from lower down the hillside.

The earliest phase of enclosure ditch contained only early Iron Age pottery (pottery phase 1; Fig 12, 3). Quantities of pottery were recovered from the later ditch terminals, some from the upper stone rich layers and the majority from the final fill. These assemblages included residual early Iron Age material but the presence of a sherd of "Belgic" pottery and other well-fired wares suggests that the filling of the ditch with quantities of stone and its final silting both occurred in the late pre-Roman Iron Age (ceramic phase 3).

The later fills of both ditch terminals also produced quantities of animal bone (c.5kg) and fuel ash slag (1.95kg).

There was a scatter of postholes and small pits across the interior of the enclosure. They were typically 0.15-0.35m in diameter, and some contained small pieces of burnt limestone. They made no discernible groups, and were not excavated. There were two small pits, 0.60 and 0.50m in diameter and 0.08 and 0.25m deep, respectively (53 and 56). The deeper pit contained tightly packed fragments of burnt limestone, and may have been a post-pit.

External features

A scatter of postholes and a few small pits lay to the west of the oval enclosure. They were 0.20-0.60m in diameter; they were not excavated. They represent a continuation of the activity in the area to the immediate west.

The roundhouse

Half of a roundhouse ring ditch lay within the pipeline corridor (Fig 8). It enclosed an area 11.50m in diameter and there was a 3.70m wide opening immediately south of east. The ditch terminals flanking the entrance (14 and 22) were steep-sided slots, 0.65m wide by 0.25m deep, and their fills contained frequent burnt cobbles and burnt fragments of limestone. To the south-west the ditch was V-shaped, up to 0.80m wide by 0.30m deep (31). At the centre of the area there was a shallow,

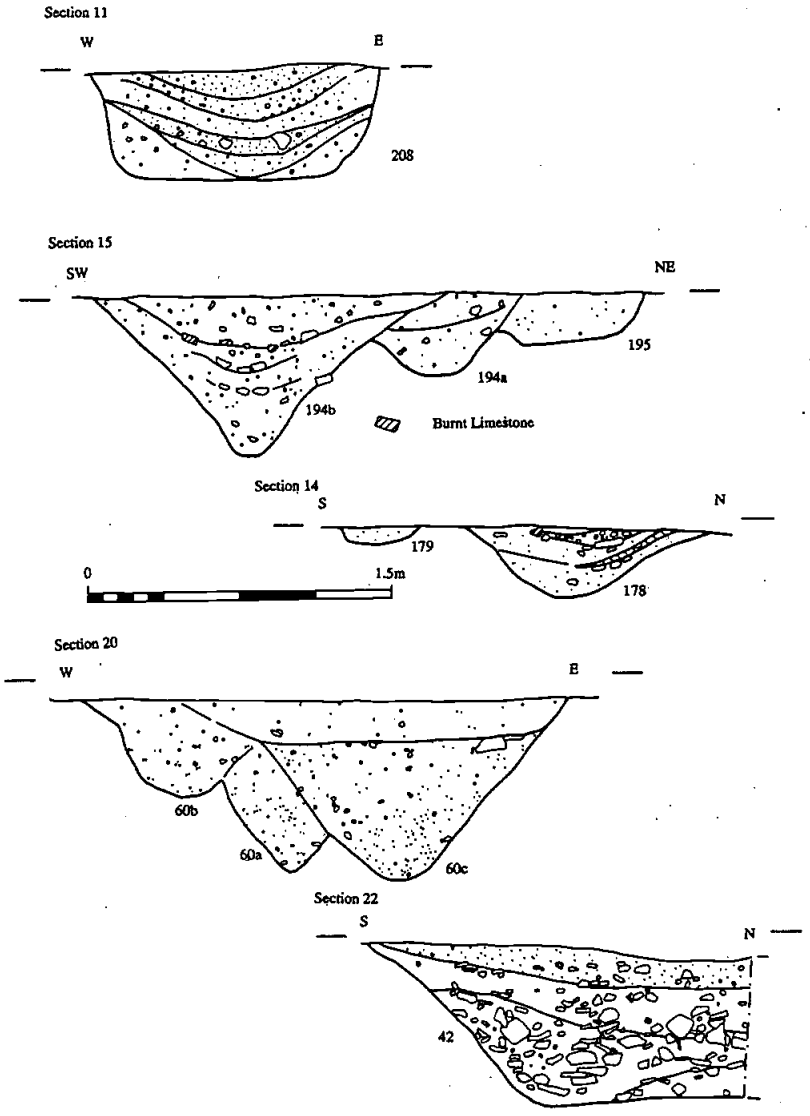

Fig 9 Great Houghton: Pit and enclosure ditch sections

bowl-shaped hollow, up to 0.20m deep, filled with three layers of flat-laid fragments of unburnt limestone. It may have been a stone-filled pit beneath a central hearth.

The pottery recovered from the ring ditch was largely undiagnostic, but a sherd of scored ware from the northern terminal suggests a middle Iron Age date (pottery phase 2; Fig 13, 14). It is likely that the roundhouse was contemporary with one phase of the adjacent enclosure.

Intersecting the southern side of ring ditch there was a 5.00m length of sinuous gully, 0.60m wide by 0.16m deep. An overlying medieval furrow had destroyed the ditch relationships.

A scatter of postholes or small pits lay within the ring ditch, outside the northern terminal and around the western side of the ditch. They were typically from 0.10-0.20m deep, and some contained small pieces of burnt limestone. They make no discernible groups and they are not necessarily all contemporary with the roundhouse. There was also a shallow circular pit to the west of the roundhouse, 1.30m in diameter by 0.20m deep (37), and another to the south, 0.80m diameter by 0.1m deep, with a grey heavily charcoal flecked fill (41).

The linear gully

The easternmost feature was a linear gully forming an L-shaped structure (Fig 8, 2 and 3). The western arm was 0.50m wide by 0.20m deep, with steep sides and a rounded bottom, and the northern arm was 0.35m wide by 0.10m deep, with a rounded terminal to the south-east. It was filled with grey-brown clay, and the upper part of this fill contained some burnt clay and frequent pieces of a light cindery slag. A near complete jar, dated to the middle Iron Age (pottery phase 2), had also been deposited in the fill (Fig 13, 8).

THE SAXON CEMETERY

INTRODUCTION

The cemetery lay on a band of limestone that appeared to form a narrow, near level platform on the sloping hillside at around 99.5m aOD (Fig 3). The burials occupied an area measuring 15.0m E-W by 11.0m N-S, and the skeletal remains of 23 individuals were recovered from a total of 22 grave cuts (Fig 10). Twenty-one of these were simple graves, while a probable upstanding timber mausoleum had marked the burial of one individual. The characteristics of the burials are summarised in Table 1.

The northern limit of the cemetery lay beyond the excavated area, although by how far, and how many additional burials this would include, is impossible to determine. It is therefore uncertain whether most of a small cemetery has been excavated or only the southern end of a much larger cemetery. Given the narrow width of the area containing burials the former seems the more likely interpretation.

THE DATE OF THE CEMETERY

The burials themselves provide no specific indication of date, beyond what may be surmised from the consistency of alignment and the near absence of grave goods (a single burial (270) was accompanied by an iron shroud pin). The only dating comes from a single radiocarbon date obtained from the bones of burial (222) at the eastern side of the cemetery. This burial was chosen for dating as it possessed the same condition of one wrist bone as in the Iron Age burial (180) higher up the hill. Burial (222) has given a date of cal AD 655-705 (Beta-116572, 1-sigma), placing the cemetery in the middle Saxon period, while the absence of grave goods indicates that it must have been a Christian and not a pagan Saxon cemetery.

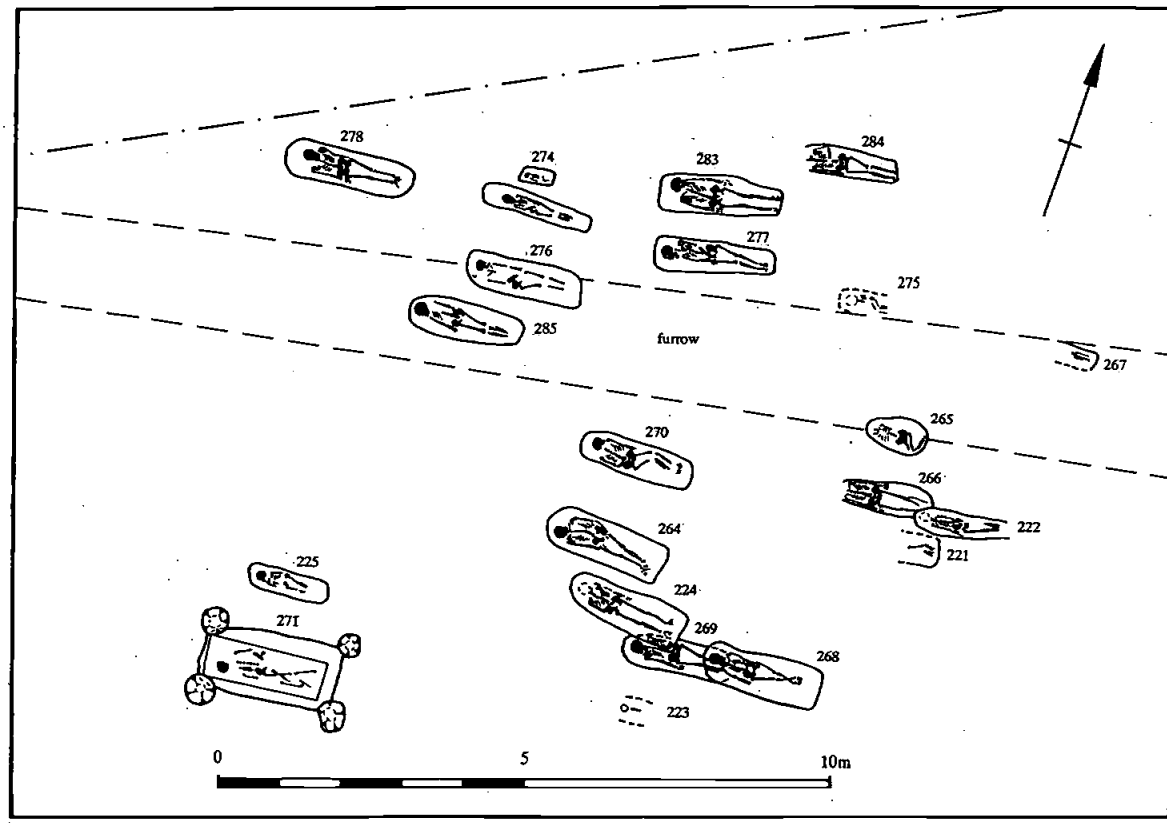

Fig 10 Great Houghton: The Saxon cemetery

Table 1: summary of burial characteristics

BURIAL	SEX	AGE (years)	STATURE	POSTURE	SPECIAL CHARACTERISTICS
NORTHERN GROUP					
278	female	Mature 50-60	1.636 (5′ 5.5″)	Supine	Broken jaw (?wife beating)
274	NA	new born	NA	Supine	
273	NA	8-10	NA	Supine	
272	NA	new born	NA	In grave 273	
276	male	young adult 22-27	NA	Supine, on R. side	
285	male	Adult 30-40	1.778 (5′ 10.25″)	Prone, but L. side raised	Un-united fracture of L. arm (fall or blow)
283	male	Young adult 23-28	1.770 (5′ 10″)	Supine	Fracture of L. clavicle (fall or blow)
277	male	Adult 30-35	1.696 (5′ 7″)	Supine	Fractures to skull and lower L. arm (assault with blunt instrument)
284	male	Young adult 20-25	1.663 (5′ 5.5″)	Supine	Possible fracture of R. humerus (fall or blow)
275	NA	Child 1	NA	Supine On R. side	
267	male	Grown			
MAUSOLEUM					
225	NA	Child 4-5	NA	Supine	
271	male	Adult 28-33	1.814 (5′ 11.5″)	Coffin and Mausoleum Supine but disarticulated	
SOUTHERN GROUP					
270	Female	Adult 30-35	1.654 (5′ 5.25″)	Supine, Iron pin R. shoulder	
264	male	Adult 30-40	1.686 (5′ 6.5″)	Supine	Broken nose (blow to front of face)
224	female	Adult 28-33	1.658 (5′ 5.5″)	Supine	
269	male	Mature 45-55	1.778 (5′ 10.25″)	Supine	
268	female	Mature 45-55	1.511 (4′ 11.5″)	Supine	Skull, three depression fractures (assault from behind)
223	Female	Grown		Supine	
SOUTH-EASTERN GROUP					
265	NA	Juvenile 14-16	NA	Supine, Legs flexed	
266	Male	Adult 35-45	1.688 (5′ 6.5″)	Supine	Fractures to R. wrist and hand
222	Male	Mature 45-55	1.792 (5′ 10.75″)	Supine Possible coffin	Hypoplastic hamulus (wrist) bone, same as Iron Age burial
221	Male	Grown		Supine	

THE GRAVES

The graves were all aligned W-E and all individuals had been buried with their heads to the west. Four burials had been heavily disturbed by ploughing and only partially survived, and parts of others had also been lost. It is therefore possible that further shallow burials may have been completely lost to ploughing, particularly in the area beneath the medieval furrow.

The graves were cut into limestone, apart from the eastern-most burial (267), which was on clay. They were typically steep-sided and flat-bottomed, and those containing adults measured from 1.90-2.14m long by 0.50-0.75m wide. They were typically 0.10-0.30m deep, although the infant burials and the partially lost adult burials were no more than 0.05m deep. The majority of the graves were parallel-sided, although some of the northern graves tapered towards the foot end. The foot ends were typically squared, while the head ends were either squared or rounded. The narrowness of the graves and the range of body postures suggest that they had not been buried in coffins, and no iron coffin nails were recovered. In a single grave (222) there were patches of charcoal in the fill above the burial. A more extensive spread of charcoal lay beneath the burial, with the wood grain aligned with the grave. This suggests that the burial had at least been lain on a board, and it may represent the former presence of a coffin.

The individuals had typically been laid supine and extended with their arms at their sides, although in some instances one or both arms had been flexed. One adult (270) had her legs slightly flexed, while a juvenile (265) had strongly flexed legs. A single inhumation had been laid prone, and was partly on its right side (285). It may be significant that this grave was also slightly out of line with the rest of the row to its north. Of the burials with fractures it was also the only example with an un-united arm fracture. This had probably occurred shortly before death, and it may therefore have been a hasty burial following a violent death.

THE MAUSOLEUM

A single burial had been interred more elaborately, burial (271) at the south-western corner of the cemetery (Fig 11 and Plate 6). The grave pit measured 2.25m by 1.15m, and was near vertical-sided, flat-bottomed, and 0.35m deep. The former presence of a coffin was denoted by a compact backfill of clean red clay containing some large cobbles, which was only present against the cut sides. Its steep inner face was associated with linear charcoal stains, and the central fill was of more mixed clays. This clean clay packing defined the coffin as having measured 1.90-1.96m long by 0.66-0.68m wide. No iron coffin nails were present.

The burial had been laid supine and extended, but had been partly disarticulated. The left arm, the right ribs and vertebrae, and the right leg and pelvis remained in-situ. All other bones had been displaced. The left tibia had been displaced but the patella was still in the correct relative position, indicating that at least some of the disarticulation had occurred before the soft tissues had fully decayed. The disarticulation may have been a result of the collapse of the coffin, but the extent to which some bones were displaced suggests that either animal disturbance, or even human disturbance, is the more likely option.

