

P_{alaeoecology} R_{esearch} S_{ervices}

**Assessment of biological remains from
excavations at the site of the former steelworks
at Normanby Park, near Scunthorpe, North
Lincolnshire (site code: NMS2003)**

PRS 2003/89

Assessment of biological remains from excavations at the site of the former steelworks at Normanby Park, near Scunthorpe, North Lincolnshire (site code: NMS2003)

by

John Carrott, Benjamin Gearey, Erika Guttmann, Allan Hall, Deborah Jaques, Kathryn Johnson, Harry Kenward and Tracey Yates

Summary

An archaeological excavation was carried out by Humber Field Archaeology at the site of the former steelworks at Normanby Park, near Scunthorpe, North Lincolnshire. Archaeological remains of significance were encountered in the trenches in the vicinity of a medieval moated manorial site. Twenty-five sediment samples, together with nine column samples taken through the moat section, ten boxes of hand-collected bone and two boxes of hand-collected shell were submitted to PRS for an assessment of their bioarchaeological potential. Additionally, this report includes notes regarding the potential of certain deposits for micromorphological analysis.

Palynological assessment of the samples from Normanby demonstrated that generally high concentrations of moderately well preserved pollen are present in the moat sediments. The data indicate that a generally open grassland environment which was very possibly grazed or mown, was present close to the moat. Strong evidence for arable land or crop processing activities on, or adjacent to, the site was recorded, whilst some local wood/scrubland was also suggested. The data might also imply a change in land use from a predominantly arable to pastoral during the latter stages of moat infilling. The diatom analyses proved less useful, with the majority of the samples containing low concentrations of poorly preserved frustules, indicating these samples were probably affected by preservation problems. Those data from which some conclusions may be drawn would appear to reflect natural processes of succession as the moat infilled over time.

The assemblages recovered from the sediment samples fell into two main types: small concentrations of mainly charred plant material (from deposits associated with the moat platform) and much richer assemblages of both plant and invertebrate macrofossils from the fills of the moat itself. The remains offered insights into both local land use and activities at the site. In general, this was consistent between the two classes of remains, and with the pollen, though, in contrast to the evidence of the pollen and plant macrofossil, there was little indication of trees or shrubs from the invertebrates.

The hand-collected shell assemblage recovered was small and dominated by rather poorly preserved oyster shell. The bias towards edible taxa suggests that the remains derive from human food waste, but the remains were of no further interpretative value.

The vertebrate remains were generally well preserved, although extensive fresh breakage damage was noted. Both butchery waste and domestic refuse were indicated, with the high frequency of pig remains and the presence of wild mammals, such as hare and fallow deer, hinting at high status occupation. Fish remains were recovered from seven of the samples, including several floor deposits and show potential for the recovery of a useful fish assemblage which could provide additional information regarding diet and also local supply networks.

KEYWORDS: NORMANBY PARK; NORTH LINCOLNSHIRE; ASSESSMENT; MOATED MANORIAL SITE; 13TH CENTURY TO 16TH CENTURY; POST-CONQUEST; MEDIEVAL; POST-MEDIEVAL; SOIL MICROMORPHOLOGY; POLLEN; DIATOMS; CHARRED PLANT REMAINS; WATERLOGGED PLANT MACROFOSSILS; INVERTEBRATES; SHELLFISH; OYSTER; VERTEBRATE REMAINS; FISH BONE

Contact address for authors:

Prepared for:

Palaeoecology Research Services
Unit 8
Dabble Duck Industrial Estate
Shildon
County Durham DL4 2RA

Humber Field Archaeology
The Old School
Northumberland Avenue
Hull HU2 0LN

26 January 2004

Assessment of biological remains from excavations at the site of the former steelworks at Normanby Park, near Scunthorpe, North Lincolnshire (site code: NMS2003)

Introduction

Archaeological excavations were undertaken by Humber Field Archaeology at the site of the former steelworks at Normanby Park, near Scunthorpe, North Lincolnshire (NGR SE 8816 1444), between the 7th of April and the 26th of September 2003, in advance of extensive reclamation of the area. The excavation was centred on the remains of a medieval moated manorial site which had been buried beneath slag in the early 20th century.

Pottery recovered from initial interventions across the moat provided dates from the 14th to the 19th centuries. In all, five phases of activity were identified:

Phase 1: undated pre-moat phase.

Phase 2: digging of the moat and construction of the initial building sequence; dating approximately late 13th to 14th century.

Phase 3: later development of the structures on the platform, including erection of the hall and the construction of the stone causeway; dating approximately 15th to mid 16th century.

Phase 4: primarily the demolition of the site, but there may be some traces of rebuilding; general 16th century date.

Phase 5: phase of abandonment; dating 17th – 20th century.

Sixty-two samples were recovered from the deposits ('GBA'/'BS' *sensu* Dobney *et al.* 1992). Twenty-five of these, together with nine column samples taken through the moat sections, ten boxes of hand-collected bone, two boxes of hand-collected shell were submitted to PRS for an assessment of their bioarchaeological potential. Additionally, the potential of micromorphological analysis to address archaeological questions relating to some of the deposits was assessed by EG

during a site visit in July 2003. Five samples, representing a range of deposits, were taken for his purpose. A review of the site inspection and notes on the samples taken is included as the Appendix to this report.

Methods

Column samples

Subsamples for pollen and diatom preparation were extracted from each monolith depending on the stratigraphy. Pollen samples were extracted from sediment with the highest apparent organic content, whilst diatom samples were also taken from silt and clay rich segments of the monoliths. One column sample (CS5) was found to be inorganic silty sand and as such was not subsampled for pollen analysis. Pollen and diatom preparations followed standard procedures (Moore *et al.* 1991; Smol *et al.* 2001). At least 125 total land pollen grains (TLP) excluding aquatics and spores were counted for each sample where possible. Pollen nomenclature follows Moore *et al.* (1991), with the modifications suggested by Bennett *et al.* (1994). The pollen sum is based on percentage of TLP excluding obligate aquatics and spores. Percentages for these excluded groups are calculated as percentage of the basic sum plus sum of the relevant group. Diatom nomenclature follows Krammer and Lang-Bertlot (1986; 1988).

Three subsamples were taken from the column samples (one each from CS 3, 7 and 9) for submission to Beta Analytic Inc. (Miami, Florida) for radiocarbon dating.

Sediment samples

The submitted sediment samples were inspected in the laboratory and their lithologies were recorded, using a standard *pro forma*, prior to processing, following the procedures of Kenward *et al.* (1980; 1986), for recovery of plant and invertebrate macrofossils.

The flots, washovers and residues resulting from processing were examined for plant and invertebrate macrofossils. The residues were examined for larger plant macrofossils and other biological and artefactual remains.

Insect preservation was recorded using the scale of Kenward and Large (1998).

Twig fragments, recovered during the processing of the subsample from Sample 36 (Context 1114) were submitted to Beta Analytic Inc. for radiocarbon dating.

Hand-collected shell

Two boxes of hand-collected shell (representing material from 69 contexts, 7 of which were unstratified or unphased) were submitted. Brief notes were made on the preservational condition of the shell and the remains identified to species where possible.

For oyster (*Ostrea edulis* L.) shell additional notes were made regarding: numbers of left and right valves; evidence of having being opened using a knife or similar implement; measurability of the valves; damage from other marine biota (polychaet worms and dog whelks); encrustation by barnacles.

Hand-collected vertebrate remains

For the hand-collected vertebrate remains, data were entered directly into a series of tables using a purpose-built input system and *Paradox* software. Subjective records were made of the state of preservation, colour of the

fragments, and the appearance of broken surfaces ('angularity'). Additionally, for the larger assemblages, other information, such as fragment size, dog gnawing, burning, butchery and fresh breaks, was noted, where applicable.

Fragments were identified to species or species group using the PRS modern comparative reference collection. The bones which could not be identified to species were described as the 'unidentified' fraction. Within this fraction fragments were grouped into a number of categories: large mammal (assumed to be cattle, horse or large cervid), medium-sized mammal (assumed to be caprovid, pig or small cervid), and totally unidentifiable. These groups are represented in Table 8 by the category labelled 'Unidentified'.

Results

The results from radiocarbon dating of twig fragments from Sample 36 (Context 1114) and of material extracted from three of the column samples (CS3, 7 and 9) are given in Table 10.

Column samples

Nine column samples (CS1-9), representing five discrete sediment sequences in total, were sampled by Humber Field Archaeology from various sections of the moat at Normanby. Table 1 lists the sequences, the sample depths and corresponding context numbers for the palynological analyses. Tables 2 and 3 present detailed and summary information for the pollen taxa. Table 4 lists the subsamples analysed for diatoms and the main species identified in each sample. The results are outlined by section.

Section 7 (CS1, 2 and 3)

Pollen

Pollen preservation was assessed as moderate for all three samples in this sequence, whilst concentrations of 27×10^3 grains cm^{-3} (0.25 m), 33×10^3 grains cm^{-3} (0.38 m) and 40×10^3 grains cm^{-3} (0.90 m) were relatively

high. The samples tended to be dominated by 'herbs', which accounted for around 60-70% of total land pollen. Poaceae (wild grasses) formed a large proportion (25-28%) of this and high percentages of Cereal-type (peaking at 21% at 0.38 m) were recorded in the basal (0.90 m) and middle samples (0.38 m). These two samples were also characterised by *Centaurea cyanus* (cornflower, 2-3%), whilst other relatively well represented herbs included Asteroideae (Lactuceae undiff. and Cardueae/Asteroideae) (dandelions/daisies etc.) which peaked at 12% and 4%, respectively (at 0.25 m), *Rumex obtusifolius*-type (broad leaved docks, 3-4%), Chenopodiaceae (fat hen, 6% at 0.25 m) and Apiaceae (3% at 0.25 m). Herbaceous taxa recorded at lower values (1-2%) were *Plantago lanceolata* (ribwort plantain), Ranunculaceae (buttercup family), Brassicaceae and Caryophyllaceae (pink family). Tree and shrub pollen was most strongly represented in the top and basal samples. In the latter, values for *Quercus* (oak) of 25% were apparent whilst *Sambucus nigra*-type (elder) accounted for 6%. The proportion of *Quercus* fell in the middle sample before recovering to 17% by the top of the sequence, whilst *Calluna vulgaris* (heather) and *Corylus avellana*-type (probably entirely hazel in this instance) increased to 6% and 7%, respectively, by the top of the sequence. Spores and aquatics tended to be present in only low proportions, although *Pteridium* (bracken) did rise to 5% at the top of the sequence.

These samples reflect a largely open landscape with grassland habitats dominant around the moat. The range of herbs includes wetland and tall herb taxa which were probably growing in, or on the edges of, the moat itself; species such as those of the carrot and buttercup families. Most notable are the high percentages of Cereal-type pollen in the middle and basal samples which are also characterised by other herbs associated with cultivation including corncockle and possibly members of the fat hen family and broad leaved docks. This suggests that cultivation or the processing of cereal crops was taking place in close proximity to the sampling site, but other herbs indicative of a short sward, especially Lactuceae undiff. indicate that low growing pastoral/meadow vegetation was present nearby. Indeed, the reduction in cereals and concomitant increase in Lactuceae undiff. at the top of the sequence may imply a shift in local landuse from what was a predominantly arable to a pastoral regime, but further analysis would be required to examine this hypothesis. Few trees other than *Quercus* (oak) are attested, with percentages of this taxa sufficient to suggest that some oak woodland was present nearby, and seemingly of greater extent at the top and base of the sequence. Elder also seems to have formed a component of the woody/scrub vegetation represented at the base of the sequence and some evidence for an increase in the extent of hazel scrub might also be inferred from the increasing representation of this taxon

up the sequence. Likewise, an expansion in dry, perhaps 'heathy', vegetation is implied by the increased proportions of *Calluna vulgaris* and *Pteridium*.