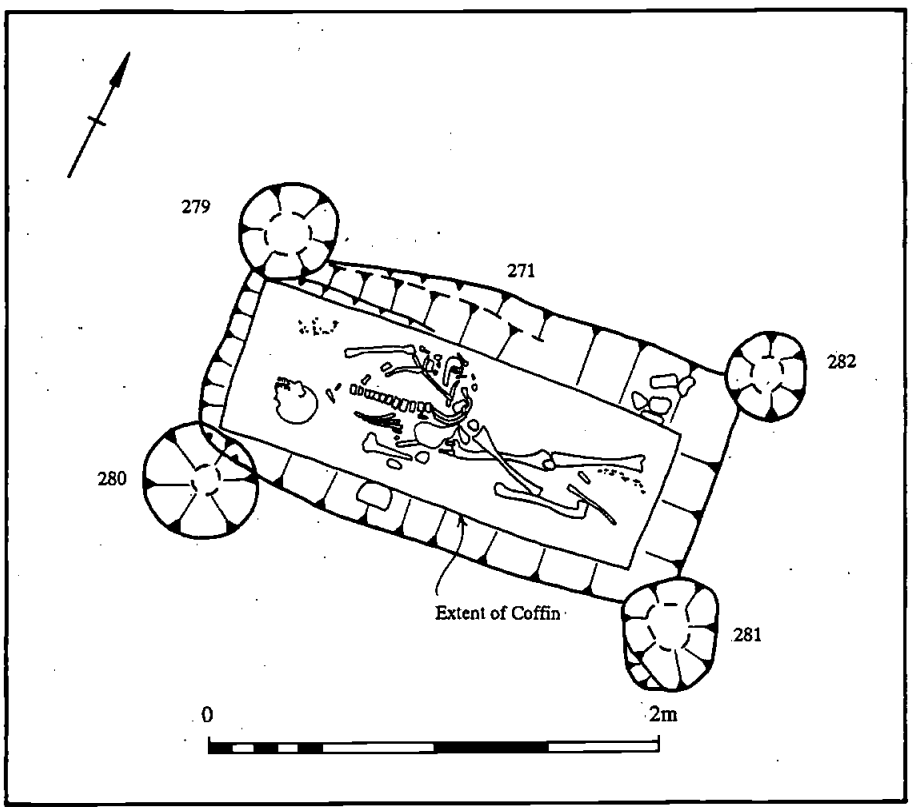

Fig 11 Great Houghton: Burial 271, with coffin and mausoleum

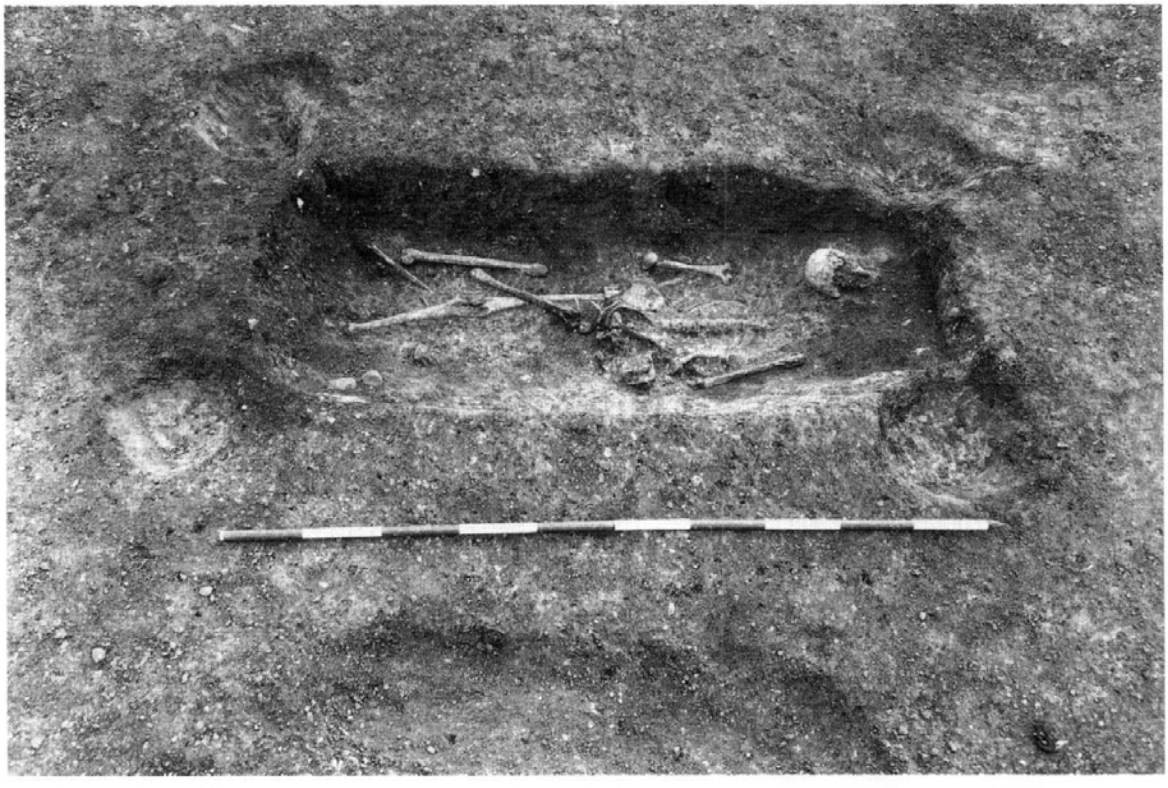

Plate 6 Great Houghton: Saxon burial 271, mausoleum

At each corner of the grave there was a circular pit (279-282), 0.40-0.50m in diameter by 0.15-0.20m deep with steep sides and rounded bottoms. They were filled with mixed clays containing some fragments of limestone and the occasional cobble. They impinged slightly onto the grave, indicating that they had been dug following its backfilling. They presumably held timber uprights, suggesting that an upstanding timber structure, a mausoleum, had surmounted the grave. The presence of such a structure might support the idea that the disarticulation of the skeleton could have resulted from human interference.

The individual buried here was also notable in a physical sense. He was a man standing 1.814m (5′ 11 ½″) tall, and certainly the tallest in a group of tall individuals. He was 28-33 years old when he died. He also had the most advanced example of osteophytes, involving most of the spine, with large outgrowths on the lumbar spine. This suggests that he had not led a life of leisure and inactivity.

THE ARRANGEMENT OF THE CEMETERY

There was very little intercutting of graves (Fig 10). The northern burials were neatly arranged in five rows, with the graves between 0.30m to 0.75m apart, although the eastern and westernmost rows contained only single burials. To the south-east the arrangement was less precise. To the east, burial (222) overlay the foot end of an adjacent grave (266), and, to the south, burials (224) and (268) overlay the head and foot ends of burial (269), but without any disturbance of the earlier burial which lay in a deeper grave.

The variations in the arrangement suggest the presence of four burial groups; a northern group, a south-eastern group, a southern group and the mausoleum.

Burial (271), in its coffin and with a probable timber mausoleum, was set well apart from the others at the south-western corner of the cemetery. With the exception of the adjacent child burial (225), which may perhaps have been a close relative, the nearest burials lay 4.0m away.

The distribution of burials contained some indication of segregation by sex and age. The northern and south-eastern groups were dominated by males, with just a single, elderly female burial at the westernmost end of the northern group. In contrast, the southern group contained all of the remaining four female burials and only two males. The male burials in the northern group were all young adults or adults, 20-40 years of age, while the southern and south-eastern groups contained adults and mature adults, 30-55 years of age. It is also notable that the infant and child burials were in the northern group, apart from the one buried adjacent to the mausoleum.

The cemetery also contained a high incidence of traumatic injuries, particularly skull and upper limb fractures, but there is no indication that the individuals who had suffered such injuries were buried preferentially in any one area, with the examples

occurring within both the northern and southern groups. It would be surprising if this was so, given that many of these injuries occurred many years before death.

One quarter of the available sample displayed metopic crania (adults with unfused cranial sutures). Three of these individuals (224, 268 and 269) were buried in close proximity to each other in the southern group, with the three graves overlapping. Such sutural variations have a genetic basis and this cluster of overlapping graves may therefore be a family group.

The outcome of this comparison is complicated, with the cemetery appearing to contain separate groupings that show variations in composition based on a combination of age, sex, family relationship and, given the presence of the mausoleum, also in terms of probable social status.

THE MEDIEVAL FIELD SYSTEM AND QUARRY PITS

The bases of the furrows of the medieval field system survived as shallow linear hollows typically 1.50-2.00 wide by up to 0.20m deep (Fig 3). At the east, they were spaced 8.5-9.0m apart, centre-to-centre, but on the hill slope to the west the interval increased to 10.0-11.0m. The furrows were aligned ENE-WSW, and ran near parallel to the eastern part of the pipeline trench and at an oblique angle to the hill slope.

At the western end of the area there were two groups of pits, which lay in the base of two adjacent lengths of furrow (Fig 4). They typically comprised square to rectangular pits of regular shape and arranged in rows, three in the northern group and two in the southern, aligned with the furrows and with the rectangular pits elongated in the same direction. The southern group was 20m in length. The pits were typically 1.50-2.50m long by 1.00-1.50m wide, with near vertical sides and flat-bottoms, and consistently 0.80-0.90m deep. Some oval pits in the same area were shallower, c. 0.35m deep.

The pits were cut into a band of mixed white to light brown natural sandy clays, and were filled with compact yellow-brown clay with sparse pebble inclusions. There were very few finds, but a few sherds of pottery indicated that they were of 13th-14th century date.

The function of these pits is unclear. They must have been excavated within the open fields, and were deliberately located within the furrows. They were most probably excavated as clay or marl pits.

THE FINDS

THE IRON AGE POTTERY
by Dennis Jackson

INTRODUCTION

A total of 1524 sherds (17.33kg) of Iron Age pottery was recovered from the excavated features within the pipeline corridor, including 90 fragments too small to include in the fabric analysis. Two broad pottery phases can be recognised (Phases 1 and 2) and these can be related to Knight's early period (IA1) and mid to late phase (IA2) (Knight 1984).

FABRICS

Almost all the pottery includes some shell in its fabric and is, in this respect, typical of many of the ceramic assemblages from north Northants and the Nene valley. Although the pottery has been divided into fabric types the difference between the various fabric groups below (i.e. Fabrics 1 and 3 and Fabrics 2 and 3) is to some extent approximate.

Fabric	Fabric description	Percentage of assemblage
1.	Includes large shell particles up to 8mm in diameter	5.5%
2.	Shell fine to moderate	54.5%
3.	Shell of moderate size and density	17.0%
4.	Shell dense, and perhaps pounded	5.5%
5.	Inclusions, including shell, sparse or absent	3.0%
6.	Shell with ironstone or sandstone	7.5%
7.	Limestone the dominant inclusion	2.0%
8.	Quartz and ironstone the dominant inclusion	4.5%

The only variation between the fabric types in each phase occurs with Fabrics 1 and 4 (including large or dense shell particles). These two fabrics combined are found in 26% of the sherds from the earlier features, but only 8% of the later pottery. A greater density of shell occurs amongst other early or early-middle Iron Age assemblages in the region, and in particular on an extensive site at Wilby, near Wellingborough, (Blinkhorn and Jackson 1998)

Fabric 8 is unusual. Quartz is not a dominant inclusion in local Iron Age pottery and Fabric 8 came largely from fragments of one vessel, found in one feature (context 104, a gully in the central pit and posthole complex). Large limestone grits also occurred in some sherds (Fabric 7), but there are no recognisable inclusions in the pottery that could not have been obtained locally.

The percentage of shell differs to that in the assemblage from the Iron Age hillfort at Hunsbury, which is sited some three miles to the south-west (D Jackson pers com). Shell is a common temper at Great Houghton, but with some 46% of the pottery from Hunsbury the dominant inclusion is ironstone, or other stone grits. Both ironstone and fossil shell would have been obtainable locally, but the latter seems to have been used as a preference.

FORMS

Only 12 sherds in the assemblage had derived from vessel walls in excess of 10mm in thickness, and these all came from Phase 2 features. It seems likely therefore, that in the early phase at least, large jars were either uncommon or were thin walled.

With much of the pottery, too little of the vessel profile survives to assess their forms, and many rims are plain. Five vessel forms dating to Phase 2 are, however, complete or sufficiently complete to assess their forms. They comprise a small bowl (Fig 13, 6), a small slack shouldered bowl or jar (7), a slack sided bowl (8), and two jars, including one with a handle (9 and 10). In common with most local Iron Age pottery the majority of bowls are probably in Fabric 2, although the percentage of fine dark wares is low.

DECORATION AND SCORING

Fingernail or fingertip decoration on the rims is not common and there are only four examples amongst the 66 rim sherds found on the site. Finger decoration also occurs on four body sherds and

there is a single sherd with linear ornament. Body decoration occurs mainly on sherds from the early features on the site, whereas rim ornamentation occurs in later contexts. Sherds from a vessel decorated in the La Tene curvilinear style were found in a late context (203, a cluster of burnt stones near the "working hollow").

The percentage of true scored ware, as opposed to light scratching or brushing, is low and occurred mainly in one feature (context 199, a group of intercut pits in the western enclosure). Only eight other scored ware sherds occur in the assemblage. The sherds from context 199 form a primary group comprising a small bowl and four large jars (Fig 13, 6, 9 and 11-13), and it is possible that the jars were brought to the site as containers. Virtually all the scored ware at Rothersthorpe, an Iron Age site south-west of Hunsbury, was found in one context and these too came from large jars (Jackson forthcoming).

SURFACE FINISH AND HARDNESS

The majority of the sherds have smooth external surfaces and are not excessively hard or soft. Very few vessels retain evidence of burnishing, and only nine sherds have a noticeably rough, coarse or very uneven surface. The latter sherds are not confined to a particular phase.

POTTERY CHRONOLOGY

Phase 1 (IA.1)
Pottery associated with the early Iron Age period includes bioconical carinated vessels and vessels with ornamentation on the body of the pot in the form of fingernail and fingertip impressions, and Knights Style 5 decoration (Knight, *op cit*, 23-25). Long necked vessels are also typical of the early Iron Age, and on this site sherds containing profuse shell (Fabric 4), or with contrasting surface colours (light oxidised external surfaces and black or dark grey internal surfaces), are both found in association with the other early types (Fig 12, 1-4).

It is likely that some of the Phase 1 material is residual, but the following contexts contain several of the diagnostically early elements and can confidently be assigned to this phase:

Contexts 235, 237, 240 & 254
There is no later pottery in Contexts 227-245 and 254 and this group of features can be assigned to this phase.

Contexts 180, 186 and 200, pits within western enclosure
The amount of pottery from these features is small but contains no later material. The upper layers of the adjacent enclosure ditch (Context 178) and other pits in the same area (Context 199) contain later scored wares and the relationship between the enclosure and the early pits and postholes is uncertain.

Context 295, 38 & 104, the eastern enclosure ditch and the central pit and posthole complex
The earliest phase of the eastern enclosure ditch (295) contains Phase 1 pottery and also a little lightly scored material. This may suggest the feature dates to the end of this period. Context 38 is a small pit situated just north of the enclosure ditch. Context 104, a curving gully in the central pit and posthole complex, contained pottery in an unusual fabric for the site (Fabric 8), and the single rim sherd is of early type.

Other contexts
Contexts other than those listed above that include sherds in Fabric 4 or have early colouring characteristics include the following:

Contexts 26 & 31 from the eastern roundhouse; Contexts 125, 168 and 175 from the central pit and posthole complex; and 193 and 198 from pits cut by the western enclosure ditch.

Phase 1 pottery from Contexts 178 and 194, the western enclosure ditch; and 203 and 218, pits close to the "working hollow"; and from Context 42, the ditch terminal of the eastern enclosure, include early types. However, these assemblages all include sherds of Phase 2 type.

Phase 2 (Middle Iron Age)
Phase 2 pottery is defined by scored ware and vessels with shorter necks. When viewing the assemblage as a whole the sherds tend to be darker in colour, harder and thicker walled. Middle Iron Age features that contain diagnostic rim sherds can be divided into two phases, Phase 2A and Phase 2B.

Phase 2A
Rim profiles in the middle Iron Age tend to vary from site to site, and there are many types that can occur throughout the Iron Age period (Knights Group 3, *op cit*, 41). Contexts that contain rim sherds assigned to Phase 2A include the following:

Context 194, the western enclosure ditch; Context 197 and 199, pits within the western enclosure; and Contexts 204 and 218 associated with the "working hollow".

Phase 2B
Vessels with mainly globular profiles and short stubby rims generally date to the later middle Iron Age. Contexts containing rim sherds of this type are:

Contexts 03, 14, 15 associated with the eastern enclosure; 114 in the central pit group; and 203 and 215 in the pit group and "working hollow" area. The single example of pottery decorated in the curvilinear style (Contexts 203) should date to this period.

Phase 3 (Late pre-Roman Iron Age)
A sherd of "Belgic" pottery as well as hard wares which probably date to this phase were found in the terminals of the eastern enclosure ditch, along with residual phase 1 material (Contexts 42 and 43). This may suggest the ditch was still partially open in this phase.

DATING

It is not possible to assign the Phase 1 pottery to a date within the early Iron Age period. It can perhaps be compared to pottery from eastern England and the south Midlands (Cunliffe 1991, A:10), and dated to the 5th-3rd centuries BC. A date around the late 4th and early 3rd centuries for the end of this period is supported by radiocarbon dates from Gretton (Jackson and Knight 1985) and Twywell (Jackson 1975), but the beginning of this phase is uncertain.

Middle Iron Age pottery probably came into general use in the 3rd century BC and continued until the introduction of Phase 3, "Belgic" pottery. The pottery assigned to Phase 2B above dates to the latter half of this period.

Pit 180
Pit 180, which contained the human burial, also produced the highest proportion of Phase 1 pottery, although much of this came

from the lower fills beneath the burial. The radiocarbon date for the burial is centred on 400BC (cal BC 405-370 at 1 sigma, cal BC 505-205 at 2 sigma, Beta 116571). It may be significant that the pits containing both human and animal burials at Twywell (Jackson *op cit*) are dated to an early phase of the site (3rd or early 4th centuries BC).

POTTERY DISTRIBUTION

The distribution of the pottery provides possible evidence of settlement drift.

At the western limit of Iron Age settlement there is a series of features containing Phase 1 pottery (the western pits). The pits and "working hollow" area and the western enclosure have features containing pottery dating to Phases 2A and 2B, as well as features dating to Phase 1.

The eastern enclosure probably came into use at the end of Phase 1 and continued into Phase 2 and the enclosure ditch was only finally filled in phase 3. Further to the east, the roundhouse ring ditch contained pottery dating to Phase 2B.

CATALOGUE OF ILLUSTRATED POTTERY

Phase 1 (Fig 12)

1 Jar or bowl, flattened upright rim, smoothed surfaces. Fabric 4, reduced, grey-black core and inner surface, oxidised outer surface. Context 200, western enclosure.

2 Bowl?, everted rim, poorly potted, with uneven rim and coarse surfaces. Fabric 3, grey-black core, inner surface mottled grey-black to orange, outer surface oxidised light brown to orange-brown. Context 38, post hole, eastern enclosure.

3 Bowl?, everted rim, fine ware, well smoothed surfaces. Fabric 2, grey-black core and inner surface outer surface largely grey, some patches of orange oxidation on rim. Context 295, early ditch, eastern enclosure.

4 Shouldered bowl. Fabric 6, grey black core, inner surface mottled grey-black to orange, outer surface orange-brown. Context 237, western pits.

5 Bowl. Fabric 6, orange to yellow-orange core and inner and outer surfaces. Context 237, western pits.

Phase 2 (Fig 13)

6 Bowl, near upright rim, well smoothed neck, lower body crazed and outer surface of base lost. Fabric 2, grey-black, core, inner surface and neck of outer surface, body mottled grey-black to brown. Context 199, pit group, western enclosure.

7 Bowl or small jar, upright, flat-topped rim, uneven surfaces, flat base. Fabric 2, grey-black core, inner surface and neck, body orange-brown, base and lower body grey-brown. Context 204, pit group and "working hollow".

8 Bowl, upright rim, flat base. Fabric 3, grey core, inner and outer surfaces mottled grey to orange-brown. Context 03, rectilinear structure, eastern enclosure.

9 Shouldered jar, upright rim. Applied handle/lug. Fabric 2, grey-black core and inner surface, outer surface mottled light to dark grey. Context 199, pit group, western enclosure.

10 Large, slack-shouldered jar, upright rim. Poorly finished with coarse, uneven surfaces. Fabric 3, grey-black core, and inner and outer surfaces, orange-brown on top and inner edge of rim. Context 197, post hole, western enclosure.

11 Large scored ware jar, flat base. Decorated with very deeply incised, well executed scoring in two oblique alignments, terminating in V-shapes on the lower body. Fabric 6, dark red-grey core and inner surface, orange to dark red outer surface. Context 199, pit group, western enclosure.

12 Large scored ware jar, flat base. Decorated with deeply incised scoring, crudely executed in a criss-cross design of roughly vertical and horizontal lines. Fabric 3,

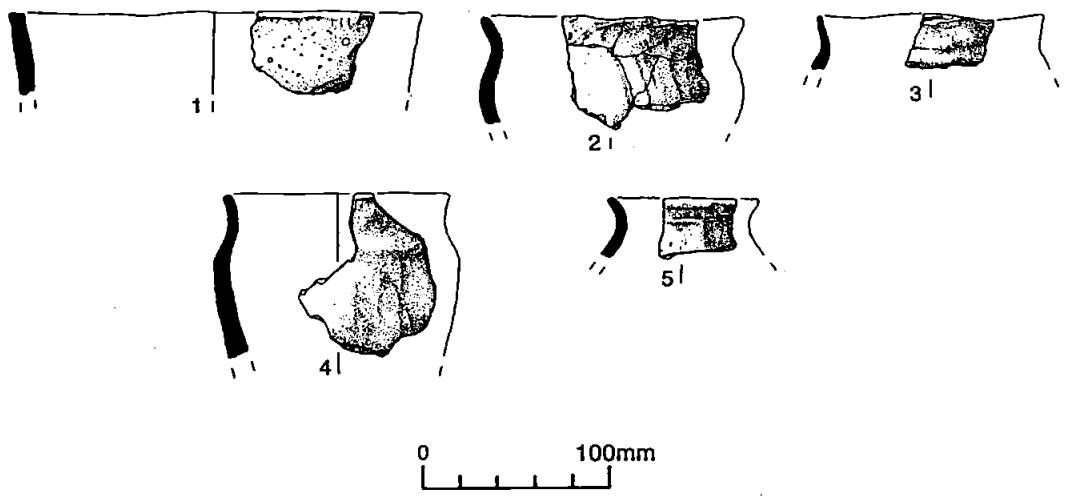

Fig 12 Great Houghton: The Iron Age pottery, Phase 1, early Iron Age

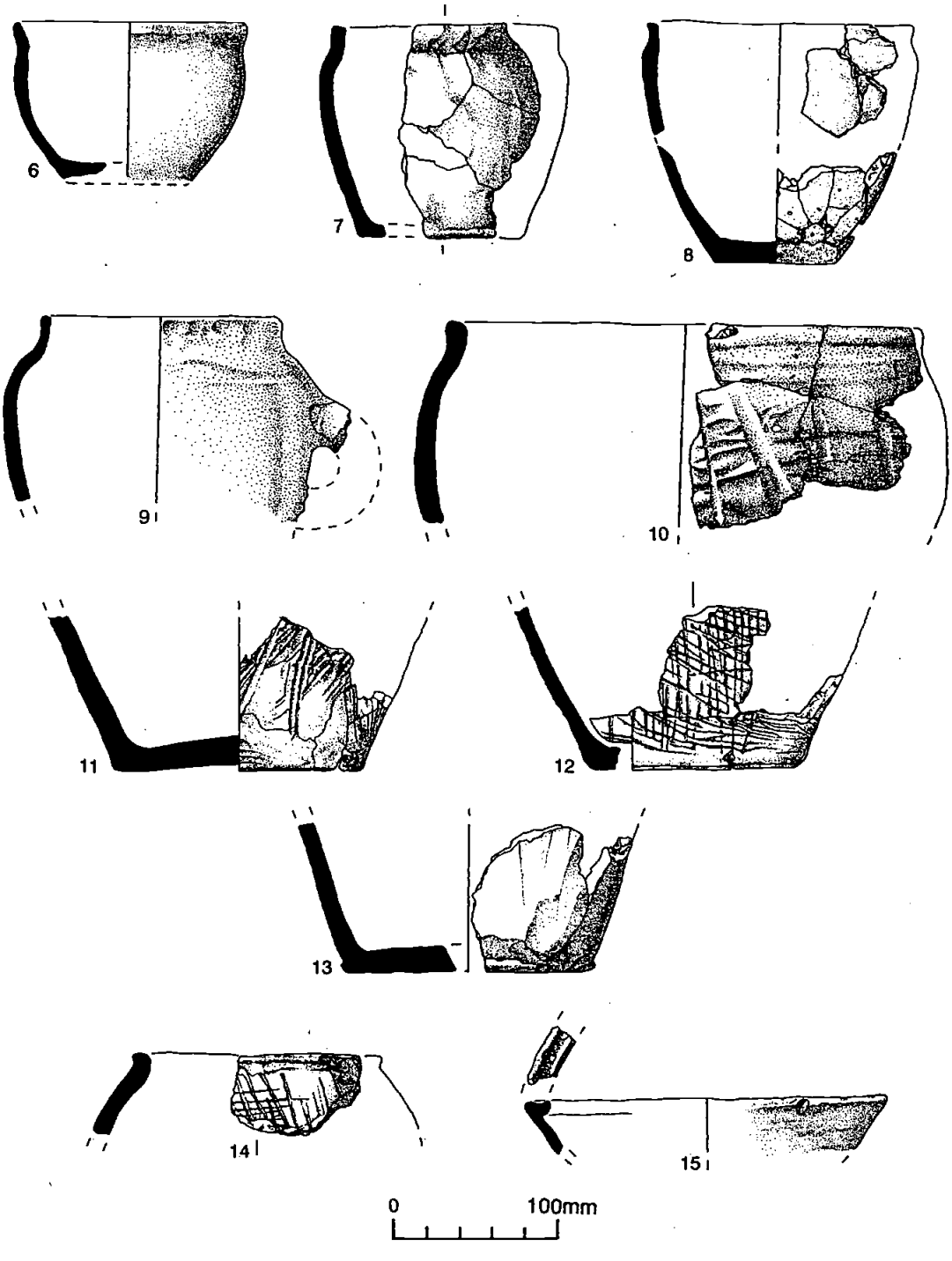

Fig 13 Great Houghton: The Iron Age pottery: Phase 2, middle Iron Age

grey-black core, grey to grey-brown inner surface and mottled orange, brown to grey outer surface. Context 199, pit group, western enclosure.

13 Large plain jar, flat base. Fabric 3, grey-black core, mottled light brown to dark grey inner and outer surfaces. Context 199, pit group, western enclosure.

14 Globular scored ware jar, flattened rim. Decorated with shallowly incised scoring, oblique and horizontal. Fabric 5, grey-black core, dark red-grey inner surface, orange to dark grey outer surface. Context 14, roundhouse ditch, eastern enclosure.

15 Inturned rim bowl. Decorated with finger impressions along top of rim. Fabric 1, grey core and inner surface, orange-brown outer surface. Context 42, eastern enclosure ditch.

THE IRON AGE TORC OR NECK RING
by Andy Chapman

The lead alloy torc or neck ring was recovered in association with a crouched inhumation burial (Small Find (SF) 3, F180, western enclosure). It was cleaned by Rolly Read, then Antiquities Conservator for Leicester Museums, and its metallurgical composition was determined qualitatively by X-ray fluorescence (XRF), carried out under air. It was shown to comprise a lead-tin alloy, with more lead than tin but with a high tin content, and with traces of zinc, copper and iron. Following cleaning the metal was a dull silver grey colour.

Both arms are fashioned from twisted, square-sectioned rods, measuring 9-10mm square. In both arms the final 50mm are of circular section and for the final 35mm they expand gradually to a diameter of 15mm (Fig 14). The ends of the terminals are flattened. The opposed terminals are more crudely fashioned, and they are respectively perforated and notched, presumably to retain a binding that has not survived. The arm with the perforated terminal is 225mm long, while the notched arm is 10mm shorter, at 215mm long. The perforation is 3mm in diameter and lies off-centre. The hole has a slightly squared shape and this, together with the outward distortion of the thinner edge suggests that the hole was punched, rather than drilled. The perforation lies 16mm from the terminal. The opposed terminal has two knife-cut, V-shaped notches on its inner face set 6mm apart and respectively 12mm and 6mm from

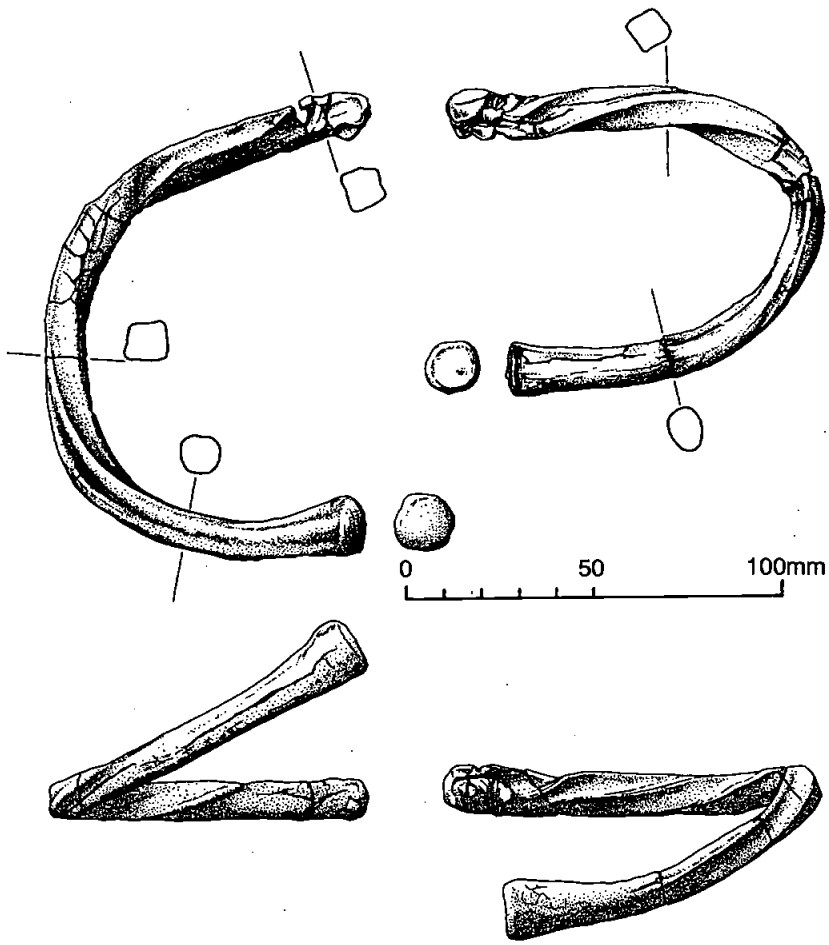

Fig 14 Great Houghton: The torc or neck ring

the terminal. The inner and more deeply incised notch is 3mm deep, with two separate cuts evident in the base. The outer notch is 2mm deep. In both notches the inner face is inclined at c45° while the outer slope is much steeper, at c 70-80, presumably to more effectively stop the binding material from slipping. As found, the perforated and notched ends lay some 40mm apart. This indicates that the original binding had been with some organic material and that the ends had been displaced following its decay.

On both arms the surfaces are crazed with numerous transverse and longitudinal cracks, and both have been fractured in two places. From the disposition of the torc in the ground it was clear that the cracking and fracturing had resulted from pressure from the clay fills. The arm with the notched terminal had lain near vertically in the ground and had therefore been subject to greater pressure, and had been distorted out of shape before it cracked. It had fractured at the mid-point, where most of the distortion had occurred, and towards the expanded terminal. The arm with the perforated terminal was also fractured in two places, with one fracture occurring at the weak point of the terminal perforation, but otherwise it appears to have more closely retained its original shape.

As part of the filming of a television documentary study of the Iron Age burial, David Freeman was commissioned by Electric Sky TV to manufacture a replica of the lead torc. This process has provided significant insights into the probable means of manufacturing. The replica was cast in one piece within a square-sectioned mould cut as a linear trough within a length of wood. After a short period of cooling, the single piece lead rod was twisted while being held firmly at either end. This produced an even twisted along some half to two-thirds of the length, with the remainder being twisted further in shorter lengths to produce a consistent twist along the entire length of the rod. Almost immediately the rod was then bent into a curve. During this process a weakness developed near to the mid-point, and it eventually fractured.

David Freeman has suggested that given the stresses introduced by the two processes of twisting and bending it is likely that the majority of attempts to produce such a lead torc would probably result in a near mid-point fracture, during either manufacture or subsequent use. The crudely knife-trimmed terminals, the perforation and the knife-cut notches may therefore be seen as a hasty repair carried out to make the broken single-piece torc wearable as a two-piece torc. There is no evidence to indicate whether this repair was carried out immediately after manufacturing or following a period of use. It is therefore uncertain whether the torc was manufactured specifically to accompany the burial or was an object that had been worn before death, although perhaps the crude knife trimming of the terminals may be more in keeping with the object being prepared, perhaps hastily, to accompany the burial.