Diatoms

The samples displayed a range of species with *Cyclotella stelligera* and *Stephanodiscus* spp. recorded in particularly high numbers at the top. The appearance and increase of these planktonic species indicate water quality changes within the pelagic environment, either in trophic status and/or water depth, but further analysis would be necessary to investigate the nature of this change. Preservation of diatom frustules was relatively good in all three samples, but the low species diversity and richness suggests the remains may have been affected by preservational bias.

Section 26 (CS4)

Pollen

Pollen preservation was assessed as moderate for this sample, and a relatively high pollen concentration of 40×10^3 grains cm^{-3} was recorded. Herbaceous pollen accounted for approximately 48% of total land pollen, whilst trees and shrubs were present at approximately 27% and 24%, respectively. The trees consisted predominantly of *Quercus* (17%) and *Fraxinus* (9%), and shrubs almost entirely of *Corylus avellana*-type (22%). Herbaceous taxa were represented by Poaceae (13%), Cereal-type (6%), Lactuceae undiff. (9%), *Plantago lanceolata* (6%), with other herbs such as Ranunculaceae (2%), *Rumex obtusifolius*-type (3%) and Brassicaceae (3%) at lower values. *Sparganium emersum*-type (bur-reeds) (5%) was the only aquatic present.

This sample reflects a generally open environment beyond the moat, with evidence for arable land and/or the processing of crops as well as disturbed/waste land and grassland/pastoral habitats. Some scrub woodland, with oak, ash and hazel, must also have been present within a reasonably close proximity of the sampling site. The record of *Sparganium* must reflect the presence of bur-reeds in open water communities in the moat itself.

Diatoms

This sample was characterised by a relatively high density of species, although the taxon diversity was low. Those diatoms observed were of an epilithic (e.g. *Fragilaria* spp.) and epiphytic nature (*Pinnularia* spp.), in the case of the latter probably associated with the local bur-reeds.

CS5*Diatoms*

This sample was very similar to that from CS4 (above), with a similar range of diatoms of an epilithic (e.g. *Fragilaria* spp.) and epiphytic nature (*Pinnularia* spp.). Low species diversity again indicated preservational bias.

Section 33 (CS6 and CS7)*Pollen*

Pollen preservation was assessed as poor for the top sample (0.01 m) and moderate for the basal sample (0.40 m); the top sample was also distinguished by a relatively low pollen concentration of 15×10^3 grains cm^{-3} , whilst the concentration of 63×10^3 grains cm^{-3} for the top sample was relatively high. Trees were reasonably well represented in the basal sample, predominantly *Quercus* (37%) and *Sambucus nigra*-type (elder, 16%), but these figures have fallen to 4% and 7% respectively by the top sample. Herb pollen increases from approximately 52% in the lower sample to 85% in the upper. At the base, the most strongly represented taxa were Poaceae (20%), Cereal-type (9%) and Apiaceae (6%), with other herbs including *C. cyanus*, Brassicaceae and *Rumex obtusifolius*-type (all 2%). A similar range was recorded from the top sample, with the main increase in total herbaceous pollen attributable to rises in Poaceae to 30%, Cyperaceae to 9% and Lactuceae undiff. to 12%. Aquatics in the form of *Sparganium emersum*-type peaked at 25% TLP+aquatics at the top of the sequence. *Pteridium* also increased from 4% to 16% TLP+spores.

These samples indicate an environment with some oak woodland and elder scrub present at the base, but also with open grassland habitats and the cultivation/processing of cereals near to the site. By the top of the sequence, the area of grassland in the near vicinity has increased at the expense of the tree and shrub cover, with dandelions especially significant in the local vegetation, implying a well grazed/closely cropped sward nearby. The expansion in bracken might also be attributed to an increase in grazing pressure. Reductions in the representation of cereal pollen indicate that either the area of land under arable cultivation was reduced locally or any processing activities which had previously been carried out had shifted location. The peak in *Sparganium* in the top sample must reflect local bur-reed growth and perhaps increased wetness within the sampling site which might also be connected to some spread of sedges reflected by the increase in Cyperaceae.

Diatoms

These samples were characterised by an extremely low percentage of poorly preserved diatoms. The majority of taxa present were fragmented beyond identification and as such no further comment may be made on the basis of this data.

Section 57 (CS8 and 9)*Pollen*

Pollen preservation was assessed as moderate for both samples in this sequence, whilst concentrations of 71×10^3 grains cm^{-3} (0.05m) and 65×10^3 grains cm^{-3} (0.50m) were relatively high. Both samples were dominated by herbaceous taxa (both approximately 78% of total land pollen). In the basal sample, the greater proportion of this was the result of an exceptionally high value (54%) for Cereal-type, with Poaceae (wild grasses) at 7%. Other herbs in this sample included Lactuceae undiff. (4%), *C. cyanus* (1%), Ranunculaceae (2%) and others at trace values (<1%), such as Chenopodiaceae, Caryophyllaceae, *Achillea*-type (yarrows) and *Plantago lanceolata*. Trees and shrubs were poorly represented, with *Quercus* (7%) and *Fraxinus*, *S. nigra*-type (6%) and *Corylus avellana*-type (4%) attaining the highest values. The range and values of taxa was similar in the top sample, although Cereal-type was reduced to 26% and Poaceae had increased to 30%. A slight increase in *Quercus* (10%) and fall in *S. nigra*-type (2%) was also observed.

The very high percentages of Cereal-type in the basal sample must reflect a very local source for this pollen such as the deposition of crop processing residue in the moat or, for example, threshing activities (cf. Hall 1988) adjacent to the sampling site. This bias in the sample means extra-local vegetation is likely to be swamped by this local source, but the other taxa recorded indicate generally open, grass and herb rich habitats with evidence for disturbed/ruderal vegetation. Evidence for some scrub woodland areas with oak, elder, hazel and ash, is also present.

Diatoms

The diatom spectra from these samples were similar to that of Section 7 (CS1-3) and characterised by relatively high concentrations, but the taxon diversity was again low suggesting frustule dissolution. Those diatoms present were again of an epilithic and epiphytic nature, with increases in the latter probably associated with the extent of aquatic macrophyte growth within the moat and either a shallowing of water because of

the accumulation/deposition of organic matter or an increase in water turbidity as the moat became naturally enriched.

Sediment samples

Plant and invertebrate remains were examined from a series of samples of moat fills and deposits associated with the moat platform. The results are presented in context number order by phase. Archaeological information, provided by the excavator, is given in square brackets. A brief summary of the processing method and an estimate of the remaining volume of unprocessed sediment follows (in round brackets) after the sample numbers.

For those samples yielding assemblages of insect and other macro-invertebrate remains (almost all from fills of the moat) the faunas were broadly similar and are not considered separately. Erosion and fragmentation data for the insects are presented, together with brief comments on the nature and size of the recovered assemblages, in Table 5. Samples not listed in Table 5 may be assumed to have yielded no invertebrates of interpretative significance (where the paraffin flots were barren of insect remains this has been noted in the following text).

PHASE 2 – LATE 13TH TO 14TH CENTURY

Context 66 [clay/mortar ?floor]

Sample 40/T (3 kg sieved to 300 microns with paraffin flotation and washover; approximately 4 litres of sediment remain)

Just moist, light to mid brown to mid grey, unconsolidated to crumbly, silty clay (in crumbly lumps) or clay silt (in unconsolidated areas). Traces of charcoal and modern rootlets were present.

There was a small washover of about 35 cm³ of roots and charcoal with a few charred cereal grains; further grains—of wheat and rye (*Secale cereale* L.)—were present in the small flot (in which insects were lacking).

The small residue (dry weight 57 g) consisted mainly of sand and small stones (to 2 mm), with traces of charcoal, fragments of unidentified mollusc shell (2 g), and some ?eggshell. Twelve unidentified fragments of

bone were recovered from this sample. Most were less than 20 mm in any dimension; a few were burnt.

Context 93 [floor]

Sample 41/T (7.5 kg sieved to 300 microns with paraffin flotation and washover; no sediment remains)

More or less dry, light to mid brown to mid grey-brown, brittle to crumbly, sandy silt. Stones (6 to 60 mm), flecks of ?charcoal, fragments of mammal bone and marine shell were present.

The very small washover of about 50 cm³ consisted of charcoal (to 25 mm) and some root fragments; there were also a few poorly preserved charred cereal grains, amongst them a single specimen of bread/club wheat (*Triticum 'aestivo-compactum'*) and a trace of charred ?heather (*Calluna vulgaris* (L.) Hull) root/twig (perhaps from burnt peat or turves). Traces of coal, bone and fish scale were also noted. The flot was barren of insect remains.

The moderate-sized residue (dry weight 1675 g) was mainly composed of sand, with fragments of charcoal/cinder and marine mollusc shell. Vertebrate material (154 fragments) recovered from this sample was extremely well preserved and dark brown in colour. Most fragments (75%) were small (less than 40 mm) and mainly represented the remains of large and medium-sized mammals. The bones appeared to represent waste from the preparation of carcasses and included fragments of pig skull, pieces of rib and caprovid teeth. Bird and fish remains indicated the presence of more domestic kitchen waste, with chicken being the only bird identified. Fish bones included eel (*Anguilla anguilla* (L.)), herring (*Clupea harengus* L.) and Gadidae (cod family) remains. Additionally, several small mammal incisors were present within the assemblage.

Context 171 [floor layer]

Sample 14/T (3 kg sieved to 300 microns, with washover; approximately 2-3 litres of sediment remain)

Just moist, light grey-brown to mid to dark grey-brown (mid grey in places), brittle to crumbly (working plastic), slightly sandy (?from mortar) clay. Stones (6 to 20 mm) and fragments of rotted mortar and charcoal were present.

The washover comprised a very few cm³ of charcoal (to 10 mm), including one fragment of hazel (*Corylus avellana* L.) nutshell and a few fragments of charred cereal grains (with further fragments of grain being recovered from the residue). Modern material, presumably from an active soil above the deposit,

included rootlets, snails (*Cecilioides acicula* Müller) and probably also nematode (*Heterodera*) cysts.

The very small residue (dry weight 32 g) was mainly sand and stones (to 20 mm), with small fragments of marine mollusc shell. Nine fragments of bone were recovered, including a herring vertebra and an amphibian shaft fragment. One fragment was burnt.

Context 182 [fill of drain 177]

Sample 17/T (2 kg sieved to 300 microns with washover; approximately 2-3 litres of sediment remain)

Moist, light to mid grey-brown to light to mid brown, crumbly and slightly sticky (working soft and sticky), slightly sandy, clay silt, with stones (6 to 20 mm) present.

There was a very small washover of a very few cm³ of slightly concreted sediment (to 2mm), traces of charcoal (to 5 mm), and a few very eroded charred cereal grains; unidentified snails and coal were also noted.

A small residue (dry weight 28 g) remained after processing, which was mostly sand with traces of snail shell. Four unidentified fragments of bone were also recovered.

Context 200 [secondary fill of pit 176]

Sample 23/T (3 kg sieved to 300 microns with washover; approximately 3 litres of sediment remain)

Moist, varicoloured (light grey-ish yellow to brown to mid grey), stiff (working plastic), clay. Charcoal flecks, land snail fragments and modern rootlets were present.

The washover, of a few cm³ in volume, comprised organic debris, mainly modern roots with a little charcoal (to 10 mm), with a single ?pea (cf. *Pisum sativum* L.) cotyledon, one bread/club wheat grain, and one unidentifiable cereal grain.

The small residue (dry weight 28 g) consisted almost entirely of sand, with traces of charcoal and a fragment of charred hazel nutshell. Bone amounted to 17 fragments, of which half were fish bones. The latter included five eel vertebrae. No other fragments were identifiable.