The only known parallel for this object is a piece recovered by Thomas Bateman in 1844. It has been brought to my attention by Pauline Beswick, who has provided the following references. It is held in the Bateman Collection in Sheffield Museum and is catalogued as follows (Howarth 1899, 189): "**2 pieces of lead** – which have apparently formed a collar, thick with square face. 6 ¾ in. diameter. Found in a field called 'the Boroughs', near Wetton, Staffordshire, April 1844 J.93.586 [G.64]".

It is further described by Bateman (1861, 193) as, "a curious article made of two semi-circular bars of lead, each perforated at both ends, as if intended for a collar, meant to be tied together when round the neck". Unfortunately, the context of the find is uncertain. This object has not been examined by the writer, so it is not possible to provide any more detailed comparison of the two objects.

OTHER FINDS

THE NEOLITHIC STONE AXE
by Andy Chapman

A fragment from the butt end of a polished stone axe, measuring 78mm x 50mm x 25mm, was recovered from the exposed surface of the natural clays following machine stripping of the topsoil and subsoil (Fig 15, Small find (SF) 2, U/S). Visual examination indicates that it is a fine-grained green-grey stone, which appears to be an epidotised tuff (Group VI), which has its principal source in the central fells of the Lake District, Cumbria. Parts of polished surfaces on both faces and edges survive, and it displays the sharp edge-facets typical of many axes of this group. Group VI axes have been recovered from other sites in the Northampton area, and they dominated the small group recovered from the causewayed enclosure at Briar Hill, Northampton (Bamford 1985, 92, fig 46).

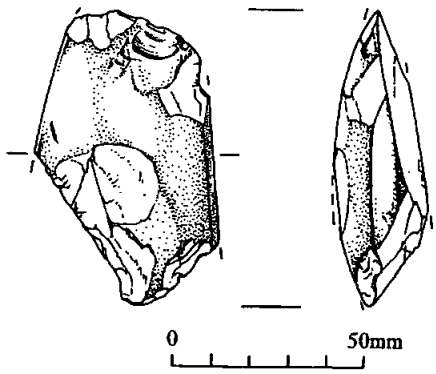

Fig 15 Great Houghton: The Neolithic polished stone axe

METAL OBJECTS
by Tora Hylton

A copper alloy rod fragment, 15mm in length, was retrieved from an Iron Age enclosure ditch (SF 4, Context 194, eastern enclosure). Although incomplete, it is possible that it is a fragment from a bracelet. It is of circular section, and one side is decorated with a series of equidistant, transverse grooves. It still retains a good patina.

The only artefact recovered from the 7th century cemetery was an iron pin found at the shoulder of an inhumation burial, identified as a female (SF 5, Burial 270). It comprises a circular sectioned shaft, with a surviving length of 50mm, surmounted by a globular head, 7mm in diameter, and is encrusted in corrosion products. Pins are common artefacts in Anglo-Saxon graves, up to 21 iron pins were located in graves at Buckland Anglo-Saxon

cemetery, Dover, Kent (Evison, 1987), where it was noted that the majority were found with female burials and were positioned close to the neck, like the Brackmills example. Evison postulated that they were used to secure a headscarf, or possibly a shroud (Ibid 82).

Other metal finds from the site comprise iron nails, fragments of copper alloy fittings and lead scrap (SFs 6 and 7) recovered from the fills of the medieval furrows as a result of metal detector scanning.

SLAG
by Andy Chapman

A total of 2.79kg of slags were recovered. This comprises 2.57kg of fuel ash slag, with its typical white to blue grey colour and low density due to its highly vesicular character. It varied from small fragments up to complete pieces 100-150mm in diameter. In addition there was 0.22kg of iron slag from part of a single smithing hearth bottom. This piece was sub-square in plan, measuring 65-70mm and 18mm thick, with a characteristic convex lower surface and concave upper surface.

The majority of the fuel ash slags (a total of 1.95kg) and the hearth bottom, came from the ditch terminals of the eastern enclosure (42 and 43). Most came from the upper secondary and final fills, but the earlier southern terminal (294) contained 0.53kg, indicating that the creation of the fuel ash slag was occurring during the lifetime of the settlement and not merely in a final phase of destruction and ditch filling at abandonment. The single smithing hearth bottom indicates that some iron smithing was practised on the site, at least in its later use.

Smaller quantities of fuel ash slag were recovered from the linear gully at the eastern limit of the settlement (3, 0.18kg), and from the ditches and one pit of the western enclosure (194, 0.12kg and 199, 0.28kg).

THE ANIMAL BONE
by Karen Deighton

INTRODUCTION

A small assemblage of 1180 bones/fragments (weighing 12.27kg) from contexts of Iron Age date was analysed to determine species present, body part representation, and state of preservation and evidence of butchery. The majority of the contexts containing bone were individual pits and postholes, which typically produced small quantities of fragmented bone. The only larger groups were from the ditch of the western enclosure (2.30kg), the ditch terminals of the eastern enclosure (4.29kg) and the adjacent roundhouse ring ditch (1.27kg).

METHOD

The bone fragments were separated into identifiable elements according to selected anatomical units (Table 2). Unidentified fragments and those not belonging to the selected anatomical units were counted and noted, as were ribs and vertebrae, but they are not included in the quantification. Identification of body parts follows Schmid (1972).

Recording follows Halstead after Watson (1979) and uses Minimum Anatomical Unit (Min A.U.), Tables 3 and 4. Long bones are held to have a proximal and a distal end, which are recorded separately. Distinctions are made between right and left. Fresh breaks were repaired and where more than one fragment appeared to belong to the same element the one with the most information was recorded, to avoid over recording.

To control for differences between species for numbers of footbones, lateral metapodials and phalanges of pig were discarded and second and third metapodials were paired where possible and only one of each pair was recorded. The following information was recorded for each element: context, anatomical unit, species, proximal fusion, distal fusion, modification (gnawing and burning), butchery and fragmentation. Fusion for dogs is after Silver (1969), ageing of sheep mandibles is after Payne (1973), and cattle ageing follows Halstead (1985) after Payne (1973). Identification of gnawing and butchery follows Binford (1981). Pathologies are described after Baker and Brothwell (1980).

PRESERVATION

In general, the bones were well preserved. There was little evidence of surface weathering, and this allows for the detection of evidence for butchery. Canid gnawing was fairly high, at 26.8%, and this would introduce preservation biases against the smaller elements (e.g. phalanges) of the smaller species (Payne 1985). Fragmentation was very common, with 87.7% of the assemblage exhibiting old breaks. A small amount of evidence for burning was observed. However, at only 1.1% of the assemblage this was obviously too small to detect any patterning.

RESULTS

The frequency of species for the whole site and for the larger groups of contexts are presented in Tables 2-5, and are summarised by site areas.

The western pit group
Only 21 elements were identifiable to species level. These represented cow, sheep/goat and pig. A near complete horse scapula was also present. A further 8 elements were assigned to the broader categories of cow/red deer and Sheep/goat/ roe deer.

The pit group and working hollow
Three of the circular pits produced bone, but two contained very little. Pit 209 contained a dog burial. This was not included in the quantification, as it would have biased the frequency of species. The epiphyses of all the long bones were fused and all the permanent teeth were present with the molars just in wear. This indicates that it was a young adult animal of at least eighteen months, and it was of medium size. Two pathologies were noted. The fourth and fifth metacarpals were fused together and the second mandibular premolar was absent, this was possibly a congenital abnormality.

The western enclosure
Bone was recovered from both the pits and the enclosure ditch. The ditch would probably have produced larger quantities of material if the terminals at the entrance had been available for excavation.

The central pit and posthole complex
This complex of shallow pits and postholes contained only 21 elements identifiable to species level as cow, sheep/goat and pig. In addition, there were 11 ribs and 27 indeterminate fragments.

Table 2: Frequency of species

Element	Horse	Cow	Pig	Sheep/ Goat	Sheep/goat/ roe deer	Cow/ red deer	Deer
Scapula	3	4	1	4		1	
P.Hum		22	1	5	3	2	
D.Hum		24	4	8	3	1	
P.Rad	1	17		16	8		
D.Rad	1	17		16	8		
Prox M.C.		7		2	2		
Dist M.C.		7		2	2		
Pelvis		8	1	2			
P.Fem		6	3	6	4	1	
D.Fem		4	6	6	4		
P.Tib	1	15	1	12	18	1	
D.Tib		15	1	11	15	1	
Prox.M.T.		8	2	9	5	2	2
Dist M.T.	1	7	1	8	5	2	2
Ulna		6	1				1
Prox.M.P.		6		6	1	1	
Dist.M.P.		5		6	1	1	
Calcan.	2	6					
Astrag				1			
Ph.1		2		5			
Ph.2		1		1			
Ph.3		1	1				1
Axis		1					
Atlas		1					
Mand.		4	2	9		1	
Tooth	2	26	6	16			
Horn		5		1			2
Total	***11***	***225***	***31***	***152***	***79***	***14***	***8***
%	***2.1***	***43.3***	***5.9***	***29.3***	***15.2***	***2.7***	***1.5***

Table 3: Frequency of species in the western enclosure

Horse	Cow	Sheep/goat	Pig	Deer	Cow/ red deer	Sheep/goat/Roe deer
2	63	35	7	6	5	34

Table 4: Frequency of species in the eastern enclosure complex

	Horse	Cow	Sheep/goat	Pig	Deer	Cow/ Red deer	Sheep/goat/ Roe deer
Round house	3	24	17	3	1	3	7
Pits	1	1	5	1			
Enclosure ditch	4	81	85	15		2	25

The eastern enclosure complex

The majority of the material came from the upper secondary and final fills of the two terminals of the enclosure ditch, with a further quantity coming from the roundhouse ring ditch.

AGING AND PATHOLOGY

Only nine mandibles could be assigned to tooth wear stages:

From the western enclosure; a Sheep/goat mandible of an animal of 1-2 years.

Table 5: Neonates by context

Area/Context	Species	Element	Number
Western enclosure			
Ditch 178	cow	Metacarpal	1
Posthole 183	cow	Metapodial	1
Pit 193	cow	Metacarpal	1
Eastern enclosure			
Roundhouse, gully 26	cow	Radius	1
Enclosure ditch 42/2	cow	Humerus	1
Enclosure ditch 42/3	cow	Femur	1
Enclosure ditch 295	cow	Radius	1
Enclosure ditch 295	pig	Femur	1

From the eastern enclosure complex; 2 cow mandibles of 8-18 months, a cow mandible of 18-30 months, 1 Sheep/goat mandible of 6-12 months, two of 1-2 years, one of 2-3years and one of 4-6 years.

The presence of neonates is summarised in Table 5.

Two pathologies were noted, a cow pelvis with eburnation in the acetabulum socket (from the western enclosure), and a cow distal humerus with heavy grooves on the articulation (from the eastern enclosure).

CONCLUSIONS

The assemblage is largely derived from domestic animals, with the addition of a few deer (two antler fragments suggest these were possibly red deer). A dominance of cow can be seen followed by sheep/goat and finally pig. From the relative proportions of species it seems reasonable to assume that elements recorded as sheep/goat/roe deer are probably sheep/goat and those recorded as cow/red deer are probably cow.

Evidence for butchery is moderate at 15.6% of identifiable fragments. Butchery is mostly suggestive of dismembering, although evidence for chopping, filleting and possibly skinning is also present. Butchery concentrates on the humerus for all species, but no evidence for butchery was detected on horse remains. The assemblage is too small for in depth analysis of body part representation, however, a dominance of humerus, radius and tibia can be seen for all species, which could suggest that they represent waste from food preparation and consumption rather than butchery waste. The concentration of bones in the upper fills at the ditch terminals of the eastern enclosure, together with the associated pottery, suggests that it was used for waste disposal.

The composition of the assemblage, with the dominance of cow followed by sheep/goat and then pig, indicates that the site economy was dominated by the exploitation of these domestic species. In addition, there is a smaller quantity of horse while dog is represented by a single pit burial. However, limited exploitation of none domestic species is indicated by small quantities of red deer, although some this probably comprises the use of antler for craft manufacturing.

The site shows the same range of species within the same range of percentages as those in Robinson and Wilson's (1983) overview of animal husbandry during the Iron Age in the south Midlands.

THE HUMAN SKELETONS
by Trevor Anderson MA

INTRODUCTION

One Iron Age pit burial and twenty-three inhumations from a cemetery were examined. The following text provides a full description of the Iron Age burial and a summary of the cemetery burials. The full description, discussion, and bibliography is presented as Appendix 1, and the related tables of measurements, photographs and radiographs, and the primary record of the individual skeletons will be deposited in the site archive. A number of case studies have been separately reported in the Journal of Palaeopathology (Anderson 1997, 1998a, 1998b).

I would like to thank Natascha Gibson, archaeological student, for her voluntary help with the recording of the skeletal remains, Adrian Murphy, Canterbury Archaeological Trust, for developing the black and white photographs, and Stuart Capel B.Sc. D.C.R. C.T.Cert. S.R.R., Senior lecturer in Diagnostic Radiography, for providing the radiographs, and Dr Adrian Carter F.R.C.P., consultant radiologist, for his useful comments and discussion of the radiographs.

THE IRON AGE SKELETON, 180

The skeleton is practically complete with even the smallest hand and feet bones present. The skull, pelvis, ribs and long bones had been broken while in the ground. However, most of the fragmented bones were repairable. Although the mandible is robust and the mastoid processes large, the remains are female aged 30-40 years. Stature was assessed as 1.563m (5′ 1¾″) (Trotter & Gleser 1958).

Detailed metric analysis is included in the archive. The upper femoral shafts display antero-posterior flattening. This finding, platymeria, is known to be more frequent in earlier, pre-industrial societies. The aetiology of the flattening is still poorly understood. It could be related to mineral or vitamin deficiencies (Buxton 1938) or it may be a response to mechanical adaptation and increased muscular stresses. The fact that extreme flattening is associated with a laterally placed gluteal ridge favours a mechanical interpretation (Schofield 1959).

Two cranial non-metrics, metopism and an asterionic ossicle

are thought to contain a high genetic component (Hauser & de Stefano 1989: 197; Torgersen 1951a). The heritability of the other cranial variants present, including mastoid foramen exsutural and zygomatic facial foramen absence, is uncertain. The only post-cranial non-metric was bilateral squatting facets on the distal tibiae. Such facets are well known in earlier populations. At Iron Age Deal three-quarters of the sample displayed squatting facets (Anderson 1995a). There is evidence that the facets are more frequent in females (Anderson 1995a). Activities which entail prolonged kneeling such as hide preparation and grinding corn may lead to facet formation.

The left hamate (a wrist bone) is considered to display a rare anatomical variation. When compared to the right side, the bone can be seen to possess a much reduced hook (hamulus). The surface of the hamulus is perfectly smooth and normal, however it is only 2.5mm long. Radiographic examination shows that internally both hamates are identical. Differential diagnosis would need to include un-united fracture of the hamulus and an anatomical variant, *os hamulus proprium*, in which the hook is an unfused separate element.

Although the unilateral nature of the condition supports a mechanical interpretation there is no evidence of external porosity or decreased internal density as noted in the only published case of archaeological hamulus fracture (Wakely & Young 1995). In clinical practice, fracture of the hamulus is an extremely rare injury, up to 1989 less than a hundred cases were known (Gupta *et al* 1989). The hamulus may fracture due to a fall or a crushing injury (Stark *et al* 1989). However, over 90% of cases are the result of injury while playing sport: mainly basketball and also golf and tennis (Stark *et al* 1989).

The appearance of the bone does not support a diagnosis of *os hamuli proprium*. In this condition, the junction of the hamate and the unfused hook would present with a smooth porosity, similar to that seen in other unfused ossicles (emarginate patella; os trigonum; calcaneus secundarius). The evidence suggests that we are dealing with a unilateral presentation of an anatomical variant, hypoplasia of the hamulus. Due to its asymptomatic nature very few clinical cases are known (Höcker 1994; Seeger, Bassett, Gold 1988). However, detailed radiographic investigation has shown that the condition may occur in 1.4% of the population (Pierre-Jerome 1996).