Context 215 [refuse dump]

Sample 31/T (4.85 kg sieved to 300 microns with washover; no sediment remains)

Just moist, light brown to light to mid grey-brown, crumbly to unconsolidated, slightly sandy silt, with

lumps of light to mid brown clay. Mortar/plaster and charcoal flecks were present in the sample.

The very small washover of about 10 cm³ comprised a trace of charcoal (to 10 mm) and very poorly preserved charred cereal grains which could not be identified further.

Sand, with some stones (to 20 mm) formed the bulk of the moderate-sized residue (dry weight 1150 g). Small fragments of charcoal were also evident. Approximately 85 fragments of reasonably well preserved bone were recovered from this sample. Fresh breakage damage—the result of excavation and post excavation processes—was extensive, the assemblage being increased by fragments representing the same bone. Fish bones were present and included the remains of flatfish (Pleuronectidae), herring and three-spined stickleback (*Gasterosteus aculeatus* L.). Several fragments of mouse (*Mus* sp.) were identified, together with a small phalanx which was probably cat.

Context 219 [?hearth]

Sample 37/T (3kg sieved to 300 microns with washover; approximately 2-3 litres of sediment remain)

Moist, light to mid orange-brown (with patches of buff and mid grey), crumbly to stiff (working soft or more or less plastic), clay silt, with a larger component of clay in places. Rotted charcoal was present.

The washover consisted of a few cm³ of charred material—apparently a mixture of pale ash and charcoal (both to 5 mm). There were also a few poorly preserved charred cereal grains and one charred cornfield weed seed.

The residue (dry weight 45 g) was composed mainly of sand, with traces of unidentified shell. Identified fragments of bone recovered from this sample included the remains of herring, flatfish and a ?gadid fragment. Small mammal remains were represented by a maxilla and a mandible, both identified as mouse.

Context 271 [levelling layer]

Sample 44/T (3 kg sieved to 300 microns with paraffin flotation; approximately 2 litres of sediment remain)

Moist, light to mid grey-brown to mid grey, stiff (working plastic), clay, with traces of ?charcoal and ?land snails.

The small to moderate-sized residue of about 220 cm³ included about 120 cm³ sand and gravel, the rest being herbaceous and woody detritus, including conspicuous quantities of some unidentified bud and bract like structures which may have come from an aquatic plant.

Although aquatic taxa were represented amongst the seeds, the more frequent taxa were weeds of various kinds and it may be that this deposit formed in part from the dredging of material from the moat, mixing with material of terrestrial origin then taking place (there was a possible grass/hay component, for example). More of the same taxa were present in the rather large flot.

Context 1082 [eggshell within dark grey/black organic Silt]

Sample 63/SPOT

This spot find comprised a bird egg, whole but fragmented, perhaps about 50 mm in largest dimension, about which it might be possible to say more via an appropriate specialist. There were also a few flattened twig fragments up to 40 mm in length.

Context 1171 [‘basket structure’ within Context 1172]
Sample 53/SPOT

The large sample (about 8 litres) consisted of dark grey, stiff clay silt, with quite a variable organic content and some quite strongly flattened twig fragments (some with obliquely cut ends) up to 110 mm long by 15 mm in width (though more usually about 10 mm wide). The twigs were identified (from a subsample) as willow (*Salix*). They would need careful dissection by a conservator to establish if they are still forming a coherent object.

Context 1172 [moat fill (within causeway)]

Sample 58/T (3 kg sieved to 300 microns with paraffin flotation, approximately 3 litres of sediment remain)

Moist, mid grey to brown to mid-dark grey internally (oxidation and reduction/sulphide staining), brittle (working soft), silt. Some lumps (to 80 mm) of layered silt, organics and sand were present. These were generally lighter in colour – light to mid grey/brown, the sand component being light brown.

The moderate-sized residue of about 500 cm³ included about 15% sand and a little gravel, the rest being rather ‘flaky’ woody detritus (which was found to include chips of oak, to 10 mm) and some ‘litter’ material—uncharred grass/cereal culm, cornfield weeds (especially corncockle, *Agrostemma githago* L. and poppy, *Papaver argemone* L.), bracken, and at least one small (less than 5 mm) fragment which may have been peat. Walnut (*Juglans regia* L.) was also recorded from this sample. *Daphnia* ehippippa were abundant.

Context 3003 [moat fill (basal fill, W moat)]

Sample 49/T (3 kg sieved to 300 microns with paraffin flotation; approximately 6 litres of sediment remain)

Moist, mid, grey-brown to light to mid and mid to dark grey to black (internally), stiff and slightly sticky (working soft), silt. Twigs were present within the sample.

Unlike those from the main sequence of moat fills, this sample gave a very small residue of about 20 cm³ of herbaceous detritus and undisaggregated sediment. There were traces of several taxa which occurred in later deposits and which presumably therefore either represent deposition of very small amounts of material under the same conditions or perhaps even a degree of contamination from above.

Context 4018 [moat fill (basal fill, N moat)]

Sample 29/T (3 kg sieved to 300 microns with paraffin flotation; approximately 2-3 litres of sediment remain)

Moist, light to mid grey-brown (locally more brown or more grey) with some sulphide staining (black or very dark grey patches internally), brittle (working soft), slightly sandy (?from the mortar) silt. Wood and twigs, both very rotted, and fragments of ?mortar (also very rotted) were present.

There was a moderately large residue of about 650 cm³, of which about 100 cm³ comprised a single piece of wood in the form of an angled stake point of oak (*Quercus*), charred at the sharpened end. The rest consisted of angular woody organic debris and a very little sand. Plant material was well preserved, with some sulphide-blackening, especially of mosses. A small ?heathland/litter component was present and, as in the sample from Context 1114, there were fragments of rye rachis. Some grains of rye present were noticeably ‘dimpled’, perhaps a result of having become partly degraded prior to charring. There was at least one fragment of free-threshing wheat rachis.

PHASE 3 – 15TH TO MID 16TH CENTURY

Context 114 [laminated floor silts]

Sample 39/T (3 kg sieved to 300 microns with paraffin flotation; approximately 5 litres of sediment remain)

More or less dry, mid grey-brown to mid to dark grey-brown (with lighter and darker mottling on a cm-scale), brittle and compressed (but with no obvious layering) to crumbly, sandy silt. Fragments of mortar and/or plaster and modern rootlets were present.

The very small flot consisted mainly of rootlets; the small washover of about 25 cm³ comprised woody and herbaceous root fragments and fine charcoal, with

traces of elder (*Sambucus nigra* L.) seeds. Everything uncharred may have been of recent origin (there were also clearly modern earthworm egg capsules and the burrowing snail *Ceciloides acicula*).

The small residue (dry weight 52 g) consisted mostly of sand, with some stones (to 50 mm) and fragments of marine mollusc shell. Vertebrate remains from this sample were well preserved, with most being quite small fragments (less than 20 mm in maximum dimension). Several eel and herring bones were identified, but the remainder of the assemblage was not identifiable.

Context 149 [demolition layer]

Sample 15/T (3 kg sieved to 300 microns with washover, approximately 4 litres of sediment remain)

Just moist, mid to dark grey-brown, crumbly to unconsolidated, slightly sandy silt. Stones (20 to 60mm) and rootlets, large mammal bone and ?freshwater molluscs were present.

The small washover consisted of about 60 cm³ of charcoal of oak and a diffuse-porous type (to 10 mm), and some modern roots. There were traces of charred cotyledons which may have been pea and there was a single charred 'sclerenchyma spindle' of cotton-grass (*Eriophorum vaginatum* L.) presumably from the burning of peat. Other remains representing debris from occupation were traces of tiny fragments of burnt bone (to 2 mm) and fish scale (to 1 mm), whilst some bones of small vertebrates (to 5 mm) probably represent an element of the local wildlife.

Sand and stones (to 40 mm) comprised the largest components of the tiny residue (dry weight 65 g), with some mollusc shell fragments. A vertebrate assemblage of fair preservation and totalling 91 fragments was recovered from this sample. Few fragments were greater than 20 mm in maximum dimension and most could not be identified to species or family group. Identified remains included several bird phalanges and shaft fragments, probably chicken, and a number of rabbit bones (a pelvis and two isolated teeth). Of the 12 fish bones within the assemblage, one was identified as herring and a second fragment was a three-spined stickleback spine. The latter was extremely well preserved.

Context 184 [fill of culvert 183]

Sample 62/T (3 kg sieved to 300 microns with washover; approximately 4 litres of sediment remain)

Just moist, light to mid grey-brown to mid grey-brown, brittle to crumbly (working more or less soft), slightly sandy, clay silt to silty clay. Stones (2 to 60 mm),

fragments of brick/tile, traces of charcoal and mammal bone (burnt) were present.

The washover of about 20 cm³ comprised very decayed roots, a little charcoal and 'char' (both to 10 mm).

The tiny residue (dry weight 70 g) was mainly sand and gravel, with some fragments of charcoal (3 g) and traces of unidentified land snail shell. A small assemblage of bone amounting to 22 fragments was produced from this sample. Most fragments were very small and included amphibian and shrew (*Sorex* sp.) bones.

Context 197 [floor surface]

Sample 22 (3 kg sieved to 300 microns with washover; approximately 3-4 litres of sediment remain)

Just moist, light brown to light-mid grey (lighter and darker in places), brittle to crumbly and locally layered (working plastic), slightly sandy slightly silty clay (much sandier in places). Stones (6 to 20 mm and 20 to 60 mm) were present.

The small washover of about 20 cm³ consisted of organic detritus (mainly very decayed roots) and a little charcoal (to 10 mm), with some snails and modern root fragments.

The tiny residue (dry weight 57 g) was mostly sand, with some stones (to 15 mm) and traces of marine mollusc shell. All 12 of the bone fragments recovered from this sample were unidentified.

Context 227 [burnt area within building]

Sample 38/T (3 kg sieved to 300 microns with washover; approximately 2 litres of sediment remain)

Dry, varicoloured (light grey to brown to light to mid orange-brown to dark grey, with some whitish areas visible), indurated, slightly sandy ?ashy silt. Charcoal flecks were present.

This subsample yielded a washover of a very few cm³ of fine charcoal and roots. Identifiable plant remains were traces of charred seeds (sedge, *Carex*; orache, *Atriplex*; and dock, *Rumex*) and a single uncharred duckweed (*Lemna* sp.) frond. The last of these may have arrived with water from the moat; such material is sufficiently often recorded from deposits which otherwise contain no ancient uncharred material to imply that they are genuine fossils.

The moderate-sized residue (dry weight 1100 g) consisted mainly of sand and cinders. A very small assemblage of bone, totalling 20 fragments was recovered from this sample. All the fragments were less

than 10 mm in any dimension and none could be identified to species.

Context 1014 [moat fill (middle fill, S moat)]

Sample 61/T (3 kg sieved to 300 microns with paraffin flotation; approximately 2-3 litres of sediment remain)

Just moist, light brown to mid grey, crumbly (working soft), sandy silt, with some areas being slightly silty sand (these being light brown in colour). Fragments of wood and twigs, together with traces of charcoal, were present.

There was a large residue of about 850 cm³ of which about 150 cm³ was sand, the rest woody and herbaceous detritus with abundant *Daphnia* ephippia. The wood fragments (to 25 mm) were often not very well preserved, having patches of vivianite in places; they probably included willow (*Salix*). Debris from litter of some kind included charred and uncharred grass/cereal straw culm fragments and the presence of cereal straw seems to be confirmed by the presence of well-preserved rachis (ear-stalk) fragments of rye. A trace of gorse (*Ulex*) twig epidermis was also noted. Quite a rich assemblage of plant remains was evidently preserved in this subsample, taxa including debris from woody plants (especially bud-scales of oak) and a variety of weeds, mostly likely to have arrived with cereals or straw. There were also a few taxa typical of damp areas with disturbance through human activity or livestock.

Context 1016 [moat fill (4th fill, S moat)]

Sample 1/T (3 kg sieved to 300 microns with paraffin flotation; approximately 5 litres of sediment remain)

Moist, mid brown to mid grey-brown, black internally (oxidation and reduction/sulphide staining), brittle to crumbly (working soft), slightly sandy silt. Fragments of wood and leaf were present.

The residue from Sample 1 was not examined closely; it was about 300 cm³ in volume and appeared to be very similar to that from Sample 2 (see below).

Sample 2/T (3 kg sieved to 300 microns with paraffin flotation; approximately 5-6 litres of sediment remain)

Moist, mid brown (externally) to black internally (oxidation/reduction or sulphide staining), brittle to crumbly (working soft), very slightly sandy silt. Stones (greater than 60mm) and fragments of leaf and twigs were also present.

This subsample yielded a moderate-sized residue of about 375 cm³ of rather fine organic debris, including

some wood fragments, and many tree leaf fragments, together with a very little sand and gravel. Preservation was mostly good, though there was a little vivianite in places. Debris from woody taxa made up a good part of the assemblage, with weeds of cornfields and waste places and some aquatics (such as duckweed, *Lemna*) likely to have been living in the moat. Traces of plant litter—bracken (*Pteridium aquilinum* (L.) Kuhn) and grass/cereal straw—were also noted.

Context 1083 [brushwood layer within moat fill]

Sample 54/T (3 kg sieved to 300 microns with paraffin flotation; approximately 3 litres of sediment remain)

Moist, mid to dark grey-brown, brittle and layered in places to crumbly (working soft), noticeably undense, slightly sandy silt. Wood was present to common in the sample.

There was a very large residue of about two litres (which might have been rather smaller had the sediment disaggregated more completely); it was largely coarse to fine woody (with a little herbaceous) debris, including some large twigs and bark fragments, and a little sand and gravel. The plant material was generally very well preserved. A wide range of taxa was represented but perhaps the most distinctive component was material likely to have originated in stable manure or other litter. As well as the remains of bracken and various fruits and seeds from hay or straw, there were some salt-marsh plants: sea aster (*Aster tripolium* L.) and sea arrow-grass (*Triglochin maritima* L.), whose occurrence in deposits so far from the sea has, elsewhere, been ascribed to arrival in hay from salt-marsh (or the deposition of herbivore dung from animals fed in such a location). The site at Normanby is certainly much closer to estuarine salt-marsh than some others at which sea aster and sea arrow-grass have been recorded in occupation deposits.

Context 1114 [from brushwood platform]

Sample 36/T (2 kg sieved to 300 microns with washover; approximately 7 litres of sediment remain)

Moist, mid to dark grey-brown to black (internally – sulphide staining), brittle to crumbly (working soft and somewhat plastic), sandy silty clay to clay silt. Stones (2 to 60 mm), together with fragments of wood and twigs/roots were present.

There was a large residue of about 600 cm³ of which about 100 cm³ was sand and gravel (to 35 mm), the rest coarse to fine woody detritus, including many twigs (to 95 mm, including willow, *Salix*), and a few large fragments of bark and wood (to 50 and 105 mm respectively). Woody taxa were strongly represented, both by unidentified leaf abscission pads and leaf

fragments, but also by well-preserved ash (*Fraxinus excelsior* L.) fruits (keys) and buds/scales of hazel (*Corylus avellana* L.), oak (*Quercus*) and willow (*Salix*). These no doubt represent taxa growing close to the moat at this time and might be consistent deposition during the stage of abandonment rather than occupation. However, there was also some 'strawy' debris, a little charcoal, coal, a few charred cereals (actually quite a lot of rye, *Secale cereale* L. and bread/club wheat, *Triticum 'aestivo-compactum'*), and traces of seeds of hemp (*Cannabis*) and flax *Linum usitatissimum* L.), indicating the deposition of occupation debris into the moat and perhaps also use of this body of water for retting textile fibres. There was in addition a wide range of herbaceous taxa which probably grew in the vicinity—mainly weeds of various kinds (some of which may have arrived with straw) and plants of damp places with disturbed soils. The more abundant were stinging nettle (*Urtica dioica* L.) and various *Polygonum* spp. (*P. hydropiper* L., *P. lapathifolium* L. and *P. persicaria* L.) as well as fat hen (*Chenopodium album* L.). Preservation overall was often very good, with some blackening through deposition of iron sulphide, as might be expected in a waterlain deposit rich in organic debris of this kind.

Twig fragments from this sample—(probably mostly) willow (*Salix*), up to about 3 years old—were extracted for dating by AMS; they returned a date of cal. AD1410-1635 (Beta-181916), reasonably consistent with the dating from pottery.

Context 1154 [moat fill, South]

Sample 42/T (3 kg sieved to 300 microns with paraffin flotation; approximately 4 litres of sediment remain)

Moist, mid grey-brown to mid to dark grey to black, brittle to crumbly (working soft), slightly sandy silt. Wood fragments were present.

The moderately large residue of about 750 cm³ consisted of woody detritus—mainly wood (to 40 mm), including oak (*Quercus*), and also hazel (*Corylus*) roundwood, together with some sand and gravel. The seeds were mostly dark in colour, rich in iron sulphide; they were, not surprisingly, well preserved. A wide range of taxa was present as propagules or vegetative material, including bracken, gorse, flax seed and hemp seed, and there was a good variety of weeds likely to have originated in straw, and some in hay, and there were weeds of waste ground too. Other plants represented ditch habitats—both drying mud and standing water.

Context 3020 [moat fill (1st fill of recut, W moat)]

Sample 51/T (3 kg sieved to 300 microns with paraffin flotation, approximately 3 litres of sediment remain)

Just moist, mid grey-brown to black internally (oxidation/reduction/sulphide staining), brittle (working soft), clay silt. Traces of vivianite, ?mortar/plaster flecks, snail shell and wood fragments were present.

Much of the small residue of about 100 cm³ was taken up by a single ash roundwood fragment (to 100 x 25 mm). There was a little undisaggregated sediment, but the remainder consisted of woody fragments (some with vivianite) and a modest range of fruits and seeds, mostly not especially well preserved (although the aquatics were in a better state of preservation than those of terrestrial origin, as might be expected). Many of the same taxa seen in other moat fills were recorded, but the amounts were always small. They indicated various weed, woodland/scrub and aquatic plant communities.

Context 4003 [moat fill (upper fill of recut, N moat)]

Sample 27/T (3 kg sieved to 300 microns with paraffin flotation; approximately 4 litres of sediment remain)

Moist, mid grey-brown, brittle to crumbly (working soft), sandy silt. Stones (6 to 20 mm), traces of ?charcoal and ?mammal bone (some fragments burnt) were present.

The washover was about 100 cm³ in size. It had caused some iron-staining of the plastic container and sulphide-blackening of some fossils was noted. It consisted mainly of rather decayed woody and herbaceous detritus with the seeds mostly appearing rather eroded. Much of the washover comprised seeds of aquatic and waterside taxa and plants from woodland or scrub.

The small residue (dry weight 37 g) consisted almost entirely of sand, with a few fragments of bone. Preservation of the bone (1 g) was excellent, however, most fragments were tiny being less than 10 mm in maximum dimension. Ten fragments were amphibian bones which were rather rounded in appearance, and a small mammal tooth was also present. The remainder of the assemblage could not be identified.

PHASE 5 – 17TH TO 20TH CENTURY

Context 2006 [moat fill (2nd fill, E moat), redeposited]

Sample 8/T (3 kg sieved to 300 microns with paraffin flotation; approximately 4 litres of sediment remain)

Moist, mid to dark grey to mid to dark grey-brown, black internally (oxidation/reduction or sulphide staining), brittle to crumbly (working soft), slightly sandy silt. Twigs and nutshells (whole hazelnuts) and fragments of ?pot were present.

There was a moderately large residue of about 675 cm³, of which less than 50 cm³ comprised sand and a little gravel, the rest being rather granular woody debris, much of it wood fragments (to 25 mm, including wood chips) and large seeds (notably modest numbers of field maple, *Acer campestre* L., of which there were also some fruits, and seeds of hawthorn, *Crataegus monogyna* Jacq.). Much of the material was pale in colour and preservation was generally excellent. Other woody debris included twig fragments and remains from oak and ash, and there was woody and herbaceous material which may have originated in litter—bracken, gorse, and charred and uncharred grass/cereal straw. Other remains included a trace of hemp and a rather rich assemblage of other taxa, especially aquatics (abundant seeds of duckweed and water crowfoot, *Ranunculus* Subgenus *Batrachium* and some bur-reed, *Sparganium*), a very few weeds and some taxa likely to have grown in shaded places under or close to trees.

Hand-collected shell

Hand-collected shell with a total weight of just over six kilograms was recovered from 62 phased contexts. Most of the individual contexts gave small amounts of remains with only 14 yielding more than 100 g of shell. Preservation was somewhat variable (ranging from very poor to good) but predominantly poor. All of the material was assessed and the taxa identified as closely as possible. Table 6 gives the total number of fragments recorded by context and Table 7 summarises this information by phase.

The remains from almost all of the contexts were either exclusively or predominantly of oyster shell. Other edible marine taxa (cockle – *Cerastoderma edule* (L.), and mussel – *Mytilus edulis* L.) were occasionally present in small numbers.

The oyster shell was, on the whole, rather poorly preserved (though approximately 73% of the valves could still be identified as being either left or right valves). Only about 7% of the valves for which ‘side’ could be determined were measurable (measurements were not taken as part of this assessment). Evidence of the oysters having been opened using a knife or similar implement (as shown by ‘V’- or ‘W’-shaped notches on the shell margins) was noted on 10-12% of the valves. Up to 16% of the valves showed some fresh breakage presumably caused during recovery of the remains (some of the bags of shell from individual contexts also contained small flakes of shell showing that the valves had disintegrated further post-excavation). There was no evidence of damage to the valves (e.g. polychaet worm burrows, dog whelk holes) or encrustation (e.g. by barnacles) by other marine biota. Some of the valves showed signs of having grown in a cramped environment—shells were distorted and, in a few cases,

pairs of valves from different individuals had become wholly or partially fused.

The only recovered land snail remains were of a single individual of *Cepaea/Arianta* sp.

Hand-collected vertebrate remains

Vertebrate material was recovered from 117 deposits and amounted to 2367 fragments. Although a number of the deposits were described as unstratified, several of these (Contexts 1000 and 1113) were assigned to specific phases and material from these has been included under those particular phases. Bones from seven other deposits have been included in Table 8 under the heading of ‘unstratified’. Six of these assemblages (from Contexts 0, 1029, 3000, 3001, 4000 and 4002) were examined because they were recovered from the moat; no phasing information was available for Context 328, the remaining deposit. Bone was recovered from four of the five phases of activity identified at the site, with the bulk of the assemblage from Phases 3 and 4 (15th-16th century date). Details of the range of species, number of fragments, measurable bones and mandibles with teeth *in situ* by phase are presented in Tables 8 and 9.