The fact that an identical case of hamulus hypoplasia was noted in another skeleton (222) in the cemetery lower down the hill is of great interest. This strongly supports a genetic link between this Iron Age lady and those buried in the Saxon cemetery, suggesting that a local population had remained in the area for over 1000 years.

The only evidence of pathology was restricted to spinal degeneration. Osteo-arthritis was confined to the right costo-vertebral facet of the first thoracic vertebra. Osteophytic outgrowths were noted on the lumbar vertebra and early stage Schmorls' nodes involved the lower thoracic and lumbar spine. Osteophytes are thought to be a response to excessive pressure on the spine and are thus indicators of mechanical stress. Schmorls' node formation is directly related to severe strain, especially compressional forces, which cause the intervertebral disc to rupture (Knowles 1983).

Based on the available teeth (ten were lost *post-mortem*) the standard of oral health is poor. A single carious cavity was present distally on the right second lower premolar. Four maxillary molars were lost during life and a large abscess had formed at the root of the upper left third molar. Calculus was present on most of the teeth, with extensive deposits on the lingual surface of the right mandibular molars. There was no evidence of enamel hypoplasia.

In addition to inhumation 180, two joining fragments of skull from an adult were recovered from a pit of Iron Age date at the western end of the site, but these were not submitted for study.

THE SAXON INHUMATION CEMETERY

A total of 23 individuals were excavated in the inhumation cemetery. Their general characteristics are summarised in Table 1. Bone preservation is mixed. Less than half the sample is practically complete and five individuals are poorly represented (221, 223, 267, 272, 275). In most cases, the skull; ribs; vertebrae and long bones are fragmented. However, after reconstruction, over a quarter of the burials were classed as well preserved. Seventeen skeletons were assessed as adult, and males outnumbered females (12 to 5). Ages ranged from full-term foetal/new born to elderly. Three children buried in close proximity (two in one grave) may be members of the same family that had died in rapid succession.

The sample is predominantly long-headed. Three individuals, with sutural variation, were buried in close proximity and may be related to each other. The high incidence of anatomical variants may indicate that we are dealing with a fairly small inbreeding community. Of particular interest is the finding of an unusual variant in the Iron Age female and one of the males (222) dated to the Saxon period. This also supports the idea that the community was a stable, and perhaps inbred, native population.

There was also a marked incidence of traumatic injuries, probably resulting from direct assaults with blunt instruments, rather than falls and no blade injuries were detected. However, in all instances the fractures had repaired without complications, indicating that they had received good medical care. They are discussed below and are fully catalogued in Appendix 1. A table summarising these injuries has been provided in the general description of the cemetery.

Both sexes were quite tall and, the males were typically robust and powerfully built. Similarly, the females were not particularly gracile. In several males there appears to be over-use of muscles, mainly involving the upper limbs and the shoulders. Also the male in the mausoleum displayed widespread spinal degeneration, suggesting that his life was not one of leisure and inactivity.

Infection and arthritic conditions, apart from spinal degeneration was relatively infrequent. This is probably related to the relatively few elderly males in the sample. Two children and one adult display cranial alterations, which suggest iron deficiency. Although this may be dietary, other factors, including parasitic infestation, should not be ignored. The single short gracile female (268) displayed numerous hypoplastic lines, indicating that childhood disease had caused stunting. A high frequency of neoplastic disease was noted, including a mandibular osteoma and a benign tumour of the hand detected by radiography.

The small sample of dentitions suggests that oral health was, for the period, not particularly poor. Although all individuals displayed calculus, the majority of the deposits were quite small. There were relatively few carious cavities. However, the older individuals displayed marked *ante-mortem* tooth loss and one old female presented with multiple carious lesions.

DEMOGRAPHY

Seventeen skeletons, some 73.9% of the total, were assessed as adult. All the adults were sexed and males (no.12) outnumbered females (no.5). From the fourteen adults who could be aged, there was no definite sexual dimorphism in age at death. The youngest individuals (272 and 274) were full-term foetal or new born. Three other children (225, 273, 275) and a juvenile (265) were also present.

There was no evidence of sexual segregation within the area of the cemetery that was available for excavation. Although four of the females (223, 224, 268, 270) are located in close proximity in the southern half of the cemetery, the other female (278) was buried in the extreme north. There is a cluster of child burials just to the east of the latter female. The only double grave contained an 8-10 year old child (273) with foetal remains at its feet (272). Just north of this we find the other foetus buried in its own grave. Possibly these represent members of the same family dying in rapid succession. The only other child, a 4-5 year old (225), was buried near the adult male (271) in the mausoleum.

STATURE

Stature could be calculated for thirteen of the adults (Table 1). The mean male stature is 1.740m (5′ 8¾″) and the mean female stature is 1.615m (5′ 3¾″). Five males were 1.770m (5′ 10″) or over. The tallest, 1.814m (5′ 11½″), was buried in the mausoleum. With the exception of (268), who was 1.511m, just under five foot, female stature attainment was also tall. Although Celts are traditionally thought to be short and stocky, examination of Iron Age male stature has shown that most sites contain males over 1.790m (5′ 10½″) (Anderson 1995a: Table 14).

Detailed examination of British height from the mid-eighteenth century to the present suggests that stature attainment is related to childhood nutritional status (Floud, Wachter and Gregory 1990); with stunting occurring before five years of age (*ibid.* p.232). As such, it appears valid to consider that tall stature in archaeological material may be, in part, related to higher social status and better levels of nutrition, especially during the first years of life.

FRACTURES

Traumatic injuries were extremely frequent, six males and two females, almost half of the adults, presented deformities considered to be the end-result of healed fracture. All showed evidence of healing, although in one case (285) the bone was un-united at the time of death.

In four individuals fractures of the skull or mandible appear to be the result of direct blows, an attack by an assailant rather than an accidental injury, such as a fall. An adult male (264) has had his nose broken, probably by a direct blow to the front of the face. Facial disfigurement would have been quite marked, with flattening of both the nasal bridge and the nostrils. Another adult male (277) has an oval depression on the left parietal just below the vertex of the vault. He also displays a healed transverse mid-shaft fracture of the left radius and ulna, typically a result of warding off a blow to the head. It therefore appears very likely that the fractures to the skull and arm were the result of a single incident, an assailant wielding the proverbial blunt instrument. The repair of the bones without complications of infection or non-union indicates that he received high-quality medical care, as it is accepted that in modern clinical practice a high proportion of lower arm fractures will require surgical intervention.

An elderly female (278) has a deformed and enlarged right condyle on the mandible, a result of an injury many years before death causing a compression fracture of the condylar head. Such a fracture is most likely to result from a blow on the opposite side of the head, and it is possible that the evident tooth lose had been caused at the same time. The healing of the fracture would have produced a marked facial asymmetry. This may be the first published archaeological example of this type of fracture (Anderson 1997), and it provides possible evidence of wife-beating in the Saxon period.

The fourth case of cranial trauma is found in another elderly female (268). Her right parietal presents three shallow depressions that are probable healed depression fractures from an incident occurring many years before death. They were probably inflicted by a right-handed person approaching from behind.

Five adult males, including the example of skull and arm injuries already discussed (277), display arm fractures. An adult male (285) present an un-united fracture of the left ulna, but not of the radius. It had probably occurred as a result of a direct blow to the back of the bone, and only a short time before death. The least robust male (266) has a fracture of the right wrist and hand resulting from severe compression of the joint. This could have occurred in falling on the outstretched hand. In two cases the cause of fracture is not certain. A young adult male (283) has a mid-shaft fracture of the left clavicle, re-united but with some overlap and callus formation. It may have been caused by a fall on an outstretched hand or by a direct blow from an assailant or by a falling object. Finally, a large muscular male (284) has a bowed right humerous. This may have been the result of a well-healed transverse mid-shaft fracture resulting from a direct blow or a fall, but it is possible that the bowing may have been a natural response to abnormal loading.

THE RADIOCARBON DATES

Radiocarbon dates were obtained for the Iron Age skeleton (SK 180) and for skeleton SK 222 from the inhumation cemetery. The latter was chosen as it possessed the same anatomical variation in its hamate wrist bone as SK180. In each case a complete femur was submitted for dating by the standard radiometric technique. The results are tabulated below (see p. 31).

Laboratory:
Beta Analytic Inc., Miami, Florida, USA
Pretreatment: collagen extraction with alkali: Analysis, radiometric-standard

References:

Stuiver, M, Long, A, Kra, R S, and Devine, J M, 1993 Calibration- 1993 *Radiocarbon* **35**(1)

Talma, A S, and Vogel, J C, 1993 A Simplified Approach to Calibrating C14 dates, *Radiocarbon*, **35(2)**, 317-322

Vogel, J C, Fuls, A, Visser, E, and Becker, B, 1993 Pretoria Calibration Curve for Short Lived Samples, *Radiocarbon*, **35**(1), 73-86

Table 6: Radiocarbon determinations

Lab. No's.	Context details	Sample details	Conventional radiocarbon age BP C13/C12 ratio	Cal BC/AD intercept 1 sigma 2 sigma
Beta-116571	SK180, Iron Age inhumation burial in pit	Bone collagen	2320 +/-60 -21.4 o/oo	BC 390 405-370 505-205
Beta-116572	SK 222, Saxon Inhumation burial	Bone collagen	1340 +/-50 -21.1 o/oo	AD 675 655-705 635-785

DISCUSSION

THE IRON AGE SETTLEMENT

The investigated area comprised a 15m wide transect across Iron Age settlement activity extending for more than 200m east–west. The field walking (Shaw 1990, 4) defined a scatter of Iron Age pottery extending some 400-500m north–south, with the excavated area at its northern margin. This gives a total settlement area of *c.*14ha (35 acres), but with the denser pottery scatters potentially defining localised concentrations of activity within this.

The pottery indicates that occupation began around the end of the early Iron Age, and this is confirmed by the single radiocarbon date centred on 400BC. There may then be continuity of occupation through the middle Iron Age, and a small amount of late Iron Age and Belgic pottery from the final fills of the oval enclosure ditch indicates that the settlement was probably abandoned in the early first century AD. There is some suggestion of settlement drift through this time, with the earlier material in the central and western areas, and the latest material to the east, indicating an uphill movement.

Lacking any further information on the plan form of the settlement there is little that can be said about its organisation. The excavated area contains elements of unenclosed settlement comprising groups of small pits and post-holes relating to domestic occupation. An oval enclosure with an adjacent roundhouse may denote a small family unit comprising a roundhouse and adjacent stock enclosure, while a small rectangular enclosure contained a pit group and other evidence for domestic activity, including limited evidence for iron smithing. It would therefore appear to be a dispersed settlement, probably containing several further enclosures, in addition to the two excavated examples, but with much of the domestic activity unenclosed.

The animal bone conforms to the pattern seen at many other contemporary settlements, comprising an almost entirely domestic assemblage dominated by cattle, sheep/goats and pigs, but with some horse and a single dog. The only non-domestic animal is deer, both red and roe, although some of this material relates to the use of antlers for craft manufacturing. While only a small assemblage was recovered, there was some butchery evidence and the dominance of humerus, radius and tibia suggests the bones were mainly derived from food preparation and consumption, rather than as primary butchery waste.

Given the intractable clay soils, a programme of environmental soil sampling was not undertaken so there is no available evidence on arable exploitation, but there is little doubt that the typical range of crops, including wheat and barley were being grown on the surrounding hillside. While numerous regular circular pits were excavated, these were typically no more than 0.50m deep, although the deepest was 0.75m deep, leaving it uncertain whether they functioned as grain storage pits.

Ritual activity is evident in one pit group, where the pits had been carefully filled with successive and alternating layers of distinctive soils devoid of any domestic debris. The only material recovered from these was a complete dog skeleton and much of a single pottery bowl. Fragments of a human skull came from another further pit group, while the most vivid example of ritual deposition was the crouched inhumation burial of a woman, 30-40 years of age, with a lead alloy torc around her neck. While such pit burials are not uncommon, examples from North-

amptonshire include Tywell (Jackson 1975) and Wilby Way (Thomas and Enright 1998), this one is unique in England in possessing a lead collar, which adds a further dimension to the process leading to her interment. It can be suggested that the lead/tin alloy was used to give the impression of silver, so that the collar was the most expensive item that this small rural community could furnish for this woman. We can therefore suggest that she was buried with respect and honour, even though she may have been a ritual sacrifice.

THE SAXON CEMETERY

The burial practice, with its west-east extended inhumations buried without any grave goods, and the radiocarbon date, indicate that this was a Christian cemetery. It was in use through the second half of the 7th century, and at the 95% confidence limit for the radiocarbon date the extremes run from the earlier 7th century to the later 8th century. The cemetery would therefore appear to fall in the transition period, when Christian burial was still taking place in cemeteries set away from the settlement, following the practise for pagan burial. This cemetery may therefore have been the direct predecessor to the establishment of a cemetery attached to a church and sited within the settlement. This may have been the establishment of the church in the village of Great Houghton itself, which lies on the lower slopes of the hill 800m to the north of the excavated cemetery.

Within the 23 burials there was a high incidence of anatomical variants and this may indicate that these people came from a fairly small inbreeding community. Of particular interest is the finding of an unusual variant in the wrist bone of the Iron Age female and one of the males dated to the Saxon period. This also supports the idea that the community was a stable, and perhaps inbred, native population. Although if this connection is valid then it indicates that there had been continuity of population and place for over a thousand years, running from the early middle Iron Age (*c.* 400BC) through to the establishment of Christianity in the middle Saxon period (*c.* 700AD).

BIBLIOGRAPHY

Anderson, T., 1997. An archaeological example of mandibular trauma, *Journal of Palaeopathology*, 9 (1), 55-58.

Anderson, T., 1998. Two cases of Hypoplastic Hamulus from Iron Age and Roman Northamptonshire, *Journal of Palaeopathology*, 10 (1), 31-35.

Anderson, T., 1998. An overlooked anatomical variant: the Vlavicular Rhomboid Fossa, *Journal of Palaeopathology*, 10 (2), 59-62.

Baker, J., and Brothwell, D., 1980. *Animal Diseases in Archaeology*, Academic Press, London.

Bateman, T., 1861 (1978 edition) *Ten Years' Diggings.*

Blinkhorn, P., and Jackson, D., forthcoming 'The Pottery', in Thomas, A., and Enright, D., *Excavation of an Iron Age Settlement at Wilby Way, Great Doddington*, Cotswold Archaeological Trust

Binford, L., 1981. *Bones: Ancient man and modern myths*, Academic Press, London.

Chapman, A., 1998. Brackmills, Northampton: an early Iron Age torc, *Current Archaeology*, 159, 92-95.

Cunliffe, B., 1991. *Iron Age Communities in Britain*, 3rd edition. Routledge and Keegan Paul Oxford.

Evison, V I., 1987 *Dover: The Buckland Anglo-Saxon Cemetery*, English Heritage Archaeol. Rep., 3.

Halstead, P., 1985. A study of mandibular teeth from Romano-British contexts at Maxey, *East Anglian Archaeol*, 27, 219-24.

Howarth, E., 1899. *Catalogue of the Bateman Collection of Antiquities in the Sheffield Public Museum*

Jackson, D., 1975. An Iron Age Site at Twywell, Northamptonshire. *Northamptonshire Archaeol*, 10, 31-93.

Jackson, D., and Knight, D., 1985 An Early Iron Age and Beaker Site at Gretton, Northamptonshire, *Northamptonshire Archaeol*, 20, 67-86.

Jackson, D., forthcoming. The Iron Age pottery, in Holmes, M., Archaeological investigation of two Iron Age settlements at Swan Valley Business Park, Rothersthorpe, Northamptonshire, 1994-1996, *Northamptonshire Archaeology.*

Knight, D., 1984. *Late Bronze Age and Iron Age Settlement in the Nene and Great Ouse Basins*, BAR, 130 (i) Oxford.

Payne, S., 1973. Kill off patterns in sheep and goats: the mandibles from Asvan Kale, *Anatolian Studies*, 23, 281-303.

Payne, S., 1975. Partial recovery and sample bias, in Clason (ed) *Archaeozoological Studies*, Amsterdam.

Payne, S., and Munson, P., 1985. Ruby and how many squirrels, in Fieller et al (eds) *Palaeobiological Investigations*, BAR Int.Ser., 266, Oxford, 31-40,.

Robinson, M., and Wilson, B., 1983. *A Survey of the Environmental Archaeology of the South Midlands.*

Schmid, E., 1972. *Atlas of Animal Bones*, Elsivier, Amsterdam.