Preservation of the vertebrate remains was generally rather good. Material from several deposits (Contexts 7, 17, 24, 32, 93, 155, 185, 279, 2011 and 2015) was described as being of either variable or poor preservation, and included fragments that were of battered appearance and, in one case (Context 185), [the bones] were quite eroded with pitted surfaces. Those deposits associated with the moat (mostly fills, of which some were unstratified) produced extremely well preserved bone which was invariably dark brown in colour; a characteristic of waterlogged deposits. The colour of the rest of the assemblage was either fawn or brown, some variability within a few contexts (Contexts 2, 7 and 40) was noted. These deposits may contain some residual or redeposited material. Damage caused during excavation and post-excavation processes was quite extensive, with fresh breakage noted on 20- 50% of the fragments from some deposits (Contexts 7, 13, 20, 51, 88, 99, 162, 203 and 1155). Evidence of butchery was largely restricted to cattle bones and included longitudinally split shaft fragments (e.g. from Context 114) and heavily chopped pelvises (e.g. from Contexts 137 and 153). Rodent gnawing was observed on a pig phalanx from Context 314, whilst another phalanx, also identified as pig, from Context 24 was very eroded as a result of acid etching. This bone probably derives from faecal material, but it is difficult to determine whether this was of human or animal origin. On the basis of the size of the fragment it is likely to represent dog faeces.

Remains of cattle were predominant, with the less numerous caprovid and pig bones represented in almost equal amounts. Horses were present, but less well represented. Small numbers of fragments of the minor domesticates, dogs and cats, were also recorded. Dog remains included a skull (Context 1155) with evidence for a depressed fracture in the frontal bone above the right eye. This had clearly occurred sometime prior to death as the bone had healed but on a slightly different alignment. The right hand side canine had also been broken before the animal died, as the remaining 'stump' showed evidence of wear. The rest of the teeth of this individual were well-worn. Eburnation, an arthropathy associated with osteoarthritis, was noted on the proximal articulation of a dog ulna from the same deposit. The dog bones (skull, radius, ulna and scapula) in this deposit are probably all from the same animal and represent an aged individual.

Wild species were represented by fallow deer (*Dama dama* (L.)) from several deposits (Contexts 40, 75, 114, 150 and 1155), mostly of 15/16th century date (Phases 3 and 4), whilst deposits of this date also produced hare and rabbit bones, the latter not appearing to be intrusive. A shed roe deer (*Capreolus capreolus* (L.)) antler fragment was identified from Context 1113. Bird remains were not particularly numerous and were mainly identified as chicken, with a few fragments of duck (*Anas* sp.) and goose (*Anser* sp.).

A preliminary examination of the representation of skeletal elements showed a preponderance of isolated teeth and mandibles for all the major domesticates. For cattle, metapodials and phalanges were also numerous, but, overall, a full range of elements were present. In contrast, caprovid remains showed an absence of phalanges and few metapodials, but there seemed to be a greater concentration of front limbs elements (i.e. scapulae, humeri and radii) and tibiae were also abundant. Similarly, for pigs, besides teeth and mandibles, humeri, radii and ulnae were the most commonly occurring bones. Isolated pig teeth included a number of canines, most of which represented males. Some of these canines were very large, particularly, two recovered from Contexts 3000 and 4000, the unstratified machine excavated moat deposits. A number of the post-cranial elements also represented large animals.

Discussion and statement of potential

Radiocarbon dates

Three of the radiocarbon dates obtained (from the bases of CS3 and CS7, and from twig fragments recovered from Context 1114, Sample 36 - the brushwood platform) were

broadly medieval and thus consistent with their representing the earliest fills of the moat (in the case of the column samples) and an associated deposit. The subsample from CS9 returned a much earlier, 4th-6th century, date. This subsample was taken from the uppermost 5 cm of CS9, the majority of the column being inorganic. From its position in the section (Section 57) it can be seen that this organic layer was located in the side of the moat (the base of which was some 20-25 cm deeper at this point). The most likely explanation for the early radiocarbon date is that the material represents the remains of an organic accumulation on an older land surface, significantly pre-dating the moat itself and subsequently cut by it.

Pollen

Other than in one sample from CS6, the state of pollen preservation in all the samples assessed as part of this report is described as moderate. With the exception of CS1, percentages of indeterminate grains do not increase above 20% TLP+indeterminate, suggesting that despite the presence of a clay/silt component in most of the sampled deposits, there has been little sediment re-working or re-deposition. Pollen concentrations tend to be relatively high, again apart from the sample from CS6.

Generally low values for trees and shrubs and high representation of other herbs point to the presence of a predominantly open, 'cultural' landscape around the moat during the period of sediment deposition represented by the sequences. The range of pollen taxa recorded in the samples tend to be very similar. The relatively high percentages of 'anthropogenic indicators' (*sensu* Behre 1981), and especially of Asteroideae (Lactuceae undiff.), in most of the sequences are notable. These taxa are low growing herbs typical of closely mown or grazed grassy places—the relatively high percentages for members of the dandelion tribe suggest that these were particularly significant taxa near to the moat. Lower, or

more sporadic, records of other herbs indicate that, amongst others, Asteroideae (daisies), *Rumex* spp. (docks), Apiaceae (carrot family), Ranunculaceae (buttercup family), Brassicaceae, Chenopodiaceae (fat hen) and *Plantago lanceolata*, were components of the vegetation around the sampling sites. Some of these herbs, such as species of Brassicaceae, Apiaceae, Ranunculaceae and Caryophyllaceae, may derive in whole or part from vegetation communities within the moat itself as well as from damp meadow or waste land in the wider environment. Despite these clear indications of a 'cultural' landscape, woodland consisting of oak, hazel, ash and elder was growing in close proximity to the moat. The last two taxa are typical of waste or woodland edge communities. Ash is generally a seral species occupying open, little disturbed and often base rich sites (Grime *et al.* 1988), and often increases following episodes of woodland clearance in pollen records from the East Riding of Yorkshire (Gearey and Lillie 1999: 118-119). Other components of the landscape mosaic might have included some dry, 'heathy' vegetation where heather and bracken were growing. The general picture, such as can be drawn from the current analyses, is of a mosaic of habitats around the moat, with well grazed pastoral and arable land likely as well as other disturbed or waste ground and some scrub woodland.

Perhaps most notable is the presence of Cereal-type pollen in the majority of the samples. The generally crumpled state of these grains precludes specific identification without recourse to more detailed analyses, but in many cases the morphological characteristics of the grains indicate the presence of *Avena-Triticum* Group as well as *Hordeum*-type which can include species of the wild grass *Glyceria* (floating sweet grass) as well as barley. The highest values are in Section 57 (CS8-9), implying that arable land may have been very near to this location or, as has been suggested above, that processing (or deposition of crop residue) near or in the moat might account for the elevated percentages. The impression of proximity to arable land is

reinforced by the presence of *Centaurea cyanus*, a weed strongly associated with cultivated areas, in many of the samples. In CS1, CS6 and CS8, representation of Cereal-type is lower in the top samples, whilst proportions of pollen types indicative of pastoral land use tend to be higher. This might reflect either a general shift in land use from arable to pastoral or a reduction in activities relating to arable agriculture on the site—the testing of this hypothesis would require further work.

Diatoms

Results of the diatom analyses indicate a generally low species richness, with diatom frustules being highly fragmented and degraded where present. Silica dissolution is a strong possibility given the 'peaty', acid environment and it is thus possible that robust species have remained intact whilst the more delicate species have been lost to taphonomic processes. The best preserved samples are from Section 7 (CS1-3) and would seem to represent a gradual increase in aquatic biomass associated with the stages of infilling and natural succession within the moat. Otherwise the general paucity of data throughout the samples indicates unquantifiable preservation problems and a likely bias in species representation.

Sediment samples

As indicated by the size and nature of the various fractions obtained through processing, the assemblages fell into two main types: small concentrations of mainly charred material (from deposits associated with the moat platform) and rich assemblages dominated by uncharred remains, mostly well preserved, from the fills of the moat itself. The latter often included frequent macrofossils from woody taxa, presumably trees growing close to the moat—including (rather unusually) field maple (*Acer campestre*), as well as ash (*Fraxinus excelsior*), oak

(*Quercus*), aspen/polar (*Populus*), and willow (*Salix*). Perhaps not surprisingly, woody taxa were well represented in the sample from Context 2006 from the stage of abandonment of the moated site. Aquatic taxa were (perhaps because of shading or intermittent drying of the moat) rather limited; the more frequent were duckweed (*Lemna*) and water-crowfoot (*Ranunculus* Subgenus *Batrachium*) but there seems to have been no very well-developed aquatic or aquatic-marginal flora at any stage except (again perhaps) at the time Context 2006 was deposited (when perhaps standing water was more persistent in the abandoned moat and despite the evidence for trees already mentioned).

However, there were also many indicators of disturbance in the form of weeds. Some, such as the biennial and perennial nitrophiles (especially stinging nettle, *Urtica dioica*—though this might also grow in fen-like habitats marginal to a large ditch—but also cow parsley, *Anthriscus sylvestris*, and hemlock, *Conium maculatum*). Other weeds are much more typical of strongly disturbed soils such as those produced by cultivation, and one group, weeds of cornfields (such as corncockle, *Agrostemma githago*, and corn marigold, *Chrysanthemum segetum*) might easily have arrived via straw or cereal grain used on the site (there was no very convincing evidence for the deposition of foul waste such as sewage into the moat to support an interpretation of the corncockle seed fragments present in many samples as having arrived in faeces via milled grain-based foods). That cereal straw was part of the material occasionally finding its way into the moat fills is attested by records for traces of charred and uncharred rachis ('ear-stalk') of rye (*Secale cereale* L.) and charred rachis of free-threshing wheat. Thatch is one strong possibility as a source, though there was no very high concentration of cereal straw as might result from the dumping of large quantities of thatching material. The records in several moat fill assemblages of a range of other taxa probably arriving as 'litter' of one kind or another—especially bracken

(*Pteridium aquilinum*)—perhaps indicates an origin in a byre or stable; again no very litter-rich deposits were observed. The traces of peatland taxa in some samples and vegetative material of gorse (*Ulex*) should perhaps be counted with these litter plants. The salt-marsh taxa (sea aster, *Aster tripolium*, and sea arrow-grass, *Triglochin maritima*) recorded in trace amounts from two Phase 3 contexts (1083 and 1154) are perhaps also part of the 'litter' component, arriving with herbivore dung or salt-marsh hay (the nearest salt-marsh habitats to the site might only have been about 3 km West of Normanby on the lower Trent estuary).

Remains of plants more certainly originating in human activity (apart from the cereal grains and chaff) were: hemp (*Cannabis sativa*) in four samples, linseed (*Linum usitatissimum*) in two, nutshell (hazel, *Corylus avellana*, in six samples, walnut, *Juglans regia* in one).

In general the invertebrate assemblages were characterised by insects and other invertebrates indicative of aquatic deposition (unsurprising given that most were from fills of the moat). Aquatic beetles and bugs were usually fairly common, though never present in huge numbers, and there were sometimes some chironomid midge larvae or caddis larval cases. However, ostracods and water fleas were noted in all the samples, sometimes in extremely large numbers. There was very little evidence via the invertebrates of submerged, floating, emergent or marginal vegetation, and water was not necessarily permanent. Beetles and bugs likely to have lived in litter or on mud by water were present in small numbers, though most may have lived in other habitats. There were a few species typically found on plants in damp places or near water, but most of the plant-associated insects were probably from stands of weeds on 'dry land', perhaps on the moat banks or in meadows beyond. The most frequently noted were various *Apion* species and *Sitona ?lineatus* (Linnaeus) (probably from clovers, *Trifolium*, or vetches, *Vicia* and its allies), and *Phyllotreta* spp., probably from crucifers.

There were a few individuals of nettle (*Urtica*) feeders, including the nettlebug *Heterogaster urticae* (Fabricius), here outside its 19th and early 20th century range (discussed by Kenward in press).

In contrast to the pollen and plant macrofossil evidence, there was little indication from the invertebrates of trees or shrubs, other than a few bark beetles (*Leperisinus varius* (Fabricius), which is almost always found in ash trunks). Woodworm (*Anobium punctatum* (Degeer)) was frequent, but as likely to have come from artificial structures as from dead wood on trees. Other species from terrestrial habitats were usually noted in modest numbers, and sometimes abundant.

Dung beetles were always present, and in some cases sufficiently numerous to hint that livestock grazed close by. Most samples had some, and some samples yielded many, synanthropic beetles (those favoured by artificial habitats). Among these, there were grain beetles (*Sitophilus granarius* (Linnaeus) and *Oryzaephilus surinamensis* (Linnaeus), and spider beetles (*Ptinus* sp. and, notably, *Tipnus unicolor* (Piller and Mitterpacher)). There was nothing from the insects to suggest that significant amounts of waste material had found its way into the moat, unless some of the weevils (e.g. *Apion* and *Sitona*) had been initially imported with hay (there was no positive evidence for this, however, and likely stored-hay species were very rare and house or stable floor fauna virtually absent).

Hand-collected shell

The recovered assemblage was rather small with most of the remains recovered from the main use phases of the site (Phases 2 to 4). The bias of the recovered shell towards edible marine shellfish, particularly oyster, suggests that this assemblage derives almost exclusively from human food waste. Only a rather small percentage (around 10%) of the oyster shells showed evidence of having been

opened using tools, but this is perhaps a reflection of the generally poor preservation.

From current evidence, the oysters could only have been imported to the site from the Kent, Essex or Suffolk coasts or the Firth of Clyde (Winder 1992 and pers. comm.). However, Kenward (1998) has speculated that exploitation of local (but as yet unlocated) oyster beds may well have been more widespread along the east coast of England. The distortion and whole or partial fusion of the valves of some of the recovered oyster shell was, perhaps, indicative of overcrowding in the bed(s). The lack of epibionts and (subjectively) small average size of the oyster remains suggests a poor environment and/or over-exploitation of this resource.

It seems likely that the small numbers of remains of other edible marine shellfish (cockle and mussel) were also derived from human food waste; these species are common off the coast of north eastern Britain today.

The only land snail remains were of a single *Cepaea/Arianta* sp (from Context 92) and of no interpretative value.

Hand-collected vertebrate remains

Vertebrate remains recovered from this site were generally well-preserved and mostly from deposits that could be tightly dated. Both butchery waste and domestic refuse were indicated, with the largest quantities of material from occupation deposits, floor surfaces and demolition deposits. Some of the moat fills also produced moderate assemblages of material. The relatively high frequency of pig remains (in comparison to the other two major domestic mammals, cattle and caprovids) is often used as an indicator of an affluent lifestyle, representing the conspicuous consumption of meat (Albarella and Davis 1996; Grant 1992). The presence of wild mammals, such as hare and fallow deer, within the recovered material also hints at high status occupation. These are likely to be

animals that were hunted, and fallow deer were usually kept in enclosed areas or 'parks' specifically for this purpose. During the medieval period, hunting tended to be restricted to the nobility, with laws limiting access to woodland and areas utilised for the pursuit of game.

Fish remains were recovered from seven of the samples, including several floor deposits and show potential for the recovery of a useful fish assemblage which could provide additional information regarding diet and also local supply networks.

Recommendations

Column samples – pollen and diatoms

Given the general lack of palaeoenvironmental sequences from this area of northern England which are intimately connected to archaeological sites and human activity, especially for the last two millennia, the analysis of any existing deposits has been identified as a priority for further palaeoenvironmental study (eg. Van de Noort and Ellis 1998, 1999, 2000; Kirby and Gearey 2001). In the rare instances that deposits of the kind excavated at Normanby have been analysed, they have produced detailed information regarding site environment and economy (Hayfield and Grieg 1990). The potential of the deposits assessed in this report for further palynological analyses should therefore be regarded as high. More detailed palynological analysis of at least one sequence from the moat is recommended. Ideally this would be the deepest organic deposit available (Section 7) and would be carried out in close conjunction with further plant macrofossil and palaeoentomological analyses and supported by radiocarbon dates. The potential for further diatom analyses is regarded as low and additional work is therefore not recommended.

Sediment samples

The processing of further samples specifically for plant macrofossil remains is probably not worthwhile, but a proper record should be made of selected assemblages from amongst those from the moat fills to provide corroborate evidence for both the insect assemblages and any further pollen analysis, and additional evidence (in the form of remains pointing to specific human activities). Plant material from any additional subsamples processed for insect remains should, however, be checked in case additional records can be made, given that data on plant remains from the medieval period in this part of the country are extremely sparse. Moreover, the data collected (plus any new ones) would sustain rather more interpretative investigation than has been possible in this assessment exercise.

The invertebrate fossils are sufficiently abundant and well preserved in most of the moat fills to make detailed analysis of at least some of these deposits worthwhile, although in some cases processing of a larger subsample is desirable. It should be possible to reconstruct conditions in the moat, and gain substantial insights into conditions in the immediate surroundings. Providing dating is sufficiently close it should be possible to detect change though time in the cut, and to detect changing input of terrestrial, especially synanthropic, insects.

Where sufficient insect remains are present in the assessed subsample, they are often very fragmented and it may be worthwhile to process a subsample from at least one of these to test whether this damage occurred in the laboratory or prior to this (e.g. through biological activity during deposit formation, as a result of the overburden of slag and through crushing by heavy machinery during its removal, or during sampling, transport and storage).

It would probably be worthwhile to allow a modest budget for processing and recording extra material during the main phase in case any significant invertebrate assemblages are too small or prove to be unusual. It should be

noted that some of the flots were composed of densely-packed particles, many of the same size as fossils, and these will be time-consuming to sort. The abundant ostracods in some samples might repay identification and provide evidence of the permanence of the water in the moat and its quality.

Shell

The small size and generally poor preservational condition of the hand-collected shell (with few measurable oyster valves) assemblage render any further study of little value.

Vertebrate remains

Most published high status medieval bone assemblages are from castles (e.g. Albarella and Davis 1994, Davis 1987, Jaques and Dobney 1996), with few being from rural manorial halls and farmsteads. This being the case, the vertebrate assemblage from Normanby warrants more detailed recording, which should include biometrical and age-at-death data.

In addition, the processing of further sediment samples for the retrieval of smaller bones, in particular a useful fish bone assemblage, would be desirable.

Retention and disposal

All of the current material should be retained pending further study.

Archive

All material is currently stored by Palaeoecology Research Services (Unit 8, Dabble Duck Industrial Estate, Shildon, County Durham), along with paper and

electronic records pertaining to the work described here.

Acknowledgements

The authors are grateful to Sophie Tibbles, Jeremy Bradley and Ken Steedman of Humber Field Archaeology for providing the material and the archaeological information.

References

- Albarella, U. and Davis, S. J. M. (1996). Mammals and birds from Launceston Castle, Cornwall: decline in status and the rise of agriculture. *Circaea, the Journal of the Association for Environmental Archaeology* **12** (1) (for 1994), 1-156.
- Behre, K. E. (1981). The interpretation of anthropogenic indicators in pollen diagrams. *Pollen et Spores* **23**, 225-243.
- Bennett, K. D., Whittington, G. and Edwards, K. J. (1994). Recent plant nomenclature changes and pollen morphology in the British Isles. *Quaternary Newsletter* **73**, 1-6.
- Davis, S. J. M. (1987). Prudhoe Castle, a report on the animal remains. *Ancient Monuments Laboratory Report* **162/87**. London.
- Dobney, K., Hall, A. R., Kenward, H. K. and Milles, A. (1992). A working classification of sample types for environmental archaeology. *Circaea, the Journal of the Association for Environmental Archaeology* **9** (for 1991), 24-6.
- Gearey, B. R. and Lillie, M. C. (1999). *Aspects of the Vegetational History of the Vale of York: palaeoenvironmental investigations at Askham Bog*, pp. 35-79 in Van de Noort, R. and Ellis, S. (eds), *Wetland Heritage of the Vale of York*. Hull: Humber Wetlands Project, University of Hull.
- Grant, A. (1992). Animal resources, pp. 149-187, in Astill, G. and Grant, A. (eds.), *The countryside of medieval England*. Oxford: Blackwell Press.
- Grime, J. P., Hodgson, J. G. and Hunt, R. (1988). *Comparative Plant Ecology*. London: Unwin Hyman.
- Hall, V. A. (1988). The role of harvesting techniques in

- the dispersal of pollen grains of *Cerealia*. *Pollen et Spores* **30**, 265-270.
- Hayfield, C. and Grieg, J. (1990). Excavation and salvage work on a moated site at Cowick, South Humberside, 1976, Pt.II: the finds assemblage. *Yorkshire Archaeological Journal* **62**, 111-124.
- Jaques, D. and Dobney, K. (1996). *Animal bone*, pp. 33-37 in Zeepvat, R. J. and Cooper-Reade, H., Excavations within the outer bailey of Hertford Castle. *Hertfordshire Archaeology* **12** (for 1994-96), 15-40.
- Kenward, H. (in press). Did insects from archaeological occupation sites track late Holocene climate in Northern England? *Environmental Archaeology*.
- Kenward, H. K. (1998). Invertebrates in archaeology in the north of England (unpublished draft).
- Kenward, H. and Large, F. (1998). Recording the preservational condition of archaeological insect fossils. *Environmental Archaeology* **2**, 49-60.
- Kenward, H. K., Hall, A. R. and Jones, A. K. G. (1980). A tested set of techniques for the extraction of plant and animal macrofossils from waterlogged archaeological deposits. *Science and Archaeology* **22**, 3-15.
- Kenward, H. K., Engleman, C., Robertson, A. and Large, F. (1986). Rapid scanning of urban archaeological deposits for insect remains. *Circaea* **3**, 163-172.
- Kirby, J. R. and Gearey, B. R. (2001). *Wetland and dryland vegetation dynamics in the Humber Lowlands*, pp. 41-68 in Atherden, M. A. (ed.), *Wetlands in the landscape: archaeology, conservation and heritage*. York: PLACE Research Centre.
- Krammer, K. and Lang-Bertlot, H. (1986). *Süßwasserflora von Mitteleuropa. Bacillariophyceae 1. Teil: Naviculaceae. Vol. 2/1*. Stuttgart: Gustav Fischer Verlag.
- Krammer, K. and Lang-Bertlot, H. (1988). *Süßwasserflora von Mitteleuropa. Bacillariophyceae 3. Teil: Centrales, Fragilariaceae, Eunatiaceae. Vol. 2/3*. Stuttgart: Gustav Fischer Verlag.
- Moore, P. D., Webb, J. A. and Collinson, M. E. (1991). *Pollen Analysis*. Second Edition. Oxford: Blackwell.
- Battarbee, R. W., Jones, V. J., Flower, R. J., Cameron, N. G., Bennion, H., Carvalho, L. and Juggins, S. (2001) *Chapter 8: Diatoms*, pp. 155-202 in Smol, P. and Birks, H. J. B. (eds), *Tracking Environmental Change Using Lake Sediments Vol. 3: Terrestrial, Algal, and Siliceous Indicators*. Dordrecht, The Netherlands: Kluwer Academic Publishers.
- Van de Noort, R. and Ellis, S. (eds.) (1999). *Wetland heritage of the Vale of York, an archaeological survey*. Hull: Humber Wetlands Project, University of Hull.
- Van de Noort, R. and Ellis, S. (eds.) (2000). *Wetland heritage of the Hull valley, an archaeological survey*. Hull: Humber Wetlands Project, University of Hull.
- Van de Noort, R. and Ellis, S. (eds.) (2001). *Wetland heritage of the Lincolnshire Marsh, an archaeological survey*. Hull: Humber Wetlands Project, University of Hull.
- Winder, J. M. (1992). *A study of the variation in oyster shells from archaeological sites and a discussion of oyster exploitation*. PhD. Thesis, University of Southampton, Department of Archaeology, 304 pp.

Table 1. Normanby Park, North Lincolnshire: location of pollen samples.