Shaw, M., 1990. *Brackmills Extension (CNT Land), Northampton. Archaeological Evaluation*, Northamptonshire Archaeology Unit (Contracts Section).

Silver, I., 1969. The ageing of domestic animals, in Brothwell and Higgs (eds) *Science in Archaeology*, 283-302, Thames and Hudson. London.

Thomas, A., and Enright, D., 1998. *Excavation of an Iron Age settlement at Wilby Way, Great Doddington*, Cotswold Archaeological Trust.

Von den Driech, A., 1976. *Guide to the measurement of animal bones from Archaeological sites*, Harvard Univ.

Watson, J. R. N., 1979. The estimation of the relative frequencies of mammalian species: Khirokitia 1972, *J.Arch.Sci.*, 6127-37.

Wessex Archaeology. 1996. *Brackmills Extension and Employment Sites, Northampton: Desktop Study and Archaeological Field Evaluation.*

APPENDIX 1: THE HUMAN BONE

Trevor Anderson

INTRODUCTION

This appendix contains the detailed report on the burials from the Saxon cemetery. A summary and brief overview is contained in the main body of the report. The principal characteristics of each burial are tabulated in Appendix Table 1 (p. 34).

METRICAL ANALYSIS

A) CRANIAL METRICS

After reconstruction, metric analysis could be undertaken on ten adult crania. One clear finding is that the population was predominantly long-headed. Half of the sample for which the cranial index could be calculated were markedly long-headed (hyperdolichranic). The mean index was 71.3, with a range of 66.1 - 78.8. The facial region was generally too incomplete to calculate orbital or nasal indices. Other metrics and calculated indices fall within the accepted range. The sample is considered too small for more detailed analysis.

B) POST-CRANIAL METRICS

Metric analysis could be undertaken on eleven male and four female adult skeletons (Archive Tables 5-7). With the exception of (266), all the males are robust and powerful individuals. The females, with the exception of (268), are not particularly gracile. Based on individual bones, 65.4% (17/26) display marked antero-posterior flattening of the upper femoral shaft (platymeria). This confirms that the condition is more frequent in earlier, pre-industrial societies. Modern femora are less flattened, although there is some evidence that flattening is also more marked on the left (Holtby, 1918). The aetiology of the flattening is still poorly understood. It could be related to mineral or vitamin deficiencies (Buxton, 1938) or it may be a response to mechanical adaptation and increased muscular stresses. The fact that extreme flattening is associated with a laterally placed gluteal ridge favours a mechanical interpretation (Schofield, 1959).

The cnemic index records the degree of transverse flattening of the upper tibial shaft. Only one individual, the rather gracile male (266) displayed marked flattening (platycnemia). Based on individual bones, this represents 7.4% of all adult tibiae. In the nineteen-thirties Buxton suggested that the flattening occurred as the result of mineral deficiency and decreased bone quantity (Buxton, 1938). More recent work has shown that there is no significant reduction in the amount of bone present and that the flattening develops due to repeated antero-posterior bending strain (Lovejoy, Burstein, Heiple, 1976). Such strain would occur when walking over rough terrain or possibly as a result of habitual squatting.

NON-METRIC VARIATION

Non-metric variants, also known as discontinuous traits, refer to anatomical, non-pathological anomalies. It is probable that many are inherited on a multifactorial basis: environmental, external influence modifying the genetic component. Consequently, the true value of non-metrics in assessing "biological distance" remains uncertain.

A) CRANIAL NON-METRICS

Based on the definitions in Berry and Berry (1967) and the detailed text of Hauser and de Stefano (1989), thirty-seven different cranial non-metrics were recorded as present, absent, or unscoreable (bone area unavailable for study). The majority fall within the bounds of normality (Archive Table 8). Although five individuals present with absence of the zygomatic facial foramen (224, 277, 278, 283, 285), as did the Iron Age skeleton (180), the variant is not thought to contain a high genetic component (Rösing, 1984). Also, parietal foramen present (268, 270, 271, 277) and post-condylar canal patent (224, 264, 272, 274) are not known to be inherited (Hauser & de Stefano, 1989: 80; 115).

Traits which contain a higher genetic component include metopism (Torgersen, 1951a) and os inca (Torgersen, 1951b). The former was present in an adult female (278) and in the nearby child (273). Coupled with the Iron Age example, one quarter of the available sample displayed metopic crania. Two skeletons displayed true os inca (224 and 270); (269) displays large ossicles at the lambda and two individuals (268 and 278) present with large ossicles just anterior to the lambda. Three of these individuals (224, 268 and 269) were buried in close proximity to each other.

B) POST-CRANIAL NON-METRICS

Based on the definitions in Finnegan (1978) and in Anderson (1987a), twenty-nine different post-cranial non-metrics were recorded as present, absent, or unscoreable (bone area unavailable for study). Many of these variants contain a high developmental component and are of limited value for assessing familial groupings. No definite groupings or significant findings emerged from our small sample (Archive Table 9). The most frequent traits were hypotrochanteric fossa and squatting facets. Five individuals, four males (271, 277, 284 and 285) and a juvenile female? (265) display evidence of the former. This represents a fifth of all femora and is not an unusual finding. Squatting facets were present in three males (264, 266 and 284) and a female (268). This represents 36.4% of adults with distal tibiae and based on individual bones, some 38.9% of tibiae were affected.

OTHER ANATOMICAL VARIANTS

A) BICIPITAL RIB (266)

One individual, the least robust male, presents with a large cervical rib. The supernumerary element has fused to the normal first rib. The result is a bone with two distinct heads. Individual

examples were published as anatomical curiosities in the nineteenth century, under the name of bicipital rib. Based on a large radiographic sample (n40,000), an incidence of 0.115% (n46) was revealed for bicipital ribs (Etter, 1944). Other more recent surveys are in agreement with this finding (Moore, Stewart, McCormick, 1988; Singh, 1973). The only published British archaeological examples of bicipital ribs are from medieval York (Stroud, 1993: Table 37) and post-medieval London (Black & Scheuer, 1997). Another specimen is known from a multiple Bronze Age grave in Thanet, Kent (Anderson, forthcoming). There is evidence that cervical ribs contain a genetic component and are familial (Purves & Wedin, 1950; Weston, 1956).

It is well known that cervical ribs may give rise to neurological and vascular problems (Brannon, 1963). Large ribs, as here, may lead to displacement and compression of the subclavian artery, which may affect the blood supply to the upper limb (Black & Scheuer, 1997). In extreme cases limb asymmetry may be demonstrable (Finnegan, 1976) and digital gangrene may develop. In our example, there is no evidence of such severe complications. However, based on clinical cases, it is quite possible that he suffered from dull aching pain (which would be

Table 1 The skeletons from the inhumation cemetery; grouped by age and sex

BURIAL	AGE (years)	STATURE m (ft)	PRESER-VATION	ANATOMY	PATHOLOGY	DENTAL
NEWBORN						
272	F/NB	---	7d			
274	F/NB	—	5d			
CHILDREN						
225	4-5	---	2d		CO	CALC, HYP
273	8-10	—	3d		CO	
275	1	—	6e			
JUVENILE						
265	14-16	---	5d			
MALES						
Young Adult						
276	22-27	—	3d			CALC
283	23-28	1.770 (5' 10")	1b	OSM	SCH, TF, TM, INF, CP	CALC
284	20-25	1.663 (5' 5½")	7f	RF	TF, TM	CALC
Adult						
264	30-40	1.685 (5' 6½")	1b		SOA, OST, SCH, TF, TM, NEO	*AM*, CAR, CALC, ABS
266	35-45	1.688 (5' 6½")	3d	BIRIB	SOA, OST, OA, TF	CALC
271	28-33	1.814 (5' 11½")	2c		SOA, OST, SCH	CALC
277	30-35	1.696 (5' 7")	1b	MTIII	OST, SCH, TF, VASC	CALC
285	30-40	1.778 (5' 10¼")	3d		SOA, TF, TM	
Mature						
222	45-55	1.792 (5' 10¾")	4d	HH	SOA, OST, SCH	
269	45-55	1.778 (5' 10¼")	1b	BIP	SOA, OST, OA, INF	*AM*, CAR, CALC, ABS, HYP
Grown						
221	----	—	7d			
267	----	---	6e			
FEMALES						
Adult						
224	28-33	1.658 (5' 5½")	1b	OT	SOA, SCH, NEO	CALC, CON
270	30-35	1.654 (5' 5¼")	3d		SOA	CAR, CALC, ABS, HYP, ABN, CON
Mature						
268	45-55	1.511 (4' 11½")	2c		SOA, OST, SCH, TF	*AM*, CAR, CALC, ABS, HYP
278	50-60	1.636 (5' 4½")	2b	OT	SOA, OST, OA, TF	*AM*, CALC, MAL
Grown						
223	----	----	7e		SOA	

most noticeable during exertion of the limb); discolouration of the skin (cyanosis) as well as coldness of the hand (Black & Scheuer, 1997).

B) RHOMBOID FOSSAE (284)

In this robust male, both clavicles display an extremely large cavitation on the medial aspect of the inferior surface. The left has been damaged *post-mortem*. However, the right cavitation is 22mm long; 10mm wide with a depth of 9mm. Such smooth cavitation at this site equates with an anatomical variant known as rhomboid fossae. Shallow fossae are not rare, occurring in 10% of dry bone English clavicles (Parsons, 1916). Interestingly, in Indian bone material the fossae are extremely frequent; occurring in 90% of individuals (Longia *et al* 1982). However, deep fossae are distinctly rare, with 59 cases demonstrated in 10,000 patients undergoing radiographic examination (Schauffer & Collins, 1966). Their aetiology is not well documented. However, the fact that they are located at the insertion of the costo-clavicular ligament and are predominantly found in males (91.5%) suggests that overuse and strain of muscles may be implicated (Schauffer & Collins, 1966). Also, the Indian findings are possibly related to a high frequency of manual work (Longia *et al* 1982).

C) OS METASTYLOIDEUM (283)

In the normal hand, the third metacarpal is distinguished by its styloid process which, when viewed dorsally, projects proximally between the capitate and trapezoid bones. The styloid process is unique to man, it developed to protect the third metacarpal base from subluxation during the newly acquired human manual dexterity (Marzke & Marzke, 1987). In rare cases, the process may present as a separate ossicle, the os metastyloideum.

In (283), a young adult male, both wrists display an absence of the styloid process. Careful examination shows that the separate ossicle has fused to the adjacent wrist bone, the capitate.

According to Prescher (1988) os metastyloideum was first described in 1878 by Gruber. Examination of the literature shows that the variant has been rarely reported since then; Prescher (1988) discovered thirteen cases and added two of his own. In a detailed osteological study of 564 hands, 5.3% (n30) displayed evidence of os metastyloideum (Thomson, 1893). It was shown that the os metastyloideum may remain as a separate ossicle (n9) or it may fuse, as here, to the capitate (n19), or less frequently fuse to the trapezoid (n2) (Thomson, 1893).

The true prevalence of os metastyloideum is probably under represented in modern populations, since only the painful, symptomatic, cases will be discovered. Careful examination of dry bone material suggests that the variant may not be as infrequent as previously thought. For instance, one case (2.6%) is known in 38 burials from Iron Age Deal (Anderson, 1995a) and Stroud has discovered six cases (1.5%) in 402 medieval burials from York (Stroud, 1993: Table 37).

D) HYPOPLASTIC HAMULUS (222)

A mature male presents with a hypoplastic hamulus (only the left hamate is available for examination). The appearance is identical to the hamate discussed with reference to the Iron Age skeleton (180). Apart from minor *post-mortem* damage at its tip, the surface of the hamulus is perfectly smooth and normal,

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Codes for Table 1 opposite

PRESERVATION

Completeness

	%
1	>95
2	80-95
3	60-80
4	40-60
5	20-40
6	5-20
7	<5
0	0

Condition

a	Excellent, all solid
b	V. good, mainly solid
c	Good, some fragmented (repairable)
d	Largely fragmented
e	V. badly fragmented
f	Powdery stain
g	Stain only
0	No bone or stain

ANATOMICAL VARIANTS

BIRIB	bicipital rib
BIP	attempted cuneiform bipartition
HH	hypoplastic hamulus
MTIII	metatarsal III variant
OSM	*os metastyloideum* (fused to capitate)
OT	*os tibiale*
RF	rhomboid fossae

PATHOLOGY

SOA	spinal osteo-arthritis
OST	osteophytes
SCH	Schmorls' nodes
OA	osteo-arthritis
TF	trauma (fracture)
TM	trauma (muscle markings)
INF	infection
CO	cribia orbitalia
CP	cranial porosis
VASC	vascular
NEO	neoplasm

DENTAL

AM	ante-mortem loss
CAR	caries
CALC	calculus
ABS	abscess
HYP	hypoplasia
MAL	malocculusion
ABN	abnormalities
CON	congenital absence

however it is only 3.8mm in length. As discussed earlier, differential diagnosis would need to include un-united fracture of the hamulus and an anatomical variant, *os hamulus proprium*. The appearance, and its similarity to that of burial (180) suggest that we have two cases of a rare anatomical variant, hypoplastic hamulus. Very few clinical cases are known (Hocker, 1994; Seeger, Bassett, Gold, 1988). However, detailed radiographic investigation suggests that the variant may occur in 1.4% of the population (Pierre-Jerome, 1996).

E) OS TIBIALE (224 AND 278)

In two female skeletons, the bilateral presence of an additional facet on the posteromedial aspect of the navicular is indicative of an accessory bone known as the *os tibiale*. Based on individual bones, this represents an incidence of 21.1% (4/19). Anatomical studies suggest that the true incidence of the *os tibiale* is 11.5% (Sarrafian, 1983: 90). Based on serial radiographs, it is known that the accessory bone frequently fuses during childhood (*ibid.*). It is possible that repeated strain and stress may predispose the ossicle to remain as a separate element.

F) ATTEMPTED BIPARTITION OF THE MEDIAL CUNEIFORM (269)

In an elderly male, the left medial cuneiform displays a deep mid-line horizontal groove. This is a partial bipartition. The first reference to bipartite cuneiform was in 1757 by Morel (cited in Barlow 1942). The condition, an error of chondrification rather than ossification is congenital (Barlow, 1942). However, persistence of the bipartition may be influenced by environmental factors. A search of the modern literature shows that cuneiform bipartition is a rare finding (Anderson, 1987b). Apparently, the only published archaeological example is from medieval Norway (Anderson, 1987b).

G) METATARSAL III VARIANT (277)

In an adult male, both cuneiform-metatarsal III articulations display a cystic cavitation on the plantar portion of the joint surface. This is not a normal location for osteo-arthritis in either modern or archaeological material (Anderson, 1995a). It is possible that the cystic lesion is an anatomical variant (Tenney, 1991; Wilbur, 1997). Careful examination of dry bone material suggests that the variant may not be as infrequent as previously thought. Stroud discovered nine case from medieval York (Stroud, 1993: Table 37) and a prevalence of 18%, with a distinct female bias, has been reported from prehistoric Illinois (Wilbur, 1997).

PALAEOPATHOLOGY

CONGENITAL (266, 268, 271 AND 277)

No significant congenital abnormalities were detected. One individual, an adult male (277), was found to have an additional lumbar vertebra, and an adult female (268) presented with congenital absence of a lumbar vertebra. In two cases, a juvenile (265) and an adult male (271) the lowest lumbar vertebra had attempted to fuse to the sacrum (partial sacralisation).

"ARTHRITIC" CONDITIONS

A) OSTEO-ARTHRITIS (268, 269 AND 278)

Based on recognised criteria (presence of eburnation; or both pitting and deformation of the joint contour), less than 18% of the adult sample display evidence of extra spinal osteo-arthritis. In two cases the degeneration may be related to previous injury, so-called secondary degeneration. As such, primary, age-related osteo-arthritis affects only one individual, less than 6% of the adult sample. The low figure is related to the small number of elderly people in the excavated area.

The only definite evidence for primary osteo-arthritis comes from an elderly female (278). Typical degenerative changes occur at the right acromio-clavicular (shoulder) joint; both radio-humeral joints (elbows) and in the right hand (3rd metacarpal/phalangeal joint). These are well-established sites in modern clinical series.