Section	Sequence	Sample depth (m)	Contexts
7	CS1	0.25	1013
	CS2	0.38	1014
	CS3	0.90	1029
26	CS4	0.20	2006
	CS5	Spot	2005
33	CS6	0.01	4003
	CS7	0.40	4016
57	CS8	0.05	3018
	CS9	0.50	3014

Table 2. Normanby Park, near Scunthorpe, North Lincolnshire: pollen records from the column samples (CS1-4 and CS6-9). TLP = Total Land Pollen. Figures are percentage of TLP excluding obligate aquatics and spores. Percentages for these excluded groups are calculated as percentage of the basic sum plus sum of the relevant group.

Taxa/Sample depth (m)	Section 7, CS1-3			Section 26, CS4		Section 6, CS 6 and 7		Section 57, CS 8 and 9	
	0.25	0.38	0.90	0.20	0.0	0.40	0.05	0.5	
<i>Betula</i>	0.0	0.8	2.2	0.0	1.1	2.6	2.9	4.9	
<i>Pinus</i>	0.0	0.0	0.0	0.9	2.1	0.0	0.7	0.0	
<i>Quercus</i>	17.4	6.1	24.6	17.4	4.2	30.9	9.4	6.3	
<i>Alnus</i>	0.9	0.8	1.4	0.0	0.0	0.7	0.0	1.4	
<i>Fraxinus</i>	0.9	0.0	2.2	8.7	0.0	1.3	3.6	3.5	
<i>Corlyus</i>	7.0	5.3	0.0	21.7	3.2	2.0	2.9	3.5	
<i>Salix</i>	0.0	6.1	0.0	1.7	0.0	1.3	0.7	0.7	
<i>Calluna</i>	6.1	9.2	2.2	0.9	3.2	1.3	1.4	0.0	
<i>Sambucus nigra</i> -type	0.0	0.0	5.8	0.0	0.0	0.0	2.2	6.3	
Poaceae	24.3	28.2	25.4	13.0	30.7	20.3	29.5	6.9	
Indet. Cereal-type	1.7	20.6	17.4	6.1	1.1	9.4	25.2	50.7	
Cyperaceae	4.3	1.5	0.7	0.0	9.1	0.0	0.7	0.7	
Apiaceae	3.5	0.8	0.7	1.7	4.5	6.3	4.3	1.4	
<i>Achillea</i> -type	0.0	0.8	0.0	0.0	0.0	0.8	0.7	0.7	
Brassicaceae	1.7	0.8	2.2	3.5	2.3	1.6	0.7	0.7	
<i>Centaurea cyanus</i> L.	0.0	2.3	2.9	0.0	1.1	1.6	0.7	1.4	
<i>C. nigra</i> -type	0.0	0.8	0.0	0.0	1.1	0.0	2.2	0.7	
Lactuceae	12.2	3.1	2.9	8.7	9.5	1.3	5.0	3.5	
Asteroideae	4.3	3.1	0.0	0.9	1.1	0.7	0.7	0.0	
Caryophyllaceae	0.9	0.8	1.4	0.0	0.0	0.0	0.0	0.7	
Chenopodiaceae	6.1	3.1	0.7	0.9	1.1	1.3	0.0	0.7	
Fabaceae indet.	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
<i>Filipendula</i>	0.0	0.0	0.7	0.0	0.0	0.7	0.0	0.0	
<i>Plantago lanceolata</i> L.	0.9	0.8	0.0	6.1	4.2	0.0	1.4	0.7	
Rosaceae undif.	0.0	0.0	0.7	0.9	1.1	0.0	0.0	0.0	
Rubiaceae	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Ranunculaceae	1.7	0.8	0.7	1.7	1.1	0.0	0.7	2.1	
<i>Rumex</i>	0.9	0.0	2.2	0.9	0.0	0.7	1.4	0.0	
<i>R. obtusifolius</i> -type	3.5	3.8	2.9	2.6	0.0	1.3	0.7	2.1	
<i>Succisa</i>	0.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	
<i>Alisma</i> -type	0.0	0.0	0.0	0.0	0.8	0.0	0.0	0.0	
<i>Myriophyllum verticillatum</i> L.	0.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	
<i>Potamogeton</i> -type	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	
<i>Sparganium emersum</i> -type	0.9	0.0	0.0	5.0	24.0	0.0	0.0	0.0	
Pteropsida	1.6	0.7	0.0	0.0	0.0	0.0	0.0	0.0	
<i>Pteridium aquilinum</i> L. (Kuhn)	4.7	2.2	0.7	1.7	14.7	3.3	0.0	0.0	
<i>Sphagnum</i>	2.4	2.2	0.7	0.8	2.3	0.7	0.7	0.7	
Indeterminate	32.4	13.7	10.3	19.7	15.4	13.6	5.4	2.0	
TLP	115.0	131.0	138.0	115.0	95.0	152.0	139.0	144.0	
Concentration x1000 grains cm ⁻³	27.0	33.0	40.0	40.0	15.0	63.0	71.0	65.0	

Table 3. Normanby Park, near Scunthorpe, North Lincolnshire: summary pollen records from the column samples (CS1-4 and CS6-9) with terrestrial forms grouped as 'Trees', 'Shrubs' or 'Herbs'. TLP = Total Land Pollen. Figures are percentage of TLP excluding obligate aquatics and spores. Percentages for these excluded groups are calculated as percentage of the basic sum plus sum of the relevant group.

	Section 7, CS1-3			Section 26, CS4		Section 6, CS 6 and 7		Section 57, CS 8 and 9	
Taxa/Sample depth (m)	0.25	0.38	0.90	0.20	0.0	0.40	0.05	0.5	
Trees	19.1	7.6	30.4	27.0	7.4	35.5	16.5	16.0	
Shrubs	13.0	20.6	8.0	24.3	13.7	20.4	7.2	10.4	
Herbs	67.8	71.8	61.6	48.7	78.9	44.1	76.3	73.6	
Aquatics	0.9	0.8	0.0	5.0	26.4	0.0	0.0	2.0	
Spores	8.7	5.0	1.4	0.8	2.3	0.7	0.7	0.7	
Unidentified	32.4	13.7	10.3	19.7	15.4	13.6	5.4	2.0	
TLP	115.0	131.0	138.0	115.0	95.0	152.0	139.0	144.0	
Concentration x1000 grains cm ⁻³	27.0	33.0	40.0	40.0	15.0	63.0	71.0	65.0	

Table 4. Normanby Park, near Scunthorpe, North Lincolnshire: Diatom sample locations and species present.

Sequence	Depth (m)	Context	Species present
CS1	0.25	1013	<i>Achnanthes lanceolata</i> (Bréb.ex Kütz.) Grun. in Cleve & Grun.
			<i>Aulacoseira</i> spp.
			<i>Cyclotella stelligera</i> (Cleve & Grun. in Cleve) Van Heurck
			<i>Navicula</i> spp.
			<i>Nitzschia palea</i> (Kütz.) W Smith
			<i>Tabularia ventricosa</i> Kütz.
CS2	0.75	1016	<i>Achnanthes lanceolata</i> (Bréb.ex Kütz.) Grun. in Cleve & Grun.
			<i>Aulacoseira</i> spp.
			<i>Amphora ovalis</i> (Kütz.) Kütz.
			<i>Cyclotella stelligera</i> (Cleve & Grun. in Cleve) Van Heurck
			<i>Fragilaria</i> spp.
			<i>Gomphenema parvulum</i> (Kütz.) Kütz.
			<i>Navicula capitata</i> var. <i>capitata</i> Ehrenb.
			<i>Navicula</i> spp.
			<i>Nitzschia dissipata</i> (Kütz.) Grun.
			<i>Nitzschia palea</i> (Kütz.) W Smith
			<i>Stephanodiscus</i> spp.
CS3	1.14	1030	<i>Aulacoseira</i> spp.
			<i>Cyclotella stelligera</i> (Cleve & Grun. in Cleve) Van Heurck
			<i>Fragilaria</i> spp.
			<i>Navicula</i> spp.
			<i>Nitzschia dissipata</i> (Kütz.) Grun.
CS4	0.20	2006	<i>Aulacoseira</i> spp.
			<i>Fragilaria</i> spp.
			<i>Pinnularia</i> spp.
			<i>Tabularia ventricosa</i> Kütz.
CS5	Spot	2055	<i>Aulacoseira</i> spp.
			<i>Fragilaria</i> spp.
			<i>Pinnularia</i> spp.
			<i>Tabularia ventricosa</i> Kütz.
CS6	0.01	4003	Barren
CS7	0.40	4016	Barren
CS8	0.20	3018	<i>Amphora ovalis</i> (Kütz.) Kütz.
			<i>Fragilaria</i> spp.
			<i>Gomphonema</i> spp.
			<i>Navicula</i> spp.
			<i>Nitzschia dissipata</i> (Kütz.) Grun.
CS9	0.72	3023	<i>Achnanthes lanceolata</i> (Bréb.ex Kütz.) Grun. in Cleve & Grun.
			<i>Amphora ovalis</i> (Kütz.) Kütz.
			<i>Cocconeis pediculus</i> Ehrenb.
			<i>Fragilaria</i> spp.
			<i>Gomphenema</i> spp.
			<i>Navicula capitata</i> var. <i>capitata</i> Ehrenb.
			<i>Navicula</i> spp.

Table 5. Normanby Park, near Scunthorpe, North Lincolnshire: erosion and fragmentation data for insects recovered from the samples (following the scheme of Kenward and Large 1998). W – weak; D – distinct.

Context	Sample	Comment	Erosion		Fragmentation	
			range	mode/ strength	range	mode/ strength
271	44	Borderline for further recording - may require a larger subsample to be processed.	1.5-2.5	2.5 W	2.0-4.0	2.5 W
1014	61	Probably sufficient remains for further study. Synanthropic taxa more pronounced.	1.5-3.0	2.0 W	1.5-3.0	2.0 W
1016	1	Sufficient remains for further work - though rather fragmented.	1.5-2.5	2.0 W	2.0-4.0	2.5 W
1083	54	Abundant remains, sufficient for analysis. Subjectively more varied than other groups. Full recording of this sample would be a good starting point for analysis, to 'learn' the site fauna.	1.5-3.0	1.5 D	2.0-4.0	2.5 W
1114	36	Probably sufficient remains for analysis. Terrestrial component appears relatively varied.	1.5-3.0	2.0 W	1.5-4.0	2.5 W
1154	42	Probably sufficient remains for analysis. Terrestrial component appears relatively large.	1.5-2.5	2.0 W	2.0-3.5	2.5 W
1172	58	Probably sufficient remains for overall analysis but perhaps should also sort a larger subsample to increase the component of terrestrial, forms especially synanthropes?	1.5-3.5	2.0 W	1.5-3.5	2.5 W
2006	8	Sufficient remains recovered but very fragmented so perhaps process a new subsample very gently to test when fragmentation occurred.	1.5-2.5	2.0 W	1.5-5.0	2.5 W
3003	49	Not a rich assemblage, a larger subsample will need to be processed for analysis.	1.5-3.0	2.5 W	1.5-5.0	2.5 W
3020	51	Larger subsample needed; subjectively this assemblage had a larger aquatic component than most other samples, and perhaps less organic input?	1.5-2.5	2.0 W	2.0-5.0	2.5 W
4018	29	Sufficient remains for analysis, though often fragmented.	1.5-3.0	2.5 W	2.0-5.0	2.5 W

Table 6. Normanby Park, near Scunthorpe, North Lincolnshire: summary information for the hand-collected shell by context. A '?' before numbers indicates possible numbers (e.g. '3/?4 = definitely 3, possibly 4). Key: 'Cn' = Context number; - = unphased; u/s = unstratified; 'left' = number of left (or lower) valves; 'right' = number of right (or upper) valves; 'in' = number of valves of indeterminate side; 'meas' = estimated number of valves intact enough to be measured; 'e' = average erosion score for valves; 'f' = average fragmentation score for valves; 'kn' = number of valves showing damage characteristic of the oyster having been opened using a knife or similar implement; 'fr' = number of valves showing fresh breakage; 'wt (g)' = total weight of shell (in grammes).

Cn	Phase	Oyster valves								Notes	wt (g)
		left	right	in	meas	e	f	kn	fr		
000	u/s	5	4		?1	2	2	1/?2	1		110
2	5	3	6	9		3	3	2	2	+ shell flakes	89
7	5	13	19	22		3	3	4		+ shell flakes	318
14	4			3		3	3				9
16	4					-	-			1 cockle valve	5
17	4	1	4	1		3	2	?1			29
20	4	1		5		2	3	1	1	+ 1 Gryphaea fragment	54
22	4		1			2	1				7
23	4	11	7	7		3	2	?1/?2	5		195
27	4		1	1		3	3		?1		10
31	5			1		3	3				5
32	2	4	10	4	1/?2	1	2	1/?2	1		123
34	3b	5	2		?1	2	1	2	2	+ 1 mussel valve	75
35	4		2			3	2				19
40	4	56	61	45	7/?10	2	3	14	17	+ shell flakes + 4 cockle valves	1100
51	3a	1	1		?1	2	2		1		26
58	4	1				1	2	1			24
75	5	1	2		1	1	1	?1	2		30
79	4	1	1	1		1	2		1		19
87	4	2	1		1	2	2		1		35
88	4	24	16	10	3/?5	2	2	6	7	+ 7 cockle valves + 1 mussel valve	421
92	4					-	-			1 <i>Cepaea/Arianta</i> in fragments	1
99	4	2	1		1/?2	2	1	1			46
114	3	3	5	14		2	3	?1	2	+ 1 bone fragment	134
115	3	3		1		2	3		1		29
116	4	1			1	2	1		?1		17
117	3a		1			2	1				11
130	4	2	2	2		2	2		2		42
133	3b	3	3		2	1	1	2			48
137	4	4	5	3		3	2	3		?burnt	54
139	3b	13	8	4		2	2	?2	8	+ 2 mussel valves	215
140	4			2		2	3				13
146	4	1				2	1		1		11
149	3			3		2	3				15
153	3	9	4	2	1/?2	3	3	2	5	+ shell flakes	126
155	3	1	1	1		3	1		1		22
162	3	20	14	20	?1	2	3	4/?6	8	+shell flakes + 2 cockle valves + 1 mussel valve	386
182	2	14	24	15	6	1	3	11	7		252
185	3			2		3	3				5
190	2	61	62	36	8	2	2	16	29	+ shell flakes + 1 Gyphaea fragment + 1 stone (rem.)	1000
194	2	5	8	3	?1	2	2	2	5	2 left valves fused	94
197	3	1			1	1	1	?1	1		9
198	2	3			1/?2	1	2	0	2		71

Cn	Phase	Oyster valves								Notes	wt (g)
		left	right	in	meas	e	f	kn	fr		
203	2	2	3	1	2/?3	2	1		2		40
223	2					-	-			2 cockle valves	6
260	3	1		1		3	2				10
281	4		1			2	3				5
288	3		1	1		1	3		1		8
292	3		1			1	3		1		8
314	4	1				3	1	1			8
1000	-					-	-			1 mussel valve	7
1032	-	1				2	2	1			13
1034	3	2	1		1	2	2	1	1		27
1113	3	2				1	2	2			32
1114	3	4	1		?1/?2	2	2	?1	3		55
1126	4	1				1	2		1		9
1127	4	2	1		1/?2	1	2	?1	1		26
1149	3	2				1	2	1	1		12
1155	3	7	3	4		2	2	1/?2	2	2 left valves fused	124
2006	5	1			?1	1	1		1		11
2029	2		1		?1	1	1				7
3000	-	1	1			1	2	1	1		15
3001	-	1			1	1	1	1	1		48
3014	5		1		?1	2	1				6
3022	3		1		?1	3	1	1			11
3023	3		2			1	3	1	1		13
3031	4		1	1		1	3		1		10
4000	-	7	13	6	4	1	2	4	5	+ shell flakes + 1 mussel valve	225
4001	-		2		?1	1	2	1			17
		310	310	231	43/?66			89/?104	136/?138		6057

Table 7. Normanby Park, near Scunthorpe, North Lincolnshire: summary information for the hand-collected shell by phase. Phase 3 includes sub-phases 3a and 3b. A '?' before numbers indicates possible numbers (e.g. '3/?4' = definitely 3, possibly 4). Key: '-' = unstratified or unphased; 'NC' = number of contexts; 'left' = number of left (or lower) valves; 'right' = number of right (or upper) valves; 'in' = number of valves of indeterminate side; 'meas' = estimated number of valves intact enough to be measured; 'Av e' = average erosion score for valves; 'Av f' = average fragmentation score for valves; 'kn' = number of valves showing damage characteristic of the oyster having been opened using a knife or similar implement; 'fr' = number of valves showing fresh breakage; 'wt' = total weight of shell (in grammes).

Phase	Oyster valves									Other taxa	wt (g)
	NC	left	right	in	meas	Av e	Av f	kn	fr		
-	7	15	20	6	5/?7	1(.3)	1(.8)	9/?10	8	1 mussel valve	435
2	8	89	108	59	18/?23	1(.4)	1(.9)	30/?31	46	2 cockle valves	1593
3	23	77	51	53	5/?12	1(.8)	2(.1)	17/?25	39	4 mussel valves 2 cockle valves	1401
4	25	111	105	81	14/?21	2(.1)	2(.2)	27/?31	38/?40	1 mussel valve 12 cockle valves 1 <i>Cepaea/Arianta</i>	2169
5	6	18	28	32	1/?3	2(.2)	2(.0)	6/?7	5		459
	69	310	312	231	43/?66			89/?104	136/?138		6057

Table 8. Normanby Park, near Scunthorpe, North Lincolnshire: hand-collected vertebrate remains.

Species		2	3	4	5	u/s	Total
<i>Oryctolagus cuniculus</i> (L.)	rabbit	-	2	3	1	-	6
<i>Lepus</i> sp.	hare	-	-	4	-	-	4
Canid	dog family	-	1	-	-	-	1
<i>Canis</i> f. domestic	dog	-	9	1	-	-	10
<i>Meles meles</i> (L.)	badger	1	-	-	-	-	1
<i>Felis</i> f. domestic	cat	-	1	1	1	-	3
<i>Equus</i> f. domestic	horse	1	2	8	6	1	18
<i>Sus</i> f. domestic	pig	7	43	42	22	6	120
cf. <i>Sus</i> f. domestic	?pig	1	-	-	-	-	1
Cervid	deer	-	-	1	1	-	2
<i>Dama dama</i> (L.)	fallow deer	-	2	6	1	-	9
cf. <i>Dama dama</i> (L.)	?fallow deer	-	1	-	-	1	2
<i>Capreolus capreolus</i> (L.)	roe deer	-	1	-	-	-	1
<i>Bos</i> f. domestic	cattle	10	127	161	57	26	381
Caprovid	sheep/goat	9	45	54	24	15	147
<i>Anser</i> sp.	goose	-	1	-	2	-	3
<i>Anas</i> sp.	duck	-	2	-	2	-	4
<i>Gallus</i> f. domestic	chicken	2	9	-	2	-	13
<i>Sub-total</i>		<i>31</i>	<i>246</i>	<i>281</i>	<i>119</i>	<i>49</i>	<i>726</i>
Unidentified bird	bird	1	2	-	-	-	3
Unidentified fish	fish	-	2	1	-	-	3
Unidentified	unid	75	540	672	233	115	1635
<i>Sub-total</i>		<i>76</i>	<i>544</i>	<i>673</i>	<i>233</i>	<i>115</i>	<i>1641</i>
Total		107	790	954	352	164	2367

Table 9. Normanby Park, near Scunthorpe, North Lincolnshire: summary of the number of bone fragments (Fragments), mandibles with teeth in situ (Mandibles) and measurable bones (Measurables) by phase. Key: u/s = unstratified.

Phase	Fragments	Mandibles	Measurables
2	107	0	7
3	790	10	48
4	954	17	58
5	352	6	22
u/s	164	5	10
Total	2367	38	145

Table 10: Normanby Park, near Scunthorpe, North Lincolnshire: results from radiocarbon dating. Key: 'Date' = the 2-sigma calibrated radiocarbon date.

Column sample	Sample depth (in column tin)	Context number	Sample number	Material	Weight	Dating method	Laboratory number	Date
CS3	0.45-0.50 m	1031	n/a	plant fragments	108 mg	AMS	Beta-181917	AD 1185 to 1285
CS7	0.45-0.50 m	4033	n/a	plant fragments	2 g	AMS	Beta-183169	AD 1300 to 1420
CS9	0.00-0.05 m	3022	n/a	organic sediment	420 g	radiometric (priority)	Beta-188736	AD 340 to 550
n/a	n/a	1114	36	<i>Salix</i> twig fragments of up to about 3 years old	13 g	radiometric	Beta-181916	AD 1410 to 1635

Appendix

Potential for micromorphological analysis of deposits at Normanby Park, near Scunthorpe, North Lincolnshire

A site visit was made on 2 July, 2003 for the purpose of assessing the potential of the deposits at Normanby for micromorphological analysis. The local soils are brown sands of the Newport Association, gleyic brown calcareous earths of the Aswarby Association and disturbed soils related to the 19th and 20th century ironstone workings (Soils Survey of England and Wales). The drift geology is till. The excavator had a number of site-specific questions to be addressed, and accordingly five samples were taken from a range of deposits.

Sample 1 was taken from Context 2005, a possible turf line beneath material forming a bank (Context 2004) on the east side of the moat, with the purpose of identifying any pedological (soil forming) features which might suggest that Context 2005 was a buried soil rather than a layer of upcast forming part of the bank. It was a mid grey-brown loamy sand which had been disturbed by 19th century tree roots. This deposit is likely to have been subject to an influx of fine particles deriving from the bank above, which will make it difficult or impossible to identify disturbance pre-dating the construction of the bank. Soil micromorphology may, nevertheless, identify biological activity and the input of anthropogenic materials into the deposit.

Samples 2 and 3 were recovered from a dark silt loam (Context 2) which covered most of the southern part of the site. This deposit was sealed beneath the early 20th century slag heap and its formation process is unknown. The samples were taken in two locations across the boundary of Context 2 and the layers below. Sample 2 included a few centimetres of a slightly sandy, mottled grey-green clay which underlay Context 2; the boundary between the two layers being fairly distinct. Sample 3 included Context 6 which was slightly greener in colour than Context 2, with yellowish mottles and contained more frequent inclusions. The boundary between these two contexts was diffuse, suggesting that the layers developed as soil horizons or that biological activity had blurred the boundary. A further sample (Sample 4) was taken from Context 30, a dark brown silt loam in the northern part of the site which was similar to Context 2 and, which may be the same deposit. Context 30 was more compacted, but may have been originally formed by the same processes. Thin section micromorphology may identify the formation processes, including biological activity. Post-depositional changes such as the influx of iron from the slag heap above, burning from the heat of the dumped slag and changes brought about through seasonal flooding of the site may also be identified by this type of analysis.

The final sample, Sample 5, was taken from Context 150, a deposit which may be associated with a hearth in the northern part of the site. The stratigraphic relationship between this deposit and the possible hearth could not be clearly established, but micromorphological analysis of the sample may provide evidence such as charcoal and/or other burnt material which link the deposit to the hearth or demonstrate that the feature was in fact a hearth. Disturbance of this deposit by possible root action was noted; this was a feature of all the deposits that were sampled.