The least robust adult male (266) displays eburnation and porosity of the right elbow and the right knee joint, the latter confined to the medial condyles. There is evidence of trauma to the right wrist (see below). As such, the early onset of osteo-arthritic changes may be a result of the hand injury.

The right foot of an elderly male (269) displays minor eburnation of the talo-calcaneal joint. The picture is complicated by severe *post-mortem* damage and the absence of most feet bones. However, there appears to be porosity of the cubo-calcaneo joint and possible erosion of the posterior aspect of the posterior calcaneal facet. The appearance and the site is atypical for primary osteo-arthritis. It is possible that an injury to the foot has resulted in an infective arthritis. The fact that the distal right fibula (lower leg) displays evidence of infection supports this interpretation.

B) VERTEBRAL DEGENERATION

As with most samples, the site of predilection for osteo-arthritis is the spine. In three males (221, 267 and 276) no spinal elements were recovered. From the fourteen adults with spines, only one young adult male (284) was free of spinal degeneration. As such, almost 93% of the adults displayed some evidence of vertebral degeneration, a high figure in a sample containing few elderly individuals.

i) Osteo-arthritis (222, 223, 224, 264, 266, 268, 269, 270, 271, 278 and 285)

Only the young adult males and one male (277) aged 30-35 years, were free of spinal osteo-arthritis. After reconstruction, each articulation (there are over 140 joint surfaces in a complete spine) was scored as present, absent or diseased. A total of 1197 articular surfaces were available for study (archive). Some 5.8% (n69) displayed osteo-arthritic changes. The sites of predilection were the lower thoracic spine, involving both the costo-vertebral and costo-transverse articulations as well as the joints between individual vertebral bodies. In two individuals joint disease was widespread, with over 19% of available joints affected. An elderly female (278) displayed arthritic changes in the cervical; lower thoracic and lumbar spine. The least robust adult male (266) presented with changes involving most of the thoracic vertebrae and the lower lumbar vertebrae.

ii) Osteophytes (222, 264, 266, 268, 269, 271, 277 and 278)

Osteophytes develop on the external circumference of the vertebral bodies. In advanced cases, exuberant examples may

cause vertebral fusion. Their development is directly related to disc space narrowing and their presence may give a clue to intervertebral disc degeneration. Although less frequent than osteo-arthritic changes, all the elderly individuals and over half the adults display osteophytic outgrowths.

The sites of predilection are the lower-mid thoracic and lumbar vertebrae, with males more frequently involved than females (archive). These findings are in agreement with clinical practice: the osteophytic outgrowths tend to be more frequent in areas of greatest curvature (Meisel & Bullough, 1984: Fig. 7.1) and a statistically significant male predilection has been reported (Nathan, 1962). The outgrowths are thought to be a response to excessive pressure on the spine and are thus indicators of mechanical stress. The most advanced case, involving most of the spine, with large outgrowths in the lumbar spine, is found in the male buried in the mausoleum (271). This suggests he had not led a life of leisure and inactivity.

iii) Schmorl's Nodes (222, 224, 264, 268, 271, 277 and 283)
In a small sample of spinal columns 56% of males and 40% of females presented with Schmorl node formation or related linear defects. The site of predilection was the lower thoracic and also the lumbar spine. It is generally accepted that node formation is directly related to severe strain, especially compressional forces, which cause the intervertebral disc to rupture (Knowles, 1983). It is possible that the cavitations will more readily develop during adolescence, while the vertebral bodies are still plastic (Knowles, 1983). The presence of nodes in a young adult male (283) supports this hypothesis.

iv) Other Intervertebral Abnormalities (277)
The only other vertebral pathology occurred in an adult male. The left pelvis had originally been fused to the sacrum, so-called sacro-ilitis. Unilateral sacro-ilitis is a component of sero-negative arthropathies, including Reiter's syndrome. However, the spine is too incomplete to demonstrate the typical osteophytic outgrowths, "skip lesions" associated with the condition.

TRAUMA

A) FRACTURES (264, 266, 268, 277, 278, 283, 284 AND 285)

Traumatic injuries were extremely frequent in this sample. Six males and two females, almost half of the adults, presented with deformities considered to be the end-result of healed fracture. All showed evidence of healing, although in one case (285) the bone was un-united at the time of death.

In four individuals fractures of the skull or mandible appear to be the result of direct blows, an attack by an assailant rather than an accidental injury, such as a fall. An adult male (264) has had his nose broken. Careful examination of the nasal bones shows a discontinuity in the mid-line nasal suture and an associated circular depression. This suggests a direct blow to the front of the face. Although the dry bone distortion is minor; facial disfigurement would have been quite marked, with flattening of both the nasal bridge and the nostrils.

An adult male (277) presents with an oval depression on the left parietal, just posterior to the centre of the bone and 20mm below the vertex of the vault. The maximum length of the lesion (arc measurement) is 36mm; and the antero-posterior length is 19mm. The same skeleton also displays a healed transverse mid-shaft fracture of the left radius and ulna. The former is firmly re-united but the lower shaft displays lateral deviation and the bone is 13mm shorter than the normal right radius. The ulna displays angular lateral curvature, evidence of healed fracture. A mid-shaft fracture of both lower arms is typically the result of direct violence, warding off a blow to the head. As such, it appears very likely that both fractures are the result of a single incidence, an assailant wielding the proverbial blunt instrument.

The victim survived the assault and the bones have repaired without complications of infection or non-union. This is indicative that he received high-quality medical care, including successful reduction, by manipulation, and adequate immobilisation. A case from medieval Canterbury in which both lower arms were involved had resulted in established non-union of both radii (Anderson, 1995b). In modern clinical practice, it is accepted that a "high proportion" of lower arm fractures will require surgical intervention (Adams, 1965: 151-2).

An elderly female (278) presents with deformity and enlargement of the right mandibular condyle. The slightly lobulated condylar surface extends anteriorly in the direction of the coronoid process. The opposite condyle is sloping laterally at *c.* 25. This is due to the hypertrophy of the right condyle, which has caused marked facial asymmetry. The diagnostic changes associated with osteo-arthritis, roughening or porosity on either the condyle or the articular eminence of the temporomandibular joint (TMJ), were not observed. Rather the TMJ has simply enlarged to accommodate the hypertrophic condyle.

Radiographic investigation showed no sign of recent fracture. The deformity is the result of injury to the condyle many years before death. The hypertrophy is diagnostic of an intracapsular compression fracture of the condylar head (Williams, 1994: 412). A fall on to the chin would result in bilateral condylar fracture. Typically, unilateral involvement is the result of a blow to the opposite side of the jaw (Keith, 198: 116). The body of the mandible had not fractured, this indicates that the injury occurred when the bone was robust and teeth were present. Clinical experience shows that unilateral intracapsular fracture is most likely to be associated with damage to the teeth (Williams, 1994: 409). As such, it is possible that several teeth were traumatically avulsed by the injury.

The fracture has healed successfully although the condylar hypertrophy and flattening of the TMJ has resulted in marked facial asymmetry. The abnormal slope of the opposite condyle confirms that the trauma occurred many years before death and also that the jaw was in function after the injury. In modern practise the majority of unilateral condylar fractures will repair with "excellent results" without any surgical intervention (Keith, 1988: 118). As far as I am aware, this is the first published archaeological example of this type of fracture. Possible evidence of wife-beating from the Saxon period?.

The fourth case of apparent cranial trauma is found in an elderly female (268). Her right parietal presents with three smooth edged depressions, two elliptical in the posterior half of the bone and a smaller circular (*c.* 12mm in diameter) depression anteriorly. The posterior depression is 37mm supero-inferior and 14mm antero-posterior wide. The middle lesion is 27 x 12mm. Although aged crania may exhibit parietal depressions such physiological changes would normally be bilateral. There is no evidence that the depressions are the end-result of a surgical intervention, such as trephination. On balance, the evidence supports an interpretation of healed depression fractures, the incident occurring many years before death. Possibly inflicted by a right-handed person approaching her from behind.

An adult male (285) presents with an un-united fracture of the left ulna. The bone is poorly preserved. However, the mid-shaft swelling indicates that the healing process had begun. The radius was not fractured and one would expect it to act as a splint for the broken ulna to lessen the amount of displacement. Inadequate immobilisation would result in permanent non-union. The appearance of the fracture indicates that it had occurred only a short time before death and bony union had not been established. A fracture at this site is probably due to a direct blow to the back of the bone.

In the case of the least robust male (266) fracture of the right wrist and hand is probably the result of indirect violence. The tip of the ulnar styloid process has been fractured and the radial articular surface displays a "v" shaped *ante-mortem* crack. This suggests severe compression of the joint associated with avulsion of the styloid. Such a picture could occur in an adult falling on an outstretched hand. The neck of the third metacarpal (middle finger) has also been fractured. It has firmly re-united with little residual deformity, except for some 5mm shortening. This may well have occurred at the same time as the injury of the lower arm bones.

In two cases, the cause of the fracture is not certain. A young adult male (283) presents with a mid-shaft fracture of the left clavicle. The bone is firmly re-united but with overlap and marked callus formation. Such fractures are frequently due to a fall on to an outstretched hand; however, a direct blow either from an assailant or by an object falling from above may produce the described injury.

A large muscular male (284), presents with bowing of the right humerus. The fact that the other limb bones are not involved rules out a nutritional problem such as healed rickets. The radiograph of the damaged bone indicates a marked increase in the medial cortex. It is possible that the bone hypertrophy and curvature represents the end result of a well-healed transverses mid-shaft fracture. Such a fracture could occur due to a direct blow or a fall. Differential diagnosis would need to include the possibility that the bowing is a natural physiological response to abnormal loading.

B) MUSCLE MARKINGS (264, 283, 284 AND 285)

The majority of the males are robust and display well-developed muscle markings. In four cases, a third of the males, roughened cavitation or bony overgrowth may be indicative of overuse or abnormal muscular strain.

In two individuals (283 and 285) roughened grooves on the upper humeral shafts correspond to the insertion of the *Pectoralis major*. This muscle is an adductor and medial rotator, which is important in climbing (Sinclair, 1966: 346-7). It is also significant in forceful humeral movements, such as pushing, punching and throwing (Plastanga *et al* 1989: 88).

A robust male (284) presents with a groove (marked on the right) on the posterior surface of both the upper tibial shafts. These equate with the insertion of the *soleus*, which is important in plantar-flexion of the foot (Sinclair, 1966: 411) and is concerned with steadying the leg whilst standing (Williams & Warwick, 1980: 608). The same individual also displays extremely deep, smooth, cavitation at the insertion of both costo-clavicular ligaments. These are considered to be an anatomical variant, rhomboid fossae. However, the development of the fossae may be, in part, related to overuse of the associated ligament. The latter is important in the elevation and antero-posterior rotation of the clavicle (Sinclair, 1966: 332).

In (264), the individual with the broken nose, the distal tibia presents with roughened bony overgrowth just superior to the tibio-fibular articulation. This equates with the interosseous ligament and may be evidence for strain on the ankle joint, including extreme dorsi-flexion. It is interesting that this individual also displays squatting facets, which are indicative of repeated flexion of the ankle joint.

INFECTION (269 AND 283)

Only one individual, an elderly male (269) displays definite evidence of bone infection. The lower right fibula is swollen and displays porosity. The localised nature of the infection as well as the arthritic changes at an atypical joint in the foot, may indicate that the pathology represents a post-traumatic infection.

A young adult male (283) displays irregularity of the left fourth metacarpal joint. No other joints are involved. The head of the metacarpal has lost its normal smooth contour and the proximal phalanx presents with minor cystic cavitation. The appearance, as well as the isolated nature of the lesion, suggests that infection and degeneration has occurred secondary to soft tissue injury. The reduced bone quantity in the phalangeal shaft argues that the joint was painful and movement was limited.

METABOLIC (NUTRITIONAL) (225, 273 AND 283)

There was no evidence for rickets, scurvy or malnutrition in our sample. However, the two children (225 and 273) with available orbits both displayed porosity of the eye sockets. The term cribra orbitalia was coined for the condition by Welcker in 1885, due to the sievelike appearance of the socket in advanced cases. Similar lesions were not found in any of the adults (n10) with preserved orbits. However, a young adult male (283) displayed minor cranial porosis, involving the parietal bones, on each side of the sagittal suture and the lambdoid region of the occipital bone. Both conditions are due to expansion of the diploë, the cancellous bone of the skull.

Most workers consider cribra orbitalia to be evidence of iron deficiency (Carlson *et al* 1974; Cybulski, 1977; Fornaciari *et al* 1982; Hengen, 1971). Marked cranial porosis presenting with a radiological "hair on end" appearance is pathognomonic for anaemia (Moseley, 1965, 1966). However, both avitaminosis C (Holck, 1987) and folic acid shortage, as a result of drinking goat's milk (Janssens, 1980), have been considered influential in diploic expansion. It must be stressed that other non-dietary factors can lead to iron shortage (Von Endt & Ortner, 1982; Walker, 1986), perhaps the most frequent is parasitic infestation (Hengen, 1971; Kent, 1987). At Poundbury 55.5% of sub-adults and 23% of adults presented with cribra orbitalia (Stuart-Macadam, 1979). Recent work on a late Roman site in Somerset has shown that the condition was widespread: adults 53%; sub-adults 83% (Robeldo, Trancho, Brothwell, 1995).

VASCULAR (277)

Only one vascular abnormality was noted, it involved the left pelvic bone of an adult male (277). The superior aspect of the iliac fossa presents with an enlarged penetrating foramen some 25mm from the auricular surface of the sacro-iliac joint. Just lateral to the

foramen two small oval, smooth-edged depressions were noted. Their appearance suggests that they represent a chronic dilation of a blood vessel. At this location the most likely contender would be the iliac branch of the obturator artery. Aneurysms may occur due to weakening of the arterial walls by infection, trauma, degeneration or a congenital problem. There is no evidence of infection and the unilateral nature might indicate degeneration or trauma. Similar lesions have rarely been reported in archaeological material (Anderson, in press; Flinn & Flinn, 1992).

NEOPLASMS (224 AND 264)

A high frequency of neoplastic disease was noted, with almost 12% of the adult sample displayed evidence of benign neoplasms.

An adult male (264) displays a solid dense bone overgrowth on the internal surface of the right mandible. The elongated oval overgrowth is just above the inferior border, in the premolar/molar region. Its maximum length is 26mm, with a breadth of 10mm and a height of 8mm. The appearance is typical of an osteoma, a neoplasm, which normally presents on the cranial vault. It may develop within the frontal sinus and less frequently on the maxilla. However, mandibular osteomata are distinctly rare, one possible case has been published from medieval York (Stroud, 1993: Fig 63). In clinical medicine solitary mandibular osteoma, often being asymptomatic, are rarely encountered. Presentation of multiple mandibular osteomata would suggest a genetic condition, Gardner's syndrome.

(264) also displays a small oval (6mm diameter) bone swelling (height 2.5mm) just to the left of the nasal aperture. The dense bone overgrowth is surrounded by multiple foramina and it may represent an osteoma which has developed secondary to the previously described nasal trauma.

An adult female (224) presents with antero-posterior bowing of a single finger bone, the fourth left metacarpal. The outward appearance suggested a healed fracture. However, there is no internal evidence for fracture. Radiographic investigation shows a marked lucency of the distal shaft; expansion of the medullary cavity; thinning of the cortical bone, with slight swelling of the palmar surface. Such a picture suggests a benign tumour. At this site, the most likely contender would be an enchondroma (Takigawa, 1971). Although a well-known finding in modern medicine, enchondromata have rarely been reported in archaeological material (Carter & Anderson, 1996). Several dry bone specimens may have been diagnosed as fractures, due to a lack of radiographic investigation.

ORAL HEALTH

A) ADULT ORAL HEALTH

The standard of adult oral health was based on the examination of nine male and four female dentitions, a total of 240 teeth were available for study. Sexual differences in the level of oral health is probably due to the higher percentage of elderly females in the sample rather than any difference in male and female eating habits.

i) Tooth Loss (264, 268, 269 and 278)

Two males (264 and 269) and two females (268 and 278) displayed *ante-mortem* tooth loss. Based on individual teeth, it was possible to ascertain, for all adults, an overall *ante-mortem* tooth loss of 15.5% (Archive Table 10). The high figure is influenced by the fact that two elderly individuals, a male (SK 269) and a female (SK 278) had between them lost 38 teeth before death. In the former, only the anterior mandibular teeth and the maxillary canines and premolars were present. This has led to marked overbite, with the mesial and distal crowns of the upper and lower first right premolars, respectively, being totally worn away.

ii) Caries (SK 264; 268; 269; 270)

Apart from one individual (SK 268), caries experience was relatively low. A female (SK 270) presented with three carious teeth. Only three male teeth were carious (1.7%). For the whole sample, 5% of individual teeth were carious (Archive Table 10). Cavities were either interproximal or else widespread with complete destruction of the crown. The most widespread involvement occurred in an elderly female (SK 268), six maxillary teeth were carious, with four cases of widespread destruction of the crowns.

iii) Calculus (SK 224; 264; 266; 268; 269; 270; 271; 276; 277; 278; 283; 284)

All the adult dentitions (except SK 285, in which only three teeth were recovered) display some evidence of calculus, with over half the available teeth showing involvement (Archive Table 10). Detailed study of each deposit (n206) by location and size (archive) shows that the majority: 68% are minimal, with the buccal/labial and lingual surfaces being the sites of predilection. The most advanced cases occur in the two females. SK 224 presents with large deposits on the buccal surface of the right maxillary molars. Loss of function of the maxillary molars in an elderly female (SK 268), is demonstrated by calculus deposits on their occlusal surfaces.

iv) Abscesses (SK 264; 268; 269; 270)

As might be expected, there was a close correlation between carious destruction and subsequent infection and abscess formation. In SK 270 an abscess on the palatal root of the left first molar had penetrated the maxillary sinus. The most advanced cases were demonstrated in two elderly individuals (SK 268; SK 269). There was no difference between the sexes, based on erupted tooth positions, some 3.4% of teeth were involved (Archive Table 10).

v) Hypoplasia (SK 268; 269; 270)

Hypoplastic lines represent defects in the enamel formation during the growth of the tooth. They occur in response to some form of childhood stress or disease (Dobney & Goodman, 1991). Once formed they remain visible throughout life. Only one individual, an elderly female (SK 268) presented with numerous (n9) defects, involving six teeth. Although the episodes of childhood disease were not fatal, it appears that they stunted her growth, as she was the shortest female in the sample, 1.511m (4' 11½") tall. The single defect in SK 270 may indicate localised trauma rather than systemic disease.

vi)Malocclusion (SK 277; 278)

Only one adult male (SK 277) displayed minor anterior mandibular crowding and mesio-labial (*c.* 35) rotation of the left upper lateral incisors. In an elderly female (SK 278) the first left upper molar was rotated around its palatal root, this, however, was due to *ante-mortem* loss of its mesial neighbour. The

absence of overcrowding in our sample can be attributed to the higher level of attrition than would be found in modern populations.

vii) Abnormalities (SK 270)

Only one abnormality was noted. The maxillary central incisors of an adult female display short root anomaly. It is very unusual for the whole dentition to display short root anomaly (Edwards & Roberts, 1990). However, dwarfing of certain roots, especially maxillary incisors is not uncommon (Sylvester (1984: 236-7). In modern day material, short roots can occur as a result of orthodontic treatment (Sylvester, 1984: 237). In archaeological material a congenital, probably inherited, condition is a more likely interpretation.

viii) Congenital Absence (SK 224; 270)

Two females, present with congenital absence of third molars, a frequency of 15.4% for all adults. In both cases it is the mandibular molars that are absent. Based on individual teeth, 8.4% of available third molars were congenitally absent. In modern day Britain, some 12.7% of individuals are reported to display congenital absence of third molars (Shinn, 1976).

The aetiology of the absence is not fully understood. The fact that third molars may be missing in large dental arches, suggests that reduction in jaw size and inadequate space is not the only factor in the absence (Brothwell *et al* 1963: 185). Higher frequencies may occur in small isolated communities and there is some evidence for a familial link in congenital absence (Graber, 1978). No familial groupings, however, could be detected in our sample. Since impacted third molars may lead to chronic sepsis, it is possible that absence is a selective advantage (Brothwell *et al* 1963: 187).

B) SUB-ADULT ORAL HEALTH (SK 225)

Only 21 deciduous and 9 permanent teeth from three sub-adult dentitions were available for study. The sample is too small for meaningful study. Only one tooth, a deciduous right mandibular canine in a 4-5 year old displayed a minor calculus deposit labially. The same child also displays enamel hypoplasia. A single defect may be due to trauma rather than systemic disease.

APPENDIX 1 BIBLIOGRAPHY

Adams, J.C., 1965 *Outline of Orthopaedics,* 4th ed, Churchill Livingstone, Edinburgh.

Anderson, T., 1987a *Post-Cranial Non-Metric Variation, The Examination of A Neglected Subjec,* M.A Thesis, Sheffield University

Anderson, T., 1987b A medieval bipartite cuneiform I with attempted unilateral fusion, *Ossa,* **13**, 3948.

Anderson, T., 1995a The human bones, in Parfitt, K., *The Iron Age Burials from St Richard's Road, Mill Hill, Deal,* British Museum Press, London

Anderson, T., 1995b Two traumatic cases from medieval Canterbury, *Journal of Paleopathology,* **7**, 227-235

Anderson, T., (in press) The human bones, in Hicks, M., & Hicks, A., *St Gregory's Priory, Canterbury,* English Heritage

Anderson, T., (forthcoming) A Bronze Age multiple grave from Monkton, Thanet, Kent, *Archaeologia Cantiana*

Barlow, T.E., 1942 Os cuneiforme I bipartitum, *American Journal of Physical Anthropology,* **29**, 95111

Berry, A.C., & Berry, R.J., 1967 Epigenetic variation in the human cranium, *Journal of Anatomy,* **101**, 361379

Black, S., & Scheuer, L., 1997 The ontogenetic developmem of the cervical rib, *International Journal of Osteoarchaeology,* **7**, 2-10

Brannon, E.W., 1963 Cervical rib syndrome, *Journal of Bone and Joint Surgery,* **45A**, 977-998

Brothwell, D.R., Carbonell, V.M., Goose, D.H., 1963 Congenital absence of teeth in human populations, in Brothwell, D.R., (ed), *Dental Anthropology,* Oxford, 179-190

Buxton, D.L.H., 1938 Platymeria and platycnemia, *Journal of Anatomy,* **73**, 3138

Carlson, D.S.G., Armelagos, G.J., Van Gerven, D.P., 1974 Factors influencing the etiology of cribra orbitalia in prehistoric Nubia, *Journal of Human Evolution,* **3**, 405-410

Carter, A., & Anderson, T., 1996 An archaeological example of enchondroma, *International Journal of Osteoarchaeology,* **6**, 411-413

Cybulski, J.S., 1977 Cribra orbitalia a possible sign of anemia in early historic native populations of the British Columbian coast, *American Journal of Physical Anthropology,* 47, 31-40

Dobney, K., & Goodman, A.H., 1991 Epidemiological studies of dental enamel hypoplasias in Mexico and Bradford: their relevance to archaeological skeletal studies, in Bush, H., & Zvelebil, M., (eds), *Health in Past Societies Biocultural interpretations of Human Skeletal Remains in Archaeological Contexts,* British Archaeological Reports, **S567**, 81-100

Edwards, D.M., & Roberts, G.J., 1990 Short root anomaly, *British Dental Journal,* **169**, 292-293

Etter, L.E., 1944 Osseous abnormalities of the thoracic cage seen in forty thousand consecutive chest photoroentgenograms, *American Journal of Roentgenology,* **51**, 359-363

Finnegan, M., 1976 Cervical ribs related to disuse atrophy in an archaic skeleton (490 B.C.): a preliminary report, *Paleopathology Newsletter,* **15**, 810

Finnegan, M., 1978 Non metric variations of the infra cranial skeleton, *Journal of Anatomy,* **125**, 2337

Flinn, M. & Flinn, R.M., 1992 Case of bilateral superior gluteal artery aneurysm, *Journal of the Royal College of Surgeons of Edinburgh,* **37**, 122-124

Floud, R., Wachter, K., Gregory, A., 1990 *Height, Health and History. Nutritional Status in the United Kingdom, 17501980,* Cambridge Studies in Population, Economy and Society in Past Times, **9**, Cambridge University Press

Fornaciari, G., Mallegni, F., Bertini, D., Nuti, V., 1982 Cribra Forbitalia and elemental bone iron in the Punics of Carthage, *Ossa,* **8**, 63-77

Graber, L.W., 1978 Congenital absence of teeth: a review with emphasis on inheritance patterns. *Journal of the American Dental Association,* **96**, 266-275

Gupta, A., Risitano, G., Crawford, R., Burke, F., 1989 Fractures of the hook of the hamate. *Injury,* **20**, 284-286

Hauser, G., & de Stefano, G.F., 1989 *Epigenetic variants of the Human Skull.* (E. Shweizerbart'sche Verlagsbuchhandlung, Stuttgart

Hengen, P., 1971 Cribra orbitalia: pathogenesis and probable etiology. *Homo,* **22**, 557-576

Höcker, K., 1994 Beiderseitiges symmetrisches Fehlen des Hamulus ossis hamati, *Handchirurgie Mikrochirurgie Plastiche Chirurgie,* **26**, 27-28

Holck, P., 1987 Scurvy a palaeopathological riddle. In: Capecchi, V., & Rabino Massa, E., (eds), *Proceedings of the 5th European Meeting of the Paleopathological Association, 1984,* Paleopathology Association, Siena, 163-171

Holtby, J.R.D., 1918 Some indices and measurements of the modern femur, *Journal of Anatomy and Physiology,* **52**, 363382

Janssens, P.A., 1980 Porotic hyperostosis and goat's milk anemia: a theory, *Ossa,* **8**, 101108.

Keith, D.A., (ed) 1988 *Surgery of the Temporomandiular Joint,* Boston

Kent, S., 1987 The influence of sedentism and aggregation on porotic hyperostosis and anaemia: a case study, *Man,* **21**, 605-636

Knowles, A.K., 1983 Acute traumatic lesions, in Hart ,G.D., (ed) *Disease in Ancient Man,* Toronto, 6183

Longia, G.S., Agarwal, A.K., Thomas, R.J., Jain, P.N., Saxena, S.K., 1982 Metrical study of rhomboid fossa of clavicle, *Anthropologishcer Anzeiger,* **40**, 111-115

Lovejoy, C.O., Burstein, A.H., Heiple, K.G., 1976 The biochemical analysis of bone strength: a method and its application to platycnemia. *American Journal of Physical Anthropology,* **44**, 489-506

Marzke, M.W. & Marzke, R.F., 1987 The third metacarpal styloid process - human origin and function. *American Journal of Physical Anthropology,* **73**, 415-432

Meisel, A.D. & Bullough, P.G., 1984, *Atlas of Osteoarthritis,* New York

Moore, M.K., Stewart, J.H., McCormick, W.F., 1988 Anomalies of the human chest plate area. *American Journal of Forensic Medicine and Pathology,* **9**, 348-354

Moseley, J.E., 1965 The paleopathological riddle of "symmetrical osteoporosis". *American Journal of Roentgenology,* **95**, 135-142

Moseley, J.E., 1966 Radiographic studies in hematologic bone disease: implications for paleopathology, in Jarcho, S., (ed) *Human Paleopathology,* Yale University Press, 121-130

Nathan, H., 1962 Osteophytes of the vertebral column. An anatomical study of their development according to age, race and sex with consideration as to their aetiology and significance, *Journal of Bone and Joint Surgery,* **44(A)**, 243-268

Parsons, F.G., 1916 On the proportions and characteristics of the modern English clavicle, *Journal of Anatomy,* **51**, 71-93

Pierre-Jerome, C., Bekkelund, S.I., Husby, G., Mellgren, S.I., Osteaux, M., Nordstrom, R., 1996 MRI anatomical variants of the wrist in women. *Surgical Radiologic Anatomy,* **18**, 37-41

Plastanga, N., Field, D., Soames, R., 1989 *Anatomy and Human Movement Structure and Function,* Oxford

Prescher, A., 1988 Über Ossa metastyloidea, parastyloidea und pisiformia secundaria, *Gegenbaurs Morphologische Jahrbuch,* **134**, 397-406

Purves, R.K., & Wedin, P.H., 1950 Familial incidence of cervical ribs, *Journal of Thoracic Surgery,* **19**, 952-956

Robeldo, B., Trancho, G.J., Brothwell, D., 1995 Cribra orbitalia: Health indicator in the late Roman population of Cannington (Somerset, Great Britain), *Journal of Paleopathology,* **7**, 185-193

Rösing, F.W., 1984 Discreta of the human skeleton: a critical review, *Journal of Human Evolution,* **13**, 319323.

Sarrafian, S.K., 1983 *Anatomy of the Foot and Ankle,* Philadelphia

Schauffer, I.A., & Collins, W.V., 1966 The deep clavicular fossa. Clinical significance and incidence in 10,000 routine chest photofluorograms, *Journal of the American Medical Association,* **195**, 778-779

Schofield, G., 1959 Metric and morphological features of the femur of the New Zealand Maori, *Journal of the Royal Anthropological Institute,* **89**, 89103.

Seeger, L.L., Bassett, L.W., Gold, R.H., 1988 Case report 464, *Skeletal Radiology,* **17**, 85-86.

Shinn, D.L., 1976 Congenitally missing third molars in a British population, *Journal of Denial Research,* **4**, 42-44

Sinclair, D., 1966 *An Introduction to Functional Anatomy,* 3rd ed.. Oxford.

Singh, H.K., 1973 Incidence of congenital rib anomalies, *Indian Journal of Chest Diseases,* **15**, 157-164.

Stark, H.H., Chao, E-K., Zemel, N.P., Rickard, T.A., Ashworth, C.R., 1989 Fracture of the hook of the hamate, *Journal of Bone and Joint Surgery,* **71(A),** 1202-07.

Stroud, G., 1993 The human bones, in Stroud, G., & Kemp, R.L., *Cemeteries of the Church and Priory of St Andrew, Fishergate,* York Archaeological Trust, **12/2**, 160-241.

Stuart-Macadam, P., 1979 Anaemia in Roman Britain: Poundbury Camp, in Bush, H., & Zvelebil, M, (eds) *Health in Past Societies,* British Archaeological Report, **567**, 101-114

Sylvester, C., 1984 Dental anomalies, in Woelfel, J.B., *Dental Anatomy,* Philadelphia.

Takigawa, K., 1971 Chondroma of the bones of the hand, *Journal of Bone and Joint Surgery,* **53(A)**, 1591-1600.

Tenney, J.M., 1991 Comparison of third metatarsal and third cuneiform defects among various populations, *International Journal of Osteoarchaeology* , **1**, 169-72

Thomson, A., 1893 Fourth annual report on the committee of collective investigation of the anatomical society of Great Britain and Ireland for the year 1892-93 Question I, *Journal of Anatomy,* **28**, 64-66

Torgersen, J., 1951a The developmental genetics and evolutionary meaning of the metopic suture. *American Journal of Physical Anthropology,* **9**, 193205

Torgersen, J., 1951b Hereditary factors in sutural patterns of the skull, *Acta Radiologica Diagnostica,* **36**, 37482

Trotter, M., & Gleser, G.C., 1958 A re-evaluation of estimation of stature based on measurements of stature taken during life and long bones after death, *American Journal of Physical Anthropology,* **16**, 79-123.

Von Endt, D.W., & Ortner, D.J., 1982 Amino acid analysis of bone form and possible case of prehistoric iron deficiency anemia from the American south west, *American Journal of Physical Anthropology,* **59**, 377-385

Wakely, J., & Young, I., 1995 A medieval wrist injury fracture of the hook of the hamate bone, *Journal of Paleopathology,* **7**, 51-56

Walker, P.L., 1986 Porotic hyperostosis in a marine dependent Californian Indian population, *American Journal of Physical Anthropology,* **69**, 345-354

Weston, W.J., 1956 Genetically determined cervical ribs: a familial study, *British Journal of Radiology,* **29**, 455-456

Wilbur, A.K., 1997 A discrete variant in the third plantar metatarsal joint: patterns of occurrence in a prehistoric population from West-central Illinois, *International Journal of Osteoarchaeology,* **7**, 124-132

Williams, J. Ll., (ed) 1994 *Rowe and Williams' Maxillofacial Injuries,* 2nd ed , Edinburgh

Williams, P.L. & Warwick, R., (eds) 1980 *Gray's Anatomy,* 36th Edinburgh